Swiss Re Institute

Green Steel: Decarbonising a Hard-to-abate Sector

Green Steel from the industry perspective – Robert Baron

Swiss Steel Group is one of the leading suppliers of special long steel solutions

1,663 kt
Sales volume in 2022

>70
Locations

77%
Engineering Steels

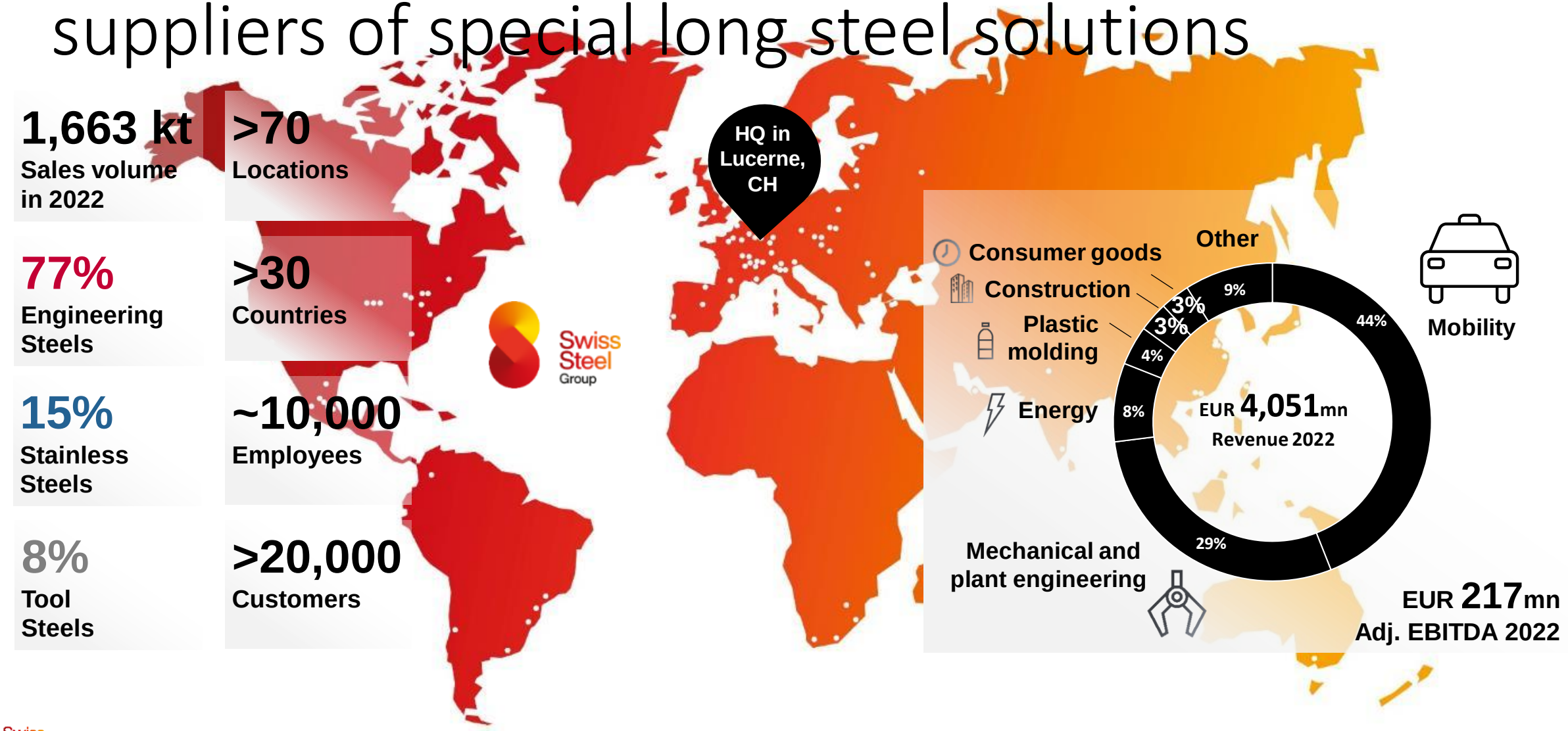
>30
Countries

15%
Stainless Steels

~10,000
Employees

8%
Tool Steels

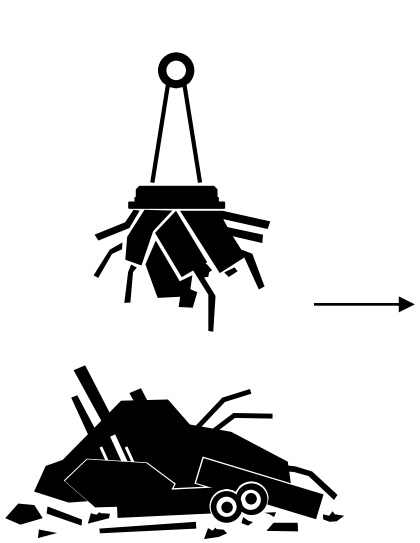
>20,000
Customers



Source: SSG Corporate Strategy

SSG's production is 100% EAF-based marking our products 'green by nature'

