



EUROPEAN STEEL  
TECHNOLOGY  
PLATFORM

# HIGHLIGHTS 2021





# European steelmaking workforce

The steelmaking industry plays an essential role in several industrial value chains, in particular for green technologies. Steel workers are behind all the great innovative solutions and products we have today.

The steel industry is a pillar of strength for the EU economy, fostering growth, innovation and employment. In Europe, the steel sector employs 308,000 people directly and is responsible for up to 1.53 million indirect jobs.

Steel is linked to so many key sectors – from automotive, construction, and electronics to engineering, renewable industries and domestic appliances. In order to become a leader in innovative and high-quality products, various key actions are required to build and foster a competitive European steelmaking workforce characterised by quality, innovation and technology. Investing in new processes and technologies will help to stay ahead of the technological curve as well as raising awareness about the opportunities in the steelmaking sector.

# Foreword

We jointly take this opportunity to warmly thank all those who supported, and cooperated with, the European Steel Technology Platform (ESTEP) in 2021.

We have been able to navigate through another challenging and productive year 2021. We have adapted our ways of working and communicating as a result of the ongoing COVID-19 pandemic. The events of the past year have again demonstrated the importance of joining efforts, collaborating, and collectively working towards a common goal: creating the necessary framework for the steel sector to grow.

ESTEP continued to provide suggestions about how to further improve the European framework in order to facilitate the sustainable transition of the European steel industry towards carbon neutrality.

The Clean Steel Partnership was in the spotlight in 2021. Indeed, we have celebrated the formal launch of the Clean Steel Partnership with the signature of the Memorandum of Understanding. This has also marked the beginning of the new governance within ESTEP. Moreover, we have also adopted its Strategic Research & Innovation Agenda and also submitted the first Clean Steel Partnership proposals for the Horizon Europe Framework Programme. Answering the call topics with impactful project proposals is key in order to achieve the targets set out in the European Green Deal. Besides our growing membership and continued successful thematic virtual workshops, the ESTEP community also continued to be engaged in various European public funded projects as both beneficiary and partner.

We look forward to another inspiring business year in 2022 for even stronger collaboration and synergies in order to continue to prosper together in our activities for the partnership and the technology platform. We would be delighted if the ESTEP community could count on your contribution within the Focus Groups, the Steering Group, the Implementation Group and beyond.

This report describes the main activities and meetings held in 2021. It then outlines the Focus Groups' efforts and engagements, as well as ESTEP's involvement in different platforms, initiatives and programmes. It finally gives a brief overview of activities and actions planned for 2022.

On behalf of ESTEP,



Klaus Peters, Secretary General, ESTEP



Franz Androsch, Chairman, ESTEP

# Activities in 2021

## January

### Staff perspective

ESTEP has welcomed a new staff member in January 2021. Patrick Lafontaine joined the team as Clean Steel Programme Director. Next to developing and implementing the Clean Steel Partnership strategies, he is also supporting the implementation of strategic policies activities.



## March

### Clean Steel Partnership logo

In March 2021, a new logo for the Clean Steel Partnership was introduced. Having the same colours and style as the ESTEP one, the CSP logo shows the link with the EU through the map. The objectives of greening the EU steel production are symbolized by the green colour and the leaf.



### Clean Steel Partnership brokerage event

On 24 March, ESTEP held its first Clean Steel Partnership brokerage event. The main aim of this event was to prepare applications

for Horizon Europe calls with deadline of September 2021. Besides sharing views and expectations from steel companies, RTOs and plant suppliers, 39 pitches were shared among the participants. Although the event had to be organised online, it was perceived by all participants as well organized, efficient and transparent.

## May

### Eurosteelmater

The XII edition of the [Eurosteelmater](#), the advanced training course for the European steel sector, was successfully held online from 3 to 7 May. The course was organised by RINA and the Centro Sviluppo Materiali (CSM) with the support of the European Commission, ESTEP, EUROFER, Federacciai and IndustriAll.

During this training course, steel production and application aspects as well as relevant external influences were discussed. A seminar on the RFCS project 'REUSteel' was also held. Klaus Peters gave a presentation on the Clean Steel Partnership and the carbon neutral steelmaking.



### Focus Group Low Carbon & Energy Efficiency workshops

The ESTEP Focus Group Low Carbon & Energy Efficiency hosted two very successful workshops in May.

The first event on ‘Waste heat recovery and utilization for steel plants’ was successfully held online in the form of a three- sessions webinar in May and one final online interactive workshop in June 2021.

The topics focused on ‘Waste heat potential and recovery solutions’, ‘Market regulations and advanced options’, and ‘Outlook on future developments’.



The second event on ‘H<sub>2</sub> Greensteel: Hydrogen route for a green steel making route web-workshop’ had more than 250 registered participants. The topics of the four sessions focused on ‘Low-carbon hydrogen production and supply chain’, ‘Hydrogen metallurgy and related up/down streams processes issues’, ‘Norm and standards relevant for hydrogen application in steelworks’, and ‘Hydrogen safety, availability and market, and related legislation and social impact.’



May

### ESSA Mid Term Conference

On 27 & 28 May 2021, the [European Steel Skills Agenda](#) (ESSA) conducted its online Mid Term Conference under the motto ‘Skills and Jobs in the Future-Proven Steel Industry’ represented by more than 30 speakers.

A total of over 150 interested participants from 36 (not only European) countries had registered for the event.

The goal of the conference was to bring together key steel sector stakeholders, including steel company representatives, trade unions, vocational training providers, research and education centres and public authorities. ESTEP was co-organizer of the conference.

June

### ESTEP Ordinary General Assembly

The fourth ESTEP General Assembly took place on 22 June. The priorities and the activities for 2021 were discussed along with the new objectives and proposed future activities for 2022. The ESTEP members welcomed the sound financial management of ESTEP and approved the 2020 accounts and the 2021 budget.

During the ordinary General Assembly, a new Board of Directors was also elected since the previous Board was re-elected in September 2020 for a shortened term. As of June 2021, the four members of the Board of Directors are represented by a new ESTEP President, Franz Androsch (voestalpine). The Vice-Presidents are Axel Eggert (EUROFER), Roberto Pancaldi (Tenova) and Wojtek Szulc (IMZ).

The General Assembly thanked Carl De Maré and Göran Carlsson for their excellent work and strong cooperation as Board members.

