

Australian National University

Submission: Artificial Intelligence and Data Centres

ANU Institute for Climate, Energy & Disaster Solutions

This submission is the collated perspective of researchers that work at The Australian National University. The views and opinions expressed in this submission reflect those of the authors and contributors.

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Committee Secretary
Senate Standing Committees on Environment and Communications
PO Box 6100
Parliament House
Canberra ACT 2600

re: Artificial intelligence and data centres

Dear Committee Secretary,

Please find enclosed a submission by the ANU Institute for Climate, Energy, and Disaster Solutions (ICEDS) for the inquiry into artificial intelligence and data centres.

Based at the Australian National University, ICEDS connects industry, governments and communities with climate, energy and disaster-risk expertise at the Australian National University. Our goal is to advance innovative solutions to address climate change, energy system transitions and disasters. We facilitate integrated research, teaching and policy engagement across disciplines.

The enclosed submission contains contributions from ANU experts in the energy transition, energy systems, environmental impact assessments and planetary health equity.

Our network of ANU researchers will gladly offer further consultation.

Sincerely,



Professor Llewelyn Hughes

Institute for Climate, Energy and Disaster Solutions

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Executive Summary

The Australian National University (ANU) Institute for Climate, Energy and Disaster Solutions (ICEDS) welcomes the opportunity to provide input to the senate inquiry into AI and data centres.

The submission recommends:

Electricity System Impacts

- Requiring data centres to build renewable electricity generation capacity to power their operations.
- Eliminating carve-outs that would allow data centres to use fossil fuels to power their operations.
- Requiring data centres create additional renewable electricity generation capacity, guaranteed by REGO certificates.
- Strengthening requirements for data centres to mitigate their impact on grid stability with provisions for fault ride-through and sub-synchronous resonance.
- Supporting research targeting power system stability in the context of large inverter-based loads.
- Increasing high-speed monitoring near data centres, especially where several are in close proximity.

Environmental & Community Impacts

- Requiring data centres to utilise best-practice solutions for water usage.
- Supporting innovation in low- or no-water cooling methods for data centres.
- Ensuring the approvals process for new data centres allows for meaningful community consultation, including with traditional land custodians.
- Applying an equity lens to data centre approval processes to avoid distributing the health risks of data centre proximity to disadvantaged communities.

Human Rights Due Diligence

- Requiring cumulative and strategic life cycle impact assessments of proposed AI and data centre developments, with human rights and environmental criteria for rejection across the value chain.

Introduction

The rapid development of artificial intelligence (AI) and data centres offers opportunities and challenges for the Australian community and government. This submission focuses on the impacts of AI and data centres on Australia's decarbonisation efforts and the electricity grid, and on the environment and community. It also calls attention to the global equity issues associated with the AI and data centre value chain, and the need for human rights due diligence in the project approval process.

Electricity System Impacts

Using renewable energy

In Australia, demand for electricity is projected to almost double between now and 2050.[1] Of this new demand, data centres are expected to reach just over 10 per cent, equivalent to more than 20 per cent of today's total grid consumption.[2]

Australia's net zero plan describes a renewable energy system underpinning decarbonisation across the economy.[3] Consistent with this plan, the federal government initially committed to require all new datacentres build their own renewable energy sources to power their operations.

Recently, this commitment was changed to exclude the Northern Territory and Queensland.[4,5] There are already plans from Beetaloo Energy to construct a hyperscale datacentre in Weddell, NT, which would be powered by gas fracked and piped from the Beetaloo Basin.[6]

Carve-outs will increase Australia's emissions at a time when it needs to be decreasing, and will slow the energy transition. They will also reduce constant renewable demand, which helps balance the energy system during the day when production is high, and lock in future fossil fuel generation.

Recommendation 1: Require data centres to build renewable electricity generation capacity to power their operations.

Recommendation 2: Eliminate carve-outs that would allow data centres to use fossil fuels to power their operations.

[1] AEMO, *2026 Integrated System Plan.*
[2] AEMO, *2026 Electricity Statement of Opportunities.*
[3] DCCEEW, Australia's Net Zero Plan.
[4] Prime Minister of Australia, "Meeting of National Cabinet."
[5] Tregenza and Armstrong, "Queensland Allowed to Use Coal, Gas."
[6] Northern Territory Government, "Beetaloo Digital."

Recommendation 3: Require data centres create additional renewable electricity generation capacity, guaranteed by REGO certificates.

Protecting grid stability

Large data centres operate on inverter systems. The body of literature examining the impact of inverter-based loads on the electricity grid identifies potential benefits and drawbacks observed in other technologies, including solar photovoltaics and batteries. As demand for data centres increases, performance issues have the potential to scale if they are not addressed.

Inverter-based loads use digital technology to operate during shocks to the electricity grid (faults). Fault ride-through supports grid stability by tolerating shocks rather than disconnecting and disrupting the electricity grid. Where these loads do not have the capacity to ride through faults, they can cause cascading outages.[7,8]

Data centre control systems can also interact with the grid to generate voltage oscillations that cause sub-synchronous resonance. These malfunctions can damage equipment and cause cascading failures across the grid.[9]

Recommendation 4: Strengthen requirements for data centres to mitigate their impact on grid stability with provisions for fault ride-through and sub-synchronous resonance.

