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Electricity Markets—Recent Issues in Market Structure and Energy Trading

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Summary

Electricity today is widely viewed as a commodity. As a commodity, electricity is bought and sold as power (measured in kiloWatts or MegaWatts) and energy (measured in kiloWatt-hours), with various attributes being traded in electricity markets. The importance of transparency in wholesale electricity markets was underscored by the Energy Policy Act of 2005 (P.L. 109-58), which aimed to facilitate price transparency in interstate markets for the sale and transmission of electric energy, and to prohibit energy market manipulation.

Regional Transmission Organizations (RTOs) are regional entities authorized by the Federal Energy Regulatory Commission (FERC) to administer the electricity transmission grid. RTOs use various types of markets to serve end-use customer needs, and to make operational decisions. Over time, each RTO market has developed its own regulations or variations thereof, all under FERC's regulatory jurisdiction. However, these regulations and rules appear to be increasing in complexity, as the markets are revised to adjust for operational issues and regional differences. Electricity market issues can be usually separated into two categories—manipulation by market participants or RTO market structural issues.

Capacity markets and Forward Capacity markets are two RTO topics often debated. Capacity markets have come under fire in some areas where they are used, as brownouts or blackouts have still occurred in unusually high demand periods. In other RTOs without formal capacity markets, the question has been whether the additional cost is justified by the perceived benefits. Several RTOs use Forward Capacity markets to provide some degree of certainty that there will be adequate capacity to serve future load demand and meet system reserve needs. However, there has been considerable debate on whether Forward Capacity markets work since high load pockets continue to persist in some RTO regions.

RTO markets have enabled a variety of products and services including derivatives and hedges for market participants, ostensibly to reduce risks from volatile prices. Financial instruments were added to RTO markets essentially to increase liquidity. It could be reasonably argued that a drive to increase liquidity has also led to the addition of financial instruments, which ostensibly act to encourage speculation in the electricity markets. With the California (or Western) energy crisis of 2000 to 2001, the susceptibility of electricity markets to manipulation became evident. Enron and its affiliates were principally found liable for "engaging in various gaming and market manipulation schemes." FERC continues to investigate allegations of energy market manipulation, with several recent cases ending in prominent settlements.

The Dodd-Frank Wall Street Reform and Consumer Protection Act (DFA or Dodd-Frank, P.L. 111-203) was passed largely as a response to the recent U.S. financial crisis. DFA initiated a number of reforms intended to strengthen oversight of the U.S. financial sector. Dodd-Frank addresses issues related to market manipulation from fraud, stating that "specific intent" or "recklessness" would trigger a rules violation. FERC for its part states that its focus is on anti-competitive "conduct that threatens market transparency." Some might argue that the recent spate of settlements at FERC leads to a lack of clarity about what constitutes market manipulation, and what does not.

The electricity industry is entering a time of change, and electricity markets are evolving with the industry. The expected retirement of many coal-fired power plants can affect RTO markets as generator portfolios change to include more natural gas-fired plants, and the prices that this new generation is expected to command. With load growth stagnant in many regions, the pull towards a greater use of hedging and more liquid markets may increase as the need to decrease costs and stabilize revenues increases. Congress may choose to consider whether to change how RTO

electricity markets are regulated and operated (i.e., through some standardization of these markets or elements in these markets), with an eye towards improving efficiency, and increasing regulatory clarity and transparency, lowering costs, and thus potentially reducing opportunities for fraud or market manipulation.

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Introduction

Electricity today is widely viewed as a commodity.[1] As a commodity, electricity is bought and sold as both power[2] and energy,[3] with various attributes being traded in electricity markets. However, electricity has some unique characteristics which distinguish it from almost all other commodities. Electricity must be available upon demand, is rarely stored in bulk, and is generally consumed as soon as it is produced. And since electricity must be available at the flick of a switch, the power industry has developed over the last century to satisfy goals for availability[4] and system reliability.[5] Electricity prices vary by region across the United States based on supply and demand factors which are largely influenced by the cost of fuels, power generation technologies and infrastructure, and trends in the weather.

Electricity is at the base of much of the economic activity in the United States, and regulators of the electricity industry generally seek to ensure that electric power is provided at as low a cost as possible. Electricity was thus considered as essentially a service until the passage of the Energy Policy Act of 1992 (P.L. 102-486; EPACT) introduced a new class of power producers called "exempt wholesale generators"[6] whose primary business was the production of wholesale[7] electricity.

The importance of transparency in wholesale electricity markets was underscored by the Energy Policy Act of 2005 (EPACT05; P.L. 109-58) where under Subtitle G Section 1281, the Federal Energy Regulatory Commission (FERC or the Commission) was directed to facilitate price transparency in interstate markets for the sale and transmission of electric energy "having due regard for the public interest, the integrity of those markets, fair competition, and the protection of consumers."[8]

EPACT05 further prohibited energy market manipulation under Subtitle G Section 1283.

> It shall be unlawful for any entity (including an entity described in section 201(f)), directly or indirectly, to use or employ, in connection with the purchase or sale of electric energy or the purchase or sale of transmission services subject to the jurisdiction of the Commission, any manipulative or deceptive device or contrivance (as those terms are used in section 10(b) of the Securities Exchange Act of 1934 (15 U.S.C. 78j(b))), in

[1] A commodity is an economic good, or a product available for shipment as a mass-produced, unspecialized product. See http://www.merriam-webster.com/dictionary/commodity.

[2] Power is the rate of producing, transferring, or using electricity. Power is measured in Watts and often expressed in kiloWatts (kW) or MegaWatts (MW). A power plant's capacity (i.e., the maximum output of power generating equipment) is commonly expressed in MW.

[3] Electrical energy is the ability of an electric current to produce work, heat, light, or other forms of energy. It is measured in kiloWatt-hours (kWh). See http://www.eia.gov/tools/glossary/index.cfm?id=E.

[4] The amount of time an electrical generator is generating or available to generate, as a fraction of the total time the generator is in commercial service. See http://www.ferc.gov/market-oversight/guide/glossary.asp#R.

[5] The Energy Policy Act of 2005 (P.L. 109-58) (EPACT05) required reliability standards for the bulk electric power system which would be mandatory and enforceable.

[6] "Exempt Wholesale Generators" (EWGs) are exempt from certain financial and legal restrictions stipulated in the Public Utilities Holding Company Act of 1935 (15 U.S.C. §79). EWG status is available to any generator of electricity that is exclusively in the business of owning and/or operating electric generation facilities for the sale of electricity to wholesale customers.

[7] Wholesale (or Resale) sales are electricity sold to other electric utilities or to public authorities for sale to an ultimate consumer.

[8] 16 U.S.C. §824t.

> contravention of such rules and regulations as the Commission may prescribe as necessary or appropriate in the public interest or for the protection of electric ratepayers.[9]

Competitive electricity markets have enabled a variety of wholesale electricity products and services to facilitate the sale and transmission of power. Services have also arisen to provide transaction flexibility, and to manage (or hedge) the risks of various transactions. But with the California (or Western) energy crisis of 2000 to 2001, the susceptibility of electricity markets to manipulation became evident.[10] Enron and its affiliates were principally found liable for "engaging in various gaming and market manipulation schemes," with an initial decision ordering the disgorgement of $1.6 billion in unjust profits.[11]

FERC continues to investigate allegations of energy market manipulation in FY2015, with the Commission's Office of Enforcement focusing on fraud and conduct that threatens the transparency of regulated markets:

> [S]taff opened 19 new investigations and brought 22 pending investigations to closure with settlement or no action. Staff obtained settlements resulting in almost $26.25 million in civil penalties and disgorgement of $1 million in unjust profits. All settlements included reporting requirements and provisions requiring the subjects to enhance compliance programs.... Enforcement also tried an anti-manipulation case before an agency Administrative Law Judge and filed three new petitions in federal district court to enforce Commission orders assessing civil penalties. Including those four matters, staff is seeking to recover more than a half-billion dollars in civil penalties and disgorgement through district court and administrative litigation.[12]

Questions for Congress may include whether current laws and regulations prohibiting energy market manipulation sufficiently protect the public interest, or whether, given the multiplicity of financial and physical transactions that exist (and the increasing convergence of these and other transactions in electricity markets), whether more regulatory oversight is needed.

The broader issue of whether the wholesale electricity markets administered by Regional Transmission Organizations (RTOs) are currently resulting in greater efficiency, and thus providing cost savings to customers, is not intended to be a major focus of this report.

Background

The power generation industry in its early stages was geared towards serving the needs of industrial manufacturers, building steam-driven power plants to operate machinery. However, in the early part of the last century, companies specializing in electric power generation developed. Economies of scale for this new industry began to emerge with privately owned, vertically integrated electric utility companies (i.e., those which generated power, and were engaged in the transmission and distribution of electricity). With demand for electricity increasing, electric utilities grew to serve the needs of whole towns and cities. State regulation of electric utilities

[9] 16 U.S.C. §824v.

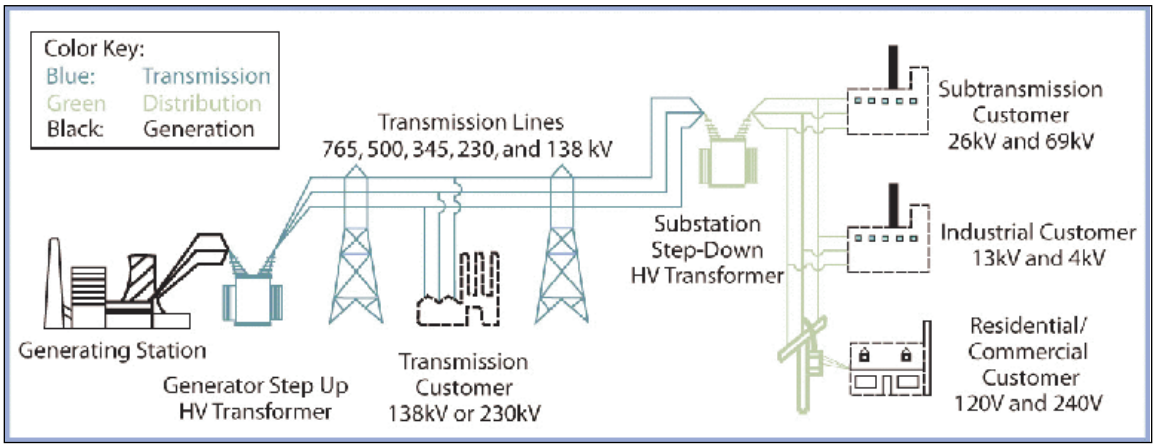
[10] California suffered through a series of electricity shortages caused mainly by market manipulation to decrease energy supplies and drive up electricity prices. See Staff Report, *Price Manipulation in Western Markets*, Federal Energy Regulatory Commission, Docket No. PA02-2-000, March 26, 2003, http://www.ferc.gov/legal/maj-ord-reg/land-docs/Gelinas_at_a_glance2.pdf.

[11] See 119 FERC ¶ 63,013 (2007) at http://www.ferc.gov/industries/electric/indus-act/wec/gaming-initial-decision.pdf.

[12] Federal Energy Regulatory Commission - Office of Enforcement, *FERC Releases 2015 Report on Enforcement*, November 19, 2015, http://www.ferc.gov/media/news-releases/2015/2015-4/11-19-15-A-3.asp.

also began in these early days as companies were granted exclusive service territories in exchange for an obligation to serve all electricity customers within that territory.[13]

Figure 1. Electric Power System Elements



Source: U.S.-Canada Power System Outage Task Force, Final Report on the August 14, 2003 Blackout in the United States and Canada: Causes and Recommendations, April 2004, p. 5, https://reports.energy.gov/BlackoutFinal-Web.pdf.

Figure 1 Figure 1. illustrates the components of an electric power system. While as of 2007, about 15% of electricity customers were served by public power systems,[14] another 13% were served by rural electric cooperatives,[15] and approximately 68% of electricity customers were served by investor-owned electric utilities[16] (IOUs). Power marketers served the remaining 4%[17] of electricity customers. IOUs are largely vertically integrated companies that own approximately 40% of power generation capacity in the electric power sector, while many public power entities and electric cooperatives are "distribution-only" utilities, owning 10% and 4%, respectively, of power generation facilities.[18] As distribution utilities, they sell power directly to retail (end-use) customers.

Regulation of the Electric Power Industry

Electric utilities in many states operate under what is called the "traditional model," with rates for electricity established by a state regulatory body based on the utility's cost of providing electric power to customers, e.g., its cost-of-service.[19] Under this model (which is also called the

[13] U.S. Energy Information Administration, *The Changing Structure of the Electric Power Industry 2000: An Update—Historical Overview of the Electric Power Industry*, http://www.eia.gov/cneaf/electricity/chg_stru_update/chapter2.html#N_1_.

[14] Public power systems (such as municipal electric utilities) are nonprofit government entities that are organized at either the local or state level.

[15] A rural electric cooperative is an electric company owned by the property owners of the rural area it serves.

[16] An investor-owned utility is an electric company owned by stockholders.

[17] See http://www.publicpower.org/files/PDFs/51HometownPowerFlyer.pdf.

[18] U.S. Energy Information Administration, *Electric Power Industry Overview 2007*, http://www.eia.gov/cneaf/electricity/page/prim2/toc2.html.

