Demonstrating sustainable value creation from industrial CO2 by its thermophilic microbial conversion into acetone

Project type: IA – Innovation Action
Start date of the project: 01/10/2021
Duration: 60 months

STRATEGIC INTELLIGENCE BULLETIN 10

Due date		**Delivery date**	April 2025
Work package	WP 6 – Exploitation, Replication, Communication and Dissemination		
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Version and amendments history

Version	Date	Created/Amended by	Changes
01	02/04/2025	Laurianne BOUVIER	

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FOREWORD

We are delighted to release the tenth strategic intelligence bulletin.

In the face of the escalating global climate crisis, the pursuit of sustainable and effective solutions has never been more urgent. This strategic bulletin delves into one such solution: Carbon Capture, Utilization, and Storage (CCUS), a technology that could play a pivotal role in our journey towards a carbon-neutral future.

The report provides an in-depth exploration of the current legislative landscape surrounding CCUS, with a particular focus on the European Union's 2040 climate change reports, the Net Zero Act, and the Renewable Energy Directive III (RED III). These pieces of legislation not only shape the development and deployment of CCUS technologies but also influence the funding and tender opportunities available in this field.

As you navigate through this report, you will discover the intricacies of these legislations and their implications for CCUS. You will gain insights into the opportunities they present and the challenges they pose. This report aims to equip its readers with the knowledge and understanding necessary to navigate the complex world of CCUS, legislations, and funding opportunities.

We hope that this report serves as a valuable resource in your quest to understand and contribute to the global effort against climate change. The journey towards a sustainable future is a challenging one, but with informed decisions and strategic actions, we can make significant strides in the right direction.

Do not hesitate to send us any comments to improve this document by writing or sharing information that could be relevant for the next bulletin to laurianne.bouvier@axelera.org

Have a good read!

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MARKET INFORMATION

CARBON, CAPTURE, UTILIZATION AND STORAGE (CCUS) MARKETS 2025-2045: TECHNOLOGIES, MARKET FORECASTS, AND PLAYERS

The IDTechEx market analysis (July 2024) provides a comprehensive technology roadmap, forecasting 18.5% annual growth in capture capacity through 2045 driven by hybrid solvent-sorbent systems and AI-optimized capture processes. The IDTechEx market analysis forecasts global CCUS capture capacity to reach 2.5 gigatonnes annually by 2045, driven by an 18.5% compound annual growth rate (CAGR) from 2025. Key growth areas include point-source capture (e.g., blue hydrogen, natural gas processing) and direct air capture (DAC), alongside emerging CO_2 utilization in fuels, chemicals, and building materials. The report highlights hybrid solvent-sorbent systems and AI-optimized processes as critical technological advancements, with carbon pricing mechanisms and 45Q tax credits accelerating adoption. By 2035, capacity is projected to hit 1.2 billion tonnes annually, though this remains below net-zero requirements. Sectors like hard-to-abate industries and low-emissions hydrogen production are prioritized, with forecasts segmented by CO_2 fate (storage, utilization, enhanced oil recovery).

For more information, please click here.

THE CONTRIBUTION OF CARBON CAPTURE AND UTILISATION (CCU) TOWARDS CLIMATE NEUTRALITY IN EUROPE (PART 1)

Published in early 2024, this report presents the first open-access quantitative model assessing CCU's crucial contribution to achieving climate neutrality in the EU by 2050. It finds that over **21% of greenhouse gas emission reductions from technological solutions** will come from CCU, equating to roughly **250 million tonnes of CO_2 avoided annually** in the EU. The report addresses key questions: Where will the CO_2 used in CCU come from in 2050? How Will the captured carbon Be Used by 2050? What CO_2-based products can be produced by 2050?

For more information, please click here.

PUTTING THE U IN CCUS: OVERVIEW OF EMERGING PATHWAYS IN CARBON UTILISATION

This Oxford Institute for Energy Studies (OIES) report published in April 2025 provides a detailed overview of current and emerging CCU pathways, examining economic opportunities and challenges to be overcome. Today, the most mature application of CCU is the production of urea and other chemicals, primarily used in fertilizer. As it does not involve permanent storage of CO_2, new CCU pathways are under development like biochar, building materials and e-fuels. To enhance a large-scale deployment of CCU, some challenges remain to be tackled like the reduction of costs for CO_2 capture, and for e-fuels, access to green H_2 and renewable energies.

For more information, please click here.

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TECHNOLOGY WATCH

30 START-UP COMPANIES ADVANCING CCUS IN 2025

Carbon Capture Utilization and Storage are clearly identified as solutions to mitigate climate change and market size is projected to be USD 9.98 billion by the end of 2030 with a projected grow of 19.5% (CAGR) on the period 2024-2030. This article selected 30 star-up companies to watch over the 1345 identified companies working on CCUS. Among them, **Carbonworks** develops an industrial platform to capture CO2 emissions from industrial sources using photosynthetic microalgae

For more information, please click here.

"BEST CO2 UTILISATION 2025" AWARD AT CO2-BASED FUELS AND CHEMICALS CONFERENCE

Announced at the 2025 CO2-based Fuels and Chemicals Conference, this initiative spotlights six trailblazing technologies, including:

- Electrochemical CO_2-to-ethanol conversion systems achieving high selectivity ;
- Biologically engineered microbes for producing polymers from captured carbon ;
- Mineralization techniques embedding CO_2 into cement substitutes with superior durability.

For deeper insights, refer to the Carbon Capture Global Summit 2025 proceedings (September 2025), which will feature cutting-edge case studies on DAC scalability and cross-sector CCUS hubs.

