Powering the future of US data centers

How electricity providers can overcome bottlenecks and supercharge growth

accenture

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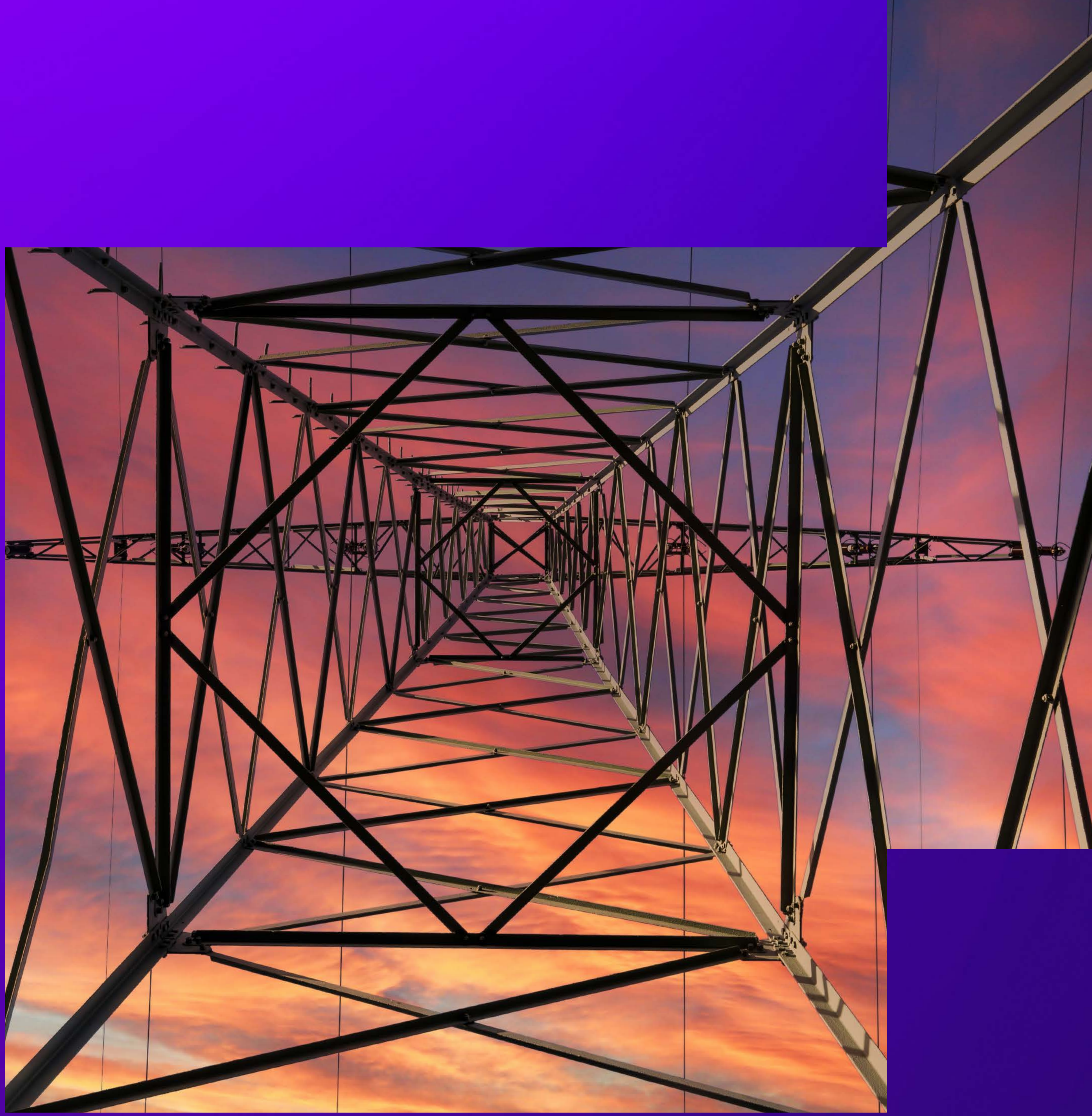

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Executive summary

Anticipated surges in the electricity needs of data centers could lead to infrastructure bottlenecks that hamper growth and technological advances. In response, electricity providers must rethink their business models, embrace emerging technologies and navigate complex regulations to secure the reliable, scalable energy supply that will power the future of technology.

Over the past decade, the data center market has experienced unprecedented growth and is poised for even more expansion. This high-intensity, spatially concentrated growth is reshaping the energy landscape, intensifying the strain on both utility and non-utility electricity providers to deliver the consistent, reliable power needed to keep data centers operational 24/7. In addition to existing services, this round-the-clock energy supply is crucial to power the advancement of generative AI and new technological capabilities.

Beyond the massive electricity requirements to support computing, data centers' extensive cooling needs further compound energy consumption, adding another layer of complexity to an already constrained power infrastructure. These hurdles, combined with the escalating energy needs, are driving customers to explore alternatives to traditional data center power sources. They include on-site and behind-the-meter approaches, both of which have their own distinct technical and regulatory challenges to consider.

Our forecast indicates that renewables—favored by large technology companies known as hyperscalers—cannot alone keep pace with rising energy demands. It's forcing hyperscalers to adapt their approach and explore alternative energy options to complement renewable power. Energy sources such as gas-based power generation and nuclear power from small modular reactors will play a key role in the energy mix going forward.

However, it is important to ensure seamless connection between new power sources and data center grids. And while power generation has traditionally been concentrated near demand centers in the East and West coast of the US, data centers are now clustering in regions offering affordable, reliable power and other strategic advantages.

Electricity providers must reimagine traditional approaches and commit to a new set of recommended actions for short-, medium- and long-term success. This requires a bold departure from business as usual and a move towards modernizing grids, embracing emerging technologies and forging deeper partnerships with hyperscalers and regulators.

In this report, we discuss the challenges that come with the surging growth of the US data center market and the steps electricity providers can take to resolve looming bottlenecks and power the future of technology. This will not just accommodate increasing demand but also supercharge their own growth.

About the research

To better understand the impact on the utilities sector, we undertook a regionalized modeling exercise that estimates future US data center electricity consumption over the next decade. The model projects power demand across three scenarios of low growth, base growth and high growth, considering factors such as installed GPUs, server utilization and cooling requirements. It also includes transport and distribution losses, capacity factors and regional generation mixes. Supply investment needs are assessed based on supply-demand imbalances and unit costs by energy source, using data from EIA, Gartner, IDC and financial institutions.

