Submission to the NSW Legislative Council Public Accountability and Works Committee Inquiry into Data Centres in New South Wales

UNSW Institute for Industrial Decarbonisation
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The UNSW Institute for Industrial Decarbonisation (IID) welcomes the opportunity to provide a submission to the Inquiry into Data Centres in New South Wales.

The IID is a cross-university initiative that coordinates discovery research, industry engagement and translational activities to support the transformation of industrial systems and infrastructure.

This submission draws on interdisciplinary expertise across UNSW in computer engineering, energy systems, land-use and industrial planning, water infrastructure and industrial technology, and reflects ongoing engagement with industry and government stakeholders.

Executive Summary

Data centres are foundational infrastructure for Australia's digital economy, sovereign artificial intelligence (AI) capability, advanced manufacturing, critical minerals value-adding and industrial decarbonisation. Although they resemble commercial buildings, they operate as high-intensity industrial facilities interacting with electricity, water, land use and digital systems.

In New South Wales (NSW), rapid growth in data centre development is increasing pressure on electricity networks, water systems, industrial land and local amenity. These impacts are highly concentrated in metropolitan growth corridors and are difficult to address through project-by-project planning processes. As Australia's primary data centre hub, NSW must manage these pressures while ensuring that infrastructure investment and associated service costs are allocated efficiently across public and private systems. Existing cost recovery frameworks for electricity and water infrastructure provide a strong foundation, but require integrated, cross-system assessment to manage the technical complexity of these interactions and to ensure that infrastructure investment is aligned with realised, rather than projected, demand.

Australia faces a growing shortfall in advanced AI and high-performance computing (HPC) infrastructure. While private investment will be essential to address this gap, it cannot by itself deliver the coordinated infrastructure, planning and workforce capability required.

The data centre sector comprises a range of proponents with differing levels of technical capability, delivery maturity, and commitment to sustainability and AI capability. Distinguishing between committed and speculative development is therefore a critical planning and industry development task. Recent NSW Government initiatives, including the Investment Delivery Authority, together with broader industry development and investment attraction efforts, are addressing this challenge by prioritising projects with credible delivery pathways and strategic alignment.

NSW has a strategic opportunity to align growth with system capacity and long-term economic, infrastructure and environmental objectives. The NSW Government is moving in the right direction, but must now accelerate coordinated delivery at scale to secure its position as the leading hub for sustainable computing in the Southern Hemisphere.

This submission proposes a precinct-based, cross-system framework to build on these foundations. This includes coordinated planning of electricity, water and land-use systems; integration of data centres with behind-the-meter renewable generation, storage and firming technologies; the development of regional digital-energy precincts aligned with Renewable Energy Zones and industrial strategies; support for domestic capability in data centre technologies and systems; and targeted workforce development.

Together, these measures would enable NSW to manage cumulative infrastructure impacts more effectively, improve system performance and reinforce its position as the national leader in sustainable and sovereign computing. The recommendations are set out in the following section.

Summary of key recommendations

NSW is already the national leader in digital infrastructure, but continued growth will require more coordinated planning across electricity, water, land use and industrial systems.

This submission proposes a precinct-based, cross-system approach to managing digital infrastructure growth, supported by targeted policy alignment, infrastructure coordination and capability development.

NSW should:

1. Position NSW as a Southern Hemisphere hub for sustainable computing

Align digital infrastructure growth with renewable electricity, climate-appropriate cooling and integrated energy–water systems.

2. Align digital infrastructure policy with sovereign AI capability, industrial productivity and Net Zero strategy

Ensure that investment in compute capacity, including AI-intensive infrastructure, supports productivity and the development of low-emission industrial value chains in Western Sydney and regional NSW.

3. Establish precinct-scale master planning for data centre clusters and regional hubs

Coordinate electricity, water, land-use and thermal impacts through integrated planning and staged infrastructure delivery.

4. Incentivise integrated energy, water and thermal systems at precinct scale

Support behind-the-meter generation, microgrids, recycled water systems and heat recovery aligned with Special Activation Precincts and Renewable Energy Zones.

5. Differentiate data centre development by type and capability

Align infrastructure requirements and location with facility type and proponent capability, reducing pressure on metropolitan systems and supporting regional development.

6. Support sovereign capability in data centre technologies and systems

Develop NSW design and manufacturing capability in cooling, power and modular infrastructure suited to Australian climatic and grid conditions.

7. Establish a pilot AI-supported modelling capability

Enable integrated, cross-system assessment of energy, water and land-use impacts to support coordinated infrastructure planning.

8. Establish a digital transition education and skills program spanning the full technology stack

Build workforce capability across digital infrastructure, AI-enabled systems and integrated industrial technologies.

Taken together, these measures would enable NSW to manage cumulative infrastructure impacts more effectively, improve system efficiency and position the state as a global leader in sustainable and sovereign computing infrastructure and services

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1 Introduction

Data centres are foundational enabling infrastructure for Australia's digital economy, sovereign artificial intelligence (AI) capability, advanced manufacturing systems and industrial decarbonisation. They underpin productivity growth, automation and emerging clean-technology value chains.

Global demand for compute capacity is accelerating as AI-enabled workloads expand (IEA 2024). At the same time, investors and enterprise customers increasingly differentiate between generic compute capacity and low-carbon, resource-efficient digital infrastructure.

