

## CRU World Aluminium Conference Series 2021

Please find attached, a presentation by Alumina Limited released at the CRU World Aluminium Conference Series 2021 on Wednesday, 16th June 2021.

This ASX announcement was approved and authorised for release by Mike Ferraro, Chief Executive Officer.

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26th



# World Aluminium Conference Series 2021

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## Bauxite, alumina and other raw materials – understanding CO<sub>2</sub> through the supply chain

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16 June 2021

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# AWAC Joint Venture (Alumina Limited 40% interest)



- Alumina Limited owns 40% of the AWAC joint venture, one of the world's largest bauxite & alumina producers (2020: 12.8 million tonnes of alumina). Alcoa Corp owns the remaining 60% of the JV and is the manager.
- The average cash cost of AWAC refineries in 2020 was \$199 per tonne.

# Topics

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1. Alumina prices
2. Alumina supply and demand
3. Bauxite supply and demand (and Indonesian developments)
4. Upstream decarbonisation issues and technologies



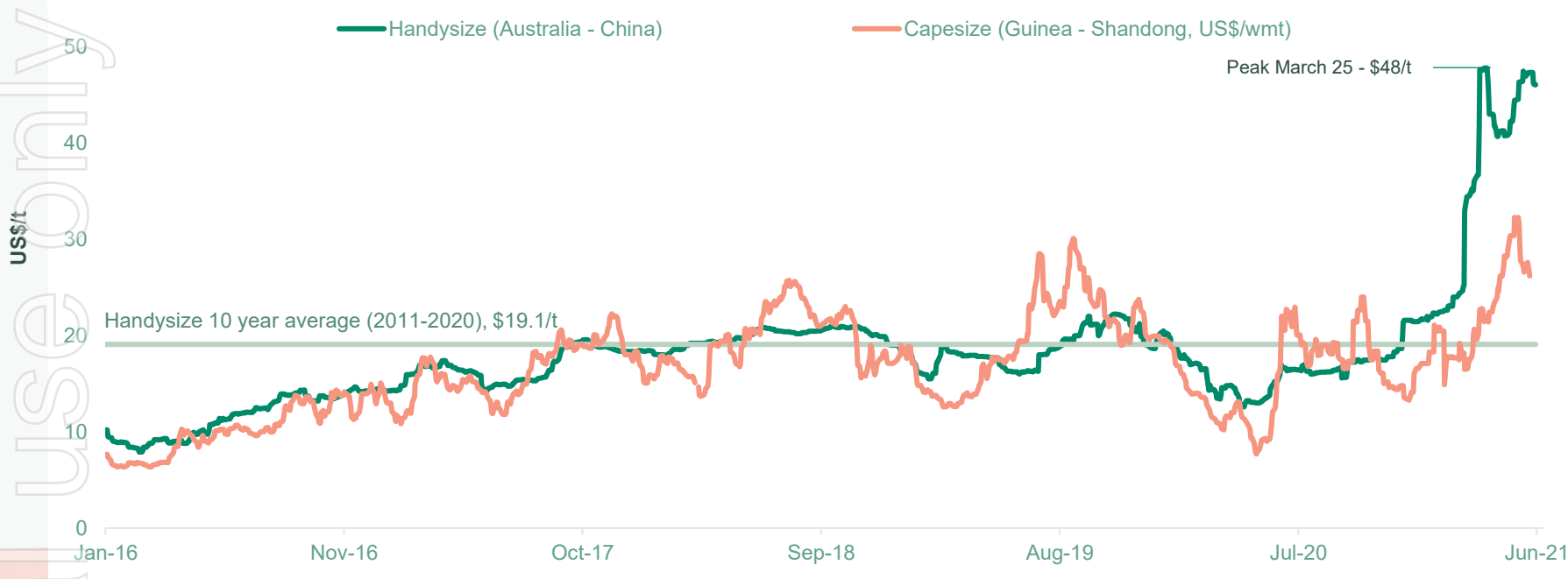
# Alumina Market

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# First half spike in dry bulk freight rates to China impacts API **ALUMINA** LIMITED

Recent abnormal spike in Handysize freight rates (reduced the Chinese alumina import parity price and the API given large RoW surplus). Capesize freight rates for seaborne bauxite were relatively stable before rising (then easing off).

