



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

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FOREWORD

We are delighted to release the eighth strategic intelligence bulletin.

In this eighth edition, we would like to highlight the progress in European legislation and technical progress related to the CCU(S). The EU Green Deal and Climate Law, along with subsequent proposals to enhance energy and climate goals for 2030, have positioned carbon capture and storage technologies as a crucial component of the EU's decarbonisation initiative.

The Commission has already established a regulatory framework for the secure transportation and storage of CO₂ via Directive 2009/31/EC, which focuses on the geological storage of carbon dioxide. As for CCU, Directive (EU) 2018/2001 governs the technology, promoting the use of energy from renewable sources and, among other things, fuels derived from captured CO₂.

On August 31, 2023, the Commission wrapped up a public consultation on the Industrial Carbon Management Strategy. The input from stakeholders and the public will inform and shape the strategy, which is expected to be implemented in early 2024. In November 2023, the Commission released a report analyzing the feedback received during the public consultation.

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 cherif.morcos@axelera.org

Have a good read!



MARKET INFORMATION

A NEW ROLE AND IMPLICATIONS FOR FRANCE AND GERMANY - IFRI

This article discusses the new wave of CCUS projects in Europe, which is significantly different from the projects of the 2000s. There are now 76 projects in 16 European countries at various stages of development. The first large-scale projects are expected to be operational by 2024. The article also highlights the importance of the “hub and cluster” approach in recent CCS projects to achieve economies of scale and cost reductions.

For more information, please click [here](#).

CARBON CAPTURE, UTILISATION AND STORAGE IN THE EUROPEAN UNION

This report discusses the current technology status, value chains, and market positions of CCUS technologies. In 2022, the industry saw unprecedented growth. Costs vary widely depending on the host industry, technology, location, plant design, and regulatory frameworks. Global venture capital investment more than doubled from 2021 to 2022, with the US attracting the most. The US, EU, and Japan filed the most high-value inventions. Within the EU, France, Germany, and the Netherlands are leaders on patents while Denmark leads in public R&D investment. CCUS offers circular carbon economy benefits but there are concerns about leakages, safety, and public acceptance. For more information, please click [here](#).

MAP OF CO2 STORAGE PROJECTS IN EUROPE - IOGP EUROPE

This article provides an overview of existing and planned Carbon storage projects in Europe. It includes details such as location, project name, elements of CCS value chain covered, type of capture project, description, participants, status of the project, planned start of operations date, CO2 storage injection capacity at start date (MTPA), and CO2 storage injection capacity after expansion (MTPA). For more information, please click [here](#).

EUROPE CARBON CAPTURE UTILIZATION MARKET REPORT HIGHLIGHTS

The Europe carbon capture utilization market size is expected to reach USD 3,985.4 million by 2028. The market is expected to expand at a CAGR of 18.4% from 2020 to 2028. Increasing applications of CCU in the enhanced oil recovery (EOR) in the oil and gas segment are expected to contribute to the growth of the market. For more information, please click [here](#).



CCS-CCU - EUROPA.EU

CCUS is both an enabler for industrial decarbonisation and a technology that complements European efforts to further reduce CO2 emissions and go carbon negative. The development of CO2 transport and storage infrastructure across Europe will allow all European CO2 emitters to access cost-efficient decarbonisation pathways. For more information, please click [here](#).

CCS/CCU PROJECTS - ZERO EMISSIONS PLATFORM

A mapping of ready projects in Europe, from full chain CCS, CO2 transport and storage and CCU. There are a number of CCS and CCU projects in Europe – in various stages of development. For more information, please click [here](#).

CCUS IN EUROPE: A NEW ROLE AND IMPLICATIONS FOR FRANCE AND GERMANY - IFRI

A second wave of projects is under development, and it is much different from the 2000 wave. While Norway, the United Kingdom and the Netherlands are at its forefront, France and Germany have major competencies, and many projects could be carried out in these countries. Italy is also becoming active. A turning point is in progress. Recent CCS projects rely on a “hub and cluster” approach to achieve economies of scale and cost reductions, increased cooperation between governments and industry, as well as regional cross-border partnerships. Regulatory barriers, which can be resolved only at the European level, still impede the industrialization of the CCUS production chain. Political support at all levels is also lacking. The synergies between hydrogen and CCS could be exploited in decarbonized clusters, at the level of applications, R&I, and transport infrastructure. This would help optimize the cost of decarbonization. For more information, please click [here](#).

EU ENERGY CHIEF ANNOUNCES ‘STRATEGIC VISION’ FOR CCUS IN 2023

The European Commission will table a “strategic vision” for carbon capture, usage and storage (CCUS) technologies next year, with the aim of clarifying rules and giving certainty to investors. For more information, please click [here](#).

CARBON CAPTURE USAGE AND STORAGE THE NEW DRIVER OF THE EU DECARBONIZATION PLAN?

This report discusses the role of Carbon Capture, Use and Storage (CCUS) in the European Union (EU) in the context of reaching its targets set out in the EU Climate Law. For more information, please click [here](#).



CCUS IN EUROPE IN THE SUSTAINABLE DEVELOPMENT SCENARIO, 2030-2070

This chart and data by the International Energy Agency provide insights into the role of CCUS in Europe in the Sustainable Development Scenario from 2030 to 2070. For more information, please click [here](#).

CONCLUSIONS SECOND MEETING OF THE CARBON CAPTURE, UTILISATION AND STORAGE FORUM

This document presents the conclusions of the second meeting of the Carbon Capture, Utilisation and Storage Forum. For more information, please click [here](#).

