

**ATSE**

29 November 2023

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Dear Ms Beattie,

**Submission to the consultation on NSW's Critical Minerals and High-Tech Metals Strategy**

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 900 of 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.

ATSE thanks the Department of Regional NSW for the opportunity to provide input to the Critical Minerals and High-Tech Metals Strategy. Attached to this letter is a copy of ATSE's submission to the Australian Critical Minerals Strategy. The submission urged the Australian Government to develop the infrastructure and skilled workforce required by the industry, embed a circular economy approach, and support operations owned by Traditional Owners.

ATSE encourages the Department of Regional NSW to consider the issues outlined in ATSE's submission to the Critical Minerals Strategy, and ensure the NSW Strategy interfaces with the national strategy. Additionally, ATSE recommends that the NSW Strategy expands on the 2021 NSW Strategy to incentivise technology development, maximise collaboration between states, foster a circular economy approach, and build the skilled workforce.

Future activity in NSW may include industry-led exploration and mining of promising deposits including cobalt, antimony, lithium, and rare earth elements. As other Australian states have more extensive critical mineral deposits, there is an opportunity for NSW to focus on developing mining and processing technologies that could be utilised in partnership with other states. The Strategy can support technology development and deployment, supplementing industry initiatives.

The Strategy can enhance the role of waste as a resource. E-waste and mining by-products represent significant sources of metals and other essential materials for a net zero future. The Strategy can support research, development and roll-out of recycling technologies, which can often be set up in regional areas. Locally developed technologies include the [MICROfactorie](#), created by ATSE Fellow, Scientia Professor Veena Sahajwalla, which can recover resources from waste to create new value-added products. New technologies from overseas are also investment opportunities such as [HyProMag](#) used in rare earth magnetic recycling.

Delivery of the Strategy will require a skilled workforce for discovery, extraction, and sustainable processing, as well as recovery and recycling, and manufacturing of net zero technologies such as batteries, solar cells and turbines. These will require skills and training in resource and economic assessment, chemical and mining engineering, mineral

separation and concentration, hydrometallurgy, pyrometallurgy, and plant operation. Developing these skills is particularly crucial given their broad applicability to other aspects of the green energy transition and development of resilient infrastructure. ATSE agrees with the Strategy's proposed focus on developing skills and training to support the workforce: we have considerable expertise in this space and would welcome the opportunity to further assist the New South Wales Government in the development of an appropriate roadmap for skilled workforce development.

We note that universities are absent from the previous Strategy, despite housing the programs essential to the mining industry and supporting the industry through technology development. Federal policy has reduced the profitability of these programs. With declining enrolments, universities are discontinuing courses such as geology, geography and metallurgy. Graduates of these programs will be vital to realise the benefits of Australia's critical mineral deposits. To be successful, the Strategy must highlight the role of universities and support their ability to deliver appropriate training. Research and development, including in recycling, and a highly skilled workforce will be imperative to supporting a minerals industry that contributes to Australia's net zero ambitions.

For further information on this submission, please contact [academypolicyteam@atse.org.au](mailto:academypolicyteam@atse.org.au).

Yours Sincerely,

Kylie Walker  
Chief Executive Officer, Australian Academy of  
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Katherine Woodthorpe  
President, Australian Academy of Technological  
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Submission to the Department of Industry, Science and  
Resources

# **ATSE SUBMISSION ON THE AUSTRALIAN CRITICAL MINERALS STRATEGY**

8 December 2022



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# ATSE SUBMISSION ON THE AUSTRALIAN CRITICAL MINERALS STRATEGY

The Australian Academy of Technological Sciences and Engineering (ATSE) is a Learned Academy of around 900 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.

ATSE welcomes the opportunity to respond to the Department of Industry, Science, and Resources review of the Australian Critical Minerals Strategy. ATSE makes the following recommendations:

**Recommendation 1:** The Australian Government implement targeted training and migration programs to develop and secure all the necessary skills for the emerging critical minerals industry.

