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Australian Academy of Science and Australian Academy of Technological Sciences and Engineering joint submission to the Joint Standing Committee on Trade and Investment Growth's Inquiry into Australia's Transition to a Green Energy Superpower

The Australian Academy of Technological Sciences and Engineering (ATSE) is a Learned Academy of independent, non-political experts helping Australians understand and use technology to solve complex problems. Bringing together Australia's leading thinkers in applied science, technology and engineering, ATSE provides impartial, practical and evidence-based advice on how to achieve sustainable solutions and advance prosperity.

The Australian Academy of Science (AAS) is a Learned Academy that provides independent and authoritative scientific advice to government.

Together, we have amongst our Fellows some of Australia's leading experts in a range of scientific and energy matters, including researchers and individuals working in industry.

ATSE and the AAS welcome the opportunity to respond to the Joint Standing Committee on Trade and Investment Growth's inquiry into Australia's transition to a green energy superpower.

Summary of Recommendations

Recommendation 1: That the Committee highlights the importance of stable education and training pipelines to supply skills to realise the green energy superpower transition.

Recommendation 2: That planning for future energy requirements should be based on energy modelling conducted by AEMO to ensure sufficient energy supplies for green industries.

Recommendation 3: That Australia provides internationally comparable support for carbon removal via negative emissions approaches (such as DACCS) that include partnerships to stimulate international investment.

Recommendation 4: That Australia provides internationally comparable support for the development of a green hydrogen industry that includes enabling partnerships to stimulate international investment.

Recommendation 5: That the Committee highlights the potential gains for green energy and green energy commodity export from, and endorse, the implementation of the Australian Energy Research Plan developed by the Australian Council of Learned Academies.

Recommendation 6: That Australia develops a product-based carbon certification scheme supported by scientific evidence and in-line with Australia's trading partners, to ensure Australian exporters can compete in an international low carbon economy.

Recommendation 7: That the Committee recommends developing a plan to coordinate and support development of green energy and green mineral hubs across companies to ensure maximum cost competitiveness.

Recommendation 8: That the Committee investigates policy options to support and re-skill workers to enable a just transition to employment in green energy jobs for affected communities.

Recommendation 9: That the Committee highlights the need to gain and maintain social license as a critical step in building the infrastructure which will enable Australia to become a green energy superpower.

Training the clean energy workforce

The development of a growing green energy sector will require a large and highly skilled workforce. Australia is suffering from shortages and poor training pipelines for critical employees. For instance, earth scientists will play a vital role in any green energy superpower scenario through discovering and utilising scarce resources, including critical minerals and groundwater. Yet, since 2013, there has been a 40% decline in Australian geoscience student numbers (Cohen, 2022). Overseas workers may not fill these gaps—the rest of the world is also transitioning to green energy. Australia needs to support the domestic education and training pipelines necessary to supply the transition.

Recommendation 1: That the Committee highlights the importance of stable education and training pipelines to supply skills to realise the green energy superpower transition.

Energy requirements for a green energy future

Australia has considerable comparative advantages in green energy production and export opportunities. Australia has an abundance of available land and ocean space for the development of cheap wind and solar production, a generally low cost of finance, the co-location of mineral deposits and renewable energy resources, amongst other advantages. This provides potential opportunities to export electricity to South-East Asia via undersea high voltage direct current cables.

This green energy advantage can also be used to produce green energy commodities, such as hydrogen and ammonia (particularly regarding developing synthetic jet and heavy vehicle fuels), ammonia-based fertilisers, and iron, steel and aluminium produced using renewable power. The transition to green production of hydrogen and mineral commodities is electricity-intensive and thus relies on the supply of green energy increasing. With the National Energy Market predicted to at least double in power consumption by 2050 (Australian Energy Market Operator, 2022), it is critical that the government use this modelling to plan power supplies accordingly and ensure that the domestic energy market is sufficiently supplied.

Recommendation 2: That planning for future energy requirements should be based on energy modelling conducted by AEMO to ensure sufficient energy supplies for green industries.

Negative Emissions Approaches

The latest report from the Intergovernmental Panel on Climate Change (IPCC) highlights the need to remove CO₂ from the atmosphere to limit global warming (IPCC 2022). Investment in negative emissions approaches will help balance emissions from hard-to-abate industries, including the manufacturing necessary to produce green energy technologies. Additionally, many negative emissions approaches require energy—which must come from green energy to have a net negative effect.

Australia has a range of scientific, technological, and other advantages for the deployment of negative emissions methods (including methods such as Direct Air Carbon Capture and Storage

(DACCS)). Australia can learn from past experience—particularly previous failures to take advantage of R&D in solar technologies—and ensure we support the translation of early R&D in negative emissions approaches, such as DACCS, to capitalise on these opportunities, which will build competitive new industries and support employment. We should also continue to research novel methods to cultivate a range of options for negative emissions and current work in negative emissions approaches, such as DACCS, must be supported to establish cost-competitiveness and to develop the long-term economic viability of these approaches.

For Australia to realise the green energy opportunity there needs to be strong financial support from state and federal governments for a portfolio of domestic negative emissions methods and industries. Internationally, governments have been increasing investment in the capture of carbon from the atmosphere. In the United States, DACCS is heavily subsidised through the Inflation Reduction Act and funding for new DACCS projects via the Investment and Jobs Act (International Energy Agency, 2022). ATSE and the AAS encourage the introduction of measures which will allow Australian companies to leverage Australia's competitive advantages in negative emissions through partnerships with emerging stakeholders in jurisdictions with favourable subsidy environments.

Recommendation 3: Australia provide internationally comparable support for carbon removal via negative emissions approaches (such as DACCS) that include partnerships to stimulate international investment.

