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Policy Solution Paper



Energy security for the AI economy

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Powering the next era of growth



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Key points

- AI is transforming electricity demand from a background utility issue into a front-line matter of economic competitiveness and national security.
- The core mismatch is speed, and data centres can be built in one to three years, while grid infrastructure takes five to fifteen.
- China and the European Union have begun linking AI and energy planning nationally, but no common framework exists to compare AI loads or grid readiness across G20 economies.
- A voluntary G20 AI-Energy Readiness Framework built on comparable demand outlooks, smarter use of existing grids, and investable project pipelines can close this gap without new bureaucracy.
- The G20 members, with their current focus on affordable and secure energy supply chains, are well positioned to shepherd this framework toward a Leaders' Statement commitment.

Why AI's power problem is also a power opportunity

Artificial Intelligence (AI) has become an energy-security, supply reliability and competitiveness issue in its own right. The data centres, accelerated servers, and cooling systems that underpin AI require large and increasingly concentrated volumes of electricity. In 2025, global electricity consumption by data centres grew by 17%, and by AI-focused facilities by around 50%, against roughly 3% growth in overall electricity demand[1]. The International Energy Agency (IEA) projects that global data-centre electricity consumption will more than double to approximately 945 terawatt-hours by 2030, slightly more than Japan's current consumption and nearly 3% of world electricity use with electricity use by accelerated servers, driven mainly by AI, growing by around 30% annually. The US and China together are expected to account for nearly 80% of this increase[2].

The central challenge is not aggregate consumption but the rapid increase and concentration of new demand. Data centres can be constructed in one to three years, whereas major grid infrastructure takes five to fifteen years to plan, permit, and build. AI facilities can also concentrate hundreds of megawatts of demand within small geographic footprints, and the IEA estimates that grid constraints could delay around 20% of planned global data-centre capacity through 2030[3]. Data centres could consume around 649 terawatt-hours by 2030, i.e., 11.8% of national electricity consumption, and more than 85% of new global data-centre capacity is expected to concentrate in the US, China, and the EU, often around already-constrained grid clusters[4].In regions where electricity systems are already under pressure, rapidly rising data-centre demand can also create cost pressures by requiring accelerated investment in generation and transmission capacity, with the risk that these additional infrastructure costs are ultimately reflected in electricity prices for households and other consumers.

This mismatch is also a considerable opportunity. AI-driven demand can anchor investment in generation, storage, renewable energy, advanced nuclear, and advanced grid flexibility technologies. Five major technology companies invested more than $400 billion in 2025 alone, largely on data-centre expansion, while the technology sector accounted for 40% of corporate renewable power-purchase agreements signed that year[5]. Economies that pair computing capacity with reliable, affordable, low-carbon, and scalable electricity will be best positioned to capture AI-led growth and associated industries; those that cannot may find that energy infrastructure, rather than algorithms or capital, becomes the binding constraint on technological competitiveness.

[1]International Energy Agency (IEA), *Energy and AI* (Paris: IEA, 2025); IEA, *Key Questions on Energy and AI* (Paris: IEA, 2026).
[2]International Energy Agency, *Electricity 2026* (Paris: IEA, 2026).
[3]International Energy Agency, *Electricity 2026* (Paris: IEA, 2026).
[4]Sarah Josephine Smith et al., *United States Data Center Energy Usage Report: 2025 Update* (Lawrence Berkeley National Laboratory, June 2026).
[5]International Energy Agency (IEA), *Energy and AI* (Paris: IEA, 2025); IEA, *Key Questions on Energy and AI* (Paris: IEA, 2026).

Coordination gap and how economies are responding

Major economies are linking AI and energy planning, but through divergent national approaches. China's 2026 Action Plan sets 29 priorities spanning reliable power, low-carbon computing, and flexible grid resources[6] while the EU's 2026 Strategic Roadmap promotes sustainable data-centre integration alongside expanded computing capacity through AI Factories and proposed Gigafactories[7]. These initiatives are constructive but remain largely national, with no common methodology to compare AI loads, grid constraints, firm capacity, or investment needs across G20 economies. This gap matters because computing investment is mobile while electricity infrastructure is fixed, and supply-chain shortages or concentrated AI demand can intensify competition for power across domestic industry and households[8].

Developing economies face a sharper challenge as rising demand from industrialization, cooling, urbanization, and expanding access requires careful sequencing to prevent AI loads from diverting scarce grid capacity and investment from broader development priorities such as expanding energy access or decarbonization pathways[9]. Globally, more than 2,500 gigawatts of generation, storage, and large-load projects are currently stalled in grid-connection queues, and annual grid investment of about $400 billion would need to rise by about 50% by 2030 simply to meet forecast demand[10]. Existing institutional responses, in short, treat national symptoms without the interoperable diagnostic tools this moment requires.

