THE ROLE OF GAS IN POWERING AI-DRIVEN ENERGY DEMAND

This report provides an independent, fact-based assessment on the role of Gas in meeting incremental electricity demand from artificial intelligence (AI)-driven data centres. It reflects the International Gas Union's (IGU) objective of providing transparent information on global Gas developments to governments, industry, and civil society.

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ABBREVIATIONS

AEMO	Australian Energy Market Operator
AI	Artificial Intelligence
BCM	Billion Cubic Meters
CCG	Combined-Cycle Gas Turbine
CCUS	Carbon Capture, Utilisation and Storage
CDN	Content Delivery Network
COD	Commercial Operation Date
CO2	Carbon Dioxide
DSO	Distribution System Operator
EIA	U.S. Energy Information Administration
EPC	Engineering, Procurement and Construction
EU	European Union
FERC	Federal Energy Regulatory Commission
GPU	General Processing Unit
GW / MW	Gigawatt / Megawatt (units of power capacity)
IEA	International Energy Agency
IGU	International Gas Union
IRA	Inflation Reduction Act
IRP	Integrated Resource Plan
ISO/RTO	ISO/RTO - Independent System Operator / Regional Transmission Organisation
kWh	Kilowatt-hour
LCOE	Levelised Cost of Electricity
LNG	Liquefied Natural Gas
METI	Ministry of Economy, Trade and Industry (Japan)
NEA	National Energy Administration (China)
NERC	North American Electric Reliability Corporation
OEM	Original Equipment Manufacturer
PPA	Power Purchase Agreement
SMR	Small Modular Reactor
TSO	Transmission System Operator
TWh / GWh	Terawatt-hour / Gigawatt-hour (units of energy consumption)
UAE	United Arab Emirates
UHV	Ultra-High Voltage (transmission lines)
VRE	Variable Renewable Energy

KEY MESSAGES

- Artificial Intelligence (AI) represents one of the greatest opportunities of the 21st century, and its transformative potential hinges on scaling digital infrastructure at speed.
- Electricity demand growth is surging as data centres are becoming the new "industrial load" of the AI economy, and their electricity consumption is projected to double to 800-1000 TWh by 2030.
- Renewables are expected to provide about half of the data centres' electricity consump-tion by 2030. However, their inherent variability creates a mismatch with the flat, 24/7 load profile of data centres which requires not only more generation but, also, significantly more dispatchable capacity.
- Gas is well positioned to provide the bulk of additional, flexible, dispatchable supply, while contributing to decarbonisation goals. Studies indicate that Gas-fired generation for data centres could nearly double by 2035, equal to ~60 bcm of incremental supply.
- Gas fulfils a critical, dual role: ensuring the stability and security of electricity to the data centres and simultaneously providing a buffer to the electricity network so that it can con-tinue to power critical national sectors such as healthcare, food processing, construction and manufacturing.
- A new class of energy customers is emerging with the scale and urgency to transform critical infrastructure investments, creating opportunities for Gas suppliers to co-develop reliable, lower-carbon solutions with digital leaders.
- Data centres can be built and energised much more rapidly than new generation and transmission projects which often face permitting, approval and construction constraints. With speed-to-power as the binding constraint, many developers are increasingly turning to proximate or behind-the-meter Gas solutions.
- Long-term energy planning must therefore remain fact-based, transparent, and grounded in realistic assumptions about electricity infrastructure and rapid expansion of AI-driven technology.

INTRODUCTION

Artificial Intelligence represents one of the greatest opportunities of the 21st century, with immense potential for transformative change. Realising this potential hinges on scaling digital infrastructure at unprecedented speed – which, in turn, depends on securing the electricity needed to power it[1].

In advanced economies, data centres alone could account for over 20% of incremental energy demand[2] growth this decade (2025-2035), ending years of stagnation in electricity demand. In the United States, data centre demand could comprise almost half of all incremental power growth by 2030.

Meeting this surge requires not only more electricity generation, but also significantly more dispatchable capacity. Renewables are on track to supply around half of the energy sector's needs by 2030, but their variability and grid bottlenecks mean they cannot fully shoulder the load alone.[3] Today, coal remains the baseline for firm power generation in most countries, but Gas, in all its qualified forms – natural gas, liquified natural gas (LNG), biomethane, synthetic methane and hydrogen, is positioned to provide the bulk of additional firm, flexible supply, while contributing to decarbonisation goals.

Studies indicate that Gas-fired generation for data centres could expand by ~30 bcm by 2030 and, in high-growth scenarios, nearly double by 2035, equal to ~60 bcm of incremental supply. With high efficiency (50-55% for modern combined-cycle turbines), fast deployment, and far lower emissions than coal, Gas is not a transitional bridge but a structural, long-term anchor of AI-era power systems.[4]

in the U.S. Southeast, utility Duke Energy's resource plan in the Carolinas includes new Gas capacity tied to hyperscale demand; another large U.S. utility, Entergy, is developing a Gas-backed project with Meta in Louisiana; and AWS signed a bridging agreement with AEP in Ohio to guarantee reliable supply during interconnection delays.[5]

In Dublin (Ireland), Microsoft has secured approval for a 170 MW on-site gas plant at its Grange Castle campus to safeguard operations during grid stress, and in Frankfurt (Germany), CyrusOne is partnering with E.ON on a 61 MW on-site Gas engine facility to directly support a hyperscale data centre.

All these developments reflect a growing trend of data centres co-locating with natural gas infrastructure or contracting dedicated firm capacity.

Time to market is the foremost priority for data centre hyperscalers, outweighing other considerations when developing new capacity, making speed-to-power the binding constraint.

Data centres can be built and energised in under two years, while new generation and transmission projects often face permitting, approval and construction timelines of four to five years or more. Average interconnection wait-times in the U.S. exceed five years, underscoring why developers are increasingly turning to proximate or behind-the-meter Gas solutions.[6]

1. International Energy Agency, Energy and AI Special Report, Paris: IEA, 2025
2. Ibid
3. Data Centre Dynamics, "IEA: Data centre energy consumption set to double by 2030 to 945 TWh," 11 April 2025.
4. International Gas Union, Global Gas Report 2025, London: IGU, 2025.
5. Duke Energy Carolinas, Integrated Resource Plan 2024, Duke Energy, 2024; Entergy, "Meta data centre in Louisiana," press release, 2024; Amazon Web Services & AEP, 6.6.
5. Bridging Agreement for Reliable Capacity press release, 2025.
6. Lawrence Berkeley National Laboratory, Queued Up: Characteristics of Power Plants Seeking Transmission Interconnection (2024 Edition) (analyzing data to end-2023), Berkeley, CA: LBNL, April 2024. Available at: https://emp.lbl.gov/sites/default/files/2024-04/Queued%20Up%202024%20Edition_R2.pdf

Regional divergence is stark. The U.S. and China together are expected to drive nearly 80% of global power demand growth by 2030.[7] In the U.S., natural gas already supplies around 40% of the country's electricity and will remain central to supporting new clusters. In China, coal remains the primary source of power, with Gas playing only a targeted role while renewables and nuclear expand.

Europe faces strong decarbonisation mandates, but it has limited spare grid capacity, creating bottlenecks despite rapid renewable build-out.