New South Wales occupies a structurally advantaged position. It hosts the majority of Australia's installed data centre capacity (CBRE 2024; Arizton 2025) and possesses the densest enterprise interconnection ecosystem in the country. However, this concentration also amplifies infrastructure pressures. Rapid and spatially concentrated development — particularly in Western Sydney — has intensified demands on electricity networks, transmission sequencing, water systems, industrial land markets and local amenity.

Few jurisdictions have been fully prepared to accommodate the rapid growth of this class of infrastructure within existing planning and regulatory systems.

Public concern does not reflect opposition to digital infrastructure per se, but uncertainty about how cumulative impacts will be governed and managed. Similar concerns are also emerging from established market participants, including parts of the property sector, reflecting competition for land, infrastructure capacity and planning certainty. These dynamics are occurring alongside broader societal uncertainty associated with the rapid expansion of AI which can amplify community sensitivity where governance arrangements are unclear.

The policy challenge is therefore not only to align data centre growth with industrial strategy, fiscal prudence, emissions objectives and evolving community expectations, but to demonstrate that this growth is embedded within a coherent plan for long-term economic vitality and resilience.

This submission proposes a coordinated, precinct-based framework to achieve that alignment. This includes linking data centre policy to existing NSW frameworks and initiatives for clean energy (eg Renewable Energy Zones,) circular water (eg Upper South Creek Advanced Water Recycling Centre) and Western Sydney and regional economic activation zones (eg Hunter and Illawarra).

NSW Government is already taking steps to manage these dynamics, including initiatives to prioritise projects with credible delivery pathways and align infrastructure with investment. This submission focuses on how these efforts can be extended through more integrated, system-level planning and assessment.

2 AI Capability and Comparative Advantage

Australia faces a growing shortfall in advanced artificial intelligence (AI) and high-performance computing (HPC) capability. Demand for GPU-accelerated compute, large-scale data environments and AI training infrastructure is increasing rapidly across research, industry and strategic domains, including energy systems, critical minerals processing, healthcare and defence. In several areas, existing national infrastructure is already capacity-constrained, and this gap is widening as global investment in AI and high-performance computing accelerates. This has implications not only for research competitiveness, but for industrial capability, including advanced manufacturing, critical minerals value-adding and energy system optimisation.

The Commonwealth's *Expectations for data centres and AI infrastructure developers* appropriately recognise data centres as strategic infrastructure and seek to align their development with clean energy, sustainable water use and sovereign capability objectives (Department of Industry, Science and Resources 2026). However, implementation occurs across state-based planning, infrastructure and approval systems that are not consistently aligned.

This fragmentation is particularly significant because responsibility for electricity planning is shared across state and national systems, which are not always fully aligned. States play a central role in land-use planning, Renewable Energy Zones and aspects of infrastructure development, while system operation, transmission planning and market coordination are managed at the national level through the National Electricity Market and the Australian Energy Market Operator (AEMO). As a result, development and infrastructure decisions taken within individual jurisdictions can have implications for network investment, system costs and performance across the broader system.

In this context, inconsistent planning and infrastructure settings across states can distort data centre investment decisions, directing projects toward locations with lower short-term constraints rather than those best aligned with long-term system efficiency. This also increases complexity and cost for operators active across multiple jurisdictions, particularly where sustainability and infrastructure requirements are not applied consistently.

Current policy settings implicitly rely on private sector investment to address Australia's shortfall in HPC capability. However, the infrastructure and system coordination required to support sustainable digital infrastructure—particularly across electricity, water and land-use systems—cannot be delivered by industry alone. In the absence of greater alignment, fragmented domestic settings risk weakening Australia's overall competitiveness and limiting its ability to establish itself as the leading Southern Hemisphere hub for high-performance computing.

These issues are often framed as a trade-off between accelerating compute capability and maintaining sustainability objectives. In practice, they reflect a coordination challenge. Without integrated planning, rapid expansion can exacerbate infrastructure constraints, while uncoordinated policy settings can discourage investment in sovereign AI capability.

Addressing this challenge requires a delivery model that aligns private investment with public infrastructure systems. As Australia's primary data centre hub, NSW is well positioned to lead this approach by translating national policy intent into coordinated planning, enabling infrastructure and clear development pathways. This provides an opportunity to strengthen Australia's comparative advantage in sustainable and sovereign computing, while ensuring that digital infrastructure development supports long-term economic and environmental objectives.

3 National Context: Interstate Competition and NSW's Position

The expansion of data centre infrastructure in Australia is occurring within an increasingly competitive national landscape. State and territory governments are actively positioning digital infrastructure within broader economic and industrial strategies, with differing planning settings, infrastructure assumptions and approaches to sustainability.

Western Australia is leveraging renewable energy potential, land availability and international connectivity to position itself as a global hub. Victoria has embedded digital infrastructure within technology and advanced industry strategies, including sustainability-linked investment frameworks. South Australia has aligned hyperscale investment with renewable generation and emerging AI capability, while Queensland has signalled active interest in attracting large-scale digital infrastructure linked to renewable energy development and industrial transformation agendas.

These approaches reflect a broader shift in which access to energy, land and coordinated infrastructure is becoming a primary determinant of data centre location, rather than connectivity alone. Jurisdictions that can align planning frameworks, infrastructure delivery and investment conditions are increasingly able to attract and retain large-scale digital infrastructure.

New South Wales occupies a distinct position within this landscape. It is already Australia's primary data centre hub, hosting the majority of installed capacity (CBRE 2024; Arizton 2025). Sydney's dense interconnection ecosystem, proximity to enterprise demand and established infrastructure base provide structural advantages that are not readily replicable.