Unprecedented growth and unforeseen challenges

According to our research, power consumption by data centers could surge to over 7% of total US electricity by 2028 and increase to 16–23% by 2033. Compared with 5% power consumption in 2024, these projections represent significant increases.

To put this power increase into historical perspective, per capita energy use in the United States grew from 150 annual GJ per capita in the early 1900s to nearly 380 annual GJ per capita in the late 1970s.[1,2] This surge was driven by rapid industrialization, widespread electrification and economic expansion. Data center energy consumption is projected to be similarly impactful, albeit with a compressed timeline, marking a significant shift in the nation's energy landscape. In this way, the rise of data center energy demand may mirror the industrial boom of the mid-20th century, marking a transformative shift in how the U.S. will consume power in the coming decades.

The rapid adoption of AI and cloud, increasing consumer data services, and the evolution of computing technology are some of the key drivers fueling a surge in demand. All of this coupled with federal and state incentives is driving massive investments and job creation in this space by technology firms.

Data centers benefit the economy by fostering partnerships and projects across various industries. In addition, data centers contribute to local business growth, boost real estate, increase tax revenues and improve infrastructure development. Investments from major tech companies—such as Google, which recently committed $3 billion to new facilities in Virginia and Indiana—highlight the market's value.[3] And the market's growth is strongly supported by government incentives like tax benefits and talent development.

For instance, the Stargate AI initiative aims to invest $500 billion to develop large-scale data centers in the US in support of AI technologies, necessitating a rapid scaling of energy infrastructure. While renewables will play a key role in meeting some of this demand, nuclear and natural gas is expected to fill much of the gap. Recent executive actions further emphasize the role of natural gas in the country's energy strategy. The development of power plants co-located with AI data centers will likely become more commonplace with such locations using fossil fuels to deliver power and take the pressure off existing baseload resources.[4]

Currently, there are over 2.6 terawatts (TW) of capacity across the US awaiting grid interconnection and with the average project timeline extending to five years, electricity providers face mounting delays in providing grid access to the growing data center sector.[5] However, the boost to economic growth comes with a massive energy cost.

In 2023 alone, US data centers consumed 176 terawatt hours (TWh) of electricity and this could increase to between 413 and 509 TWh by 2030.[6] The jump in consumption is primarily driven by data centers capable of accommodating advanced AI, which may account for 70% of overall demand surge with generative AI contributing about 40% by 2030.[7]

Figure 1:

Growth in energy requirement from data centers fueled by increase in demand and slowing gains in energy efficiency

Increase in AI and cloud computing demand

$ 270 Bn
Cloud infrastructure market

70% **Data center supply** under construction in North America's top markets jumped by about 70% compared to a year ago to a record 3.9 GW

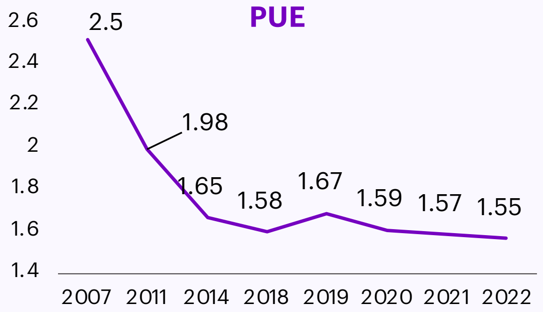
37.3%
Annual growth rate of data through 2030

$ 2.2 Bn
North America mobile edge computing market is expected to grow by 32.2% annually and reach $2.2 Bn by 2030

$ 100k/day
Cost of Cloud for the latest versions of LLMs vs $40k/day for the older versions

100 Tn MB
North America recorded use of 100 Tn MB of **wireless data** in 2023 (growth of 36% YoY)

Stagnation in PUE



- Gains in **power usage efficiency (PUE) have been stagnant** over the decade.
- The gains prior to that have been majorly **driven by hyperscale data centers** due to scale and use of AI-based energy optimization solutions.
- Stagnating PUE gains **limit the opportunity** for data centers to **scale up compute power** and **drive down cost** of operation

Source: "AI fuels cloud computing boom for tech giants" Reuters News, May 1, 2024: D1. Factiva, Inc. All Rights Reserved; Tom Hawkes. "The case for private clouds for data management in government" Federal News Radio, December 16, 2024: D1. Factiva, Inc. All Rights Reserved; George Lawton. "The future of cloud computing: Top trends and predictions" SearchSecurity.com, November 1, 2024: D1. Factiva, Inc. All Rights Reserved; "North America sees 70% jump in data center supply in construction, CBRE report says" Reuters News, August 20, 2024: D1. Factiva, Inc. All Rights Reserved; Taiwan News, "North America Mobile Edge Computing (MEC) Market is Estimated to Grow Incredible CAGR till 2033", December 2024: D1, Factiva, Inc. All Rights Reserved; "Americans used record 100 trillion megabytes of wireless data in 2023" Reuters News, September 10, 2024: D1. Factiva, Inc. All Rights Reserved

AI's increasing appetite for energy

To support both the prolific growth and sustainable operations of AI data centers, advanced cooling systems are quickly becoming must-haves. Traditional air-cooling technologies are still commonplace but emerging solutions like liquid immersion are gaining popularity—liquid cooling can reduce power usage effectiveness (PUE) by 23%.[8] These systems also help reduce the demand for water used to cool data centers, which in turn alleviates the pressure on water supplies. However, while advancements in liquid cooling technology have significantly reduced water demand for data centers, making it less of an issue in site selection, water availability remains a relevant consideration especially in hotter climates. Ensuring a reliable and sustainable water supply is still vital for the operational and environmental sustainability of data centers within these regions.

Data centers have emerged in locations that offer a mix of benefits. From economic incentives to land availability, reliable utility interconnections and robust fiber connectivity, data center operators tend to seek as many favorable attributes as possible when scouting for locations. Clusters have sprung up in places like Virginia and Kansas City—which have the necessary infrastructure readiness and resources—shifting the focus away from traditional coastal hubs.

These locations tend to have access to reliable, low-cost energy and are found in favorable climates for cooling. They typically also offer robust connectivity, strong regulatory frameworks and are in proximity to key markets and tech hubs, making it easier to develop data centers compared to less established regions.

