

CONFERENCE & EXHIBITION

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CLOSING THE DATA CENTRE POWER GAP:

LESSONS FROM THE US FOR A GLOBAL CHALLENGE

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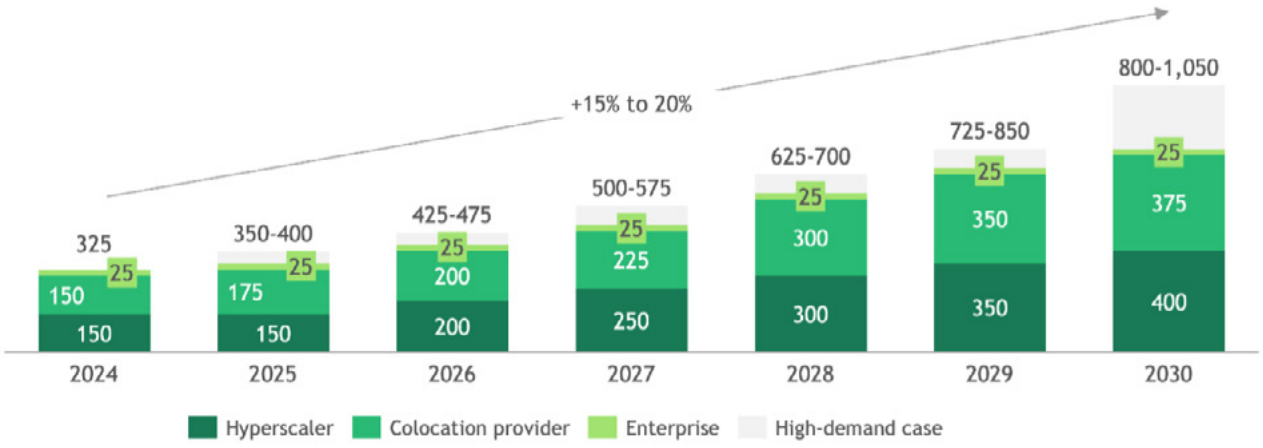
The rapid rise of AI is driving an unprecedented surge in data centre investment, significantly increasing demand for reliable, around-the-clock power. While this dynamic is particularly visible in the United States, where power generation is struggling to keep pace, and an estimated capacity shortfall of up to 80 gigawatts could emerge by 2030, it is not unique to one market.

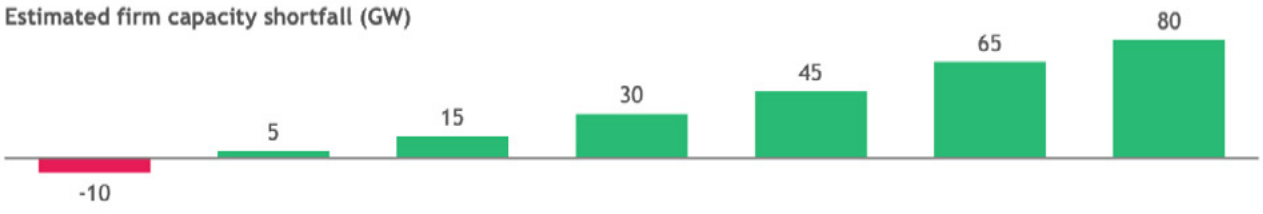
Similar pressures are unfolding globally. Across Europe, Asia, and the Middle East, accelerating digitalisation and AI adoption are pushing electricity systems to their limits, with grid expansion, permitting timelines, and infrastructure constraints creating bottlenecks. As a result, securing low-carbon power is becoming a critical challenge for data centre developers worldwide.

Although this article focuses on the US as a leading case study, the underlying challenge, and the need for scalable, reliable, and sustainable power solutions, applies broadly across regions.

AS THEIR ENERGY DEMAND OUTPACES CAPACITY GROWTH, DATA CENTERS FACE A SHORTFALL OF ~80 GW BY 2030

Projected annual US data center power demand[1] (TWh)





Sources: NERC; market participant interviews; Aurora; Goldman Sachs; BCG analysis. **Notes:** Estimated power demand based on expected utilization rates for each data center segment by year (ranging from 85-87% in 2024 to 85-90% in 2030). Low-demand case defined as a data center infrastructure constrained case based on current and planned facilities. High-demand case based on hardware-constrained environments based on bottom-up GPU supply. Values rounded. TWh = terawatt-hour; GW = gigawatt. [1]Low-demand case scenario unless otherwise specified. [2]Does not include anticipated but unannounced capacity additions.