Recommendation: Priorities for an AI-ready power system

The G20, through its members strong focus on unlocking affordable, sustainable, and secure energy supply chains, is well positioned to close this diagnostic and coordination gap. Rather than creating new bureaucracy, the G20 should establish a voluntary AI-Energy Readiness Framework, built on existing national systems and anchored in three practical commitments.

1. Preparing power systems for AI-driven demand

G20 members should pair planning for AI-driven electricity demand with greater use of AI to improve power-system efficiency, reliability, and access. Pilot programmes should test applications such as geospatial electrification planning, renewable-generation forecasting, **congestion management**, mini-grid and storage dispatch, **distributed-energy-resource optimization**, battery optimisation, outage detection, predictive maintenance, and demand management.

For emerging economies, these tools can optimize limited infrastructure, integrate renewables, reduce system losses, and expand reliable electricity access. G20 support should prioritize scalable, affordable applications with safeguards for data governance, consumer protection, **cybersecurity and the operational resilience of increasingly interconnected power, telecommunications and digital infrastructure**.

[6]National Energy Administration of China, *Action Plan for Promoting the Two-Way Empowerment of Artificial Intelligence and Energy*, 2026.
[7]European Commission, *Strategic Roadmap for Digitalisation and Artificial Intelligence in the Energy Sector*, Brussels, June 3, 2026; European Commission, "Energy Performance of Data Centres," 2026.
[8]International Energy Agency (IEA), *Energy and AI* (Paris: IEA, 2025); IEA, *Key Questions on Energy and AI* (Paris: IEA, 2026).
[9]World Bank Group, "Building Data Infrastructure for AI Readiness," May 6, 2026.
[10]International Energy Agency (IEA), *Energy and AI* (Paris: IEA, 2025); IEA, *Key Questions on Energy and AI* (Paris: IEA, 2026).

2. Enable AI-ready infrastructure through smarter planning, investment, and grid flexibility

The second component of the AI-Energy Readiness Framework should translate demand outlooks into infrastructure priorities across generation, transmission, storage, and grid flexibility. Governments should integrate projected AI and data-centre loads into power-system planning through coordination across energy, digital, infrastructure, industry, and finance authorities. New computing capacity should also be aligned with additional electricity supply, grid capacity, water availability, and climate conditions. Practical levers include:

- **Efficient power markets with flexible connection agreements and effective demand response** to manage large computing loads during periods of system stress;
- **Energy storage deployment and virtual power plants (VPPs)** at data-centre sites to enhance grid flexibility and reliability;
- **Shifting non-time-critical loads** away from peak periods to reduce pressure on electricity systems;
- **Streamlining permitting and regulatory processes** for generation, transmission, storage, and clean-energy projects to avoid unnecessary barriers to infrastructure investment.
- **Resource-efficient data-centre development**, incorporating water availability, cooling technologies, local water stress and climate vulnerability into siting and readiness assessments.

3. Turn readiness gaps into investable projects

National readiness reviews should identify priority investments in generation, transmission and distribution, storage, grid-enhancing technologies, and data-centre efficiency, helping governments, development banks, and private investors turn infrastructure gaps into bankable projects. For emerging and developing economies, reviews should also assess cost of capital, currency risk, utility creditworthiness, and project-preparation capacity, supported by G20 and MDB technical assistance, guarantees, risk-sharing, and blended finance. Assessments should address supply-chain vulnerabilities across semiconductors, transformers, batteries, and critical minerals, while promoting local processing, value addition, and skills development in mineral-producing economies. Infrastructure planning should also take a long-term perspective, including diversification into low-carbon technologies such as nuclear power, particularly small and micro modular reactors where appropriate.

As a next step, G20 Energy and Digital Ministers should endorse the framework and pilot it across advanced, emerging, and developing economies. Success should be measured by earlier identification of bottlenecks, faster viable connections, mobilised investment, and computing growth without compromising reliability or affordability. In emerging and developing economies, it should also assess gains in energy access, productivity, industrial development, employment, and skills.

Short bio of authors

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Prof. Khasru is Chairman of the international knowledge outfit, the Institute for Policy, Advocacy, and Governance (IPAG). An MBA from the Wharton School of the University of Pennsylvania, he is well known in the G20 and G7 community for his leading role in writing close to 25 policy briefs on a wide range of issues, which include digital transformation, AI, energy, climate, governance, multilateralism and sustainable development. He brings both policy and implementation perspectives from the Global South into international economic and technology governance.

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