SUBMISSION ON THE NATIONAL BATTERY STRATEGY

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The Clean Energy Council welcomes the opportunity to make a submission on the National Battery Strategy issues paper (**Issues Paper**).

The Clean Energy Council is the peak body for the clean energy industry in Australia. We represent and work with over 1,000 of the leading businesses operating in consumer energy resources, large-scale solar, on-shore and offshore wind, large-scale storage, and renewable hydrogen. We are committed to accelerating Australia's clean energy transformation.

The Clean Energy Council is pleased to see the Australian Government investigating a National Battery Strategy, as investment in our batteries is essential to the country's clean energy transition. The Australian Energy Market Operator (**AEMO**) described the investment in storage facilities as 'the most pressing need in the next decade (beyond what is already committed)' to manage the variations in the output from fast-growing solar and wind generation.

Batteries of all sizes and technology types will be essential to provide this support. AEMO's 2022 Integrated System Plan **(ISP)** forecasts that that firming capacity of the electricity system needs to treble to counteract the withdrawal of coal-fired generation. Investment will be required across a range of storage types, but the current ISP modelling forecasts that 46 GW (640 GWh) of dispatchable storage in all its forms will be required by 2050. The ISP estimates that this is broken down into 31 GW of Virtual Power Plants (**VPPs**), vehicle-to-grid (**V2G**) services and other emerging technologies and 16 GW of utility-scale battery and pumped hydro storage. It is key that any National Battery Strategy needs to be battery-technology agnostic to maximise the opportunities available to align with and support Australia's other strategies and goals.

The Clean Energy Council agrees that Australia has a unique opportunity to be a world leader in a future battery industry. Access to finance, materials, products and workforce is extremely pertinent in a situation of increasingly competitive clean energy economies, such as the repercussions of the USA's *Inflation Reduction Act* (**IRA**). However, careful consideration is required to determine what role Australia wants to and should play going forward in a battery industry. We recommend that any decision on a National Battery Strategy should be considered in the wider context of a long-term Renewable Energy Superpower Masterplan, which we recommended to the Australian Government in our pre-Budget submission.

With this in mind, we outline some of the key opportunities and barriers to a developing battery industry in Australia below.

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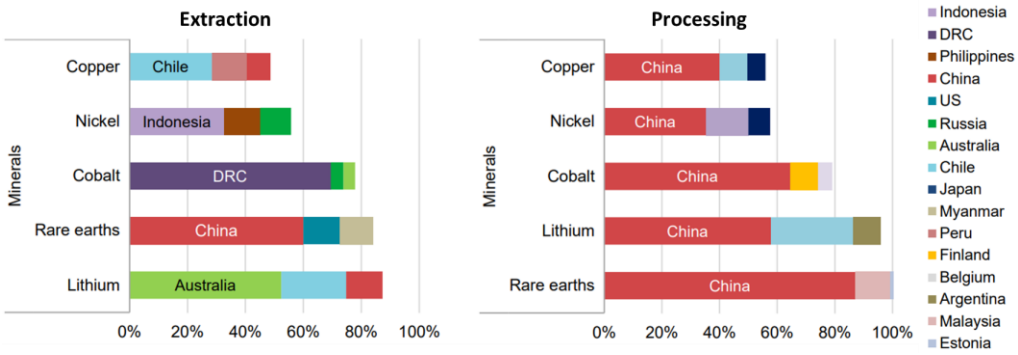
Critical minerals

The timely decarbonisation of the energy sector depends on a major expansion of the critical minerals sector. As noted in the Issues Paper, Australia has world-leading critical minerals resources essential to the development of a domestic battery industry. However, the processing of critical minerals is highly concentrated in a few countries, mainly China (see Figure 1). This concentration is increasingly raising concerns about supply chain security, and potential impacts on the clean energy transition. Exported ores are also a key source of scope 3 emissions, with total exports exceeding 1 billion tonnes for CO_2-e per annum.[1] This represents many times Australia's current emissions. With access to some of the cheapest renewable energy resources in the world, onshoring critical mineral processing is a key opportunity for Australia reduce scope 3 emissions of the mining sector while moving up the supply chain and capturing value currently being sent overseas.

Figure 1 | Share of top three producing countries in production of selected minerals in 2019.



Source: International Energy Agency, 2021.

The IRA also presents a key opportunity for Australian critical minerals. It offers generous tax credits for companies that use minerals extracted, processed or recycled from countries with which the US has a free trade agreement. Electric vehicle (**EV**) manufacturers can receive a tax credit up to US$3,750 per vehicle. China currently holds 78 per cent of manufacturing capacity for EV batteries, and refines 68 per cent of the world's nickel, 40 per cent of copper, 59 per cent of lithium, and 73 per cent of its cobalt. Chinese products are not eligible for a tax credit under the IRA. With the battery value chain forecast to increase tenfold to 2030, Australia is in a strong position to capture a greater share of the downstream mineral processing market.