In 2024, the innovation award has been granted to the French company **Dioxycle**, able to transform industrial emissions into sustainable ethylene solely utilising renewable electricity and water. **D-CRBN** (Belgian company) was awarded with the second prize, offering plasma technology capable of splitting the CO_2 molecule into CO, which is subsequently converted into high value chemicals, including e-fuels, organic acids, polymers, etc. Finally, last awarded company in the US company **Twelve** for the E-Jet® Fuel technology, producing Power-to-X sustainable aviation fuels using electricity, water and CO2.

For more information, please click here.

ADVANCES IN CCS TECHNOLOGIES AND COST REPORT 2025

This Global CCS Institute report details breakthroughs in carbon capture efficiency and cost reduction, particularly in Direct Air Capture (DAC) and next-generation solvent systems. It emphasizes innovations like modular DAC units and advanced membranes that reduce energy demands while scaling deployment. The report also explores how carbon utilization (e.g., converting CO_2 into fuels and construction materials) is becoming economically viable through improved catalytic processes.

For more information, please click here.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101037009.

EU POLICIES & LEGISLATION

EU 2040 CLIMATE TARGET

The European Commission, in its Communication released on February 6 2024, outlines the 2040 climate target for the EU. This target aims to achieve a 90% reduction in net greenhouse gas emissions compared to 1990 levels. The communication emphasizes the importance of renewable energy growth and advocates for a combination of zero and low-carbon solutions, including energy efficiency, sustainable bioenergy, nuclear power, storage, carbon capture and utilization (CCU), and carbon removal. Additionally, it calls for private investment to support the transition and encourages the development of new business models in key sectors of the economy. The document also proposes initiatives such as a legislative package for CO2 transport infrastructure. Overall, this communication sets the tone and direction for future EU efforts to meet climate targets, with CCU playing a crucial role. New legislative actions – such as a potential 'Fit-for-90' package – are expected after the EU elections on 6-9 June 2024

For more information, please click here.

NET ZERO INDUSTRY ACT

The Net Zero Industry Act (NZIA) became law on 28 June 2024 after being published in the Official Journal of the European Union, following approval by the European Parliament and Council. This landmark regulation accelerates the EU's clean-tech manufacturing capacity by simplifying administrative procedures, speeding up permitting and granting strategic project status to key decarbonization technologies – including carbon capture and utilization (CCU).

Under the NZIA, CCU projects—such as e-fuels production, CO_2-based chemicals, and mineralization—gain streamlined approvals and priority status at the national level. The Act explicitly recognizes CCU alongside carbon capture, renewable fuels (RFNBOs), and synthetic fuels as pivotal for Europe's energy transition.

For more information, please click here.

UPDATED GUIDANCE ON GEOLOGICAL CO2 STORAGE

In July 2024, the European Commission released updated guidance documents to support the implementation of the 2009 CCS Directive. These updates aim to streamline permitting processes and better accommodate emerging CO_2 storage technologies. New guidance focuses on geological formations such as mafic/basaltic rock and depleted hydrocarbon reservoirs, and addresses topics including corrosion risks, regulatory transition from oil/gas to CO_2 storage, and overall supply chain integration. Member States now have clearer instructions for identifying suitable geological storage sites, thereby facilitating the development of a coherent European CO_2 storage infrastructure.

For more information, please click here.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101037009.

RED III DIRECTIVE

The revised Renewable Energy Directive (RED III) sets a 5.5% aggregate target by 2030 for advanced biofuels (including recycled carbon fuels) and renewable fuels of non-biological origin (RFNBOs) in transport, with a 1% sub-target for RFNBOs (e.g., hydrogen-based CCU fuels). For industry, it mandates 42% RFNBOs in hydrogen use by 2030, rising to 60% by 2035, accelerating CCU-derived fuels in hard-to-abate sectors. FuelEU Maritime (aligned with RED III) introduces phased GHG cuts for shipping (2% by 2025, 80% by 2050) and a 2% RFNBO target by 2034 if adoption lags. The RED III update (2024) refines cross-border renewable projects and grid integration, indirectly supporting CCU infrastructure. Member States must transpose RED III into national law by May 2025, with recent EU guidance clarifying RFNBO accounting and refinery inclusion.

For more information, please click here.

EU CARBON REMOVAL CERTIFICATION FRAMEWORK

In November 2024, the Council of the EU adopted a regulation establishing a certification framework for carbon removals, aimed at supporting the EU's climate neutrality goals. This voluntary framework sets common rules for certifying three types of activities: permanent carbon removals (e.g., DACCS and BECCS), carbon storage in products (e.g., wood-based construction materials), and carbon farming (e.g., soil and forest carbon sequestration). Certified activities must meet four core criteria: a measurable climate benefit, additionality, long-term storage, and no significant harm to the environment. Certification will be carried out by independent third parties, and an EU-wide digital registry will be established within four years to ensure transparency and traceability of certified units.

For more information, please click here.

EU CLEAN INDUSTRIAL DEAL (2025)

The EU's Clean Industrial Deal, announced in February 2025, positions carbon capture and utilization (CCU) as a cornerstone for industrial decarbonization, targeting energy-intensive sectors like steel, chemicals, and cement. It emphasizes scaling markets for captured CO_2 by prioritizing projects that convert emissions into synthetic fuels, chemicals, and low-carbon construction materials. Key measures include revised public procurement rules (2026) favoring "Made in Europe" clean products, €100 billion in funding via an Industrial Decarbonisation Bank, and an Industrial Accelerator Act (late 2025) to boost demand for CCU-derived goods. The Deal also promotes circular economy integration (2026 Circular Economy Act) to optimize CO_2 reuse and reduce material dependencies, alongside simplified regulations to accelerate CCU deployment and cross-border infrastructure.

