CLEAN STEEL PARTNERSHIP

Infoday CDTI

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Who are we?

5.200
Million euro turnover forecast in 2020

9.680
Direct & indirect employees

8M
Tons recycled annually

- Family company
- Steel recyclers
- Vertically integrated
- 2035 Zero Waste
  2050 Net Positive

Key data

- Aligned with EU's goal to achieve climate neutrality by 2050 – European Green Deal, Clean Planet for All strategy, Paris Agreement.
- Will develop and test lean CO2 technologies at large scales until 2030
- Aims to reduce CO2 from steel production by 80-95 % compared to 1990.

Horizon Europe Pillar and Cluster:	Pillar II – Cluster 4: Digital, industry and space
Type of partnership:	Co-programmed
Coordinating entity:	European Steel Technology Platform (ESTEP)
Total estimated budget:	EUR 1.7 bn
EU commitments:	EUR 700 m
Partners' commitments:	Up to EUR 1 bn
Predecessor under Horizon 2020:	The Clean Steel Partnership is a new partnership

Objectives

To develop technologies at **TRL8** to **reduce CO2** while preserving the competitiveness of the EU steel industry both for **BF-BOF and EAF** routes including the wider steel value chain.

BF-BOF vs EAF routes

ELECTRIC ARC FURNACE (EAF)

BLAST FURNACE (BOF)

