



## Demonstrating sustainable value creation from industrial CO<sub>2</sub> 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 05

<b>Due date</b>		<b>Delivery date</b>	January 2023
<b>Work package</b>	WP 6 – Exploitation, Replication, Communication and Dissemination		
<b>Responsible Author(s)</b>	AXELERA		
<b>Contributor(s)</b>	AXELERA		
<b>Dissemination level</b>	Consortium and AXELERA Cluster		

#### Version and amendments history

Version	Date	Created/Amended by	Changes
<b>01</b>	27/01/2023		



## TABLE OF CONTENTS

<b>FOREWORD.....</b>	<b>4</b>
<b>MARKET INFORMATION.....</b>	<b>5</b>
Project Air receives €97 million grant from EU Innovation Fund.....	5
ArcelorMittal inaugurates European steel industry's first CCU project at Belgium plant.....	5
World's largest CO <sub>2</sub> -to-methanol plant starts production .....	5
Scaling the CCUS industry to achieve net-zero emissions.....	5
EU Commissioner For Energy Announces 'Strategic Vision' For Carbon Capture In 2023 .....	5
Germany and Norway will build a big hydrogen pipeline .....	6
Global Status of CCS .....	6
Porsche begins production of 'e-fuel' that could provide gas alternative amid EV push.....	6
EU to fund Holcim Decarbonization projects .....	7
This company wants to make air travel sustainable .....	7
Rewriting the Story of CO <sub>2</sub> – Call for Innovations “Best CO <sub>2</sub> Utilisation 2023” .....	7
<b>TECHNOLOGY WATCH.....</b>	<b>8</b>
Proposing a new process for methanol production based on renewable hydrogen .....	8
Surface charge as activity descriptors for electrochemical CO <sub>2</sub> reduction to multi-carbon products on organic-functionalised Cu .....	8
A Brief Review of Hydrogen Production Methods and Their Challenges .....	9
Decarbonization of Mining and Metals Industry. A Critical Overview .....	9
Advances in Carbon Capture and Use (CCU) Technologies: A Comprehensive Review and CO <sub>2</sub> Mitigation Potential Analysis .....	9
IPCC Report: The Role of Carbon Capture and Utilisation (CCU) to Mitigate Climate Change.....	10
Sustainability analyses of CO <sub>2</sub> sequestration and CO <sub>2</sub> utilization as competing options for mitigating CO <sub>2</sub> emissions.....	10
Carbon capture and utilization for industrial applications.....	10
Climate change impacts of e-fuels for aviation in Europe under present-day conditions and future policy scenarios .....	10
The chemical engineering aspects of CO <sub>2</sub> capture, combined with its utilization .....	11
PlasCO <sub>2</sub> project: Greenhouse gas transformed into a raw material .....	12
Energy Sector Derived Combustion Products Utilization—Current Advances in Carbon Dioxide Mineralization.....	12
Toward economical application of carbon capture and utilization technology with near-zero carbon emission .....	12
Techno-economic and environmental assessment of CCU options.....	13
<b>EU POLICIES &amp; LEGISLATION.....</b>	<b>14</b>
Regulatory limbo leaves EU heavy emitters in the dark on net zero .....	14
A final sprint to make the EU Fit for 55.....	14
Committed to implementing CCU? A comparison of the policy mix in the US and the EU .....	14
EU Reaches First Milestone Agreements on Fit-for-55, with Key Provisions for CCU .....	15
Federal cabinet adopts evaluation report on the Carbon Dioxide Storage Act.....	15
Reducing Emissions from Aviation in the EU .....	15
<b>FUNDING &amp; TENDER OPPORTUNITIES .....</b>	<b>16</b>
<b>France .....</b>	<b>16</b>
Appel à projets (IBAC) Stratégie d'accélération décarbonation .....	16
Appel à projets (DEMIBAC) Stratégie d'accélération décarbonation .....	16
Favoriser le développement de Zones Industrielles Bas Carbone (ZIBAC) .....	16



<b>FUNDING &amp; TENDER OPPORTUNITIES .....</b>	<b>17</b>
<b>Europe.....</b>	<b>17</b>
Breakthrough Energy Catalyst .....	17
Innovation fund - Small-Scale Projects .....	17
Innovation fund - large-Scale Projects .....	17
HORIZON EUROPE – WORK PROGRAM 2023-2024 .....	18
Turning CO2 emissions from the process industry to feedstock .....	18
<b>CCU ONGOING PROJECTS - HORIZON 2020 .....</b>	<b>19</b>
Providing access to cost-efficient, replicable, safe and flexible CCUS.....	19
Demonstrating a refinery-adapted cluster-integrated strategy to enable full-chain CCUS.....	19
Advanced carbon capture for steel industries integrated in CCUS Clusters .....	20
Production of synthetic renewable aviation fuel from CO2 and H2 .....	21
Creating value from industrial CO2 sources .....	21
CO2 capture, utilisation and storage for a net-zero carbon future .....	22
<b>CCU ONGOING PROJECTS - INOVATION FUND.....</b>	<b>22</b>
K6 Program .....	22
AGGREGACO2.....	23
Kairos-at-C .....	23
Beccs Stockholm .....	23
Project Syverstone .....	24
CCGeo (Closed Carbon Geothermal Energy) .....	24
SHARC.....	25
<b>CCU PROJECTS IN FRANCE.....</b>	<b>25</b>
C2FUEL .....	25
REUZE .....	25
VALORCO.....	26
CarBioRed.....	26
Hycanais .....	26
KerEauZen .....	26
Salamandre.....	27
Methycentre.....	27
Step Pau Lescar .....	27
VABHYOGAZ3.....	28
Jupiter1000.....	29
HYNOVERA .....	29
Gaya .....	30
CIMENTALGUE .....	30
HYNOVI .....	31
CEOPS.....	31
<b>UPCOMING EVENTS .....</b>	<b>32</b>
<b>INTERESTING SITES.....</b>	<b>33</b>



## FOREWORD

We are delighted to release the fifth strategic intelligence bulletin.

The current scenario shows a change in the market with regard to the electricity energy price, which is returning to more reasonable levels, although still higher than pre-war levels.

Another major change that took place in the last two months was the fact that EU policy makers have agreed on some points of the 'Fit for 55' document. Below, it is presented some points agreed in these discussions :

Emission trade systems revision ( ETS) - The new revision sets new very ambitious goals for reducing ETS emissions by 62% by 2030 compared to 2005 by:

- Reducing progressively the number of free allowances as well as the total number of allowances available on the market.
- Including unprecedented incentives for CCU mineralisation, in which companies that are mineralising CO<sub>2</sub> from industrial point sources will not need to surrender ETS allowances.
- Ending double-counting for CCU fuels and chemicals.
- Provide new funding support for defossilisation in particular via the Innovation Fund.

New rules for ETS in aviation:

- ETS-free allowances will be completely phased out for aviation: 25% in 2024, 50% in 2025 and 100% in 2026. In other words, as of 2027, airlines will need to pay their ETS fees in full.
- 5 million allowances from revenues collected will go to the Innovation Fund, which represents 450 million euros in today's ETS prices.
- 20 million allowances (in today's prices: about 1.8 billion euros) will be allocated to support the sector's transition to sustainable aviation fuels between 2024 and 2030. It will in particular cover 95% of the price differential between RFNBOs (CCU fuels) and fossil equivalents.

