EUROFER
The European Steel Association

Innovations for Competitiveness. The Basic Industries – A Drive for Growth
Sofia, 31 January 2018

TOWARDS AN EU MASTERPLAN FOR A LOW-CARBON, COMPETITIVE EUROPEAN STEEL VALUE CHAIN

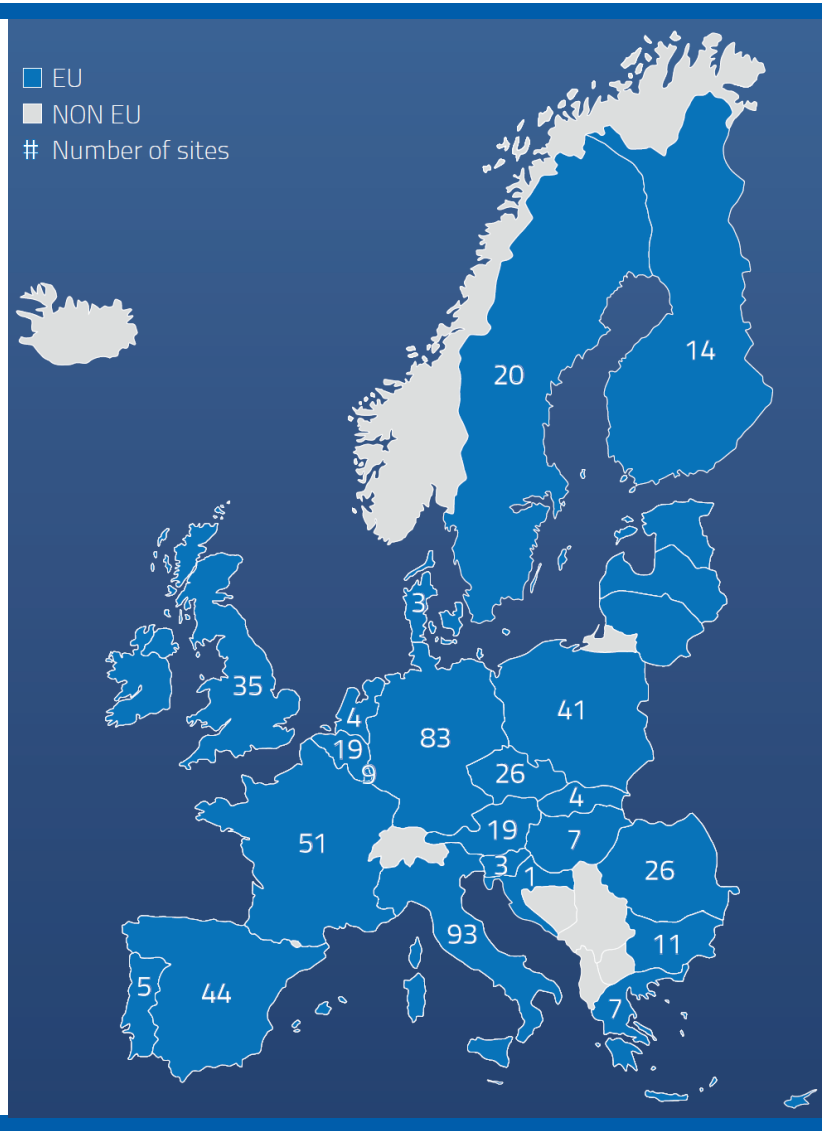
Axel Eggert, EUROFER

ABOUT THE EUROPEAN STEEL INDUSTRY

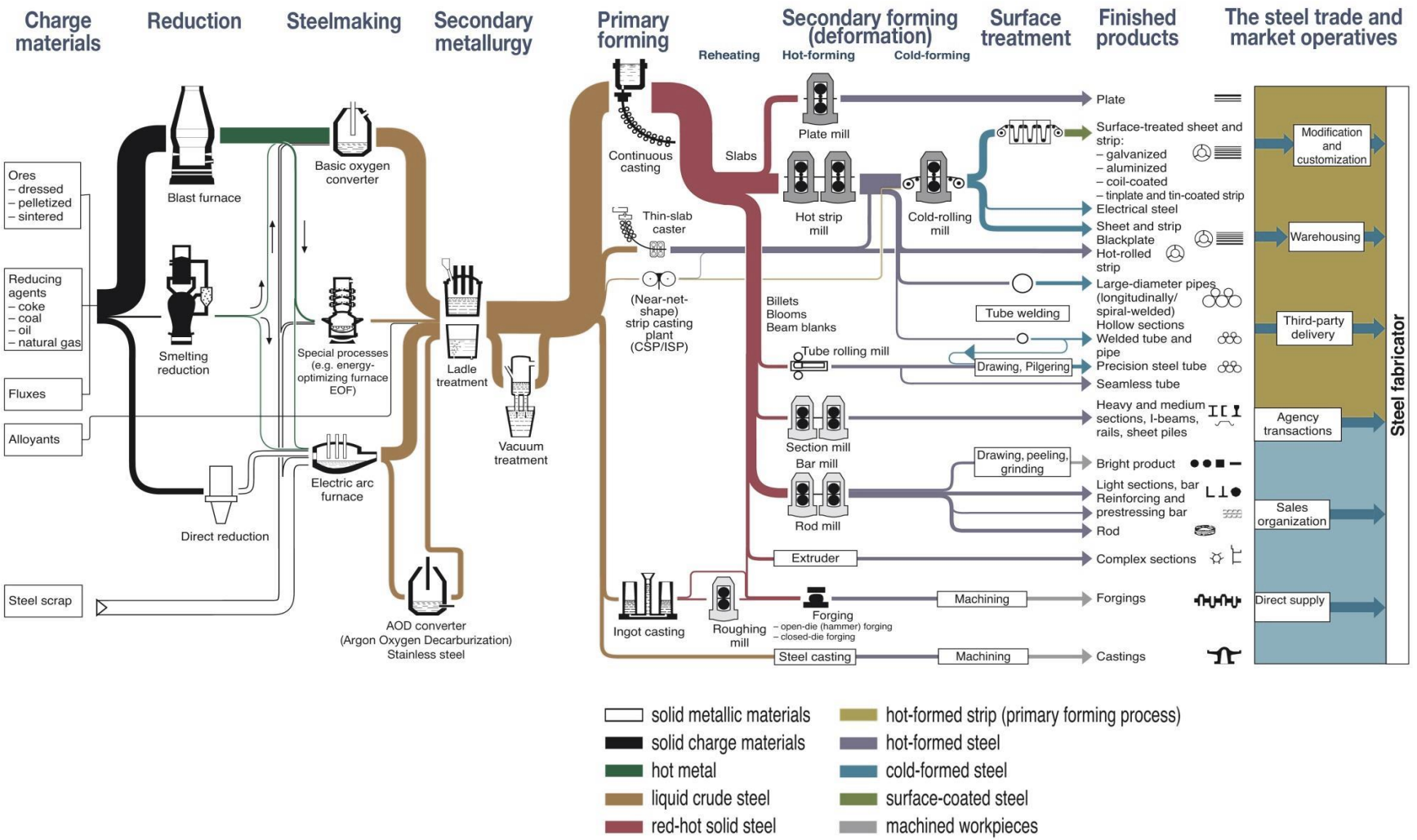
- 500 production sites
- 160 million tonnes of steel produced per year
- €166 billion turnover; 1.12% of EU GDP
- 320,000 direct jobs
- Millions of indirect jobs in value chain and related service sectors