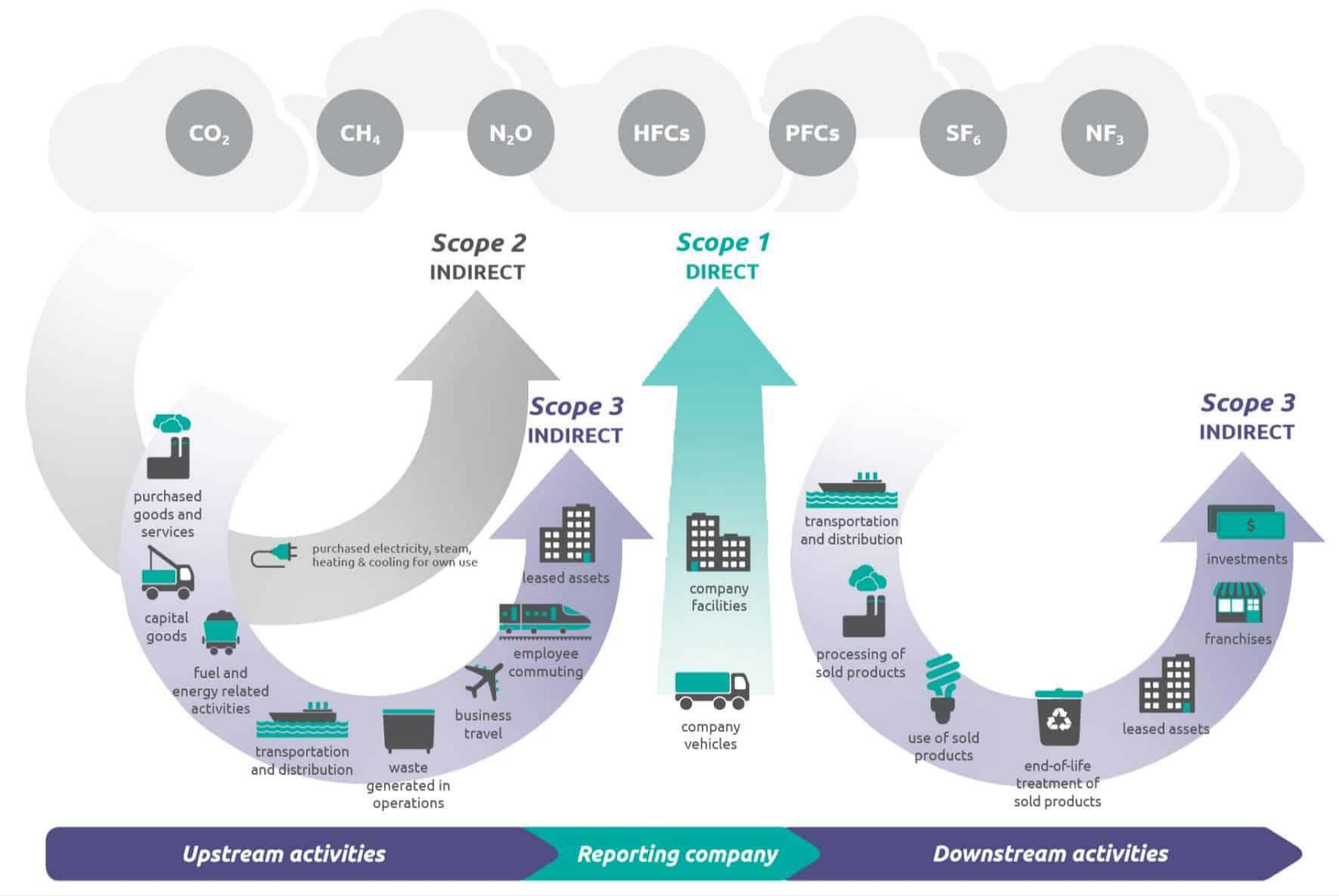
0,25t CO_2

x9

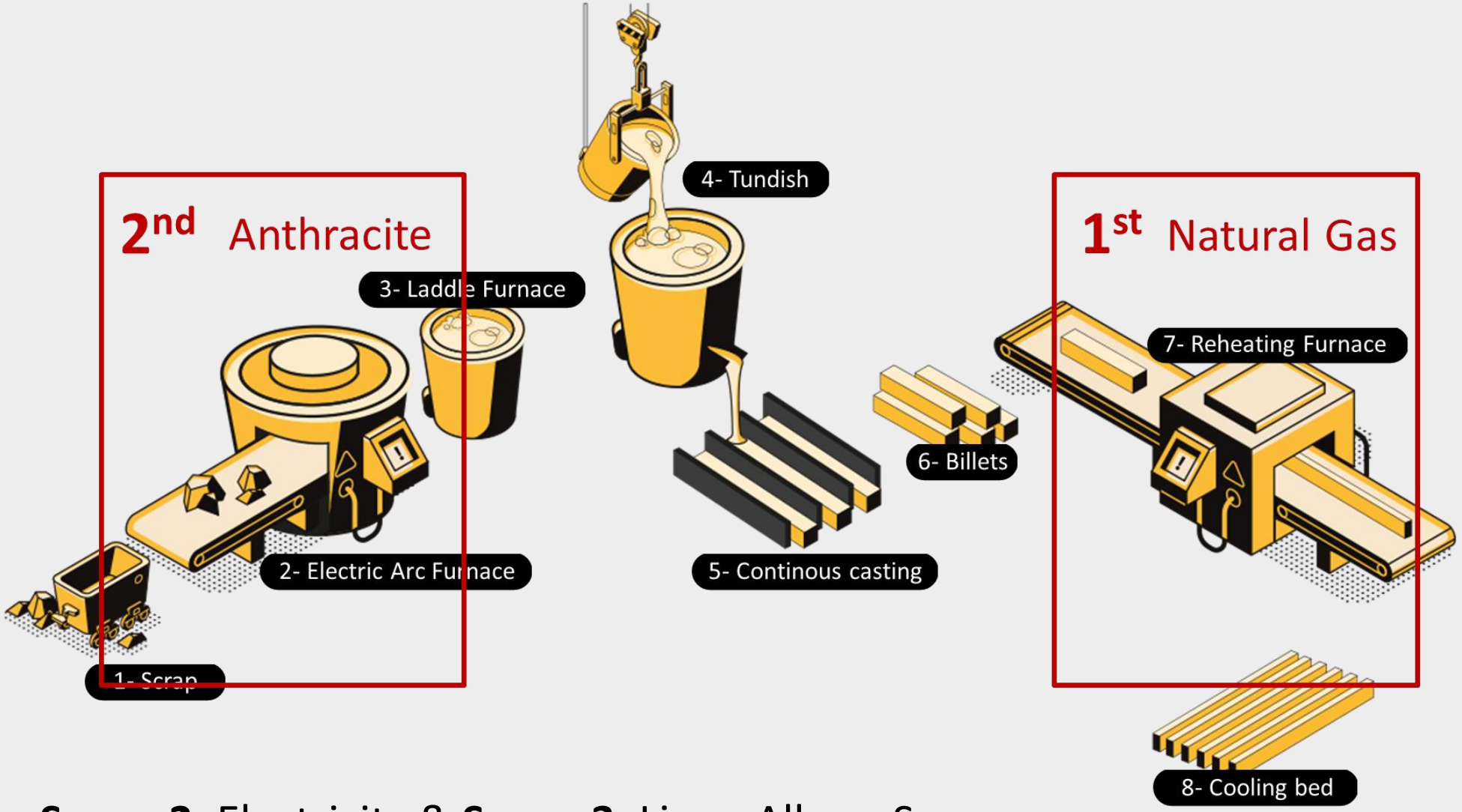
2,20t CO_2

CELSA IS **CIRCULAR**

Emission sources

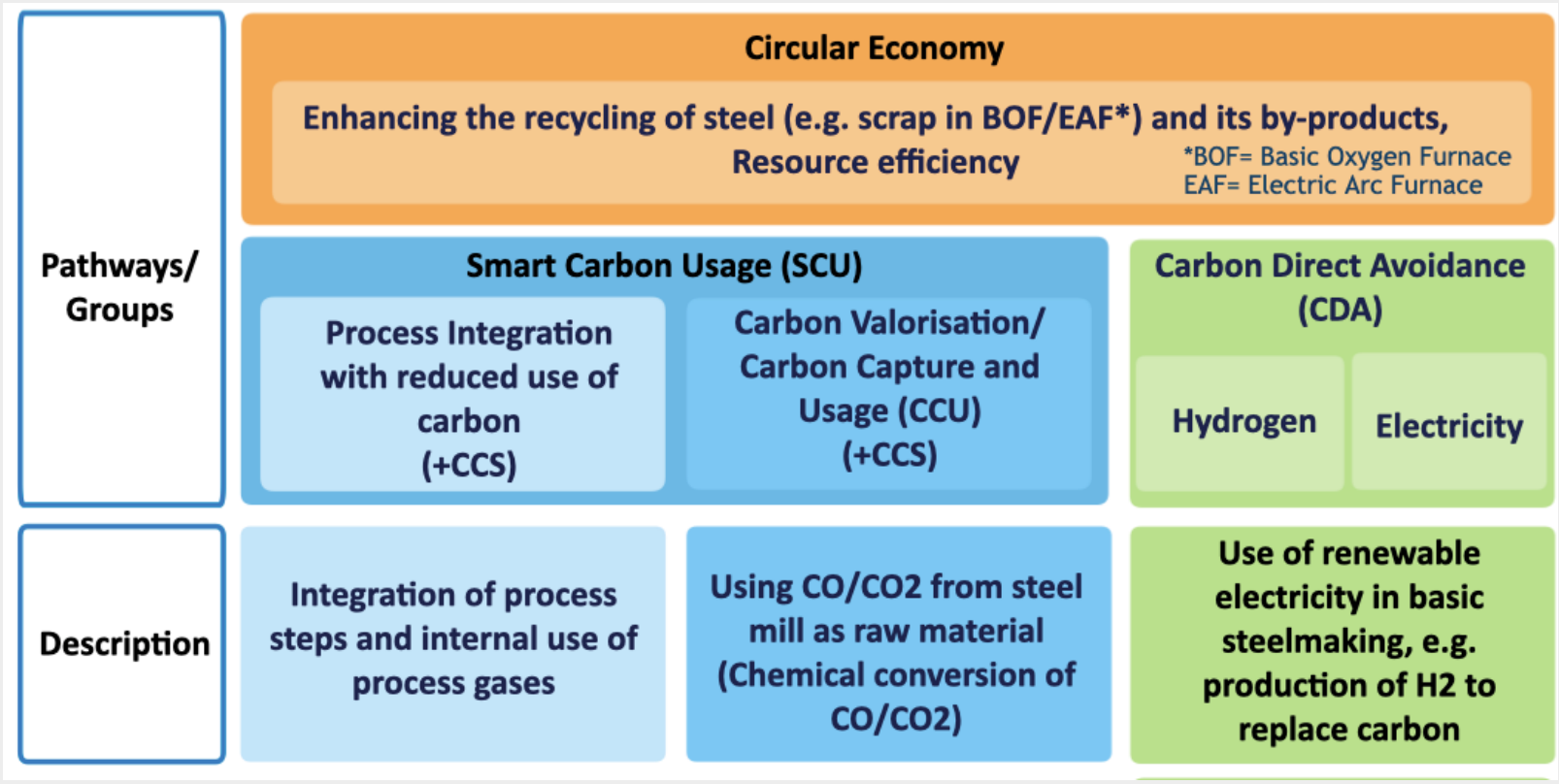


Scope 1 emissions in EAF process



