Legislative Council Staff
Nonpartisan Services for Colorado's Legislature

Memorandum

April 29, 2026

TO: Interested Persons

FROM: Max O'Connor, PhD; Science and Technology Policy Program (STPP) Fellow

SUBJECT: Colorado Electricity Generation, Transmission, Distribution, and Regulation

Summary

This memorandum provides information on how electric utilities in Colorado generate, transmit, and distribute electricity to Colorado homes and businesses. It also describes the regulation of investor-owned electric utilities and balancing authorities by Colorado's Public Utilities Commission (PUC) and federal entities.

Electric Utilities

Utilities are entities that deliver a public good, such as electricity, natural gas, water, or transportation. Colorado residents generally purchase electricity from one of three different types of retail utilities: investor-owned utilities (IOUs), rural electric cooperatives (RECs), or municipal electric utilities. In addition, wholesale electric utilities generate electricity for sale by retail utilities in Colorado. The Colorado Energy Office provides a map of the service areas of Colorado's retail electric utilities.

Investor-Owned Utilities

IOUs are private for-profit companies and operate as state-sanctioned monopolies that are regulated by the PUC. Two electricity IOUs currently operate in Colorado: Public Service Company of Colorado (more commonly known as Xcel Energy) and Black Hills Energy. Xcel Energy serves the Denver/Boulder area, Northern Colorado, parts of the central mountains and Western Slope, as well as portions of Southern Colorado and provides electricity to approximately 1.6 million Colorado customers. Black Hills Energy serves portions of the state south of Colorado Springs, including Pueblo, and provides electricity to approximately 100,000 Colorado customers.

Rural Electric Cooperatives

RECs are member-owned, not-for-profit electricity providers. There are 22 RECs throughout the state, operating in every county except Denver County. RECs are not regulated by the PUC, and are overseen by a member-elected board of directors. The largest REC in Colorado, CORE Electric Cooperative, operates in 11 counties to the west, south, and east of Denver County and serves approximately 375,000 customers.

Municipal Electric Utilities

Municipal utilities are public, not-for-profit electric utilities that are operated by local governments. There are 28 municipal electric utilities located throughout Colorado, including in Colorado Springs, Fort Collins, Aspen, and other cities, altogether serving about 462,000 customers. Municipal electric utilities are not regulated by the PUC, but rather by local city councils or utility boards.

Wholesale Utilities

Wholesale utilities generate electricity for delivery and sale to other utilities, who then sell and distribute that electricity at the retail level. For example, Tri-State Generation and Transmission Association ("Tri-State") provides power to 15 RECs in Colorado and the Platte River Power Authority provides power to its four member municipalities of Fort Collins, Longmont, Loveland, and Estes Park.