For more information, please click here.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101037009.

FUNDING AND TENDERS OPPORTUNITIES

FRANCE

CALL FOR PROJECTS – ANR PEPR SPLEEN

The program “Programme et Équipements Prioritaires de Recherche” (PEPR) aims to support innovation to develop new sustainable processes for industry. This program is financing R&D activities at low maturity level (TRL 1-4) in the field of decarbonization. 10 projects were launched in 2023 for a total budget of 35 M€ and six are related to CCUS.

For more information, please click here.

CALL FOR PROJECTS – COLLECTIVE OPERATION FOR THE DECARBONIZATION OF COMPANIES ACT® AND PACTE INDUSTRIE

This call for projects is launched to accelerate the decarbonization of companies through collective operations using the ACT® (Assessing low-Carbon Transition / Accelerate Climate Transition) and PACTE Industrie programs.

About the ACT Initiative

The ACT initiative, launched in 2015 and supported by the French government and ADEME, is part of the Global Climate Action Agenda. It provides companies with tools and methodologies to design and assess low-carbon transition strategies aligned with the Paris Agreement.
ACT is structured in two complementary components:
ACT Step-by-Step (Démarche ACT Pas-à-Pas) : Helps companies develop a low-carbon transition strategy and implementation plan.
ACT Assessment (Evaluation ACT) : Evaluates the alignment of a company’s strategy with sectoral decarbonization pathways.

About the PACTE Industrie Program

The PACTE Industrie program supports industrial companies in their decarbonization journey by promoting knowledge, technical support, and investment planning. It is structured around three main pillars:

1. Training: Training 2,700 industry professionals (technical, financial, executive profiles) and building a community of energy advisors equipped with shared tools and best practices.
2. Support: Technical assistance to over 1,700 industrial sites and groups, including:
   - 280 ISO 50001 certifications,
   - 700 energy mix opportunity studies,
   - 100 industrial project coaching sessions,
   - 600 investment strategy roadmaps for 2030,
   - 50 ACT strategy evaluations.
3. Engagement and Communication: Mobilizing the wider industrial ecosystem and ensuring long-term impact through outreach and coordination efforts.

This program is part of the French Energy Savings Certificates (CEE) scheme and was officially launched following the ministerial decree of December 17, 2022.

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 101037009.

Objectives of the Call for Projects

- Mass adoption of ACT and/or PACTE Industrie tools by businesses;
- Development of tailored decarbonization strategies and transition plans;
- Identification of key levers (energy performance, renewable energy, process electrification, hydrogen, etc.);
- Preparation of investment plans for low-carbon technologies;
- Transparent reporting of climate strategies.

Companies are encouraged to apply as a collective, enabling peer exchange, knowledge sharing, and development of territorial or sectoral synergies. This collaborative approach boosts ambition, reduces risk, and helps build technical capacity across participants.

Deadline: April 15th 2025 and July 11th 2025

For more information, please click here.

CALL FOR PROJECTS – DECARB IND 25

The DECARB IND 25 program, operated by ADEME, is part of the French France 2030 plan and the European Commission's Fit for 55 package. Its goal is to reduce greenhouse gas (GHG) emissions in the industrial sector, in line with the National Low Carbon Strategy (SNBC), which targets a 42% reduction in emissions between 2021 and 2030. This requires a decrease from 78 $MtCO_2eq$ per year in 2021 to 45 $MtCO_2eq$ per year by 2030.
The DECARB IND 25 call for projects aims to reduce GHG emissions in industrial sites across four key areas:

- Energy efficiency improvements.
- Changes to the energy mix.
- Changes to material usage.
- Carbon capture, utilization, and storage.

Applications can be submitted via the ADEME AGIR platform starting December 9, 2024, with a final deadline of May 15, 2025, pending official publication in the French Official Journal.

For more information, please click here.

EUROPE

INNOVATION FUND 2024

Launched on December 3, 2024, the European Commission's Innovation Fund 2024 Call aims to accelerate the deployment of innovative decarbonization technologies across Europe. With a total budget of €3.4 billion, this call is part of the EU's broader strategy to achieve climate neutrality and reduce greenhouse gas emissions. The application deadline is April 24, 2025, at 17:00 CEST.

Main Themes and Budget Allocations
The Innovation Fund supports projects under the following five themes:

- Large-Scale Projects
  - Budget: €1.2 billion

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101037009.

  - Capital Expenditure (CAPEX): Above €100 million
  - Focus: Decarbonization projects in sectors such as carbon capture and storage (CCS), renewable energy, energy storage, and maritime and aviation industries.
- Medium-Scale Projects
  - Budget: €200 million
  - CAPEX: Between €20 million and €100 million
  - Focus: Innovative decarbonization technologies with a moderate scale of implementation.
- Small-Scale Projects
  - Budget: €100 million
  - CAPEX: Between €2.5 million and €20 million
  - Focus: Smaller-scale projects demonstrating innovative approaches to emission reductions.
- Clean-Tech Manufacturing
  - Budget: €700 million
  - CAPEX: Above €2.5 million
  - Focus: Manufacturing of components for renewable energy, energy storage, heat pumps, and hydrogen production.
- Pilot Projects
  - Budget: €200 million
  - CAPEX: Above €2.5 million
  - Focus: Highly innovative projects aiming to validate, test, and optimize deep decarbonization solutions.

