

US GRIDS RAMP UP INVESTMENTS TO TACKLE AI POWER CRUNCH



Image: REUTERS/Jonathan Ernst

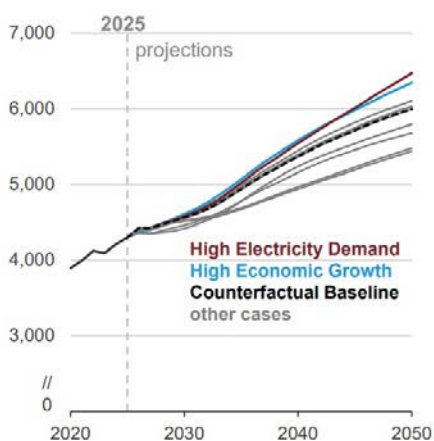
INTRODUCTION

Grid operators and utilities urgently need to expand the U.S. power network to accommodate surging demand from data centers and electrification, creating major opportunities in the supply and construction of grid infrastructure.

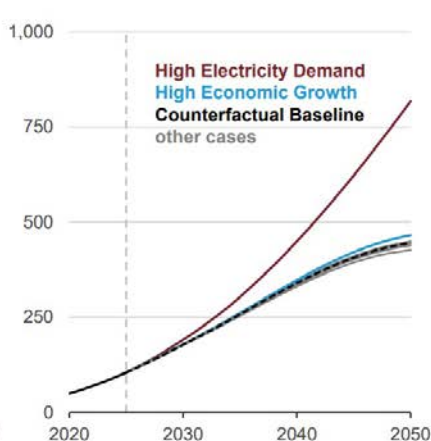
After years of stagnant growth in power demand, electricity use in the U.S. is expected to increase by 25% to 50% by 2050, according to the Energy Information Administration (EIA).

Forecast US power consumption

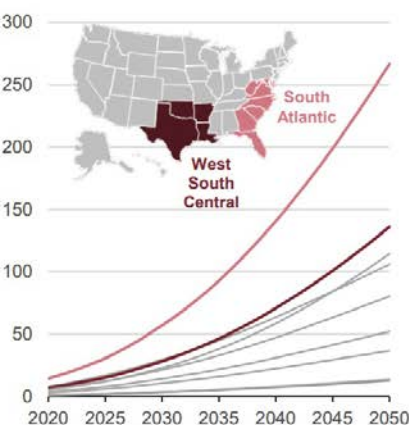
Total electricity consumption, all sectors
billion kilowatthours



Commercial data center server electricity consumption
billion kilowatthours



Commercial data center server electricity use, High Electricity Demand case, by census division
billion kilowatthours



Data source: U.S. Energy Information Administration, *Annual Energy Outlook 2026*, April 2026

Source: U.S. Energy Information Administration (EIA)

Massive deployment of grid infrastructure is required to accommodate rising clean power capacity and new gas-fired generation and to minimize grid congestion which is already impacting power generation revenues.

Over 2,200 GW of planned U.S. power capacity was waiting for grid approval in June 2026, compared with 1,400 GW of total installed capacity, according to RMI, a non-profit clean energy research group.

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Investor-owned utilities plan \$1.1 trillion in grid upgrades and expansions across the U.S. to support soaring power demand from 2025 to 2029, according to industry association Edison Electric Institute.

Grid operators have announced scores of projects to expand transmission networks and upgrade existing lines with HDVC cables, but deployment is being held back by long development times.

Long-distance power lines take several years to complete and data centers need power in a much shorter timeframe. Developers are encountering siting and permitting challenges as well as supply chain constraints and they are turning to multiple power generation technologies as they seek to prioritize speed of connection. Hyperscalers are venturing into new regions and many are building on-site generation to curb delays.

To manage rising demand, grid operators including SPP and MISO are rolling out crucial multi-year expansion plans, and

operators are prioritising new loads that can bring their own power generation. Long-distance transmission lines under development could open up massive opportunities for clean power developers, and transport power from areas with high solar and wind resources to large consumption hubs.

