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The Federal Power Act (FPA) and Electricity Markets

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Summary

The electric power industry is in the process of transformation. The electricity infrastructure of the United States is aging; uncertainty exists around how to modernize the grid, and what technologies and fuels will be used to produce electricity in the future. Unresolved questions are arising about market structure, potential cyber and physical security threats, and continuing interest in harnessing low carbon sources of electricity. Concerns about reliability and electricity prices are being affected by new environmental regulations, and the rising availability of natural gas for the production of electric power.

On September 7, 2016, the House Energy and Commerce Committee's Energy and Power subcommittee (E&P subcommittee) made efforts to re-evaluate the relevance of the Federal Power Act (FPA) in the context of a changing electricity industry, with a hearing on historical perspectives of the act. The FPA has been the primary vehicle that Congress has used to modify national policies affecting the U.S. electricity industry. It will be the most likely vehicle for Congress to consider in initiating new policies for the modernization of this industry.

In 1935, Congress passed the Public Utility Act (PUA) seeking to end the abuses of market power evident at that time. Title II of the PUA created the Federal Power Act. Part I of the FPA addressed licensing of nonfederal hydropower projects on navigable waters. Part II of the FPA addressed the regulation of electric utilities engaged in interstate commerce, delineating federal and state jurisdiction, respectively, with respect to wholesale and retail sales. The Federal Energy Regulatory Commission's (FERC's) regulatory authority derives from the FPA.

Electric utilities were originally vertically integrated companies responsible for power generation, transmission, and distribution of electricity to end-use customers. Congress began to move the electric power industry towards competition with the passage of the Energy Policy Act of 1992 (EPACT92; P.L. 102-486). In 1996, the Commission exercised its authority under the FPA, issuing two regulations intended to inaugurate an open and efficient marketplace for electric power. A few years later, FERC took the next step encouraging the formation of independent regional transmission organizations (RTOs) in Order No. 2000. In RTO regions, electricity utilities were restructured, shifting power generation from a rate-regulated to a competitive regime, with FERC regulating the transmission of power. Under restructuring, states continued to regulate distribution. RTO electricity markets provide about 60% of power nationwide supplied to distribution utilities.

A number of conceptual, structural, and policy issues have emerged with RTO operations and energy markets. Some RTOs are being confronted with concerns over whether there will be adequate levels of competitive generation to participate in the markets, and sufficient future capacity in the marketplace. FERC has been involved in recent court proceedings to ensure that state actions to incentivize new power plant construction do not unduly inhibit competitive price formation in RTO markets.

Other concerns involve the use of market power and price manipulation. FERC was tasked by the Energy Policy Act of 2005 (P.L. 109-58) with prohibiting "any entity" from using "manipulative or deceptive device or contrivance" in connection with the purchase or sale of natural gas or electric energy in transactions subject to FERC jurisdiction. The 2000-2001Western energy crisis showed that electricity markets are susceptible to market manipulation. RTO markets have enabled a variety of products and services, including derivatives and other tools for market participants, ostensibly to reduce risks from volatile prices. Regulating such products and services still faces a number of issues.

FERC continues to refine its approach to these and other wholesale electricity market issues. But the emergence and of new technologies and energy conservation schemes will likely bring new pressures to change how the electricity industry operates. As the electricity markets continue to evolve, Congress may examine whether changes to the FPA are necessary to ensure the economic and reliable operation of the U.S. electricity system.

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Introduction

The electric power industry is in the process of transformation. The electricity infrastructure of the United States is aging, and uncertainty exists around how to modernize the electric grid, and what technologies and fuels will be used to produce electricity in the future. Questions about transmission expansion and grid reliability are arising from potential cyber and physical security threats, and continuing interest in harnessing renewable energy and other low carbon sources of electricity. Concerns about reliability and electricity prices are being affected by new environmental regulations, and the rising availability of natural gas for the production of electric power.

The Federal Power Act (FPA) has been the primary vehicle that Congress has used to modify national policies affecting the U.S. electricity industry. It will be the most likely vehicle for Congress to consider in initiating new policies for the modernization of this industry.

On September 7, 2016, the House Energy and Commerce Committee's Energy and Power subcommittee (E&P subcommittee) made efforts to reevaluate the relevance of the FPA in the context of a changing electricity industry, with a hearing on historical perspectives of the act.[1] Some questions from subcommittee members in the hearing were largely focused on wholesale power market concerns, while other questions delved into issues of state vs. federal jurisdiction (such as state policies viewed as promoting the integration of customer-owned generation into wholesale markets).[2]

This report reviews the history of the Federal Power Act,[3] and focuses on current electricity market issues and their connection to the act.

History of the Federal Power Act

In 1920, Congress enacted the Federal Water Power Act (FWPA) to provide federal oversight of hydropower development on navigable waters in the United States. The act created the Federal Power Commission (FPC) to regulate the construction and operation of nonfederal hydropower projects.[4] In subsequent years, many companies began to enter the electric power industry. Large companies began to form and consolidate the industry, as economies of scale began to dominate the production of electric power. Many of these individual companies fell under the organizational control of even larger "holding companies."[5] This was likely an effort to evade

[1] House Energy and Commerce Committee, *Subcommittee to Commence Electricity Review by Looking Back at Evolution of Markets Under the Federal Power Act*, September 1, 2016, https://energycommerce.house.gov/news-center/press-releases/hearing-subenergypower-examine-foundations-federal-power-act-next-week.

[2] J. Porter Wiseman, *United States: Congress Revisits the History of the Federal Power Act to Consider Its Future*, Akin Gump Strauss Hauer and Feld, LLP, September 16, 2016, http://www.mondaq.com/unitedstates/x/527410/Energy+Law/Congress+Revisits+The+History+Of+The+Federal+Power+Act+To+Consider+Its+Future.

[3] 16 U.S.C. 791 et seq.

[4] 16 U.S.C. Sections 791 to 823d.

[5] "A company that confines its activities to owning stock in and supervising management of other companies. The Securities and Exchange Commission, as administrator of the Public Utility Holding Company Act of 1935, defines a holding company as 'any company that directly or indirectly owns, controls, or holds, with power to vote, 10 percent or more of the outstanding voting securities of a public-utility company or of a holding company of any public-utility company.'" 42 U.S.C 16451.

state regulation because states did not have jurisdiction over interstate transmission or rates charged for electricity, and federal regulations did not exist for such interstate activities.[6]

In 1935, Congress passed the Public Utility Act (PUA) which sought to end the abuses of market power at that time.[7] Title I of the PUA, the Public Utility Holding Company Act of 1935 (PUHCA; P.L. 74-333), was created to address the lack of oversight over holding companies. Among other actions, PUHCA gave the Securities and Exchange Commission (SEC) authority over many holding company transactions, and it limited power industry mergers and acquisitions to contiguous areas.[8]

Federal Power Act

Title II of the PUA amended the FWPA to create the FPA, and granted authority to the FPC to regulate the interstate transmission and sales of electricity and natural gas. The FWPA became Part I of the FPA, with the FPC assuming authority over nonfederal hydropower projects on navigable waterways and federal lands.

Part II of the FPA authorized the FPC to regulate the interstate transportation and wholesale sale (i.e., sale for resale) of electric energy, while leaving jurisdiction over intrastate transportation and retail sales (i.e., sale to the ultimate consumer) in the hands of the states.[9]

The FPA was codified as 16 U.S.C. Chapter 12, Federal Regulation and Development of Power, with four Subchapters (or Parts):

- Subchapter I—Regulation of the Development of Water Power and Resources (§§791 to 823d)
- Subchapter II—Regulation of Electric Utility Companies Engaged in Interstate Commerce (§§824 to 824w)
- Subchapter III—Licensees and Public Utilities; Procedural and Administrative Provisions (§§825 to 825u)
- Subchapter IV—State and Municipal Water Conservation Facilities (§§828 to 828c)

Under FPA Section 205, all rates and charges "made, demanded, or received" by public utilities for the transmission or sale of electricity subject to FPC authority, cannot be "unjust or

[6] Jonathan Lesser and Leonardo Giacchino, "A Brief History," in *Fundamentals of Energy Regulation*, 1st ed. (Vienna, VA: Public Utilities Reports Inc., 2007), pp. 4-5. (Hereinafter, FER.)

[7] "Congress enacted PUHCA as a response to the shady business practices of huge utility holding companies during the 1920s and 30s. These holding companies controlled utilities in complicated pyramid structures, where a few investors at the top held controlling shares of many subsidiary companies. In the early 1930s, three holding companies controlled almost half the utility industry, with one owning 130 utilities. This pyramid structure led to a variety of problems. For example, subsidiaries of the holding company could charge each other inflated rates for service, and hide the charges in their regulated rates. Also, since the holding company was legally separate from the subsidiary, it was not liable for debts." Union of Concerned Scientists, *Public Utility Holding Company Act (PUHCA)*, 2017, http://www.ucsusa.org/clean_energy/smart-energy-solutions/strengthen-policy/public-utility-holding.html#.WLX7vL-YKk4.