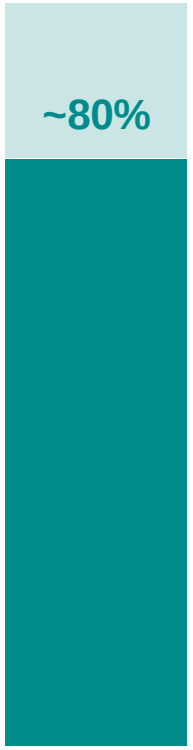
Steelmaking with electric arc furnace



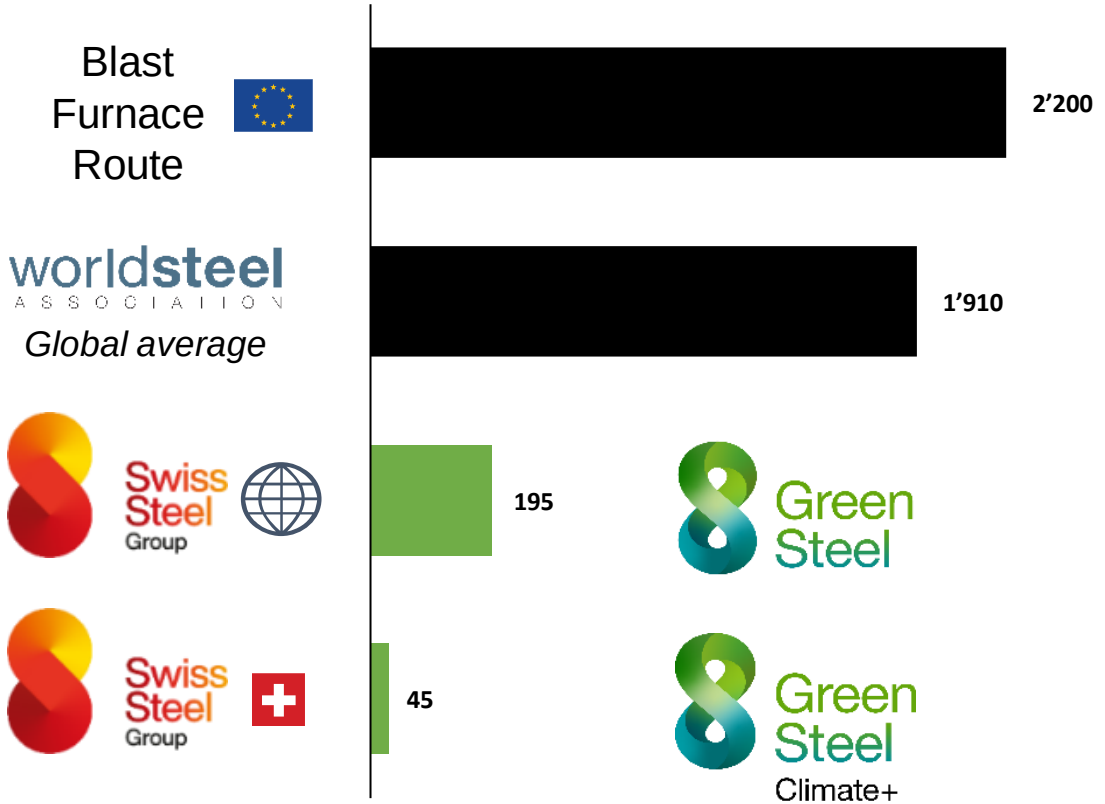
Scrap

Electric Arc Furnace

Decarbonized electricity



Emissions (Scope 1+2)
kg CO2 per ton of crude steel



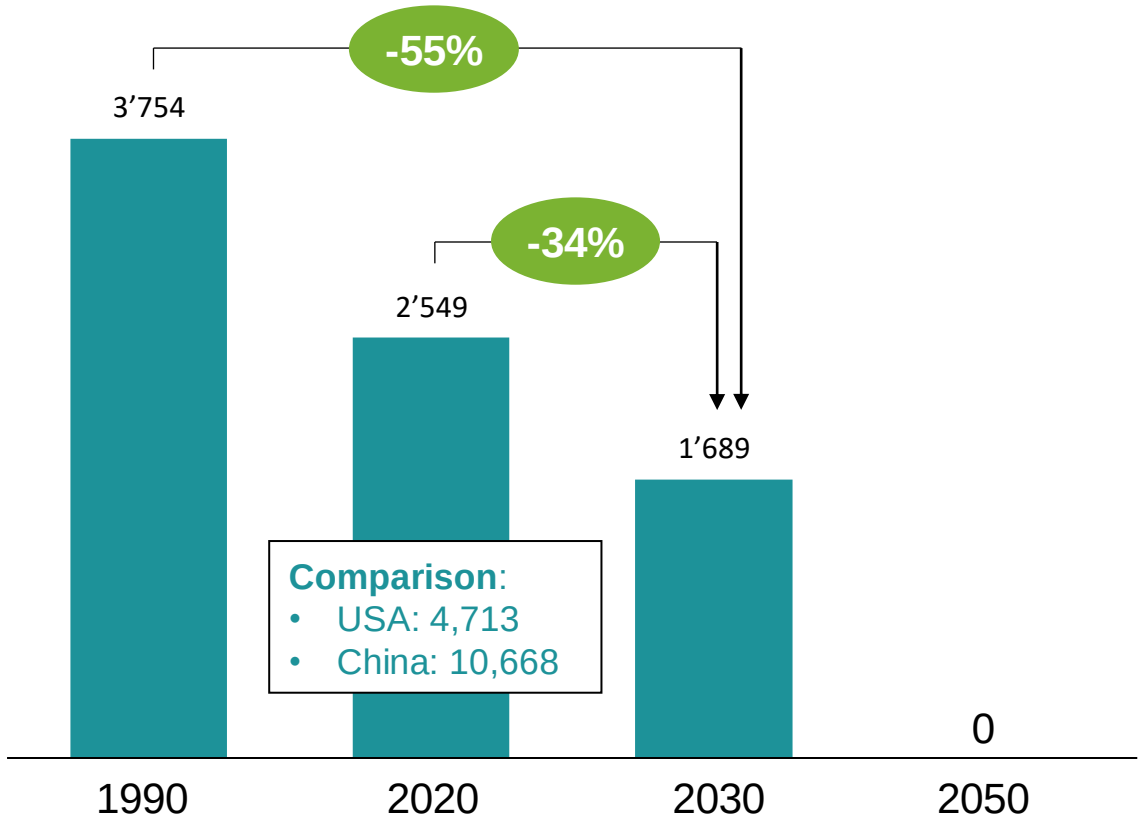
Source: Worldsteel; CRU; SSG Corporate Strategy