July

### Kick-off Implementation Group

The Implementation Group, which deals with all issues in regard to the Clean Steel Partnership, held its kick-off meeting on 6 July 2021. The Implementation Group, in which all ESTEP members are automatically members, is established in addition to the Steering Group.

The nomination of Carl De Maré as chairperson was decided by the Board of Directors in June 2021 and was endorsed by the Implementation Group. The meeting was also an opportunity to start with the new organisational chart of ESTEP.



July

### Decarbonisation workshop

The International Forum on ‘[Decarbonisation of the Steel Industry: a Challenge for Ukraine](#)’ organized its hybrid workshop on 14 July in 2021 in Kiev in order to discuss the prospects for decarbonisation of metallurgy.

More than 250 participants joined. Among them, heads of mining and metallurgical companies, representatives of engineering, consulting and R&D companies, public officials, industrial and business associations, international experts and scientists.



Klaus Peters represented ESTEP with a presentation on ‘Ultra low-carbon steelmaking (ULCOS) to the EU Clean Steel Partnership’. The topic was highly appreciated by the participants.

October

### Adoption of the CSP SRIA

The Strategic Research & Innovation Agenda (SRIA) for the Clean Steel Partnership was adopted on 8 October 2021 in its first Partnership Board meeting.

As indicated in the SRIA, the Clean Steel Partnership aims to deliver at least two demonstration projects leading to 50% CO<sub>2</sub> emission reduction compared to 1990 levels and at least two demonstrations of a technological pathway leading to 80% CO<sub>2</sub> emission reduction compared to 1990 levels.



### Clean Steel with Hydrogen

Co-hosted by the Fuel Cells and Hydrogen Joint Undertaking (FCH JU), ESTEP contributed to the ‘extended programme’ of the [EU Sustainable Energy Days](#) on 18 October 2021.

The joint high-level event on greening European industry showcased groundbreaking initiatives and projects. This session discussed technical and policy issues related to the decarbonisation of the steel industry through hydrogen.



November

### GREENSTEEL final conference

The [final conference](#) of the [Green Steel for Europe](#) (GREENSTEEL) project, a European Parliament Pilot Project on Research on reduction of CO<sub>2</sub> emissions in steel production, was held online by CEPS on 9 November & 10 November 2021.

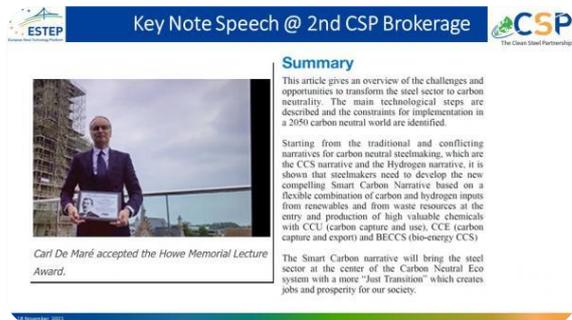
The first day focused on ‘Technology, Investment and Financing for Decarbonising Steelmaking’, while the second day on the ‘Policy Options and the Way Forward Towards Climate-Neutral Steelmaking in Europe’. Roadmapping of funding instruments and technology pathways were one of the main outcomes of the event.



### Clean Steel Partnership second brokerage event

ESTEP has held its second Clean Steel Partnership (CSP) brokerage event on 17 November 2021. Carl de Maré, former President of ESTEP, opened the event with a [keynote speech](#) on “Why both hydrogen and carbon are key for Carbon Neutral steelmaking”. More details about the scope and the participation of the event can be found in the dedicated CSP section.

In mid- 2021, Carl De Maré received the Howe Memorial Award for his extensive work.



November

### Sustainable Development Goals in the Steel Industry webinar

The ESTEP Focus Group Circular Economy organised its third event on the Sustainable Development Goals (SDGs) in the Steel Industry. The webinar, which was held on 26 November 2021, introduced SDGs principles as a core business practice and to share the approach available to quantify key sustainability indicators for steel. Case studies from the steel industry and other relevant industrial sectors were also shared along with the ongoing action regarding standards and certification in the steel sector.



Stay tuned and visit our website!

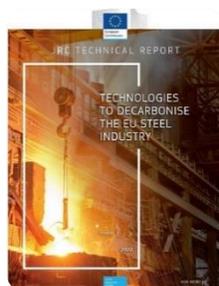


# Suggestions for further reading

At ESTEP we consider research as well as publications very important. Several ESTEP members are publishing papers, articles and reports. Below a few suggestions (in addition to the ones described in the Focus Group section) reflecting the work done by ESTEP members as well as other publications that we consider valuable for the steel industry.



ESTEP Focus Group Transport & Mobility: [Report](#) on 'Hydrogen measurement of zinc coated rolled strip' (2021)



European Commission – [JRC technical report](#): 'Technologies to decarbonise the EU Steel industry' (2022)



[Publication](#) from European Commission (REA) & Green steel for Europe: 'Climate-neutral steelmaking in Europe: Decarbonisation pathways, investment needs, policy conditions, recommendations' (2021)

