

UNSW Submission – Productivity Commission Consultation on Investing in Cheaper, Cleaner Energy and the Net Zero Transformation

The UNSW Energy Institute welcomes the opportunity to comment on the Productivity Commission's interim report on investing in cheaper, cleaner energy and the net zero transformation. Australia's universities play a critical role in achieving these goals by generating knowledge that delivers lasting national benefit, developing a skilled workforce, fuelling innovation through research and development (R&D) and strengthening sovereign capability. UNSW specifically has deep expertise and globally recognised leadership across energy technologies, policy, and workforce development.

Executive Summary

This submission presents three nationally focused recommendations to the Productivity Commission that will accelerate the pace of new energy infrastructure deployment to support the net zero transformation:

1. Fuelling clean energy innovation by uplifting Australia's R&D capabilities

- a. Noting the stated desire of government to reach R&D investment of 3 per cent of GDP, there should be a commensurate uplift in mission-driven R&D towards the energy transition, in line with the Australian Government's increase in investment in clean energy deployment.
- b. Position energy research infrastructure as a strategic national asset to significantly enhance Australia's innovation capacity, accelerate the deployment of clean energy infrastructure and safeguard our national security.

2. Building a skilled and adaptable clean energy workforce

- a. Support education innovation initiatives that will be crucial for enabling greater labour productivity alongside the net zero transformation including interdisciplinary programs, lifelong learning initiatives and world-class educational infrastructure

These recommendations are an investment in Australia's future that will deliver a return to that nation's economic competitiveness and resilience. The recommendations can also be read in complement to those put forward in UNSW's broader submission to the five interim reports. UNSW stands ready to partner with government, industry, and the broader community to create long-term prosperity for all Australians.

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Introduction

Australia's declining productivity growth is one of the most pressing economic challenges of this generation. Productivity growth has stagnated in the past decade, and it is now at its lowest level in 60 years. At the same time, investment in R&D has steadily declined as a share of GDP for 15 years. The Treasurer has correctly identified that Australia's lull in productivity is because Australia's economy "is not dynamic or innovative enough".

Reversing the trend of declining productivity in our energy sector will require coordinated effort of both government and industry to strengthen domestic R&D capacity. To achieve this, the Government must first create the conditions for businesses of all sizes to innovate, scale and compete globally. Alongside enabling business innovation and uplifting Australia's R&D capabilities, building a skilled and adaptable workforce is essential to ensuring Australia can fully capture the benefits of new technologies. It is important to note that this is a multi-sectoral challenge requiring a systems approach to achieve cheaper, cleaner energy and the net zero transformation.

1. Fuelling clean energy innovation by uplifting Australia's R&D capabilities

Unlocking productivity in our energy sector is deeply reliant on our ability to deploy renewables fast and in manner that: upholds system reliability and security; minimises environmental impacts; and delivers affordable energy for all Australians. This is reflected strongly in the Productivity Commission's interim report recommendations and is aligned with significant investments in the deployment of renewables. Those investments include, but are not limited to, the *Future Made in Australia* policy, the Capacity Investment Scheme and state-based initiatives.

However, most energy experts agree that it will be very difficult to meet the Australian Government's target of 82% renewables by 2030 without doing something very differently. Independent analysis undertaken at the UNSW Collaboration on Energy and Environmental Markets supports this. Even with the Capacity Investment Scheme in place, and now expanded, Australia is chasing a trajectory that is exceptionally difficult to achieve. We need a step-change in the pace of renewable energy deployment to replace our ageing coal fleet beyond what can be achieved by the business sector alone. To achieve our renewable deployment targets, and thus emissions reduction goals, innovative approaches beyond the measures proposed in the interim report are required.

Professor Roy Green, who is leading the Net Zero Authority's energy industry jobs plan, supports this when stating, "our productivity growth depends on investment in research, innovation and skills [that] all contribute to a high-value adding net-zero industrial structure."

It is important to acknowledge the current inadequacy of investment, both public and private, in Australian R&D, as highlighted also by the Australian Universities Accord. While peer OECD nations are investing around 3 per cent of GDP in R&D, Australia lags significantly behind at just 1.68 per cent. The urgency of addressing this gap is further amplified by growing economic and geopolitical uncertainty, with the Commonwealth Treasury identifying low R&D investment as a risk to Australia's sovereign capability. Indeed, realising the ambition of lifting R&D investment nearer the OECD average of 3 per cent is a fundamental precondition of achieving a *Future Made in Australia*.

