SUBMISSION

Submission to the House of Representatives Standing Committee on Primary Industries

Submission to the inquiry into factors shaping social licence and economic development outcomes in critical minerals projects across Australia

27 February 2026

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.

Critical minerals projects contribute to Australia's economic security and regional development and will play an important role in achieving Australia's emission reduction targets. Our analysis indicates opportunities to advance Australia's critical minerals industry so that it delivers greater economic value through developing midstream and downstream processing while benefiting regional communities and Traditional Owners through a robust social licence framework. As stated in ATSE's Mining and Minerals position statement, there is an opportunity for Australia to shift its focus from raw extracts to downstream processing, and align social licence frameworks to the UN Sustainable Development Goals (ATSE, 2023). This submission draws on the expertise of over 900 Fellows in applied science, technology and engineering. This submission presents evidence-based analysis on technical, workforce and sustainability factors affecting social licence and economic development in Australia's critical minerals sector.

There is no single, global definition of critical minerals. The Australian Government identifies 53 critical minerals, while the US Geological Survey identifies 60 (including uranium, which is not on the Australian list), and the EU identifies 34. This creates challenges when discussing sovereign and global supply and needs.

ATSE makes the following recommendations on factors shaping social licence and economic development outcomes in critical mineral projects across Australia:

Recommendation 1: Increase investment in projects that build renewable energy infrastructure in mineral-rich regions, to support a low-carbon approach to producing more critical minerals.

Recommendation 2: Prioritise innovation and the commercialisation of research to advance critical mineral recovery through urban mining.

Recommendation 3: Use evidence-based international best practice to obtain social licence of critical minerals projects by following the ICMM framework and conducting early engagement in the pre-development stage.

Recommendation 4: Prioritise the development of mining operations that are owned by, or owned in genuine partnership with, Traditional Owners through grants and loan guarantees.

Recommendation 5: Accelerate new critical minerals projects through streamlined approvals processes, while engaging with communities to develop social licence.

Recommendation 6: Investigate the possibility of further uranium exploration and mining while building support from regional communities and Traditional Owners.

Recommendation 7: Address the workforce gap through long-term support for proven programs that actively expand the engineering workforce, such as Elevate, which supports more women and non-binary people to study engineering degrees.

Recommendation 8: Extend paid practical placements to engineering degrees to incentivise enrolments and address the engineering workforce gap.

Advancing critical minerals infrastructure

Australia contributes to global supply chains in critical minerals, including lithium, cobalt and rare earths; however, this is primarily focused on raw ores (DISR, 2023). Australia has the ambition and intention to move up the value chain in processing, refining and advanced manufacturing, which generates more value than raw extraction. To achieve economic development, downstream industries will need more skilled workers, noting that the jobs created will be stable and contribute to national security.

As a part of the Future Made in Australia Investment Framework, the Australian Government in 2024 announced the Critical Minerals Production Tax Incentive, which will provide a refundable tax offset of 10% of processing costs for Australian critical minerals (DISR, 2024). Export Finance Australia is also incentivising downstream processing through the government's $5 billion Critical Minerals Facility. ATSE encourages support for mineral-specific projects with high global demand that promise long-term societal and economic value. We note that this could extend to minerals not currently on the Australian critical minerals list such as uranium. To support success and wealth generation, justify investment and support

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local supply chains, projects should have robust cash flow, transparent governance and a strong social licence with life deposits of 25 years or longer.

The Australian Government has a crucial role to play in supporting the development of infrastructure for a sustainable minerals industry. Low-carbon technologies which use renewable energy, including solar in remote mining operations, can boost the sustainability of the critical minerals industry. However, ATSE's Decarbonising Diesel Industries report, which articulated options for the mining industry to decarbonise through technology, found that limited charging infrastructure and insufficient grid capacity in regional areas presented major barriers (ATSE, 2025b). Processing critical minerals requires a substantial amount of energy and water (Bruce et al., 2021). Renewable energy in mining operations could reduce energy costs and present as a value-add to minerals where customers are interested in paying a premium for ethical production. There is an opportunity for the government to advance the critical minerals industry and value-add processing through expanding renewable energy infrastructure to power the move downstream. In some cases, this can also have the dual benefit of providing renewable energy and upgrading transmission infrastructure to regional communities. For example, in 2023, the Queensland Government took over the Copper String 2.0 project which will deliver renewable energy to North-West Minerals Province. This will enable downstream processing while also benefitting the communities of the region by making electricity supply better and cheaper (Toome & Nothling, 2023). Similarly, in the Central-West Orana region, infrastructure will improve mobile and internet connection, particularly in rural areas (Energy Co, 2023).