FRANCE'S CCUS STRATEGY

On the 23rd of June 2023, the French Prime Minister Elizabeth Borne presented France's Carbon Capture, Utilisation and Storage strategy during a meeting of the National Industry Council. For more information, please click [here](#).



TECHNOLOGY WATCH

CARBON CAPTURE, STORAGE AND UTILISATION - ENERGY

This article discusses the set of technologies aimed at capturing, transporting, and permanently storing CO₂ that would otherwise be emitted into the atmosphere. It also talks about the adoption of the EU Green Deal, the Climate Law, and the subsequent proposals to increase energy and climate targets for 2030 have made carbon capture and storage technologies an important part of the EU decarbonisation effort. For more information, please click [here](#).

CCS-CCU - EUROPA.EU

This article discusses how CCUS is both an enabler for industrial decarbonisation and a technology that complements European efforts to further reduce CO₂ emissions and go carbon negative. The development of CO₂ transport and storage infrastructure across Europe will allow all European CO₂ emitters to access cost-efficient decarbonisation pathways. For more information, please click [here](#).

FRONTIERS | COMMITTED TO IMPLEMENTING CCU? A COMPARISON OF THE POLICY ... This paper identifies and analyses relevant strategies and policies that promote CCU as well as set the boundaries for research, development, and the implementation of CO₂ utilization technologies in the US and the EU. For more information, please click [here](#).

CCS/CCU PROJECTS - ZERO EMISSIONS PLATFORM

This article discusses the projects included on this map are market-ready projects – projects that are on track to become operational before 2030, provided that supportive policy and financial frameworks are in place. For more information, please click [here](#).

FRANCE RELEASES CCUS STRATEGY AND LAUNCHES CONSULTATION

France has released its Carbon Capture, Storage and Utilisation Strategy, as part of the government's efforts to reach carbon neutrality by 2050. The strategy notes that CCUS can have the potential to capture and store between 4-8.5 million tons of CO₂ emissions per year by 2030. For more information, please click [here](#).



HIGH LEVEL REPORT: CCUS IN EUROPE

This high-level report provides an overview of the recent developments for Carbon Capture Utilization and Storage (CCUS) in Europe, as well as a short analysis of the key elements driving the deployment of CCUS. For more information, please click [here](#).

A NEW ERA FOR CCUS – CCUS IN CLEAN ENERGY TRANSITIONS – ANALYSIS - IEA

This report by the International Energy Agency examines in detail the role for CCUS technologies in clean energy transitions. It identifies four key contributions: tackling emissions from existing energy infrastructure; a solution for sectors with hard-to-abate emissions; a platform for low-carbon hydrogen production; and removing carbon from the atmosphere. For more information, please click [here](#).

UN NOUVEL ELAN POUR LE CAPTAGE, STOCKAGE ET UTILISATION DU ... - IFRI

This report discusses a second wave of carbon capture, utilization and storage (CCUS) projects under development. While Norway, the United Kingdom and the Netherlands are at its forefront, France and Germany have major competencies, and many projects could be carried out in these countries. For more information, please click [here](#).



EU POLICIES & LEGISLATION

EMPOWERING EUROPE'S GREEN FUTURE: A GRID ACTION PLAN

The article discusses Bellona's position on the upcoming Grids Action Plan, which is aimed at facilitating the transition towards climate neutrality through the widespread adoption of renewable energy. The European grid is expected to undergo a significant evolution in size and operation, shifting from a centralised, fossil-based system to a decentralised, renewable-centric model.

Bellona Europa has outlined key criteria for the credibility of the Grid Action Plan:

Clear Objective for Direct Electrification: The action plan should articulate a distinct objective for direct electrification, providing grid operators with the regulatory certainty necessary for strategic infrastructure investments.

Addressing Bottlenecks: The plan should address slow permitting processes, a scarcity of skilled workforce, and insufficient supply chains for components and critical raw materials, which are crucial for grid deployment.

Flexibility Integration: The plan should empower the grid to provide flexibility to the system, ensuring seamless adaptation to the intermittent nature of renewable energy sources.

Financial Environment for Investment: A robust financial environment is essential to encourage investments in grid expansion and optimisation, fostering a resilient and adaptive energy infrastructure.

Regulator Alignment with Decarbonization Goals: The regulator's mandate should be aligned with the broader decarbonisation goals.

For more information, please [click here](#).

EU POLICY AND SUPPORT FOR DEVELOPING CCUS

This article discusses the EU's policy and support for developing CCUS. It mentions the CCS Directive which ensures CCS is done safely for the environment and human health. It also talks about the allowances in the EU ETS and how CCU fuels are encouraged through the Renewable Energy Directive (RED2) as of 2021. For more information, please [click here](#)



A EUROPEAN STRATEGY FOR CCUS

This article discusses the current legislation covered by the European strategy for CCUS. For more information, please [click here](#).

EUROPEAN CARBON DIOXIDE REMOVAL POLICY: CURRENT STATUS AND FUTURE OPPORTUNITIES” DISCUSSES THE CURRENT STATUS AND FUTURE PROSPECTS OF CARBON DIOXIDE REMOVAL (CDR) POLICY IN EUROPE

Over the past two years, the European Union, Norway, Iceland, and the UK have increased climate ambition and aggressively pushed forward an agenda to pursue climate neutrality or net-zero emissions by mid-century. This increased ambition, partly the result of the Intergovernmental Panel on Climate Change’s landmark findings on limiting global warming to 1.5°C, has also led to a renewed approach to and revitalized debate about the role of carbon capture and storage and carbon dioxide removal.

