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 09

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Version	Date	Created/Amended by	Changes
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FOREWORD

We are delighted to release the ninth 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 cherif.morcos@axelera.org

Have a good read!

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MARKET INFORMATION

CARBON CAPTURE: CAN A NEW COMMISSION STRATEGY REVIVE CCUS?

The article “Carbon Capture: Can a New Commission Strategy Revive CCUS?” discusses a new strategy aimed at promoting investments in the production capacity of products that are key in meeting the EU’s climate neutrality goals. The strategy sets a target of 50 million tonnes of annual CO2. The Commission has published a call for evidence and a public consultation on industrial carbon management – carbon capture, utilisation and storage deployment. The Commission’s communication on an EU strategy for establishing an industrial carbon management market by 2030 is due for publication by the end of 2023. It will cover industrial carbon management through the transport, use, and storage of carbon dioxide (CO2) captured from fossil fuel, biogenic and atmospheric sources. For more information, please click here.

NEXT STEPS FOR UK HYDROGEN

Next Steps for UK Hydrogen” discusses the UK’s first national hydrogen strategy. The vision is that by 2030, the UK will be a global leader in hydrogen, with 5GW of low carbon hydrogen production driving decarbonisation. This could lead to the creation of 100,000 jobs and £13 billion GVA by 2050. The strategy also outlines challenges to overcome, such as the cost of hydrogen relative to existing high carbon fuels, technological, policy and regulatory uncertainty, need for infrastructure and supply and demand coordination, and a need for “first-of-a-kind” and “next-of a kind” investment and deployment. The outcomes by 2030 include decarbonisation of existing UK hydrogen supply, lower cost of production, end-to-end hydrogen system with a range of users, emissions reduced under Carbon Budgets 4 and 5, prepared for a ramp up beyond 2030 - on a pathway to net zero and evidence-based policy development.. For more information, please click here.

GLOBAL ENERGY PERSPECTIVE 2023: CCUS OUTLOOK | MCKINSEY

The “Global Energy Perspective 2023: CCUS Outlook” by McKinsey models the outlook for demand and supply of energy commodities across a 1.5°C pathway, aligned with the Paris Agreement, and four bottom-up energy transition scenarios. The article examines the role that Carbon Capture, Utilization and Storage (CCUS) could play in decarbonizing energy systems and what will be needed for it to scale to a globally impactful level. It mentions that to meet current announced net-zero targets, global CCUS capacity needs to grow over 100 times in the longer term, reaching 4 to 6 gigatons CO2 by 2050 and decarbonizing around 15 to 20 percent of today’s energy-related emissions. This will require a significant acceleration from the current uptake pipeline, and more than double the CCUS capacity from the Current Trajectory scenario. For more information, please click here.

CCUS MARKET OUTLOOK 2023: ANNOUNCED CAPACITY SOARS BY 50%

The article “CCUS Market Outlook 2023: Announced Capacity Soars by 50%” on BloombergNEF discusses the significant expansion of the global carbon capture, utilization and storage (CCUS) market. The industry is set for a 50% growth spurt since the last market outlook, reaching 420 million metric tons per annum by 2035. This expansion is driven mainly

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by global policy support. The market is diversifying rapidly into hard-to-abate sectors such as cement, iron and steel, and power. Investments in carbon capture, transport and storage infrastructure hit $6.4 billion in 2022. More than 140 million metric tons per annum of new capture capacity has been announced since the last market outlook. The industry is now expected to grow at an 18% compound annual growth rate to capture 420 million tons per annum by 2035. The US will retain its place as the market leader for the deployment of carbon capture, with a 40% market share in 2035. The UK and Canada will follow, at 16% and 12% respectively, while Australia, the Netherlands and China round out the top tier with 3-4% each. For more information, please click here.