[19] "Cost-of-service" is a ratemaking concept used for the design and development of rate schedules to ensure that the filed rate schedules recover only the cost of providing the electric service at issue. This concept attempts to correlate the utility's costs and revenue with the service provided to each of the various customer classes. See

Regulatory Compact), a utility is recognized as having a "natural monopoly" in a service territory in exchange for an obligation to serve all electricity customers in that territory. A state public service commission or public utility commission (both hereinafter referred to as "PUC") oversees those utility operations which affect the public interest. Among various functions, PUCs in this regulatory model review and authorize the design of rates for service by which customers are billed for electricity consumption, authorize and allow the costs of new power plants to be recovered in rates, and provide for utility acquisition of rights-of-way[20] and construction of power transmission and distribution lines and related facilities.

Much of the Federal Energy Regulatory Commission's (FERC's) authority in these areas is derived from the Federal Power Act[21] (FPA) wherein FERC's duty to ensure that electric power rates are "reasonable, nondiscriminatory, and just to the consumer"[22] is defined. Thus, FERC has authority over the sale and transmission of wholesale[23] power, interstate transmission siting and investment, the reliability of the bulk power system, utility mergers and acquisitions, and certain utility corporate transactions.[24] Under the FPA, it is FERC's responsibility to oversee wholesale power transactions with regard to the prices, terms, and conditions of these transactions.

The Public Utility Regulatory Policies Act of 1978 (PURPA; P.L. 95-617) allows non-governmental entities (i.e., qualifying facilities)[25] authorized by federal law to generate and sell electric power. PURPA required utilities to buy power from qualifying facilities at the utility's own "avoided cost"[26] of power production. With the viability of non-utility generation established by PURPA, EPACT (under Title VII, Subtitle A) essentially launched the independent power industry by giving FERC authority to grant access to the transmission system on request for Electric Wholesale Generators, which were allowed to sell power in wholesale markets.[27]

Dissatisfaction with high electricity rates led some states to drop traditional regulation in favor of competition as a way to bring down prices. The passage of EPACT and PURPA allowed entities other than electric utilities to build power plants and generate electricity. Deregulation (or liberalization) in other industrial sectors had shown how new services and price options for end-use customers might be spurred by providers competing for retail customers. A number of states in high electricity cost regions also chose to implement retail competition, aiming to replace

http://www.eia.gov/tools/glossary/index.cfm.

[20] "The land and legal right to use and service the land along which a transmission line is located. Transmission line right-of-way is usually acquired in widths that vary with the kilovolt (kV) size of the line." See EIA Glossary at http://www.eia.gov/tools/glossary/index.cfm?id=r.

[21] 16 U.S.C. 791 et seq.

[22] 16 U.S.C. §§813.

[23] "[Wholesale sales are] energy supplied to other electric utilities, cooperatives, municipals, and Federal and state electric agencies for resale to ultimate consumers." See http://www.eia.gov/tools/glossary/index.cfm.

[24] Federal Energy Regulatory Commission, *Overview of FERC*, April 9, 2012, http://www.ferc.gov/about/overview.asp.

[25] Qualifying facilities (QFs) under PURPA include both "small power" production facilities that generate less than 80 megawatts using solar, wind, geothermal, biomass, or waste, and "cogeneration" facilities (with no size limitation) which sequentially produce electric power and thermal energy for a useful application. QFs must meet certain ownership, operating, and efficiency criteria established by FERC pursuant to PURPA.

[26] The incremental cost that a utility would have to pay if the utility purchased or generated the electricity itself, as determined by a regulatory process under state jurisdiction.

[27] 15 U.S.C. 79, §79z-5a.

traditional regulation with markets wherein electricity prices were more reflective of the marginal costs[28] of electricity production.

EPACT opened wholesale electricity markets to competition by allowing wholesale buyers to purchase electricity from any generator, requiring transmission line owners to transport (or "wheel") power for other generators and purchasers of wholesale power at "just and reasonable" rates. The next step was to ensure that these transactions could take place as efficiently as possible, and momentum for allowing access to the transmission grid for all users was realized with the issuance of FERC Order 888[29] in 1996. The order required electricity transmission owners to allow open, non-discriminatory access to their transmission systems, thus promoting wholesale competition. Order 888 also required vertically integrated utilities to "functionally unbundle" their transmission and generation functions,[30] with the intent of ensured nondiscriminatory access to transmission to enhance competitive wholesale markets. FERC Order 889[31] followed to provide for posting information on available transmission capacity, and establish rules governing the "Open Access Same-time Information System" (OASIS), with standards of conduct for the use and access to OASIS.[32]

Both state and federal regulators seek to assure that no generator (or group of generators) can exercise "market power."[33] FERC defines market power as "[t]he ability of any market participant with a large market share to significantly control or affect price by withholding production from the market, limiting service availability, or reducing purchases."[34] It should be noted that the exercise of market power is differentiated from simply having market power, since a harm (i.e., artificially high electricity rates) does not result to electricity consumers without the exercise of market power.[35]

Development of Markets

In the early years of the last century, electric utility companies quickly realized that they could reduce costs and enhance reliability by interconnecting with one another, thus sharing generation

[28] "Marginal cost: The change in cost associated with a unit change in quantity supplied or produced." See http://www.eia.gov/tools/glossary/index.cfm.

[29] 75 FERC ¶ 61,080.

[30] "Functional unbundling is achieved when a company's organizational structure separates operation of and access to the transmission system from power generation. To comply with functional unbundling, electric utilities created an open access transmission tariff, established separate rates for wholesale generation, transmission, and ancillary services, and established an electronic information network that supplies information on the availability of transmission capacity to customers." See http://www.eia.gov/cneaf/electricity/chg_stru_update/chapter9.html.

[31] 75 FERC ¶ 61,078.

[32] See http://www.ferc.gov/legal/maj-ord-reg/land-docs/order889.asp.

[33] "Each firm would want to produce whatever quantity it decides to sell in the most efficient way possible, but a firm exercising market power will restrict its output so that its marginal cost is below price (and equal to its marginal revenue), while other firms that are price-takers will produce units of output for which their marginal cost is virtually equal to price. Thus, there will be inefficient production on a market-wide basis: the same quantity could be produced more efficiently if the firm with market power produced slightly more and a price-taking firm produced slightly less." Severin Borenstein, James Bushnell, and Christopher R. Knittel, *Market Power in Electricity Markets: Beyond Concentration Measures*, University of California Energy Institute, February 1999, http://www.ucei.berkeley.edu/PDF/pwp059r.pdf. (Hereinafter CAL.)

[34] See http://www.ferc.gov/market-oversight/guide/glossary.asp#M.

[35] "Prices above marginal cost lead to both inefficient allocations—since consumption will be too low in response to prices that are too high—and potentially to inequitable transfers from consumers to producers." CAL.

resources. The development of "power pools" allowed member electric utilities to exchange power, or transfer (i.e., "wheel") power to another utility in either wholesale or retail (to an end-use customer) transactions. Power pools can be "loose" or "tight," with the level of independence being the primary differentiator:

> A loose power pool is a voluntary association of utilities that negotiates generation sales primarily on a bi-lateral (two-party) basis. Bi-lateral transactions are private, thus other participants are unaware of the terms of the exchange, including price and transmission access. In contrast, tight power pools require true pooling of generating and transmission assets. The cost of each resource in the pool is known and each is operated on the basis of those costs, with the lowest cost resources being used more than higher cost ones. Operation of pooled generation also requires cooperative operation of transmission in the pool. As a result, tight power pools have some form of centralized transmission dispatch. Usually, there is a control center for the pool as a whole that issues dispatch instructions to the control centers of the larger utilities in the pool.[36]

In 1927, the Pennsylvania-New Jersey Interconnect became the first U.S. power pool, transitioning to a fully independent transmission organization in 1997 with the opening of its first bid-based energy market. FERC approved the Pennsylvania, New Jersey, Maryland (PJM) pool as the first independent system operator (ISO) that year.[37]

Utility Restructuring and Regional Transmission Organizations

A move towards deregulation of several large, monopolistic industries took hold in the United States in the latter decades of the last century. Competition replaced regulation as the preferred regime in the communications, airline, and trucking industries, as the presumed efficiencies and innovation of the marketplace came into favor. Reliance on market-based prices for wholesale electric power has been federal policy since the passage of EPACT. The commitment to competition in wholesale power markets as national policy was reaffirmed with the passage of EPACT05.

While competition at the wholesale power level is still federal policy,[38] there is no federal law requiring competition at the state level. In a number of states with high electricity costs, a belief that competitive power generation could result in lower prices for consumers soon led to the first state restructuring efforts for electric utilities, and the breakup of vertically integrated utilities. Under several state restructuring efforts, vertically integrated utilities were required to divest themselves of power plant ownership or control, with power generation moving to a competitive, "deregulated" function. However, under restructuring, the transmission and distribution of power remain regulated functions. Power generators in restructured markets can sell their electricity directly under bilateral contracts to retail customers, or at wholesale to retail suppliers, or into wholesale spot markets.

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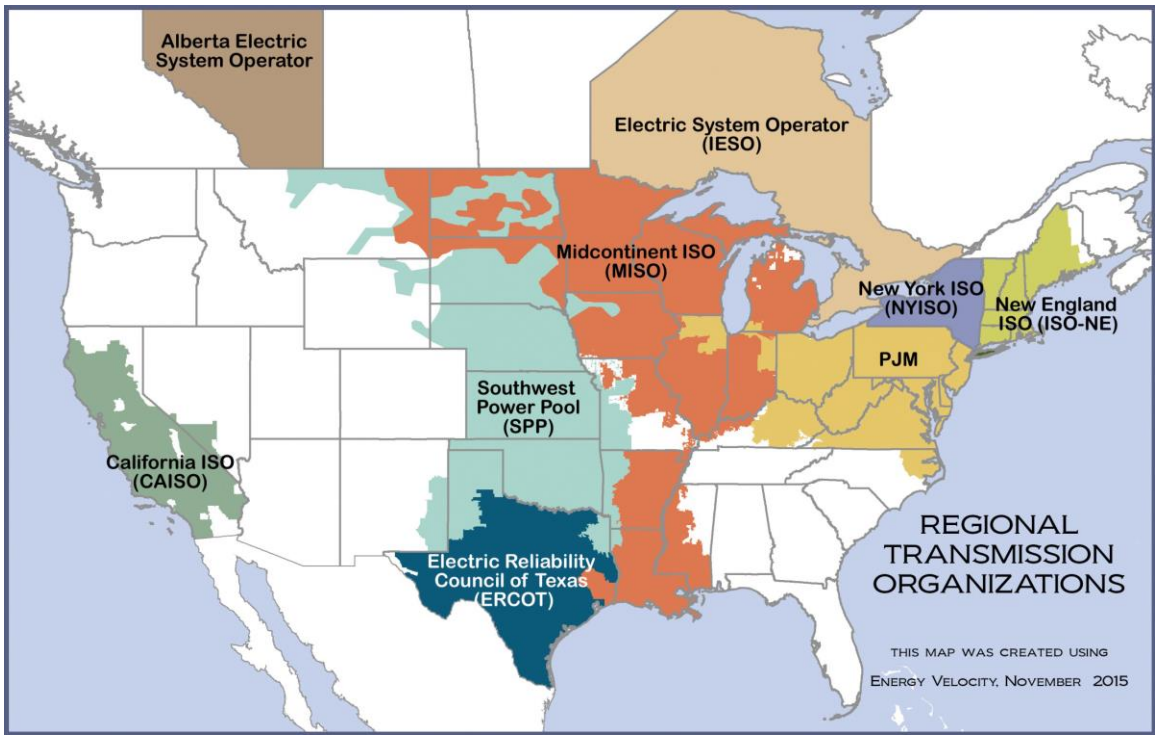
[36] W.M. Warwick, *A Primer on Electric Utilities, Deregulation, and Restructuring of U.S. Electricity Markets*, U.S. Department of Energy, PNNL-13906, May 2002, http://www1.eere.energy.gov/femp/pdfs/primer.pdf. http://www1.eere.energy.gov/femp/pdfs/primer.pdf.

[37] See http://www.pjm.com/about-pjm/who-we-are/pjm-history.aspx.

[38] "Congress has taken a number of steps to facilitate competition in wholesale electric power markets. The Public Utility Regulatory Policies Act of 1978 (P.L. 95-617, 92 Stat. 3117 (codified in U.S.C. titles 15, 16, 26, 30, 42, and 43) (1978)), the Energy Policy Act of 1992 (P.L. 102-486, 106 Stat. 2776 (1992), and the Energy Policy Act of 2005 (P.L. 109-58, 119 Stat. 594 (2005)) promoted competition by lowering entry barriers and increasing transmission access. Federal electricity policies have sought to strengthen competition but continue to rely on a combination of competition and regulation." Electric Energy Market Competition Task Force, *Report to Congress on Competition in Wholesale and Retail Markets for Electric Energy*, April 2007, http://www.ferc.gov/legal/fed-sta/ene-pol-act/epact-final-rpt.pdf.

Figure 2. Regional Transmission Organizations (RTO)/Independent System Operators (ISO)



Source: FERC, Electric Industry Activities, Regional Transmission Organizations at http://www.ferc.gov/industries/electric/indus-act/rto/elec-ovr-rto-map.pdf.

In some states and regions, independent system operators (ISOs) were formed to promote competition in wholesale electric power transactions. FERC then followed Orders 888 and 889 with the issuance of Order 2000[39] to advance the formation of Regional Transmission Organizations (RTOs). According to FERC, engineering and economic inefficiencies abounded in the industry at the time, and were impeding the competitive procurement of wholesale power.