The EU policy makers also agreed on a new carbon tax at the borders of EU (CBAM). More detailed information can be found in this document. In the next months, new fit for 55 legislations should be adopted in order to complete the regulatory framework. Special attention should be done for the RED II delegated Acts ( it will determine the conditions to account for the electricity used in the RFNBO as renewable) and RED III ( new quotas and targets for the use of CCU fuels in transport and industry). Both of them will have a strong impact on new CCU projects.

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 [marcos.versiani@axelera.org](mailto:marcos.versiani@axelera.org)

Have a good read!



---

## MARKET INFORMATION

### **Project Air receives €97 million grant from EU Innovation Fund**

World Ports Org, January 2023

Perstorp, a wholly-owned subsidiary of PETRONAS Chemicals Group Berhad (PCG), Uniper, a Germany-based energy company, and the European Climate, Infrastructure, and Environment Executive Agency (CINEA) have signed an agreement granting €97 million in funds to Project Air from the Innovation Fund. [For more information](#)

---

### **ArcelorMittal inaugurates European steel industry's first CCU project at Belgium plant**

HP Green steel world, December 2022

ArcelorMittal's €200 million 'Steelanol' project is a first of its kind for the European steel industry, utilising cutting-edge carbon recycling technology developed by project partner LanzaTech. At an event held at its steel plant in Ghent, Belgium, attended by the Prime Minister of Belgium, Alexander De Croo, Flemish Minister-President Jan Jambon, members of the Belgian and Flemish governments, European Investment Bank Vice-President Kris Peeters, ArcelorMittal Executive Chairman, Lakshmi Mittal, and ArcelorMittal Europe CEO, Geert Van Poelvoorde, ArcelorMittal ('the Company') successfully inaugurated its flagship carbon capture and utilisation ('CCU') project. [For more information](#)

---

### **World's largest CO<sub>2</sub>-to-methanol plant starts production**

HP Hydrocarbon processing, October 2022

The world's first commercial scale CO<sub>2</sub>-to-methanol plant has started production in Anyang, Henan Province, China. The cutting-edge facility is the first of its type in the world to produce methanol — a valuable fuel and chemical feedstock — at this scale from captured waste carbon dioxide and hydrogen gases. [For more information](#)

---

### **Scaling the CCUS industry to achieve net-zero emissions**

McKinsey & Company, October 2022

Carbon capture, utilization, and storage can help hard-to-abate industries achieve net-zero emissions. Scaling the industry will require action by governments, investors, and industrial players. [For more information](#)

---

### **EU Commissioner For Energy Announces 'Strategic Vision' For Carbon Capture In 2023**

Carbon Herald – October 2022

---



---

The European Commission will table a communication on a strategic vision for carbon capture, usage and storage (CCUS) in 2023, the EU Commissioner for Energy Kadri Simson said on Oct. 27. She spoke at the CCUS Forum in Oslo, Norway. According to European Commission modeling, the EU will have to capture and utilize or store 300 to 640 million metric tons of CO<sub>2</sub> per year by 2050 to meet net zero goals.. [For more information](#)

---

### **Germany and Norway will build a big hydrogen pipeline**

CNN, January 2023

Germany just took a step closer to finding a long-term, greener replacement for Russian natural gas and coal. German power producer RWE (RWEOWY) and Norwegian state-owned energy firm Equinor on Thursday announced plans to build hydrogen-fueled power plants in Germany over the next few years, as well as a major pipeline between the two countries to feed them. The agreement — which is not yet legally binding — is part of Germany's efforts to phase out all coal-fired power stations by 2030 and decarbonize its energy sector. Berlin has pivoted dramatically away from Russia as a source of energy since its invasion of Ukraine, and needs to find secure alternative suppliers. "Through this collaboration we will strengthen the long-term energy security for Europe's leading industrial country," Anders Opedal, Equinor's CEO and president, said in a joint statement. [For more information](#)

---

### **Global Status of CCS**

Global CCS institute , January 2023

New CCS projects have been announced each month in 2022. As of September 2022, there are 196 (including two suspended) projects in the CCS facilities pipeline. This is an impressive growth of 44 per cent in the number of CCS facilities since the Global Status of CCS 2021 report and continues the upward momentum in CCS projects in development since 2017. [For more information](#)

---

### **Porsche begins production of 'e-fuel' that could provide gas alternative amid EV push**

CNBC, December 2022

Porsche and several partners have started production of a climate neutral "e-fuel" aimed at replacing gasoline in vehicles with traditional internal combustion engines. The German automaker, owned by Volkswagen, said Tuesday that a pilot plant in Chile started commercial production of the alternative fuel. By mid-decade, Porsche is planning to produce millions of gallons of the e-fuel. Porsche expects to initially use the fuel in motor sports and at its performance experience centers, followed by other uses in the years to come. Ultimately, the plan is for the fuel to be sold to oil companies and others for distribution to consumers. [For more information](#)

---



---

**EU to fund Holcim Decarbonization projects**

Press release Holcim website , January 2023

The European Union (EU) Innovation Fund announces funding of EUR 328 million in two Holcim decarbonization projects at the Financing Innovative Clean Tech Conference in Brussels. The grants will accelerate the development of Holcim's breakthrough carbon capture utilization and storage (CCUS) projects in Germany and Poland. These projects are part of Holcim's net-zero roadmap, including over 50 CCUS projects worldwide, to decarbonize its business. They contribute to the EU's Green Deal, putting clean technologies to work for a climate-neutral economy by 2050. [For more information](#)

---

**This company wants to make air travel sustainable**

CNN Business, October 2022

In 2019, Air Company made a splash when it launched vodka derived from recaptured carbon, in an effort to reduce the amount of the harmful greenhouse gas in the atmosphere. Today, the Brooklyn-based startup has begun using the same process to make fuel for airplanes. Air Company's sustainable aviation fuel, which was recently tested by the US Air Force, could ultimately help the airline industry hit its goal of net zero carbon emissions by 2050. Currently, the airline industry accounts for about 3% of total global carbon emissions each year, and mostly relies on traditional, fossil-based fuels that require various forms of environmental disruption to produce. [For more information](#)

---

**Rewriting the Story of CO<sub>2</sub> – Call for Innovations “Best CO<sub>2</sub> Utilisation 2023”**

Renewable carbon news, January 2023

Innovators in the field of carbon capture and utilisation are invited to present their breakthrough technology or product at the Conference on CO<sub>2</sub>-based Fuels and Chemicals 2023. Applications for the CO<sub>2</sub> Innovation Award “Best CO<sub>2</sub> Utilisation 2023” are open until 13 February 2023. [Access here](#)

---



---

## TECHNOLOGY WATCH

### **Proposing a new process for methanol production based on renewable hydrogen**

Haoran Wei, Chenqing Su, Jie Dai, Mahmood Shaker Albdeiri, Theyab R. Alsenani, Samia Elattar, Ahmed M. Abed, Yinhai Hua, January 2023.