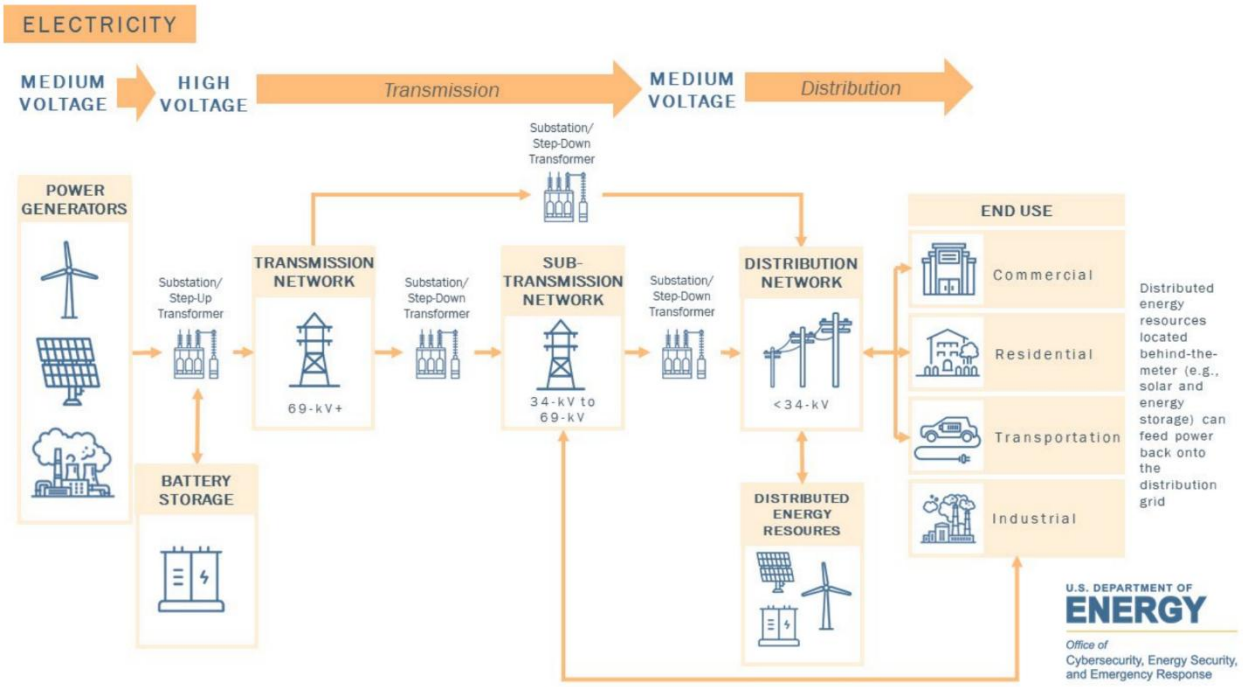
The Electricity Supply Chain

The electricity supply chain consists of three primary segments:

- generation, where electricity is produced;
- transmission, which moves power over long distances via high-voltage power lines; and
- distribution, which moves power over shorter distances to retail customers (homes, businesses, industrial sites, etc.) via lower voltage power lines.

Figure 1 provides an overview of this supply chain.

Figure 1
Overview of Electricity Generation, Transmission, and Distribution



Source: U.S. Department of Energy, "How it Works: Electric Transmission & Distribution and Protective Measures".

Electricity Generation

At power plants, utilities generate electricity using both fossil fuels, including coal and natural gas, and renewable energy sources, including wind and solar. Each generation source has associated environmental and utility planning considerations, including cost, greenhouse gas (GHG) emissions, and transmission needs. Colorado's 2024 electricity generation profile was composed of about 29 percent natural gas, 29 percent wind, 27 percent coal, 12 percent solar, and 3 percent hydropower.

Colorado's mixture of electricity generation sources has changed over time, due, in part, to Colorado's renewable energy standards and Colorado's Climate Action Plan, which aim to limit the production of GHG emissions from the burning of fossil fuels. Colorado's renewable energy standard, passed by the voters as Amendment 37 in 2004, created a system of tradable renewable energy credits and required that utilities generate certain percentages of electricity from renewable sources by 2020. Colorado's Climate Action Plan, created in 2019 by House Bill 19-1261 and amended by Senate Bill 23-016, compels utilities to reduce their GHG emissions by 50 percent by 2030 and 100 percent by 2050, relative to 2005 emissions levels.

Electricity Transmission and Distribution

After electricity is generated, it is transmitted through the electric transmission system (grid) to individual consumers. In general, transmission lines carry electricity over long distances at high voltages, then connect to substations which "step-down" the power to a lower-voltage so that it can be delivered to customers through distribution lines. However, some large industrial customers receive their electricity at intermediate voltages.

Managing transmission and distribution effectively has become a key challenge for Colorado utilities as the mix of energy generating sources changes and demand for electricity increases. For instance, rural areas of the state may be ideally located to generate solar or wind energy, but that electricity must be transported to communities that have the greatest demand, most often located along the state's populated Front Range. Additionally, existing transmission infrastructure requires updates that add capacity and promote wildfire resistance. For instance, a report by the Colorado Electric Transmission Authority (CETA) projects that, in addition to new-build projects, at least 3,000 miles of existing transmission lines in Colorado require updating or rebuilding in order to meet projected electricity demand over the next 20 years.

Distributed Energy Resources

In the traditional model of electricity transmission, electricity travels in one direction from the generating source to the customer. However, customers can also generate their own electricity and, in some cases, distribute excess electricity back into the grid using distributed energy resources (DERs)— small, modular, energy generation and storage technologies that provide electric capacity at end-user sites (e.g., rooftop solar panels). In Colorado, some electric utilities purchase the electricity produced by their customers through a net metering billing mechanism, resulting in lower utility electricity bills for customers with DERs. The use of DERs may increase both the reliability and complexity of the transmission and distribution systems, and are increasingly accounted for in utilities' resources planning processes.

Microgrids

A microgrid is a group of interconnected electric loads and DERs that can function as a single, controllable entity. Importantly, microgrids can operate either in connection with the larger electrical grid ("grid-connected mode") or independently from the utility grid when necessary, such as during an outage resulting from an extreme weather event ("island mode").

