

JOINT STATE GOVERNMENT COMMISSION

General Assembly of the Commonwealth of Pennsylvania

PJM Interconnection: Pennsylvania's Role

Progress Report

September 2026



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REPORT

PJM Interconnection: Pennsylvania's Role Progress Report

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The Joint State Government Commission was created in 1937 as the primary and central non-partisan, bicameral research and policy development agency for the General Assembly of Pennsylvania.¹

A fourteen-member Executive Committee composed of the leadership of both the House of Representatives and the Senate oversees the Commission. The seven Executive Committee members from the House of Representatives are the Speaker, the Majority and Minority Leaders, the Majority and Minority Whips, and the Majority and Minority Caucus Chairs. The seven Executive Committee members from the Senate are the President Pro Tempore, the Majority and Minority Leaders, the Majority and Minority Whips, and the Majority and Minority Caucus Chairs. By statute, the Executive Committee selects a chairman of the Commission from among the members of the General Assembly. Historically, the Executive Committee has also selected a Vice-Chair or Treasurer, or both, for the Commission.

The studies conducted by the Commission are authorized by statute or by a simple or joint resolution. In general, the Commission has the power to conduct investigations, study issues, and gather information as directed by the General Assembly. The Commission provides in-depth research on a variety of topics, crafts recommendations to improve public policy and statutory law, and works closely with legislators and their staff.

A Commission study may involve the appointment of a legislative task force, composed of a specified number of legislators from the House of Representatives or the Senate, or both, as set forth in the enabling statute or resolution. In addition to following the progress of a particular study, the principal role of a task force is to determine whether to authorize the publication of any report resulting from the study and the introduction of any proposed legislation contained in the report. However, task force authorization does not necessarily reflect endorsement of all the findings and recommendations contained in a report.

Some studies involve an appointed advisory committee of professionals or interested parties from across the Commonwealth with expertise in a particular topic; others are managed exclusively by Commission staff with the informal involvement of representatives of those entities that can provide insight and information regarding the particular topic. When a study involves an advisory committee, the Commission seeks consensus among the members.² Although an advisory committee member may represent a particular department, agency, association, or group, such representation does not necessarily reflect the endorsement of the department, agency, association, or group of all the findings and recommendations contained in a study report.

¹ Act of July 1, 1937 (P.L.2460, No.459); 46 P.S. §§ 65–69.

² Consensus does not necessarily reflect unanimity among the advisory committee members on each individual policy or legislative recommendation. At a minimum, it reflects the views of a substantial majority of the advisory committee, gained after lengthy review and discussion.

Over the years, nearly one thousand individuals from across the Commonwealth have served as members of the Commission's numerous advisory committees or have assisted the Commission with its studies. Members of advisory committees bring a wide range of knowledge and experience to deliberations involving a particular study. Individuals from countless backgrounds have contributed to the work of the Commission, such as attorneys, judges, professors and other educators, state and local officials, physicians and other health care professionals, business and community leaders, service providers, administrators and other professionals, law enforcement personnel, and concerned citizens. In addition, members of advisory committees donate their time to serve the public good; they are not compensated for their service as members. Consequently, the Commonwealth receives the financial benefit of such volunteerism, along with their shared expertise in developing statutory language and public policy recommendations to improve the law in Pennsylvania.

The Commission periodically reports its findings and recommendations, along with any proposed legislation, to the General Assembly. Certain studies have specific timelines for the publication of a report, as in the case of a discrete or timely topic; other studies, given their complex or considerable nature, are ongoing and involve the publication of periodic reports. Completion of a study, or a particular aspect of an ongoing study, generally results in the publication of a report setting forth background material, policy recommendations, and proposed legislation. However, the release of a report by the Commission does not necessarily reflect the endorsement by the members of the Executive Committee, or the Chair or Vice-Chair of the Commission, of all the findings, recommendations, or conclusions contained in the report. A report containing proposed legislation may also contain official comments, which may be used to construe or apply its provisions.³

Since its inception, the Commission has published over 465 reports on a sweeping range of topics, including administrative law and procedure; agriculture; athletics and sports; banks and banking; commerce and trade; the commercial code; crimes and offenses; decedents, estates, and fiduciaries; detectives and private police; domestic relations; education; elections; eminent domain; environmental resources; escheats; fish; forests, waters, and state parks; game; health and safety; historical sites and museums; insolvency and assignments; insurance; the judiciary and judicial procedure; labor; law and justice; the legislature; liquor; mechanics' liens; mental health; military affairs; mines and mining; municipalities; prisons and parole; procurement; state-licensed professions and occupations; public utilities; public welfare; real and personal property; state government; taxation and fiscal affairs; transportation; vehicles; and workers' compensation.

Following the completion of a report, subsequent action on the part of the Commission may be required, and, as necessary, the Commission will draft legislation and statutory amendments, update research, track legislation through the legislative process, attend hearings, and answer questions from legislators, legislative staff, interest groups, and constituents.

³ 1 Pa.C.S. § 1939.



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To the Members of the General Assembly of Pennsylvania:

This report, *PJM Interconnection: Pennsylvania's Role* is an interim report as directed by House Resolution 361, Pr.'s No. 3289, which directs the Joint State Government Commission to study the potential costs and reliability risks and the potential financial and reliability benefits associated with the state's participation in the PJM Interconnection (PJM). PJM is the regional electricity transmission organization supervising the transmission lines and the wholesale electricity market in Pennsylvania and several other states. PJM's role in those two functions, transmission and wholesale, is the focus of this study.

The pages that follow describe the legal structure and organization of PJM and how its membership is determined. Further, this report provides a summary of the Commission's initial findings regarding current issues before PJM that could have the most significant impact on Pennsylvania's electricity consumers.

The final report will provide comprehensive coverage of the topics listed in HR361 and will be released in February 2027.

The interim report is also available at <https://jsg.legis.state.pa.us>.

Respectfully submitted,

Glenn J. Pasewicz
Executive Director

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INTRODUCTION

House Resolution 361, Printer's No. 3289, was adopted by the Pennsylvania House of Representatives on June 3, 2026. The resolution directs the Joint State Government Commission to study the potential costs and reliability risks, and potential financial and reliability benefits associated with participation in the PJM Interconnection (PJM). PJM is the regional transmission organization supervising electric transmission lines and the wholesale electricity market in Pennsylvania, 11 other states, and the District of Columbia.⁴ PJM's role in those two functions is the focus of this study.

The final report is due within 270 days, with an interim progress report due in 90 days.

This report serves as the interim progress report, and as such, is designed to identify the exact legal structure and organization of PJM and how its membership is determined. Further, this report is a brief summary of JSGC's initial findings as to the current issues before PJM that have potentially the most significant impact on Pennsylvania's electricity consumers.

The resolution calls for public hearings which staff are in the process of organizing through the fall and early winter of 2026.

Any person or organization wishing to submit written comments can send them to the Commission at:

jntst02@legis.state.pa.us

OR

Joint State Government Commission
Room 108 Finance Building
613 North Street
Harrisburg, PA 17120

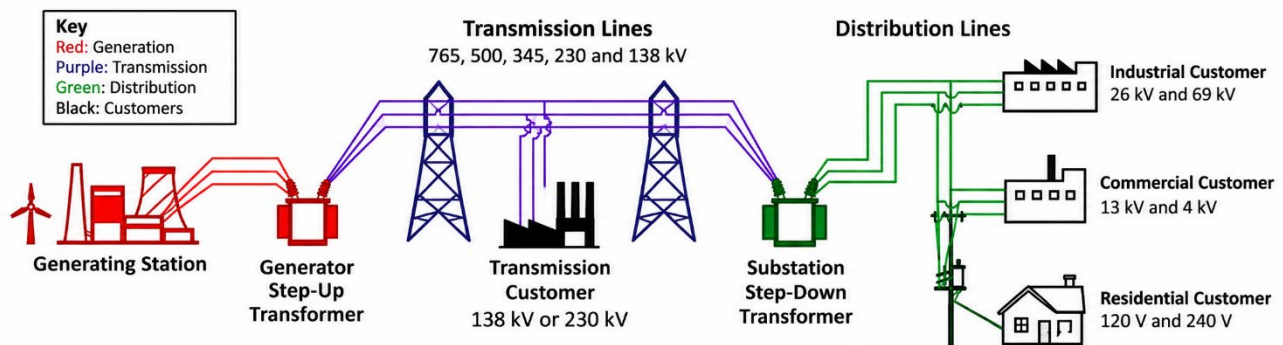
To date, staff have met with PJM personnel and consumer advocates, attended a Federal Energy Regulatory Commission hearing focused on concerns regarding PJM, and began research of particular issues listed in HR 361.

It is important to differentiate the function and role of transmission lines in the overall electricity delivery system for purposes of examining PJM's role. Power plants create electricity that passes into the "grid," a common term for the "network for the transmission of electricity

⁴ Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and the District of Columbia. "Meeting Each Moment, PJM 2025 Annual Report," accessed August 27, 2026, <https://services.pjm.com/annualreport2025/>.

throughout the state, region or nation. The term is also used to refer to the layout of an electric distribution system.”⁵ Broadly, there are two types of power lines: transmission and distribution. Transmission lines are high-voltage power lines that transport electricity from where it is produced to a local distribution system, which includes substations, transformers to reduce the voltage, and the wires that deliver electricity to homes and businesses.⁶ Figure 1 includes a diagram showing the path electricity takes from site of generation to end users. Transmission lines are the “interconnection” between electricity generators and distribution lines that deliver electricity to individual homes and businesses, essentially the infrastructure of the retail market for electricity.

Figure 1
Electricity Generation, Transmission and Distribution
2025



Source: North American Electric Reliability Co., “Understanding the Grid,” NERC.com, Sept. 2025, <https://www.nerc.com/globalassets/who-we-are/september-2025-understanding-the-grid.pdf>.

The following chapters of this report will include a description of PJM’s organizational and operational structure, and a list of preliminary findings regarding the significant issues identified to date. The last two chapters will provide background information to introduce the uninitiated to the United States electrical grid and the evolution of PJM from a southeast Pennsylvania agreement between two power companies located in Pennsylvania and New Jersey to an organization serving more than 67 million people, overseeing approximately 186,000 megawatts of generation capacity, and 88,000 plus miles of transmission lines covering over 360,00 square miles of territory.⁷

⁵ Pennsylvania Public Utility Commission, “Electric Terms Dictionary,” PA PUC, 2026, <https://www.puc.pa.gov/electricity/electric-terms-dictionary/>.

⁶ “Electric Terms Dictionary,” Pennsylvania Public Utility Commission.

⁷ PJM 2025 Annual Report, https://services.pjm.com/annualreport2025/assets/PJM_2025_Financial-Report.pdf.

ORGANIZATIONAL STRUCTURE OF PJM

The first important distinction to recognize about PJM is that it is neither an electric company nor a governmental entity. Legally, it is a non-stock, non-profit organization and does not own the electric grid infrastructure. Instead, it is an organization of electricity suppliers of various types, coordinating transmission line usage among its members and conducting capacity auctions to attempt to ensure that future electricity needs of its service area are met. Its regulation can be somewhat analogized to that of an individual public utility under the authority of the Pennsylvania Public Utility Commission (PUC), in that it is a regional conglomeration of public utilities cooperating together under the authority of the Federal Energy Regulatory Commission (FERC). It is also important to note that PJM does not own the power plants, transmission lines, or any of the physical infrastructure it manages; all of those assets are the property of individual investor-owned utilities (IOUs).

Governing Documents

PJM arrangements within the region are controlled by three major governing documents.

- The Operating Agreement which defines the roles and responsibilities of the PJM Board of Managers, Members Committee, and management and staff office.
- The Open Access Transmission Tariff includes the provisions governing transmission service within the region and is subject to FERC acceptance.
- The Reliability Assurance Agreement is signed by all members who sell electricity to end-use customers and establishes standards for the reliable operation of the electric grid. It deals with ensuring adequate capacity resources, assistance during emergencies, and future planning.

Membership in PJM fluctuates slightly from day to day, but hovers slightly above 1,100 members on average.

*Types of PJM Membership*⁸

Voting Members can participate in the competitive wholesale electricity market and vote at Members Committee and Markets and Reliability Committee meetings in one of the five industry sectors. Voting members may vote with lower-level groups as well.

Affiliate Members also can participate in the competitive wholesale electricity market. They are in the same corporate family of companies as Voting Members and have voting rights at senior task force and lower-level standing committee meetings. However, Affiliate Members do not have voting rights at Members Committee and Markets and Reliability Committee meetings.

Associate Members have special membership status and do not participate in PJM's markets. They do not have voting rights in any stakeholder activities, committees or task forces.

Special Members are granted special membership for purposes of participating in the Emergency Customer Load Reduction Program. They do not have voting rights.

Ex Officio State Office of Consumer Advocate Representatives to the Standing Committees have voting rights on the Members Committee and Markets and Reliability Committee as part of the End-Use Customer sector and may participate and vote in all lower committees and task forces.

Ex Officio Regulatory Representatives to the Standing Committees represent federal and state agencies with regulatory authority over a PJM member. They do not have voting rights but may participate in the stakeholder process.

Annual membership fees depend upon the type of membership category, as follows:

PJM Annual Membership Fee 2026

Category	Annual Fee
Voting Member	\$5,000
Associate Member	\$2,500
Ex Officio Member	\$500
Special Member	\$500
Affiliate Member	\$0

Source: PJM Membership Enrollment,
<https://www.pjm.com/about-pjm/member-services/membership-enrollment.aspx>.

⁸ PJM Oversight and Transparency Fact Sheet, <https://www.pjm.com/-/media/DotCom/about-pjm/newsroom/fact-sheets/oversight-and-transparency-fact-sheet.pdf>.

**PJM Membership
by Category
August 2026**

Category	Total Members
Voting Members	511
Ex Officio Members	15
Affiliate Members	532
Associate Members	78
Special Members	2
Total	1,138

Source: PJM Member List, <https://www.pjm.com/about-pjm/member-services/member-list>.

PJM is overseen by an independent Board of Managers, and no board member can have a financial interest in any PJM member. Voting members are the driving force of PJM. The Members Committee is the more senior committee, followed by the Markets and Reliability Committee, and only voting members may serve on those committees. The Members Committee provides advice to the board by proposing and voting on changes and new programs, while the Markets and Reliability Committee oversees changes to the governing documents.

The Commonwealth of Pennsylvania is not a “member” of PJM in the traditional sense that is seen in interstate compacts. Multiple electric suppliers are licensed under Pennsylvania law, but no member of Pennsylvania’s state government is a member of the entity, with the exception of two ex officio members: the consumer advocate, who has voting rights on the Members Committee and Markets and Reliability Committee as an end-use customer, and a representative of the PUC who has no voting rights. No ex-officio member can participate in the competitive wholesale electricity market.

Within the category of Voting Members, members must fall into one of five industry sectors. Each category has a 20 percent voting weight. PJM’s 2026 Manual 33 defines the five categories as:

1. *Transmission Owner:* A company that owns transmission lines.
2. *Generation Owner:* An owner of a power plant, including fossil, nuclear, and renewable resources
3. *End-Use Customer:* A consumer advocate, a high-usage industrial and commercial customer, university grid, or any other customer representative.

4. *Electric Distributor*: A local utility or public power cooperative distributing power directly to end-use retail customers.
5. *Other Supplier*: Businesses engaged in buying, selling or transmitting wholesale electric energy or other services but do not own the underlying transmission lines. This can include marketers, brokers, and energy traders.⁹

PJM's 2026 Manual 33 provides a more granular look at the technical qualifications for each category.¹⁰

⁹ Federal Energy Regulatory Commission, "An Introductory Guide for Participation in PJM Processes," <https://www.ferc.gov/introductory-guide-participation-pjm-processes>.

¹⁰ PJM Manual 33: Administrative Services for the PJM Interconnection Operating Agreement Section 2: Qualifications for PJM Membership Revision: 21, Effective Date: 04/22/2026, <https://www.pjm.com/-/media/DotCom/documents/manuals/m33.ashx>.

PRELIMINARY ISSUES IDENTIFIED

This chapter is presented informally, and represents the issues identified for exploration by staff during initial forays into the requirements of this study. It is not currently footnoted, but as the issues are explored and drafts written for the final report, all citations will be included. Several issues are prominent in PJM at first glance.

Regional transmission organizations (RTOs) are a relatively new development, first authorized by the Federal Energy Regulatory Commission in 1999, with PJM becoming the first created in the US in 2001. FERC has provided guidance on the characteristics of an RTO, but each of the nation's seven is organized differently from the others. One of the future research goals of staff is to examine the structure of other RTOs in the country to investigate whether some of them may have organizational and procedural features that may be considered by Pennsylvania in reviewing its electric public utilities' participation in the RTO. Staff will further examine alternative means of coordinating transmission networks in lieu of an RTO in general and PJM in particular.

Governance of the PJM has been a topic of discussion for the past decade. Concerns have been raised about the board's independence given the decision-making "guidance" invested in the voting members. There have also been pushes for greater roles for state government beyond its current limited advisory role.

The Federal Power Act (FPA) provides two rules to pursue changes under the operating agreement. Rule 205 requires the support of two-thirds of the voting members in each sector to approve such changes and can only be proposed by a PJM member. Any other person or entity proposing a change must utilize Rule 206, which requires that applicants prove the current rules are unjust and unreasonable and that their replacement is a just and reasonable alternative. Several other RTOs around the country allow state committees to submit changes under Rule 205, but it has not been judicially confirmed that such actions are permissible under the FPA. State governments within PJM's territory have petitioned for these rights, which are under consideration at FERC. The Rule 206 complaint process was the mechanism by which Governor Shapiro was able to pursue a cap on the last two capacity market auctions to try to hold down the soaring price of wholesale electricity.

Electricity costs and ratemaking are issues receiving attention in many of the Commonwealth's neighbors within PJM territory, and they will be examined as well. Regulatory and legislative efforts, as well as litigation in other states, will be evaluated.

The development of new, and expansion of existing, capacity is also an urgent issue. The growing demand for power for data centers is driving many of the predictions underlying the anticipated need and expense of electricity in the next few years. It is possible that some of this stress may lighten somewhat, given recent efforts in Pennsylvania and other states to slow the speculation on rapid development of data center infrastructure. Additionally, alternative energy sources and newer technologies, such as linear generators, grid-scale battery storage, advanced transmission technologies, grid-enhancing technologies, and surplus interconnection service have been suggested as ways to increase capacity and lower costs to consumers. The potential impact of these new energy sources and technological developments will also be assessed.

Resiliency and reliability are also important issues, given that extreme weather events have taken a toll on transmission infrastructure in general. Ways to harden and create backup redundancy in the event of weather-related blackouts need further exploration.