Hyperscalers demand clean, dependable and affordable power supply

Leading technology companies are driving the future of renewable energy adoption for data centers. Companies like Meta, Google and Microsoft are investing in renewable energy solutions. Meta plans to allocate $10 billion to build out an AI facility in Louisiana. Google partnered with Intersect Power to co-locate clean energy parks, while Microsoft signed a 10.5 GW renewable power purchase agreement. These initiatives are transforming the energy mix for data centers, making sustainability integral to operations.[9] However, it should also be noted that many hyperscalers are investing in nuclear power solutions to achieve their energy needs as renewables alone are unable to meet demand. They are looking to co-locate nuclear power supply with their data centers and bypass the grid completely. Hyperscalers also prefer locations near reliable, cost-effective power sources, focusing on regions with available energy and scalable grid infrastructure.

Before the gold rush: Balancing bottlenecks and business

The changing geographic distribution of data centers is further straining the power grid, with electricity providers facing mounting challenges to deliver affordable, dependable and clean energy where it's needed most.

The ever-increasing demand for energy is putting transmission and distribution (T&D) infrastructure under immense pressure.

Transmission capacity increases by 2035[10]

128%
increase within regions

412%
increase between regions

With existing multi-year delays in grid interconnection—the system by which neighboring power grids are connected to one another to improve reliability, efficiency and constant power supply—the surge in data center energy needs is impacting electricity providers' ability to quickly meet demand.

The concentration of data centers in a few key regions presents significant challenges for electricity providers. As of 2023, 80% of the nation's data center electricity consumption was concentrated in just 15 states, with Virginia, Texas and California leading the way. In Virginia alone, data centers accounted for nearly a quarter of the total electricity consumption.[11] Regional transmission organization PJM, which includes Virginia, accounted for 31% of the total US data center electricity consumption in 2023, and our modeling estimates that data centers could consume up to 20% of PJM's overall electricity demand by 2030.[12] This geographic imbalance leaves some regions overwhelmed and others underutilized. Electricity providers must adopt tailored strategies, including localized grid enhancements, to meet regional surges in demand while ensuring equitable energy distribution nationwide.

Keeping climate risks in mind

When selecting sites and locations for data centers, it is crucial to consider climate risks—like the Californian wildfires—that could affect operations and reliability. These risks include the potential for extreme weather events such as tornadoes and flooding, which can cause physical damage, disrupt power supply and reduce the availability of essential resources. To ensure the resiliency of data center operations, especially in areas prone to these climate events, electricity providers and planners should conduct thorough climate risk assessments and implement advanced measures such as elevated building designs, redundant power and cooling systems, and emergency response plans. Collaboration with government entities is also vital for developing comprehensive strategies.

Figure 2:

Data center demand growth across key US transmission regions

	Expected Power Supply Required				
	Actual 2023	Change 2023 - 2027	Forecast 2027	Change 2023 - 2030	Forecast 2030
PJM	54 TWh	78 - 93%	96 - 105 TWh	166 - 236%	144 - 182 TWh
West	33 TWh	61 - 74%	53 - 57 TWh	125 - 177%	74 - 91 TWh
ERCOT	25 TWh	42 - 50%	36 - 38 TWh	88 - 125%	48 - 57 TWh
MISO	19 TWh	62 - 75%	30 - 33 TWh	124 - 174%	42 - 51 TWh
Southeast	17 TWh	70 - 84%	30 - 32 TWh	142 - 199%	42 - 52 TWh
CAISO	11 TWh	70 - 83%	18 - 20 TWh	129 - 178%	25 - 30 TWh
SPP	11 TWh	82 - 98%	19 - 21 TWh	148 - 205%	26 - 32 TWh
Others	6 TWh	52 - 62%	10 TWh	89 - 121%	12 - 14 TWh

Source: Accenture Research modeling

Data center energy demand across the world is growing

It's not just the US that's experiencing unprecedented energy demand driven by data centers. The global data center industry is also expanding at an extraordinary pace, with workload capacity projected to grow over 40% annually through 2027, underscoring its centrality to modern life.[13] However, this growth naturally means a significant increase in energy consumption, which is already under scrutiny due to emissions. It tests the limits of energy systems, influencing the reshaping of global alliances as it threatens to outstrip the capacities of grids and renewable energy systems in traditional hubs. For instance, Ireland now devotes 20% of its national electricity consumption to data centers, highlighting their growing role as economic and technological keystones.

As the country reaches the limits of its energy infrastructure, it faces the challenge of sustaining growth while ensuring other industries receive a fair share of the power supply. The same question applies to the US and countries across Europe, where data center hubs have long been concentrated, thriving in cooler climates with reliable grids and mature renewable energy ecosystems. As with the US, certain countries and regions offer distinct advantages compared to others, which must be considered when choosing a location.

Potential location advantages for data centers (selected examples)

	# of data centers	Per million people	Potential location advantages
Iceland	10	25.4	Green power mix, low temperature, hi-speed connections
Luxembourg	16	23.9	Ease of doing business, strong electricity imports
US	5381	15.8	Proximity to tech hubs and consumers
Ireland	71	13.5	US/EU distance, green power imports
Switzerland	108	12.2	Ease of doing business, green power and temperature
Norway	60	10.9	Low-cost hydropower, low temperature

Source: Accenture Research analysis with data from **Datacentermap.com** and IMF. Showcasing only selected potential location advantages while recognizing several further repeating advantages, e.g. green power.

There are several additional uncertainty factors regarding where future data centers will be located. If new data center capacity was built purely based on levelized cost of energy (LCOE), the regions with lowest cost of industrial electricity, especially in the US Southeast, would see an overproportionate need for new power supply. [Figure 3]

Figure 3:

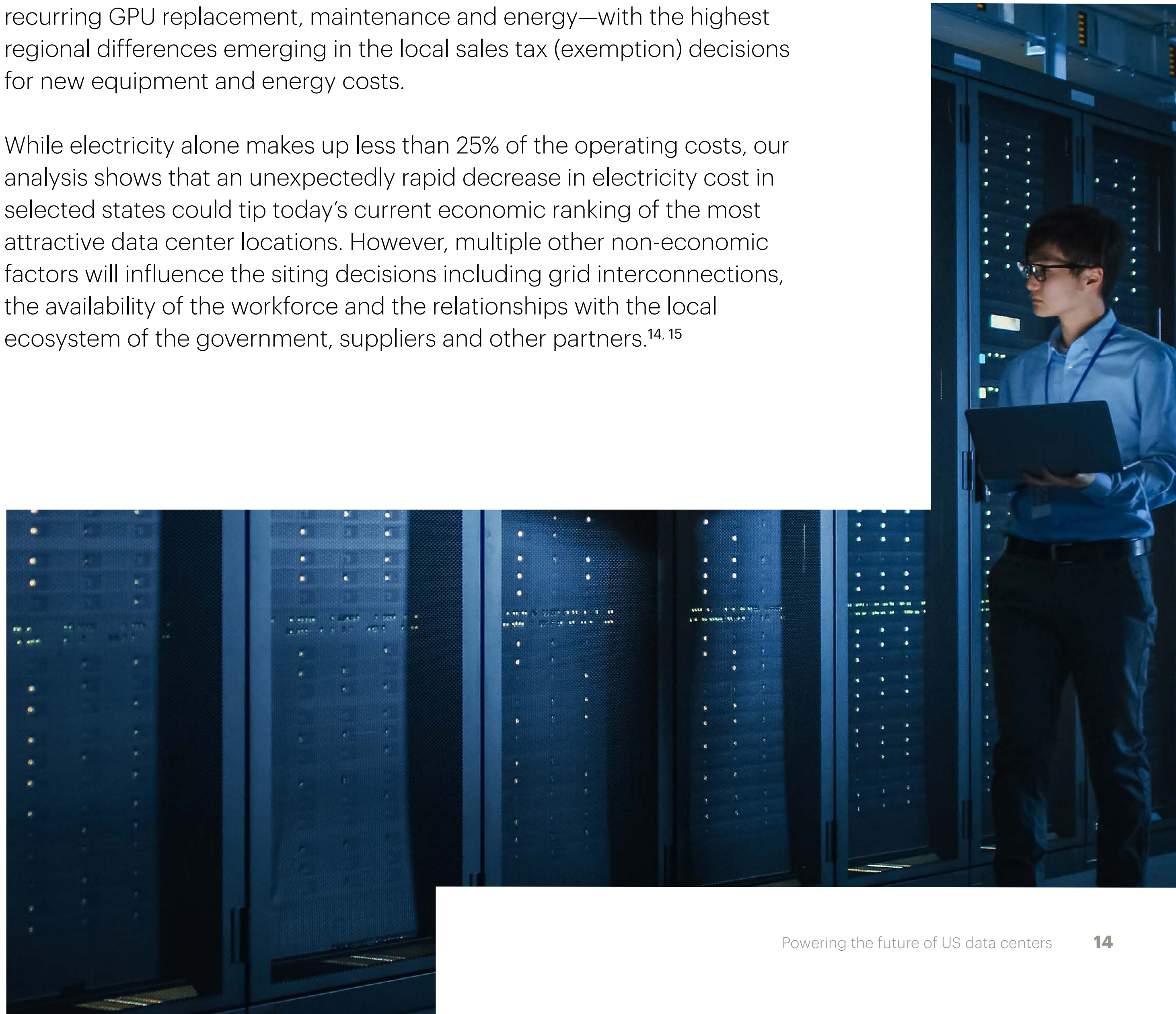
Theoretical data center power supply % split by region, with LCOE-based siting (2024-2030 new capacity)

Southeast	41%
SPP	23%
MISO	4%
West	4%
Others	28%

Source: Accenture Research modeling

In economic terms, data center siting is a sensitive business case—considering annualized capital costs (e.g. one-time construction costs, GPU/equipment replacement costs) and the annual operating costs (labor, maintenance and energy). The substantial cost components include the recurring GPU replacement, maintenance and energy—with the highest regional differences emerging in the local sales tax (exemption) decisions for new equipment and energy costs.

While electricity alone makes up less than 25% of the operating costs, our analysis shows that an unexpectedly rapid decrease in electricity cost in selected states could tip today's current economic ranking of the most attractive data center locations. However, multiple other non-economic factors will influence the siting decisions including grid interconnections, the availability of the workforce and the relationships with the local ecosystem of the government, suppliers and other partners.[14, 15]



Balancing net-zero commitments with growing demand

While renewable sources like wind and solar are central to long-term sustainability goals, they are intermittent and require advanced energy storage to fully support high-demand operations like data centers. Natural gas and nuclear energy, along with other options like geothermal and bioenergy, can help ensure a stable and clean energy supply. Fossil fuels are expected to fill the gap, which will increase in the coming years as demand grows.

Electricity providers must also balance key business needs and sustainability initiatives. Capital expenditure (CapEx) planning is essential to factor in the variability of demand from data centers. For example, per our research, an additional CapEx of $58-89 billion would be required for incremental generation builds in the US till 2030.[16] Electricity providers must prioritize their green goals, comply with clean energy standards and prepare for the energy transition.

Smarter grids can enhance capacity and reliability

Outdated transmission infrastructure represents a significant bottleneck in meeting data center power demand. Beyond expanding grid capacity and coverage, electricity providers must also focus on non-infrastructure actions like enhanced demand response programs to dynamically manage rising loads. Electricity providers can also introduce new regulations like tariffs that incentivize efficient energy use and grid-friendly practices for large customers. Integrating smart technologies, automation and proactive regulatory measures will help balance grid reliability and growing energy demands.

Nuclear can be a solution but comes with challenges

Nuclear energy, including both large-scale facilities and small modular reactors (SMRs), presents a reliable, low-carbon power source for data centers. However, nuclear energy projects require longer development timelines, which makes them a crucial part of the long-term energy strategy that must be combined with shorter-term supply solutions.

While legacy challenges like safety, waste disposal and regulatory hurdles persist, the evolving public perception of nuclear energy is becoming more favorable, especially with technological advancements enhancing safety. In this context, nuclear energy should be considered as a viable option for enabling reliable and sustainable power for data centers, especially in regions where renewable energy alone may not be sufficient.

Natural gas can help with growing clean energy needs, especially in the near-term

Natural gas can provide consistent, low-carbon power. It complements the intermittency of renewables like solar and wind, making it a transitional option while renewable energy sources and energy storage technologies are scaled up. Leveraging carbon capture and storage technologies further enhances this solution by reducing the emissions associated with gas-based generation—we've estimated a potential reduction of up to 78 million tons (MT) of CO_2 by 2030 if carbon capture and storage/carbon capture, utilization and storage (CCS/CCUS) is applied to all gas-fired power generation supplying new US data centers built after today.