[8] See 15 U.S.C. 79c(a). PUHCA required interstate holding companies engaged through their subsidiaries in the electric utility business to register with the SEC; to file detailed reports about their organization, financial structure, and operations; and to operate as coordinated, integrated systems, confined to the "State in which it is organized and States contiguous thereto." The repeal of PUHCA in the Energy Policy Act of 2005 (P.L. 109-58) nullified the contiguous requirement.

[9] See 16 U.S.C. 824(b)(1).

unreasonable" and cannot be "unduly discriminatory or preferential."[10] Under FPA Section 206, the FPC could initiate an investigation (on its own or by request) to ensure that rules or practices affecting wholesale rates are just and reasonable.[11]

As new federal energy policies have emerged in the subsequent years since the FPA's initial passage, a number of new sections have been added to the FPA by legislative amendments.[12]

Creation of the Federal Energy Regulatory Commission

In 1977, Congress enacted the Department of Energy Organization Act (EOA, P.L. 95-91), terminating the FPC and creating the Federal Energy Regulatory Commission (FERC or the Commission) as an independent commission under the newly formed U.S. Department of Energy. The reorganization effort was largely ascribed to growing doubts about the effectiveness of the FPC.[13]

Section 402 of the EOA outlined FERC's jurisdiction, transferring some of the FPCs obligations to FERC. The Commission was tasked with hydroelectric dam licensing and safety (primarily under Part (Subchapter) I of the FPA), and regulation of rates and services for the interstate transmission or wholesale sale of electric energy (primarily under Parts II and III of the FPA). Section 402 of the EOA also transferred the FPC's administrative, procedural, and accounting functions (among other responsibilities) under Part III of the FPA to FERC.[14]

Competition in the Electric Power Industry

Electric utilities were originally vertically integrated companies responsible for power generation, transmission, and distribution of electricity to end-use customers. State regulatory commissions oversaw utility operations, setting the rates electric utilities charged for services.

In 1978, the Public Utility Regulatory Policies Act (PURPA; P.L. 95-617) was enacted. PURPA established an alternate class of power generators called Qualifying Facilities (QFs). QFs could sell their power to electric utilities, which had a general obligation to purchase the power under PURPA at the utility's avoided cost[15] or at a negotiated rate. Under PURPA, two categories exist for QFs: qualifying small power production facilities and qualifying cogeneration facilities. Small power production QFs use renewable (hydro, wind, or solar), biomass, waste (including waste coal), or geothermal resources, and have a capacity of 80 megawatts (MW) or less.[16] Cogeneration (or combined heat and power) facilities produce electric energy and forms of useful

[10] 16 U.S.C. 824d.

[11] 16 U.S.C. 824e.

[12] For example, amendments to the FPA defining "qualifying small power production facility" and "qualifying cogeneration facility" under the Public Utility Regulatory Policies Act of 1978 (P.L. 95-17) were codified in FPA Subchapter II, §824a–3—Cogeneration and Small Power Production.

[13] "There was a colossal backlog of applications for natural gas permits, while there were chronic brownouts in the 1960s and the [Organization of the Petroleum Exporting Countries (OPEC)] embargo in the 1970s." FERC, *History of FERC*, 2016, https://www.ferc.gov/students/ferc/history.asp.

[14] 16 U.S.C. 825 et seq.

[15] "Avoided cost is the incremental cost to an electric utility of electric energy or capacity which, but for the purchase from the QF, such utility would generate itself or purchase from another source." 18 C.F.R. 292.101(b)(6).

[16] 18 C.F.R. 292.204

thermal energy from a single use of fuel.[17] While there is no restriction on the type of fuel used, cogeneration QFs are subject to standards for operation, efficiency, and use of energy output.[18]

Congress began to move the electric power industry towards competition with the passage of the Energy Policy Act of 1992 (EPACT92; P.L. 102-486). EPACT92 created a new class of power generators called Exempt Wholesale Generators (EWGs). Companies qualify for EWG status if they are exclusively in the business of owning/operating generating facilities and if they sell electricity solely to wholesale customers.[19] EWGs were not subject to regulation as a utility under PUHCA and, as producers of electricity at scale, they were direct competitors to existing utility generation. Under Subtitle B of EPACT92, the Federal Power Act was amended to allow wholesale generators to apply to FERC for an order requiring a transmitting utility to provide transmission services to transport (or "wheel") the electricity they generated.[20]

In 1996, the Commission exercised its authority under the FPA, issuing two regulations intended to encourage an open and efficient marketplace for wholesale electric power. FERC Order 888[21] ensured access to the transmission grid for all that wished to transport electricity. The order required electricity transmission owners to allow open, nondiscriminatory access to their transmission systems, thus promoting wholesale competition. Order 888 also established the Commission's Open Access Same-time Information System (OASIS) to sanction nondiscriminatory tariffs[22] and for scheduling of transmission-related transactions. FERC also released Order 889 to establish rules and standards of conduct for OASIS arrangements.[23] These orders and other efforts to move towards market-based rates for electric power purchase and transmission are discussed in further detail in the next section.

Regional Transmission Organizations (RTOs) and Power Markets

Electricity today is widely viewed as a commodity, and as a commodity, electricity is bought and sold in electricity markets. Electricity can be measured as power (kilowatts or megawatts) and energy (kilowatt-hours or megawatt-hours), and these attributes can be traded in electricity markets. Regional transmission organizations (RTOs) manage electric power systems across the United States by which much of the wholesale electricity is transported. **Figure 1** shows a map of RTO regions. In RTO regions, electricity utilities were restructured, moving power generation from a rate-regulated to a competitive regime, with transmission of power regulated by FERC, and distribution systems remaining largely under state regulation. In most regions of the country

[17] 18 C.F.R. 292.205

[18] Ibid.

[19] 15 U.S.C. 79z-5a.

[20] 16 U.S.C. 824j.

[21] Order No. 888, *Promoting Wholesale Competition Through Open Access Nondiscriminatory Transmission Services by Public Utilities; Recovery of Stranded Costs by Public Utilities and Transmitting Utilities*, FERC Statutes and Regulations ¶31,036, 61 *Federal Register* 21,540 (1996).

[22] "A compilation of all effective rate schedules of a particular company or utility. Tariffs include General Terms and Conditions along with a copy of each form of service agreement." See FERC, Glossary, https://www.ferc.gov/resources/glossary.asp#T.

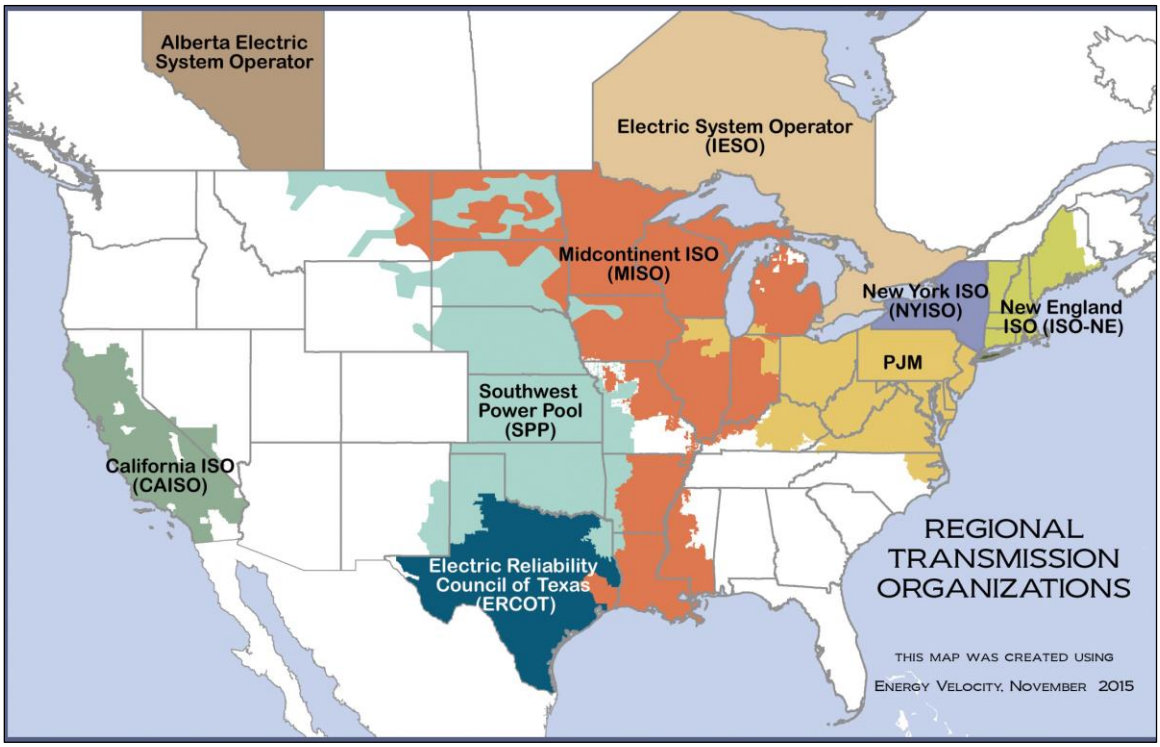
[23] Order No. 889—*Open Access Same-Time Information System and Standards of Conduct*, 61 *Federal Register* 21,737 (1996).

without RTOs, vertically integrated companies under state public utility commission (PUC) regulation provide electricity services.

