

July 2015

United States Electricity Industry Primer



Office of Electricity Delivery and Energy Reliability
U.S. Department of Energy
DOE/OE-0017



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4 MARKETS AND OWNERSHIP STRUCTURES

4.1 OVERVIEW

Before discussing various markets within the U.S. electricity sector, it is important to define some of the major players and regions that make up the industry. The first few sections that follow will provide an overview of major regulatory bodies, regional organizations, and utilities and their ownership structures. Later in this section, the various markets within the electric industry will be described.

4.2 FERC

The Federal Energy Regulatory Commission (FERC) is an independent agency within the U.S. Department of Energy that regulates the interstate transmission of electricity (as well as natural gas and oil) within the United States. FERC also regulates natural gas and hydropower projects. Within the electricity sector, FERC:

- Regulates the transmission and wholesale sales of electricity in interstate commerce.
- Reviews certain mergers and acquisitions and corporate transactions by electricity companies.
- Reviews the siting application for electric transmission projects under limited circumstance.
- Licenses and inspects private, municipal, and State hydroelectric projects.
- Protects the reliability of the high voltage interstate transmission system through mandatory reliability standards.
- Monitors and investigates energy markets.
- Enforces FERC regulatory requirements through imposition of civil penalties and other means.
- Oversees environmental matters related to hydroelectricity projects.
- Administers accounting and financial reporting regulations and conduct of regulated companies.

The Energy Policy Act of 2005 expanded FERC's authority to enforce regulations concerning the reliable availability of energy resources. FERC is entrusted with assisting consumers in obtaining reliable, efficient, and sustainable energy services at a reasonable cost through appropriate regulatory and market means by: (1) ensuring that rates, terms and conditions are just, reasonable and not unduly discriminatory or preferential; (2) promoting the development of safe, reliable and efficient energy infrastructure that serves the public interest; and (3) achieving organizational excellence by utilizing resources effectively, adequately equipping FERC employees for success, and executing responsive and transparent processes that strengthen public trust.

To maintain FERC's independence as a regulatory agency capable of providing fair and unbiased decisions, neither the President of the United States nor Congress reviews the decisions of FERC. FERC decisions are only reviewable by the Federal courts.

It is important to note that FERC does not regulate retail electricity sales to retail customers, approve the construction of electric generation assets, regulate the activities of nuclear power plants, assess reliability problems related to distribution facilities, or monitor utility vegetation control residential areas.



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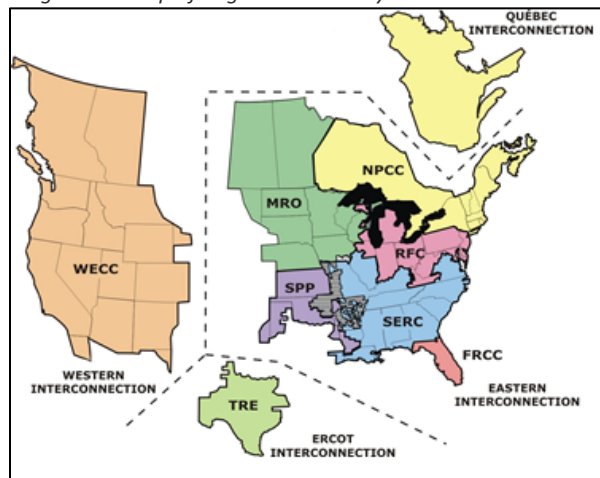
4.3 NERC

The North American Electric Reliability Corporation (NERC) is a not-for-profit international regulatory authority whose objective is to ensure the reliability of the bulk power system in North America. In 2006, FERC designated NERC as the government's electrical reliability organization (ERO), thereby granting NERC the power to oversee and regulate the electrical market according to certain reliability standards. Although NERC is the organization that audits power companies and levies fines for non-compliance, the authority behind NERC's decisions comes from FERC. Several of NERC's responsibilities include:

- Developing and enforcing reliability standards
- Annually assessing seasonal and long-term reliability
- Monitoring the bulk power system through system awareness
- Educating, training, and certifying industry personnel.