Companies are actively exploring energy solutions capable of supporting the heavy requirements of their data centres. Any viable option must meet several key conditions. Above all, it needs to be deployed quickly to help address the impending shortfall. Ideally, it should also be affordable, scalable, reliable, supported by regulators, and aligned with technology companies' commitments to reducing carbon emissions

Although they currently depend on a mix of energy sources - including unabated gas-fired plants - data centre developers are investigating several alternatives to secure reliable, low-carbon power. These include geothermal energy, nuclear power, and renewable sources combined with battery storage. While each option shows promise, all come with limitations across one or more critical dimensions. Our analysis suggests that gas-fired generation equipped with carbon capture, utilisation, and storage (CCUS) technology is among the most viable solutions to meet these needs at scale through 2030, particularly in the US.

If major technology companies adopt this approach to power their data centres, it could significantly accelerate growth in the CCUS sector. We estimate this shift could drive as much as US $80bn in capital investment for retrofitting existing facilities and building new gas plants with CCUS capabilities, while also lowering costs for other carbon capture uses. As CCUS-enabled gas and power gain traction in the US data centre market, developers, operators, and asset owners should consider its role in their long-term energy strategies. However, swift action will be necessary to take advantage of the 45Q tax credit, which rewards US companies for permanently storing carbon dioxide (CO_2) or utilising it in enhanced oil recovery.



HOW GAS WITH CCUS COMPARES TO ALTERNATIVE SOLUTIONS

We reviewed eight different technologies to evaluate their ability to meet the power needs of data centres in the US. Six of these have already proven in real-world applications that they can deliver continuous, 24/7 electricity.

Among the options, only gas with CCUS performs strongly across all six criteria. A closer look shows that many of these technologies face limitations that could hinder their ability to address the projected capacity gap by 2030. For instance, regulatory support for renewable energy paired with battery storage differs widely across US states, creating challenges that can slow down development and add complexity to projects. Moreover, scaling these solutions depends largely on access to consistent wind or sunlight.

Geothermal energy, while a reliable low-carbon option with solid regulatory backing, is currently constrained by economic factors, as viable projects must be located near geothermal hotspots - limiting broader deployment. Likewise, large-scale nuclear power projects face hurdles such as high capital costs, extended build timelines, and intricate regulatory requirements.

Across the six main criteria that US data centre developers prioritise, gas with CCUS stands out as a mature, deployable solution that delivers strong performance across all dimensions.

AMONG VARIOUS OPTIONS, ONLY GAS WITH CCUS PERFORMS WELL ACROSS ALL SIX CRITERIA

Play	Speed	LCOE	Proof prints	Scalability	Regulatory backing	Low carbon
Traditional CCGT	2-4 years	$	High	High	High	Low
Renewables + storage	3 years	$$[1]	High	Medium	Low	High
CCGT + CCUS	3-5 years[2]	$$	High	High	High	High
BECCS	3-5 years	$$$	High	High	Medium	High
Geothermal	3-6 years	$$	High	Low	High	High
H_2 CCGT	1-12 years[3]	$$$[4]	Medium	High	Low	Medium
Advanced nuclear	5-6 years	$$	Low	Medium	Medium	High
Legacy nuclear	7+ years	$$$	High	Medium	Medium	High

Attractiveness: High · Medium · Low

Sources: Lazard; Sargent & Lundy; US Department of Energy; LevelTen Energy; Duke Energy; BCG analysis. **Notes:** CCUS = carbon capture, utilization, and storage; CCGT = combined cycle gas turbine; H_2 = hydrogen; BECCS = bioenergy with carbon capture and storage; LCOE = levelized cost of energy. [1]Range shown for solar PV + storage. [2]Captures usual time to build with broader ranges possible based on configuration. [3]One-year build scenario for retrofitted gas plants (up to 30% H_2 blend); longer for full H_2. [4]Speed for 100% H_2 CCGT.

SPEED

Behind-the-meter (BTM) gas plants, built specifically to power a single data centre, operating independently of the grid, and equipped with CCUS, can be up and running within roughly three years of construction starting. The trade-off, however, is that power reliability depends on a single facility.