Congress's introduction of competition in the electricity industry eventually led FERC to establish RTOs (as discussed in the following sections). Congress has followed the development of electricity markets, and gave FERC additional authority to ensure market transparency with the passage of the Energy Policy Act of 2005 (EPACT05; P.L. 109-58). The efficient functioning of RTO electricity markets may be an issue for Congress to consider in the context of the FPA and FERC's regulatory authority.

In 2009, RTOs managed 60% of the power supplied to load-serving entities (LSEs).[24] The history of RTO development under FERC is discussed in the sections that follow.

Figure 1. Map of RTO Regions



Source: Regional Transmission Organizations (RTO) and Independent System Operators (ISO) at https://www.ferc.gov/industries/electric/indus-act/rto.asp.

Electricity Markets and Regional Transmission Management

In the early decades 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

[24] A load-serving entity is "[a]ny entity, including a load aggregator or power marketer, that serves end-users within a control area and has been granted the authority or has an obligation pursuant to state or local law, regulation, or franchise to sell electric energy to end-users located within the control area." See FERC, Market Oversight Glossary, https://www.ferc.gov/market-oversight/guide/glossary.asp#L.

Energy Information Administration, *About 60% of the U.S. Electric Power Supply Is Managed by RTOs*, April 4, 2011, http://www.eia.gov/todayinenergy/detail.php?id=790.

resources and transmission assets. The development of "power pools" allowed member electric utilities to wheel power to another utility to then be sold to wholesale or retail customers.

As state agencies moved towards deregulation of the electricity industry in the 1990s, the electricity transmission facilities often remained under the control of the public utility. On occasion those utilities would discriminate with respect to access to the transmission facilities, preventing certain market participants from transmitting electric power to certain customers.

Specifically, Order No. 888 required the utilities to file tariffs for open access nondiscriminatory transmission services.[25] The order mandated that these tariffs, at a minimum, include certain terms and conditions set forth in a "pro forma" tariff published by FERC as part of Order No. 888. The order also required the utilities to "functionally unbundle" wholesale power services.

Under functional unbundling, the public utility must (1) take transmission services under the same tariff offered to others; (2) establish separate rates for wholesale generation, transmission, and ancillary services; and (3) when buying or selling power, rely on the same electronic information network that its transmission customers rely on to obtain information about the transmission system.[26]

Order No. 888 amplified the industry's shift to a more competitive and restructured wholesale electricity market already initiated by state PUCs, the Energy Policy Act of 1992 and previous FERC regulatory actions.[27] However, the expansion of FERC's regulatory authority was not without controversy. A number of parties questioned FERC's assertion of authority over transmission services provided by utilities. FERC responded in the Order by stating that "the Commission's jurisdiction extends to all unbundled transmission in interstate commerce by public utilities. It is irrelevant to the Commission's jurisdiction whether the customer receiving the unbundled transmission service in interstate commerce is a wholesale or retail customer."[28]

Several parties continued to question whether FERC had exceeded its authority under the FPA in adopting Order No. 888, ultimately taking the dispute to the United States Supreme Court. In *New York v. FERC*, the Court held that the plain language of the FPA supported FERC's assertion of authority over transmission service regardless of the customer.[29] The Court noted that the expansion of the industry had eliminated the bright lines between retail and wholesale sales, and that electric energy destined for retail customers often traveled in interstate commerce.[30] The Court recognized that the FPA explicitly limits FERC jurisdiction over retail sales, but found that Order No. 888 amounted to an exercise of jurisdiction over interstate *transmission* of any electric energy, be it in service of a wholesale or retail transaction, and therefore the order was a legitimate exercise of FERC's jurisdiction pursuant to Section 201(b) of the FPA (16 U.S.C. §824(b)).[31]

In addition to the functional unbundling of electricity services and the mandate that utilities provide open access, nondiscriminatory transmission services, Order. No. 888 also encouraged

[25] Ibid., at 21,541.

[26] Order No. 2000, *Regional Transmission Organizations*, FERC Statutes and Regulations ¶31,089, at 30,995 (2000), 65 *Federal Register* 809 (2000).

[27] Jeffrey S. Dennis, "Twenty-Five Years of Electricity Law, Policy and Regulation: A Look Back," 25 *Natural Resources & Environment Journal* 33, 36 (Summer 2010).

[28] Order No. 888, 61 *Federal Register* at 21,571.

[29] New York v. FERC, 535 U.S. 1, 16 (2002).

[30] Ibid.

[31] Ibid., at 21-22.

utilities to push for the formation of Independent Systems Operators (ISOs) not affiliated with generators, utilities, or other interested parties to regulate transmission services over a discrete geographic area.[32] In the order, FERC noted that "we believe that ISOs have great potential to assist us and the industry to help provide regional efficiencies, to facilitate economically efficient pricing, and, especially in the context of power pools, to remedy undue discrimination and mitigate market power."[33] FERC thus included eleven principles to guide the formation and administration of ISOs, addressing "the ISO's governance, independent structure, reliability and operations, efficiency of management, fostering of economic efficiency in use of and investment in generation, transmission and consumption, provision of electronic information systems, regional coordination and dispute resolution process."[34] FERC declined to mandate the creation of ISOs in this order; however, it noted that "if it becomes apparent that functional unbundling is inadequate or unworkable in assuring nondiscriminatory open access transmission, we will reevaluate our position and decide whether other mechanisms, such as ISOs, should be required."[35]

Just a few years later, FERC would strengthen its push for coordinated independent regional transmission in Order No. 2000.[36] Order No. 2000 strongly encouraged the formation of RTOs, a term sometimes used interchangeably with ISOs, usually describing an organization formed pursuant to the direction provided in Order No. 2000 that regulates transmission services; wholesale market-based electricity transactions; and grid reliability. Although a stated objective of Order No. 2000 was for "all transmission-owning entities in the Nation, including non-public utility entities, to place their transmission facilities under the control of RTOs in a timely manner,"[37] the order did not mandate creation of specific RTOs or membership in them. However, FERC did require all owners and operators of interstate transmission facilities who were not members of an ISO to file either an RTO proposal or a description of efforts to participate in an RTO,[38] and noted that "[i]f the industry fails to form RTOs under this approach, the Commission will reconsider what further regulatory steps are in the public interest."[39]

Order No. 2000 set forth four minimum characteristics of RTOs: (1) independence from market participants and an independent decisionmaking process; (2) scope sufficient to allow the RTO to perform required functions, including ensuring reliability and efficient, nondiscriminatory markets; (3) operational authority for all transmission facilities under its control; and (4) ability to ensure short-term reliability.[40] The order also lists eight key functions of an RTO, including tariff administration and design, congestion management, parallel path flows, ancillary services, open access same-time information systems, market monitoring, planning and expansion, and interregional cooperation.[41]

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[32] Order No. 888, 61 *Federal Register* at 21,551.

[33] Ibid.

[34] Order No. 888, 61 *Federal Register* at 21,595-96.

[35] Order No. 888, 61 *Federal Register* at 21,552.

[36] Order No. 2000, *Regional Transmission Organizations*, FERC Statutes and Regulations ¶31,089 (2000), 65 *Federal Register* 810 (2000).

[37] 65 *Federal Register* at 811.

[38] Ibid.

[39] Ibid.

[40] Ibid., at 842.

[41] Ibid., at 811.

RTO Structural Issues

Implementation of a significant shift in the organization of an industry as vast as the electricity industry is virtually certain to face some structural challenges. This section looks at some of these likely challenges.

Capacity Markets

Several RTOs pay power generators for capacity reserved to meet reliability goals through "capacity markets." 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 auctions for load-serving entity capacity in the Midcontinent Independent System Operator).[42]

Capacity markets have occasionally been criticized because brownouts or blackouts have still occurred in unusually high demand periods.[43] In RTOs without formal capacity markets (principally those in California and Texas), some have asked whether the additional cost of a capacity market would be justified by the perceived benefits.[44] 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,[45] or unexpected high loads. The real-time or "spot" market[46] 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; it receives the market clearing price for energy provided in the times it operates.