Funding and Eligibility

- Funding Rate: The Innovation Fund can cover up to 60% of a project's relevant costs.
- Eligible Applicants: Entities from EU Member States, Norway, and Iceland, including startups, SMEs, mid-caps, and large companies.
- Evaluation Criteria: Projects will be assessed based on their potential to reduce greenhouse gas emissions, degree of innovation, financial and technical maturity, replicability, and cost efficiency.

For more information, please click here.

CET PARTNERSHIP JOINT CALL 2025 – MODULE 2025-04 : CARBON, CAPTURE, UTILISATION AND STORAGE (CCUS)

This module aims to accelerate the development and implementation of CCUS technologies to reduce CO_2 emissions and contribute to climate neutrality by 2050.

- Opening Date: June 2025 11th
- Pre-proposal Submission Deadline: October 2025 9th
- Eligible Applicants: Research organizations, higher education institutions, and industrial stakeholders from participating countries.

For more information, please click here.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101037009.

HORIZON EUROPE CLUSTER 5

Horizon Europe Cluster 5 – Climate, Energy and Mobility is a key funding source for CCUS-related projects. It supports research and innovation aligned with the EU's climate neutrality goals.

Relevant Destinations for CCUS:

1. Destination 3: Sustainable, secure and competitive energy supply
    - Includes topics on decarbonising energy-intensive industries, carbon capture technologies, and CO_2 transport and storage infrastructure.
    - CCUS is often linked to hydrogen production, industrial processes, or negative emissions technologies (NETs).
2. Destination 1: Climate sciences and responses
    - Could support systemic approaches involving CCUS as part of broader mitigation strategies.

Key features:

- TRL levels typically between 4–7 (depending on the call).
- Projects may be RIA (Research and Innovation Actions) or IA (Innovation Actions).
- Funding typically ranges from €3–15 million per project, depending on the topic.

2025 Calls:

Drafts of the 2025 Cluster 5 topics suggest that CCUS remains a strategic focus, particularly under energy decarbonisation and industrial transformation.

The European Commission has recently published the draft of the 2025 calls.

For more information, please click here.

The Horizon Europe 2025 calls are expected to be officially published in mid-May, with submission deadlines likely in September 2025.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101037009.

CCU ONGOING PROJECTS - HORIZON EUROPE

WaterProof : urban WAste and water Treatment Emission Reduction by utilizing CO2 for the PROduction Of Formate derived chemicals

The WaterProof project aims at developing an electrochemical process that converts CO_2 emission captured from consumer waste incineration and wastewater treatment facilities into formic acid to be used in valuable green consumer products such as cleaning detergents and the tanning of fish leather apparel. Additional products of the electrochemical process are peroxides that can be applied to remove pharmaceuticals and pesticides from wastewater. Furthermore, formic acid is used for the generation of acidic deep eutectic solvents (ADES), that can be applied to recover precious metals from wastewater sludge and incineration ashes. As the electrochemical process uses renewable energy, it contributes to a clean water cycle with zero-emission. WaterProof enables the closing of the waste(water) carbon loop and the shift from fossil to renewable carbon sources. It hereby supports the transition towards a climate-neutral Europe and an effective and truly circular economy.

WaterProof
Grant agreement ID: 101058578

DOI
10.3030/101058578

EC signature date
16 May 2022

Start date 1 June 2022 — **End date** 31 May 2026

Funded under
Digital, Industry and Space

Total cost
€ 9 219 914,00

EU contribution
€ 9 219 914,00

Investment in EU policy priorities

Digital agenda	○	Clean air	○
Artificial Intelligence	○	Climate action	◐
Biodiversity	○		

Coordinated by
AVANTIUM CHEMICALS BV
Netherlands

Carbon4Minerals : Transforming CO2 into added-value construction products

The project Carbon4Minerals addresses the simultaneous use of CO2 from industrial flue gases with current and future waste streams to unlock a vast stock of resources for innovative low carbon binders and construction materials (80-135% lower CO2-emissions than reference). A total of 8 industrial pilots will be built and operated across the process value chain from CO2 capture to cement production and low carbon construction products. This cross-sectorial innovation has the potential to reduce European CO2 emissions by 46 Mt/y, equal to 10% of the EU process industry emissions, while safeguarding the competitiveness of the European industry. A consortium of technology providers, producers and research partners will develop, test and demonstrate the processes. Technical, environmental and economic feasibility will be validated by an integrated assessment, in combination with the development of a service

Project Information

Carbon4Minerals
Grant agreement ID: 101091870

DOI
10.3030/101091870

EC signature date
14 November 2022

Start date 1 January 2023 — **End date** 31 December 2026

Funded under
Digital, Industry and Space

Total cost
€ 20 322 450,00

EU contribution
€ 14 846 811,00

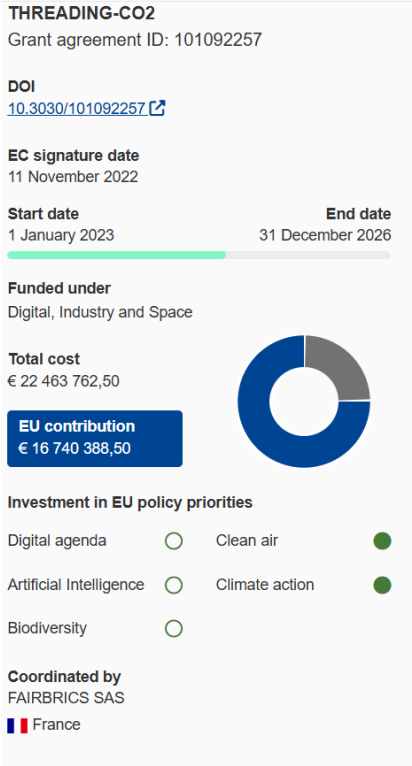
Coordinated by
VLAAMSE INSTELLING VOOR TECHNOLOGISCH ONDERZOEK N.V.
Belgium

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101037009.

life test package tailored to these new products. Co-learning modules are developed to support industrial implementation and market introduction.