Supply chain shortages mean order books are bulging for suppliers of key components for new power lines and the upgraded technology needed to overhaul existing transmission infrastructure.

Grid enhancing technologies and flexibility tools such as virtual power plants are another key area of growth, helping grid operators minimise short-term supply issues as they roll out multi-year transmission projects.

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GRID EXPANSIONS

Expansion of transmission lines has been slow, despite federal orders requiring transmission providers to create long-term plans and reform cost allocation processes.

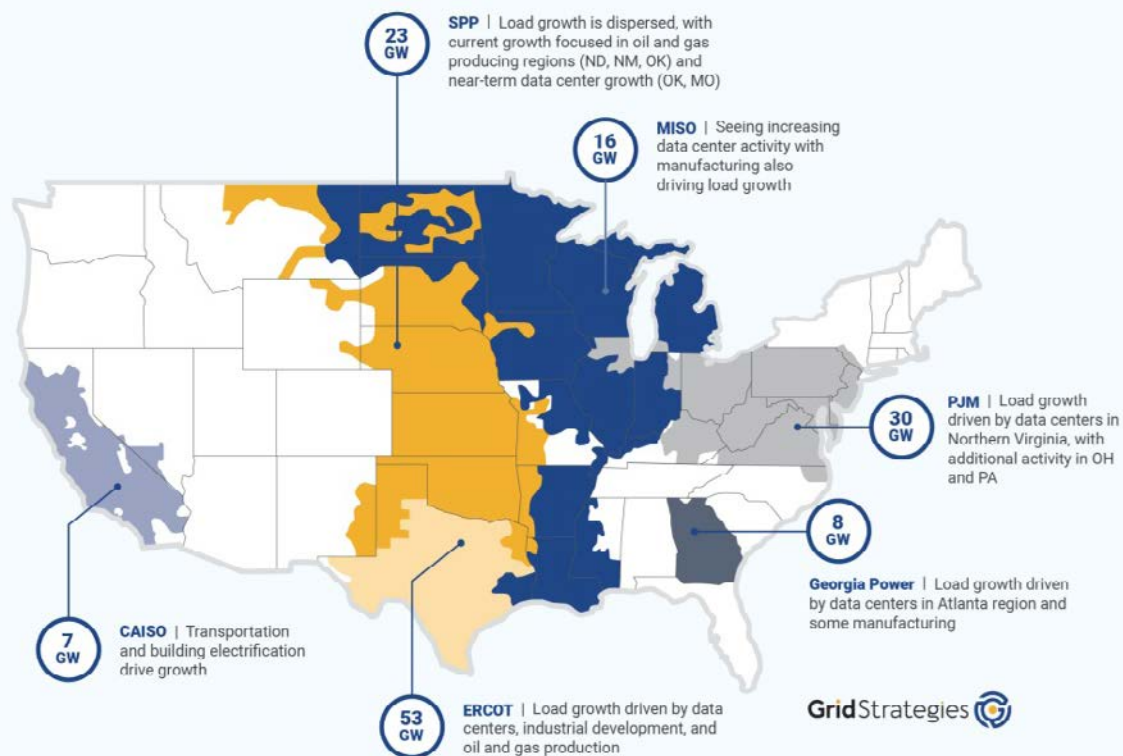
Federal Energy Regulatory Commission (FERC) order 1920, issued in 2024, requires transmission providers to develop long-term plans to integrate more clean energy into the grid and meet new power demands. But a fragmented national grid along with local permitting and supply chain challenges have held back projects.

The U.S. hosts seven major Regional Transmission Operators (RTOs) and Independent System Operators (ISOs), and three mostly-independent electrical networks.

Parts of the Southeast and West rely on utilities to coordinate power transfers and nationwide around 3,000 electric distribution companies transport power to consumers across local networks, including investor-owned utilities, public-owned utilities and rural electric cooperatives.

Sharp upswings in power demand have complicated grid planning and transmission developers must work with multiple stakeholders, including utilities, RTOs, regulators, and state authorities. Power line projects take years to complete and can be derailed or re-routed due to cost concerns or local opposition.

