AUSTRALIAN
ALUMINIUM
COUNCIL LTD

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

House of Representatives Standing Committee on Industry, Science and Resources
PO Box 6021
Parliament House
Canberra ACT 2600
https://www.aph.gov.au/Parliamentary_Business/Committees/OnlineSubmission

30 March 2023

Dear Chair

Re: Developing Advanced Manufacturing in Australia

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 six bauxite 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. Additional downstream processing industries includes more than 20 extrusion presses, production of metal powders and aluminium coatings. 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 input to the House of Representatives Standing Committee on Industry, Science and Resources into its Inquiry into Developing Advanced Manufacturing in Australia. As Australia is undergoing the biggest clean industrial and economic revolution this country has seen, the Council welcomes the recognition that this also provides an opportunity to ensure advanced manufacturing is incorporated to improve products, processes or both and to develop new opportunities for Australia. During this revolution Australia must ensure a rapid transfer of emerging scientific and technical developments into its manufacturing process and products.

The Australian aluminium industry is developing and using technology to improve the safety, productivity, accessibility and sustainability of our operations. This includes technologies which help locate bauxite deposits, autonomous equipment and fatigue monitoring systems that protect workers, and real time monitoring demonstrating that digitalisation can be a force for good in our industry. The Council recognises that the Government is looking at a range of measures to advance Australian manufacturing and transition the economy including the National Reconstruction Fund (NRF), Rewiring the Nation, Powering the Regions Fund (PRF) and the Net Zero Economy Taskforce.

Australia's strategic advantages and value adding

Aluminium is one of the commodities most widely used in the global transition to a clean energy future[1]. 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[2]. While an increasing proportion will be met through recycled aluminium, there will still be a need for increased production of primary aluminium requiring a comparable increase in global bauxite mining and alumina refining rates.

As articulated by Minister Husic in his speech to the National Press Club[3], there is great opportunity in not simply extracting minerals but in transforming them into value and jobs. Today's aluminium industry contributes around $16.9B[4] a year to the economy in export value (Figure 1). 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 processed into a consumer products right here in Australia. However, there is an opportunity to leverage this existing industry further.

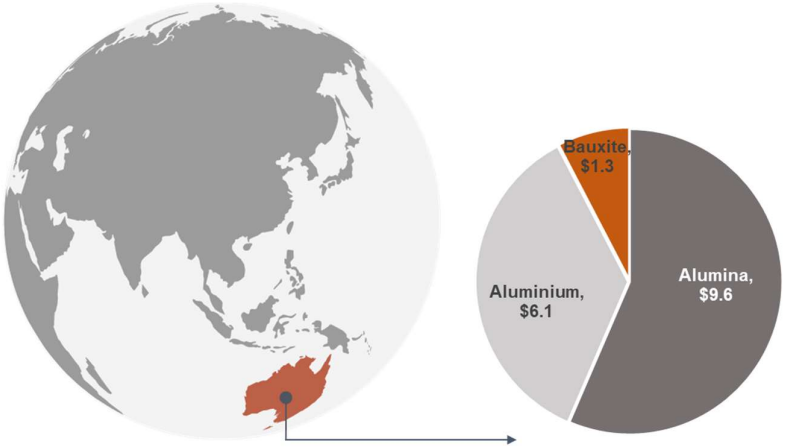

Figure 1. FY 2021-22 Industry Export Value ($B)

Australia is the world's largest bauxite producer, producing over 100 Mt per annum or almost 30% of global production in 2021[5]. Of this, around 40 Mt is exported, with more than 98% going to China. The balance is refined to produce 21 Mt per annum of alumina (aluminium oxide) in Australia. Of this more than 85% is exported to a range of countries[5], 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 40 Mt of alumina, which is nearly double Australia's current production, 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. The single biggest factor in determining the location of future refining, smelting and manufacturing locations is reliable, internationally competitive, low emissions energy.

[1] https://www.worldbank.org/en/topic/extractiveindustries/brief/climate-smart-mining-minerals-for-climate-action
[2] International Aluminium Institute High Substitution Scenario
[3] https://www.minister.industry.gov.au/ministers/husic/speeches/national-press-club-address-building-economy-future
[4] 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
[5] https://aluminium.org.au/wp-content/uploads/2022/09/221214-TRADE-AND-COMPETITIVENESS.pdf

Existing industry is already an enabling pathway for new advanced manufacturing

This strong existing vertically integrated aluminium industry with a regional manufacturing base in Australia enables existing industry to be leveraged to create new manufacturing opportunities. Strengthening our national manufacturing capabilities now will put Australia in the strongest possible position to meet these future forecasts for not only traditional commodities such as bauxite, alumina and aluminium; but also, other emerging aluminium related commodities, like high purity alumina (HPA), aluminium fluoride, aluminium alloys and aluminium salts. As the world's largest producer of bauxite and the largest exporter of alumina, Australia is strategically positioned to support this opportunity.

