



The path forward

Supporting the development of a Lithium and Battery Minerals
Industry in Western Australia

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The Opportunity

Western Australia mines over 60% of the world's supply of lithium and produces all of the other minerals necessary to domestically manufacture batteries. The spodumene mined in Western Australia has a lower conversion cost to lithium hydroxide when compared to the brine evaporated in other jurisdictions. This comparative advantage, is reinforced by tariff advantages when compared with China, making Australia cost competitive in a technology and industry that is not heavily reliant on low labour costs.

With Government engagement and leadership, Australia could take the lead in the development and delivery of lithium ion batteries. A technology that is increasingly found in everyday objects, as well as phones and electric vehicles, and is at the forefront of the international response to climate change.

The alternative is for the Government to leave industry, and the market, to resolve the location of industries in the value chain itself. Australia's international competitors, supported by Government action, have also identified the substantial jobs, revenues and flow on benefits of fostering this new industry - and are working to develop these industries in their countries.

To detail the opportunity for greater value adding a number of AMEC's member companies commissioned an independent research report (the report) by Future Smart Strategies to outline the lithium value chain, the demand and Australia's key advantages.

The Report concurs with the majority of forecaster opinions that global demand for batteries will grow exponentially in the coming decade. Future Smart Strategies identified that the currently \$165 billion global lithium value chain will grow to a conservatively estimated \$2 trillion by 2025. Without Government and industry collaboration, Australia is estimated to capture \$10 billion of the total value in the next eight years. However, if one more step was taken down the value chain into electro-chemical processing, by 2025 Australia would have a share of a further \$297 billion.

It is estimated that there is roughly a two year window before the value chain is solidified. This timeframe is predicated on the speed of South American brine production growth and an increase in global manufacturing capacity.

The Report found that currently 89% of global electro-chemical processing, the next major step down the value chain from mining and concentrating, occurs in China. The Report contends that as opposed to commonly held views, Australia can compete on cost and quality grounds.

In Western Australia, all the necessary reagents are produced domestically. The Report found that approximately 40% of a battery chemical facilities operating cost is sourcing the chemical reagents. The dependability of Australia's spodumene compared to brine, which face greater purity challenges is a further positive. A key hurdle, the Report identifies is that the necessary chemistry at the electro-chemical stage is subject to patents and is closely guarded intellectual property. Companies with that knowledge must be attracted.

The advantages of Western Australia's Kwinana industrial strip are identified as having already attracted Tianqi to develop a lithium hydroxide processing facility.

The Report estimates the cost of developing a 20,000 KiloTonne per annum processing facility as being approximately US\$350m, with the caveat that further detailed cost feasibility analysis is needed.

The initial Report from AMEC was a first step to draw attention to this unique, once in a generation confluence of local advantages that are in global demand. This is an opportunity that could reshape the entire Australian economy, providing jobs, economic diversification and leadership in a key technology. Unlike other minerals, the value chain for lithium and its end product, batteries, is still fluid enough for Australia to harvest a greater return for our minerals.

To achieve this, the Association of Mining and Exploration Company recommends that the Federal and State Government's work with industry to deliver on the following recommendations.

Recommendations

- 1. Leadership***
- 2. Investment Attraction***
- 3. Planning and Coordination***
- 4. State Agreements***
- 5. Financial Incentives***
- 6. Research***

1. Leadership

The State and Federal Government need to clearly signal to the domestic and international market that Western Australian is committed to the development of a lithium and battery minerals industry in Australia. Both the State and Federal Government need to take ownership of developing Australia's battery mineral industry and actively engage with industry to seize the opportunity. The prevailing attitude across Australian Governments that assumes industry will be able to progress down the value chain by itself ignores the roles foreign Governments have taken to facilitate investment into their own domestic mineral processing and battery manufacture.

Australia risks ceding its substantial comparative advantages to other countries which are already focussed on facilitating the growth of this industry in their countries.

To demonstrate leadership, both tiers of Government must publicly articulate their commitment to supporting the development of the industry and put forward their strategy for the delivering on this commitment. Within these strategies, Government needs to identify which agencies are to be primarily responsible for co-ordinating, facilitating and supporting the development further down the value chain.

It is important to demonstrate to potential battery mineral entrants to Australia that both tiers of Government will ensure a smooth and efficient process for approvals and the development of a project.

Australian Governments need to look past the 'conventional wisdom' that suggests Australia cannot be cost competitive because of a comparatively high cost labour environment. The greater the technological and scientific requirements of an industry, the less reliant on low cost labour. Battery mineral processing is such an industry.

In the Federal sphere, AusTrade is well placed to undertake investment attraction and the Department of Industry best placed to coordinate Federal Government regulatory approvals, as and should they be required. Battery minerals processing must be clearly articulated as a priority for both agencies.

