EPA

State and Local Climate and Energy Program

State Energy and Environment Guide to Action:
Overview of Electric Utility Policies

2022

Table of Contents

Preface and Acknowledgments

The U.S. Environmental Protection Agency (EPA) *State Energy and Environment Guide to Action* offers real-world best practices to help states design and implement policies that reduce emissions associated with electricity generation and energy consumption. First published in 2006 and then updated in 2015, the *Guide* is a longstanding EPA resource designed to help state officials draw insights from other states' policy innovations and implementation experiences to help meet their own state's climate, environment, energy, and equity goals.

As part of the 2022 update, each chapter reflects significant state regulatory and policy developments since the 2015 publication. *Guide* chapters provide descriptions and definitions of each featured policy; explain how the policy delivers energy, climate, health, and equity benefits; highlight how states have approached key design and implementation issues; and share best practices based on state experiences.

Unlike earlier *Guide* editions, which were released as a complete set of chapters comprising a single document, the 2022 update is being released in phases of collected chapters. This chapter is one of seven addressing state-level utility policies that support clean energy and energy efficiency:

- Overview of Electric Utility Polices
- Electricity Resource Planning and Procurement
- Electric Utility Regulatory Frameworks and Financial Incentives
- Interconnection and Net Metering
- Customer Rates and Data Access
- Maximizing Grid Investments
- Energy Efficiency Programs and Resource Standards

Guide chapters are available online on the *Guide to Action* webpage.

All *Guide* chapters were developed by the Climate Protection Partnership Division's State and Local Climate and Energy Program within EPA's Office of Atmospheric Protection. Phil Assmus managed the overall update of the *Guide* and provided content and editorial support for all chapters. David Tancabel served as the chapter lead for six utility policy chapters, and Cassandra Kubes led a crosscutting effort to address equity issues across all *Guide* chapters. Maggie Molina provided technical review and editorial support across all chapters and led the development of the energy efficiency chapter. We thank additional EPA staff, namely Erica Bollerud, Joe Bryson, Beth Conlin, James Critchfield, Risa Edelman, Maureen McNamara, and Neeharika Naik-Dhungel, who provided guidance for one or more chapter's initial development, early draft review, or final content.

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Electric Utility Policies

The U.S. electricity sector encompasses the generation, transmission, and distribution of electricity. Electric utilities are the regulated entities that own and manage many of the sector assets and their operations as well as the sale of electricity to end users. This chapter provides an overview of the U.S. electricity system and introduces five *State Energy and Environment Guide to Action* chapters that describe some of the key polices states use to regulate the utility sector and that can be used to promote environmental and equity benefits.

State Utility Policies and Programs in the *Guide to Action*

Many states are taking action to enable greater investments in clean energy, including energy efficiency, renewable energy, demand response technologies and practices, energy storage, and other low- or zero-emission and distributed energy resources (DERs). Some states are updating their electricity resource planning and procurement processes as well as their utility regulatory frameworks to align them with environmental, energy, and equity priorities and encourage utilities to fully incorporate clean resource options into their infrastructure investment and operational decisions. Some utility regulators are also modifying customer electricity rates and interconnection standards to increase individual and business access to clean energy resources and their benefits. States are also providing policy direction to ensure that new electric grid investments are made and deployed in a manner that maximizes current and future energy resources.

State legislatures grant authority to a commission, agency, board, or authority within each state (often named public utility commission or public service commission and hereinafter collectively referred to as "utility regulator") to regulate certain activities, rates, and services of public utilities. Other state agencies, such as air offices, energy offices, and consumer advocates, as well as local governments, can work with their utility regulators to provide collaborative input or formally intervene during policy design and implementation. The electricity sector policies discussed in the *Guide* are generally focused on investor-owned utilities (IOUs). However, many could also apply to municipally and cooperatively owned utilities, which are not subject to utility commission regulation in most states but are subject to city councils or consumer boards, to the extent that decision-makers can direct or encourage these utilities to act. Communication and collaboration between state legislatures, state energy offices, air pollution control agencies, and utility regulators are increasingly important to effective and equitable policy development and implementation (refer to text box).