GLOBAL ENERGY PERSPECTIVE 2023: HYDROGEN OUTLOOK | MCKINSEY

The “Global Energy Perspective 2023: Hydrogen Outlook” by McKinsey discusses the potential role of hydrogen in decarbonizing the energy system and the challenges in setting up a global hydrogen economy by 2050. Clean hydrogen demand is projected to increase to between 125 and 585 Mtpa by 2050. Nearly all new hydrogen production coming online after 2025 is expected to be clean hydrogen. This coincides with the start of the expected phaseout of grey hydrogen, driven by the growing cost competitiveness of clean hydrogen and commitments to decarbonize. After 2040, private and public sector commitments are projected to drive the uptake of clean hydrogen and hydrogen-based fuels in emerging applications. For more information, please click here.

GLOBAL HYDROGEN MARKET SURPASSES $150 BILLION MARK, SET TO SOAR AT 6.37% CAGR THROUGH 2028

The “Global Hydrogen Market Surpasses $150 Billion Mark, Set to Soar at 6.37% CAGR Through 2028” article discusses the substantial growth of the global hydrogen market. The market, valued at $156.76 billion in 2022, is projected to grow at a Compound Annual Growth Rate (CAGR) of 6.37% from 2023 to 2028. This growth is attributed to increasing demand for hydrogen-based fuels, focus on industrial decarbonization and desulfurization to meet sustainability goals, and developments in steel and power generation industries to address rising global electricity demand. The market is diversifying into hard-to-abate sectors such as cement, iron and steel, and power. Investments in carbon capture, transport and storage infrastructure reached $6.4 billion in 2022. More than 140 million metric tons per annum of new capture capacity has been announced since the last market outlook. The industry is now expected to grow at an 18% compound annual growth rate to capture 420 million tons per annum by 2035. The US will retain its place as the market leader for the deployment of carbon capture, with a 40% market share in 2035. The UK and Canada will follow, at 16% and 12% respectively, while Australia, the Netherlands and China round out the top tier with 3-4% each. For more information, please click here.

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MAP OF CO2 STORAGE PROJECTS IN EUROPE - IOGP EUROPE

The “Map of CO2 Storage Projects in Europe” by IOGP Europe provides a comprehensive overview of existing and planned carbon storage projects across the continent. The map includes a wealth of details for each project, such as:

- Location
- Project name
- Elements of the CCS (Carbon Capture and Storage) 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)
- CO2 storage injection capacity after expansion (MTPA)
- Type of CO2 storage

This resource is invaluable for understanding the landscape of carbon storage projects in Europe, their current status, and future plans. It also provides insights into the types of CO2 storage being used and the capacity for CO2 storage at the start and after expansion. For more information, please click here.

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TECHNOLOGY WATCH

EUROPEAN COMMISSION STRATEGY ON INDUSTRIAL CARBON MANAGEMENT

The European Commission has released a strategy for industrial carbon management, highlighting the need for carbon capture technologies to reduce emissions in industrial processes. Five chapters are elaborated into this release, a resumé of each chapter will be presented hereafter.

Chapter 1: Why the EU needs an industrial carbon management strategy

The European Union is committed to achieving economy-wide climate neutrality by 2050 to limit global warming to 1.5 °C. An EU industrial carbon management strategy is essential to reduce emissions by at least 55% by 2030. The strategy aims to decarbonise production processes in industrial sectors that are important for the European economy.

Chapter 2: The state of play on industrial carbon management in Europe

The strategy describes the current state of play for industrial carbon management, the envisioned pathway towards 2050, the policy framework for industrial carbon management, and the necessary pre-conditions to support industrial carbon management approaches.

Chapter 3: The scale of the challenge

The scale of this challenge requires an EU-wide industrial carbon management strategy, which will be based on three pathways: Capturing CO2 for storage (CCS), where CO2 emissions of fossil, biogenic or atmospheric origin are captured and transported for permanent and safe geological storage.

Chapter 4: The policy framework for industrial carbon management

The strategy acknowledges some of the challenges of CCS deployment and provides some genuine answers to the decades-old chicken and egg problem, i.e., the intricacies of coordinating investments where those seeking to capture emissions will not do so until access to transport and storage infrastructure is certain.