Recommendation 1: Increase investment in projects that build renewable energy infrastructure in mineral-rich regions, to support a low-carbon approach to producing more critical minerals.

Enhancing critical minerals resource recovery

Australia has an opportunity to tap into the under-utilised supply of critical minerals in e-waste. These include gold, copper, cobalt, lithium, palladium, nickel and Rare Earth Elements (REEs). Australia has a significant supply of e-waste from solar panels, electric vehicles and energy storage batteries, but only a small proportion of critical minerals from this waste is recycled, known as urban mining (ATSE, 2023b). Low rates of recycling are driven by a lack of economically feasible technologies to separate valuable critical minerals from components. Recycling critical minerals could become more economically viable through new technologies, infrastructure and regulations, or due to increased costs over time of mining new critical minerals. Proof of concept for recycling technologies has been demonstrated by some Australian and international innovative companies. ATSE Fellow, Professor Veena Sahajwalla AO FTSE FAA, has developed MicroFactorie technologies to recover valuable waste products, including from e-waste, for use in advanced manufacturing of new value-added products. Internationally, HyProMag has developed a technology (Hydrogen Processing of Magnet Scrap) to break down rare earth magnets from e-waste, which could be recycled into new magnets. As another example, Ionic Technologies, a subsidiary of an Australian mining company, received a UK Government grant to build a demonstration plant for their recycling technology extracting rare earth elements from spent permanent magnets.

As Australia increases its supply of carbon-neutral technologies that result in more e-waste, there will be an enhanced need for recycling infrastructure. E-waste recycling also poses a regional economic development opportunity: unlike primary mining, this infrastructure can be located near population centres. Technical barriers associated with e-waste recycling include high costs, incompatible product design, complex material compositions and inadequate recycling infrastructure. Some of these can be addressed through government priorities and investment in research and development, translation and commercialisation of technologies designed to improve efficient low-carbon processes. This could be achieved within the Future Made in Australia framework, noting some initiatives already in progress such as the National Solar Panel Recycling Pilot.

Alongside development and scaling of recycling technologies, design considerations and regulation can be leveraged to increase the economic viability of e-waste recycling. This is highlighted in ATSE's Towards a Waste-Free Future report, which recommends using circular economy principles, including manufacturers designing products for recovery and participating in product stewardship or extended producer responsibility schemes (ATSE, 2020). Extended producer responsibility schemes, which shift responsibility for product disposal to the manufacturers, have been demonstrated internationally, including through the European

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Union's Waste Electrical and Electronic Equipment Directive. Small-scale industry schemes operate in Australia, including MobileMuster and the National Television and Computer Recycling Scheme, which provide free-to-consumer mechanisms for recycling e-waste.

Recommendation 2: Prioritise innovation and the commercialisation of research to advance critical mineral recovery through urban mining.

Supporting socially responsible mining development

Public perceptions about critical minerals projects remain a challenge to adoption and growth in this sector. In a CSIRO survey, 61% of participants agreed that mining has negative environmental consequences (CSIRO, 2024). Social licence to operate in the mining and minerals sector has been severely impacted by reputational damage from practices that have damaged the environment and culturally significant sites. A key example of this is the destruction of 46,000-year-old caves that were Aboriginal heritage sites at Juukan Gorge (Joint Standing Committee on Northern Australia, 2020). Low social licence leads to project delays, increased costs, workforce attraction problems and sector capability barriers. A global study found that a major mining project with US$3-5 billion could lose approximately US$20 million per week resulting from delays (Davis & Franks, 2014) Research from other jurisdictions shows that projects that engage communities early (pre-exploration) experience fewer delays than those that engage late (post-exploration, pre-development). In Canada, a hydro-power development developed in consultation with Indigenous communities demonstrated that early consultation leads to better outcomes for regional communities and the environment (International Hydropower Association, 2022). A comprehensive social licence framework for socially responsible mining development has been developed by the International Council of Mining and Metals (ICMM). It aligns with the UN Sustainable Development Goals and covers essential elements, such as social performance, which is critical for securing social licence in regional areas where critical minerals projects are often clustered (ICMM, 2026).

