The Australian Power Institute

SUMMER SCHOOL+ 2026

CHALLENGE PROJECT EXECUTIVE SUMMARIES

Group 1 - Executive Summary

'How can organisations balance the need to reduce costs with managing risk, and what decision-making and risk communication frameworks are needed so engineers can clearly communicate the safety, reliability and long-term impacts of cost-cutting decisions to non-engineers and decision makers?' Darryl Rowell - CEO, Powerlink Queensland

Electricity networks across the National Electricity Market (NEM) are facing a growing tension between the need to control costs for customers and the need to maintain safe, reliable, and resilient infrastructure. This challenge has intensified over the past five years due to rising input costs, ageing assets, increasing extreme weather events, and the scale and pace of the energy transition.

The core issue is not simply the existence of cost–risk trade-offs, but the industry's limited ability to consistently communicate and evaluate those trade-offs in a way that drives effective decision-making. Cost is precise, tangible, and easily understood, while risk—particularly long-term safety and reliability risk—is uncertain, probabilistic, and often poorly translated into business impacts. As a result, decision-making can become biased toward short-term cost reduction at the expense of long-term system outcomes.

Our findings highlight several systemic gaps. First, there is a **translation gap** between technical risk assessments and executive decision-making, where engineering insights are not effectively articulated in terms of customer, financial, and regulatory consequences. Second, **organisational silos** across planning, operations, and delivery limit the ability to understand risk at a whole-of-system level. Third, **traditional economic frameworks**, such as cost-benefit analysis, struggle to capture uncertainty and low-probability, high-impact events. Finally, there is a **capability gap**, with engineers often lacking formal training in risk communication, storytelling, and decision framing.

Despite these challenges, the industry has strong foundations to build upon, including scenario-based planning through AEMO's Integrated System Plan, evolving risk-based asset management practices, and established regulatory mechanisms such as the RIT-T. However, these tools are not yet fully integrated into a cohesive, decision-ready framework.

To address this, we recommend the adoption of the **SCRC Framework**, focused on four key pillars:

- **Standardising risk framing** to ensure consistency and comparability
- **Cross-disciplinary integration** to align planning, operations, and delivery
- **Risk communication capability uplift** to enable engineers to translate technical insights into business impacts
- **Customer impact narratives** to connect decisions to real-world consequences

Supporting these pillars are broader recommendations to enhance regulatory frameworks with risk-based metrics, strengthen system-level coordination, and leverage digital tools to improve real-time risk visibility.

Ultimately, the opportunity for the industry is to shift from analysing risk to making it actionable. By translating probability into consequence, integrating perspectives across the system, and aligning decision-making with long-term outcomes, organisations can better balance cost pressures while maintaining the safety, reliability, and resilience expected by customers, regulators, and the community.

Group 2 - Executive Summary

'How can AEMO and industry develop fit-for-purpose connection and operating frameworks for rapidly growing data centres, ensuring power system security and reliability without creating unnecessary barriers to data centre investments and operation?' Margarida Pimentel - GM Onboarding and New Connections, Australian Energy Market Operator

Australia's electricity sector is undergoing a rapid structural transformation driven by two concurrent shifts: the transition to renewable generation and the emergence of large, energy-intensive loads such as data centres, electrified industry, and transport. These changes are reshaping both supply and demand, with electricity consumption becoming significantly larger, less predictable, and more concentrated.

Data centres are at the heart of this transformation. Driven by global AI and digital infrastructure growth, they are becoming strategic national assets under Australia's National AI Plan. Investment and demand are accelerating rapidly, with forecasts now indicating sustained high-growth scenarios as the baseline. However, this growth is accompanied by "phantom demand," where speculative connection applications significantly overstate actual realised demand, complicating system planning and increasing the risk of inefficient infrastructure investment.