Further to this point, energy-related R&D only accounts for 5 per cent of our national R&D effort and is declining. This is despite the fact that energy is estimated to account for 75% of global greenhouse gas (GHG) emissions. Analysis led by the Australian Council of Learned Academies (ACOLA) found that there has been a four-fold decline in energy R&D expenditure since 2012-13. A 2019 IEA comparison of energy research funding found that the Australian Government's spending ranked 25th out of 27 key country economies, well behind the countries that Australia competes with in international trade and technology development. While the figures do not fully encompass private

funding and the money received through the R&D Tax Incentive (an important issue to be resolved), the outlook is far from encouraging. It certainly does not reflect a commensurate investment with the importance of the energy transition, which is likely to be the most pressing and urgent challenge of our time.

Recommendation 1a: Noting the stated desire of government to reach R&D investment of 3 per cent of GDP, there should be a commensurate uplift in mission-driven R&D towards the energy transition, in line with the Australian Government's increase in its investment towards clean energy deployment.

The global research landscape is shifting in parallel with the global energy transition. Countries are asserting control over their scientific assets and research. If Australia does not invest in its own energy research infrastructure now, we risk becoming dependent in a world where innovation is increasingly strategic. UNSW Professor Elizabeth Thurbon highlights in her Green Energy Statecraft Project¹ that there are multiple aspects of national security that should be considered in developing our future energy system, including energy security, economic security, environmental security, socio-political security and geopolitical security. To this end, the Government should prioritise policy instruments that are not just economically efficient but that also have clear security multiplier effects. The Clean Commodities Trading Initiative (CCTI), developed under the auspices of the Green Energy Statecraft Project, is an example of such an instrument and is clearly aligned with the Government's productivity agenda. Building sovereign infrastructure to safeguard the security of our energy sector would help promote domestic innovation, achieve our ambitious clean energy targets, while also supporting a *Future Made in Australia*.

UNSW's previous technology successes underscore the critical importance of research infrastructure as an enabler of world class research and industry collaboration. For example, at UNSW, Australia has made significant breakthroughs in solar photovoltaics (PV) through the Solar Industrial Research Facility and has been supporting the deployment of novel grid technologies through the Real-Time Digital Grid Simulation Laboratory. Both were supported by strategic funding in the national interest more than ten years ago, initially through the Australian Solar Institute and Solar Flagships Program, with those investments continuing to provide value to Australia's energy sector through innovation.

Recent examples from the UNSW Real-Time Simulation Laboratory (RTS) demonstrates the power of this innovation. Grid simulation allows hardware to be tested under multiple scenarios off-site, dramatically shortening connection times and reducing integration risks. Most large-scale renewable plants are located in regional or remote areas, making on-site testing costly and vulnerable to delays. By testing scenarios early and often in a controlled environment, on-site commissioning is more likely to succeed. UNSW's industrial partners, such as Potentia Energy, estimate that the RTS is 100x faster than conventional modelling software, reducing commissioning times and delivering lower costs for both their business and consumers. The facility has also been used to support the commissioning of AGL's Broken Hill battery, ensuring its grid-forming capabilities were validated before deployment. However, UNSW's ability to support future projects is limited by the current scale of the RTS facility.

Scaled-up electrification testing facilities of national significance, with more advanced RTS capabilities, exist in other advanced economies. This includes the UK's Power Networks Demonstration Centre and the US National Renewable Energy Laboratory's megawatt-scale testing facilities. Establishing a comparable facility in Australia would accelerate deployment, de-risk investment, strengthen sovereign capability, and enable ongoing workforce training and education.

Another emergent example is the opportunity to accelerate the deployment of clean energy infrastructure through a research-led approach to nature positive design. The rapid expansion of onshore wind farms and solar facilities is a critical component of Australia's transition to renewable energy, yet this shift must be guided by an evidence-based approach that accounts for potential

¹ <https://www.greenenergystatecraft.org/>

biodiversity impacts. The establishment of Renewable Energy Zones presents both challenges and opportunities for balancing energy development with conservation priorities. The industry requires improved methods for assessing the impacts of biodiversity, to both expedite the approvals process and better mitigate risk. For example, researchers at UNSW Science are working with emerging technologies that leverage high-precision optical and AI systems to identify and track avian species to improve windfarm site selection and operation, thus minimising biodiversity loss. There is an opportunity for the Productivity Commission to recommend a programmatic approach to energy policy, engineering and conservation.

