



Marghanita Johnson, CEO of the Australian Aluminium Council



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Marghanita Johnson has been the Chief Executive Officer of the Australian Aluminium Council since 2019. She has over 25 years of experience in the Australian mining and manufacturing sectors, predominantly within the aluminium industry. Earlier,

she led government engagement and advocacy on behalf of Rio Tinto's Pacific Aluminium assets and also held key climate and sustainability roles at Rio Tinto.

We are glad to have a conversation with her and get an insight into the sustainability leads taken by the Australian Aluminium Council.

AlCircle: In response to the exponentially growing efforts towards building a sustainable aluminium value chain, what guidelines would you like to introduce for the Australian bauxite miners to reduce mining impacts on the environment, society and economy as a whole?

Marghanita Johnson: Australia has a reputation as a reliable and responsible producer of bauxite, alumina, aluminium and finished goods with some of the world's most robust ESG credentials. This is particularly true for 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 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 has been translated into Bahasa Indonesian, Chinese Mandarin and French. The guidelines were updated, and the second edition was published in February 2022.

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. Many of Australia’s mines, refineries, smelters and chains of custody supply chains are certified.

Noting these existing initiatives, the industry does not need any new guidelines, as these existing models will continue to be updated to meet society’s expectations.

AlCircle: Please brief us on the roadmap of Australian bauxite miners and alumina refineries to attain net-zero carbon emissions in the future.

Marghanita Johnson: 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.

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 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 CO₂-e/t), compared to the global industry average of 1.2 tCO₂-e/t. Additionally, Australia's alumina producers work collaboratively through the Collaboration within the Heavy Industry Low Carbon Technology Cooperative Research Centre (HILT CRC).

The Australian Renewable Energy Agency (ARENA), in consultation with Alcoa, Rio Tinto and South32, has published a Roadmap for Decarbonising Australian Alumina. 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 transform the sector into an industry at the forefront of the transition to net zero.

AlCircle: Could you please share with us about the latest technologies that Australian alumina refineries are using to reduce carbon emissions?

Marghanita Johnson: Australia's alumina refineries are currently undertaking a range of decarbonisation studies in conjunction with Government agencies:

- **Case Study 1:** In May 2021, Alcoa of Australia Limited (Alcoa) announced it had received funding from 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 vapour 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 vapour that would otherwise be lost in 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 focused 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. Alcoa is undertaking a \$19.7 million project in conjunction with ARENA (\$8.6 million) and the West Australian government (\$1.7 million) 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.

AlCircle: What is the progress of Australian refineries switching to renewable energy to decarbonise the refining process?

Marghanita Johnson: Australia's electricity markets are going through a once-in-a-century transformation, as Australia moves towards net zero emissions by 2050. Decarbonisation of Australia's electricity supply is the single biggest opportunity to decarbonise the vertically integrated domestic aluminium industry in the coming decade. Aluminium smelters already offer a range of services and functions which support the network over varying weather, network demand and operating conditions. 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. This is helping the market operator 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 emission 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. Hopefully, some technologies for refinery digestion can be deployed before 2030. However, access to the required generation, storage, and infrastructure outside the facility could be the rate-limiting step in the electrification process.

AlCircle: How do you think sustainability goal will drive the Australian mining and refining industry in 2023?

Marghanita Johnson: Aluminium is one of the commodities most widely used in the global transition to a clean energy future. It is also recognised for its importance to both economic development and low emissions transition. It is expected that by 2050, global demand for aluminium is expected to nearly double from around 100 million tonnes per annum to around 190 million tonnes. 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.

Looking forward, there is a growing focus on Australian manufacturing and a sentiment that “If we mine it here, we should make it here”. 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. This includes an ongoing focus on Australia’s leading global research and ESG reputation.