Europe has committed to gradually decrease its CO_2 emissions to net zero until 2050

Climate initiatives

Paris agreement	Keep rise in mean global temperatures below 2°C above pre-industrial levels[1]
European Green Deal	Make the European Union climate neutral by 2050 (net-zero greenhouse gas emissions)
Fit for 55	Cut emissions by 55% until 2030 (compared to 1990)

CO_2 emissions in the EU (actual and targets)
Million metric tons

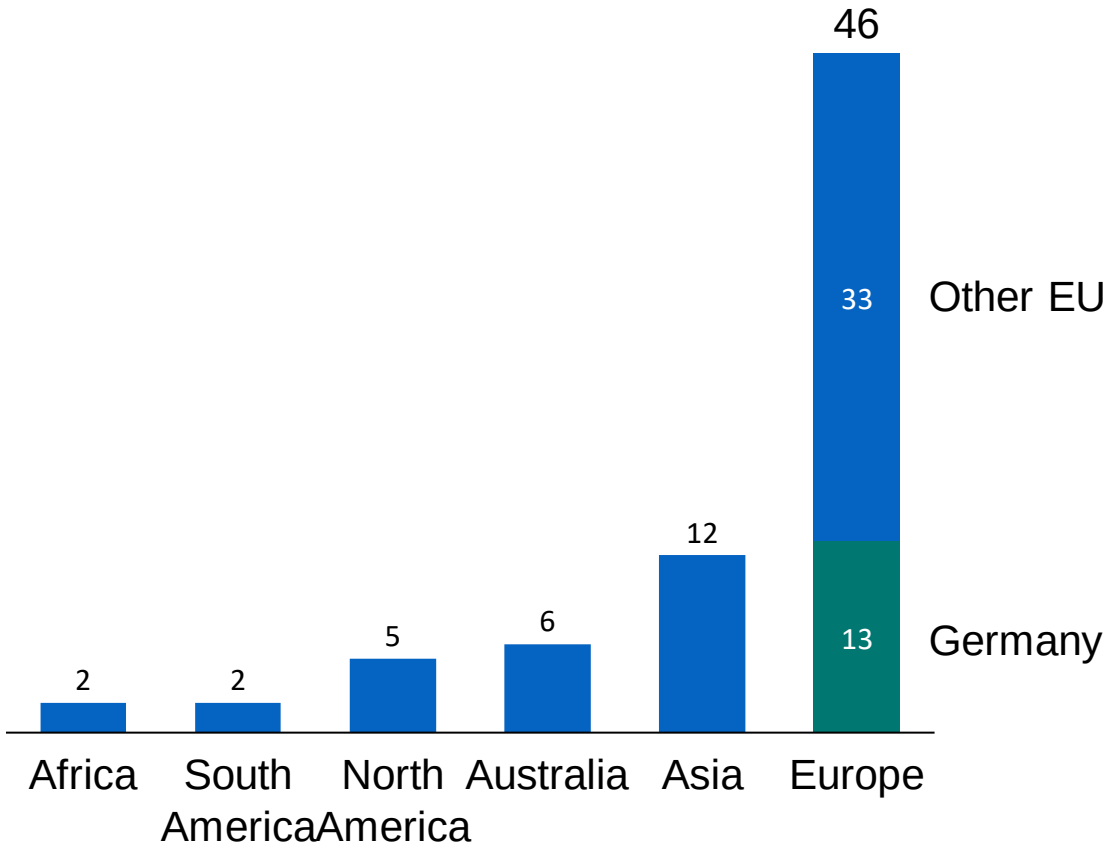


1. "Pre-industrial" currently refers to period of 1850 – 1900

Source: United Nations Climate Change; European Commission; SSG Corporate Strategy

Naturally, most Green Steel projects announced in Europe; Germany with most projects