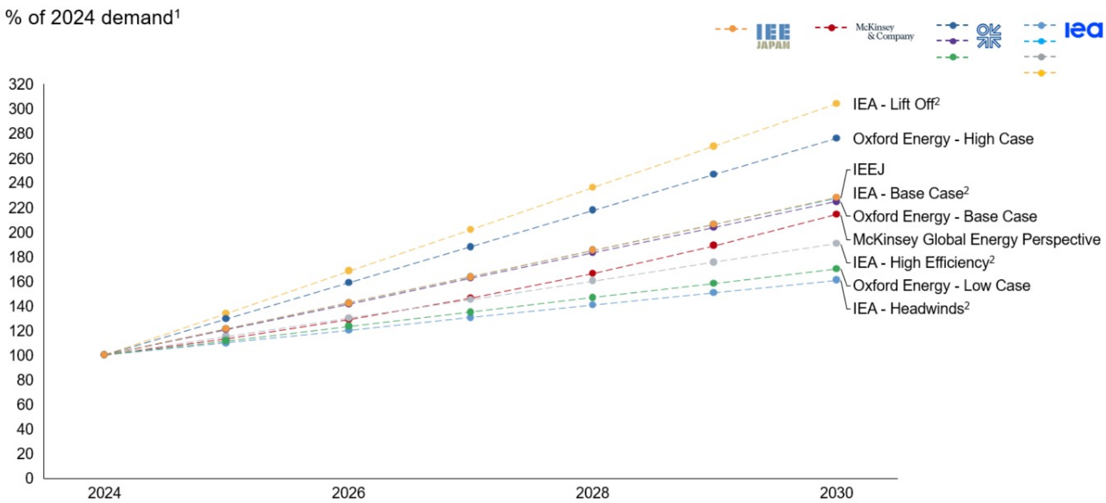
The Middle East is building sovereign-backed mega-campuses co-located with industrial zones and cable landing points, leveraging abundant Gas and solar power to offer low-cost, reliable supply.

In Asia-Pacific (ex-China), LNG-to-power is becoming the enabler of reliability as grids seek to displace coal. In Africa and Latin America, data centre growth will remain selective and metro-centric, relying on LNG imports, captive hybrid power and renewables where grids are weak.[8]

Hyperscale computing is also reshaping the energy industry. Tech majors already account for ~30% of global corporate renewable Power Purchase Agreements (PPAs) and are pioneering hybrid procurement models where renewables are firmed by Gas or nuclear. This represents a new class of energy customers whose urgency and scale are directly influencing investment patterns, creating opportunities for Gas and LNG suppliers to co-develop reliable, lower-carbon solutions with digital leaders.[9]

AI-driven data centres are now a strategic infrastructure priority for competitiveness and growth. Gas is both a structural component of future electricity systems and an enabler of human progress and global growth, reducing reliance on coal and complementing renewables' variability. Long-term planning must remain fact-based, transparent, and grounded in realistic assumptions about electricity infrastructure and rapid expansion of AI-driven technology.[10]

Figure 1 – Estimated global data centre electricity demand, aggregate projections from leading industry sources 2024-2030



1. Projections were normalized to a 2024 baseline (set as 100%) for comparability; values represent total data center electricity demand (TWh)
2. IEA scenarios: Headwinds (slower buildout), Base Case (expected growth), High efficiency (adoption partly offset by efficiency gains), Lift-off (AI-driven surge)

Source: Aggregate projections from leading industry sources IEA, OIES, IEEJ, McKinsey

7. International Energy Agency, Energy and AI Special Report, Paris: IEA, 2025

8. International Gas Union, Gas for Africa Report, Barcelona: IGU, 2023; International Gas Union, "The Role of Gas in East Mediterranean Economies and the Path to the Energy Transition, London: IGU, 2025.

9. McKinsey & Company, "How data centres and the energy sector can sate AI's hunger for power," McKinsey & Company, 2024. Available at: https://www.mckinsey.com/industries/private-capital/our-insights/how-data-centers-and-the-energy-sector-can-sate-ais-hunger-for-power

10. International Gas Union, Global Gas Report 2025, London: IGU, 2025.

PART I – DEMAND OUTLOOK

Underlying data centre energy demand and compute growth

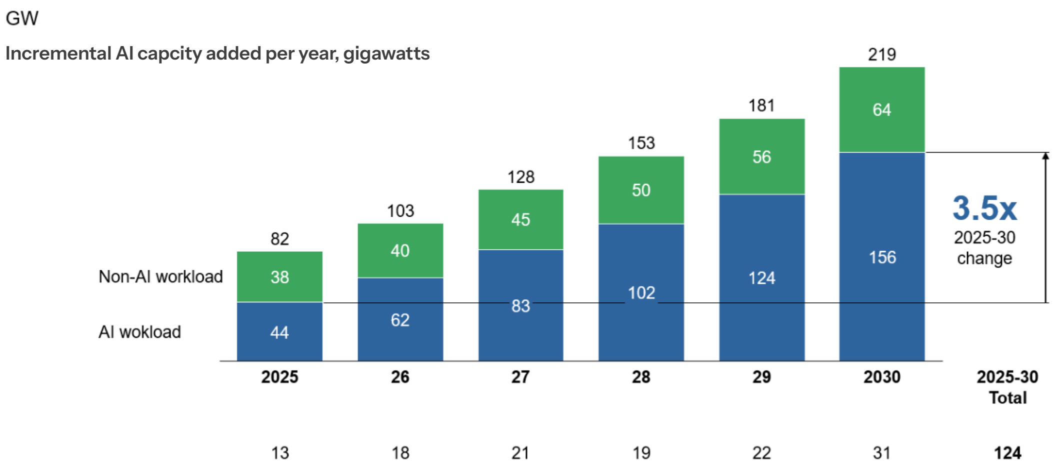
AI is accelerating electricity demand from data centres, transforming them into critical infrastructure. If the global electricity consumption continues in the current trend, by 2030 the equivalent of a decade of historical demand growth will be compressed into just five years.

Growth spans both AI training (large, power-intensive graphic processing units (GPU) clusters) and AI inference (deployed broadly across industries). Training runs require tens of megawatts for weeks at a time, while inference workloads multiply steadily as adoption spreads into core business processes[11] This dual expansion means that demand grows not only in spikes but also in continuous base load.

The mix of workloads driving this demand is evolving. Today, most incremental electricity consumption reflects generative AI training, but the share of inference workloads is expected to rise sharply as adoption scales. Non-AI cloud services will remain important, but they represent a smaller share of incremental growth. Efficiency gains in models and hardware may temper growth, but the expansion of applications is expected to more than offset such savings. Planning must therefore be range-based rather than point-forecast.[12]

Figure 2 below illustrates this shift, showing how the share of generative AI training dominates today's electricity consumption, while inference grows sharply by 2030.

Figure 2 – Estimated global data centre electricity demand by workload, 2025-2030[13]



Note: Figures may not sum to totals, because of rounding

Source: McKinsey Data Center Demand Model data. Published May 2025 at: https://www.mckinsey.com/featured-insights/week-in-charts/data-center-demands

Efficiency improvements in chips, cooling and algorithms are significant, but they generate rebound effects: as the cost per unit of compute falls, more compute is consumed. This Jevons paradox dynamic ensures that efficiency gains slow the pace of demand growth but do not reverse it. [14]

11. arXiv, "AI server power density studies," arXiv preprint, 2024.
12. Institute of Energy Economics, Japan, Special Bulletin: Fast-spreading AI and Stable Electricity Supply, April 2025.
13. McKinsey & Company, "Data center demands," McKinsey & Company, 2025. Available at: https://www.mckinsey.com/featured-insights/week-in-charts/data-center-demand
14. International Energy Agency, Energy and AI Special Report, Paris: IEA, 2025

Robustness of the AI growth trajectory

- **Hyperscalers** (Amazon, Microsoft, Google, Alibaba) are building massive GPU clusters.

- **Co-location providers (e.g., Equinix, Digital Realty, NTT, STT GDC) are rapidly adding new halls and campuses to host enterprise workloads,** giving companies access to AI-ready infrastructure without having to build their own data centres. Sovereign data centre programs (notably in the Middle East and Asia) are scaling national-level clusters.