To address these challenges, the sector is beginning to adopt new approaches, including commitment-based forecasting, conditional connection frameworks, and greater alignment with renewable energy development. However, gaps remain in coordination, planning integration, and cost allocation consistency. Key challenges include:

- Forecasting uncertainty due to speculative demand
- Infrastructure timing and investment risk
- System security concerns from large load behaviour
- Cost pressures and fairness in cost allocation
- Coordination complexity across stakeholders
- Workforce capability gaps at the interface of power systems and data centre technologies

The report identifies a set of critical strategic decisions, including how to plan under uncertainty, allocate costs and risks, enable anticipatory investment, define obligations for large loads, and improve coordination across institutions. Recommended actions include:

- Proactive, scenario-based system planning led by AEMO that minimises cost to consumers
- Staged, modular network investments by transmission and distribution providers
- Clear funding and connections methodologies to ensure general customers do not cross subsidise the connection of these large loads
- Clear policy direction and coordination from governments
- Regulatory reforms enabling flexible, risk-sharing frameworks
- Greater commitment, flexibility, and co-investment from large load proponents

There is also a pressing need to address workforce capability gaps through targeted initiatives such as technical advisory panels, cross-industry collaboration and specialised training.

Australia can capture significant economic value from data centre growth, but only if connection frameworks evolve. A coordinated, forward-looking approach that combines structured connections, better planning, and shared responsibility will be critical to maintaining reliability, affordability, and long-term system sustainability.

Group 3 - Executive Summary

'This challenge explores how artificial intelligence and digital technologies can be embedded across the entire energy value chain, from planning and design through to operations and customer energy use. The challenge includes organisational change, workforce capability, cyber security, data governance and building trust in digital systems, not just technology implementation.' Lara Kruk - Regional Solutions Director, APAC Energy & Power, Jacobs

Australian electricity networks are at a pivotal moment. Artificial intelligence (AI) tools are already in use across parts of the sector, but their deployment is uncoordinated, uneven, and siloed. The sector does not suffer from a lack of AI capability, but from a total lack of structure around how that capability is governed. Without a unifying framework, isolated teams are deploying tools in ways that actively increase operational risk while reducing business value. Low-value outputs generated through lazy use of AI - commonly known as 'AI Slop' - are creating significant rework, eroding employee trust, and introducing unacceptable blind spots into safety-critical environments.

This report addresses that gap directly. It presents a whole-of-business framework for embedding AI across the electricity networks industry in a consistent, deliberate, and risk-managed way. The framework is designed to unlock AI's significant productivity potential making work faster, cheaper, and higher quality while actively managing the operational, financial, safety, cyber security, and reputational risks that uncontrolled AI adoption introduces.

The framework is built around six foundational pillars: Risk Management, Governance, Workforce Readiness, Scaling from Pilot to Business-as-Usual, Public Trust, and Cybersecurity and Data Management. Together, these pillars provide a structured pathway from the 'Old World' of fragmented, ad hoc AI experimentation to a 'New World' in which AI operates as a genuine ally of our business which empowers employees, improves decision-making, reduces costs, and ultimately enables the sector to serve its customers and communities better.

Key Findings

- AI adoption in the sector is fragmented and siloed, with different teams pursuing AI applications independently and without a consistent framework, leading to duplicated effort, inconsistent quality, and emerging 'AI Slop' risks.
- The risk profile of unmanaged AI adoption is high across all risk categories including and no specific AI risk framework currently exists within most network businesses.
- Governance gaps are significant: most organisations lack defined structures for approving, overseeing, and auditing AI applications, particularly in high-consequence operational environments such as network control and engineering design.
- The existing workforce is not adequately equipped to use AI effectively. Critical shortages exist in IT/OT integration, data engineering, governance, and cybersecurity.
- Data quality is a foundational constraint: inconsistent asset data, poor defect labelling, and a lack of standardised data structures undermine AI model performance and erode trust in AI outputs across the business.
- Public trust in AI is low and declining, driven by job displacement fears and negative perceptions of major technology companies. Our frameworks must actively demonstrate responsible, transparent AI use to maintain social licence.
- Cybersecurity exposure increases with AI adoption, particularly where AI systems interact with SCADA, OMS, and other critical operational systems. Compliance with obligations under the Security of Critical Infrastructure (SOCI) Act requires specific AI-related data and system protections.
- The pathway from successful pilot to business-as-usual (BAU) deployment is unclear in most organisations, with a high risk of either moving too slowly (missed opportunity) or too quickly (operational or safety breach).