Microgrids can range in size from providing service to a single building, multiple buildings, or an entire community. The deployment of microgrids has been targeted to serve isolated rural

communities and critical facilities like hospitals and fire stations in order to operate with little or no interruption even in the event of an outage on the larger grid system.

Balancing Authorities

Balancing authorities are responsible for maintaining the safe and reliable operation of the electric power system by ensuring that power system demand and supply are always balanced. Balancing authorities also manage transfers of electricity (interchanges) with other balancing authorities and optimize the use of various generation sources to minimize costs.

There are more than 60 balancing authorities in the U.S. They are typically either utilities, power marketing administrations, or a group of utilities that have formed regional entities called regional transmission organizations and independent system operators.

Regional Transmission Organizations and Independent System Operators

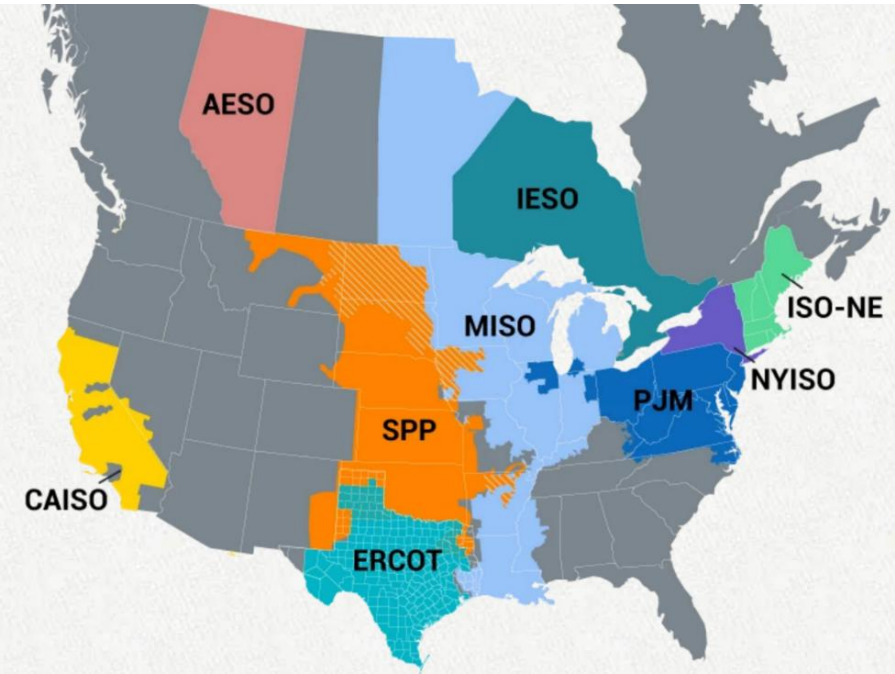
In some regions of the U.S., coordination, control, and monitoring of single-state or multistate electric grids are managed by entities known as Independent System Operators (ISOs) and Regional Transmission Organizations (RTOs). ISOs and RTOs are independent, non-profit, membership-based organizations that:

- manage a competitive wholesale power market;
- operate the high-voltage electricity grid across a wide region; and
- plan for the long-term needs of its regional electricity power system.

RTOs and ISOs are very similar to one another, with the primary difference being that RTOs tend to cover larger geographic areas. The Federal Energy Regulatory Commission created ISOs and RTOs to foster competition for electricity generation among wholesale energy market participants and promote non-discriminatory, reliable access to transmission services. The ISOs and RTOs that operate in North America, whose service territory is shown in Figure 2, include:

- Alberta Electric System Operator (AESO)
- California Independent System Operator (CAISO)
- Electric Reliability Council of Texas (ERCOT)
- Independent Electricity System Operator (IESO)
- PJM Interconnection (PJM)
- Southwest Power Pool (SPP)
- Midcontinent Independent System Operator (MISO)
- New York Independent System Operator (NYISO)
- ISO New England (ISO-NE)

Figure 2
Service Territories of ISOs and RTOs in North America



Source: ISO/RTO Council.

Each ISO/RTO operates energy and ancillary services markets in which electricity buyers and sellers can bid for or offer electricity generation. ISOs/RTOs use these bid-based markets to determine the least-cost dispatch of generation resources at a given time of day. Most RTO/ISO electricity market transactions are done one day in advance ("day-ahead market"), relying on load and weather forecasting to predict demand and allow power generators time to prepare for operation. The remaining electricity market transactions take place in the real-time market, which is typically run at short intervals throughout the day to balance real-time, unforeseen changes in demand, generation outages, or transmission constraints.