Scope 2: Electricity & **Scope 3**: Lime, Alloys, Scrap.

3 Technology pathways for decarbonisation

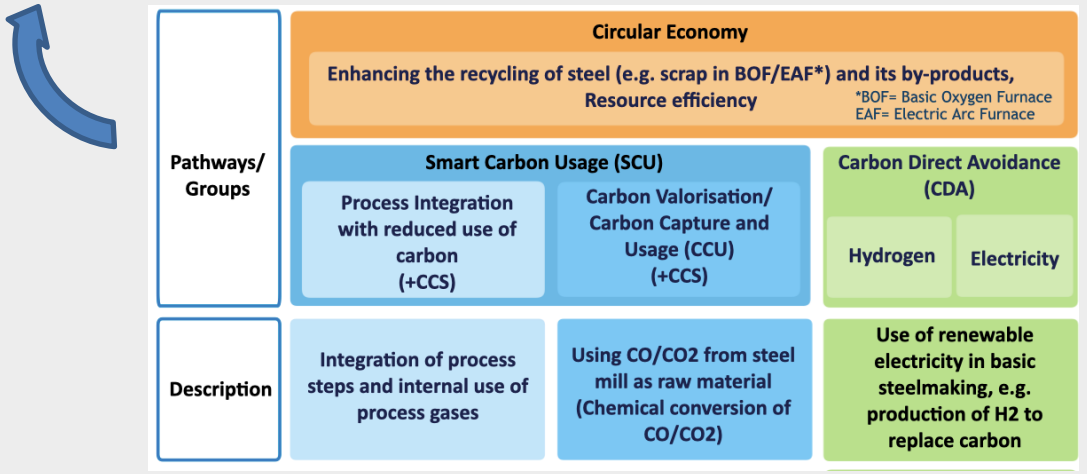


Source: Low Carbon Roadmap: Pathways to a CO_2-Neutral European Steel Industry, EUROFER, November 2019.