Key US load growth regions through 2030 (predictions)



Source: Grid strategies, November 2025.

Some regions are progressing faster than others. CAISO in California, the Midcontinent Independent System Operator (MISO), which covers five states in the Midwest and South, and the Southwest Power Pool (SPP), have conducted “a few rounds of good long-term proactive planning,” said Rob Gramlich, President of Grid Strategies, a consulting firm that specializes in transmission policy.

Other operators are “falling behind,” he added.

SPP will release its largest ever long-term transmission planning portfolio in November, Casey Cathey, VP for Engineering at SPP, told Reuters Events.

A centerpiece will be an “overlay” of 765 kV extra high-voltage regional transmission lines that builds upon the existing 345 kV line backbone. The overlay will span the 14 state SPP region in the eastern interconnection.

SPP has so far approved five 765 kV projects in its southern territory, and is working on five 500 kV lines in the southeastern part, including Arkansas, Oklahoma, Texas, and Louisiana “to further strengthen the connection and transfer capability between MISO and SPP,” Cathey said.

These high-voltage lines will help meet a boom in power demand from data centers and manufacturing facilities, such as ammonia and aluminum plants, as well as the electrification of industries including oil and gas and transportation.

SPP forecasts 110 GW of load growth over 10 years, with 70% taking place over a five-year horizon.

Most of the new power will be generated by natural gas facilities, but solar and batteries are also planned.

“For the last two years, we’ve seen over 10 times more gas than we’ve seen in history in our queue. I think the number of natural gas plants waiting for interconnection is over 30 GW now,” Cathey said.

MISO forecasts a five-year compound annual growth rate of 3.1% to 5.1% over the next five years, with proposed data center projects accounting for over 20 GW of new demand.

MISO in February unveiled a preliminary transmission expansion plan that includes 236 miles of new 500 kV lines, two new

substations, and upgrades to several existing substations in Louisiana and Arkansas to help utility Entergy meet increased demand.

In December 2024, MISO’s board approved a Long-Range Transmission Planning (LRTP) initiative that includes 3,631 miles for regional projects in MISO’s Midwest subregion (which includes Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, North Dakota, South Dakota, and Wisconsin).

“This tranche includes plans to develop a 765 kV backbone across the Midwest to improve transfer capability, reduce congestion, and enable states to share resources more efficiently as large power centers like data center hubs develop,” a MISO spokesperson told Reuters Events.

“As is the case across the country, developers in MISO’s footprint face challenges related to siting and permitting, supply chain constraints, and local land use concerns,” the spokesperson added.

SPP is also implementing policies to shorten grid connection waits. The High Impact Large Load Generation Assessment (HILLGA) aims to provide grid connection agreements in under 90 days to data centers that bring their own power generation, often on site, to support their load.

SPP’s Conditional High Impact Large Load Service (CHILLS) seeks to give data centers immediate, non-firm conditional access to the grid for up to seven years, with the caveat that data centers might face curtailment.

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SUPPLY CHAIN CHALLENGES



Image: REUTERS/Morris MacMatzen

The rush to build transmission infrastructure has led to shortages of grid components and rising costs. For instance, U.S. demand for generator step-up (GSU) transformers hiked by 274% between 2019 and 2025 and demand for substation power transformers rose by 116%, according to Wood Mackenzie.

To reduce the supply gap, manufacturers are expanding U.S. transformer production capacity and increasing the supply of HDVC cables, switch gears, and circuit breakers.

Siemens in February said it planned to invest \$421 million in manufacturing facilities in North Carolina, including a new transformer factory in Charlotte due online this year.

Hitachi Energy has announced more than \$1 billion in investments, including \$457 million in a new transformer facility in south Boston due online in 2028, and \$106 million in a transformer component plant in Tennessee due online in 2027.

The company is facing high demand for high-voltage products, including wires, switch gears, and high-capacity circuit breakers for

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500 kV and 800 kV transmission projects, said Andreas Wrener, VP & General Manager, Breakers & Modules, Americas at Hitachi Energy.