ISOs/RTOs do not directly serve retail customers or own any transmission assets themselves. Rather, transmission-owning members such as utilities, independent transmission companies, or federal agencies agree to let the RTOs largely manage the power on their systems and perform long-term planning in exchange for compensation. RTOs and ISOs are made up of many types of members, including:

- IOUs, RECs, and municipal utilities;
- independent power generators, transmission companies and load-serving entities; and
- other entities such as power marketers, energy traders, and large retail energy customers.

Today, approximately two-thirds of the nation's electricity load is served within ISO or RTO regions. However, large sections of the U.S., primarily the Southeast and much of the West and Southwest, are not covered by an RTO or ISO. In these areas, electric systems are typically run by vertically integrated utilities, which are utilities that own and manage the entire process from electricity generation to transmission and distribution to end users.

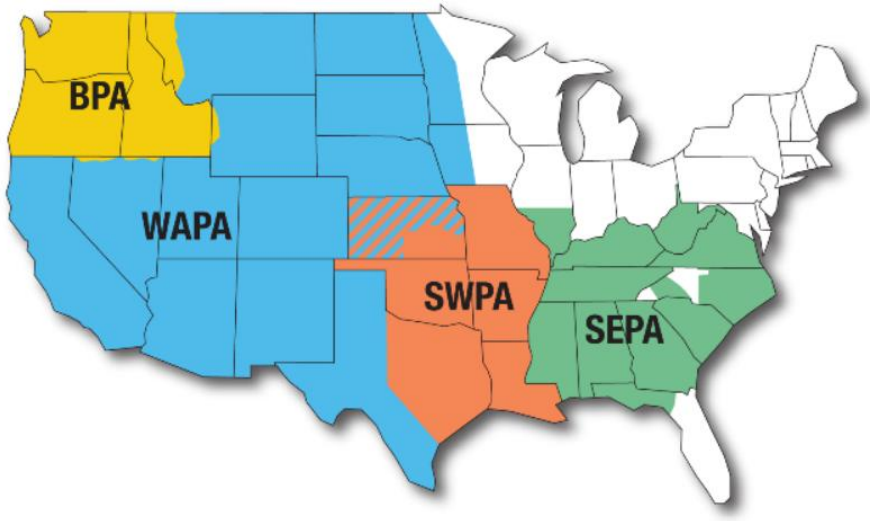
Senate Bill 21-072 created CETA and required transmission utilities to join an organized wholesale markets (RTO) by 2030, among other things. While utilities in Colorado have historically not participated in an ISO or RTO, several entities are joining the SPP RTO in 2026 as it aims to expands into the western U.S. transmission grid system, commonly referred to as the Western Interconnection.

Power Marketing Administrations

Power Marketing Administrations (PMAs) are federal agencies under the U.S. DOE that that provide transmission services and market and deliver wholesale electricity from federally owned hydroelectric dams to utilities and Indian tribes across 34 states. The four PMAs within the DOE, whose service territory is shown in Figure 3, include:

- the Bonneville Power Administration (BPA);
- the Southwestern Power Administration (SWPA);
- the Southeastern Power Administration (SEPA); and
- the Western Area Power Administration (WAPA).

Figure 3
Service Territories of U.S. Power Marketing Administrations



Source: Western Area Power Administration.

PMAs generally only provide service to regions that are within the watershed area of federally owned hydroelectric dams. Colorado is within WAPA's service territory and buys both wholesale electricity from some WAPA hydroelectric projects as well as transmission capacity on WAPA's transmission infrastructure. Some PMAs have integrated into RTOs or ISOs to participate in wholesale energy markets. For instance, portions of WAPA are joining the SPP RTO in 2026.