Creating opportunities for regional communities and Traditional Owners to benefit from projects, including co-ownership and employment opportunities, can contribute to social licence. In a genuine co-ownership with Traditional Owners, an Indigenous group, whether individuals or an incorporated entity, holds equity in a developer company, parent company or a diversified portfolio and can be considered a co-owner of a mining project. This has been demonstrated in Canada, with a petroleum facility achieving 49% combined equity with First Nations groups in the community, leading to improved engagement, environmental management and economic outcomes for First Nations groups (Kung et al., 2022). A barrier to Indigenous co-ownership of critical minerals projects can be access to capital to purchase equity: government grants and loan guarantees could provide a solution. As noted by ATSE's 2023 response to the Critical Minerals Strategy, moving beyond engagement to facilitation of Aboriginal and Torres Strait Islander leadership could enhance outcomes of critical minerals projects. Equity participation represents one mechanism for such leadership.

An additional major barrier to critical minerals projects is overlapping regulatory requirements across states, which can mean assessment processes are duplicated (Gilbert & Tobin, 2023). Regulatory barriers can increase timelines and costs of critical minerals projects, as well as delay value from extraction and processing (ATSE, 2025a). Regulation inefficiencies also create uncertainty for investors and reduce Australia's competitiveness in global critical minerals markets. There is an opportunity for stronger coordination between state and federal governments to streamline regulatory processes while maintaining environmental and community protection. International approaches to regulatory coordination vary. The EU's framework includes defined timelines while maintaining assessment standards. Analysis of such approaches could inform Australian coordination mechanisms, balancing timeliness with thoroughness. While regulatory coordination can reduce duplication and uncertainty, evidence indicates that rushed approvals without adequate community engagement and environmental assessment can undermine social licence and lead to greater delays through legal challenges and community opposition.

Finally, while Australia has the largest reserves of uranium in the world, the nation's potential to develop new industry opportunities in uranium is dampened by negative public sentiment (Minerals Council of Australia, 2025). Reform to regulation that impacts uranium mining presents an opportunity to increase export earning potential, but this should be considered carefully in accordance with community sentiment, including Traditional Owners. ATSE's 2024 Small Modular Reactors report highlighted the need if growth in uranium mining is to be pursued for ongoing and broad community consultation, collaboration, acceptance and engagement.

Recommendation 3: Use evidence-based international best practice to obtain social licence of critical minerals projects by following the ICMM framework and conducting early engagement in the pre-development stage.

Recommendation 4: Prioritise the development of mining operations that are owned by, or owned in genuine partnership with, Traditional Owners through grants and loan guarantees.

Recommendation 5: Accelerate new critical minerals projects through streamlined approvals processes, while engaging with communities to develop social licence.

Recommendation 6: Investigate the possibility of further uranium exploration and mining while building support from regional communities and Traditional Owners.