OVERVIEW OF NATIONAL ELECTRICITY GRID

In traditional wholesale electric markets, utilities were vertically integrated: the same entity owned every stage of electricity including production, transmission, and distribution to customers.¹¹ These utilities traded power as needed through bilateral transactions and power pool agreements.¹² Bilateral transactions are direct contracts between sellers and buyers outside of a centralized market or exchange.¹³ A power pool is “An association of two or more interconnected electric systems having an agreement to coordinate operations and planning for improved reliability and efficiencies.”¹⁴ For example, PJM existed as a regional power pool long before its reconfiguration under FERC. At the dawn of the twentieth century, electric utilities were vertically integrated monopolies that operated independently within state borders. Pennsylvania’s industrial boom created demand for reliable electric service and highlighted the inefficiencies of isolated operations.

Evolution of Power Pools

In the mid-1920s, Malcolm MacLaren, a Princeton engineering professor, and Farley Osgood of Public Service Electric & Gas Co. (PSE&G) produced reports proposing a coordinated transmission network linking PSE&G, Philadelphia Electric Company (PECO), and Pennsylvania Power & Light Company (PP&L). They argued that pooling generation through a high-voltage backbone would reduce required reserves, lower costs, and improve reliability for Pennsylvania’s manufacturing and urban customers. Their cost-benefit analysis predicted annual consumer savings of roughly \$2.8 million (approximately \$53 million adjusted for inflation) by pooling, an enormous sum during the interwar years.¹⁵

Spurred by these studies, the companies decided to build a 220-kilovolt transmission line between New Jersey and Pennsylvania and to share operational control. The system, completed in 1928, was lauded in *The New York Times* as a “superpower system” that allowed diversification of generation, dependable service, and more concentrated use of power plants.¹⁶

¹¹ Federal Energy Regulatory Commission, “Electric Power Markets,” March 2025, <https://www.ferc.gov/electric-power-markets>.

¹² Federal Energy Regulatory Commission, “Electric Power Markets,” March 2025, <https://www.ferc.gov/electric-power-markets>.

¹³ Federal Energy Regulatory Commission, “Glossary,” August 2020, <https://www.ferc.gov/industries-data/market-assessments/overview/glossary>.

¹⁴ Southwest Power Pool, “Glossary,” Spp. Org, 2026, <https://spp.org/glossary/>.

¹⁵ *PJM Inside Lines*, What’s Past Is Prologue at Annual Meeting General Session, May 16, 2017.

¹⁶ *PJM Inside Lines*, What’s Past Is Prologue at Annual Meeting General Session, May 16, 2017.

On September 27, 1927, the companies formalized the *Pennsylvania–New Jersey Interconnection*. The agreement, the first continuous, centrally dispatched power pool in the United States, established a joint dispatch office in downtown Philadelphia, symbolizing the centrality of Pennsylvania’s largest city to the new venture. It created a mechanism for sharing generation and coordinating maintenance across state lines. The participants hoped to eliminate duplicate reserves and take advantage of diversity in peak demand. Despite early skepticism, the arrangement survived the onset of the Great Depression because the reduced reserve requirements and ability to draw on one another’s facilities provided essential resilience when capital markets tightened. The success of this Pennsylvania-led experiment would later inspire similar pools elsewhere.¹⁷

The US Constitution’s Commerce Clause¹⁸ gave the federal government power to regulate interstate commerce, but courts considered electricity transmission and wholesale sales to be intrastate transactions. The US Supreme Court’s decision in *Public Utilities Commission v. Attleboro Steam & Electric Co.*, 273 U.S. 83 (1927), held that states could not regulate interstate wholesale transactions, leaving a regulatory gap.

The most important legal development of the 1930s was the *Federal Power Act* (FPA) of 1935. Responding to the regulatory gap identified in *Attleboro*, Congress gave the Federal Power Commission (FPC) jurisdiction over interstate transmission and wholesale power sales. The FPA authorized the FPC (now FERC) to regulate rates, require open access to transmission, and ensure reliability. For the Pennsylvania–New Jersey pool, federal regulation codified practices already in place and provided legal certainty for expanding across state lines. The FPC used its new authority to approve joint operating agreements and set interstate transmission tariffs. Although the FPA did not mandate pooling, it removed legal obstacles that had inhibited multi-state cooperation and encouraged utilities to integrate operations.

Interconnections

It was during the period between the 1940s and 1960s that additional grid interconnections were formed. The US electric grid is a complicated and highly connected network composed of power generation plants, transformers, transmission lines, substations, and distribution lines delivering power to over 163 million residential, commercial, and industrial customers.¹⁹ Three main interconnections in the continental US, the Eastern, Western, and Texas, comprise the nation’s electric grid. See Figure 2.

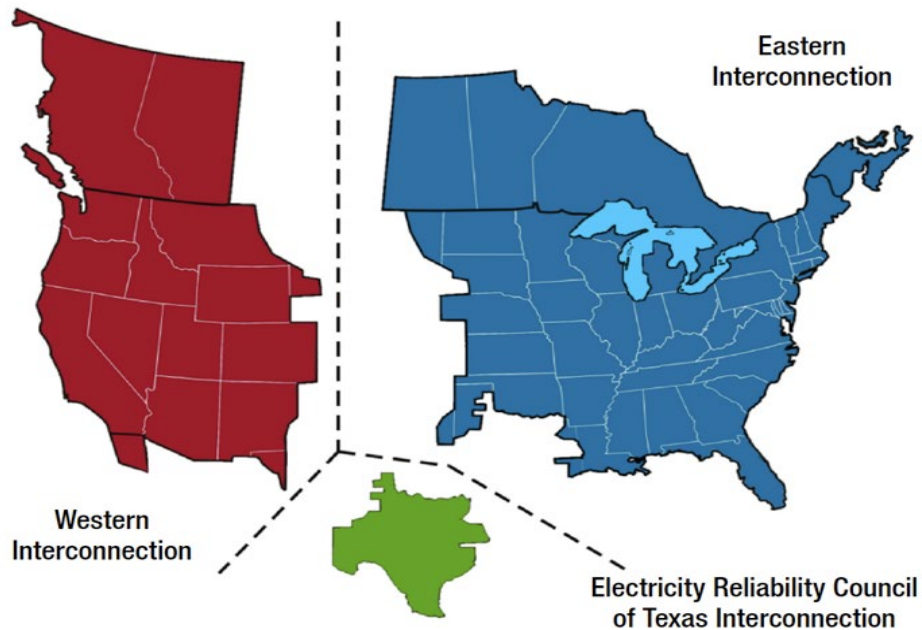
The Eastern Interconnection is located east of the Rocky Mountains and includes Pennsylvania’s electricity infrastructure. One of the reasons for the complexity of these interconnections is that many organizations contribute to, operate, and ensure that the interconnection works as intended. The organizations are governmental agencies, quasi-governmental partnerships, and private, including independent power producers, investor-owned utilities, energy co-ops, and municipalities.

¹⁷ *PJM Inside Lines*, What’s Past Is Prologue at Annual Meeting General Session, May 16, 2017.

¹⁸ U.S. Constitution, Article I, Section 8, Clause 3.

¹⁹ “Electric Power Annual,” US Energy Information Administration, 2025, https://www.eia.gov/electricity/annual/table.php?t=epa_01_02.html.

Figure 2
US Grid Interconnections
2022



Source: U.S. Dept of Energy, “Power Grid Fundamentals and Electricity Pricing,” Jan. 2022, <https://www.energycap.com/ebooks/power-grid-fundamentals-and-electricity-pricing/>.

In 1948, the pool changed its name from the Pennsylvania-New Jersey Interconnection to reflect its broadened scope, becoming the Pennsylvania–New Jersey Power Pool. The Federal Power Commission oversaw these expansions and approved interstate power sales under the FPA. States continued to regulate retail rates, but federal jurisdiction over wholesale transactions ensured that the pool’s agreements were nondiscriminatory. The post-war period also saw the first integrated resource planning efforts, as utilities collaborated on forecasts to optimize generation and transmission investments across Pennsylvania and its neighbors.²⁰

In 1956, the power pool underwent its first significant expansion when the Baltimore Gas & Electric (BG&E) and General Public Utilities (GPU) companies joined the existing three-member pool. The Five-Party Interconnection Operating Agreement formalized the new membership and renamed the organization the Pennsylvania–New Jersey–Maryland Interconnection (PJM).²¹ The agreement set forth detailed protocols for dispatch, accounting, and cost allocation among five utility systems. It included provisions for scheduling, energy balancing, emergency sharing, and dispute resolution, representing an early model for regional transmission

²⁰ The Technology of the “Grid”: Expansion and Extension in the 1940s and 1950s.

²¹ *PJM Inside Lines*, What’s Past Is Prologue at Annual Meeting General Session, May 16, 2017.

organizations. The FPC approved the agreement under § 202(b) of the FPA, recognizing the benefit of coordinated operation across state lines.²²

PJM utilities pioneered high-voltage transmission. Rapid demand growth in the 1950s encouraged investment in a 500-kilovolt backbone system to move bulk power long distances and interconnect generating stations. Construction began in 1957 and continued through the 1960s, eventually linking central Pennsylvania with Philadelphia, northern New Jersey, and Maryland. The high-voltage system reduced line losses and allowed the central dispatch office to redirect power efficiently. These infrastructure investments set PJM apart from other pools and laid the groundwork for its later expansion into the Midwest and South.²³

On November 9, 1965, a massive blackout cascaded across the Northeast, affecting New York, New England, Ontario, and parts of New Jersey. PJM largely maintained service but experienced disturbances that highlighted the vulnerability of the interconnected grid. Pennsylvania's utilities helped isolate and stabilize the system, demonstrating the benefits of a strong instate transmission network. In response, utilities and regulators formed the *Electric Research Council*, which later evolved into the *North American Electric Reliability Council* (NERC). NERC established voluntary reliability criteria, including requirements for contingency analysis, frequency control, and reserve sharing.²⁴ PJM adopted these standards and participated in early reliability councils, enhancing its operational protocols. Pennsylvania's experience during the blackout bolstered the case for regional reliability oversight.

Technological advances transformed PJM's operations. In 1968, the pool installed the nation's first Energy Management System (EMS), a computerized control system for monitoring and dispatching generation and transmission.²⁵ The EMS allowed operators to view real-time system conditions, calculate the scheduling and adjustment of power output by multiple electricity generators to meet total customer demand at the lowest possible cost while also maintaining reliability under changing demand.²⁶ This innovation positioned PJM as a leader in system control and foreshadowed the use of algorithms for market operations. It also marked the start of real-time data exchange between utilities, a precursor to the open-access information sharing required by later FERC orders.

The 1960s saw the FPC exercise increasing oversight under the FPA. Formal public proceedings in which a utility company requests permission from the utility regulator to change prices to customers, known as "rate cases" became more complex as utilities sought cost recovery for large capital projects. The *Public Utilities Regulatory Policies Act* (PURPA) of 1978 and early environmental laws would soon reshape generation mix, but the seeds of federal environmental regulation were sown in the late 1960s with the *Clean Air Act* (1963) and the *National Environmental Policy Act* (1969). PJM utilities began to consider the environmental impact of coal plants, though compliance obligations remained modest compared to later decades.

²² The Technology of the "Grid": Expansion and Extension in the 1940s and 1950s.

²³ The Technology of the "Grid": Expansion and Extension in the 1940s and 1950s.

²⁴ PJM Inside Lines, What's Past Is Prologue at Annual Meeting General Session, May 16, 2017.

²⁵ Yes Energy, The Introduction of Independent System Operators (ISOs).

²⁶ Economic Dispatch and Optimization, *Monolithic Power Systems*, <https://www.monolithicpower.com/en/learning/mpscholar/ac-power/economics-of-operation-and-planning-of-electricity-systems/dispatch-and-optimization>

During this period, academic work on electricity pricing emerged. Massachusetts Institute of Technology professor Fred Schweppe and colleagues developed the theory of locational marginal pricing (LMP), which proposed that the cost of delivering electricity should reflect both generation costs and transmission congestion.²⁷ Although LMP would not be implemented until the 1990s, its intellectual foundation emerged in the 1970s energy crises. PJM engineers studied these concepts and recognized that pricing congestion could improve dispatch efficiency. The existence of the PJM pool provided a real-world laboratory for testing economic dispatch principles, though actual implementation would require regulatory reforms. Under the Department of Energy Organization Act of 1977, the Federal Power Commission (FPC) was abolished and its responsibilities transferred to the Federal Energy Regulatory Commission.²⁸

In 1981, Delmarva Power & Light and Atlantic City Electric (now part of Exelon) joined PJM, expanding the footprint into Delaware and the Jersey Shore.²⁹ Membership agreements adapted the five-party model, incorporating lessons from twenty-five years of pooled operations. The new members increased load diversity and brought additional transmission assets, enabling PJM to schedule generation more flexibly. Around the same time, Pennsylvania Power & Light (PPL) commercialized the Susquehanna nuclear units on the Susquehanna River near Berwick (Unit 1 began commercial operation in 1983; Unit 2 followed in 1985), adding significant baseload capacity.³⁰

The 1980s saw improvements in communications technology. PJM upgraded its EMS, installed fiber optic networks for control signals, and implemented automatic generation control across a larger footprint. Computerized economic dispatch tools became more sophisticated, enabling real-time adjustments that would later underpin wholesale markets. The introduction of microprocessors allowed remote monitoring of substations and automated switching. These investments improved reliability and set the stage for open-access transmission.

Although wholesale deregulation would not occur until the 1990s, the 1980s witnessed debates over competition. The *Public Utility Regulatory Policies Act* (PURPA) of 1978 allowed non-utility generators, particularly cogeneration and renewable facilities, to sell power to utilities at avoided-cost rates. “Avoided-cost rates” are the price an electric utility pays for power from alternative energy producers based on what it would cost to generate the electricity itself or buy elsewhere. Some independent generators within the PJM footprint have built cogeneration plants, and PJM utilities were required to purchase their output. This experience introduced utilities to third-party power producers and foreshadowed competition. In Pennsylvania, PURPA encouraged industrial cogenerators along the Delaware and Susquehanna Rivers to sell excess steam and electricity to PECO and PP&L. Meanwhile, state regulators increasingly supported rate-of-return incentives tied to performance rather than capital investment. These changes eroded the long-standing vertically integrated monopoly model and set the stage for retail restructuring.

²⁷ PJM Inside Lines, What’s Past Is Prologue at Annual Meeting General Session, May 16, 2017.

²⁸ Department of Energy Organization Act of 1977 (91 Stat. 565; 42 U.S.C. § 7101 note).

²⁹ PJM Inside Lines, What’s Past Is Prologue at Annual Meeting General Session, May 16, 2017.

³⁰ PJM Inside Lines, What’s Past Is Prologue at Annual Meeting General Session, May 16, 2017.

ISOs and RTOs

In April 1996, FERC issued Order No. 888, requiring transmission owning utilities to provide open, nondiscriminatory access to their transmission networks under a single tariff and to unbundle transmission from generation. To facilitate open access, FERC encouraged formation of *Independent System Operators* (ISOs) to operate transmission systems independently of generation owners. Concurrently, Order No. 889 required utilities to establish an *Open Access Same-Time Information System* (OASIS) and to separate marketing from transmission functions. These orders created the institutional framework for competitive wholesale markets and effectively mandated the separation of transmission operations from generation ownership.³¹

Pennsylvania's policymakers complemented FERC's initiatives with the state's own restructuring law. In December 1996, the General Assembly enacted the *Electricity Generation Customer Choice and Competition Act* effective January 1, 1997.³² The statute declared that advances in generation technology and federal initiatives made it in the public interest to permit retail customers to obtain direct access to competitive generation, provided that safe and affordable transmission and distribution services remained available.³³ The law observed that Pennsylvania electricity rates were above national averages and that competitive market forces would better control generation costs. It directed utilities to unbundle generation from transmission and distribution, required open access over their systems, and empowered the Pennsylvania Public Utility Commission to oversee the orderly transition to competition and determine recovery of stranded costs.³⁴ Pennsylvania thus became one of the first states to restructure its retail electric market, giving PJM a legal framework to integrate state and federal deregulation.

PJM responded to FERC's orders and state initiatives by restructuring itself as an ISO. In 1997, PJM launched bid-based day-ahead and real-time energy markets that used locational marginal pricing to allocate generation and manage congestion. It became the first U.S. power pool to adopt an EMS-based LMP market and the first ISO authorized under FERC's new regime.³⁵ The market allowed generators to submit bids for energy and ancillary services; PJM centrally dispatched units based on least-cost subject to transmission constraints. The FERC approved PJM's *Open Access Transmission Tariff* (OATT), which offered nondiscriminatory network and point-to-point service. The same year, FERC issued Order No. 888-A clarifying details of open access and discouraging network utilities from operating their own dispatch.

During the late 1990s, PJM also designed a forward capacity market to ensure long-term resource adequacy. The capacity auction procured generation and demand-response commitments three years ahead of delivery. The mechanism, later called the Reliability Pricing Model (RPM), aimed to provide price signals for investment and maintain reserve margins. At the same time, PJM implemented ancillary services markets (regulation, spinning reserve, synchronized reserve) and refined LMP algorithms. Early market results showed improved dispatch efficiency and lower

³¹ *PJM Inside Lines*, PJM Celebrates 90 Years, Looks Toward Future, Sept. 26, 2017.

³² 66 Pa.C.S. Ch. 28.

³³ 66 Pa.C.S. §§ 2801–2815.

³⁴ 66 Pa.C.S. §§ 2801–2815.

³⁵ Yes Energy, The Introduction of Independent System Operators (ISOs).

energy prices, but critics questioned whether capacity payments over-compensated incumbents. In Pennsylvania, consumer advocates were influential, and debates over the fairness of capacity payments and the treatment of stranded costs dominated proceedings before the Public Utility Commission.

FERC Order 2000 of 1999 allowed utilities to voluntarily form organizations that would administer transmission regions across North America known as regional transmission organizations (RTOs).³⁶ This order outlines the 12 characteristics an entity needs to become an RTO. Two such examples include open access to transmission and a formal stakeholder governance process.³⁷ The goal of this order was to create equitable management of transmission and operation of wholesale electricity markets over large interstate regions.³⁸

PJM applied for RTO status and, in 2001, became the first organization to be approved as a full RTO.³⁹ RTO status expanded PJM's obligations: it assumed responsibility for regional transmission planning, long-term resource adequacy, and markets for capacity and ancillary services. FERC's order recognized PJM's existing governance structures and required modifications to ensure independence from market participants.

While the distinction between the two can be confusing, it should be noted that all RTOs are ISOs, but also meet additional criteria determined by FERC. Both ISOs and RTOs run wholesale energy operations, including energy and ancillary service markets. These markets are centered on the concept of providers offering bids, which in this context is "a commitment to pay a specific maximum price for a quantity of Energy or Transmission Congestion Rights."⁴⁰ Since their creation 20 years ago, RTOs have grown more commonplace and now two-thirds of the nation's electricity load is within RTO regions.⁴¹ While a substantial amount has changed over the last 30 years in US energy landscape, much of this shift has been incremental in nature and varies greatly across regions, as ISOs consolidate formerly independent functions and take on additional responsibilities.

