AUSTRALIAN
ALUMINIUM
COUNCIL LTD

Level 1,
18 National Circuit
Barton ACT 2600
Ph: 02 6267 1800
info@aluminium.org.au

Critical Minerals Facilitation Office
Department of Industry, Science and Resources
Via https://consult.industry.gov.au/2023critminsstrategy

3 February 2023

Dear Minister

Australian Aluminium Council Response to Australia's Critical Minerals Strategy: Discussion Paper

The Australian Aluminium Council (the Council) represents Australia's bauxite mining, alumina refining, aluminium smelting and downstream processing industries. The aluminium industry has been operating in Australia since 1955, and over the decades has been a significant contributor to the nation's economy. It includes five large (>10 Mt per annum) bauxite mines plus several smaller mines which collectively produce over 100 Mt per annum making Australia the world's largest producer of bauxite. Australia is the world's largest exporter of alumina with six alumina refineries producing around 20 Mt per annum of alumina. Australia is the seventh largest producer of aluminium, with four aluminium smelters and additional downstream processing industries including more than 20 extrusion presses. Aluminium is Australia's highest earning manufacturing export. The industry directly employs more than 17,000 people, including 4,000 full time equivalent contractors. It also indirectly supports around 60,000 families predominantly in regional Australia.

The Council welcomes the opportunity to provide feedback to the Australia's Critical Minerals Strategy: Discussion Paper (the Paper). The Council also welcomes the recognition by the Australian Government that Critical Minerals are the building blocks of clean energy technologies as well as essential inputs to technologies used every day. The Council agrees that without mining, the world cannot reach net zero by 2050 and that the minerals required to achieve our decarbonisation goals are of such magnitude that to reach net zero, we will need more mining, not less. This provides us with an unrivalled opportunity which Australia is well placed to capture. Leveraging our competitive advantages, by not only mining but also refining, smelting and processing critical minerals here in Australia can help the nation to move up the value chain. The Council agrees with the Paper that Australia should be a supplier of choice to our partners, allies and emerging markets like the United States, the United Kingdom, Japan, Korea, India and the European Union.

The Council believes that Australia must include bauxite, alumina, and aluminium as critical minerals in order to capitalise on its wealth of resources and make Australia a supplier of choice. Aluminium is recognised by the World Bank and the International Energy Agency as one of the essential commodities for both clean energy technologies and electricity network infrastructure. While the existing aluminium industry in Australia is a successful example of vertical integration, it is far from being at capacity and there is economic opportunity for Australia to be gained by in the future under the right policy conditions. The single biggest factor in determining the location of future refining, smelting and manufacturing locations is reliable, internationally competitive, low emissions energy.

Australia's narrow definition of Critical Minerals is limiting its strategic advantage

Australia currently has a very narrow definition[1] of Critical Minerals – which basically does not include major minerals which we already produce (e.g., aluminium, copper, nickel) and is limited largely to rare earths and new materials, including High Purity Alumina (HPA). While the Council agrees with the Paper that Australia has a narrow window of opportunity to capitalise on global critical minerals demand and unlock its potential as a clean energy superpower, the current window is also only offering a limited perspective on the strategic advantage that is possible.

Other countries include a much broader definition, for example Canada[2], USA[3] and Europe[4] identify bauxite (aluminium ore) and aluminium as critical, as it is the second most widely used metal and also essential for clean energy technologies. Australia's 2022 Critical Minerals Strategy[5] references these inclusions but stops short of including bauxite or aluminium. CSIRO's Critical Mineral's Roadmap[6] includes aluminium, nickel and copper. The Queensland Government uses the term New Economy Minerals[7] to be more inclusive than Australia's Critical Minerals list. The recent address by the Prime Minister[8] to the Sydney Energy Forum included aluminium in the list of critical minerals. Having a single consolidated list rather than the current range of lists would be advantageous during strategic national planning. Unlike Australia's current strategy, the 2022 Canadian Critical Minerals Strategy[2] recognises that there are three categories of critical minerals:

- those critical minerals which are priorities for economic growth today (P42),
- those with significant prospects for the future (P43); and
- those where Canada already has capacity but must maintain its existing position as a world leader in like aluminium (P43).

Australia's strategy similarly needs these multiple levels, rather than just focusing on materials it does not already produce in significant quantities. Additionally, Annex E of the Canadian Strategy shows that Canada, one of our core partners on critical minerals and the leader of the newly announced Sustainable Critical Minerals Alliance[9], believes Australia already includes aluminium on its list of critical minerals.

The Council believes there is a case to change the current national definition of Critical Minerals and include bauxite (aluminium ore), alumina and aluminium on the Critical Minerals List, to better align with international definitions and ensure Australia is optimally placed to capitalise on its strategic resources. This would also identify the materials globally regarded as critical to a clean energy future, where Australia can be a supplier of choice.

The Australian aluminium industry considers itself to be a critical mineral industry and has responded to the Paper, accordingly, including response to relevant questions. The Council and its Members urge the Government to update the list of Critical Minerals as part of the development of this strategy, to look beyond the unique needs of rare earths and new materials to capture the full advantage Australia really has from its wealth of mineral resources.