Engagement between Air Regulators, Utility Regulators, State Energy Officials and Legislatures

A collaborative relationship between state air regulators, utility regulators, energy offices, and their state legislatures is beneficial to the development and implementation of clean, reliable, and equitable energy policy. The *Guide to Action* highlights utility policy impacts relevant to all of these authorities and opportunities for shaping the impacts. For more information on engaging with utility regulators, see the Mini Guide Series published by the National Council on Electricity Policy.

The *State Energy and Environment Guide to Action* includes five chapters listed in Table 1 that describe utility policies and programs that states are using to support clean electricity generation and reduce the environmental impacts of the power system. Other chapters of the *Guide* cover policies that support broader approaches to reduce utility system impacts, including energy efficiency resource standards and clean generation requirements like a renewable portfolio standard, which are adopted by many utility regulators and state legislatures to ensure utilities deploy clean energy resources. *Guide* chapters include a description of each policy and its potential benefits, considerations for effective policy design, related implementation and evaluation approaches, and action steps states can take to adopt best practices. Each chapter concludes with at least three examples of states that have effectively implemented example policies.

Table 1: Electric Utility Policies in the* Guide to Action *that Support Clean Energy

Chapter	Description
Electricity Resource Planning and Procurement	Many states require electric utilities to engage in resource planning through integrated resource planning, pre-approval of large capital investments, benefit-cost analyses, and resource procurement processes. These policies provide a mechanism for utilities, regulators, and other stakeholders to assess the long-term costs, benefits, and risks of existing and new supply- and demand-side resources. These policies may also prioritize or create a more level playing field for clean energy resources.
Electric Utility Regulatory Frameworks and Financial Incentives	Traditional regulatory approaches can discourage investment in cost-effective energy efficiency and other demand-side resources that reduce sales. State utility regulators can encourage energy efficiency, distributed renewable generation, and storage by decoupling profits from sales volumes, enabling program cost recovery, adopting performance-based regulation (PBR), and providing performance incentives.
Interconnection and Net Metering	Interconnection and net metering policies may promote distributed energy resources such as solar photovoltaics (PV) and energy storage. Interconnection standards establish system requirements and application procedures, while net metering rules allow distributed systems to receive credit for electricity generated on site that is exported to the grid. States can develop policies for interconnection and net metering that remove barriers and facilitate clean distributed generation.
Customer Rates and Data Access	Utility rates and other charges can influence the economic attractiveness of clean energy resources. Some rate structures have greater potential for monetizing or recognizing clean energy benefits than others. Providing customers with access to energy usage data can serve a complementary role by helping them make informed and efficient decisions about their energy use.
Maximizing Grid Investment	States can take steps to ensure that new investments in electricity distribution infrastructure are planned and operated in a manner that increases energy efficiency and enables high penetrations of renewable energy.

Though each utility policy chapter may be read on its own, all include cross references to draw out the many complementary interconnections between topics. A few prominent themes are present across all five chapters:

- Accelerated deployment of DERs[1] – Utility planning decisions, customer rate design, and utility financial incentives are increasingly shaping and being shaped by the widespread and rapid deployment of clean DERs. A *Guide* chapter describes state interconnection and net metering polices, which are evolving rapidly and differently across the country, and significantly affect the incentives to deploy DERs and help to manage their impacts on the operation of the power grid.
- Emerging focus on environmental justice and equity – State decisionmakers are increasingly acknowledging and addressing the equity dimensions of their utility policies. *Guide* chapters identify the equity benefits of each policy or program; describe how to quantify and communicate those benefits; present examples of stakeholder engagement to reach historically marginalized communities, including low-income communities and communities of color; describe how program design choices can affect the distribution of policy impacts across communities, and provide state examples of how equity is addressed in state utility policies or programs.

[1] DERs are electric generation, demand-side measures, or energy storage systems located on the distribution system, typically close to load, used individually or aggregated to provide more value. Types of DERs include energy efficiency, demand response, electric vehicles, battery storage, and rooftop solar PV.