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 15,000-16,000 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.

HPA is not the only new industry linked to the existing aluminium value chain. ABx subsidiary ALCORE 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, an essential chemical for aluminium smelting, for which Australia currently imports 100% of its requirements. The potential to establish domestic aluminium fluoride production 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.

Community Approach to Advanced Manufacturing

The aluminium industry also aims to ensure that the local communities in which it operates are able to develop associated advanced manufacturing. For example, led by Bell Bay Aluminium, the Bell Bay Advanced

Manufacturing Zone[6] (BBAMZ) was established in 2015. The BBAMZ is an industry based economic development group working in collaboration with government and community to support growth, investment and business diversification in the George Town and Tamar Valley regions.

Cross Value Chain Opportunities

Recent work[7] undertaken by the Council in conjunction with Deloitte and Coreo found that significant opportunities in manufacturing and recycling can 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 narrow 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 in 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.

International trends in the application of advanced manufacturing in the aluminium industry

The global aluminium sector is adopting advanced manufacturing to continue to transform its operations to be safer, cleaner, more productive, more efficient and ultimately, more sustainable. This includes the application of these trends in the Australian aluminium industry.

This focuses on the development and application of custom smart sensors, robotics /automation/ machine vision, data science and intelligent mining. For example, the use of digital technology to increase employee mobility and automate manual processes is helping to embed best practice in digital workflows while giving employees access to tailored, real time information so they can make effective decisions and solve problems on the shop floor[8]. Adopting these new technologies involves more than just understanding the technology itself, but also consideration of the cultural implications, role design, IT infrastructure, policies and processes including data management.

Better use of the huge amounts of valuable data[9] collected by automated trucks, shovels, conveyors and process technologies, by combining it with clever analytics, artificial intelligence, machine learning and automation, is already making the industry safer and more productive.

The Weipa and Gove Bauxite Mines[10] already use a centralised operations centre in Brisbane. The Bauxite Integrated Operations Centre (BIOC) has transformed how Rio Tinto's aluminium group mines bauxite in the

[6] https://bbamz.com.au/
[7] https://aluminium.org.au/news/aac-deloitte-and-coreo-cast-anew-project/
[8] https://www.alcoa.com/australia/en/news/releases?id=2021/07/alcoas-digital-transformation&year=y2021
[9] https://www.riotinto.com/en/about/innovation/smart-mining
[10] https://www.riotinto.com/en/about/innovation/automation

Pacific[11]. The BIOC runs across four shifts 24 hours a day, seven days a week, 365 days a year. Team members in the BIOC remotely manage dispatch, monitoring and control capabilities for both the Weipa (including Amrun, Andoom and East Weipa) and Gove bauxite mines (located more than 2,500 kilometres away) using Rio Tinto-first technology. With the inclusion of both operations, the centre operates a fully integrated bauxite mine despatch, leading to safer operations in the pit, increased pit productivity and a new opportunity to share best practice across the two mines. The BIOC also enables improved decision making on the end to end supply, like the impact of bauxite grades on refineries and smelters.

As well as trends in developing new processes, there are also a new generation of aluminium alloys required for use in advanced technologies such as electric vehicles and 5G antennas[12]. By partnering with customers and technology providers industry leading research and development capability allows the industry to deliver products that meet the specific needs of manufacturers and end customers.

Additionally, there are new applications of aluminium such as into additive manufacturing[13] or 3D printing. While 3D printing is not new, it is challenging when done with metals. 3D-printing started and is still primarily done with plastics, due to the low melting point. Metals are more challenging due to their higher melting points and, thereby, higher amount of energy needed. 3D-printing for metals is either done with powder or by melting wire rod. Opportunities to create additive manufacturing with aluminium could be applied to the space, transport and defence industries. Machining one off or complex geometries often creates large amounts of waste, whereas additive printing creates custom outcomes.

The barriers to growth in advanced manufacturing are similar to barriers for existing manufacturing

Decarbonisation of electricity supply is the biggest opportunity and challenge in the next decade

Australia's grid-connected mines, refineries and, particularly, smelters perform an enabling function in grid stabilisation which helps with increased penetration of variable renewable electricity. Over the longer term, smelters play a key role in being more flexible users of power to help balance variable generation grid systems. Aluminium smelters in Australia are providing a leading role in already delivering this flexibility.