+ Enablers: digitalisation and social innovation.

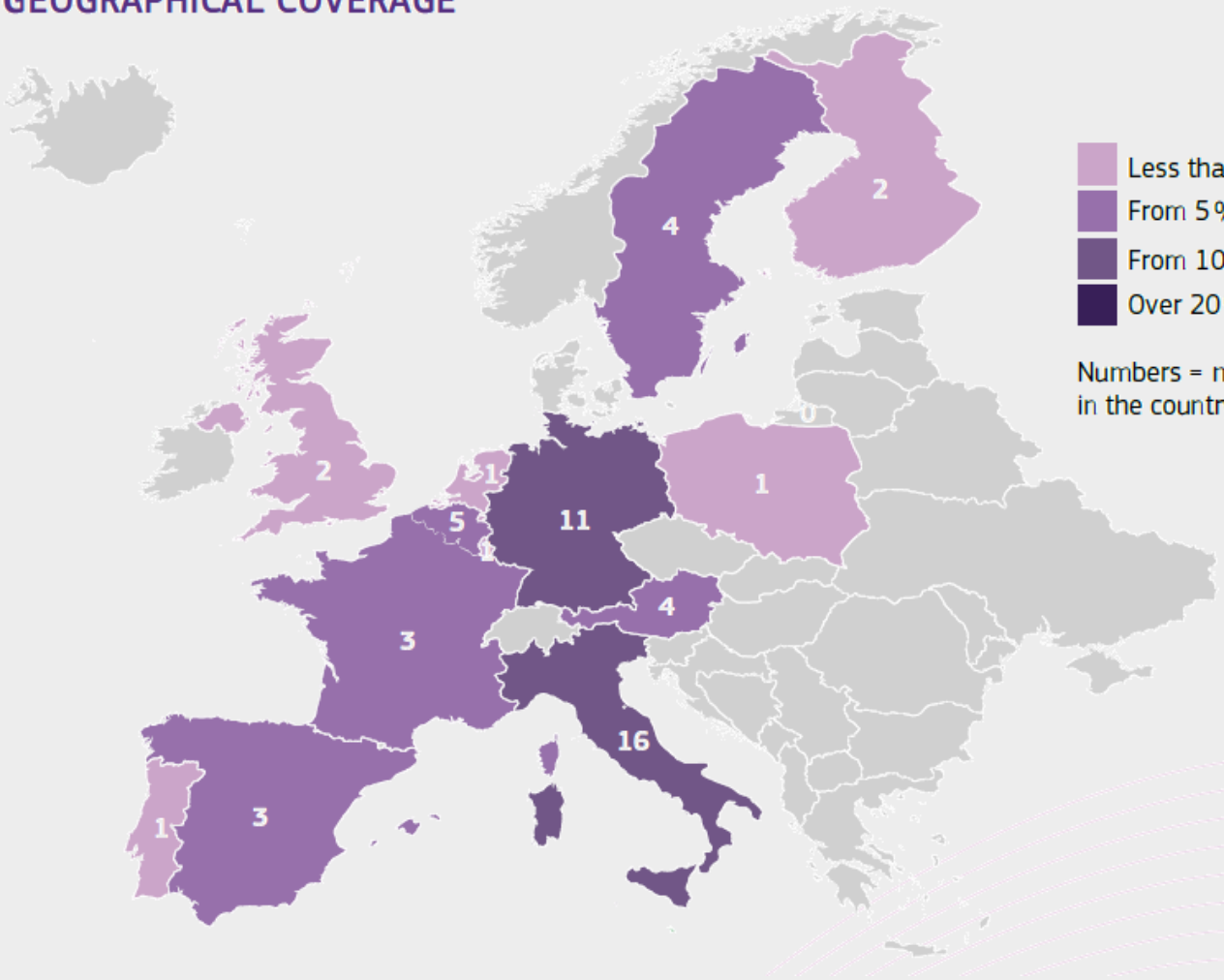
CSP Specific Objectives

CSP Specific objectives		
	1	Enabling steel production through carbon direct avoidance (CDA) technologies at a demonstration scale
	2	Fostering smart carbon usage (SCU – Carbon capture) technologies in steelmaking routes at a demonstration scale, thus cutting CO2 emissions from burning fossil fuels (e.g. coal) in the existing steel production routes
	3	Developing deployable technologies to improve energy and resource efficiency (SCU - Process Integration)
	4	Increasing the recycling of steel scrap and residues, thus improving smart resources usage and further supporting a circular economy model in the EU
	5	Demonstrating clean steel breakthrough technologies contributing to climate-neutral steelmaking
	6	Strengthening the global competitiveness of the EU steel industry in line with the EU industrial strategy for steel