Announced Green Steel projects by continent
No. of projects



Exemplary integrated steelmakers with Green Steel projects

SSAB, Boston Metal, posco, LIBERTY, ArcelorMittal, TATA STEEL, saarstahl, SALZGITTER AG Stahl und Technologie, thyssenkrupp, voestalpine ONE STEP AHEAD., H2 green steel, Vulcan GREEN STEEL Part of Jindal Steel Group

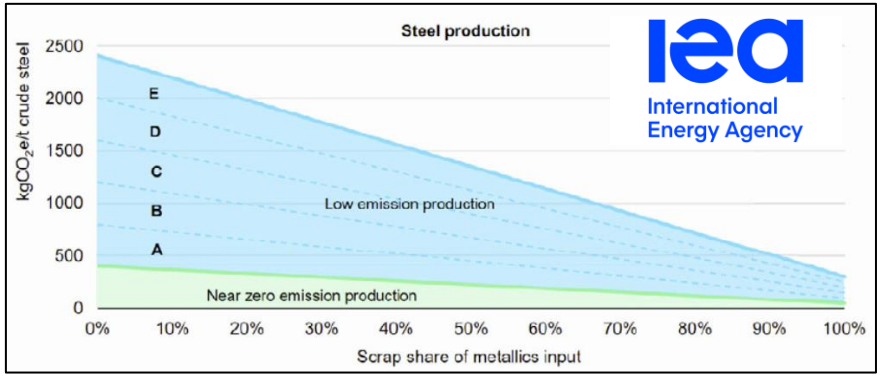
Swiss Steel Group

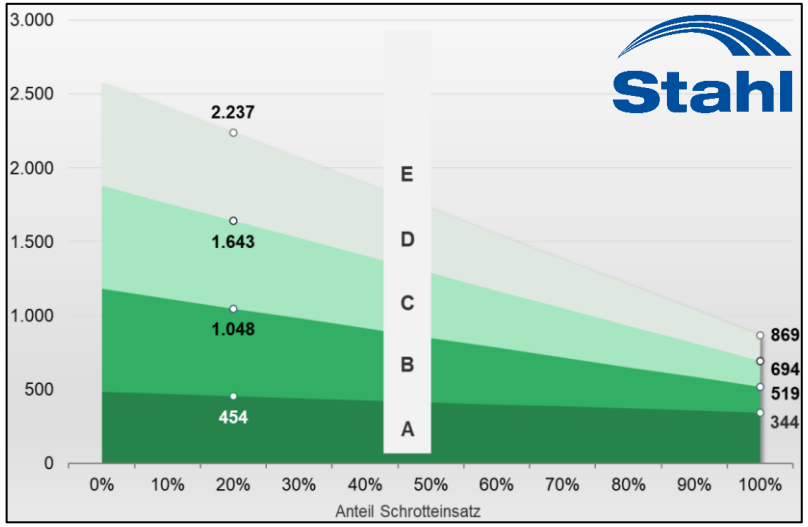
Source: Green Steel Tracker Version 11th November 2022

What is Green Steel?
No definition generally established yet

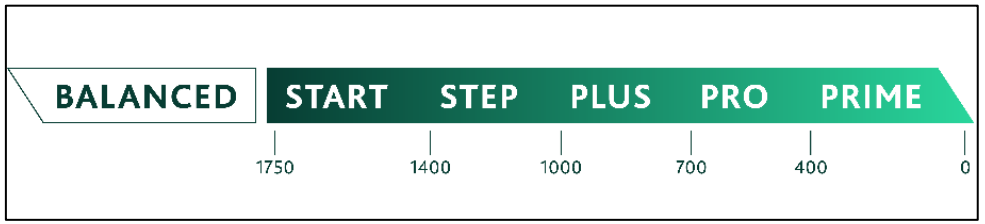
“Steel produced with lower CO2 emissions than conventional BF/BOF route”

Overview of some attempts to establish green steel definition
Selection





klöckner & co



Other definitions

RMI ENERGY. TRANSFORMED.

Responsible Steel standards & certification

SUSTAINABLE STEEL PRINCIPLES

EU Taxonomy

EUROFER THE EUROPEAN STEEL ASSOCIATION

Swiss Steel Group

Source: Websites; SSG Corporate Strategy

Exemplary full scale Green Steel projects with Green H2 Direct Reduction

H2 green steel

- Prominent Green Steel green field project
- Aims at leveraging abundant Swedish hydropower supply for green H2 production to be used for direct reduction of iron ore
- Green field approach founded in 2020, secured €260m in Series B round, €3.5bn in loans

SALZGITTER AG
Stahl und Technologie

- Project SALCOS to replace blast furnace with H2 direct reduction
- Overall, three project phases with first phase to go online 2025
- Costs for first phase ~€1.7bn of which €1bn government funding

thyssenkrupp

- Project tkH2Steel to replace blast furnace with H2 direct reduction
- Facility to go online end of 2026
- Order to build plant placed in March 2023; order size €1.8bn