[1] https://www.industry.gov.au/publications/critical-minerals-strategy-2022
[2] https://www.canada.ca/content/dam/nrcan-rncan/site/critical-minerals/Critical-minerals-strategyDec09.pdf
[3] https://www.usgs.gov/news/national-news-release/us-geological-survey-releases-2022-list-critical-minerals
[4] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0474
[5] https://www.industry.gov.au/publications/critical-minerals-strategy-2022
[6] https://www.csiro.au/en/work-with-us/services/consultancy-strategic-advice-services/csiro-futures/energy-and-resources/critical-energy-minerals-roadmap
[7] https://www.resources.qld.gov.au/mining-exploration/initiatives/critical-minerals/uses-of-critical-minerals
[8] https://www.pm.gov.au/media/address-sydney-energy-forum
[9] https://www.minister.industry.gov.au/ministers/king/media-releases/australia-joins-global-commitment-esg-critical-minerals

Creating Economic Opportunity

As outlined by the Treasurer[10], in his recent address to the Australian Critical Minerals Summit, meeting the demand for minerals needed in the clean energy transition is the generational opportunity Australia cannot afford to miss or mishandle. Aluminium is one of the commodities most widely used in the global transition to a clean energy future[11]. It is also recognised for its importance to both economic development and low emissions transition. Aluminium use is highly correlated with GDP, so as countries urbanise, per capita use of aluminium increases. It is expected that, by 2050, global demand for aluminium is expected to nearly double from around 100Mt per annum to around 190Mt[12]. While an increasing proportion will be met through recycled aluminium, there will still be increased production of primary aluminium requiring a comparable increase in global bauxite mining and alumina refining rates.

1. How can Australia capitalise on its existing advantages to create economic opportunity for all Australians – particularly regional communities and First Nations Peoples?

2. What could be done to facilitate project development and ensure benefits flow to regional communities?

3. What might be done to ensure maximum reasonable opportunity for local employment and local business participation in projects?

Australia's existing aluminium industry is already predominantly located in regional Australia (Figure 1). The majority of the more than 17,000 employees live in the regions in which they work and there is often intergenerational employment at sites. In regions like Cape York, bauxite mining companies such as Metro Mining have a dedicated local workforce including 30% indigenous participation[13]. Across Rio Tinto's aluminium operations in Australia as a whole, the indigenous employment rate is more than 8%. In the regions in which the Council's members operate the intent is to provide financial benefits but also education, training, cultural heritage protection and employment.

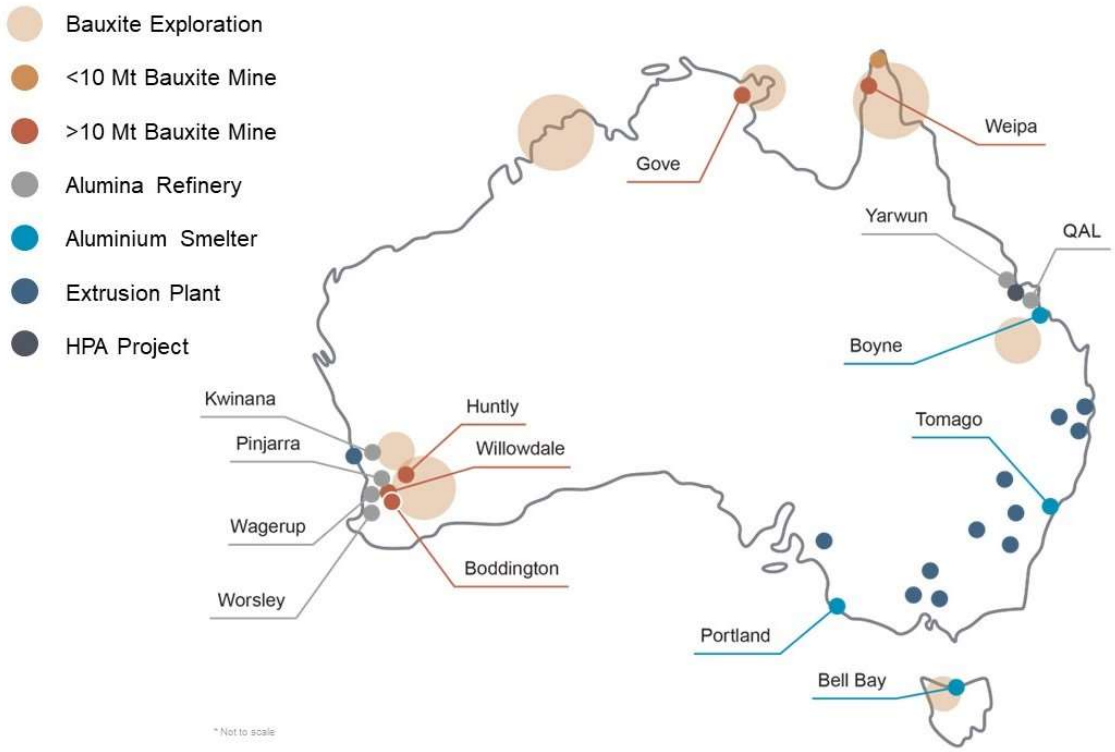

Figure 1. Aluminium Operations in Regional Australia

[10] https://ministers.treasury.gov.au/ministers/jim-chalmers-2022/speeches/address-australian-critical-minerals-summit-sydney

[11] https://www.worldbank.org/en/topic/extractiveindustries/brief/climate-smart-mining-minerals-for-climate-action

[12] International Aluminium Institute High Substitution Scenario

[13] https://www.metromining.com.au/media/33566/metro-investor-presentation-noosa-conference-nov-2022.pdf

There is also an opportunity for benefits to flow to regions through targeted schemes such as regional tax credits.

