AUSTRALIAN ALUMINIUM COUNCIL LTD

Australia's Role

in a Global Aluminium Decarbonisation Pathway

Aluminium - A Climate Smart Future Metal

Aluminium is a critical enabler of sustainable economic development.

It is strong, lightweight and infinitely recyclable. Aluminium use is highly correlated with GDP, so as countries urbanise, per capita use of aluminium increases. Today, global demand for aluminium is about 103 million tonnes. 66 million tonnes, or **64%**, of which was met by **primary aluminium** (produced from bauxite/alumina) and 37 million tonnes, or **36%**, from **recycled aluminium**.

The International Aluminium Institute's (IAI) modelling predicts a demand growth rate of 2% per annum, recognising aluminium's importance to both economic development and low-emissions transition. This means that even with increased recycling rates, recycled aluminium will only meet around **50% of global demand by 2050**. This means that 90 million tonnes per annum of primary aluminium is expected to be required in 2050, a 40% increase on today's primary aluminium production rates, requiring a comparable increase in global bauxite mining and alumina refining rates.

Global Pathways

Through the IAI, the global aluminium sector, including the Australian industry, is exploring realistic and credible technological pathways for 2050 sector-wide greenhouse gas emissions reductions in line with International Energy Agency's scenarios.

Under a Below 2 Degree Scenario (B2DS), the industry would need to reduce its total emissions to **250 Mt CO_2e**, from a 1.1 Gt CO_2-e 2018 baseline and a projected 2050 Business as Usual scenario of 1.6 Gt CO_2-e.

To achieve this, the IAI has identified three broad pathways for emissions reduction whilst meeting growing demand:

Pathway 1 - Electricity decarbonisation
Pathway 2 - Direct emissions reduction
Pathway 3 - Recycling & resource efficiency

For more information on the IAI's greenhouse gas pathways, visit **international-aluminium.org**.

The B2DS solution will require all three pathways. The relative weighting of each pathway, within a jurisdiction, will depend on resource endowment, geographical limitations, government policy, market and consumer forces and the maturity of the economy.

Pathway 1 - Electricity Decarbonisation

Primary aluminium production is an energy-intensive process. More than 60% of the aluminium sector's carbon dioxide emissions are currently from the production of electricity. By mid-century, under a B2DS-aligned scenario, such emissions would need to be reduced to near zero.

Globally, two-thirds of the sector's electricity needs are met by captive power stations owned and operated by aluminium producers, which are largely fossil fuel based. However, in Australia all the aluminium smelters are grid connected in the National Electricity Market (NEM). The Australian smelters perform an enabling function in grid stabilisation which helps with increased penetration of variable renewable electricity as the grid transitions. The carbon intensity of the Australian grid is rapidly transforming, with this increased penetration of variable renewables. Smelters also have the opportunity, as part of contract renewal, to source firmed renewable electricity from on or off grid sources.

For more information on Electricity Decarbonisation see Factsheet #5.

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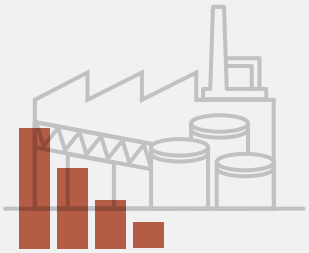
Pathway 2 - Direct Emissions Reduction



The major sources of non-electricity related emissions in the aluminium sector are fuel combustion in alumina refineries and smelter anode consumption. Australian Aluminium Council members are involved in global trials of inert anode technologies, potentially eliminating the need for carbon anodes. Rio Tinto and Alcoa are part of a joint venture with Apple in Canada on the Elysis process* and Rusal is also trialling a technology†.

Australia is the world's largest producer of alumina outside of China. Australia is where global alumina research headquarters for Alcoa, Rio Tinto and and South32's Worsley Alumina operations are based. Australia is a global leader in low carbon alumina research with the electrification of a significant portion of the refining process a key pathway forward (requiring Pathway 1 if this is to be successful). Hydrogen may also be a potential pathway, for parts of the process not suitable for electrification.

