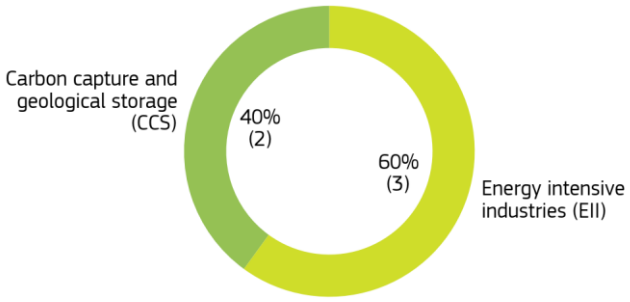
European Commission

Innovation Fund Programme

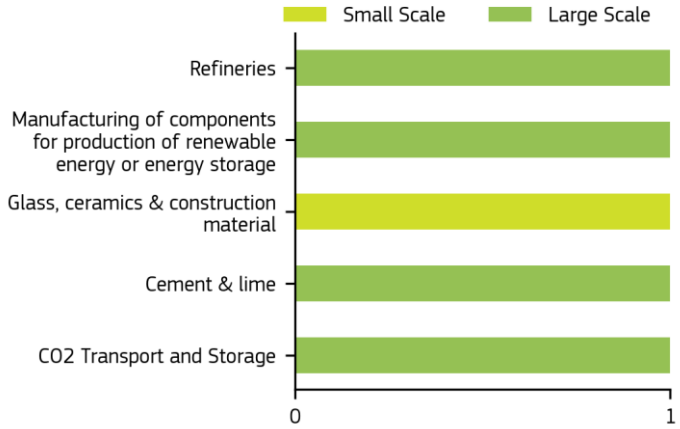
Overview of ongoing projects in Belgium

Funded by the revenue of the EU Emissions Trading System, the Innovation Fund's goal is to help businesses investing in innovative low-carbon technologies with significant GHG emissions reduction potential.
The Innovation Fund currently supports **5 projects** located in Belgium, which will contribute to the decarbonisation of European industries with a total expected GHG emission reduction of **32.2 Mt CO_2 equivalent in the first 10 years of operation.**
The total **Innovation Fund grant in Belgium is of EUR 670.8 million**, out of the **total relevant costs of EUR 1.1 billion**, as defined in Art 5 of the Delegated Regulation 2019/856 on the Innovation Fund[1].

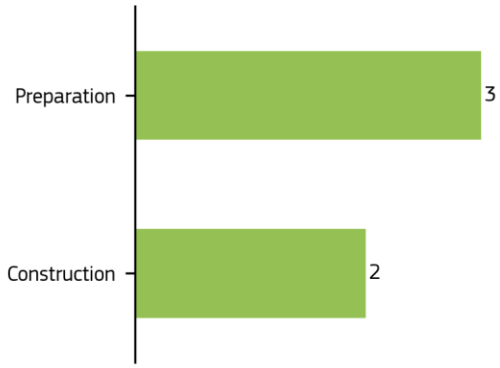
Projects per category
Number of projects and percentage of the total



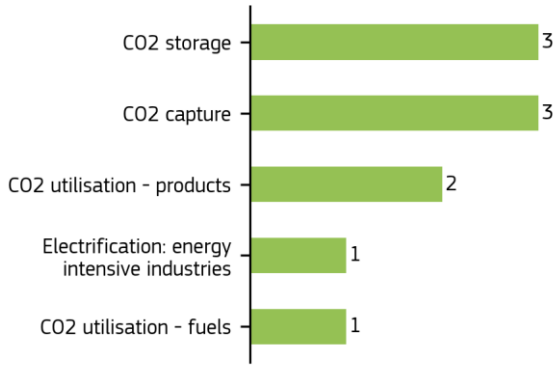
Projects per sector
Number of Small and Large-Scale projects



Projects per phase[2]
Number of projects



Top 5 technology pathways[3]
Number of projects



[1] *OJ L 140, 28.5.2019, p. 9.*
[2] *Preparation means the period before financial close is reached; construction means the period between financial close and entry into operation; operation means that the construction is finished and the project has already started production.*
[3] *Projects may employ several technological pathways, only the top 5 per country are kept in the graph.*
State of play: 18/06/2024