NERC's area of responsibility spans the continental United States, Canada, and the northern portion of Baja California, Mexico made up of regional reliability coordinators. NERC has jurisdiction over electric users, owners, and operators of the bulk power system. In the United States, FERC oversees the operations of NERC as an ERO.

Figure 27: Map of Regional Reliability Councils Under NERC



Source: NERC

4.4 ISOs/RTOs

Within the three main interconnections in the United States lie regional entities called regional transmission organizations (RTOs) and independent system operators (ISOs). The formation of ISOs and RTOs comes at the direction or recommendation of the Federal Energy Regulatory Commission (FERC). The role of ISOs and RTOs are similar and may be confusing. Comparable to an RTO, ISOs either do not meet the minimum requirements specified by FERC to hold the designation of RTO or have not petitioned FERC for that status. In short, an ISO operates the region's electricity grid, administers the region's wholesale electricity markets, and provides reliability planning for the region's bulk electricity system. RTO's perform the same functions as the ISOs, but have greater responsibility for the



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transmission network as established by the FERC. The RTOs coordinate, control, and monitor the operation of the electric power system within their territory. They also monitor the operation of the region's transmission network by providing fair transmission access. ISOs/RTOs engage in regional planning to make sure the needs of the system are met with the appropriate infrastructure. Before ISOs/RTOs were developed, individual utilities were responsible for coordinating and developing transmission plans. Utilities in areas where there is no RTO or ISO continue to serve this function. As can be seen from the map below, there are large sections of the United States, particularly in the Southeast and the West, where there is no ISO or RTO. Electric utilities in these areas, however, are still subject to the same rules under FERC. The Electric Reliability Council of Texas (ERCOT) does not fall under interstate FERC authorities over interstate transmission and wholesale markets, but is still subject to NERC oversight and FERC regulation for reliability.

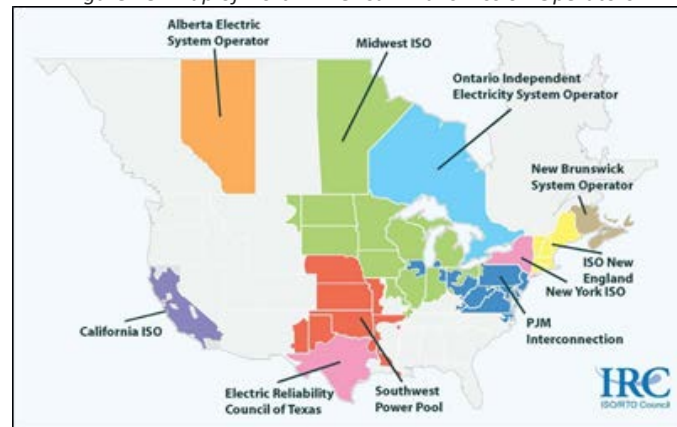
There are currently seven ISOs within North America⁴:

- CAISO—California ISO
- NYISO—New York ISO
- ERCOT—Electric Reliability Council of Texas; also a Regional Reliability Council
- MISO—Midcontinent Independent System Operator
- ISO-NE—ISO New England
- AESO—Alberta Electric System Operator
- IESO—Independent Electricity System Operator

There are currently 4 RTOs within North America⁵:

- PJM—PJM Interconnection
- MISO—Midcontinent Independent System Operator; also an RTO
- SPP—Southwest Power Pool; also a Regional Reliability Council
- ISONE—ISO New England; also an RTO

Figure 28: Map of North American Transmission Operators



Source: IRC ISO/RTO Council

⁴ <http://www.ferc.gov/industries/electric/indus-act/rto.asp>

⁵ <http://www.ferc.gov/industries/electric/indus-act/rto.asp>



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4.5 STATE REGULATORY AGENCIES

The role of State regulatory bodies in the electricity sector can vary significantly by State. There are numerous State agencies that regulate the electric industry. The list below describes the function of each as they are related to electricity.