- **Telecoms, content delivery networks (CDNs), and edge facilities** are increasingly building AI-ready infrastructure.[15]

AI adoption is moving rapidly from pilots to mainstream business operations, embedding electricity-intensive AI services into core functions. While efficiency breakthroughs may moderate growth, they are unlikely to offset the scale of demand in the medium term.

Overall, electricity demand from AI workloads is expected to remain structurally strong this decade, with hyperscale clusters joined by a wide range of providers sustaining growth.[16]

The durability of this demand is also reinforced by market structure. Announced data centre electricity demand is highly concentrated, with the four largest hyperscalers projected to account for nearly 60% of owned U.S. electricity capacity by 2030. This concentration underpins the structural nature of demand growth.

PART II – ELECTRICITY SUPPLY DYNAMICS

The growth trajectory of the electricity demand is not uniform. Demand is concentrated in 30-40 global clusters, where grid stress is already acute.

- In Dublin, data centres consumed 22% of national electricity in 2024, projected to exceed 30% by 2027. [17]

- In Northern Virginia (U.S.), the world's largest data centre (or computing) hub, interconnection queues stretch multiple years, making power availability the decisive factor in site selection.[18]

When developing new capacity, time to market is the foremost priority for data centre hyperscalers, often outweighing other considerations. Reflecting this urgency, hyperscalers have indicated they are willing to pay a 10–30% premium on the levelized cost of electricity (LCOE) to secure faster access to power.

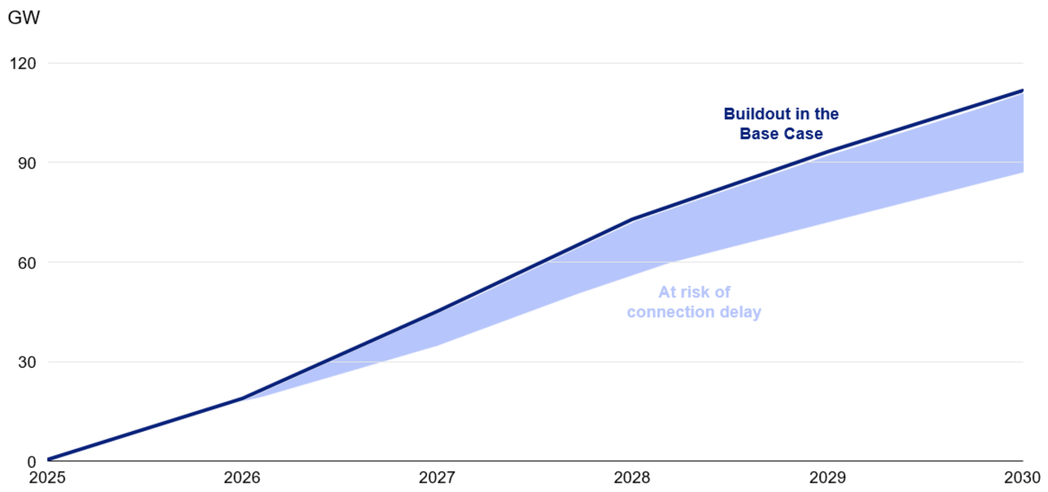
Another key factor in evaluating potential sites for new data centre development is the availability of ultra-reliable grid connections, as for hyperscale AI clusters reliability standards are non-negotiable.[19]

Transmission bottlenecks and permitting delays are increasingly the binding factor for new sites. In the U.S., average generator interconnection wait times now exceed five years, compared with less than two years for typical data centre build cycles.[20]

15. McKinsey & Company, "AI power: Expanding data centre capacity to meet growing demand," McKinsey & Company, 2024.
16. International Energy Agency, Energy and AI Special Report, Paris: IEA, 2025
17. https://www.cso.ie/en/releasesandpublications/ep/p-dcmec/datacentresmeteredelectricityconsumption2024/keyfindings/
18. McKinsey & Company, "How data centres and the energy sector can sate AI's hunger for power," McKinsey & Company, 2024. Available at: https://www.mckinsey.com/industries/private-capital/our-insights/how-data-centers-and-the-energy-sector-can-sate-ais-hunger-for-power
19. North American Electric Reliability Corporation (NERC), Large Load Reliability Guidelines, Princeton, NJ: NERC, 2025.
20. Lawrence Berkeley National Laboratory, Queued Up: Characteristics of Power Plants Seeking Transmission Interconnection (2024 Edition) (analyzing data to end-2023), Berkeley, CA: LBNL, April 2024. Available at: https://emp.lbl.gov/sites/default/files/2024-04/Queued%20Up%202024%20Edition_R2.pdf

In Europe, transmission approvals can stretch to a decade, making power availability the decisive factor in siting.[21]

Figure 3 – Global data centre capacity additions in IEA's Base Case and capacity at risk of connection delay due to grid constraints, 2025-2030[22]



Source: IEA (2025), Energy and AI report

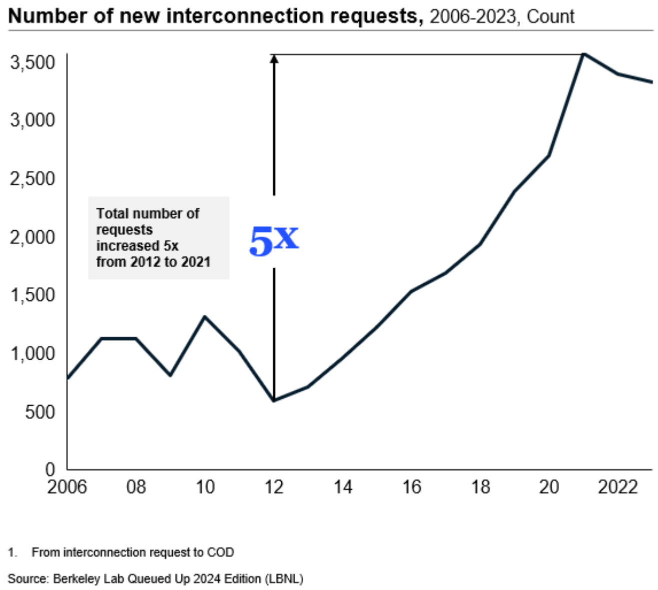
Due to these reasons, where grid connections are delayed, data centres operators are considering behind-the-meter natural gas turbines, LNG-to-power, or hybrid microgrids to secure a reliable electricity supply.[23]

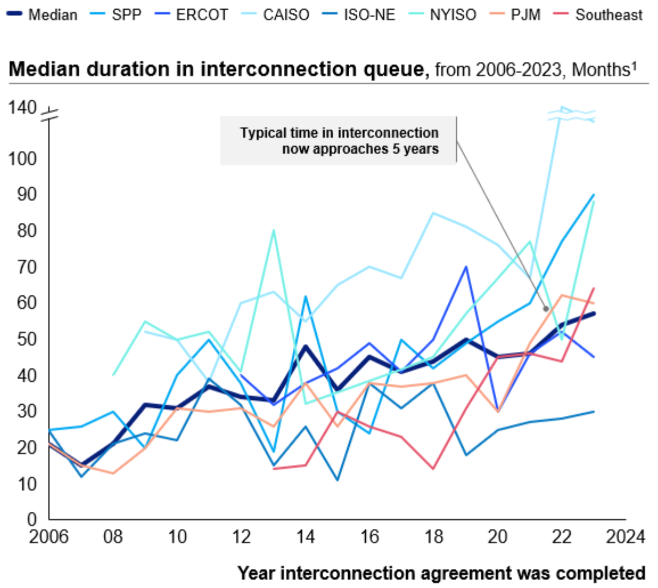
While delays in power connection could also be shortened through better coordination between Transmission System Operators (TSOs) and Distribution System Operators (DSOs), any future system planning of the electricity system does not satisfy the immediate market need of the AI data centres.

