



AI, Power and the Emerging Constraint on Compute

Artisan Partners Growth Team

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Insights

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P A R T N E R S

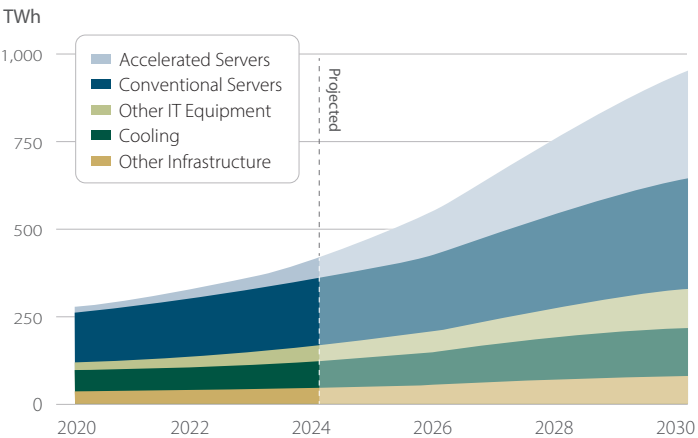
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Big Tech may be able to buy compute, but it cannot buy grid capacity on the same timeline

Large technology companies are set to spend more than \$700 billion on artificial intelligence (AI)-related capital expenditures in 2026, fueling a rapid expansion of data center infrastructure. That level of spending can secure chips, servers and data-center capacity. It cannot as easily compress the timelines required to generate, transmit and deliver electricity. The recent announcement of the first futures market for AI computing power underscores this, with contracts tied to graphics processing unit rental prices. While the buildout of AI infrastructure is often framed as a compute problem, power, rather than chips, is increasingly becoming the gating factor in how quickly AI adoption can scale.

The growing focus on power availability comes as electricity demand is accelerating across the US economy. Recent industry estimates suggest US data center IT load capacity could roughly double from approximately 80 gigawatts (GW) in 2025 to 150 GW in 2028, highlighting the pace at which AI infrastructure is scaling. Training and inference workloads are materially more energy-intensive than traditional computing tasks, while higher-performance chips are increasing power consumption per workload. As a result, the AI buildout is making digital infrastructure materially more power intensive.

Exhibit 1: Global Data Center Electricity Consumption (By Equipment, Base Case, 2020-2030)



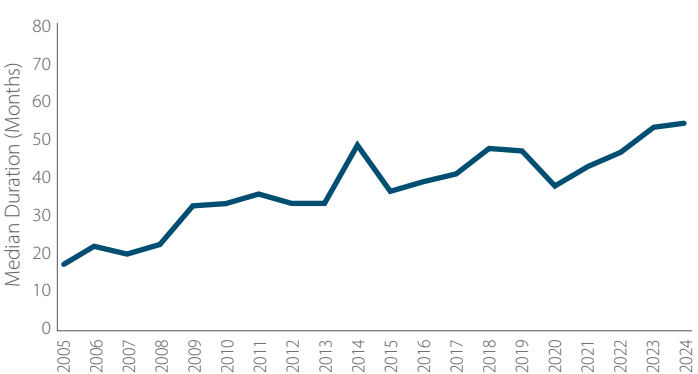
Source: International Energy Agency, Energy and AI, 2025. Data through 2024; projections through 2030.

The ability to deliver incremental power is not keeping pace

The traditional grid model is constrained by both physical infrastructure and regulatory processes. Transmission buildout can take years. Interconnection queues, which formalize access to the electric grid, are increasingly backlogged, and utilities must balance new sources of demand against existing capacity and reliability requirements. These processes typically introduce multi-year delays before new power can be delivered.

The core challenge is whether new generation capacity can come online fast enough to support rapid data center growth. Today, the evidence suggests it cannot. Projects completed in 2024 took roughly four to five years from initial interconnection request to commercial operation, highlighting the mismatch between AI-driven demand and grid-scale supply. For hyperscalers, power may represent a smaller cost than compute hardware, but it can be the more binding constraint as data centers can only go where reliable power can be secured.

Exhibit 2: Median Duration from Interconnection Request to Commercial Operations Date



Source: Lawrence Berkeley National Laboratory, Queued Up: 2025 Edition, December 2025. Data through 2024.