> With respect to engineering and economic inefficiencies ... the transmission facilities of any one utility in a region are part of a larger, integrated transmission system which, from an electrical engineering perspective, operates as a single machine. Engineering and economic inefficiencies occur because each separate operator usually makes independent decisions about the use, limitations and expansion of its piece of the interconnected grid based on incomplete information, even though any action taken by one transmission provider can have major and instantaneous effects on the transmission facilities of all other transmission providers.[40]

Much of the rationale for moving towards RTO structures was rooted in FERC's expectation that the formation of RTOs would increase efficiency in wholesale energy markets, and lower end-use prices to consumers.[41] FERC described four minimum characteristics of an RTO for these organizations to provide economically efficient and reliable service to customers:[42]

[39] 89 FERC ¶ 61,285.

[40] Ibid.

[41] Ibid.

[42] See Minimum Characteristics of an RTO at http://www.ferc.gov/legal/maj-ord-reg/land-docs/RM99-2A.pdf.

1. Independence from market participants;
2. Appropriate scope [of operations] and regional configuration;
3. Possession of operational authority for all transmission facilities under the RTO's control; and
4. Exclusive authority to maintain short-term reliability.

Order 2000 also encouraged vertically integrated utilities to divest control over their transmission systems to the RTO, but FERC did not require electric utilities to divest their generation assets.[43]

Competitive Electricity Markets

In regions with traditional regulation, power plants are generally scheduled to run by the vertically integrated utility which owns the generation and wires (i.e., transmission and distribution) businesses. However, in RTO regions, power generators generally compete to sell electricity from their power plants to retail suppliers (i.e., a distribution utility or other Load Serving Entity[44] (LSE)) via a wholesale electricity market. RTOs are the facilitator in this supply and demand process, coordinating the purchase, sale, and delivery of wholesale electricity from seller to buyer.

Wholesale electricity can theoretically be bought and sold a number of times before it finally is consumed. Given the number of transactions that can occur, liquidity is essential to the efficient functioning of competitive markets.[45] Electricity from the wholesale market is obtained by distribution utilities or LSEs and resold to retail customers (i.e., the end-users or consumers of electricity), with actual wholesale prices varying by locality.[46] While the RTOs and most wholesale electricity transactions are under FERC's jurisdiction, LSEs are under state jurisdiction and make retail sales to end-use customers.

Currently, RTOs serve approximately two-thirds of electricity consumers in the United States.[47] RTO system operators seek to fulfill the need for electricity, taking transmission system constraints and reliability into consideration. Since the need for power is continuous and variable (both around the clock and seasonally), RTOs seek to balance the power going into the grid with the power being withdrawn from the grid using the least costly generation available. This is called "security-constrained economic dispatch" (SCED). Operating reserves are maintained on the system to deal with contingencies.[48]

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[43] Divestiture of generation assets is defined as the sale of assets to another company, or the transfer of assets from the regulated utility subsidiary to an unregulated subsidiary within the company structure. See http://www.eia.gov/cneaf/electricity/chg_stru_update/chapter9.html.

[44] An entity that secures electric energy, transmission service, and related services to serve the demand of its customers.

[45] "Liquidity is a measure of the ability to buy or sell a product—such as electricity—without causing a major change in its price and without incurring significant transaction costs. An important feature of a liquid market is the presence of a large number of buyers and sellers willing to transact at all times." U.K. Office of Gas and Electricity Markets, *Liquidity*, 2016, https://www.ofgem.gov.uk/electricity/wholesale-market/liquidity.

[46] FERC Office of Energy Market Oversight, Office of Enforcement, *Energy Primer—A Handbook of Energy Market Basics*, Federal Energy Regulatory Commission, November 2015, http://www.ferc.gov/market-oversight/guide/energy-primer.pdf. (Hereinafter, FERCPrimer.)

[47] See http://www.isorto.org/site/c.jhKQIZPBImE/b.2603295/k.BEAD/Home.htm.

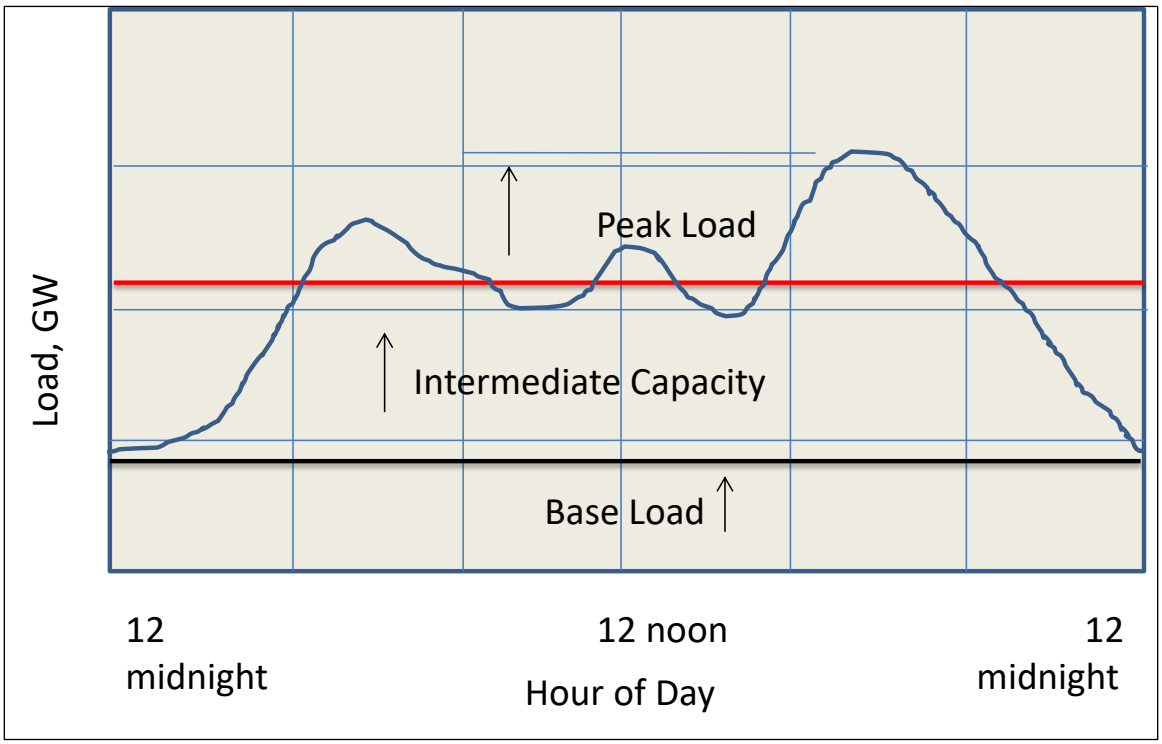
[48] Operating reserves: "[A]dditional capacity (generation and responsive load availability) above that needed to meet actual load demands are made available either on-line or on-standby so that it can be called on to assist if load increases or generation decreases, due to unpredictability or variability of the conditions." See Erik Ela, Michael Milligan, and Brendan Kirby, *Operating Reserves and Variable Generation*, National Renewable Energy Laboratory, NREL/TP-

The process of scheduling power plants to operate to serve a specific increment of load is called dispatch, and is generally designed to meet goals of reliability and economy as the demand for power (i.e., the load) rises and falls. **Figure 3** illustrates how the demand for power might vary throughout a day, and shows the various types of generating capacity which may be dispatched to serve the demand for electricity. Base load power plants[49] are designed to run almost continuously, while peaking power plants[50] only run in periods of the highest demand with intermediate load plants[51] serving at both midrange and high demand periods. RTOs generally monitor the system loads every few minutes for dispatch purposes, thus allowing intermediate load plants to maintain or change their output to meet demand periodically (at least every five minutes) in a load-following mode of operation.

RTOs also seek to maintain power reserves at levels which allow for some unexpected situations (such as an unplanned power plant outage) or unexpectedly high demands for power on the system, and to account for the security constraint of maintaining reliability. Some regions have a summertime peak demand for electricity, while demand in other regions peaks in the winter.

Figure 3. Potential Variation of Load with Daily Demand

Illustrative Example



Source: CRS.

To accomplish SCED, RTO administrators compare the costs of various power plants which offer their energy for dispatch. These offers to sell are made in price-for-quantity amounts of energy

5500-51978, August 2011, http://www.nrel.gov/docs/fy11osti/51978.pdf.

[49] Typically, these are coal, nuclear, or hydropower facilities which are cheaper to run continuously. Some regions include renewables in this category (such as wind or solar power) since they essentially have zero fuel costs.

[50] These are typically simple cycle combustion turbines fueled by natural gas or oil.

[51] Most often these are combined cycle plants fueled by natural gas.

(which may be submitted on an offer curve reflecting varying levels of generation during an operating day) in dollars per MegaWatt-hour ($/MWh), which the RTO matches against bids from loads to purchase varying amounts of energy. The RTO then seeks to serve the entire system demand, matching the lowest cost offers at or below the prices that bidders are willing to pay. Running a system involving multiple generators bidding to serve multiple increments of load at various hours of the day or night requires a computer-run model to optimize the system, and arrive at the least-cost model for serving the next day's load.

In a competitive market, prices for electricity should essentially reflect the underlying forces of supply and demand. FERC authorizes sellers of wholesale electricity to charge market-based rates[52] if they have demonstrated that they or their affiliates "lack or have adequately mitigated horizontal market power (percent of generation owned relative to total generation available in a market), and vertical market power (the ability to influence the cost of production for competitive electricity suppliers)."[53] Alternatively, FERC may authorize cost-based rates for sellers of electricity in wholesale markets.

Market Monitors are associated with each RTO to observe and report on whether the RTO's market rules and tariffs are achieving customer benefits in a competitive environment. FERC issued a policy statement outlining the duties of Market Monitors in this role.

> [Market Monitors] should evaluate the market-specific responses of individual market participants to existing or proposed market rules and tariff provisions. It is therefore critical that the [Market Monitor] consistently and impartially evaluate the existing ISO/RTO rules and tariff provisions, including mitigation and their effects on the economic signals sent to market participants.[54]

Thus, the Market Monitor is to recommend changes to the RTO's market rules and tariffs to achieve these benefits as part of its ongoing duties.

Nodal or Locational Marginal Pricing

RTOs generally price wholesale electricity based on the cost of power at various localized points in a system called nodes. These nodes are generally at a physical power plant bus bar[55] or collection of buses where electricity generated enters the transmission system. When an increment of power (for example, a MegaWatt) is transferred from one bus to another, it affects all other flows in a network, and changes the marginal cost[56] at these nodes. The locational marginal price (LMP) of electricity (measured in $/MWh) is then the cost of supplying an increment of load at a particular location, or the change of the total production cost to deliver an additional increment of load, while considering constraints on the system. Power generators typically receive the LMP at the generator bus bar, while buyers are charged the LMP at the local

[52] "When the facts or circumstances the Commission relied upon in granting a seller market-based rate authorization change, the seller is required to report the change by filing a Notice of Change in Status consistent with Order No. 652 PDF and 18 C.F.R. § 35.42." FERC, *Electric Market-Based Rates*, December 17, 2015, http://www.ferc.gov/industries/electric/gen-info/mbr.asp.

[53] Sellers of wholesale electricity in Day-ahead or Real-Time markets are also bound by RTO rules. See http://www.ferc.gov/market-oversight/guide/energy-primer.pdf, p. 62.

[54] FERC, *Market Monitoring Units in Regional Transmission Organizations and Independent System Operators*, Docket No. PL05-1-000, May 27, 2005, http://www.ferc.gov/whats-new/comm-meet/052505/E-5.pdf.

[55] A bus bar is a point of connection for a conductor or group of conductors for two or more electric circuits.

[56] Marginal cost is the change in total cost associated with a unit change in the quantity supplied.

load bus bar. LMPs are made up of three components: the cost of the energy, a congestion charge, and a component which considers transmission line or system losses.

The key constraint on an electric transmission line is usually congestion. This condition can occur when there is insufficient transfer capacity available to implement all of the preferred schedules for electricity transmission simultaneously.[57] If there are no transmission constraints in a system, the LMP is expected to be very similar across the system. When there are transmission constraints, the highest variable cost unit dispatched to meet load requirements will set the LMP in that area. This is because when demand in an area exceeds supply (and the ability to bring in energy from the lower cost generation supplies is limited by transmission capacity), some higher cost generation units in an area will be dispatched to meet the demand.[58]

RTOs typically construct supply and demand curves made up of offers and bids at specified locations for a collection of nodes (called "Load Zones"). The intersection of these curves identifies the market-clearing price at each location for every hour. Supply offers below and demand bids above the identified price are cleared, and are scheduled to run. Offers and bids that clear are entered into a pricing software system along with binding transmission constraints (reflecting congestion and line losses) to produce the LMPs for all locations.

RTOs invoice market participants for their involvement in the markets. Settlement is the process by which the RTO determines the amounts to be paid associated with buying and selling energy, capacity and ancillary services, and paying administrative charges.

RTO Markets

RTOs use various types of markets both to serve end-use customer needs, and to make operational decisions. The dispatch of power plants essentially involves two stages, encompassing the planned commitment of generation to meet projected RTO system demand, and the dispatch of additional or alternative capacity in real-time. In states with deregulated electricity markets with retail choice, LSEs provide electricity to end-use customers and may be required to show that they have procured capacity to meet a defined level of reserve. As such, the LSE can self-supply capacity, procure capacity from wholesale markets, or meet its obligations through bilateral contracts with power generators.