Another lever is greater flexibility in utility–operator contracts, such as staged load ramp-up or interim supply arrangements, likely requiring a shift in procurement and interconnection frameworks on both sides.

21. European Transmission Operators' Association (ENTSO-E), Permitting and Grid Expansion Outlook 2024, Brussels: ENTSO-E, 2024.
22. International Energy Agency, Energy and AI Special Report, Paris: IEA, 2025
23. International Gas Union, Global Gas Report 2025, London: IGU, 2025; and other various regional LNG-to-power project announcements

Figure 4 – New U.S. interconnection requests and average lead time, 2006–2023[24]





Gas as a Critical Enabler of Electricity Security and Stability of Supply

In an environment where power availability is the defining constraint, Gas plays an indispensable role.[25] Modern Gas turbines provide rapid ramping, firm capacity and system stability, responding to data centres developers' needs. IGU's Global Gas Report 2025 stresses that Gas is not a transitional "bridge" but a structural component of AI-era power systems, anchoring reliability alongside renewables.[26]

Additionally, Gas-fuelled power provides a significant edge in ensuring a faster time-to-market, as new Gas plants can be brought online more rapidly than renewable alternatives which, typically,

24. Lawrence Berkeley National Laboratory, Queued Up: Characteristics of Power Plants Seeking Transmission Interconnection (2024 Edition) (see note 7); also see Berkeley Lab's interconnection queue data web portal: https://emp.lbl.gov/generation-storage-and-hybrid-capacity

25. International Gas Union, Global Gas Report 2025, London: IGU, 2025.

26.Ibid.

face longer permitting, infrastructure and integration timelines.

No single energy source can meet the surging electricity needs of AI-driven data centres. Renewables are expected to provide about half of data centre electricity by 2030, up from ~27% today.[27] However, their inherent variability creates a mismatch with the flat, 24/7 load profile of data centres. Batteries can balance intra-day fluctuations but are not yet economic for multi-day or seasonal gaps.[28]

Nuclear power is also emerging as a strategic pillar for data centres seeking round-the-clock, carbon-free electricity. In the U.S., hyperscalers like Microsoft and AWS have already signed long-term PPAs with nuclear plants, while interest in small modular reactors (SMRs) is growing as a campus-adjacent option. In Europe and Asia, nuclear complements renewables by providing baseload stability when weather-dependent output falls short.

Although its deployment timelines are longer than those of Gas or renewables, nuclear energy's unmatched reliability and zero-emission profile make it an increasingly attractive part of the long-term energy mix for digital infrastructure, though long touted as the future of nuclear energy, SMRs will actually generate more radioactive waste than conventional nuclear power plants, according to research.[29]

Weather and climate are increasingly material considerations in data centre development. Extreme heat waves drive up cooling loads while droughts restrict the use of water-intensive cooling technologies. Severe storms, floods, and wildfires can disrupt transmission networks or constrain renewable generation.

For example, prolonged cloud cover and wind lulls reduce renewable output precisely when demand surges due to high temperatures. Firm capacity, such as that provided by Gas, plays a stabilising role during these weather-driven stress events, anchoring system reliability when variable renewables falter.

Developers are also rethinking design: some operators are beginning to adopt closed-loop air systems and liquid immersion cooling instead of water-intensive designs, enabling deployment in hotter or humid climates once considered unsuitable.[30] Examples include Phoenix in the U.S. and Singapore, both of which are now seeing large-scale AI-ready clusters. This flexibility broadens the geographical map for new campuses, but also intensifies their demand for reliable, dispatchable electricity.

Gas-fired power remains competitive for dispatchable electricity generation. At moderate fuel prices, industry estimates put new combined-cycle Gas turbines (CCGT) costs in the ~$50–80/MWh range, cheaper than coal in many regions and substantially below long-duration storage.[31]

Data centre operators, whose revenues depend on uptime, are often more willing to pay premium prices for ultra-reliable supply. In many cases, the cost of downtime far exceeds incremental electricity costs. This makes Gas-backed electricity procurement viable even under price volatility or carbon offsetting costs.[32]

27. Data Centre Dynamics, "IEA: Data centre energy consumption set to double by 2030 to 945 TWh" 11 April 2025.

28. International Energy Agency, Energy and AI Special Report, Paris: IEA, 2025

29. StanfordReport, Stanford-led research finds small modular reactors will exacerbate challenges of highly radioactive nuclear waste, 30 May 2022, available at https://news.stanford.edu/stories/2022/05/small-modular-reactors-produce-high-levels-nuclear-waste

30. Uptime Institute, "Cooling innovation in AI-ready clusters," Uptime Institute, 2024.

31. McKinsey & Company, "Levelised cost of power for dispatchable generation," McKinsey & Company, 2024.

32. McKinsey & Company, "How data centres and the energy sector can sate AI's hunger for power," McKinsey & Company, 2024. Available at: https://www.mckinsey.com/industries/private-capital/our-insights/how-data-centers-and-the-energy-sector-can-sate-ais-hunger-for-power

Infrastructure choices also shape economics. Behind-the-meter Gas plants can reduce reliance on constrained transmission capacity, while co-location with LNG import terminals or pipeline infrastructure avoids costly grid upgrades.[33]

As developers increasingly evaluate firm power supply before fibre or real estate, marking a reversal of traditional priorities, onsite power generation emerges as a viable and feasible solution.[34]

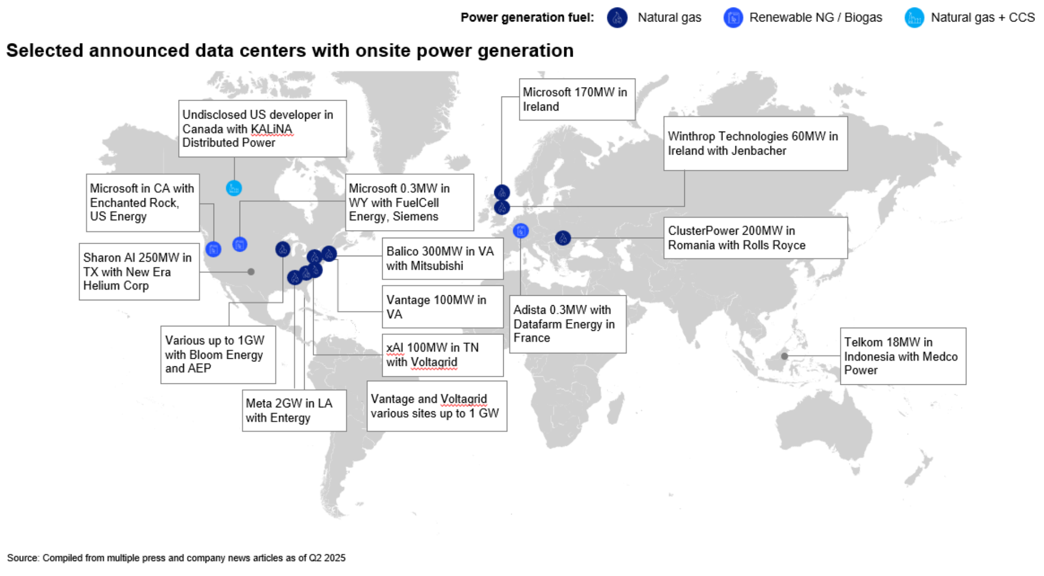
A clear trend is the co-location of data centres with Gas infrastructure or their contracting of dedicated firm capacity, with ~30% of data centre sites expected to use onsite power generation:[35]

- Duke Energy (Carolinas, U.S.): new combined-cycle and peaking units explicitly tied to hyperscale load growth.[36]
- Entergy (Louisiana, U.S.): partnership with Meta on a Gas-backed data centre campus adjacent to existing infrastructure.[37]
- AWS–AEP (Ohio, U.S.): bridging agreement to secure Gas-backed capacity during interconnection delays.[38]