**Abstract:** Moving towards a sustainable future requires modernized and economic energy production, especially in the context of current policy incentives. In the present paper, a new integrated process using flue gas leaving a power plant is projected and studied. The proposed process consists of a carbon dioxide (CO<sub>2</sub>) capture unit (CCU), a water electrolyzer unit (WEU) for renewable hydrogen production, a power generation unit (PGU), a heat generation unit (HGU), and a methanol production unit (MPU). The designed structure has low CO<sub>2</sub> emission, low production cost, and high thermodynamic efficiency. This process is simulated using Aspen HYSYS. The simulation results show that the methanol production in this process is equal to 606,228 ton/year (methanol with a purity above 99% mole), and according to the environmental analysis, the intensity of CO<sub>2</sub> emission is 0.61, which is lower compared to that of bi- and tr-reforming processes. The results indicate that the overall exergy and energy efficiencies of the proposed process are 71.97% and 56.74%, respectively.

[For more information](#)

---

### **Surface charge as activity descriptors for electrochemical CO<sub>2</sub> reduction to multi-carbon products on organic-functionalised Cu**

Carina Yi Jing Lim, Meltem Yilmaz, Juan Manuel Arce-Ramos, Albertus D. Handoko, Wei Jie Teh, Yuangang Zheng, Zi Hui Jonathan Khoo, Ming Lin, Mark Isaacs, Teck Lip Dexter Tam, Yang Bai, Chee Koon Ng, Boon Siang Yeo, Gopinathan Sankar, Ivan P. Parkin, Kedar Hippalgaonkar, Michael B. Sullivan, Jia Zhang & Yee-Fun Lim, January 2023.

**Abstract:** Intensive research in electrochemical CO<sub>2</sub> reduction reaction has resulted in the discovery of numerous high-performance catalysts selective to multi-carbon products, with most of these catalysts still being purely transition metal based. Herein, we present high and stable multi-carbon products selectivity of up to 76.6% across a wide potential range of 1 V on histidine-functionalised Cu. In-situ Raman and density functional theory calculations revealed alternative reaction pathways that involve direct interactions between adsorbed histidine and CO<sub>2</sub> reduction intermediates at more cathodic potentials. Strikingly, we found that the yield of multi-carbon products is closely correlated to the surface charge on the catalyst surface, quantified by a pulsed voltammetry-based technique which proved reliable even at very cathodic potentials. We ascribe the surface charge to the population density of adsorbed species on the catalyst surface, which may be exploited as a powerful tool to explain CO<sub>2</sub> reduction activity and as a proxy for future catalyst discovery, including organic-inorganic hybrids. [For more information](#)

---





---

## A Brief Review of Hydrogen Production Methods and Their Challenges

MDPI Open access Journals , January 2023

Abstract: Hydrogen is emerging as a new energy vector outside of its traditional role and gaining more recognition internationally as a viable fuel route. This review paper offers a crisp analysis of the most recent developments in hydrogen production techniques using conventional and renewable energy sources, in addition to key challenges in the production of Hydrogen. Among the most potential renewable energy sources for hydrogen production are solar and wind. The production of H<sub>2</sub> from renewable sources derived from agricultural or other waste streams increases the flexibility and improves the economics of distributed and semi-centralized reforming with little or no net greenhouse gas emissions. Water electrolysis equipment driven by off-grid solar or wind energy can also be employed in remote areas that are away from the grid. Each H<sub>2</sub> manufacturing technique has technological challenges. These challenges include feedstock type, conversion efficiency, and the need for the safe integration of H<sub>2</sub> production systems with H<sub>2</sub> purification and storage technologies. [For more information](#)

---

## Decarbonization of Mining and Metals Industry. A Critical Overview

Ashok D. Dalvi, January 2023

This is a follow-up to the discussion on sustainability challenges presented during COM2020. Decarbonization of mining and metals industry is a major challenge of the twenty-first century. In this paper, the targets related to the decarbonization of mining and metals industry are quantified – specifically for steel, aluminium, copper and nickel. Corresponding technologies are identified based on a literature review and the author's experience. Implementation of these technologies is discussed based on the author's 40+ years of hands-on experience in the industry involving all stages of projects from conceptual design to commercial-scale implementation. Potential timelines for implementation as well as technological, regulatory and other constraints are discussed. Metals have been an important part of the circular economy; the end-of-life recycling rates for most common metals are greater than 50%. Recycling is an important part of decarbonization and there is scope for increasing it. [For more information](#)

---

## Advances in Carbon Capture and Use (CCU) Technologies: A Comprehensive Review and CO<sub>2</sub> Mitigation Potential Analysis

Christiano B. Peres ,Pedro M. R. Resende ,Leonel J. R. Nunes and Leandro C. de Morais , October 2022

One of society's major current challenges is carbon dioxide emissions and their consequences. In this context, new technologies for carbon dioxide (CO<sub>2</sub>) capture have attracted much attention. One of these is carbon capture and utilization (CCU). This work focuses on the latest trends in a holistic approach to carbon dioxide capture and utilization. Absorption, adsorption, membranes, and chemical looping are considered for CO<sub>2</sub> capture. Each CO<sub>2</sub> capture technology is described, and its benefits and drawbacks are discussed. [For more information](#)

---



---

## **IPCC Report: The Role of Carbon Capture and Utilisation (CCU) to Mitigate Climate Change** CO2 value Europe , November 2022 (Videos)

On the occasion of the Sharm el-Sheikh Climate Change Conference (COP27), It WAS highlighted once again the role of Carbon Capture and Utilisation (CCU) as a solution to mitigating climate change as assessed in the last IPCC report. For the first time in 30 years, CCU is discussed in the IPCC report as a solution to decrease net CO2 emissions, as well as a potential technology to move away from fossil carbon by using CO2 as an alternative feedstock for the production of renewable chemicals and fuels.. [For more information](#)

---

## **Sustainability analyses of CO2 sequestration and CO2 utilization as competing options for mitigating CO2 emissions**

Anirudh Parekh, Gauri Chaturvedi, Arnab Dutta, January 2023

Abstract: CO2 capture and sequestration (CCS) and CO2 capture and utilization (CCU) are potential alternatives to mitigate CO2 emissions. There have been concerns regarding long-term geological impact of CCS and CCU requires co-reactant(s) for converting CO2 into value-added products. In this work, sustainability of CCS and CCU are assessed by simulating three processes. Each of these processes used post-combustion amine technique to capture CO2 from flue gas stream coming out of natural gas-based power plant. In the first process (CCS), captured CO2 undergoes sequestration whereas in the other two processes (CCU) CO2 reacts with hydrogen to produce methanol and dimethyl ether. [For more information](#)

---

## **Carbon capture and utilization for industrial applications**

Science Direct, January 2023

Abstract: Heavy industries such as cement, iron and steel, oil refining, and petrochemicals are responsible for about 22% of global carbon dioxide (CO2) emissions. There are several pathways for global CO2 mitigation. Capturing, storage, and utilization of CO2 (CCS and CCU) provide an operational solution for significant emission mitigation. High purity CO2 streams are the most interesting points for CCS and CCU. Pure CO2 streams are suitable for compression, transport, and storage. Capture technology categories are typically pre-combustion, oxy-fuel combustion, and post-combustion processes. Moreover, the main challenges of the robust industrial CCS/U development are the high costs of CO2 separation from flue gas or ambient air and the conversion of CO2 in various utilization pathways. This research study includes a summary of several CCS technologies and CCU pathways, their current status, cost, and industrial deployment. [For more information](#)