Natural gas-fired, modular, fast-start and captive/off grid power generation solutions could alter the landscape completely for power hungry data centers. These are behind-the-meter solutions where gas-based power generation infrastructure is co-located with data centers and powers a microgrid that caters entirely to the data center or is shared with other consumers. Front of the meter solutions include captive gas-powered peaking plants connected to the grid. A significant portion of the additional data center power demand will be met through power plants driven by large gas turbines which might be new assets or retrofitted retired coal power plants which have switched to natural gas.[17]

As the US natural gas market, currently at 120 billion cubic feet per day (bcf/d), evolves to further support power generation, industrial applications and liquified natural gas exports, data centers are becoming a pivotal driver of growth.[18] By 2030, we're projecting data centers to add 2.9-4 bcf/d of incremental gas demand, accounting for approximately 54-62% of the power sector's growth and driving an 8-11% increase in overall gas use for power generation. And gas is expected to supply nearly 60% of the incremental power demand for data centers, enabling the sector to meet total power requirement of 26-37 GW across North America. For gas companies, meeting the rising demand will require substantial new pipeline capacity. This will drive revenue growth for midstream operators.[19]

Future trends and forecasts

To gain a better understanding of potential demand, we conducted a stress test by evaluating multiple growth scenarios ranging from conservative to aggressive projections. Our bottom-up analysis revealed that even in the lowest growth scenarios, efficiency gains alone cannot address the surging demand. Multiple unpredictable factors will affect demand:

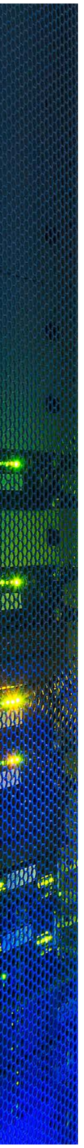
- **Ever-increasing data processing needs** for AI, edge and quantum computing, in addition to cryptocurrency mining, is gaining momentum. Data centers will increasingly serve as AI hubs for edge computing and manage the massive data volumes of internet of things (IoT) devices.

- **Growing sustainability concerns** due to several factors including stricter regulations and a shift toward direct investment in renewables. Reusing equipment and components to promote circularity is becoming more common, as is the use of small modular reactors and carbon-free nuclear energy to power data centers.

- **Supply chain disruptions** driven by geopolitical tensions and resource shortages are likely to be a headwind for data center growth. Delays in sourcing critical materials such as rare earth metals could impact construction timelines and increase costs, forcing operators to review growth projections and adopt strategies like diversified sourcing. Likewise, new tariffs and trade policies may affect the cost of imported equipment and raw materials, influence energy prices and alter economic incentives for data centers in the US.

- **Technology evolutions** on both the demand and supply side will continue. On the demand side innovation is driving high-performing servers, increasing rack power densities and adding on to the cooling load. Any future breakthroughs in efficient algorithms or hardware could impact the trajectory of this load growth. On the supply side, the preference for clean power can be supplied majorly by variable renewable energy sources, nuclear and CCUS coupled gas-based generation. Future technology platforms will need to optimize energy consumption, balance supply and demand and ensure sustainability by switching between different energy sources based on availability, cost and environmental impact.

- **Global talent shortages** in infrastructure build, operations and sustainability could slow the sector’s growth. As construction demands for data centers and the power plants that serve them increase, the challenge of finding skilled workers will impact timelines and future growth forecasts.

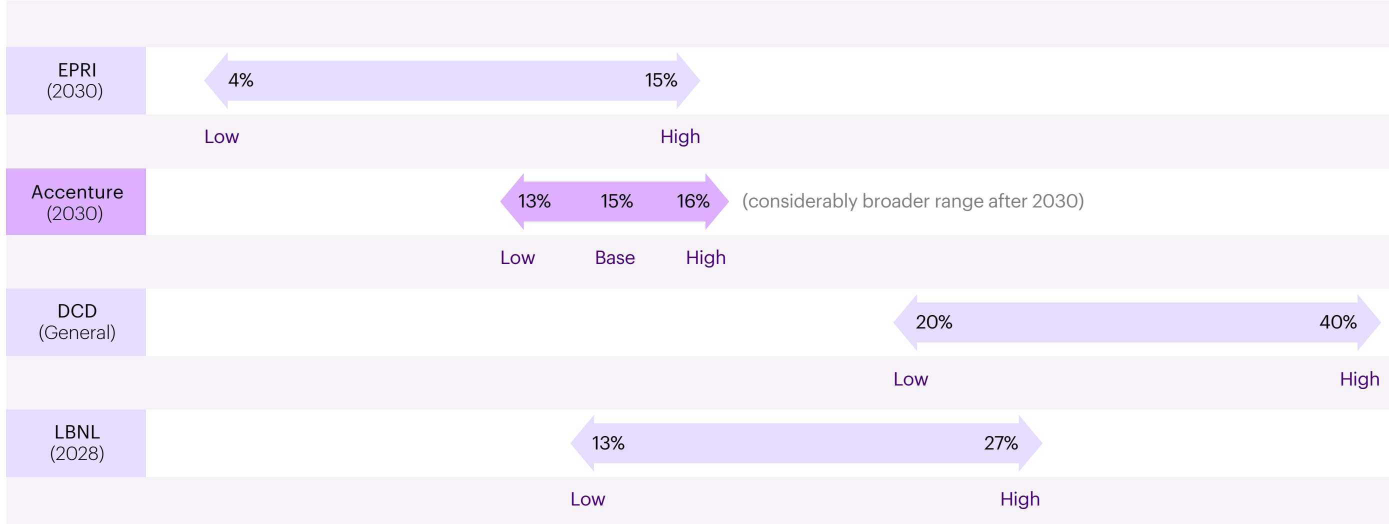


Our model can help electricity providers develop data center growth projects based on a set of assumptions and understand how that growth will be scattered across regions. We project three growth scenarios of Low, Base and High Growth ranging from 13% to 16% till 2030.