Chapter 5: The necessary pre-conditions to support industrial carbon management approaches

The strategy sets out a comprehensive policy approach to deliver on targets laid out in the Net-Zero Industry Act, in which the European Commission proposes that the EU develops at least 50 million tonnes per year of carbon dioxide (CO2) storage capacity by 2030. For more information, please click here.

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CARBON CAPTURE TECHNOLOGY EXPO EUROPE 2024

This expo is dedicated to discussing the increasing role that Carbon Capture, Utilisation & Storage (CCUS) will play in transitioning to a net-zero carbon economy. It will feature the latest advances in new technology for carbon capture, storage, and transport. For more information, please click here.

CARBON DIOXIDE REMOVAL GUIDELINES | WORLD ECONOMIC FORUM

The “Carbon Dioxide Removal: Best-Practice Guidelines” by the World Economic Forum discusses the urgent need for new technologies to deliver additional, permanent, and quantifiable impacts to slash emissions. Despite needing to halve emissions by 2030 to stand a chance of limiting warming to 1.5°C, they continue to rise. The paper examines the potential of engineered carbon dioxide removal (CDR) through biochar, bioenergy with carbon capture and storage (BECCS), direct air capture with carbon storage (DACCS), and enhanced rock weathering. It draws on interviews with eight “First Movers” to gain their insights into why “wait and see” is not an option and how best to navigate this nascent market. It calls on every company to make advance purchases of engineered CDR part of their wider climate strategy. The world must accelerate the removal of CO2 from the atmosphere, from 2 billion to 10 billion tonnes a year by 2050, to reverse the accumulation of historic emissions, balance the hardest-to-abate emissions, and safeguard against Earth’s feedback loops from a warmer world. The scale of the challenge is mind-blowing, with up to 687 billion tonnes of CO2 needing removal by the end of the century. The paper provides insights into why engaging in engineered CDR now is good for corporate climate strategy, provides business opportunities, and is essential for leadership. It also discusses how to access the nascent market for engineered CDR, including how to secure the budget, choose the right market access model, and communicate CDR performance in-house and outside the company. The paper concludes that a mix of natural-climate solutions and engineered CDR is needed.

For more information, please click here.

REQUEST FOR INFORMATION: INDUSTRIAL DEPLOYMENT AND DEMONSTRATION

The “Request for Information: Industrial Deployment and Demonstration Opportunities for Carbon Capture Technologies” by the U.S. Department of Energy’s (DOE) Office of Fossil Energy and Carbon Management (FECM) was released on January 29, 2024. The RFI seeks input to assist DOE in planning priorities and initiatives to catalyze the development, demonstration, and deployment of carbon capture, conversion, and storage technologies to decarbonize America’s industrial sectors. This is crucial to meeting the Biden-Harris Administration’s ambitious climate goal of achieving a net-zero emissions economy by 2050. The RFI solicits potential industrial carbon capture demonstration and deployment projects and their associated locations, considering the urgent need for a clean and equitable energy transition. FECM seeks comments from industry, investors, developers, academia, research laboratories, government agencies, potentially impacted communities, and other stakeholders. Input is encouraged from both domestic and international entities. The RFI is not a funding opportunity announcement and DOE is not accepting applications currently. For more information, please click here.

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CEMTECH LIVE WEBINAR: CARBON CAPTURE TECHNOLOGIES FOR CEMENT PLANTS

The “Cemtech Live Webinar: Carbon Capture Technologies for Cement Plants” introduces the main technologies for capturing carbon emissions from the exhaust gas of a cement kiln. Several approaches are explored – including absorption, adsorption, phase transition and membrane separation – along with their advantages and disadvantages. The consistent and indispensable role of electrical and digital infrastructures in optimising and collecting data for carbon capture is also highlighted. Presentations include KHD Humbolt Wedag (Germany), Sumitomo SHI FW (Finland), KC8 Capture (Australia) and Schneider Electric (France). For more information, please click here.