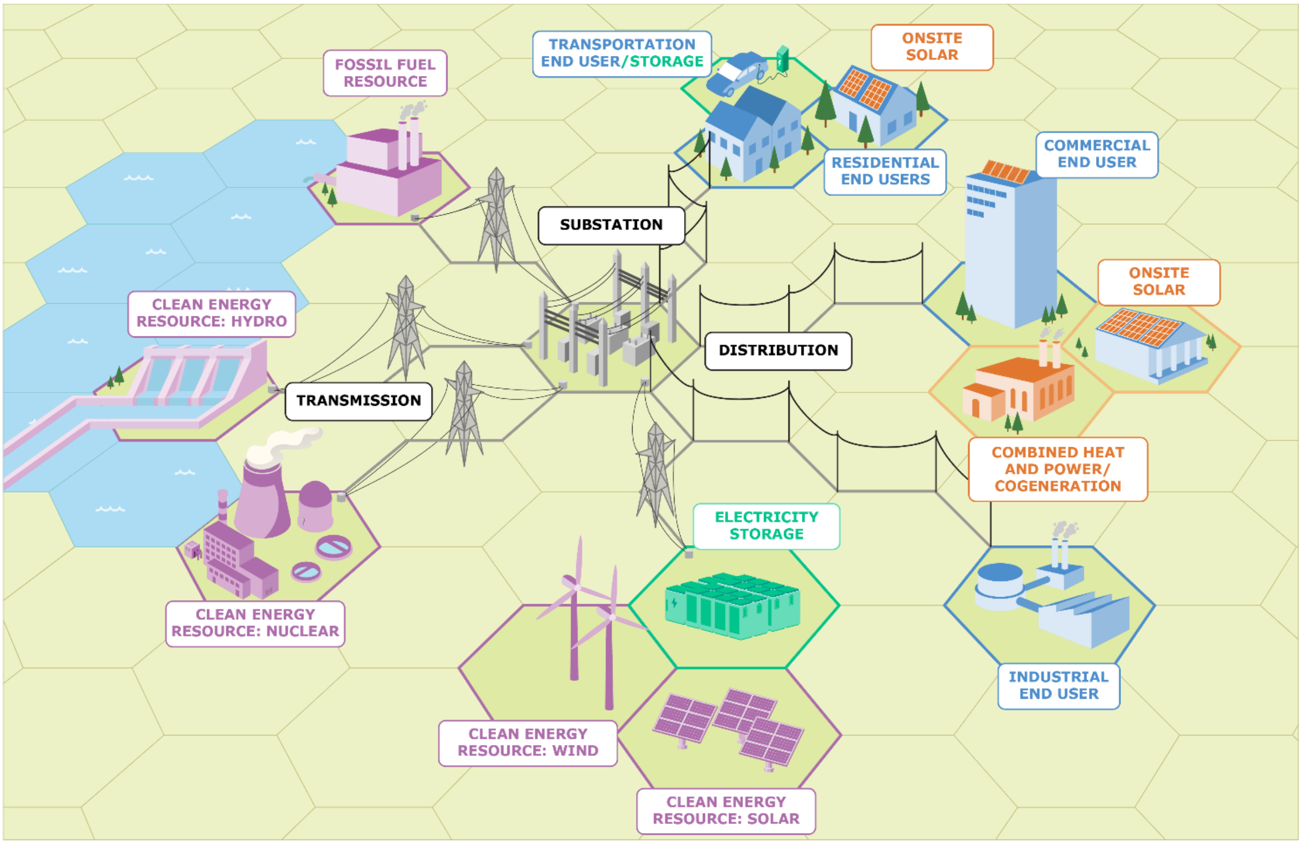
- Aligning utility policies with state environment, energy, and equity goals – State legislatures and utility regulators are adjusting or broadening traditional utility financial policies focused on safety, reliability, and affordability to incorporate additional priorities such as environmental and equity goals. Examples addressed in *Guide* chapters include planning mechanisms that emphasize cleaner generation, use of policies like net metering and interconnection standards to integrate cleaner resources into the grid, tying customer rates to conservation measures, and the application of utility performance incentives to reduce pollution, increase energy efficiency, and improve equitable outcomes.

Overview of the U.S. Electricity System

To understand how these electric utility policies work, it helps to understand the U.S. electric power grid and the roles that states, utilities, regional organizations, and regulators play.[2] The power grid is a complex, interconnected system (Figure 1). Most of the nation's electricity is generated at centralized power plants, transmitted over long distances through high-voltage transmission lines (sometimes across multiple states), and then delivered through local distribution wires to residential, commercial, and industrial end-users. At each level, activities and decisions have the potential to affect states' clean energy strategies.