1. **State Public Service Commission:** Names of these entities can vary by State, such as Public Utilities Commission or Corporation Commission. State commissions regulate what are fair and reasonable rates for electric service under their jurisdiction. Commissions adopt and enforce regulations that protect the public's safety and interests, study the economic and environmental impact of utility operations, ensure the safe and reliable service of electricity to customers, and in some cases, mediate disputes between the utility and its customers. Commissions are also charged with electric system reliability. They oversee utility plans for vegetation management, facility inspections, and maintenance of assets.
2. **State Department of Environmental Protection:** Names of these entities can also vary by State. Some States have a Department of Environmental Quality, which serves a similar purpose. The basic role of these organizations is to regulate the State's air, land, and water resources. These departments provide air permits for the construction of pollutant emitting assets, ensure public safety by cleaning contaminated sites, and monitor emissions by companies.

4.6 UTILITIES

A utility is a power company that generates, transmits, and distributes electricity for sale to customers. Not all utilities, however, must provide all three functions. There are more than 3,200 electric utilities in the United States, serving over 145 million customers.⁶ The following section describes the various types of electric utilities in the Nation:

- **Investor-Owned Utilities (IOUs)** are for-profit companies owned by their shareholders. These utilities may have service territories in one or more States. State commissions will grant IOUs the license to operate in specific areas of the State under certain terms and conditions. Their interstate generation, transmission, and power sales are regulated by FERC and their distribution system and retail sales are regulated by State commissions.
- **Public Power Utilities (also known as "Municipals" or "Munis")** are not-for-profit utilities owned by cities and counties. City-owned utilities are referred to as municipal utilities (munis). Universities and military bases can own and operate their own utilities. These are generally not regulated by FERC or by States, but by their own local government.
- **Cooperatives (Co-Ops)** are not-for-profit entities owned by their members. They must have democratic governance and operate at cost. Members vote for representatives to the co-op's Board of Directors who oversee operations. Any revenue in excess of costs must be returned to members. Co-ops also tend to serve in rural areas that were not historically served by other utilities.

⁶ Energy Information Administration Forms EIA-861



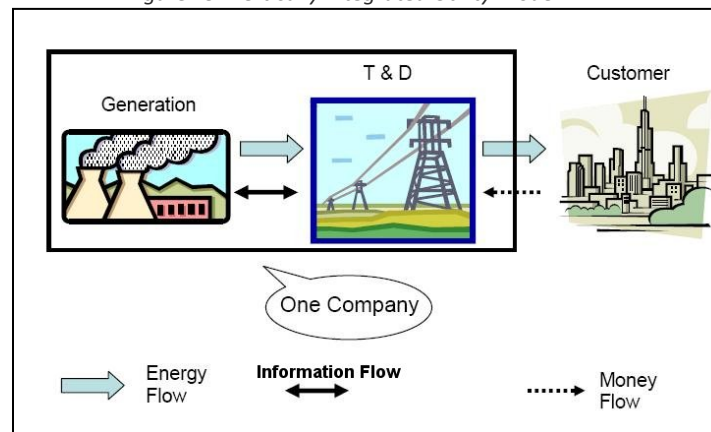
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- **Federal Power Programs** include the Bonneville Power Administration (BPA), the Tennessee Valley Authority (TVA), the Southeastern Power Administration (SWPA), the Southeastern Power Administration (SEPA), and the Western Area Power Administration (WAPA). These wholesale-only entities provide a range of electric service functions to other utilities (mostly to munis) for distribution to end users. TVA is an independent, Government-owned corporation, but should not be confused with BPA and WAPA, also known as Power Marketing Administrations (PMAs). BPA and TVA own both generation and transmission facilities. WAPA is a transmission-only utility providing power from Federal hydroelectric facilities in the West to other retail utilities. PMAs are explained in more detail in the fact box on the next page.
- **Independent Power Producers**, or sometimes called a non-utility generator, are privately-owned businesses that own and operate their own generation assets and sell power to other utilities or directly to end users.