THREADING-CO2 : Converting CO2 waste streams into polyester for circular textile production

The pollution produced by the textile industry has severe impact on the planet. Fashion, footwear and household textiles are responsible for water pollution, greenhouse gas emissions and landfill. Polyester (PET), a synthetic fibre derived from oil, is the most widely used fibre in the industry. Unfortunately, it is not a sustainable textile option. The EU-funded THREADING-CO2 project will demonstrate, on an industrial scale, a first-of-its-kind technology that converts CO2 waste streams into high-quality, commercially viable, sustainable polyester textiles. The project will use a circular manufacturing approach and run on renewable energy sources to reach a 70 % reduction of greenhouse gas emissions compared to existing PET manufacturing processes



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101037009.

CCUS ONGOING PROJECTS - INNOVATION FUND 2022-2023

eM-Rhône : electroMethanol-Rhône

IF2022 Large-scale

| Project Factsheet

The eM-Rhône project will integrate several technologies for large-scale e-methanol production beyond the current state of the art. The project will combine renewable hydrogen production, carbon capture from an existing cement plant, and e-methanol synthesis. It aims to demonstrate an optimised synergy between these three mature building blocks to produce e-methanol. This will translate into a 99% relative greenhouse gas (GHG) emission avoidance compared to the reference scenario of methanol production from natural gas.

In practice, 27 kilotonnes per year (kt/y) of renewable hydrogen are planned to be produced using 170 megawatt (MW) Proton exchange membrane (PEM) electrolysers, powered with renewable energy. The electrolysers will combine different power purchase agreements that ensure additionality and traceability of the renewable power, while providing flexibility of electrolysis for the e-methanol plant. In order to ensure a continuous e-methanol production, the

COORDINATOR
ELYSE ENERGY

LOCATION
France

CATEGORY
Energy intensive industries (EII)

SECTOR
Chemicals

AMOUNT OF INNOVATION FUND GRANT
EUR 115,190,750

EXPECTED GHG EMISSIONS AVOIDANCE
2,325,243 tonnes CO2 equivalent

STARTING DATE
01 January, 2024

ENTRY INTO OPERATION DATE
31 May, 2028

FINANCIAL CLOSE DATE
31 December, 2025

E-fuel Pilot: : Innovative and cost-efficient production process for PtL using industrial off-gases

IF2022 Large-scale

| Project Factsheet

The objective of the E-Fuel Pilot project is to set up and operate a first-in-kind plant for synthetic fuel production at Herøya, Norway. The key innovation is the Power-to-energy (P2X) e-fuel production process provided by Nordic Electrofuel AS (NELF), a breakthrough in flexibility, reliability, and simplicity. The P2X process will also be very energy efficient with carbon utilisation at close to 100%. The carbon source is the blast furnace waste gas from a local Ferro/Silicon-Manganese plant. The carbon capture and use (CCU) based process will use reversed water gas shift and Fischer-Tropsch technology to produce 8 000 tonnes/year of synthetic hydrocarbons (syncrude). A relative greenhouse gas (GHG) emission avoidance above 99% is expected, compared with the reference scenario.

The plant will convert blast furnace gas directly to e-fuel, at lower cost (CAPEX and OPEX) and higher efficiencies compared with current state-of-the-art projects. As well as sourcing carbon from blast furnace waste gases, the project process is also

COORDINATOR
NORDIC ELECTROFUEL AS

LOCATION
Norway

CATEGORY
Energy intensive industries (EII)

SECTOR
Refineries

AMOUNT OF INNOVATION FUND GRANT
EUR 40,000,000

EXPECTED GHG EMISSIONS AVOIDANCE
228,163 tonnes CO2 equivalent

STARTING DATE
01 January, 2024

ENTRY INTO OPERATION DATE
31 March, 2028

FINANCIAL CLOSE DATE
30 November, 2025

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101037009.

GREEN MEIGA: Green Methanol in Galicia

IF2022 Large-scale

| Project Factsheet

GREEN MEIGA, located in Begonte, Galicia (Spain), aims to deploy innovative and integrated technological approaches, clustered in an unique integrated plant. The proposed approach will achieve three key outcomes: enhanced production performance, improved operational flexibility, and competitive production costs. GREEN MEIGA plans to reach 157% relative greenhouse gas (GHG) emissions avoidance compared to the reference scenario.