Developing new sovereign capabilities and industries

5. What are the specific opportunities Australia should seek to realise while developing downstream processing and manufacturing capabilities?

Today's aluminium industry contributes around $16.9B[14] a year to the economy in export value (Figure 2). More than $15B of this comes from the alumina and aluminium industries, as value adding mineral processing sectors. Australia is one of the very few countries which has bauxite mining, alumina refining, aluminium smelting and aluminium extrusion industries, making aluminium one of the few commodities in which the raw materials are mined and are processed all the way to a consumer product right here in Australia. However, there is an opportunity to leverage this existing industry further.

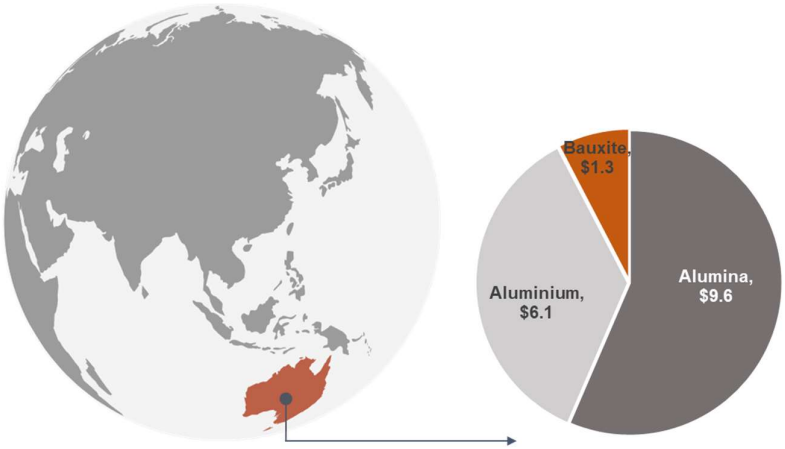

Figure 2. FY 2021-22 Industry Export Value ($B)

Australia is the world's largest bauxite producer, producing over 100 Mt per annum or almost 30% of global production in 2021[15]. Of this, around 40 Mt is exported, with more than 98% going to China[16]. The balance is refined to produce 21 Mt per annum of alumina (aluminium oxide) in Australia. More than 85% of this is exported to a range of countries[15], with Australia being the world's largest exporter. Australia produces around 1.6 Mt of aluminium per annum, of which more than 90% is exported. There is some downstream manufacturing of aluminium in extrusion presses (around 150 kt capacity), metal powders (~10kt) and aluminium coatings (~10kt). However, the bauxite mined in Australia produces nearly double Australia's current production of alumina, 40 Mt, and around 20 Mt of primary aluminium; more than 13 times Australia's current production. So, while the existing aluminium industry in Australia is a successful example of vertical integration, it is far from being at capacity and there is economic opportunity for Australia to be gained under the right policy conditions. The single biggest factor in determining the location of future refining, smelting and manufacturing locations is reliable, internationally competitive, low emissions energy.

While the Paper notes that Australia's domestic demand alone cannot sustain a large critical minerals sector, there is currently a knowledge gap, which the Government is well placed to fill and which is to initially quantify Australia's domestic demand for critical minerals. For example, the 2022 Integrated System Plan[17] identifies that about 10,000 km of new transmission lines and 120GW of large scale energy will be required in the

[14] https://www.industry.gov.au/sites/default/files/minisite/static/ba3c15bd-3747-4346-a328-6b5a43672abf/resources-and-energy-quarterly-september-2022/documents/Resources-and-Energy-Quarterly-September-2022-Aluminium.pdf
[15] https://aluminium.org.au/wp-content/uploads/2022/09/221214-TRADE-AND-COMPETITIVENESS.pdf
[16] China identifies aluminium as a Critical Mineral https://www.iea.org/policies/15519-national-plan-for-mineral-resources-2016-2020
[17] https://aemo.com.au/en/energy-systems/major-publications/integrated-system-plan-isp/2022-integrated-system-plan-isp

National Electricity Market (NEM). However, it is not clearly articulated how much copper, zinc, aluminium and other critical minerals this will require, and nor is it articulated as to where there are currently gaps in Australia's ability to meet these needs, even when it has the mineral potential. For example, in the case of aluminium, while Australia produces the bauxite, alumina and aluminium it does not currently have the manufacturing capability to produce the wires needed for transmission lines. Understanding the scale of this domestic economic demand would assist in positioning why not just mining but also mineral processing and metal production should be undertaken in Australia.

Australia has a number of prospective bauxite mining regions and projects (Figure 1) which, due to their locations, may be eligible for equity or financing support through financing vehicles such as Australia Infrastructure Facility (NAIF). The Council would like to understand whether there are any limitations on access to this funding for critical minerals, such as which market is being supplied.

