Challenges for the R&I Steel Programmes

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The Proposed New Commission 2024-2029

Challenges for the New Commission

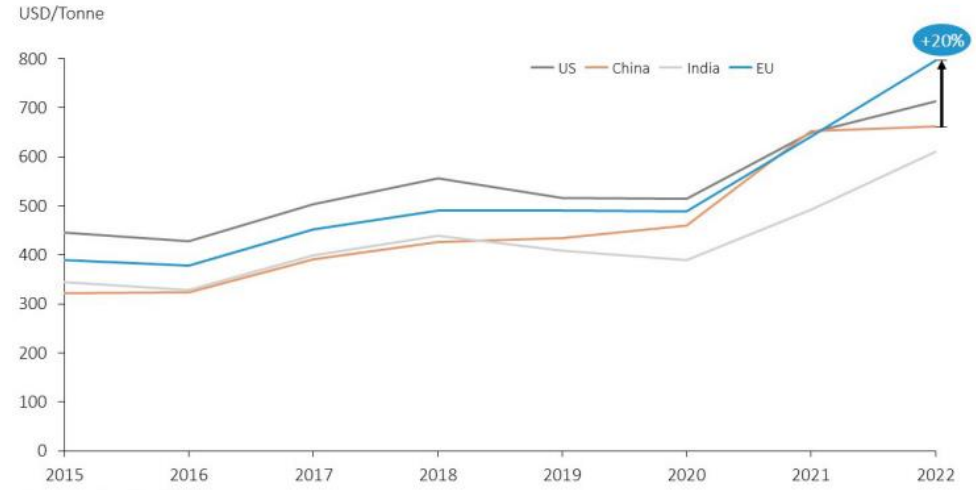
Europe needs acceleration to address multiple challenges, as highlighted in the Draghi Report. For our steel industry we will:

- Support **simplification** and strengthen **competitiveness**.
- Establish a new approach to competition policy, make business easier and faster.
  - The Commission is actively working towards the **Clean Industrial Deal**.
- The Draghi report calls for a required transformation to **close the innovation gap**: accelerate innovation and find new growth engines.

Draghi Report: Energy Intensive Industries

EII in Europe have been at the forefront of global quality and innovation for decades. Nevertheless, they are now facing increasing competitive pressure.

Example steel: hot rolled coil production costs



Source: European Commission, JRC, 2024.

Problems	Proposals
• Energy costs • Strong decarbonization effort • Declining competitiveness	11 specific proposals are outlined to: • Ensure a competitive and predictable supply of energy input. • Support transition to decarbonised solutions (by ensuring investment and markets for low-emissions products). • Avoid production relocation driven by asymmetric subsidies, weaker decarbonisation regulation, or regulatory burden.

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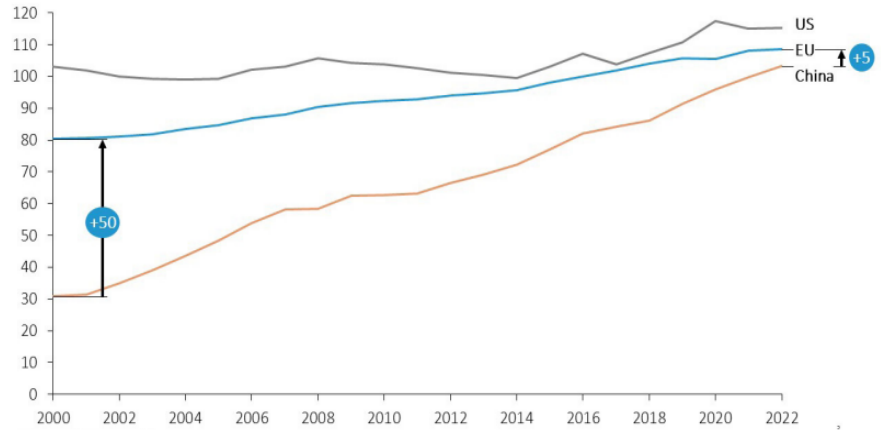
Draghi Report: Innovation Gap

For several decades, the EU's innovation capacity has lagged behind that of the US, while China is catching up quickly.