---

## **Climate change impacts of e-fuels for aviation in Europe under present-day conditions and future policy scenarios**



---

Department of Energy and Process Engineering, Norwegian University of Science and Technology, January 2023

Abstract: 'E-fuels' or 'synthetic fuels' are hydrocarbon fuels synthesized from hydrogen (H<sub>2</sub>) and carbon dioxide (CO<sub>2</sub>), where H<sub>2</sub> can be produced via electrolysis of water or steam reforming of natural gas, and CO<sub>2</sub> is captured from the combustion of a fossil or biogenic source or directly from the atmosphere. E-fuels are drop-in substitutes for fossil fuels, but their climate change mitigation benefits are largely unclear. This study evaluates the climate change impacts of e-fuels for aviation by combining different sources of CO<sub>2</sub> and H<sub>2</sub> up to 2050 under two contrasting policy scenarios. The analysis includes different climate metrics and the effects of near-term climate forcers, which are particularly relevant for the aviation sector. Results are produced for European average conditions and for Poland and Norway, two countries with high and low emission intensity from their electricity production mix. E-fuels can either have higher or lower climate change impacts than fossil fuels, depending on multiple factors such as, in order of importance, the electricity mix, the origin of CO<sub>2</sub>, the technology for H<sub>2</sub> production, and the electrolyzer efficiency. [For more information](#)

---

### IEA - CO<sub>2</sub> Capture and Utilisation - an overview

IEA (2022), CO<sub>2</sub> Capture and Utilisation, IEA, Paris, October 2022

Carbon capture and utilisation refers to a range of applications through which CO<sub>2</sub> is captured and used either directly (i.e. not chemically altered) or indirectly (i.e. transformed) into various products. Around 230 Mt of CO<sub>2</sub> are currently used each year, mainly in direct use pathways in the fertiliser industry for urea manufacturing (~130 Mt) and for enhanced oil recovery (~80 Mt). New utilisation pathways in the production of CO<sub>2</sub>-based synthetic fuels, chemicals and building aggregates are gaining momentum. By 2030 the current project pipeline shows that around 5 Mt of CO<sub>2</sub> could be captured for synthetic fuel production. While this level of deployment is not far from the 7.5 Mt of CO<sub>2</sub> used in synthetic fuels production in 2030 in the Net Zero Scenario, half of announced projects are at early stage of development and will likely require further support to proceed towards operation.. [For more information](#)

---

### The chemical engineering aspects of CO<sub>2</sub> capture, combined with its utilization

Abriele Centi, Siglinda Perathoner, January 2023

CO<sub>2</sub> carbon capture and utilisation (CCU) technologies are discussed from the chemical engineering perspective of their role in a future low-carbon scenario. We highlighted that current techno-economic assessment procedures have limits in predicting the role of CCU technologies. There is a need to pass from current 1st-generation power-to-X technologies to synthesise e-fuels to the 2nd-generation solar fuel technologies. The hard-to-abate sector, particularly steel and cement production, is also shortly analysed, remarking on the necessity to overcome current approaches starting from analysing the critical aspects limiting feasibility and economics.

. [For more information](#)

---



---

**PlasCO2 project: Greenhouse gas transformed into a raw material**

Press release Evonik website, January 2023

Evonik has launched the PlasCO2 project together with three partners. The aim is to use carbon dioxide (CO<sub>2</sub>) as a raw material in the production of C4 chemicals. Evonik is working with three partners on processes for using CO<sub>2</sub> by means of plasma reactors. Innovative process could significantly reduce energy requirements for the production important chemical products

German Federal Ministry of Education and Research funds project with more than 1.8 million euros.

[For more information](#)

---

**Energy Sector Derived Combustion Products Utilization—Current Advances in Carbon Dioxide Mineralization**

MDPI open access journals, October 2022

Carbon dioxide and combustion products are among the main waste streams deriving from the energy sector. Efficient and cost-effective methods of solid waste valorization and carbon capture, storage and utilization are needed in the transition period towards carbon neutrality in light of the recent scenarios forecasting energy demand and energy supply mix under dynamic social, economic and political circumstances. Within this paper, the current advances in carbon dioxide mineralization, combining carbon dioxide utilization and combustion products valorization, are presented in terms of the recognized methodological options of carbonation methods, process efficiency and effects on the process product properties. Special attention is given to the studies on the valorization of fluidized bed boilers fly ash, differing in a range of parameters from the conventional boilers fly ash, as well as the effects of the carbonation process on the stabilization and improvement of its properties and the resulting extended range of applicability. The relevant research fields needing further investigations, as well as the desired decision makers' supporting actions, are also specified. [For more information](#)

---

**Toward economical application of carbon capture and utilization technology with near-zero carbon emission**

Nature, December 2022

Abstract: Carbon capture and utilization technology has been studied for its practical ability to reduce CO<sub>2</sub> emissions and enable economical chemical production. The main challenge of this technology is that a large amount of thermal energy must be provided to supply high-purity CO<sub>2</sub> and purify the product. Herein, It is proposed a new concept called reaction swing absorption, which produces synthesis gas (syngas) with net-zero CO<sub>2</sub> emission through direct electrochemical CO<sub>2</sub> reduction in a newly proposed amine solution, triethylamine. Experimental investigations show high CO<sub>2</sub> absorption rates (>84%) of triethylamine from low CO<sub>2</sub> concentrated flue gas. In addition, the CO Faradaic efficiency in a triethylamine supplied membrane electrode assembly electrolyzer is approximately 30% (@-200 mA cm<sup>-2</sup>), twice higher than those in conventional alkanolamine

---



solvents. Based on the experimental results and rigorous process modeling, we reveal that reaction swing absorption produces high pressure syngas at a reasonable cost with negligible CO<sub>2</sub> emissions. This system provides a fundamental solution for the CO<sub>2</sub> crossover and low system stability of electrochemical CO<sub>2</sub> reduction. [For more information](#)

---

### **Techno-economic and environmental assessment of CCU options**

Adelung, Sandra and Dietrich, Ralph-Uwe and Habermeyer, Felix and Heimann, Nathanael and Maier, Simon and Moser Rossel, Francisco Tomas and Raab, Moritz and Rahmat, Yoga Pranata and Weyand, Julia, October 2022

Abstract: If the transport sector, especially aviation, shipping and heavy load, will continue to rely on liquid fuels, carbon-based fuels might be unavoidable for the foreseeable time. With countless options of sustainable fuels, feedstocks and production routes, it's difficult to determine preferences of one over the others. This paper presents a methodology to assess these options fair and transparent simultaneously technically, economically as well as environmentally for comparison and selection. Because aviation is one of the fastest growing sectors in terms of CO<sub>2</sub> emissions, the regulatory initiative ReFuelEU Aviation was introduced to mitigate the impact of aviation on the environment. Significantly reduced GHG emissions and lower abatement costs require technological innovations of Power-to-liquids, Biomass-to-liquids and Power enhanced Biomass-to-liquids processes. A detailed discussion of sustainable aviation fuels prospects will be presented. [For more information](#)

