

Carbon Direct Avoidance in steel: Electricity and hydrogen-based metallurgy (Clean Steel Partnership) (IA)

TOPIC ID: HORIZON-CL4-2021-TWIN-TRANSITION-01-18

Grant

General information

Programme

Horizon Europe Framework Programme (HORIZON)

Call

TWIN GREEN AND DIGITAL TRANSITION 2021 (HORIZON-CL4-2021-TWIN-TRANSITION-01)

 [See budget overview](#)

Open for submission

Type of action

HORIZON-IA HORIZON Innovation Actions

Type of MGA

HORIZON Action Grant Budget-Based [HORIZON-AG]

Deadline model

single-stage

Opening date

22 June 2021

Deadline date

23 September 2021 17:00:00 Brussels time

Topic description

ExpectedOutcome:

Projects outcomes will enable achieving the expected impacts of the destination by improving energy efficiency in raw materials value chains.

Projects are expected to contribute to the following outcomes:

- Demonstration of technologies in the steel sector leading to a reduction of CO₂ emissions by 2050 by at least 80 to 95% compared to 1990 levels;
- Improve energy and resource efficiency and increase utilisation of renewable energy sources^[1] in metallurgical processes to substitute fossil fuels;
- Enabling steel production through carbon direct avoidance (CDA) technologies at a demonstration scale;
- Efficient integration of renewable energy sources, considering also their intermittency and the possibility to offer demand-response flexibility.

Relevant indicators and metrics, with baseline values, should be clearly stated in the proposal.

Scope:

This topic covers carbon direct avoidance technologies leading to significant CO₂ emission reduction in the steel sector.

The Commission's Strategic Vision "A Clean Planet for all" indicates that deep CO₂ emissions reductions in the steel sector are possible through a combination of technological pathways, including steel recycling, carbon capture utilisation and storage, process integration, and electricity/hydrogen-based metallurgy. While energy intensity has reduced significantly over the past decades, the steel industry remains a large source of emissions due to preferred use of coal and energy needed to reduce iron oxides. With alternative pathways used with green electricity and green gases, the emissions can be further reduced so that these pathways could achieve CO₂ reductions of up to 95% by 2050 compared to 1990 levels.

There is no one solution to achieve low-CO₂ steelmaking, as there is expected to be a variety of production technologies in the future. Relevant participation from sectors other than steel is not excluded, if the technologies presented are compatible with the expected outcomes of the topic and the Clean Steel partnership objectives.

The projects proposed are expected to address the following research and innovation areas:

- Replacement of fossil carbon energy by renewable (hydro/wind/solar) electricity in iron and steelmaking;
- Development of pilots and demonstrators in the field of direct reduction of iron with hydrogen. Direct reduction of iron ore with high amounts of hydrogen is expected to be key for CO₂ neutral steelmaking;
- Improvement of plasma melting processes with improved electrode technologies using a plasma torch or plasma smelting reduction leading to CO₂ reduction compared to fossil-based fuels;
- Development and testing of direct electricity based iron oxides reduction processes including the electrolytic reduction at high or low temperature;
- Innovation activities focused on the process and the product properties as well as on the impact of the product properties on the downstream processes (e.g. Electric Arc Furnace). The process technology may have to be adapted to the new boundary conditions;

Proposals submitted under this topic should include a business case and exploitation strategy, as outlined in the introduction to this Destination.

This topic implements the co-programmed European Partnership on Clean Steel.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement

Specific Topic Conditions:

Activities are expected to start at TRL 5 and achieve TRL 8 by the end of the project – see General Annex B.

Cross-cutting Priorities:

[Co-programmed European Partnerships](#)

[1]Biomass utilisation in line with the objectives of the EU Biodiversity Strategy.