However, this position also creates system asymmetry. Pressures on electricity networks, water systems and metropolitan land markets are most acute in NSW, placing greater strain on planning frameworks to reconcile economic opportunity with infrastructure capacity, environmental constraints and community expectations.

At the same time, competition is intensifying. Jurisdictions with lower-cost energy, more readily available land and more streamlined development pathways are actively seeking to attract investment that might otherwise locate in NSW. This creates a risk that, without coordinated planning and enabling infrastructure, future growth may be either constrained within NSW or displaced to other jurisdictions.

The strategic challenge for NSW is therefore not to attract investment, but to shape it. This requires moving beyond project-by-project assessment toward coordinated, system-level planning that aligns data centre development with electricity, water and land-use capacity.

Historically, NSW has played a leading role in national coordination on infrastructure and sustainability policy through COAG and related intergovernmental processes. This creates an opportunity for NSW to lead the practical implementation of emerging national policy settings, including through sustainable computing, coordinated infrastructure planning and the development of sovereign AI capability.

Substantial private investment is already flowing into data centre expansion in NSW. The policy task is to channel this investment through coordinated planning frameworks, integrated energy and water systems and targeted industry development settings that maximise system-wide economic value while maintaining NSW's position as the national digital infrastructure hub.

4 Recommendations in detail

4.1 Recommendation 1: Position NSW as a Southern Hemisphere hub for sustainable computing

NSW should position itself as a global hub for sustainable computing by aligning data centre development with low-carbon electricity, climate-appropriate cooling and system-integrated infrastructure.

Advanced computing is now a core industrial input. Artificial intelligence (AI), cloud computing and large-scale data processing are embedded across financial services, logistics, advanced manufacturing and energy systems. Access to reliable, high-performance computing infrastructure is therefore becoming a determinant of economic competitiveness.

The infrastructure that enables this capability—hyperscale and multi-tenant data centres, and high-GPU-density "AI factories"—is expanding rapidly in scale and complexity.

Globally, data centres account for approximately 1–1.5% of total electricity consumption and around 0.5–1% of energy-related greenhouse gas emissions (IEA 2024). Electricity demand from the sector is projected to increase significantly as AI-enabled workloads scale, with global consumption expected to more than double by 2030 under high-growth scenarios (IEA 2024).

In Australia, this growth is increasingly concentrated in NSW. Data centres already represent one of the fastest-growing sources of electricity demand in the National Electricity Market, with connection requests reaching multiple gigawatts of proposed capacity across major developments (AEMO 2024; Oxford Economics 2025). This demand is highly spatially concentrated, particularly in Western Sydney, amplifying local infrastructure constraints.

The performance of digital infrastructure is shaped by a tightly coupled energy–water system. Cooling systems represent one of the largest operational loads in modern facilities and introduce structural trade-offs between electricity demand and water consumption. Air-cooled systems minimise water use but increase electricity demand, while evaporative or water-assisted systems reduce electricity intensity but increase reliance on water resources. These trade-offs become more pronounced as compute densities increase, particularly in AI-oriented workloads.

Cooling system selection also has direct implications for local amenity, particularly noise. Air-cooled systems rely on large fans and mechanical cooling equipment that can generate sustained noise at scale, while water-assisted systems can reduce both energy demand and noise impacts but increase reliance on water infrastructure. As data centre clusters expand near residential and mixed-use areas, these trade-offs introduce a further dimension to the water–energy nexus, linking infrastructure design to community impacts and planning constraints.

Australia's operating conditions materially affect these dynamics. Higher ambient temperatures, more frequent extreme heat events and long-term water constraints shift optimal system design relative to Northern Hemisphere markets. Under these conditions, infrastructure performance depends on the interaction between cooling architecture, electricity system capacity and water availability, rather than facility-level optimisation alone.

These interactions are inherently location-specific. In metropolitan growth corridors such as Western Sydney, electricity networks are increasingly constrained while recycled water infrastructure is emerging. In these environments, water-assisted or recycled-water-integrated cooling can reduce electricity demand and defer network augmentation, provided potable water use is avoided.

In contrast, regional areas with abundant renewable electricity, lower land constraints and reduced urban heat impacts enable different optimisation pathways. Air-cooled or low-water approaches may be preferable despite higher electricity intensity, where higher electricity demand can be offset by access to low-cost renewable generation and reduced transmission constraints. Locations with existing energy and water infrastructure, including former thermal generation sites such as Liddell, present opportunities for co-locating data centres with transmission capacity and water resources.

The rapid growth of large, staged electricity loads also introduces structural uncertainty into infrastructure planning. Data centre developments are typically built in phases, with connection capacity secured ahead of final investment decisions and utilisation ramping over time. This creates divergence between reserved capacity and realised demand, sometimes described as "phantom demand" (Oxford Economics 2025). If treated as deterministic, this can lead to premature transmission investment and underutilised infrastructure.

This uncertainty also creates opportunities to consider alternative energy supply architectures alongside traditional transmission expansion. Large data centre facilities are increasingly incorporating behind-the-meter energy infrastructure, including on-site renewable generation, battery storage and firming technologies. These systems can reduce peak network demand, improve resilience and improve how large loads interact with the electricity system. In some cases, clusters of large electricity users can support islandable microgrid configurations, enabling partial operation independent of the wider network under defined conditions.