- 20% drop in employment since 2007
- 28% drop in EU steel demand (2007-2014); gradual recovery has mostly benefitted importers
- EU steel faces relatively high energy prices
- Unfair trade practices from non-EU countries undermine EU

- Multiplier effect : 1€ demand for steel = 3.1€ to society
- 100% infinitely recyclable - Steel is a permanent material
- 50% reduction in CO_2 emissions and energy use since 1960s
- 500 million tonnes of CO_2 can be saved in other sectors per year by 2030 with innovative steel applications

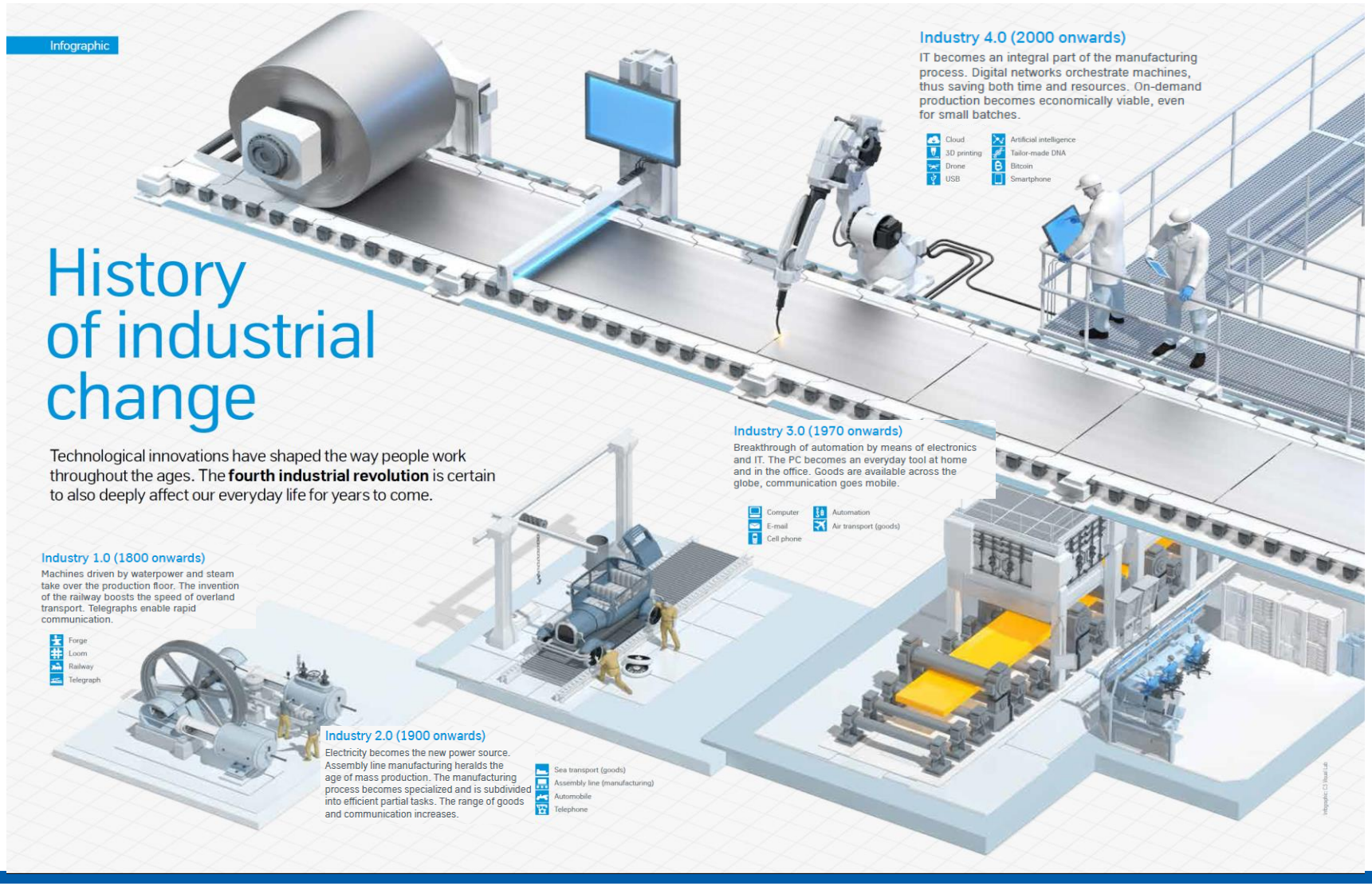


STEELMAKING … A COMPLEX BUT SOPHISTICATED PROCESS



EUROPEAN STEEL IS HIGH TECH

4 INDUSTRIAL REVOLUTIONS

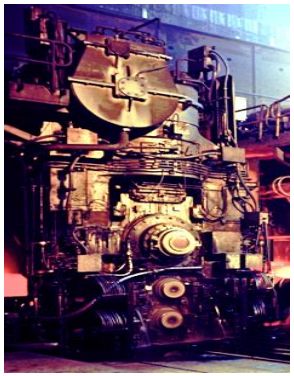