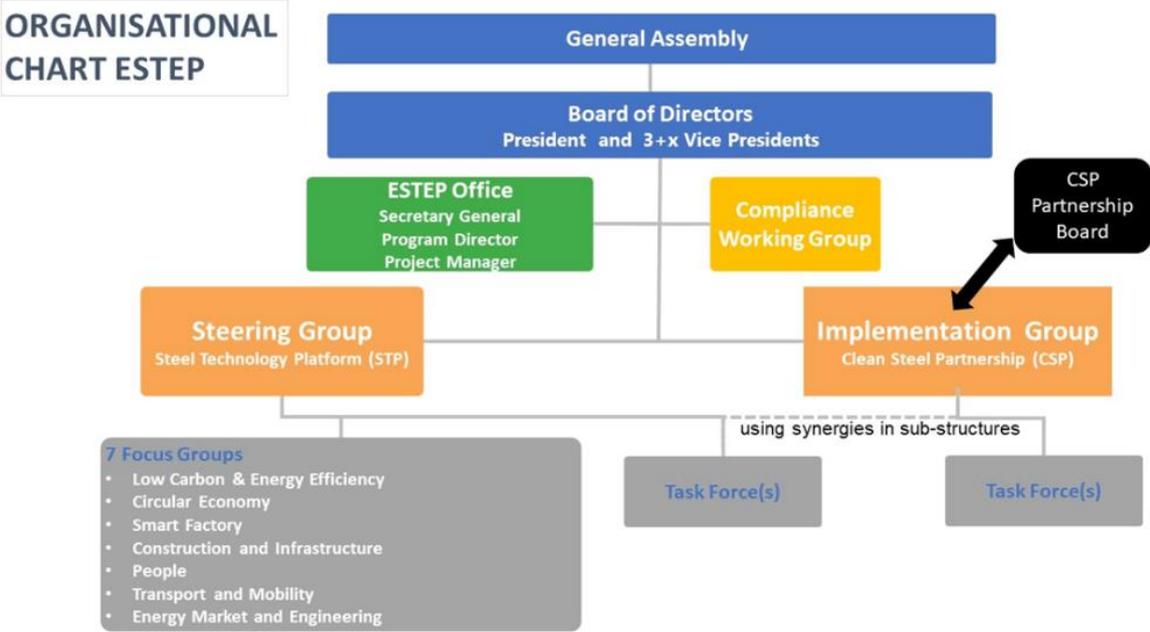


European Commission – [JRC technical report](#) : 'Greenhouse gas intensities of the EU steel industry and its trading partners' (2022)

# ESTEP new organisational chart

The year 2021 marked the beginning of the new governance within ESTEP and the Clean Steel Partnership. After the nomination of the new ESTEP President Franz Androsch in June, the new governance has launched a collaborative way of working between the Clean Steel Partnership (CSP) and the Technology Platform. Hence, the ESTEP organisational chart covers both the activities of the Technology Platform as well as the private side of the Clean Steel Partnership.

With the introduction of the new governance, all representatives from the Steering Group are also automatically member of the Implementation Group. This latter deals with all the topics related to the Clean Steel Partnership, in which the private side of the CSP aligns its position. The ESTEP Board of Directors decided in June the nomination of Carl De Maré as chairperson of the Implementation Group along with three vice-chairs. The designated vice-chairs for the Implementation Group are Tim Peeters (Tata Steel), Enrico Malfa (Tenova) and Pietro Gimondo (Rina-CSM).



The Steering Group, which is in charge of piloting the overall ESTEP research programme and reviewing the activities of the Focus Groups, held four meetings in 2021. The exchange between the Focus Groups (FG), the Heads of Research of steel producers and key representatives of steel stakeholders, allowed to provide valuable feedback to the work programme of the Focus Groups.

The chairperson of the Steering Group strongly supported the cooperation between the Focus Groups since today’s challenges are often broader than the scope of one single focus group. Franz Androsch hold the chairmanship of the Steering Group for the first semester until he was elected the new ESTEP President, while Rachel Pettersson became the new chairperson in the second semester as his successor.



# ESTEP Focus Groups

Throughout the year 2021 the Focus Groups continued to work with a well-established task-oriented approach. The tasks are still divided under three categories depending on the efforts and resources needed. The two first task categories can for example represent a mini-conference or a pre-study. More complex tasks fall under the third category and can be defined as a project that needs a contract among task members.

## Focus Group Circular Economy

The Focus Group Circular Economy remained very active in 2021, where the main focus continued to be on the training, design and innovation/uptake pillar.

After the well-attended online workshop on ‘Resi4Future – Residue valorisation in iron and steel industry: sustainable solutions for a cleaner and more competitive future Europe’ in 2020, the FG produced its [final report](#) with the main key takeaways. The Resi4Future workshop also resulted with a publication of an [article](#) in Metals in 2021, which was coordinated by K1-MET.



Special Issue "Sustainable Steel Industry: Energy and Resource Efficiency, Low-Emissions and Carbon-Lean Production"



At the end of 2021, the FG Circular Economy had organised its third event on the Sustainable Development Goals (SDGs) in the Steel Industry. The webinar aimed at introducing the SDGs principles as a core business practice and sharing the approach available to quantify key sustainability indicators for steel. Case studies from various sectors (steel, cement, aluminium and water) were also shared along with the ongoing action regarding standards and certification in the steel sector.



On the design pillar, the Focus Group Circular Economy continued to identify areas of interest as well as defining projects ideas & calls for the Clean Steel Partnership. The Focus Group also worked on a new task proposal on ‘Machine learning tools and techniques applied to reduction of local environment impacts of steelworks’.

In the frame of the innovation/uptake pillar, the [roadmap](#) on ‘Improve the EAF scrap route for a sustainable value chain in the EU Circular Economy scenario’ (also called EAF roadmap), which was under the coordination of Scuola Superiore Sant’Anna, has been finalised and is also publicly available. This task was a good example of the collaboration among the various ESTEP Focus Groups since it has involved 19 ESTEP members.



The EAF roadmap mainly summaries the vision of ESTEP’s Strategic Research Agenda (SRA), the Clean Steel Partnership (CSP) and the challenges that the steel sector faces in terms of Research & Development & Innovation (R&D&I), both in the fields of sustainable steel production and circular economy. The paper was presented at the SteelTech Congress 2021 in Bilbao, where Enrico Malfa, chair of the FG



Circular Economy, gave a keynote speech on ‘Circular Economy: one of the pillars of EU Steel industry to address its decarbonisation’.

### Focus Group Transport & mobility

During 2021, the Focus Group Transport and Mobility continued to work on collaborative actions and solutions for steel customers in the field of transport and mobility. This includes automotive, trucks, ships, containers, rail and rail cars.

The Focus Group was a pioneer in establishing a template for a contract among ESTEP members, which defines the large tasks - i.e., also called projects. Two tasks were established and both resulted in a contract, which will serve as a guidance for further large tasks within ESTEP. The Focus Group made good progress on both projects. One project is focused on ‘Measurement of Local Ductility for AHSS’, which is a joint project with the VDA (Verband der Automobilindustrie). The objective of the project ‘Local Ductility’ is the generation of a common understanding of local ductility measurements via tensile tests and to show the added value of such a characteristic for material characterisation. The second project “Hydrogen Embrittlement” should generate a scientific basis for an EN-standard that will allow testing hydrogen embrittlement in cold formable steel grades.



The Focus Group also had some exchanges with other platforms such as the European Council for Automotive R&D (EUCAR), the European Green Vehicles Initiative Association (EGVIA) and 2Zero - Towards zero-emission road transport partnership.



For the near future, the Focus Group is looking for new tasks related to the future challenges and opportunities for steel in transportation under the circumstances of reducing greenhouse gases, autonomous driving and other future trends.