Providing electricity is supplied consistently, with firm power, and at internationally competitive prices, aluminium smelting can be run on renewable electricity. The carbon intensity of the Australian grid is declining rapidly[14], with this increased penetration of variable renewables. The owners of Australia's four smelters have signalled their desire to recontract renewable electricity at the end of their current terms (2025-2029).

Australia's electricity markets are going through a once-in-a-century transformation, as Australia moves towards net zero emissions by 2050 and this transition will need to be carefully managed to ensure that all consumers are provided with competitively priced, reliable, low emissions energy. The Council has, for many years, recognised that the National Electricity Market (NEM) is at risk of becoming a system which lacks reliability and system strength and has been actively working with the Energy Security Board (ESB) on the Post 2025 Market Reforms. Aluminium smelters already offer a range of services and functions which support the network over varying weather, network demand and operating conditions, including Reliability and Emergency Reserve Trader (RERT) and Frequency Control Ancillary Services (FCAS). Smelters' large and fast-acting interruptibility helps secure and restore stability to the network before and after contingencies occur. The industry has increasingly been called upon to support grid stability and reliability, as the challenges in managing the grid increase. For example, during May and June 2022 Tomago Aluminium provided 32 hours of modulation across 18 events which were a mixture of RERT and responding to high market price. This response

[11] https://aluminium.org.au/news/brisbane-bauxite-integrated-operations-centre-bioc/

[12] https://www.riotinto.com/en/news/releases/2021/rio-tinto-and-comptech-partner-to-deliver-next-generation-of-electric-vehicle-and-5g-giga-casting-alloys

[13] https://www.shapesbyhydro.com/en/material-science/is-additive-manufacturing-the-next-big-thing-for-aluminium/

[14] https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/market-operations/settlements-and-payments/settlements/carbon-dioxide-equivalent-intensity-index

by Tomago supported AEMO to manage a complex and challenging system and maintain supply to domestic customers.

Alumina refineries will require technology changes to meet zero-emissions goals; either in the form of electrification or adaptation to use hydrogen for process heating. Development of this technology and its application will be stepwise as new technologies to reduce overall emissions (Scope 1 plus Scope 2) become viable. However, this relies on not only the development of commercial and technological solutions for electrification of alumina refineries 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, 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 pace it has historically, this will become the rate limiting step in the transition[15]. For example, the SWIS may not have the generation nor transmission capacity to electrify one alumina refinery, let alone four. For example, Worsley Alumina[16] have confirmed that a substantial expansion and modification of the energy grid would be required to deliver renewable power at the necessary scale for industrial users in the region (SWIS).

Decarbonisation of Australia's electricity supply is the most significant opportunity and challenge in the transformation of Australia's industry, in the biggest clean industrial and economic revolution this country has seen. It is hoped that some technologies for refinery digestion may be able to be deployed prior to 2030. However, access to the required generation, storage and infrastructure outside the facility could be the rate limiting step in the electrification process.

Bauxite, alumina and aluminium should be recognised as a Critical Mineral and Australia as a supplier of choice

A further non-financial barrier is Australia's narrow definition of critical minerals. While the Council welcomes the Australian Government's commitment[17] to develop a new National Critical Minerals Strategy in consultation with industry, Australia currently has a very narrow definition[18] 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). 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 only offering a limited perspective on the strategic advantage which is possible.

Other countries include a much broader definition, for example Canada[19], USA[20] and Europe[21] identify bauxite (aluminium ore) and aluminium as critical, as it is the second most widely used metal and is essential for clean energy technologies. Australia's 2022 Critical Minerals Strategy[22] references these inclusions but stops short of including bauxite or aluminium. CSIRO's Critical Mineral's Roadmap[23] includes aluminium, nickel and copper. The Queensland Government uses the term New Economy Minerals[24] to be more inclusive than

[15] https://www.worley.com/~/media/Files/W/Worley-V3/documents/our-thinking/from-ambition-to-reality/from-ambition-to-reality-report.pdf
[16] P73, https://www.south32.net/docs/default-source/all-financial-results/2022-annual-reporting-suite/sustainable-development-report-2022.pdf
[17] https://www.minister.industry.gov.au/ministers/king/media-releases/support-critical-minerals-breakthroughs
[18] https://www.industry.gov.au/publications/critical-minerals-strategy-2022
[19] https://www.canada.ca/content/dam/nrcan-rncan/site/critical-minerals/Critical-minerals-strategyDec09.pdf
[20] https://www.usgs.gov/news/national-news-release/us-geological-survey-releases-2022-list-critical-minerals
[21] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0474
[22] https://www.industry.gov.au/publications/critical-minerals-strategy-2022
[23] https://www.csiro.au/en/work-with-us/services/consultancy-strategic-advice-services/csiro-futures/energy-and-resources/critical-energy-minerals-roadmap
[24] https://www.resources.qld.gov.au/mining-exploration/initiatives/critical-minerals/uses-of-critical-minerals

