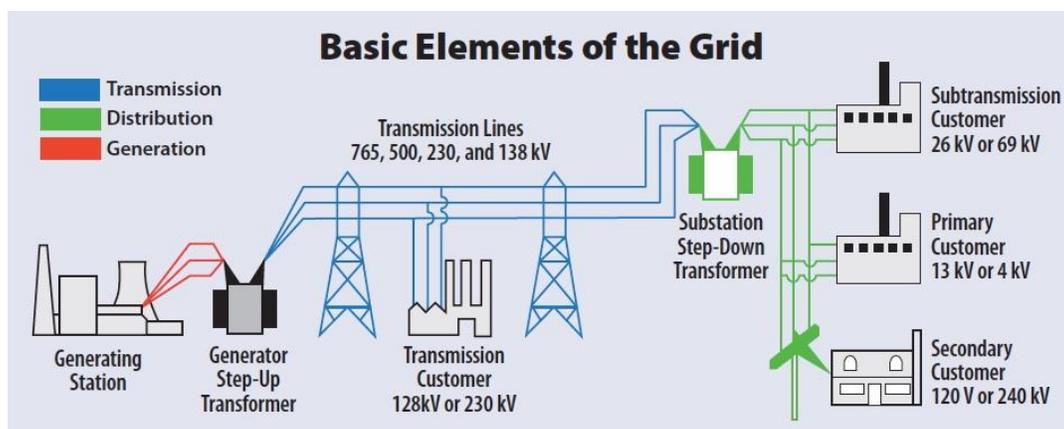


Electricity Regulation in the US: A (Brief) Guide

Regulatory Assistance Project
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How Is the Utility Industry Structured?

The US power sector comprises more than 3,000 public, private, and cooperative utilities, more than 1,000 non-utility power generators, and more than 700,000 homes and businesses with onsite solar generating systems. There are three regional synchronized power grids, eight electric reliability councils, about 140 control-area operators, and thousands of separate engineering, economic, environmental, and land-use regulatory authorities. Most electricity in the United States is generated by coal, natural gas, and nuclear power plants, with lesser amounts from hydropower and other renewable resources such as wind, solar, and geothermal energy. Licensing of hydropower and nuclear facilities is federally administered, for the most part, by the Federal Energy Regulatory Commission (FERC) and the Nuclear Regulatory Commission, whereas licensing and siting of other types of power production and transmission facilities—about 75 percent of the total—is managed at the state and local levels. There are three main components of the electricity system: generation, in which power sources provide electricity to the grid; transmission, in which that electricity is carried in bulk over high-voltage lines to local distribution facilities; and distribution, in which the electricity is delivered to end users at lower voltages. Vertically integrated utilities are responsible for generation, transmission, and distribution of power to retail customers. They can be investor-owned utilities (IOUs) or consumer-owned utilities. In many cases, they own some or all of their power plants and transmission lines, but they may also buy power from others through contracts.