The GREEN MEIGA project will develop novel concepts and technologies. They will be clustered in a unique integrated system and business case that will allow the production of 100 000 tonnes per year (t/y) of e-methanol and will avoid 2.9 million tonnes of CO2 equivalent during the first ten years of operation. The project will integrate (i) an innovative hybridised H2 production system including an alkaline Proton Exchange Membrane (PEM), a Solid Oxide Electrolyser Cell (SOEC) and Co-SOEC systems, (ii) an integrated self-sustainable e-methanol production system, and

COORDINATOR
IBERDROLA CLIENTES SOCIEDAD ANONIMA

LOCATION
Spain

CATEGORY
Energy intensive industries (EII)

SECTOR
Chemicals

AMOUNT OF INNOVATION FUND GRANT
EUR 122,917,845

EXPECTED GHG EMISSIONS AVOIDANCE
2,901,078 tonnes CO2 equivalent

STARTING DATE
01 October, 2023

ENTRY INTO OPERATION DATE
30 June, 2027

FINANCIAL CLOSE DATE
30 September, 2025

TRISKELION: Green Methanol manufacturing from CO2

IF2022 Large-scale

| Project Factsheet

TRISKELION: Green Methanol manufacturing from CO2

The TRISKELION project will build an innovative e-Methanol production plant in Mugardos (Galicia, Spain). This renewable product will be synthesised in an innovative single reactor from CO2 (captured from the flue gas of a combined heat and power plant), and renewable hydrogen (produced from electrolyses). The relative greenhouse gas (GHG) emission avoidance is estimated to around 137%compared to the reference scenario.

The innovation of the project comes from the combination of different technologies with different degrees of technological maturity. The proposed capacity is significantly larger than any demonstration project in Europe, and will increase the System Readiness Level (SRL) and Technology Readiness Levels (TRL) of the plant, enabling it to reach a commercial level that allows its replication in different sectors.

COORDINATOR
FORESTAL DEL ATLANTICO, S.A

LOCATION
Spain

CATEGORY
Energy intensive industries (EII)

SECTOR
Refineries

AMOUNT OF INNOVATION FUND GRANT
EUR 48,846,672

EXPECTED GHG EMISSIONS AVOIDANCE
860,282 tonnes CO2 equivalent

STARTING DATE
01 January, 2024

ENTRY INTO OPERATION DATE
31 December, 2027

FINANCIAL CLOSE DATE
30 June, 2025

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101037009.

INNOZHERO - INNOVATION FOR ZERO EMISSIONS IN HELSINGBORG

IF23Call – General large-scale

| Project Factsheet

INNOZHERO is a pioneer project in the waste-to-energy (WtE) sector that aims to install one of Europe's first carbon capture and conditioning (CCC) plants at the Filbornaverket WtE facility in Helsingborg, Sweden. The project will implement an end-to-end value chain for capturing, transporting, and storing CO2 to achieve climate-neutral district heating and waste incineration, and to generate negative emissions. INNOZHERO aims to capture approximately 200 000 tonnes of CO2 annually. During its first ten years of operation, the project is expected to prevent nearly 1.9 million tonnes of greenhouse gas (GHG) emissions from reaching the atmosphere, supporting the achievement of Helsingborg's net-zero targets by 2030 as part of the EU Climate-Neutral Cities initiative. As a replicable model, it aspires to become a reference in the global WtE sector's transition to carbon neutrality.

COORDINATOR
Oresundskraft Kraft Aktiebolag

LOCATION
Sweden

CATEGORY
Energy intensive industries (EII)

SECTOR
other

AMOUNT OF INNOVATION FUND GRANT
EUR 54,106,252

EXPECTED GHG EMISSIONS AVOIDANCE
1,869,656 tonnes CO2 equivalent

STARTING DATE
01 April, 2025

ENTRY INTO OPERATION DATE
31 October, 2028

FINANCIAL CLOSE DATE
31 December, 2025

CO2LLECT – Innovation IN CARBON CAPTURE AND TRANSPORT

IF23Call – General large-scale

| Project Factsheet

CO2LLECT: Innovation in Carbon Capture and Transport

CO2LLECT is an innovative end-to-end carbon capture and storage (CCS) project that will achieve negative emissions in Germany's largest cement plant in Rüdersdorf by applying a proprietary adsorptive and cryogenic capture technology developed by a leading technology provider. Following capture, the liquid CO2 will be temporarily stored and transported by railroad to a CO2 hub in Northern Germany, where it will be shipped to an offshore storage site in the North Sea. CO2LLECT is expected to lead to a substantial relative greenhouse gas (GHG) emission avoidance compared to the reference scenario, thus contributing to carbon-negative cement production.

COORDINATOR
CEMEX ZEMENT GMBH

LOCATION
Germany

CATEGORY
Carbon capture and geological storage (CCS)

SECTOR
Cement lime

AMOUNT OF INNOVATION FUND GRANT
EUR 157,116,975

EXPECTED GHG EMISSIONS AVOIDANCE
12,560,406 tonnes CO2 equivalent

STARTING DATE
01 April, 2025

ENTRY INTO OPERATION DATE
31 May, 2030

FINANCIAL CLOSE DATE
31 August, 2027

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101037009.

CARBOCLEARTECH

IF23Call – General large-scale

| Project Factsheet

The CarboClearTech project led by Lafarge Ciments will provide a significant boost to reduce carbon dioxide (CO2) emissions from hard-to-abate industries in Southwest Europe. The project will kick-start a new end-to-end Carbon Capture and Storage (CCS) value chain from the Lafarge cement plant at Martres-Tolosane to an onshore storage in the Pyrenean Piedmont. The project aspires to reach a relative greenhouse gas (GHG) emissions avoidance of up to 124.7% due to the biogenic fraction of the refused derived fuel used in the cement plant.