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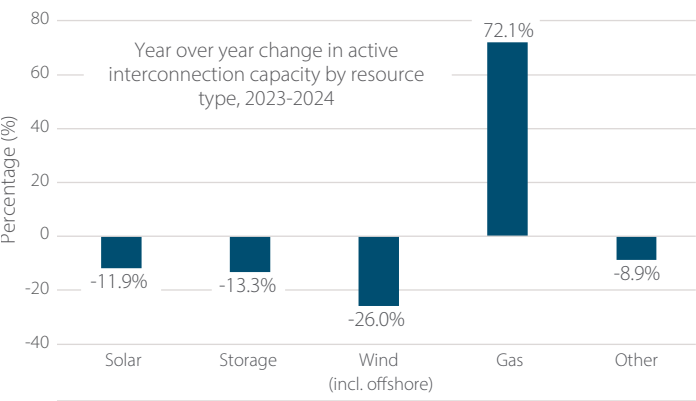
In the near term, natural gas is likely to play a central role in meeting new demand

These constraints are changing how power is sourced. Developers are increasingly prioritizing generation that can be deployed relatively quickly and provide reliable, continuous output. This helps explain the recent increase in natural gas capacity in interconnection queues, while solar, storage and wind declined year over year.

Natural gas is unlikely to be the final state of the power system, but it is well suited to meeting immediate needs. It is dispatchable, scalable and supported by existing infrastructure, making it one of the more practical near-term solutions for large loads that require high reliability. In some cases, this may include grid-connected generation. In others, operators may explore onsite or co-located generation to reduce reliance on constrained transmission infrastructure and accelerate deployment timelines.

This does not imply that localized or behind-the-meter generation will replace the grid. Large-scale operators value the reliability, cost efficiency and simplicity of centralized infrastructure. Rather, these solutions are likely to complement grid-based power in regions where electricity access has become a limiting factor.

Exhibit 3: Interconnection Trends Reflect Increasing Demand for Dispatchable Power



Source: Lawrence Berkeley National Laboratory, Queued Up: 2025 Edition, December 2025. Data through 2024.

Implications across the power value chain

Diversified power sourcing is creating a multi-layered investment opportunity across the energy and industrial ecosystem. Companies that enable additional power supply, such as GE Vernova, are seeing increased demand for generation equipment as well as improved pricing dynamics. Besides supplying gas turbines to meet the demand for more generation, service revenue tied to installed equipment can extend the profit cycle over many years.

Greater reliance on natural gas power generation also supports demand for pipeline and processing infrastructure. For example, Williams operates critical transmission systems that connect major supply basins to end markets, particularly along the Eastern Seaboard where data center development is concentrated. Importantly, much of the incremental electricity demand has already been secured through long-term capacity agreements with power producers. In many cases, expansion can be achieved through compression, pipeline extensions or other investments in existing systems, which may be faster and less complex than entirely new infrastructure.

At the same time, the solution set is broader than gas. Fuel cells and other modular systems may also serve as complementary solutions in constrained regions, particularly where grid access or permitting timelines limit the pace of deployment. While these technologies are unlikely to replace traditional generation at scale, they can help address localized power shortages.

As data centers become more power-intensive, the electrical systems inside the facility become more complex. We believe power management providers such as Eaton are positioned to benefit from rising demand for transformers, switchgear, backup systems and controls that help distribute electricity efficiently and reliably across higher-density computing environments. While this demand is being accelerated by near-term power bottlenecks, these systems should remain important long-term as data centers become larger, denser and more electricity intensive.

Over the longer term, additional sources of generation, including nuclear and other low-carbon technologies, may play a role in meeting sustained demand growth. However, these solutions are typically characterized by longer development timelines and greater regulatory complexity, meaning their impact is more likely to be gradual than immediate.

The AI buildout may be driven by digital innovation, but scaling it is increasingly a physical infrastructure challenge. For investors, that shifts the opportunity set beyond chips and cloud platforms toward generation, power delivery and localized energy solutions.

For a visual overview of how AI-driven electricity demand flows through the power ecosystem, [see our companion one-pager](#).

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