The Net-zero Steel Pathway Methodology Project

How to measure and track emissions from steel production

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‘Difficult to Abate’

- 7-8% of Global CO$_2$ Emissions
- Carbon intensive
- High capital cost
- Long investment cycle
- Low average asset age
Steel Summary

Steel benefits from promising technological pathways, but more decisive action is required to boost demand and investments in green steel.

Key messages

- Low-emission production technologies are increasingly available but far from commercially competitive to be deployed at scale.

- The cost of transforming steel assets is dwarfed by the cost of infrastructure needed – a significant bottleneck risk exists.

- The green premium for end consumers is low, but steel buyers need to be incentivized to generate demand for producers.

- Further decisive policy action can incentivize steel players into low-emission production.

- Further de-risking and better returns will be needed to reorient larger investment flow towards the low-emission industry.

Technology

Readiness stage 2

- The low-emission production technologies are largely prototyped at scale.

- +25-50% Production cost increase for low-emission production today.

- $1,750 billion Investments required in low-emission power generation

- $222-586 billion Investments required in low-emission hydrogen production

- $35-109 billion Investments required in CO₂ transport and storage

Infrastructure

Readiness stage 1

- The necessary infrastructure required by the low-emission industry needs to be developed almost entirely.

- +25-50% Expected green premium for steel buyers

- +0.5-1% Expected green premium for end consumers

Demand

Readiness stage 4

- Most of the market can pay the required green premium.

Policies

Readiness stage 1

- Very limited policies complement current environment (technology, infrastructure, demand, capital), to support growth of the low-emission industry.

- $180-360/tCO₂e Carbon price equivalent required to level competitive landscape

- $300 billion CapEx required to transform industry asset base by 2050 (-$10 billion/year)

The Net-Zero Steel Pathway Methodology Project
The Net-Zero Steel Pathway Methodology Project overview

• Project aims:
  • To enable the steel sector to support the achievement of the Paris objectives through a credible, well informed sectoral decarbonisation approach
  • To resolve the challenges by defining what is expected from a steelmaker to make a realistic and credible commitment to the Paris Agreement, with a net zero or 'science-based target’

Project background, presentations and draft recommendations available at:
https://www.netzerosteelpathwayproject.com/
Steering Group

- ArcelorMittal
- BlueScope Steel
- Tata Steel
- GFG Alliance

Supported By

- World Steel Association
- ResponsibleSteel

Technical Working Group Members

- Celsa Group
- JSW
- Liberty Steel / Infrabuild
- Nippon Steel
- NLMK
- Outokumpu
- POSCO
- Severstal
- Tenaris
- Ternium
- Voestalpine
- Wirtschaftsvereinigung Stahl
• ACT Developed a Methodology to measure Steel Sector Decarbonisation with a defined value chain. March 2021 (Road-test)
• The NZSPMP kicked off the debate on how to develop a common methodology to measure the decarbonisation of the Steel Sector (7% Global GHG emissions) July 2021
• SBTi Development of a method for measuring the achievement of a 1.5°C Aligned decarbonisation pathway for the Steel Sector. Ongoing
• NZSI Steel Transition Strategy a 2 scenario 1.5°C aligned strategy for Steel Sector Decarbonisation. September 2022
• Responsible Steel Standard V2 September 2022
• UNIDDI – partial sector coverage
Steel system SBT = refers to targets incorporating scope 1+2 emissions of crude steel production, as well as the scope 3 emissions relative to raw material preparation and iron making production (steel input production).

Value chain

Core steel system boundary

Variable steel company boundary

Value chain

FIGURE 10: BOUNDARIES FOR THE IRON AND STEEL SECTOR
SBTi – Key recommendation 1 SDA Proposed Boundary *

- Boundary changes
  - Exclude secondary metallurgy (IEA Scrap curve issue)
  - Include Hot Rolling
  - *Still under development
Use of Scrap Curve (Sliding Scale)

Figure 3.7 Emissions intensity ranges for near zero and low emission steel and cement production

- The Scrap sliding scale is used in several methodologies.
- However, it is not always used as intended - It is not suitable for use at a product level. (UNIDDI)
- It is only suitable for normal carbon steel production, not for engineering steels, High Alloy Steels or Stainless Steels.
**Figure 3.1 Analytical boundary for defining near zero emission steel production**

This Boundary should be noted as it does not include Semi Finishing or Hot Rolling.

IEA (2022), Achieving Net Zero Heavy Industry Sectors in G7 Members, IEA, Paris
https://www.iea.org/reports/achieving-net-zero-heavy-industry-sectors-in-g7-members

Notes: “Other materials production” refers to the production of material inputs to the iron and steel sector besides iron ore and limestone, including electrodes, alloying elements and refractory linings.
Liberty Steel – Decarbonisation @ Ostrava

NOW
Integrated Route
Production: 2.6 Mt
CO₂ Emissions: 2.4 t CO₂/tls

IRON MAKING

STEEL MAKING

DOWNSHARE FACILITY

RENEWABLE ENERGY

STEP 1
Hybrid Furnaces with 40% Scrap: 60% HM Route
Production: 2.8 Mt
CO₂ Emissions: 1.19 t CO₂/tls

RAW MATERIAL

Sinter Plant
North and South

Coking Plant
COB 1&2 and COB11

2 Blast Furnaces

1 Blast Furnace

New 400 kV Line

Scrap yard extension & processing units

HBI / DRI will be sourced from the market.

2 Hybrid Furnaces (100% Scrap or 60-70% Scrap & 30-40% HBI/DRI)

STEP 2
Hybrid Furnaces with 100% Scrap or 60-70% scrap
30-40% HBI/DRI
Production: 3.2 Mt
CO₂ Emissions: 0.3 t CO₂/tls

All reheating furnaces except Stackel Mill will be charged with multi-fuel burners to adapt to natural gas as transition fuel to H₂ Energy optimisation and automation.

Reheating furnaces to be fuelled with H₂

H₂ & SOLAR & WIND PLANTS

BOF GAS

NG

BLUE / GREEN H₂ SUPPLIES
The Steel Sector Boundary is Key for a consistent methodology that can compare company progress towards a 1.5°C 2050 de-carbonization pathway.

The Scrap Sliding-Scale/Curve is an appropriate method of defining Near-Zero and low emission steel production. However currently it has limitations:

- It is based on the boundary defined by the IEA.
- It is suitable for company and plant level use but not for products.
- It is not suitable for Stainless Steel or High Alloy Steels.

Summary
• To measure de-carbonization of the Steel Sector methodologies have been developed that can provide a consistent measurement.

• The boundary must be recognized when setting targets (the measurement of downstream processing must also be included).

• The Scrap Sliding-Scale/curve should be used for the boundary it was based on. If the boundary is different than the sliding-scale/curve will need to be adjusted to include any extra emissions.

• Convergence in Methodologies will be critical to ensure progress to a 1.5°C Compatible Net-Zero pathway is transparent and comparable.
QUESTIONS?
USEFUL WEBSITES

- GFG Alliance
- NZSPMP
- ACT Methodologies
- worldsteel

- Responsible Steel
- SBT – Steel Sector Guidance
- ETC – Net-Zero Steel STS
- IEA – I&S technology Roadmap