Beyond the U.S., Middle Eastern sovereign projects pair natural gas turbines with solar in integrated "campus-plus-power" developments.[39] In Asia, LNG-to-power is enabling new hubs such as Singapore and Jakarta, where grid capacity is constrained but LNG import terminals provide scalable supply.[40]

Historically, data centre growth clustered in connectivity hubs such as Northern Virginia, Dublin and Singapore. Increasingly, developers are shifting to energy-abundant regions with stranded or underutilised Gas, reflecting a new priority: power first, fibre second.[41]

Figure 5 – Selected announced data centres with on-site power generation (as of Q2 2025; compiled from press and company announcements; illustrative, not exhaustive)[42]



33. International Gas Union, Gas for Africa Report, Barcelona: IGU, 2023; and other regional LNG-to-power announcements
34. Bloom Energy (2025), 2025 Data Center Power Report.
35. Ibid.
36. Duke Energy Carolinas (2024), Integrated Resource Plan filing.
37. Entergy press release (2024), "Meta data centre in Louisiana."
38. AWS–AEP bridging agreement (2025).
39. IGU (2025), The Role of Gas in East Mediterranean Economies and the Path to the Energy Transition Report
40. IGU (2023), Gas for Africa Report; regional LNG-to-power announcements.
41. McKinsey & Company, "How data centres and the energy sector can sate AI's hunger for power," McKin-sey & Company, 2024. Available at: https://www.mckinsey.com/industries/private-capital/our-insights/how-data-centers-and-the-energy-sector-can-sate-ais-hunger-for-power
42. Press releases: e.g., Rolls-Royce, "$24M expansion of data center generator production in Mankato, U.S.", 3 June 2025; INNIO, "Jenbacher engines to power 60 MW hyperscale data center in Ireland" 2024; INNIO/NorthC, "Hydrogen-based backup power for data center in Eindhoven", 2022.

PART III – THE ENVIRONMENTAL AND SOCIETAL CASE

Gas-fired generation emits roughly 350-400 gCO_2/kWh in modern combined-cycle plants, about half the level of unabated coal (800-1,000 g/kWh).[43] Substituting coal or diesel with Gas therefore lowers emissions intensity while maintaining reliability. In markets such as the U.S. and UK, this coal-to-gas switch has been the main driver of power-sector decarbonisation over the past decade.[44]

However, the absolute carbon footprint of data centres power demand will still rise, as this is directly proportional with their total electricity use, and it can be offset against a progressive decarbonisation of the Gas supply.

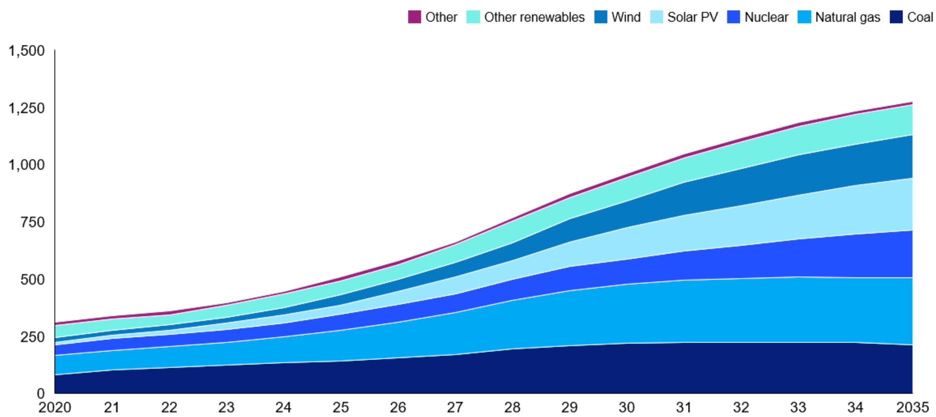
Pathways to low-carbon gas supply

While conventional natural gas and LNG underpin reliability in this decade, momentum is building around early decarbonisation pathways for gas supply:

- Biomethane production is scaling in Europe and North America; fully compatible with existing turbines.[45]
- Hydrogen blending is progressing, with OEMs delivering turbines capable of 20–30% hydrogen co-firing today and roadmaps to 100% by the 2030s.[46]
- CCUS projects for gas-to-power reached final investment decision in North America and Europe in 2024-25.[47]
- Synthetic methane pilots are advancing in Europe and Japan, demonstrating conversion of surplus renewable electricity into gaseous fuel.[48]

Methane management is also critical, and many players in the global Gas industry are currently addressing this issue through enhanced monitoring, leak detection, electrification of compressors, and certification schemes. Of note is the fact that the global Gas industry contributes only 8.62% to the total anthropogenic (human activities-generated) emissions, and less than 4% to the overall global methane emissions.

Figure 6 – Sources of global electricity generation for data centres (TWh), IEA Base Case, 2020-2035[49]



Source: IEA (2025), "Sources of Global Electricity Generation for Data Centres, Base Case 2020–2035

43. International Energy Agency, Energy and AI Special Report, Paris: IEA, 2025
44. UK Committee on Climate Change (2024), Progress Report on Power Sector Decarbonisation.
45. IGU (2024), Introduction to Low-Carbon Gas Technologies Report.
46. OEM datasheets (GE, Siemens, Mitsubishi, 2024–25).
47. Global CCS Institute (2025), "CCUS in Power Generation: Status Update."
48. Pilot project announcements in Europe and Japan (2024–25).
49. International Energy Agency (2025), Sources of global electricity generation for data centres, Base Case, 2020–2030.

A Fragile Balance

Electricity systems must balance the needs of critical public services (hospitals, emergency response, water treatment) with new large loads such as AI data centres. Regulators and system operators consistently maintain priority for essential services in emergency load-shedding protocols.[50]

The growth of data centres raises public questions: who should get power first? The fact-based answer is that with sufficient investment in renewables and firm Gas capacity, societies need not choose. Gas resources developed at speed and scale ensure that critical services and digital infrastructure can both be served.

This balance also provides a competitive advantage. Jurisdictions capable of deploying reliable Gas-backed capacity rapidly are more attractive to investors, both in digital infrastructure and in wider industries, thus creating jobs, strengthening local supply chains, and accelerating knowledge transfer[51]. In this sense, Gas is not only a technical enabler but also a driver of human progress and global, inclusive growth.[52]

Community acceptance and trust are central. Communities weigh the impact of data centres not only in terms of electricity consumption, but also in terms of livelihoods, including jobs, training, and local economic opportunities that shape their willingness to support new projects.

Public scepticism often focuses on the perception that data centres "hog" electricity or water; explicitly addressing fairness and resilience can help secure their social licence to operate.

Demonstrating resilience to shocks is also vital: in many regions, extreme weather, geopolitical disruptions, or supply chain breakdowns put energy systems under strain. Firm capacity, such as that provided by Gas, helps anchor stability under these conditions.

Finally, global digital equity is at stake. AI and data services are increasingly regarded as public goods in education, health and governance. Their reliability is tied to inclusion. Firm Gas capacity ensures that access to these services is not restricted to wealthier regions with already-robust grids.

Greater digitalisation of power systems increases exposure to cyber risks, further underlining the value of secure firm assets.[53]

50. NERC (2025), Large Load Reliability Guidelines.
51. World Bank (2025), Energy Infrastructure Investment Climate Report.
52. International Gas Union, Global Gas Report 2025, London: IGU, 2025.
53. Global electricity demand: what's driving growth and why it matters? Oxford Institute for Energy Studies, January 2025

PART IV – REGIONAL OUTLOOK

North America

North America, particularly the U.S., is at the epicentre of hyperscale data centre growth. The region combines abundant natural gas, increasingly competitive renewable resources, and extensive transmission and pipeline infrastructure, positioning it as the leading global market in the field. Gas already provides around 40% of U.S. electricity supply, anchoring reliability, with renewables providing about a quarter, nuclear 15-20%, and coal still contributing but declining.[54]

Utilities are adding new Gas capacity explicitly to serve hyperscale loads (e.g., Duke Energy in the Carolinas, AWS-AEP in Ohio), often complemented by renewable PPAs that help large customers meet sustainability targets while still guaranteeing 24/7 availability.[55]

At the same time, grid access remains a constraint, where transmission and interconnection queues often stretch for several years. This is driving interest in behind-the-meter Gas projects and campus-adjacent turbines that can be deployed more quickly and controlled directly by operators.