Internationally, data centres are increasingly co-located with renewable energy generation and other electricity-intensive industries to improve system efficiency and reduce transmission congestion. In the Nordic region, large-scale facilities have been developed in locations such as northern Sweden and Finland, where abundant hydropower and renewable electricity provide low-carbon supply for digital infrastructure.

Similar dynamics are emerging in the Asia-Pacific. Energy-constrained digital hubs such as Singapore are exploring strategies that link data centre growth to access to low-carbon electricity, including cross-border renewable energy imports and regional digital infrastructure partnerships. More broadly, energy availability is increasingly shaping data centre policy across the region, with jurisdictions assessing how renewable energy access and grid capacity will constrain or enable future development (IEA 2024; Carbon Trust 2025; Walton 2024).

In the NSW context, these approaches align with the development of Renewable Energy Zones under the Electricity Infrastructure Roadmap and emerging regional industrial strategies in the Hunter and Illawarra (NSW Government 2020a; NSW Government 2022). Within such precincts, digital infrastructure can provide large, flexible loads that can underpin renewable generation investment while enabling low-carbon industrial development.

At the same time, the data centre sector is one of the most energy-optimised infrastructure sectors globally. Metrics such as Power Usage Effectiveness (PUE) and Water Usage Effectiveness (WUE) have driven continuous efficiency improvements, with modern hyperscale facilities achieving PUE values close to 1.1–1.2 (Uptime Institute 2024). Despite rapid growth in compute demand, global electricity consumption has increased relatively slowly due to these efficiency gains (IEA 2024).

NSW policy settings can accelerate this trajectory by incentivising efficient compute architectures, flexible workload deployment and cooling strategies aligned with local infrastructure conditions, including integration with renewable generation, storage and recycled water systems.

The sustainability of digital infrastructure depends on system-level coordination. Reliable low-carbon electricity requires generation, transmission and storage infrastructure beyond individual facilities, while sustainable cooling depends on recycled water systems and climate-resilient infrastructure. These dependencies cannot be resolved at the project level.

Coordinated, system-level planning across energy, water and land-use systems enables infrastructure to be delivered more efficiently while reducing environmental impact and system risk. Where data centre development aligns with Renewable Energy Zones, transmission capacity and recycled water infrastructure, it can support both industrial decarbonisation and digital capability.

NSW has the opportunity to build on its existing position as Australia’s primary digital infrastructure hub by establishing a globally distinctive model of sustainable computing, demonstrating how high-performance digital infrastructure can be deployed as part of a coordinated, high-performance infrastructure system.

4.2 Recommendation 2: Align digital infrastructure policy with sovereign AI capability, industrial productivity and Net Zero strategy

NSW should align digital infrastructure policy with sovereign AI, industrial transformation and decarbonisation priorities, and actively attract AI-capable infrastructure that supports domestic capability and system integration.

Digital infrastructure is a production input, not a standalone asset class. Its economic value depends on integration with industrial systems, research capability and energy infrastructure. UNSW econometric analysis indicates that digital infrastructure generates stronger and more durable economic outcomes when integrated with advanced manufacturing and industrial systems, including measurable productivity gains and reductions in carbon intensity (Ouysse 2026).

At the same time, Australia faces a growing gap in advanced artificial intelligence (AI) and high-performance computing (HPC) capability. Demand for GPU-accelerated compute, large-scale data environments and AI training infrastructure is increasing rapidly across research and strategic domains, including energy and water systems, critical minerals, healthcare, cyber security and defence. In several areas, existing national infrastructure is already capacity-constrained, limiting the ability of research institutions, government and industry to develop and deploy next-generation AI models.

Recent analysis indicates that Australia will require a staged expansion of sovereign AI compute capability, including tightly integrated GPU clusters, high-performance networking and data infrastructure to support both research and industrial applications (Keay et al. 2026). Data centres therefore form a critical enabling layer of sovereign capability, rather than simply a source of electricity demand.

This also highlights the importance of distinguishing between different types of data centre development. AI-capable infrastructure requires advanced technical capability, significant capital investment and integration with energy and industrial systems, and is not equivalent to all proposed data centre projects.

NSW Government initiatives, including the Investment Delivery Authority, are already recognising this distinction by prioritising projects with credible delivery pathways and demonstrated capability. This provides a strong foundation for policy settings that support high-quality, technically capable infrastructure while managing risks associated with more speculative proposals.

AI capability is directly linked to emerging industrial systems, where AI-enabled optimisation, digital twins and real-time data exchange are becoming core operational requirements. Regional development strategies in the Hunter and Illawarra identify electrified industry, hydrogen production and critical minerals processing as key pillars of future growth (NSW Government 2022a; NSW Government 2022b).

This is particularly relevant for Australia’s critical minerals sector. Moving beyond extraction to higher-value processing and manufacturing requires increasingly sophisticated digital capability, including AI-enabled optimisation, advanced process control and real-time data integration. Access to reliable, high-performance computing infrastructure is therefore a key enabler of domestic value-adding, allowing Australia to capture greater economic value from its mineral resources.

In NSW, this opportunity is supported by significant mineral endowments and established industrial capability, including copper resources in the Central West and rare earth and critical minerals potential across regional NSW. These resources underpin emerging industrial development strategies in the Hunter and Central West, where electrified processing, refining and advanced manufacturing are expected to play an increasing role (NSW Government 2022; Geoscience Australia 2023). Aligning digital infrastructure with these industries enables AI-enabled optimisation of extraction and processing systems, supporting higher productivity, reduced emissions intensity and increased domestic value-adding.