Capacity Procurement

State governments, not FERC, issue permits or certificates that authorize utilities to build new power plants. States also exercise their eminent domain authority to site power plants and transmission lines.[47] In RTO regions, LSEs may choose the option to serve a portion or all of their customer's electricity demand, using either their own generation, power purchased through bilateral contracts from power generators or a combination of both.

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[42] 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.

[43] 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.

[44] 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.

[45] Day-ahead markets are "[f]orward markets for electricity to be supplied the following day. This market closes with acceptance by the independent system operator, power exchange, or scheduling coordinator of the final day-ahead schedule. Day-ahead is not a term commonly used for natural gas ("next day" is more common)." FERC, Market Oversight Glossary, https://www.ferc.gov/market-oversight/guide/glossary.asp#D.

For a discussion of markets in regional transmission organizations, see CRS Report R43093, *Electricity Markets—Recent Issues in Market Structure and Energy Trading*, by Richard J. Campbell.

[46] Real-time markets are "[a]n electricity market that settles—determines the price—for one-hour periods or less during the day of delivery." FERC, Market Oversight Glossary, https://www.ferc.gov/market-oversight/guide/glossary.asp#R.

[47] However, EPACT05 did give FERC backstop authority to site transmission lines in National Interest Electric Transmission Corridors designated by the U.S. Department of Energy. FERC may only act if a state does not act to site an approved transmission line within one year.

Because FERC has no authority to direct or encourage generation, several RTOs use Forward Capacity Markets (FCMs) to provide some degree of certainty that there will be adequate generating 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 locational marginal prices) in the location zones. FCMs were developed when it appeared that reliance on price signals alone was not inducing new capacity.

FCMs have "capacity obligation and resource procuring" elements, including the following:

- an obligation on those responsible for serving end-use customers (load) to have sufficient capacity to reliably serve that load;
- a methodology to determine a capacity reserve margin and future capacity needs for subregions within the RTO and for the entire RTO;
- a process for soliciting qualified supply (and demand) resources to meet future capacity needs (for constructing an offer or supply curve);
- some type of benchmark to judge the cost of new capacity;
- a methodology or approach for creating a "demand curve"; and
- a process (such as an auction) to select resources and determine a capacity "price."[48]

FCMs 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 price load zones (although demand response or building a new transmission line are other options). However, despite the existence of FCMs and similar constructs, there has been considerable debate on whether these constructs work because high electricity price load pockets[49] continue to persist in some RTO regions.[50]

A related issue raised in connection with FCMs 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 (i.e., 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 places in the RTO with sustained high prices for electricity, or for the entire RTO footprint.[51]

> 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

[48] Kenneth Rose, *An Examination of RTO Capacity Markets*, Michigan State University—Institute of Public Utilities, September 1, 2011, http://ipu.msu.edu/research/pdfs/Working-Paper-Rose-Capacity-Markets.pdf.

[49] A load pocket is "[a]n area often dependent on transmission for reliable electric system operation because the area's load often exceeds the generation in the area." See FERC, Market Oversight Glossary, https://www.ferc.gov/market-oversight/guide/glossary.asp#L.

[50] "[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 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.

[51] 142 FERC ¶61,079.

> 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.[52]

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 and lower fuel costs. CONE pricing alleviates concerns raised by existing generators in some RTO markets that some new entrants are deliberately submitting below-market bids which could undermine the competitiveness of markets under capacity market rules. CONE values can be used to help provide a screen for possible exercise of "buyer" market power under RTO "minimum offer price rules" (MOPR), by screening bids for prices which appear to be uneconomic.[53] FERC allows RTOs to establish MOPR whether low-priced bids from new projects are consistent with the project's costs or not, and are therefore uncompetitive.

Former FERC commissioner and chairman Norman Bay was critical of MOPR (in his concurring opinion in Docket No. EL16-92-000), characterizing it as "unsound in principle and unworkable in practice" with respect to the growing conflict between federal and state authority:

> [A]s an institutional matter, imposition of the MOPR places the Commission in constant tension with the states. While there are times when the Commission must check state action that impermissibly interferes with the wholesale markets, it should endeavor to do so only when necessary. I believe that respect for federalism requires no less.... Beyond the recurring cost to FERC's relationship with states, it is important to recognize the economic costs of the MOPR as well. While the MOPR is often characterized as a pro-market policy, correcting the intrusions of the states, this assumes that a market can and should be free from out-of-market influences; there is the judgment that such influences are undesirable and that they can be managed through administrative review and mitigation. In point of fact, out-of-market influences are everywhere. Supply-side resources face a diverse range of costs and benefits that are the result of a myriad of public policies and choices by state and federal agencies. In the vast majority of situations, we should let those costs and benefits simply pass through our markets and have an impact on supply and demand.... Instead, the MOPR not only frustrates state policy initiatives, but also likely requires load to pay twice—once through the cost of enacting the state policy itself and then through the capacity market. If states have chosen to provide out-of-market revenue to some resources, the resulting capacity market price should send a signal consistent with the actual capacity needed in light of such revenue. In contrast, a capacity price that is based on an administratively-determined MOPR may not send an efficient signal for entry and exit. Administrative attempts to remove such revenue could result in inefficiently high capacity prices that signal the need for new capacity when no such need exists.

[52] 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.

[53] Generally, bids below the minimum price (unless deemed to represent legitimate cost and revenue estimates by the RTO and the RTO's market monitor) may be considered uneconomic since the net CONE is the RTO's estimate of constructing a new (gas-fired combustion turbine) generation unit, net of the revenue the RTO estimates such a generator would earn from the RTO's energy and ancillary services markets.

Recent Litigation over State/Federal Jurisdictional Issues[54]

In EPACT05, Congress established an interagency task force to study competitive markets,[55] since "under competitive markets, prices are expected to guide consumption and investment decisions, leading to more economically efficient investments and lower prices than under traditional cost of service monopoly regulation."[56]

The Supreme Court has recently examined the scope and reach of FERC's jurisdiction under the FPA. In two cases, the Court was tasked with reconciling FERC's role in regulating wholesale interstate electricity transactions with state regulatory efforts to address companies and rates under their jurisdiction. Congress may want to consider whether FERC's authority under the FPA is, or is not, adequate to ensure the economic and reliable functioning of electricity markets, without unduly infringing on the authority of states over retail electricity markets, and the ability of LSEs to economically serve end-use customers.

FERC v. Electric Power Supply Association

In *FERC v Elec. Power Supply Ass'n*.,[57] the Court heard a dispute concerning FERC's Order No. 745,[58] which mandated that wholesale market operators set a certain rate for providers of "demand response," a pricing mechanism by which end-users of electricity receive price incentives to reduce usage during certain times in response to real-time high electricity prices or a situation which may reduce reliability. Order No. 745 did not mandate specific retail rates, instead focusing on the behavior of wholesale marketers by requiring them to compensate providers of demand response services at a rate designed to encourage such services.[59] In response to legal challenges to Order No. 745, the U.S Court of Appeals vacated the order, finding that its impact on retail customers meant that FERC had exceeded its authority under the FPA.[60]

The Supreme Court reversed the lower court decision and held that the rule was within FERC's authority under the FPA.[61] The Court disregarded challenges that claimed Order No. 745 exceeded FERC's authority because of its impact on non-jurisdictional retail rates, noting that while it may have had incidental impact on non-jurisdictional rates, its focus and direct impact was on jurisdictional wholesale rates.[62] As the Court stated:

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[54] Portions of the text in this section were taken from a CRS Congressional Distribution Memorandum, *Preemption and the Balance of State and Federal Authorities in Heavily Regulated Areas of Law*, by Denise Penn, Jennifer Staman and Adam Vann. This memorandum is available to congressional clients upon request.

[55] Section 1815 of EPACT05 created an "Electric Energy Market Competition Task Force" to conduct a study of competition in wholesale and retail markets for electricity in the United States.

[56] Electric Energy Market Competition Task Force, Report to Congress on Competition in Wholesale and Retail Markets for Electric Energy, April 2005, https://energy.gov/oe/downloads/report-congress-competition-wholesale-and-retail-markets-electric-energy.

[57] 577 U.S.—, 136 S. Ct. 760 (2016).

[58] Demand Response Compensation in Organized Wholesale Energy Markets, Order No. 745, 76 *Federal Register* 16,658 (2011).

[59] Ibid.

[60] Electric Power Supply Ass'n v. FERC, 753 F. 3d 216 (D.C. Cir. 2014).

[61] Ibid., at 784.

[62] Ibid., at 775-77.