Including PJM, there are seven ISO/RTOs within the country. See Map 1. While there may be organizational differences among ISOs and RTOs, there are also many similarities. Each is controlled by a board of stakeholders and receives funding through fees collected from entities paying to access the transmission system.⁴² Their typical responsibilities include:

- Operating wholesale power markets (which include trading of electricity, capacity, and transmission congestion contracts);

³⁶ Federal Energy Regulatory Commission, "RTOs and ISOs," 2024, <https://www.ferc.gov/power-sales-and-markets/rto-and-iso>.

³⁷ Pilot Energy, "The ISOs and RTOs," May 26, 2026, <https://pilotenergy.com/outlet/topics/iso-rto-map>.

³⁸ Federal Energy Regulatory Commission, "Electric Power Markets," March 2025, <https://www.ferc.gov/electric-power-markets>.

³⁹ *PJM Inside Lines*, PJM Celebrates 90 Years, Looks Toward Future, Sept. 26, 2017.

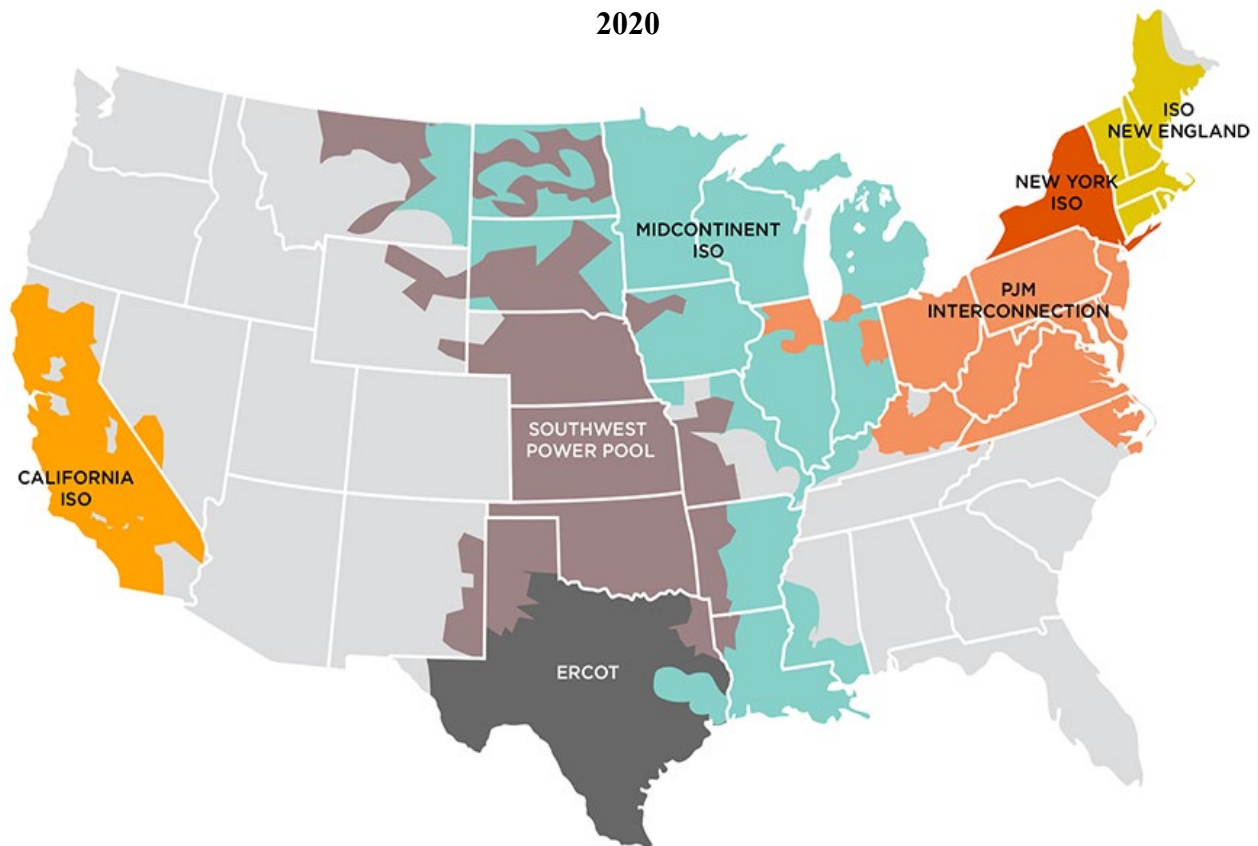
⁴⁰ Southwest Power Pool, "Glossary," Spp.Org, 2026, <https://spp.org/glossary/>.

⁴¹ Federal Energy Regulatory Commission, "Electric Power Markets," March 2025, <https://www.ferc.gov/electric-power-markets>.

⁴² Pilot Energy, "The ISOs and RTOs," May 26, 2026, <https://pilotenergy.com/outlet/topics/iso-rto-map>.

- Administering auctions for sale of capacity;
- Operating transmission network; and
- Conducting long-term planning.⁴³

Map 1
ISOs/RTOs
2020



Source: Sustainable FERC Project, “RTO Backgrounders,” 2020, <https://sustainableferc.org/rto-backgrounders-2/>.

California Independent System Operator (CAISO) was founded in 1998 and since that time centrally dispatches generation and coordinates movement of wholesale electricity to the majority of California and a small portion of Nevada.⁴⁴ CAISO performs the duties typical of an ISO, and its energy markets include day-ahead and real time service. It also provides ancillary service and congestion revenue rights. CAISO oversees a \$14.9 billion annual market that makes over 41,000 daily market transactions.⁴⁵ One unique aspect of CAISO is that since 2014 it has operated the energy imbalance market in the western US. A subsequent section will elaborate on the energy imbalance market.

⁴³ Federal Energy Regulatory Commission, “Electric Power Markets,” March 2025, <https://www.ferc.gov/electric-power-markets>.

⁴⁴ California ISO, “History,” Caiso.Com, 2026, <https://www.caiso.com/about/history>.

⁴⁵ California ISO, “Our Business,” 2026, <https://www.caiso.com/about/our-business>.

Unlike many of the other ISOs, Midcontinent Independent System Operator (MISO) did not exist as power pool prior to its formation in 2001.⁴⁶ MISO began market operations in 2005 and in 2013 greatly expanded southward. Today, MISO extends across a large vertical swath of the continent from Canada down to Louisiana across three operational regions. MISO has an independent board of directors.

Additionally, the Organization of MISO States (OMS), is a group representing state utilities. Each of the 15 states, the City of New Orleans, and the Province of Manitoba has a board member. They have a representative on MISO's advisory committee, provide recommendations to them and FERC, and participate in transmission planning and cost allocation.⁴⁷

Independent System Operator – Northeast (ISO-NE) was founded in 1997 and evolved out of a pre-existing power pool operating in this region since the 1970s.⁴⁸ The organization achieved RTO status with FERC in 2005. ISO-NE hosts an annual Forward Capacity Auction for both generator and demand resources. At this auction, capacity is offered three years in advance of when it's supplied with the goal of encouraging participation of new resources and adjusting for retired sources. Across the ISO-NE footprint 49 percent natural gas and 31 percent nuclear generation for its supply.⁴⁹ ISO-NE is known for its greater emphasis on renewable resources and it is comprised of states pursuing greater adoption of these sources. ISO-NE is an energy importer and receives 17 percent of its annual energy from Quebec, NYIOS, and New Brunswick.

New York Independent System Operator (NYISO) has a service area that covers only New York State. It replaced the New York Power Pool which had existed since 1965.⁵⁰ NYISO was created in 1999 and performs many duties typical of the ISO. It is notable for its transmission bottleneck in the southeast area of the state, as it struggles to direct enough power to New York City and Manhattan, where most energy is consumed in the state. As a result, energy within this state flows toward New York City and it maxes out transmission infrastructure, and these constraints raise electric prices in this region.⁵¹

⁴⁶ Federal Energy Regulatory Commission, "Electric Power Markets," March 2025, <https://www.ferc.gov/electric-power-markets>.

⁴⁷ Federal Energy Regulatory Commission, "Participation in Midcontinent Independent System Operator (MISO) Processes," [www.Ferc.Gov](https://www.ferc.gov/participation-midcontinent-independent-system-operator-miso-processes), April 25, 2024, <https://www.ferc.gov/participation-midcontinent-independent-system-operator-miso-processes>.

⁴⁸ ISO New England, "Our History," 2023, <https://www.iso-ne.com/about/who-we-are/our-history>.

⁴⁹ Federal Energy Regulatory Commission, "Electric Power Markets," March 2025, <https://www.ferc.gov/electric-power-markets>.

⁵⁰ Stegmann, Kelly, "Introduction to NYISO," In *Nyiso.Com*. New York Market Orientation Course Webinar, May 4, 2026, <https://www.nyiso.com/documents/20142/3037451/Introduction-to-NYISO.pdf/f7ad7e5c-65e9-635a-0aee-62709c33c412>.

⁵¹ Federal Energy Regulatory Commission, "NYSIO," in *www.Ferc.Gov*. 2026, <https://www.ferc.gov/industries-data/electric/electric-power-markets/nyiso>.

The Southwest Power Pool (SPP) began as an 11-member tight power pool that was founded in 1941.⁵² The goal of a tight power pool is to have formal agreements between its members to optimize deployment of energy and operating reserves, to dispatch resources on a least-cost basis, and operate out of a centralized control center. SPP became an RTO in 2004 and today it manages the transmission network in a portion of 17 states and with a diverse membership body composed of many types of organization.⁵³

The SPP started a real-time energy imbalance service market in 2007 and in 2014 created an integrated marketplace for both day-ahead, real-time, and operating reserves.⁵⁴ In 2015, the SPP expanded to include the ‘Western Area Power Administration - Upper Great Plains’ (WAPA-UGP) region as well as Basin Electric Power Cooperative and Heartland Energy (formerly the Heartlands Consumer Power District). This expansion effectively doubled the size of its service territory.⁵⁵ The WAPA-UGP is a reliability coordinator for NREC, which oversees compliance with reliability standards and is a FERC Approved regional entity. The WAPA-UGP was the first federal power marketing administrator to join an RTO in the US.⁵⁶ This later led to an expansion of SPP’s service area in April of 2026.⁵⁷ According to SPP 2025 Member Value Statement, it has saved its members \$4.6 billion dollars that year.⁵⁸

The Electric Reliability Council of Texas (ERCOT) is an ISO managing 24 million customers and represents 90 percent of Texas’ electrical load. ERCOT, an energy-only market (with real-time, day-ahead and ancillary service markets. Because Texas grid is not connected to the rest of the country, it is not subject to FERC’s jurisdiction. Unlike other ISOs, it does not have a capacity market. ERCOT performs financial settlement for competitive wholesale bulk power market and administers retail switching. ERCOT is governed by a 12-member board, subject to oversight from the Texas PUC and state legislators.⁵⁹ The board has seen significant upheaval and restructuring in recent years. It has shrunk from 16 members, and no longer represents various market segments, requires no fiduciary duty or assets in ERCOT market, has selection by a political appointment, and Texas residency requirements.⁶⁰

⁵² Federal Energy Regulatory Commission, “Electric Power Markets,” March 2025, <https://www.ferc.gov/electric-power-markets>.

⁵³ Southwest Power Pool, “Fast Facts,” Spp.Org, 2026, <https://www.spp.org/about-us/fast-facts/>.

⁵⁴ Federal Energy Regulatory Commission, “Electric Power Markets,” March 2025, <https://www.ferc.gov/electric-power-markets>.

⁵⁵ Southwest Power Pool, “Fast Facts.” Spp. Org, 2026, <https://www.spp.org/about-us/fast-facts/>.

⁵⁶ Federal Energy Regulatory Commission, “Electric Power Markets,” March 2025, <https://www.ferc.gov/electric-power-markets>.

⁵⁷ Western Area Power Administration, “Southwest Power Pool Membership,” Wapa.Gov, April 2, 2026, <https://www.wapa.gov/about-wapa/the-source/key-topics/southwest-power-pool-membership/>.

⁵⁸ SPP Stakeholder Affairs, “2025 Member Value: SPP’s Member Value Statement,” *Southwest Power Pool*, 2026, https://www.spp.org/documents/76696/member%20value%20statement_05122026.pdf.

⁵⁹ Electric Reliability Council of Texas, “Board of Directors,” Accessed August 16, 2026. <https://www.ercot.com/about/governance/directors>.

⁶⁰ Electric Reliability Council of Texas, “Board of Directors,” Accessed August 16, 2026. <https://www.ercot.com/about/governance/directors>.

Table 1
Overview of ISO/RTO Characteristics
2026

ISO/RTO Name	Sq Miles (thousands)	Customer Population (millions)	Miles of Transmission lines (thousands)	Number of generation units	Peak Demand (MW)	State Footprint
CAISO ⁶¹	132	32	26	1,019	44,301	CA, NV
ERCOT ⁶²	200	27	52.7	1,460	91,089	TX
SPP ⁶³	732	15	85.5	1,179	56,184	AR, IA, KS, LA, MN, MO, MT, NE, NM, ND, OK, SD, TX, WY
MISO ⁶⁴	100,000	45	79	2,015	127,100	AR, IL, IN, IA, KY, LA, MI, MN, MS, MT, LA, ND, SD, TX, WI, Manitoba
PJM ⁶⁵	369	67	88.3	1,400	168,158	DE, IL, IN, KY, MD, MI, NJ, NC, OH, PA, TN, VA, WV, and DC
NYISO ⁶⁶	55	19.8	11	760	30,397	NY
ISO-NE ⁶⁷	72	7.6	9	400	28,130	CT, ME, MA, NH, RI, VT

Source: See footnotes 61-67.

Areas without ISO or RTOs

In the United States there are several areas without ISOs such as the Southeast, Pacific Northwest and Mountain West, which have traditional vertically integrated utilities. To restate the implications of this decision: these areas do not have competitive wholesale markets and instead trade their power bilaterally between utilities at negotiated prices.⁶⁸ According to some analyzes, those most heavily impacted by the decision to not have an ISO are commercial and industrial

⁶¹ Sustainable FERC Project, “Navigating CAISO,” Sustainable FERC Project, October 13, 2023.

<https://sustainableferc.org/navigating-caiso/>.

⁶² Electric Reliability Council of Texas, “ERCOT Snapshot,” Texas.Gov, 2023.

<https://comptroller.texas.gov/economy/economic-data/energy/2023/ercot-snap.php>.

⁶³ Southwest Power Pool, “Fast Facts,” Spp. Org, 2026, <https://www.spp.org/about-us/fast-facts/>; and

<https://sustainableferc.org/rto-backgrounders/navigating-spp/>.

⁶⁴ Midcontinent ISO, “MISO Fact Sheet,” 2026, <https://www.misoenergy.org/meet-miso/media-center/corporate-fact-sheet/>.

⁶⁵ PJM, “PJM at a Glance,” April 2025, <https://www.pjm.com/-/media/DotCom/about-pjm/newsroom/fact-sheets/pjm-at-a-glance.pdf>.

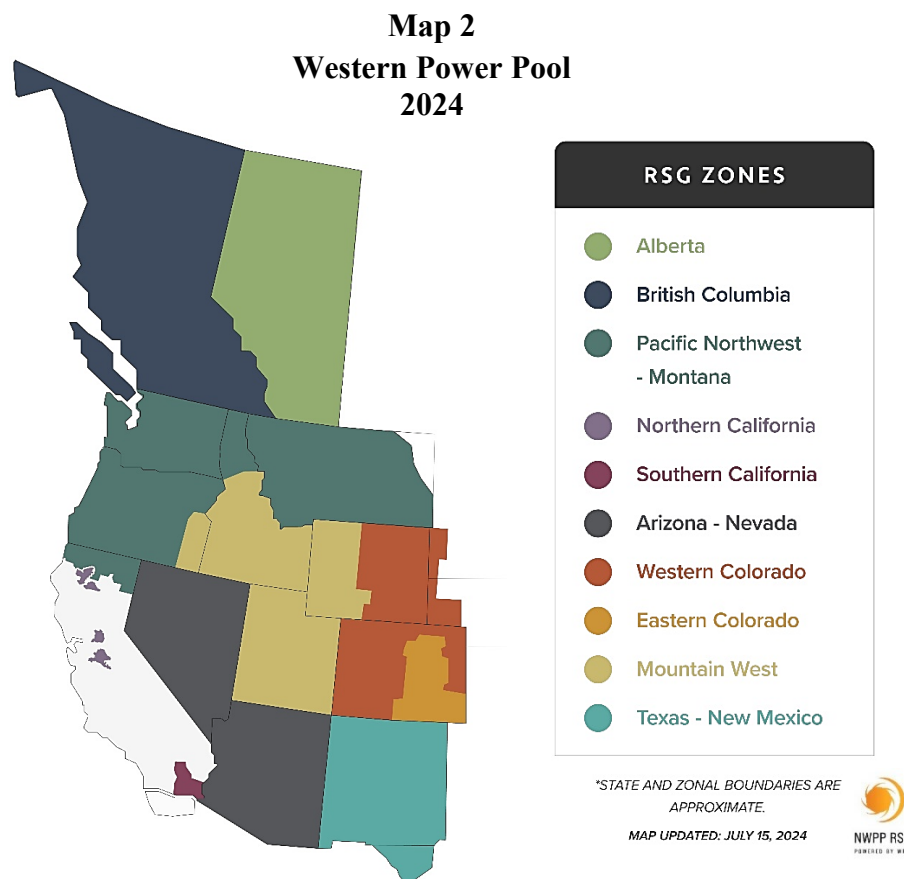
⁶⁶ Electric Power Supply Assoc., “Competitive Electricity Markets Spotlight: New York ISO,” April 20, 2021, <https://epsa.org/competitive-electricity-markets-spotlight-new-york-iso/>.

⁶⁷ Sustainable FERC Project, “Navigating ISO-NE,” Sustainable FERC Project, October 13, 2023, <https://sustainableferc.org/navigating-iso-ne/>.

⁶⁸ Pilot Energy, “The ISOs and RTOs,” May 26, 2026, <https://pilotenergy.com/outlet/topics/iso-rto-map>.

power customers who have fewer market signals, limited opportunity to participate in demand response, and less access to green tariffs.^{69 70}

The Western Power Pool (formerly Northwest Power Pool) was formed in 1941 from six IOUs during WWII.⁷¹ Due to the absence of an ISO, these regions contain multiple balancing authorities that dispatch generation, procure power, and perform the other necessary reliability and resource adequacy functions.⁷² However, because they are not part of a formal organization does not mean some of these entities do not cooperate. One example is the Western Resource Adequacy Program by the WPP, which is a planning organization.⁷³ Map 2 below shows Reserve Sharing Program areas.



Source: WPP, “RSG Zones Map,” July 2024, <https://www.westernpowerpool.org/private-media/documents/RSG-Zones-Map.jpg>.