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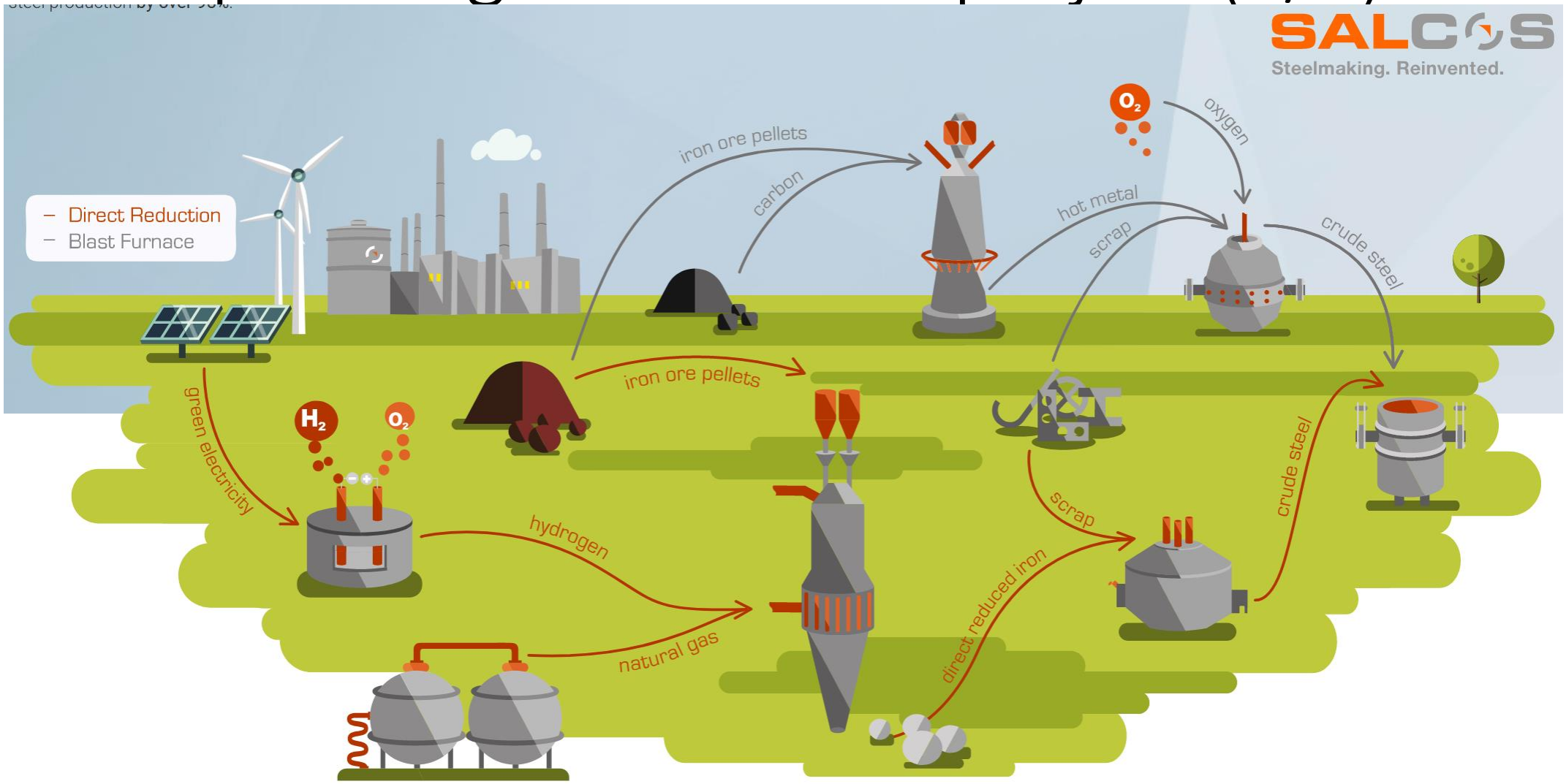
Source: Company websites; SSG Corporate Strategy

Example Salzgitter SALCOS project (1/2)



Source: Company website

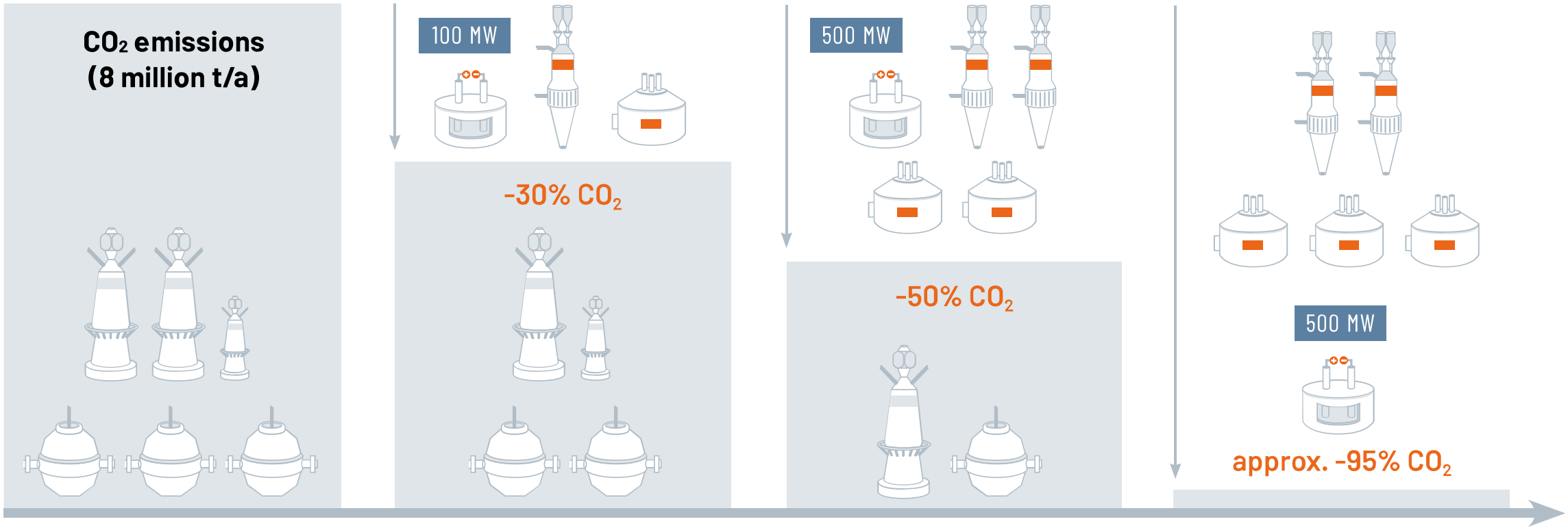
Example Salzgitter SALCOS project (2/2)