With increasing climate ambition, including a mid-century climate neutrality goal for the whole European Union, the potential role of technological carbon dioxide removal (CDR) is emerging as one of the critical points of debate among NGOs, policymakers, and the private sector. Policymakers are starting to discuss how to incentivize a CDR scale-up.

The article highlights that policy must fill two gaps: the accounting and the commercialization gap for the near-term development of a comprehensive CDR policy framework. It shines a light on the current status of negative emission technologies and the role of carbon capture and storage in delivering negative emissions in Europe’s decarbonized future. It also analyzes the role of carbon markets, including voluntary markets, as potential incentives while exploring policy pathways for a near-term scale-up.

The paper concludes that the EU provides a promising comprehensive climate policy framework where CDR is already included, and that these policies are likely to be able to drive CDR deployment once the technologies are commercialized via a technology-specific innovation policy.

For more information, please [click here](#).



FUNDING & TENDER OPPORTUNITIES

FRANCE

DEEP DECARBONISATION OF DISRUPTIVE TECHNOLOGIES

France has prioritized the development of a draft strategy for Carbon Capture, Utilization, and Storage (CCUS) with the aim to capture and store between 4 and 8 million tonnes of CO₂ by 2030. This goal is contingent on the advancement of relevant industrial projects. The initial phase will concentrate on the export hubs of Dunkirk, Fos sur Mer, and Le Havre, with a rapid expansion planned until 2035 to encompass France's primary industrial sites, potentially capturing approximately 12 million tons of CO₂. The implementation of CCUS necessitates substantial investment in capture clusters and the potential development of a dedicated transport network spanning hundreds of kilometers, depending on the industrial projects involved. This network could range from 500 to 1,000 kilometers by 2030, requiring an estimated investment of €4 billion, and could potentially extend up to 4,800 kilometers by 2050. For more information please click [here](#)

A NEW ROLE AND IMPLICATIONS FOR FRANCE AND GERMANY

A report by IFRI mentions that France and Germany have major competencies, and many projects could be carried out in these countries. It also mentions that recent CCS projects rely on a "hub and cluster" approach to achieve economies of scale and cost reductions, increased cooperation between governments and industry, as well as regional cross-border partnerships. For more information please click [here](#).

OPINION ON THE CARBON CAPTURE, UTILIZATION, AND STORAGE (CCUS)

The High Council for Climate (HCC) has issued its opinion on France's carbon capture, utilization, and storage (CCUS) strategy. This process involves capturing CO₂ emissions from industrial facilities and transporting them for storage underground (carbon storage) or using them as a resource (carbon utilization). This mechanism serves as a decarbonization lever for sectors that cannot be decarbonized otherwise, helping isolate residual greenhouse gas emissions. The government, in its national low-carbon strategy (SNBC), aims to capture 4 to 8.5 million tons of CO₂ (MtCO₂) annually by 2030 and 15 to 10 MtCO₂ annually by 2050. This initiative would initially focus on major industrial zones, implementing it between 2028 and 2034. The High Council for Climate highlights the lack of a rigorous regulatory framework for CCUS and uncertainties regarding the availability of storage sites. Therefore, it recommends limiting this technology "to uses aimed at reducing residual emissions that cannot be eliminated at the source, in addition to actions of moderation and energy efficiency." According to the HCC, this process is relevant for industrial decarbonization, "where decarbonization solutions are limited," even though it should be used "as a last resort to achieve overall greenhouse gas neutrality by 2050." Regarding the numerical targets proposed by the Minister of Ecological Transition, Agnès Pannier-Runacher, and



the Minister Delegate for Industry, Roland Lescure, the High Council for Climate believes that "given the deployment time of these technologies, ongoing projects, and the immaturity of storage phases," the goal of capturing 4 to 8.5 MtCO₂ annually by 2030 seems ambitious. However, the figures put forward for 2050 appear "consistent with available knowledge."

For more information please click [here](#).



FUNDING & TENDER OPPORTUNITIES

EUROPE

TURNING CO2 EMISSIONS FROM THE PROCESS INDUSTRY TO FEEDSTOCK (PROCESSES4PLANET PARTNERSHIP) (IA)

Deadline date: 7 February 2024

Project Overview:

The project, titled "Turning CO2 emissions from the process industry to feedstock (Processes4Planet partnership)", aims to demonstrate the economic viability of efficiently capturing and utilizing CO2 streams from point sources, such as large and medium industrial installations. The proposed technologies should support cross-sectorial concepts and sector integration. The semi-industrial scale demonstrators proposed should process significant amounts of CO2 containing emissions from energy-intensive process industries. The total capital expenditure for projects under this topic is expected to be above EUR 20,000,000 and up to EUR 100,000,000.

Expected Outcomes:

The project outcomes will enable the achievement of the objectives of the Processes4Planet partnership by developing efficient CO/CO2 capture and purification technologies. It is expected to showcase the system effectiveness for the GHG emission avoidance in the process industries as well as the scalability and the cost efficiency of the proposed concept. The project also aims to prove the efficient integration and use of renewable energy sources. Ultimately, it seeks to increase the competitiveness and resilience of the European process industry.

For more information please click [here](#).

CO2-NEUTRAL STEEL PRODUCTION WITH HYDROGEN, SECONDARY CARBON CARRIERS AND ELECTRICITY OR INNOVATIVE STEEL APPLICATIONS FOR LOW CO2 EMISSIONS (CLEAN STEEL PARTNERSHIP) (RIA)

Deadline date: 07/02/2024

Project Overview and Objectives:

The project, titled "CO2-neutral steel production with hydrogen, secondary carbon carriers and electricity OR innovative steel applications for low CO", aims to demonstrate the economic viability of efficiently capturing and utilizing CO2 streams from point sources. These sources include large and medium industrial installations such as steel, cement, refining, and chemical plants. The project supports cross-sectorial concepts and sector integration.