Vertically Integrated Utility Model

The sale and delivery of electricity can occur in two ways: the traditional, regulated, vertically integrated model and a more competitive approach that uses electricity as a tradable commodity. In a vertically integrated model, utilities are responsible for generation, transmission, and distribution of electricity in a specific geographical area. They may own all or have shares in power plants and transmission lines, or purchase power through contracts with other electricity producers. The price the customer pays in a vertical model is based on costs to serve over a period of time. These costs are monitored by State regulatory commissions and are adjusted in rate cases. The following diagram provides an overview of how a vertically integrated model is structured.

Figure 29: Vertically Integrated Utility Model



Source: National Programme on Technology Enhanced Learning

4.7 WHOLESALE ELECTRICITY MARKETS

Electricity can also be bought and sold in what is known as a wholesale market. The wholesale electricity market is where producers of electricity offer their electricity output to load serving entities (LSEs) and power marketers who sell to LSEs and other marketers. With the exception of ERCOT, sales of wholesale power are regulated by FERC. ISOs and RTOs administer wholesale power markets. They dispatch the system in accordance with their respective market rules employing some form of economic dispatch algorithm, and can provide market monitoring oversight. Both ISOs and RTOs provide open access to transmission and to ancillary services such as reserves and voltage support.



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Fact Box Power Market Administrations

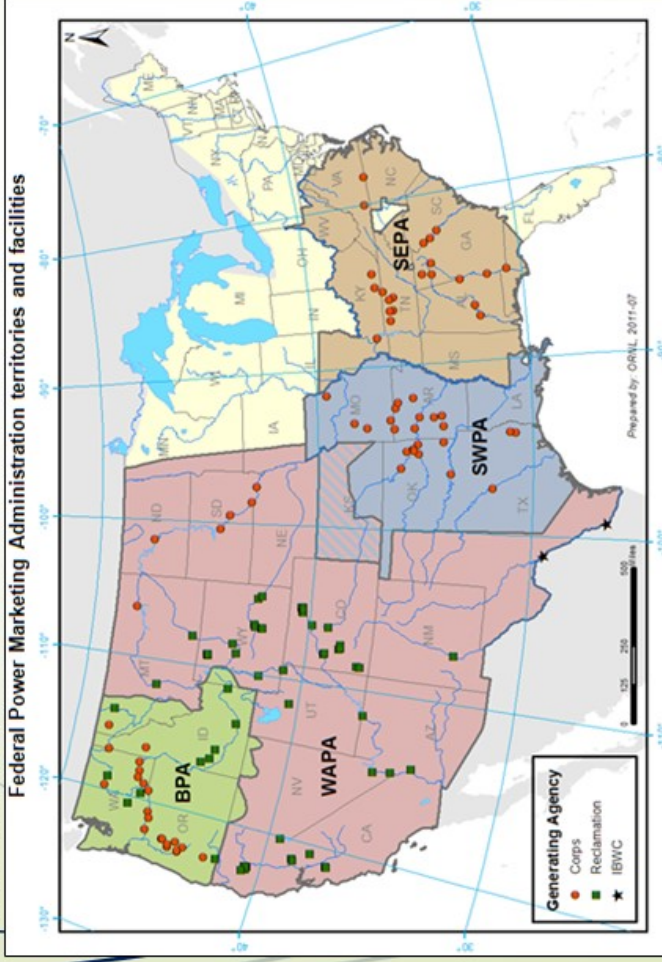
- Four federal Power Marketing Administrations (PMAs) operate electric systems and sell the electrical output of federally owned and operated hydroelectric dams in 33 states. The Bonneville Power Administration (BPA), the Western Area Power Administration (WAPA), the Southeastern Power Administration (SEPA), and the Southwestern Power Administration (SWPA) marketed 42% of the nation's hydroelectricity in 2012, representing 7% of total generation in the United States. There is minor overlap in territories, but generally, the territories are self-contained. The U.S. Army Corp of Engineers and the Department of Interior's Bureau of Reclamation also own and operate hydroelectric facilities within these regions.
- The purpose of a PMA is to market wholesale power. In most cases, PMAs do not own their own electric generation plants. They market the electricity that is generated by plants and acts as a balancing authority (ensures electricity supply matches electricity demand at all times).
- PMAs also have a role in the transmission system as both transmission owners and operators, however SEPA does not own any transmission assets.