---

### **Climate Change Mitigation: The contribution of Carbon Capture and Utilisation (CCU)**

Célia J. Sapart Katrin Arning, André Bardow, Christian Breyer, Angela Dibenedetto, Colin D. Hills, Suren Erkman, October 2022

Carbon Capture and Utilisation (CCU) is a broad term that covers processes that capture CO<sub>2</sub> from flue and process gases or directly from the air and convert it into a variety of products such as renewable electricity-based fuels, chemicals, and materials. No precise estimate of the potential mitigation role of CCU technologies exists to date, because of uncertainties in renewable electricity cost scenarios and the low granularity of models that simulate different CCU options. [For more information](#)

---



---

## EU POLICIES & LEGISLATION

### Regulatory limbo leaves EU heavy emitters in the dark on net zero

Politico working group , January 2023

The climate clock is ticking — and industry is begging for clarity before making massive investments. "We are less than 30 years away from that objective and as an industrial sector we don't even know when our sector needs to be climate neutral in order to do our share," said Florie Gonsolin, climate change transformation director at Cefic, the chemicals industry group. "Given the long investment cycles in this industry ... if we don't have regulatory clarity about eligible solutions, we are going to be left wondering, 'What are the tools we are allowed to use?'" Gonsolin added. "This is why we have been asking desperately for a roadmap" from the Commission. [For more information](#)

---

### A final sprint to make the EU Fit for 55

Euractiv, January 2023

As 2022 recedes into the history books, a new dawn – albeit one with ubiquitous grey cloud cover – is breaking over Brussels. Welcome to 2023, the year in which the contours of the EU's flagship climate laws package (which still sports the questionable moniker 'Fit for 55') will be finalized. [For more information](#)

---

### Committed to implementing CCU? A comparison of the policy mix in the US and the EU

Sonja Thielges, Barbara Olfe-Kräutlein, Alexander Rees, Joschka Jahn, Volker Sick and Rainer Quitzow, October 2022

Carbon capture and utilization (CCU) technologies aim to use carbon dioxide (CO<sub>2</sub>), either captured from industrial point sources or from the atmosphere, instead of fossil carbon in the production of a variety of valuable goods. CCU has the potential to contribute to emission reductions and to lower raw material consumption as well to foster transitional processes toward a circular economy. To enable societies to take full advantage of this potential, policy support is needed in overcoming current barriers and fostering CCU implementation as a feasible option for the industry. Based on a literature and online investigation, this paper identifies and compares the current policy mixes for CCU in the US and the EU, focusing on policy strategies and existing and proposed policy instruments. The analysis shows that US strategy documents, with very few exceptions, do not mention CCU specifically in the context of the country's 2030 or 2050 climate targets. In the EU, in contrast, the future role of CCU is clearly linked to achieving climate-neutrality by 2050. [For more information](#)

---



---

## EU Reaches First Milestone Agreements on Fit-for-55, with Key Provisions for CCU

CO2 Value Europe, December 2022

Over the last weeks, EU policymakers have struck several major deals in interinstitutional negotiations (known as “trilogues”), with immediate and unprecedented implications for Carbon Capture and Utilisation (CCU) projects. The EU institutions agreed on a new emission trading system (ETS) revision. The new revision sets new very ambitious goals for reducing ETS emissions by 62% by 2030 compared to 2005. [For more information](#)

---

## Federal cabinet adopts evaluation report on the Carbon Dioxide Storage Act

Federal ministry for economic affairs and climate action, December 2022

The Federal Government adopted the evaluation report on the Carbon Dioxide Storage Act in December 2022. The report describes the advances in technology, the latest scientific findings and the potential contribution from carbon capture and storage (CCS) to climate change mitigation. The Act requires the Federal Government to present the evaluation report every four years. The new report covers both CCS and carbon capture and utilisation (CCU). In contrast to CCS, in the case of CCU the CO<sub>2</sub> is not stored, but used – e.g. in the chemical industry. Further to this, the report looks ahead to the carbon management strategy which the Federal Government intends to draw up in 2023. [For more information](#)

---

## Reducing Emissions from Aviation in the EU

The New Federalist, October 2022

The aviation sector contributes 4.6% to global warming. In 2015, aviation accounted for 2.1% of global CO<sub>2</sub> emissions. Aviation does not only emit CO<sub>2</sub> emissions but also other potent GHG emissions, including nitrogen oxides, water vapour and soot. To recap, the European Commission proposed the ‘Fit for 55 package’ on the 14th of July 2021, which includes policies to achieve the ambitious goal of carbon neutrality in Europe by 2050. It also involves concrete measures to reduce the emissions of the aviation sector. The three particularly noteworthy measures are ReFuelEU, a revision in the European Emissions Trading System, and the Energy Taxation Directive. [For more information](#)





---

## FUNDING & TENDER OPPORTUNITIES

### FRANCE

#### **Appel à projets (IBAC) Stratégie d'accélération décarbonation**

ADEME

Deadline date: 17/04/2023, 16/10/2023 ( The dates have changed by ADEME)

This call for proposals aims to support projects led by SMEs developing innovative, competitive and sustainable methodologies, technologies, industrial solutions and services in the field of industrial decarbonization. [For more information](#)

---

#### **Appel à projets (DEMIBAC) Stratégie d'accélération décarbonation**

ADEME

Deadline date: 17/04/2023, 16/10/2023 ( The dates have changed by ADEME)

This call aims to support innovation projects led by companies which accelerate in the market the implementation of sustainable technologies and/or solutions to decarbonize industry, from the industrial research phase to the demonstration phase. [For more information](#)

---

#### **Favoriser le développement de Zones Industrielles Bas Carbone (ZIBAC)**

ADEME

Deadline date: 15/05/2023 ( The dates have changed by ADEME)

This call aims to support industrial territories in their ecological and energy transformation in order to gain in competitiveness and attractiveness. [For more information](#)





---

## FUNDING & TENDER OPPORTUNITIES

### EUROPE

#### Breakthrough Energy Catalyst

Deadline date :13/05/2022 - Submissions received after 15 June 2022 will be evaluated on a rolling basis, but no less frequently than semi-annually

Commission President Ursula von der Leyen and Bill Gates have announced a pioneering partnership between the European Commission and Breakthrough Energy Catalyst to boost investments in the critical climate technologies that will enable the net-zero economy. Presented on the occasion of the sixth Mission Innovation Ministerial meeting, the new partnership aims to mobilize new investments of up to €820 million/\$1 billion between 2022-26 to build large-scale, commercial demonstration projects for clean technologies – lowering their costs, accelerating their deployment, and delivering significant reductions in CO2 emissions in line with the Paris Agreement.