⁶⁹ Pilot Energy, “The ISOs and RTOs,” May 26, 2026, <https://pilotenergy.com/outlet/topics/iso-rto-map>.

⁷⁰ A green tariff allows large customers to buy bundled renewable energy from a specific project through their utility, <https://tangoanalytics.com/blog/green-tariffs-what-they-are-and-why-they-matter/#:~:text=Green%20tariffs%20are%20programs%20in,a%20special%20utility%20tariff%20rate>.

⁷¹ Western Power Pool, “History,” 2026, <https://www.westernpowerpool.org/about/history/>.

⁷² Federal Energy Regulatory Commission, *Western Energy Markets Explainer*, 2025. <https://www.ferc.gov/OPP/western-markets-explainer>.

⁷³ Federal Energy Regulatory Commission, *Western Energy Markets Explainer*, 2025, <https://www.ferc.gov/OPP/western-markets-explainer>.

Again, states in the Southeast have no ISO. However, there are two NERC regions within this area, the Florida Reliability Coordinating Council (FRCC) and the Southeast Regional Council (SERC). Utilities in the Southeast Region are vertically integrated, and energy sales are bilateral. FRCC region increasingly uses natural gas while most of the other areas rely primarily on coal and nuclear.⁷⁴ In Florida, the state PSC hosts competitive bidding process and investor-owned utilities must issue requests for proposals for new generation projects 75MW or more.⁷⁵ The bidding requirement may be waived by the PSC if determined prudent for taxpayers

Energy Imbalance Markets

While bilateral contracts between utilities are able match most energy supply with the demand in areas without ISOs, Energy Imbalance Markets (EIM) can fill the short-term gaps in these agreements. The Western EIM (WEIM) is run by CAISO. Participation in an EIM allows utilities to have greater real-time coordination across a large area without fully having to be part of an ISO. WEIM is a real-time energy supply market which offers electric generation and transmission services within the hour. As of 2026, 22 balancing authorities across 11 western states as well as portions of Canada are represented by WEIM.⁷⁶ This is 80 percent of the demand for electricity in the Western Interconnection. See Map 3. Its primary functions are to automatically balance demand every 15 minutes and dispatch power from generation sources to meet demand every five minutes based on the lowest cost of energy.⁷⁷

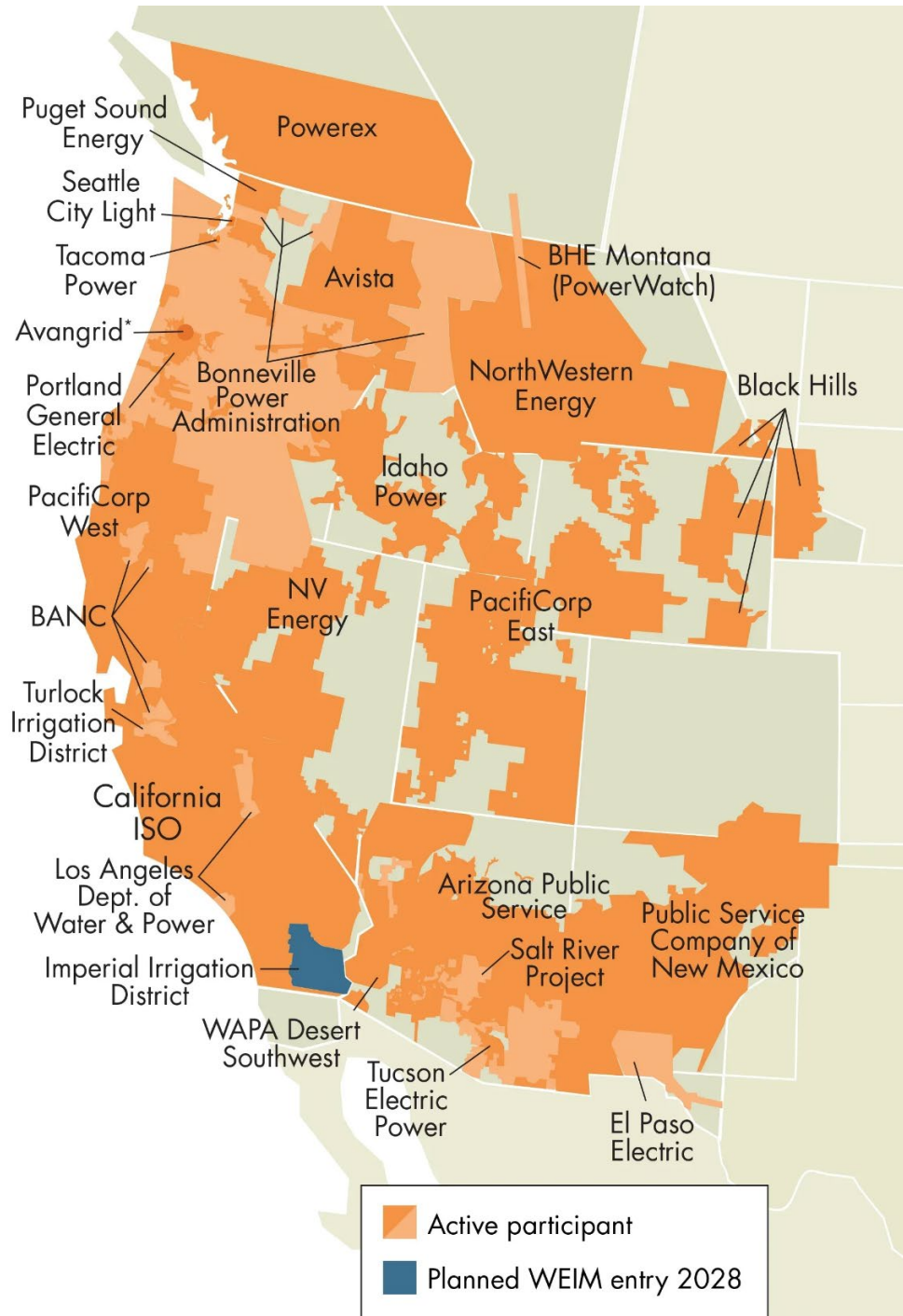
⁷⁴ Federal Energy Regulatory Commission, “Electric Power Markets,” March 2025, <https://www.ferc.gov/electric-power-markets>.

⁷⁵ Federal Energy Regulatory Commission, “Electric Power Markets,” March 2025, <https://www.ferc.gov/electric-power-markets>.

⁷⁶ California ISO, “Western Energy Imbalance Market Surpasses \$8 Billion in Total Benefits Since Inception,” February 13, 2026, <https://www.caiso.com/about/news/news-releases/western-energy-imbalance-market-surpasses-8-billion-in-total-benefits-since-inception>.

⁷⁷ Bonneville Power Administration. “EIM Stakeholder Meeting Appendix: How the EIM Work.” July 24, 2018, PowerPoint Slides, <https://www.bpa.gov/-/media/Aep/projects/energy-imbalance-market/20180724-july-24-2018-eim-stakeholder-mtg-appendix.pdf>.

Map 3
Western Energy Imbalance Markets (WEIM) Participants
2026



Source: WEIM “Western Energy Imbalance Market: Participants”, 2026,
<https://www.westernenergymarkets.com/western-energy-imbalance-market-weim>.

The EIM uses “bid ranges” wherein resource partners offer power and the EIM chooses the least expensive one that best suits the situation. Reliability and security are also considered. Software estimates prices from data provided by entities and power sources, and computer models determine where to send the power based on this information. Some of the types of information the system needs are accurate information on the network, outages, forecasts, and the regular “base” schedules.⁷⁸

There are many reasons why a utility might want to join an EIM. For Tacoma Energy in Washington State, which participated in the WEIM starting in 2022, part of the rationale was that partners with which it had existing bilateral agreements were joining the WEIM. This utility saw that ITS flexible Hydro generation resources would be in demand due to their renewable status, and that participating in the organization would allow it to be part WEIM’s decision-making. Participating also showed a net present value over a decade.⁷⁹ It is worth noting that, unlike ISO, there are pathways for utilities that wish to stop participating in EIMs.

Despite being operated by CAISO as an extension of its RTO’s real-time market, customers of the EIM outside the RTO region do not get all the advantages of CAISO members. For example, capacity ancillary services and contingency dispatch are not part of the EIM. See Figure 3 below.

Figure 3
Responsibilities of the CAISO EIM
2018

What an EIM IS :	What an EIM is NOT :
■ An intra-hour real-time energy market to serve load and imbalance across participating Balancing Authorities (EIM Entities) and the CAISO (a.k.a. the EIM Area) ■ A tool for centralized 5-minute dispatch of resources that have been voluntarily offered to the market (at a price) ■ Economically dispatches offered resources ■ Security-constrained, meaning transmission and reliability constraints are not exceeded, improving grid reliability, reducing energy supply cost and enhancing integration of renewable resources	■ An RTO (with planning, day-ahead markets, BA consolidation) ■ A centralized unit commitment tool ■ A capacity market ■ A replacement for the current contractual bi-lateral business structure

Source: Bonneville Power Administration, “EIM Stakeholder Meeting Appendix: How the EIM Work,” July 24, 2018, PowerPoint Slides, <https://www.bpa.gov/-/media/Aep/projects/energy-imbalance-market/20180724-july-24-2018-eim-stakeholder-mtg-appendix.pdf>.

⁷⁸ Bonneville Power Administration, “EIM Stakeholder Meeting Appendix: How the EIM Work,” July 24, 2018, PowerPoint Slides, <https://www.bpa.gov/-/media/Aep/projects/energy-imbalance-market/20180724-july-24-2018-eim-stakeholder-mtg-appendix.pdf>.

⁷⁹ “Energy Imbalance Market (EIM) Program Brief,” Tacoma Public Utility Board, July 14, 2021, <https://www.mytpu.org/wp-content/uploads/EnergyImbalanceMarket.pdf>.

EIMs are changing in response to market conditions that prompt utility companies to find new ways to work together. WEIM is overhauling its governance structure, transitioning into a new model called an independent regional organization as early as 2028.⁸⁰ This new entity, the Regional Organization for Western Energy (ROWE), seeks to be an independent governance structure, for voluntary energy markets in the western US.⁸¹

Previously, SPP operated the Western Energy Imbalance Service (WEIS) as part of its integrated market, which has been phased out since April 2026.⁸² Its functions are being replaced by SPP Markets+. SPP Markets+ will offer day-ahead wholesale electricity sales (rather than just real-time) without ceding control of utility operations to the RTO.⁸³ A western utility within the range of this market must sign a participation agreement to a stakeholder governance structure in order to join.

While an EIM cannot replace all functions of an ISO/RTO, it allows utilities a greater degree of security, flexibility, and cost savings without the potential longer-term benefits such organizations purport to offer.

Areas of ISO/RTO Expansion

The areas of the country that participate in ISO are not immutable or even long-established characteristics of a region, but the result of policy choices. Increasingly, there are states investigating joining or creating ISOs, or energy consultants providing estimates of the potential benefits from greater participation in an ISO. For example, Colorado and Nevada both have enacted bills requiring their state to join an RTO by 2030.⁸⁴ One analysis found that if a western RTO was formed it could spur economic growth, create between 159-657 jobs, and add \$79.2 billion in annual gross regional product. FERC claims this would save customers in this region \$2 billion per year Southeast Region estimated that the formation of an RTO could save \$384 billion by 2040.⁸⁵ Competitive pricing could save customers \$17.4 billion a year and would likely lead to the retirement of coal plants and gas peakers.⁸⁶ South Carolina has shown interest in joining an

⁸⁰ California ISO, “Western Energy Imbalance Market Surpasses \$8 Billion in Total Benefits Since Inception,” February 13, 2026, <https://www.caiso.com/about/news/news-releases/western-energy-imbalance-market-surpasses-8-billion-in-total-benefits-since-inception>.

⁸¹ ROWE, Regional Organization For Western Energy, 2026, <https://rowesternenergy.org/>.

⁸² Southwest Power Pool, “Western Energy Imbalance Service Market,” 2026, <https://www.spp.org/western-services/weis/>.

⁸³ Southwest Power Pool, “RTO vs. Markets+: What’s the Difference?,” July 2026, <https://southwestpowerpool.s3.amazonaws.com/newstories/Markets-Fact-Sheet-RTO-vs-Markets-v4-1.pdf>.

⁸⁴ National Caucus of Environmental Legislators, “Understanding RTOs: The West,” National Caucus of Environmental Legislators, December 13, 2023, <https://www.ncelenviro.org/articles/understanding-rtos-the-west/>.

⁸⁵ National Caucus of Environmental Legislators, “Understanding RTOs: Southeast,” April 25, 2024, <https://ncel.net/articles/understanding-rtos-southeast/>.

⁸⁶ Gas peakers also known as peaking power plants are power plants that burn natural gas to supply electricity only when demand is highest.

RTO and passed a law to study the initiative.⁸⁷ The result of the study was that \$362 million in savings per year if it joined PJM or \$187 million if the region formed its own RTO.⁸⁸

Ultimately, the factors that determine the retail electricity rate paid by the consumer are many and multifaceted; the structure of the regional energy market is only one factor affecting retail prices. For example, the mixture of energy sources also contributes to expensive reliability upgrades. While joining RTOs in other states could potentially lead to economic activity and substantial savings, it is the duty of state regulators to ensure that final retail prices of electricity are fair to consumers.

Growth and Expansion of PJM

After obtaining RTO status, PJM began expanding beyond the Mid-Atlantic. In 2002, Allegheny Power (Monongahela Power, Potomac Edison, and West Penn Power) joined PJM, linking western Pennsylvania, Maryland, and parts of West Virginia with PJM's network. The integration brought the greater Pittsburgh area into PJM and reduced the need to sell power across the Western Area Power Administration interface. In 2003 the Northeast Blackout underscored the importance of regional coordination; while most of the PJM system remained online and assisted neighboring regions in restoration, the event spurred further support for expanded RTOs.⁸⁹

In May 2004, Commonwealth Edison (ComEd), serving northern Illinois including Chicago, was integrated into PJM following FERC approval.⁹⁰ Later that year, American Electric Power (AEP), one of the nation's largest transmission owners with facilities across Ohio, Indiana, Kentucky, West Virginia, and Michigan, joined PJM after FERC issued an order permitting its withdrawal from the Midwest ISO and integration into PJM.⁹¹ FERC directed that AEP be integrated by October 1, 2004, and emphasized reliability and congestion benefits.⁹² Dayton Power & Light joined simultaneously.

On January 1, 2005, Duquesne Light Company, serving Pittsburgh and several western Pennsylvania counties, joined PJM. This integration brought 2,300 MW of generation and a critical urban load center under PJM dispatch. On May 1, 2005, Dominion (Virginia Electric & Power Company), serving most of Virginia and eastern North Carolina, transferred operational control of 6,000 miles of high-voltage lines to PJM.⁹³ With Dominion's addition, PJM's projected

⁸⁷ South Carolina General Assembly, 2019-2020 Bill 4940: Electricity Market Reform Measures Study Committee, Scstatehouse.gov, https://www.scstatehouse.gov/sess123_2019-2020/bills/4940.htm.

⁸⁸ Diana DiGangi, "South Carolina Could Save Electricity Customers up to \$362M a Year by Joining RTO: The Brattle Group," Utility Dive, May 15, 2023, <https://www.utilitydive.com/news/brattle-south-carolina-rto-legislature-energy-market/650227/>.

⁸⁹ *PJM Inside Lines*, In Times of Uncertainty, the Electric Grid Remains the Foundation for Continuity and the Enabler of Change, Apr. 6, 2020.

⁹⁰ Affidavit of Michael Kormos, *In re Exelon Corp.* (SEC Docket).

⁹¹ Commission on Electric Utility Restructuring (Virginia), *American Electric Power and Dominion Applications to Join PJM*, June 29, 2004.

⁹² Commission on Electric Utility Restructuring (Virginia), *American Electric Power and Dominion Applications to Join PJM*, June 29, 2004.

⁹³ ElectricNet News, Dominion Transmission System Integrated into PJM, May 1, 2005.

peak demand exceeded 130 GW and its generating capability reached 164 GW, doubling its size in one year.⁹⁴ Virginia's *Electric Utility Restructuring Act* required utilities to join an RTO by 2005, and FERC's order approving AEP's integration noted the legal mandate and economic benefits.⁹⁵

During the mid-2000s, PJM refined its market rules. It launched the Reliability Pricing Model in 2007 to replace earlier capacity auctions, aiming to procure adequate resources three years ahead and incorporate demand response. The Energy Price Formation reforms improved scarcity pricing and introduced uplift cost allocation. PJM also enhanced the Regional Transmission Expansion Plan (RTEP), a planning process that identifies transmission projects to maintain reliability and relieve congestion. In Pennsylvania, the RTEP became a vehicle for evaluating reinforcement of aging 230 kV lines and for planning new 500 kV corridors to integrate wind resources from western Pennsylvania and solar from the eastern part of the state. FERC required PJM to comply with Order No. 890 (2007), which mandated greater transparency in planning and equitable cost allocation.

On June 1, 2011, PJM assumed operational control of FirstEnergy Corp.'s *American Transmission Systems Incorporated* (ATSI), which includes the transmission systems of Toledo Edison, Ohio Edison, Cleveland Electric Illuminating, and Pennsylvania Power. The integration occurred at 1 a.m. EDT and brought all of FirstEnergy's utilities into PJM.⁹⁶ The inclusion of Pennsylvania Power ensured that customers in western Pennsylvania would be served under PJM's tariffs and have access to the energy and capacity markets. ATSI added more than 8,200 miles of high-voltage lines and expanded PJM's service territory across northern Ohio to the Michigan border. FirstEnergy's president noted that aligning the transmission facilities into PJM would enhance long-term planning and leverage efficiencies; he emphasized PJM's ample reserves and successful demand-response programs to manage customers' needs.⁹⁷

At midnight on January 1, 2012, PJM successfully assumed operational control of the transmission systems of Duke Energy Ohio, Inc. and Duke Energy Kentucky, Inc., subsidiaries of Duke Energy Corporation.⁹⁸ The integration increased PJM's all-time peak demand to 163,848 MW and raised generating capacity to 185,600 MW, with more than 62,000 miles of transmission lines and a territory of 214,000 square miles.⁹⁹ By comparing PJM statistics from 1993 and 2011 with Duke's system, the addition of Duke Energy's 3,000 MW of generation and 5,800 miles of lines illustrated how far PJM had grown since its early days.¹⁰⁰ Although Duke's footprint lay outside Pennsylvania, the integration further diversified PJM's supply and demand base, which benefited Pennsylvania customers through increased liquidity and improved

⁹⁴ ElectricNet News, Dominion Transmission System Integrated into PJM, May 1, 2005.

⁹⁵ Commission on Electric Utility Restructuring (Virginia), *American Electric Power and Dominion Applications to Join PJM*, June 29, 2004.

⁹⁶ T&D World, FirstEnergy's ATSI Transmission System Successfully Integrated into PJM Interconnection, June 9, 2011.