Group 4 - Executive Summary

"How can electricity networks expand and modernise to meet rapid growth and the energy transition through investment prioritisation, asset replacement and system modernisation, while remaining safe, reliable and affordable within strict regulatory funding limits?" Suzanne Shipp - Chief Engineer, Energy Queensland

The Challenge

Australia's electricity distribution networks are operating under structural pressure with no modern precedent. Assets designed for a predictable, one-directional power system must now manage rapid electrification, accelerating distributed energy resource (DER) uptake, ageing infrastructure reaching end-of-life, supply chain constraints, and increasing regulatory scrutiny and funding limits. The central question this report addresses is how networks can expand and modernise to support the energy transition while remaining safe, reliable, and affordable within strict regulatory funding limits.

Key Findings & Recommendation

Five interconnected findings define the current challenge. First, the traditional infrastructure-first investment model is no longer sufficient — augmentation alone cannot resolve the constraints utilities now face. Second, investment decision-making remains fragmented and experience-dependent, with siloed systems and manual processes creating both efficiency risk and AER exposure. Third, the energy transition is outpacing the five-year regulatory determination cycle, leaving programs based on assumptions that are outdated before delivery is complete. Fourth, a critical capability gap is emerging in asset modelling, data analytics, and probabilistic risk frameworks — the disciplines most needed to improve decision quality. Fifth, non-network solutions including demand response, battery storage, and DER orchestration remain systematically underutilised as genuine investment alternatives.

This report makes five strategic recommendations:

1. implement a unified risk-based investment prioritisation framework that replaces age-based decision-making with a consistent, AER-defensible methodology weighted by asset criticality, probability of failure, and customer consequence.
2. invest in an integrated asset intelligence platform combining GIS, condition data, SCADA, and predictive analytics to replace fragmented manual processes.
3. shift regulatory engagement from reactive submission justification to proactive alignment — establishing pre-agreed methodologies for risk scoring and non-network alternatives ahead of reset.
4. transition network planning from reactive augmentation to scenario-driven, corridor-based investment that integrates DER forecasts and climate resilience.
5. build a stable internal capability in asset modelling, data analytics, and regulatory engagement to reduce dependence on key individuals and external consultants.

Conclusion

The networks best positioned to navigate the next decade won't be those that spend the most — they will be those that make better decisions with the funding they have. This report provides a structured and practical path to get there.

Group 5 - Executive Summary

'How can the electricity sector ensure that the rapid growth of data centres supports the renewable energy transition rather than undermining it?' Marc England - CEO, Ausgrid

Australia is experiencing a significant growth in the data centre market, largely driven by the global shift towards AI-ready infrastructure and hyperscale cloud services. Data centres pose a challenge to appropriately integrate into the energy system as the current infrastructure is unable to handle the growth of the boom. Unchecked, the increased demand for data centres could delay the energy transition and bring forward augmentation projects, driving up costs for energy consumers.

Diving into this further, the following issues were identified:

- Rules/legislation in Australia are unable to keep up with the quick turnaround and high demand of these loads.
- Negative sentiment is present from community due to the environmental impacts of Data centres.
- Current infrastructure in our electricity system is unable to service the power needed to keep these centres operate stably without affecting other industries.
- There is discourse on how to incorporate these large loads with the energy transition.
- As this is a growing area, the knowledge and skillsets in the sector needs to evolve to understand and connect these to the system.