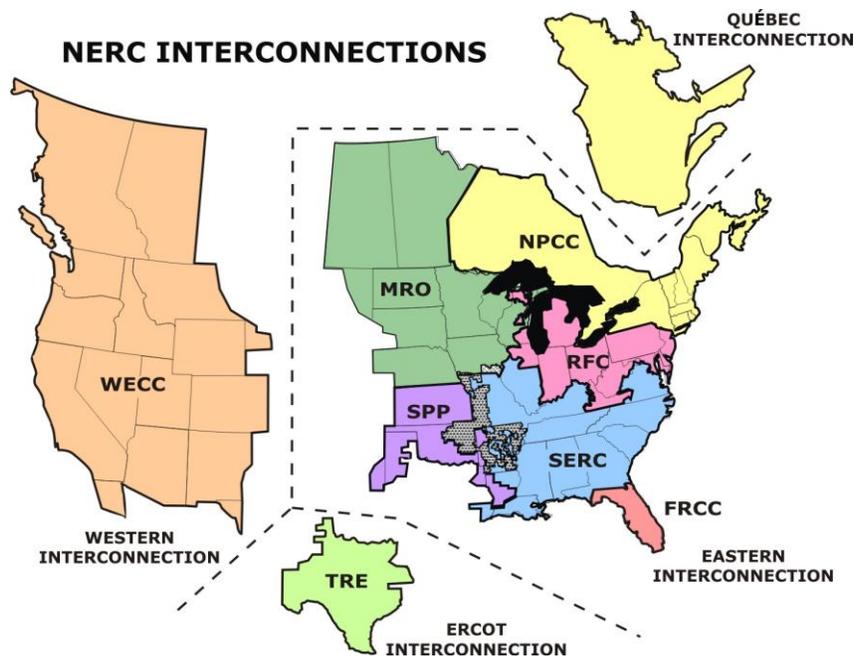


Source: Electricity Regulation in the US: A Guide—Second Edition

Power from various generation resources is distributed over extra-high-voltage, alternating current (AC) transmission networks (115,000 volts and greater), linked into three synchronous interconnections (sometimes termed “interconnects”) in the continental United States. These are the Eastern Interconnection, covering the region east of the Rockies, excluding most of Texas, but including adjacent

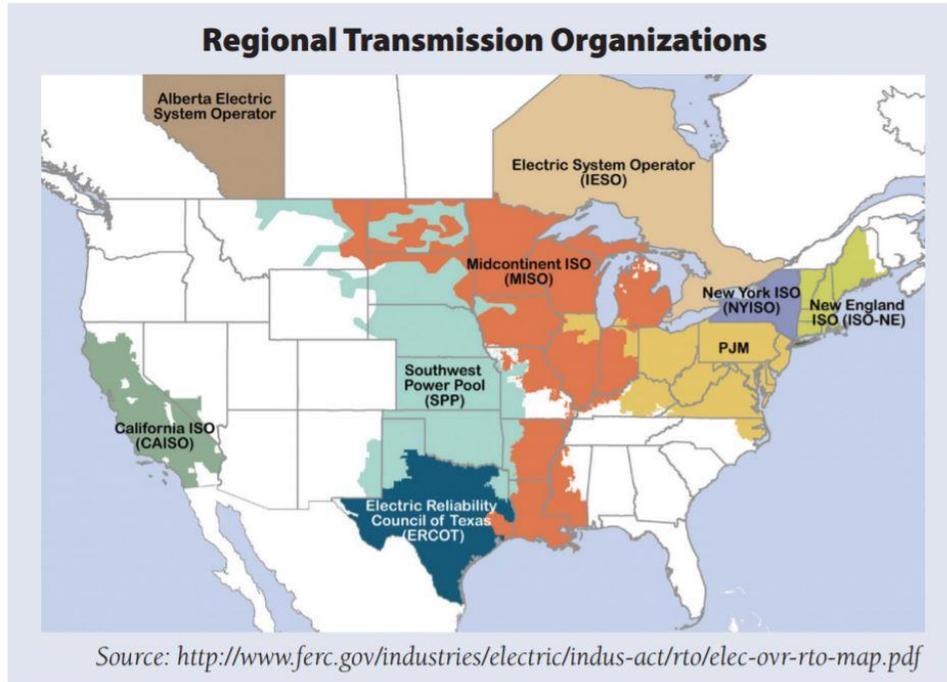
Canadian provinces except Québec; the Western Interconnection, from the Rockies to the Pacific Coast, again including adjacent Canadian provinces; and the Electric Reliability Council of Texas (ERCOT) Interconnection, covering most of Texas.

Electricity must generally be produced at the same time it is consumed. Large batteries and other storage systems such as pumped storage dams are methods to store electricity, but are expensive. In most grids, the real-time balancing of customer demand and system supply requires sophisticated control of power plants and transmission lines. A number of organizations manage the flow of power over the transmission network. The continental United States (along with most of Canada and a bit of Mexico) is divided into eight reliability planning areas, under the oversight of the North American Electric Reliability Corporation (NERC). NERC has adopted specific reliability standards for transmission that are legal requirements under FERC authority. The map below shows the interconnections and reliability planning areas.



Source: NERC

Within the NERC regions, many entities manage minute-to-minute coordination of electricity supply with demand. In the parts of the country shown in the map below, a regional transmission organization (RTO; sometimes called an independent system operator or ISO) controls the dispatch of generators and the high-voltage flow of electricity over large, multi-utility service territories. RTOs also operate electricity markets and conduct system planning. But many parts of the country do not have an RTO. In those areas, individual utilities employ “control-area operators” who dispatch generators and manage transmission lines to balance supply with demand within the utility’s service territory.