CARBON CAPTURE, STORAGE AND UTILISATION - ENERGY

The webpage on the European Commission’s Energy site titled “Carbon capture, storage and utilisation” provides an overview of the EU’s efforts in the field of carbon capture, storage, and utilisation (CCUS). It discusses the role of CCUS technologies in achieving the EU’s decarbonisation goals. The Commission provides a regulatory framework for the safe transport and storage of CO2 and promotes the use of energy from renewable sources. In December 2021, the Commission adopted a Communication on Sustainable Carbon Cycles that aims to establish sustainable and climate-resilient carbon cycles. It lists key actions to support industrial capture, use and storage of CO2, including the assessment of cross-border CO2 infrastructure deployment needs at EU, regional and national levels until 2030 and beyond. On 30 November 2022, the European Commission adopted a proposal for an EU-wide voluntary framework to certify carbon removals. It will boost innovative industrial carbon removal technologies, such as bioenergy with carbon capture and storage (BioCCS) or direct air carbon capture and storage (DACCS). Both these technologies can capture carbon and store it permanently in geological formations. In November 2023, the Commission published a report providing an analysis of the response received from stakeholders and citizens to the open public consultation on the Industrial Carbon Management Strategy. For more information, please click here.

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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 European Parliament and the Council have recently reached an agreement on a piece of legislation known as the Net Zero Industry Act. Although the final text has not yet been published due to ongoing technical adjustments, the general structure is already understood. Notably, there exists a single list of technologies, which includes "CO2 transport and utilization technologies," "sustainable alternative fuels technologies," and "RFNBO technologies."

Member States will play a crucial role in determining which projects are strategically important. These strategic projects will benefit from favorable provisions outlined in the legislation. Importantly, all the aforementioned technologies, including CO2 utilization, can be considered strategic choices. This development represents a significant milestone in recognizing the role of Carbon Capture and Utilization (CCU) in achieving the EU's climate objectives. Throughout the negotiation process, CO2 Value Europe has been a strong advocate for this recognition.

While the door is now open for CCU strategic projects across more than 20 out of 27 Member States, further work remains at the national level. Additionally, the final version of the text will address whether certain technologies receive preference in EU public procurement and renewable auctions. Expect the legislation to be formally adopted by the Parliament and Council in the coming weeks. Fore more information, please click here.

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RED III directive

The RED III Directive, which amends and updates the existing Renewable Energy Directives, has introduced several new provisions starting from 2024. Notably, it accelerates permit-granting procedures, which must be transposed into national law by 1 July 2024. Furthermore, a presumption of "overriding public interest" for renewable energy installations and their related infrastructure is introduced by 21 February 2024. This presumption applies particularly to permitting requests for projects impacting a Natura 2000 protected biodiversity area.

ETS 2026 proposal

The ETS 2026 proposal is a significant step towards carbon capture, utilization, and storage (CCUS). It includes a plan for the European Commission to assess the implementation of CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation) in reducing aviation emissions. If CORSIA is found insufficient, the Commission will propose to extend the scope of ETS to all flights departing from the EEA. The proposal also includes a plan to phase out free emission allowances for the aviation sector, with allowances being fully auctioned from 2026. Additionally, the proposal aims to incentivize the uptake of sustainable aviation fuels (SAF) and establish a single market for industrial carbon management.

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FUNDING & TENDER OPPORTUNITIES

FRANCE

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 tonnes of CO2 emissions per year by 2030.

CCUS deployment in the country will be focused on industrial zones, such as Dunkerque, Le Havre, Fos-sur-Mer, Lacq/Sud-Ouest, Loire-Estuaire, and Grand Est. To support project developers and scale up CCUS deployment, the government will launch a call for tenders through a Contracts for Difference scheme. Under the aims outlined in the strategy, a framework for CO2 transport will be developed, and geological storage sites will undergo pilot testing from 2024-2025.

The French Government is calling on stakeholders to share their input on key items highlighted in the CCUS strategy. The consultation was open until 29 September 2023. Among these projects, there is DECLYC, a project for the decarbonation of AURA Valley in France, held by AXELERA.

ACT Pas à Pas

The ADEME Formation offers a course titled “ACT Pas à Pas” for consultants. This course aims to equip consultants with the knowledge and tools to assist companies in developing and implementing their decarbonization strategies. The course combines theory and practice, and is highly sought after due to its strategic relevance.