Evolution of the innovation performance of the EU and its main competitors

European Innovation Scoreboard

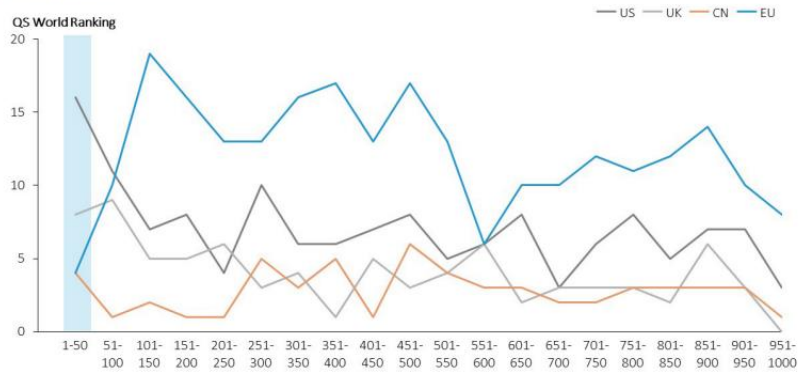


Source: European Commission, 2004.

The EU shows weaknesses throughout the entire lifecycle of innovation, as well as in its pattern of sectoral specialisation.

Distribution of universities by quality

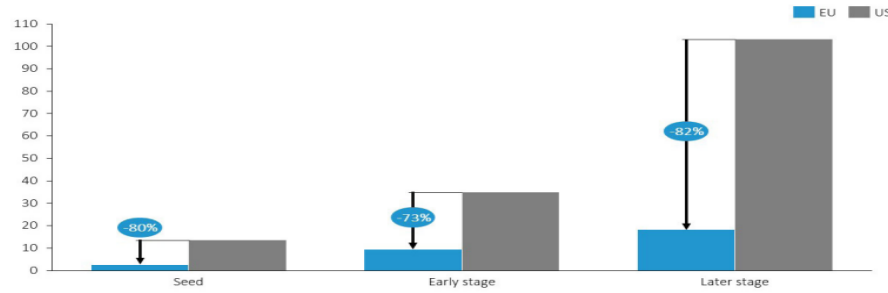
Number of universities, 2024



Source: QS World Ranking.

Venture capital investment by development stage

USD billion, 2023



Source: PitchBook data. Accessed 20 November 2023.

Innovation is the driver for the green and digital transitions.

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Draghi- Report : Accelerating Innovation – in General

Problems	Proposals
• EU lays behind in digital tech and the leadership in green tech is challenged. • Innovation focused on sectors of M/L R&D intensity. • Low private and less effective public R&D spending. • Innovation ecosystem too fragmented. • Not enough academic excellence. • Low development of EU innovation clusters. • Poor financial system to scale up. • Bureaucratic, legal, regulatory barriers. • Low diffusion of innovation.	• A better financing environment for disruptive innovation, start-ups and scale-ups. • Design a simpler and more impactful tenth EU R&I FP. • Promote academic excellence. • Invest in world-leading research infrastructure. • More R&I and strengthened coordination of policies through a R&I Union. • A more favorable and simpler regulatory ecosystem for innovative companies. • Shared prosperity as fundamental enabler of EU innovation.

EU Calls for Proposal for Steel

Clean Steel Partnership: EU budget of € 700 million for 2021-2027

- Top-down calls / Topics approved by MS&AC
- Annual EU budget may vary: in 2024 was € 30 M
- Type of projects:
  - CSA, financing100%
  - RIA, financing 100%
  - IA, financing 60-70% (depends on legal status of institution)
- Clean Steel topics are mostly placed in middle TRL levels, with indicative grant amount specified in the single topics (may vary).

- Bottom-up calls / Objectives in Council Decision 2003/376 amended in 2021.
- Big Tickets steel:
  - € 52 M / year
  - Large PDP projects indicatively up to € 18 million
  - From TRL 4-5 and achieve TRL 7-8
- Annual call (steel): € 29 M / year
- Type of projects under the Annual call

Type	TRL	Financing	Indicative grant amount
AM	-	100 %	€ 0,3-0,5 M
RPJ	1-3 and achieve 4-5	60 %	€ 1-3 M
PDP	4-5 and achieve 7-8	50 %	€ 3-5 M

EU Funding & Tenders portal: https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/home

