

Pathway 1 – Electricity Decarbonisation

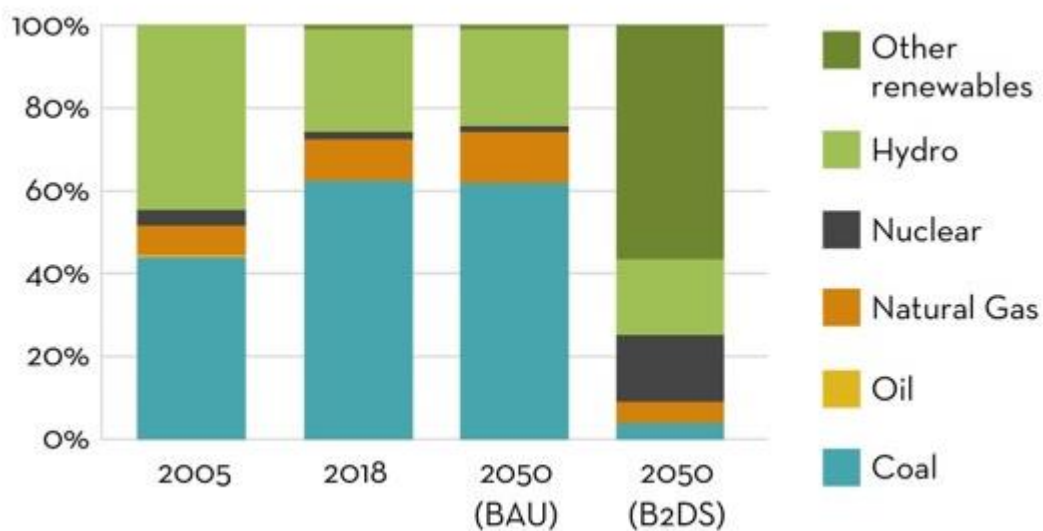
Primary aluminium production is an energy-intensive process, requiring significant amounts of electricity to break the strong oxygen-aluminium bonds of the raw material, alumina.

More than sixty per cent of the aluminium sector's 1.1 billion tonnes of CO₂e emissions (2018) are from the production of electricity consumed during the smelting process. By mid-century, under an *International Energy Agency Beyond 2 Degree Scenario (B2DS)*, such emissions would reduce to near zero, as fossil fuels would be phased out or continued with carbon capture, utilisation and storage (CCUS).

Two-thirds of the sector's electricity needs are met by power stations owned and operated by aluminium producers. Most of these are fossil-based and are among the newest and most efficient of the industry's capacity. Decarbonised power generation and the deployment of CCUS offer the most significant opportunity for emissions reduction for these power producer-consumers.

Smelters that are already grid-connected will need to reduce their electricity emissions via the decarbonisation of existing grids. As power systems transition to (intermittent) renewables, large and consistent electricity consumers, like smelters, will play an essential role in stabilising grids.

In addition to the decarbonisation of the (already electrified) smelting process, electrification and renewable energy could reduce emissions from the sector's major fuel combustion processes (furnaces, alumina refineries and transportation).



Changing aluminium smelter power mix under IAI Business as Usual (BAU) and IEA-aligned Beyond 2 Degree (B2DS) scenarios (Coal & Gas in 2050 with Carbon Capture and Storage)