"In general, more high-end products will be needed because the grid needs to be stronger to be able to carry that additional load," Wrener told Reuters Events.

CTC Global, which is working with dozens of utilities to supply advanced conductors for over 250 projects, said it expects a five-fold increase on its orderbook this year.

The "fastest and cheapest value add" is by reconducting on existing rights of way on existing towers with advanced conductors, said CTC Global CEO JD Sitton.

Some projects will spawn from a collaboration between Google and CTC announced in 2025 to accelerate deployment of advanced

conductors, which the companies say can double transmission capacity in months, as opposed to years for new infrastructure.

"CTC will provide the technical solution for the utilities, which will choose the routes that it gets applied to with an eye towards helping Google data centers and providing larger grid benefits for all users," Sitton told Reuters Events.

The companies expected to announce the first round of projects toward the end of the summer, Sitton said in June.

Prysmian North America CEO Andrea Pirondini said the company is investing heavily to meet strong U.S. demand across its product line, which includes high-voltage, medium-voltage, and low-voltage cables, as well as optical fiber.

The company plans to invest \$600 million to increase production capacity of medium-voltage cables at two facilities, including Encore Wire in Texas, which was acquired by Prysmian in 2024 for \$4.2 billion.

Further investments are planned to increase HDVC capacity at Prysmian's plant in Williamsport, Pennsylvania.

"A long-term supply agreement with Invenergy supports the facility expansion," Pirondini told Reuters Events. "The order will support projects including the Grain Belt Express, New Mexico North Path, and Cimarron Link lines."

Large transmission projects like the 800-mile Grain Belt Express (from southwest Kansas to Indiana, through Missouri and Illinois), the 400-mile New Mexico North Path (across the northern part of

New Mexico), and the 800-mile Cimarron Link (in the Oklahoma Panhandle) could unlock untapped wind and solar resources.

"Expanding grid capacity will create more opportunities for renewables," Gramlich noted.

In 2021, Prysmian signed a \$900 million deal to supply cables to SOO Green HVDC Link, a 350-mile line to connect the MISO and PJM power markets. These types of interregional projects boost grid resilience because they allow regions to share capacity during stress events, including those caused by extreme weather.

Large infrastructure projects continue to face challenges in siting and permitting approvals that delay projects and push up costs.

SunZia, a 3.6 GW wind farm and 550-mile transmission line that will carry clean power from central New Mexico to south-central Arizona was completed in June 2026. Owner Pattern Energy Group began development in 2008 and underwent years of permitting hurdles before construction started in 2023.

SOO Green has largely avoided major permitting setbacks because it will be fully underground alongside an existing railroad line, Pirondini noted. Underground lines can help minimize permitting pushback but costs are typically higher than overground lines.

The SOO Green project "represents an innovative and technically sound approach to the co-location of power transmission assets within transportation corridors ... one that can certainly be replicated in other regions around the U.S.," Pirondini said.



Image: REUTERS/David Swanson

BUILD POWER FAST

Data center developers are using a range of strategies to secure firm power supplies for the years ahead, prioritizing deals that can minimize grid connection delays.

Developers are signing power purchase agreements (PPAs) with clean power and nuclear projects under development, or teaming up with developers to build new natural gas, solar or energy storage generation.

Tech companies have focused on ‘Data Center Alley’ in northern Virginia, which has the world’s highest contracts of data centers, but surging demand has prompted developers to look to other regions such as Texas. Capacity became available in Georgia following the completion of the Vogtle 3 and 4 nuclear reactors in 2023 and 2024 but “that got filled up pretty quickly,” said Gramlich.

Texas offers competitive power prices, large land areas, and favorable permitting and grid regulations. But ERCOT has been

inundated with requests, leading to grid connection delays. In June, the grid operator announced new policies to reduce the backlog, saying it was working through 438 GW of grid connection requests, 89% of which were from data centers.