Australia's Critical Minerals list. The recent address by the Prime Minister[25] to the Sydney Energy Forum included aluminium in the list of critical minerals. Unlike Australia's current strategy, the 2022 Canadian Critical Minerals Strategy[19] 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. 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[26], 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 aluminium ore (bauxite)/alumina/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, for example the IEA notes that not only is aluminium one of the most widely used minerals for clean energy technologies[27] but also that for electricity networks copper and aluminium represent about 20% of total grid investment costs. 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.

Financial and non-financial reforms to provide opportunities for advanced manufacturing

Australia competing to attract the capital and investment for existing and advanced manufacturing.

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. For example, under the US Inflation Reduction Act there are US$370 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.

The Act specifically includes all aspects of the aluminium value chain.

It is also worth noting, when considering appropriate rates of return and risk, that first of a kind investments and investments in new technologies are not risk free. A partnership approach may be required to share both risk and equity.

[25] https://www.pm.gov.au/media/address-sydney-energy-forum

[26] https://www.minister.industry.gov.au/ministers/king/media-releases/australia-joins-global-commitment-esg-critical-minerals

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

Australia needs to leverage its existing research capability in developing advanced manufacturing.
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 Alumina operations all have their global bauxite and alumina 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.

Case Study 1: In May 2021[28] 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 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[29], 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[30] 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. 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 System (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.

Australia has the systems and processes to extract and process critical minerals, like bauxite into alumina and 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.

[28] https://arena.gov.au/projects/mechanical-vapour-recompression-for-low-carbon-alumina-refining/
[29] https://arena.gov.au/projects/rio-tinto-pacific-operations-hydrogen-program/
[30] https://arena.gov.au/projects/alcoa-renewable-powered-electric-calcination-pilot/

ARENA, in consultation with Alcoa, Rio Tinto and South32, has published a Roadmap for Decarbonising Australian Alumina[31]. 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.

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. A summary of key Australian Aluminium industry initiatives is provided in Table 1.

Table 1 Key Australian Aluminium Industry Initiatives

Activity	Link
Electric Calcination Study	https://arena.gov.au/projects/alcoa-renewable-powered-electric-calcination-pilot/
Gladstone Renewable Request for Proposals	https://www.riotinto.com/news/releases/2022/Rio-Tinto-calls-for-proposals-for-large-scale-wind-and-solar-power-in-Queensland
Hydrogen Calcination Study	https://arena.gov.au/projects/rio-tinto-pacific-operations-hydrogen-program/
Hydrogen Pilot Plant	https://www.riotinto.com/news/releases/2021/Rio-Tinto-and-Sumitomo-to-assess-hydrogen-pilot-plant-at-Gladstones-Yarwun-alumina-refinery
Mechanical Vapour Recompression Study	https://arena.gov.au/projects/mechanical-vapour-recompression-for-low-carbon-alumina-refining/
Memorandum of Understanding between Tasmania and Rio Tinto	https://www.stategrowth.tas.gov.au/__data/assets/pdf_file/0010/334558/TAS-RIO_TINTO_MOU_Feb_2022.pdf
Refinery of the Future	https://www.alcoa.com/global/en/stories/releases?id=2021/11/alcoa-to-design-an-alumina-refinery-of-the-future
Rio Tinto and GMG	https://graphenemg.com/gmg-riotinto-energysavings-battery/
Spinifex Wind Farm (Portland)	https://arena.gov.au/news/offshore-wind-could-power-portland-aluminium-smelter/ https://www.spinifexoffshore.com.au/#/
Tomago Aluminium Renewable Future	https://www.tomago.com.au/tomago-aluminium-future-renewable-energy-needs/
Weipa Solar and Battery Capacity	https://www.riotinto.com/news/releases/2021/Rio-Tinto-to-triple-Weipa-solar-capacity-and-add-battery-storage-to-help-power-operations
Mission Possible Partnership	https://missionpossiblepartnership.org/wp-content/uploads/2022/10/Making-1.5-Aligned-Aluminium-possible.pdf
HILT CRC	Heavy Industry Low-carbon Transition Cooperative Research Centre https://hiltcrc.com.au/
Affreightment Carbon Reduction	https://www.combinationcarriers.com/insights-and-news/2022/1/4/kcc-and-south32-conclude-first-sustainability-linked-contract-of-affreightment