By contrast, sourcing lower-emission gas power through the grid, typically via a power purchase agreement with a local utility and involving retrofitting existing turbines with CCUS, takes longer due to grid connection backlogs, which can add at least two to three years. Even so, this approach still outperforms many alternatives on other key criteria

REGULATORY SUPPORT

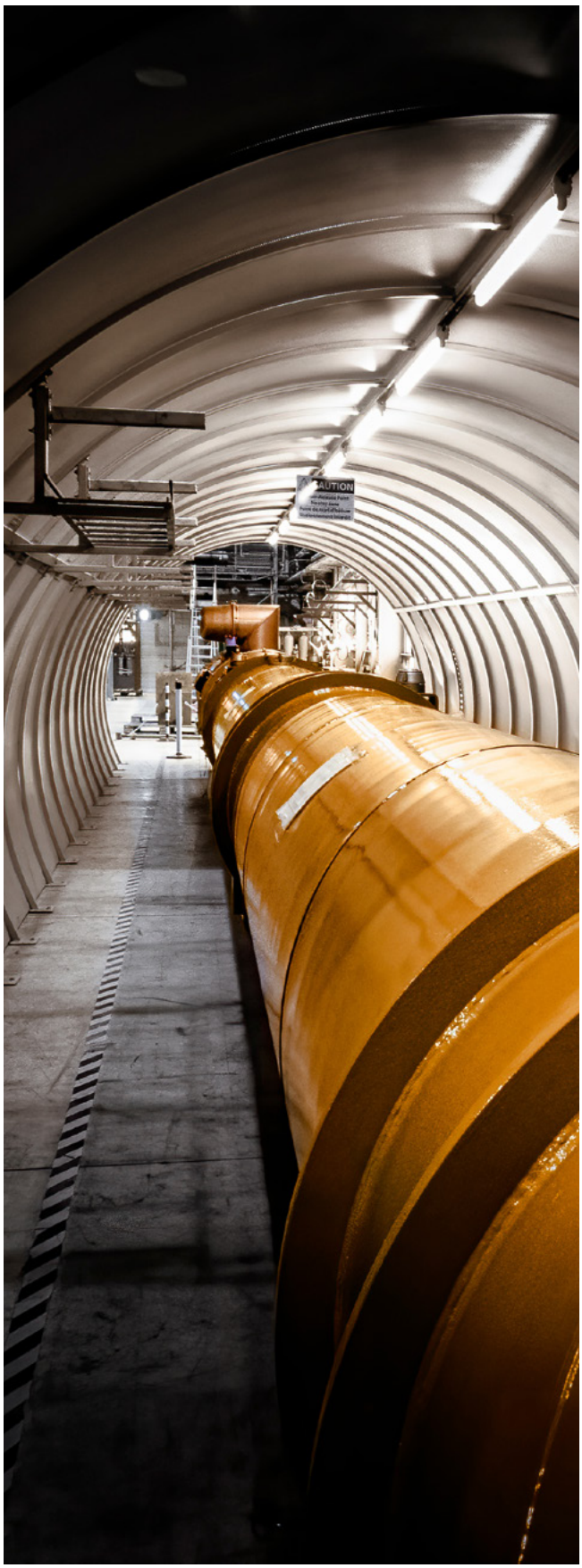
In the US, CCUS currently receives relatively strong bipartisan support from state policymakers and regulators compared with many other technologies. This backing can help streamline and speed up permitting processes that often delay large infrastructure projects.

Although political priorities may shift over time, CCUS is presently supported by the 45Q tax credit, which has maintained cross-party support and includes an important condition that projects must reach an advanced stage of development before January 1, 2033.

SCALABILITY

Gas with CCUS offers several advantages when it comes to scaling. While they are unabated, Gas-fired power plants already represent a significant share of electricity generation in the US, providing a strong foundation for expansion. CCUS further enhances scalability, with substantial CO_2 storage capacity available in regions such as Texas and the Midwest.

In addition, a front-of-the-meter CCGT plant equipped with CCUS, which delivers power through the grid, does not necessarily need to be near the data centre it supplies, as long as it operates within the same wholesale electricity market.



PROOF POINTS

While combined cycle gas turbine (CCGT) plants have lower flue gas concentrations compared to some other post-combustion capture applications, their emissions are relatively clean, with fewer impurities, making them well-suited for CCUS deployment.