List of ongoing Innovation Fund projects in Belgium

Acronym	Title	Sector	Start date	Project phase	Beneficiaries	Innovation Fund grant (EUR million)	Expected GHG emission avoidance (t CO2eq)
Large Scale						**666.5**	**32,010,014**
Columbus	A scalable and replicable solution to decarbonise industry by the combination of captured "fatal" CO2 from lime production with green hydrogen, to produce carbon-neutral synthetic E-methane	Refineries	01/01/2024	Construction	ELECTRABEL | TECFORLIME	68.6	1,874,305
GIGA-SCALES	GIGA-watt SCaling of advanced ALkaline water Electrolyser Separators	Manufacturing of components for production of renewable energy or energy storage	01/04/2023	Construction	AGFA	11.0	6,129,995
GO4ZERO	Towards a carbon negative large-scale clinker plant through first-ever demonstration of a groundbreaking flue gas recirculation & concentration-based concept paired with a full CCS solution	Cement & lime	01/01/2024	Preparation	AL E&C | Holcim BE | Air Liquide	230.0	10,045,932
Kairos-at-C	Kairos-at-C, Building strong momentum for massive decarbonisation in the EU through a unique end to end CCS project	CO2 Transport and Storage	01/11/2020	Preparation	Air Liquide | AL Maritime | BASF ANTWERPEN	356.9	13,959,782
Small Scale						**4.3**	**190,967**
CO2ncrEAT	Cement-free building products with negative carbon footprints by using CO2 gas and by-product from respectively Lime and stainless steel plants	Glass, ceramics & construction material	01/06/2023	Preparation	LHOIST | PREFER | FLUXYS | ORBIX	4.3	190,967

Project overview

Acronym	Title	Description
CO2ncrEAT	Cement-free building products with negative carbon footprints by using CO2 gas and by-product from respectively Lime and stainless steel plants	The objective of the CO2ncrEAT project is to contribute to the decarbonisation of the European construction sector, offering a new line of carbon negative precast materials, such as masonry blocks. This project offers a sustainable and environmentally sound alternative to the concrete manufacturing process that is traditionally used for those blocks. Instead of the traditional aggregates and binders used in masonry blocks, the new CO2ncrEAT process will reuse residues from slag recycling centres and CO2 captured from the exhaust gases of a lime manufacturing process. The project will lead to a relative greenhouse gas emissions avoidance of 176% compared to the reference scenario. Carbstone Technology® is a patented process developed by Orbix Solutions to produce precast elements for the construction sector. This is done through the combination of recycled by-products from the stainless steel industry and CO2 as binder. Thanks to the close collaboration between the members of the consortium, this technology will be adapted to directly use the industrial fumes from the lime kilns of Lhoist. CO2ncrEAT will use CO2 without purification or liquefaction. The energy needs of the process will be therefore greatly reduced and the masonry blocks will store more CO2 eq than the GHG emissions emitted during the manufacturing process. Based on an annual production of 130 000 tonnes of eco-friendly and durable blocks, in terms of greenhouse gas emissions avoidance CO2ncrEAT will avoid more than 190 000 tonnes of CO2 equivalent over its first ten years of operation.The foundation of the CO2ncrEAT project lies in the development of a strong local circular economy. The lime produced by Lhoist is used (outside the project) by the stainless steel industry in their production process (for purification purposes). The slag that is a by-product of stainless steel production is used by Orbix Solutions, which ensures the recovery of the carbonated mineral material. This will then become the raw material used for the manufacture of the carbonated masonry blocks by Prefer. The CO2 needed for the carbonated block is produced during the lime production by Lhoist and transported to the production plant by pipeline, which will built and operate by Fluxys Belgium. CO2ncrEAT will enable the four project partners to ensure the sustainability of their local businesses by offering a unique and innovative solution, in line with European climate objectives. Once implemented, the consortium will focus on the development of other types of precast products for the construction sector. This pioneering project can be easily replicated in Europe.