[2] For more background on the U.S. electricity sector, including a discussion on the electricity supply chain, grid fundamentals, markets and ownership structures, and reliability issues, refer to the U.S. Department of Energy electricity industry primer (DOE 2015).

Figure 1: How Electricity Is Generated and Delivered to Customers



CENTRALIZED GENERATION

The United States generates most of its electricity at centralized power plants, which are usually located away from end-users. In 2021, most U.S. electricity generation came from **fossil fuel resources** (61%), including natural gas, coal, and other fossil fuels. **Clean energy resources** include hydroelectricity (6%), wind and solar (14%), and nuclear power (19%). Large wind and solar installations are considered centralized generation, and their share of total generation is projected to increase.

DISTRIBUTED ENERGY RESOURCES

DERs are electric generation, demand response, or energy storage systems located on the distribution system, typically close to load, used individually or aggregated to provide more value. Types of DERs include **energy efficiency, electric vehicles, battery storage,** and **rooftop solar PV**. DERs may serve a single structure, such as a home or business, or be part of a system such as a microgrid at an industrial complex, military base, or college campus. When connected to the grid, DERs have the potential to reduce peak demand and support delivery of clean, reliable power to additional customers and to reduce electricity losses along transmission and distribution lines. Distributed sources produce far less electricity than centralized power plants, but their use is growing.

STORAGE

Thermal and electricity storage technologies can be used to improve reliability, save excess power for when it is needed, and reduce costs. Though not widespread today, utility-scale storage options and industrial, commercial, and residential-sized battery DERs are increasingly being used to support renewable energy generation. There are pilots and demonstration projects using electric vehicles for energy storage, locally aggregating the use of their batteries to store and discharge electricity to support the needs of the local grid.

DELIVERY

Once electricity is generated at a centralized power plant, it travels long distances through a series of interconnected high-voltage **transmission** lines. **Substations** "step-down" high-voltage power to a lower voltage, sending the lower voltage electricity to consumers through a network of **distribution** lines.

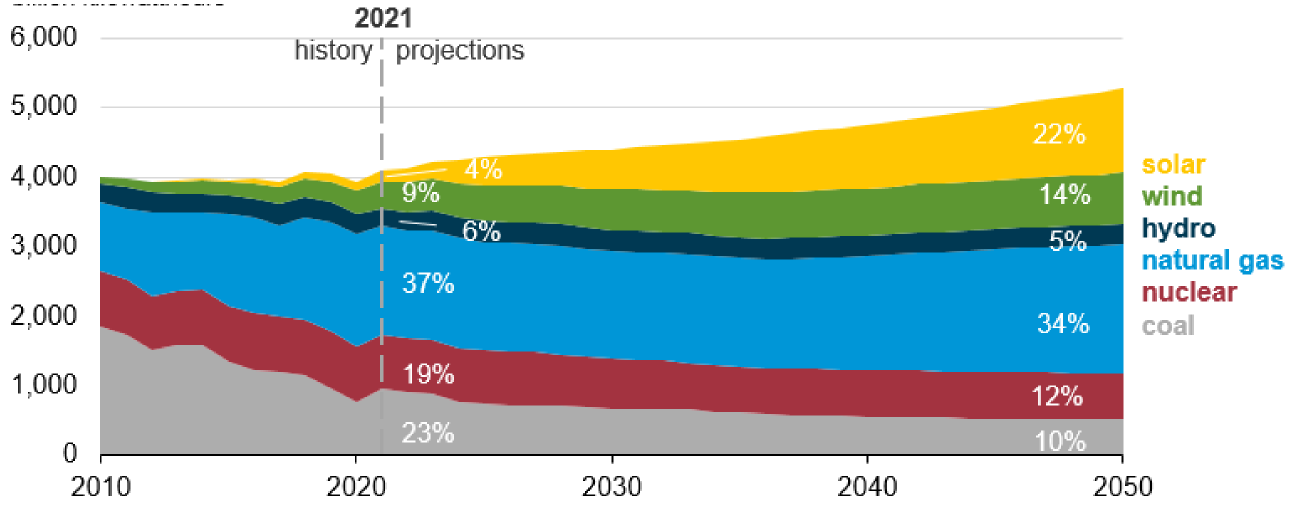
END-USERS AND ENERGY EFFICIENCY

U.S. electricity use is approximately evenly split among **residential**, **commercial**, and **industrial customers**. The **transportation** sector accounts for a small fraction of electricity use, though this may increase due to electric vehicles. End-users can meet some of their needs by adopting energy-efficient technologies and practices. In this respect, energy efficiency is a resource that reduces the need to generate electricity.