AI-capable infrastructure differs materially from conventional data centres. GPU-dense architectures, liquid cooling and high-performance networking increase power density, cooling requirements and system integration complexity. Planning frameworks that recognise these distinctions will allow NSW to support nationally significant research, industrial and strategic capability while managing infrastructure impacts.

Alignment with the Electricity Infrastructure Roadmap, the Net Zero Plan and Commonwealth initiatives such as *Future Made in Australia* positions digital infrastructure as an enabling layer of sovereign capability and industrial transformation.

Positioning NSW as a hub for sustainable and sovereign AI-capable computing infrastructure would strengthen the state's role in Australia's research ecosystem, while supporting emerging applications across energy systems, critical minerals, advanced manufacturing, healthcare and national security.

4.3 Recommendation 3: Establish precinct-scale master planning for data centre development in cluster corridors and regional hubs

NSW should implement precinct-scale master planning to coordinate electricity, water, land-use and thermal impacts of data centre development.

Project-by-project assessment cannot resolve cumulative system interactions. Clustering of high-density facilities creates localised constraints across electricity networks, water systems, land use and thermal environments that are not captured through individual approvals.

In metropolitan growth corridors, particularly Western Sydney, concentrated connection requests can distort demand signals and accelerate infrastructure sequencing. Water demand, recycled supply availability and thermal discharge interact with electricity constraints and land-use allocation, creating complex interdependencies across infrastructure systems.

These challenges are compounded by variation in project maturity and delivery certainty. Not all proposed developments proceed to construction, and connection requests, land acquisition and planning applications may exceed realised infrastructure outcomes. This creates a risk that infrastructure is planned or reserved on the basis of demand that is not ultimately realised.

NSW Government initiatives, including the Investment Delivery Authority, are already addressing this challenge by prioritising projects with credible delivery pathways and strategic alignment. This provides an important foundation for more coordinated, system-level planning and more efficient allocation of public and private infrastructure costs.

Urban heat is a material planning factor in the context of climate response. Clusters of high-density facilities increase thermal discharge and cooling demand under peak conditions, amplifying local heat loads and affecting infrastructure performance and community amenity. These effects are difficult to address through facility-level assessment.

Precinct-scale master planning, supported by integrated assessment across electricity, water and land-use systems, provides a mechanism to coordinate these interactions prior to capital commitment. This includes:

- staging electricity load against realistic connection realisation
- aligning recycled water infrastructure with cooling demand
- managing cumulative thermal impacts
- allocating industrial land across competing uses

This approach establishes coordinated infrastructure and land-use assumptions within which State Significant Development (SSD) applications can be assessed more consistently and transparently, while improving infrastructure sequencing and reducing system risk.

4.4 Recommendation 4: Incentivise precinct-scale deployment of integrated energy, water and thermal systems

NSW should incentivise shared infrastructure systems that improve efficiency, resilience and emissions performance at precinct scale.

The scale and operational characteristics of modern data centres create both risks and opportunities for system performance. While data centres have historically been considered relatively stable loads, emerging AI-driven workloads introduce greater variability, including rapid changes in power demand associated with training cycles, workload allocation and utilisation ramp-up.

At the same time, high-density computing directly translates into high thermal output. Intensive processing generates large volumes of heat that must be continuously removed to maintain operational stability. Cooling systems therefore become a primary driver of both electricity consumption and, depending on the technology used, water demand.

This creates a structural water–energy nexus. Air-cooled systems minimise water use but increase electricity demand through higher fan loads and mechanical cooling. Water-assisted or evaporative systems reduce electricity demand and can mitigate local thermal impacts, but increase reliance on water resources. As compute densities increase, particularly in AI-oriented facilities, these trade-offs become more pronounced.

At scale, clusters of data centres combine these effects. Large, rapidly changing electrical loads interact with cooling systems that draw on either electricity or water infrastructure, creating coupled pressures across both systems. In metropolitan environments, this can manifest as simultaneous stress on electricity networks, recycled and potable water systems, and local thermal conditions.

These dynamics reinforce the need to treat data centre development as an integrated infrastructure system rather than a collection of individual facilities.

Precinct-scale systems provide a pathway to manage these interactions. Data centres can be integrated with:

- behind-the-meter renewable generation and storage
- battery systems capable of load smoothing and peak shaving
- islandable microgrids providing operational flexibility
- recycled water networks and shared thermal management systems

This includes circular water solutions such as decentralised recycled water systems and sewer mining, which can provide non-potable supply for cooling while reducing pressure on potable water infrastructure.

When designed appropriately, these systems can optimise trade-offs between electricity and water use at system level. Storage and control systems can manage short-term load variability, while coordinated cooling strategies can align water use with available recycled supply and local infrastructure capacity.

Existing NSW frameworks provide important enabling mechanisms. Special Activation Precincts (SAPs) support coordinated infrastructure delivery across energy, water and industrial systems, while Renewable Energy Zones (REZs) align generation, storage and transmission infrastructure with emerging industrial loads. These provide a practical foundation for precinct-scale integration of digital infrastructure.

In high-renewables electricity systems, where system inertia is reduced and flexibility becomes more important, large loads such as data centres must be actively integrated rather than passively accommodated. When coupled with storage and flexible infrastructure, data centres can contribute to system stability while reducing overall infrastructure pressure.