"Day-ahead" (or "Day 2") markets are a mainstay of RTO operations. This market allows demand bids and supplier offers to be evaluated (establishing hourly LMPs for the next day), thus enabling power to be bought and sold a day before electricity is actually generated or consumed (i.e., the operating day). This also allows the power plants selected to serve an increment of load to be ready to serve their commitment, and gives the RTO a look ahead to what units are being committed to meet the next day's demand on an hourly basis.

The vast majority of energy generated in RTOs serves the Day-ahead market.[59] Commitments to run in a Day-ahead market are financially binding transactions. Generators failing to meet their commitments may face significant financial penalties. Generally, intermittent resources like wind do not bid into Day-ahead markets because these markets can penalize for non-performance (for example, if wind speeds fall below those needed for wind power generation).[60] However, some

[57] See http://www.eia.gov/tools/glossary/index.cfm?id=C.

[58] FERCPrimer.

[59] "Typically, 95 percent of all energy transactions are scheduled in the Day-Ahead market, and the rest scheduled in real-time." FERCPrimer, p. 59.

[60] See Wind and Electricity Markets at http://www.nerc.com/docs/pc/ivgtf/WindinMarketsTableAug09%282-

RTOs allow wind capacity to submit a zero dollar bid (or even a negative bid price) to participate in Day-ahead markets.[61] Wind may also be accommodated in Day-ahead markets if meteorological data indicate sustained winds are anticipated for the next day.

"Day 1" (Spot, Real-Time, or Balancing) markets are run by RTOs to deal with contingencies experienced in the day of operation. These contingencies may be due to legitimate power plant operational problems causing outages or otherwise impairing the plant's ability to meet the Day-ahead commitment. Additionally, system demand may exceed original projections, so RTOs run a spot market in real-time (i.e., with LMPs calculated every five minutes) to deal with any resulting generation shortfalls. Intermittent resources (i.e., wind power) can generally participate in spot markets, with some RTOs paying intermittent resources based on hourly rather than five minute schedules.[62] Forward contracts can be used to minimize risk in spot markets, as contracts for the purchase and sale of electricity can be negotiated for some time or period in the future at a pre-negotiated price. Standardized futures contracts are also available to facilitate electricity trades.

Ancillary Service markets are operated by RTOs to maintain reliability on transmission systems. FERC originally defined six ancillary services in Order 888,[63] including scheduling, system control and dispatch; reactive supply and voltage control from generation service; regulation and frequency response service; energy imbalance service; operating reserve-synchronized reserve service; and operating reserve-supplemental reserve service. RTOs do not necessarily offer all these services in their Ancillary Service markets.

Capacity markets are used by several RTOs to provide payments covering marginal costs of operation[64] for system capacity providing reliability services to the RTO, and by LSEs in some RTOs to acquire enough capacity (via primarily in-state bilateral contracts or their own generation) to meet their customer service obligations. This means that generation capacity is reserved, and kept available to meet "unusually" high loads or reliability requirements. Capacity payments can be used to support both Day-ahead and Real-Time markets.

Forward Capacity markets are used by several RTOs to ensure that there will be adequate capacity to serve forecast future load demand and system reserve needs. In theory, the need for new capacity is indicated by price signals (i.e., sustained high LMPs) in the location zones. A Forward Capacity market is designed to pay higher prices to new capacity providers (for a defined period) to incentivize the investment. The capacity is usually obtained from competitive auctions conducted (from several months to three years) in advance of the projected need, with varying periods of commitment. Demand-side resources may participate in most Forward Capacity auctions as a capacity resource.[65]

4Task_Force%29.pdf. (Herinafter NERCWind.)

[61] For a discussion of Wind Power in RTO markets, see CRS Report R42818, *U.S. Renewable Electricity: How Does Wind Generation Impact Competitive Power Markets?*, by Phillip Brown.

[62] NERCWind. In June 2012, FERC issued Order No.764 to allow for 15 minute scheduling of transmission service to more easily incorporate new variable resources, requiring variable energy resources to provide meteorological and forced outage data to transmission providers. See http://www.ferc.gov/whats-new/comm-meet/2012/062112/E-3.pdf.

[63] 75 FERC ¶ 61,080.

[64] For example, the basic costs for the plant to start up, and remain on line should it be called upon to provide power to the system.

[65] Meg Gottstein and Lisa Schwartz, *The Role of Forward Capacity Markets in Increasing Demand-Side and Other Low-Carbon Resources*, The Regulatory Assistance Project, May 2010.

Clearing and Settlement of Prices

In order to supply reliable power at the lowest possible cost, wholesale electricity is typically dispatched to load centers based on the lowest marginal cost of electricity available to satisfy the demand. Wholesale prices thus vary according to LMP. Generally, the marginal cost of electricity production is based in part on the cost of fuel needed to generate a unit of electricity (typically measured in MegaWatt-hours) as well as the efficiency of individual power plants. In most RTO markets, prices for wholesale electricity currently reflect the price of wholesale natural gas in the regions.

To establish wholesale prices in the energy market, RTOs commonly use a "Uniform Clearing Price" (UCP) auction by which a market administrator dispatches generators to serve increments of load demand.

> The [RTO] dispatches generators in the region starting from the lowest-priced bids ... and progressing to higher-priced bids ... until ... [there is] enough generation to meet consumers' demand for electricity. Under a UCP auction, each generator receives the same (uniform) price based on the price of the last unit needed to meet the overall demand for electricity, regardless of each generator's bid. The bid price of the last generator used to satisfy the total demand for electricity therefore determines the wholesale price of electricity.[66]

Thus, the RTO establishes a "load dispatch curve" for all hours of the day, for all locations for which it calculates marginal prices. The uniform clearing price auction is intended to push generators to reduce their operating costs so that their bids will be accepted. Under this type of auction, lower cost generators are likely to recover more of their costs than higher cost generators,[67] since all selected generators receive the market-clearing price[68] (i.e., the offer price of the highest-priced generation selected to run in a market).[69]

Electricity prices must arguably be at levels that are attractive enough for the generators to want to sell into the RTO's markets, since they can potentially sell their electricity elsewhere in the wholesale market.[70] Ideally, selling locally would be to the generator's and the buyer's mutual

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[66] ISO New England Inc., *The Benefits of Uniform Clearing-Price Auctions for Pricing Electricity*, March 2006, http://www.iso-ne.com/pubs/whtpprs/uniform_clearing_price_auctions.pdf. (Herinafter NEISO UCP.)

[67] "Because the recovery of capital costs is largely dependent on energy market revenues, the UCP auction provides strong incentives to reduce the costs of unit operations and to operate units when needed. The historic performance of New England generators makes the results of these competitive market incentives apparent, as generators have become significantly more available to produce electricity. The average rate of availability increased from less than 80 percent before markets to approximately 87 percent since markets were introduced.... Resources can recover their capital and construction costs by keeping their operating costs below the clearing price." NEISO UCP.

[68] RTOs use the word clearing to refer to the matching of supply and demand—to clear the market means the RTO accepts sufficient generation offers to meet demand. If a generator's offer in the day-ahead market clears, it means that generation was offered at or below the market clearing price and was chosen to generate the next day. FERCPrimer.

[69] However, the UCP auction is not without critics. Some argue that when natural gas prices are high, the UCP auction methodology will cause "lower cost" base load coal and nuclear producers to be paid excessively high prices at the expense of consumers. Others may say the resulting "high" profits are a price signal that new capacity may be needed in a market to provide competition. See Ross Baldick, *Single Clearing Price in Electricity Markets*, University of Texas at Austin, February 18, 2008, http://works.bepress.com/cgi/viewcontent.cgi?article=1156&context=cramton.

[70] John Chandley, *How RTOs Establish Spot Market Prices (And How This Helps To Keep The Lights On)*, PJM Interconnection, September 2007, http://www.pjm.com/~/media/documents/reports/spot-market-prices-j-chandley.ashx.

benefit, given the physical limitations and inherent losses in electricity transmission. Similarly, prices on the RTO markets must be low enough for the buyers to accept.[71]

If a generator is directed to produce more energy than it committed in the Day-ahead market, or if it was directed to produce less energy, then the difference is settled at spot market prices. Settlement is also the process by which an RTO invoices buyers for electricity sold, and bills the buyers for capacity and ancillary services, as well as administrative charges for operating the system.

Competitiveness of the Auction Process

Some observers have raised questions about the competitiveness of auction processes, with one observer saying that auction rules based on clearance pricing tends to "drive prices up, not down."[72] The contention is that power suppliers learn to arrange their bids to achieve the maximum price. All that such a result would require is learning from bid patterns, recognizing that all bids below the cleared price receive that price, regardless of their bid.[73]

Make Whole Payments

When a generator's bid is accepted by an RTO either in a Day-Ahead or Real-Time market, it generally means that that resource is scheduled to provide power at the time and for the duration of the commitment. However, if the RTO does not require the generator to operate in the periods or manner committed to (by bids accepted in the markets), then the RTO may compensate the generator by a "make whole" (or "uplift") payment for at least its marginal costs of operation.[74]

Demand Response in Energy Markets

FERC defines Demand Response as "[c]hanges in electric usage by demand-side resources from their normal consumption patterns in response to changes in the price of electricity over time, or to incentive payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized."[75] Thus, end-users of electricity can be incentivized to reduce usage in response to real-time high electricity prices or a situation which may reduce reliability.

FERC issued Order 745[76] in March 2011 to buttress its determination that demand response can play a role in organized energy markets run by RTOs, and to remove barriers to its use. FERC reasoned that a demand response resource could serve "as an alternative to a generation resource

[71] Ibid.

[72] David Cay Johnston, "Enron-Style Price Gouging Is Making a Comeback," *Al-Jazeera*, May 2, 2014, http://america.aljazeera.com/opinions/2014/5/new-england-electricitymarketwallstreetenron.html. (Hereinafter, DCJ).

[73] Ibid.

[74] "Make Whole" payments generally include a generator's start-up and energy costs. For example, in PJM "... these payments are intended to be one of the incentives to generation owners to offer their energy to the PJM Energy Market at marginal cost and to operate their units at the direction of PJM dispatchers." See http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2012/2012q2-som-pjm-sec3.pdf.

[75] FERC, *Reports on Demand Response and Advanced Metering*, December 20, 2012, http://www.ferc.gov/industries/electric/indus-act/demand-response/dem-res-adv-metering.asp.

[76] 134 FERC ¶ 61,187.

and when dispatch of that demand response resource is cost-effective."[77] The demand response resource, in that instance, would be entitled to receive the market price for energy (i.e., the LMP), if it passed a "net benefits test."[78]

In May 2014, the U.S. Court of Appeals in Washington, DC, vacated Order 745 in a 2-1 decision. The Appeals Court decided that, with Order 745, "... FERC went far beyond removing barriers to demand response resources. Instead of simply 'removing barriers,' the rule draws demand response resources into the market and then dictates the compensation providers of such resources must receive."[79] FERC contested the Appeals Court decision, and Order 745 was upheld by the Supreme Court in January 2016.[80]

Other Transactions

In addition to the physical energy markets, other mostly financial transactions exist which are seen to either enhance liquidity or provide a way to recoup costs of congestion in the market.

FERC defines a **Financial Transmission Right** (FTR) as a contract that entitles the holder to receive compensation for transmission charges that arise when grid congestion causes price differences due to the redispatch of generators.[81] FTRs were developed to give transmission owners or LSEs protection against the risk of congestion-driven price increases in Day-ahead markets.

> Each FTR is unidirectional and is defined in megawatts from a point of receipt (where the power is injected onto the New England grid) to a point of delivery (where the power is withdrawn from the New England grid). For each hour when there is congestion on the New England Transmission System between the receipt and delivery points specified in the FTR, the holder of the FTR is awarded a share of the congestion charges collected for that hour. FTRs are financial entitlements to the Day-Ahead Locational Marginal Price Congestion Component differences for the associated receipt and delivery points. They do not represent a right for physical delivery of power. Market Participants can submit bids for FTRs in [RTO or ISO] administered Auctions, which take place annually and monthly. FTRs are acquired for bids that clear in an Auction.[82]

FTRs are used both by physical and financial participants in electricity markets. FTRs are acquired through allocations, but can be purchased in RTO-administered auctions or from a secondary market.[83] FTRs can be used by participants for hedging purposes, but can also be used by speculators as they can be traded separately from transmission service. FTRs are financial entitlements, not a physical right, and are independent of energy delivery.[84]

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[77] See Docket No. RM10-17-000; Order No. 745 at http://www.ferc.gov/EventCalendar/Files/20110315105757-RM10-17-000.pdf.

[78] Ibid. See net benefits test in "Commission Determination" at paragraph 78 (p. 65).

[79] *Electric Power Supply Association v. FERC*, No. 11-1486 U.S. (Court of Appeals for the District of Columbia 2014).

[80] *FERC v. Electric Power Supply Association, et al.*, No. 14-840 S. Ct. (2016).

[81] See http://www.ferc.gov/market-oversight/guide/glossary.asp#H.

[82] ISO New England Inc., *Financial Transmission Right*, 2013, http://www.iso-ne.com/mkts_billing/mkt_descriptions/line_items/financial_transmission_right.html.

[83] FERCPrimer, p. 62. The FTR secondary market is an ISO-administered bulletin board where existing FTRs are electronically bought or sold on a bilateral basis. See http://www.iso-ne.com/nwsiss/grid_mkts/how_mkts_wrk/ftrs_arrs/.

[84] FERCPrimer.

