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Location Matters: Evolving Trends in Datacenter Siting

Right-siting becomes crucial for datacenters as power demand fluctuates and grids lock

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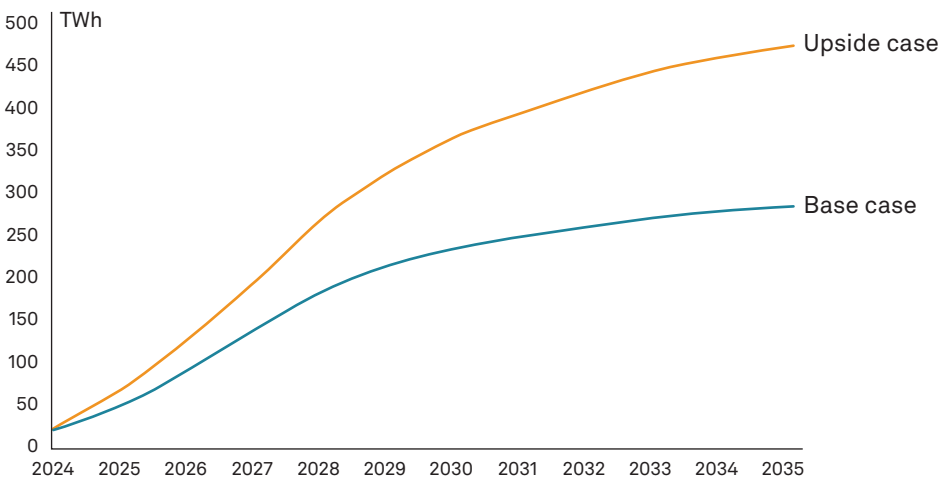
The widening energy footprint of datacenters

Grid operators, utilities and regulators are increasingly focused on power-hungry datacenters. In Q1 2024, datacenters were mentioned over 120 times in utilities' earnings calls, signaling a notable shift in how the industry perceives and responds to their energy needs.

Historically, datacenter power demand was considered negligible in the context of total energy consumption. Cut to 2035, and datacenters are expected to boost United States (US) net on-grid electricity demand by a staggering 278-468 TWh, with the bulk of it emerging before 2030 (Figure 1).

Figure 1: New US datacenter energy demand, 2024-35



Source: S&P Global Commodity Insights, 2024.

This underscores the increasing impact of datacenters on grid infrastructure and energy policy, emphasizing the need for strategic energy planning.

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US datacenter market trends and shifts

Datacenters in the US have traditionally been concentrated near major population centers, with key hubs located in Northern Virginia, Chicago, Atlanta, Dallas, Silicon Valley, and New York. The expansion of these markets was driven by established fiber networks, reliable power availability, and, in some cases, state tax incentives or other cost-reducing factors. Furthermore, cooler ambient temperatures and low risk of extreme weather events enhanced the appeal of certain locations.

Northern Virginia, home to 4.8 GW of built-out IT power, leads North America's datacenter market with forecasts indicating an additional 7.7 GW by 2030. However, the market is approaching saturation, fueled by mounting challenges in meeting power demand and rising local opposition.

Such concerns over the feasibility of expanding power supply and transmission infrastructure have dampened the outlook for new datacenter capacity in Dominion Energy's service area, which includes Northern Virginia.

Meanwhile, the latest forecast by PJM, the regional transmission organization, indicates that the service area of American Electric Power will surpass that of Dominion Energy in new datacenter capacity in the early 2030s.

As 'datacenter fatigue' takes hold in Northern Virginia and similar challenges emerge in other top markets, datacenter siting strategies are undergoing a significant shift.

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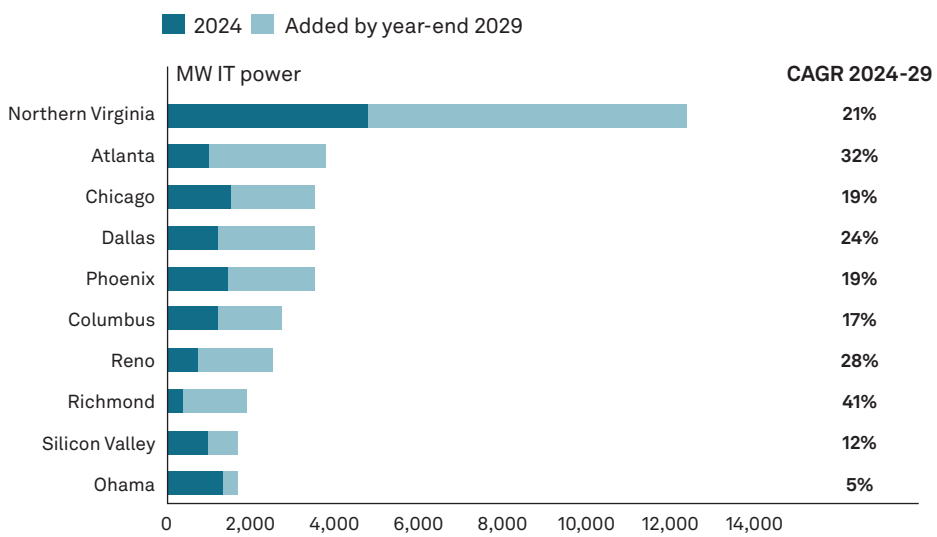
Heading towards new horizons