The “ACT Pas à Pas” course is designed for consultants who regularly conduct greenhouse gas assessments for companies and assist them in reducing their GHG emissions. The course provides a comprehensive understanding of the ACT Pas à Pas method and its objectives, and teaches how to use various tools at each step. It also helps consultants adapt to the needs of the company they are assisting.

The course is 14 hours long and costs €2000, but it’s free for the public and non-profit sectors. The course is in high demand, and ADEME will prioritize registration requests based on its strategic priorities for assisting companies. 96% of trainees recommend this course.

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FUNDING & TENDER OPPORTUNITIES

EUROPE

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

Deadline date: 09/04/2024

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

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.

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

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.

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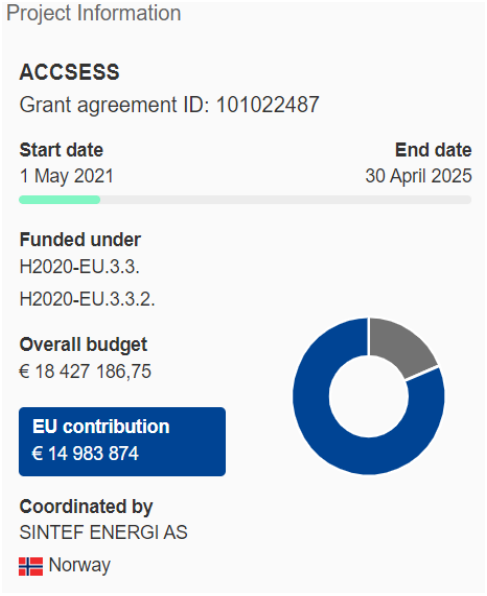
CCU ONGOING PROJECTS - *HORIZON 2020*

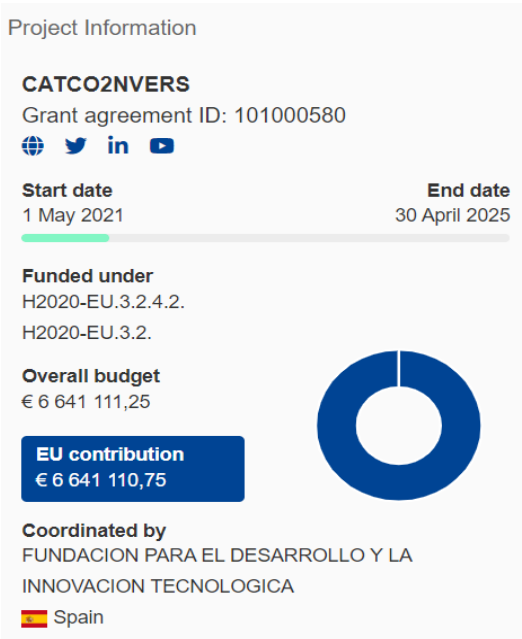
Providing access to cost-efficient, replicable, safe and flexible CCUS

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



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



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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

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

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

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Funded under
Climate, Energy and Mobility

Total cost
€ 1 782 627,50

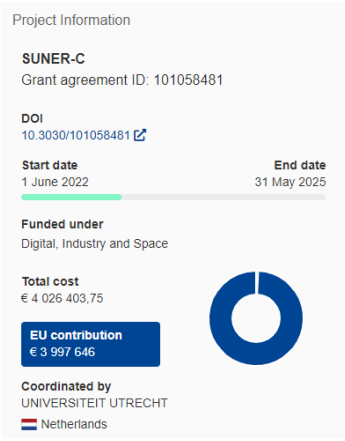
EU contribution
€ 1 782 627,50

Coordinated by
SINTEF AS
Norway

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

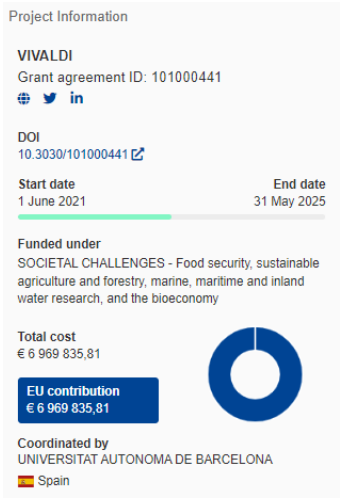
SUNER-C: SUNERGY COMMUNITY AND ECO-SYSTEM FOR ACCELERATING THE DEVELOPMENT OF SOLAR FUELS AND CHEMICALS.

