ICA Executive Roundtable: Energy Revolution

Introduction
Australia's energy transition is accelerating, driven by climate imperatives, technological innovation, and global competitiveness. South Australia has emerged as a leader in renewable energy integration. A roundtable hosted by Flinders University's Innovation Central Adelaide in September 2025 brought together academia, industry, and government to explore the challenges and opportunities herein.

This paper distils the key insights from that discussion. It highlights emerging technologies driving the transition and discusses its digital enablement. It reveals barriers to adoption and makes recommendations on workforce and policy development. It concludes with recommendations for action by government, industry, and university.

Issue definition
The energy sector faces a dual challenge in transitioning away from fossil fuels: that of rapidly deploying proven technologies while navigating complex policy, infrastructure, and equity considerations. Despite advances in technological and consumer readiness, progress is threatened by systemic inertia, fragmented governance, and slow commercialisation. The urgency to act is undeniable and the window for change, narrowing.

> We need to have a 'just' transition, which includes equity for consumers, but also cradle to grave and waste stream considerations.

Key technology trends
The roundtable discussed a broad range of technologies, in the direct generation and delivery of energy, and the importance of green energy to transition heavily powered industries critical to South Australia, such as steel production. An increasing decentralisation of energy generation is being accelerated through advances in solar and wind, and in future applications, like vehicle-to-grid technologies, while novel approaches to in-situ energy provision such as nuclear batteries, move the conversation towards emerging innovations.

Digital twins are being used to both model and optimise energy systems, and there is scope to advance the utility of AI for increasingly complex data systems. The potential for hybrid AI systems that combine operating data with predictive modelling is an emerging frontier, and one being currently addressed through industry and research collaborations. Furthermore, digital twin systems have the potential to model grid-wide generation and distribution and provide real-time insights.

Alternatives to grid-wide generation were also highlighted. Energy technology delivering power via small radioactive power sources, in localised areas was a highlighted example of novel application. Drawing on waste products from existing nuclear industries this approach provides adjacencies to grid delivery. The promise of electrified mobility offers new industrial pathways, and vehicle-to-grid power scenarios. Innovations in green metals production that harness renewable and green energy offer the potential to address the high level of carbon emissions from this core industry.

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Autonomous systems and robotics are enhancing adaptability and resilience in infrastructure. Advances in AI and IoT technologies are delivering more data and new potential for predictions and efficiencies, enabled by advances in digital network technologies. However, the geographic spread of South Australia's population and energy needs, at consumer and industry scales, combined with the urgency of the transition timeline, place pressures on the barriers to adoption.

Technology adoption barriers

Key barriers to adoption of technologies in the energy transition include the integration of emerging technologies into legacy systems, effective protocols and standards to enable this integration, and a policy framework to support momentum in the shift. In addition to the technical and regulatory barriers to energy technology adoption, a critical concern discussed was ensuring equity in both access to energy and the distribution of its benefits.

Communities in lower-income brackets, rural and remote areas, and First Nations populations are often excluded from the advantages of the energy transition. Addressing this imbalance is essential to achieving a just and inclusive energy future.

A recurring obstacle in research and implementation projects using digital twins, IoT, and AI is the lack of access to high-quality, reliable data. These tools, while powerful for conducting meaningful analysis, and informing decision-making, are only as effective as the data they rely on. Poor data quality and fragmented systems—due to the coexistence of legacy assets, new digital platforms, and IoT devices—can result in siloed information, reduced interoperability, and diminished efficacy.

Can we create hybrid AI systems that combine data driven techniques with simulation engineering, physics-based models, and leverage both of those together to improve the predictions and accuracy of the digital twin?

At the same time, industry stakeholders face mounting pressure to optimise energy use and manage consumption patterns in the face of rising costs. However, many businesses struggle to navigate the complexity of available technologies and lack the resources or confidence to invest in solutions without clear returns.

The transition to renewable energy also raises questions about sovereign capability. South Australia maintains a reliance on imported technologies, which, when drawn from potential geopolitical competitors, poses a strategic risk. Building domestic capacity in manufacturing, storage, and advanced energy systems is not only an economic opportunity but one that holds potential economic security benefits.