6. For key technologies and value chains, such as batteries, magnets, alloys and other clean energy technologies, what are the key obstacles to Australia moving up the value chain?

Recent work[18] undertaken by the Council, in conjunction with Deloitte and Coreo found that significant opportunities in manufacturing and recycling may be unlocked by cross-value chain coordination, including with Government and its agencies. There are clear opportunities for value-added manufacturing enabled by the existing integrated aluminium industry.

The work identified three flagship projects which the Council believes would present a different approach to industry policy, consistent with Australia's future as a green energy superpower. By focusing on specific value chains, these projects have the potential to unearth challenges and opportunities which could then be more broadly applied to other commodities and across industries.

1. A closed-loop mine-to-panel solar value chain - Aluminium is the second largest input by weight, and domestic extruders already have the capability to produce frame and rail for the sector. In addition, the upstream industry has a growing demand for renewables, which could further catalyse demand for manufacturing.
2. Green caustic soda production - Caustic is a critical input into alumina refining (and other industries) but is currently 100% imported into Australia. A broader review of supply chains for energy intensive products currently imported into Australia may identify opportunities, like caustic, to increase domestic manufacturing, reducing supply chain risk while increasing sovereign capability.
3. Increase recycling capacity - Global demand for recycled aluminium is growing rapidly, driven by emerging minimum content requirements from governments and corporate demand for low carbon products. A circular industry policy could lower cost and risk for domestic pre- and post-consumer scrap reprocessing.

There is strong alignment between these projects, the Critical Minerals Strategy, the Government's NRF priorities, Powering the Regions and other Government initiatives. The Council believes using an existing value adding critical mineral industry, such as aluminium provides opportunities for the growth of other industries. As articulated by Minister Husic in his speech to the National Press Club[19], there is great opportunity in not simply extracting minerals but in transforming them into value and jobs - If we mine it here, we should make it here.

Many of the key challenges for moving up the value chain are the same as those for decarbonising existing industries such as alumina and aluminium. However, this relies on, not only the development of commercial and technological solutions, but also the development of sufficient competitively priced low emissions generation and storage, and transmission capacity at scale to match. The electrification of existing industry,

[18] https://aluminium.org.au/news/aac-deloitte-and-coreo-cast-anew-project/

[19] https://www.minister.industry.gov.au/ministers/husic/speeches/national-press-club-address-building-economy-future

combined with the development of new electricity intensive industries, such as hydrogen, will require substantial volumes of electricity delivered reliably, affordably and at scale.

The Council is concerned that if technology development lags, or energy infrastructure is delivered in the manner and at the historic pace , this will become the rate limiting step in the transition. For example, the South West Interconnected System (SWIS) may not have the generation nor transmission capacity to electrify one alumina refinery, let alone four. The single biggest factor in determining the location of future refining, smelting and manufacturing locations is reliable, internationally competitive, low emissions energy.

7. How can governments, industry, and researchers support Australia's critical minerals industry to move further downstream and develop new sovereign capabilities?

The integrated nature of bauxite mining, alumina refining, aluminium smelting and extrusion processes in Australia means that efficient and effective regulatory processes for each step is critically important to the ongoing operation of the overall system. It is imperative for the Commonwealth and States to collaborate on prioritising and streamlining regulatory processes and approvals for critical minerals projects, which includes allocating adequate departmental resources and working toward clear timeframes.

High Purity Alumina (HPA)

While alumina has been produced in Australia for more than fifty years and is largely supplied to the global aluminium smelting industry as metallurgical grade alumina, usually at purities of more than 99%, alumina refineries can also produce alumina for a range of non-metallurgical uses, including water treatment; aluminium fluoride production; ceramics, refractories and abrasives. However, there has been an emergence in demand for very high purity alumina (HPA). Until about five years ago, HPA had a very small global market demand of only 15,000 tonnes per annum. More recently demand has grown due to the need for its quality, purity and versatility in high-tech applications. Today the market stands at more than 40,000 tonnes per annum and has been widely forecast to have a compound annual growth rate (CAGR) of about 20%.

This is driven by an increased global demand for a new world of technologies. HPA's properties such as high brightness, resistance to corrosion, good thermal conductivity, high melting point, chemical stability and high mechanical strength make it suitable for manufacturing various electronic and vehicle components, including for both electric vehicles and the aeronautical sectors. It is used to make safer, more efficient and longer lasting lithium-ion batteries, synthetic sapphire for LED lighting and high technology optics. Use of HPA in battery technologies means batteries have a higher retention capacity compared to conventional anode materials, with potential cost benefits and increased range for electric vehicles.

Given the positive CAGR and Australia's long track record in the alumina industry there are now a range of novel Australian HPA projects in the pipeline. Indeed, it is the strong regional bauxite and alumina industry in Australia which is being leveraged to create these new manufacturing opportunities. For example, Alpha HPA has announced its intention to construct what would potentially be the world's largest HPA plant in Gladstone, with targeted production of 10,000 tonnes per annum. Gladstone is well known as the location of Rio Tinto's Yarwun and Queensland Alumina Ltd refineries, as well as the Boyne aluminium smelter. The Alpha HPA process will use a precursor sourced from one of the alumina refineries in its "Smart SX" (solvent extraction) low emissions refining technology. Alpha HPA also collaborates with other neighbouring manufacturers so that by-products from its extraction process can be recycled, making the project an almost zero discharge facility. The solvent extraction technology, combined with renewable energy, aims to generate a range of HPA products with a carbon footprint lowered by as much as 70% compared to the incumbent method of production.