Many other electric utilities are not vertically integrated, but rather provide only distribution service. By sheer number, the vast majority of these distribution-only utilities are smaller and consumer-owned, but some are large IOUs serving in states that have undergone restructuring. These distribution-only utilities do not own any generating resources. They either buy their power from one or more wholesale providers, or, in the restructured states, consumers may obtain their power directly from suppliers, with the utility providing only the distribution service.

About 75 percent of the US population is served by IOUs. These are private companies, subject to state regulation and financed by a combination of shareholder equity and bondholder debt. Most IOUs are large (in financial terms), and many have multi-service (electricity and natural gas heating) or multistate operations.

Consumer-owned utilities (COUs) serve about 25 percent of the US population, including cities and many large rural areas. These include city-owned or municipal utilities, known as “munis”; public utility districts that are utility-only government agencies; private, nonprofit co-ops; and other public or quasi-public entities (including companies that lease solar panels to customers). COUs are often distribution-only entities. Some procure all of their power from large IOUs, and some from federal power-marketing agencies. Others have formed generation and transmission cooperatives (G&Ts) or joint action agencies to jointly build and own power plants and transmission lines. A significant number of COUs do own some of their own power resources.

Many states prohibit the sale of electricity to the public by any business other than a utility. Nonetheless, they exempt or tolerate various exceptions to this rule, such as campground and marinas that offer hookups or landlords who submeter their tenants in a multi-unit building. More recently, companies have begun installing solar electric systems and charging customers either a fixed lease payment (not linked to kilowatt-hour production) or a per-kWh rate for power provided. In some states this has been controversial, and in a few it has been prohibited. Similarly, providers of electric vehicle

(EV) charging stations provide electricity to the public; some do so at no charge, some at regulated prices, and some at unregulated prices.

What Is Economic Regulation and Why Are Utilities Subject To It?

Electric utilities that deliver retail service to consumers are regulated by state, federal, and (in the case of a muni or public utility district) local agencies. These agencies govern the prices utilities charge, the terms of their service, their budgets and construction plans, and their programs for energy efficiency and other services.

Two broad principles justify governmental oversight of the utility sector. First, because a utility provides essential services for the well-being of society—both individuals and businesses—it is an industry “affected with the public interest.” The technological and economic features of the industry are also such that a single provider tends to act as a “natural monopoly,” enabling it to restrict output and set prices at levels higher than are economically justified. Economic regulation is therefore necessary to achieve public benefits that the market fails to achieve on its own. Because of the natural monopoly, and because reliable electric service requires some level of reserve capacity (surplus capacity that can meet demand when one or more generating units or transmission lines are out of service), prices are set differently than they would be in a fully competitive market. For a description of this process, see “What Are the Fundamentals of Rate Regulation?” below.

The “public interest” that regulation is intended to protect comprises a variety of elements. Utilities are expected to offer and provide service to anyone who requests it and can pay for it at the regulator’s (or government’s) approved prices. In this sense, service is “universal.” Utilities must also adhere to strict government safety standards. Generation and distribution also have potentially adverse environmental and health impacts. Depending on the scope of authority delegated to them, which varies by state, regulators may therefore impose environmental responsibilities on utilities to protect these public interests.