Expanding the extraction and processing of critical minerals will also be subject to barriers from social licence and community pushback, extending development timelines to fifteen years. Embedding social licence and community consent at the core of new expansions presents a major opportunity to improve outcomes for all stakeholders, including First Peoples, local communities and businesses, industry, and workers. This requires additional funding options for capital-intensive, pre-revenue critical minerals projects willing to demonstrate the viability of innovative

[1] Sandiford, M. (2022). The Net-Zero Opportunity for Australian Minerals. In R. Garnaut (ed.), The Superpower Transformation (pp.149-169). La Trobe University Press.

approaches that increase financial returns and improve environmental outcomes, while enhancing the profitability and global reputation of the Australian mining sector. This would unlock private investment and support new businesses willing to test the viability of more sustainable modes of operation. Prioritising ESG and social licence has the potential to increase profitability by minimising project delays and ensuring that projects, governments, and the communities in which they operate agree on project parameters.

There are major training capacity shortfalls in Australian universities that will constrain the ambitions of an expanded mining sector. Geophysics, metallurgy and mining engineering departments have experienced weak domestic enrolments and have had funding slashed in the face of declining international enrolments throughout the COVID pandemic. Downsizing has occurred in geoscience departments at The University of Melbourne, Macquarie University, Newcastle University, and the Australian National University. Finally, extra funding is needed for geoscience research that supports the energy transition. Lack of training capacity risks labour shortfalls, increasing project costs. The Federal Government has a role to play by increasing funding for geoscience that supports the energy transition at universities.

In the absence of domestic capacity, permanent skilled migration may be required to meet project demands. The Federal Government has enabling role to play with regards to skilled migration visa sponsorships for the mining industry to address capacity gaps in the short- to medium-terms. Visas issued by the industry rather than an employer would encourage movement within the sector, leading to better employee outcomes.

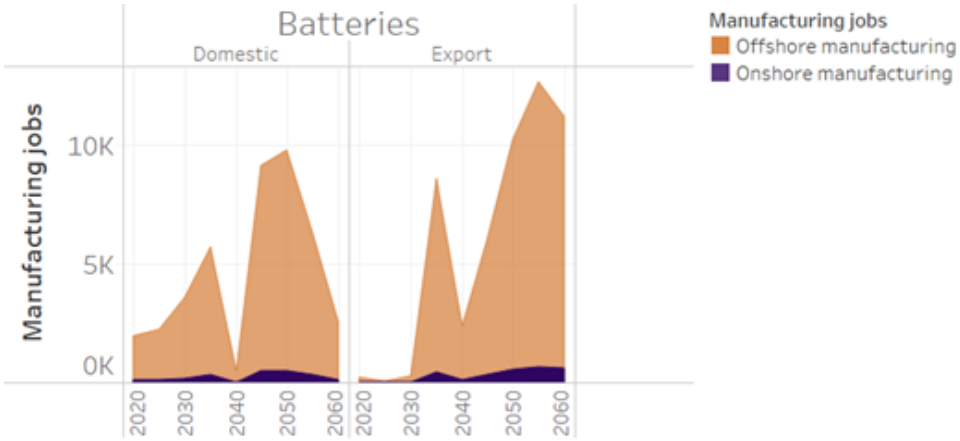
Research and development
To reach greater scale in our R&D space, Australia could explore strategic partnerships with other countries. For example, a licensing partnership could see Australia starting with a small, local factory and R&D facility and to then eventually set up licensed manufacturing plants in partner countries. Australia's competitive advantage would play well into this sort of partnership, with our expertise in mining, refining and refined material export.

This structure could enable greater volumes necessarily to further support technical development and future R&D effort, allowing ongoing R&D and patents, training and development.

Manufacturing
Recent research from the Net Zero Australia (NZA) project indicates the potential for workforce growth by expanding manufacturing capacity upstream. NZA is a collaborative research project between the University of Melbourne, the University of Queensland, Princeton University, and the Nous Group. The study models changes to Australia's energy system as both domestic and export sector emissions decarbonise across all technologies from 2020 to 2060, as well as the associated impacts on jobs. The study assumes that onshore manufacturing capacity will remain at historically low levels throughout the transition, which is unlikely given the current policy and political focus on Australian manufacturing.

Figure 2 depicts projected onshore and offshore battery manufacturing jobs by sector over time. By capturing 100 per cent of manufacturing jobs, Australia could onshore up to 20k full-time equivalent jobs in 2050. Note these projections reflect local demand required to decarbonise domestic and export emissions only, and do not account for the possibility of Australian-made battery exports. Furthermore, onshoring all battery manufacturing jobs would require production at a large scale to be competitive. A more viable niche is onshoring jobs in battery cell manufacturing, which would be a smaller proportion of overall jobs.