State of Play of the Steel R&I Programmes for the Period 2021-2024

- Calls opened (11): Horizon Europe (2021-24), RFCS Big Tickets-steel (2022-24), RFCS Annual Call-steel (2021-24, awards of 2024 excluded).
- 32 proposals awarded under the CSP (23 under Horizon Europe and 9 under the RFCS Big Tickets-steel) and 71 under the RFCS Annual call-steel.
- Budget awarded:
  - Horizon Europe: 107 M€
  - RFCS Big Tickets-steel: 64 M€
  - RFCS Annual call-steel: 87 M€ (excluding 2024, still under evaluation)
- Areas of research (for RFCS see Art. 8, 9, 10 and 10a of 2008/376/EC, amended in 2021)

Horizon Europe	RFCS Big Tickets	RFCS Annual Call
DRI, EAF decarbonization, H2 plasma reduction, hybrid heating tech, scrap valorization, re-use of metallurgic gases, digitalization, impact of impurities, etc.	Hybrid heating technologies, H2 for reheating furnaces, re-use of slag, H2 production from metallurgical gases, DRI, smelter, etc.	Thermal processing, controllers, H2 embrittlement, re-use of H2-rich syngas, H2 injection system, numerical modelling, structural integrity, etc.

Awarded Horizon Europe Projects 2021-2024

Year	Coordinator	Project Title
2021	VDEH-BETRIEBSFORSCHUNGSINSTITUT GMBH	Maximise H2 Enrichment in Direct Reduction Shaft Furnaces
2021	KUNGLIGA TEKNISKA HOEGSKOLAN	Highly efficient technologies for increased yields in steelmaking processes and reduced environmental impact
2021	DALMINE SPA	REcovering Metals and Mineral FRAction from steelmaking residues
2021	CENTRE DE RECHERCHES METALLURGIQUES ASBL	CirculArity Enhancements by Low quality Scrap Analysis and Refinement
2021	ARCELORMITTAL BELGIUM NV	Recycling renewable hydrogen for climate neutrality
2022	SWERIM AB	Purity improvement of scrap metal
2022	VDEH-BETRIEBSFORSCHUNGSINSTITUT GMBH	Upgrading of low-quality iron ores and mill scale with low carbon technologies
2022	SCUOLA SUPERIORE DI STUDI UNIVERSITARI E DI PERFEZIONAMENTO S. ANNA	Gradual Integration of REnewable non-fossil ENergy sources and modular HEATing technologies in EAF for progressive CO2 decrease
2022	RINA CONSULTING - CENTRO SVILUPPO MATERIALI	Modular HEATing Technology through renewable resources for steel production
2022	RINA CONSULTING - CENTRO SVILUPPO MATERIALI	HYbrid TEChnologies for sustainable steel reHEATing
2023	ABO AKADEMI	Agent-based models minimizing carbon usage in flexible and efficient future integrated steelworks
2023	OULUN YLIOPISTO	Hydrogen Plasma Reduction for Steelmaking and Circular Economy
2023	FUNDACION CIRCE CENTRO DE INVESTIGACION DE	Valorisation of iron-rich & Zinc-containing steelmaking by-products via HYdrogen-based ReductiON
2023	MONTANUNIVERSITAET LEOBEN	Pioneering Sustainable Recovery in Steelmaking: Hydrogen-Based Technology for Byproduct Management
2023	KUNGLIGA TEKNISKA HOEGSKOLAN	Metallic Elements Dissipation Avoided by Life cycle design for Steel
2024	RINA CONSULTING - CENTRO SVILUPPO MATERIALI	SEAMLESS DIGITAL INTEGRATION IN STEEL VALUE CHAIN FOR HIGH QUALITY FINAL PRODUCTS
2024	FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV	Demonstration of Digital twins for a Green Steel value chain
2024	SWERIM AB	Integrated modelling for sustainable and optimized steel manufacturing processes
2024	ASOCIACION CENTRO TECNOLOGICO CEIT	Unlocking the effect of residual elements via the NANOengineering of Sustainable MARTensitic steels
2024	VDEH-BETRIEBSFORSCHUNGSINSTITUT GMBH	Development of heating technologies for the Efficient renewable Energy COnsumption of CO2-neutral DOWNSTREAM-
2024	TECHNISCHE UNIVERSITAET BERGAKADEMIE FREIBERG	Decarbonized Steel Production with Novel Processes
2024	ONDERZOEKSCENTRUM VOOR AANWENDING VAN STAAL NV	MULTI-FACETED ASSESSMENT AND OPTIMIZATION OF WELDED STRUCTURAL GREEN STEEL PLATES FOR USE IN EUROPEAN SUSTAINABLE INFRASTRUCTURE
2024	FUNDACIO EURECAT	Circular Steel for Mass Market Applications