Several projects around the world demonstrate this in practice, including the UK's Net Zero Teesside initiative and the recently announced Broadwing Energy Center in Illinois, supported by Google.

COST

Since electricity can make up as much as 80% of a data centre's operating costs, securing an economically competitive power source is critical. A new unabated combined cycle gas turbine (CCGT) plant typically has a levelized cost of energy (LCOE) in the range of US $45 to $100 per megawatt-hour (MWh), depending on natural gas prices and plant capital expenditures, which have ranged from approximately $800 to $3,000 per kW in recent years. When fitted with CCUS, CCGT remains competitive relative to alternatives like hydrogen and nuclear, largely due to low onshore CO2 storage costs, and supported by the 45Q Tax Credit.

We estimate that, after factoring in tax incentives, a retrofitted CCGT plant with CCUS has an LCOE of around US $65 to $80 per MWh, while a newly built CCGT plant with CCUS can come in below US $120 per MWh. In addition, as deployment scales up, learning curve effects are expected to gradually reduce the cost gap between unabated and CCUS-equipped gas plants.

LOW CARBON CREDENTIALS

While a CCGT plant with CCUS has a higher lifecycle carbon footprint than geothermal or existing nuclear power, it performs far better than a traditional, unabated gas plant. Our estimates indicate that CCUS can capture more than 90% of emissions from a CCGT facility, cutting lifecycle carbon intensity by over 70% per kilowatt-hour.

This makes it an attractive option for hyperscale companies like Google and Amazon, which have pledged to achieve 50% to 100% carbon-free energy usage by 2030.



A FAVOURABLE ENVIRONMENT IS DEVELOPING FOR CCUS TECHNOLOGY

A range of factors is driving growing interest in CCUS and gas-based solutions across the US. By design, CCUS systems capture CO_2 from fixed emission sources and either transport it to aquifers for sequestration or deliver it to industrial users where it can be utilised in processes like enhanced oil recovery.

Beyond having an established network of CO_2 transport pipelines, the US also possesses extensive storage capacity. Its geological storage potential is estimated at around 6 gigatons - roughly 20 times larger than the current pipeline of CCUS projects. Although this capacity is not evenly distributed nationwide, large volumes are concentrated in Texas, a frontrunner in CCUS deployment, as well as in emerging regions such as the Midwest, the West Coast, the Mountain West, and parts of the Northeast.

An increasing number of companies are recognising the commercial potential at the intersection of data centres and CCUS. Oil and gas firms have long utilised CO_2 to enhance oil recovery, positioning them as natural participants in this space. As demand for cleaner power from data centres rises, several major energy companies are expanding into gas with CCUS solutions.

CCUS has been building traction in the US, with adoption expanding in recent years into sectors such as steel, cement, and chemicals. If demand from hyperscalers looking for low-carbon power for their data centres accelerates, it could significantly boost the technology, unlock cost advantages through greater scale, and potentially drive adoption beyond the US.

We estimate that for the four largest US hyperscalers - Google, Meta, Amazon, and Microsoft - to meet their 2030 clean energy targets solely using CCGT plants with CCUS would require approximately US $70 - $80bn in capital investment (including retrofits and new builds) and more than 105 mtpa CO_2 storage.



FOUR STEPS DATA CENTRES CAN TAKE TO ADVANCE CCUS ADOPTION

Gas-fired power combined with CCUS is emerging as a promising low-carbon solution for US data centres.

As owners and developers increasingly recognise its advantages and incorporate it into their long-term strategies, they should consider taking the following actions:

1 POSITION GAS WITH CCUS AS PART OF THE TRANSITION

Hyperscalers should begin by estimating the amount of reliable, always-on power needed to support their expansion plans. From there, they must evaluate trade-offs between cost, sustainability, and scalability to define the role gas with CCUS will play alongside other energy options. Data centre developers should also clarify how this solution fits within their overall energy portfolios.

2 DEVELOP AN ASSET-LEVEL ROADMAP

Create a clear execution plan that balances immediate energy requirements with longer-term objectives, such as decarbonisation. At the same time, developers can improve access to financing and build customer confidence by demonstrating transparency and credibility around key metrics - such as capture efficiency, lifecycle emissions, and the reliability of CO_2 storage.

3 ENGAGE STAKEHOLDERS EARLY AND ACTIVELY

Articulate a clear value proposition to regulators, investors, and customers, highlighting how gas with CCUS can work alongside renewables to support net-zero goals. Developers should also structure projects to take advantage of existing incentives while ensuring they remain viable if policy support evolves.