Supporting engineering education for a STEM-skilled workforce

The critical minerals sector faces significant workforce shortages, alongside the broader science, technology, engineering and mathematics (STEM) workforce. Poor public sentiment has led to declining enrolments in university mining-related courses (Abenov et al., 2023) and workforce attraction problems (ATSE, 2023a). In 2020 – the most recent year for which data is available – there were only 104 mining engineering graduates in Australian universities, down from almost 300 in 2016. In addition, many courses need 30-40 students for financial viability, but every university offering mining engineering in 2020 had 20 graduates or less (AusIMM, 2020). There is a clear demand for graduates in mining-related degrees, and it was estimated by the Minerals Council of Australia (MCA) in 2020 that 200 per year were needed to meet demand. In 2024, 91% of recent graduates in process and resource engineering were employed full-time, the third highest employment rate amongst 45 study areas (QILT, 2025). The mining industry has record-level vacancies, higher than during the mining boom between 2011-12 (Mining and Automative Skills Alliance, 2025). There are multiple workforce gaps along the critical minerals value chain. There is a shortage of engineering skills more broadly, with only 8.2% of Australian university graduates obtaining an engineering qualification compared to 24.2% in Germany and 18.5% in Japan (Bell & Briggs, 2022). As Australia develops its downstream industries, there will be increased demand for skills in processing, chemical engineering and hydro and pyro-metallurgical skills which are currently experiencing capability and capacity decline. The mining sector is the third largest employer of industrial and mechanical engineers, and the fourth largest employer of environmental engineers and scientists (Minerals Council of Australia, 2023) so STEM skill shortages more broadly are crucial to address to grow the mining industry.

Incentivising enrolment into courses that have high workforce demand but low enrolments, such as geology and engineering, can be done through small scholarship grants, such as ATSE's Propel: Australian Submarine Scholarships program, which will provide thousands of $5000 scholarships for students enrolled in degrees in nuclear, civil and mechanical engineering. Focusing on attracting and retaining historically underrepresented cohorts (such as women) to STEM disciplines can also be a lever for increasing the size of the STEM-skilled workforce. Internationally, targeted underrepresented groups are demonstrated to increase the size of the mining workforce. The Canadian Critical Mineral Strategy outlines actions to grow a diverse workforce in critical minerals, and one of these core actions is to achieve 30% participation of women in mining by 2030 by supporting efforts that contribute to this goal (Natural Resources Canada, 2022). In Australia, participation of women in the mining industry is at approximately 22% (Workplace Gender Equality Alliance, 2023). Increasing participation of women and diverse people could therefore help address workforce shortages in mining. Targeted programs such as ATSE's Elevate: Boosting Diversity in STEM (supported by the Department of Industry, Science and Resources) can be used to support priority areas and reduce inequities in access to education. However, under current funding levels, ATSE can no longer offer new undergraduate scholarships from 2027 onwards.

Ensuring engineering work placements are paid is another lever to increasing the size of the engineering workforce and encouraging participation from those who could not otherwise afford to complete their studies. Extending the Commonwealth Prac Payment to engineering degrees with mandatory placements would support the development of the mining workforce and other engineering disciplines in shortage. The payment would only need to be extended to students in unpaid placements, with many engineering placements – particularly those at large firms – already being remunerated.

Recommendation 7: Address the workforce gap through long-term support for proven programs that actively expand the engineering workforce, such as Elevate, which supports more women and non-binary people to study engineering degrees.

Recommendation 8: Extend paid practical placements to engineering degrees to incentivise enrolments and address the engineering workforce gap.

ATSE thanks the House of Representatives Standing Committee on Primary Industries for the opportunity to respond to the inquiry into factors shaping social licence and economic development outcomes in critical minerals projects across Australia. For further information please contact academypolicyteam@atse.org.au.

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References

Abenov, T., Grabbert, T., Franklin-Hensler, M., & Larrat, T. (2023, February). Has mining lost its luster? Why talent is moving elsewhere and how to bring them back. *McKinsey & Company*. https://www.mckinsey.com/industries/metals-and-mining/our-insights/has-mining-lost-its-luster-why-talent-is-moving-elsewhere-and-how-to-bring-them-back#/

ATSE. (2020). *Towards a Waste Free Future*. https://atse.org.au/media/1jligyqm/atse-towards-a-waste-free-future-report-low-res.pdf

ATSE. (2023a). *Mining & mineral resources: Responsible partnership for sustainability*. https://www.atse.org.au/what-we-do/strategic-advice/mining-and-mineral-resources-position-statement/

ATSE. (2023b). *Submission to the consultation on NSW's Critical Minerals and High-Tech Metals Strategy*. https://www.atse.org.au/what-we-do/strategic-advice/submission-to-the-consultation-on-nsws-critical-minerals-and-high-tech-metals-strategy/