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Destination

Climate neutral, circular and digitised production

This destination will directly support the following Key Strategic Orientations, as outlined in the Strategic Plan:

- KSO C, **'Making Europe the first digitally led circular, climate-neutral and sustainable economy** through the transformation of its mobility, energy, construction and production systems.'
- KSO A, **'Promoting an open strategic autonomy by leading the development of key digital, enabling and emerging technologies, sectors and value chains** to accelerate and steer the digital and green transitions through human-centred technologies and innovations.'
- KSO D, **'Creating a more resilient, inclusive and democratic European society**, prepared and responsive to threats and disasters, addressing inequalities and providing high-quality health care, and empowering all citizens to act in the green and digital transitions.'

Proposals for topics under this Destination should set out a credible pathway to the following expected impact of Cluster 4:

- **Global leadership in clean and climate-neutral industrial value chains, circular economy and climate-neutral digital systems and infrastructures (networks, data centres)**, through innovative production and manufacturing processes and their digitisation, new business models, sustainable-by-design advanced materials and technologies enabling the switch to decarbonisation in all major emitting industrial sectors, including green digital technologies.

Accelerating the twin green and digital transitions will be key to building a lasting and prosperous growth, in line with the EU's new growth strategy, the European Green Deal. Europe's ability to lead the twin transitions will require new technologies, with investment and innovation to match. Research and innovation will be fundamental to create the new products, services and business models needed to sustain or enable EU industrial leadership and competitiveness, and to create new markets for climate neutral and circular products. The shift towards a sustainable and inclusive economic model will be further enabled by the broader diffusion and uptake of digital and clean technologies across key sectors.

As Europe transitions towards climate neutrality, some sectors will have to make bigger and more transformative changes than others, due to their centrality in a variety of value chains and their large potential contribution to emissions reductions. Activities under this Destination focus on the twin green and digital transition providing a green productivity premium to discrete manufacturing, construction and energy-intensive industries, including process industries. This will make an essential and significant contribution to achieving climate neutrality in the European Union by 2050, and to the achievement of a circular economy. It will also enhance the Union's open strategic autonomy with regard to the underlying technologies. To achieve these goals, the activities in this Destination are complementary to those in Destination 2, which will enhance open strategic autonomy in key strategic value chains for a resilient industry.

The gross added value of the European manufacturing sector is EUR 2,076 billion (2019). The sector employs more than 30 million people in the Union and represents 22% of the world's manufacturing output. The Union's trade surplus in manufactured goods is EUR 421 billion (2019). Similarly, the construction ecosystem (driven mainly by SMEs) offers 22 million jobs and contributes 10.5% of EU-27 global value added[[Updating the 2020 New Industrial Strategy: Building a stronger Single Market for Europe's recovery', COM(2021)350 final and associated Staff Working Documents]]. However, the manufacturing and construction sectors must significantly reduce their pollution and waste, and increase their recycling. Moreover, the potential of digital technologies is underused in manufacturing industry, e.g. 12% of EU enterprises use big data technologies and only 1 out of 5 SMEs is highly digitised, and in construction, which remains one of the least digitised sectors with a notable underinvestment in R&D.[[The digital intensity of the construction sector is below 10%, meaning that the sector has a very slow absorption rate of digital technologies, according to the Digital Transformation Scoreboard 2018, https://ec.europa.eu/information_society/newsroom/image/document/2018-20/4_desi_report_integration_of_digital_technology_B61BEB6B-F21D-9DD7-72F1FAA836E36515_52243.pdf]] A key issue for the manufacturing sector is that its complex supply and value chains are heavily affected by the current pandemic crisis, and the sector needs to further develop resilience against financial and technical disruptions.