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



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



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

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

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

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

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 **K6**	Project ID **101051358**
Start date **01 April 2022**	End date **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 AGGREGACO2	Project ID **101038931**
Start date **01 April 2021**	End date **31 December 2027**
Coordinated by PETROLEOS DEL NORTE SA	
Funded under **Innovation Fund (InnovFund)**	

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

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)

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

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)

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

UPCOMING EVENTS

CO2-BASED FUELS AND CHEMICALS CONFERENCE 2024

17-18 April 2024 Maternushaus, Cologne (Germany), hybrid event. Please find more info on registration **here**.

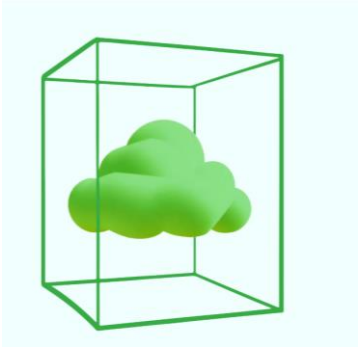
The CO2-based Fuels and Chemicals Conference is one of internationally established and has developed into a unique meeting and networking place for the entire Carbon Capture and Utilisation (CCU) and Power-to-X industry and its customers. The upcoming 12th edition of this conference again will continue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

CAPTURING A NET ZERO TO FUTURE

15 - 16 October 2024, Central Hall Westminster, London.
Please find more information on registration here.

CCUS 2024, now in its sixth year, provides an excellent opportunity for UK and EU Governments, industry and wider stakeholders to drive progress on CCUS, demonstrating our commitment as an organisation to representing CCSA members and providing a voice for the industry. The focus this year will be on the way forward for CCUS and the pivotal role it will need to play as we journey towards net zero. The conference will cover many key CCUS topics, such as the UK's CCUS Vision, cross-border frameworks, how to create a European-wide storage market, markets and mandates, CCU, finding the route-to-market for CCS.

BIO-CO2 USE AND REMOVAL 2024



16 April 2024, 9 am – 7 pm, Kulttuurikasarmi, Helsinki, Finland.
Please find more information on registration here.

Bio-CO2 Use and removal 2024, organized by the Bioenergy Association of Finland in collaboration with VTT Technical Research Centre of Finland and Finnish Energy. The Bio-CO2 Use and Removal 2024 conference will be focused on the next steps in promoting the use of biogenic CO2 in products and carbon removals in Europe, exploring existing carbon capture projects in Finland, and gaining insights into the future. Learning about financing options for carbon removal and delving into the logistics of CO2 transportation in the Finnish context will be also a key topic.

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

CO2 CAPTURE, STORAGE & REUSE 2024 CONFERENCE

15 -16 May - Copenhagen, Denmark.
Please find more information on registration here.

During this 2-day event rich in presentations from industry end-users and running projects case studies will give you a comprehensive overview of CO2 Capture. The 2024 edition of the conference will focus on new regulations, changing market situation, including interesting industry panel discussions, technical insights, and networking opportunities with industry leaders.

Securing the future of European industries: The Role of CCUS in the EU's legislative term 2024-2029

26 March 2024, Brussels.
Please find more information on registration here.

Join this event organised by the Carbon Capture & Storage Association, the leading European CCUS trade association with 120+ members across the entire value chain, to explore the CCUS industry perspective about achieving the CO2 storage targets set by the European Commission.

Key discussion points will include:

– Assessing the impact of CCUS on industrial decarbonisation processes.

– Advancing solutions for compelling business cases to increase CO2 storage and transport infrastructure investments.

– Identifying key policy measures to promote the use of CCUS technologies.

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

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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