For more information on Australia's contribution to Alumina and Aluminium Decarbonsation, see Factsheets #3 and #4.

Pathway 3 - Recycling & Resource Efficiency

Infinite recyclability without loss of properties is one of aluminium's unique benefits. Globally, the recycling of post-consumer scrap today mitigates the need for almost 20 million tonnes of primary aluminium every year. However, with a comparably small and geographically dispersed population, there are logistical and commercial challenges that limit the extent of recycling aluminium in Australia. Currently, around 400,000t per year of post-consumer scrap aluminium is collected in Australia for recycling overseas. Although it is carried out offshore, this scrap recycling still contributes to global resource efficiency.

International Collaboration

In addition to working with the IAI, members of the Australian aluminium industry are directly and indirectly investing in the development of a range of industry specific pathways that support emissions reduction:

- Aluminium Stewardship Initiative (ASI) **https://aluminium-stewardship.org/**
- World Economic Forum (WEF) **https://www.weforum.org/our-impact/mission-possible-we-re-helping-heavy-industry-reach-net-zero-carbon-emissions-by-2050**;
- Science Based Targets – Development of an aluminium specific pathway in partnership with Alcoa **https://sciencebasedtargets.org/aluminium/**, **https://sciencebasedtargets.org/wp-content/uploads/2015/05/Sectoral-Decarbonization-Approach-Report.pdf**;
- International Energy Agency (IEA) -through its membership of the IAI, the Council contributes to the development of the IEA aluminium pathway **https://www.iea.org/reports/tracking-industry/aluminium**, as well as non-aluminium specific pathways **https://www.iea.org/topics/tracking-clean-energy-progress**, **https://www.iea.org/topics/energy-technology-perspectives**; and
- COP26 – Aluminium Pathway under development **https://unfccc.int/climate-action/marrakech-partnership/background**

Additionally, within Australia, the industry is collaborating through the:

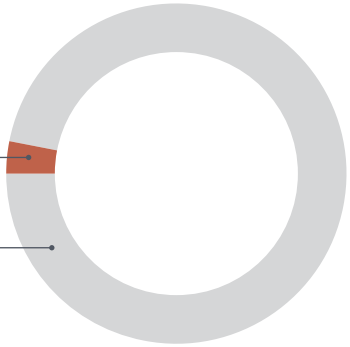
- Australian Renewable Energy Agency (ARENA) **https://arena.gov.au/projects**;
- Australian Industry Energy Transitions Initiative **https://energytransitionsinitiative.org**; and
- Heavy Industry Low Carbon Transition CRC **https://www.hiltcrc.com.au/**

Australia contributes about **3.1% global aluminium industry emissions**[1] and the vertically integrated industry about **7.1% national emissions**[3].

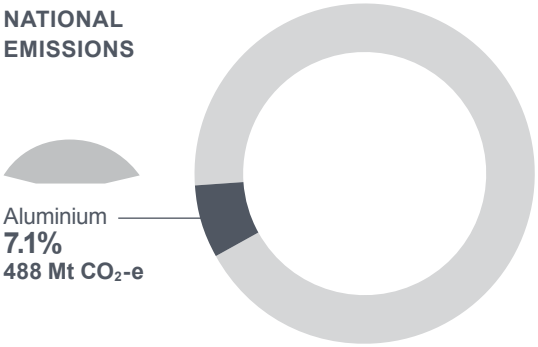
GLOBAL ALUMINIUM INDUSTRY EMISSIONS
(Bauxite, Alumina, Aluminium)

Australia
3.1% | **34.7 Mt CO_2-e**

Global[2]
97% | **1120 Mt CO_2-e**



NATIONAL EMISSIONS



Aluminium
7.1%
488 Mt CO_2-e

Source: *https://elysis.com †https://rusal.ru/en/innovation/technology/inertnyy-anod/ [1]Australian Aluminium Council [2]International Aluminium Institute [3]https://www.industry.gov.au/news/australias-greenhouse-gas-emissions-december-2021-quarterly-update