**Recommendation 2:** The Clean Energy Finance Corporation and Australian Renewable Energy Agency Acts be amended to facilitate investment into environmentally sustainable critical mineral mining and processing.

**Recommendation 3:** As a part of the Critical Minerals Strategy, the Australian Government should develop a coordinated infrastructure and industry investment plan for the critical minerals industry and grow investment in industry-critical infrastructure identified in this plan.

**Recommendation 4:** The terms of reference for the Ministerial Advisory Group on the Circular Economy include a requirement for the group to provide advice on electronic and critical mineral waste and how it can be included in Australia's circular economy.

**Recommendation 5:** The Australian Government should support the development of mining operations that are owned by, or owned in genuine partnership with, Traditional Owners.

## Targeting programs for developing the skilled workforce

The ability of the critical minerals industry to expand to meet Australia's needs depends on a skilled workforce. There is currently a skills crisis for highly trained engineers (Engineers Australia, 2022), with the number of students choosing to study engineering declining (Australian Council of Engineering Deans, 2022). It is critical that more domestic engineers are trained in key specialisations, and additional students are encouraged to consider studying engineering. It is particularly important that women and Aboriginal and Torres Strait Islander people are supported to enter and thrive within the engineering profession, as full workforce participation will be required to fill skill shortages in the sector. However, as this training pipeline will take several years to fully train local talent, it is also essential to take immediate measures to ensure Australia can attract international engineers and mining industry experts, and to make the relocation of these engineers as seamless as possible to foster this growing industry.

**Recommendation 1:** The Australian Government implement targeted training and migration programs to develop and secure all the necessary skills for the emerging critical minerals industry.

## Changing mandates of government funding agencies

Opening investment into cleaner and more sustainable mineral extraction and processing can be a key driver of both the critical minerals industry and Australia's green energy future. Energy is a major expense in the extraction and processing of critical minerals and the sector is the fastest growing in terms of energy consumption (Department of Industry Science and Resources, 2016). To maintain the social licence of the mining sector and ensure energy costs are managed, the development of reliable green energy supplies for these projects is essential. The legislation that governs the Clean Energy Finance Corporation and the Australian Renewable Energy Agency should be amended to help facilitate investment in sustainable critical minerals processing. This legislative change could supercharge a green transformation of this industry while helping to develop supplies of key minerals required for Australia's transition to a green energy superpower.

**Recommendation 2:** The Clean Energy Finance Corporation and Australian Renewable Energy Agency Acts be amended to facilitate investment into environmentally sustainable critical mineral mining and processing.

### **Building adequate and resilient infrastructure**

There are considerable economic advantages to the development of coordinated critical mineral processing hubs. Positioning processing facilities near extraction sites decreases transportation costs, making processing more efficient and competitive. Developing extraction and processing hubs may also make it easier for smaller-scale processing to extract minerals from the by-products of larger scale processing (e.g., indium, gallium, and germanium from zinc processing).

Upscaling of Australia's processing capacity will necessitate access to increased quantities of both water and low-cost green energy, which will need to be reliably supplied to these hubs based around critical mineral deposits. This will require a robust network with necessary storage and redundancy (ATSE, 2022). These benefits and challenges of the development of critical minerals infrastructure suggest that a centralised approach to industry and infrastructure investment would make Australia's critical minerals industry more efficient and competitive. A coordinated approach would enable the alignment of government managed infrastructure with industry investment incentives (e.g., accelerated depreciation schemes), to efficiently develop Australia's critical mineral extraction and processing capacity.

**Recommendation 3:** As a part of the Critical Minerals Strategy, the Australian Government should develop a coordinated infrastructure and industry investment plan for the critical minerals industry and grow investment in industry-critical infrastructure identified in this plan.

### **Developing a circular mineral economy**

The recycling of critical minerals and the products they become is crucial for meeting Australia's net zero target and is a key opportunity for Australian processing (ATSE, 2020). Improving the environmental, social and governance standards of our critical mineral products, particularly batteries, will only become more important as consumers become more aware of the origins of the goods they buy.