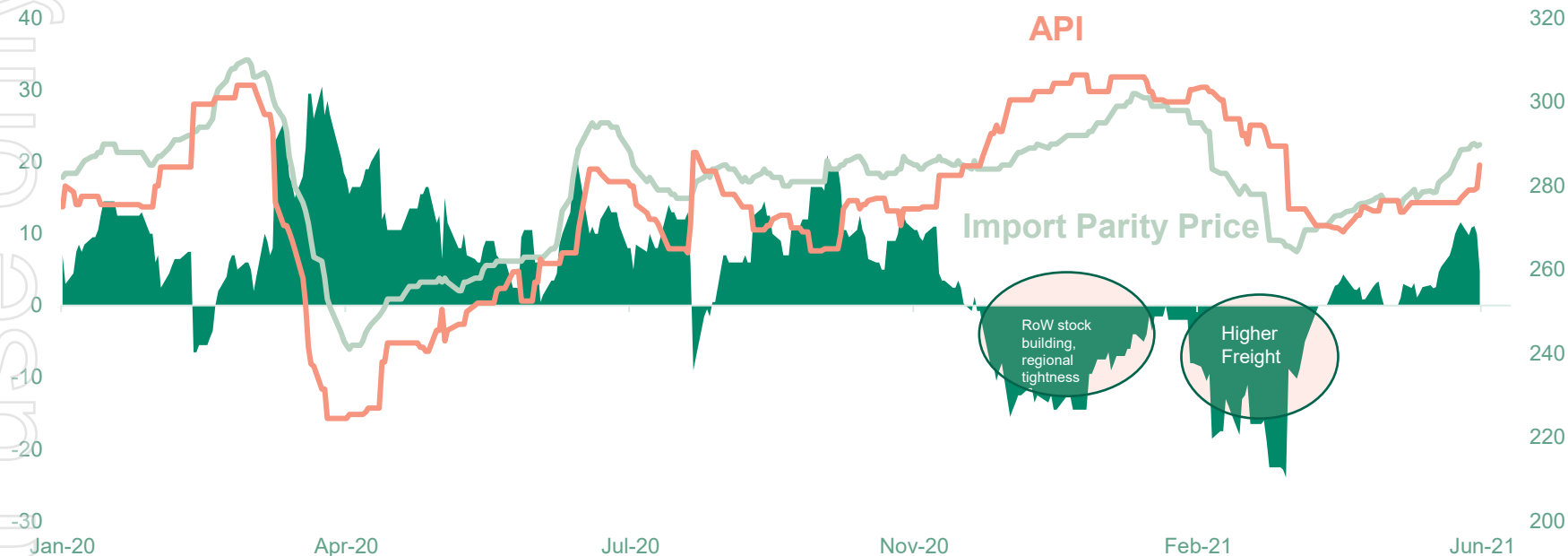


# API & China alumina prices: import arbitrage open from April

RoW alumina surplus, ~2.9 million tonnes forecast to be imported into China FY 2021