Australian manufacturing needs free and fair trade

It is important to recognise Australia's manufacturing sector is facing intense near-term challenges securing and maintaining internationally competitive gas and electricity contracts, mounting inflationary pressures and labour shortages. The COVID-19 pandemic and geopolitical issues have underscored the importance of manufacturing domestically, both in terms of economic and employment contribution, supporting a productive and resilient economy, and addressing supply chain challenges. This has also demonstrated the advantages of not only the ability to value add within an almost exclusively domestic aluminium supply chain

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

but also the importance of local industry which provides the underpinning market for our dependent contracting and manufacturing sector. Australia's manufacturing sector provides not only current regional jobs, but also supports the advanced manufacturing jobs of the future.

While Australia exports the majority of the primary aluminium it produces (1.4 of 1.6 million tonnes), around 120 thousand tonnes of it is further manufactured domestically. This is an important market for billet from Australian smelters. Every tonne of imported aluminium extrusion material impacts on the Australian portfolio and ultimately, the cash margin.

The Australian extrusion market in total is estimated at around 190 thousand tonnes. Australia's extruders have a nameplate capacity of around 150 thousand tonnes. Support for the Australian aluminium manufacturing sector could see a growth in domestic production; and more jobs for Australians. The Council believes a review of Australia's trade remedies framework, particularly the Anti-dumping area is required to ensure aluminium extrusions are not imported at dumped pricing levels which cause material injury to the value-add Australian aluminium extrusion industry. A better framework is required to ensure free and fair trade to enable industry growth.

Employment opportunities and skills in advanced manufacturing

Australia's existing aluminium industry is already predominantly located in regional Australia (Figure 2). 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[32]. 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.

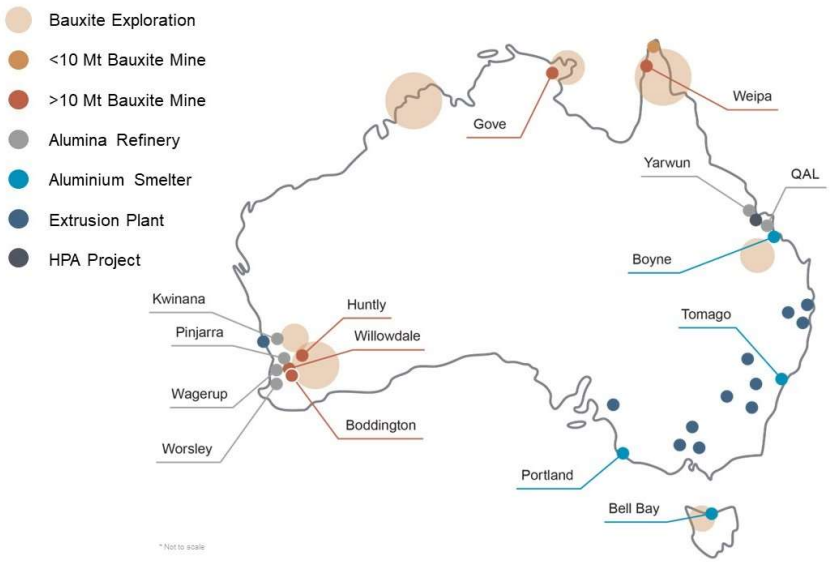

Figure 2. Aluminium Operations in Regional Australia

The Council agrees that there are already workforce and skills shortage across many industries and regions that will impact on industry growth and the further development of advanced manufacturing. The scale of the workforce and skills required for transformational abatement projects and new industries should not be underestimated, nor should the impacts of this on the pace of abatement.

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

Conclusion

Aluminium is part of a clean energy future and Australia has a central role to play in its global supply and transformation. Australia's natural and competitive strengths support the development of strategically important industries, such as aluminium, and shore up supply chains. Given the global strength of the Australian aluminium supply chain, while noting the greater possibilities to not only mine but make here in Australia, the aluminium industry would welcome the opportunity to collaborate on co-investment plans in 2023. To capitalise on its wealth of resources and to make Australia a supplier of choice, Australia's critical minerals strategy needs to be broader, including recognising aluminium. The Australian industry is investing in the transition; however, the scale of the investment is substantial and decarbonising Australia's electricity supply is the biggest opportunity in the next decade. This will require Government support. Australia's industry is already leading global research into new technologies, and further investment is required. A key pathway to enabling new economy industries, will be to leverage the capability in the regions of existing industries. A circular economy and domestic focus to industry policy, will maximise the value of these new industries.

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