INFOGRAPHICS SUMMARY

MAKING NET-ZERO, 1.5°C-ALIGNED ALUMINIUM POSSIBLE
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1 The solution: Low carbon power is vital

Emissions pathways, Gt CO₂e/y

- Remaining emissions
- Additional fuel switching
- Inert and carbon capture and storage (CCS) anodes
- Material and resource efficiency measures
- Low-carbon power
- Low-carbon refineries

% of cumulative reduction, 2022–50

- Low-carbon power
  - High usage of CCS or new grid connections
  - Introduction of nuclear small modular reactors (SMRs)
  - Grid decarbonisation
  - 55%–60%

- Material and resource efficiency
  - Improved recycling rates
  - Higher design efficiency
  - 15%–20%

- Additional fuel switching
  - Fuel switching for mining, casting, recycling and processing
  - Decarbonisation of electricity use across value chain
  - 10%–15%

- Low carbon anodes
  - Develop low-carbon anode production technology, including inert anodes and CCS retrofits
  - 10%

- Low-carbon refineries
  - Deployment of low-carbon boilers (electric and hydrogen) and heat recovery systems
  - Develop low-carbon calciners (electric and hydrogen)
  - 5%–10%

2 What it will take

Investment for a net zero primary sector, annual capital investment, in billion US$ (in a Business-as-Usual future)

- 75% of investments required for electricity production and upstream infrastructure

- Power and other energy infrastructure
- Smelters and refineries

- 2020s: 14 billion US$
- 2030s: 23 billion US$
- 2040s: 60 billion US$

Note: Compared to regular investments of $9 billion–$15 billion per year (in a Business-as-Usual future)

Green premium, levelised cost of alumina, $/tonne of alumina

- Business-as-Usual scenario
- 1.5°C scenario

Levelised cost of aluminium, in $/tonne of aluminium

- 2020: $2,400–$2,800
- 2030: $2,600–$3,000
- 2040: $2,800–$3,200
- 2050: $3,000–$3,400

Note: Values are weighted by production type.

Resource requirements, share of global demand by 2050

- Low-carbon electricity
  - 1,000 TWh out of 90,000–130,000 TWh
  - ~1%

- Hydrogen
  - 2–3 Mt out of 500–800 Mt
  - <1%

- Captured carbon
  - 0–360 Mt CO₂ out of 7–11 Gt CO₂
  - 0%–5%
Key milestones

- **Carbon Intensity of Smelter Power**
  - 2020: 660
  - 2030: 480
  - 2040: 60
  - 2050: 40

- **Average Carbon Intensity of Primary production**
  - 2020: 16
  - 2030: 14
  - 2040: 3
  - 2050: 1

- **Low Carbon Digesters**
  - 2020: 0%
  - 2030: 35%
  - 2040: 81%
  - 2050: 100%

- **Secondary aluminium in total production**
  - 2020: 34%
  - 2030: 43%
  - 2040: 48%
  - 2050: 54%

Priorities for this decade

**INDUSTRY ACTION TO BOOST SUPPLY**
- **Invest in RD&D** for low-TRL technologies in refineries and anodes starting their roll out by the end of the decade
- **Develop site-specific decarbonisation of power**, particularly focusing on decarbonisation power over the next decade

**ALUMINIUM DEMAND**
- **Key users of aluminium** to commit to **buying low-carbon products** with a green premium
- **Work with government and secondary producers** to increase efficient aluminium use and recycling

**FINANCE ACTION**
- **Mobilise capital across the electricity and aluminium sector in integrated projects**
- **Establish climate-aligned investment principles** for near-zero emissions aluminium production
- **Reduce cost differential between low-carbon and fossil-based-aluminium**, e.g., by carbon pricing
- **Use government procurement levers** to support the development of a market for low carbon aluminium
- **Work with producers and regulators to integrate aluminium smelters into electricity, CCS, and hydrogen grids**