Columbus	A scalable and replicable solution to decarbonise industry by the combination of captured “fatal” CO2 from lime production with green hydrogen, to produce carbon-neutral synthetic E-methane	The Columbus project will demonstrate a first of its kind, industrial scale process of E-methane production in Wallonia, Belgium. The integrated process will first involve capturing carbon dioxide (CO2) emissions from an oxy-combustion lime kiln. The process then involves the production of hydrogen from a 100 megawatt electric (MWel) electrolyser using renewable electricity sources. This will up-scale and combine several innovative technologies. The CO2 and hydrogen (H2) are then converted to E-methane by a thermocatalytic methanation plant. The by-products of the process, including water, heat, and oxygen (O2) will be reused inside and outside the process. The project plans to achieve a 284% drop in relative greenhouse gas emissions compared to the reference scenario. The innovation combines new and established technologies in synergy, allowing the generation of 55 MW equivalent of E-methane through water electrolysis, lime kiln carbon capture, and methane synthesis. Specifically, the project includes: 1) Green-H2 production using electrolysis (through a Pressurised Alkaline Electrolyser (AEL) of 20 stacks), enhancing cost efficiency and downstream integration; 2) Pioneering a lime kiln carbon capture oxy-combustion technique, a first in industrial application; and 3) Significantly upscaled thermocatalytic methanation process compared to the largest pilot plan currently active. The produced E-methane has been recognised by the Walloon Region where the project will be implemented, as an equivalent to biomethane (July 2020), which will cause no process or infrastructure change due to its natural gas-like properties. The project plans to achieve an absolute greenhouse gas emissions avoidance of 1.8 million tonnes of CO2 emissions over the first 10 years of implementation. The project will contribute to the REPowerEU objectives of reducing fossil fuel consumption in industry and transport. It will also contribute to the European Hydrogen Strategy in terms of domestic renewable hydrogen production by 2030. Columbus will operate the electrolyser on Renewable Energy (RE) based on Power Purchase Agreements (PPAs) compliant with the Renewable Energy Directive II (REDII) for the usage of renewable electric sourcing. The produced E-methane will be of high quality and suitable for heavy industries such as the steel industry and as an alternative fuel in the transport sector (especially shipping), to support their decarbonisation. The Columbus project will also have a range of socio-economic impacts. Firstly, it will contribute to positioning both Wallonia and Belgium as H2 and E-methane production pioneers, driving local economic growth. It also ensures cost-efficient deployment, and the potential creation of more than 45 operational jobs and 100+ construction roles. The outcomes will further expand to other industries, offering E-methane for decarbonising sectors like glass, ceramic, and other industries producing materials for high-temperature industrial processes (refractory industries). Finally, this project presents a unique opportunity to forge new linkages, create new value chains, and foster collaboration with external stakeholders.
GIGA-SCALES	GIGA-watt SCaling of advanced ALkaline water Electrolyser Separators	The GIGA-SCALES project will establish a pioneering industrial-scale hydrogen membrane production plant, with up to 20 gigawatt (GW) capacity. The project introduces the latest generation of ZIRFON membranes which can boost stack electrical efficiency and reduce renewable electricity needs for electrolytic hydrogen production. This technology is expected to achieve 100% relative greenhouse gas avoidance compared to the reference scenario. Centrally located in Europe near major hubs and ports, the manufacturing plant will strategically anchor the value chain, ensuring reliable short-term supply to regional and European electrolyser manufacturers. The GIGA-SCALES project is a first-of-a-kind commercialisation of hydrogen membrane production and represents a major step towards a more ecologically responsible future. The project has an unmatched production scale of 20GW, and includes automated, defect-free production lines specifically designed to overcome current bottlenecks. This, plus the use of the highly efficient ZIRFON membranes, will reduce the Levelised-cost-of-hydrogen (LCoH) while setting new industry benchmarks. With the planned entry into operation already set for October 2025, the project will avoid an estimated 6.13 million tonnes of CO2 equivalent greenhouse gases over the first ten years of operation. Its energy-efficient practices are projected to save a total of 157 terawatt-hours (TWh) of renewable electricity, which is equivalent to an additional greenhouse gas emission reduction of 27.60 million tons of CO2 equivalent. The project is located in the heart of Europe’s value chain, in the Northern part of Belgium, 10km from the Port of Antwerp-Bruges and 100km from the Port of Rotterdam, two major