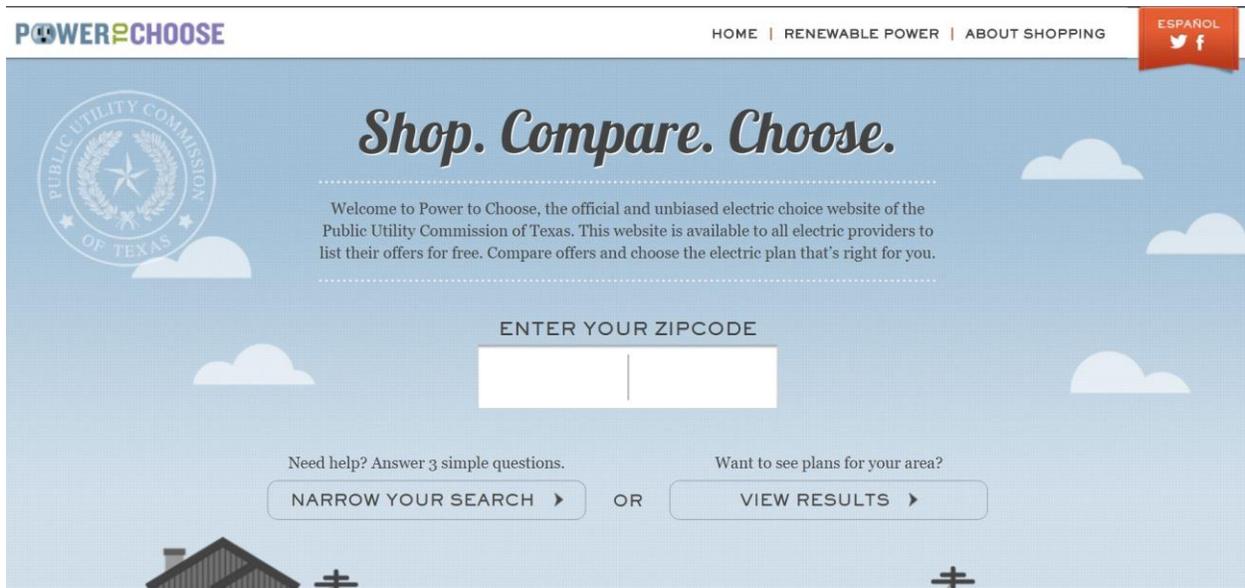
Regulation ensures that service is adequate, companies are responsive to consumer needs, new service orders and billing questions are handled responsively, and consumers receive essential information. Service reliability standards are often imposed as well.

Regulatory trends and restructuring

Since the 1980s, the United States has been seeing a trend toward a less-regulated power sector. In particular, the power supply function is more commonly seen as one in which competition-infused regulation can produce beneficial results for consumers. This is particularly evident in New England, the mid-Atlantic region, and Texas.

Some regulators are experimenting with significant changes to the regulation of distribution utilities in order to accelerate customer resource deployment and improve utility performance. In some states, these changes also include enabling non-utility aggregators of services for customers. A common thread across all systems is a commitment to connect customers at reasonable terms and conditions.

In states that have restructured their retail electric markets, unregulated competitive companies provide *supply* service while regulated utilities still provide *delivery* service. Some suppliers specialize in selling “green” power from renewable energy, whereas others specialize in residential, commercial, or industrial service. These suppliers may own their own power plants, buy from entities that do, or buy from marketers and brokers. Some states allow large customers to “buy through” their utility to obtain direct purchases of electric power. Customers in these restructured markets choose their energy provider and electric plan from the options available in their area, and receive a single bill that combines the charges for supply from their chosen provider with charges for delivery by their utility.



Source: Power to Choose

Example: In Texas, where retail energy supply service is open to competition, consumers can log on to the Power to Choose website and select their preferred electricity provider and plan from the options available in their area.

How Are Regulatory Commissions Structured?

Most state regulatory commissions and FERC follow generally similar procedures. Local regulatory bodies (generally elected city councils or boards) that govern COUs, however, can use very different processes. In any event, the regulatory body ultimately:

- determines the revenue requirement (the annual revenues a utility is entitled to collect, including operation and maintenance expenses, depreciation, taxes, and a rate of return);
- allocates costs (revenue burdens) among customer classes;
- designs pricing to collect the allowed revenues while providing appropriate price signals to customers;
- sets service quality standards and certain consumer protection requirements;
- oversees the financial responsibilities of the utility, including reviewing and approving utility capital investments and long-term planning; and
- serves as the arbiter of disputes between consumers and the utility.

State commissions consist of three to seven appointed or elected commissioners and a professional staff to provide analysis, conduct hearings, carry out enforcement and other tasks. Not every commission carries out each of these functions. In some states, the commissioners sit through hearings and listen to the evidence, asking questions and ruling on motions. In others, the hearings are conducted before a hearing officer (sometimes called a hearing examiner or administrative law judge), who then writes a proposed order to the commissioners. The commissioners then may only hear or review arguments on the proposed order before rendering a decision. In some states, both approaches are used.

Commissions' decisions are subject to appeal to state courts (or federal court, in the case of FERC). In general, courts will defer to the expertise of the regulators, but if they find that regulators have exceeded their statutory authority, misinterpreted the law, or conducted an unfair process, they will take appropriate remedial action.