[For more information](#)

---

#### Innovation fund - Small-Scale Projects

Deadline date: March 2023 (forecast)

The second call for small-scale projects was launched on 31 March 2022 with a budget of EUR 100 million. The call text and application process remained largely similar to those of the first call and applicants have five months to prepare their application (until 31 August 2022). [For more information](#)

---

#### Innovation fund - large-Scale Projects

Deadline date: March 2023 (forecast)

With a budget of EUR 1.5 billion, which is increased by 50% compared to the previous call, it will finance breakthrough technologies for renewable energy, energy-intensive industries, energy storage, and carbon capture, use and storage. [For more information](#)

---



---

## HORIZON EUROPE – WORK PROGRAM 2023-2024

### Turning CO<sub>2</sub> emissions from the process industry to feedstock

Projects outcomes will enable achievement of the objectives of Processes4Planet partnership by developing efficient CO/CO<sub>2</sub> capture and purification technologies, in combination with valorisation routes; that will drive the partnership's innovation portfolio towards first of a kind demonstrator and de-risk investment (related P4Planet operational objectives 3, 4 and 9). [For more information](#)

---

### CCU for the production of fuels

Conversion of captured CO<sub>2</sub> is not only a means to replace fossil fuels, but also a promising solution for seasonal energy storage. There are still some scientific and technological challenges to overcome to be able to exploit CO<sub>2</sub> as a fuel feedstock, the main challenge being that the utilisation of CO<sub>2</sub> is limited by the highly energy intensive conversion process. New solutions for the conversion of captured CO<sub>2</sub> from different sources to fuels will create new markets for innovative industrial sectors and diversify the economic base in carbon intensive regions, as well as contribute to achieving a Circular Economy. The project should evaluate the possibility for industrial CO<sub>2</sub> use/reuse through the combination of processes (industrial symbiosis) and the efficient integration of CO<sub>2</sub> capture and conversion to combine and/or reduce stages. [For more information](#)

---

### DACCS and BECCS for CO<sub>2</sub> removal/negative emissions

The project is expected to develop highly innovative CCUS /carbon negative technologies leading to CO<sub>2</sub> removal. It should enable the cost-effective deployment of technologies such as (DACCS), (BECCS) ideally linking them to industrial clusters with special emphasis of these technologies to safe CO<sub>2</sub> underground storage and CO<sub>2</sub> utilization. [For more information](#)



## 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 CO<sub>2</sub> 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 (CO<sub>2</sub>) to mitigate climate change. Reducing CO<sub>2</sub> 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 CO<sub>2</sub> produced during the combustion of fossil fuels from entering the atmosphere. Currently, these technologies focus on the greatest sources of CO<sub>2</sub> in a process, ignoring smaller ones. The EU-funded REALISE project is developing a way to capture up to 90 % of CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> energy- and resource-efficiently in bio-based industries to produce zero GHGs and reduce the quantity of CO<sub>2</sub> released into the atmosphere. [For more information](#)

### Project Information

#### CATCO2NVERS

Grant agreement ID: 101000580



**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 TECNOLÓGICA  
Spain



## Production of synthetic renewable aviation fuel from CO<sub>2</sub> and H<sub>2</sub>

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 CO<sub>2</sub> 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 PYROCO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> for viable business cases and pre-developed processes for replication and commercialization. [For more information](#)

### Project Information

#### PYROCO<sub>2</sub>

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 CO<sub>2</sub> to formate and formic acids for market uses and finally a safe cyclic loading system of CO<sub>2</sub> 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

## CCU 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 CO<sub>2</sub>, 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 CO<sub>2</sub>e 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 CO<sub>2</sub> 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	Project ID
<b>AGGREGACO2</b>	<b>101038931</b>
Start date	End date
<b>01 April 2021</b>	<b>31 December 2027</b>
Coordinated by	
<b>PETROLEOS DEL NORTE SA</b> 	
Funded under	
<b>Innovation Fund (InnovFund)</b>	

## 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
<b>Kairos-at-C</b>	<b>101051344</b>
Start date	End date
<b>01 November 2020</b>	<b>31 July 2035</b>
Coordinated by	
<b>AIR LIQUIDE LARGE INDUSTRY</b> 	
Funded under	
<b>Innovation Fund (InnovFund)</b>	

## 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
<b>Beccs Stockholm</b>	<b>101051202</b>
Start date	End date
<b>01 July 2021</b>	<b>31 August 2036</b>
Coordinated by	
<b>STOCKHOLM EXERGI AB</b> 	
Funded under	
<b>Innovation Fund (InnovFund)</b>	





## Project Syverstone

Project Silverstone offers permanent CO<sub>2</sub> 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 CO<sub>2</sub> levels in the atmosphere, turning CO<sub>2</sub> 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
<b>Silverstone</b>	<b>101038888</b>
Start date	End date
<b>01 December 2021</b>	<b>31 December 2030</b>
Coordinated by	
<b>CARBFIX OHF</b> 	
Funded under	
<b>Innovation Fund (InnovFund)</b>	

## 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
<b>CCGeo</b>	<b>101038843</b>
Start date	End date
<b>01 January 2022</b>	<b>31 March 2026</b>
Coordinated by	
<b>AAT GEOTHERMAE DOO</b> 	
Funded under	
<b>Innovation Fund (InnovFund)</b>	





## 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 (CO<sub>2</sub>), this project will maximize the environmental impact and development of a strong supply chain covering the oil refinery, the CO<sub>2</sub> capture and transport facilities and the storage site. It will also lay the foundation for a European hub for renewable hydrogen and CO<sub>2</sub> utilization. [For more information](#)

### Project information

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

## CCU PROJECTS IN FRANCE

### C2FUEL

Production of two promising energy carriers: Formic acid and dimethyl ether using CO<sub>2</sub> from the steel industry and hydrogen produced from water electrolysis using surplus electricity from renewable energies

Location: Dunkirk harbor ;2.4 million tons of formic acid; 100.000 tons of green hydrogen ; 1.8TW/h of green electricity ; 1.2 million tons of DME ; 320.000 ton de green hydrogen ; 11TW/h renewable electricity. [For more information](#)

### REUZE

This project aims to produce 100,000 tons of electro-fuels and naphtha using 300,000 tons per year of CO<sub>2</sub> from the local steel production industry. This project will also produce steam to satisfy the needs of the local industries. The production of hydrogen will be done by the electrolysis of water using renewable energy

Location: Dunkirk harbor;

CO<sub>2</sub> captured and utilized by year: 300.000 tons;

Total production of Electrofuel and naphtha per year: 100.000tons.

[For more information](#)



---

## VALORCO

The project aims to reduce CO<sub>2</sub> emissions in the steel making industry through CO<sub>2</sub> capture and valorization. The project objectives are to develop laboratory-scale reduction and recovery of CO<sub>2</sub> from industrial processes to quantify the degree of profitability and implement the most promising in the form of a laboratory-scale pilot.

CO<sub>2</sub> Source: Steel production;

CCU Technology Category: Capture (Point sources) ;

Start TRL: 4 ; End TRL: 5.

---

## CarBioRed

Design of a catalyst made from non-noble metals, based on CO<sub>2</sub> electro-reduction catalysts ;

Timeline Start - End: 2012-2016 ;

Project Status: Completed ;

Project Budget: 556916.0 € ;

Funding source: ANR. [For more information](#)

---

## Hycanais

Project led by Storengie. Synthesis methane production from CO<sub>2</sub> using a water-based electrolysis system to provide the necessary hydrogen. The energy required to power the electrolysis will be from wind energy. The electrolysis will be of 1 to 2MW. The methane produced will be injected into the grid.

CO<sub>2</sub> reduction: 1522 teq/year.