> a FERC regulation does not run afoul of [the FPA's] proscription just because it affects—even substantially—the quantity or terms of retail sales. It is a fact of economic life that the wholesale and retail markets in electricity, as in every other known product, are not hermetically sealed from each other. To the contrary, transactions that occur on the wholesale market have natural consequences at the retail level. And so too, of necessity, will FERC's regulation of those wholesale matters. When FERC sets a wholesale rate, when it changes wholesale market rules, when it allocates electricity as between wholesale purchasers—in short, when it takes virtually any action respecting wholesale transactions—it has some effect, in either the short or the long term, on retail rates. That is of no legal consequence. When FERC regulates what takes place on the wholesale market, as part of carrying out its charge to improve how that market runs, then no matter the effect on retail rates, [the FPA] imposes no bar.[63]

The decision also noted that state public service commissions would lack the authority to mandate the wholesale pricing mechanism established by the order.[64]

Hughes v. Talen Energy Marketing

In *Hughes v. Talen Energy Marketing*,[65] the Court reviewed, and ultimately rejected, a Maryland regulatory order designed to encourage construction of new electricity generation plants in the state. Because Maryland's location on the Pennsylvania-New Jersey-Maryland (PJM) RTO grid created some difficulties in importing electricity from elsewhere on the grid,[66] the Maryland Public Service Commission (PSC) attempted to address these concerns with a state program that would ensure generation companies would be compensated for the generation capacity they would add to the region via a mechanism known as a "contract for differences."[67] Under this program, the state solicited proposals to construct and operate generation facilities and mandated that LSEs enter into a 20-year contract to obtain power from the new generation facility, helping ensure that the generator has a steady purchaser of its electric power capacity at a set price and creating an environment conducive to construction of new generation.[68] However, rather than set up this arrangement via a "traditional" bilateral contract for power between a generator and a purchaser, the Maryland program directed the generator to sell its capacity into the PJM capacity auction, with (1) the generator agreeing to "pay back" the LSEs if the auction clearing price was above the agreed-upon contract price; and (2) the LSEs agreeing to pay the generator if the auction clearing price was below the agreed upon contract place.[69]

A group of existing or "incumbent" power generators in the region challenged this Maryland program, claiming that the state program violated the Supremacy Clause of the U.S.

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[63] Ibid., at 776.

[64] Ibid., at 780.

[65] 136 S. Ct. 1288 (2016).

[66] Ibid., at 1294.

[67] "A contract for differences (CFD) is an arrangement made in a futures contract whereby differences in settlement are made through cash payments, rather than by the delivery of physical goods or securities. This is generally an easier method of settlement, because both losses and gains are paid in cash. CFDs provide investors with the all the benefits and risks of owning a security without actually owning it." See Investopedia, *Contract for Differences*, http://www.investopedia.com/terms/c/contractfordifferences.asp.

In the Matter of Whether New Generating Facilities Are Needed to Meet Long-Term Demand for Standard Offer Services, Order No. 84815, Case No. 9214 (April 12, 2012).

[68] *Hughes*, 136 S. Ct. at 1294-95.

[69] Ibid., at 1295.

Constitution[70] because it (1) effectively set wholesale rates for the sale and purchase of electric power, an authority reserved for the federal government under Part II of the FPA; and (2) interfered with FERC policies regarding capacity auctions, an exercise of the authority granted by the FPA.[71] The U.S. District Court for the District of Maryland agreed and granted the request for a declaratory judgment.[72] The decision was affirmed by the U.S. Court of Appeals for the Fourth Circuit,[73] and the Supreme Court granted certiorari.[74]

In a unanimous decision, the Supreme Court affirmed the decisions of the lower courts,[75] seemingly relying on an amalgamation of field preemption and conflict preemption principles. Writing for the majority, Justice Ginsburg wrote that the FPA "allocates to FERC exclusive jurisdiction over 'rates and charges ... received ... for or in connection with' interstate wholesale sales."[76] As a result, for the Court, FERC's approval of the PJM capacity auction as "the sole rate setting mechanism for sales of capacity to PJM" was an exercise of this exclusive authority.[77] By requiring the generator to participate in the PJM capacity auction but guaranteeing different rates for the sale of capacity, the Maryland program "invades FERC's regulatory turf," wrote Justice Ginsburg.[78]

Although the Court struck down this particular program because it was preempted by the FPA, it took care to limit the application of the decision. The decision noted that "[s]tates, of course, may regulate within the domain Congress assigned to them even when their laws incidentally affect areas within FERC's domain."[79] The decision seems to also suggest that if the Maryland program had attempted to encourage new generation in the state by setting guaranteed prices through traditional bilateral contracts rather than by adjusting the prices obtained via the capacity auction mechanism, the program may not have run afoul of the Supremacy Clause.[80] The decision explicitly noted that the holding is limited and that the Court rejects the Maryland program "only because it disregards an interstate wholesale rate required by FERC" and does not address "the permissibility of various other measures States might employ to encourage development of new or clean generation."[81]

Market Manipulation

Competitive electricity market services have arisen to provide transaction flexibility, and to manage (or hedge) the risks of various transactions. RTO markets have enabled a variety of products and services including derivatives and hedges for market participants, ostensibly to

[70] Article VI, Clause II of the U.S. Constitution provides that the "Constitution, and the Laws of the United States which shall be made in Pursuance thereof ... shall be the supreme Law of the Land."

[71] Ibid., at 1296.

[72] PPL Energyplus, LLC v Nazarian, 974 F.Supp.2d 790, 840 (D. Md. 2013).

[73] 753 F.3d 467, 476 (4th Cir. 2014).

[74] Certiorari is a petition to a higher court asking it to review the decision of a lower court. The review is at the discretion of the higher court.

[75] *Hughes*, 136 S. Ct. at 1297.

[76] Ibid., at 1297.

[77] Ibid.

[78] Ibid.

[79] Ibid., at 1298-99.

[80] Ibid.

[81] Ibid.

reduce risks from volatile prices. Financial instruments were added to RTO markets essentially to increase liquidity. However, the addition of financial instruments encourages speculation in the electricity markets. Some purchasers of electricity as a commodity do so solely for financial gain. The Energy Policy Act of 2005 (EPACT05; P.L. 109-58) attempted to address some of the concerns associated with these derivative products and speculative trading by prohibiting "any entity" from using "manipulative or deceptive device or contrivance"[82] 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.

The 2000-2001 Western energy crisis[83] showed that electricity markets were (and are still) susceptible to market manipulation.[84] FERC's staff investigation of the Western energy crisis concluded that specifically Enron (and several other companies) had engaged in market manipulation.[85] FERC views market manipulation as a "significant threat" to energy markets since energy consumers are likely to bear the burden of losses from such activity.[86] With the passage of EPACT05, Congress gave FERC new authority to prevent manipulation in natural gas and electricity markets. 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. 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" (i.e., refunds to rate payers) ordered of $243 million.[87]

The Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank, P.L. 111-203) was passed largely as a response to the recent U.S. financial crisis. Dodd-Frank 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 indicates that its focus is on anticompetitive "conduct that threatens market transparency."[88]

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[82] 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)))."

[83] "California's market worked well and delivered value to customers until May 2000 after a serious drought diminished the region's supplies of typically abundant and inexpensive hydropower. The underlying imbalance between supply and demand, along with inadequate infrastructure and flawed market rules, triggered the crisis in the California markets. The Commission staff's March 2003 final investigation report on the Western energy crisis concluded that these conditions made possible the market manipulation that prolonged and exacerbated the economic harm caused by the crisis." FERC, *Addressing the 2000–2001 Western Energy Crisis: Chronology at a Glance*, April 28, 2005, https://www.ferc.gov/industries/electric/indus-act/wec/chron/print.asp.

[84] "It shall be unlawful for any entity, directly or indirectly, to use or employ, in connection with the purchase or sale of natural gas or the purchase or sale of transportation services subject to the jurisdiction of the Commission, any manipulative or deceptive device or contrivance (as those terms are used in section 78j (b) of this title) in contravention of such rules and regulations as the Commission may prescribe as necessary in the public interest or for the protection of natural gas ratepayers. Nothing in this section shall be construed to create a private right of action." 16 U.S.C. §§824v, 825o-1 (2012); 15 U.S.C. §§717c-1, 717t-1 (2012).

[85] FERC, *Staff Report—Price Manipulation in Western Markets*, Docket No. PA02-2-000, March 26, 2003, https://www.ferc.gov/industries/electric/indus-act/wec/enron/summary-findings.pdf.

[86] FERC, *Prohibition of Energy Market Manipulation*, December 3, 2015, https://www.ferc.gov/enforcement/market-manipulation.asp.

[87] FERC, *Addressing the 2000-2001 Western Energy Crisis*, October 21, 2010, https://www.ferc.gov/industries/electric/indus-act/wec.asp.