CarboClearTech will deploy a disruptive technology to capture the carbon dioxide, using a combination of Vacuum Pressure Swing Adsorption (VPSA) and

COORDINATOR
LAFARGE CIMENTS

LOCATION
France

CATEGORY
Carbon capture and geological storage (CCS)

SECTOR
Cement lime

AMOUNT OF INNOVATION FUND GRANT
EUR 120,003,734

EXPECTED GHG EMISSIONS AVOIDANCE
7,047,400 tonnes CO2 equivalent

STARTING DATE
01 April, 2025

ENTRY INTO OPERATION DATE
31 December, 2030

FINANCIAL CLOSE DATE
31 January, 2028

ADRIATICO2

IF23Call – General medium-scale

| Project Factsheet

The project, led by Marcegaglia Ravenna S.p.A., aims to reduce CO2 emissions in the Ravenna industrial district through Carbon Capture Utilisation and Storage (CCUS) technologies. It features a high degree of innovation, being the first project in Italy and Southern Europe to deploy Bioenergy with carbon capture and storage (BECCS), thus resulting in more than 100% reduction of CO2 emissions in the atmosphere compared to the reference scenario. AdriatiCO2 allows the integration of CCUS technology in a cogeneration plant with a green Direct Reduced Iron (DRI) production, which will use biochar and biomethane as sources. The project employs a patented technology, which, combined with a heat recovery system and a novel solvent, will enable the annual capture of up to 112 000 tonnes of CO2 from the plant's flue gases.

COORDINATOR
MARCEGAGLIA RAVENNA S.P.A.

LOCATION
Italy

CATEGORY
Carbon capture and geological storage (CCS)

SECTOR
Iron steel

AMOUNT OF INNOVATION FUND GRANT
EUR 31,238,542

EXPECTED GHG EMISSIONS AVOIDANCE
1,233,307 tonnes CO2 equivalent

STARTING DATE
01 April, 2025

ENTRY INTO OPERATION DATE
31 December, 2028

FINANCIAL CLOSE DATE
30 November, 2026

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101037009.

ACCSION - AALBORG PORTLAND CARBON CAPTURE AND STORAGE USING INFRASTRUCTURE ONSHORE IN NORTH JUTLAND

IF23Call – General large-scale

| Project Factsheet

The project aims to establish one of Europe's first full onshore carbon capture, transport, and storage value chain using innovative, reliable, and efficient technologies. This project seeks to eliminate 15 million tonnes of greenhouse gas (GHG) emissions by capturing 1.4 million tons of CO2 annually from the Aalborg Portland cement plant and supplying recovered heat from the capture process. Aalborg Portland is Denmark's sole cement producer and largest industrial CO2 emitter, contributing to over 4% of national emissions. Planned to be operational by the end of 2029, ACCSION aims to fulfil a cumulative 113% emissions avoidance over its first ten years of operations compared to the reference scenario, playing a critical role in Denmark's GHG emissions reduction goals. By 2030, Aalborg Portland aims to become Europe's first net-zero cement plant producing grey and white cement, leveraging on capturing and storing the biogenic CO2 fraction, which offsets any remaining fossil emissions.

COORDINATOR
Aalborg Portland A/S

LOCATION
Denmark

CATEGORY
Carbon capture and geological storage (CCS)

SECTOR
Cement lime

AMOUNT OF INNOVATION FUND GRANT
EUR 220,123,498

EXPECTED GHG EMISSIONS AVOIDANCE
15,077,949 tonnes CO2 equivalent

STARTING DATE
01 May, 2024

ENTRY INTO OPERATION DATE
31 December, 2028

FINANCIAL CLOSE DATE
31 October, 2025

DANUBE REMOVALS : DANUBE ONSHORE FERMENTATION CARBON REMOVALS

IF23Call – General medium-scale

| Project Factsheet

Danube Removals is a full chain Carbon Capture and Storage (CCS) operation in Central Hungary. It will collect more than 500 000 tonnes of biogenic CO2 per year from the yeast fermentation and anaerobic digestion processes of Pannonia Bio, one of Europe's largest biorefineries. The collected CO2 will be transported via pipeline and injected into a nearby permanent onshore geological storage site in a saline aquifer of the Pannonian Basin. The project will generate EU-certified carbon removal credits for the voluntary carbon markets. Europe's existing fermentation sector has the potential for over 10 million tonnes per year of similar carbon removals using biogenic CO2. This impact could further increase as the EU biomethane sector grows.

The Danube Removals project will demonstrate the first large-scale integration of bioCCS in Europe, with low CCS unit costs. The proposed CO2 storage model

COORDINATOR
DANUBE ENERGY VENTURES KFT

LOCATION
Hungary

CATEGORY
Energy intensive industries (EII)

SECTOR
other

AMOUNT OF INNOVATION FUND GRANT
EUR 48,445,901

EXPECTED GHG EMISSIONS AVOIDANCE
5,646,038 tonnes CO2 equivalent

STARTING DATE
01 April, 2025

ENTRY INTO OPERATION DATE
30 September, 2027

FINANCIAL CLOSE DATE
30 June, 2026

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101037009.