Source, percentage of electricity generation by fuel type: EIA 2022a.

The system must generate enough electricity supply and deliver it through a network of transmission and distribution lines to meet the demand from all end users. This is a balancing act: the need for electric services is dynamic, with demand fluctuating by season, time of day, weather, and end-use activity levels, and the balancing must take place in real time, as the grid has limited ability to store excess power for later use. Grid operators have traditionally met this challenge by relying on large, predictable fossil fuel generating units that can be ramped up and down in response to demand fluctuations. Increasingly, electricity supply also fluctuates due to a growing reliance on intermittent generating resources such as wind and solar. The operating capacity of intermittent resources can be affected by operating conditions, weather conditions, and time of day. In 2021, renewable resources represented 20 percent of the U.S. electricity generation mix and their share is projected to more than double from 2021 to 2050 (Figure 2) (EIA 2022c; 2022b). According to the U.S. Energy Information Administration (EIA), in 2022, generation from renewables surpassed nuclear and coal, with most of the growth attributed to wind and solar (EIA 2022c).[3]

Figure 2: U.S. Electricity Generation from Selected Fuels in Billions of Kilowatt-Hours, 2010 to 2021 and Projections to 2050



Note: Source reports that solar includes both utility-scale and end-use photovoltaic electricity generation.
Source: EIA 2022b.

Grid systems are accommodating the growth of both utility-scale renewable resources and customer-site renewable technologies and other DERs. DERs are smaller than a utility-scale system, typically in the range of 1 to 10,000 kilowatts (FERC 2020). DERs encompass a range of technology types deployed by a utility customer including backup diesel generators, combined heat and power (CHP), fuel cells, energy management practices, and increasingly, clean energy technologies such as solar PV and battery storage.

Demand response, energy efficiency, and energy storage offer grid benefits, including providing flexibility by better aligning the increasing share of variable utility-scale and DER resources with patterns of consumer demand. These tools can lower customer costs and facilitate the continued market growth of renewables. Some states have adopted targets for integrating demand response and energy storage resources. For more information on improving renewable energy integration, refer to other chapters of the *Guide*, including Maximizing Grid Investments and Interconnection and Net Metering.

[3] In the rolling 12 months ending in July 2022, generation from renewable sources totaled 919 billion kilowatt-hours [kWh], compared to 856 billion kWh for coal and 773 billion kWh for nuclear (EIA 2022a).

Many companies and other organizations play a role in generating, selling, and delivering electricity. These entities are subject to different regulations and oversight at the local, state, regional, and federal levels. Electricity sales generally occur in wholesale markets among energy traders and utilities and at the retail level between utilities or competitive suppliers and the end-use customers. The Federal Energy Regulatory Commission (FERC) has jurisdiction over the wholesale but not the retail markets. States vary in their authorities over the types of power plants and delivery infrastructure, including their locations (i.e., siting), that utilities build and maintain, as well as the terms of service for and rates charged by the utilities that deliver power to customers.

Regional balancing authorities coordinate the transmission of electricity across states. In some areas of the country where wholesale markets are restructured, this coordination takes place through organizations known as independent system operators (ISOs) or regional transmission organizations (RTOs). Approximately two-thirds of U.S. electricity demand is served in RTO regions (FERC 2021a). FERC approves the RTO/ISO market rules and recognizes the North American Electric Reliability Corporation (NERC) as the national electric reliability and security regulatory organization. At each level, FERC activities and decisions can affect states' clean energy strategies. For example, FERC issued a policy statement that acknowledged its jurisdiction over wholesale electricity markets and rates, creating a framework for FERC to consider proposals to incorporate a state-determined carbon price into a regional wholesale market (FERC 2021b).

Over the past thirty years, some states have restructured their electricity markets at the wholesale or retail level.[4] In the traditional vertically integrated utility model, the same entity (a utility) is responsible for electricity generation, transmission, and distribution to retail customers within the utility's defined geographic service area and with oversight by utility regulators at the state level. To meet customer needs, vertically integrated utilities may own and operate their own power plants and transmission lines, or contract with other entities for grid resources. Traditional vertically integrated utilities operate in much of the U.S. Northwest, Southeast, and Southwest (FERC 2021a). States and utilities serving about one third of U.S. electricity demand still largely follow this model (RFF 2022).