SALZGITTERAG Stahl und Technologie

STATUS QUO	STAGE I	STAGE II	STAGE III
Today	End of 2025	End of 2030	End of 2033

380 kV line

Expansion H_2 network



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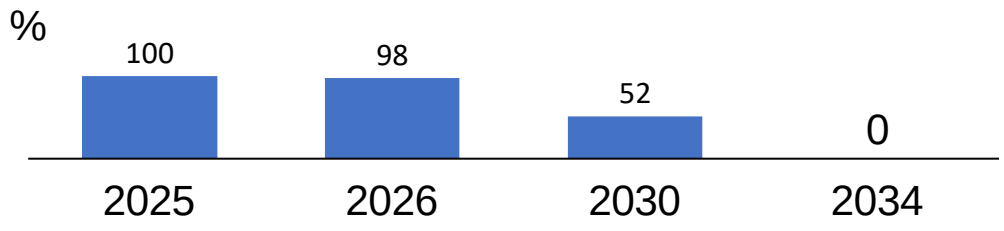
Source: Company website

Drivers of Green Steel transition

1

Reduction of free CO2 allowances for EU steel companies



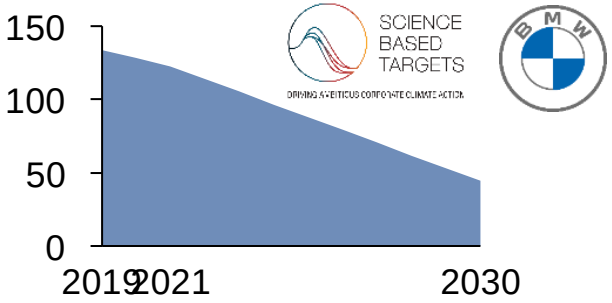
Carbon price

2

Sustainable "Zeitgeist"

- End consumers more aware of sustainability issues
- Companies aiming to become greener and market themselves as such
- Many set decarbonization targets also for upstream emissions