Digitising the energy system presents significant opportunities for improving energy efficiency, forecasting demand, and enhancing system resilience. However, its deployment must be safe, robust, and ethically grounded. Complex digital systems require sophisticated threat management strategies,

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and AI can also play a critical role in cybersecurity, helping to detect anomalies, predict threats, and safeguard digital infrastructure.

As energy systems become increasingly reliant on real-time data and interconnected devices, ensuring ultra-low latency and high-security communication networks is essential. Energy storage also remains a significant bottleneck in the transition. Addressing storage shortfalls is critical to stabilising the grid, managing variability in renewable generation, and ensuring energy reliability.

Workforce & policy recommendations

Workforce development is a critical enabler of Australia's energy transition. The roundtable highlighted two key avenues for effort, in well-aligned education and skills to ensure a future-ready workforce, and in industry-research collaborations supporting innovation, commercialisation, and sovereign capability.

> We are held hostage to infrastructure that came from the industrial revolution hundreds of years ago. What would we build if we didn't have the grid?

The development of effective partnerships between academia and industry is vital for equipping the workforce with the skills required to manage and operate next-generation energy systems. Collaborating to co-design micro-credentials, offer guest lectures, and embed real-world experience into curricula are initiatives that actively address skills mismatch.

Strengthening collaborative research and development between industry and universities is recommended to accelerate energy innovation. Joint labs and sandboxes should be established to enable real-world testing of technologies such as digital twins, AI, and energy optimisation systems. Aligning research with industry needs, focusing on scalable, applied outcomes, where industry partners are encouraged to co-develop solutions, share data, and participate in knowledge exchange is essential collaboration to bridge the gap.

Policy recommendations for industry, business, and R&D emphasised the need for a more agile, mission-driven approach to energy innovation. Streamlined regulatory processes that reduce red and green tape could accelerate projects, while procurement policies that prioritise Australian-made technologies would support sovereign capability and local manufacturing.

> There are two key issues: urgency and scale.

Industry should be incentivised to collaborate with universities on applied research and commercialisation initiatives—not only at the SME level, but also with larger enterprises in order to create change at scale. National standards for interoperability and cybersecurity must be developed to support digital energy systems. Finally, policies should promote equitable access to energy infrastructure and ensure inclusive participation in the energy transition across all sectors and communities.

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Top priorities for action

For government

- Ensure equitable energy access and value-share for all communities
- Prioritise Australian-made technologies in procurement to strengthen sovereign capability
- Enable non-dilutive funding to businesses for research collaboration
- Invest in digital infrastructure to support secure, low-latency communication

For business

- Focus on proven methods and existing knowledge for rapid change
- Increase collaborations with research institutions for co-development and testing
- Improve digital and energy literacy for consumption management
- Build domestic capability in manufacturing and storage

For university

- Co-develop with industry through collaboration and facilitate knowledge exchange
- Establish joint labs and sandboxes with industry for real-world testing and innovation
- Lead transdisciplinary research in energy systems, AI, and sustainability with industry
- Create programs and innovation projects aligned with emerging industry needs

Conclusion

Ultimately, the energy transition is a complex, multi-dimensional challenge. It requires coordinated action across sectors, a willingness to embrace innovation, and a commitment to equity and resilience. By addressing these interconnected issues: data quality, system interoperability, policy reform, workforce development, and sovereign capability, South Australia can position itself as a global leader in sustainable energy.

The energy revolution is a time-critical mission. South Australia has the tools, talent, and leadership to drive global change—but the imperative is to act with urgency, clarity, and collaboration. By focusing on scalable solutions, equitable outcomes, and strategic partnerships, South Australia can take a lead in sustainable energy transformation.

About ICA

Innovation Central Adelaide (ICA) at Flinders University is a collaboration with Cisco, and one of six innovation centrals across Australia. These anchor the National Industry Innovation Network, an initiative that engages with higher education institutions. ICA's purpose is to collaborate with industry, business, and government to advance digital enablement and uptake. It does this via defined research and innovation work packages, including contract research, concept-to-proof programs, student projects, higher degree engagement, and by generating and fostering issues-based communities.

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