Recommendation 5: Support research targeting power system stability in the context of large inverter-based loads.

Recommendation 6: Increase high-speed monitoring near data centres, especially where several are in close proximity.

Environmental & Community Impacts

Water resources

Data centres use cooling systems to function. In many data centres this is achieved by piping cold water through server racks. Low- and no-water cooling solutions exist, with varying degrees of efficiency and efficacy.[10] Hybrid arrangements using direct-to-chip liquid cooling and air cooling have shown promising results, demonstrating enhanced thermal management and energy efficiency.[11]

[7] FERC, *United States of America before FERC*.
[8] Mishra et al., “Understanding the Inception of 14.7 Hz Oscillations Emerging from a Data Center.”
[9] Fan et al., "Replicating Real-World 23-Hz Oscillations."
[10] Punch, "Better Way to Cool Data Centres."
[11] Ahmadi et al., "Performance Evaluation of Cooling."

In the United States there is evidence that the large amount of water required to cool data centres has led to shortages for communities living nearby the facilities, in water-stressed areas.[12] As the driest inhabited continent in the world,[13] Australia's data centre infrastructure expansion has the potential to add further stress to water availability.

Recommendation 7: Require data centres to utilise best-practice solutions for water usage.

Recommendation 8: Support innovation in low- or no-water cooling methods for data centres.

Land

International research suggests data centre siting has caused tension amongst landholders, including farmers and indigenous groups.[14] Media reporting suggest the land available in Australia for infrastructure and industrial use is under increasing pressure due to the increase in the number of planned data centres.[15]

In Australia, it is also important to take into consideration the potential impact of large data centre developments on indigenous rights to lands and waters. Approvals processes, in particular, should be made consistent with principles of Free, Prior, and Informed Consent, allowing for meaningful engagement with traditional land custodians.

Recommendation 9: Ensure the approvals process for new data centres allows for meaningful community consultation, including with traditional land custodians.

Health equity

In the United States, data centres have been found to be disproportionately sited in areas with existing socioeconomic burdens, including environmental burdens such as air and water pollution, and social vulnerabilities including poverty and education access.[16] Data centres have been found to generate noise (and in the case of fossil fuel powered centres, air pollution), impacting the health of nearby communities.[17] Data centres in the proposal stage have also

[12] Hogan, "Data Flows and Water Woes."
[13] DCCEEW, "Outback Australia."
[14] Sovacool, Upham, and Monyei, "'Whole Systems' Energy Sustainability."
[15] Taylor and Ittimani, "Rapid Demand for AI Datacentres."
[16] World Resources Institute. "7 Ways Data Centers Affect US Communities".
[17] Tao and Gao, "Global Data Center Expansion and Human Health."

been linked to anticipatory impacts and anxieties, which have been shown in the international literature to affect communities in addition to realised impacts. [18]

Given the potential co-location of data centres and disadvantaged communities, the expansion of data centres may entrench existing inequalities without due consideration.

Recommendation 10: Apply an equity lens to data centre approval processes to avoid distributing the health risks of data centre proximity to disadvantaged communities.

Human Rights Due Diligence

Human rights risks from globalised value chains for data centres commonly fall on communities in Emerging Market and Developing Economies (EMDEs). New data centres require significant quantities of rare earth minerals, and the location of mining sites for 30 energy transition minerals has been shown to overlap significantly with geographies that have high levels of indigeneity, human modification of land, food production, water risk, conflict, as well as low capacity for project permitting, consultation and consent.[19]

Artificial intelligence products also require training. Tasks including data entry, verification, image classification, and text transcription rely on human input. These tasks are largely conducted by workers in EMDEs, with little regulation or oversight.[20] This work is platformed in a “gig economy”, leaving workers vulnerable to a strict algorithmic management which reduces the labour to opaque performance metrics. Workers are exposed to confronting imagery and unsafe conditions without support to manage their psychosocial risks.[21]

In Australia, only one third of e-waste is recycled.[22] The majority of e-waste ends up in EMDEs as landfill. In Agbogbloshie, in Ghana, West Africa, for example, evidence shows large quantities of e-waste is dumped and then sorted for recycling by inhabitants of an informal settlement through unsafe means, releasing toxic chemicals into the air.[23] Proposed AI and data centre developments thus require cumulative and strategic life cycle impact assessments, with human rights and environmental criteria for rejection across the value chain.

[18] Renn and Benighaus, “Perception of Technological Risk.”
[19] Owen et al., “Energy Transition Minerals.”
[20] Posada, “Embedded Reproduction in Platform Data Work.”
[21] Anindya, “The Human Cost of Training AI.”
[22] DCCEEW, "E-Stewardship in Australia."
[23] Finn, “Poison or Poverty.”

Recommendation 11: Require cumulative and strategic life cycle impact assessments for proposed AI and data centres, incorporating human rights and environmental criteria across the value chain.

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