Hyperscalers will continue to build in key U.S. markets such as North Virginia, Dallas, and Phoenix, intensifying existing power constraints, while other States with high land and energy availability (e.g., Ohio, Indiana, Wyoming) are attracting investments to service rising national demand. By 2030, the U.S. could face a ~25GW supply gap, underscoring the urgency for alternative hubs.

Natural gas remains the dominant fuel in most new data centre power project announcements. In the U.S., utilities are actively planning dozens of new Gas plants to meet data centre load growth, particularly in the Southeast.[56] At the same time, PPAs with nuclear plants are gaining traction, with Microsoft contracting output from the Three Mile Island facility and AWS from the Susquehanna station, ensuring low-carbon baseload supply with unmatched stability.[57]

Canada, with its hydro-rich provinces, has attracted data centre investment, with key hubs being developed around Toronto, Montreal, and Vancouver. Yet Quebec has paused new connections due to capacity saturation, underscoring that even low-carbon grids with strong renewable resources can struggle to keep pace with the speed of hyperscale build-out.[58]

Opportunities for further large hydro expansion are limited by geography, permitting and environmental considerations, pushing policymakers to explore other reliable, stable and immediately dispatchable options such as Gas.

Gas remains an important part of the Canadian generation mix, particularly in Ontario and Alberta, where it provides flexible capacity and grid stability. In parallel, Canada's nuclear ambitions, such as life-extension programs in Ontario and SMR initiatives in Saskatchewan, are being positioned as complementary to hydro and Gas, potentially providing the dispatchable backbone that can support future waves of digital infrastructure.

Policy and regulatory dynamics are shaping how quickly and where this build-out can occur. In the U.S., federal measures such as the Inflation Reduction Act (IRA) and interconnection reforms led by the Federal Energy Regulatory Commission (FERC) are influencing investment signals,

54. U.S. EIA (2023), Annual Energy Outlook – Electricity Demand by Sector
55. Duke Energy Carolinas (2024), Integrated Resource Plan; AWS-AEP bridging agreement (2025).
56. IEEFA (2025), Data centers drive buildout of gas power plants and pipelines in the South-east.
57. U.S. Energy Information Administration (EIA), "Data center owners turn to nuclear as potential electricity source," EIA article, 2024.
58. Hydro-Québec (2023), Electricity Planning Update.

while permitting timelines at state level continue to affect project delivery. In Canada, provincial approaches are decisive: Hydro-Québec's pause on new data centre connections reflects grid capacity concerns, while Alberta has introduced new rules to manage the pace and location of renewable additions. These structural factors frame the investment landscape and determine how quickly digital and energy infrastructure can scale.

Mexico is also emerging as a secondary data centre market within North America. The country's electricity system is anchored by natural gas, largely imported from the U.S., and faces reliability challenges due to limited grid investment. While Mexico has world-class solar and wind potential, deployment has slowed. Data centre activity is concentrated around Querétaro, Monterrey, and Mexico City, with growth closely tied to cross-border Gas flows and infrastructure development.

Europe

North-Western Europe remains the core hub for hyperscale data centre activity, anchored by markets such as Dublin, London, Amsterdam and Frankfurt. These cities benefit from dense fibre connectivity, proximity to major financial and corporate customers, and strong policy commitments to digital infrastructure. However, their success has created acute challenges: Dublin's data centres already consume more than one-fifth of national electricity and face strict caps on new connections[59], while Amsterdam and London have experienced temporary moratoria due to grid stress and land scarcity.

Frankfurt continues to expand but is under increasing pressure from both power constraints and local community concerns about land and energy use. In response, operators are experimenting with on-site generation (including Gas-engine plants) and flexibility commitments to secure approvals, while policymakers are linking new permits to renewable integration or energy-efficiency requirements.

As a result, North-Western Europe exemplifies both the maturity and the constraints of the sector: it is the most established cluster, but also the one where growth is most tightly shaped by grid, land and regulatory limits.

In Ireland, data centres already accounted for 22% of national electricity demand in 2024, highlighting the strain of concentrated load growth.

Within this context, the Nordics have emerged as attractive due to high land availability, access to green energy, and favourable regulation—although construction and workforce costs are higher with connectivity focused on Northern Europe and Asia through hubs in Stockholm (Sweden), Oslo (Norway), and Helsinki (Finland).

Beyond the core north-western hubs, other regions are emerging. Central and Eastern Europe (CEE), including Poland, The Czech Republic, and Hungary, are beginning to see hyperscale growth, often tied to coal-to-Gas transitions and expanding interconnections.

These markets benefit from lower costs and proximity to demand but face less mature infrastructure and policy frameworks, which may slow development.

Spain is also gaining momentum, leveraging access to renewable energy and its strategic location with connectivity to Europe, North/Latin America, and Middle East and Africa (MEA), further

59. Commission for Regulation of Utilities (Ireland, 2024).

reinforced by direct access to subsea cables such as Grace Hopper, MAREA and 2Africa, with Madrid and Barcelona serving as its largest hubs.

Southern Europe, beyond Spain, is also positioning for growth: Portugal, Italy and Greece are leveraging high renewable potential and submarine cable access to attract investment. These regions are increasingly framed as alternative nodes to relieve pressure on saturated north-western markets while aligning with Europe's broader decarbonisation goals.

As Europe faces strong decarbonisation mandates (e.g., EU Fit for 55, UK net-zero law)[60], much of the recent growth in data centre electricity demand is being met by renewables complemented by nuclear, and their combined share is expected to rise sharply by 2030. Gas, nevertheless, remains essential to stabilise renewable-heavy grids, especially in countries with high wind penetration such as the UK and Germany.[61]

Europe's challenge is that grid expansion, including permitting delays and transmission bottlenecks, lags data centre demand requiring interim reliance on flexible Gas.

Europe's digital agenda extends beyond decarbonisation. The EU Digital Decade targets aim for 75% of European enterprises to adopt cloud, big data and AI by 2030, driving structural demand for data centre capacity. Initiatives such as GAIA-X, the European federated data infrastructure project, seek to ensure that this growth supports data sovereignty, security and interoperability. Together, these policies position digital infrastructure not just as a power-sector challenge but as a strategic enabler of Europe's competitiveness and autonomy.[62] This intense policy drive requires intensive and reliable electricity outputs and, in the light of the recent Dunkelflaute events across the continent in the recent years, Gas' ability to immediately intervene to supplement the intermittency of renewables was critical.

Energy price dynamics also influence investment decisions. The 2021-22 energy crisis highlighted Europe's exposure to global Gas markets and, while prices have since moderated, power costs remain a consideration for hyperscaler siting, particularly outside the Nordics and Spain, where abundant renewable resources provide some insulation.

Asia-Pacific (ex-China)

The region is characterised by rapid digital growth, diverse energy mixes, and increasing reliance on LNG.

In Asia's advanced economies, nuclear and renewables are becoming increasingly important in the grid mix, yet data centres continue to rely on fossil fuels, particularly LNG, for backup and dispatchable generation.