Most states have a designated consumer advocate who represents the public in rate proceedings. Some consumer advocates are charged with representing all customers (or at least those not otherwise adequately represented), whereas others are explicitly limited to residential and, possibly, commercial customer classes. Consumer advocates tend to focus on the total revenue requirement, the allocation of that requirement among customer classes, the design of rates, and the approval and oversight of tariffs. Some also concern themselves with resource planning and environmental impacts or costs.

COUs typically are not regulated by a state commission. Instead, city utilities/munis are generally subject to control by the city council or a special board or committee. Public power districts generally have voter-elected boards. Cooperatives generally also have boards, elected by the utility's consumers (including business consumers). In general, COUs have much more streamlined processes for setting rates and policies—and sometimes no visible process at all, except for a decision by the governing body in open session. State public utility laws, however, generally do apply to COUs. These may cover elements such as the timing of and notice requirements for rate adjustments, resource portfolio requirements, availability of low-income assistance, and standards for termination of service for nonpayment.

In some states, the legislature has given the state commission regulatory authority over cooperatives and munis. Where COUs are regulated by state commissions, they may be less stringently or prescriptively regulated than IOUs. In some states, the regulatory commission also issues certificates in facilities siting cases, while in other states that is the role of a board created for that purpose alone. States vary in the type and size of facility that must go through the state's facilities siting process.

What Does the Regulator Actually Regulate?

The state regulatory commission normally regulates all IOUs in a state. In most but not all states, municipal utilities and public power districts are not subject to any economic regulation by the state commission, but they are still subject to regulation by state statute. In about 20 states, cooperatives are subject to some form of state regulation.

State commissions have jurisdiction over a wide variety of aspects of the utility industry. Among others, these include:

- **The revenue requirement and rates:** The first and best-established functions of the state commission are to determine a utility’s revenue requirement and to establish the prices or rates for each class of consumers.
- **Portfolio standards:** Many state legislators, commissions, and voters have adopted energy portfolio standards, which require utilities to meet a certain percentage of their sales with designated resource types, generally a defined set of renewable resources.
- **Integrated resource planning:** An IRP is a long-term plan prepared by a utility to guide future energy efficiency, generation, transmission, and distribution investments. Some commissions require utilities to develop IRPs and review the plans.
- **Energy efficiency:** About half of the states have directives related to energy efficiency, which is typically the least expensive way to meet consumer needs for energy services. Some states have adopted mandatory energy efficiency standards for buildings, appliances, and other equipment.
- **Competitive activities:** Regulators may permit utilities to engage in activities that may be competitive in nature. Energy efficiency services could be competitive, yet utilities are in a special position to cover their territories with offers of support. Solar photovoltaic (PV) systems on customer premises are competitive, yet some suggest that utility involvement will help grow deployment faster, whereas others fear it will impair progress.
- **Service standards and quality:** Commissions adopt specific standards for voltage, frequency, and other technical requirements, generally based on industry standards. This is generally limited to the distribution service, not to transmission, which is subject to FERC regulation. Commissions also adopt and oversee standards governing all interconnections of generators to the distribution system, including distributed energy resources. These standards can include technical safety, reliability, and operational requirements, processes for applications, timelines, studies, approvals and disputes, and fees and cost-allocation protocols. Interconnection standards have been adopted in 32 states and the District of Columbia. Finally, commissions have adopted service quality indices based on specific indicators, such as the frequency and duration of outages or the speed of response to customer reports and complaints.

Utility regulation and the environment

Utility regulation and environmental regulation are increasingly intertwined. In most states, the utility regulator is tasked by statute as an economic regulator, leaving the enforcement of environmental laws to separate agencies. In many states, however, the economic regulator nonetheless evaluates environmental costs and risks to consider the appropriate long-term energy resources that best serve ratepayers. In many cases, this economic and risk analysis encourages utility investment in low-pollution alternatives, such as renewable resources and energy efficiency as a prudent long-term investment strategy for the electric sector.



Utility regulators are increasingly paying attention to utility resource decision-making through the IRP process. They are also taking a more active role with respect to the promulgation of regulations by environmental agencies; in some cases this is focused only on reliability, while in others cost and technology diversification play a role.

What Are the Fundamentals of Rate Regulation?

To set rates, commissions must determine the utility's costs for providing service in their state in a procedure known as a rate case. The key elements of a general rate case include determining the overall level of expenses and investment to be recovered in rates, determining the appropriate rate of return (profit and interest), and then dividing the required revenue between customer classes and developing rates to recover that revenue.

