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STEEL INDUSTRY

Decarbonising Indian steel sector: Green steel remains a long-term aspiration

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Contents

Abbreviations

AMNS: ArcelorMittal Nippon Steel

BF-BOF: Blast Furnace – Basic Oxygen Furnace

BEES: Battery Energy Storage System

CBAM: Carbon Border Adjustment Mechanism

CCUS: Carbon Capture, Utilisation and Storage

CP: Carbon Pricing

CY: Calendar Year

DRI: Direct Reduced Iron

EAF: Electric Arc Furnace

ESG: Environment, Social and Governance

EU-ETS: European Union Emissions Trading System

FY: Financial Year

GHG: Greenhouse Gas

GW: Gigawatt

GPP Green Public Procurement

GRIHA: Green Rating for Integrated Habitat Assessment

IF: Induction Furnace

LCOS: Levelised Cost of Steel

LEED: Leadership in Energy and Environmental Design

Mt: Million tonnes

NDC: Nationally Determined Contributions

OEM: Original Equipment Manufacturer

PPA: Power Purchase Agreement

RE: Renewable Energy

SECI: Solar Energy Corporation of India

tCO_2/t: Tonnes of Carbon Dioxide per Tonne of Steel

WHR: Waste Heat Recovery

Highlights – Industry trends

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Green steel, in its strictest definition, entails an emission intensity of <0.5 tCO_2/tonne of steel. Against this benchmark, India's current average intensity of 2.5 tCO_2/t underscores a substantial gap and deep decarbonisation would be contingent on technology maturity and cost competitiveness. The low-hanging fruit through energy transition and other material efficiencies is expected to achieve ~19% reduction to around ~2 tCO_2/t by FY2030.

- **The introduction of the Green Steel Taxonomy in December 2024 marks a key policy intervention,** establishing formal emission thresholds to classify steel output into graded green categories. The taxonomy is expected to shape procurement behaviour, policy incentives and capital allocation towards decarbonisation of the steel sector.
- **Steel capacity additions in India until FY2031 remain skewed towards the BF-BOF route,** with its share rising to ~51% from 45% currently. While India's green steel taxonomy defines green steel at ~1.6-2.2 tCO2/tonne, Indian primary steel producers' average remains elevated at 2.5tCO2/tonne. Consequently, major reductions in intensity would be driven by process level efficiency gains in the medium term.
- **Leading primary steelmakers in India are targeting ~19% reduction in emission intensity by FY2030.** Renewable energy transition alone can reduce intensity by ~13% for BF-BOF and ~22% for DRI-IF routes. Large renewable capacity of ~9 GW is already in pipeline. Also, incremental gains are expected from material efficiency via beneficiation, increased scrap usage and greater adoption of alternative fuel sources.
- **Green steel supply transition in India is expected to be long-drawn and capital intensive,** with deep decarbonisation hinging on scaling green hydrogen-based DRI route. However, commercial viability remains constrained by elevated green hydrogen costs of >~$3.0/kg, against a break-even of $1.5-1.6/kg versus the BF-BOF route, limiting large-scale adoption in the near to medium term.
- **Globally, ~70 million tonnes (mt) of announced hydrogen-DRI capacity are largely subsidy-backed**, underscoring limited standalone commercial viability without Government support
- **Long-term net-zero targets by primary steelmakers signal intent, but execution remains gradual,** given the scale of technological shifts required. While Europe and other developed economies may transition faster, adoption in India will be paced by technology maturity, cost competitiveness and policy support.

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Thank You!

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