To facilitate the connection of data centres and maintain cost equity without delay to the energy transition, government can enact appropriate policy and regulation. It is recommended that the government, in collaboration with industry groups like AEMO and network service providers (NSPs), commission a holistic and cross-sector National Data Plan, allowing the optimum locations for data centres to be identified and utilised, considering constraints in both the power system and water. Government should also enforce equitable connection costs by DNSPs and TNSPs for data centres, ensuring that data centres proponents fund the cost of bringing forwards major augmentation projects, without any negative impact to bill payers.

To bring forward the transition of data centres, some key milestones are needed. They are as follows:

- Implementing appropriate policies and regulations will facilitate effective oversight of data centres and their integration into the electricity system, while also eliminating any ambiguities for major stakeholders.
- It is essential to shift community sentiment from negative to positive by addressing any misinformation about data centres with accurate, up-to-date information. This can include; o The water usage is used in a sustainable way. I.e. Recycled, reused etc.
    - May benefit or not impact the grid by including their own renewable remediation schemes. This can be in a form of a Battery Energy Storage System (BESS) to be the backup generation.
    - Outlining benefits to communities.
- Establish short, medium, and long-term objectives for integrating data centres into the electricity market, along with defining their potential roles. Incorporating frameworks such as the Integrated System Plan (ISP) and the Transition Plan for System Security (TPSS), among others, will support effective planning for the integration of new data centres in Australia.

With a coordinated pathway laid forward for these data centres, it is possible to achieve their integration within the renewable energy transition safely, sustainable and economically.

Group 6 - Executive Summary

'How can energy gentailers enable the independence customers want while still coordinating the system everyone relies on, in a way that earns customer trust and remains fair, reliable and effective?' Jason Froud Executive General Manager – Strategic and Corporate Affairs, Synergy.

The Australian energy landscape is rapidly transitioning towards Consumer Energy Resources (CER), including rooftop solar, household batteries, and electric vehicles. While these assets enable customer energy independence, they remain largely uncoordinated, responding mainly to retail tariffs rather than real-time system needs. This disconnect creates operational risks, inefficient infrastructure utilisation, and increased system costs. The core challenge is enabling customer independence while maintaining a secure, reliable, and efficient grid through "coordinated independence."

Key Findings

The Scalability Gap: Independent optimisation of CER does not scale efficiently, increasing operational risk, underutilised infrastructure, and overall system costs.

Customer Participation Barriers: Trust, simplicity, and clear financial incentives remain the main barriers to participation in coordination programs such as Virtual Power Plants (VPPs).

Equity and Inclusion Risks: Vulnerable customers, particularly renters and low-income households, face barriers due to limited upfront capital and lack of control over property infrastructure.

The Workforce Evolution: Addressing these challenges requires broader workforce capability across engineering, stakeholder engagement, digital integration, and behavioural science.

Strategic Recommendations

1. **Shift to Active Coordination**: Transition the energy system from passive, tariff-driven behaviour to active, coordinated optimisation where gentailers or aggregators manage customer assets against real-time market and network conditions.
2. **Enhance Trust and Simplicity**: Offer transparent, simple participation and ensure customers retain override capability to build confidence.
3. **Prioritise Equitable Access**: Develop shared energy models, such as community batteries, solar subscriptions, or "Energy-as-a-Service", to ensure benefits are accessible to those who cannot own physical assets.
4. **Strengthen Regulatory and Technical Frameworks**: Accelerate the adoption of national technical standards for interoperability and cyber security, while creating flexible trading rules that allow customers to maximise the value of their CER.
5. **Invest in Multi-Disciplinary Capability**: Build a future-ready workforce by upskilling in power systems engineering, data analytics, and community engagement to bridge the gap between technical grid requirements and customer needs.

Summary

Outcome Successfully integrating CER as a coordinated system resource will lower energy costs, accelerate decarbonisation, and improve grid reliability. Failing to coordinate these assets will result in a more complex, costly, and high-risk system for all Australians.