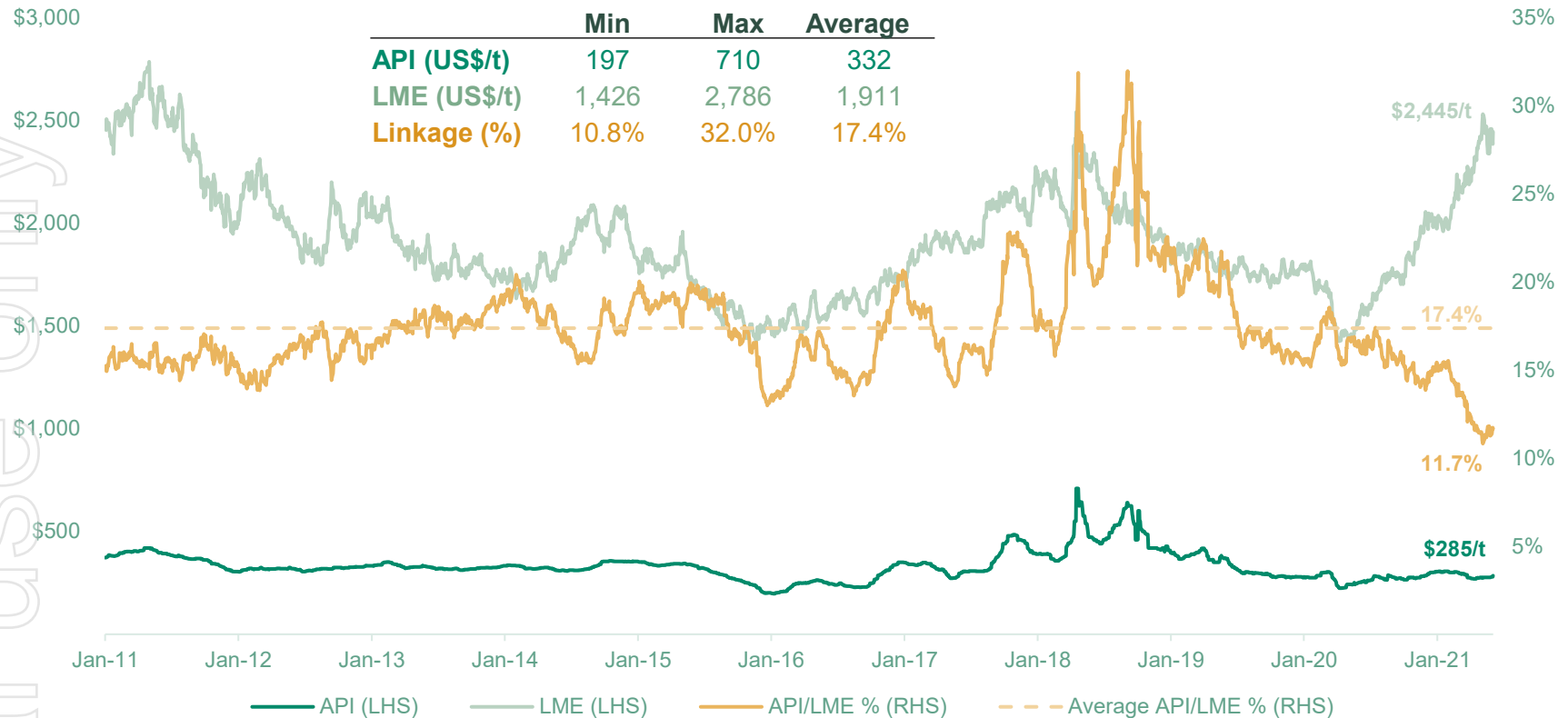
Low API on lower import parity price (high freight costs to China and modest refining costs)

■ Import Arbitrage (LHS)