⁹⁷ T&D World, FirstEnergy's ATSI Transmission System Successfully Integrated into PJM Interconnection, June 9, 2011.

⁹⁸ *Renewable Energy World*, Duke Energy Ohio, Kentucky Link into PJM, Jan. 3, 2012.

⁹⁹ *Renewable Energy World*, Duke Energy Ohio, Kentucky Link into PJM, Jan. 3, 2012.

¹⁰⁰ *Renewable Energy World*, Duke Energy Ohio, Kentucky Link into PJM, Jan. 3, 2012.

reliability. The integration allowed Duke to participate fully in PJM's energy and capacity markets and required coordination with the Midwest ISO to handle cross-border flows.

On June 1, 2013, the *East Kentucky Power Cooperative* (EKPC) integrated its system into PJM. The not-for-profit cooperative, serving sixteen owner-member distribution cooperatives and 520,000 homes and businesses, contributed 3,099 MW of generating capacity and 2,797 miles of transmission lines.¹⁰¹ EKPC's chief executive noted that joining PJM would help the cooperative operate more efficiently and economically, providing benefits to members.¹⁰² The integration created a separate PJM transmission zone for EKPC and required adjustments to PJM's revenue-allocation formulas. FERC approved the integration after considering the *Kentucky Public Service Commission's* orders and EKPC's withdrawal from the Southeast Energy Supply pool. While EKPC's system lies outside Pennsylvania, the added capacity and diversity supported overall reliability, indirectly benefiting Pennsylvania consumers.

Throughout the early 2010s, PJM adjusted market rules in response to extreme weather events. The 2014 polar vortex caused natural gas shortages and spiking prices, leading to generator outages and threatening reliability. PJM responded by tightening capacity performance requirements, increasing penalties for non-performance, and enhancing winter preparedness. FERC approved reforms to ensure that capacity resources could deliver energy during stressed conditions. Pennsylvania's regulators supported these reforms, noting that the Commonwealth's coal, gas, and nuclear fleet needed incentives to perform during cold spells. At the same time, PJM integrated increasing amounts of wind and solar generation, prompting new ancillary services and forecasting tools. Policy debates over the capacity market intensified as states pursued renewable portfolio standards and considered subsidizing nuclear plants. PJM developed proposals such as the Minimum Offer Price Rule to address interactions between state subsidies and market pricing, leading to legal challenges and ongoing FERC proceedings.

On December 1, 2018, the *Ohio Valley Electric Corporation* (OVEC) successfully integrated its transmission system into PJM.¹⁰³ OVEC, formed in 1952 to power a uranium enrichment facility near Piketon, Ohio, operates two coal-fired plants and 705 miles of 345-kV transmission lines that produce 2,200 MW of capacity.¹⁰⁴ Before integration, OVEC's generation sold power into PJM markets via pseudo-ties; after integration the system became a separate transmission zone subject to PJM's operational control and reliability requirements.¹⁰⁵ PJM determined that OVEC met membership criteria and that integration would not cause reliability issues. While OVEC lies outside Pennsylvania, the additional capacity and transmission paths increased regional resilience and allowed Pennsylvania generation to flow more efficiently into the Midwest. The addition further enlarged PJM's footprint and reinforced its status as the nation's largest RTO.

¹⁰¹ Power Engineering, *East Kentucky Co-op Connected to PJM Power Grid*, June 3, 2013.

¹⁰² Power Engineering, *East Kentucky Co-op Connected to PJM Power Grid*, June 3, 2013.

¹⁰³ *PJM Inside Lines*, *OVEC Successfully Integrates Transmission System into PJM*, Dec. 3, 2018.

¹⁰⁴ *PJM Inside Lines*, *OVEC Successfully Integrates Transmission System into PJM*, Dec. 3, 2018.

¹⁰⁵ *PJM Inside Lines*, *OVEC Successfully Integrates Transmission System into PJM*, Dec. 3, 2018.

During the late 2010s, electric utility companies, state governments, and other stakeholders debated PJM's governance. Consumer advocates argued that the PJM board lacked representation from renewable and environmental interests, while some state regulators criticized the capacity market's cost. FERC considered proposals to adjust capacity accreditation and the minimum offer price rule. Meanwhile, PJM advanced reforms to its Interconnection Queue to address delays in connecting new resources. It also implemented Fast Start pricing and marginal loss calculations to improve price signals. PJM's planning process began to incorporate state policy goals under FERC's Order No. 1000, which required RTOs to consider transmission needs driven by public policy and introduced competitive bidding for transmission projects.

By 2020, PJM had more than 80,000 MW of proposed renewable generation in its interconnection queue. Many of these projects were located in Pennsylvania's mountainous regions and farmland, where wind and solar developers sought to connect to the existing 500-kV and 230-kV lines. The queue suffered from long processing times and speculative projects, hampering the deployment of wind and solar resources. PJM and stakeholders developed reforms to process projects in clusters, tighten milestone requirements, and coordinate with transmission planning. FERC approved these reforms in 2022, and PJM began implementing them in 2023. The reforms aim to integrate renewables more efficiently and support state clean-energy mandates, including Pennsylvania's Alternative Energy Portfolio Standards Act.

In the 2020s, PJM and FERC grappled with the alignment of markets and state policies. Several PJM states adopted Zero Emission Credits (ZECs) to support nuclear plants, raising questions about the capacity market's integrity. Pennsylvania debated but ultimately declined to adopt a ZEC program, instead relying on the capacity market and PJM's energy revenues to support its two remaining nuclear stations (Susquehanna and Beaver Valley). PJM initially expanded the minimum offer price rule to mitigate the effect of subsidies, but FERC subsequently narrowed its application. Ongoing litigation and policy debates reflect tensions between state sovereignty in resource selection and FERC's oversight of wholesale markets. At the same time, PJM explored Energy and Ancillary Services Market Reform to better compensate flexible resources and integrate distributed energy resources. It implemented Aggregated Resource Participation rules, enabling small solar, storage, and demand-response facilities to bid as aggregated units.

PJM's transmission planning faces new challenges. States increasingly expect transmission to enable renewable energy imports (e.g., offshore wind in the mid-Atlantic) and to connect remote onshore wind projects. FERC's Order No. 1000 requires PJM to consider public policy needs, but cost allocation remains contentious. In 2021, New Jersey used a State Agreement Approach within PJM to advance transmission for offshore wind, demonstrating new models for state-RTO collaboration.

2025 HOUSE RESOLUTION 361

PRIOR PRINTER'S NO. 2539

PRINTER'S NO. 3289

THE GENERAL ASSEMBLY OF PENNSYLVANIA

HOUSE RESOLUTION

No. 361 Session of
2025

INTRODUCED BY MATZIE, STEELE, FRANKEL, PIELLI, HILL-EVANS,
HARKINS, HADDOCK, MALAGARI, SANCHEZ, NEILSON, RIVERA, CEPEDA-
FREYTIZ, DELLOSO, PARKER, GALLAGHER, DONAHUE, BOROWSKI,
CIRESI, KAUFFMAN, REICHARD, SCOTT, SHUSTERMAN AND SHAFFER,
OCTOBER 28, 2025

AS REPORTED FROM COMMITTEE ON CONSUMER PROTECTION, TECHNOLOGY
AND UTILITIES, HOUSE OF REPRESENTATIVES, AS AMENDED,
APRIL 28, 2026

A RESOLUTION

1 Directing the Joint State Government Commission to study the
2 costs and benefits of continued membership in the PJM
3 Interconnection.

4 WHEREAS, The PJM Interconnection (PJM) plays a crucial role
5 in the reliable and affordable operation of the electric grid
6 and the wholesale electricity market as the Regional
7 Transmission Organization (RTO) in the Mid-Atlantic Region; and

8 WHEREAS, PJM operates the transmission system across
9 Pennsylvania, 12 other states and the District of Columbia, with
10 approximately 65 million customers, and manages an energy
11 marketplace which establishes the energy and capacity prices for
12 Pennsylvania residential, commercial and industrial customers;
13 and

14 WHEREAS, Pennsylvania has been a part of PJM since 1927, when
15 the intent of its original members was to pool generation
16 resources for the economic benefit of its members and the

1 public; and

2 WHEREAS, Resource adequacy by PJM has played a more
3 significant role for Pennsylvania since 1997, with the enactment
4 of the Electricity Generation Customer Choice and Competition
5 Act, which restructured the electric industry, removing
6 generation from jurisdiction under the Pennsylvania Public
7 Utility Commission; and

8 WHEREAS, Membership in PJM offered benefits such as enhanced
9 reliability and access to a broader electricity market, but also
10 potential impacts on electric rates and adequate generation
11 resources for this Commonwealth in the future; and

12 WHEREAS, Since joining PJM and through 2024, Pennsylvania
13 customers have enjoyed competitive energy prices and cost
14 savings from the PJM electricity market; and

15 WHEREAS, PJM conducts capacity auctions for the PJM planning
16 year that runs from June 1 to May 31 each year with the primary
17 objective of incentivizing power plant owners and operations to
18 develop, permit, construct and bring into operation new power
19 plants to meet the increasing electric demands of customers in
20 Pennsylvania and across PJM; and

21 WHEREAS, In July 2024, PJM conducted the capacity auction for
22 June 2025 through May 2026 planning year, which resulted in the
23 increase from \$29.50 per megawatt (MW) day, for the period June
24 2024 through May 2025, to \$270.35 per MW day, a 600% increase
25 from the prior year, effective June 2025 through May 2026, with
26 an estimated increase in prices paid by Pennsylvania customers
27 of \$2.2 billion in capacity market payments to the power plant
28 owners in PJM; and

29 WHEREAS, As a result of this PJM capacity market cost
30 increase to Pennsylvania customers, Governor Shapiro, in

1 December 2024, filed a complaint against PJM at the Federal
2 Energy Regulatory Commission, arguing that the capacity prices
3 were unjust and unreasonable; and

4 WHEREAS, In February 2025, Governor Shapiro and PJM entered
5 into a settlement agreement that created a floor price of \$175
6 per MW day and a ceiling price of approximately \$325 per MW day
7 for the next two capacity auctions of June 2026 through May 2027
8 and June 2027 through May 2028; and

9 WHEREAS, In July 2025, PJM conducted the capacity auction for
10 the June 2026 through May 2027 period and announced that the
11 prices cleared at the ceiling price of \$329.92 per MW day, a 22%
12 increase from the prior year, increasing costs to Pennsylvania
13 customers by an estimated additional \$538 million above the
14 estimated \$2.2 billion increase from the current period; and

15 WHEREAS, But for the ceiling price cap negotiated by Governor
16 Shapiro, the price would have cleared at \$388.57 per MW day and
17 cost Pennsylvania customers an estimated additional \$595
18 million; and

19 WHEREAS, The cumulative estimated increase in capacity costs
20 across the past two auctions is approximately \$4.9 billion; and

21 WHEREAS, In December 2025, PJM is scheduled to conduct the
22 next capacity auction for the June 2027 through May 2028 period,
23 which will be subject to the floor and ceiling prices estimated
24 to cost Pennsylvania customers between \$1.2 billion at the floor
25 and \$2.8 billion at the ceiling; and

26 WHEREAS, Compared to capacity prices in May 2025, by May
27 2028, Pennsylvania electric customers will have paid an
28 estimated additional \$6.1 billion to \$7.7 billion under the PJM
29 capacity market; therefore be it

30 RESOLVED, That the House of Representatives direct the Joint

1 State Government Commission to undertake a comprehensive study
2 to evaluate the costs and benefits of this Commonwealth's future
3 membership in PJM; and be it further

4 RESOLVED, That the study objectives include the following:

5 (1) Assess the potential financial costs and reliability
6 risks associated with membership in PJM, including, but not
7 limited to:

8 (i) membership fees, administrative costs and other
9 costs paid to PJM;

10 (ii) costs and fees to exit PJM;

11 (iii) any potential increase in electricity rates;

12 (iv) impact of price volatility created by PJM
13 markets;

14 (v) potential costs and risks for Pennsylvania to
15 join a new RTO; and

16 (vi) increasing risk of blackouts for consumers and
17 businesses in the future.

18 (2) Analyze potential financial and reliability benefits
19 associated with membership in PJM, including, but not limited
20 to:

21 (i) adequate electric generation and transmission
22 infrastructure in the future and necessary reliability
23 improvements;

24 (ii) access to competitive electricity markets;

25 (iii) long-term cost savings for consumers;

26 (iv) economic development for this Commonwealth;

27 (v) reducing the risk of blackouts for consumers and
28 businesses in the future;

29 (vi) environmental benefits from renewable energy
30 integration;

1 (vii) maintaining Pennsylvania's position as a net
2 electricity exporter to other states; and
3 (viii) potential benefits for Pennsylvania to join a
4 new RTO.
5 (3) Evaluate the impact of PJM membership on various
6 stakeholders, including residential, commercial and
7 industrial customers;
8 and be it further
9 RESOLVED, That the study be initiated within 30 days of the
10 adoption of this resolution, with a progress report submitted to
11 the General Assembly and made public within 90 days; and be it
12 further
13 RESOLVED, That the final report be completed and published
14 within ~~180~~ 270 days, permitting public participation, including: <--
15 (1) public hearings and forums;
16 (2) solicitation of written comments from stakeholders;
17 and
18 (3) availability of the study's findings on the
19 Pennsylvania Public Utility Commission's website;
20 and be it further
21 RESOLVED, That the study require that all data, methodologies
22 and findings be made publicly accessible to ensure transparency
23 and foster informed public debate; and be it further
24 RESOLVED, That the final report include the following:
25 (1) detailed findings on the costs and benefits of PJM
26 membership;
27 (2) recommendations for action based on the study's
28 conclusions; and
29 (3) a summary of public input received during the study
30 process.

PJM GLOSSARY

PJM Glossary

A	
Actual Load	A load serving entity's total load per electric distribution company zone, as determined through meter readings and electric distribution company load profiling methods.
Adjacent System or Adjacent Control Area	Any control area directly interconnected with another control area.
Agent	An entity appointed by a PJM member to do business in PJM on behalf of the member.
Aggregate	A group of more than one individual bus into a pricing node (pnode) that is considered as a whole in the Energy Market and other various systems and Markets within PJM.
Alternating Current	The movement of an electric charge that periodically reverses direction. This is compared to the flow of electric charge in direct current, which moves in only one direction. Electric power is delivered to homes and businesses through alternating current.
Analog Control	A signal which, with respect to time, varies continuously in proportion to the measured quantity.
Ancillary Services	Ancillary services help balance the transmission system as it moves electricity from generating sources to ultimate consumers. PJM operates several markets for ancillary services: the Synchronized Reserve Market, the Non-Synchronized Reserve Market, the Day-ahead Scheduling Reserve Market and the Regulation Market. There are also several other nonmarkets for ancillary services such as black start service and reactive service.
Annual Demand Resources	Can be called on an unlimited number of times any day of the delivery year, unless on an approved maintenance outage.
Area Control Error (ACE)	A measure of the imbalance between sources of power and uses of power within the PJM RTO. The ACE calculation uses the difference between scheduled and actual net interchange plus the PJM RTO frequency bias contribution.
Area Regulation Signal	A signal generated by the PJM Control Center and sent to the plants, stations and/or PJM members scheduled to provide regulation to change generation quickly to keep PJM's area control error within allowable limits. It is used to control for small fluctuations in load.

PJM Glossary

Auction Revenue Rights (ARR)	Entitlements allocated annually to Firm Transmission Service Customers that entitle the holder to receive an allocation of the revenues from the Annual FTR Auction.
Automatic Generation Control (AGC)	Equipment that automatically adjusts a control area's generation to maintain its interchange schedule plus its share of frequency regulation.
Available Flowgate Capability	A measure of the flow capability remaining on a flowgate for further commercial activity over and above already committed uses. It is defined as total flowgate capability less existing transmission commitments, less a capacity benefit margin, less a transmission reliability margin, plus postbacks, and plus counterflows.
Available Transfer Capability (ATC)	The amount of energy above “base case” conditions that can be transferred reliably from one area to another over all transmission facilities without violating any pre- or post-contingency criteria for the facilities in the PJM control area under specified system conditions.
B	
Balancing Authority	The responsible entity that integrates resource plans ahead of time, maintains demand and resource balance within a balancing authority area, and supports interconnection frequency in real time.
Balancing Authority Area	A balancing authority area is the collection of generation, transmission and loads within the metered boundaries of the balancing authority. The balancing authority maintains load-resource balance within this area.
Balancing Energy Market	Matches the power output of the generators within the electric power system(s) and energy purchased from entities outside the electric power system(s) with the load within the electric power system(s).
Balancing Operating Reserves	Generation and demand response resources that operate as requested by PJM are guaranteed to recover the costs of their offer amounts through balancing operating reserve credits that are charged to market participants. Accounting for these "make-whole" costs is performed on a daily basis, for both the Day-Ahead Energy Market and the Real-Time Energy Market. Balancing operating reserve costs are out of market and as such are not included in the pricing signals that are visible and transparent to the entire market. When these "uplift" payments are charged to the market, they are not predictable and cannot be hedged on a forward basis.
Base Offer Segment	The buy or sell offer segment of a resource or virtual transaction that can consist of up to 10 MW/price pairs that are monotonically increasing.
Base Residual Auction (BRA)	The capacity auction conducted by PJM three years in advance of the delivery year to procure unforced capacity to satisfy reliability requirements on behalf of load-serving entities.

PJM Glossary

Basepoint	The desired megawatt output sent to a resource.
Behind-the-Meter Generation	Generation that is physically located behind the retail meter and does not participate in the wholesale market as a generation resource.
Bilateral Transaction	An agreement between two entities (one or both being PJM Members) for the sale and delivery of a service.
Black Start Service	Black Start Service enables Transmission Providers and Transmission Owners to designate specific generators called Black Start Units whose location and capabilities are required to re-energize the transmission system following a system-wide blackout.
Black Start Unit	A generating unit that has equipment enabling it to start without an outside electrical supply when disconnected from the grid.
Blackout (System Shutdown)	(Also called a power cut, power outage or power failure) is a short- or long-term loss of the electric power to an area. In other words, the lights go out at homes and businesses in the impacted area. This system shutdown can be brought on by an emergency forced outage in the generation, transmission or distribution system serving the area.
Board of Managers	The 10 members of the PJM Board of Managers are responsible for maintaining PJM's independence and, by exercising their prudent business judgment, ensuring that PJM fulfills its business obligations and legal and regulatory requirements. The Board also is responsible for ensuring that PJM maintains the reliability of the power grid and operates a robust, competitive and non-discriminatory electric power market, preventing any market participants from having undue influence over the operation of PJM.
Board of Managers	The PJM Board is the Board of Managers of PJM Interconnection.
Bulk Electric System	Composed of: All transmission elements operated at 100 kV or higher; transformers with primary and secondary windings connected to 100 kV or higher facilities; generating resources with a high-side step-up transformer of 100 kV or higher and nameplate rating of greater than 20 MVA (or greater than 75 MVA for total gross aggregate nameplate rating for an entire plant or facility); any black start resource identified in a restoration plan.
Bus	A point of interconnection to the system where power produced becomes available for transmission. It can also be an electrical conductor that serves as a common connection for two or more electrical circuits.
C	
Capacitor	An electronic component that stores an electric charge and releases it when required. A capacitor is a device for storing large quantity of electric charge. When connected to the power system, capacitors will provide reactive power and thereby increase the voltage on the system.