[88] For a discussion of Dodd-Frank and Electricity Market Manipulation, see CRS Report R43093, *Electricity Markets—Recent Issues in Market Structure and Energy Trading*, by Richard J. Campbell.

Market Power

On September 22, 2016, FERC issued a Notice of Inquiry to explore whether it should revise its current approach to "identifying and assessing" market power in electric utility transactions.[89] 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."[90]

FERC's rationale for the notice arose from the different ways market power can be analyzed under its rules. For example, under Section 203 of the FPA, FERC reviews industry mergers and other transactions for consistency with the public interest,[91] while pursuant to Section 205 of the FPA, FERC considers requests to sell wholesale electric energy and related attributes at market-based rates.[92] It should be noted that the exercise of market power is differentiated from simply having market power. Electricity consumers are not harmed (i.e., by artificially high electricity rates) unless market power is actually exercised. In a competitive market, prices for electricity should essentially reflect the underlying forces of supply and demand. The recent spate of settlements at FERC leads to a lack of clarity about what does and what does not constitute market manipulation. FERC authorizes sellers of wholesale electricity to charge market-based rates 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)." Alternatively, FERC may authorize cost-based rates for sellers of electricity in wholesale markets.

It remains to be seen whether FERC will move forward with a market manipulation rulemaking as contemplated by the notice.[93] Congress may want to consider whether further definition of market power is necessary to ensure the economic, reliable, and transparent operation of electricity markets.

Other Emerging FPA Issues

Some observers argue that the electric power industry is in the process of change due to regulatory and market pressures, resulting in industry mergers and acquisitions, and new market entrants. Other changes are being driven by state policies which drive new technologies and practices affecting wholesale markets. Given that the impetus for change is coming from drivers both inside and outside the industry, it is possible that further amendments to the Federal Power Act may be considered.

Prior to its September 2016 hearing, the E&P subcommittee sent a letter to the FERC chairman inquiring as to his perspectives on the current and future state of the organized markets, to which the FERC chairman responded with a summary of FERC's efforts "to promote greater efficiency, competition, and transparency in the wholesale markets."[94]

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[89] 156 FERC ¶61,214.

[90] See FERC, Market Oversight Glossary, http://www.ferc.gov/market-oversight/guide/glossary.asp#M.

[91] 16 U.S.C. 824b.

[92] 16 U.S.C. 824d.

[93] CRS Insight IN10588, *FERC Reviewing Its Approach to Market Power Determinations*, by Richard J. Campbell.

[94] Letter from Norman Bay, FERC Chairman, to Fred Upton, Chairman, U.S. House Committee on Energy and Commerce, August 30, 2016, http://docs.house.gov/meetings/IF/IF03/20160907/105263/HHRG-114-IF03-20160907-

Distributed Generation and Net Metering

Innovation in electric power led to the development of technologies able to harness renewable resources.[95] Technological development is further enabling customer choice, giving electricity consumers a greater the ability to generate their own electricity, and may potentially lead to a distributed generation future for customers, supported by utility base load generation and infrastructure.[96] Congress began to address the move of the electricity utility industry away from the regulatory compact concept[97] by introducing competitive providers to the electric utility industry with PURPA, and reinforced competition as federal policy with EPACT. Congress may want to consider further amendments to the FPA in this competitive era, to ensure that customer choice can continue to develop as an option as new technologies are developed.

Net metering is an enabling regime for customer choice, allowing customers who generate their own electricity (usually from a renewable source like solar photovoltaic power) to offset that generated power against power purchased from an electric utility in a billing period.[98] However, the electric utility industry has raised specific concerns about state programs for net metering, especially in areas with growing penetration of residential solar PV installations.

Net metering is one of several "states must consider" standards added to PURPA by EPACT05. Section 1251 of EPACT05 directed electric utilities to consider making net metering available as a service to customers wishing to generate at least a portion of their own electricity needs. Most net metering retail customers rely on PURPA's mandatory purchase requirement to compel local utilities to purchase their energy, since the FPA does not obligate utilities to purchase energy at wholesale prices.[99] Utilities have expressed concerns that their current investment in power generation infrastructure to serve today's customers may not be fully recovered if growing numbers of these customers opt for distributed generation.[100]

SD888.pdf.

[95] "Energy resources that are naturally replenishing but flow-limited. They are virtually inexhaustible in duration but limited in the amount of energy that is available per unit of time. Renewable energy resources include biomass, hydro, geothermal, solar, wind, ocean thermal, wave action, and tidal action." Energy Information Administration, *Renewable Energy Resources*, 2017, https://www.eia.gov/tools/glossary/index.cfm?id=R.

[96] For further discussion, see CRS Report R43742, *Customer Choice and the Power Industry of the Future*, by Richard J. Campbell.

[97] "In the United States, the modern electric utility industry began to emerge about 100 years ago, guided by a philosophy which came to be called the 'regulatory compact.' Under the compact, state and local governments generally granted the right to provide electric power in a designated service territory, in exchange for an obligation to serve all electric power customers. Much of the nation's power generation and delivery infrastructure was built under this arrangement, with customers ultimately paying for the costs of electricity services." Ibid.

[98] "Net metering enables customers to use their own generation from on-site renewable energy systems to offset their consumption over a billing period by allowing their electric meters to turn backwards when they generate electricity in excess of their demand, enabling customers to receive retail prices for the excess electricity they generate. Without net metering, a second meter is usually installed to measure the electricity that flows back to the provider, with the provider purchasing the power at a rate much lower than the retail rate.… Providers may also benefit from net metering because when customers are producing electricity during peak periods, the system load factor is improved." See U.S. DOE—Office of Energy Efficiency and Renewable Energy, "Green Power Markets—Net Metering," May 25, 2011, http://apps3.eere.energy.gov/greenpower/markets/netmetering.shtml.

[99] Under FERC regulations, retail customers that own on-site generators with a maximum net generating capacity of less than 1 MW are permitted to self-implement PURPA's mandatory purchase requirement without any notification to or approval from FERC. See FERC, *What Are the Benefits of QF Status?*, June 30, 2016, https://www.ferc.gov/industries/electric/gen-info/qual-fac/benefits.asp.

[100] "Distributed Generation (DG) is the term used to describe electric power generated at or near the point of consumption (i.e., the customer or load). DG thus differs from base load power plants (mostly coal and nuclear power

State net metering programs are intended to encourage customers to employ distributed generation by allowing them to reduce their bills based on any power they may generate locally. The issue is one of cost of net metering programs for electric utilities. Net metering requirements are intended to compensate consumers for specific types of self-generation identified by states, or to promote self-generation. For electric customers who generate their own electricity, net metering allows for the flow of electricity both to and from the customer—typically through a single, bi-directional meter. In some states, during times when a customer's generation exceeds the customer's on-site use, electricity from the customer flows back to the grid, offsetting electricity consumed by the customer at a different time. In other states, the customer is paid for power generated at either the utility's full retail rate or at the utility's avoided cost price.[101] The full retail rate can be higher than the market price of wholesale electricity:

> As noted above, the average residential price of electricity (the average bundled rate) is currently around 12.5 cents per kWh.... According to published data as of November 2013, the market price of energy from grid-connected generators is averaging, in most locations, between 2 and 3 cents per kWh during off-peak periods and between 4 and 5 cents per kWh during on-peak periods. Recent sales of grid-connected renewable energy have been priced near or below 3 cents per kWh. Therefore, net metering allows the owners of distributed generation to effectively sell their energy at prices between two and six times the market price for energy.[102]

Clean Power Plan and Electricity Markets

On October 23, 2015, the Environmental Protection Agency (EPA) released the final version of regulations to reduce greenhouse gas (GHG) emissions from existing fossil-fueled power plants dubbed the Clean Power Plan (CPP).[103] Under the CPP, states must prepare plans that reduce either total CO_2 emissions or emission rates from existing (mostly coal-fired) power plants.[104] Some observers have posited situations in which implementation of the CPP could result in situations whereby reliability of the grid could be impacted, as some power plants may possibly be closed or have generation curtailed if they cannot satisfy the requirements of the CPP, and new

units) which were designed for economies of scale, and located usually at some distance from where the electricity is consumed. DG includes traditional backup power sources (such as the large gas-powered generators used by institutions and companies), combined heat and power facilities (used for industrial, district, and community power generation, and renewable electricity power systems used by some businesses and residences. Many manufacturers and institutional users have traditionally generated on-site some or all of the electricity they consume, while others maintain diesel or oil generation for emergency backup purposes when power outages occur. DG technologies are also referred to as distributed energy resources (DER)." CRS Report R43742, *Customer Choice and the Power Industry of the Future*, by Richard J. Campbell.