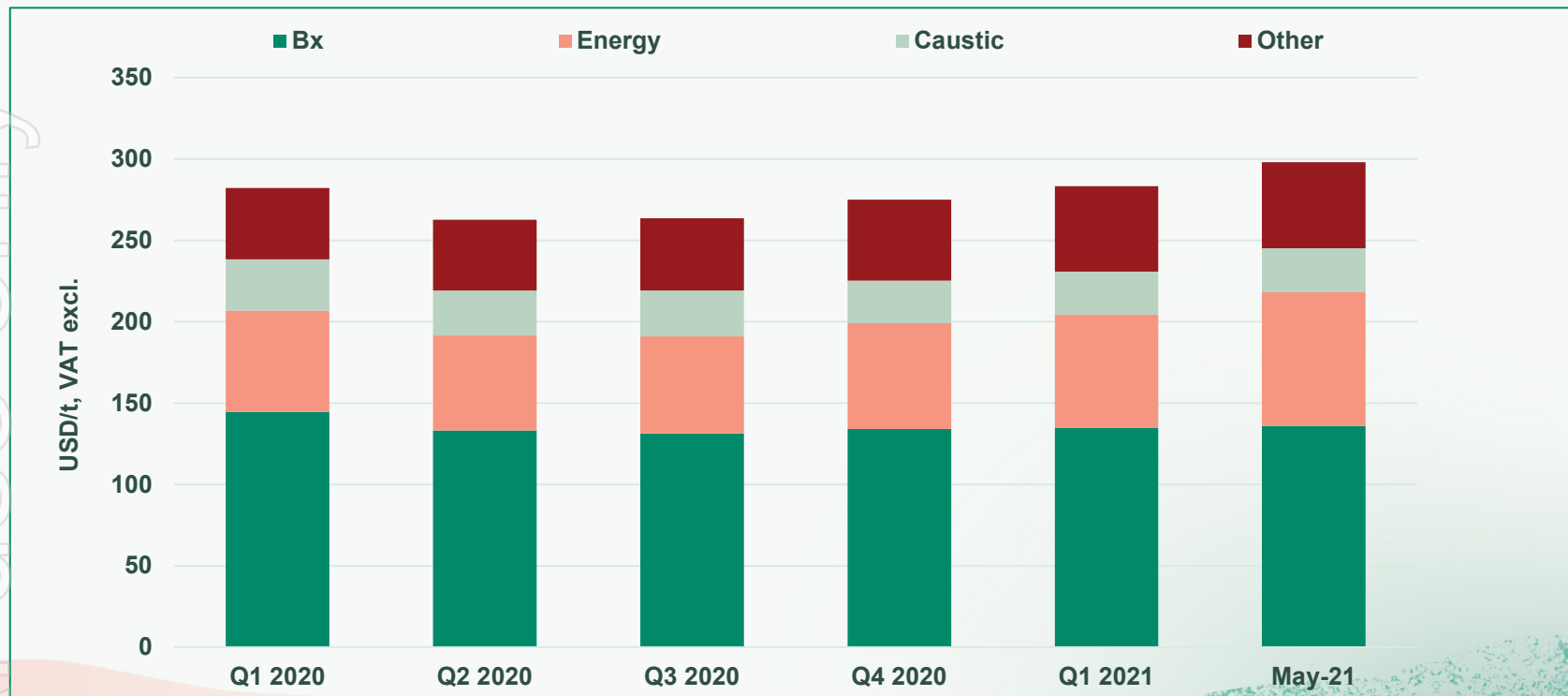




# API/LME price linkage: 11-12% well below 17.4% past average **ALUMINA** LIMITED



# China's alumina production costs have been increasing



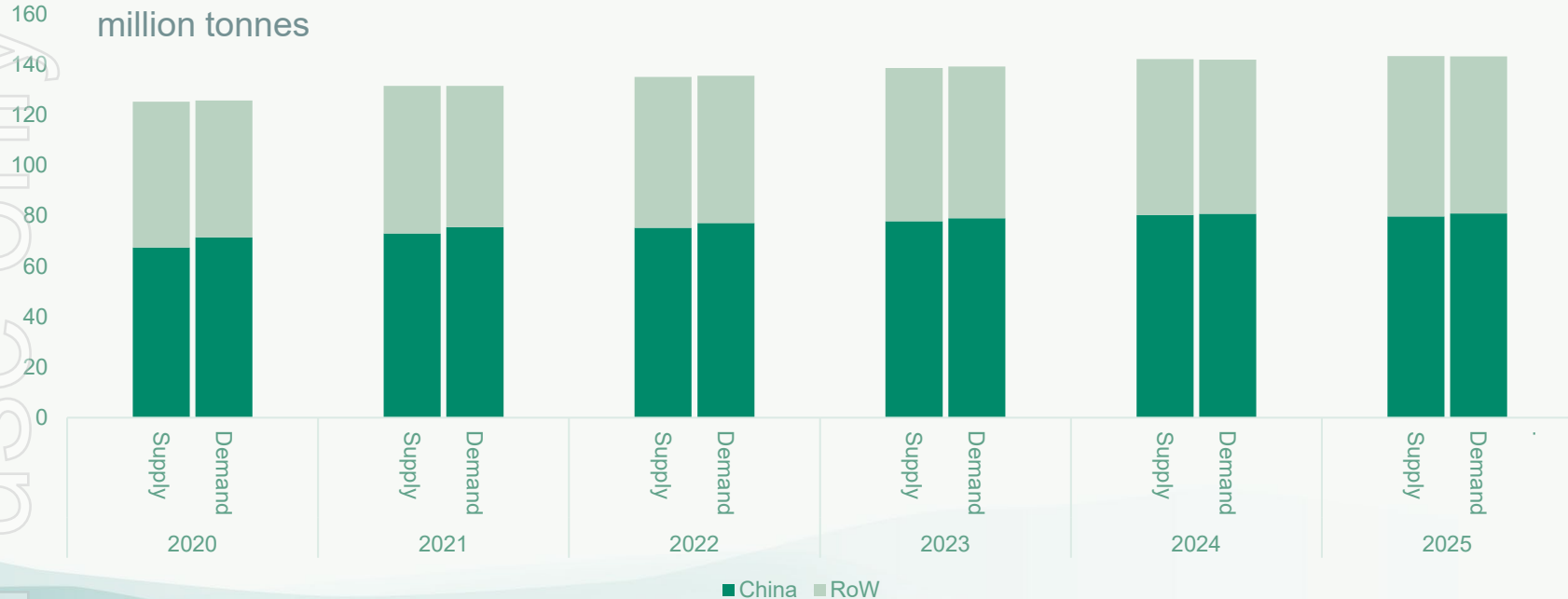
# RoW additional\* smelter-grade alumina supply/demand 2021-25

2.3 million tonnes of smelter-grade alumina (SGA) supply gap due to smelting growth outpacing refining growth (gap to be met from current production surplus)