### Focus Group Construction & Infrastructure

During 2021, the Focus Group Construction & Infrastructure continued to develop the task ‘Smart Dual Function Building Envelop’. The main aim of the proposal is to develop a steel intensive active, adaptable, intelligent dual function building envelop that is capable to generate and capture the energy needs of a building. In addition, the Brexit has made the situation uncertain for some key players of the Focus Group Construction & Infrastructure.

### Focus Group People

In 2021, Antonius Schröder from TU Dortmund, assumed the role of chairman of the Focus Group People by switching the role with Veit Echterhoff, who became vice-chairman accordingly. The members of the FG thanked him for his strong commitment and work in the previous years as chairman.

The Focus Group People continued in 2021 to raise awareness about proactive skills adjustments, especially concerning the digital and green transitions. This was mainly done through the engagement of many ESTEP members and a large number of other organisations in the two Skills Flagship Projects: [ESSA](#) (European Steel Skills Alliance) and [SPIRE-SAIS](#) (Skills Alliance for Industrial Symbiosis).



Within the ESSA+ task, not only project results but also the people-driven approach of ESTEP were disseminated both at European and global levels, across the steel industry and other sectors. The experts from the steel sector were also the main drivers for integrating people’s perspectives into the SPIRE programme ‘Processes for Planet’, where next to other non-technological and social innovation issues, human resources (especially skills) became an innovation topic.

Both ESSA and SPIRE-SAIS projects continued to be presented to the audiences of various workshops and conferences.



The common [ESTEP/ESSA Midterm Conference](#) took place online in May 2021, with the aim of conducting a broad and high-level speaker integration of steel industry actors.

The conference stressed the need for the European steel industry to focus on skills and human resources improvement to move forward with digitisation and decarbonisation to achieve the digital and green transition by adding the social component.

European Commission, steel companies, trade unions, vocational training providers, research and education centres have contributed very effectively to design strategies, methods and objectives in order to cooperate and work together for an even more competitive EU steel industry, including social and environmental sustainability. The first day was dedicated to the question on ‘How to define and adjust skills and jobs for a future proven Steel industry?’, while the second day focused on the topic ‘Shaping the Future Steel Transformation together’.

Mid-term Conference of the European Steel Skills Alliance (ESSA)  
**“Skills and Jobs in the Future-Proven Steel Industry”**  
 27th & 28th of May 2021  
 Online ZOOM Meeting

**27th of May 2021 (12:00 - 17:00, CET)**

- Welcome notes by Anubias Schröder, Project Leader ESSA and by the European Commission
- ESSA - On the road to clean, green and smart steelmaking and its impact on future skills and high-value jobs
  - ESSA Blueprint in a Nutshell - First Tools and Measures
  - ESSA Insights - Shaping technology and skills together
- Three Sessions on Skills and Jobs in the Future Steel Industry
  - Technological and Economic Development in the Steel Industry
  - Industry Skills Requirements for a Future proven Steel industry
  - VET System Requirements to meet New Skills and Training Demands
- Podium Discussion on “Future Skills - other Findings and Perspectives”

**28th of May 2021 (12:00 - 17:00, CET)**

- Welcome & Topic of the Day: Implementation and Rollout of the European Blueprint ESSA
- Panel Discussion on “Step into Action: Implementation and Rollout of the European Blueprint - Shaping the Future Steel Transformation together”
- Three parallel Sessions on Skills and Jobs in the Future Steel Industry
  - The Skills Perspective: How to Detect New Skills and improve Learning Arrangements
  - The Member States Perspective: National VET System Strategies for the Steel Industry of Tomorrow
  - The Regional Perspective: Regional Strategies for Future Skills in the Steel Industry
- Future Funding Possibilities by Erasmus+
  - Wrap Up, Next Steps and Farewell

Co-funded by the Erasmus Programme of the European Union

## Focus Group Energy Market Applications & Engineering

During 2021, the Focus Group Energy Market & Engineering discussed opportunities for collaborative actions in the area of steel applications for renewable energy. Possible projects ideas were identified: energy hydrogen production, cost and safety and availability of hydrogen, storage of CO<sub>2</sub> as underground basis, or applications of steels for transportation/usage and underground storage. The Focus Group finetuned these ideas in order to kick-start the ideas into projects for 2022. The members also contributed to the various workshops and events of ESTEP.

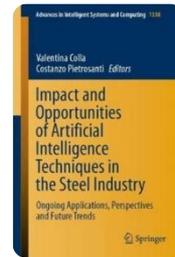
## Focus Group Smart Factory

Throughout 2021, the Focus Group Smart Factory continued its activities and enhanced its close cooperation with other Focus Groups of ESTEP, mainly with the Focus Group People and Focus Group Circular Economy. The Focus Group Smart Factory also exchanged with worldsteel.

Amongst the various activities, the Focus Group worked on the standardised approach for global interoperability supporting faster digitalisation in the steel sector. Another key activity during 2021 was the continuation of the elaboration of the ‘Steel Smart Factory Roadmap’. However, the roadmap had to be re-thought because of the speed of developments in the digitalisation field.

Hence, the approach needed to be changed: the development of a specific position paper could be a new way and an observatory can be another solution.

In terms of publications, after the successful workshop on ‘Artificial Intelligence (AI) and Machine Learning (ML): Impact and opportunities of artificial intelligence in the steel industry’ in 2020, the editors Costanzo Pietrosanti and Valentina Colla, respectively chair and vice-chair of the Focus Group, collected the main perceptions of the event in a dedicated book (Springer 2021).



### Focus Group Low-Carbon & Energy Efficiency

The ESTEP Focus Group Low Carbon & Energy Efficiency hosted its first event on ‘[Waste heat recovery and utilization for steel plants](#)’. The event was held online as a three-sessions webinar in May and one final online interactive workshop in June 2021. The webinar and the workshop were dedicated to key players dealing with waste heat recovery and utilization in iron and steel industry, such as steel manufacturers, energy supply companies, solutions providers, academics, research institutes, policy makers.



The topics focused on ‘Waste heat potential and recovery solutions’, ‘Market regulations and advanced options’, and ‘Outlook on future developments’. The final session was held in the form of an interactive workshop where participants were divided into small working groups in order to identify missing factors. The main target of the workshop was to identify the white spots for a wide application and the elaboration of a basis for future roadmaps. As a follow-up, the FG produced a [workshop report](#) collecting all

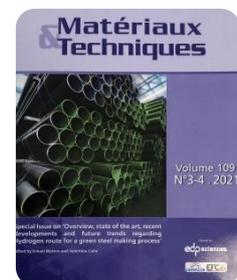


the key takeaways.