Source: compact steel, issue 01/2017, thyssenkrupp-steel.com

WHAT IS A CYBER PHYSICAL SYSTEM?

„…merging of information processing with physical processes“

- IT-systems directly **embedded** in the technical process
- Integration of processes among themselves by **information flows**
- **Interaction** of the technical process with its environment
- **Learning functions** to adapt technical processes and IT-systems



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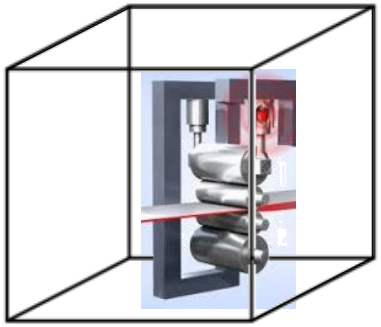
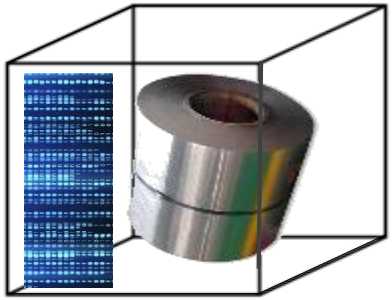


Digital twins

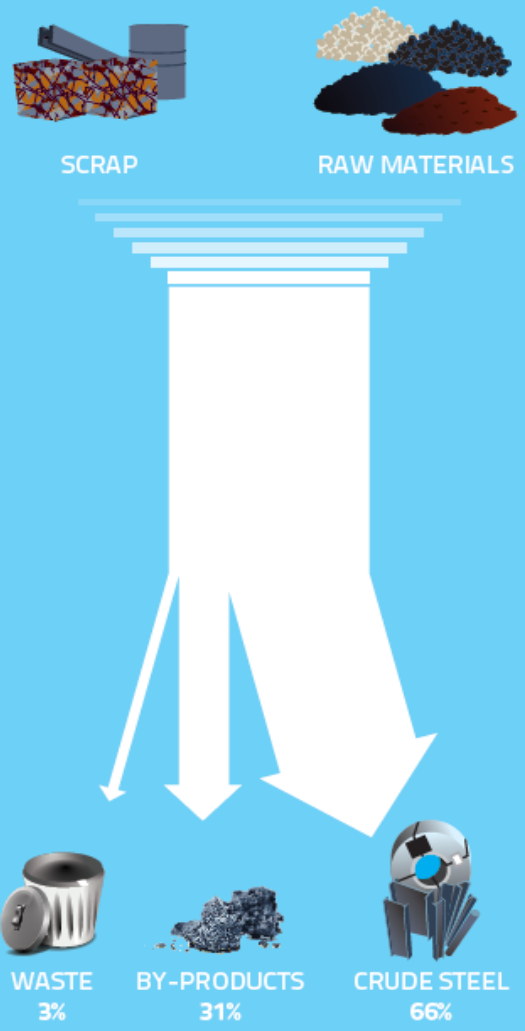
- mechanics
- electrics
- automation
- IT + Software
- maintenance
- HMI
- identification