Aluminium Fluoride

Aluminium fluoride (AlF_3) is an essential chemical for aluminium smelting, for which Australia currently imports 100% of its requirements. Currently aluminium fluoride is produced globally from aluminium hydroxide, an intermediate form of alumina, by reaction with anhydrous hydrogen fluoride gas (AHF) that is produced from fluorspar and sulfuric acid. Fluorspar is classed as a critical material in Canada, EU, USA and Japan.

A subsidiary of ABx Limited, Alcore, is proposing to build a $16.4M aluminium smelter bath recycling plant in Bell Bay, Tasmania. The plant is proposed to transform 1,600 tonnes per year of aluminium smelter bath into aluminium fluoride. This has the potential to establish domestic aluminium fluoride production which will help protect the aluminium industry from supply chain disruption, increase Australia's manufacturing resilience and capability. This increase in the security of supply for Australian aluminium smelters will also create highly skilled manufacturing jobs, and the production of aluminium fluoride from aluminium smelter bath is an excellent illustration of the circular economy. The process also removes the need to use fluorspar, which is in increasingly short supply.

8. What can Australia do to better develop and retain IP and to attract IP investment from likeminded partners?

Australia has more than 50 years of technical experience in bauxite mining and alumina refining technologies. This experience helps not only us, but our bauxite, alumina and aluminium customers, to reach their sustainability goals. Alcoa, Rio Tinto and South32's Worsley Alumina operations all have their global research headquarters in Australia, helping develop new technologies for the world. Australia's alumina already has some of the lowest emissions in the world, with an average emissions intensity of 0.7 tonnes of carbon dioxide per tonne of alumina (t CO_2-e/t), compared to the global industry average of 1.2 tCO_2-e/t. Additionally, Australia's alumina producers work collaboratively through the Collaboration within the Heavy Industry Low Carbon Technology Cooperative Research Centre (HILT CRC[20]).

The Australian Renewable Energy Agency (ARENA), in consultation with Alcoa, Rio Tinto and South32 has published a Roadmap for Decarbonising Australian Alumina[21]. The Roadmap identifies four key themes for decarbonisation that could transform the way alumina refineries consume and use energy by enabling the uptake of renewables and removing the use of fossil fuels. It also provides a framework for future policy and investment decisions and serves as a call to action to collaboratively transition the sector into an industry at the forefront of the transition to net zero.

Case Study 1: In May 2021 Alcoa of Australia Limited (Alcoa) announced it had received funding from the Australian Renewable Energy Agency (ARENA) to test the potential use of renewable energy technology in a process known as Mechanical Vapor Recompression (MVR). Alcoa is currently conducting technical and commercial studies to adapt MVR technology to alumina refining. Electricity sourced from renewable energy would power compressors to turn waste vapor into steam, which would then be used to provide refinery process heat. If the feasibility studies are successful, Alcoa plans by the end of 2023 to install a three-megawatt MVR module with renewable energy at its Wagerup refinery in Western Australia, to test the technology at scale. The MVR technology powered by renewable energy could reduce an alumina refinery's carbon footprint by 70%. The technology also has the potential to significantly reduce water use in the refining process by capturing water vapor that would otherwise be lost to the atmosphere.

Case Study 2: Rio Tinto announced a partnership with ARENA in June 2021, to conduct a feasibility study investigating the potential to partially decarbonise its alumina refining operations using renewable hydrogen. Rio Tinto will investigate the technical implications of displacing natural gas with renewable hydrogen at its Yarwun alumina refinery in Gladstone, particularly focussed on simulating the use of hydrogen in the calcination process. In August 2021, Rio Tinto announced a further partnership with Sumitomo Corporation to study the construction of a hydrogen pilot plant and explore the potential use of hydrogen at the Yarwun alumina refinery.

Case Study 3: Electric pressure calcination can produce pure, uncontaminated steam exhaust, which can be captured and reused, reducing demand for steam from natural gas boilers. Electric calcination could potentially reduce Australian alumina refining emissions by 40% when powered by 100% renewable electricity.

[20] https://www.hiltcrc.com.au/

[21] https://arena.gov.au/assets/2022/11/roadmap-for-decarbonising-australian-alumina-refining-report.pdf

Alcoa is undertaking a $19.7 m project in conjunction with ARENA ($8.6m) and the WA Govt ($1.7 M) to test this process. The project also aims to improve understanding of load flexibility and the provision of essential systems services to the South West Interconnected Grid (SWIS).

The findings of these studies have potential applications in other high temperature Australian manufacturing processes beyond the alumina and outside the mineral processing sectors. Additionally, if successful, the technical and commercial lessons from the hydrogen calcination technology could lead to its wider implementation not only in Australia, but also globally.