Regulatory Entities

Federal Level

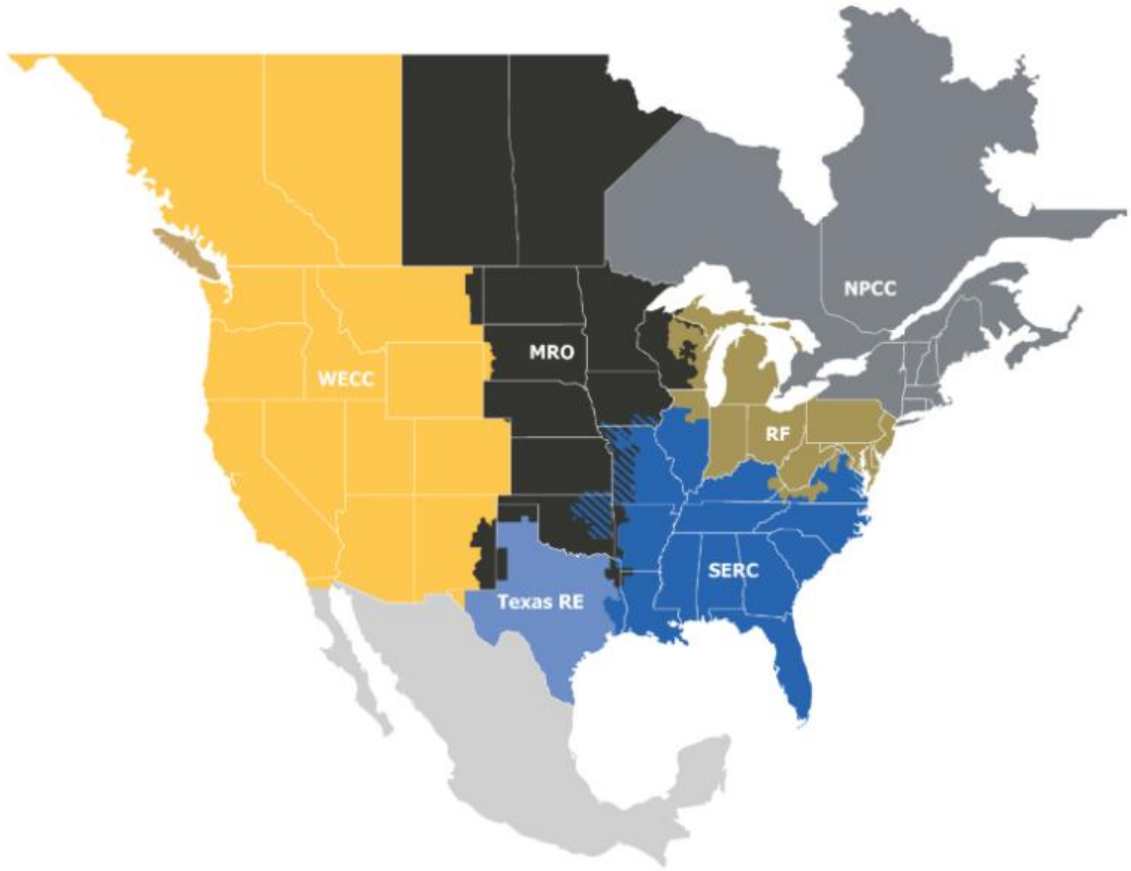
The Federal Energy Regulatory Commission (FERC) is an independent federal agency within the DOE that regulates the interstate transmission of electricity, natural gas, and oil, among other responsibilities. FERC's jurisdiction and regulatory authority are largely focused on interstate energy transactions, the development of a reliable energy infrastructure, and the protection of wholesale customers from unjust or unreasonable rates and undue discrimination or preference.

The North American Electric Reliability Corporation (NERC) is a not-for-profit, non-governmental international regulatory authority to which FERC has delegated authority to create and enforce reliability standards for North America's electrical grid. All utilities in Colorado that connect to the bulk power system, including those that are not regulated by the PUC, must adhere to NERC reliability standards. NERC works with six regional entities, which propose regional reliability standards, engage in compliance monitoring and enforcement activities, and perform reliability assessments. NERC's six regional entities are:

- Midwest Reliability Organization (MRO)
- Northeast Power Coordinating Council (NPCC)
- ReliabilityFirst (RF)
- SERC Reliability Corporation (SERC)
- Texas Reliability Entity (Texas RE)
- Western Electricity Coordinating Council (WECC)

The area regulated by each of these regional entities, shown in Figure 4, can encompass multiple balancing authorities or bisect them. Balancing authorities within each region are responsible for maintaining operating conditions under the mandatory reliability standards issued NERC and approved by FERC. The WECC is responsible for ensuring reliability within the Western Interconnection, which includes Colorado.

Figure 4
NERC Regional Entities



Source: NERC Regional Entities.

State Level

Colorado's PUC is a three-member board within Colorado's Department of Regulatory Agencies. The members of the commission are appointed by the Governor to serve staggered four-year terms. In Colorado, the PUC oversees:

- investor-owned utilities that administer electric, gas, steam, or water;
- telecommunication carriers and services such as 911, and communication services for persons who are incarcerated;
- transportation services such as movers, booting, and towing;
- transportation network companies (e.g., Lyft and Uber);
- pipeline safety; and
- rail and light rail safety.