Figure 2 | Onshore and offshore battery manufacturing jobs by domestic and export sector emissions for Net Zero rapid electrification (E+) scenario.



In the lithium-ion battery value chain, cell manufacturing is considered one of the most complex and difficult aspects of the chain to do well, resulting in a range of cell qualities being produced. Stationary energy storage procurement teams are looking for high quality, competitively priced lithium iron phosphate (**LFP**) cells outside China. Australia has an opportunity to set a new standard of cell manufacturing, and provide the expertise to our own, as well as partner country facilities to ensure a consistent and high-quality product.

The National Battery Strategy should consider how local manufacturers could produce a cost competitive product for both domestic use and export. This would create scope to develop and train people with relevant engineering and technical skills to set up and provide expertise to leading cell manufacturing facilities. There is also an opportunity to partner with other countries to subsidise the cost of development and cell manufacturing setup.

Capturing jobs beyond the manufacture of lithium-ion battery cells requires production at a large scale to be competitive. These steps, including battery modules, enclosures and full storage systems, do not require as much high-skill effort and are very labour-intensive. This is also part of the value chain many storage technology companies are already well placed to do, and procuring at the cell-level is much more flexible for companies to manage supply chain.

However, it may be that onshoring jobs in Australia may be possible for alternative batteries and energy storage technologies, such as vanadium redox flow batteries and iron flow batteries. Announcements already made by several organisations in Australia highlight the opportunity for development of long-duration non-lithium technologies and the associated supply chains in Australia.

The opportunity to partner with international organisations and establish regional hubs for the material supply, assembly and support of these alternative technologies is significant and could establish Australia in the forefront of the global supply network for such technologies.

Investment in battery storage
The Issues Paper notes that capital investment and demand security is critical to growing domestic battery industries.

Globally, battery-based energy storage uptake is accelerating. Markets with strong investment drivers and policy settings have the fastest growing deployments. Australia is now following suit with strong market signals including the proposed Capacity Investment Scheme, Victoria's Storage Target and NSW targets announced last year.

Following a period of investment stagnation, Australia now has an active market. However, barriers to transacting storage remain, including:

- Grid connection delays;
- Supply chain disruptions;
- Volume and complexity of regulatory reform; and
- Uncertainty of coal generator retirement dates.

Battery innovation
Innovation for batteries doesn't just apply to the battery chemistry, but also the balance of plant for a battery system and covers the battery management system. The National Battery Strategy should consider how innovation in not just the battery can be support, but the broader range of tools needed to make a battery project successful.

There are a number of companies in Australia developing or that have developed software and hardware that effectively manages a battery. For instance, software with a controller will determine that there is "spare" solar PV generation or a lower electricity price and trigger the battery to charge; Where a battery is contracted to provide a system service, either locally or to the grid, the management software will ensure that service contracts can be met with the appropriate state of charge.

The battery is likely to be part of a wider energy management strategy that could include an electric vehicle, large loads (or domestic appliances) and solar PV generation. The "smarts" that facilitate successful management of all of these integrated items of energy assets are an important tool in maximising the benefits of these assets. A site manager or home energy management system are critical approaches that will underpin the transition to clean energy and to manage energy costs, particularly for businesses and homes.

Recycling considerations
Lithium-ion batteries present a key opportunity for recovery and recycling of critical minerals, due to the projected increase in demand for electric vehicles and the high potential for recovery and recycling. Current battery recycling techniques involve pre-processing lithium-ion batteries to create black mass, which typically recycles 85-95 per cent of the battery. Refining black mass to recover critical minerals can recovery up to 80 per cent of lithium, and 95 per cent of nickel and cobalt. At present, pre-processing is not well established in Australia and all black mass is exported overseas for further refining. Domestic refining would add 2-3x the current margin. With a growing supply of lithium-ion batteries, this presents a substantial economic opportunity. However, low feedstock volume presents a challenge to commercial viability in the short term.

One of the biggest barriers to lithium-ion battery recycling is safely handling the battery at its end of life. This is of concern for all areas from collection, transport, storage, second-life remanufacturing and materials recovery.

Given the hazardous nature of end-of-life lithium-ion batteries, storage of these materials must comply with the relevant laws and regulations. One of the challenges identified for the recycling industry is the variance between state regulations, which includes the extent of pre-processing required to declassify end-of-life battery waste as a dangerous good for storage and transport. For example, the CSIRO identified that having a set of comprehensive and consolidated transport regulations across all states and territories, as well as guidelines for import and export could assist the battery recycling industry and the battery manufacturing, importing and retail sectors more broadly.[2] However, it is also important to differentiate between the different battery technologies as safety requirements will differ between.

Thank you for the opportunity to provide initial input into the National Battery Strategy. We look forward to continuing to engage with the Government as this Strategy is developed.

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[2] Australian landscape for lithium ion battery recycling and reuse in 2020 (fbicrc.com.au)