Virtual trading allows any authorized participant in the Day-ahead and Real-Time energy markets to hedge their positions, or speculate on LMP differences between these markets. Virtual transactions are offers that have no physical backing to supply energy or bids to purchase energy at an LMP location in the Day-Ahead Energy Market. Any market participant can submit virtual transactions. While virtual bids are considered as "actual injections and withdrawals at the applicable ... node for the Day-ahead market ... [they] are not considered in Real-time market execution."[85] However, virtual supply bids and virtual demand offers are seen to add liquidity to the market.

Virtual trades "are used to arbitrage price differences between the Day-ahead and Real-Time energy markets, and hedge financial exposure from physical positions."[86]

> If the day-ahead price were higher than the real-time price, a trader would profit by submitting an increment offer (INC) to sell energy at the high day-ahead price and buy out of that position at the lower real-time price. Conversely, a decrement bid (DEC) would make money if the real-time price is higher.[87]

Virtual transactions can therefore either make or lose money. Cleared virtual transactions will pay (or be paid) the difference between Day-ahead and Real-time prices multiplied by the capacity cleared in the Day-ahead market at the LMP node of the transaction.[88]

> The primary benefits of virtual transactions are achieved through their financial impact on the markets. Virtuals sometimes are referred to as convergence bidding, as a competitive virtual market should consistently cause the day-ahead and real time prices to converge in each hour.
>
> The convergence of day-ahead and real-time prices within the RTOs is intended to mitigate market power and improve the efficiency of serving load. Thus, virtuals have a physical impact upon the operations of the RTO, as well as on market participants that physically transact at the LMPs set in the day-ahead and real-time markets.[89]

While electricity is not physically delivered in a virtual transaction, the transaction can set the LMPs. As vehicles for potential speculation, virtual transactions are monitored for large losses as these could indicate a possible attempt to manipulate market prices.[90]

Discussion

The regional wholesale electricity markets run by RTOs were established almost two decades ago, with goals of achieving new efficiencies and lowered costs from a focus on the basic economic rules of supply and demand. Over time, each RTO market has developed its own regulations or variations thereof, all under FERC's regulatory jurisdiction. However, these

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[85] MidWest ISO, *Virtual Transactions in the Midwest ISO Markets*, April 17, 2009, p. 16, http://www.misostates.org/files/WorkGroups/VirtualPrimerOMS041709_1.pdf. (Herinafter MidWISO.)

[86] RTO Insider, *Virtual Trading 101: INCs, DECs, UTCs*, February 25, 2014, http://www.rtoinsider.com/virtual-trading-101-pjm/.

[87] Ibid.

[88] Ibid.

[89] FERCPrimer, p. 64.

[90] "For example, a participant may submit a high-priced virtual bid at a constrained location that causes artificial congestion in the day-ahead market. The participant will buy in the day-ahead at the high, congested price and sell the energy back at a lower, uncongested price in the real time market. Although the virtual transaction would be foreseeably unprofitable, the participant could earn net profits if it increases its FTR payments or the value of a financial position." MidWISO, p. 19.

regulations and rules appear to be increasing in complexity, as the markets are revised to adjust for operational issues and regional differences.

Recent RTO Market Issues

Electricity market issues can be usually separated into two categories—manipulation by market participants or RTO market structural issues. This section will look at some current instances and examples of each.

Structural Market Issues

Capacity Markets

The need for, and functioning of, capacity markets and forward capacity markets are two topics often debated today. Capacity markets are used by several RTOs to provide payments to power generators for capacity reserved to meet reliability goals for the RTO system. However, not all RTOs want to pay power generators simply to be available when they are called upon during infrequent periods of "unusually" high demand. The design of capacity markets has also been controversial, as some elements are used in some market designs and not in others (such as mandatory auctions for LSE capacity in MISO).[91]

Capacity markets have come under fire in some areas where they are used, as brownouts or blackouts have still occurred in unusually high demand periods.[92] In other RTOs without formal capacity markets (principally those in California and Texas), the question has been whether the additional cost would be justified by the perceived benefits.[93] RTOs generally seek to ensure that power will be available to meet all the demands of the system, and still have operating reserves available to cover outages from plants already committed in Day-ahead markets, or unexpected high loads. The Real-Time market exists to cover at least some of that unanticipated demand. If a plant is committed in the Day-ahead market, then the generator must have the plant up and running to serve load when it is required, and it receives the market clearing price for energy provided in the times it operates.

Forward Capacity Markets

Several RTOs use Forward Capacity markets to provide some degree of certainty that there will be adequate capacity to serve future load demand and meet system reserve needs. The need for new or additional capacity is supposed to be indicated by price signals (i.e., sustained high LMPs) in the location zones. These markets were added in the last decade, as it appeared that reliance on price signals alone were not inducing new capacity in some RTO markets. Forward Capacity markets were arguably intended to provide revenues to allow new participants in the markets to recover the cost of investment of building new power plants in the high LMP load zones (although demand response or building a new transmission line are other options). However,

[91] American Public Power Association, *FERC Approves MISO Capacity Market Plan, but Leaves It Voluntary*, June 18, 2012, http://www.naylornetwork.com/app-ppw/articles/index-v2.asp?aid=180090&issueID=23333.

[92] Reuters, *UPDATE 1-New York City Has Enough Power Despite Astoria 4 Outage*, July 28, 2011, http://www.reuters.com/article/2011/07/28/utilities-operations-uspowergen-astoria-idUSN1E76R0JM20110728.

[93] Bill Peacock, *TPPF Study Finds That a Capacity Market Would Not Improve Texas' Electricity Market*, Texas Public Policy Foundation, February 6, 2013, http://www.texaspolicy.com/press/tppf-study-finds-capacity-market-would-not-improve-texas%E2%80%99-electricity-market.

despite the existence of Forward Capacity markets, there has been considerable debate on whether these constructs work since high load pockets continue to persist in some RTO regions.[94]

A related issue raised in connection with Forward Capacity markets in some RTOs has been the question of how to incorporate new generation. The regulatory concept of "Cost of New Entry" (CONE) represents the estimated cost of building and connecting a reference power plant (typically, a natural gas-fired combustion turbine serving peak loads) to the grid in a particular location. CONE may be estimated by the RTO at various load pocket nodes or for the entire RTO footprint.[95]

> CONE refers to the price at which a peaking power plant can recover its fixed costs in the marketplace. This price is set as a benchmark based on the cost of building a peaking unit. When the market needs new resources to meet reliability, the capacity price would rise above CONE to incent generation. When there are sufficient resources to meet reliability needs the price would fall below CONE to show that no new generation is needed.[96]

With declining costs for natural gas, new natural gas combined cycle generating units could have cost advantages over existing generating plants due to their higher efficiency. Concerns have been raised by existing generators in some RTO markets that some new entrants are submitting low bids which could undermine the competitiveness of markets under capacity market rules. CONE values can also be used to help provide a screen for possible exercise of "buyer" market power under RTO "minimum offer price rules" (MOPR).[97] FERC allows MOPR to establish whether low priced bids from new projects are consistent with the project's costs, and not, therefore, uncompetitive.

States and Long-Term Power Needs

With load pockets and high prices persisting in some areas of PJM, the states of New Jersey and Maryland tried to incentivize the construction of generation capacity.[98] Only states have authority under the Federal Power Act to order the construction of new power plants to accommodate long-term needs. The proposed natural gas-fired power plants were to be "subsidized" by the states,

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[94] "[O]pponents of forward capacity markets have argued that customers are paying excessive amounts for capacity and have questioned whether capacity prices are just and reasonable. These critics also allege that capacity markets are not sending the signals to incent new investment even though more than 9,300 MW of new capacity (with more than 2,000 MW of that total demand resources) have been made available in PJM since the implementation of RPM." See http://www.epsa.org/forms/uploadFiles/FE84000001B2.filename.FYI-4_Policy_Paper-_Essential_Elements_Final.pdf.

[95] 142 FERC ¶ 61,079.

[96] Electric Power Supply Association, *Essential Elements of Forward Capacity Markets*, April 2009, http://www.epsa.org/forms/uploadFiles/FE84000001B2.filename.FYI-4_Policy_Paper-_Essential_Elements_Final.pdf.

[97] "In 2007, the Commission directed the NYISO to modify its NYC capacity market rules to provide a level of capacity compensation that would attract and retain needed infrastructure, without over-compensating or under-compensating generators. In response, the NYISO proposed, and the Commission accepted, new buyer-side and seller-side market power rules. The intended purpose underlying buyer-side mitigation rules is to prevent 'uneconomic entry' that would suppress prices in the NYC capacity market below 'just and reasonable levels.' These new rules became effective in 2008, prospectively, and thus, only apply to new capacity entrants in the NYC market. Unless exempt under the Services Tariff's exemption test ('Market Exemption Test'), new capacity entrants to the NYC market are generally subject to a capacity price offer floor ('Offer Floor') set at 75 percent of the net cost of new entry ('Net CONE'). Under the Mitigation Exemption Test, a new entrant is exempt from buyer-side mitigation, among other ways, if its capacity clearing prices are projected to be higher than 75 percent of Net CONE for two capability periods." See http://www.blankrome.com/index.cfm?contentID=37&itemID=2484.

[98] Michael Giberson, *Meanwhile, More "Power Market and the State" Battles in New Jersey and Maryland*, March 23, 2011, http://knowledgeproblem.com/2011/03/23/meanwhile-more-power-market-and-the-state-battles-in-new-jersey-and-maryland/.

and thus potentially able to bid less than MOPR.[99] PJM reacted with a change to its market rules to allow such state initiatives but wanted FERC to make a determination whether such a bid was uncompetitive. FERC allowed PJM's exemption for such state initiatives, but maintained that PJM should first make its determination on the competitiveness of the bid before any appeal to FERC on whether to allow the bid. In its decision, FERC agreed that LSEs can self-supply, but rejected the state proposals based on potential impacts on wholesale prices from an exemption to MOPR for the self-supply facilities to bid into PJM's capacity auctions.

> The Commission is not infringing on the sovereignty of the state, but is merely regulating the wholesale prices charged in the capacity market. Load serving entities are free to contract with any generator they choose to supply power. The MOPR affects only the price that such a generator will be permitted to bid into the capacity market, which may affect the ultimate wholesale price to be paid to all resources, including generation, demand response, and energy efficiency.[100]

FERC's decision was challenged twice but upheld, and the Virginia U.S. Court of Appeals affirmed the lower court decision, finding that Maryland's efforts to incentivize new generation violated the Supremacy Clause,[101] infringing on FERC's jurisdiction over wholesale rates.[102] Among Maryland's arguments for its program was the contention that it was addressing a long-term, local need, not trying to affect short-term, wholesale capacity markets.[103] Maryland appealed the decision to the U.S. Supreme Court, which agreed to consider the Appeals Court decision.[104]

Market Settlement Processes

The market settlement process can also be an area for disagreements and formal disputes between parties. RTO markets have processes in place to establish the creditworthiness of market participants. Settlement processes in RTO markets generally involve physical transmission transactions, and financial settlements for market transactions.

> A transmission settlements process financially settles (provides for billing and payment) the participant's use of the RTO transmission system for both transmission and ancillary services. Ancillary services are mandated support services necessary to operate the grid and maintain reliability, such as scheduling and voltage support. Charges to market participants for transmission and ancillary services are based on tariffs approved by FERC. The funds collected are distributed to the transmission owners and the providers of the ancillary services.
>
> A market settlements process financially settles generation transactions for market participants (e.g., generators of electricity and purchasers of energy) within an RTO-managed market operations footprint. Depending on the specific market structure for an RTO, there may be multiple market settlement processes that assign financial charges and

[99] Fortnightly Magazine, *Race to the Bottom—Two Eastern Governors Make War Against Markets*, March 2012, http://www.fortnightly.com/fortnightly/2012/03/race-bottom.

[100] 137 FERC ¶ 61,145.

[101] According to the Supremacy Clause, if a state measure conflicts with a federal requirement, then the state provision must give way. Article VI, Section 2, of the U.S. Constitution.

[102] *PPL EnergyPlus LLC v. Nazarian*, 13-2419 U.S. (4th Circuit 2015).

[103] Craig R. Roach, Frank Mossburg, and Vincent Musco, *Partnership, Not Preemption*, Public Utiliities Fortnightly, December 2013, http://www.fortnightly.com/fortnightly/2013/12/partnership-not-preemption.

[104] Robin Bravender, *Supreme Court Leery of State Power Incentives*, GreenWire, February 24, 2016, http://www.eenews.net/greenwire/stories/1060032917.

> credits to market participants and asset owners based upon their participation in the markets. Markets can include day-ahead energy, real-time energy, Financial Transmission Rights, and those ancillary services not covered under the RTO's transmission settlements process (e.g., operating reserve services to handle load in the event of an emergency).[105]

More timely and accurate accounting of transactions in a settlements process can only serve to enhance the efficiency of the RTO market, reducing cash flow and counterparty risks for market participants.

Market Manipulation

Competitive electricity markets have enabled a variety of wholesale electricity products and services to facilitate the sale and transmission of power. These involve both physical transactions (i.e., electricity is generated, and sent to or taken off the grid), and financial transactions (i.e., the purchase and sale of electricity, and contracts for future delivery). Services have also arisen to provide transaction flexibility, and to manage (or hedge) the risks of various transactions. Some purchasers of electricity as a commodity do so solely for financial gain.