## Tightly balanced total global SGA market forecast in next 5 years

In 2022 and 2025 the RoW surplus is expected to be under 1.5 million t, in 2023 and 2024 is expected to be no more than 0.7 m t



# Bauxite Market

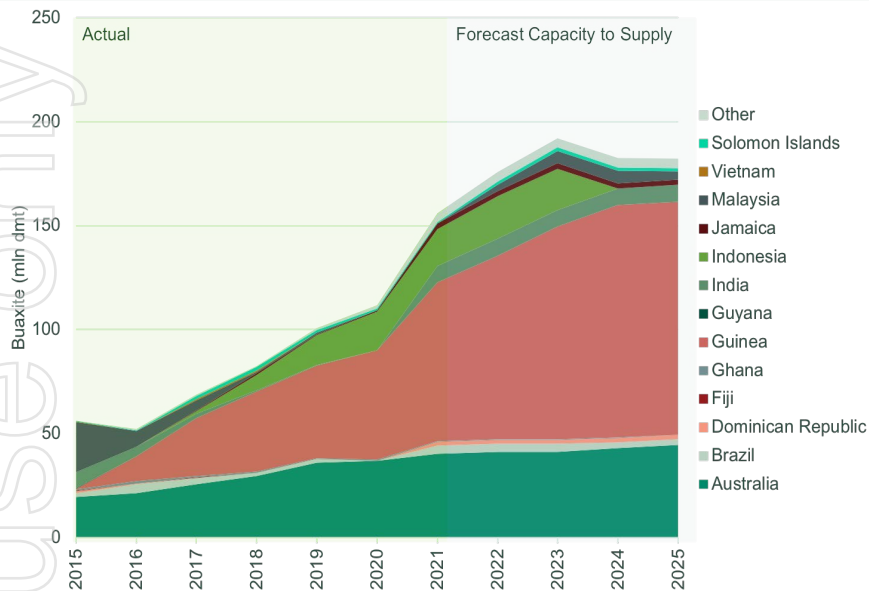
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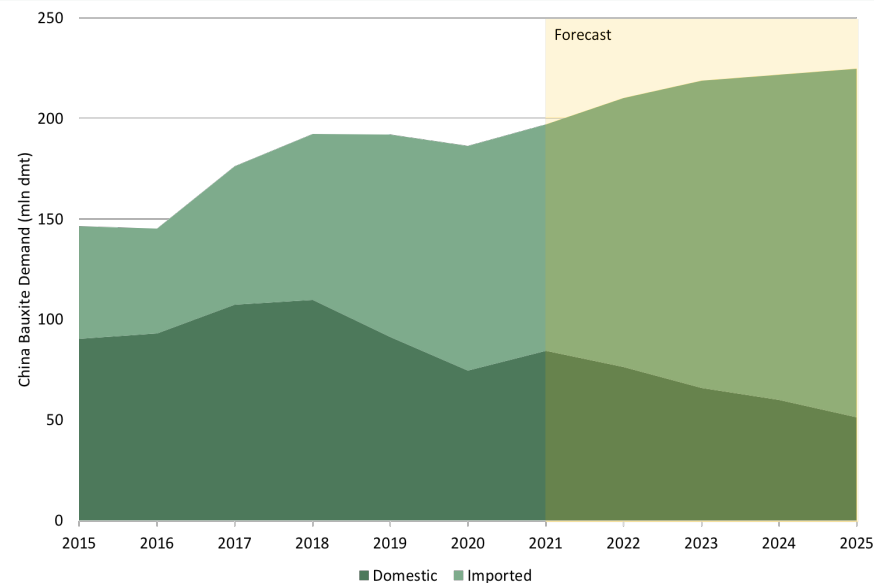


# Bauxite supply & demand – main supply growth to China expected from Guinea and Australia and Indonesia

## China's Imported Bauxite Supply



## China's Bauxite Demand



- Overall demand forecast to grow on back of domestic bauxite grade depletion and continued primary AI production growth.
- Guinea supply continues to grow. More projects set to join the supply mix.
- Indonesia continues to shift policies in relation to minerals exports

# Indonesia's shifting bauxite export policy and Chinese-led refinery project updates

- May 2020: Indonesian Government extended the export window through to June 2023
- April 2021: Citing the impact of COVID-19, Government relaxed requirements for granting quotas, reducing the importance of downstream refinery construction and opening the way for higher bauxite volumes to be exported until end 2021
- Under the current rules, exports will end after 2023 unless a further policy shift occurs