---

## KerEauZen

Production of e-kerosene from biogenic CO<sub>2</sub>, renewable electricity and water . Aim to find an alternative support for biokerosene . The e-kerosene should be blended with fossil aviation kerosene in order to meet the decarbonization targets of the aviation industry. Part of the e-kerosene produced will be used for research and certification purposes by French players in the aviation sector. [For more information](#)

---



## Salamandre

project based on the pyrogazeification process followed by a methanation process for biomethane production with subsequent injection of the produced methane into the grid. The unit will be fueled by dry biomass from local wood-waste sources ;

Location : Le Havre ;

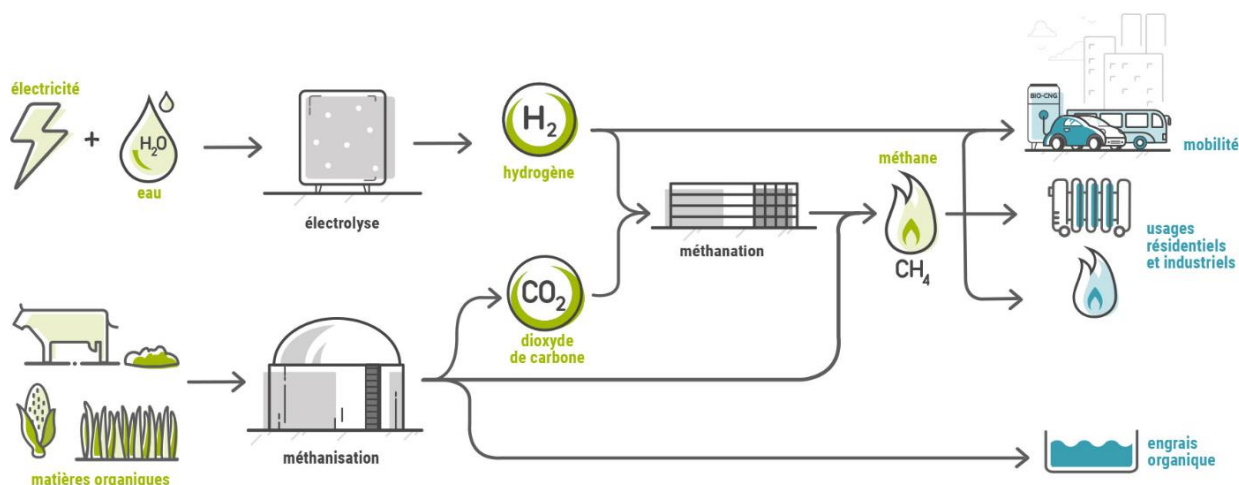
Project led by Engie ;

Site production expected: 11,000 tons of biomethane annually, starting in 2026 ;

Total investment of €150 million. [For more information](#)

## Methycentre

The project will have an equipment for performing the water electrolysis for hydrogen production that will be needed for the methanation process. The methanizers will supply the CO<sub>2</sub>. The hydrogen + CO<sub>2</sub> will be transformed into methane by the methanation process and this methane will then be injected into the grid. MéthyCentre will consume 1 GWh per year of electricity from the grid, accompanied by certificates of guaranteed renewable origin . [For more information](#)



Source : <https://methycentre.eu/projet/>

## Step Pau Lescar

utilization of the CO<sub>2</sub> from the methanization units (sludge from wastewater treatment plants) for the methanation process. In this process the necessary hydrogen will be obtained through the electrolysis of water. The product of the methanation will be the methane synthesis which will then be sent to the network. As a sub product of the electrolysis, the oxygen will be used for the

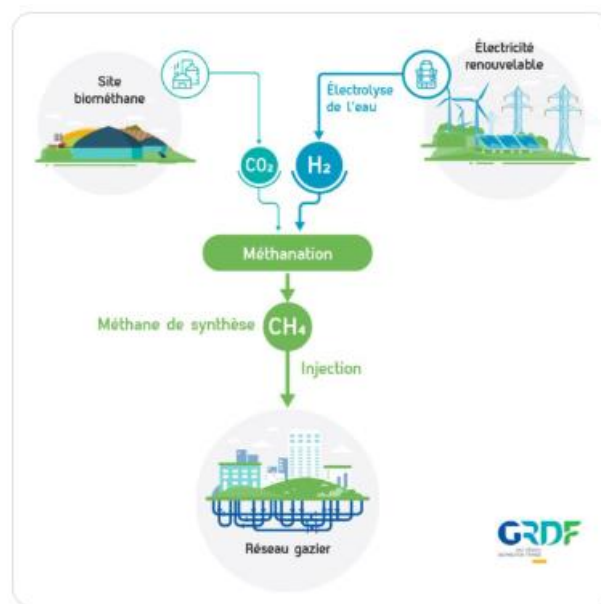
oxygenation of the wastewater treatment basins. Valorization of 100% of the CO<sub>2</sub> from methanization ;

Complete balance of -550 tons of CO<sub>2</sub> per year for the plant, which is therefore a carbon sink ;

-2,300 tons of CO<sub>2</sub> per year compared to the past site thanks to methanation ;

Location : Agglomeration of Pau Béarn Pyrénées [For more information](#)

Source: GRDF website



### VABHYOGAZ3

Hydrogen production units by steam reforming of raw biogas ;

Project coordinator : Hera ;

Location : Labessière-candeil, Tarn ;

TRL: 9 ;

Production Volume: 3 ktonnes/year ;

Timeline Start - End: 2016-2020 ;

Project Budget: 11500000.0 € [For more information](#)

## Jupiter1000

The project consists in transforming renewable electricity into gas in order to store it. Surplus electricity will be converted into hydrogen by two electrolyzers and also into synthetic methane by means of a methanation reactor. the project also has a CO<sub>2</sub> capture structure from the gases emitted by nearby industries

Location: Fos-sur-Mer (Bouches-du-Rhône)

Project coordinator : GRTGAZ

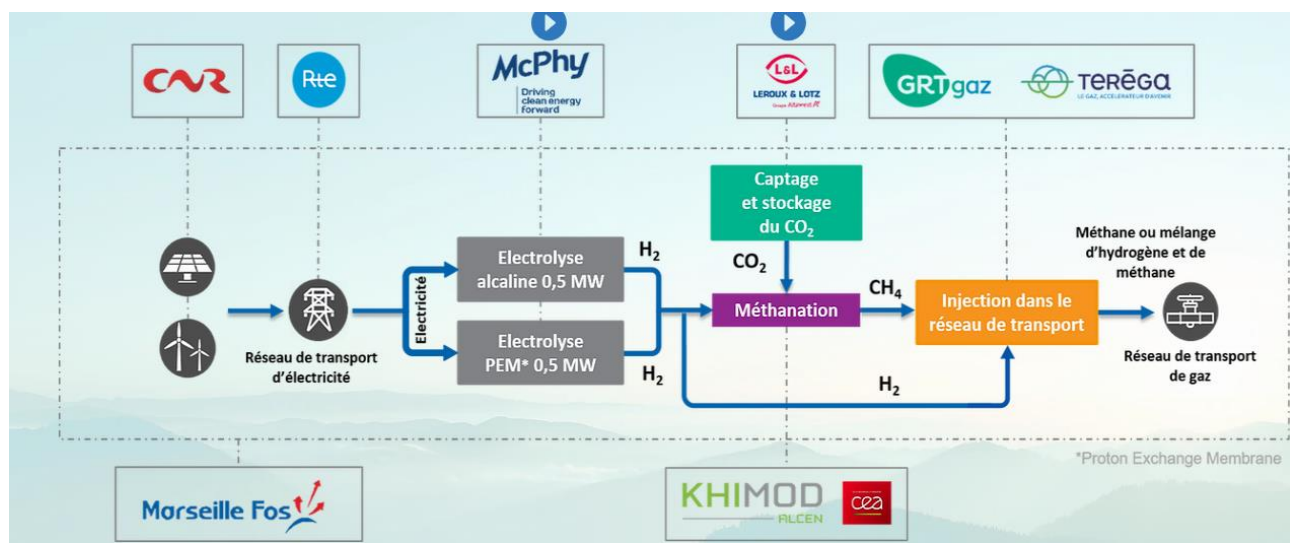
1 MWe hydrogen production, consisting of two electrolyzers