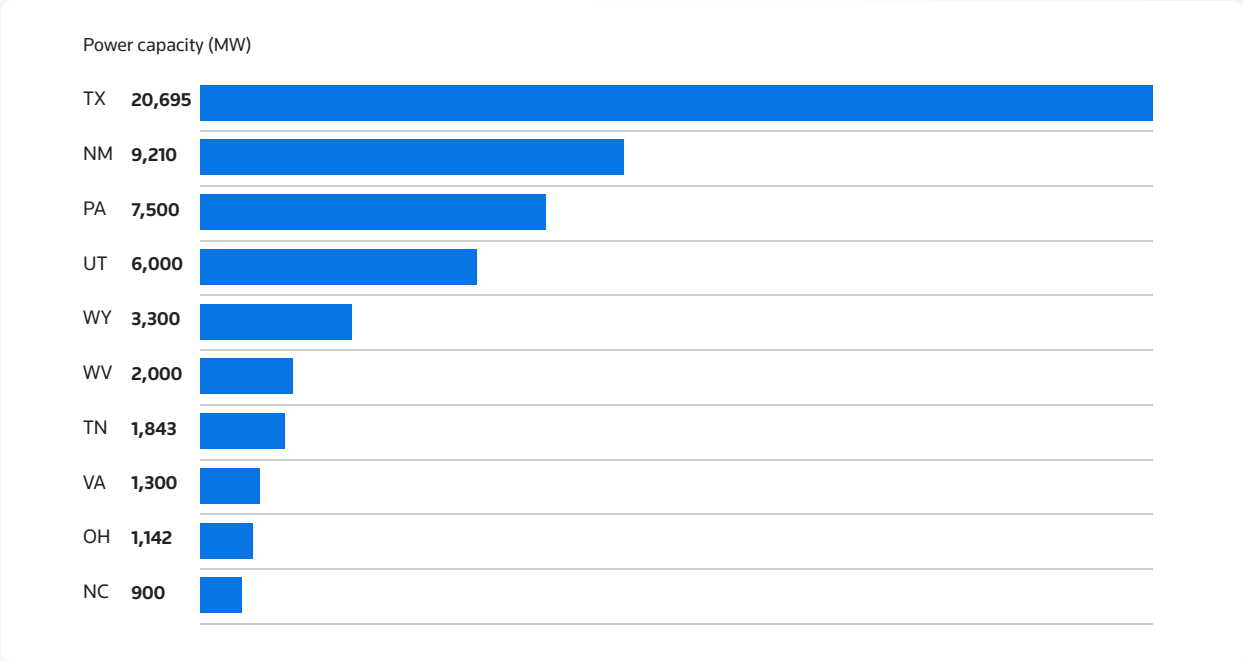
Crucial new power lines planned in Texas will take years to complete, and many data center developers are turning to on-site generation to avoid long delays.

Data center developers were planning around 56 GW of on-site power generation capacity across the United States as of February 2026, market intelligence platform Cleanview said, representing roughly 30% of all planned data center capacity.

“There’s not really spare capacity anywhere right now,” Gramlich said.

On-site power generation “is not what they want to do long term, but it might be what they have to do in the short term,” he said.

Planned behind-the-meter capacity – top states (end 2025)