Acronym	Title	Description
		hotspots for future large-scale hydrogen production and distribution. The project has potential to advance the EU's clean tech hydrogen manufacturing leadership by shifting from pilot to full-scale production. This augments the value chain by answering industry hesitations with substantial membrane production, lowered hydrogen costs, and stakeholder collaboration. The project is set to create between 1000 and 2000 direct and indirect jobs in various sectors. By enhancing renewable hydrogen production and reducing costs, the initiative attracts businesses and investments, enhancing local and regional economies. Moreover, it opens broader integration of renewable hydrogen technologies, unlocking further potential for scalability and impact. By using new technology, cutting harmful emissions, and bringing social and economic advantages, the project moves us towards a more environmentally friendly future.
GO4ZERO	Towards a carbon negative large-scale clinker plant through first-ever demonstration of a groundbreaking flue gas recirculation & concentration-based concept paired with a full CCS solution	The GO4ZERO project aims to put into operation an innovative pollutant free and carbon negative clinker kiln in the Holcim Obourg plant located in Wallonia, Belgium. The project will couple an oxy-combustion process with a large-scale carbon capture and sequestration system (CCS). The oxyfuel clinker kiln design significantly concentrates CO2 in its flue gases and, CO2 processing technologies, will make the project excel in carbon capture and purification. The processed CO2 will be transported by pipeline to the Antwerp@C CO2 Export Hub, where it will be liquefied and loaded onto CO2 ships for permanent and safe offshore storage beneath the North Sea. The project is expected to have 103% avoidance in relative greenhouse gas (GHG) emissions when compared to the reference scenario without implementing Carbon Capture and Sequestration. The project will combine several innovative technologies to produce a carbon negative clinker, ultimately supporting the construction sector in improving its sustainability. The CO2 intensity per tonne of clinker will be below the European benchmark value prior to carbon capture through low heat consumption, optimised combustion and gas recirculation conditions, as well as intensive use of alternative high-biomass content fuels and decarbonised raw materials. The cement portfolio will be further developed to reduce the embedded clinker factor (the amount of clinker in cement) and to push the use of new mineral components in substitution to clinker and slag. The plant will also contribute a very low level of indirect carbon emissions from energy input. This will be achieved through a combination of sourcing energy from a locally developed 30 megawatt (MW) floating photovoltaic farm, secured electricity through Power Purchase Agreements (PPAs), and the installation of a Waste Heat Recovery, yearly producing 50 gigawatt hours (GWh) of energy. Additionally, to reach the inlet gas specifications of the cryogenic purification unit (CPU), the design of the oxyfuel kiln is combined with cleaning technologies for flue gases, the combination of which will be the first of its kind (including a wet scrubber, thermal oxidiser, and selective non-catalytic reduction (SNCR)). A cooling & condensing unit will extract water from the kiln gases and send it to a condensate treatment plant to comply with strict wastewater disposal conditions. The project is planning to produce annually more than 2.3 million tonnes (Mt) of carbon neutral cementitious materials - mainly cement, but also clinker - pioneering work on the path to a sustainable construction sector. It will also avoid more than 10 million tonnes CO2 equivalent of absolute GHG emissions over the first ten years of operation. The project will contribute to the European objectives to reach climate neutrality by 2050, and in particular to the Net-Zero Industry Act to reach 50 Mt per year of CO2 storage capacity in 2030. The dissemination of the project results, developed knowledge and lessons learned, will directly benefit all stakeholders throughout the project lifecycle, accelerating the roll-out of the oxyfuel process combined with an efficient Carbon processing unit. The project is expected to create 18 direct jobs for the oxyfuel kiln, auxiliaries and the CPU and 54 indirect jobs.
Kairos-at-C	Kairos-at-C, Building strong momentum for massive decarbonisation in the EU through a unique end to end CCS project	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. The infrastructure in the Port of Antwerp will be built in a phased approach and will be scalable. Kairos@C will enable the deployment of several pioneering technologies that together have the potential to avoid the emission into the atmosphere of 14 Mt of CO2 over its first ten years of operation. Among the project innovations are: a cryogenic CO2 capture process at industrial scale; an energy efficient CO2 liquefaction plant, with ten times the capacity of the largest CO2 liquefaction unit in operation today; and the development of a major functioning cross border shipping and storage CCS chain. The first major innovation is the deployment of CryocapTM, a cryogenic CO2 capture process, at industrial scale. This process enables the transition to a zero-carbon energy system as it consumes mainly electricity and it can use renewable electricity. The integrated multi-feed capture scheme will integrate CO2 capture and purification from five different sources located on the Zandvliet industrial complex: two hydrogen (H2) plants, two ethylene oxide (EO) plants, and one ammonia (NH3) plant. The project will focus first on the more concentrated CO2 emissions in the process streams, i.e. those generated as a by-product in a chemical process (ammonia and ethylene oxide) for which no alternative or costeffective low-carbon technology is available. This is a very cost-effective phased approach (vs full capture upfront investment), starting with the more concentrated emissions in the process streams and allowing integration of future expansions at a later stage. The second innovative element of the project is the use of an energy efficient liquefaction plant at a scale not realized before (ten times the capacity of the largest CO2 liquefaction unit in operation today) and tailored to the needs of the Antwerp port. The third innovative element is the development of liquid CO2 vessels on a hitherto unavailable scale, whereby the main innovation lies in an appropriate design and steel grade able to withstand both the pressure and weight of liquefied CO2. Kairos@C is a prominent example of Sustainable Energy Technology (SET) Plan strategy implementation, which looks for clusters and hubs linking a range of carbon and energy intensive industries to increase synergies. The project will support the Port of Antwerp in becoming a regional hub for innovative energy and carbon value chains. The project will also contribute to maintaining and reinforcing European industry's global competitiveness, in line with the EU Industrial Strategy. Kairos@C will be the first and largest reference for a cross-border liquid CO2 value chain in a multi-user environment due to a series of factors. First, Antwerp is the second largest European port (after Rotterdam) and fourth largest European industrial cluster. In addition, the BASF site located in the Port of Antwerp is the largest integrated chemical production complex in Belgium, where Air Liquide owns and operates two world scale hydrogen production units on which capture units will be added. Kairos@C will benefit from the synergies with the Antwerp@C initiative, such as the use of shared CO2 infrastructure within the port of Antwerp. Kairos@C is also a flagship project in terms of supporting decarbonisation of hard-to-abate sectors t