SUBMISSION

Submission to the Senate Environment and Communications References Committee

Submission to the inquiry into artificial intelligence and data centres

1 September 2026

The Australian Academy of Technological Sciences and Engineering (ATSE) is a Learned Academy of independent, non-political experts helping Australians understand and use technology to solve complex problems. Bringing together Australia's leading thinkers in applied science, technology and engineering, ATSE provides impartial, practical and evidence-based advice on how to achieve sustainable solutions and advance prosperity.

Artificial intelligence (AI) and data centres present a series of opportunities and challenges for Australia. Since the beginning of the decade, AI has embedded itself – not just in our everyday lives – but in almost every sector of our economy (Austrade, 2026). However, Australia faces significant global competition from the select few countries leading in AI development. If Australia wants to make the most of this opportunity, developing sovereign AI capability should be designated as a national priority. This is outlined in ATSE's 2025 action statement *Made in Australia: Our AI opportunity.*

As AI uptake has increased, so has the demand for, and scale of, data centres. Those most often-cited in media reporting – i.e., large, hyperscale data centres – require the greatest amount of energy. Hyperscale data centres have greater capability in storing data, training AI models and processing AI requests, compared to traditional data centres. Recent investment has increased considerably (ABS, 2026). While energy demands will be significant, this should be placed in context, when considered in relation to other major energy users. Currently there are over 290 data centres, of all types, operating in Australia. Sydney leads with 93 data centres, followed by Melbourne with 56 (Data Centre Map, 2026). Australian data centres tend to cluster in metropolitan (87%), as opposed to regional areas (13%) (Data Center Map, 2026). Given the national growth in data centres, now is the time to act to ensure Australia sees the benefits of this boom.

This submission will focus on the technological, infrastructure, environmental and capability dimensions that need to be considered in relation to AI and data centres. Further discussion on the potential impacts that AI and data centres could have, will be made with reference to areas that ATSE has particular expertise in, that of energy and water. ATSE recommends the following measures – which aim to support AI-driven growth – whilst also providing sustainable solutions for managing the projected increase in data centres:

Recommendation 1: Invest in sovereign AI capability, including Australian-owned and managed AI infrastructure, models and datasets.

Recommendation 2: Require new data centres to underwrite additional renewable electricity generation and storage capacity, to support increased electricity demand and accelerate the deployment of renewable energy.

Recommendation 3: Extend energy performance reporting requirements beyond government data centres by mandating the public disclosure of key metrics, including Power Usage Effectiveness (PUE), for large data centres across Australia.

Recommendation 4: Develop a national water reporting framework for data centres that requires consistent disclosure of both direct water consumption and indirect water use associated with electricity generation.

Recommendation 5: Support industry-research partnerships to accelerate the development and deployment of next-generation energy-efficient computing technologies such as quantum computing.

Recommendation 6: Incorporate data centre workforce needs into national skills and infrastructure workforce planning.

Investment in sovereign AI capability

As argued in ATSE's *Made in Australia: Our AI opportunity*, without investment in sovereign AI capability,[1] Australia risks becoming dependent on foreign AI providers. AI supply chains are currently dominated by the United States, Taiwan, the Netherlands and China (Hawkins et al., 2026). Sovereign AI models do not require the multibillion-dollar development funding of the kind seen in the United States with OpenAI, Google or Anthropic. For example, Switzerland has built an open-source AI model – with infrastructure costing a relatively modest AU$70 million annually (ETH Zurich, 2025).

To support Australia's efforts to seize this opportunity, ATSE's *Unleashing growth: Australia's AI investment blueprint* outlines six priority enablers for an Australian AI industry that will produce the greatest economic impact – a national AI talent pipeline, population-scale AI training, purpose-built AI compute facilities, specialised AI models and national datasets, and effective AI standards and regulations. ATSE & Kearney modelling estimates[2] that, under an increased-investment scenario, AI could contribute an additional AU$160 billion to AU$235 billion to annual Australian GDP by 2034 (ATSE & Kearney, 2025). This is equivalent to about 6–8% of 2024 GDP. Of this, AU$25 billion to AU$45 billion is the modelled incremental benefit associated with the proposed additional AU$5 billion government investment. Further

[1] Sovereign AI capability is the ability of a country's government, industry and society, having the independent capacity to effectively use technology in the absence of any inputs sourced from other countries (CSIRO, 2024).

[2] Estimates remain highly dependent on assumptions about AI adoption and productivity gains.

Level 2, 28 National Circuit
Forrest ACT 2603
Australia

PO Box 4776
Kingston ACT 2604
Australia

+61 2 6185 3240
info@atse.org.au
atse.org.au

ABN 58 008 520 394
ACN 008 520 394

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benefits could arise if there is increased AI innovation in areas such as healthcare, biotechnology and robotics.