ATSE. (2025a). *5 Pillars Productivity Inquiry*. https://www.atse.org.au/what-we-do/strategic-advice/5-pillars-productivity-inquiries/

ATSE. (2025b). *Decarbonising diesel industries*. https://www.atse.org.au/what-we-do/strategic-advice/decarbonising-diesel-industries/

AusIMM. (2020). *A Critical Moment: The supply and demand of mining, metallurgical and geotechnical engineers in the Australian resources industry*. A Critical Moment The supply and demand of mining, metallurgical and geotechnical engineers in the Australian resources industry

Bruce, S., Delaval, B., Moisi, A., Ford, J., West, J., Loh, J., & Hayward, J. (2021). *Critical Energy Minerals Roadmap*. https://publications.csiro.au/publications/publication/PIcsiro:EP21681/RI10/RT10

CSIRO. (2024, October). *Australian attitudes toward mining 2024 survey report*. https://www.csiro.au/en/work-with-us/industries/mining-resources/Social-and-environmental-performance/Attitudes-to-Mining-Survey-Report-2024

Davis, R., & Franks, D. (2014). *Costs of Company-Community Conflict in the Extractive Sector*. https://www.csrm.uq.edu.au/media/docs/603/Costs_of_Conflict_Davis-Franks.pdf

DISR. (2023). *Critical Minerals Strategy 2023-2030*. https://www.industry.gov.au/sites/default/files/2023-06/critical-minerals-strategy-2023-2030.pdf?utm_source=copilot.com

DISR. (2024, May). *Investments to capitalise on Australia's critical minerals and the global clean energy transition*. https://www.industry.gov.au/news/investments-capitalise-australias-critical-minerals-and-global-clean-energy-transition#:~:text=Offering%20tax%20incentives&text=The%20government%20will%20provide%20$7,and%20legislation%20ahead%20of%20time.

Gilbert & Tobin. (2023). *Mining in Australia 2023*. https://www.gtlaw.com.au/insights/mining-in-australia-2023#:~:text=Practically%20all%20the%20mineral%20resources,formally%20approved%20in%20certain%20circumstances.

ICMM. (2026). *Our Principles*. https://www.icmm.com/en-gb/our-principles

International Hydropower Association. (2022). *Building indigenous community partnerships in Canada*. https://www.hydropower.org/resources/case-studies/building-community-partnerships-with-indigenous-communities-in-quebec#:~:text=As%20an%20example%20of%20effective,yearly%20conditions%20and%20communication%20needs

Joint Standing Committee on Northern Australia. (2020). *Inquiry into the destruction of 46,000 year old caves at the Juukan Gorge in the Pilbara region of Western Australia - Interim Report*. https://apo.org.au/node/310049

Kung, A., Holcombe, S., Hamago, J., & Kemp, D. (2022). Indigenous co-ownership of mining projects: a preliminary framework for the critical examination of equity participation. *Journal of Energy & Natural Resources Law*, *40*, 413–435. https://www.tandfonline.com/doi/full/10.1080/02646811.2022.2029184

Minerals Council of Australia. (2023). *Submission to the Australian Universities Accord Panel Discussion Paper*.

Minerals Council of Australia. (2025). *Uranium: untapped potential*. https://minerals.org.au/about/mining-facts/mineral-uranium/

Mining and Automative Skills Alliance. (2025). *Insights for tomorrow: 2025 Workforce: Plan*. https://ausmasa.org.au/media/di3lhonm/2025-workforce-plan.pdf

Natural Resources Canada. (2022). *The Canadian Critical Minerals Strategy*. https://www.canada.ca/content/dam/nrcan-rncan/site/critical-minerals/Critical-minerals-strategyDec09.pdf

Toome, J., & Nothling, L. (2023, March). *Queensland government buys $5 billion CopperString 2.0 to connect north-west to national electricity grid*. https://www.abc.net.au/news/2023-03-07/copper-string-energy-transmission-line-queensland-government/102059900

Workplace Gender Equality Alliance. (2023). *WGEA Mining Industry Snapshot*.