In anticipation of the significant impact of artificial intelligence (AI) deployments on datacenter power consumption, IT companies are exploring sites further away from the crowded primary markets.

Datacenter capacity is set to surge in Georgia, Texas, Illinois, Arizona, Nevada, and Ohio over the next five years (Figure 2). Moreover, smaller datacenter markets are emerging in Mississippi, Minnesota, Missouri, Indiana, and Wisconsin.

These locations are gaining popularity due to power availability, lower energy costs, regulatory tailwinds, and access to renewable energy.

Figure 2: Top US datacenter markets by operating and planed capacity



Source: 451 Research Datacenter KnowledgeBase, 2024.

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Recent government-backed initiatives are poised to further accelerate the expansion of datacenters into non-traditional markets. Following an executive order by former US President Joseph Biden, select federal sites owned by the Departments of Defense and Energy are set to host gigawatt-scale AI datacenters.

Additionally, a public-private partnership for the Stargate Project has committed to investing $500 billion to enhance AI infrastructure nationwide, with construction of projects currently underway in Texas.

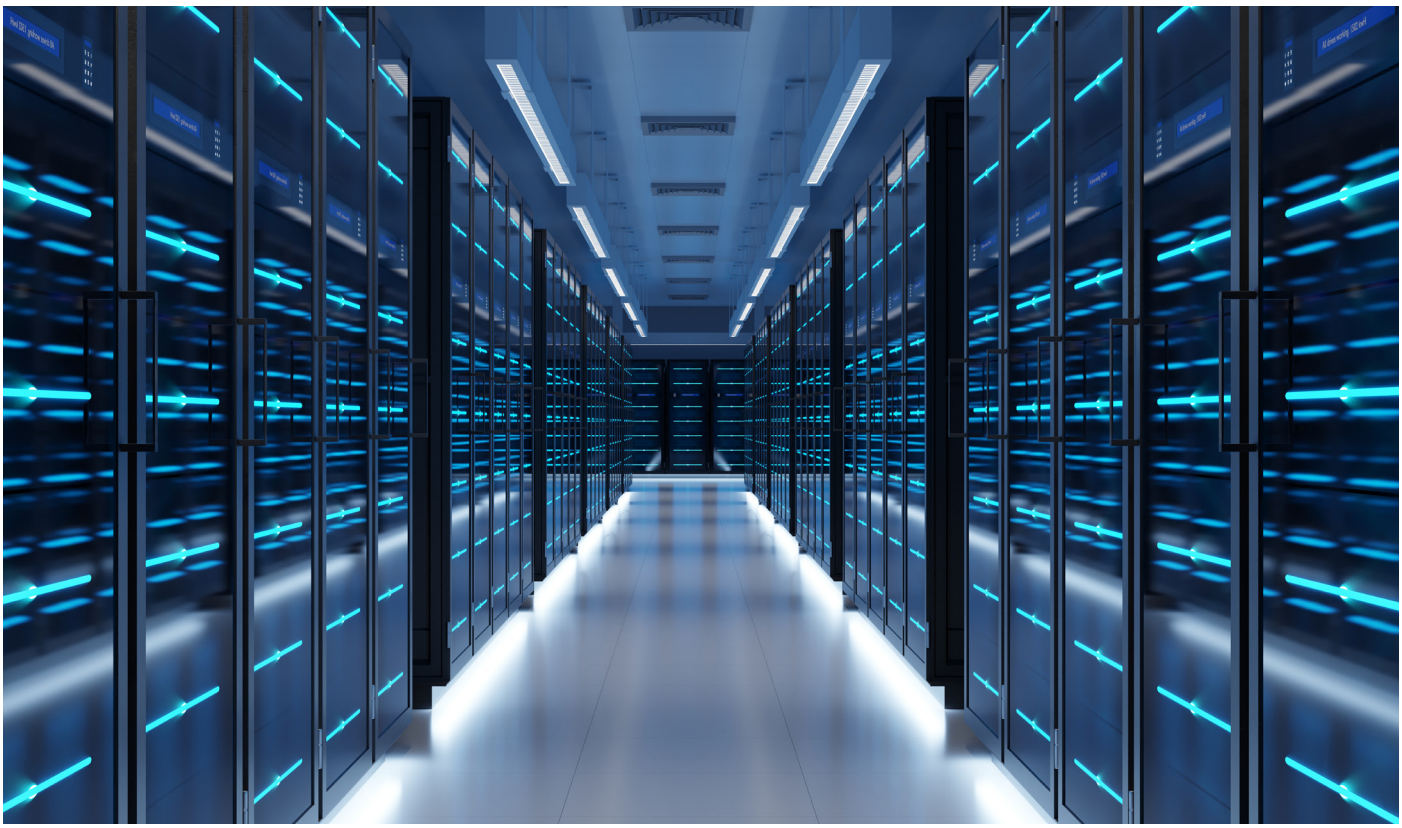
These incentives for large-scale datacenter development can reshape regional power demand and intensify competition for access to the grid.