[101] For example, in Arizona, net metering is accomplished using a single bi-directional meter. Any customer with net excess generation (NEG) will have that value carried over to the customer's next bill at the utility's retail rate, as a kiloWatt-hour credit. Any NEG remaining at the customer's last monthly bill in a calendar year will be paid to the customer, via check or billing credit, at the utility's "avoided cost" payment (i.e., the cost the utility would have incurred had it supplied the power itself or obtained it from another source). See http://www.dsireusa.org/library/includes/seeallincentivetype.cfm?type=Net&currentpageid=7&back=regtab&EE=0&RE=1.

[102] David B. Raskin, "The Regulatory Challenge of Distributed Generation," *Harvard Business Law Review*, December 2, 2013, http://www.hblr.org/2013/12/the-regulatory-challenge-of-distributed-generation/.

[103] *Carbon Pollution Emission Guidelines for Existing Statutory Sources: Electric Utility Generating Units*, 80 *Federal Register* 64,661 (2015).

[104] For further details, see CRS Report R44265, *EPA's Clean Power Plan: Implications for the Electric Power Sector*, by Richard J. Campbell.

infrastructure may take several years to build.[105] However, the Trump Administration has reportedly indicated its intent to either change or not enforce the CPP.[106]

Under Section 207 of the FPA, FERC is allowed to act to remedy an instance of insufficient interstate service, upon a complaint by a state utility regulatory commission.[107] Also, under Section 202(c) of the FPA, when an emergency exists by reason of a sudden increase in the demand for electric energy, or of a shortage of electric energy, facilities for the generation or transmission of electric energy, or the fuel or water for generating facilities, or other causes, FERC is authorized to temporarily order connections of facilities, and generation, delivery, interchange, or transmission of electricity as determined to best meet the emergency and serve the public interest.[108]

Because some generators and RTOs serve customers in more than one state, some have had concern over the effectiveness of FPA regulations to ensure the reliable generation and transmission of electricity.[109] Furthermore, the North American Electric Reliability Corporation (NERC) has stated that the final CPP rule could result in a transformative shift in resource use, and lead to the need for transmission and gas infrastructure, requiring "additional time beyond currently proposed targets [in the CPP]."[110]

States will have to coordinate decisions on CPP compliance with other states, power generators, and electric utilities. FPA Section 207 provisions may require formal hearings and determinations, and these may have to be in concert with state utility commission proceedings since FERC has "no authority to compel the enlargement of generating facilities for such purposes, nor to compel the public utility to sell or exchange energy when to do so would impair its ability to render adequate service to its customers."[111]

Congress acted to specifically address conflicts between FERC emergency reliability orders and utility compliance with environmental laws in the "Fixing America's Surface Transportation Act" (FAST; P.L. 114-94). Power plant operators had been concerned that they could be in violation of either an emergency order from FERC or an environmental regulation, if a grid emergency were to arise. Section 61002 of the FAST Act amended FPA Section 202(c) to clarify that an emergency order issued by FERC will override federal, state, and local environmental laws.

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[105] North American Electric Reliability Corporation, *Potential Reliability Impacts of EPA's Proposed Clean Power Plan*, November 2014, http://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/Potential_Reliability_Impacts_of_EPA_Proposed_CPP_Final.pdf.

[106] Niina Heikkinen, "White House Readies 'Review' of Carbon Rule for Pruitt EPA," *E&E News Climatewire*, February 21, 2017, http://www.eenews.net/climatewire/2017/02/21/stories/1060050334.

[107] "Whenever the Commission ... shall find that any interstate service of any public utility is inadequate or insufficient, the Commission shall determine the proper, adequate or sufficient service to be furnished, and shall fix the same by its order, rule or regulation: *Provided*, That the Commission shall have no authority to compel the enlargement of generating facilities for such purposes, nor to compel the public utility to sell or exchange energy when to do so would impair its ability to render adequate service to its customers." 16 U.S.C. 824f.

[108] 16 U.S.C. 824a(c).

[109] Susan Tierney, Eric Svenson, and Brian Parsons, *Ensuring Electric Grid Reliability Under the Clean Power Plan*, April 2015, http://www.eenews.net/assets/2015/04/20/document_gw_02.pdf.

[110] NERC, *Potential Reliability Impacts of EPA's Proposed Clean Power Plan*, Phase I, April 2015, http://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/Potential%20Reliability%20Impacts%20of%20EPA's%20Proposed%20Clean%20Power%20Plan%20-%20Phase%20I.pdf.

[111] 16 U.S.C. 824a(b)(1).

State Support for Nuclear Power

EPA recognizes that renewable energy and nuclear generating capacity, as sources of lower- or zero-CO_2 emission power, can potentially replace more carbon-intensive generation from existing fossil-fueled power plants. Therefore, EPA had originally considered including nuclear generation (from nuclear units under construction) in the CPP,[112] and considered incentives to help existing nuclear generation that may be at risk of early retirement due to electricity market prices.[113] But in the final CPP, EPA chose not to include generation from units under construction in its "Best System of Emissions Reduction" (BSER)[114] because such generation does not actually reduce existing levels of CO_2 emissions from affected power plants. EPA also chose not to include a BSER component in the final CPP for existing nuclear generation.[115]

Several nuclear power plants operating in regions with competitive energy markets are threatened with the prospect of closure.[116] Low prices for natural gas have dropped market prices for electricity as more natural gas-fired power plants have been dispatched. The nuclear plants at risk may not be able to generate power competitively over the long term.[117] Since nuclear power is the largest zero carbon emitting power source in the United States, several proposals have been suggested to provide support or incentives to the plants and protect the jobs and related economic activity they represent.[118] Two proposals with the potential to affect price formation in the electricity markets are discussed below.

In New York, state regulators approved a subsidy for three nuclear plants to establish a credit for a "backwards carbon price-based floor" as part of the state's 50% renewable and nuclear energy goal by 2030.[119] The subsidy will be based on the social cost of carbon under New York's *Zero Emissions Credit* program:

> In an effort to keep FitzPatrick and Ginna operating, along with Exelon's two-unit Nine Mile Point plant next to FitzPatrick, the State of New York Public Service Commission approved a system of Zero Emission Credits (ZECs) that would provide additional revenue for the four reactors. The ZEC program would require Exelon to purchase FitzPatrick from Entergy and operate all four of the upstate New York reactors through 2029. Exelon has

[112] EPA, *FACT SHEET: Clean Power Plan—Opportunities for Nuclear Power*, November 5, 2015, https://www.epa.gov/cleanpowerplan/fact-sheet-clean-power-plan-opportunities-nuclear-power.

[113] "Exelon and Entergy are among US power generators facing rising pressures to close some of their nuclear plants, as a result of lower electricity prices, competition from cheap gas, and sometimes political opposition." Ed Crooks, "Uneconomic US Nuclear Plants at Risk of Being Shut Down," *Financial Times*, February 19, 2014.

[114] In the CPP, EPA settled on three paths for reducing CO_2 emissions from existing fossil-fueled power plants, modeling opportunities for coal-fired power plant heat rate improvements, dispatch of more natural gas-fired combined cycle power plants and fewer coal-fired power plants, and increased renewable electric power generation as its *Best System of Emissions Reduction* under the CPP.

[115] CRS Report R44265, *EPA's Clean Power Plan: Implications for the Electric Power Sector*, by Richard J. Campbell.

[116] For further details, see CRS Report R44715, *Financial Challenges of Operating Nuclear Power Plants in the United States*, by Phillip Brown and Mark Holt.

[117] Alex Gilbert, *Addressing the Plight of Existing Nuclear Retirements*, SparkLibrary, July 14, 2016, https://www.sparklibrary.com/addressing-plight-existing-nuclear-part-1/.

[118] "In 2014, nuclear energy accounted for 62.9 percent of carbon-free sources of electricity." Nuclear Energy Institute, *Fact Sheets*, 2016, http://www.nei.org/Master-Document-Folder/Backgrounders/Fact-Sheets/Nuclear-Energy-America-s-Low-Carbon-Electricity-Le.

[119] Database of State Incentives for Renewables and Efficiency, *New York PSC Order in Case No 15-E-0302, Establishing Clean Energy Standard*, August 23, 2016, http://programs.dsireusa.org/system/program/detail/5883.

> agreed to the purchase and to keep the four reactors running if the program is implemented as planned.
>
> This ZEC funding is being provided in the wake of more than 10 years of experience with a market price on carbon in New York State through the Regional Greenhouse Gas Initiative (RGGI). Given the stated economics of the FitzPatrick and Ginna plants, this price advantage under the market price set through RGGI (approximately $5/ton of carbon dioxide or $2.70 per MWh) for low-carbon power units has not been sufficient to make these plants profitable.[120]

However, such state programs to recognize the carbon-free aspect of nuclear power must be structured to avoid the constraints of the federal/state jurisdictional divide highlighted by *Hughes v. Talen Energy Mktg, LLC*, discussed above.