EU funding ranging between 3 and 6 M€

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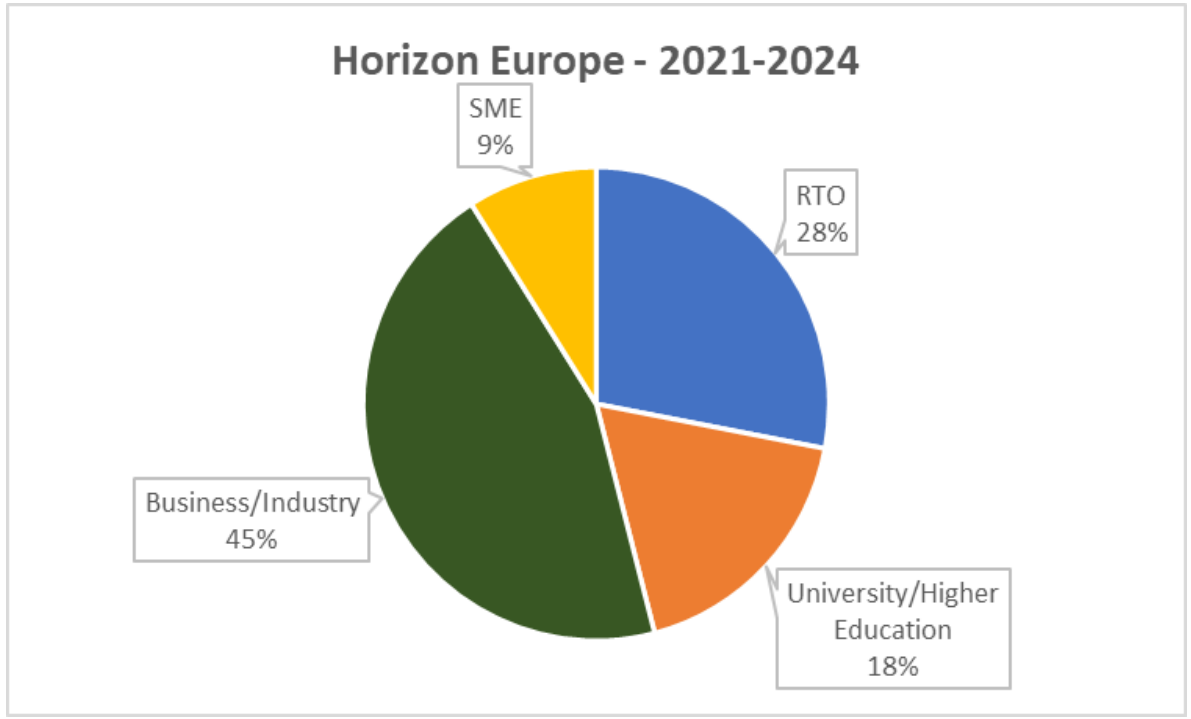
Awarded RFCS Projects 2022