The second event on ‘H2 Greensteel: Hydrogen route for a green steel making route web-workshop’ had more than 250 registered participants. The topics of the four sessions focused on ‘Low-carbon hydrogen production and supply chain’, ‘Hydrogen metallurgy and related up/down streams processes issues’, ‘Norm and standards relevant for hydrogen application in steelworks’, and ‘Hydrogen safety, availability and market, and related legislation and social impact’.



The topics presented during the workshop have been published in a [special issue](#) on ‘Overview, state of the art, recent developments and future trends regarding Hydrogen route for a green steel making process’ in the Matériaux & Techniques journal. The journal has been edited by SSSA.



Given its considerable success, the Focus Group is considering to organise a second version of the hydrogen workshop in 2022.

# Clean Steel Partnership

In 2021, the co-programmed Clean Steel Partnership (CSP) became a mature organisation. The Memorandum of Understanding was finalised and signed, while the Strategic Research & Innovation Agenda (SRIA) became an official document. The organisation became gradually fully operational, based on the work of the Task Force, the Implementation Group and the Partnership Board. Work was focused on the ongoing and future Horizon Europe (HEU) and Research Fund for Coal and Steel (RFCS) calls, finalising the SRIA, monitoring and reporting of the partnership activities. Two brokerage events were organised, aiming at the collaboration among the ESTEP members in order to prepare the applications of projects.



## Memorandum of Understanding (MoU)

The year 2021 started with a focus on the [Memorandum of Understanding](#) for the Co-programmed partnership. In January, the Commission provided high-level support regarding the rewording of the contribution from the private side and the selection and presentation of the key performance indicators (KPIs).



The private contribution has been increased up to 1 billion EUR, while the public side provides a funding envelope of 700 million EUR. The Interservice Consultation of the European Commission took place in March, where feedback was also received from the Steel Advisory Group (SAG) and the EUROFER Research Committee members in April. The wording for the objectives regarding the reduction of greenhouse gas (GHG) emissions, the use of biomass and large demonstrator projects was clarified in the text or in additional footnotes of the SRIA.

The complete signature of the MoU was organised in the summer (June to August) between DG RTD (Commissioner Mariya Gabriel), DG Grow (Commissioner Thierry Breton), and ESTEP (President Franz Androsch and Vice-President Axel Eggert).

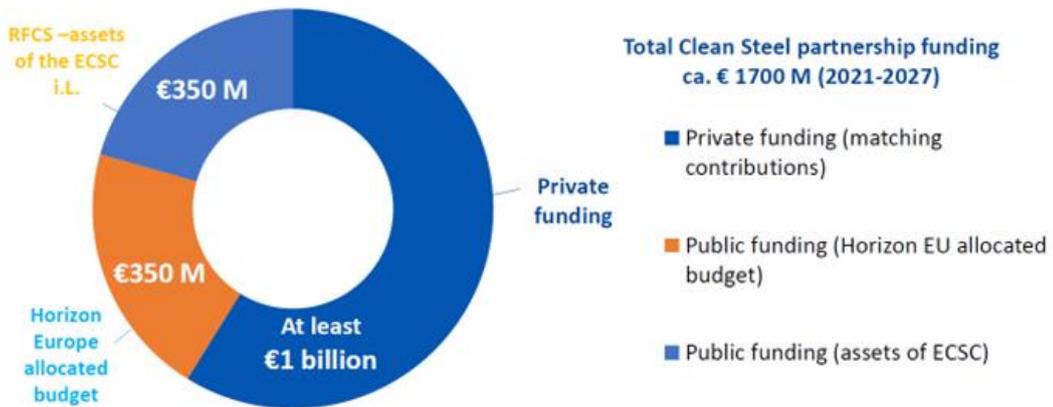
## Horizon Europe (HEU) and Research Fund for Coal and Steel (RFCS)

An overview of the main topics for the HEU and RFCS calls in 2021 and 2022 as well as the allocation of the budget to the different topics were proposed to the European Commission in February.

The potential call topics covering all six areas of intervention, as stated in the Strategic Research & Innovation Agenda, were split between HEU and RFCS. ESTEP played an important role since it communicated to the European Commission the main needs of the private side to be considered for the topics.

HEU and RFCS form two legs of the Clean Steel Partnership. HEU provides 50 million EUR per year and RFCS 54 million EUR per year.

# Sources of funding for the Clean Steel partnership



The RFCS Big Ticket call dedicated to the CSP was developed in July. The topics are complementary to Horizon Europe steel topics, i.e., on Carbon Capture Usage & Storage (CCUS) in 2021 and Carbon Direct Avoidance (CDA) in 2022. The scope of the RFCS Big Ticket, which focused on both large and small size projects, was finally put in one call with four objectives. The European Commission finally decided to merge the 2021 and 2022 RFCS calls into one single call, to be issued in the beginning of 2022. This would provide a higher call budget of 104 million EUR, allowing to consider also large size projects.

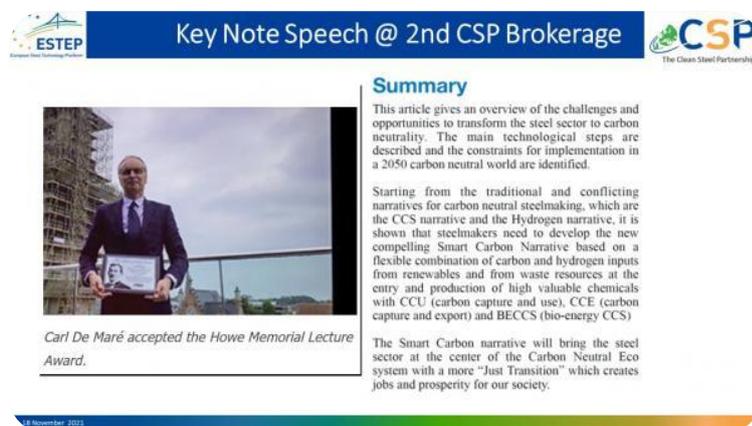
The work on proposals for the topics in the HEU 2023-24 calls started in September. A first draft was shared with the European Commission, who responded with an orientation paper. A final proposal is to be finalised in January 2022. For this purpose, three discussion groups were created within the CSP Task Force to address the call proposal topics.



## Brokerage events

The first CSP brokerage event was organised on 24 March, in view of preparing the applications for the HEU calls with deadline of September 2021. Although the event had to be organised online, it was perceived by all the participants as well-organised, efficient and transparent. Some 145 participants from 40 ESTEP members across 10 countries presented 39 pitches, of which 15 in CDA/CCUS areas and 24 in PI/CE. Further discussions among participants took place in 19 virtual breakout rooms.