Other proposals to maintain at-risk nuclear power plants consider capacity market reforms to recognize the carbon-free or reliability aspects of these plants. For example, the PJM RTO has restructured its capacity market to ensure that generators perform and are available when needed. This restructuring benefits nuclear power plants. Generators must meet performance obligations or be faced with penalties. Conversely, pricing incentives have also been instituted to ensure that generating resources deliver power when required. However, such incentives may raise energy costs.

> [PJM] expects the changes to raise capacity costs by $5 billion a year in 2018/19 but to reduce energy costs $2.4 billion a year by increasing supply during peak periods. This works out to about 0.2 [cents per kilowatt-hour (cents/kWh)] or $2 to $3 per month per household....
>
> Others think the effect could be much greater. Former Illinois Power Agency Director Mark Pruitt thinks the capacity performance reforms could raise capacity prices to $272/MW-day, 118% higher than today's prices. In an analysis for Crain's Chicago Business, Pruitt estimated the changes "will funnel more than $560 million in additional revenue [in 2020] to five of Exelon's six Illinois nuclear stations." (Note that this sort of capacity market change is what Exelon has been saying it needs to keep its nuclear units economic.) Energy prices paid by ComEd customers would climb 1.4 cents/kWh, or 19%, from today's 7.4 cents/KWh, he thinks. UBS market analyst Julien Dumoulin-Smith sees a similar impact, with capacity prices rising from $120/MW-day in the most recent auction (for delivery in 2017/18) to $204/MW-day the following year.[121]

Some are concerned that such "out-of-market" constructs may distort price signals and lead to an unsustainable future, with subsidies propping up uneconomic generation. The subsidies, regardless of oft-mentioned environmental or reliability goals, could potentially discourage investment and innovation in electricity markets.[122]

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[120] CRS Report R44715, "*Financial Challenges of Operating Nuclear Power Plants in the United States*," by Phillip Brown and Mark Holt.

[121] Bentham Paulos, *PJM Tightens Capacity Market Rules to Improve Reliability*, POWER magazine, December 18, 2014, http://www.powermag.com/pjm-tightens-capacity-market-rules-to-improve-reliability/?printmode=1.

[122] Dick Munson, *The Surprising Ground Zero for Electricity Market Fights*, Environmental Defense, October 1, 2016, http://www.powermag.com/surprising-ground-zero-electricity-market-fights/.

Electric Grid Security

FERC Cybersecurity Authority

The U.S. bulk electric power system[123] has mandatory and enforceable standards for cybersecurity.[124] EPACT05 gave FERC authority over the reliability of the grid, with the power to approve mandatory cybersecurity standards proposed by the Electric Reliability Organization (ERO). Currently, NERC serves as the ERO. NERC therefore proposes reliability standards for Critical Infrastructure Protection, which are updated considering the status of reliability and cybersecurity concerns for the grid. FERC has authority over wholesale power sales and the transmission of electricity in interstate commerce, while states have authority over retail sales by electric distribution systems. FERC acknowledged that EPACT05 excluded local distribution systems from its reliability mandate under Section 215 of the Federal Power Act, because they are not part of the bulk power system.

FERC views grid security as a high priority. The Commission has established the Office of Energy Infrastructure Security (OEIS) to deal with cyber and physical security. OEIS has a mission to provide expertise to the Commission to "identify, communicate and seek comprehensive solutions to potential risks to FERC-jurisdictional facilities from cyberattacks and such physical threats as electromagnetic pulses."[125] However, FERC still asserts that it does not have the authority to act quickly in the event of a major cyber event.[126]

DOE's Quadrennial Energy Review Recommendations

In January 2017, the Department of Energy (DOE) issued its Quadrennial Energy Review (QER) report focusing in the electricity grid, including grid security as one issue.[127] DOE discussed the FPA's statutory basis for the separate roles of NERC in proposing mandatory and enforceable standards for cyber and physical security and FERC's approval or rejection of such standards, finding that the resulting federal oversight might be inadequate in a national emergency.[128] In the

[123] "Electricity transferred over transmission lines is often known as bulk power, and the collection of transmission lines and associated equipment is referred to as the transmission system or bulk electric system." ISO New England, *Overview of the Bulk Power System and ISO New England*, 2017, https://www.iso-ne.com/static-assets/documents/2014/08/iso101-t1-isocore.pdf.

[124] FERC Order No. 773 establishes a "bright-line" threshold essentially considering all transmission facilities and related equipment operating at 100 kilovolts or above to be part of the bulk electric power system. As such, these facilities are subject to the applicable NERC reliability standards.

[125] FERC, *FERC Office of Energy Infrastructure Security*, January 3, 2017, https://www.ferc.gov/about/offices/oeis.asp.

[126] "However, as has been stated by FERC staff and members of the Commission in the past, the tools FERC currently has available to it are inadequate in the face of a fast moving or imminent [cyber]attack, and to the degree FERC does have authority it is limited to the bulk power system and not the myriad of other systems that interact with it. The FERC-NERC standard setting process does have the ability, over time, to create a security ecosystem that makes it much harder for cyber attacks to be successful. But that process is too slow and too open to deal with threats in real time." Federal Energy Regulatory Commission, *Written Testimony of Commissioner Tony Clark, Federal Energy Regulatory Commission, Before the Committee on Energy and Commerce Subcommittee on Energy and Power United States House of Representatives Hearing on FERC Perspective: Questions Concerning EPA's Proposed Clean Power Plan and other Grid Reliability Challenges Reliability Challenges*, July 29, 2014, https://www.ferc.gov/CalendarFiles/20140729091839-Clark-07-29-2014.pdf.

[127] DOE, *Quadrennial Energy Review Second Installment: Transforming the Nation's Electricity System*, January 2017, https://energy.gov/epsa/downloads/quadrennial-energy-review-second-installment. (Hereinafter, QER.)

[128] "The nature of a national security threat, however, as articulated in the FAST Act, stands in stark contrast to other

QER, DOE made several recommendations to address U.S. grid security concerns, chief of which was to amend the FPA giving more authority to both DOE and FERC to act in such an emergency:

> **Amend Federal Power Act authorities to reflect the national security importance of the Nation's electric grid**. Grid security is a national security concern—the clear and exclusive purview of the Federal Government. The Federal Power Act, as amended by the FAST Act [P.L. 114-94], should be further amended by Congress to clarify and affirm the Department of Energy's (DOE's) authority to develop preparation and response capabilities that will ensure it is able to issue a grid-security emergency order to protect critical electric infrastructure from cyber attacks, physical incidents, EMPs, or geomagnetic storms. In this regard, Federal authorities should include the ability to address two-way flows that create vulnerabilities across the entire system. DOE should be supported in its development of exercises and its facilitation of the penetration testing necessary to fulfill FAST Act emergency authorities. In the area of cybersecurity, Congress should provide FERC with authority to modify NERC-proposed reliability standards—or to promulgate new standards directly—if it finds that expeditious action is needed to protect national security in the face of fast-developing new threats to the grid. This narrow expansion of FERC's authority would complement DOE's national security authorities related to grid-security emergencies affecting critical electric infrastructure and defense-critical electricity infrastructure. This approach would maintain the productive NERC-FERC structure for developing and enforcing reliability standards, but would ensure that the Federal Government could act directly if necessary to address national security issues.[129]

Conclusion

The Federal Power Act has been amended by Congress numerous times to reflect changes in technology, industry circumstance and practices, and federal policies. Former FERC Chairman Norman Bay has stated his opinion that the FPA "is flexible and thus well-suited to respond to changing circumstances and [the responses herein show] how the Commission continually assesses its markets to ensure that they can adapt to the challenges presented by changes happening in the energy space."[130]

This report discussed several policy issues and technical challenges in the electric power industry, with a focus on electricity markets. FERC continues to refine its approach to these and other wholesale electricity market issues. But the emergence and of new technologies and energy conservation schemes will likely bring new pressures to change how the electricity industry operates. As electricity markets continue to evolve, Congress may examine whether changes to the FPA are necessary to ensure the economic and reliable operation of the U.S. electricity markets.

major reliability events that have caused regional blackouts and reliability failures in the past. In the current environment, the U.S. grid faces imminent danger from cyber attacks. Widespread disruption of electric service because of a transmission failure initiated by a cyber attack at various points of entry could undermine U.S. lifeline networks, critical defense infrastructure, and much of the economy; it could also endanger the health and safety of millions of citizens." QER, p. 7-7.

[129] QER, pp. 7-7 and 7-8.

[130] Letter from Norman Bay, FERC Chairman, to Ed Whitfield, Chairman, Committee on Energy and Commerce, August 30, 2016, http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14345888.

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