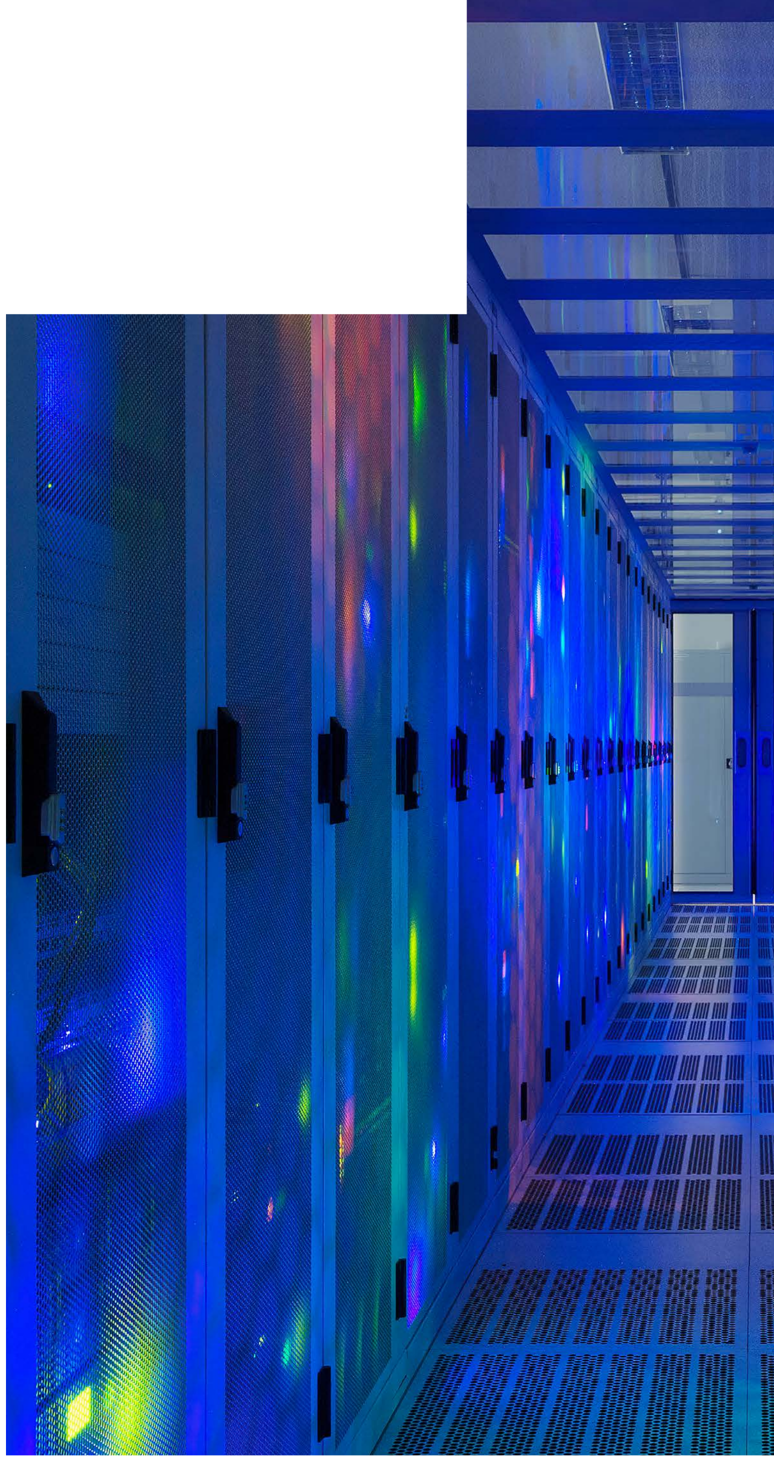
Figure 4:

US data center power projections/scenarios, average annual growth

Range of data center power demand growth projections vary from a low 4% by EPRI to a high of 40% by DCD.



Source: Accenture Research modeling, Dow Jones Factiva
EPRI: "EPRI Study: Data Centers Could Consume up to 9% of U.S. Electricity Generation by 2030" PR Newswire, May 29, 2024: D1. Factiva, Inc. All Rights Reserved; DCD: Andy Connor, Subzero Engineering. "Building the future together: Strategic partnerships for advancing sustainable AI practices" Datacenter Dynamics, October 31, 2024: D1. Factiva, Inc. All Rights Reserved; LBNL: Sebastian Moss. "DOE: Data centers consumed 4.4% of US power in 2023, could hit 12% by 2028" Datacenter Dynamics, December 20, 2024: D1. Factiva, Inc. All Rights Reserved



Each growth scenario presents distinct challenges and opportunities for electricity providers, requiring tailored strategies to ensure resilience and efficiency.

Figure 5:

Data center growth scenarios

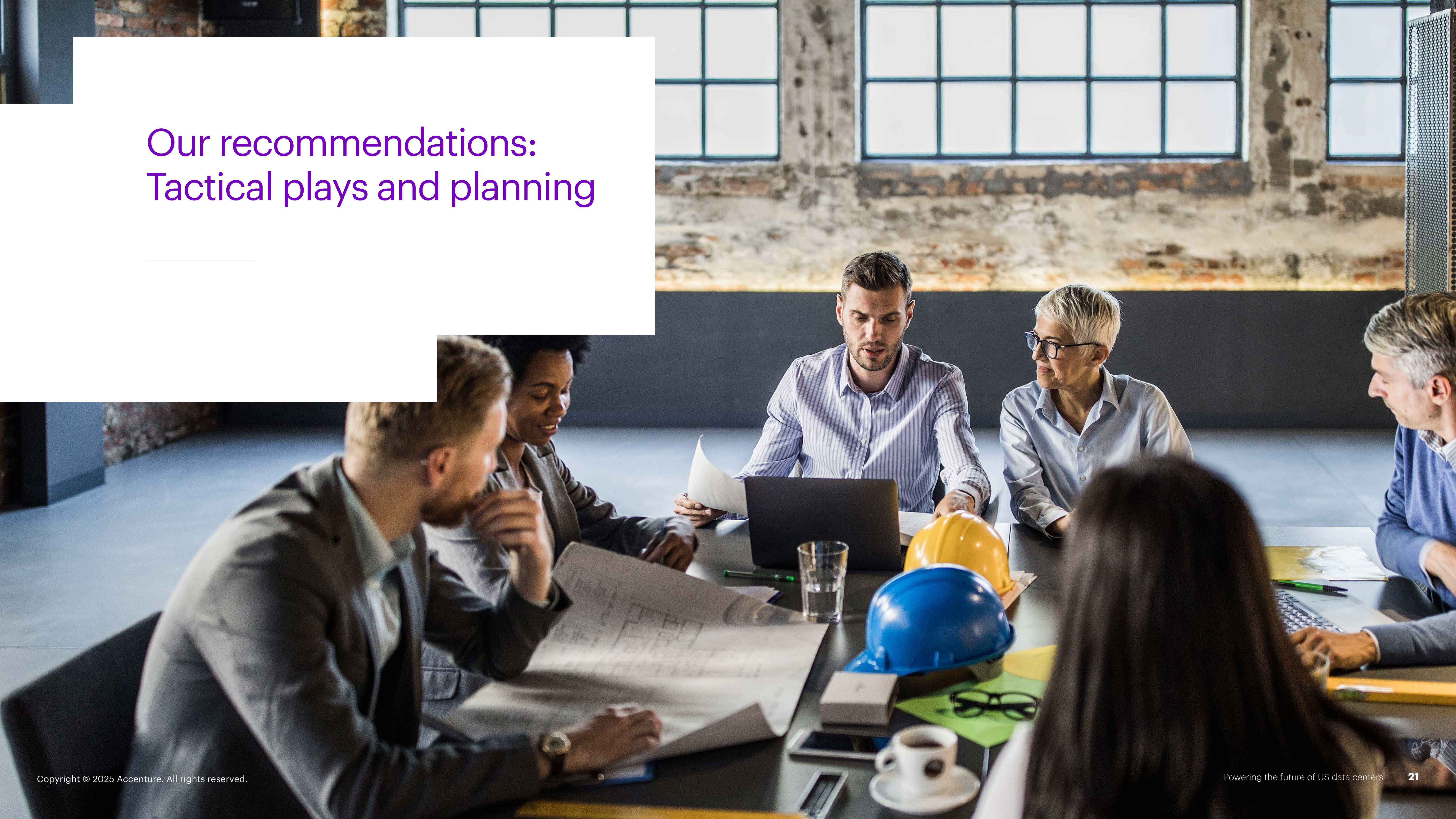
	Average power demand annual growth to 2030	Scenario assumptions
Low Growth	12.9%	• 3% increase in effective power consumption estimated using individual H100 GPU power consumption data from a microchip market analysis accounting for projected increase in chip power consumption; higher than historical experience • 80% server utilization rate • PUE forecast from microchip market analysis
Base Growth	14.6%	• 5% increase in effective power consumption estimated using individual H100 GPU power consumption data from a microchip market analysis accounting for projected increase in chip power consumption • 85% server utilization rate • Adjustment to the PUE forecast from microchip market analysis by +0.05
High Growth	16.4%	• 7% increase in effective power consumption estimated using individual H100 GPU power consumption data from a microchip market analysis accounting for projected increase in chip power consumption • 90% server utilization rate • Adjustment to the PUE forecast from microchip market analysis report by +0.10

Source: Accenture Research

Rapidly evolving AI technology landscape (DeepSeek)

The scenario models included in this analysis do not consider the potential impacts associated with the recent announcement of the Chinese AI startup DeepSeek's R1 model, which claims to enable AI model development in a significantly more energy-efficient manner and at a fraction of the cost of similar models. At the time of this publication, the data surrounding DeepSeek's performance was still under review and will require further validation over time before considering the potential impacts to long-term electricity demand. It is an open question whether this technology advancement will lead to a reduction or an increase in electricity demand. As the DeepSeek advancements further unfold, they could ultimately lead to a "Jevons paradox" of this more efficient AI actually accelerating the broader proliferation of AI technology.

Our recommendations: Tactical plays and planning



Now is the time for action. Electricity providers should leverage the following short-, medium- and long-term recommendations as tactical plays. They can help guide electricity providers on what to offer customers, how to partner and what tech foundations to put in place now.

Short-term recommendations: Immediate actions to enhance grid flexibility and streamline expansion

Electricity providers can get started with the following to help address immediate challenges:

- **Enable next-generation demand response and load shifting:** Leverage AI and machine learning to enhance demand response through real-time, automated load optimization, energy demand predictions and personalized responses based on key factors such as weather, grid conditions and energy pricing. This provides greater grid flexibility and scalability while reducing grid stress and costs. For data center customers, it can predict high-demand periods such as heatwaves or regional events and preemptively adjust cooling systems, reschedule non-essential operations, or delay computational tasks reducing demand during peak times without affecting critical operations.

- **Collaborate with hyperscalers to optimize data center siting:** Foster ongoing communication with hyperscalers to better understand their data center growth plans and help them gain a clearer understanding of utility long-range planning (LRP) efforts. Identify strategic locations where hyperscaler growth aligns with infrastructure capabilities, ensuring access to critical resources such as power, fiber, water and cooling. Assess areas with potential for renewable energy integration and backup power capabilities while prioritizing speed to market. By strengthening collaboration and aligning on growth priorities, electricity providers can more effectively plan for future demands, optimize grid capacity and ensure reliable, scalable infrastructure that supports the growing needs of data centers.

- **Improve interconnection, regulatory and economic strategies:** Accelerate interconnection timelines by simplifying data center grid interconnection processes and improving coordination between key stakeholders. Collaborate to enable temporary regulatory fixes and fast-track permitting approvals. Consider increasing engineering staffing to speed up feasibility studies, leveraging generative AI to automate parts of the study development and improving document management capabilities to streamline access to study materials, ensuring faster and more efficient completion. Additionally, offer targeted economic incentives like energy-efficient equipment rebates that encourage the adoption of sustainable practices.

Identifying electricity provider archetypes

Some electricity providers are in oversubscribed regions and face significant capacity constraints due to high energy demand. They must find ways to balance incremental demand growth with resource availability and infrastructure challenges. Other electricity providers operate in previously untapped regions with minimal data center presence and must adopt an aggressive approach to attract investment and increase partnerships with data centers to ensure continued patronage and low operating costs. These two starting points underscore the need for varied approaches shaped by the unique circumstances and challenges different electricity providers face.

Medium-term recommendations: Strengthening grid resilience and scaling clean energy investments

The following strategies will take longer to get up and running but are essential to cater for the ever-growing demand:

- **Balance the energy mix and investments:** Optimize existing power plants while diversifying into cleaner energy solutions to mitigate financial risks. Increasing investments in renewable energy and energy storage systems will help ensure consistent energy supply. Electricity providers should also fast-track clean energy infrastructure investments and ensure capacity additions are modular and scalable to accommodate future demand.

- **Enhance grid capacity and resilience—debottleneck before build:** Prioritize enhancing the efficiency and resilience of current infrastructure when grid investments are slow-paced. As demand increases, accelerate grid modernization and integrate smart technologies along with load management tools for higher capacity needs. In the case of significant growth, electricity providers must allocate substantial CapEx for comprehensive grid upgrades, including overhauls of existing networks to support larger energy loads and prevent bottlenecks.