+

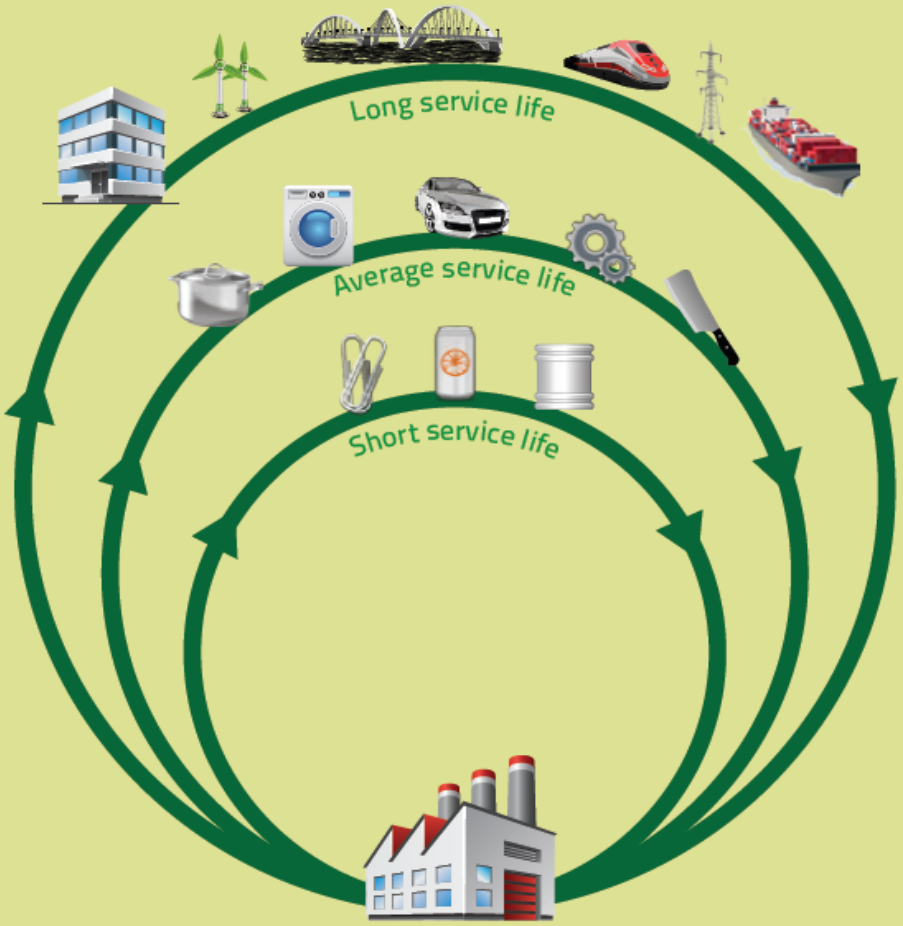


- identification
- quality data
- production history
- process data
- customer demands
- ...

STEEL IS TRULY CIRCULAR



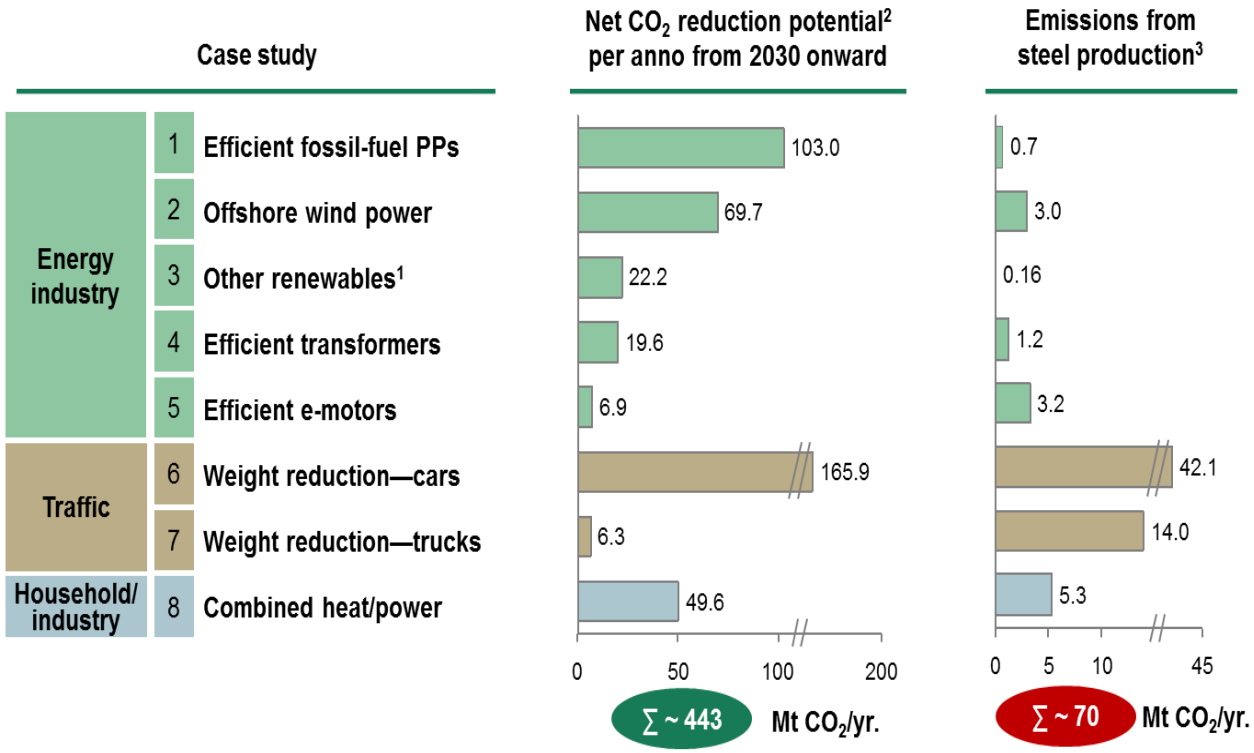
EUROFER based on worldsteel calculations



EUROFER based on WV Stahl

THE USE OF STEEL IN INNOVATIVE APPLICATIONS …

… saves more CO_2 than is emitted in the production phase.



