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PRIMARY NON-FERROUS METAL INDUSTRY

Domestic primary aluminium entities are behind the curve in adopting decarbonisation measures

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Highlights

Switching to low carbon renewable power would involve significant capital expenditure for domestic primary aluminium manufacturers.

Entities may choose to follow an asset-light model, instead of an upfront capex. However, the storage technologies required are expected to increase the cost of production (COP).

While greener aluminium demand is expected to increase, higher COP would mean a significant premium over the current realisation.

- Aluminium remains the second highest greenhouse gas (GHG) emitting metal after steel, primarily due to its high power consumption in the smelting process, resulting in a carbon intensity of 16t CO_2e/tonne[1] of production. Entities operating in India and China have the highest intensity (almost 17-20t CO_2e/tonne) owing to significant usage of coal in generating power, while western economies are gradually switching to lower carbon-intensive hydro power, with almost 60% lower carbon intensity emissions compared to the global average.
- Domestic primary aluminium manufacturers adopting decarbonisation measures need significant advancement in enhancing their renewable energy (RE) or low carbon-intensive power sources. Domestic entities have set an ambitious target for ~25% reduction in next five-seven years and net zero by 2050. ICRA expects significant capital investments of ~$5bn by 2030 and ~$20bn by 2050, depending on the RE mix adopted. Entities may choose to sign PPAs to secure RE power, instead of doing an upfront capex.
- Green aluminium's cost of production is estimated to increase by $250-300/tonne, as integration of higher share of RE would require storage capacity, including battery energy storage systems (BESS), to manage the intermittency associated with wind and solar power. The levelised cost of RE power along with storage for four hours using BESS is estimated to be in the range of Rs 4.5-6.0 per unit, much higher than the current power cost for domestic entities. Thus, large-scale adoption of BESS projects hinges on reduction in battery costs.
- Enhancing secondary aluminium production is an additional lever for decarbonisation. While secondary production is around 38% of the total production in India, the scrap is largely imported. Thus, focus on organised post-consumer scrap collection, as seen in developed nations, would be an imperative to increase secondary production. Hindalco is taking steps to set up recycling units to increase the proportion of recyclable products.
- Globally, the technologies related to reduce process emissions like carbon capture and storage, inert anode and fuel switching in calcination are at an early stage and may take a long time to be proven for mass adoption, including in India.
- India exports a large share (~45-50%) of its primary aluminium production, out of which ~20% is exported to the European Union (EU). The recent announcement by the EU to impose carbon tax, effective January 2026, would significantly impact the export competitiveness of the domestic entities in case the emissions remain unabated.

1 CO_2 equivalent per tonne

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Thank You!