Most of the evidence in a rate case is directed at determining the **revenue requirement**, or the total amount of revenue the utility would need to provide a reasonable opportunity to earn a fair rate of return on its investment, given specified assumptions about sales and costs. To determine the revenue requirement, a commission analyzes three factors:

- 1) The **rate base**, the total of all long-lived investments made by the utility to serve consumers, net of accumulated depreciation. It includes buildings, power plants, fleet vehicles, office furniture, poles, wires, transformers, pipes, computers, and computer software. It also includes some adjustments for working capital and deferred taxes.
- 2) The annual **rate of return** that utilities are allowed the opportunity to earn on their rate base. Legal precedent requires that return to be sufficient to allow the utility to attract additional capital under prudent management, given the level of risk that the utility business faces.
- 3) **Operating expenses**, which include labor, power purchases, outside consultants and attorneys, purchased maintenance services, fuel, insurance, and other costs that recur regularly. They also include state and federal taxes and depreciation expense.

Once the revenue requirement is determined, the commission next decides how each class of consumers should contribute to meeting the revenue requirement, based on the usage characteristics of each class. Not all states use the same categories for customers. The broadest categories cover residential, commercial, or industrial service, given that these groups tend to have similar usage characteristics and impose similar costs of service on the utility. Some utilities have separate classes for single-family and multi-family residential consumers, some have agricultural classes, some have institutional classes for government buildings, and so on. Determining the right customer classes for each utility is important, and no single method is right for all systems. Some costs are allocated based on the number of customers, some on the basis of their peak demands, some on their total energy consumption, and some on other aspects of usage.

In the context of a rate case, utilities perform cost of service studies, analyses that allocate their allowed costs to provide service among the various customer classes. Ultimate rates may be designed to recover this amount, or the regulator may find that each class should contribute a different share of the total revenue requirement.

Customer, demand, and energy classification

Cost of service studies allocate costs based on the number of customers, the peak demand, and the total energy usage. The choice of how to allocate each type of cost typically requires judgments on the part of the commission and is often heavily contested.

The customer count and energy usage for each class are known with great accuracy, but the peak demand is sometimes estimated, because detailed peak load metering is only available if utilities have invested in advanced metering infrastructure (or “AMI,” sometimes called “smart meters”) and can process data from it. There are many different measures of demand, and the choice of measure can have a significant impact on the study results. For the purpose of allocating demand-related costs, some studies define peak as only a few hours of the year, whereas others consider (for example) the highest peak demand in each of several months of the year or the highest 200 or more hours of the year. Ideally, the same definition of “peak” should be used for cost allocation as for rate design.

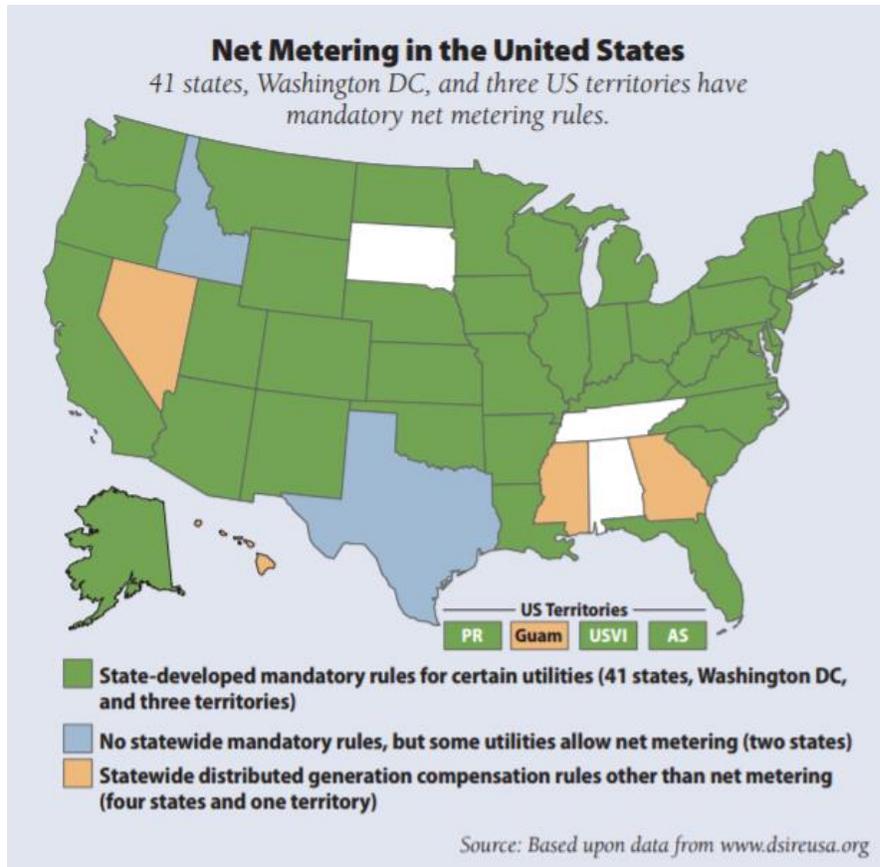
The classification of distribution system costs among the customer, demand, and energy categories is a very controversial element of this process. Many of these costs do not directly vary with any of these factors—they are related to the system density of the service territory, the need to maintain clearances over roadways, and other factors.