The Western energy crisis (WEC) showed that electricity markets were (and are still) susceptible to manipulation, especially when the motive is to make as much money as possible. With the passage of the EPACT05, Congress gave FERC new authority to prevent manipulation in natural gas[106] and electricity markets.[107] EPACT05 prohibited "any entity" from using "manipulative or deceptive device or contrivance"[108] in connection with the purchase or sale of natural gas or electric energy (or the purchase or sale of related transportation or transmission services) in transactions subject to FERC jurisdiction. EPACT05 increased the maximum civil penalty for market manipulation and other violations to $1 million per day per violation, in addition to disgorgement of unjust profits.[109] EPACT05 states that any entity can be subject to the prohibition against energy market manipulation whether (or not) it has been previously under FERC's jurisdiction.[110] FERC acknowledges that market manipulation is a "significant threat" to energy markets since energy consumers are likely to bear the burden of losses from such activity. Additionally, the noncompetitive activity can result in a loss of market transparency or otherwise impair the efficiency of energy markets, and thus FERC seeks to prevent fraud or market manipulation.[111]

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[105] ScottMadden Management Consultants, *Emerging Regional Electricity Market Issues*, April 2009, http://www.scottmadden.com/?a=strm&aid=271.

[106] See EPACT05, Title III—Oil and Gas, Subtitle B, Natural Gas. §315, Market Manipulation.

[107] See EPACT05, Title XII—Electricity, Subtitle G, Market Transparency, Enforcement, and Consumer Protection. §1281, Electricity Market Transparency, to §1283, Market Manipulation.

[108] EPACT05 defined "any manipulative or deceptive device or contrivance" to be "(as those terms are used in section 10(b) of the Securities Exchange Act of 1934 (15 U.S.C. 78j(b)))."

[109] See EPACT05, §314, Penalties, and §1284, Enforcement.

[110] 16 U.S.C. 824v.

[111] Under 18 C.F.R. §1c, it is unlawful for any entity, directly or indirectly, in connection with the purchase or sale of electric energy or natural gas or the purchase or sale of transmission or transportation services subject to Commission jurisdiction:

1. To defraud using any device, scheme or artifice (i.e. intentional or reckless conduct);
2. To make any untrue statement of material fact or omit a material fact; or
3. To engage in any act, practice or course of business that operates or would operate as a fraud or deceit.

See FERC, Prohibition of Energy Market Manipulation at http://www.ferc.gov/enforcement/market-manipulation.asp.

> Manipulation comes in many varieties.... [FERC] recognized this reality by framing its Anti-Manipulation Rule broadly, rather than articulating specific conduct that would violate its rules.... [T]he following are broad categories of manipulations that have surfaced in the securities and commodities markets (including the energy markets) over the years. The borders of these categories are not clearly defined and some can belong to multiple categories, such as wash trading (i.e., buying and selling identical stocks or commodities at the same time and price, or without economic risk). Traders may also combine elements of various schemes to effect a manipulation.... A number of manipulative trading techniques that have arisen in securities and commodities trading may be subject to the [FERC's] Anti-Manipulation Rule. Traders may seek to inflate trading volumes or trade at off-market prices to serve purposes such as maintaining market confidence in a company's securities or to move a security's price to trigger an option. **Marking the close** is a manipulative practice in which a trader executes a number of transactions near the close of a day's or contract's trading to affect the closing or settlement price.[112] (Emphasis added.)
>
> Many manipulative schemes rely on **spreading false information**, which involves knowingly disseminating untrue information about an asset's value in order to move its price. A well-known scheme is the pump and dump, in which a participant spreads a rumor that drives the price up and then sells the shares after the price rises. In energy markets, a common way to misrepresent a commodity's value is to misrepresent the price of the commodity or its level of trading activity.... **False reporting** occurs when a market participant submits fictitious transactions to a price-index publisher to affect the index settlement price.... Similarly, **wash trading** may involve actual but offsetting trades for the same (possibly nonmarket) price and volume between the same market participants such that no economic exchange takes place; however, it may falsely inflate trading volumes at a price level and give the impression of greater trading activity.... **Withholding** is the removal of supply from the market and is one of the oldest forms of commodities manipulation. The classic manipulation of a market corner involves taking a long contract position in a deliverable commodity and stockpiling physical supply to force those who have taken a short position to buy back those positions at an inflated price.[113] (Emphasis added.)

EPACT05 stated that FERC was to conclude a "memorandum of understanding" with the U.S. Commodity Futures Trading Commission (CFTC) to allow information sharing "which shall include, among other things, provisions ensuring that information requests to markets within the respective jurisdiction of each agency are properly coordinated to minimize duplicative information requests, and provisions regarding the treatment of proprietary trading information."[114] The potential for issues of regulatory jurisdiction to arise was suggested in the legislation, as EPACT05 also states that "Nothing in this section may be construed to limit or affect the exclusive jurisdiction of the Commodity Futures Trading Commission under the Commodity Exchange Act (7 U.S.C. 1 et seq.)."[115]

In 2014, the CFTC and FERC signed two memoranda of understanding (MOU) to address overlapping jurisdiction and information sharing in connection with market surveillance and

[112] FERCPrimer, p. 128.

[113] Ibid. p. 129.

[114] See EPACT05, §1281, Electricity Market Transparency, (c)(1).

See FERC-CFTC Memorandum of Understanding on information sharing under both the electric and gas market transparency provisions. (EPACT05, Secs. 316 and 1281), at http://www.ferc.gov/EventCalendar/Files/20051020121515-MOU.pdf.

[115] See EPACT05, §1281, Electricity Market Transparency, (c)(2).

investigations into potential market manipulation, fraud or abuse.[116] A jurisdictional MOU sets out a process under which the agencies will notify each other of activities that may involve overlapping jurisdiction and coordinate to address the agencies' regulatory concerns. A second MOU establishes procedures for FERC and CFTC to share information related to their respective market surveillance and investigative responsibilities.[117]

[116] See MOUs at http://www.cftc.gov/PressRoom/PressReleases/pr6816-14.

[117] Note that in the past, FERC and CFTC have argued over jurisdiction. A recent case in 2012 had CFTC taking issue with a $30 million fine issued by FERC to a natural gas trader for market manipulation. The CFTC sided with the trader saying FERC has no jurisdiction over trading on the New York Mercantile Exchange. See http://www.platts.com/latest-news/natural-gas/washington/cftc-again-sides-with-hunter-against-ferc-cites-6224789.

Dodd-Frank and Electricity Market Manipulation

Companies providing energy to or purchasing energy from wholesale electricity markets may hedge these transactions to manage perceived business risks. That risk may arise from the volatility of spot prices in physical electricity markets, or may result from the impacts of weather on forward electricity prices. Such risks may be hedged using physical transactions, such as bilateral contracts to lock in electricity sales at a price certain. Alternatively, companies have also hedged risks by the use of various financial transactions. These financial transactions may involve over-the-counter[118] (OTC) swaps,[119] swaps traded on a financial exchange, or even the use of puts and calls for a commodity.[120]

Derivatives[121] based on financial transactions are often used to manage business risk. The value of a derivative is linked to a change in an underlying variable. Since weather is one of the principal factors affecting the demand for electricity, power generators could potentially hedge risks using derivatives based on weather conditions, or even fuel prices based on weather conditions. LSEs may potentially use derivatives to manage electricity costs by linking the instrument to the risk of volatile spot market prices, or they may hedge financially using bilateral contracts on OTC markets.[122]

The Dodd-Frank Wall Street Reform and Consumer Protection Act[123] (DFA or Dodd-Frank, P.L. 111-203) was passed largely as a response to the U.S. financial crisis which began in 2008. DFA initiated a number of reforms intended to strengthen the U.S. financial sector, leading to a number of rulemakings at the CFTC. Reforms were aimed at previously unregulated areas involving hedge funds and OTC derivatives markets with new regulations and reporting requirements for swap dealers and participants, and specific prohibitions against fraud and market manipulation.

The CFTC was given exclusive jurisdiction over swap transactions by Title VII of Dodd-Frank, and the Securities and Exchange Commission was given jurisdiction over security-based swaps. DFA includes energy swaps in its definition of swaps, and makes such transactions potentially subject to a number of new CFTC clearing and reporting requirements, but there are important exceptions. Wholesale electricity producers and buyers typically see themselves as participants in

[118] The trading of commodities, contracts, or other instruments not listed on any exchange. OTC transactions can occur electronically or over the telephone. Also referred to as Off-Exchange. See http://www.cftc.gov/ucm/groups/public/@educationcenter/documents/file/cftcglossary.pdf.

[119] Swaps are useful when two parties have different expectations of the outcome of a situation involving risk. For example, an electric utility may believe its revenues in a period will be less than average, and so may be willing to exchange the revenues for a defined payment. The counterparty believes that revenues may be greater than expected, and so is willing to give a fixed payment in exchange for the utility's revenues.

[120] A "put" is an option which permits the holder to sell a commodity at a fixed price for a stated amount and within a stated period. The buyer of this right to sell typically expects the price of the commodity to fall so that the commodity can be delivered at a profit. However, if the price rises, the option does not need to be exercised. A "call" takes the opposite position.

[121] A derivative is "[a] financial instrument, traded on or off an exchange, the price of which is directly dependent upon (i.e., 'derived from') the value of one or more underlying securities, equity indices, debt instruments, commodities, other derivative instruments, or any agreed upon pricing index or arrangement (e.g., the movement over time of the Consumer Price Index or freight rates). They are used to hedge risk or to exchange a floating rate of return for fixed rate of return. Derivatives include futures, options, and swaps. For example, futures contracts are derivatives of the physical contract and options on futures are derivatives of futures contracts." See http://www.cftc.gov/ucm/groups/public/@educationcenter/documents/file/cftcglossary.pdf.

[122] See http://www.nreca.coop/press/fastfacts/Documents/FastFactsDoddFrankAct.pdf.

[123] See http://www.gpo.gov/fdsys/pkg/PLAW-111publ203/pdf/PLAW-111publ203.pdf.

the physical energy markets, not financial markets, using derivatives instruments (primarily swaps and futures contracts) to hedge business risks.

> Sections 723 and 763 of the Dodd-Frank Act provide exceptions to the clearing requirement for swaps and security-based swaps when one of the counterparties to the transaction is not a financial entity; is using the transaction to hedge or mitigate its own commercial risk; and notifies the relevant agency "how it generally meets its financial obligations associated with entering into non-cleared swaps." This has been widely referred to as the end-user exemption because it applies only to transactions where at least one counterparty is "not a financial entity."[124]

Various entities in the electric power sector have applied to the CFTC for no-action relief until petitioners' requests for exemption from regulatory and reporting requirements can be acted upon.[125]

The CFTC issued new rules on July 14, 2011, dealing with DFA's prohibition against fraud and market manipulation "in connection with any swap, or contract of sale of any commodity in interstate commerce, or contract for future delivery on or subject to the rules of any registered entity."

Rule 180.1 addresses DFA issues of fraud, with "specific intent" or "recklessness" triggering a violation, while negligent conduct does not. Trades (i.e., "hedging or speculating") may not be executed, according to the Rule, based on "nonpublic information" which has been illegally obtained. A violation of the Rule "may exist in the absence of any market or price effect."

Hedging Activities of Electric Utilities

Electric utilities and other load serving entities (collectively "electricity entities" or EEs) say that they use hedges or derivatives primarily to reduce risk. For example, if they buy power in the future because of future needs, they may use a derivative so that they can guarantee the price. They may also trade physical power and power derivatives to match their power supply needs to the expected demand so to reduce the supply and price risks. EEs generally don't speculate on derivatives, as speculation would involve trading far beyond their power needs. Commonly, EE hedging and trading activity matches their actual volumes of physical power. They typically hedge some portion or percentage of their power capacity or needs but not all of it.

EEs therefore propose the use of derivatives as an insurance policy against buying power when the price is high. They may also hedge when they have planned power outages at power generating plants and have obligations to sell power (which may otherwise have to be met by power purchases on the spot markets). In such an instance, they could use a "call option." A call option places a cap or ceiling on the price the buyer pays for a commodity. A utility in this case would use a call option to purchase power at a specific time in the future, at a price it was willing to afford. Conversely, a "put option" has a bottom price, which could be used to sell excess power at a bottom rate a selling utility would be willing to accept. However, if the price of power on the spot market at the time the call option is due is lower than the ceiling price, then the buyer can let the call option expire, and buy power from the market.

EE hedges typically involve bilateral contracts. These contracts hedge prices or risk, transferring the risk to the counterparty, which sees an opportunity. The simplest forms of derivatives are forward contracts and swaps. Forward contracts are an agreement between two parties to exchange a commodity (such as physical power or fuel). For example, a utility may estimate how much natural gas it needs but doesn't have a fixed price contract and is concerned about the volatility of natural gas prices. Prices for natural gas could change based on weather,

[124] See "End User" discussion in CRS Report R41398, *The Dodd-Frank Wall Street Reform and Consumer Protection Act: Title VII, Derivatives*, by Rena S. Miller and Kathleen Ann Ruane.

[125] For example, see letter from Edison Electric Institute, American Gas Association, American Public Power Association, and Electric Power Supply Association (i.e., "Joint Associations") at http://www.epsa.org/forms/uploadFiles/24DEE00000038.filename.3_25_2013_Joint_Associations_support_RTO_no_action_Final.pdf.

supply, or other variables. A utility in this instance could buy forward contracts at $4 per million British thermal units (MMBTU), whereas the actual price could vary from $3 to $6 per MMBTU. But the utility has used the forward contract to lock in a price it may not have been able to find on the open market and achieved price certainty in a volatile market. Electricity swaps are widely used in providing short- to medium-term price certainty for EEs. Swaps are also used to exchange cash flows at specified times (i.e., payment dates). For example, a utility may have a stream of revenues that it wants to exchange for a fixed payment. The counterparty may believe, for example, that the utility's rates may be higher than it believes will be realized and is willing to take that risk.