Beyond policy and capital investments, advancements in energy efficiency are also influencing datacenter siting trends. DeepSeek has demonstrated notable efficiency gains in AI training and inference, although its broader implications remain uncertain.

The release of the Chinese chatbot has rekindled discussions around the Jevons paradox, an economic principle suggesting that as a resource becomes more efficient, demand for it tends to increase. If power availability becomes less of a limiting factor for AI growth than initially thought, this could accelerate the development of datacenters in various locations, depending on the specific use case.

Today, AI workloads are primarily focused on training, which is typically conducted in large-scale, centralized facilities that can be situated in remote areas. However, as inferencing becomes a larger proportion of AI workloads, it is likely to drive the development of smaller, more distributed facilities closer to population centers, particularly to support latency-sensitive AI applications.

Although training is more resource-intensive, the sheer volume of inferencing workloads may ultimately outweigh training demand. Consequently, the ongoing training and deployment of new models are likely to boost energy consumption in both remote and suburban areas, further influencing datacenter siting strategies.



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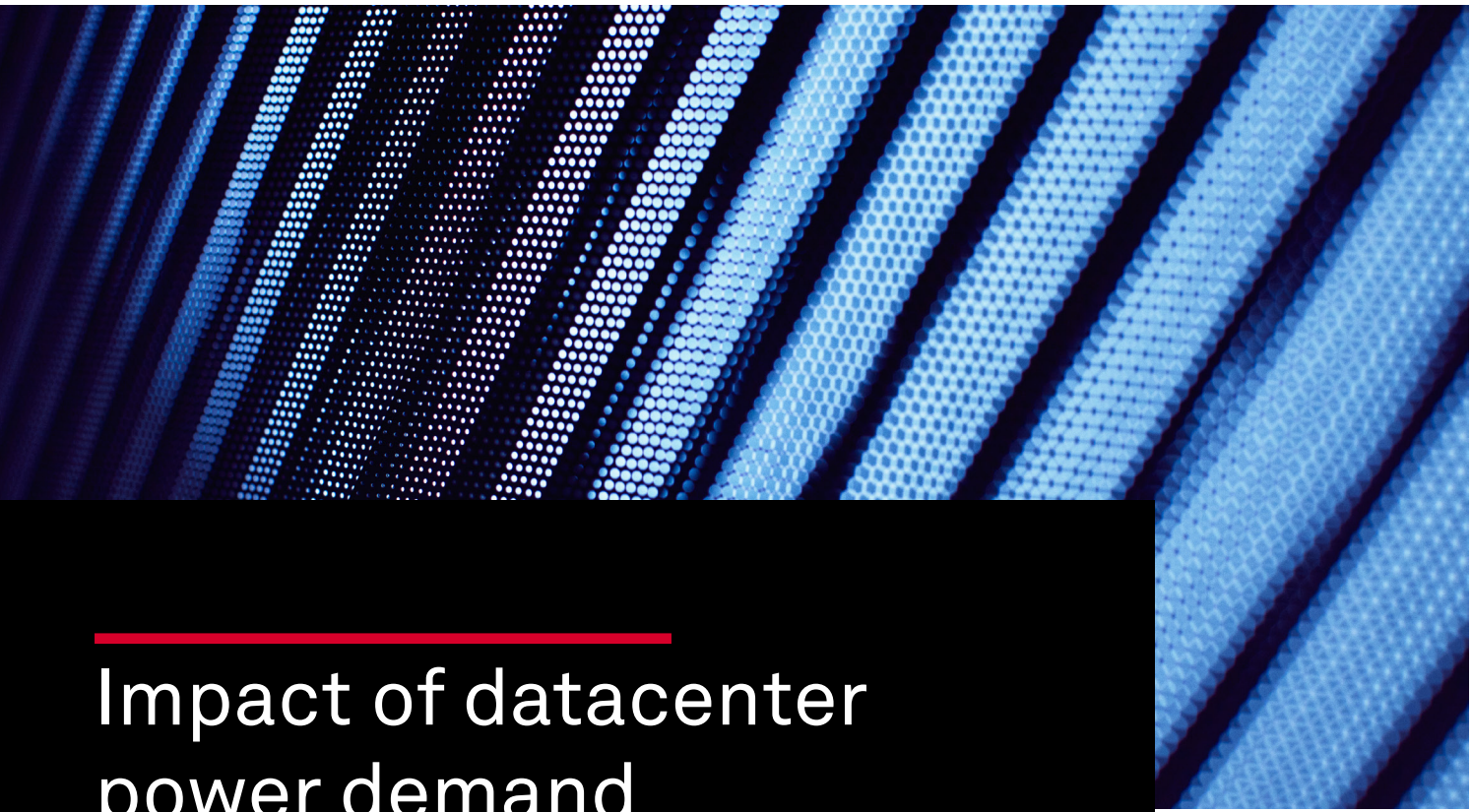