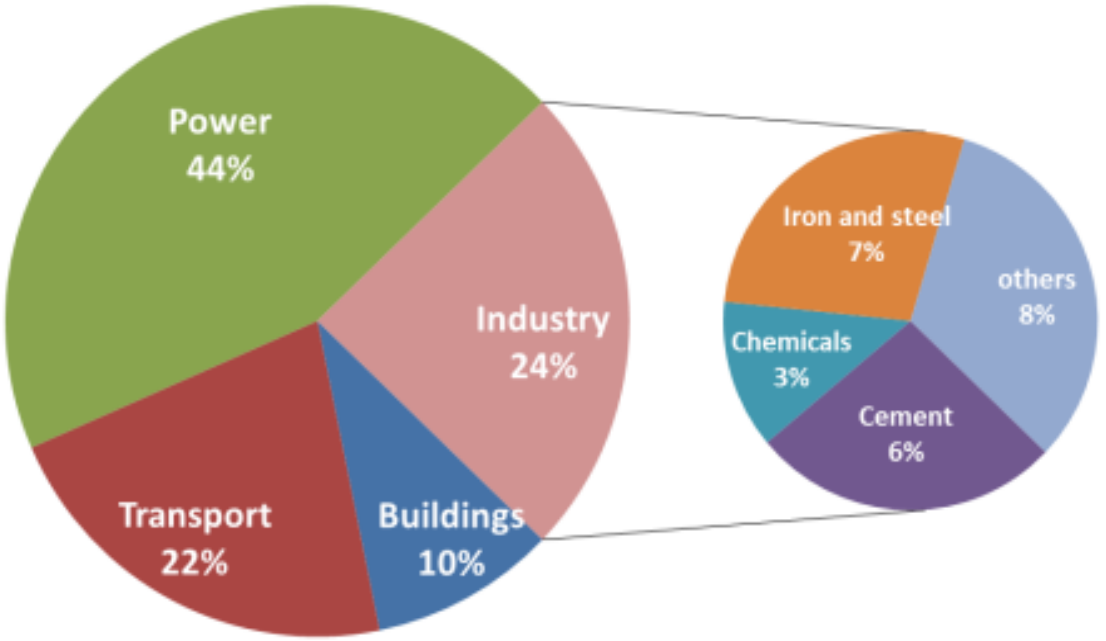
Ratio: 6/1

- Innovations in the EU steel industry have led to almost 2500 steel grades
- 8 case studies show that the use of steel in innovative applications saves 6 times more CO_2 than is emitted in the production phase

1. Bioenergy 2. *Net reduction* refers to reduction attributable to steel 3. Refers to the emissions related to the amount of steel needed for the specific application
Note: PP = power plant ;
Source: BCG and Steel Institute VDEh

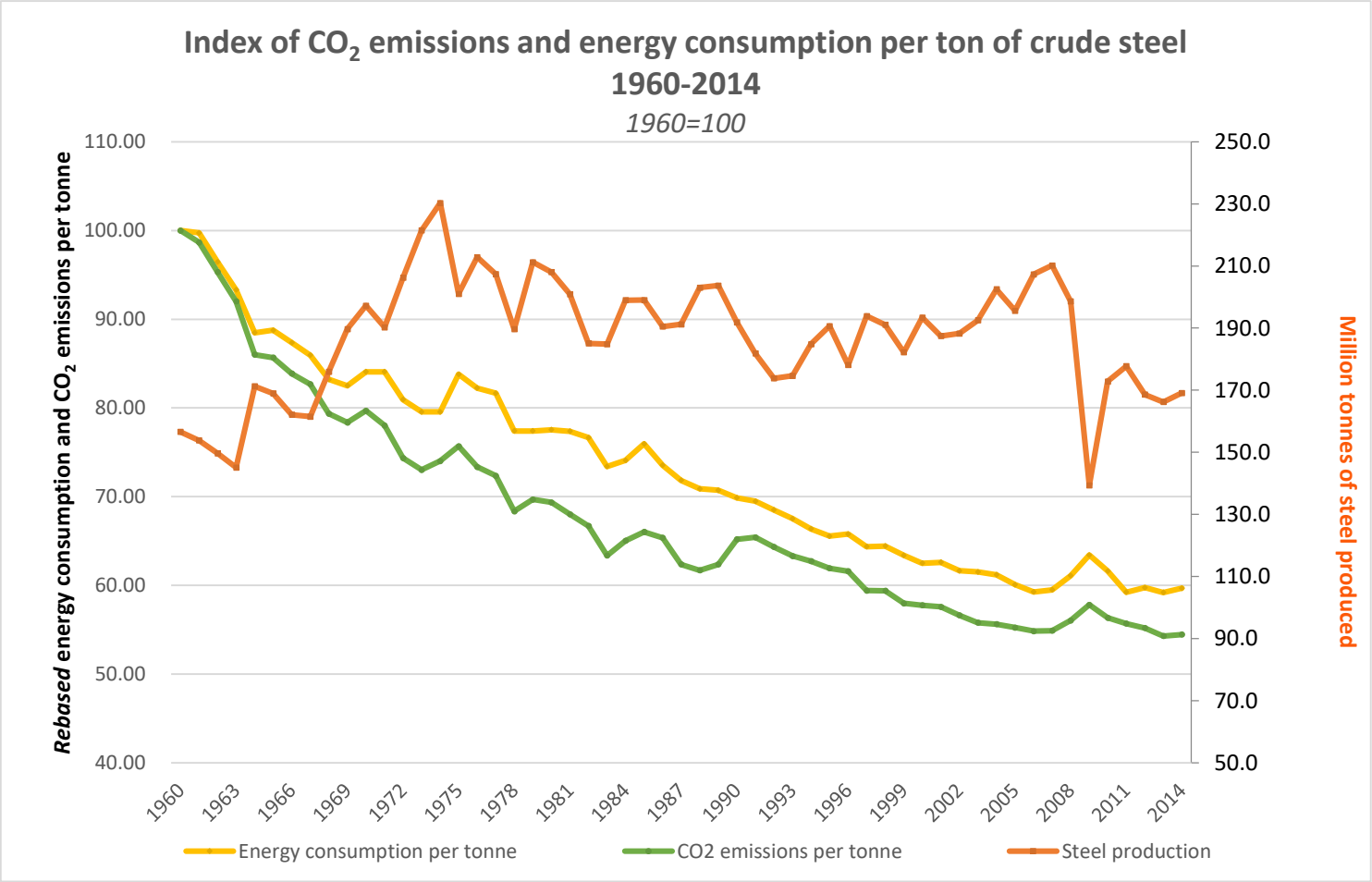
A GLOBAL CHALLENGE – CAN THE EU LEAD BY EXAMPLE ?

- 1.7 billion tonnes of steel are produced globally every year - and it continues to increase
- Direct emissions from global steel production represent almost 7% of the global total



Direct CO_2 Emissions Sources 2014 (IEA)

CO_2 EMISSIONS & ENERGY CONSUMPTION IN EU STEEL



- EU producers are reaching the thermodynamic limits of current processes

EU CLIMATE OBJECTIVES – CAN INDUSTRY COPE ?