Markets such as the European Union implement tariffs and other regulatory controls to ensure environmental sustainability. At the same time, the development of a more circular economy provides Australia with the opportunity to become a net importer of waste by employing our skills in primary

metals production to recycle electronics, including batteries, at the end of their life. With suitable investment, the extraction of critical minerals from waste streams may be more cost effective than traditional mining (Zeng, Mathews and Li, 2018) and can help fuel the nation's needs for critical minerals. Combining this with actions to decarbonise the power generation will help Australia on the path to net zero.

The establishment of the Ministerial Advisory Group on the Circular Economy is an important first step in building Australia's circular economy capacity. It is crucial that electronic and critical minerals waste be considered as part of the group's actions.

**Recommendation 4:** The terms of reference for the Ministerial Advisory Group on the Circular Economy include a requirement for the group to provide advice on electronic and critical mineral waste and how it can be included in Australia's circular economy.

### Supporting traditional owners to take an active role in mineral extraction

It is important to protect equitable engagement with the Traditional Owners of the lands on which mining operations are conducted. The Australian Government has helped support this focus by producing resources to help guide engagement with local communities (Department of Industry, Science and Resources, 2016). While this is a positive first step, supporting Traditional Owners to engage in and develop their own minerals extraction operations, or to obtain genuine co-ownership of mineral extraction, provides far reaching benefits to local communities and to Australia's mineral processing potential. A [recent landmark deal](#) for the first iron ore mine owned by an Aboriginal and Torres Strait Islander company in the Pilbara could provide a template for future mining operations operated by traditional owners (National Indigenous Times, 2019). Utilising programs such as the Indigenous Procurement Policy would enable the Australian Government to support the development of a growing Aboriginal and Torres Strait Islander-led mining industry.

**Recommendation 5:** The Australian Government should support the development of mining operations that are owned by, in partnership with, traditional owners.

## References

- Australian Academy of Technological Sciences & Engineering (2022) *Building a Resilient Australia*. Canberra. Available at: <https://www.atse.org.au/research-and-policy/publications/publication/building-a-resilient-australia/> (Accessed: 17 November 2022).
- Australian Academy of Technological Sciences and Engineering (2020) *Towards a Waste Free Future*. Canberra. Available at: <https://www.atse.org.au/research-and-policy/publications/publication/towards-a-waste-free-future/> (Accessed: 17 November 2022).
- Australian Council of Engineering Deans (2022) *Summary Numbers and Facts for Australian Higher Education in Engineering & Related Technologies*. Available at: <http://www.aced.edu.au/downloads/ACED%20Engineering%20Statistics%20April%202022.pdf> (Accessed: 18 November 2022).
- Department of Industry Science and Resources (2016) *Energy Management in Mining: Leading Practice Sustainable Development Program for the Mining Industry*. Canberra. Available at: <https://www.industry.gov.au/publications/leading-practice-handbooks-sustainable-mining/energy-management-mining> (Accessed: 17 November 2022).
- Engineers Australia (2022) *Strengthening the engineering workforce in Australia*. Canberra. Available at: <https://www.engineersaustralia.org.au/publications/strengthening-engineering-workforce-australia> (Accessed: 17 November 2022).
- International Energy Agency (2021) *The Role of Critical World Energy Outlook Special Report Minerals in Clean Energy Transitions*. Paris. Available at: <https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions> (Accessed: 17 November 2022).
- National Indigenous Times (2019) 'Australian Aboriginal Mining Corporation to develop first Aboriginal-owned iron ore mine', 27 October. Available at: <https://www.nit.com.au/australian-aboriginal-mining-corporation-to-develop-first-aboriginal-owned-iron-ore-mine/> (Accessed: 17 November 2022).
- Zeng, X., Mathews, J.A. and Li, J. (2018) 'Urban Mining of E-Waste is Becoming More Cost-Effective Than Virgin Mining', *Environmental Science & Technology*, 52(8), pp. 4835–4841. Available at: <https://doi.org/10.1021/acs.est.7b04909>.