Electrolysis technology : PEM (membrane) et Alcaline

Methane production up to 25 m<sup>3</sup>/h

Hydrogen injection up to 200 m<sup>3</sup>/h

[For more information](#)



## HYNOVERA

Torrefaction and subsequent gasification of biomass from forests in order to produce initially a synthesis gas that will be the basis for the subsequent production of kerosene or diesel. In this project it is considered in a second phase in 2030 the production of methanol from renewable energy

Budget: Approximately 460 million euros

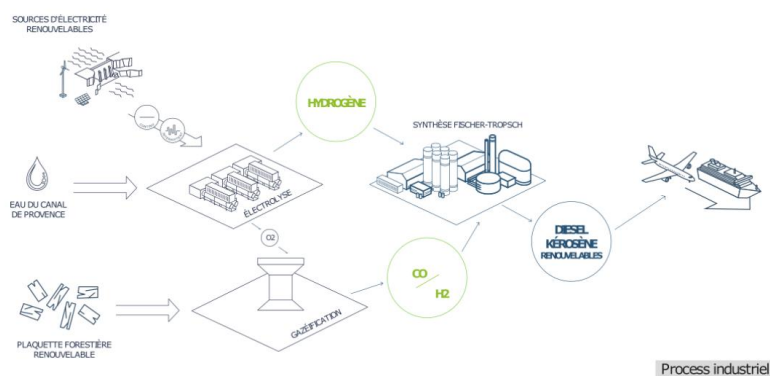
Production of Kerosene/ Diesel (2027) : 16.000ton/year

Oxygen production (2027): 97.000 ton/year

Naphtha paraffinic production (2027) : 9.000Ton/Year

Methanol production (2030) : 70.000ton/Year

Location : Gardanne, Meyreuil - Bouches-du-Rhône - Provence-Alpes-Côte d'Azur [For more information](#)



## Gaya

Project for gasification of material from dry biomass (forests and agriculture) to produce biomethane. This biomethane will be produced from 100% renewable resources, which can be transported in the current networks or directly usable as fuel. the process consists of 4 phases 1 - dry biomass preparation 2 - Injection of the biomass into a gasifier working at a temperature between 800-1000 degrees Celsius. The product of this gasifier will be a gaseous mixture mainly composed of CO and H<sub>2</sub>. A filtering process is done in order to eliminate the impurities of these gases 3 - The methanation is done in order to transform the synthesis gas in methane. 4 - The last step of the process consists in the separation of the methane from the other molecules. [For more information](#)

## CIMENTALGUE

Cultivating microalgae in greenhouses in order to protect them from external impurities and to maintain them at a controlled temperature. The gas from the cement plant which has a significant concentration of CO<sub>2</sub> is injected into the culture in order to transform the CO<sub>2</sub>. Various technologies are being evaluated such as open and closed raceway ponds, a tubular photobioreactor, and an AlgoFilm thin-layer photobioreactor (PBR). [For more information](#)



## HYNOVI

Production of methanol from CO<sub>2</sub> captured from a cement production and hydrogen produced by a 330MW water electrolysis unit

Location: Montalieu-Vercieu, France

Vicat Hynamics (EDF)

40% of the CO<sub>2</sub> emitted by the Vicat cement plant in Montalieu-Vercieu (38).

330 MW electrolyser by 2025

the use of oxygen to make oxy-combustion

Production target: over 200,000 tons of methanol [For more information](#)

## CEOPS

CEOPS project will focus on a sustainable approach for the production of methanol from CO<sub>2</sub>, which is a precursor for fine chemicals products. The approach will reinforce the link between large CO<sub>2</sub> emitters and fine chemical industries at the European level. The concept relies on two chemical pathways, CO<sub>2</sub> to CH<sub>4</sub> and CH<sub>4</sub> to CH<sub>3</sub>OH with the intermediate carbon vector: methane. Methane benefits from the extended and existing natural gas network infrastructure. Its distribution will prevent additional CO<sub>2</sub> emissions (rail & road transportation). This approach will favor the emergence of small and flexible production units of fine chemicals from methanol. (Source: Cordis EU research)

Location: Grenoble

End TRL: 5

Project leader: CEA

Project Budget: 3508268.0 € [For more information](#)



## UPCOMING EVENTS

### EXPO NANTES – FRANCE - Bio360 Expo 2023

08-09 February 2023 - Nantes (France)

[Website EXPO NANTES](#)



8-9 february  
Nantes FR 2023

It will take place from 8-9 February 2023 in Nantes, France. Bio360 Expo is an international assembly point comprising a large international exhibition and multi-track conference programme dedicated to advancing bioenergy, the bioeconomy, and atmospheric carbon removal in order to create a circular and renewable society, in contrast to the current model still dominated by dead-end fossil fuels.

### 2nd GREENERING INTERNATIONAL CONFERENCE

21-23 March 2023 - Valladolid – Spain

[Website 2nd GREENERING INTERNATIONAL CONFERENCE](#)



Green Chemical Engineering Network towards upscaling sustainable processes (CA18224) – GREENERING, is project (Action) funded by COST (European Cooperation in Science and Technology). The objective of GREENERING COST action is to promote and boost the industrial application of green chemistry and sustainable technologies, developing the tools for the scale-up and implementation of emerging processes into industry.

### Conference on CO<sub>2</sub>-based Fuels and Chemicals

19-20 April 2023 - Maternushaus, Cologne (Germany)

[Website Conference on CO<sub>2</sub>-based Fuels and Chemicals](#)



The nova “Conference on CO<sub>2</sub>-based Fuels and Chemicals” is one of the most established worldwide and has developed into a unique meeting and networking place for the entire Carbon Capture & Utilisation (CCU) and Power-to-X industry and its customers. The upcoming 10th 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 CO<sub>2</sub> capture and utilisation.

### CO<sub>2</sub> Capture, Storage & Reuse 2023

16-17 may , Copenhagen, Denmark

[Website CO<sub>2</sub> Capture, Storage & Reuse 2023](#)



The event will focus on utilisation of captured CO<sub>2</sub> and its use for production of building materials like cement, concrete, steel, but also production of advanced fuels that will contribute to further decarbonization of other sectors. Also, as 2022 was a breakthrough year in terms of policies and regulations for green technologies we will be discussing the influence of legislation on the state of carbon capture and utilization technologies.





---

## 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/>