	Refinery	Operating Capacity (mtpy)	Brownfield Capacity (mtpy)	Status
Weiqiao	PT. WHW	1.0	1.0	Phase 2 to be commissioned H2 2021
Nanshan	PT. BAI	1.0	1.0	Phase 1 being commissioned



# Decarbonisation Issues and Technologies

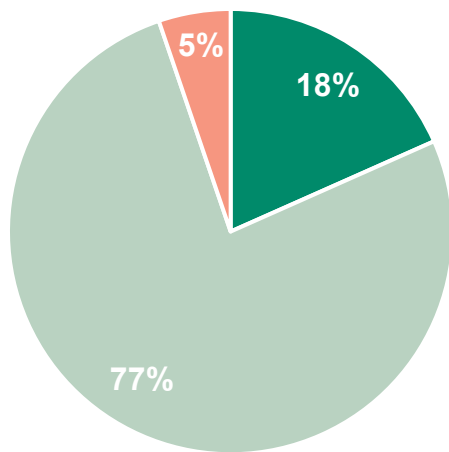
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# GHG emissions breakdown across aluminium industry

Aluminium key part of low carbon world – increasing recycled aluminium forecast

2018 Global GHG Emissions

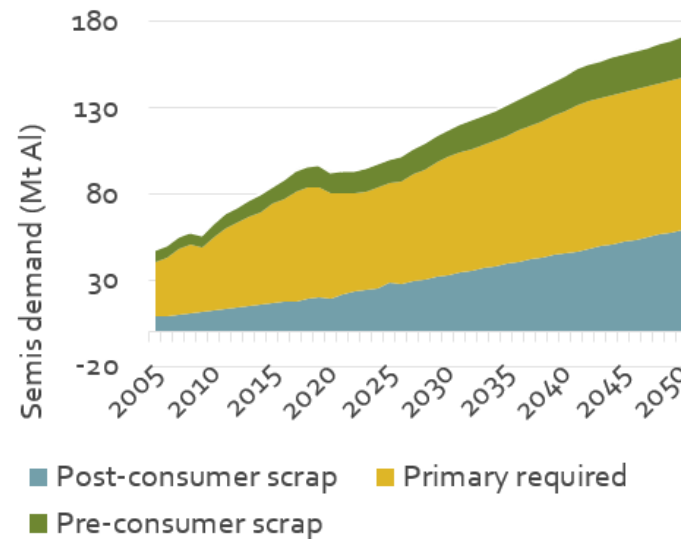


■ Bauxite & Alumina ■ Primary Al ■ Other\*

\* "Other" is made up of – recycling, semi production and internal scrap recycling