Globally, there is a focus across industry to find solutions for the technology challenges required to decarbonise. There is an opportunity for Australia to lead the world in development and implementation of these technologies, capitalising on Australia's national advantages, providing jobs and value to the economy. Australia has the systems and processes to extract and process critical minerals, like bauxite into alumina and then into aluminium, safely, efficiently and sustainably. Australia is the world's largest producer of bauxite and second largest producer of alumina and is a global leader in the ethical and environmentally responsible supply of these key critical minerals.

The Council believes that a model of leveraging large private corporate investment including from customers, or Original Equipment Manufacturers (OEMs), together with national and regional government support for research and collaboration has been successful internationally. For example, members of the Council, Rio Tinto and Alcoa, are involved in a joint venture with Apple in Canada on the Elysis process which would remove the use of carbon in the direct smelting process. This process is aiming to have this technology demonstrated by 2024[22]. The Council believes this model of investment and collaboration could have applicability as Australia develops its Critical Minerals Strategy.

Building reliable, competitive and diverse supply chains

10. How should Australia engage with international partners to support the diversification of supply chains? What should this engagement focus on (including which countries)?

When considering existing international collaboration, many examples quoted in the Paper such as:

- The Australia-France Critical Minerals Dialogue;
- The Australia-Germany Working Group on Raw Materials;
- Scientific partnerships such as the Critical Minerals Mapping Initiative between Geoscience Australia, the US Geological Survey and the Geological Survey of Canada; and
- The IEA Critical Minerals Working Party

all include relationships with jurisdictions which identify bauxite or aluminium as a critical mineral. The IEA notes that not only is aluminium one of the most widely used minerals for clean energy technologies[23] but also that for electricity networks copper and aluminium represent about 20% of total grid investment costs. Higher prices as a result of tightening of supply could have a major impact on the level of grid investment[24].

To be a supplier and collaborator of choice across the full range of critical minerals, Australia should align its national definitions with that of its key partners, or it risks missing the associated development and economic opportunities.

11. What actions can Australia take to ensure it leverages related investment by other countries, for example the US Inflation Reduction Act.

When considering the scale of investment required, it is also worth considering the cost of transformational abatement. The Mission Possible Partnership, in collaboration with the International Aluminium Institute,

[22] https://www.elysis.com/en

[23] https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions/mineral-requirements-for-clean-energy-transitions

[24] https://iea.blob.core.windows.net/assets/ffd2a83b-8c30-4e9d-980a-52b6d9a86fdc/TheRoleofCriticalMineralsinCleanEnergyTransitions.pdf

recently released Making Net Zero Aluminium Possible: A Transition Strategy for a 1.5°C-compliant Aluminium Sector[25] highlighted that a global investment of approximately US$1 trillion will be required for the aluminium sector transition, including significant investment to supply the required zero-emissions electricity. For the crucial minerals sector -this represents both a risk and an opportunity – to decarbonise while also creating the materials which will be required for the transition.

Australia is competing internationally to attract the necessary capital and investment to undertake the transition but also to attract the type of priority areas which are the focus of the Government. The scale of the investment by the Government at this stage does not match the scale of investment of Australia's competitors, such as in the US Inflation Reduction Act. For example, under the US Inflation Reduction Act there are US$392 billion in Energy and Climate Tax Credits and Incentives. Specifically for the aluminium and related industries:

- Advanced Manufacturing Production Tax Credit (Section 45X)
    - $10 billion in 10% tax credit for qualifying projects;
    - Certain aluminium qualifies as a 'critical mineral' for clean energy technology production which includes bauxite conversion to alumina or aluminium.
- Qualifying Advanced Energy Project Tax Credit (Section 48C)
    - $10 billion in tax credits;
    - Projects that re-equip industrial or manufacturing facilities with equipment designed to reduce greenhouse emissions by at least 20% through the installation of new heat process systems, carbon management systems, industrial processes efficiency upgrades, and other industrial technology designed to reduce emissions.
- Advanced Industrial Facilities Deployment Program
    - $5.812 billion in grants for greenhouse emission reduction projects in energy intensive industries, where aluminium specifically qualifies.

It is also worth noting that the Act specifically includes all aspects of the aluminium value chain.

Supporting clean energy technologies

14. What are the opportunities for critical minerals projects to maximise their ability to support clean energy supply chains and technologies?

As noted in the Paper, Critical minerals are vital to the decarbonisation efforts needed by countries to reach net zero emissions. As noted in the recent "Cast Anew" work undertaken by the Council[18] by 2030, global demand for aluminium is expected to rise by 33Mt or 38.6% over 2020 levels driven by diversified requirements across a range of sectors. In the report Deloitte outlines that factors driving this include:

1. Solar PV generation is which expected to double over the next 4 years and aluminium makes up 85% of the material used in solar panels by weight.
2. While only making up 4% of the materials used, wind turbines will require 35 million tons of aluminium per year by 2050.
3. The rise of EV's will see the car industry go increase its global aluminium consumption by 60% to 31.7Mt in 2030; and
4. Transitioning the world towards green energy sources will require 50% more aluminium than the electricity sector consumes today.