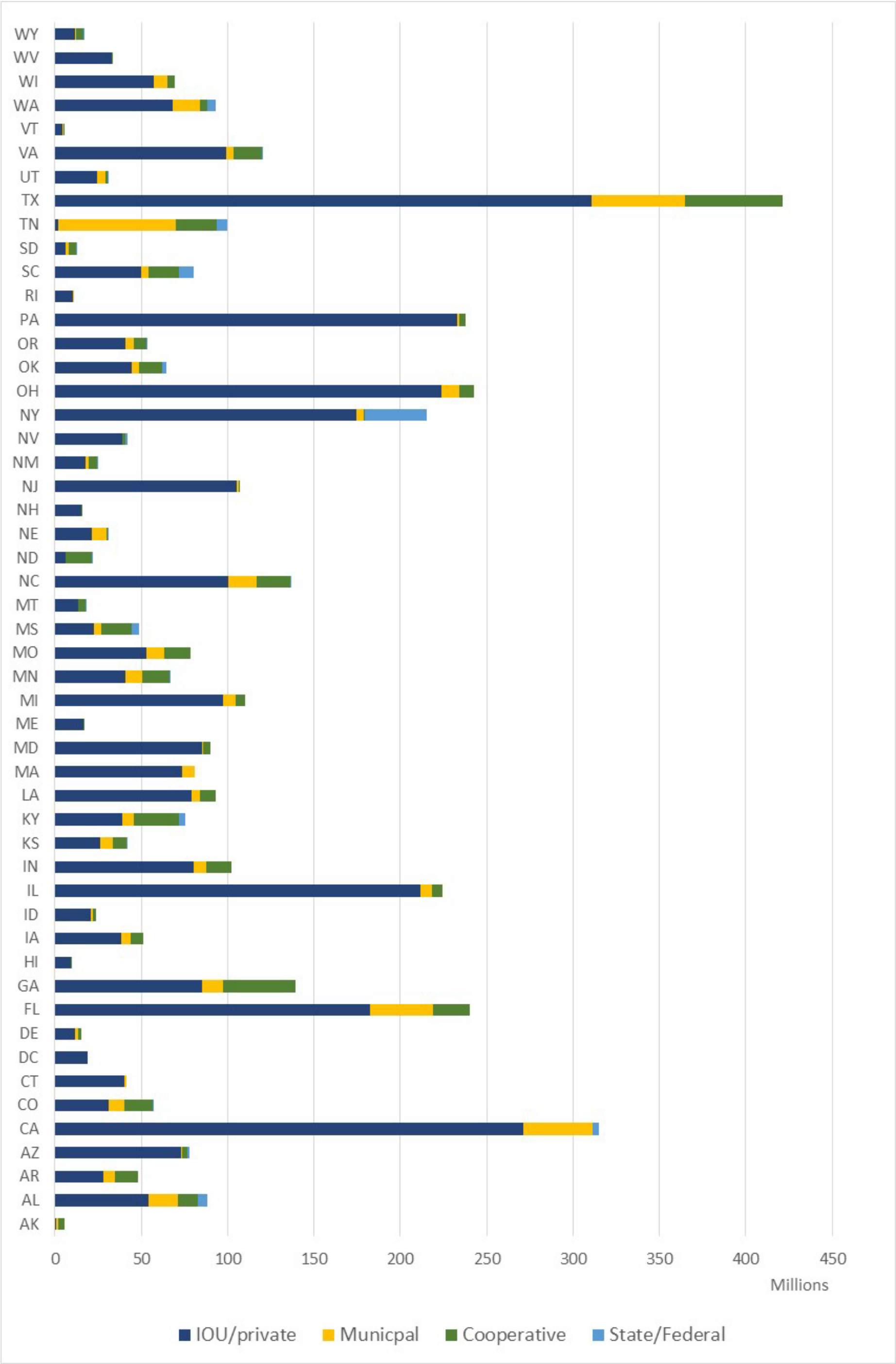
Other regions have decoupled generation, transmission, and distribution through restructuring. Regions with restructured wholesale markets allow RTOs/ISOs to operate transmission grids independently, facilitating open access to transmission capacity. Where retail markets are restructured, end-use customers may choose among competitive suppliers of electricity service. As of 2017, 13 states and the District of Columbia have fully restructured retail electricity markets, and 5 states offered partial electricity retail choice (i.e., not all load or all customer classes are eligible for choice) (NREL 2017). EPA's Green Power Partnership program offers more information on the U.S. electricity grid and markets.