Expected Outcomes and Results:

The project outcomes will enable the achievement of the objectives of the Processes4Planet partnership by developing efficient CO/CO2 capture and purification technologies. This will drive



the partnership's innovation portfolio towards first-of-a-kind demonstrator and de-risk investment. The project is expected to master the capture, purification, and conversion of CO/CO₂ from process industry point sources and utilization of renewable energy at reasonable costs. It aims to showcase the system effectiveness for the GHG emission avoidance in the process industries as well as the scalability and the cost efficiency of the proposed concept.

For more information please click [here](#).

INNOVATION FUND 2023 NET ZERO TECHNOLOGIES – GENERAL DECARBONISATION – SMALL-SCALE PROJECTS

Deadline date: 09/04/2024

Project Overview and Objectives: The project in question is part of the Funding & Tenders Portal managed by the European Commission. The specific project, titled “Innovation Fund Small Scale Projects”, aims to support innovation in low-carbon technologies and processes. The focus is on sectors listed in Annex I to the EU ETS Directive 2003/87, including environmentally safe carbon capture and utilisation (CCU) that contributes substantially to mitigating climate change.

Expected Outcomes and Results: The expected outcomes of this project include the stimulation of construction and operation of projects that aim at the environmentally safe capture and geological storage of CO₂. It also aims to stimulate the construction and operation of innovative renewable energy and energy storage technologies. The results of the project are expected to contribute significantly to climate change mitigation by reducing carbon emissions and promoting the use of renewable energy sources.

For more information please click [here](#).

INNOVATION FUND 2023 NET ZERO TECHNOLOGIES – GENERAL DECARBONISATION – MEDIUM-SCALE PROJECTS

Deadline date: 09/04/2024

Project Overview and Objectives: The project, titled “Innovation Fund 2023 Net Zero Technologies – General decarbonisation – Medium-Scale Projects”, is part of the European Commission’s Funding & Tenders Portal. It aims to support innovation in low-carbon technologies and processes, focusing on sectors listed in Annex I to the EU ETS Directive 2003/87.

Expected Outcomes and Results: The project is expected to stimulate the construction and operation of projects that aim at the environmentally safe capture and geological storage of CO₂. It also aims to stimulate the construction and operation of innovative renewable energy and energy storage technologies. The results of the project are expected to contribute significantly to climate



change mitigation by reducing carbon emissions and promoting the use of renewable energy sources.

[For more information](#)

INNOVATION FUND 2023 NET ZERO TECHNOLOGIES – PILOTS

Deadline date: 09/04/2024

Project Overview and Objective:

The Innovation Fund 2023 Net Zero Technologies – Pilots is a project that aims to support highly innovative, disruptive, or breakthrough technologies in deep decarbonisation needed for achieving the climate neutrality goal. The project focuses on the construction and operation of pilot projects that validate, test, and optimise highly innovative, deep decarbonisation solutions in all sectors eligible for Innovation Fund support.

Expected Outcomes and Results:

Pilot projects should prove an innovative, deep decarbonisation or net carbon removal technology or solution in an operational environment. If successful, the proposed technology should move to the next stage of large-scale demonstration or first-of-a-kind commercial production. The maximum amount of Innovation Fund grant for an individual project under this topic is limited to EUR 40 million.

For more information please click [here](#).

INNOVATION FUND 2023 NET ZERO TECHNOLOGIES – GENERAL DECARBONISATION – LARGE-SCALE PROJECTS

Deadline date: 09/04/2024

Project Overview and Objective:

The Innovation Fund 2023 Net Zero Technologies – General Large-Scale Projects is a project that aims to support innovation in low-carbon technologies and processes in sectors listed in Annex I and Annex III to the EU ETS Directive 2003/87. This includes environmentally safe carbon capture and utilisation (CCU) that contributes substantially to mitigating climate change, in particular for unavoidable process emissions, as well as products substituting carbon-intensive ones produced in sectors listed in Annex I to the EU ETS Directive.

Expected Outcomes and Results:

The project aims to stimulate the construction and operation of projects that aim at the environmentally safe capture and geological storage of CO₂ (CCS). It also supports the construction and operation of innovative renewable energy and energy storage technologies. Only projects with a total capital expenditure above EUR 100,000,000 are eligible under this topic. The



successful implementation of these projects will contribute significantly to reducing the EU's greenhouse gas emissions.

For more information please click [here](#).

CCU FOR THE PRODUCTION OF FUELS

Deadline date: 21/01/2025

Project Overview and Objective:

The Horizon Europe: this project aims to develop next-generation technologies for the production of novel synthetic renewable liquid and gaseous fuels from CO₂, and/or renewable carbon, nitrogen, hydrogen or their compounds and from renewable energy. The focus is on high source-to-product conversion efficiency, process energy efficiency, and carbon emission neutrality from the overall production. The project also addresses uses in fuel cells for all transport modes for electricity generation from renewable fuels used as renewable energy carriers with high conversion efficiency and low pollution.

Expected Outcomes and Results:

The project results are expected to increase the availability of disruptive emerging synthetic renewable fuel technologies and accelerate the readiness of cost-effective and highly performing future technologies of synthetic renewable fuels for all economy sectors. An assessment of the sustainability and the GHG emissions should be made based on a Life Cycle Analysis. The new technologies should also address uses in fuel cells for all transport modes for electricity generation from renewable fuels used as renewable energy carriers with high conversion efficiency and low pollution. The project aims to reinforce the European scientific basis and European technology export potential for synthetic renewable fuel technologies.



