

Pathway 2 – Direct Emissions

The major sources of non-electricity related emissions in the aluminium sector are fuel combustion, smelter anode consumption, transport, and the carbon footprints of raw materials.

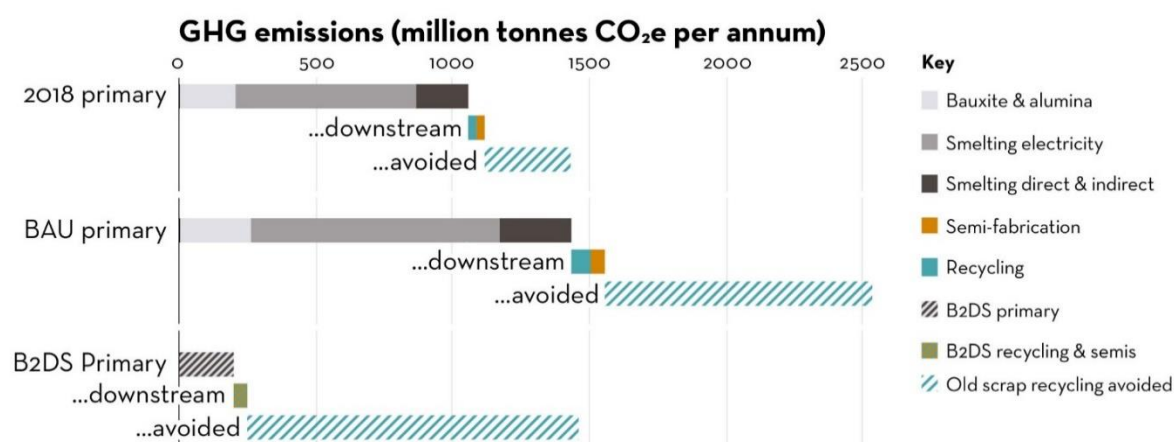
These sources are common to all producers, with minor variability in performance across the industry.

By mid-century, under an *International Energy Agency Beyond 2 Degree Scenario (B2DS)*-aligned slope, the 650 million tonnes of Business As Usual greenhouse gases emitted from these sources will need to be reduced to 250 million tonnes, even as demand for the metal increases by about 80%.

Direct emissions from fuel combustion to produce heat and steam make up 15% of the sector's emissions (2018) – from alumina refining, anode production, casting, remelting and recycling processes. For these thermal processes, electrification with low carbon sources offers a potential pathway to decarbonisation. Where electrification is not feasible, green hydrogen, concentrated solar thermal energy, and carbon capture utilisation and storage (CCUS) are the best options.

Another 15% of the sector's emissions come directly from the refining and smelting processes.

Removal of direct emissions from the smelting process is a challenge common to all producers and will require a step-change in technology to realise.



Sector-wide emissions in 2018 and 2050 under BAU and B2DS

Novel cell technologies such as inert anodes, which emit oxygen instead of CO₂ will play an important role in emissions reduction, even though their deployment is currently very limited.

Ancillary materials and transport emissions (representing around 8% of the sector-wide total) will be reduced at a similar rate as direct emissions through changes in other sectors and purchasing choices by aluminium producers.

Unprecedented investment will be required to deliver an additional 20 million tonnes of low carbon primary aluminium, decarbonise the existing 65 million tonnes, and build a 60 to 70 million tonne low-emitting post-consumer scrap recycling industry by 2050.