Green Hydrogen

Australia also possesses significant competitive advantages for the production of green hydrogen. We should capitalise on these factors and support the translation of early R&D in green hydrogen to build a strong domestic and export industry. This may be supported by taking advantage of opportunities to gain overseas government investment. For example, through the United States' Inflation Reduction Act green hydrogen production has been subsidised, such that the maximum subsidies are around US\$3/Kg, equivalent to over half the cost of hydrogen production (Gibbs and Wu 2022).

Recommendation 4: That Australia provides internationally comparable support for the development of a green hydrogen industry that includes enabling partnerships to stimulate international investment.

Research powered transition

The Australian Council of Learned Academies (ACOLA) has developed a [research plan](#) (Australian Council Of Learned Academies, 2021), identifying critical and strategic research priorities to support our transition to a clean energy future. The ACOLA research plan also stresses that Australia's green energy sector has unique needs and cannot rely on overseas researchers or innovations to provide our solutions, including for domestic consumption and export of green energy and green energy commodities. ATSE and the AAS support the implementation of this research plan as a useful roadmap for the necessary steps to turn Australia into a green energy superpower.

Recommendation 5: The Committee highlight the potential gains for green energy and green energy commodity export from, and endorse, the implementation of the Australian Energy Research Plan developed by the Australian Council of Learned Academies.

Carbon certification

Greenhouse gas accounting frameworks enable the proper accounting of emissions for particular processes and help identify areas where emissions could be reduced (Australian Academy of Technological Sciences and Engineering, 2022). Current accounting frameworks, such as the National Green Energy Regulator, provide for corporate and national level carbon estimates, but do not provide accounting and certification for individual products. As part of the European Green Deal, the European Union is currently examining laws that will require environmental impact information on imported goods (Centre for the Promotion of Imports 2021) and thus accounting for the carbon footprint of individual products may be necessary to engage with the global economy. This could include emissions along the entire value chain for the product, from feedstock production to delivery at the customer gate. A certification scheme developed in cooperation with Australia's global trading partners will be able to establish the carbon content of our export products and make it easier for Australian exporters to demonstrate the comparable advantage of their products in a low-carbon economy. Such a system may also help to make any future domestic or international price on carbon more efficient and accountable.

Recommendation 6: That Australia develops a product-based carbon certification scheme supported by scientific evidence and in-line with Australia's trading partners, to ensure Australian exporters can compete in an international low carbon economy.

Integrated infrastructure development

It is essential that Australian green energy infrastructure is developed and utilised in a coordinated manner. Co-locating manufacturing with extraction increases efficiency (for example, hot briquetted iron is much cheaper to transport than iron ore). At the same time, coordinated use of infrastructure minimises duplication, both improving cost competitiveness. Previous energy projects have seen the siloing of critical infrastructure, resulting in the unnecessary duplication of infrastructure (e.g., the LNG export hub in Gladstone, QLD; see: Institute for Energy Economics for Financial Analysis, 2017). This inefficiency results in increased capital and operational costs, potentially undermining cost competitiveness and endangering future green energy projects.

Strong national leadership, for example, through a Green Energy Commissioner or existing body such as Infrastructure Australia, can coordinate investment, development, and use of green energy infrastructure and resources to eliminate wasteful duplication and ensure competitiveness. The commercial arrangements for shared infrastructure will necessarily involve joint ventures, and additional tolling-like arrangements. Such a coordinating body could consider convening regional and/or commodity/product-focused roundtables to develop approaches to shared infrastructure. Similarly, the Australian Government should consider supportive settings for shared green energy infrastructure across the relevant financial, tax and regulatory regimes.

Recommendation 7: That the Committee recommends developing a plan to coordinate and support development of green energy and green mineral hubs across companies to ensure maximum cost competitiveness.

Transforming Australia into a green energy superpower may present opportunities to transition workers into green energy industries. At least 25,000 Australians were employed in the clean energy sector in 2019, which is expected to rise to 44,000 by 2025 (Clean Energy Council, 2020).

Concurrently, coal-fired power plants are scheduled to shut down over the next few decades, leaving many skilled workers to seek new employment opportunities. It would be advantageous to shift these workers into the green energy workforce to meet the demands of the green energy transition. The government can play an important role in supporting this transition by developing programs to support workers as they move between industries, and by providing skills training where required.

Recommendation 8: That the Committee investigates policy options to support and re-skill workers to enable a just transition to employment in green energy jobs for affected communities.

Social license

Transforming Australia into a green energy superpower will require significant economic, cultural, and environmental change. This particularly applies to the need for vastly more electricity transmission. For instance, the June 2022 Integrated System Plan suggests that more than 10,000 kilometres of transmission lines will be required under AEMO's optimal development path to 2050 to deliver firming renewable energy to main grids (Australian Energy Market Operator, 2022).

In addition to requiring additional transmission lines, the increase in energy production and storage required under AEMO modelling and the closure of fossil fuel-powered energy generators will further require the development of new clean energy generation facilities. Such a large volume of new infrastructure will require significant community co-design to develop the buy-in necessary to mitigate tensions that may delay projects, particularly from traditional owners and marginalised communities (Australian Council of Learned Academies, 2021). Minimising impacts on biodiversity from the construction and maintenance of this new infrastructure will also be an important element of social license, particularly in light of Australia's international commitments to conserve biodiversity. The Australian Government can play a significant coordination role in this regard, particularly for large interstate projects.

Recommendation 9: That the Committee highlights the need to gain and maintain social license as a critical step in building the infrastructure which will enable Australia to become a green energy superpower.

To discuss or clarify any aspect of this submission, or to arrange further consultations with the Academies and their Fellowships, please contact Chris Anderson, Director Science Policy (AAS)
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