Recommendation 1b: Position energy research infrastructure as a strategic national asset to significantly enhance Australia's innovation capacity, accelerate the deployment of clean energy infrastructure and safeguard our national security.

2. Building a Skilled and Adaptable Workforce

The global energy workforce shortage has become a key barrier to Australia's productivity and is already a bottleneck for Australia's clean energy transition. This issue will only become more problematic with analysis suggesting that Australia's electricity workforce will need to double by 2030². And these estimates do not fully account for the broader energy transformation, beyond electricity, or even the complete demand-side of the electricity system. Without a substantial increase in domestic training places, greater engagement in schools to grow the pipeline and targeted upskilling of the existing workforce, the pace of the energy transition will remain constrained.

A shortage of engineers specifically, is a key barrier to ensuring a sufficient workforce to support the energy transition. Romily Madew, CEO of Engineers Australia, has stated that "engineers are not only central to the infrastructure workforce today, they are the linchpin of our clean energy and net zero transition". Many engineers in the clean energy sector are trained overseas, however global demand for engineering talent is intensifying, making this pipeline increasingly insecure³. As home to Australia's largest engineering faculty, UNSW is well-placed to provide solutions to address the widening shortfall of engineers and improve Australia's labour productivity in the energy sector.

UNSW is tackling the challenge of the energy workforce shortfall directly through education innovation. Examples of this include the development of:

- Interdisciplinary programs that combine engineering, science, business and policy, equipping graduates with the breadth of capabilities required for the net zero transformation
- Lifelong learning, including through short courses and microcredentials, that provide flexible pathways to skills that industry has already identified as urgent bottlenecks such as Consumer Energy Resources (CER), green hydrogen for electrical engineers, battery safety, grid integration of renewables and GHG emission reporting to support decarbonisation, and
- World-class educational infrastructure that will be crucial for skilling-up the energy workforce and, in the future, could be co-located with industry, entrepreneurs and vocational education training (VET) providers.

Education innovation requires novel models of university-industry engagement. An example of UNSW's leadership in new partnership models is the Technology Translation Squad (TTS), which is supported through the Trailblazer for Recycling and Clean Energy. The TTS provides small to medium enterprises and startups with rapid, high-impact engineering support by offering up to five free days of hands-on

² <https://www.uts.edu.au/news/2024/09/renewable-electricity-workforce-needs-double>

³ <https://www.engineersaustralia.org.au/sites/default/files/2024-09/transferable-engineering-skills-clean-energy-transition.pdfch>

technical expertise. The TTS bridges the gap between large consultancies (often too costly and slow) and small firms (which often lack technical breadth).

New models of education innovation could be further scaled through targeted government and industry investment in people, programs and facilities.

Recommendation 2: Support education innovation initiatives that will be crucial for enabling greater labour productivity alongside the net zero transformation including interdisciplinary programs, lifelong learning initiatives and world-class educational infrastructure.

Conclusion

Australia's future prosperity depends on our ability to adapt, innovate, and invest in the capabilities that will drive long-term economic growth and productivity. By strengthening the connection between research, education, industry, and community, we can build a dynamic and inclusive energy sector equipped to meet the challenges and seize the opportunities of the decades ahead.

UNSW is committed to working collaboratively with the Government and stakeholders to deliver reforms that are fiscally responsible, nationally focused, and designed to achieve measurable impact. Our proposals aim to unlock the full potential of Australia's people, institutions, and ideas; ensuring that knowledge created here generates enduring economic and societal benefits for all Australians.

We thank the Productivity Commission for the opportunity to contribute to this important process and stand ready to support the design and delivery of policies that will help Australia reach net zero. Should you wish to discuss any issues or recommendations raised in this submission, please do not hesitate to contact the Chief Executive Officer of the UNSW Energy Institute, Ms Dani Alexander, on [REDACTED] or [REDACTED].

Sincerely,

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