Recommendation 1: Invest in sovereign AI capability, including Australian-owned and managed AI infrastructure, models and datasets.

Supporting renewable energy

Australia's data centre sector is growing rapidly, creating a significant new source of electricity demand. AEMO estimates that data centres consumed 4TWh of electricity across the National Electricity Market in FY 25, with demand projected to reach approximately 12TWh by 2029-30[3] (AEMO, 2025b). As Australia builds data centre capacity, ensuring this additional demand is matched by new renewable generation and storage is critical to meeting progress towards Australia's emissions-reduction targets (DCCEEW, 2026).

Recent guidance on data centres and AI infrastructure from the AEMC has recommended the government *"mandate data centres to obtain Renewable Electricity Guarantee of Origin (REGO) certificates from new renewable generators to offset their energy consumption*" (AEMC, 2026a). This recommendation aligns with ATSE's previous call for large-scale data centres to be required to invest in renewable energy generation and/or storage. Enabling the traceability of data centres' renewable energy use would also help to ensure additionality in renewable energy for large-scale data centres. This additional energy generation capacity is essential to ensuring Australia stays on track for its emissions reduction targets and that consumer energy price rises remain minimal as Australia develops its data centre sector. The precise mechanisms used to deliver this outcome may need to vary across jurisdictions to reflect differing electricity market arrangements.

Recommendation 2: Require new data centres to underwrite additional renewable electricity generation and storage capacity, to support increased electricity demand and accelerate the deployment of renewable energy.

Managing electricity demand of data centres

As Australia continues to electrify its economy, total electricity demand is expected to increase substantially. Under AEMO's Step Change scenario, electricity consumption is projected to nearly double from 205 terawatt hours (TWh) to at least 390 TWh by 2050 (AEMO, 2026). This increase is projected to be drawn predominantly from industry, rather than households, as electrification of the economy grows (AEMO, 2026). While electricity demand from data centres is significant – it should also be placed in context. The electrification of corporate fleets and commercial vehicles are expected to consume an additional 31 TWh of electricity by 2029-30, while non-road freight and industrial processes are expected to need an additional 45 TWh (AEMO, 2026). Data centres, meanwhile, are predicted[4] to consume only 12 TWh[5] by that time (AEMO, 2025). This makes improving transparency around data centre energy efficiency particularly important for tracking, benchmarking and managing future electricity demand growth.

Energy efficiency in data centres is measured using power usage effectiveness (PUE), which compares total facility energy consumption with the energy used for IT equipment. A PUE of 1.0 represents an ideal facility in which all electricity is used directly by IT equipment, while a higher PUE indicates lower efficiency. While energy performance standards and reporting requirements apply to data centres supporting Commonwealth operations, comparable disclosure requirements are not consistently applied across the private sector, limiting transparency and benchmarking of energy performance across the broader industry. This gap could be addressed by extending energy performance reporting requirements to large private-sector data centres and mandating the public disclosure of key metrics, including PUE, to support consistent benchmarking, improve transparency, and encourage improvements in energy efficiency.

Recommendation 3: Extend energy performance reporting requirements beyond government data centres by mandating the public disclosure of key metrics, including Power Usage Effectiveness (PUE), for large data centres across Australia.

Strengthen water management and reporting

Data centres consume significant amounts of water, both directly through onsite cooling systems, and indirectly through the water used to generate electricity off-site (Ashtine & Mytton, 2021). Demand for water has increased in line with growing data centre development. Sydney Water has identified data centres as a significant emerging source of water demand and is planning for up to 25% of water consumption to occur through data centre activity by 2035 (Shine & Smith, 2025).

[3] Under AEMO's *Step Change* scenario, cited in 2025 Inputs, Assumptions and Scenarios Report (AEMO, 2025a).
[4] Degree of uncertainty on projections given uncertainty on future demand for data centres.
[5] See n. 3.

Level 2, 28 National Circuit
Forrest ACT 2603
Australia

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Australia

+61 2 6185 3240
info@atse.org.au
atse.org.au

ABN 58 008 520 394
ACN 008 520 394

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While the typical measure of water use[6] examines direct on-site water use, indirect energy generation accounts for most water use (Ragusa & Crampton, 2026). In 16 of 26 OECD countries examined, more than 60% of the water associated with data centre usage was attributed to energy generation rather than cooling (Farfan & Lohrmann, 2023). This suggests that efforts to reduce the water footprint of data centres should focus not only on cooling efficiency and water recycling, but also on reducing electricity consumption and increasing the use of low-water-intensity renewable energy sources. A combination of careful planning and technological solutions will be required to ensure sufficient water supplies.