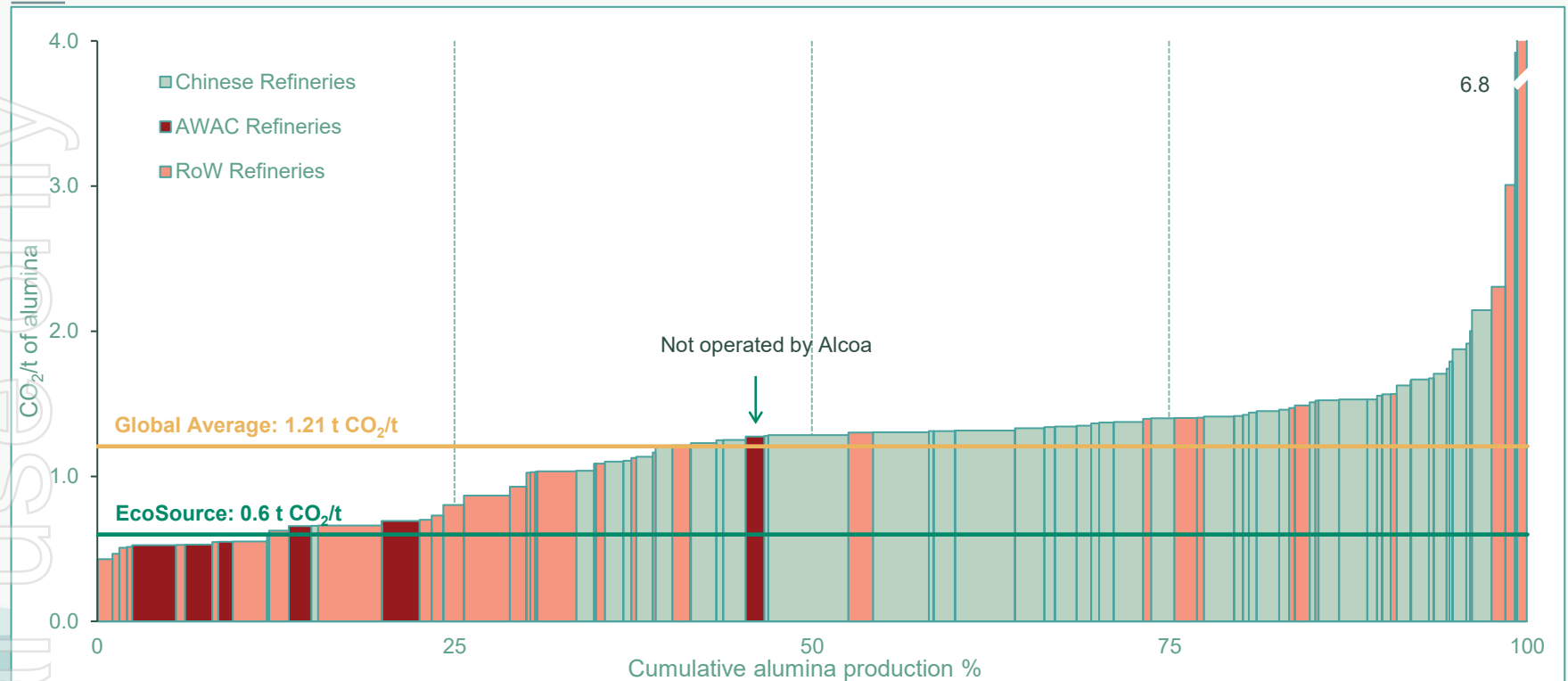
Source: IAI, May 2021

## IAI expects demand for semis to reach 170Mt by 2050



# AWAC is the lowest CO<sub>2</sub> emitter amongst major alumina producers

(Direct and indirect emissions, 2021 estimated)



Source: CRU, May 2021

\*EcoSource: AWAC's low carbon smelter grade alumina (SGA) product that has no more than 0.6 tonne of carbon dioxide equivalent per tonne of alumina



# Natural gas switch potential in China's alumina refineries

87% of production based on coal in 2020

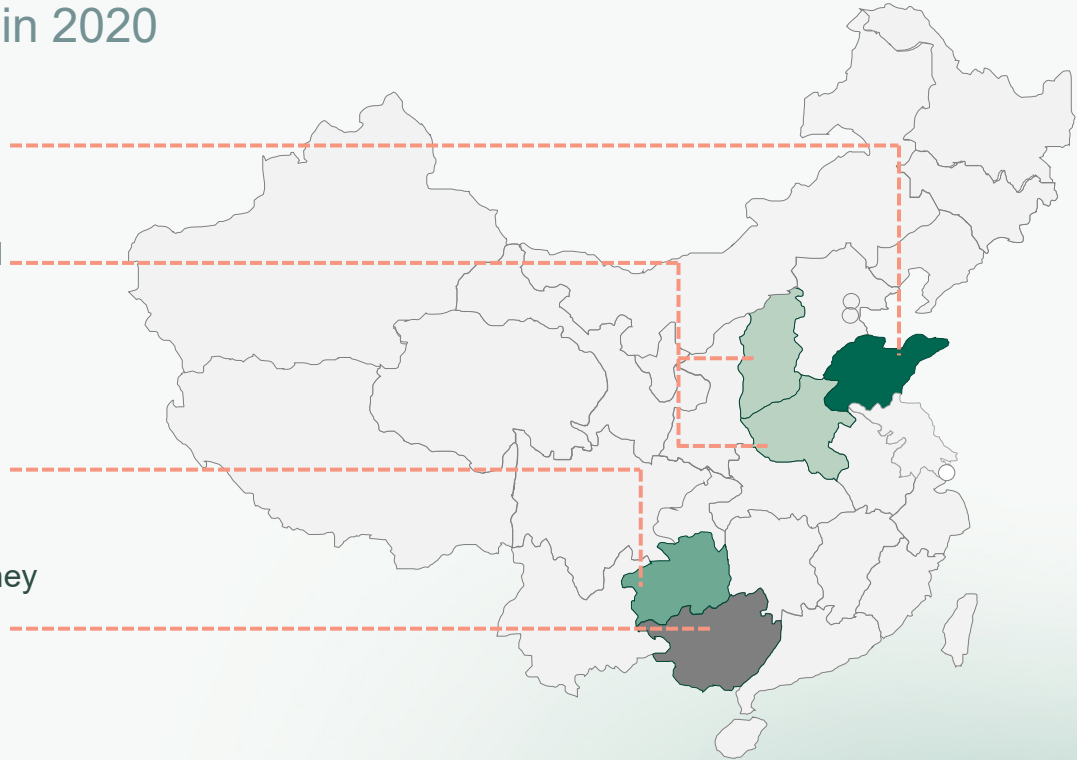
**Shandong:** All refineries have natural gas facilities, most of them are already using natural gas for calcination