Group 7 - Executive Summary

'How do we improve our capability plan, sequence and coordinate to efficiently connect multiple renewable energy generators to both existing and new transmission networks across several locations simultaneously - while maintaining system safety, reliability and security?'
Hannah McCaughey - CEO, Energy Co NSW

Australia's energy transition is a multi-disciplinary program, and fundamentally a coordination challenge. The technical components of generation, transmission, storage and system strength are well understood. What remains underdeveloped is the industry's capability to plan, sequence and deliver these components concurrently across multiple regions and stakeholders. Renewable Energy Zones (REZs) are a critical step toward addressing this challenge, but their success depends on moving beyond traditional project-based delivery.

The current approach was designed for a centralised, lower-complexity system and struggles to manage the interdependencies of a distributed, multi-project environment. Key decisions on sequencing, system reliability, design alignment and community engagement are routinely made too late, driving rework, schedule slippage, cost escalation and delivery risk. Workforce and supply chain constraints, combined with fragmented community engagement, compound these issues and now act as binding limits on delivery.

This report identifies four interconnected challenges: coordination across stakeholders, maintaining system reliability through transition, workforce and supply chain capacity, and social licence pressures. Addressing them requires a shift from isolated project execution to a program-level, system-oriented approach, built on four foundations: earlier decision-making, clear sequencing and staging, standardised interface management, and integration of workforce, supply chain and community readiness into planning from the outset.

Ultimately, the transition demands a shift in both systems and culture. In the "Old World," reliability was achieved through centralised control of a small number of assets. In the "New World," it must be achieved through shared foresight across a coordinated, multi-stakeholder system that includes consumers as active participants, underpinned by clear governance, aligned incentives and a common view of delivery. Success will be measured in more predictable outcomes, lower cost and delay, sustained system reliability, and stronger community trust through the transition.

Group 8 - Executive Summary

'How can the energy transition be delivered in a way that ensures equitable access, builds social licence, and enables all customers to participate and benefit, rather than leaving part of the community behind?' Colin Crisafulli, General Manager Future Grid and Asset Management, Endeavour Energy

Australia's energy transition is rapidly reshaping the electricity sector through growing renewable generation, distributed energy resources (DER), and battery storage. While this shift supports decarbonisation and grid modernisation, it also raises challenges around social licence, equity, affordability, and workforce capability.

The report's core challenge asks how to deliver the transition fairly so all customers can participate and benefit, rather than leaving vulnerable groups behind. Higher income households currently access rooftop solar, batteries, and incentives more easily, while renters, apartment residents, lower income households, and some Indigenous communities face barriers related to cost, housing, and limited information.

Social licence has become critical to project success, with communities expecting transparency, engagement, and shared benefits. Regulators such as the Australian Energy Regulator and Australian Energy Market Operator now recognise social licence as a key factor in planning and delivery.

The report identifies several issues:

- Unequal access to renewable technologies
- Weak customer engagement and education
- Limited trust in energy providers and policy frameworks
- Workforce and skills shortages
- Risk of increasing socio-economic inequality

Existing initiatives including community batteries, virtual storage, and renewable energy cooperatives show positive progress. Organisations such as Endeavour Energy and Origin Energy are trialling programs to improve access for renters and apartment residents. However, many customers still do not perceive direct benefits or fully understand these offerings.

Key opportunities identified include:

- Virtual Net Metering (VNM)
- Community investment models
- Improved customer education and targeted engagement
- AI and data-driven energy management
- Expanded community battery participation

The report also stresses the need for a future ready workforce with both technical and social capabilities. Beyond engineering and digital skills, stronger expertise is required in communication, stakeholder engagement, systems thinking, and equitable program design.

Overall, the report concludes that Australia's energy transition must be delivered through collaboration, transparency, and inclusive participation. Building trust, improving access, and ensuring equitable outcomes are essential to achieving a socially sustainable transition.