In Japan and South Korea, LNG accounts for more than a quarter of electricity supply, providing the flexibility needed to balance expanding offshore wind and solar fleets.[63] Both countries are also restarting or commissioning new nuclear units, with Japan reactivating reactors under revised safety standards, and Korea targeting nuclear for up to 30% of its power mix by 2036.[64]

LNG imports underpin reliability for urban data centre clusters in Tokyo (Japan), Osaka (Japan), and Seoul (Korea), where Gas turbines are valued for meeting peak demand and ensuring grid stability.

60. European Commission (2024), Fit for 55 Progress Report.
61. International Gas Union, Global Gas Report 2025, London: IGU, 2025.
62. Eurostat (2025), Digitalisation in Europe – 2025 Edition.
63. METI (2024), Energy White Paper; Singapore EMA (2024).
64. S&P Global (2023), South Korea to cut LNG in power mix to 9.3% in 2036, sharply raises role of nuclear energy.

Policy incentives and long-term planning frameworks are accelerating renewable and nuclear integration but, in practice, LNG-fired generation remains the backbone for new hyperscale projects, ensuring uninterrupted supply while low-carbon sources scale.

At the same time, reliance on LNG exposes these markets to global price shocks, most visibly after Russia's invasion of Ukraine, straining competitiveness for these countries. This volatility underscores both the importance of diversifying supply and the structural, fundamental role that Gas continues to play in balancing regional grids.

Australia's data centre sector is expanding in Sydney and Melbourne, with coal retirements driving investment in renewables, batteries and peaking Gas. The country is undergoing one of the fastest coal-to-renewables transitions globally, with early coal retirements creating a reliability gap. While solar, wind, and large-scale batteries are scaling quickly, transmission delays, such as the stalled Snowy 2.0 pumped hydro project, limit timely delivery.

Gas remains critical for peaking and balancing capacity, yet LNG exports keep domestic pricing contentious, raising questions about affordability for large loads such as data centres. Power availability is increasingly a constraint, prompting interest in co-located renewable generation backed by Gas turbines to guarantee firm supply. Policy targets of 82% renewables by 2030 and net-zero by 2050 set a clear direction[65], but The Australian Energy Market Operator (AEMO) continues to warn of potential shortfalls unless firming capacity is accelerated.

In Southeast Asia, regional dynamics are gradually shifting as Singapore's limited land and power capacity encourage hyperscale investment in nearby markets. Johor in Malaysia and Batam in Indonesia, once viewed mainly as spillover locations, are beginning to evolve into more established clusters with their own growth momentum. By 2026, both markets are seeing direct hyperscaler commitments, supported by LNG-to-power projects and subsea cable links that provide low-latency connectivity to Singapore while offering lower costs and more flexible permitting.

Cheaper labour and construction costs add to their competitiveness, positioning Johor and Batam as complementary growth poles alongside Singapore's role as the regional anchor.

India also stands out for its low workforce and construction costs and high land availability, though growth is hindered by complex regulatory hurdles; nevertheless, additional investments are expected to meet data demand from its vast population, with hubs spread across Mumbai/Navi Mumbai, Delhi, Chennai, Bangalore and Hyderabad. Beyond cost competitiveness, India's policy framework is increasingly shaped by digital sovereignty considerations: both domestic cloud providers and global hyperscalers are being pushed to host data locally, a trend that amplifies power demand as more capacity must be built within national borders.

In this region, Gas plays a dual role, displacing coal in the power mix while also acting as the balancing resource needed to integrate variable renewable energy.

Renewables are scaling quickly, but infrastructure and regulatory constraints mean Gas will remain essential for the next two decades.

65. Australian Government (2025), Setting our 2035 target and path to net zero.

Across Asia, the trajectory of data centre growth is shaped as much by social and political acceptance as by technical feasibility. In India and Indonesia, projects can be delayed by land disputes and community opposition, while in Singapore, public concern over the energy and water footprint of facilities led to a temporary moratorium on new approvals, now cautiously reopening under stricter efficiency and green-power criteria.

Policy and regulatory frameworks further add complexity: Japan and Korea are committed to net-zero pathways but remain heavily dependent on imported fuels, highlighting tensions between decarbonisation goals and energy security.

India illustrates another dimension, where regulatory hurdles, ranging from multiple permitting processes to differing grid codes across states, slow the pace of build-out despite strong demand fundamentals. Together, these factors underscore that the region's digital expansion is not solely a matter of investment and technology, but also of governance, local acceptance, and national energy strategies.

China

In China, coal remains the backbone of electricity supply for data centres, particularly in the eastern coastal regions where around 60–70% of power still comes from coal.[66] At the same time, the country is advancing the world's fastest clean-energy build-out, installing more solar capacity in 2023–24 than the rest of the world combined.[67] Alongside this surge in renewables, China is also expanding its nuclear fleet with more than 30 reactors under construction.[68]

Natural gas, while a smaller share of the national mix (3-4%), plays an increasingly important role in coastal provinces where natural gas-fired peakers help meet air quality standards and provide flexibility for renewable integration.[69] LNG imports and pipeline expansions are expected to support this role, with Gas-fired generation positioned as a cleaner alternative to coal for urban clusters.

Recent large-scale projects, such as the 2.4 GW Dongguan Ningzhou and a 2GW GE Vernova-equipped plant, illustrate how natural gas is being commissioned to displace coal and enhance flexibility in high-demand regions.

China's Western Data, Eastern Compute initiative is shifting facilities inland to provinces rich in renewable resources, with ultra-high-voltage (UHV) transmission delivering power eastward. In this model, Gas remains a targeted but important complement to large renewable and nuclear investments.

China's data centre boom is closely linked to its ambition for leadership in AI and cloud computing, with government subsidies and industrial policy driving accelerated build-out. Digital sovereignty is a central priority: hyperscale infrastructure is viewed not only as an economic enabler but as a foundation of technological and geopolitical competitiveness.

This framing elevates power adequacy to a national security concern, as outages or shortages risk undermining strategic objectives.

Digital sovereignty is a central priority: hyperscale infrastructure is viewed not only as an economic enabler but as a foundation of technological and geopolitical competitiveness.

66. International Energy Agency, Energy and AI Special Report, Paris: IEA, 2025
67. International Energy Agency PVPS (2023), National Survey Report of PV Power Applications in China 2023.
68. World Nuclear Association (2025), Nuclear Reactors in China.
69. China National Energy Administration (NEA, 2024), Power Sector Data.

Middle East

The Middle East is leveraging abundant natural gas and world-class solar to become an AI compute hub. Sovereign-backed mega-projects (e.g., in the United Arab Emirates (UAE) and Saudi Arabia) co-locate data centres with industrial zones and cable landing points, ensuring reliable supply and connectivity.[70]

Gas remains the dominant fuel, with more than 60% of regional electricity generation supplied by natural gas, and new combined-cycle projects are being commissioned both to displace oil-fired capacity and to anchor data centre demand.[71] At the same time, the UAE has connected its first nuclear units at Barakah, which are beginning to provide carbon-free baseload that can complement solar and Gas in the long term.[72]

Hybrid models pair utility-scale solar with Gas turbines for round-the-clock availability, as well as LNG-to-power integration for digital infrastructure in LNG-rich nations such as Qatar and Oman.[73]

Harsh desert conditions in the region add another layer of complexity: high ambient temperatures raise cooling loads, making water use and efficiency key differentiators. As a result, operators are piloting liquid immersion cooling and exploring synergies with co-located desalination facilities to adapt digital infrastructure to regional climates.

In Saudi Arabia, as part of NEOM and the broader Vision 2030, initiatives are driving the creation of large digital clusters linked to industrial zones, renewable energy projects, and new interconnections with Egypt and Jordan.

The UAE has emerged as a focal point, benefiting from low-cost power relative to established markets, connectivity to Europe, Asia and Africa, and significant public sector investments (e.g., MGX, G42), with major hubs in Dubai and Abu Dhabi.