PJM Glossary

Capacity Benefit Margin (CBM)	The portion of PJM's emergency import capability that is deducted from total transfer capability to determine available transfer capability. CBM is reserved to import capacity assistance from external areas under emergency conditions. CBM allows a system to reduce its installed generating capacity below that which may have otherwise been required if transmission interconnections did not exist.
Capacity Emergency Transfer Limit (CETL)	The capability of the transmission system to support deliveries of electric energy to a given area experiencing a localized capacity emergency as determined in accordance with the PJM manuals.
Capacity Emergency Transfer Objective (CETO)	The amount of electric energy that a given area must be able to import in order to remain within a loss of load expectation of one event in 25 years when the area is experiencing a localized capacity emergency.
Capacity Factor	The ratio of the total energy generated by a generating unit for a specified period to the maximum possible energy it could have generated if operated at the maximum capacity rating for the same specified period, expressed as a percent.
Capacity Interconnection Rights	The rights to input generation as a generation capacity resource into the transmission system at the point of interconnection.
Capacity Performance Resource	A generating unit, demand resource, energy efficiency resource or aggregate resource that has met the qualification requirements to participate in the PJM capacity market.
Capacity Resource	A capacity resource is a generating unit, demand resource or energy efficiency resource that has met the qualification requirements to participate in the PJM capacity market.
Capacity Resource	A generating unit, demand resource, energy efficiency resource or aggregate resource that has obligated itself to deliver electricity or reduce load whenever PJM determines it is needed to meet power system emergencies.
Capacity Transfer Rights (CTR)	A method of allocating the economic value of transmission import capability that exists in a constrained load serving area to load serving entities.
Carrying Charges	Typically the cost of the time value of money associated with a project (i.e., allowance of funds used during construction). It also may include other short-term costs such as costs associated with storing a physical commodity, holding a financial instrument over a defined period of time, insurance or interest charges on borrowed funds.
Charging Current	The current that flows into a capacitor when a voltage is first applied.
Circuit	A system of conductors and its component parts through which an electrical current flows or is intended to flow.
Circuit Breaker	A circuit breaker is a switching device capable of starting, carrying and stopping electrical currents under normal circuit conditions. It also can start and carry currents for a specified time and stop currents under specified abnormal conditions such as a short circuit.

PJM Glossary

Coincidental Peaks	The unrestricted load of a zone, load-serving entity or end-use customer, coincident with one of the five highest loads used in the weather normalization of the PJM seasonal peak. Five coincidental peak values are used in the allocation of the PJM and zonal normalized peaks.
Combined Cycle	An electric generating technology in which electricity and process steam are produced from otherwise lost waste heat exiting from one or more combustion turbines. The exiting heat is routed to a conventional boiler or to a heat recovery steam generator for use by a conventional steam turbine in the production of electricity. This process increases the efficiency of the electric generating facility.
Combustion Turbine	A generating unit in which a combustion turbine engine is the prime mover for an electrical generator. It is typically used for peak-shaving operation due to quick response capability.
Congestion	A condition that arises on the transmission system when one or more restrictions prevents the economic dispatch of electric energy from serving load.
Congestion Cost	The price that represents the inability to use the least expensive generation to meet the electricity demand due to transmission limitations. Congestion Cost is one of the three components of Locational Marginal Pricing.
Consensus Based Issue Resolution (CBIR) Process	A group structured problem-solving process in which stakeholders develop, and agree to support a proposal in the best interest of the whole; used at all levels of the stakeholder process, including on complex, multiparty issues. The process allows various stakeholders to work together to develop a mutually acceptable solution.
Contingency	An event, usually involving the loss of one or more elements, that affects the power system at least momentarily.
Contract Path	A predetermined transmission service electrical path between contiguous transmission providers established for scheduling and commercial settlement purposes that represents the continuous flow of electrical energy between the parties to a transaction.
Control Area (Balancing Authority)	An electric power system or combination of electric power systems bounded by interconnection metering and telemetry to which a common generation control scheme is applied. PJM operates as one control area.
Control Zone	One or more transmission zones or multiple contiguous zones as defined in PJM manuals.
Converter	Any device for changing alternating current to direct current, or direct current to alternating current.

PJM Glossary

Coordinated Transaction Scheduling (CTS)	CTS transactions are interchange transactions between neighboring RTOs/ISOs designed to increase scheduling efficiencies across the seam using forward pricing information. Transactions leverage the differences in price projections, thereby resulting in price convergence and efficiency in flow direction.
Cost of New Entry	Averaged revenue required (\$/MW-year) to build a reference combustion turbine in a specific area of PJM.
Cost-Based Offers	Offers that shall not exceed the variable cost of producing such energy or other service, as determined in accordance with the Cost Development Guidelines. Cost-based offers are used by PJM to schedule generation in cases in which structural market power is found to exist.
Critical Energy Infrastructure Information (CEII)	Specific engineering, vulnerability or detailed design information about proposed or existing critical infrastructure (physical or virtual) that relates details about the production, generation, transmission or distribution of energy; could be useful to a person planning an attack on critical infrastructure; is exempt from mandatory disclosure under the Freedom of Information Act; and gives strategic information beyond the location of the critical infrastructure.
Current	The movement of an electric charge.
Curtailement	A reduction in transmission service or generation as a result of system reliability conditions.
Customer Account	One or multiple accounts belonging to a single PJM member that allow the member to separate transactional activity and PJM business tool access. When a PJM member chooses to set up multiple accounts, these are often referred to as subaccounts. If a member creates separate accounts, PJM settlements calculations, invoicing and reporting would follow based on the activity in each account, though financial settlement is still accomplished through a single net payment to or from the member for each invoice period. Each account has a unique account name, account short name and account numerical identifier.
D	
Daily Unforced Capacity Obligation	A load-serving entity's daily assignment in megawatts of the zonal unforced capacity obligation. It is calculated as the obligation peak load in the zone/area * the final zonal RPM scaling factor * the forecast pool requirement in a zone/area.
Day-Ahead Demand	The demand bids cleared in the PJM Day-Ahead Energy Market, inclusive of fixed and price sensitive demand, virtual bids and transactions.

PJM Glossary

Day-Ahead Energy Market	A day-ahead hourly forward market in which PJM market participants may submit offers to sell and bids to buy energy. The results of the Day-Ahead Energy Market are posted daily by 1:30 p.m. and are financially binding. The Day-Ahead Energy Market is based on the concept of locational marginal pricing and is cleared using least price security-constrained unit commitment and dispatch programs.
Day-Ahead Scheduling Reserve (DASR) Market	Voluntary, offer-based market for 30-minute (supplemental) reserves that can be provided by both generation and demand resources. It clears the day-ahead 30-minute reserve requirement, and is co-optimized with the Day-Ahead Energy Market.
DCS	Disturbance Control Standard (DCS) is the NERC DCS measures the ability of a control area to return Area Control Error either to zero or to its initial value following the loss of a large generating unit.
Dead (De-energized)	Free from any electrical connection to a voltage source and from an electric charge; not having a potential different from that of ground.
Decrement Bids	An hourly bid, expressed in megawatt-hours, to purchase energy in the PJM Day-Ahead Energy Market if the day-ahead locational marginal price is less than or equal to the specified bid price. This bid must specify hourly quantity, bid price and location (nodes where generation, load or interchange transactions are settled or at trading hubs).
Delivery Year	The 12 months beginning June 1 and extending through May 31 of the following year. Delivery year may also be referred to as planning year or planning period.
Demand (Load)	Demand is the usage or consumption of electricity on a power system. Demand is generally expressed in kilowatt-hours or megawatt-hours.
Demand Bid (Fixed)	An hourly bid, expressed in megawatt-hours, that may be submitted into the Day-Ahead Energy Market to purchase a certain amount of energy at day-ahead locational marginal price. Fixed demand bids must specify hourly quantity and location (transmission zone, aggregate or single bus).
Demand Bid (Price-Sensitive)	An hourly bid, expressed in megawatt-hours, that may be submitted into the Day-Ahead Energy Market to purchase a certain amount of energy at day-ahead locational marginal price only if the day-ahead LMP value is less than or equal to the specified bid price. Price-sensitive demand bids must specify hourly quantity, bid price and location (transmission zone, aggregate or single bus).
Demand Resource	A resource with a capacity commitment to reduce load when dispatched by PJM. A demand resource may be an existing or planned resource.
Demand Resource Factor (DR Factor)	Used to determine the reliability benefit of demand resource products and to assign an appropriate value to demand resource products. The DR factor is calculated by PJM and is approved and posted by February 1 prior to its use in the capacity auction for the delivery year.

PJM Glossary

Demand Resource Modification (DR Mods)	Transaction used by PJM to track an increase or decrease of the nominated value of the demand resource in a party's resource portfolio in the Capacity Exchange tool.
Demand Response	Program that allows end use customers to reduce their electricity usage during periods of higher power prices. In exchange, end-use (retail) customers are compensated through PJM members known as Curtailment Service Provider for decreasing their electricity use when requested by PJM.
Demand Side Management	Demand Response and energy efficiency measures used by end-use (retail) customers to modify or reduce load.
Demand Side Response	A change in electricity usage by a customer in response to price or an emergency event affecting grid reliability.
Direct Current (DC)	The movement of an electric charge from negative to positive that flows in only one direction. This is compared to an alternating current, which periodically reverses direction.
Disconnect Switch	A mechanical switching device used for changing the connections in a circuit or for isolating a circuit or equipment from a voltage source.
Dispatch Rate	The control signal, expressed in dollars per megawatt hour, calculated and transmitted continuously and dynamically to direct the output level of all generation resources dispatched by PJM in accordance with the offer data.
Dispatchable Generation	Generation that can follow dispatch instructions between economic minimum and economic maximum.
Distribution	Distribution is the final stage of delivering electricity to an end user. A distribution system steps down electricity from the higher voltage levels on the transmission system to deliver it directly to homes or businesses.
Distribution Factor	The term is generally applied to the percentage of power flowing on Element A that will be picked up (or backed down) on Element B as a result of an outage on Element A or a shift on generation.
Dynamic Reserves	Used during system restoration to ensure the system will remain stable following the loss of the largest energy contingency. Dynamic reserve consists of two components: 1) Reserve on generators available via generator governor action during a frequency disturbance 2) System load with under-frequency relay protection enabled
Dynamic Schedule	A telemetered value that is updated in real time and included in the interchange schedule in the area control error equation. It is commonly used for generation or load to or from another control area.
Dynamic Transfer	The provision of the real-time monitoring, telemetering, computer software, hardware, communications, engineering, energy accounting (including inadvertent interchange) and administration required to electronically move all or a portion of the real energy services associated with a generator or load out of one balancing authority area into another.

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E	
Eastern Interconnect Data Sharing Network (EIDSN)	A network for the sharing of operating reliability data, including both Supervisory Control and Data Acquisition (SCADA) and synchrophasor data, among appropriate entities to promote the reliable and efficient operation of the Eastern and Quebec Interconnections.
Economic Demand Response	Ability for end-use customer to participate in the wholesale energy and ancillary service markets through a Curtailment Service Provider which it is economic for them to participate in the market(s).
Economic Dispatch	The short-term determination of the optimal output of generation facilities, to meet the system load, at the lowest possible cost, subject to transmission and operational constraints.
Economic Generation	Units producing energy at an offer price less than, or equal to, LMP.
Economic Maximum Generation	The highest incremental MW output level a unit can achieve while following economic dispatch.
Economic Minimum Generation	The lowest MW output level a unit can achieve while following economic dispatch.
Electric Cooperative	A business jointly owned by its customers and operated as a pooled resource; engaged in the generation, transmission, and/or distribution of electric energy.
Electric Utility	An electric utility is an entity involved in the generation, transmission or distribution of electricity for sale and for use by the general public. An electric utility can be investor owned, cooperatively owned or government owned such as a municipal system.
Electrical Energy	The generation or use of electric power by a device over a period of time, expressed in kilowatt-hours (kWh), megawatt hours (MWh) or gigawatt hours (GWh).
Emergency Demand Response	A commitment to reduce load or consume electricity only up to a certain level when PJM needs assistance under expected emergency conditions (also called Load Management).
Emergency Maximum Generation Limit	The maximum output of energy a generating unit can produce and still maintain a stable level of operation.
Emergency Minimum Generation Limit	The least amount of energy a unit can produce and still maintain a stable level of operation.
End-Use (Retail) Customer	One of PJM's defined sectors for voting purposes.
Energy	Broadly defined, energy is the ability to do work. Electrical energy is produced by a generator, which converts other forms of energy into electrical energy that is then transmitted through the electric transmission and distribution systems. It is measured in kilowatt-hours and megawatt-hours.
Energy Imbalance Service	Used to supply energy for mismatch between scheduled delivery and actual loads that have occurred over an hour.

PJM Glossary

Energy Management System	Energy Management System (EMS) provides real-time monitoring of operational information for all critical electrical equipment - information that is central to reliable operation of the bulk power system.
Energy Management System (EMS)	Energy Management System
Energy Market	An energy market is a type of spot market in which energy is sold or purchased for immediate delivery. Because electricity is a commodity that is consumed the same moment it is produced, by its nature, energy is delivered immediately upon sale or purchase. PJM's energy market functions at a wholesale level. These energy markets operate every day and participants in the market establish a price for electricity by matching supply (what generators want to sell) and demand (what utilities and customers want to buy). Utilities and competitive retailers that purchase energy from a wholesale market resell it to final consumers at retail rates or prices.
Energy Market Opportunity Cost	Energy Market Opportunity Cost is the value associated with an externally imposed environmental run-hour restriction on a generation unit. Examples would include a limit on emissions for the unit imposed by a regulatory agency or legislation, a direct run hour restriction in the operating permit, or a heat input limitation defined by a regulatory decision or operating permit.
Equivalent Demand Forced Outage Rate (EFORd)	A measure of the probability that generating unit will not be available due to a forced outages or forced deratings when there is a demand on the unit to generate.
Equivalent Demand Forced Outage Rate (EFORd-5)	An EFORd determined based on five years of outage data through Sept. 30 prior to the Delivery Year.
Equivalent Forced Outage Factor (EFOF)	The proportion of hours in a year that a unit is unavailable because of forced outages.
Equivalent Load	The sum of a market participant's net system requirements to serve its customer load in the PJM footprint, plus its net bilateral transactions.
Equivalent Planned Outage Factor (EPOF)	The proportion of hours in a year that a unit is unavailable because of planned outages.
Event Analysis	Utilization of a systematic approach to analyze an event which had negative consequences, with the goal of finding the causal factors of the event and develop recommendations to prevent a of the event.
Exempt Wholesale Generator (EWG)	Independent power facilities generating electricity for sale in wholesale power markets that do not meet the size, efficiency or ownership requirements for Qualifying Facility status. The Federal Energy Regulatory Commission determines EWG status.
Exports	External transactions where PJM is the point of receipt.

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Extended Summer Demand Resources	Demand Resources which can be called on as many times as needed from 10 a.m. to 10 p.m. any day from June through October and the following May of that delivery year.
External Resource	A generation resource located outside the metered boundaries of the PJM RTO.
External Transaction	An energy transaction between two parties in which the path of the energy crosses a PJM RTO border.
Extra High Voltage (EHV)	Refers to 345 kV transmission lines and above on the PJM system.
F	
Fault	A physical condition that results in the failure of a component or facility of the transmission system to transmit electrical power in the manner for which it was designed.
Federal Energy Regulatory Commission	FERC is an independent regulatory agency within the U.S. Department of Energy. FERC regulates the transmission and wholesale sales of electricity in interstate commerce. FERC also administers accounting and financial reporting regulations and conduct of jurisdictional companies.
Final Zonal RPM Scaling Factors	Applied to a load-serving entity's daily obligation peak load for purposes of calculating its daily unforced capacity obligation.
Financial Transmission Right (FTR)	A financial instrument awarded to bidders in the FTR auctions that entitles the holder to a stream of revenues (or charges) based on the hourly day-ahead congestion price differences across the path.
Firm Point-to-Point Transmission Service	A transmission service that is intended to be available at all times to the maximum extent practicable, subject to an emergency, an unanticipated failure of a facility, or other event beyond the control of the owner or operator of the facility or of PJM.
First Contingency Basis	The operation of the bulk power electric supply system in the PJM RTO in a manner intended to protect against the consequences of the failure or malfunction of any single bulk power facility, such that prior to a contingency occurring: - The loading on all such bulk power facilities is maintained within normal continuous ratings. - Voltages are maintained at predetermined normal schedules at all load levels and such that immediately following any single facility malfunction or failure: - The loading on all remaining facilities can be expected to be within emergency ratings. - System stability is maintained. - An acceptable voltage profile is maintained.
Fixed Resource Requirement	An alternative method for an eligible load-serving entity to meet a fixed resource requirement with its own capacity resources as opposed to having PJM procure capacity resources on the load-serving entity's behalf in RPM auctions.

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Forced Transmission Outage	An immediate removal from service of a designated transmission facility.
Forecast Pool Requirement	The FPR is the PJM installed reserve margin expressed in unforced capacity terms. The FPR is applied to a peak load forecast in order to establish the level of unforced capacity that will provide an acceptable level of reliability.
Frequency Bias	A value, usually expressed in megawatts per 0.1 Hertz (MW/0.1 Hz), associated with a balancing authority area that approximates the balancing authority area's response to interconnection frequency error.
Frequency Disturbance	A system frequency deviation from normal as a result of a generation/load imbalance.
Frequently Mitigated Unit (FMU)	A unit that was offer-capped for more than a defined proportion of its real-time run hours in the most recent 12-month period. FMU thresholds are 60 percent, 70 percent and 80 percent of run hours. Such units are permitted a defined adder to their cost-based offers in place of the usual 10 percent adder.
FRR Capacity Plan	An FRR entity's advance commitment of capacity resources to satisfy their unforced capacity obligation and any specific locational or product-type resource requirements for a delivery year.
FTR Auction	A PJM-administered market for FTRs in which PJM market participants may submit offers to sell and bids to buy on-peak, off-peak or 24-hour FTRs. FTRs awarded in these auctions can have a term of one calendar month, three calendar months, one year or three years.
Fuel Cost	The cost of the fuel used by each unit, as expressed in \$/MMBTU. When multiplied by the incremental heat rate (MMBTU/MWh), the incremental fuel cost (\$/MWh) results.
Full Requirements Service	Term used by electric distribution companies, which typically entails a commitment to supply all of a customer's wholesale load requirements.
G	
Generation	Both the process of producing electrical energy from other forms of energy (e.g., a power plant burning coal or a windmill turning moving air into energy) as well as the amount of electrical energy produced, which is usually expressed in kilowatt-hours or megawatt-hours.
Generation Dispatcher	Member personnel who participate in the real-time operations of the PJM system by dispatching generation and performing other generation-related real-time duties as found on the "PJM Generation Dispatcher Task List".
Generation Offer	Schedules of megawatts offered and the corresponding offer price.
Generation Owner	Generation Owner is one of PJM's defined sectors for voting purposes.