At the distribution system level, where electricity is delivered to retail customers, utility ownership type and state regulatory structure varies. About 78 percent of the nation's electricity is delivered by IOUs—which are for-profit corporations—or other private entities (EIA 2020). The remaining share is delivered to customers by cooperatively owned utilities; utilities owned by local governments; and other publicly owned entities, including those owned by the federal government. For example, the Tennessee Valley Authority (TVA)—a federally owned utility—generates electricity that it sells to certain large customers and over 150 local utilities. Similarly, four federal Power Marketing Administrations (PMAs) sell electricity generated by federally owned

4 For an overview of the different types of electricity markets and how they are regulated, refer to US Electricity Markets 101 (RFF 2022). For more on wholesale electricity markets, refer to the FERC Energy Primer, A Handbook of Energy Market Basics (FERC 2015). For more on retail electricity choice, refer to the National Renewable Energy Laboratory Introduction to Retail Electricity Choice in the United States (NREL 2017).

and operated hydroelectric dams in 33 states to other utilities and a few large customers. Figure 3 shows the prevalence of utility types by state.

Figure 3: Share of Electricity Delivered to Customers by Utility Ownership Type (in Millions of Megawatt-Hours), 2019



Notes: IOU/private includes IOUs, retail power marketers, and unregulated utilities.
Municipally and cooperatively owned includes utilities classified as cooperatives or political subdivisions.
Source: EIA 2020.

Role of State Electric Utility Regulators

State utility regulators typically have authority over planning, ratemaking, and terms of service, which can all affect deployment of clean energy. Utility regulatory processes vary by state, according to the authorities granted to them by relevant statute. The regulatory structure for the electricity market is a key difference across states. Utility regulators have traditionally regulated IOUs that generate, transmit, and distribute electricity. Utility regulators typically have less authority over publicly and cooperatively owned utilities, which are often overseen by municipal authorities or boards, though some states do regulate these utilities' rates to customers (refer to the Customer Rates and Data Access chapter of the *Guide*) and oversee their electricity resource planning processes (refer to the Electricity Resource Planning and Procurement chapter of the *Guide*). Regulatory authorities over electricity markets vary also based on whether a state is vertically integrated or restructured.[5] Regardless of restructuring status, state utility regulators oversee the distribution system's electricity delivery to customers.

Role of State Environmental Agencies

Regardless of utility ownership and electricity market structure, state air agencies and other environmental regulators have significant authority over aspects of the electric power sector because of its substantial environmental impacts. The U.S. Clean Air Act imposes permitting and emission control requirements on power plants and has successfully reduced air pollution emissions from the sector (EPA 2022a). State and local air agencies are often delegated Clean Air Act authorities to implement federal air pollution standards and have played a critical role in achieving these reductions. States may also choose to develop their own pollution control programs and policies that are more stringent than or fill gaps in federal standards. Nearly all parts of the electricity system can affect the environment, and the size of these impacts often depends on how and where the electricity is generated and delivered. In general, the environmental effects can include the following:

- Emissions of greenhouse gases and other air pollutants, especially when a fossil fuel is burned.
- Use of water resources to produce steam, provide cooling, and serve other functions.
- Discharges of pollution into water bodies, including thermal pollution (water that is hotter than the original temperature of the water body).
- Generation of solid waste, which may include hazardous waste.
- Land use for fuel production, power generation, and transmission and distribution lines.

Each of these environmental effects can have harmful impacts on plants, animals, ecosystems, and human health, particularly if they result in people being exposed to pollutants in air, water, or soil. Communities with environmental justice concerns experience these impacts disproportionately and tend to be located near fossil fuel power plants (EPA 2022b). As such, many aspects of utility operations are subject to regulation by states and other authorities.

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[5] For more information on how electricity markets are structured and regulated, and how regulatory authorities may vary by state, refer to the National Governor Association website on Electricity Markets (NGA n.d.).

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