Retail rate design

Once the revenue requirement and cost allocation are completed, the last important topic that regulators address in a general rate case concerns the design of the retail rates paid by specific customer classes. Residential rates typically consist of a monthly customer charge (sometimes called a basic charge or service charge) plus an energy charge in cents per kWh based on the amount of usage. This energy charge may be a flat rate (the same for all usage), inclining (with higher rates for usage over a base level), or declining (with lower rates for usage over a base level). Other variations, like differing rates over time or season, are also possible.

Traditional rate design principles were established in an era when vertically integrated utilities satisfied almost all of their customers’ electrical needs and nearly all electricity flowed in only one direction: from the utility to its customers. This is no longer the case. Growing numbers of customers supply some of their energy needs with on-site distributed generation, including solar PV, and engage in bidirectional transactions with their utilities, importing or exporting electricity to and from the grid.

This evolution in the roles of customers and utilities poses new challenges for retail rate design. Traditional residential rate designs rely in large part on volumetric energy charges to recover most utility costs of service, including grid costs. When residential customers produce energy onsite, they purchase less energy from their utility and may also reduce congestion on the grid. The utility can generally avoid some of its costs of service, particularly those associated with energy supply, but its costs for transmission and distribution infrastructure may not change immediately and may take some time to be realized. The crucial question is whether the value these distributed renewable resources bring to the system exceeds or falls short of the revenue that is lost. Many studies have found a net benefit and many others show a net cost when customers produce electricity onsite; the conclusions reached depend on the questions asked, the time frame considered, the assumptions made in the analyses, and the circumstances of the utility studied.



Solar customers are often put on a **net energy metering (NEM)** rate, which charges customers who have onsite generation only for their “net” consumption, measured by subtracting the power supplied to the grid from the amount delivered to the customer by the utility. The concept behind NEM is that a customer who generates more than they consume in some hours, and exports power to the grid at those times, should be compensated for the power exported to the grid at the same price as power they purchase from the grid. Many utilities have been critical

of NEM, which in their view overcompensates the customer, effectively transfers fixed system costs to other customers, and reduces their revenue and the rate base. The alternative view, voiced by solar customers, advocates, and industry providers, is that the new, clean solar power received by the utility is more valuable than standard grid power.

To address infrastructure cost recovery issues, a few jurisdictions (including Minnesota, Maine, and Austin, Texas) have recently turned to a new tariff design, the **value of solar tariff (VOST)**. A VOST offers customers a predetermined credit rate for each kWh of solar generation their systems produce for the duration of the rate. The price is based on a comprehensive assessment by the utility or its regulators of the value of solar generation to the utility and society. This value of solar analysis is a cataloguing of all the costs avoided or imposed by solar generation sited at the distribution end of the electric system.

Ensuring reliable electricity service at reasonable cost while meeting societal goals involves balancing the interests of utility investors, energy consumers, and the entire economy. Limiting the environmental impacts of the utility system while also assuring reasonable prices, reliability, and safety is the daunting challenge that utility regulators face, and evolving technology provides new opportunities, but also creates new challenges.

For a more in-depth look at these issues, see: Lazar, J. (2016). *Electricity Regulation in the US: A Guide—Second Edition*. Montpelier, VT: Regulatory Assistance Project. Retrieved from <http://www.raonline.org/knowledge-center/electricity-regulation-in-the-us-a-guide-2/>