BPA – Owns and operates three-quarters of the high voltage transmission system in its territory. BPA also owns the Columbia Nuclear Generating Station in Washington.

WAPA – Service area composed of a 15-state region with more than 17,000 circuit miles of transmission systems that carry electricity from 56 hydropower plants operated by the Bureau of Reclamation, U.S. Army Corps of Engineers and the International Boundary and Water Commission. WAPA also markets power from the Hoover Dam, the nation's sixth largest hydroelectric plant in the U.S. located on the Colorado River.

SWPA – Markets hydroelectric power from 24 U.S. Army Corps of Engineers dams.

SEPA - Markets hydroelectric power from 23 U.S. Army Corps of Engineers water projects.



Source: EIA



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4.8 RETAIL ELECTRICITY MARKETS

The retail market involves the sale of electricity from an electricity provider to an end-user. The end-user could be a large industrial facility, small business, or individual household. In every State, regardless of whether there is retail competition or not, the electricity supply for end-users is obtained either through the competitive wholesale market, or from utility-owned rate-based generation, or a combination of the two. All States regulate rates for the delivery of electricity to end users (customers) through distribution wires and related systems. In States where there is full retail competition, "retail choice", customers may choose between their current utility supplier and other competitive suppliers for the generation portion of their electric service. Competitive retail suppliers provide a variety of service plans that give consumers and businesses options for electricity purchases. The price the end-user pays, or the retail price, may not reflect the real-time pricing of wholesale market pricing. Retail prices may be an average of annual costs or some other mechanism to determine end-user prices.

For investor-owned utilities, the regulation of retail markets falls under the jurisdiction of states. State regulatory commissions, which are often called the State "Public Utility Commission" or "Public Service Commission," regulate a utility's costs and rate of return. Municipally- and cooperatively-owned utilities may be subject to some State regulation but in general, self-regulate their costs. As non-profit entities, municipally- and cooperatively-owned do not earn a return on capital invested. In retail choice States, the commissions can require competitive suppliers to be licensed and subject to some regulation before they are allowed to service customers. In States without retail competition, commissions regulate the expenditures of investor-owned utilities and set an authorized rate of return on capital invested. In these States, where utilities are vertically integrated, utilities may construct, own and operate power plants and the costs are reflected in retail prices.

4.9 CAPACITY MARKETS

To meet Federal and State reliability requirements, grid operators must ensure that load serving entities have enough resources to meet expected demand plus a "reserve margin," that provides for a cushion during unexpected spikes in demand or potential loss of a supply or transmission resource. Reserve margins help operators maintain the reliability of the system. Capacity markets in RTO/ISO regions are typically set up to ensure that there are sufficient resources available to serve load plus reserves at some point in the future, typically from one month to several years out in time. Capacity markets may use auctions to lock in prices for electric capacity from generation resources well before they are actually needed (3 years in some markets). Capacity markets can also be marketplaces for demand response in which customers reduce their demand when called upon to do so in exchange for capacity payments similar to what generators receive. Prices vary by location and timing of capacity commitments and typically not by size or fuel type. ISO New England, PJM, MISO and NYISO operate capacity markets, while other ISOs do not currently have capacity markets.