GREENSAND FUTURE: CONTRIBUTING TO EU'S CO2 EMISSIONS REDUCTION TARGET BY ESTABLISHING CRITICAL EU STORAGE CAPACITY

IF23Call – General medium-scale

| Project Factsheet

The project aims to permanently store 2.4 million tonnes of captured CO2 by injecting 0.3 million tonnes per annum (mtpa) for eight years into a depleted oilfield in the Danish North Sea (Nini West). Biogenic CO2 will be sourced from Danish and other European biogas producers and transported by truck to the port of Esbjerg for temporary storage, then by a dedicated CO2-carrier vessel to Nini West for permanent storage. The project builds on its experience from the successful 2023 Greensand pilot, which demonstrated for the first time that CO2 could be transported across borders to be injected safely in a depleted oil field. The project's ambition is to start Greensand Future's operations in early 2026 as one of the first carbon capture and storage (CCS) projects in the European Union to store CO2 at an industrial scale. If further scaled up, Greensand has the potential to store up to 8 mtpa from 2030, which equals the yearly emissions of approximately 1.1 million Danish citizens and thus plays an important role in the ambitions to reduce Denmark's CO2

COORDINATOR
INEOS E A/S

LOCATION
Denmark

CATEGORY
Carbon capture and geological storage (CCS)

SECTOR
other

AMOUNT OF INNOVATION FUND GRANT
EUR 41,041,661

EXPECTED GHG EMISSIONS AVOIDANCE
2,251,599 tonnes CO2 equivalent

STARTING DATE
01 May, 2024

ENTRY INTO OPERATION DATE
31 December, 2025

FINANCIAL CLOSE DATE
31 July, 2025

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101037009.

INTERESTING EVENTS IN 2025

CARBON CAPTURE EUROPE SUMMIT 2025

The Carbon Capture Europe Summit 2025 (#CCES2025) will be held on **29-30 April 2025** at the KIT Royal Tropical Institute in Amsterdam. This premier event focuses on advancing Carbon Capture, Utilisation, and Storage (CCUS) technologies, which are critical for Europe's goal of achieving net-zero emissions by 2050123.
Key details:
Attendance: Over 450 C-suite executives from government, industry, and finance14.
Focus Areas: Regulatory frameworks, technological innovations, and investment strategies for CCUS deployment, particularly in hard-to-abate sectors like steel, cement, and chemicals23.
EU Targets: 50 million tonnes of CO_2 captured annually by 2030, scaling to 450 million tonnes by 205023.
Speakers: Includes high-profile figures like Mechthild Wörsdörfer (European Commission) and Martijn Smit (Equinor).

BIO-CO2 USE AND REMOVAL 2024 MAY 6, 2025, KULTTUURIKASARMI, HELSINKI, FINLAND

This conference organized by Bioenergy Association of Finland (Bioenergia ry), with partners like VTT and Finnish Energy focuses on the latest advancements in technological carbon removal and the innovative use of biogenic CO2 in products, with insights into climate policy and practical implementation

- Topics:
    - International and EU-level CCUS developments
    - Breakthrough technologies and Finnish projects
    - CO2 infrastructure, utilization, and storage

CO2 CAPTURE, STORAGE & REUSE 2025 CONFERENCE

The **CO2 Capture, Storage & Reuse 2025** conference will take place on **May 21–22, 2025**, in **Copenhagen, Denmark**, focusing on the latest developments in carbon capture, utilization, and storage (CCUS) technologies. The event follows a successful 2024 edition that attracted over 390 participants from 27 countries.

Key Topics include:

- EU ETS carbon pricing and CBAM regulations
- Investment strategies for clean technology in CCUS

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- Direct air capture (DAC) and carbon-to-chemicals applications
- Decarbonization of hard-to-abate industries like cement and steel
- Onshore/offshore CO_2 storage challenges and infrastructure

DECARB CONNECT, JUNE 3-4TH 2025, AMSTERDAM

Decarb Connect Europe 2025 is a premier event bringing together over 250 leaders from Europe's energy-intensive industries to discuss policy, technology, and investment strategies for achieving net-zero emissions. The event focuses on key decarbonization challenges, including CO2 transport, alternative fuels, CCUS, hydrogen, electrification, and financing.

Key Features

- **Networking:** Engage with industrial emitters, technology providers, investors, and policymakers.
- **Expert Speakers:** Leaders from companies like LyondellBasell, BASF, ArcelorMittal, and Holcim will share insights.
- **Topics Covered:** Policy frameworks, breakthrough technologies, project scalability, and investment opportunities.

12TH EUROPEAN CARBON DIOXIDE UTILISATION SUMMIT 2025

The 12th European Carbon Dioxide Utilisation Summit 2025 will take place on **24–25 September 2025** in Antwerp, Belgium, organized by ACI London.

Key Details:

- **Focus**: Advancing carbon capture and utilisation (CCU) technologies to drive the transition to a sustainable, low-carbon economy16.
- **Participants**: Industry leaders, policymakers, innovators, investors, and NGOs.
- **Agenda**: Sessions on scalable strategies, investment opportunities, policy frameworks, and emerging technologies like CO2-to-fuels and renewable polymers.
- **Notable Speakers:** Representatives from CO2 Value Europe, Equinor, European Energy, Port of Antwerp-Bruges, and technology innovators like Oxylum and Spark e-Fuels.
- **Networking:** Emphasis on collaboration in Europe's industrial hub, with participation from companies such as Avantium, a leader in sustainable polymer materials

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INTERESTING SITES

PYROCO2 Project - https://www.pyroco2.eu/

CO2 Value Europe - https://www.co2value.eu/

CO2 Value Europe database - https://database.co2value.eu/

Club CO2 - https://www.club-co2.fr/fr

International Energy Agency - https://www.iea.org/

Zero Emission Platform - https://zeroemissionsplatform.eu/

Strategy CCUS - https://www.strategyccus.eu/

Global CCS Institute - https://www.globalccsinstitute.com

France Hydrogen - https://www.france-hydrogene.org/

GreenH2Atlantic Project - https://www.greenh2atlantic.com/

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