CCU ONGOING PROJECTS - HORIZON 2020

PROVIDING ACCESS TO COST-EFFICIENT, REPLICABLE, SAFE AND FLEXIBLE CCUS

The ACCSESS concept is centered around the project vision to Develop replicable CCUS pathways towards a Climate Neutral Europe in 2050. ACCSESS will improve CO2 capture integration in industrial installations (20-30% cost cuts) as a key element to accelerate CCUS implementation, address the full CCUS chain and the societal integration of CCUS. ACCSESS has the ambition unleash the ability of CCUS to contribute to the ambitious EU Green Deal transformation strategy. The project is dedicated to developing viable industrial CCUS business models. ACCSESS will engage with citizens and citizens, explaining how CCUS can contribute to the production of climate neutral or climate positive end-products in a sustainable cities' context. [For more information](#)

Project Information

ACCSESS

Grant agreement ID: 101022487

Start date

1 May 2021

End date

30 April 2025

Funded under

H2020-EU.3.3.

H2020-EU.3.3.2.

Overall budget

€ 18 427 186,75

EU contribution

€ 14 983 874

Coordinated by
SINTEF ENERGI AS

Norway



DEMONSTRATING A REFINERY-ADAPTED CLUSTER-INTEGRATED STRATEGY TO ENABLE FULL-CHAIN CCUS

Almost everyone now agrees that we should decrease the amount of atmospheric carbon dioxide (CO2) to mitigate climate change. Reducing CO2 production is not the only way to reduce emissions. Carbon capture, use and storage (CCUS) refers to an integrated set of technologies to prevent the CO2 produced during the combustion of fossil fuels from entering the atmosphere. Currently, these technologies focus on the greatest sources of CO2 in a process, ignoring smaller ones. The EU-funded REALISE project is developing a way to capture up to 90 % of CO2 from multiple sources in operating refineries at a cost that is 30 % lower than existing capture methods. The project will include the evaluation of the entire CCUS chain from emitter to storage as well as socio-political aspects and social readiness assessments based on three business cases in the EU and China. [For more information](#)

Project Information

REALISE

Grant agreement ID: 884266

Start date

1 May 2020

End date

30 April 2023

Funded under

H2020-EU.3.3.2.

Overall budget

€ 7 131 752,50

EU contribution

€ 6 444 163,75

Coordinated by
SINTEF AS

Norway



ADVANCED carbon capture for steel industries integrated in CCUS Clusters

The Paris Agreement sets out a global framework to avoid dangerous climate change by limiting global warming to well below 2 °C and pursuing efforts to limit it to 1.5 °C. Without carbon capture, utilisation and storage (CCUS), it is difficult to realise the temperature levels indicated in the Paris Agreement. In the context of the European Energy Union, CCUS is a vital research and development priority to achieve 2050 climate objectives in a cost-effective way. With the focus on the iron and steel industry as part of the CCUS chain, the EU-funded C4U project will work with eight European countries and Mission Innovation countries (Canada, China and the United States) to address all the essential elements required for optimal integration of CO2 capture into the North Sea Port CCUS cluster. [For more information](#)

Project Information

C4U
Grant agreement ID: 884418

Start date 1 April 2020 **End date** 31 March 2024

Funded under
H2020-EU.3.3.
H2020-EU.3.3.2.

Overall budget
€ 13 845 496,89

EU contribution
€ 12 499 083,27

Coordinated by
UNIVERSITY COLLEGE LONDON
United Kingdom

CREATING ADDED-VALUE CHEMICALS FROM BIO-INDUSTRIAL CO2 EMISSIONS USING INTEGRATED CATALYTIC TECHNOLOGIES

The European Green Deal sets the blueprint for making Europe the first climate neutral continent in the world. The goal is to reduce greenhouse gas emissions (GHGs) to at least 55 % below 1990 levels by 2030. The EU-funded CATCO2NVERS project will develop and optimize technologies that convert waste CO2 into useful bio-origin chemicals to produce plastics, methanol, cosmetics, and renewable feedstocks for industrial processes. The project's overall vision will be to use waste CO2 energy- and resource-efficiently in bio-based industries to produce zero GHGs and reduce the quantity of CO2 released into the atmosphere. [For more information](#)

Project Information

CATCO2NVERS
Grant agreement ID: 101000580

[Globe](#) [Twitter](#) [LinkedIn](#) [YouTube](#)

Start date 1 May 2021 **End date** 30 April 2025

Funded under
H2020-EU.3.2.4.2.
H2020-EU.3.2.

Overall budget
€ 6 641 111,25

EU contribution
€ 6 641 110,75

Coordinated by
FUNDACION PARA EL DESARROLLO Y LA INNOVACION TECNOLOGICA
Spain



PRODUCTION OF SYNTHETIC RENEWABLE AVIATION FUEL FROM CO2 AND H2

Aviation fuels derived from non-fossil resources are the only way to diminish the hefty carbon footprint of air transport. The EU-funded TAKE-OFF project will bring together leading industrial players and prominent research institutes to develop an innovative process for producing sustainable aviation fuels with higher efficiency and lower costs compared to other power-to-liquid alternatives. State-of-the-art successful attempts to turn carbon dioxide into jet fuel involve complex processes such as the Fischer-Tropsch process. The unique TAKE-OFF technology will be based on converting carbon dioxide and green hydrogen into fuel via ethylene as an intermediate. In this process, carbon dioxide is captured from industrial flue gases and reacts with hydrogen produced by renewable electricity to create light olefins. [For more information](#)

Project Information

TAKE-OFF

Grant agreement ID: 101006799

Start date
1 January 2021

End date
31 December 2024

Funded under
H2020-EU.3.3.3.