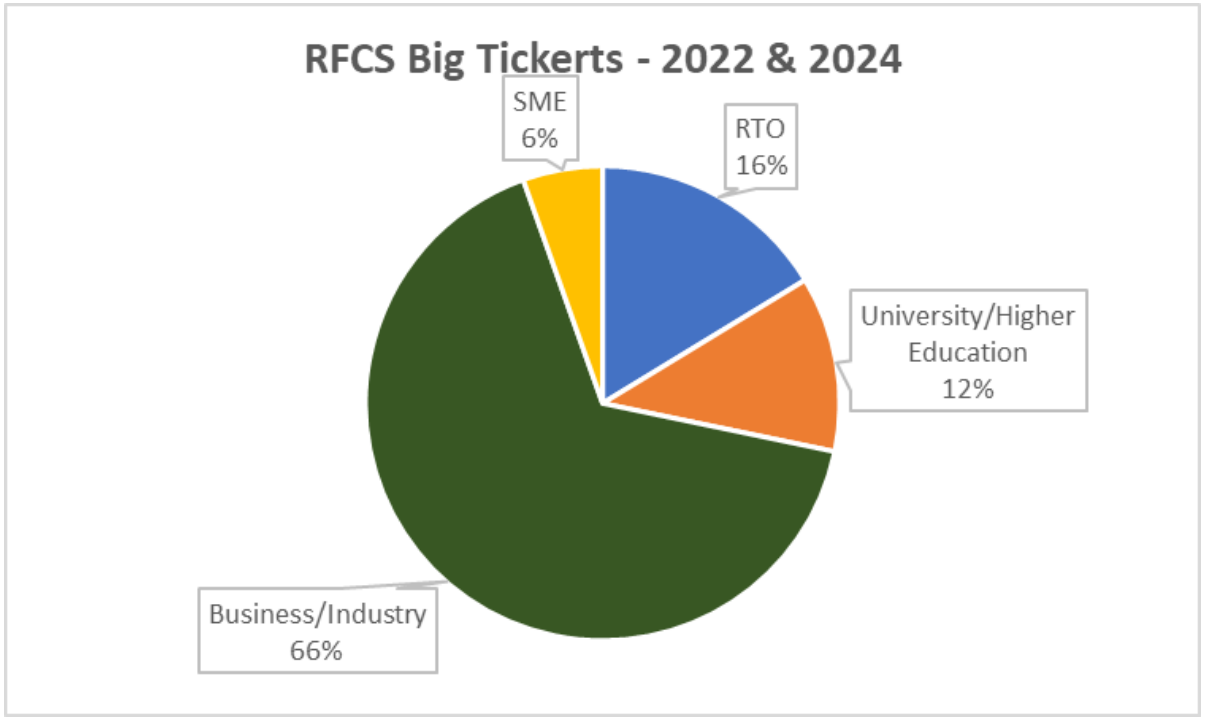
Year	Coordinator	Project Title
2022	RINA CONSULTING - CENTRO SVILUPPO MATERIALI SPA	MODular hybrId technology in the Steel PLANT production
2022	ARCELORMITTAL BELVAL & DIFFERDANGE SA	Demonstrator of Industrial Transformation with Hydrogen for HAV long products rolling mills.
2022	UGITECH S.A.	Clean Hydrogen and Digital tools for REheating And heat treatMent for Steel
2022	COMPANIA ESPANOLA DE LAMINACION SL	Digital TWINs for Green HYdrogen transition in steel industry

- RFCS Big Tickets funding is ranging between 4,3 and 8,6 M€ for the projects awarded in 2022.
- No call happened in 2021 (merged into call of 2022) and no award happened in 2023.
- The RFCS Big Tickets awards for 2024 are still under grant agreement preparation.
- The RFCS Annual call accounts for 71 awards in the period 2021-2023.
- The RFCS Annual call proposals are still under evaluation.

Comparison of Participation Horizon Europe/RFCS

Research Fund for Coal & Steel





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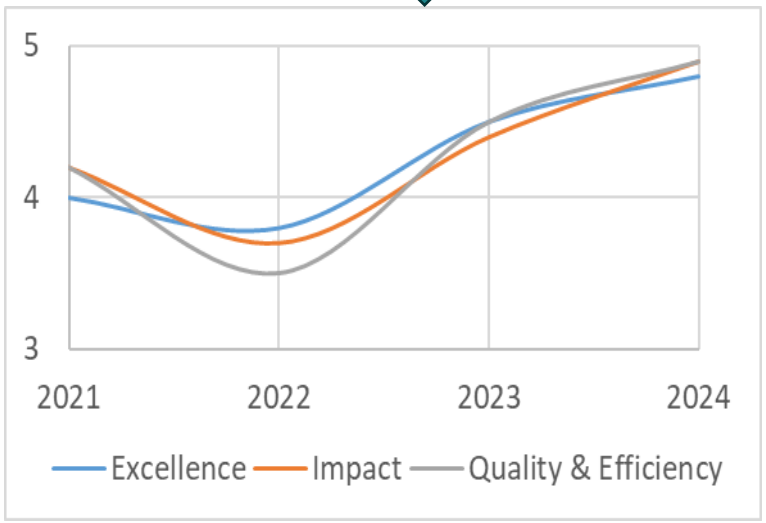
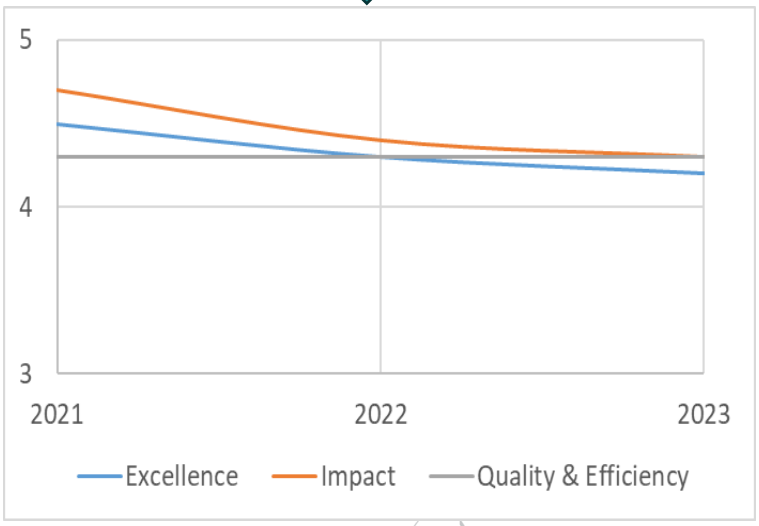
Comparison of Quality of the Proposals Based on the Evaluation Ranking