There are also innovative, alternative cooling technologies that could be employed to a far greater extent. As outlined in ATSE's March 2026 submission to the NSW Public Accountability and Works Committee, emerging low-loss transmission technologies, including superconducting cable infrastructure and advanced cryogenic cooling systems, represent further opportunities to reduce data centre energy consumption. This is in addition to the potential benefits of employing closed-loop cooling systems to help reduce water consumption. The most energy efficient forms of cooling systems tend to use evaporative cooling, though this uses more water and also has limited viability in humid climates. Conversely, closed loop liquid cooling uses far less water,[7] at the cost of increased power consumption. Whilst this would be energy intensive – it could be offset substantially if sourced through renewable energy.

Recommendation 4: Develop a national water reporting framework for data centres that requires consistent disclosure of both direct water consumption and indirect water use associated with electricity generation.

Build industry-research partnerships

Public investment in science, research and innovation needs improvement. The latest year in available data by the OECD cites Australia's gross domestic expenditure on research and experimental development (GERD) in 2023 to be at 1.68%[8] (OECD, 2026). This lags significantly behind leading innovation economies, such as Taiwan (4.10%), South Korea (5.13%) and Israel (6.76%), and is below the OECD average of 2.72%[9] (OECD, 2026). Contributing to this issue is the long-term decline in business investment in R&D, which has decreased from 1.37% of GDP in 2009, to 0.88% in 2022[10] (DISR, 2025).

Increased, targeted funding would support the long-term sustainability of Australia's data centre sector. Partnership programs can help researchers and industry develop technologies that improve energy efficiency, water efficiency and manage growing computational demands. For example, supporting industry R&D in quantum computing would assist in developing next generation computational hardware. Opportunities for collaboration extend beyond physical infrastructure, including the development of more computationally efficient AI models and algorithms. For example, the Australian Institute for Machine Learning's collaboration with CommBank on foundational AI research aims to improve the mathematical efficiency of AI training and inference, demonstrating how industry-academia partnerships can reduce computing and energy requirements through algorithmic innovation (Ji et al., 2025). Supporting similar partnerships would help position Australia to develop and commercialise technologies that improve the efficiency and sustainability of data centres.

Recommendation 5: Support industry-research partnerships to accelerate the development and deployment of next-generation energy-efficient computing technologies.

Address workforce constraints for data centre development

Australia's growing data centre industry will require a workforce spanning construction, facility operations, engineering, science and technology. This comes at a time when Australia already faces shortages in many of the occupations needed to build and operate new infrastructure. For example, construction is hampered by the availability of a construction workforce, with 50% of 'Technician and Trade Work' occupations being in shortage (Jobs and Skills Australia, 2025). Data centres will require people with skills in managing hardware, networks, physical infrastructure, security, performance optimisation, and machine learning. This workforce is expected to more than double from 8,300 in 2024 to 17,900 nationwide by 2030 (Mandala, 2024).

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[6] Water-use effectiveness (WUE) - the annual litres of water used for humidification and cooling, divided by the total annual kilowatt-hours consumed by IT equipment (Microsoft, 2026).
[7] CDC boasts that closed loop liquid cooling saves them 5 GL of water each year across their 13 New Zealand data centres (CDC, 2025).
[8] Estimated value by the OECD from the latest year in available data (OECD, 2026).
[9] Taiwan GERD of 4.10% in 2024; South Korea provisional value GERD of 5.13% in 2024; Israel estimated value GERD of 6.76% in 2024; OECD average GERD of 2.72% recorded in 2024 (OECD, 2026).
[10] See 'R&D expenditure: expenditure on R&D by sector (% of GDP)' (DISR, 2025).

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atse.org.au

ABN 58 008 520 394
ACN 008 520 394

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An embedded, long-term science and technology workforce is also critical to progress AI technology development. To build a world-class data centre sector, workforce thinking will be needed to develop an AI capability based around home grown models, data sovereignty and engineering expertise. This workforce needs to be distinguished from facility operations staff. Approvals for future data centres should be contingent on a commitment to include a genuine R&D presence, helping boost our sovereign AI capability.

A diverse workforce that is representative of Australian society would provide further benefits in the push for developing an effective data centre workforce. Women remain underrepresented in the technical workforce needed for data centres, accounting for only 20% of roles (Project F, 2025). One way to increase diversity in this workforce could involve building on existing successful programs, such as ATSE's Elevate: Boosting Diversity in STEM program, which provides participants with scholarships and wrap-around support including mentoring and networking, workshops, and access to wellbeing support. Elevate boasts a 98% retention rate, providing a targeted mechanism for increasing the size and diversity of the STEM-skilled workforce.

Recommendation 6: Incorporate data centre workforce needs into national skills and infrastructure workforce planning.

ATSE thanks the Environment and Communications References Committee for the opportunity to respond to the inquiry into artificial intelligence and data centres. For further information, please contact academypolicyteam@atse.org.au.

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