Qatar leverages its LNG wealth to subsidise digital growth, with initiatives such as the National Digital Agenda 2030 and sovereign investments through the Qatar Investment Authority to strengthen connectivity and cloud capacity.

Oman is positioning itself as a subsea cable hub connecting Asia and Europe, with landing points in Salalah and Sohar now hosting new carrier-neutral data centres such as Equinix SN1 and Ooredoo's Salalah facility. LNG-to-power projects in Sohar act as transitional enablers, bolstering grid reliability in the same geographies where digital clusters are emerging.

In Kuwait and Bahrain, data centre development remains more limited in scale but is gaining traction through targeted colocation projects. In Kuwait, operators such as Ooredoo, Zajil Telecom, and stc are expanding facilities in Kuwait City, with the national co-location market forecast to grow nearly sixfold by 2030. In Bahrain, telecom-led initiatives are shaping the landscape, with Batelco and Qareeb Data Centres planning new facilities in Manama and stc Group launching a "data centre park" linked to subsea cable landings like SeaMeWe-6 and 2Africa.

Emerging markets are at earlier stages of digital growth but are building selectively in metro-adjacent clusters.

Africa

Africa's digital infrastructure remains concentrated in South Africa, though chronic grid unreliability is prompting exploration of LNG-to-power and hybrid renewable projects.

70. Saudi Ministry of Energy (2025); UAE Energy Strategy documents.
71. International Energy Agency (2024), World Energy Outlook, Middle East section.
72. World Nuclear Association (2024), World Nuclear Association - Nuclear Power in the United Arab Emirates.
73. IGU (2025), The Role of Gas in East Mediterranean Economies and the Path to the Energy Transition Report

Other markets are beginning to emerge: Kenya leverages geothermal, Egypt combines renewables and Gas with strategic subsea cable landings, and Nigeria and Mozambique seek to monetise their natural gas reserves to underpin regional hubs.[74]

The arrival of new submarine cables such as 2Africa and Equiano is reshaping connectivity, but infrastructure gaps, water stress and regulatory uncertainty continue to limit the scale of hyperscale build-out.

Latin America

Latin America's growth is led by Brazil, where hydro dominates but drought cycles drive greater reliance on LNG peakers and complementary renewables.

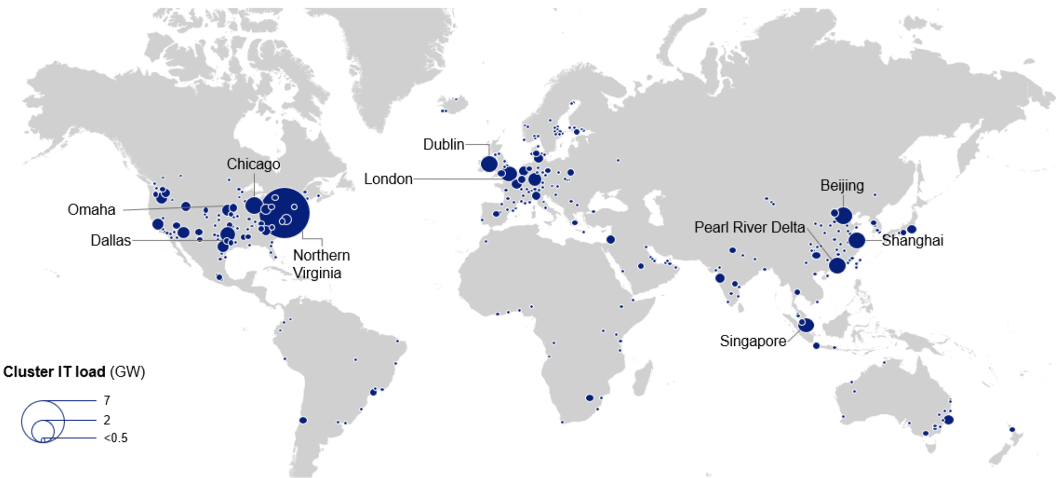
Chile's solar-heavy system is increasingly paired with imported LNG for firming, while Colombia, Peru and Argentina are beginning to attract interest as secondary hubs.[75]

Across the region, abundant solar, wind and hydro resources create long-term potential, but political volatility, infrastructure fragility and data localisation laws shape investment strategies and pace.

In both regions, Gas is critical for firm capacity and early digital development, while renewables (solar, hydro, wind) provide abundant but variable supply.

As shown in Figure 7, the world's largest data centre clusters are highly concentrated in a few regions.

Figure 7 – Global map of large data centre clusters in 2024[76]



Data centre cluster defined as a group of data centres located within 100 km of each other. The ten largest clusters have been named. The Pearl River Delta encompasses the combined capacity of Guangzhou, Shenzhen and Hong Kong (China)

Source: IEA (2025), Energy and AI report

74. IGU (2023), Gas for Africa Report.

75. Latin American Energy Organization (OLADE, 2024); Petrobras (2024).

76. International Energy Agency, Energy and AI Special Report, Paris: IEA, 2025. Available at: https://iea.blob.core.windows.net/assets/ed0483fd-aab4-4cf9-b25a-5aa362b56a2f/EnergyandAI.pdf

CONCLUSION – IMPLICATIONS FOR POLICY & PLANNING

By 2040, global data centre electricity consumption could plausibly double again from the 2030 levels, reaching 1,800-2,000 TWh per year.

This would equate to 6-8% of projected world demand, comparable to the electricity use of a total global major industrial sector. The unprecedented speed of this rise makes AI-driven data centre loads a structural component of electricity planning worldwide.

The period to 2040 highlights three imperatives:

System value
Gas underpins renewable integration by providing firm, flexible capacity.

Speed
Jurisdictions capable of developing reliable capacity quickly will gain competitive advantage in attracting digital and industrial investment.

Decarbonisation
investment must target low-carbon gases, CCUS and methane abatement to align with climate goals, where applicable.

Past experience shows the risks of mis-forecasting: in China, 2005 demand overshot projections by about 25 percent, while in the U.S. utilities have also overbuilt under conservative assumptions. With AI demand highly uncertain, range-based planning anchored by flexible capacity is essential.[77]

Governments and Regulators

- Align permitting, interconnection, and planning timelines with the pace of digital infrastructure growth.
- Design electricity market policies that incentivise hybrid procurement models (renewables + dispatchable capacity) while safeguarding security of supply.
- Ensure energy security and decarbonisation objectives are advanced in parallel, as national competitiveness will increasingly hinge on reliable power access for AI-driven growth.

Energy Suppliers and Utilities

- Adapt to a new class of large, fast-moving customers (hyperscalers) whose demand differs from traditional industrial loads.
- Explore co-location opportunities with digital campuses, LNG-to-power projects and dedicated low-carbon Gas supply.
- Form strategic partnerships with hyperscalers to de-risk investments in flexible and cleaner capacity.

77. Global electricity demand: what's driving growth and why it matters? Oxford Institute for Energy Studies, January 2025.

Hyperscalers and Data centre Developers

- Embed energy reliability into site selection decisions — moving from "fibre first" to "power first."
- Pursue long-term contracts for Gas + renewable hybrids, nuclear PPAs, and future low-carbon solutions such as hydrogen or SMRs.
- Engage transparently with communities and regulators to secure social acceptance and maintain license to operate.

Technology OEMs and Innovators

- Accelerate deployment of hydrogen-capable turbines, CCUS retrofits, advanced cooling systems, and energy-efficient digital hardware.
- Collaborate directly with digital infrastructure providers to shorten innovation-to-market cycles.

Communities and Civil Society

- Acceptance will depend on visible local benefits: jobs, training, and local supply-chain participation.
- Concerns about emissions, water use and resilience must be addressed explicitly.
- Gas-backed capacity can anchor resilience during extreme weather, ensuring continuity of critical public and digital services.

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