In addition, the Union's process industries are important to its economy, its resilience and its environmental credentials. Process industries are responsible for a turnover of > 2 trillion, 8.5 million direct jobs and 20 million indirect jobs. They represent 0.5 million enterprises and 5 % of the EU27 GDP. The process industry however faces two key challenges: a strong global competition, and an environmental challenge. In particular, energy-intensive industries are resource intensive, using extensive amounts of raw materials (often imported and fossil based). In their operations, they generate large amounts of waste, 20% of global greenhouse gases (GHG) but also pollutants. The industries need to transform itself to decrease GHG and pollutant emissions, its resource utilisation and its overall environmental impact. It will have to achieve climate neutrality, near zero waste, zero pollution and zero landfill by 2050 at the latest. By 2030, decisive steps need to be taken given the long investment cycles these industries are facing. As the process industry is transforming primary raw materials into materials ready for use by the manufacturing industry, it will play a key role in the pathways toward circularity of materials by transforming industrial and end-of-life waste into secondary raw materials leading to the same quality output in the newly produced materials.

In the first Work Programme, outcomes of R&I investments in the long-term will focus on the following impacts:

- Accelerate the twin green and digital transition of the manufacturing and construction sectors;
- Create a new green, flexible and digital way to build and produce goods. This will lead to sustainable, flexible, responsive and resilient factories and value chains, enabled by digitisation, AI, data sharing, advanced robotics and modularity. At the same time it will help reduce CO2 emissions and waste in these sectors, and enhance the durability, reparability and re-cycling of products/components. It will also ensure better and more efficient use of construction-generated data to sustain competitiveness and greening of the sector;
- Make the jobs of the humans working in the manufacturing and construction sectors more attractive and safer, and point the way to opportunities for upskilling;
- Set out a credible pathway to contributing to climate neutral, circular and digitalised energy intensive industries;
- Increase productivity, innovation capacity, resilience, sustainability and global competitiveness of European energy intensive industries. This includes as many as possible new large hubs for circularity by 2025 (TRL 7 or above); developing sustainable ways for circular utilisation of waste streams and CO2/CO streams; and electrifying industry to enable and foster a switch to a renewable energy system;
- Contribute to a substantial reduction of waste and CO2 emissions, turning them into alternative feedstocks to replace fossil-based raw materials and decrease reliance on imports.

In order to achieve the expected outcomes, for particular topics international cooperation is clearly not mandatory but advised with some regions or countries to get internationally connected and add additional specific expertise and value to the activities.

In line with the European Green Deal objectives, research and innovation activities should comply with the 'do no significant harm' principle[[as per Article 17 of Regulation (EU) No 2020/852 on the establishment of a framework to facilitate sustainable investment (EU Taxonomy Regulation)]]. Compliance needs to be assessed both for activities carried out during the course of the project as well as the expected life cycle impact of the innovation at a commercialisation stage (where relevant). The robustness of the compliance must be customised to the envisaged TRL of the project. In this regard, the potential harm of Innovation Actions contributing to the European Green Deal will be monitored throughout the project duration.

To achieve wider effects activities beyond R&I investments will be needed. Three co-programmed partnerships will enhance dissemination, community building and foster spillover effects: Made in Europe for the manufacturing sectors, Clean Steel and Processes4Planet for the energy intensive industries. This destination has strong links to other clusters in Pillar II, notably Cluster 5 for the activities related to the integration of renewables and thermal energy management in industry, and with the European Innovation Council and Pillar III of Horizon Europe given the strong role of SMEs in the development of the innovations planned. Synergies will be sought to access blended funding and finance from other EU programmes; testing and deployment activities under the Digital Europe Programme (DEP); links to the EIT (Manufacturing and Digital KICs); and links to the thematic smart specialisation platform on industrial modernisation.

Much of the research and innovation supported under this Destination may serve as a cradle for the [New European Bauhaus](#): this is about designing sustainable ways of living, situated at the crossroads between art, culture, social inclusion, science and technology. This includes R&I on manufacturing, construction, advanced materials and the circular economy approaches.

Business cases and exploitation strategies for industrialisation: This section applies only to those topics in this Destination, for which proposals should demonstrate the expected impact by including a business case and exploitation strategy for industrialisation.