Illustrative BMW's decarbonization roadmap
Mio. tons CO2, approximation



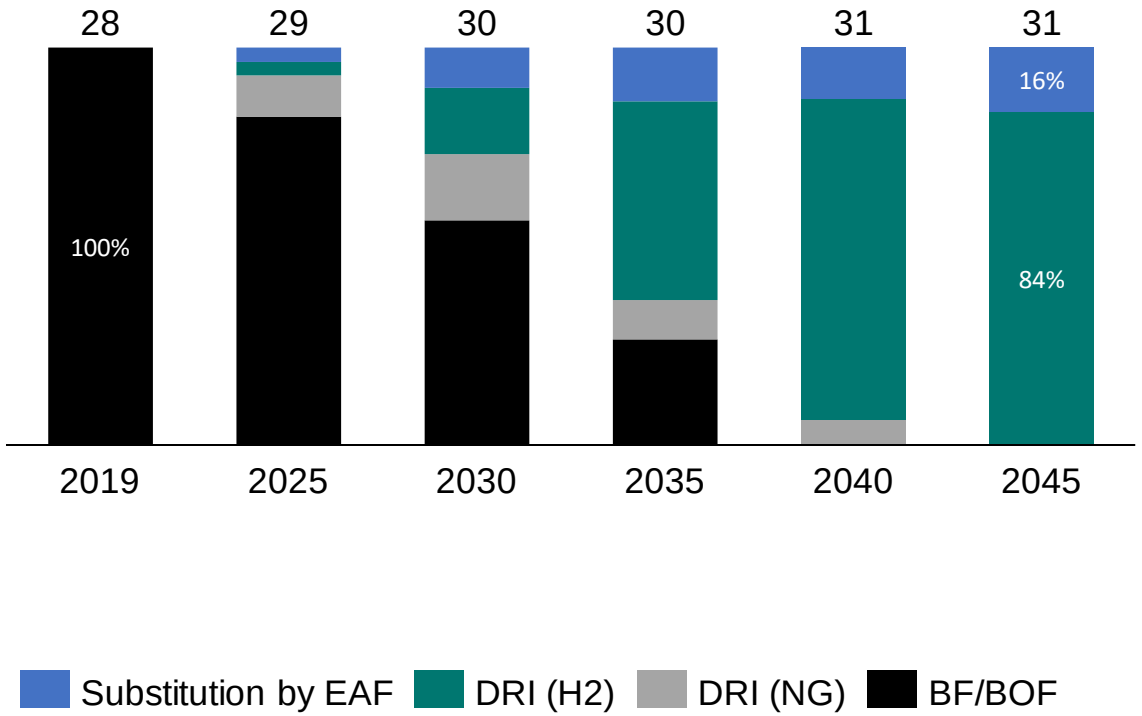
Targets

- Reduce emissions of own locations (Scope 1+2) by 80%
- Reduce emissions in use phase (Scope 3.11) by 50% per kilometre driven
- Reduce emissions in the supply chain (Scope 3.1) by 20% per vehicle produced

Source: EU Commission; BMW; Tradingeconomics; SSG Corporate Strategy

Implications of the Green Steel transition

Expected technological transition of German primary steel making

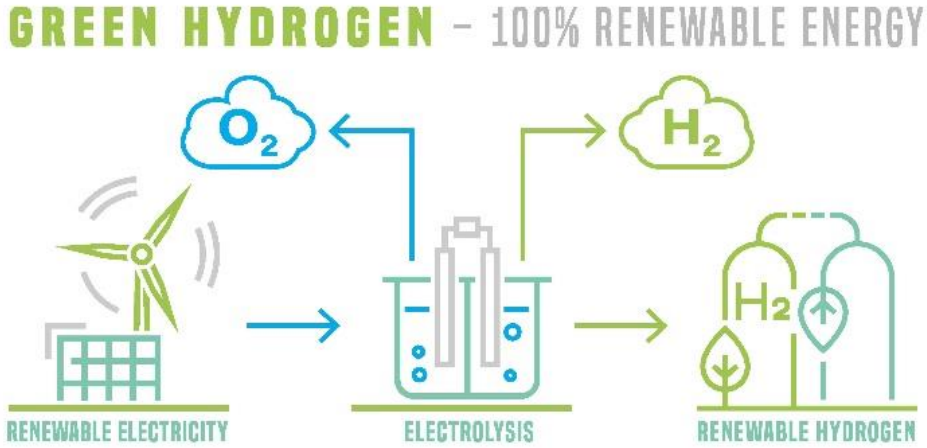


Implications

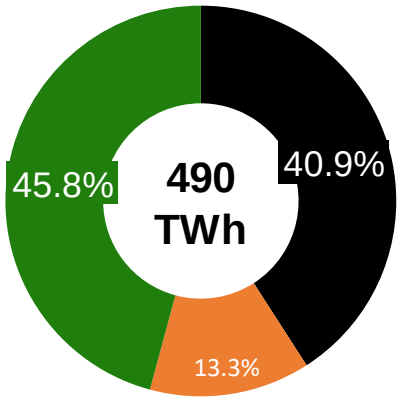
- Required massive investment in non-fossil power generation and hydrogen infrastructure
  - Increase in securing energy supply, e.g. PPAs
- Est. CAPEX requirements until 2050
  - Germany €30bn, Europe €100bn
  - Replacement of BF/BOF infrastructure; investments in downstream operations, e.g. hydrogen burners €1mn per heat treatment furnace
- Shift towards local power generation and hydrogen production
- Threat of production shift towards countries with low levelized cost of energy
- Protectionism (e.g. Carbon Border Adjustment Mechanism)
- Increase in demand for hydrogen resistant steels
- Increase in OPEX driven by, e.g. increased energy intensity of steel production, increased maintenance cycles, training, health and safety
- Electrification wherever possible

Source: Bundesverband der Deutschen Industrie (BDI) – Klimapfade 2.0; WV Stahl; EUROFER; SSG Corporate Strategy