Overview of members

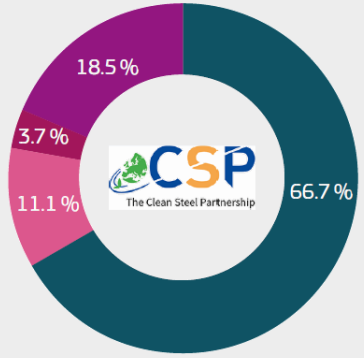
GEOGRAPHICAL COVERAGE



Less than 5%
From 5% to 10%
From 10% to 20%
Over 20%

Numbers = number of partners in the country

MEMBERS PER TYPE



INDUSTRY
UNIVERSITY
RESEARCH
OTHERS

- 54 Members
- In Spain: UNESID, Sidenor, CELSA Group

Calls

The topics of the Clean Steel Partnership are part of:

- **Horizon Europe** Work Programme: Cluster 4, Destination 1 (co-funded)
- **RFCS**:
  - Regular: next expected deadline March 2023
  - Big ticket: next expected deadline May 2023

CSP in Horizon Europe

TWIN GREEN AND DIGITAL TRANSITION

- Pilot started in 2021-22 and continued in 2023-24
- IA: 60% funding for with-profit entities

2023	TWIN-TRANSITION-01-43: Low CO2 emission technologies for melting iron-bearing feed materials OR smart carbon usage and improved energy & resource efficiency via process integration (IA)
	TWIN-TRANSITION-01-45: Circular economy solutions for the valorisation of low-quality scrap streams, materials recirculation with high recycling rate, and residue valorisation for long term goal towards zero waste (RIA)
2024	TWIN-TRANSITION-01-44: Digital transformation and ensuring a better use of industrial data, which can optimise steel supply chains (IA)
	TWIN-TRANSITION-01-46: CO2-neutral steel production with hydrogen, secondary carbon carriers and electricity OR innovative steel applications for low CO2 emissions (RIA)

Topics 2023

TWIN-TRANSITION-01-43: Low CO2 emission technologies for melting iron-bearing feed materials OR smart carbon usage and improved energy & resource efficiency via process integration

Indicative budget: 23 M€

EU grant/project: 4-6 M€

IA - TRL: 5→6-7

Expected Outcomes:

- Integrating the next-generation iron-bearing feed materials melting technologies into an existing and optimised steelwork
  - Introduce novel or enhanced melting processes reducing CO2 by at least 20% compared to current state of the art
  - Integrate next-gen melting technologies into an existing and optimized steelwork; consider supply chain C footprint
  - Enhanced use of iron-bearing feedstock intermediate products with variable content of carbon and metallization

- Cut CO2 emissions by SCU-PI; replace coal with, e.g., biogas, H2, or advanced management or systems/gases
  - Integrate information and communication technology (ICT) to optimize efficiency of steelmaking and downstream processing (heating and treatment furnaces) in steel plants.
  - Improve injection of metallurgical gases, H2-rich gases and/or H2 within the steel making processes.
  - Adapts gas handling systems to new gases and their related properties.
  - Use and recycle gases in integrated plants with mixed technologies routes (e.g., waste gases from neighbouring chemical plants or syngas produced from an external pyrolysis plants).
  - Enhance production and energy management of integrated plants with mixed routes (e.g. BF-BOF, DR-EAF).

Procedure: To ensure a balanced portfolio covering the 2 areas, grants will be awarded to at least one project in each area

Topics 2023

TWIN-TRANSITION-01-43: Low CO2 emission technologies for **melting iron-bearing feed materials** OR smart carbon usage and improved energy & resource efficiency via process integration

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RESEARCH ACTIVITIES:

- Adding variable % of iron-bearing feed materials with variable content of carbon and metallisation to the melting process without prejudice to the yield of the metallic charge.
- replace the use of carbon by climate-neutral sources or H2
- Reducing specific energy consumption – optimising charge mix or preheating.
- Assess material quality of low value iron-ore recovering metal through reduction
- Controlling tramp elements
- Real time management tools for the melting process

Topics 2023

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RESEARCH ACTIVITIES:

- Injection / reutilisation of gases: H2, biogas
- Monitoring and control

- **Cut CO2 emissions by SCU-PI**; replace coal with, e.g., biogas, H2, or advanced management or systems/gases
  - Integrate information and communication technology (ICT) to optimize efficiency of steelmaking and downstream processing (heating and treatment furnaces) in steel plants.
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Topics 2023

TWIN-TRANSITION-01-45: Circular economy solutions for the valorisation of low-quality scrap streams, materials recirculation with high recycling rate, and residue valorisation for long term goal towards zero waste

Indicative budget: 12 M€

EU grant/project: 4-6 M€

RIA - TRL: 4→5-6

Expected Outcomes:

- Implement highly efficient technologies for recovering metal (iron and non-ferrous metals) and mineral fractions from in-plant steelmaking residues. The recovery technology should condition the composition and properties of the residue. If appropriate, use high-throughput characterization and/or multi-modal approaches in analytical research infrastructures to build relevant structural/statistical information.

- Characterize and/or modify properties of residues in the present value chain and/or innovative applications, to valorize them. If appropriate, use high-throughput characterization and/or multi-modal approaches in analytical research infrastructures to build relevant structural/statistical information.

- Enhance use of low-quality scrap by new technologies and iron/steel making routes targeting high quality of finished products and reduced CO2 emissions.

- Develop technologies and processes for upgrade of low-grade iron ores and other iron-bearing materials.

Topics 2023

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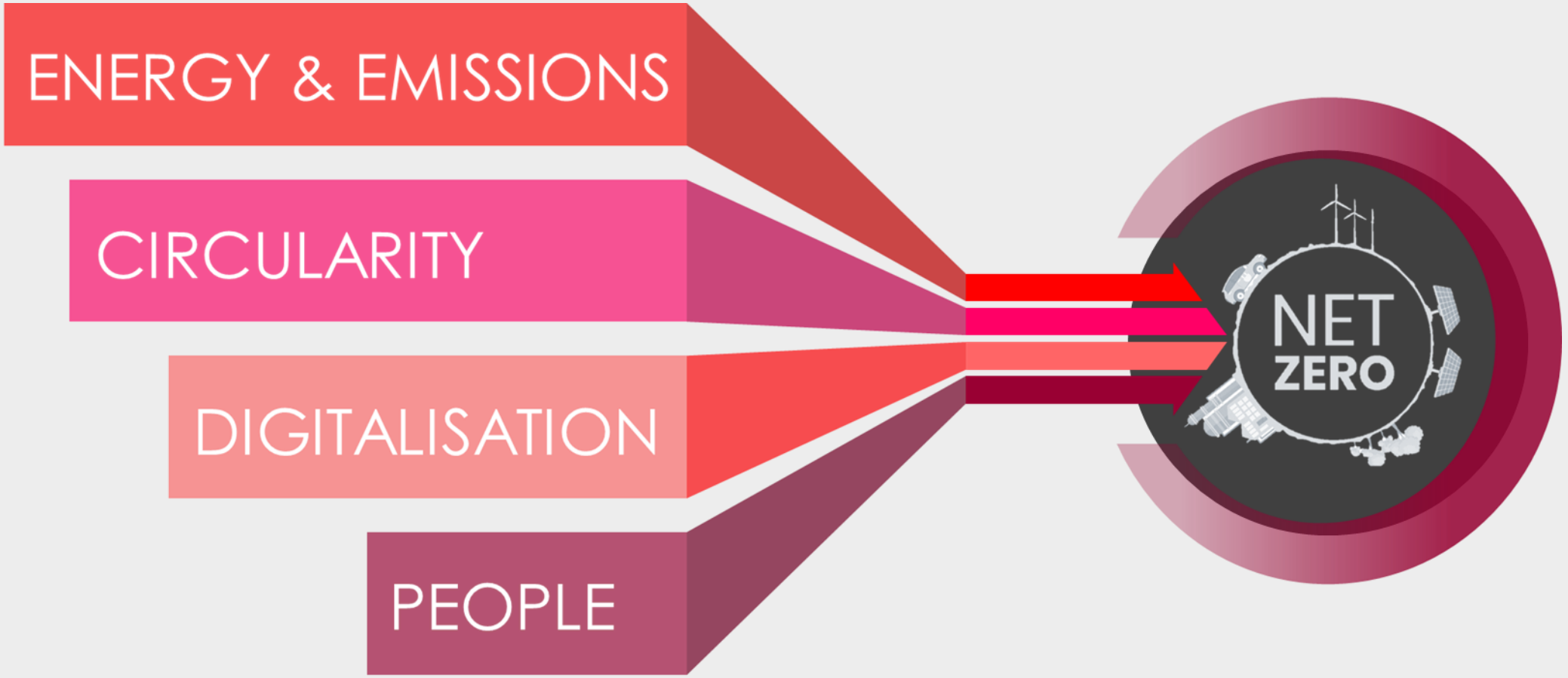
RESEARCH ACTIVITIES:

- To reduce / reuse / recycle of by-products: slags, dusts, sludges.
- Increased scrap rates through better classification, management, sorting, charging.