The possibility that hedging may be used to enhance the financial position of an EE organization certainly exists. There may be organizational pressure to provide certainty with regard to costs and revenues, and hedging may provide opportunities to enhance a company's financial position. Prudent companies involved in derivatives should arguably have financial controls in place to ensure that these transactions reduce risk, assuring that the cost is proportionate to the risk in order to make the transaction worthwhile. Government oversight with regard to EE management decisions is likely to be at the state level since many EEs are retail organizations operating primarily under state or local jurisdiction.

DFA's prohibition of market manipulation is addressed in Rule 180.2. Essentially, CFTC's traditional four-part test[126] for market manipulation continues as the agency's standard for a violation. The Rule requires specific intent, not recklessness, to trigger a market manipulation violation. As regards "cross market manipulation," the CFTC states that it intends to "apply final Rule 180.1 to the fullest extent allowed by law" when determining whether conduct in one market is "in connection with" an activity or product subject to its jurisdiction.

> Further, where the [CFTC's] jurisdiction is not exclusive, the [CFTC] will, to the extent practicable and consistent with its longstanding practice, coordinate its enforcement efforts with other federal or state law enforcement authorities.[127]

CFTC's Proposal for Position Limits

In 2015, CFTC proposed new rules that would set position limits on derivatives.[128]

> Position limits are intended to constrain the size of a derivatives position that can be taken by any single speculator. (Exemptions exist for what are termed "commercial hedgers"—i.e., those who tend to engage in the physical production or delivery of a commodity.) The limits often take one of two forms: either a ceiling on the number of contracts that a speculator may control or an "accountability level"—a position size threshold beyond which traders must explain to the futures exchange why they have such a large position (and reduce the position if the exchange so orders).[129]

The CFTC believes that DFA requires the agency to address the risk of "excessive speculation" in commodity markets by implementing position limits. The proposed rulemaking on position limits would enable the CFTC to set position limits in order to prevent excessive speculation and

[126] The four criteria being "(1) that the accused had the ability to influence market prices; (2) that the accused specifically intended to create or effect a price or price trend that does not reflect legitimate forces of supply and demand; (3) that artificial prices existed; and (4) that the accused caused the artificial prices." Commodity Futures Trading Commission, "17 CFR Part 180," 76 *Federal Register* 41398-41411, July 14, 2011.

[127] Ibid.

[128] CFTC, *Position Limits for Derivatives*, 78 *Federal Register* 75680-75842, December 12, 2013. (Hereinafter, CFTCProp).

[129] CRS Report R43117, *The Commodity Futures Trading Commission: Background and Current Issues*, by Rena S. Miller.

manipulation while ensuring sufficient market liquidity for *bona fide* hedgers and protecting the price discovery process.[130]

> "I believe position limits help to protect the markets both in times of clear skies ... as well as when there's a storm on the horizon," CFTC Chairman Gary Gensler said. "This is consistent with congressional intent." ... Democratic CFTC Commissioner Mark Wetjen said the limits would "enhance transparency and minimize manipulation" within the derivatives market. "Today's release builds on that history and finds that position limits are necessary as a prophylactic measure—that is, to lessen the likelihood that a trader will accumulate excessively large speculative positions," he said.[131]

Limits on speculative positions were proposed for 28 physical commodity futures, and swaps considered economically equivalent to these contracts.[132]

FERC's investigation of the Western energy crisis concluded that specifically Enron (and several other companies)[133] had engaged in market manipulation. FERC stated that Enron's business practices and use of derivatives led to its control over a significant amount of energy generation which it did not disclose in its filings before it. FERC accused Enron of flouting its regulations, since Enron did not notify FERC of changes in its market position so that it could continue to charge market-based rates. This resulted in Enron having market power, which it exercised to manipulate the Western energy markets.[134] FERC's investigation concluded that derivatives and other actions were used by Enron and its affiliates to manipulate spot energy prices and markets in the WEC, causing price distortions and market disruptions.

It cannot be definitively answered what the effect of the proposed rules for position limits may have been, had they been in effect during the WEC. The CFTC expects the proposed rules to further its mission to deter and prevent manipulative behavior while maintaining sufficient liquidity for hedging activity and protecting the price discovery process.

The goal of CFTC's position limits is to prevent any entity (or group of entities) from gaining market power which it would use to influence prices. Henry Hub natural gas was one of the 28 commodities included in the CFTC's proposed rules for position limits. FERC's investigation showed that Enron potentially manipulated prices at the Henry Hub for its own gain.[135] Electricity is not included as a commodity by the CFTC, but since electricity was often the marginal fuel in California, manipulation of natural gas prices impacted prices for electricity.

It is apparent from FERC's investigations that Enron (especially) ignored the rules that were in effect (at the time) to prevent the exercise of market power, and fashioned schemes to hide its

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[130] CFTC, *Fact Sheet: Proposed Regulations on Position Limits for Derivatives*, 2016, http://www.cftc.gov/idc/groups/public/@newsroom/documents/file/pl_150_factsheet.pdf.

[131] Brian Mahoney, "CFTC Votes to Consider New Position Limits on Derivatives," *Bloomberg Law 360*, November 5, 2013.

[132] Henry Hub Natural Gas is one of the covered commodities. Electricity is not included in the covered commodities.

[133] Five other traders (Williams, Dynegy, AEP, CMS, and El Paso Merchant Energy) admitted that their employees falsified information used for natural gas price indices. The false reporting included fabricating trades, inflating the volume of trades, omitting trades, and adjusting the price of trades. FERC, *Final Report on Price Manipulation in Western Markets*, Docket No.PA02-2-000, March 2003, http://www.ferc.gov/industries/electric/indus-act/wec.asp.

[134] "Enron violated its [Market Based Rate Authority] and the [California Power Exchange] and Cal ISO tariffs throughout the Relevant Period by engaging in various gaming and market manipulation schemes throughout the Western interconnect." See p. 81, 119 FERC ¶ 63,013.

[135] "FERC Staff obtained information indicating that Enron traders potentially manipulated the price of natural gas at the Henry Hub in Louisiana to profit from positions taken in the over-the-counter (OTC) financial derivatives markets (OTC markets)." FinRep, p. IX-1.

positions in the markets in order to manipulate prices for its own gain. It is unlikely that the CFTC's position limits would have any effect on these sorts of illegal behaviors, but could possibly have limited their effects if the position limits were adhered to.

Some Recent FERC Anti-Market Manipulation Actions

FERC states that it is focusing on anti-competitive "conduct that threatens market transparency" because such conduct undermines "confidence in the energy markets and [can] damage consumers and competitors."[136]

> ... [FERC's] Division of Investigations (DOI) conducts investigations of potential violations of the statutes, regulations, rules, orders, and tariffs administered by the Commission. Those investigations may begin from self-reports, tips, calls to the Enforcement Hotline, referrals from organized markets or their monitoring units, other agencies, other divisions within Enforcement, other program offices within the Commission, or as a result of other investigations.... If staff finds significant violations, it reports its findings to the Commission and attempts to settle investigations for appropriate sanctions and future compliance improvements before recommending that the Commission initiate a public show cause proceeding.... If a settlement cannot be reached, the Commission may issue an order to show cause (OSC) directing the subject to explain why it did not commit a violation and why penalties and disgorgement are not warranted. The subject has a full opportunity to respond to that OSC, and Enforcement staff may reply to the subject's response.... Most DOI investigations do not result in a contested court matter but are either closed without further action or settled. In all cases, staff attempts to settle matters when it is in the public interest to do so.[137]

Ten recent cases (brought by FERC in the 2012 to 2014 period) alleging energy market manipulation concluded in settlements with $448 million in civil penalties, and total disgorgements ordered of $243 million.[138] The most prominent of these settlements involved the Constellation Energy Commodities Group,[139] and the JP Morgan Ventures Energy Corporation.[140] Resolution of the complaint brought against BP America[141] is still pending.

In FY2015, FERC litigated five matters in United States District Courts to enforce the Commission's penalty assessments as discussed in the following.

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[136] See http://www.ferc.gov/enforcement/market-manipulation.asp.

[137] FERC, *2015 Report on Enforcement*, Docket No. AD07-13-009, November 19, 2015, http://www.ferc.gov/legal/staff-reports/2015/11-19-15-enforcement.pdf.

[138] See FERC, *Prohibition of Energy Market Manipulation*, December 3, 2015, http://www.ferc.gov/enforcement/market-manipulation.asp. (Hereinafter, FERC15).

[139] The Constellation Energy Commodities Group settlement resulted in $135 million in penalties, with $110 million ordered in disgorgement. The agreement resolved allegations that the company had traded energy in ISO-NE and NY-ISO markets to affect market prices in financial instruments based on those prices, and misrepresented the purpose of the trades to the NY-ISO market monitor. 138 FERC ¶ 61,168.

[140] FERC's settlement with the JP Morgan Ventures Energy Corporation resolved allegations that the company engaged in multiple strategies in the CAISO and MISO markets intended to obtain above-market payments through fraudulent billing practices. The settlement resulted in $285 million in penalties, with $125 million ordered in disgorgement to ratepayers. 144 FERC ¶ 61,068.

[141] FERC alleged that BP America manipulated sales of natural gas at specific natural gas trading hubs to affect the index price at which related financial instruments settled. FERC proposed a civil penalty of $28 million, with $800,000 in disgorgement. FERC issued an order setting the matter for hearing before an Administrative Law Judge. 147 FERC ¶ 61,130.

On May 1, 2015, the Commission issued an Order Assessing Civil Penalties against Maxim Power Corporation, Maxim Power (USA), Inc., Maxim Power (USA) Holding Company, Inc., Pawtucket Power Holding Co., LLC, and Pittsfield Generating Company, LP (collectively Maxim) and Maxim employee Kyle Mitton. The Commission determined that Maxim and Mitton had violated the Commission's Anti-Manipulation Rule through a scheme to collect $3 million in inflated payments from ISO-NE for reliability runs by charging the ISO for costly oil when it actually burned much less expensive natural gas. In addition, the Commission found that Maxim had violated section 35.41(b) of the Commission's regulations by making false and misleading statements and material omissions in its communications with the ISO-NE Market Monitor. The Commission assessed civil penalties of $5 million against Maxim and $50,000 against Mitton.... On July 1, 2015, Enforcement staff filed a petition in the United States District Court for the District of Massachusetts to enforce the Commission's Order, and the respondents filed a motion to dismiss the petition on September 4, 2015.[142] That motion remains pending as of the date of this report.[143]

On May 29, 2015, the Commission issued an Order Assessing Civil Penalties, in which it determined that Powhatan Energy Fund, LLC (Powhatan), Houlian "Alan" Chen, HEEP Fund, Inc. (HEEP), and CU Fund, Inc. (CU) had violated the Commission's Anti-Manipulation Rule by engaging in fraudulent Up-To Congestion trades in the PJM Interconnection, LLC (PJM) market during the summer of 2010.... Specifically, respondents had placed fraudulent round-trip trades (trades in opposite directions on the same paths, in the same volumes, during the same hours) that involved no economic risk and constituted wash trades. The Commission assessed civil penalties of $16.8 million against Powhatan, $1 million against Chen, $1.92 million against HEEP, and $10.08 million against CU and ordered disgorgement of unjust profits in the amounts of $3,465,108 from Powhatan, $173,100 from HEEP, and $1,080,576 from CU, plus interest. On July 31, 2015, Enforcement staff filed a petition in the United States District Court for the Eastern District of Virginia to enforce the Commission's Order.[144] On October 19, 2015, the respondents filed a motion to dismiss the petition, and that motion remains pending as of the date of this report.[145]

On July 2, 2015, in another PJM Up-To Congestion market manipulation matter, the Commission issued an Order Assessing Civil Penalties against City Power Marketing, LLC (City Power) and its owner, K. Stephen Tsingas. The Commission found that City Power and Tsingas had violated the Commission's Anti-Manipulation Rule by engaging in fraudulent Up-To Congestion trades in the PJM market during the summer of 2010. As part of that finding, the Commission determined that City Power and Tsingas had engaged in three types of trades to improperly collect MLSA payments intended for bona fide Up-To Congestion trades.... The Commission also found that City Power had violated section 35.41(b) of the Commission's regulations by making false and misleading statements and material omissions in its communications with Enforcement staff to conceal the existence of relevant instant messages. The Commission assessed $14 million in civil penalties against City Power and $1 million against Tsingas and ordered disgorgement of $1,278,358 in unjust profits, plus interest. On September 1, 2015, Enforcement staff filed a petition in the United States District Court for the District of Columbia to enforce the Commission's

[142] Reference added. FERC v. Maxim Power Corporation, No. 15-cv-30113 (D. Mass.).

[143] FERC15, see p. 6.

[144] Reference added. FERC v. Powhatan Energy Fund, LLC, No. 3:15-cv-00452 (E.D. Va.).

[145] FERC15, see p. 7.