The business case should demonstrate the expected impact of the proposal in terms of enhanced market opportunities for the participants and enhanced manufacturing capacities in the EU, in the short to medium term. It should describe the targeted market(s); estimated market size in the EU and globally; user and customer needs; and demonstrate that the solutions will match the market and user needs in a cost-effective manner; and describe the expected

market position and competitive advantage.

The exploitation strategy should identify obstacles, requirements and necessary actions involved in reaching higher TRLs, for example: matching value chains, enhancing product robustness; securing industrial integrators; and user acceptance.

For TRLs 7-8, a credible strategy to achieve future full-scale manufacturing in the EU is expected, indicating the commitments of the industrial partners after the end of the project.

Activities beyond R&I investments will be needed to realise the expected impacts: these include the further development of skills and competencies (also via the European Institute of Innovation and Technology, in particular EIT Manufacturing); and the use of financial products under the InvestEU Fund for further commercialisation of R&I outcomes.

Where relevant, in the context of skills, it is recommended to develop training material to endow workers with the right skillset in order to support the uptake and deployment of new innovative products, services, and processes developed in the different projects. This material should be tested and be scalable, and can potentially be up-scaled through the European Social Fund Plus (ESF+). This will help the European labour force to close the skill gaps in the relevant sectors and occupational groups and improve employment and social levels across the EU and associated countries.

The topics serving these objectives are structured as follows:

- Green, flexible and advanced manufacturing
- Advanced digital technologies for manufacturing
- A new way to build, accelerating disruptive change in construction
- Hubs for circularity, a stepping stone towards climate neutrality and circularity in industry
- Enabling circularity of resources in the process industries, including waste, water and CO₂/CO
- Integration of Renewables and Electrification in process industry

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Topic conditions and documents

General conditions

1. Admissibility conditions: described in [Annex A](#) and [Annex E](#) of the Horizon Europe Work Programme General Annexes.

Proposal page limits and layout: described in Part B of the Application Form available in the Submission System.

2. Eligible countries: described in [Annex B](#) of the Work Programme General Annexes.

A number of non-EU/non-Associated Countries that are not automatically eligible for funding have made specific provisions for making funding available for their participants in Horizon Europe projects. See the information in the [Horizon Europe Programme Guide](#).

3. Other eligibility conditions: described in [Annex B](#) of the Work Programme General Annexes.

4. Financial and operational capacity and exclusion: described in [Annex C](#) of the Work Programme General Annexes.

5. Evaluation and award:

Award criteria, scoring and thresholds are described in [Annex D](#) of the Work Programme General Annexes.

Submission and evaluation processes are described in [Annex F](#) of the Work Programme General Annexes and the [Online Manual](#).

Indicative timeline for evaluation and grant agreement: described in [Annex F](#) of the Work Programme General Annexes.

6. Legal and financial set-up of the grants: described in [Annex G](#) of the Work Programme General Annexes.

The funding rate is up to 60% of the eligible costs. This funding rate applies both to members and non-members of the partnership, except for non-profit legal entities, where the funding rate is up to 100% of the total eligible costs.

Specific conditions

7. **Specific conditions:** described in the specific topic of the Work Programme.

Documents**Call documents:**

[Standard application form \(HE RIA, IA\)](#) – call-specific application form is available in the Submission System

[Standard evaluation form \(HE RIA, IA\)](#) – will be used with the necessary adaptations

[HE General MGA v1.0 – MGA](#)

Additional documents:

[HE Main Work Programme 2021–2022 – 1. General Introduction](#)

[HE Main Work Programme 2021–2022 – 7. Digital, Industry and Space](#)

[HE Main Work Programme 2021–2022 – 13. General Annexes](#)

[HE Programme Guide](#)

[HE Framework Programme and Rules for Participation Regulation 2021/695](#)

[HE Specific Programme Decision 2021/764](#)

[EU Financial Regulation](#)

[Rules for Legal Entity Validation, LEAR Appointment and Financial Capacity Assessment](#)

[EU Grants AGA – Annotated Model Grant Agreement](#)

[Funding & Tenders Portal Online Manual](#)

[Funding & Tenders Portal Terms and Conditions](#)

[Funding & Tenders Portal Privacy Statement](#)

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Partner search**38**

Organisations are looking for collaborating partners for this topic

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LEARs, Account Administrators or self-registrants can publish partner requests for open and forthcoming topics after logging into this Portal.