The second brokerage event took place on 17 November in preparation of the HEU call for the first quarter of 2022. Representatives of the steel producers, RTOs and plant builders were again well-represented. A high number of participants (~100) and pitches (~25, of which 10 from RTOs), the high quality and maturity of the proposed projects contributed to the high standards of the event. A second pitch category was introduced. Next to project proposals, ESTEP members were able to briefly present their organisation by highlighting their competences, capacity and experiences in regard to the CSP. Representatives from the public side also participated actively.



The slide features the ESTEP logo on the left and the CSP logo on the right. The title is "Key Note Speech @ 2nd CSP Brokerage". On the left, there is a video thumbnail showing Carl de Maré, with the caption "Carl De Maré accepted the Howe Memorial Lecture Award." Below the thumbnail is the date "18 November 2021".

### Summary

This article gives an overview of the challenges and opportunities to transform the steel sector to carbon neutrality. The main technological steps are described and the constraints for implementation in a 2050 carbon neutral world are identified.

Starting from the traditional and conflicting narratives for carbon neutral steelmaking, which are the CCS narrative and the Hydrogen narrative, it is shown that steelmakers need to develop the new compelling Smart Carbon Narrative based on a flexible combination of carbon and hydrogen inputs from renewables and from waste resources at the entry and production of high valuable chemicals with CCU (carbon capture and use), CCE (carbon capture and export) and BECCS (bio-energy CCS).

The Smart Carbon narrative will bring the steel sector at the center of the Carbon Neutral Eco system with a more "Just Transition" which creates jobs and prosperity for our society.

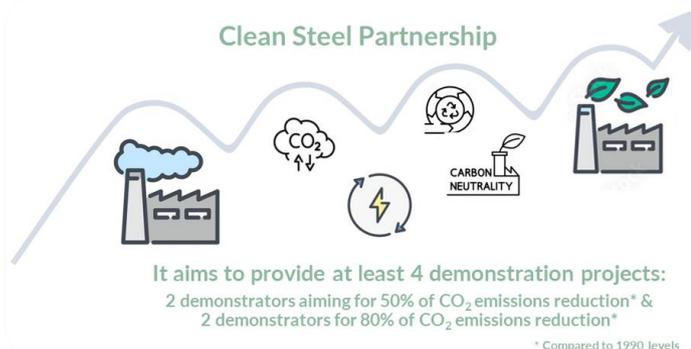
Carl de Maré, former President of ESTEP, opened the event with a [keynote speech](#) on “Why both hydrogen and carbon are key for Carbon Neutral steelmaking”. In mid-2021, Carl De Maré received the Howe Memorial Award for his extensive work on the decarbonisation of the steel industry.

## Synergies with other EU partnerships

In April, the Commission proposed a Hydrogen Inter-partnership Assembly. Possible synergies between the Clean Steel Partnership and Clean Hydrogen were explored. Hydrogen will be an important contributor to the decarbonisation of the steel sector. Collaboration on calls and other joined activities can be planned in the future. Another close cooperation was established with Processes4Planet.

## Large demonstrator projects

In April, following the feedback from the Interservice Consultation of the MoU, additional explanations were developed regarding the objective of reducing 80% of greenhouse gas emissions and the definition and clarification of large demonstrators. This means combining several technologies into a technological pathway and organising field campaigns on physical demonstrators, leading to pre-engineering of full-scale projects. This area remains an important topic and requires further work.



## Monitoring and Reporting

A questionnaire on the relevance and the availability of data regarding the KPIs of the MoU was filled out in view of the yearly reporting process that was due to start in November 2021. The CSP Task Force prepared a position paper that was presented to the European Commission in April. Analytical work was carried out in July on the consistency between the monitoring & reporting items and the additional activities, the SRIA objectives and finally the KPIs. Following this, the response to the information request (with deadline of 15 November) was provided and positive feedback was received.

In addition, a Small Expert Group (SEG) was created to adopt a common methodology for calculation of GHG emission reductions.

The additional activities plan was also drafted and endorsed in December, based on the template received from the experts appointed by the Commission.

## CSP Partnership Board

In April, the ESTEP Secretariat drafted a proposal for the composition of the co-Programmed Partnership aiming for a balanced representation of European Commission services, SMEs, gender, geography, steel production routes, experience in terms of decarbonisation and society. Compliance with the Rules of Procedure for the co-Programmed Partnership was also checked, namely regarding rotation, substitutes, lead times and competition. The ESTEP Board finally endorsed the proposal in July.

The first Partnership Board meeting took place on 8 October. The SRIA was adopted by both the public and private sides as an official document.



Only some minor modifications, such as the wording regarding biomass that had been put in conformity with the taxonomy, were introduced.

The European Commission commented the relatively low response to the 2021 HEU call. The private partners explained that the call deadline coincided with deadlines for applications for other funding schemes, which caused a work overload for applicants.

The second Partnership Board meeting took place on 13 December. The focus of this meeting was on the upcoming RFCS and HEU calls, the monitoring and reporting activities, and the approval of the additional activities plan (AAP) for the second half of 2021 and 2022.

It goes without saying that the Clean Steel Partnership had a bright start thanks to the strong contribution of all stakeholders. ESTEP is looking forward to the continuation of the journey in order to achieve the CSP objectives and beyond.

# ESTEP's projects & contributions

ESTEP is involved in a number of initiatives and has continued its involvement in various activities in 2021 in order to strengthen the position of the steel sector. The activities are based on the ESTEP membership in the relevant committees and bodies.

In 2021, several EU partnerships started in Horizon Europe. Many were an evolution of an already successful partnership in Horizon 2020. A new comer in the picture is the Clean Steel Partnership.

## Sustainable Process Industries through Resource and Energy Efficiency (SPIRE)

**A.SPIRE** has developed its vision for 2050, which built the basis for the **Processes4Planet** partnership (P4Planet). The Strategic Research and Innovation Agenda (SRIA) of the P4Planet presents the common view of 10 sectors from the process industry – among them steel – with respect to the research challenges to achieve climate neutrality, circularity and competitiveness.



The SRIA reveals in detail the innovation research areas, which are composed of innovation programmes.