In the State Government, a public declaration of support by the Premier for developing a battery minerals industry is needed. This public declaration should go beyond a statement of intent and include a plan for how prospective companies can engage and what they can expect from Government. The State Government should appoint a Minister responsible for co-ordinating a whole of government approach and the development of the battery minerals industry to drive industry engagement and smooth approvals.

This Minister should be supported by a departmental unit, located in a central government agency such as the Department of Premier and Cabinet, that will support the delivery and coordination of regulatory approvals. This unit must be empowered to undertake this important task.

Recommendations:

- 1.1 Federal Government Priority:** Federal Government announce battery minerals processing as an Australian Industry priority for AusTrade and the Department of Industry, Innovation and Science;

- 1.2 **State Government Strategy:** WA State Government announce a strategic focus on battery minerals extraction and processing, and publish their plan to support the development of the battery mineral processing industry in Western Australia;
- 1.3 **Identify Lead Minister:** The WA Government identify a Minister and Department responsible for leading this initiative within Government.

2. Investment Attraction

The technology and intellectual property to successfully process high grade lithium hydroxide, and undertake further battery cathode development, is closely held by a small number of companies globally. The companies that have this knowledge and experience are based primarily in Japan, South Korea, China, the EU and the USA.

These companies not only hold the expertise but are the well-established suppliers into the global market with secure contracts to vehicle and phone manufacturers. Attracting an international battery producer to Western Australia will cement Australia's position in the battery supply chain.

The decisions of international players, Tianqi, SQM and Albermarle (currently under consideration by the environmental regulator) to develop lithium hydroxide processing facilities in Western Australia demonstrates the commercial viability of investing in Australia. Australia provides a low sovereign risk environment, has a highly skilled workforce, and has a commitment to high quality standards. These three strengths are necessary for attracting investment for a product that is reliant on achieving the highest grade possible.

To attract a global battery producer, the necessary precursor materials need to be readily available domestically. A lithium ion battery is composed of:

- Cathodes (which provides the positive charge)
- Anodes (which provides the negative charge)
- Electrolytes (chemical medium that allows the electrical charge between the cathode and anode)
- Separators (permeable membrane between cathode and anode preventing short circuits)
- A battery management system (the computer that monitors performance and helps recharge).

The development of lithium hydroxide processing facilities by Tianqi, SQM and Albermarle will supply some of the necessary chemistry for the development of cathode materials and electrolyte solutions.

The necessary battery materials need to be readily accessible to make the decision to invest in Western Australia attractive. This makes a concentrated single hub preferable, as it will help provide critical mass. While not all the precursors need to be domestically produced, there are obvious advantages if the majority are.

A preliminary focus of engagement must be on ensuring Australia attracts the companies developing precursor materials. The next step is attracting the international companies that combine the precursor materials, make cathodes and eventually assemble batteries. A strategic approach is needed.

We cannot wait for these countries and companies to come to us. We cannot expect them to understand the opportunities available in Australia; we must make the case.

A Federal and State Ministerial level trade mission to the leading battery manufacturing nations of South Korea, Japan and China to attract investment in Australia is needed. Currently, mining and mineral exploration companies are undertaking these discussions alone and in an ad hoc fashion. If Australia's opportunity is to be realised, the weight of coordinated Ministerial and Government strategic engagement is needed.

Recommendations:

2.1 Develop focused attraction strategies: Identify expansion opportunities for companies that are leading anode, cathode and battery manufacturers and develop focused strategies to attract them to Australia

2.2 Lead Trade Delegations: Lead a Federal and State Ministerial trade mission to China, South Korea and Japan to promote and attract investment to Western Australia.

2.3 Bring companies to WA: Extend formal invitation for battery manufacturers to visit Western Australia, and work with local industry to support these visits.

3. Planning and Coordination

A necessary first step to attracting investment is to provide certainty and transparency. Identifying and defining where processing facilities will have streamlined approvals and have access to the necessary infrastructure and precursor materials will support development. There are substantial advantages if the Government were to encourage the concentration of multiple battery industries into a single area. There are two likely options for the position of processing facilities: near the mine or near the Port.

The possible synergies of co-locating battery mineral processing facilities in a single battery processing hub are considerable. The Kwinana industrial strip is a logical choice in Western Australia as it is an existing site of heavy and chemical industry. Kwinana has ready access to gas, electricity, water and rail infrastructure. The existing industries present produce a wide range of products, and by-products, some of which will be beneficial to attract precursor materials.

However, Government will need to be cognisant of the needs of these companies, and willing to be flexible should companies prefer to develop processing facilities in regional areas, such as in the Kemerton Industrial Park near Bunbury Port, around Kalgoorlie or Esperance near mine operations in the Goldfields, or in other regional areas such as the Pilbara.