[25] https://missionpossiblepartnership.org/wp-content/uploads/2022/10/Making-1.5-Aligned-Aluminium-possible.pdf

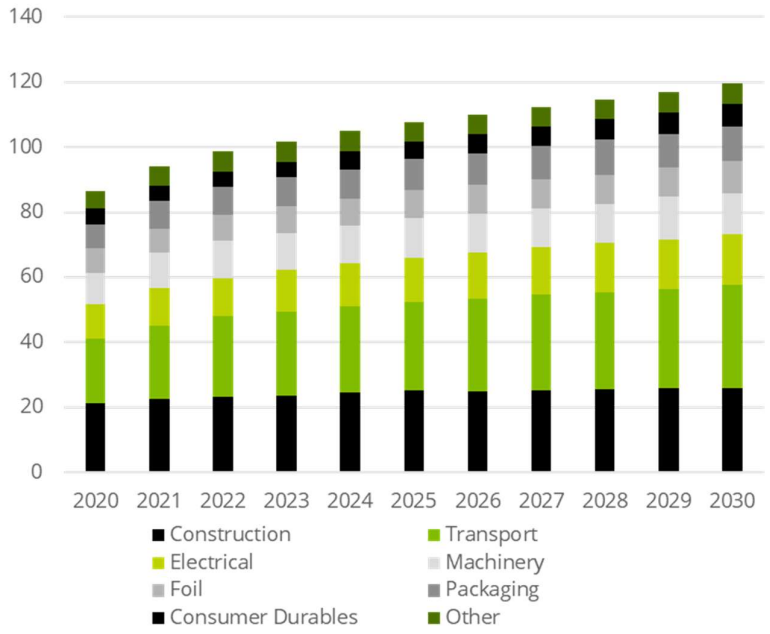

Figure 3 Estimated Global Aluminium Demand by End Use Sector[26]

16. How can the Australian Government support the sector's integration with key clean energy supply chains, both domestic and international?

Notwithstanding the current energy crisis and the challenges in the transition over the next decade, in the future Australia's energy transition could help revive Australia's mine-to-market value chain by reshaping its cost base. The single biggest factor in determining the location of future refining, smelting and manufacturing locations is reliable, internationally competitive, low emissions energy. But lower energy prices would enhance the competitiveness of manufacturing and aluminium production and after 2030, Australia is forecast to have a comparative energy advantage over other aluminium producers, which would have a significant impact across the value chain including in the downstream manufacturing sectors (Figure 4).

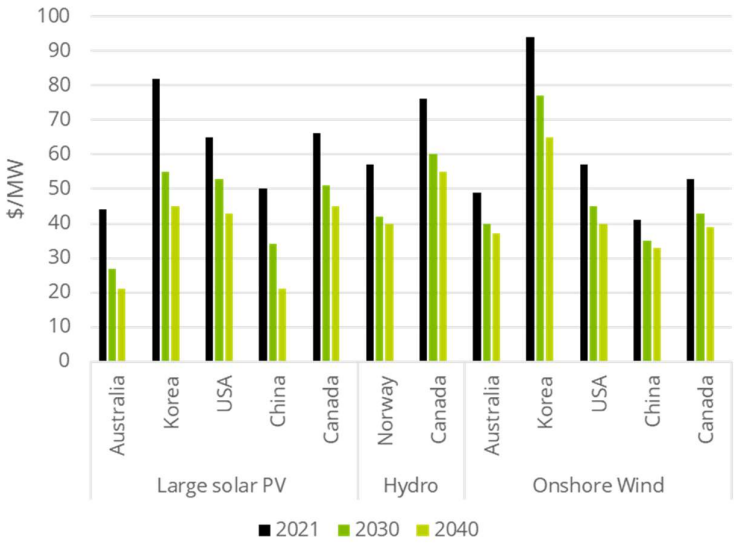

Figure 4 Levelised Cost of Energy[27]

[26] Slide 8, https://aluminium.org.au/wp-content/uploads/2022/11/Cast-Anew-Discussion-Paper-for-Website.pdf
[27] Slide 10, https://aluminium.org.au/wp-content/uploads/2022/11/Cast-Anew-Discussion-Paper-for-Website.pdf

Supporting sustainable critical minerals development

17. What more can Australia do to ensure we are the international best practise jurisdiction for ESG?

Australia has a reputation as a reliable and responsible produce of bauxite, alumina, aluminium and finished goods with some of the world's most robust ESG credentials. This is particularly true of Australian bauxite mining which is regarded as having some of the highest sustainability standards in the world, particularly for rehabilitation. At the same time, changes are occurring in global bauxite supply with new countries and new operators entering the market. Sustainable bauxite mining practices are critical to the global reputation of the industry. Sustainable practices should be perceived and valued as a competitive advantage for all mining companies. In 2018, the Council co-authored the Sustainable Bauxite Mining Guidelines[28] together with the International Aluminium Institute and the Brazilian Aluminium Association, aiming to share the expertise learned from decades of sustainable mining practices in Australia with the global industry. Sustainable bauxite mining is not a "one-size fits all" prescriptive process but involves risk management and applying technologies appropriate to the circumstances of each mine. The guidelines aim to identify and communicate the criteria and encourage emerging bauxite suppliers to improve their practices in line with the rest of the global industry. The applicability to a range of countries has been enhanced using case studies from areas as diverse as Australia, Brazil, Jamaica, Guinea, India, Indonesia and Malaysia and have been translated into Bahasa Indonesian, Chinese Mandarin and French. The guidelines were updated, and the second edition was published in February 2022.