In the NSW context, incentivising precinct-scale deployment of integrated energy, water and thermal systems would:

- reduce cumulative impacts on electricity and water networks
- optimise the water–energy trade-off across different locations
- improve system stability under high-load, high-variability conditions
- defer infrastructure augmentation and reduce capital costs

By shifting from facility-level optimisation to coordinated precinct-scale systems, NSW can ensure that the growth of compute infrastructure strengthens both electricity and water system performance.

4.5 Recommendation 5: Differentiate data centre development by type and capability

NSW policy should differentiate data centre typologies and align infrastructure requirements and location with facility characteristics and proponent capability

NSW Government initiatives, including the Investment Delivery Authority (IDA), are already evaluating data centre proponents on the basis of technical capability, contribution to sovereign capability and sustainability outcomes. This provides a central coordination and prioritisation mechanism for major investment proposals. Extending this approach through planning policy provides an opportunity to more explicitly align infrastructure requirements and location with facility characteristics and proponent capability, while supporting wider strategic planning, investment attraction and industry development objectives.

Data centre developers have a strong commercial preference for metropolitan locations, particularly within established interconnection ecosystems where latency, connectivity and customer access are optimised. In NSW, this has resulted in a concentration of development in Sydney and Western Sydney corridors, increasing pressure on electricity networks, water systems and industrial land.

A further structural factor influencing location decisions is project financeability. Metropolitan sites typically offer higher underlying land values and more established market conditions, which can support financing and reduce perceived risk. This can reinforce a preference for urban locations, even where alternative siting may be better aligned with infrastructure capacity or long-term system efficiency.

Treating data centres as a homogeneous asset class reinforces this concentration by allowing all facilities to compete for the same locations, regardless of their operational requirements or system impacts.

In practice, data centre typologies differ materially. Multi-tenant colocation facilities are structurally embedded in metropolitan interconnection ecosystems and require proximity to enterprise clients. By contrast, specialised hyperscale facilities and certain AI workloads—particularly those that are less latency-sensitive—have greater locational flexibility and can be located in regional areas with access to renewable energy, network capacity and less constrained industrial land.

Planning policy provides an important mechanism to shape these outcomes. NSW can use differentiated planning pathways, approval timeframes and infrastructure access conditions to steer development toward locations that better align with system capacity and long-term economic objectives.

This could include:

- expedited planning approvals and infrastructure access in designated precincts or regional hubs
- more stringent assessment of cumulative infrastructure impacts in already constrained metropolitan corridors
- alignment of development approvals with system capacity across electricity, water and land use, including active management of competing demands between industrial and residential development

Planning frameworks can also incorporate amenity considerations, including urban heat and noise mitigation, into location and design requirements, reinforcing the case for locating higher-impact facilities in appropriately zoned precincts or regional areas.

The analytical capability proposed in Recommendation 7 provides a foundation for this approach. Scenario-based modelling can identify locations where additional load can be accommodated efficiently, where infrastructure investment delivers the greatest system benefit, and where alternative siting reduces cumulative impacts.

A planning framework informed by this analysis enables government to move beyond passive approval of projects toward active coordination of infrastructure location. This reduces pressure on constrained urban systems, improves utilisation of regional infrastructure and aligns private investment with broader economic and sustainability objectives.

4.6 Recommendation 6: Support sovereign capability in the development and manufacturing of data centre technologies

Actively support design and manufacturing capability in cooling, power and modular infrastructure solutions suited to Australian climatic and grid conditions.

Specialised data centre technologies represent a realistic opportunity for NSW to develop advanced manufacturing and engineering capability aligned with sector growth.

Australia’s rapid expansion of data centre infrastructure has relied heavily on integrated equipment and prefabricated system stacks supplied by a small number of global OEMs. While these systems accelerate deployment, they are typically designed for Northern Hemisphere climates and grid conditions.

In NSW, higher ambient temperatures, increasing heatwave frequency, water constraints and an electricity system transitioning to high shares of variable renewable energy create a need for locally adapted solutions (CSIRO and Bureau of Meteorology 2022; IEA 2024). This includes cooling systems, power electronics and modular infrastructure optimised for Australian climatic and grid conditions.

An NSW Climate-Adapted Digital Infrastructure Initiative could support discovery and commercialisation projects focused on:

- climate-appropriate cooling and low-water thermal management
- grid-integrated power electronics
- modular infrastructure adapted to high-renewables operation
- innovation in energy storage and power modulation
- precinct-scale control systems integrating electricity and water optimisation

Such an approach focuses on targeted capability development rather than generalised import substitution, creating exportable products and expertise while supporting domestic infrastructure performance. It would strengthen the NSW advanced manufacturing ecosystem and support high-value jobs aligned with emerging digital and energy infrastructure systems.

4.7 Recommendation 7: Establish a pilot AI-supported integrated modelling and assessment capability

***NSW should establish a pilot AI-supported modelling capability to enable integrated assessment of digital infrastructure development, supporting coordinated decision-making and collaborative planning between government and industry across energy, water, land-use and industrial systems*.**

Planning for digital infrastructure requires coordination across electricity systems, water infrastructure, land-use planning and industrial development. These interactions are currently assessed across multiple agencies using partially overlapping datasets, modelling approaches and regulatory processes.

Project-by-project assessment limits the ability to evaluate cumulative impacts, while parallel modelling and analysis processes increase transaction costs, reduce transparency and constrain institutional learning. As a result, infrastructure planning can become reactive, with limited capacity to test alternative development pathways or coordinate outcomes across systems.