To get further down the value chain, the Government must foster development, and in part that is ensuring that the correct combination of companies come together. If the necessary precursors are planned for and their development sequenced and coordinated appropriately, this will substantially improve Australia's chances of attracting battery producers.

One of the largest costs and uncertainties for any company investment is the timeframe for receiving the necessary approvals. This is especially important with a small window of opportunity, and a need to get to market quickly. The Lead Agency Framework was developed by the State Government to provide an easily identifiable, single point of entry and one department to assist and coordinate approvals. Ensuring the coordination of Federal and State Government approvals, is necessary planning approvals and the coordination of approvals across both jurisdictions.

State Government has proven the ability to facilitate approvals expeditiously when recognised as a state development priority.

Recommendations:

- 3.1 **Identify and designate Battery Precincts:** Identify and designate sites as battery precincts, for processing and for Western Australia to provide certainty and transparency.
- 3.2 **Co-ordination of development:** Planning of Government attraction to ensure that the necessary precursor materials consolidate to support the attraction of companies further down the value chain.
- 3.3 **Prioritise Battery mineral projects:** Give battery precursor facilities and battery assembly the highest priority under the Lead Agency Framework.

4. State Agreements

State Agreements provide regulatory certainty and a clear positive signal to foreign investors. As a legal contract written into law between the Western Australian State Government and a proponent of a major project within the boundaries of Western Australia, a State Agreement provides the greatest possible level of certainty for an investor.

The State Government has written a number of State Agreements to secure processing and manufacturing facilities in Western Australia. These include but are not limited to: Oil Refinery (Kwinana) Agreement Act 1952; Alumina Refinery Agreement Act 1961; and Industrial Lands (CSBP & Farmers Limited) Agreement Act 1976. These State Agreements have supported industries that have made a long-term contribution to the Western Australian economy, the BP refinery, the Alcoa refinery, and the CSBP fertiliser facility.

Recommendations:

- 4.1 **Utilise State Agreements:** The WA Government consider employing a State Agreement for companies manufacturing battery grade precursor material and creating batteries for significant projects.

5. Financial Incentives

AMEC does not consider financial incentives are currently necessary to attract investment to Australia. The investment by companies such as Tianqi, SQM and Albermarle demonstrate the commercial viability for a multinational to choose to invest in Australia. However, this may change. If other countries begin to offer major financial incentives, Australia must also give these types of measures consideration.

Incentives may be necessary to compete with international jurisdictions who are offering inducements such as tax or royalty holidays, free power and free water.

The Federal Government should consider the battery mineral processing opportunity on the same scale as the Snowy Hydro 2.0 scheme in New South Wales. A first step would be to undertake a feasibility study, as has been done with Snowy Hydro 2.0, to identify the economic incentives and infrastructure necessary to ensure Australia secures itself across the battery mineral value chain.

The Western Australian State Government does not have the present Budget capacity to earmark expenditure to attract investment in battery manufacturing. However, the cost of water and electricity are two key costs for battery manufacture, the State Government could consider through State Agreements securing those costs for companies.

Recommendations:

5.1 Monitoring our Competitors: Government and industry to monitor the actions of our international competitors and assess the need for financial incentives at both a State and Federal level, as well as the anticipated return on investment.

6. Research

There is a significant number of research activities and projects happening that relate to battery minerals and processing.

As stated earlier, AMEC's members commissioned an initial independent report, published in January 2018. This Report undertaken by Future Smart Strategies outlined the opportunity for Western Australia.

Regional Development Australia (RDA) Perth is preparing a detailed report for consideration by the Federal Government that outlines the advantages of developing a 'lithium valley' in Australia. In reference to the Silicon Valley the report outlines the development of a focussed lithium processing and battery minerals hub.

Recently, the Chamber of Commerce and Industry Western Australia commissioned a Business Case for Western Australia for investment in Lithium and Battery Minerals. This business case will unpack the economics of developing a lithium battery industry in Australia.

State Government, WA Universities and industry have combined to support a bid for a New Energy Industry Co-operative Research Centre (CRC) bid for Energy Minerals. This will support ongoing research into the potential of battery minerals development and processing and will further enhance the long term development and attractiveness of the industry. Each breakthrough in technology and innovation could drive Australia further down the cost curve, further down the value chain, or both.

State and Federal Government backing of the New Energy Industry CRC bid will support initial academic and industry funding to grow a domestic research capacity to support a battery minerals industry in Australia.

Recommendations:

6.1 Economic Assessment: Government should undertake an Economic Feasibility Study into the potential for domestic battery manufacture and the resulting economic benefits for Australia, building on the research work already being done

6.2 Research & Development: State and Federal Government support the New Energy Industry CRC bid.