Year	Horizon Europe	RFCS Big Tickets	RFCS Annual Call
2021	12,4	No call	13,5
2022	11	12,1	13,1
2023	13,4	No award	12,8
2024	14,6	11,6	Under evaluation





AVERAGE VALUES calculated over the full set of proposals in the main ranking list (reserve excluded)

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Lesson Learned

1. Data analysis shows that the quality of the proposals is lower under the RFCS…
2. …thus, we account for a better proposal quality under Horizon Europe.
3. Looking at participation level, the biggest fluctuations between Horizon Europe and the RFCS concern industry and RTOs.

What Do They Do in the US?

In April 2024 ARPA-e announced 13 proposals to be funded under the ROSIE program for a total of 28 M$ - single projects ranging between 1 and 3,5 M$

Project Listing

- Argonne National Laboratory (ANL) - High Efficiency, Solid State Microwave-Powered Hydrogen Plasmas for Use in Direct Reduction of Taconite Ore and Ore Concentrates in a Rotary Kiln Furnace
- Electra - Low-Temperature Green Ironmaking from Unconventional Feedstocks
- Form Energy - Intensification of Continuous Alkaline Electrochemical Ironmaking with Net-Negative CO2 Emissions at Cost Parity with Pig Iron
- Georgia Institute of Technology (Georgia Tech) - Direct Hydrogen Reduction of Iron Ore Concentrate and Net-Shaped Fabrication of Linear Cellular Alloy Steels
- Limelight Steel - Laser Furnace for Reduction of Iron Ore to Iron Metal
- Pennsylvania State University (Penn State) - Multi-Cation Electrolytes for Electrolytic Reduction of Complex Iron Oxides at Low Temperatures
- Phoenix Tailings - Novel Electrolytic, Zero Carbon Emission Direct Reduced Iron Production
- Tufts University - Solving Ore Concentrate Reduction with New Chemistry
- University of Minnesota (UMN) - Ultrafast Hydrogen Microwave Plasma Reduction of Iron Ore
- University of Nevada, Las Vegas (UNLV) - Fast Electrowinning via Rotors for Responsible Iron Creation (FERRIC)
- University of Utah - Producing Clean Steel Directly from Iron Ore Concentrate
- Worcester Polytechnic Institute - Low-Carbon Iron Production and High Silicon Steel Manufacturing (LCIPHSSM)

What Can Be Improved?

The journey ahead for Europe is tough and we need to move faster! Together! NOW!

SYNERGIES?

COLLABORATIONS?

CURIOSITY?

FRAMES?

IDEAS?

COMPETITION?

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Conclusions

1. The promise of the Clean Industrial Deal will be maintained, and the Commission will do its best to address competitiveness issues in the steel industry.
2. Competitiveness needs to be translated also into the Clean Steel R&I proposal, improving quality and increasing participation.
3. Could European research centres be a catalyst for the industrial participation and a possible answer to tackle low participation in the RFCS Big Tickets for steel?

Let’s start preparing for the upcoming R&I calls for 2025!

Thank you

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