Overall budget
€ 5 340 538,75

EU contribution
€ 4 998 788,25



Coordinated by
NEDERLANDSE ORGANISATIE VOOR TOEGEPAST
NATUURWETENSCHAPPELIJK ONDERZOEK TNO
 Netherlands

Creating value from industrial CO2 SOURCES

Twenty leading industrial and research partners from 11 countries have teamed up to prove that large-scale conversion of industrial carbon emissions into value-added chemicals and materials is possible. As a game changer for European carbon-intensive industries, the EU-funded PYROCO2 project will pave the way for the sustainability of Europe's chemical industry. It will demonstrate the scalability and economic viability of carbon capture and utilisation to generate climate-positive acetone from industrial CO2 and renewable electricity-derived hydrogen. The project will demonstrate that the acetone produced is an ideal platform for the catalytic synthesis of a range of chemicals, synthetic fuels and recyclable polymer materials from CO2 for viable business cases and pre-developed processes for replication and commercialization. [For more information](#)

Project Information

PYROCO2

Grant agreement ID: 101037009

Start date
1 October 2021

End date
30 September 2026

Funded under
INDUSTRIAL LEADERSHIP - Leadership in enabling
and industrial technologies

Total cost
€ 43 887 817,75

EU contribution
€ 39 999 561,18



Coordinated by
SINTEF AS
 Norway



CO2 CAPTURE, UTILISATION AND STORAGE FOR A NET-ZERO CARBON FUTURE

With climate change putting people worldwide in danger and nations taking steps to decrease its effects, new innovations regarding green solutions are more welcome than ever. The EU-funded ConsenCUS project aims to assist in this goal by providing an industrial plan for a net-zero carbon reality. To this aim it will utilise 3 electricity-based innovations: carbon capture based on alkali absorption, methods for conversion of CO2 to formate and formic acids for market uses and finally a safe cyclic loading system of CO2 into salt formations and aquifers for storage purposes. These innovations should greatly benefit the EU in reaching its net-zero carbon goal. [For additional information](#)

Project Information

ConsenCUS

Grant agreement ID: 101022484

Start date

1 May 2021

End date

30 April 2025

Funded under

SOCIETAL CHALLENGES - Secure, clean and efficient energy

Total cost

€ 13 905 272,50

EU contribution

€ 12 862 331,88



Coordinated by

RIJKSUNIVERSITEIT GRONINGEN

Netherlands

ZERO EMISSION NETWORK TO FACILITATE CCUS UPTAKE IN INDUSTRIAL CLUSTERS

Carbon capture, utilisation and storage (CCUS) technology is an important tool in reducing climate change. The EU-funded CCUS ZEN project will increase the rollout of CCUS technology in Europe through knowledge-sharing and the development of specific action plans, focusing specifically on the Baltic Sea and Mediterranean Sea regions. The project consortium will bring together 15 partners with leading expertise in all aspects of CCUS value chains. CCUS ZEN will select at least eight value chains (four in each region) for detailed study and comparison with successful value chains from the North Sea region. This will result in policy recommendations for CCUS value chain development, including CO2 source mapping, generic technical frameworks and business plan models. [For additional information](#)

Project Information

CCUS ZEN

Grant agreement ID: 101075693

DOI

10.3030/101075693 [↗](#)

Start date

1 August 2022

End date

31 January 2025

Funded under

Climate, Energy and Mobility

Total cost

€ 1 782 627,50

EU contribution

€ 1 782 627,50



Coordinated by

SINTEF AS

Norway



SUNER-C: SUNERGY Community and eco-system for accelerating the development of solar fuels and chemicals.

Photovoltaic power is increasingly competing with grid power in the EU and around the world. Soon, sunshine could be used to decarbonise air travel. The potential in solar fuel is shining. The EU-funded SUNER-C project will put these uses under a bright spotlight. Bringing together 31 organisations from a variety of sectors and across the EU, the project will speed up the development of solar fuels and chemicals. By replacing fossil-derived fuels and chemicals with renewables and carbon recycling, SUNER-C aims to contribute to the creation of a circular economy. [For additional information](#)

Project Information

SUNER-C
Grant agreement ID: 101058481

DOI
10.3030/101058481 [🔗](#)

Start date
1 June 2022

End date
31 May 2025

Funded under
Digital, Industry and Space

Total cost
€ 4 026 403,75

EU contribution
€ 3 997 646

Coordinated by
UNIVERSITEIT UTRECHT
🇳🇱 Netherlands



INNOVATIVE bio-based chains for CO2 VALorisation as aDded-value organic acids

The conversion of industrial CO2 emissions is gaining significant interest as a strategy to alleviate the effects of climate change. Bio-based industries are primary candidates to turn emissions into feedstock. The EU-funded VIVALDI project proposes an integrated solution for the conversion of biogenic CO2 into added-value organic acids (succinic, itaconic, 3-hydroxypropionic and lactic) powered by ground-breaking advances in CO2 electrochemical conversion and bioprocess engineering. The solution will involve CO2 enrichment from industrial sources and its electrochemical reduction to formic acid (FA) and methanol (MeOH), as well as bioelectrochemical nutrient recovery from industrial wastewaters. [For additional information](#)