It is worth noting that the global competitors for each part of the aluminium industry vary with commodity. For bauxite, this is principally Guinea, which is the world's largest exporter, principally to China, including some captive bauxite mines; as well as Brazil, India, and Indonesia (Figure 5). Key competitors in alumina refining are China (>50% global production) and emerging economies such as Brazil, India, Saudi Arabia, Vietnam and Kazakhstan. Similarly, for aluminium smelting, China accounts for almost 60% of global production and the key countries for growth are India, United Arab Emirates, Bahrain, Saudi Arabia, and Malaysia.

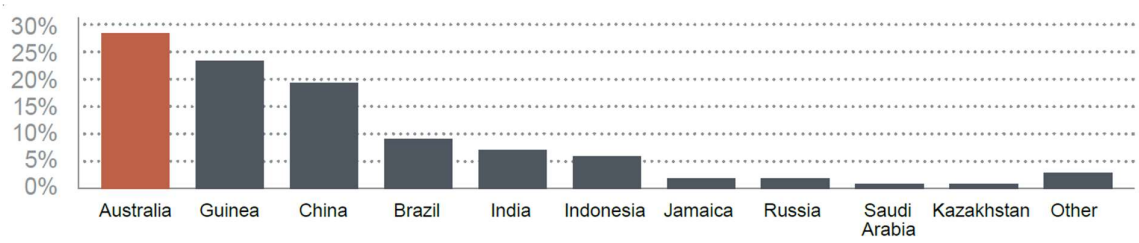

Figure 5 Global Bauxite Production Rankings[15]

While seeking to maintain Australia's highest standards for ESG, it is also worth considering that global demand will continue to be met from elsewhere if not provided by Australia. This may increase the net global impact of mining, compared with continued development in Australia.

20. What are the opportunities to further strengthen the ESG credentials of the sector? For example, helping industry showcase their high ESG projects or support enabling capabilities such as the adoption of mineral traceability measures.

The Aluminium Stewardship Initiative (ASI) provides the industry with a global certification scheme which includes not just carbon content – but the full range of Environmental, Social, and Governance issues for all parts of the value chain[29]. Many of Australia's mines, refineries, smelters and chains of custody supply chains are certified. Additionally, the global industry is differentiating products on the basis of the carbon credentials[30].

[28] https://aluminium.org.au/recent-releases/sustainable-bauxite-mining-guidelines/

[29] https://aluminium-stewardship.org/asi-standards/performance-standard

[30] For example: https://www.riotinto.com/-/media/Content/Documents/Products/Aluminium/RT-Aluminium-RenewAl-fact-sheet.pdf?rev=f89b8d105e15400fa053d58a364c3be8, https://www.alcoa.com/sustainability/en/pdf/EcoSource.pdf

Additionally, the aluminium industry[31] uses blockchain technology to provide provenance traceability and transparency.

21. What are the opportunities for Australia in increasing recycling and circular economy practices in the critical minerals sector?

As well as increased demand for primary aluminium, there is also increasing demand for recycled aluminium. The closure of Australia's car industry a decade ago was accompanied by a closure in the two aluminium rolling mills which also provided aluminium remelt capabilities. Australia has lost this manufacturing capability. However, there is an opportunity for Australia to redevelop this capability as part of an integrated circular industry policy[18]. This new manufacturing capability would fit with Australia's need to transition some regional economies, providing the potential for a new manufacturing base not linked to the location of a mineral deposit. This would cut across multiple critical minerals as well as a circular industry approach to the development of Australia's emerging clean energy industries, where these could be established with circularity in their design.

Within the existing industry, pre-consumer scrap offers a simpler, more cost-efficient feedstock for recycled billet product and may offer an initial entry point into increased recycled content for Australian supply chains. The Council and its Members will be exploring this further in 2023 and will seek to partner with the Government through programs such as the Powering the Region Fund (PRF) to overcome barriers in the establishment of this opportunity.

There may also be opportunities to re-process and extract critical minerals from the industries' current by-products. Valorisation strategies supporting the use of materials derived from wastes to improve the outcomes of products generated from the processing of critical minerals are programs which are continuing to be developed.

Conclusion

The Council believes that Australia's aluminium value chain (bauxite, alumina and aluminium), as well as HPA, should be considered as Critical Minerals in order to capitalise on its wealth of resources and make Australia a supplier of choice. Aluminium is recognised by the World Bank and the International Energy Agency as one of the essential commodities for both clean energy technologies and electricity network infrastructure.. While the existing aluminium industry in Australia is a successful example of vertical integration, it is far from being at capacity and there is economic opportunity for Australia to be gained by in the future under the right policy conditions. The single biggest factor in determining the location of future refining, smelting and manufacturing locations is reliable, internationally competitive, low emissions energy.

The Council would be happy to provide additional information on any issues raised in this submission.
Kind regards,

Marghanita Johnson
Chief Executive Officer
Australian Aluminium Council
M +61 (0)466 224 636
marghanita.johnson@aluminium.org.au

[31] https://www.startresponsible.com/