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Generator	A machine that converts different forms of energy into electrical energy. A generator or power plant might burn coal, capture the sun's energy through solar panels, convert moving air into electricity through windmills or transform the movement of water into energy as hydroelectric power. PJM has a diverse generation fuel mix that includes nuclear power, natural gas, coal and renewable generation such as wind and solar.
Generator Operator	The entity that operates generating facility(ies) and performs the functions of supplying energy and interconnected operating services.
Geo-Magnetic Disturbance (GMD)	Events that occur on the earth as a result of solar activity. The sun emits a stream of charged particles that flow to Earth and disturb Earth's magnetic field causing unwanted currents and possible damage in grounded electrical transmission systems.
Gigawatt (GW)	A unit of power that is equal to one billion watts or 1,000 megawatts. One gigawatt of electricity generated would power between 800,000 and one million homes.
Gigawatt-hour (GWh)	A unit of measurement used to describe the amount of electricity produced or consumed. One gigawatt-hour is equal to one billion watt-hours or 1,000 megawatt-hours.
Grid	An interconnected network of generation, transmission and distribution elements that delivers electricity from suppliers to consumers.
H	
Hertz (Hz)	Electricity system frequency is measured in hertz (Hz). Frequency measures 60 Hz in U.S. electric markets and 50 Hz in those in Europe.
Hub	A group of more than one individual bus into a regional pricing node (pnode) developed to produce a stable price signal in the Energy Market and other various systems and markets within PJM.
Human Performance	How people do what they do in order to accomplish goals and achieve results. The goal of Human Performance is to reduce the frequency of human error and prevent human error from becoming negative events.
I	
Immature Unit	A unit having between zero and five full calendar years of operating experience for reliability calculations.
Imports	Imports are external transactions where PJM is the point of delivery. Capacity imports from external units must be certified as deliverable using firm transmission and nonrecallable by any external party.
Inadvertent Interchange	The difference between net actual energy flow and net scheduled energy flow into or out of a control area.
Increment Bids (Increment Offers)	An hourly bid, expressed in megawatt-hours, to sell energy in the PJM Day-Ahead Energy Market if the Day-Ahead locational marginal price is less than or equal to the specified bid price. This bid must specify hourly quantity, bid price and location (nodes where generation, load or interchange transactions are settled or at trading hubs).

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Incremental Auctions	First, second and third incremental auctions allow for capacity suppliers to purchase replacement capacity and for PJM to adjust previously committed capacity levels due to reliability requirement increases or decreases.
Incremental Capacity Transfer Rights	A method of allocating the economic value of transmission import capability that exists into a constrained locational deliverability area to eligible transmission facility upgrades.
Incremental Cost	The incremental energy cost is the cost per megawatt-hour to produce all of the energy segments above the economic minimum level. It is calculated by summing the cost of each segment of energy in the unit's incremental cost curve up to the generation level. This cost is a dollar per megawatt-hour rate.
Inframarginal Unit	A unit that is operating, with an accepted offer that is less than the clearing price.
Installed Capacity (ICAP)	A megawatt value based on the summer net dependable capability of a unit and within the capacity interconnection right limits of the bus to which it is connected.
Installed Reserve Margin (IRM)	A percentage value used to establish the level of installed capacity resources required to satisfy reliability criteria. The IRM is expressed as a percent of the forecasted 50/50 peak load.
Instantaneous Reserve Check	A PJM survey to obtain the current actual available megawatt reserves on the system. It is an activity performed and recorded daily, typically just prior to the morning and evening peaks, by dispatch in conjunction with generator owners.
Interconnection Reliability Operating Limit (IROL)	A system operating limit that, if violated, could lead to instability, uncontrolled separation or cascading outages that adversely impact the reliability of the bulk electric system.
Inter-Control Center Protocol (ICCP)	An industry standard protocol used to communicate real-time data between control centers. PJM uses this to send and receive operations analog data measurements and digital measurements.
Interface	The specific set of transmission elements between two areas or between two areas constituting one or more electrical systems.
Internal Bilateral Transaction (IBT)	A transaction for the physical transfer of energy between two parties in which the path of the energy remains inside the PJM RTO borders. IBTs for energy are reported to PJM by participants using the PJM InSchedule tool.
J	
Joint and Common	MISO and PJM Interconnection have developed complementing system operations and a robust, non-discriminatory wholesale electricity market to meet the needs of all customers and stakeholders within both regions. The market was developed through an open stakeholder process, designed to serve residents regardless of whether they reside in states with bundled or unbundled retail rates.

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Joint-Owned Unit	A generating unit owned by two or more member systems whose output is dispatched as a pool resource, with each owner receiving a share of output for billing purposes on the percentage of ownership.
K	
Kilowatt	A unit of power that is equal to 1,000 watts. The power output of many electric motors or heaters is typically expressed in kilowatts.
Kilowatt-hour	Monthly electricity bills for residential consumers show the kilowatt-hours that were used. One thousand kilowatt-hours equals one megawatt-hour.
L	
Limited Demand Resources	Demand Resources which can be called on during weekdays (other than NERC holidays) from noon to 8 p.m. for at least 10 times from June through September.
Load (Demand)	The overall consumption of electricity. Load is generally expressed in kilowatt-hours or megawatt-hours.
Load Curtailment	Completely or partially reducing consumer electricity consumption.
Load Management	A resource with a capacity commitment to reduce load when dispatched by PJM. A demand response resource may be an existing or planned resource.
Load Management Subzone	A collection of zip codes within a transmission zone where any one location on the demand response registration is located within a zip code. Those within these locations should respond to the PJM dispatch signal, unless otherwise notified by PJM. Registrations based on residential and small commercial direct load control programs not having operational capability to respond to a transmission subzone dispatch signal. These do not need to respond to a transmission subzone dispatch signal, unless instructed by PJM requesting all direct load control related registrations.
Load Pick-up Factor	The amount of load (expressed in terms of percentage of generator rating) that a generator can pick up without incurring dynamic frequency decay below a level that will cause under-frequency load shed relays to operate or trip online generation. It is used during the system restoration process.
Load Serving Entity	Any entity (or the duly designated agent of such an entity), including a load aggregator or power marketer that: (a) serves end users within the PJM control area and (b) is 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 PJM control area.
Locational Constraints	Localized capacity import capability limitations within the PJM footprint that are caused by transmission facility limitations or voltage limitations that are identified for a delivery year in the PJM Regional Transmission Expansion Planning Process prior to the delivery year's capacity auction.

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Locational Deliverability Area (LDA)	Sub-regions within PJM used in evaluating locational constraints. LDAs include transmission zones, sub-zones and combinations of zones.
Locational Marginal Price (LMP)	The marginal price for energy at the location where the energy is delivered or received. LMP is a pricing approach that addresses transmission system congestion and loss costs, as well as energy costs.
Locational Price Adder	A component of the resource clearing price that represents the additional price value of capacity resources located in a constrained locational deliverability area.
Locational Reliability Charge	Fee applied to each load-serving entity that serves load in PJM during the delivery year. It is equal to the LSE's daily unforced capacity obligation multiplied by the applicable final zonal capacity price.
Long-Term Firm Point-to-Point Transmission Service	Firm Point-to-Point Transmission Service with a term of one year or more.
Loss of Load Probability (LOLP)	The probability of system load exceeding available capacity over a defined period of time.
Losses	The power that is lost as dissipated heat when power flows in transmission lines and transformers.
Loss-of-Load expectation (LOLE)	Defines the adequacy of capacity for the entire PJM footprint based on load exceeding available capacity, on average, only once in 10 years.
Lost Opportunity Cost (LOC)	In general, the foregone revenues resulting from: 1) following PJM's dispatch instructions to provide some type of ancillary service or 2) reliability or transmission constraints. Lost opportunity costs are calculated for generating units participating in many PJM markets.
M	
Manual Load Dump	The removal of electric load from a system by manually opening circuit breakers. Also known as load shedding.
Marginal Losses Cost	The price that represents the power lost when power moves across the transmission system. Marginal losses cost is one of the three components of locational marginal pricing.
Market-Clearing Price (MCP)	The price that is paid by all load and paid to all suppliers for the service received or provided.
Marketer	An entity that has the authority to take title to electrical power generated by itself or another entity and re-market that power at market-based price.
Markets Operations Center (MOC)	The equipment, facilities and personnel used by or on behalf of a market participant to communicate and coordinate with PJM in connection with transactions in the PJM Energy Market or the operation of the PJM RTO.
Mature Unit	A unit that has at least five years of operating experience for reliability calculations.

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Megawatt (MW)	A unit of power equaling one million watts (1 MW = 1,000,000 watts) or one thousand kilowatts (1 MW = 1,000 kW). To put it in perspective, under nonsevere weather conditions, one MW could power roughly 800 to 1,000 average-sized American homes.
Megawatt-hour (MWh)	A unit of measurement used to describe the amount of electricity produced or consumed. It is equal to 1 million watt-hours or 1,000 kilowatt-hours.
Member	Any entity that has completed an application and satisfies the requirements of the PJM Operating Agreement to conduct business with PJM, including transmission owners, generating entities, load serving entities and marketers.
Metered	Refers to facilities or market entities that are within the PJM RTO.
Metered Value	A measured electrical quantity that may be observed through telemetering, supervisory control and data acquisition (SCADA) or other means.
Mileage	Mileage is the absolute summation of movement requested by the Regulation control signal a resource is following in a given time period. It is calculated for the duration of the market interval for the Regulation control signal. Dimensions are in Δ MW/MW.
Minimum Offer Price Rule (MOPR)	A provision that imposes a minimum offer screening process to determine whether an offer from a new resource is competitive and prevents market participants from submitting uncompetitive, low new entry offers in capacity auctions to artificially depress auction clearing prices.
Monitoring Analytics	Established in 2008, created by spinning off the Market Monitoring Unit of PJM Interconnection. Monitoring Analytics continues to serve as the independent market monitor for PJM under a long-term contract. Monitoring Analytics also has extensive experience producing reports on a variety of market topics.
Monthly Energy Reconciliation	Billing for the difference between the hourly load responsibility initially reported to PJM and the actual hourly load. Hourly load responsibilities including load reconciliation quantities are reported by electric distribution companies using the PJM InSchedule tool.
Mothballed Unit	A mothballed unit is a generating unit placed on inactive status for a defined amount of time (e.g., one to two years). This unit would be deactivated but not retired.
Must-Run Generation	Self-scheduled to run by the member company. The unit can elect to follow or not follow PJM's economic signal.
N	
Net Capability	The number of megawatts of electric power that can be delivered by an electric generating unit of a system under conditions and criteria specified by Manual 21. Net capabilities for all units are determined for both summer and winter operating conditions.

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Net Energy & Ancillary Services (E&AS) Offset	A value representing historical energy revenue and Tariff-defined ancillary services revenue (\$/MW-year) for a reference combustion turbine, which is used to offset the value of cost of new entry in order to determine the net value of the cost of new entry.
Net Interchange (energy)	Net interchange is gross import volume less gross export volume in MWh.
Net Tie Flow (Telemetered)	Summation of the flows on all ties between PJM and neighbors. Flows into PJM RTO are positive (+); out of PJM are negative (-).
Network Integration Transmission Service	Allows a transmission customer to integrate, plan, economically dispatch and regulate its network resources to serve its network load in a manner comparable to that in which the transmission provider utilizes its transmission system to serve its native load customers. Network integration transmission service also may be used by the transmission customer to deliver nonfirm energy purchases to its network load without additional charge.
Network Service Peak Load (NSPL)	A load's contribution to the zone's metered annual peak load.
New Entry Pricing	Allows planned generation resources that satisfy the requirement criteria to recover the amount of their initial base residual auction cost of entry-based offer for up to two additional consecutive delivery years.
Nominated DR Value	The installed capacity value of committed load reduction. The value cannot exceed the customer's peak load contribution in the summer or winter peak load during the winter.
Non-Coincident Peak	Non-coincident Peak is a transmission zone's, load-serving entity's or end-use customer's peak load during a stated period of time, whether or not it occurs at the same time as the overall system peak.
Non-economic Generation	Non-economic generation describes units producing energy at an offer price greater than the locational marginal price.
Non-Firm Point-to-Point Transmission Service	Point-to-point transmission service under the Tariff is reserved and scheduled on an as-available basis and is subject to curtailment or interruption. Non-firm point-to-point transmission service is available on a stand-alone basis for periods ranging from one hour to one month.
Non-PJM-Designated Transmission Facilities	Non-PJM-designated transmission facilities within the PJM RTO that are not designated for PJM operation. These are also referred to as local non-designated transmission facilities.
Non-retail Behind the Meter Generation	Behind the Meter Generation that is used by municipal electric systems, electric cooperatives, and electric distribution companies to serve load.
North American Electric Reliability Corporation	NERC operates as an electric reliability organization to improve the reliability and security of the bulk power system in North America. To achieve that, NERC develops and enforces reliability standards; monitors the bulk power system; assesses future adequacy; audits owners, operators and users for preparedness; and educates and trains

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	industry personnel. As an Electric Reliability Organization, NERC is subject to audit by the U.S. Federal Energy Regulatory Commission and governmental authorities in Canada.
O	
Obligation Peak Load	The obligation peak load is the summation of the peak load contributions (PLCs) of end-use customers that a load-serving entity is responsible to serve in a zone on an operating day.
Off Peak	Off-peak is a period of time when consumers typically use less electricity - normally on weekends, holidays or times of the day when many businesses are not operating (typically from 11 p.m. to 7 a.m.).
Off-Cost	Out-of-merit dispatch operation that may necessitate expensive resources coming online or economic resources decreasing their output to relieve a transmission constraint.
Offer Data	Generator data including availability, operational limits, cost data, etc. specified for submission to the PJM Interchange Energy Market that is necessary to schedule and dispatch generation resources to meet the reliability and security of the Transmission System in the PJM RTO.
On-Peak	A period of time when consumers typically use more electricity - normally on weekdays, when many businesses are operating. PJM typically considers weekdays from 7 a.m. to 11 p.m. on-peak, except for holidays.
Operating Day	The daily 24-hour period beginning at midnight EPT for which transactions on the PJM Interchange Energy Market are scheduled.
Operational Flow Order (OFO)	A mechanism to inform the public of potential constraints of a natural gas pipeline.
Outage	"Outage" has multiple meanings in PJM. First, an outage is a short- or long-term loss of electric power to an area. It can also refer to planned or unplanned intervals of time when either transmission lines or power plants are temporarily brought out of service.
Outage Transfer Distribution Factor (OTDF)	The OTDF is the electric power transfer distribution factor with a specific system facility removed from service (outage). The OTDF applies only for the post-contingency configuration of the systems under study.
P	
Parameter Limited Schedules (PLS)	Schedules containing pre-determined limits that could be imposed on the parameters in generation offers when certain operational circumstances exist. Cost-based offers are parameter limited. Price-based offers can be parameter limited or not.
Peak Demand	The highest electric requirement occurring in a given period of time. In PJM there are hourly, daily, monthly, seasonal and yearly peaks.
Peak Load Contributions (PLCs)	An end-use customer's contribution to the zone's weather-normalized summer peak load, as determined by the zone's electric distribution company.

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Peak Season	Those weeks containing the 24th through 36th Wednesdays of the calendar year. Each such week begins on a Monday and ends on the following Sunday, except for the week containing the 36th Wednesday, which ends on the following Friday.
Peak Season Maintenance	Planned outages and maintenance outages during the peak season.
Peak-Period Equivalent Forced Outage Rate Peak (EFORp)	A measure of the probability that a generating unit will not be available due to forced outages or forced deratings when there is a demand on the unit to generate during the defined critical peak hour periods.
Percentage Internal Resources Required	Determines the amount of resources located in an locational deliverability area that must be committed to a fixed resource retirement capacity plan.
Performance Assessment Interval	PJM assesses resources' performance during defined emergency periods. These are called Performance Assessment Intervals, or PAIs. There are two sets of conditions that trigger a PAI. Condition 1 includes procedures implemented to avoid elevated emergency levels and must be accompanied by a Primary Reserve Shortage. Condition 2 applies to four elevated levels of emergency, each of which triggers a PAI. These conditions only trigger a PAI if they apply to an entire zone or sub-zone. Smaller areas may be affected by one or more of these conditions without triggering a PAI.
Performance-Based Regulation (PBR)	The PJM Regulation market structure that aligns compensation with the actual performance each resource provides to the power system to control ACE. Resources are provided compensation for their precision of response in providing regulation service to the system.
Phase Angle Regulator (PAR)	A power system transformer that has tap changing capability and can change the phase angle across the transformer and thereby increase or decrease power flow.
Phasor Measurement Unit	Measures the electrical waves on an electricity grid to determine the health of the system. In power engineering, these are also commonly referred to as synchrophasors and are considered one of the most important measuring devices in the future of power systems.
PJM Control Center	The equipment, facilities and personnel used by PJM to coordinate and direct the operation of the PJM RTO and to administer the PJM Interchange Energy Market, including facilities and equipment used to communicate and coordinate with the market participants in connection with transactions in the PJM Interchange Energy Market or the operation of the PJM RTO.
PJM Electronic Reporting Compliance System (PERCS)	A PJM Tool used by Member TO for data and evidence submittals.