**Shanxi & Henan:** Only a few refineries have natural gas facilities, and it is unlikely others would switch given the higher operating costs

**Guizhou:** Most refineries have natural gas facilities

**Guangxi:** No refineries have natural gas facilities, they may switch to use natural gas. Guangxi alumina production accounted for 14% of domestic total production

**Coastal greenfield projects:** China's dependency on imported gas is around 43%, so coastal projects are more likely to use natural gas



# Bauxite – key GHG emission sources

## Bauxite

Combustion of fuel for stationary, mobile and other ancillary equipment, particularly for:

- mining
- crushing and
- if applicable washing, drying, tailings

Production of fuel and electricity

Blasting

Purchased good and services including capital goods

Transportation (conveyor, truck, rail, ship)

Waste from operations

# Alumina – key GHG emission sources

## Aluminium hydroxide (hydrate) and aluminium oxide (alumina)

Combustion of fuel for steam for digestion (high temperature or low temperature) – approx. 70% of refining emissions

Production of fuel and electricity for other equipment

Combustion in calciners for the production of calcined alumina

Purchased good and services including production of calcined lime and caustic soda

Transportation (conveyor, rail, ship)

Waste from operations (in particular bauxite residue)

# Alumina – potential pathways towards net zero emissions

## Alumina

Steam for digestion – fuel switching from coal to gas or biomass (transitional)

Steam for digestion – waste heat recovery

Steam for digestion – mechanical vapour recompression

Green hydrogen (from renewable electricity such as solar, wind, hydro or nuclear)

Electrification from renewable electricity

Calcination – concentrated solar thermal

Process energy efficiency

Carbon capture and storage (including soil or bauxite residue sequestration)

Offsets (e.g. forestation, renewable energy certificates)

# Mechanical Vapour Recompression development project



Australian Renewable Energy Agency A\$11.3 million funding May 2021

- Alcoa of Australia Limited project to demonstrate the technical and commercial feasibility of electrifying the production of steam in alumina refining process using renewable energy
- Mechanical Vapour Recompression (MVR) is a potential alternative to produce steam using renewable electricity to power compressors to turn waste vapour into steam to provide refinery process heat
- First-of-its-kind deployment in Australia planned at Wagerup refinery
- MVR recompresses waste steam that would otherwise be exhausted to the atmosphere and recycles it in the refining process, potentially significantly reducing water use
- This technology has the potential to improve efficiency, reduce operating costs and significantly reduce emissions
- Stage 1 will investigate the feasibility of integrating MVR at the refinery
- Stage 2 would then involve installation by the end of 2023 of a 3 MW MVR module, powered by renewable energy at Wagerup to test the technology at scale



## Another ARENA-funded project: Concentrating Solar Thermal **ALUMINA** LIMITED

Led by University of Adelaide, including Alcoa of Australia, CSIRO, Hatch

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- Integrating Concentrating Solar Thermal Energy project evaluating potential for energy produced from concentrating solar thermal (CST) technologies to be integrated into Bayer alumina refining process
- Aim to develop technologies and process knowledge to enable the progressive integration of low temperature CST, solar reforming of natural gas and high temperature CST into the existing Bayer process
- Uses mirrors to concentrate a large area of sunlight into a targeted location, producing high temperatures
- Heat captured using a fluid, such as oil or molten sodium, enabling the generation of electricity or provision of heat when the sun is not shining

# Summary

- Alumina prices at low point in cycle, both in dollar terms and as a % of LME aluminium price due to:
  - Material RoW alumina surplus being exported to China
  - Relatively modest alumina production cost increases over 2020 low base inside and outside China
  - Abnormally high Handysize freight costs to China, reducing import parity price
- Flat RoW aluminium production – increases expected in 3<sup>rd</sup> and 4<sup>th</sup> quarters 2021
- RoW alumina supply and demand expected to tighten considerably in 2023-2024
- 3<sup>rd</sup> party bauxite demand forecast to continue to grow and potentially be oversupplied for a few years
- No quick/easy answers to significant refining decarbonisation, however various promising R&D and trial projects underway to establish technical and commercial viability

Thank You!

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