> Order.[146] On November 2, 2015, the respondents filed a motion to dismiss the petition, and that motion remains pending as of the date of this report.[147]
>
> On July 16, 2013, the Commission issued an Order Assessing Civil Penalties, in which it determined that Barclays Bank, PLC (Barclays) and several of its traders had violated the Commission's Anti-Manipulation Rule by engaging in loss-generating trading of next-day, fixed-price physical electricity on the Intercontinental Exchange with the intent to benefit financial swap positions at primary electricity trading points in the western United States. The Commission assessed civil penalties of $435 million against Barclays and $18 million against the named traders and ordered Barclays to disgorge $34.9 million in unjust profits, plus interest. On October 9, 2013, Enforcement staff filed a petition in the United States District Court for the Eastern District of California to enforce that civil penalty assessment.[148] ... On October 2, 2015, the court issued a scheduling order indicating that it will proceed with this case by reviewing FERC's Order (and underlying administrative record) and will also consider whether a determination as to this penalty assessment requires supplementation of the record submitted by FERC and/or alternative means of fact-finding. The Court, in this scheduling order, also bifurcated the disgorgement calculation from its review of liability and civil penalty assessment.[149]
>
> On August 29, 2013, the Commission issued two Orders Assessing Civil Penalties in which it determined that Lincoln Paper and Tissue LLC (Lincoln), Competitive Energy Services, LLC (CES), and Richard Silkman (CES's Managing Partner) had violated the Commission's Anti-Manipulation Rule in connection with a demand response program. It found that the respondents had engaged in a scheme to fraudulently inflate Lincoln's energy load baselines and then offer load reductions against that inflated baseline. The Commission assessed civil penalties of $5 million against Lincoln, $7.5 million against CES, and $1.25 million against Silkman and ordered disgorgement of $379,016 from Lincoln and $166,841 from CES, plus interest. On December 2, 2013, Enforcement staff filed two petitions in the United States District Court for the District of Massachusetts to enforce those penalty assessment orders (one against Lincoln and another against CES and Silkman).[150] The respondents filed motions to dismiss the petitions in FY2014, and those motions still are pending with the court.[151]

FERC's allegations in the above cases bring to mind the speculative and manipulative market schemes it found Enron liable for during the Western energy crisis. Several of the same strategies used by Enron are alleged, with the entity said to have fabricated transactions for profit or to change market outcomes.

However, there has also been at least one instance where the 'unusual' actions of an entity reportedly had a negative impact for consumers, but FERC did not perceive market manipulation. That instance involved the New England power market and the acquisition of the Brayton Point power plant for $650 million by Energy Capital Partners, who then moved to close the plant five weeks later. With the Brayton Point plant suddenly closed, Forward Capacity market prices rose

[146] Reference added. FERC v. City Power Marketing, LLC, No. 15-cv-01428 (D.D.C.).

[147] FERC15, see p. 7.

[148] Reference added. FERC v. Barclays Bank, PLC, No. 2:13-cv-2093 (E.D. Cal.).

[149] FERC15, see pp. 7 and 8.

[150] FERC v. Lincoln Paper and Tissue, Inc., No. 1:13-cv-13056 (D. Mass.), and FERC v. Silkman, No. 1:13-cv-13054 (D. Mass.).

[151] FERC15, see p. 8.

significantly, and it was estimated that New England electricity consumers could pay $2.6 billion more per year for electricity.[152]

ISO-NE has since proposed Forward Capacity market retirement reforms[153] to install a "priced retirement" requirement under which an existing resource will have to submit a market price at which the supplier will drop out of the auction process. A supplier may then retire a resource after giving notice and submitting the retirement price prior to the qualification process for upcoming forward capacity auctions. A supplier could still retire a resource regardless of price, or take a capacity supply obligation only if the auction clearing price is above their originally submitted retirement bid. ISO-NE stated that "the Retirement Reforms remove the potential for a capacity supplier to exercise market power in the form of physical withholding by unconditionally retiring a resource that is still economically viable or, if the conditional treatment option is elected, in the form of economic withholding by submitting a priced retirement bid at a level that is not economically justified."[154]

Jurisdictional Issues

With the passage of the Energy Independence and Security Act of 2007 (P.L. 110-140, EISA), there are at least three federal agencies authorized to prevent and levy civil fines for energy market manipulation. EISA gave new authority to the U.S. Federal Trade Commission (FTC) to prevent energy market manipulation, similar in scope to the authority previously given to FERC in EPACT05,[155] and authorized FTC to impose civil penalties of up to $1 million per day per violation.

Congress required FERC, CFTC, and FTC to draw up memoranda of understanding[156] to prompt the agencies to share information, and, presumably, to discuss where the boundaries between their different jurisdictions and enforcement roles exist in preventing energy market manipulation. However, questions apparently still exist about these roles.

In a case of alleged market manipulation, FERC attempted to levy a $30 million fine against the lead natural gas trader at the hedge fund Amaranth after the CFTC had already taken civil action for trades on the New York Mercantile Exchange (NYMEX) in 2007. Sales of natural gas futures were alleged to have been made so that other assets in natural gas markets would benefit from a price decrease. While the CFTC has jurisdiction over NYMEX trading, FERC argued that manipulation of natural gas futures in NYMEX influenced the prices of natural gas transactions under its jurisdiction, thus giving FERC an enforcement role in the proceedings. CFTC rejected this reasoning, and the interagency dispute was decided by the U.S. Court of Appeals in a ruling handed down in March 2013. A three-judge panel of the D.C. Circuit ruled unanimously in favor of the CFTC position, rejecting FERC's involvement in the case as outside the scope of the

[152] DCJ.

[153] ISO-NE, *Forward Capacity Market Retirement Reforms*, December 16, 2015, http://www.iso-ne.com/static-assets/documents/2015/12/er16-551-000_retire_reforms.pdf.

[154] Ibid.

[155] See EISA, Title VIII—Improved Management Of Energy Policy, Subtitle B—Prohibitions on Market Manipulation and False Information, section 811.

[156] See DFA, Title VII.

FERC's authority.[157] Amaranth had previously settled the alleged market manipulation of natural gas futures case with the CFTC for $7.5 million in 2009.[158]

Barclays also tried to move its case from FERC to the CFTC, but the Court held that "the manipulative scheme was jurisdictional to FERC and not within the Commodity Futures Trading Commission's exclusive jurisdiction."[159]

The CFTC recently issued a final order exempting certain RTO transactions, agreements, and contracts from Dodd-Frank regulations.[160] The transactions exempted included FTRs, energy transactions (in both Day-ahead and real-time markets, including demand response, and virtual and convergence bids and offers), Forward Capacity transactions, and reserve or regulation transactions which are sold or offered in an RTO market administered by the petitioning RTOs and ISOs.

Discussion

RTO markets have enabled a variety of products and services, including derivatives and hedges for market participants, ostensibly to reduce risks from volatile prices. Financial instruments were added to RTO markets essentially to increase liquidity. Markets are said to be liquid if trading and volumes allow traders to liquidate a position at any time, without affecting prices.[161] Liquidity encourages entrants to the electricity markets, and helps smaller LSEs find counterparties with which to trade. A liquid market is especially important to energy brokers or traders who purchase energy for resale, not for end-use. It could be reasonably argued that a drive to increase liquidity and create mechanisms to deal with volatility has also led to the addition of financial instruments such as FTRs and virtual trades, which ostensibly act to encourage speculation in the electricity markets.

Electric utilities and LSEs maintain that they hedge transactions primarily to reduce risk, whereas speculators in electricity markets ostensibly hedge transactions to capitalize on positions. However, Dodd-Frank addresses issues related to market manipulation from fraud, stating that "specific intent" or "recklessness" would trigger a rules violation.

FERC for its part states that its focus is on anti-competitive "conduct that threatens market transparency," and says that it frames its anti-manipulation rule "broadly" rather than articulating specific conduct because of the wide potential for manipulative actions.[162] Yet some might argue that the "preference" for settlements at FERC leads to a lack of clarity about what constitutes market manipulation, and what does not.

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[157] *Hunter vs. FERC*, U.S. Court of Appeals No. 11-1477, March 13, 2013 at http://www.cadc.uscourts.gov/internet/opinions.nsf/99CC9904B30AC2CB85257B2F004DEA04/%24file/11-1477-1425550.pdf. (Herinafter Hunter.)

[158] LegalTimes, *In Agency Turf Battle, Appeals Court Voids $30M Fine Against Trader*, March 15, 2013, http://legaltimes.typepad.com/blt/2013/03/in-agency-turf-battle-appeals-court-voids-30m-fine-against-trader.html.

[159] FERC15, see pp. 7 and 8.

[160] See Final Order in Response to a Petition From Certain Independent System Operators and Regional Transmission Organizations to Exempt Specified Transactions Authorized by a Tariff or Protocol Approved by the Federal Energy Regulatory Commission or the Public Utility Commission of Texas From Certain Provisions of the Commodity Exchange Act Pursuant to the Authority Provided in the Act; Notice at http://www.cftc.gov/ucm/groups/public/@lrfederalregister/documents/file/2013-07634a.pdf.

[161] FERCPrimer, p. 115.

[162] "The Commission recognized this reality by framing its Anti- Manipulation Rule broadly, rather than articulating specific conduct that would violate its rules." Ibid, p. 128.

Issues for Congress

When RTOs were originally authorized, the expectation was that an efficient, functionally competitive market would send price signals with prices reflecting scarcity of capacity. In 2007, as it became apparent that pricing signals were not sufficient for a long-lived, capital-intensive investment, Forward Capacity markets were proposed to augment price signals. Some states and LSEs still maintain that new generation is not being built despite price signals and high capacity prices in load pockets. Price volatility in markets is said to be part of the reason for the lack of construction, and uncertainty results when the dynamic of constantly changing rules is thrown in. This uncertainty causes doubts to arise in the minds of investors and builders of generation with regard to the ability of forward capacity markets to incentivize new plant construction.

- A question Congress may want to consider is how to judge the success of Forward Capacity markets as regards customer benefits, and whether a single, FERC-mandated approach on Forward Capacity markets (where elected) would serve to provide clear price signals and market rules?
- Should the federal Supremacy Clause apply to FERC-regulated RTO markets, or should states in these regions be allowed to incentivize power plants built to address "long-term" electric power needs?

It appears that the RTO electricity markets are gradually becoming more financial in nature. Physical and financial transactions are being increasingly linked and apparently converging in order to increase liquidity in the markets. Examples of this convergence are FTRs, virtual trading, and the "Up to Congestion" transaction which was "created as a mechanism to provide some price certainty in the day-ahead energy market. Customers can specify how much they are willing to pay for congestion.... If the congestion charges are up to or less than the specified amount, then the transaction is scheduled."[163] In essence, these financial tools are taking the place of traditional load forecasting tools which are reliant on using customer history and interactions to estimate demand needs. As financial instruments available to speculators as investments, it is not surprising that these financial transactions are possible instruments for market manipulation.

Further potential concerns for Congress may include:

- As a possible trend increases towards an apparent convergence of financial and physical transactions, will the incidences of market manipulation increase with increasing opportunities to engage in financial electricity transactions?
- Will the potential for increasingly financial transactions lead mostly physical RTO market participants to become increasingly involved with hedging to ensure financial health?
- Are current electricity market rules and tariffs designed to encourage liquidity in the marketplace increasing speculation without further benefits to customers?

The electricity industry is entering a time of change, and electricity markets are evolving with the industry. The expected retirement of many coal-fired power plants can affect RTO markets as generator portfolios change to include more natural gas-fired plants, and the prices that this new generation is expected to command. With load growth stagnant or diminishing in many regions, the pull towards a greater use of hedging and more liquid markets may increase as the need to

[163] See http://www.pjm.com/committees-and-groups/issue-tracking/issue-tracking-details.aspx?Issue={A1D2CD14-012A-47E0-8456-A76BDB97BA6C}.

decrease costs and stabilize revenues increases. Market manipulation is said to be difficult to detect, as prices can be manipulated through a variety of mechanisms.[164]

Relevant questions may include:

- Would standardized market rules for the RTO markets (or elements of these markets) help to reduce opportunities for market manipulation? and
- Would such standardized market rules provide regulatory clarity and transparency, and thus help to decrease costs?

It should be noted that electricity prices in most U.S. regions are closely tied to natural gas prices.[165] In the Amaranth case, one of the FERC Commissioners commented on the Appeals Court ruling postulating that the decision may mean there is less oversight of cross-market manipulation.[166] A number of enforcement proceedings at FERC alleged market manipulation by "companies that traded at a loss in either a financial or physical electricity market in order to gain in the other market."[167]

Congress may want to consider whether there is sufficient clarity on jurisdictional issues:

- Given that electricity generation in the United States appears to moving to a greater dependence on natural gas as a fuel, does this trend lend itself to a conclusion that the opportunities and potential gains from cross-market manipulation are likely to increase?
- Are the "seams" between FERC and CFTC jurisdiction sufficiently addressed by MOU between the agencies?

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[164] See http://www1.eere.energy.gov/femp/pdfs/primer.pdf.

[165] The United States has many regional wholesale electricity markets. Wholesale electricity prices are closely tied to wholesale natural gas prices in all but the center of the country. Therefore, one can often explain current wholesale electricity prices by looking at what is happening with natural gas prices. See http://www.eia.gov/electricity/monthly/update/wholesale_markets.cfm.

[166] PR Newswire, *Platts Energy Podium: Court Ruling on U.S. FERC Enforcement May Need Legislative Fix—Clark*, March 20, 2013, http://www.marketwatch.com/story/platts-energy-podium-court-ruling-on-us-ferc-enforcement-may-need-legislative-fix-clark-2013-03-20.

[167] Ibid.

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