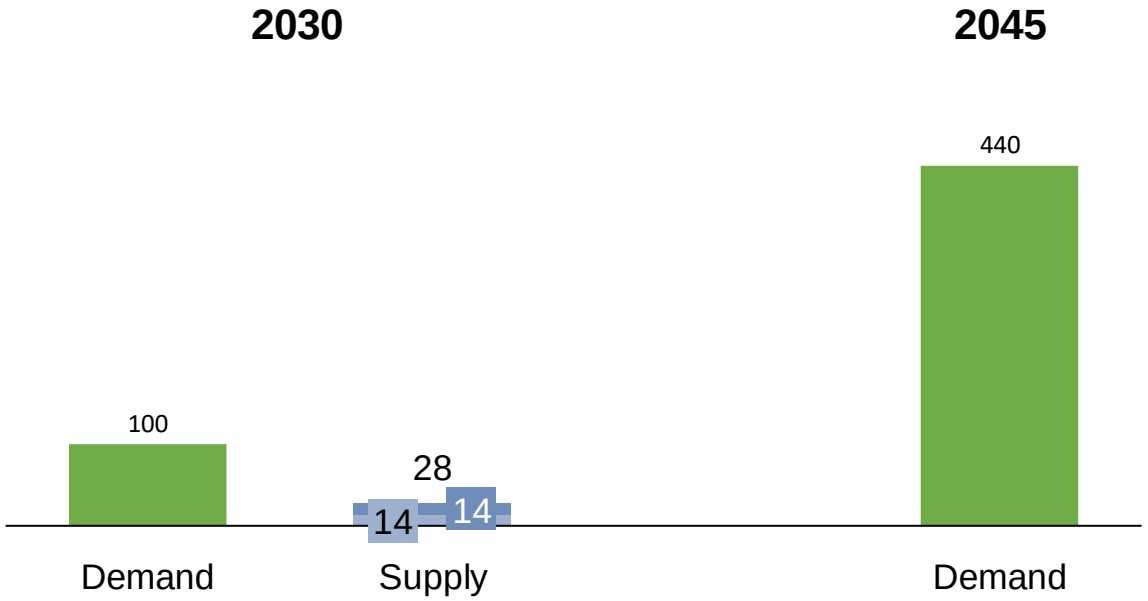
Use case: German green hydrogen supply



German power mix
2021



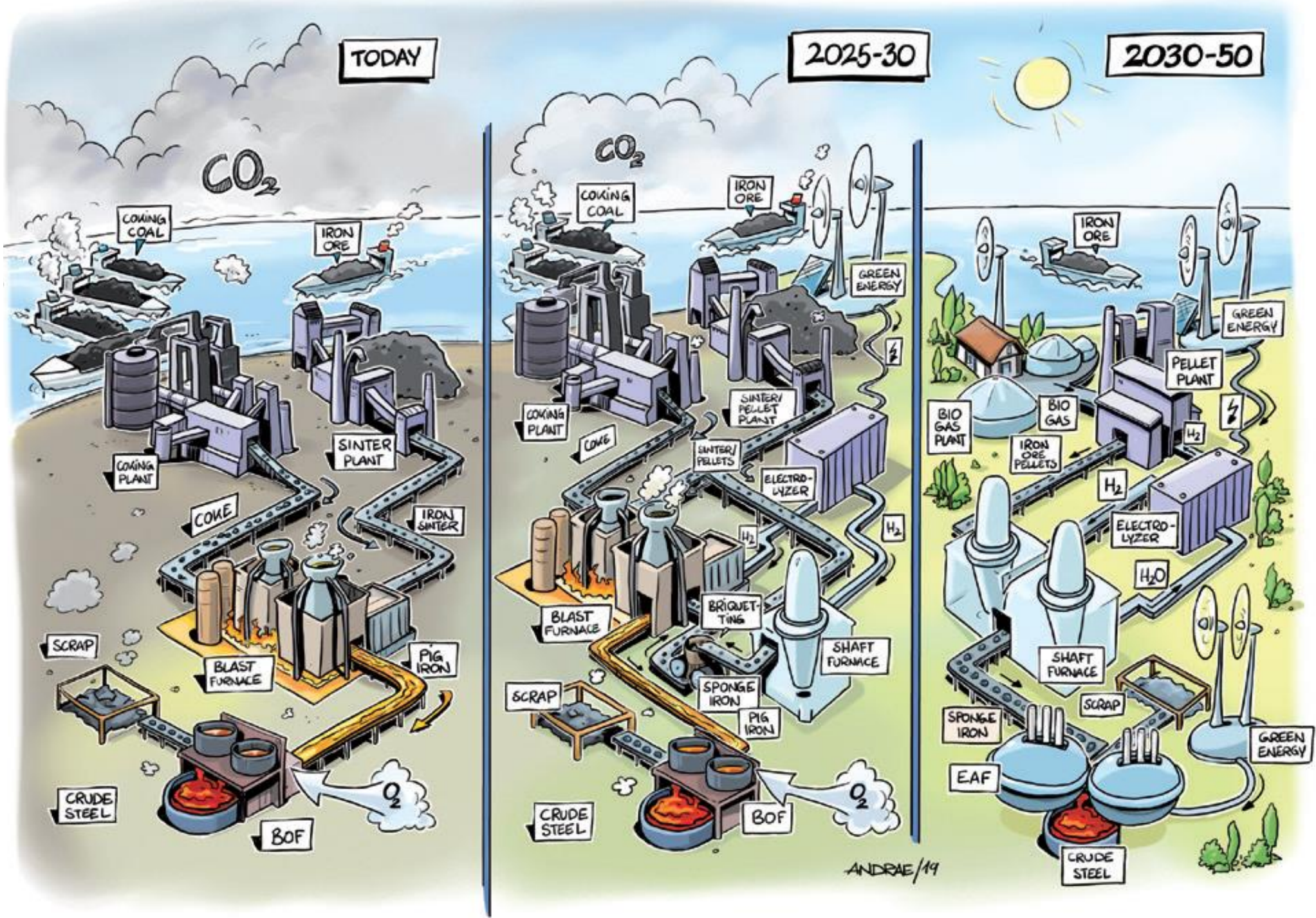
Fossil Nuclear Renewables



Demand Government coalition agreement National H2 strategy

Source: German National Hydrogen Strategy; Fraunhofer; VNG; SSG Corporate Strategy

Thank you



Source: Thomas Andrae

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