Develop technologies and processes for upgrade of low grade iron ores and other iron bearing materials.

Our challenges



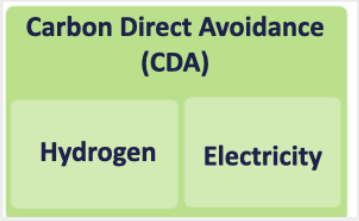
Our main challenges for CSP

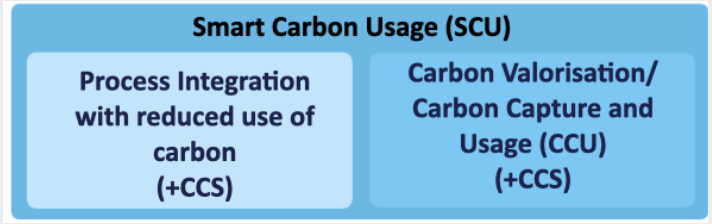
- Energy efficiency
- Using H2 as a fuel and as a reducing agent

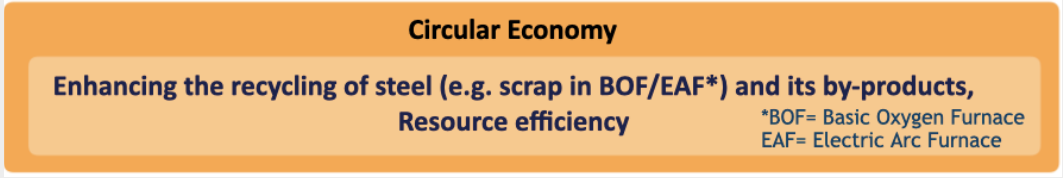
- Heat recovery
- Energy & water management solutions
- Hybrid heating
- Replacing anthracite

- Scrap/residues recovery
  - Plastics, Al, Cu…
- Material characterisation
- Upcycling of by-products

- Enablers: process modelling and simulation, scrap management.