Process industries are often clustered to take advantage of shared or related energy, services, infrastructure and material flows. The P4Planet introduced in its SRIA the concept of **Hubs4Circularity** as follows: “H4Cs are self-sustaining economic industrial ecosystems for full-scale Industrial-Urban Symbiosis and Circular Economy, closing energy, resource and data loops and bringing together all relevant stakeholders, technologies, infrastructures, tools and instruments necessary for their incubation, implementation, evolution and management”.

A.SPIRE has modernised its organisational structure. The main working body is the Advisory & Programming Group (APG). The steel sector is strongly involved in A.SPIRE and P4P. It holds two seats in the Board of A.SPIRE and in the Advisory & Programming Group leading a team of four persons, where one among them is from steel. Moreover, the Processes4Planet and the Clean Steel Partnership have regular exchanges on synergies and collaboration.

## Other partnerships

### Made in Europe partnership

**EFFRA** is the private association facilitating the Made In Europe partnership, which focusses on the manufacturing industry. Several ESTEP members are also member of EFFRA and participated in the events organised by Made in Europe.



### Clean Hydrogen partnership

The objective to become climate neutral requires a basket of technologies and a supporting framework to make it happen. One important pathway is to use hydrogen instead of fossil fuels. The **Clean Hydrogen** partnership (as per its legal name) Joint Undertaking (JU) is the successor of Fuel Cells Hydrogen JU (FCH<sub>2</sub> JU). The Clean Hydrogen Partnership addresses the aspects of hydrogen production, storage, transportation and usage. ESTEP and Hydrogen Europe have signed a joint declaration to outline potential areas of collaboration.



## EMIRI

ESTEP continued its contribution to the Steering Committee of **EMIRI**, the Energy Materials Industry Research Initiative. While the main focus of EMIRI continued to be on advanced materials, a dedicated action was



developed to support the establishment of a battery partnership. EMIRI also catalyses public-private interactions and ensures that public innovation programmes do contribute to protecting and reinforcing the industrial sector of Advanced Materials for low carbon energy.

### Research Fund for Coal and Steel

There were some changes in the [Research Fund for Coal and Steel](#) (RFCS) in 2021. The leading unit within DG RTD.D of the European Commission welcomed Jane Amilhat as new Head of Unit, while Andrea Gentili continued as deputy Head of Unit. The main contact for RFCS is now Agnieszka Zaplatka.

The implementation of the RFCS programme was delegated to the Research Executive Agency (REA). The harmonisation of RFCS with Horizon Europe continued. The key document for funding projects – the RFCS Information Package – was modernised, in particular to fully cover the EU Green Deal as well as the additional calls dedicated to the Clean Steel Partnership. Therefore, the legal basis of RFCS needed to be updated. Unfortunately, the policy-making decision process was delayed and the new legal basis was not in place in time for the 2021 annual call of RFCS. Hence, the normal procedure was in place, which allowed to use the interest generated from the assets for the funding of RFCS projects. The low interest rate resulted in an all-time low funding envelope of 11.4 million EUR for steel, instead of the envisaged 40 million EUR for coal and steel (out of which 72% for steel, namely 28.8 million EUR).

In 2021, there was no Clean Steel Partnership call financed by RFCS. The funding envelope of 54 million EUR was transferred to 2022 with the idea of providing a Big Ticket for Steel call in RFCS with a call budget of 104 million EUR. In a similar way, the funding envelope for the annual call was transferred to 2022, so that in 2022 a funding envelope of 68 million EUR for both coal and steel is expected.

### SET Plan action 6

The main work of the [Strategic Energy Transition \(SET\)](#) was made by defining the implementation Plan document. Steel is one of the key sectors addressed by the SET Plan. In 2021, several SET Plan meetings aimed at identifying decarbonisation projects. ESTEP and EUROFER took advantage of the Clean Steel Partnership by providing the data of the Clean Steel Partnership as input to the SET Plan meetings. Hence, a coherent set of KPIs and target values was established. The Clean Steel Partnership will work and report on them.

### High-Level Group on Energy Intensive Industries (HLG EII)

The mandate of the HLG EII came to an end in 2020 in parallel with the conclusion of Horizon 2020. The main result was the industry roadmap towards decarbonisation. The mandate was renewed in Horizon Europe in order to further work on sectorial pathways of decarbonisation and to investigate the links between the sectors, which finally could evolve in a decarbonisation scenario for EU industry, considering its transformation as well as the supply of renewable energy (electricity and hydrogen) and a supportive policy framework. ESTEP successfully applied for membership in 2021. The HLG has not convened many meetings in 2021.

# Projects

## REUSTEEL

ESTEP is beneficiary of the RFCS project ‘[REUSTEEL](#): project dissemination of results of the European projects dealing with reuse and recycling of by-products in the steel sector.’



The proposal aimed at developing an extensive action of dissemination and valorisation of the most important research results on the reuse and recycling of by-products derived from the steel production cycle as well as the exploitation of by-products coming from other industrial sectors within the steelmaking cycle. The project started in June 2019 and was set to last for a total duration of 24 months (until mid-2021). However, a prolongation of the project (for six months) was requested since COVID-19 made dissemination activities challenging.

Nevertheless, the REUsteel project was successfully presented in various online conferences, namely the ESTAD symposium in 2021. As part of its dissemination activities, ESTEP held a series of



open webinars in June (14, 15 and 16) 2021 on the European projects dealing with reuse and recycling of residual materials in the steel sector. The sessions focused on slag, sludge and dust, as well as on refractory, millscale and other residual materials from inside and outside of the steelwork.

The main partners of the projects wrote an article that was published on *Metals* in 2021. The paper made it to the list of Metal’s Top Cited Papers in the years 2020-2021.

Challenges and Prospects of Steelmaking Towards the Year 2050

**Reuse and Recycling of By-Products in the Steel Sector: Recent Achievements Paving the Way to Circular Economy and Industrial Symbiosis in Europe**

Teresa Annunziata Branca et al.

## SPIRE- SAIS

The ‘Skills Alliance for Industrial Symbiosis – A Cross-sectoral Blueprint for a Sustainable Process Industry (SPIRE – SAIS)’ project, which falls under the Erasmus+ Programme (Key Action 2), started in 2020 for a total duration of four years.

The [SPIRE-SAIS](#) project brings together stakeholders from across the SPIRE community, including industry sector associations, education and training providers, research & technology organisations, research institutions, regional institutions, companies and others, to enable and accelerate the uptake of industrial symbiosis and energy efficiency by developing a comprehensive cross-sectoral blueprint for skills.