Effective precinct-scale planning therefore requires decision-support capability that combines land-use data, electricity network capacity, water infrastructure, environmental constraints and staged development scenarios within a coherent analytical framework.

Advances in artificial intelligence, machine learning and digital twin technologies now make this integration increasingly feasible. AI-supported modelling platforms can combine datasets across agencies and domains, enabling scenario testing, probabilistic demand modelling and dynamic assessment of infrastructure interactions.

UNSW's capability in electricity grid modelling and simulation demonstrates the technical foundation required for integrated, cross-system assessment of digital infrastructure. This includes the ability to analyse system performance across multiple timescales, from long-term energy and cost optimisation through to millisecond-level modelling required for protection and high-speed control systems. These approaches incorporate root mean square (RMS), electromagnetic transient (EMTP) and transient system modelling, supported by advanced real-time simulation infrastructure capable of representing large-scale, inverter-dominated systems (Fletcher et al. 2024). Such capability is directly relevant to evaluating precinct-scale configurations involving data centres, storage, inverter-based resources and microgrids, reducing uncertainty in infrastructure design and enabling more robust assessment of system interactions.

Complementary work in spatial planning and decision-support systems at the UNSW City Futures Research Centre (Pettit et al. 2018) highlights the value of integrated, data-driven approaches to land-use and infrastructure coordination. Extending these approaches to integrate energy, water and land-use systems within a unified AI-supported analytical environment represents a logical next step in capability development.

Internationally, fully integrated cross-system planning platforms remain at an early stage of development. However, there is growing recognition that complex infrastructure systems require shared analytical environments capable of supporting coordinated decision-making across institutions and sectors.

A pilot AI-supported modelling capability would provide NSW with a practical pathway to develop this capability. Led by Digital NSW in partnership with infrastructure and planning agencies, such a platform would integrate cross-agency datasets into a shared analytical environment, enabling:

- scenario testing of data centre clustering and infrastructure sequencing
- probabilistic modelling of electricity demand aligned with connection realisation rates

- assessment of energy–water trade-offs across cooling and siting strategies
- evaluation of land-use allocation and infrastructure capacity constraints at precinct scale

This capability can also support structured engagement with industry by providing a shared analytical environment in which government, utilities and project proponents can evaluate development pathways using consistent data and assumptions.

An initial focus on Western Sydney cluster corridors or a priority regional hub would allow testing and refinement of modelling approaches in a real-world planning context.

This aligns with NSW Digital Strategy objectives for integrated, data-driven decision-making (NSW Government 2024a; NSW Government 2024b). It also represents a practical application of AI in government—using AI to manage the system impacts created by the growth of AI-driven infrastructure.

This capability would directly support NSW Government coordination mechanisms, including the Investment Delivery Authority, by providing a consistent analytical basis for assessing project proposals, distinguishing between committed and speculative demand, and aligning development with infrastructure capacity, sequencing and strategic priorities.

Over time, this capability could support more coordinated infrastructure planning, reduce system risk, improve investment sequencing and enable more transparent and collaborative engagement with industry, utilities and communities.

4.8 Recommendation 8: Establish a NSW digital transition education and skills program spanning the full technology stack

NSW should establish a coordinated education and skills program to build workforce capability in data centres, AI-enabled systems, IoT, robotics and 'smart' energy, water and industrial infrastructure.

The rapid penetration of digital technologies across the economy is creating new workforce demands and expanding opportunities for high-value employment. Meeting this demand requires coordinated capability development across vocational, technical and professional pathways.

NSW should establish a coordinated program linking universities, TAFEs and industry partners to deliver:

- targeted training pathways across vocational and tertiary education
- interdisciplinary programs spanning electrical engineering, data science, automation and next-generation infrastructure systems
- applied research and industry placement opportunities
- microcredentials and professional upskilling aligned with emerging technologies

This program should align with broader NSW and Commonwealth priorities in industrial transformation, Net Zero and sovereign AI capability, ensuring that workforce development supports both infrastructure delivery and long-term economic competitiveness.

5 Conclusion

Thank you for the opportunity to provide a submission to the NSW Legislative Council Public Accountability and Works Committee Inquiry into Data Centres in New South Wales.

Data centre development in NSW presents both economic opportunity and system-level risk. The interaction between electricity planning, water allocation, land use sequencing, industrial strategy and fiscal exposure requires coordinated governance rather than isolated regulatory responses.

A structured approach based on precinct-scale master planning, scenario modelling, typology differentiation, recycled water integration, sustainable compute positioning and industrial alignment will allow NSW to secure productivity gains while maintaining infrastructure integrity and community confidence.

UNSW stands ready to support the NSW Government with cross-disciplinary expertise to inform evidence-based policy development and industry development programs.

UNSW would welcome the opportunity to support the Committee's ongoing work through a technical briefing or workshop, including the option of hosting a session at UNSW to explore the issues raised in this submission in greater depth. This could include detailed analysis of energy, water and infrastructure interactions, as well as emerging AI and digital infrastructure requirements, to support evidence-based policy development.

Should you wish to discuss any issue raised in this submission, please do not hesitate to contact David Eyre, CEO UNSW Institute for Industrial Decarbonisation, on +61 0403199966 or d.eyre@unsw.edu.

Appendix A: Mapping of submission to Terms of Reference

This submission addresses the Terms of Reference (TOR) for the Inquiry into Data Centres in New South Wales through a coordinated, system-level framework spanning energy, water, land-use planning, industrial strategy and workforce development.