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PJM Environmental Information Services, Inc. (PJM-EIS)	A wholly-owned subsidiary of PJM Connexx that was formed to provide environmental and emissions attributes reporting and tracking services to its subscribers in support of renewable portfolio standards and other information disclosure requirements that may be implemented by government agencies. PJM-EIS owns and administers the Generation Attribute Tracking System.
PJM Interchange Energy Market	The regional competitive market administered by PJM for the purchase and sale of spot electric energy at wholesale in interstate commerce and related services established in the PJM Operating Agreement.
PJM Interchange Net Interchange (Spot Market Energy Settlements)	The difference between a participant's total energy resources (including both generation and purchased energy) and its total energy demand (including both load and energy sale obligations). Net interchange for this purpose is calculated separately for the Day-ahead Energy Market and the Real-Time Energy Market.
PJM Manuals	The instructions, rules, procedures and guidelines established by PJM for the operation, planning, and accounting requirements of the PJM RTO and PJM Interchange Energy Market.
PJM Region	The PJM Region represents the aggregate of all the PJM transmission zones.
PJM Reliability Facilities	Those facilities above 100kV which are monitored as part of the NERC BES set of facilities but are not included in the LMP calculations for congestion management.
PJM Reliability Only Facilities	Those facilities above 100 kV that are monitored as part of the NERC bulk electric system set of facilities but are not included in the locational marginal price calculations for congestion management.
PJM RTO	The control area recognized by NERC that coordinates the movement of wholesale electricity in all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia.
PJM Settlement, Inc.	A subsidiary of PJM Interconnection, LLC, that provides member settlement transaction activities for those participating in PJM's markets. The subsidiary acts as a counterparty to members' pool transactions and provides a clearly defined legal standing to collect unpaid balances of a member if the member should declare bankruptcy. All current PJM members are also members of PJM Settlement, Inc. PJM Settlement, Inc. is a Pennsylvania nonprofit corporation that has a service agreement with PJM to provide and retain services, including PJM staff support.
Planned Demand Resource	A demand resource that does not currently have the capability to provide a reduction in demand or to otherwise control load, but that is scheduled to be capable of providing a reduction or control on or

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	before the start of the delivery year for which the resource is to be committed.
Planned Outage	The scheduled removal from service, in whole or in part, of a generating unit for inspection, maintenance or repair with approval of PJM.
Planned Transmission Outage	Any transmission outage scheduled for the performance of maintenance or repairs or the implementation of a system enhancement that is planned in advance for a pre-determined duration and that meets the notification requirements for such outages as specified by PJM.
Planning Period	The 12 months beginning June 1 and extending through May 31 of the following year. Planning period may also be referred to as planning year or delivery year.
Planning Year	The 12 months beginning June 1 and extending through May 31 of the following year. Planning year may also be referred to as planning period or delivery year.
PMAX	Maximum real power (WATTS) that can be achieved by a resource.
Point(s) of Delivery (POD)	Point(s) on the transmission provider's transmission system where capacity and energy transmitted by the transmission provider is made available to the receiving party.
Point(s) of Receipt (POR)	Point(s) of interconnection on the transmission provider's transmission system where capacity and energy are made available to the transmission provider by the delivering party.
Point-to-Point Transmission Service	Point-to-point transmission service is the reservation and transmission of capacity and energy on either a firm or non-firm basis from the point(s) or receipt to the point(s) of delivery.
Pool-Scheduled Resource	A resource that the seller has turned over to PJM for scheduling and control.
Pool-Wide Average EFORD	Average of the forced outage rates based on five years' history, weighted for unit capability and expected time in service, attributable to all units that are planned to be in service during the delivery year.
Posted Path	A posted path is any control area-to-control area interconnection; any path for which service is denied, curtailed or interrupted for more than 24 hours in the past 12 months; and any path for which a customer requests to have available transfer capability or total transfer capability posted (defined in FERC Order 889).
Power	The rate at which energy is transferred, used or transformed. It is measured in watts.
Power Transfer Distribution Factor	A measure of the responsiveness or change in electric loading on system facilities due to a change in electric power transfer from one area to another, expressed in percent (up to 100 percent) of the change in power transfer in the pre-contingency configuration of a system under study.

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Price Node (Pnodes)	A single point or subset of points where a physical injection or withdrawal of energy is modeled and for which a locational marginal price (LMP) is calculated and used for financial settlements.
Price Responsive Demand (PRD)	End-use customer commitment to only consume a certain amount of electricity when energy prices are high. PRD commitment will reduce the amount of capacity needed to ensure the reliability of the customer because their load will be lower when energy prices are high.
Primary Reserve	Reserve capability that can be converted fully into energy within 10 minutes from the request of PJM. The primary reserve requirement is met with synchronized reserves and non-synchronized reserves.
Pseudo Tie	A time-varying energy transfer that is updated in real-time and included in the actual net interchange term (NIA) in the same manner as a tie line in the affected balancing authority's reporting area control error equation (or alternate control processes).
Q	
QMAX	Maximum reactive power (VAR) that can be achieved by a resource
Qualifying Transmission Upgrade (QTU)	A proposed enhancement or addition to the transmission system that may be offered into the base residual auction if such upgrade increases the capacity emergency transfer limit into a locational deliverability area by a megawatt quantity certified by PJM.
R	
Ramp Rate	The rate, expressed in megawatts per minute, at which a generating unit can change output level.
Reactive Limits	The maximum power flow possible into or through some particular part of the system to maintain post contingency system bus voltage within operating criteria.
Reactive Power	The product of voltage and the out-of-phase component of alternating current. Reactive power, usually measured in units of volt-amperes reactive (VAR), is produced by capacitors and overexcited generators and absorbed by reactors and other inductive devices.
Reactive Service	Maintains transmission voltages within acceptable limits. Generators whose active energy output is altered at the request of PJM for the purpose of maintaining reactive reliability are credited hourly for lost opportunity costs if their output is reduced or suspended and credited in accordance with balancing operating reserve credit calculations if their output is increased. Generators operating as synchronous condensers for the purpose of maintaining reactive reliability at the request of PJM are credited for each hour (or partial hour) of condensing.
Real Power	The maximum power flow possible into or through some particular part of the system to maintain post contingency system bus voltage within operating criteria.

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Real-Time Energy Market	A balancing market in which the clearing prices are calculated every five minutes based on the actual system operations security-constrained economic dispatch. The Real-Time Energy Market is based on the concept of locational marginal pricing and is settled based on actual five-minute quantity deviations from day-ahead scheduled quantities and on real-time prices calculated every five minutes.
Recallability	The right of a transmission provider to interrupt all or part of a transmission service for any reason, including economic, that is consistent with Federal Energy Regulatory Commission policy and the transmission provider's transmission service tariffs or contract provisions.
Redispatch Cost	The cost to increase and/or decrease output from generation to manage transmission congestion.
Regional Transmission Expansion Planning (RTEP) Process	PJM's comprehensive annual process that examines the three interrelated components of electric power system reliability: load, generation and transmission. The RTEP process employs a range of planning study tools and methodologies to analyze and assess each component to ensure that reliability remains firm. The RTEP process is designed to meet established reliability criteria, keep markets robust and competitive, and ensure stable operations.
Regulation	The capability of a specific resource with appropriate telecommunications, control and response capability to increase or decrease its output in response to a regulating control signal to control for frequency deviations.
Regulation Control Point	The regulation signal point that is used for all regulating resources taking into account the RTO frequency and tie error.
Regulation Market Capability Clearing Price	The Capability Clearing Price for regulation is the 5 minute jointly co-optimized regulation price to reserve MWs. It is set by finding the difference between the RMCP and the RMMCP.
Regulation Market Capability Clearing Price (RMCCP)	The five-minute jointly co-optimized regulation price to reserve MWs. It is set by finding the difference between the regulation market clearing price and the regulation market performance clearing price.
Regulation Market Clearing Price (RMCP)	The price of supplying the last megawatt of Regulation needed to satisfy the Regulation Requirement. The RMCP is calculated every five minutes through joint co-optimization of Regulation, Synchronized Reserve, Non-Synchronized Reserve and energy to achieve the lowest cost alternative. The RMCP is used with the Regulation Market Mileage Clearing Price to calculate the Regulation Market Capability Clearing Price.
Regulation Market Mileage Clearing Price	The Regulation Market Mileage Clearing Price (RMMCP) for regulation is the 5 minute jointly co-optimized regulation price to move megawatts. It is calculated as the highest adjusted mileage offer from the set of cleared resources. In settlements, five-minute RMMCPs are used in the calculation of Regulation Mileage Credits.

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Regulation Market Performance Clearing Price (RMPCP)	The five-minute jointly co-optimized regulation price to move megawatts. It is calculated as the highest adjusted performance offer from the set of cleared resources. In settlements, five-minute regulation market performance clearing prices are used in the calculation of regulation performance credits.
Regulation Signal	Signal generated by PJM control center and sent to controllable entities to automatically adjust generation or consumption quickly to keep PJMs Area Control Error (ACE) within allowable limits. PJM employs one regulation signal for all Regulation resources to follow.
Reliability Must Run (RMR)	Refers to a generating unit that is slated to be retired by its owners but is needed to be available for reasons of reliability. Typically, it is requested to remain operational beyond its proposed retirement date until transmission upgrades are completed.
Reliability Pricing Model (RPM)	PJM's capacity market design that includes a series of auctions to satisfy the reliability requirements of the region PJM serves for a delivery year.
Reliability Principles and Standards	The principles and standards established by NERC or ReliabilityFirst ensure the reliability of the bulk power system.
Reliability Requirement	The reliability requirement is a target level of capacity resources (in MWs) required to meet reliability principles and standards.
Renewable Portfolio Standard	A regulation or law that requires a defined amount of energy to be delivered from renewable resources. Many states within the PJM service area have renewable portfolio standards.
Reserved Transmission Capability	The maximum amount of capacity and energy reserved or agreed to be transmitted for the transmission customer over the PJM RTO transmission service facilities between the point(s) of receipt and the point(s) of delivery. Reserved transmission capability shall be expressed in terms of whole megawatts on a 60-minute interval (commencing on the clock hour) basis.
Reserves	The megawatts (MW) or megavolt-amperes reactive (MVAR) available to quickly replenish the loss of real or reactive power due to the loss of an energy source or transmission facility.
Resource Clearing Price	A locational and product-specific clearing price paid to a resource that clears in an RPM auction.
Retail Customer	The end use customer that purchases electricity from a state licensed distribution company or a state licensed alternate supplier at a retail rate.
Retail Load Responsibility	A type of energy transaction in the PJM InSchedule tool between a load serving entity serving retail load and the electric distribution company for the applicable service territory. The RLR transaction is used to report the hourly real-time megawatt-hours of load responsibility for the load-serving entities and includes losses.
Retail Market	End-use customers purchase electricity through a retail market. In some retail markets, there may be only one choice of an electric

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	distribution company in an area through which customers can purchase electricity, while other markets may have multiple choices.
Retail System User	An end-user of electric energy within the PJM RTO.
Right of First Refusal (ROFR)	Incumbent transmission owners have the right to construct, own and propose cost recovery for any new transmission project that is located within their service territory and approved for inclusion in a transmission plan developed through FERC guidelines. FERC has stated in Order 1000 that it is unjust and unreasonable to grant incumbent transmission providers a federal right of first refusal with respect to certain transmission projects because doing so may result in the failure to consider more efficient or cost-effective solutions to regional needs and, in turn, result in the inclusion of higher-cost solutions in the regional plan.
RTO Unforced Capacity Obligation	Represents the net amount of unforced capacity megawatts cleared in delivery year capacity market auctions on behalf of load-serving entities.
RTO Weather Normalized Summer Peak	The sum of the Zonal Weather Normalized Summer Coincident Peaks.
S	
Secondary Reserve	Reserve capability that can be converted fully into energy within a 10- to 30-minute interval following the request of PJM. Equipment providing secondary reserve need not be electrically synchronized to the power system.
Secondary Transmission Provider (Reseller, or Secondary Provider)	Any customer who offers to sell transmission capacity it has purchased.
Sector	One of five divisions of the PJM Members Committee, which are: the Generation Owners Sector, Other Suppliers Sector, Transmission Owners Sector, Electric Distributors Sector and End-Use Customers Sector.
Self-Scheduled Resource	A generating resource that is turned on by the operating company and committed into the energy market by the operating company. Self-scheduled resources are also known as "running for company."
Shadow Price	The incremental reduction in congestion cost achieved by relieving a constraint by 1 MW. The shadow price multiplied by the flow (in megawatts) on the constrained facility during each hour equals the hourly gross congestion cost for the constraint.
Shared Reserves	An agreement between PJM and another balancing authority to assist the opposite pool in faster recovery from a sudden loss of generation or energy purchase than it would otherwise have achieved without outside assistance.

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Short-Term Firm Point-to-Point Transmission Service	Firm Point-To-Point Transmission Service under Part II of the PJM RTO Open Access Tariff with a term of less than one year.
Sink	The balancing authority in which the load is located for an interchange transaction. (This will also be a receiving balancing authority for the resulting interchange schedule.)
Source	The balancing authority in which the generation is located for an interchange transaction. (This will also be a sending balancing authority for the resulting interchange schedule.)
Spot Market Energy	Energy bought or sold by market participants through the PJM Interchange Energy Market at locational marginal prices.
Static Var Compensator (SVC)	A static Var compensator is an electrical device for providing fast-acting, reactive power compensation on high voltage electricity transmission networks.
Substation	Changes energy from one amount of voltage to another, often in the direction of a higher voltage to a lower voltage. A high-voltage transmission line will connect to a substation to move electricity into a low-voltage distribution system on its way to consumers.
Summer Peaking Zone	A system whose maximum one-hour load during the period of June through September exceeds its winter peak.
Surge	A transient variation of current, voltage or power flow in an electric current.
Synchronized Reserve Market	Provides PJM participants with a market-based system for the purchase and sale of the Synchronized Reserve ancillary service. Resources must have capability that can be converted fully into energy within 10 minutes or customer load that can be removed from the system within 10 minutes of the request from the PJM dispatcher, and must be provided by equipment electrically synchronized to the system. Resource-specific offers are optimized in Ancillary Service Optimizer to determine hourly commitments of inflexible Synchronized Reserves. In real time, the remaining RTO reserve needs are optimized simultaneously with energy and regulation to calculate a clearing price for Synchronized Reserve every five minutes based on current system conditions.
Synchronous Condenser	A synchronous machine that operates without mechanical load to supply or absorb reactive power for voltage control purposes.
System Operating Limit (SOL)	The value (such as MW, MVAR, amperes, frequency or volts) that satisfies the most limiting of the prescribed operating criteria for a specified system configuration to ensure operation within acceptable reliability criteria. System Operating Limits are based upon certain operating criteria.

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T	
Telemetry	The process by which measurable electrical quantities from substations and generating stations are instantaneously transmitted using telecommunication techniques.
Tie Line	A circuit connecting two or more control areas or systems of an electric system.
Transformer	An electromagnetic device for transforming energy from one circuit to another of different voltage levels as in an alternating current system.
Transmission Constraints	Limitations on a transmission line or element that may be reached during normal or contingency system operations.
Transmission Facilities	Facilities within the PJM Region that have been approved by, or meet the definition of transmission facilities established by, FERC; or have been demonstrated to the satisfaction of the Office of Interconnection to be integrated with the PJM Region transmission system and integrated into the planning and operation of the PJM Region to serve all of the power and transmission customers within the PJM Region.
Transmission Loading Relief	A NERC procedure developed for the Eastern Interconnection to mitigate overloads on the transmission system by allowing reliability coordinators to request the curtailment of transactions that are causing parallel flows through their system.
Transmission Owner	A member that owns or leases, with rights equivalent to ownership, transmission facilities. Taking transmission service is not sufficient to qualify a member as a transmission owner.
Transmission Reliability Margin	A reliability margin is applied to a flowgate in the available flowgate capability calculation to account for the inherent uncertainty of system conditions, including the uncertainty of load forecasts, sources of loop flow and variations in generation dispatch.
Transmission Service Request	A request made by a participant for transmission service over PJM designated facilities. Typically the request is for either short-term or long-term service, over a specific path for a specific megawatt amount. PJM evaluates each request and determines if it can be accommodated, responding back to the requesting party in a time frame outlined in the PJM transmission tariff.
Transmission System	The facilities owned, controlled or operated by the transmission provider within the PJM RTO that are used to provide transmission service.
U	
Unaccounted for Capacity	The capacity reported on the load and capacity printout, minus the calculated operating capacity, minus scheduled capacity not available in 30 minutes. This is the amount of capacity that is reported available at the time of the instantaneous reserve check (IRC), but cannot be accounted for based on system conditions at the time of the IRC.

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Unavailable Capability	Generation that is out of service due to forced, maintenance or planned outages.
Unconstrained Posted Path	Any posted path not determined to be a constrained posted path (defined in FERC Order 889).
Unforced Capacity (UCAP)	The megawatt value of a capacity resource in the PJM capacity market. For generating unit, the unforced capacity value is equal to installed capacity of unit multiplied by (1– unit's EFORD). For demand resources and energy efficiency resources, the unforced capacity value is equal to demand reduction multiplied by the forecast pool requirement.
Up-To-Congestion (UTC) Transaction	A bid in the Day-ahead Energy Market to purchase congestion and losses between two points. The UTC bid consists of a specified source and sink location, megawatt quantity and a “bid spread” that identifies how much the market participant is willing to pay for a congestion and loss position between the source and the sink.
V	
Variable Resource Requirement Curve	An administratively determined demand curve (defining prices for various levels of resource procurement) for the PJM Region or a locational deliverability area that is used in a capacity market auction.
Voltage	If the flow of electricity through a wire were like the flow of water through a pipe, voltage would be akin to the difference in water pressure between two points in the pipeline. It is measured in volts.
Voltage Reduction	Lowering voltage on the distribution system to reduce customer demand and increase megawatt reserves.
W	
Watt	A unit of power that measures the rate at which energy is transferred or converted. A 100-watt light bulb, for example, is rated to consume 100 watts of power when turned on.
Weekday Period	The period of the week that begins at 0800 on Monday and ends at 2200 on Friday.
Weekend Period	The period of the week that begins at 2200 on Friday and ends at 0800 on Monday.
Wheeling	The contracted use of electrical facilities of one or more entities to transmit electricity for another entity.
Wheel-through	An energy transaction – flowing through a transmission grid – whose point of receipt and point of delivery are outside of that transmission grid.
Wholesale Customer	An entity that purchases electric energy for resale, or uses transmission service for such transactions, within the PJM RTO.
Wholesale Load Responsibility	A type of energy transaction in the PJM InSchedule tool between a load-serving entity serving wholesale load and the electric distribution company for the applicable service territory. The WLR transaction is used to report the hourly real-time megawatt-hours of load responsibility for the load-serving entity and includes losses.

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Wholesale Market	Like other commodities, electricity is bought and resold multiple times before being delivered to the end-use customer. These transactions form the wholesale electricity market. Suppliers that sell electricity to retail consumers or other large-scale consumers purchase energy through the wholesale market. PJM operates a competitive wholesale market for electricity in the region PJM serves.
Winter Peak Period	The period from December 1 through February 29 of the planning period.
Winter Peaking Zone	A system whose reduced winter peak is greater than its maximum one-hour load during the period of June through September.
Z	
Zonal Capacity Price	The price charged to a load-serving entity for their unforced capacity obligation in a zone based on the results of capacity market auctions for the delivery year.
Zonal CTR Credit Rate	The rate applicable to zonal CTRs allocated to load-serving entities in the zone, expressed as dollars per megawatt-hour of unforced capacity obligation.
Zonal CTR Settlement Rate	The rate applicable to zonal CTRs allocated to load-serving entities in the zone, expressed as dollars per megawatt of CTRs.
Zonal Unforced Capacity Obligation	The zonal unforced capacity obligation is a zone's assignment in megawatts of the RTO unforced capacity obligation for the delivery year.
Zone	A transmission owner's area within the PJM Region.

Source: PJM Glossary, September 2, 2026, <https://www.pjm.com/Glossary>.

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