**Erasmus+ Programme (Key Action 2)**  
Skills Alliance for Industrial Symbiosis -  
A Cross-Sectoral Blueprint for a Sustainable Process  
Industry (SPIRE-SAIS)

The project counts 24 partners, where ESTEP represents the steel sector along with other steel companies.

Every three months, the whole project consortium comes together during General Assembly meetings, which ensures the continuity of the project as well as the progress of activities across the various work packages.

At the end of 2021, the project partners were very busy to prepare the project's mid-term conference 'A Cross-Sectoral Skills Strategy for Industrial-Urban Symbiosis and Energy Efficiency - Empowering the EU citizens to contribute to the transition'. The main purpose of the conference, which was held in March 2022, was to share the project's learnings and progress, discuss with stakeholders the potential transfer and implementation strategies for the Blueprint rollout and establish links to related initiatives.



In 2021, the European Commission launched a [Pact for Skills](#), which is a shared engagement model for skills development in Europe. The SPIRE-SAIS project has proudly joined it to support a fair and resilient recovery and to deliver on the ambitions of the green and digital transitions and of the EU Industrial and SME Strategies.

### European Parliament Pilot Project – Green Steel for Europe (GREENSTEEL)

In 2021 the Green Steel for Europe project was almost finalised. It all started in April 2019 when the European Commission adopted a financing [decision](#) to implement the European Parliament Pilot Project on 'Research on reduction of CO<sub>2</sub> emissions in steel production'. The Pilot Project GREENSTEEL explores the feasibility of implementing breakthrough technology options,



deployment paths and investment strategies for clean steelmaking in Europe with almost zero CO<sub>2</sub> emissions. The overall objective is to contribute to the sustainable decarbonisation of the steel industry, helping to position

the EU as a leading provider of low-carbon products, services and advanced technologies in steelmaking.

The [project](#) officially started in January 2020 for a total duration of 18 months (until June 2021), but it was extended for four extra months as a consequence of the COVID-19 pandemic. Its consortium comprises 10 partners, including ESTEP and EUROFER, and is coordinated by the Centre for European Policy Studies (CEPS). The deliverables of this project are pressing as they are intended to support the preparation for the Clean Steel Partnership.

Throughout the year 2021, intensive work was carried out by the whole consortium in order to complete the following [work packages](#): technology roadmapping (WP1), analysis of investment and funding (WP2), impact assessment (WP3) and the dissemination and stakeholders' engagement (WP4). Several validation workshops were also held in order to communicate the added value of the project to selected stakeholders, gathering feedback from them and ensuring the broadest possible dissemination of the project results.

The final conference of the [Green Steel for Europe](#) project, organised by CEPS, took place online on 9-10 November 2021. The first day focused on 'Technology, Investment and Financing for Decarbonising Steelmaking', while the second day concentrated on the 'Policy Options and the Way Forward Towards Climate-Neutral Steelmaking in Europe'. The final report provides factsheets on the various technology pathways for decarbonising the steel industry. Another highlight of the final report is the quite exhaustive mapping of funding instruments across Europe.



# Outlook 2022

Looking ahead at what the remaining of 2022 might bring, it goes without saying that steel will continue to be high on the agenda with an increasing level of activities regarding the Clean Steel Partnership and the Technology Platform. At ESTEP we will continue to push for more ambitious reforms, to gather additional support for our members, and to accelerate the creation of the necessary framework conditions for our industry to grow.

ESTEP is deeply involved in research and is strongly connected with the European Commission through the Horizon Europe and RFCS programmes. It is also a European Technology Platform and will, as such, continue to work on its visibility and on providing input for the decision-making process at European level. It will also continue to search for opportunities for its community in order to provide inputs of the highest interest for its members. ESTEP will keep on going to EU events and meetings with the aim to establish new relationships with key European actors and to attract new potential members.

In order to achieve the targets set out in the European Green Deal, the continuation of the activities of the Clean Steel Partnership remains vital. Other call topics will be published and will have to be answered with impactful project proposals to keep the momentum.

In the context of RFCS and Horizon Europe, ESTEP will continue to submit collaborative proposals, disseminating results via workshops and leading the informal follow-up meetings of the Steel Advisory Group – a voice for steel stakeholders. ESTEP's Focus Groups will play a key role. Several workshops and webinars in the area of 'Hydrogen' and of the Clean Steel Partnership will be organised during 2022. ESTEP will also continue to engage in European-funded projects as a dissemination partner.

Furthermore, in order to increase awareness of steel success stories, ESTEP will participate in, and contribute to, several initiatives and high-level events during the course of 2022. One of the main activities will be the 20th anniversary of the RFCS programme, the conference on Industrial Technologies (IndTech) as well as the European Industry Days.



# Glossary Notes

AISBL	Association Internationale sans but lucratif (internationally non-for-profit acting association)
CE	Circular Economy
CEMBUREAU	European Cement Association
CCU	Carbon Capture and Usage
CCS	Carbon Capture and Storage
CSP	Clean Steel Partnership
DG GROW	Directorate General for Internal market, Industry, Entrepreneurship & SMEs
DG RTD	Directorate General for Research & Innovation
EIIs	Energy Intensive Industries
EMIRI	Energy Materials Industry Research Initiative
ESSA	European Steel Skills Agenda
ESTEP	European Steel Technology Platform
EU	European Union
EUCAR	European Council for Automotive R&D
EU ETS	EU Emissions Trading System
EUNITED	European Engineering Industries Association
EUROFER	European Steel Association
FG	Focus Group
GHG	Greenhouse gas
GREENSTEEL	Green Steel for Europe project
H2020	Horizon 2020
HEU	Horizon Europe
HLG EII	High Level Group of Energy Intensive Industries
ICT	Information and Communication Technology
IPCEI	Important Projects of Common European Interests
LCA	Life Cycle Assessment
MEP	Member of the European Parliament
PI	Process Integration
PPP	Public Private Partnerships
P4Planet	Processes4Planet partnership
REA	Research Executive Agency
R&D	Research & Development
R&D&I	Research & Development & Innovation
RFCS	Research Fund for Coal and Steel
RTO	Research and Technologies Organisation
SAG	Steel Advisory Group
SET	Strategic Energy Transition
SPIRE	Sustainable Process Industries through Resource and Energy Efficiency
SPIRE-SAIS	Skills Alliance for Industrial Symbiosis - A Cross-sectoral Blueprint for a Sustainable Process Industry
SRIA	Strategic Research Innovation Agenda

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