4 FOCUS ON SCALING EFFICIENTLY

Select partners and solutions that enable rapid replication of gas with CCUS across different locations, rather than relying on one-off, customised projects. Developers should also design with repeatability in mind - leveraging modular construction, securing standardised CO_2 transport and storage agreements, and building partnerships that can be duplicated at scale.

Data centres require reliable, low-carbon power today - not years from now - to keep pace with rising AI-driven demand while remaining environmentally responsible and preventing a widening gap in generation capacity. Gas paired with carbon capture, utilisation, and storage stands out as one of the most scalable solutions to meet this need.

While the US offers particularly favourable conditions for deployment - such as supportive policy frameworks and existing CO_2 infrastructure - the broader opportunity extends well beyond its borders. As data centre growth accelerates globally, developers and hyperscalers will need solutions that can be adapted across regions with varying regulatory environments, resource availability, and infrastructure maturity.

Companies looking to move forward should start by evaluating how gas with CCUS - and other firm low-carbon options - fit within their specific priorities around speed, cost, and emissions. Those that act early to develop scalable, repeatable approaches will be better positioned to meet both rising power demand and increasingly ambitious sustainability commitments on a global scale.





GASTECH CONFERENCES

DRIVING THE CRITICAL ENERGY CONVERSATIONS

8,000	1,000	200	12
Delegates	Speakers	Sessions	Theatres

STRATEGIC CONFERENCE

The Strategic Conference delivers a focused view of the forces shaping global energy systems, bringing together senior leaders and decision-makers to tackle the most pressing challenges across policy, investment and delivery.

Spanning natural gas and LNG, low carbon solutions, hydrogen, electrification and AI in energy, the programmes reflect both established sectors and fast-evolving areas of growth. They highlight where capital is flowing, where new markets are emerging and how technologies are being deployed at scale.

Each programme offers targeted insight into the risks and opportunities defining its theme, equipping delegates with the strategies, partnerships and perspectives needed to drive progress across the global energy landscape.

TECHNICAL & COMMERCIAL CONFERENCE

The Technical & Commercial Conference presents the latest research, engineering expertise and operational insight advancing industry performance. Technical specialists, researchers and practitioners share proven approaches that improve efficiency, reliability and sustainability.

Covering natural gas, LNG, hydrogen, low carbon solutions, artificial intelligence in energy, and shipping and marine, the programme highlights innovations already being deployed across the value chain to improve delivery, optimise processes and support lower carbon outcomes.

It offers practical insight into real-world applications, informing technical decision-making and strengthening operational delivery across the sector.

FEATURE PROGRAMMES

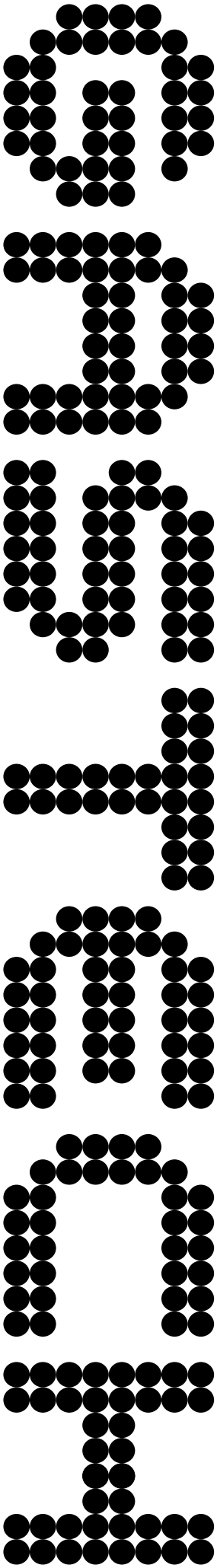
The Feature Programmes complement the core conferences by creating dedicated programmes for innovation, collaboration and talent development across the energy industry. These programmes highlight emerging ideas, showcase new technologies and bring together stakeholders working across the wider energy ecosystem.

From the Supply Chain & Procurement Programme and the Talent for Energy Transformation Programme, to the Gastech Innovation Accelerator, each initiative provides opportunities to exchange ideas, demonstrate solutions and build new partnerships that support the continued evolution of the global energy sector.

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