Impact of datacenter power demand on the grid

New datacenter load will introduce greater uncertainty in electricity demand and pricing. A notable example of this trend is the Dallas-Fort Worth market, which is experiencing rapid datacenter growth.

Hyperscalers and leased datacenter operators are drawn to the area due to the lower costs associated with building and operating datacenters compared with other major US datacenter markets.

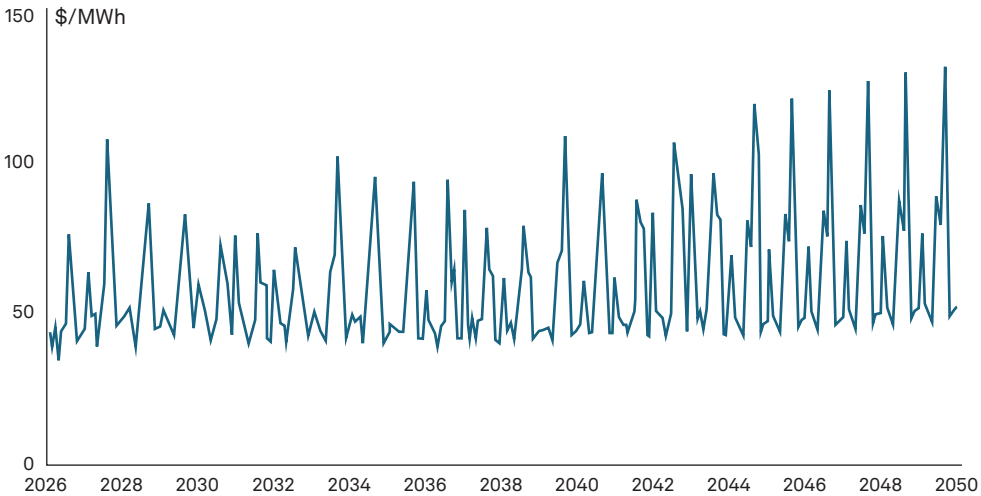
Currently, Dallas-Fort Worth is home to 195 datacenters with a total built-out capacity of over 1.2 GW, a figure that is expected to nearly double in the next five years. As demand for datacenters outpaces traditional power infrastructure in Dallas-Fort Worth and other key markets, the grid will need to increasingly adapt.

Granular power price forecasts can serve as a valuable tool for developers to identify optimal locations for new generation and storage assets, as well as for grid operators to future-proof their systems.

S&P Global's Power Evaluator utilizes machine learning to generate nodal price forecasts up to 30 years into the future. The example below features a long-term nodal forecast for a prospective 100 MW dual-axis solar tracking system located in Hill County, approximately 50 miles south of Dallas (Figure 3). Nodal energy prices can be viewed at different temporal resolutions—hourly, monthly, or annually—for around-the-clock or on-peak and off-peak periods.