- **EU GHG emission reduction target:**
  - 80%-95% by 2050 compared to 1990
- **EU ETS reduction target:**
  - 43% by 2030 compared to 2005 (= 55% compared to 1990)
  - 2.2% p.a.
- **Shortage for the EU steel industry in free allowances 2021-2030:**
  - 25.5% on average
- **EU Carbon Price (EUAs):**
  - EU carbon price 26/01/2018: € 9,34
  - Forecast 2020: € 14,70
  - Forecast 2030: € 25,00-53,00
- **EU steel industry average EBITDA 2002-2014: ~ 35€/t steel**
  - EU steel – squeezed between global overcapacities and trade distortions by third countries – needs sustainable profit margins

A GLOBAL CHALLENGE – CAN THE EU LEAD BY EXAMPLE ?

- ***Only** if the EU can demonstrate that the decarbonisation of the industry is possible without the sector losing market share or profit margins, other regions will follow the EU's path*

EU STEEL VALUE CHAIN – A GLOBALLY UNIQUE R&D NETWORK

Joint research institutes*

Germany
- BFI, Duesseldorf ..... A
- MPIE, Duesseldorf..... B
- FEhS, Duisburg..... C
- SGA, Othfresen..... D

Belgium
- CRM, Liege..... E

Spain
- CENIM, Madrid..... F
- Fundaction Labein, Derio..... G

Portugal
- ISQ, Cabanas-Leiao..... H

Italy
- CSM, Rom..... I

Slovenia
- IMT, Ljubljana..... J

Czech Republic
- Skoda Research, Pilsen..... K
- Vitkovice-R&D, Ostrava..... L

Poland
- IMZ, Gleiwitz..... M

Sweden
- Swerea MEFOS, Lulea..... N
- KIMAB, Stockholm..... O

Austria
- K1-MET, Linz, Leoben** ..... P

Research Societies[1]
- Max-Planck Institute..... 1
- Helmholtz Institute..... 2
- Fraunhofer Institute..... 3
- Christian Doppler Forschung..... 4

Research Institutes of the Steel Industry*

Germany
- ThyssenKrupp WKZ, Duisburg..... a
- SZMF, Salzgitter/Duisburg..... b
- Vallourec & Mannesmann, Riesa... c

France
- ArcelorMittal Research, Metz ..... d
- ArcelorMittal, Grandrange..... e
- ArcelorMittal, Le Creusot..... f
- ArcelorMittal, Montataire..... g
- Aperam, Imphy..... h
- Aperam, Isbergues..... i

The Netherlands
- Tata Steel, Ijmuiden..... j

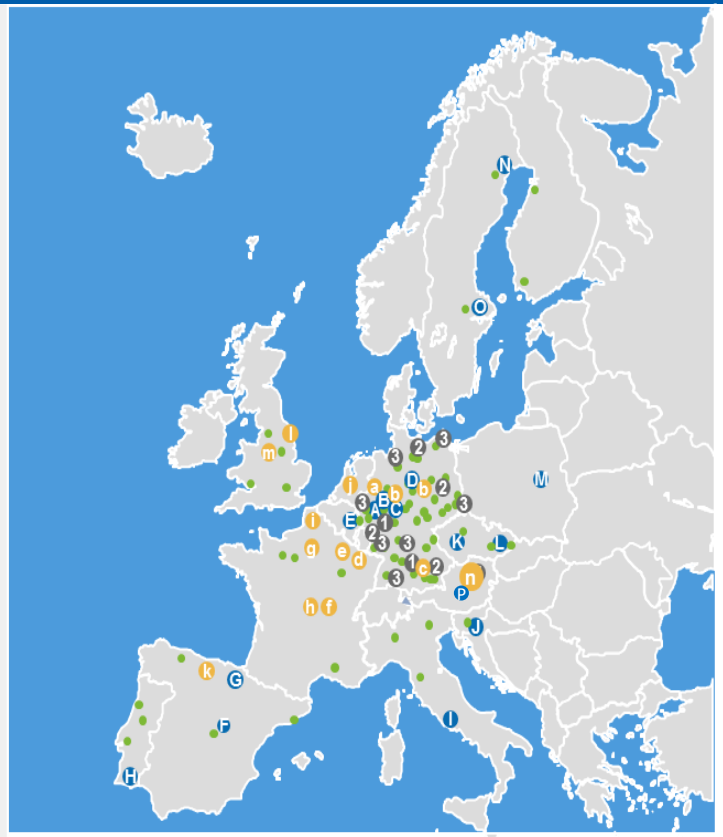
Spain
- ArcelorMittal, Asturias..... k

Great Britain
- Tata Steel, Teeside..... l
- Tata Steel, Sheffield Swinden..... m

Austria
- voestalpine AG, Linz, Donawitz n

Institutes* at universities with significant focus on steel research:

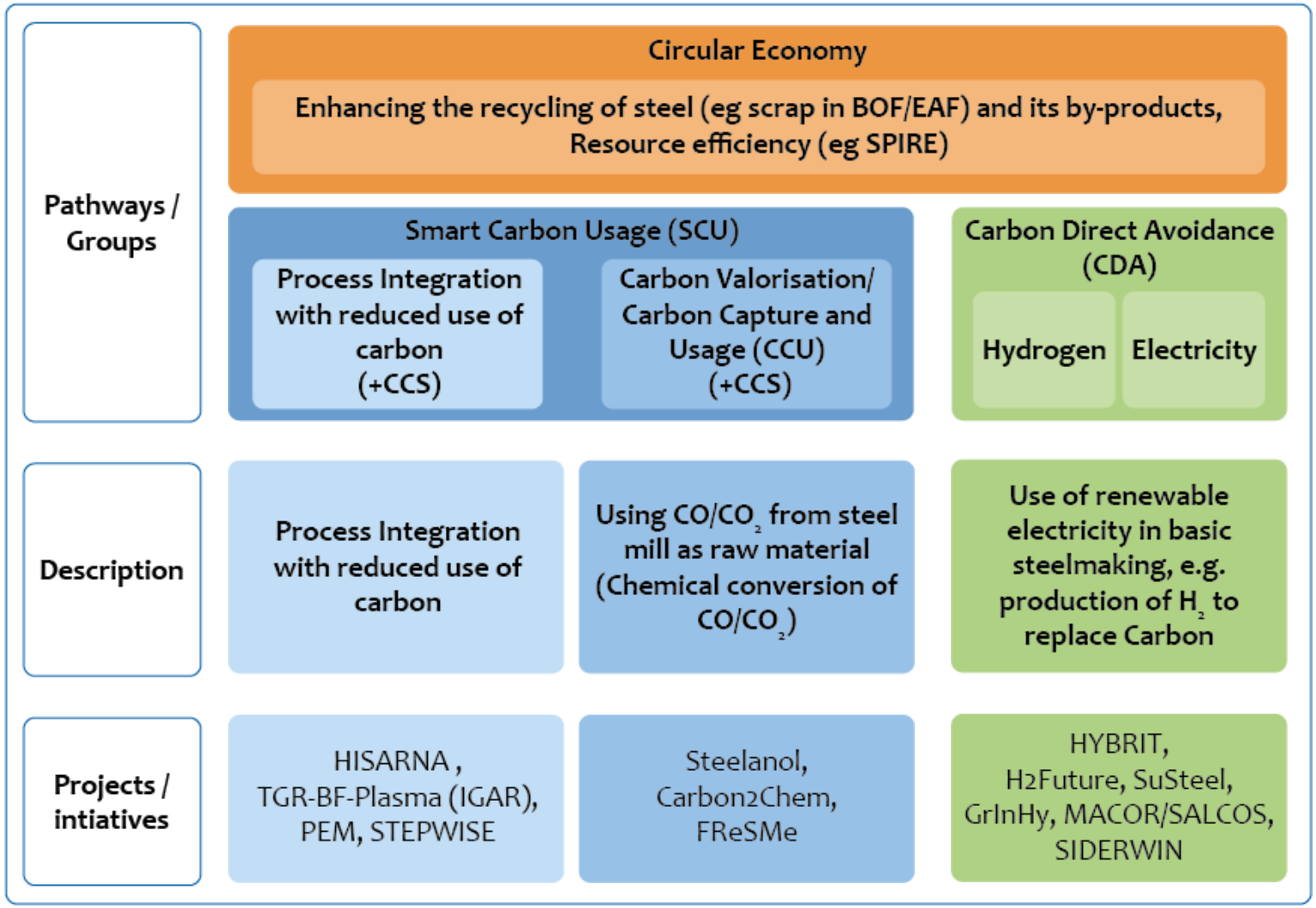
Germany	Great Britain
The Netherlands	Spain
Italy	Belgium
Greece	Slovenia
Portugal	Finland
Sweden	Austria
France	Czech Republic



*) Selection, Source: Booz & Company, Steel Instutute VDEh ; **) EUROFER

- Collaboration between universities, research establishments, sectors and companies is crucial to **achieving innovations and CO_2 reductions** in the value chain

TECHNOLOGICAL PATHWAYS TO CO_2 REDUCTION IN STEEL



POTENTIAL CO_2 REDUCTION IN THE EU STEEL INDUSTRY

- **Indicative reduction potential, with the assumption of external green power being sufficiently available at competitive prices/costs:**
  - **95%** with 100% electrical power based iron reduction (hydrogen or direct electrolysis process)
  - **80%** with smart carbon combined with CCS (or more if CO_2 from lime, sinter/pellet plants is captured)
  - **70%** with smart carbon w/o with external hydrogen to maximize synergies with chemicals
  - **50%** smart carbon w/o external hydrogen
  - **30%** Electric Arc Furnace (EAF)/Direct Reduced Iron (DRI) based on natural gas
- **Total cost of the projects up to industrial scale:**
  - ca. € 10 billion
- **Timeframe for implementation of all projects up to industrial scale:**
  - 2030/35

BRIDGING THE "VALLEY OF DEATH"

- **Without funding no low-carbon breakthrough technology for steel will emerge**

- **Adequate funding of the projects under a Big Scale Initiative for steel**
  - **Public funding** up to industrial scale demonstrators with up to 75% of the costs, and **preferential loans** and access to credit – this approach would '**de-risk'** otherwise economically risky breakthrough projects
  - **Continuity of financing**, which includes funding, at different stages of the projects is essential to avoiding discontinuity of the projects
  - **Cooperation** between the stakeholders and adequate regulatory framework are key for the effectiveness of the various innovative technologies