Start submission

To access the Electronic Submission Service, please click on the submission-button next to the **type of action** and the **type of model grant agreement** that corresponds to your proposal. You will then be asked to confirm your choice, as it cannot be changed in the submission system. Upon confirmation, you will be linked to the correct entry point.

To access existing draft proposals for this topic, please login to the Funding & Tenders Portal and select the My Proposals page of the My Area section.

Please select the type of your submission:

HORIZON Innovation Actions [HORIZON-IA], HORIZON Action Grant Budget-Based [HORIZON-AG]

Start submission

 Need help?

Topic related FAQ

There are no FAQ related to this topic.

Get support

Please read carefully all provisions below before the preparation of your application.

Online Manual is your guide on the procedures from proposal submission to managing your grant.

Horizon Europe Programme Guide contains the detailed guidance to the structure, budget and political priorities of Horizon Europe.

Funding & Tenders Portal FAQ – find the answers to most frequently asked questions on submission of proposals, evaluation and grant management.

Research Enquiry Service – ask questions about any aspect of European research in general and the EU Research Framework Programmes in particular.

Enterprise Europe Network – contact your EEN national contact for advice to businesses with special focus on SMEs. The support includes guidance on the EU research funding.

IT Helpdesk – contact the Funding & Tenders Portal IT helpdesk for questions such as forgotten passwords, access rights and roles, technical aspects of submission of proposals, etc.

European IPR Helpdesk assists you on intellectual property issues.

CEN-CENELEC Research Helpdesk and ETSI Research Helpdesk – the European Standards Organisations advise you how to tackle standardisation in your project proposal.

The European Charter for Researchers and the Code of Conduct for their recruitment – consult the general principles and requirements specifying the roles, responsibilities and entitlements of researchers, employers and funders of researchers.

Partner Search Services help you find a partner organisation for your proposal.

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Call updates

Updates - News

CALL :

Jun 22, 2021 4:20:15 PM

The submission session is now available for: HORIZON-CL4-2021-TWIN-TRANSITION-01-14(HORIZON-RIA), HORIZON-CL4-2021-TWIN-TRANSITION-01-02(HORIZON-IA), HORIZON-CL4-2021-TWIN-TRANSITION-01-16(HORIZON-CSA), HORIZON-CL4-2021-TWIN-TRANSITION-01-12(HORIZON-RIA), HORIZON-CL4-2021-TWIN-TRANSITION-01-17(HORIZON-IA), HORIZON-CL4-2021-TWIN-TRANSITION-01-21(HORIZON-IA), HORIZON-CL4-2021-TWIN-TRANSITION-01-20(HORIZON-IA), HORIZON-CL4-2021-TWIN-TRANSITION-01-22(HORIZON-IA), HORIZON-CL4-2021-TWIN-TRANSITION-01-18(HORIZON-IA), HORIZON-CL4-2021-TWIN-TRANSITION-01-03(HORIZON-RIA), HORIZON-CL4-2021-TWIN-TRANSITION-01-07(HORIZON-IA), HORIZON-CL4-2021-TWIN-TRANSITION-01-19(HORIZON-IA), HORIZON-CL4-2021-TWIN-TRANSITION-01-01(HORIZON-IA), HORIZON-CL4-2021-TWIN-TRANSITION-01-08(HORIZON-IA), HORIZON-CL4-2021-TWIN-TRANSITION-01-11(HORIZON-RIA), HORIZON-CL4-2021-TWIN-TRANSITION-01-10(HORIZON-IA), HORIZON-CL4-2021-TWIN-TRANSITION-01-05(HORIZON-RIA)

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