Project Information

VIVALDI
Grant agreement ID: 101000441

[🌐](#) [🐦](#) [in](#)

DOI
10.3030/101000441 [🔗](#)

Start date
1 June 2021

End date
31 May 2025

Funded under
SOCIETAL CHALLENGES - Food security, sustainable agriculture and forestry, marine, maritime and inland water research, and the bioeconomy

Total cost
€ 6 969 835,81

EU contribution
€ 6 969 835,81

Coordinated by
UNIVERSITAT AUTONOMA DE BARCELONA
🇪🇸 Spain





ADVANCED chemicals production from biogenic CO2 emissions for circular bio-based industries

The sustainable conversion of CO2 to value-added chemicals is considered critical to avoiding catastrophic global warming. Biorefinery industries can lead the way. In this context, the EU-funded CO2SMOS project will develop a platform of technologies to transform CO2 emissions produced by bio-based industries into a set of high value-added chemicals with direct use as intermediates for bio-based products. Specifically, it will create a toolbox combining intensified chemical conversions (electrocatalytic and membrane reactors) and innovative biotechnological solutions based on gas/liquid combined fermentation processes and organic/green-catalysts reaction processes. The CO2SMOS will contribute to the sustainability and cost competitiveness of the integrated conversion processes. [For additional information](#)

Project Information

CO2SMOS
Grant agreement ID: 101000790

DOI: [10.3030/101000790](https://doi.org/10.3030/101000790)

Start date 1 May 2021 **End date** 30 April 2025

Funded under
SOCIETAL CHALLENGES - Food security, sustainable agriculture and forestry, marine, maritime and inland water research, and the bioeconomy

Total cost
€ 6 918 240

EU contribution
€ 6 918 240

Coordinated by
FUNDACION CARTIF
Spain



INNOVATIVE INDUSTRIAL transformation of the steel and chemical industries of Europe

Urea is widely used as a nitrogen-release fertiliser in agriculture but also in many industrial sectors. The EU-funded INITIATE project advances an innovative symbiotic process to generate urea NH3 from steel residual gases. This innovation will considerably reduce primary energy intensity, carbon footprint, raw material intensity and waste production. The project relies on a consortium consisting of the full value chain, including major steel and urea industries, multidisciplinary researchers, functional material suppliers and experienced promoters of symbiosis issues. It will develop a commercial implementation roadmap to ensure commercial production and implementation of the system and similar symbiotic systems. The reliability of the process will be assessed and validated on a regional and European level by advanced dynamic modelling and life-cycle assessment in line with ISO 14404 guidelines. [For additional information](#)

Project Information

INITIATE
Grant agreement ID: 958318

DOI: [10.3030/958318](https://doi.org/10.3030/958318)

Start date 1 November 2020 **End date** 31 October 2025

Funded under
INDUSTRIAL LEADERSHIP - Leadership in enabling and industrial technologies - Advanced manufacturing and processing

Total cost
€ 23 148 255,86

EU contribution
€ 21 298 571

Coordinated by
NEDERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK TNO
Netherlands





CCUS ONGOING PROJECTS - INOVATION FUND

K6 Program

The project will deploy a first-of-its-kind industrial-scale combination of an oxy-fuel kiln and carbon capture technology. The captured CO₂, otherwise emitted to the atmosphere, will be finally stored in a permanent storage site in the North Sea (although this part of the technology chain falls outside the Innovation Fund project boundary, the storage location will most probably be located in Western Norway). The project will result in the avoidance of 8.1 Mt CO₂e emissions over its first ten years of operation. The integration of the K6 Program project with the nearby Port of Dunkirk will foster the development of the port as a future European CO₂ hub. [For more information](#)

Project information

Acronym	Project ID
K6	101051358
Start date	End date
01 April 2022	31 December 2037
Coordinated by	
EQIOM	
Funded under	
Innovation Fund (InnovFund)	

AGGREGACO2

AGGREGACO₂ project targets the aggregates industry for a revolution through the successful commercial deployment of a sustainable aggregate as a solid alternative of conventional aggregates not fully environment-friendly. The AGGREGACO₂ proposes a FOAK innovation through the introduction of CO₂ captured of refinery processes in an Accelerated Carbonation Technology (ACT), that revalorise Air Pollution Control residues (APCr), which are hazardous residue nowadays stored after treatment, for the fabrication of carbon negative aggregates. [For more information](#)

Project information

Acronym	Project ID
AGGREGACO2	101038931
Start date	End date
01 April 2021	31 December 2027
Coordinated by	
PETROLEOS DEL NORTE SA	
Funded under	
Innovation Fund (InnovFund)	



KAIROS-AT-C

The main objective of the Kairos@C project is to create the first and largest cross-border carbon capture and storage (CCS) value chain to capture, liquefy, ship and permanently store CO₂. Located in the Port of Antwerp, Kairos@C will establish a regional hub for innovative energy and carbon value chains. Kairos@C will develop a full industrial-scale CCS project that will encompass the CO₂ capture from various industrial sources on the Zandvliet industrial platform, the CO₂ transport by pipeline to the liquefaction and export terminal located in the same port, the shipping towards CO₂ subsea storages in the North Sea and the permanent sequestration of the CO₂ in these storages. [For more information](#)

Project information

Acronym	Project ID
Kairos-at-C	101051344
Start date	End date
01 November 2020	31 July 2035
Coordinated by	
AIR LIQUIDE LARGE INDUSTRY 	
Funded under	
Innovation Fund (InnovFund)	