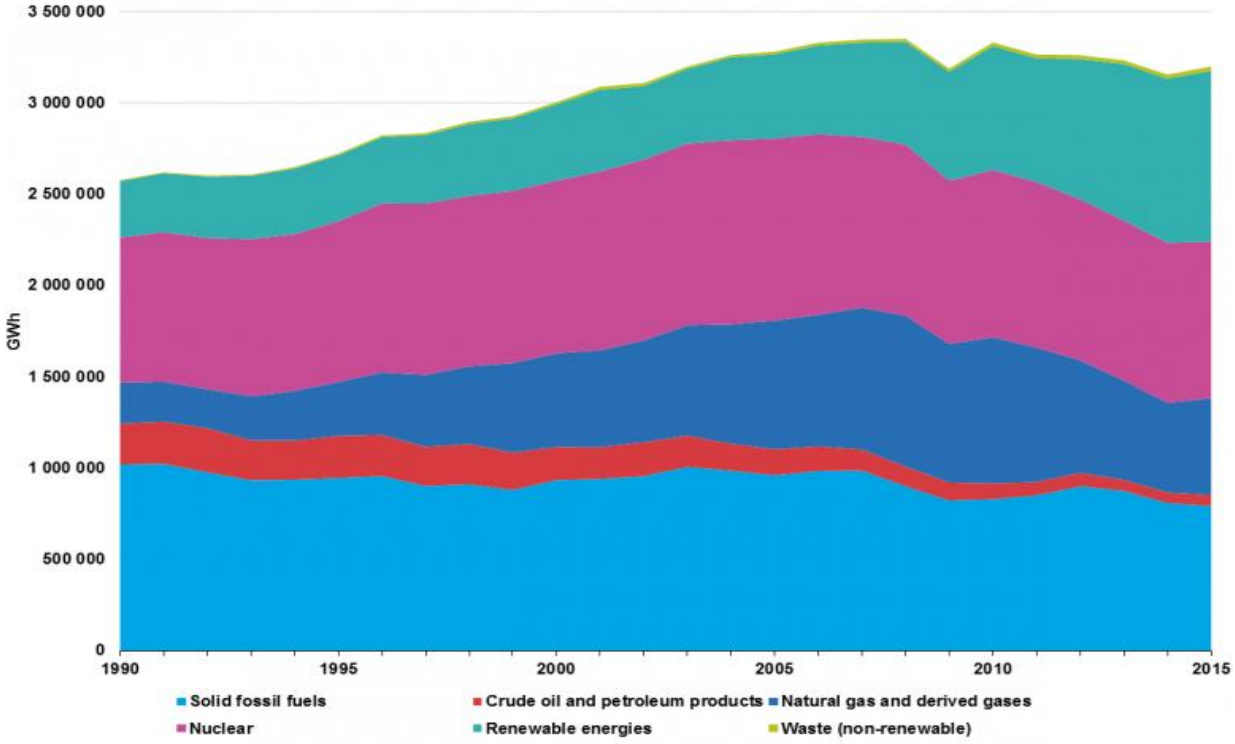
- **Framework Programme 9**
  - **Adequate budget** for FP9 overall
  - **A mission for low-carbon steel** and its value chain
  - **Interoperability** between, and financing from several EU and national funding programmes must be possible to tackle the challenge

BRIDGING THE “VALLEY OF DEATH”

WHY SEVERAL PROJECTS AND NOT JUST ONE ?

- Due to infrastructure constraints and downstream needs more then just one technology – or the combination of several technologies – may be the most efficient and sustainable way towards decarbonisation.
- Use the dynamics of the participation of a large part of the EU steel industry.
- Competition and synergy effects among the projects will lead to success.

INFRASTRUCTURE NEEDS & OPERATIONAL COSTS



Gross electricity production by fuel, GWh, EU-28, 1990-2015 (*Source:* Eurostat)

EU-28 gross electricity production 2015: 3 234 TWh
EU-28 final electricity consumption 2015: 2 741 TWh
German final electricity consumption 2015: 514 TWh

EU steel electricity consumption (today): ~ 75 TWh
If 100% hydrogen/electricity/CCUS based: ~ 400-500 TWh – ca. 18% of current EU total consumption

OPERATIONAL COSTS

WHAT WILL THE EU ELECTRICITY MARKET LOOK LIKE IN 2030/40?

- **Amount of Electricity needed?**
- **Share of renewables?**
- **Infrastructures?**
- **Prices globally competitive for industry?**
- **Which will be the right legal framework to shield industry from carbon leakage?**

TOWARDS AN EU MASTERPLAN FOR LOW-CARBON STEEL

ESTABLISHING A 'MASTERPLAN' IS KEY TO MANAGING RESEARCH AND DEPLOYMENT RISKS

- **EUROFER has highlighted its aims in a discussion paper:**
  - *"Towards an EU Masterplan for a Low-Carbon, Competitive European Steel Value Chain"*

- **Coordinated, cross-sectoral approach**
  - EU institutions and Member States: relevant Commission DGs, Council, European Parliament, …
  - Sectors of the steel value chain: steel, low-carbon energy providers, chemical industry, automotive industry, …
  - Research institutions, unions, NGOs, …

TOWARDS AN EU MASTERPLAN FOR LOW-CARBON STEEL

PROPOSED OBJECTIVES OF AN EU MASTERPLAN

- **IDENTIFY:**
  - the most salient facts and underlying trends in production, CO_2 emissions and energy consumption in the EU and global steel industry
  - low-carbon and circular economy upstream and downstream raw material, energy and infrastructure requirements up to 2050
  - the cross sectoral context with the main energy consuming sectors
- **PRODUCE:**
  - an overview of key R&D&I activities and trends in the EU steel value chain
- **SET OUT:**
  - broad lines for a European Big Scale Initiative for steel that reflects the interaction with other sectors
- **OUTLINE:**
  - the necessary regulatory framework for projects up to industrial scale demonstrators and market roll-out ensuring that neither new technologies nor existing installations face competitive disadvantages within the internal market or vis-à-vis global competitors in the transition to a low-carbon industry

CONCLUSION

KEY MESSAGES FOR POLICYMAKERS

- **Foresee a powerful budget for Framework Programme 9 (FP9) under the Multi-Annual Financial Framework with a strong element for industry as the driver of innovation and added value in Europe**
- **Support circular materials which give a real benefit to society**
- **Foresee a mission for a low-carbon steel value chain under the FP9**
- **Foresee access to additional EU and national funding schemes for Big Scale projects**
- **Establish a working group that works out an EU Masterplan for a low-carbon, competitive European Steel Value Chain**
- **Continue to address vigorously steel trade distortions by non-EU countries and reduce EU regulatory burdens to keep our industry globally competitive and able to invest**

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THANK YOU FOR YOUR ATTENTION!

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