- **Innovate energy offerings for large customers:** Offer tailored value-added services to different customer segments in response to evolving energy demand, especially from data centers in low growth situations. As demand increases, expanding customized green energy solutions will provide data centers with flexible options to align with their sustainability goals. In high growth situations, implement real-time energy management solutions that deliver dependable, on-demand power.

- **Redesign interconnection, regulatory and economic strategies:** Build upon related short-term efforts by taking actions to streamline interconnection, zoning and approval processes to reduce bureaucratic delays and ensure faster approval for data centers. Strengthen partnerships with local governments and key stakeholders to align infrastructure planning with the anticipated growth of high-energy consumers. Expand financial incentives, such as grants and subsidies, to further promote renewable energy adoption, energy-efficient technologies and sustainable infrastructure development.

Long-term recommendations: Future-proofing energy infrastructure and optimizing investment strategies

To win in the long term, electricity providers must be strategic in their investments and develop innovative products and solutions by redesigning their business models, partnering with key stakeholders and developing platform expertise. Data center growth will impact the entire business and electricity providers need key capabilities across functions to support this growth. Given the varied starting points, we’ve split these recommendations to cover both oversubscribed and untapped regions.

Oversubscribed regions:

- **Expand grid modernization activities and transmission capacity:** Expand grid modernization efforts by incorporating a wider range of advanced platforms and delivery infrastructure, enhancing grid flexibility and integrating non-wired alternatives. This approach allows for more effective and efficient infrastructure development. By leveraging AI-enabled demand forecasting and advanced grid technologies, electricity providers can optimize resource allocation, improve grid reliability and meet evolving energy demands while reducing costs and supporting sustainable energy solutions.

- **Rethink generation capacity planning:** Revisit traditional integrated resource planning (IRP) processes to account for data center-driven power demand growth and consider potential technological disruptions. Leverage an agile approach that prioritizes no-regrets actions and can be pursued across multiple scenarios, with incremental investment modules that can change as conditions evolve. Expanding renewable energy while incorporating scalable solutions like SMRs is essential, alongside addressing regulatory approval challenges.

- **Innovate pricing and financing models:** Adopt tailored pricing structures such as time-of-use rates and long-term contracts, ensuring equitable cost distribution. This helps protect other customer groups by preventing rate hikes for non-data center customers. Collaborative investments in renewables between electricity providers and data center operators can further enhance financial sustainability while fostering partnerships that support long-term growth.

- **Reimagine interconnection, regulatory and economic strategies:** Expand upon earlier short- and medium-term efforts by focusing on proactive infrastructure planning where electricity providers, data centers and regulatory bodies collaborate to enable a resilient, scalable energy system that can support increasing demand from data centers and other high-consumption customers. Advocate for permanent economic incentives like tax breaks, grants and subsidies to attract long-term investments and drive sustainable growth.

Untapped regions:

While electricity providers in untapped regions should leverage many of the same recommendations as those in oversubscribed regions, they should also consider additional potential actions including:

- **Identify opportunities for cost-effective and reliable energy solutions:** Explore opportunities to offer competitive, reliable energy supplies—such as natural gas as a bridge generation source with lower emissions—until renewables can fully achieve zero-emissions power. Emphasizing stable rate designs and 24/7 resilient service ensures predictable operating costs for data centers. Additionally, highlighting cleaner generation options will attract customers with net-zero ambitions and 24/7 carbon reduction goals.

- **Highlight location advantages:** Promote the geographic advantages of service territories (affordable land, low FEMA Risk Index, proximity to major network interconnection points, cool water sources). These factors, combined with access to skilled labor and sufficient transmission line capacity, make for an attractive proposition for data centers seeking optimal sites for operations.

- **Investigate strategic partnerships and co-investment potential:** Assess strategic partnership opportunities with data centers and other high-consumption customers (e.g. large C&I customers) to proactively plan for future needs. By co-investing, electricity providers and customers can share the costs and develop a more reliable energy grid with redundant power supplies, state-of-the art transmission facilities and middle-mile data and fiber connectivity.

The path forward

To succeed, electricity providers will need better insights into the potential growth of data centers within their service regions and the resulting impact on power demand. They may also need guidance in choosing the right renewable energy investments and energy storage solutions to meet their net-zero goals and provide reliable power to data centers. In an increasingly volatile grid environment, these decisions will require advanced analytics, forecasting and integrated approaches to ensure sustainable and resilient infrastructure.

Stakeholder collaboration across electricity providers, regulators, policymakers and data center investors will be essential in shaping frameworks and the processes and approvals for timely infrastructure development. These innovative partnerships will play a key role in addressing data center growth challenges.

At the same time, electricity providers, whether nuclear, natural gas or renewable power, can work closely with data center operators to ensure that the right mix of energy is available, with flexibility to meet changing needs. These partnerships can also extend to the integration of advanced energy storage solutions, which will be crucial in mitigating the intermittency of renewable energy.

Building close partnerships with data center operators will help identify and address bottlenecks in infrastructure together, while capital project advisory services will ensure cost-effective, accelerated build-outs of the necessary power and energy storage infrastructure.

From site selection support, data center developer collaboration and energy supply evaluations, to grid optimization support, demand response enhancements, AI-enabled energy solution development and more, we can help you navigate the complex challenges facing electricity providers today. Get in touch to learn more about our expertise and experience working with electricity providers and data center operators.

About the research

To better understand the data center impact on the utilities sector, we undertook a regionalized modeling exercise to learn more about the drivers and limitations of the related electricity demand and required supply at a regional level. Our model estimates US annual data center electricity consumption by projecting power demand growth across three scenarios over the next decade. Using a bottom-up approach, the model is based on the expected installed GPUs, adjusted for power consumption, server utilization, and additional cooling requirements. The methodology assumes no significant disruptions to innovation trajectories and focuses on regional supply-demand balances, excluding interregional electricity transmission. Regional projections account for electricity needs from new data centers. These are informed by company announcements, historical trends and growth forecasts. The model also adjusts for transport and distribution losses, capacity factors and regional generation mixes. The approach also quantifies the supply investment needs based on the simple supply-demand imbalance applied on unit costs by energy source. These estimates are refined using data from sources such as EIA, Gartner, IDC, multiple financial institutions available via Factiva.com and sector-specific literature, ensuring alignment with market trends and regional specifics. This framework provides a structured approach to estimating future energy requirements for data centers, enabling decision-makers to plan effectively based on reliable, data-driven insights.

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