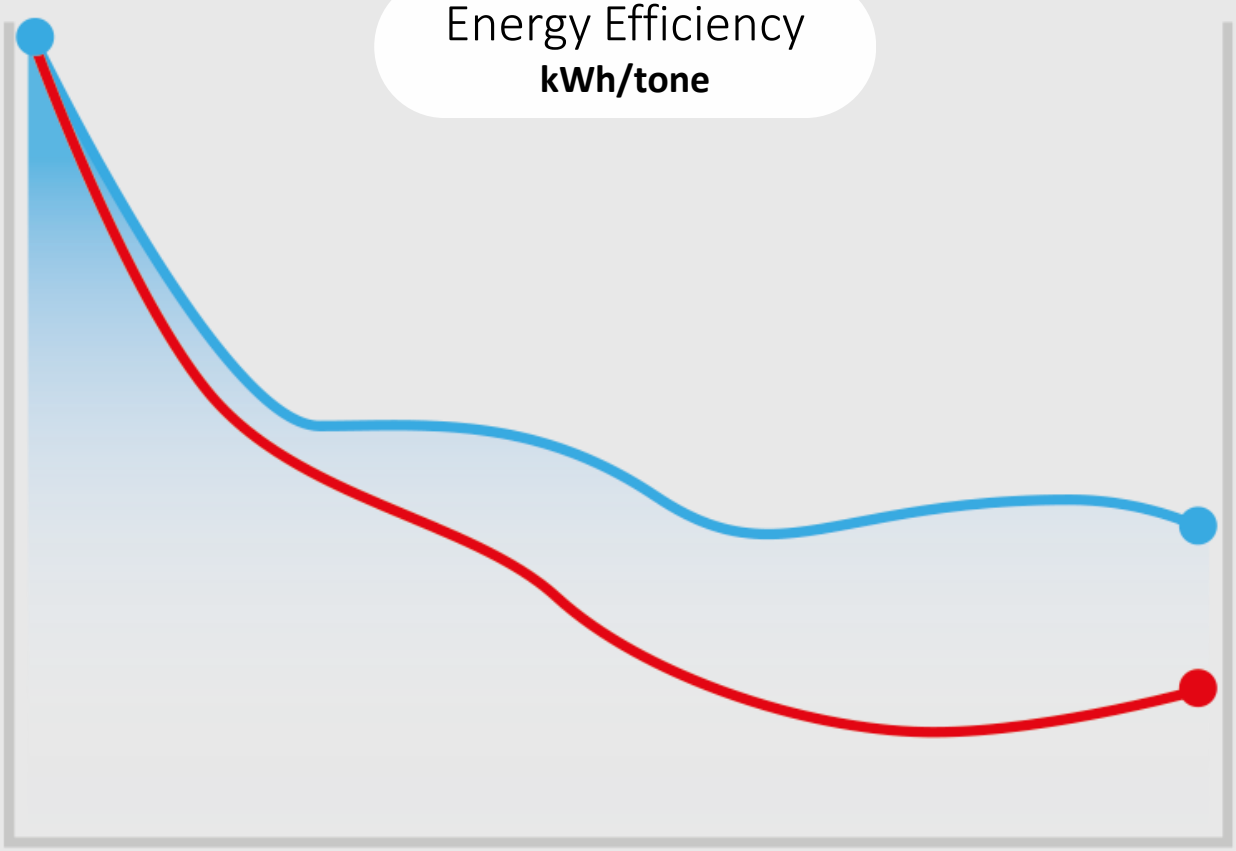




What are we achieving?

2005
1130 kWh/tone

Energy Efficiency
kWh/tone

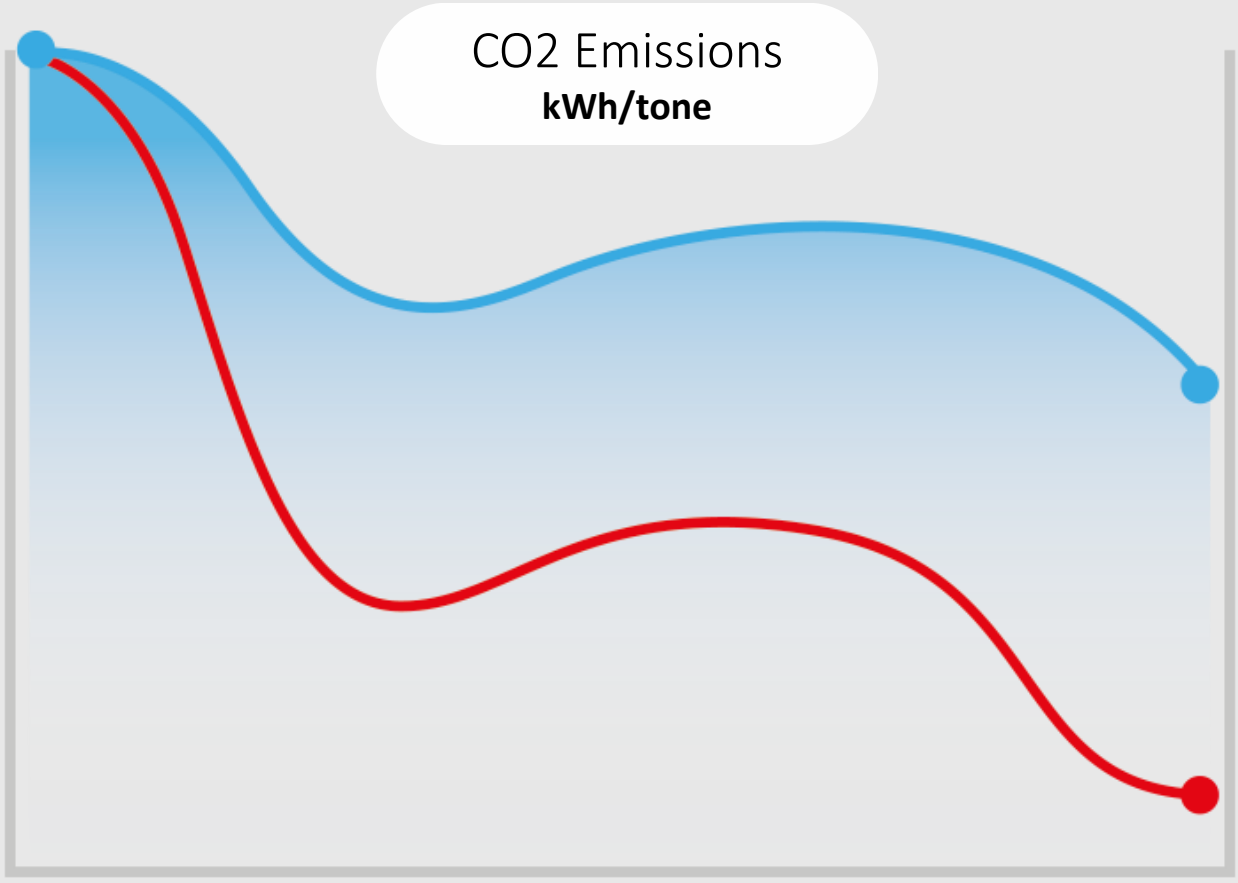


2021
957 kWh/tone

-15%

What are we achieving?

2005
423 Steel/TN



2021
256 kCO2/tone

-40%

How to do more?

COLLABORATING