Source: Cleanview

GRID-ENHANCING TECHNOLOGIES

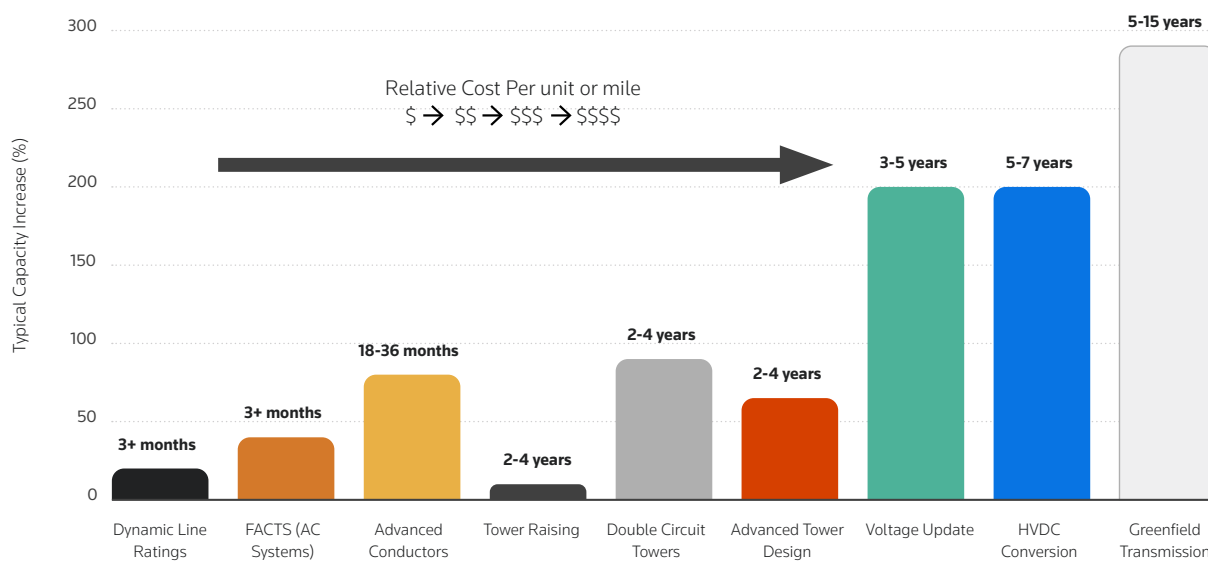
Rising grid congestion and the slow expansion of transmission capacity have spurred investments in grid-enhancing technologies (GETs) that squeeze more capacity from existing infrastructure.

Technologies including Dynamic Line Rating (DLR), Advanced Power Flow Control (APFC), and Transmission Topology

Optimization (TTO) are more economical and faster to deploy than new transmission infrastructure.

GETs could unlock over 80 GW of incremental peak capacity by reducing grid congestion and connection delays, according to research by RMI.

Capacity vs cost of advanced transmission technologies



Source: Energy Systems Integration Group (ESIG) "Utility perspectives on making grid enhancing technologies work," July 2025.

MISO is deploying GETs to optimize existing transmission lines and increase the power they can safely carry, the RTO said, noting that "these technologies complement, rather than replace, the need for large scale, steel in the ground transmission projects."

GETs are a useful short-term tool to extract more value from the

grid, "while the larger infrastructure comes into play," SPP's Cathey said. SPP estimates that it will take at least "six or seven years" to build 765 kV lines.

However, GETs deployment has been slow, in large part because these are new technologies that need to be rolled out gradually

and in combination with one another to significantly increase transmission rates. But also because capital assets investments offer bigger regulated returns for utility shareholders, whereas GETs are often considered operational expenses.

A March 2026 study by the Brattle group highlights how demand flexibility tools could be deployed to create more power system headroom. This broad suite of technologies includes GETs, flexible distributed energy resources, storage, virtual power plants (VPPs), and energy efficiency solutions, among others.

Under VPP deals, data centers will effectively “pay other customers in that area to reduce their load or shift their load out of the peak hours to create additional system headroom,” explained Brattle analyst Ryan Hledik, the lead author of the report.

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Sunrun, Tesla, and Renew Home in June said they planned to create a 16 GW VPP that will provide energy to tech giants and utilities.

The system would provide dispatchable capacity by activating hundreds of thousands of home battery systems operated by Sunrun and Tesla. Power demand would be reduced by adjusting more than 8 million smart thermostats and devices managed by Renew Home, the companies said.

In May, Google signed a three-year agreement with technology platform Voltus to create a 100 MW VPP by aggregating batteries, smart thermostats and other flexible assets.

“Google is exploring partnerships to basically compensate vertically integrated utilities to expand their demand side management portfolio and create new capacity for load growth as a result,” Hledik told Reuters Events.

By increasing demand flexibility, aggregators like Voltus could create at least 200 GW of “demand response capability across utilities and in wholesale markets,” Hledik said.

– Eduardo Garcia, July 2026