Group 9 - Executive Summary

'We can build the technology for a decarbonised grid, but we do not yet have the trust, institutional design, or behavioural understanding to make it work at scale. What knowledge, disciplines and decision-making frameworks are missing, and how should industry, government and universities develop this knowledge?' Chris Kellett - RACE for 2030 CRC

This report argues that the most effective lever for accelerating Australia's renewable energy transition is regulatory reform via the Australian Energy Regulator (AER), rather than attempting to directly shift public sentiment.

It introduces a reverse-auction reframing, where communities compete to host renewable developments as a demonstration of their trust in the transition and their clear understanding of the benefits of the transition and how they can capture local value.

Australia has the technology required to deliver a decarbonised energy system, but the transition is increasingly constrained by a lack of trust, community partnership, and effective governance. The key challenge is no longer purely technical — it is social, behavioural, and institutional.

Current energy planning processes are often top-down and infrastructure-focused, leaving communities feeling excluded from decisions that directly affect them. This has contributed to declining social licence, project delays, increased costs, and growing resistance to renewable developments. At the same time, many regional communities do not clearly see the long-term economic and social benefits of the transition.

This report focuses specifically on large-scale transmission and REZ-related trust challenges, acknowledging that additional trust challenges exist at the distribution/DER level.

Key recommendations include Establishing Regional Energy Councils to support co-designed decision-making in Renewable Energy Zones (REZs). Implementing standardised community benefit-sharing frameworks. Embedding customer and community engagement into technical and regulatory processes. Strengthening policy stability through trusted institutions such as CSIRO, universities, and the AER. Expanding education and workforce capability.

Priority sequencing:

1. Immediate: standardised benefit-sharing frameworks and AER guidance
2. Medium: pilot Regional Energy Councils
3. Long-term: cooperative ownership and reverse-auction hosting models

Group 10 - Executive Summary

'How do we de-risk the energy transition when regulatory incentives for transmission businesses are optimised for just-in-time investment, but system reliability increasingly depends on building ahead of the need; and what regulatory, funding or risk-sharing models could enable this?' Jason Krstanoski – Executive General Manager of Networks, Transgrid

Situation

The energy transition is accelerating the need for major transmission investment in Australia. The uptake of inverter-based generation, connection of large loads such as data centres, and the retirement of synchronous generators are all contributing to emerging issues such as grid congestion and low system strength. To support these new connections and maintain the ongoing security and reliability of the power system, it is widely recognised that additional transmission infrastructure is required. However, changes to the power system are occurring much faster than the required infrastructure can be delivered.

Complication

The existing regulatory framework is optimised for 'just in time' investment to minimise building transmission infrastructure before it is required, and only when certainty is high. This has created a coordination trap, where Transmission Network Service Providers (TNSPs), renewable developers, large load customers, governments, regulators and financiers are all waiting on each other to make the first move. As a result, the energy transition is being slowed by delays in transmission investment and ultimately contributing to rising network reliability risks and potential reputation risks in the event of unplanned outages and market constraints. On the contrary, building ahead of need also carries significant reputational risks for TNSPs as this may be considered as over-building, over-spending and/or 'gold-plating'. Therefore, in lieu of regulatory change, it is critical that TNSPs effectively consider and quantify the risk of building 'too early' versus 'too late'.

Resolution

1. Building on the situation and the associated challenges, we would recommend the following NEM focused resolutions.
2. Expand proactive community engagement and benefit-sharing lead by Transgrid.
3. Introduce a regulated risk-sharing framework for anticipatory transmission investment lead by relevant regulatory authorities (AEMC, AER, State governments) facilitated by Transgrid.
4. Increase certainty around generation retirement and replacement timelines by Transgrid proposing a rule change to the AEMC.
5. Create priority regulatory pathways for system security infrastructure with targeted investment case prioritized.