Price forecasts provide valuable insights into where datacenters are likely to be built to access cheap and reliable energy, highlighting opportunities for new energy projects in areas with high demand.

Figure 3: Monthly nodal energy price forecast for a 100MW solar asset in Hill County, TX, 2026-50



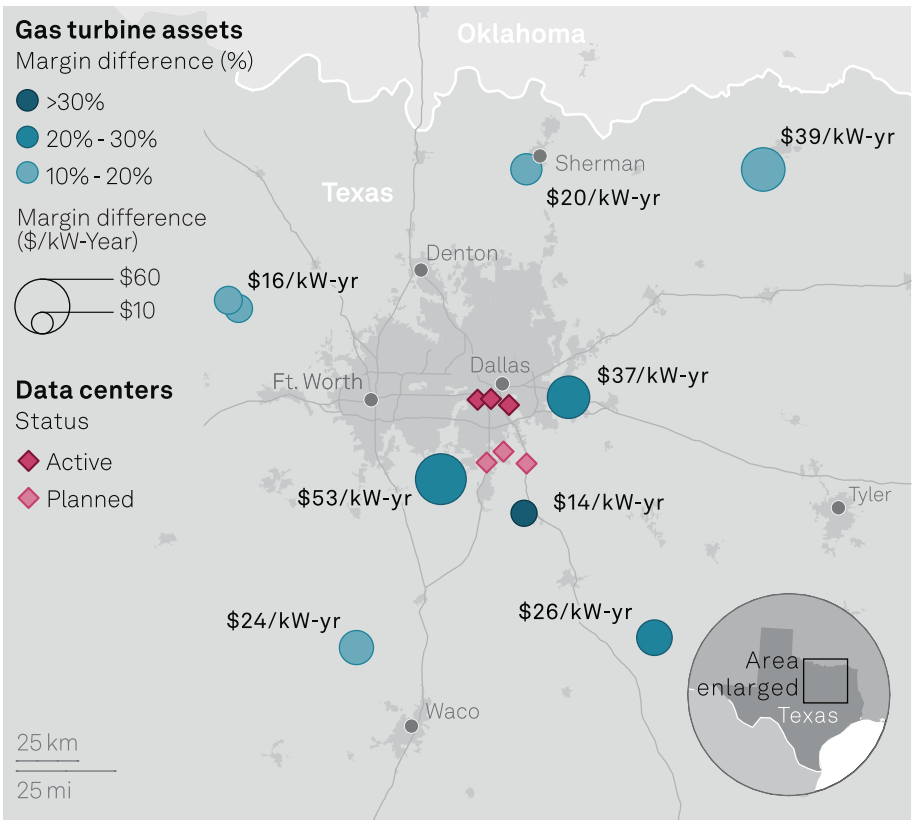
Source: S&P Global Market Intelligence, 2024.

In addition to nodal forecasting, S&P Global Commodity Insights Power Consulting offers custom modeling capabilities to evaluate the impact of datacenters on asset performance. In the example below, we selected an area in Dallas-Fort Worth with both operational and planned large datacenters to demonstrate their effect on the performance of existing combined-cycle gas turbine (CCGT) power plants (Figure 4 in next page).

The base case included three operational datacenters located near downtown Dallas. The change case featured the same three operational datacenters, as well as three planned or under-construction datacenters located south of Dallas.

The simulation was run for the year 2030. The results of the nodal analysis revealed an 18% increase in energy margins for CCGT power plants with the addition of the planned datacenters. The impact on energy margins was more pronounced for the plants located in close proximity to the new datacenters. The continued expansion of datacenters in the area is expected to drive even greater energy margins for nearby generation assets.

Figure 4: Energy margin difference for combined-cycle gas turbine assets in ERCOT North (Change case-Base case)



Credit: CI Content Design
Source: S&P Global Commodity Insights, 2024.

As datacenter capacity is surging across the US, so is competition for high-value sites to deploy power infrastructure. While some geographic trends are evident, significant uncertainties persist around future datacenter siting. These uncertainties are driven by potential changes to local retail tariffs, grid connection queue times, the balance between training and inference power demand, commercial demand for AI applications, and energy efficiency gains in both hardware and software.

In today's dynamic environment, understanding the impact of datacenters on power markets is critical. CI Consulting offers expert guidance to successfully navigate the evolving energy landscape.

To learn more about how our Power Consulting team can assist with your datacenter or power needs, contact Natallia Pinchuk - **Natallia.Pinchuk@spglobal.com**

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