The PUC has the full authority to regulate the rates charged and the services provided by IOUs in Colorado in order to ensure fair pricing and reliable delivery of service. IOUs are required to file all rate changes with the PUC for approval. The PUC also regulates an IOU's return on equity (ROE), which is the authorized rate of profit that a regulated utility is allowed to earn on its shareholders' invested capital. Finally, the PUC reviews IOUs' infrastructure improvement plans and the effect of those plans on consumer electricity rates.

As a wholesale electric cooperative, the rates charged by Tri-State are not subject to regulation by the PUC. However, Senate Bill 19-236 gave the PUC some authority over Tri-State's resource planning by directing Tri-State to submit a binding electric resource plan that reduced the utility's carbon emissions 80 percent by 2030 relative to 2005 levels.

The Office of the Utility Consumer Advocate is a non-regulatory office within Colorado's Department of Regulatory Agencies that represents the public interest in front of state and federal regulatory bodies and advocates for quality, reasonably priced utility service.

Electricity Pricing

Wholesale Electricity Pricing

Wholesale electricity is sold at no profit and rates are set to cover the costs associated with building, maintaining, and operating the infrastructure to generate and transmit electricity. Wholesale electricity is sold by power generators and bought by retail utilities and retail suppliers, who in turn provide the electricity to retail customers. Rates fluctuate throughout the day as supply, demand, and transmission congestion impact market conditions.

Retail Electricity Pricing

Retail electricity pricing is the final price end-users pay, which includes the wholesale cost plus additional taxes or fees for transmission, distribution, administration, or risk premiums. For-profit utilities also include a financial ROE for owners and shareholders in their electricity prices. These costs represent a utility's "cost-of-service" and are recovered through the rates charged to customers. Retail electricity rates are often a fixed, averaged rate, though some retail utilities use time-of-use pricing where the electricity rate that a customer pays varies depending on the time of day. The day is divided into on-peak and off-peak periods, with electricity being more expensive during the on-peak period. The PUC is responsible for considering proposals for rate increases and compensation frameworks by IOUs in Colorado. Municipal and cooperative utilities do not make a profit on customer rates and set rates to cover only the cost to serve their customers.

Factors Driving Increases in Energy Prices

According to the U.S. Energy Information Administration (EIA), national residential electricity prices have increased faster than inflation since 2022, though trends differ by region. While Colorado utilities of all types, including IOUs, RECs, and municipal utilities, have announced rate increases in recent years, electricity prices in Colorado are lower than the national average.

There are a diverse set of factors influencing energy prices, and research presented in Laurence Berkeley National Lab's (LBNL) 2026 Retail Electricity Price Report suggests that no single factor is solely responsible for increasing energy prices. The factors influencing energy prices include:

- upgrades and replacement of transmission and distribution infrastructure to increase capacity, mitigate wildfire risk, and harden against extreme weather;
- inflation and supply chain constraints that increase equipment and materials costs;
- the installation of natural gas-fired, nuclear, wind, and solar generation, and battery storage;
- the expansion of transmission lines to interconnect renewable generation;
- variable natural gas and petroleum fuel prices;
- the addition of new technology, including smart meters, sensors, and automated controls, to the grid system;
- utility profit structures that incentivize large capital investments and provide large ROE; and
- changes in load from large industrial customers and behind-the-meter solar.

The EIA found that, while the cost of generating electricity makes up the largest component of the price of electricity, capital spending on the distribution system was the main driver of electricity spending increases over the last two decades.[1]

After two decades of minimal growth, U.S. electricity demand has grown steadily since 2020. According to the Grid Strategies 2025 load growth report, new large-load data centers are on average the largest driver of U.S. electricity demand growth, though the factors driving load growth differ by region. Other factors include electric vehicle adoption, onshoring of manufacturing, oil and gas production, and electrification of industry and buildings.

New generation and transmission resources are being deployed in order to meet increased demand, which can cause retail electricity rates to either increase or decrease depending on how costs are allocated. CETA reports that Colorado's transmission grid will require an investment of about $4.5 billion over the next 20 years in a business-as-usual scenario, with an additional $4.2 billion required in the case of high-load growth.

[1] LBNL's Visualizing Utility Expenditures Tool provides an interactive view of utility expenditures.