BECCS STOCKHOLM

The Beccs Stockholm project will create a world-class, full-scale Bio-Energy Carbon Capture and Storage (BECCS) facility at its existing heat and power biomass plant in Stockholm. The project will combine CO₂ capture with heat recovery, making the process much more energy-efficient than the process in a usual CCS plant. It will capture and permanently store large quantities of CO₂ from biological sources, leading to carbon removals from the atmosphere, also called negative emissions. [For more information](#)

Project information

Acronym	Project ID
Beccs Stockholm	101051202
Start date	End date
01 July 2021	31 August 2036
Coordinated by	
STOCKHOLM EXERGI AB 	
Funded under	
Innovation Fund (InnovFund)	

PROJECT SYVERSTONE

Project Silverstone offers permanent CO₂ capture and mineral storage (CCMS) through a safer and more economical technology than provided by alternative Carbon Capture and Storage (CCS) solutions. The Carbfix technology imitates and accelerates geological processes that nature has applied for millions of years to regulate long-term CO₂ levels in the atmosphere, turning CO₂ into solid carbonate minerals underground. The project will deploy full-scale CCMS at one of the largest geothermal power plants in the world, reaching a near-zero carbon footprint. The technology is proven at the project site to be safe, efficient, and environmentally friendly [For more information](#)

Project information

Acronym	Project ID
Silverstone	101038888
Start date	End date
01 December 2021	31 December 2030
Coordinated by	
CARBFIX OHF 	
Funded under	
Innovation Fund (InnovFund)	



CCGEO (CLOSED CARBON GEOTHERMAL ENERGY)

Continental Croatia has vast geothermal potential; however, only a negligible share of it is exploited for energy generation. The proposed Project, located in north-west Croatia, aims to make a difference in the geothermal sector and support Croatia on an energy transition pathway. The objective of the Project is to implement one line for the production of power and heat from the gas dissolved in the geothermal water using the internalization of carbon compounds. The proposed Action is a part of a fully planned advanced geothermal power plant using the internalization of carbon compounds (ICC), which would result in nearly zero GHG emissions throughout the Project lifetime and add to the net-carbon removal efforts. [For more information](#)

Project information

Acronym	Project ID
CCGeo	101038843
Start date	End date
01 January 2022	31 March 2026
Coordinated by	
AAT GEOTHERMAE DOO 	
Funded under	
Innovation Fund (InnovFund)	

SHARC

The SHARC (Sustainable Hydrogen and Recovery of Carbon) project will reduce emissions at the Porvoo oil refinery in Finland, by moving away from the production of grey (fossil-fuel based) hydrogen towards both green hydrogen production (through the introduction of electrolysis facilities) and blue hydrogen production (by applying carbon capture technology). Combined with the offshore storage of carbon dioxide (CO₂), this project will maximize the environmental impact and development of a strong supply chain covering the oil refinery, the CO₂ capture and transport facilities and the storage site. It will also lay the foundation for a European hub for renewable hydrogen and CO₂ utilization. [For more information](#)

Project information

Acronym	Project ID
SHARC	101051125
Start date	End date
01 March 2022	31 July 2035
Coordinated by	
NESTE OYJ 	
Funded under	
Innovation Fund (InnovFund)	



UPCOMING EVENTS

INTERNATIONAL CONFERENCE ON CARBON CAPTURE AND STORAGE TECHNOLOGIES (ICCCST)
29-30 March 2024 in Paris, France

For more information and registration please click [here](#)

XVIII. International Carbon Capture and Storage Technologies is the premier interdisciplinary forum for the presentation of new advances and research results in the fields of Environmental and Ecological Engineering. Today more than ever before it is extremely important to stay abreast of the changing landscapes of the Environmental and Ecological Engineering world. The multidisciplinary focus of this event aims to bring together presenters and attendees from different fields with expertise in various areas of Environmental and Ecological Engineering, providing an excellent opportunity to participate in the international exchange of ideas, current strategies, concepts and best practices, collaborations, and cooperation, offering a broader perspective and more enriching experience.



The program includes time allocated for networking, peer-to-peer discussions, and exploring the host city.

3RD ANNUAL CCUS & CARBON SINKS 2024
22-23 January 2024 in Amsterdam, Netherlands.

Please find more info on registration [here](#).

3rd Annual CCUS 2023 provides an opportunity for collaboration and knowledge sharing in the industry. It prepares a unified and practical strategy for developing and implementing CCUS techniques in the energy sector. Furthermore, it will discuss the perspectives on the status of the CCUS development and its potential. It welcomes key market players to join the discussion and peer-to-peer networking with an exclusive group of experts to share their thoughts on the current CCUS status and its development potential in the near future.



Bio360 Expo 2024

24-25 January 2024 in Nantes, France.

Please find more info on registration [here](#).

Bio360 Expo isn't just a trade show; it's a platform for innovation, connection, and transformation. With a focus on expo renewable carbon, bioenergy, and bioeconomy, our event is where potential turns into progress. Explore cutting-edge technologies, discover new horizons, and immerse yourself in the world of renewable solutions that are revolutionizing industries and reshaping our world. Be a part of the sustainable future - jump aboard today.



CO₂-BASED FUELS AND CHEMICALS CONFERENCE 2024

17-18 April 2024 Maternushaus, Cologne (Germany), hybrid event.

Please find more info on registration [here](#).



The CO₂-based Fuels and Chemicals Conference is one of internationally established and has developed into a unique meeting and networking place for the entire Carbon Capture and Utilisation (CCU) and Power-to-X industry and its customers. The upcoming 12th edition of this conference again will continue with this success and will showcase again the newest and most important developments in the fast growing field of CO₂ capture and utilization.

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/>