The table below maps the key issues identified in the Terms of Reference to relevant sections of this submission.

Terms of Reference	Relevant sections in this submission
a. The costs and benefits of data centres to the NSW economy	Executive Summary; Introduction; Align NSW digital infrastructure policy with sovereign AI capability, industrial productivity and Net Zero strategy
b. Energy supply, demand and impacts on electricity infrastructure	The structural challenge of electricity demand uncertainty; Implications for electricity infrastructure planning in NSW; Opportunities for flexible energy supply architectures; Recommendation 4
c. Environmental impacts, including emissions, water use and climate resilience	Climate resilient cooling strategies; Integrate recycled water and climate resilience infrastructure into digital infrastructure planning; Data centres as leaders in energy and water efficiency
d. Land-use planning, zoning and community impacts	Establish precinct-scale master planning for data centre development; Differentiate data centre typologies in planning frameworks; The structural coordination challenge
e. Infrastructure coordination, including electricity, water and transport systems	The case for precinct master planning; Recommendation 3; Recommendation 4; A system-level infrastructure challenge — an opportunity for NSW
f. Regional development and distribution of infrastructure	National context: interstate competition and NSW's position; Differentiate data centre typologies; regional discussion across sections
g. Workforce and skills requirements	Establish a NSW digital infrastructure education and skills program
h. Innovation, research and technology development	Innovation-led sustainability; Support sovereign capability in data centre technologies; Sustainable compute and digital infrastructure systems
i. Planning, regulatory frameworks and coordination across government	The structural coordination challenge; Precinct master planning; Innovation in modelling and integrated assessment; Recommendation 8
j. Any other related matters	Establish a pilot AI-supported integrated modelling and assessment capability; broader system integration arguments across the submission

Appendix B: Implementation Pathways – Agencies and Delivery Mechanisms

This appendix outlines indicative NSW Government agencies and delivery mechanisms associated with each recommendation.

Recommendation	Lead / Key Agencies	Delivery Mechanisms
1. Position NSW as a global hub for sustainable computing	Premier's Department; NSW Treasury; IDA, Investment NSW; DCCEEW	IDA; State strategy integration; investment attraction; Net Zero Plan; Electricity Infrastructure Roadmap
2. Align digital infrastructure with sovereign AI and Net Zero	IDA; Investment NSW; DCCEEW; Treasury; Digital NSW	Industry programs; Commonwealth alignment; targeted investment attraction
3. Establish precinct-scale master planning	IDA; DPHI; EnergyCo; Sydney Water; councils	SAPs; growth area planning; corridor coordination; infrastructure sequencing
4. Incentivise integrated energy, water and thermal systems	IDA; DCCEEW; EnergyCo; IPART; Sydney Water	Planning incentives; co-investment; REZ alignment; shared infrastructure models
5. Differentiate data centre typologies	IDA; DPHI; Investment NSW; Regional NSW	Planning framework reform; zoning pathways; regional investment incentives
6. Support sovereign capability in technologies	IDA, Investment NSW; Treasury; Industry	Targeted industry programs; pilot funding; procurement signals; innovation partnerships
7. Establish AI-supported modelling capability	Digital NSW; DPHI; DCCEEW; Treasury; IDA	Cross-agency data integration; modelling platform; digital twin capability
8. Establish digital transition skills program	Education; TAFE NSW; universities; Investment NSW	Training pathways; microcredentials; industry partnerships; workforce programs

Appendix C: UNSW Capability

The growth of data centre and AI infrastructure presents a system-level challenge spanning energy, water, land use, digital systems and industrial strategy. UNSW's strength lies in its ability to integrate these domains, combining engineering, data science, economics and planning capability to support coordinated infrastructure development.

Energy systems and electricity infrastructure

UNSW has nationally leading expertise in electricity system modelling, renewable integration, storage and grid planning through the School of Photovoltaic and Renewable Energy Engineering and the School of Electrical Engineering and Telecommunications. This includes development of models aligned with the Australian Energy Market Operator's Integrated System Plan, analysis of large-scale load integration, and design of distributed and behind-the-meter energy systems.

Water systems and climate resilience

UNSW has extensive capability in urban water systems, recycled water, industrial water use and climate resilience through the School of Civil and Environmental Engineering. This includes modelling of water demand, design of decentralised and precinct-scale recycled water systems, and analysis of water–energy interactions under climate variability.

Land-use planning and spatial systems

The UNSW School of Built Environment has internationally recognised capability in spatial analysis, land-use planning and infrastructure coordination, including development of planning support systems that integrate land, infrastructure and economic data for precinct-scale decision-making.

Artificial intelligence, data systems and modelling

UNSW hosts leading capability in artificial intelligence, machine learning, high-performance computing and data systems through the School of Computer Science and Engineering. This includes AI-enabled decision-support systems, digital twins and integrated modelling platforms for infrastructure planning and scenario analysis.

UNSW is well positioned to partner with government and industry to support evidence-based policy development, integrated infrastructure planning and the design of pilot initiatives, including AI-enabled modelling platforms and precinct-scale infrastructure coordination.

Economics, finance and business systems

The UNSW Business School provides expertise in infrastructure economics, energy markets, finance and policy analysis relevant to digital infrastructure development. This includes assessment of system-wide costs and benefits, investment incentives, electricity market impacts and financing structures for large-scale infrastructure, as well as analysis of productivity and industrial transformation outcomes.

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