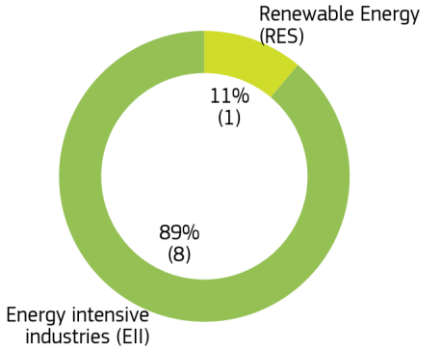
European Commission

Innovation Fund Programme

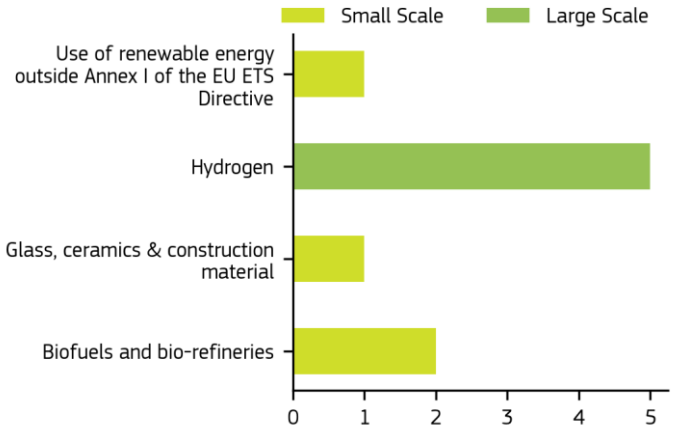
Overview of ongoing projects in Netherlands

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 **9 projects** located in Netherlands, which will contribute to the decarbonisation of European industries with a total expected GHG emission reduction of **14.4 Mt CO_2 equivalent in the first 10 years of operation.**
The total **Innovation Fund grant in Netherlands is of EUR 416.2 million**, out of the **total relevant costs of EUR 1.0 billion**, as defined in Art 5 of the Delegated Regulation 2019/856 on the Innovation Fund[1].

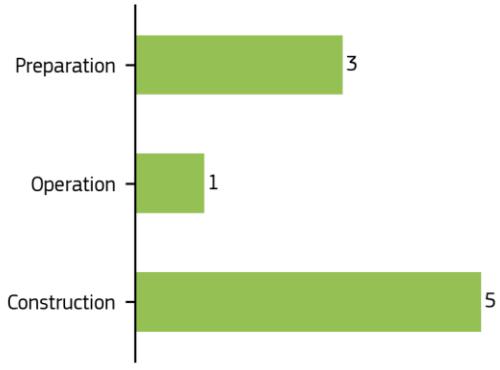
Projects per category
Number of projects and percentage of the total



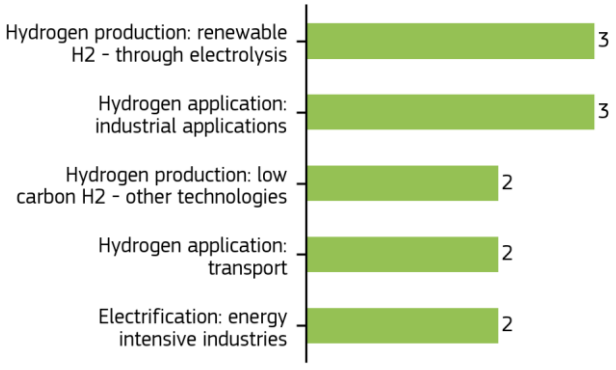
Projects per sector
Number of Small and Large-Scale projects



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 Netherlands

Acronym	Title	Sector	Start date	Project phase	Beneficiaries	Innovation Fund grant (EUR million)	Expected GHG emission avoidance (t CO2eq)
Large Scale						**401.5**	**14,155,803**
CFCPILOT4CCS	CFC Pilot for CCS	Hydrogen	01/04/2023	Preparation	Esso	30.5	45,689
ELYgator	Kickstarting a renewable hydrogen value chain for industry and mobility: highly integrated, flexible large-scale 200MW water electrolyser producing renewable hydrogen and oxygen.	Hydrogen	01/04/2022	Construction	AL | AL E&C	99.0	3,314,197
EnergHys	EnergHys	Hydrogen	01/01/2024	Preparation	TRF | TE REN NL BV | TMOB | TEHNL	75.0	2,091,499
FUREC	FUse, REuse,ReCycle	Hydrogen	01/01/2023	Preparation	OCI Nitrogen bv | RWE NL | RWE AG	108.0	3,619,900
HH	Holland Hydrogen	Hydrogen	01/01/2023	Construction	SHOP | PORT OF RDAM | RoHC	89.0	5,084,518
Small Scale						**14.7**	**239,380**
FirstBio2Shipping	First Bio-LNG to Marine Shipping	Biofuels and bio-refineries	01/01/2022	Operation	ATTERO BV | BioLNG Wilp | Nordsol | Titan | NS Projects	4.3	87,764
HFP	Hybrid Furnace Project	Glass, ceramics & construction material	01/09/2022	Construction	SGCPN	4.0	100,239
SOL	Sugar Oil as sustainable marine fueLs	Biofuels and bio-refineries	01/06/2023	Construction	Vertoro West | Vertoro	4.0	44,736
Solvent2Energy	Solvent2Energy	Use of renewable energy outside Annex I of the EU ETS Directive	01/01/2024	Construction	Pure Infinity	2.3	6,642

Project overview

Acronym	Title	Description
CFCPILOT4CCS	CFC Pilot for CCS	Carbonate Fuel Cells Pilot for Carbon Capture and Storage The project aims to develop an innovative decarbonisation solution by using Carbonate Fuel Cells (CFCs) to capture CO2 from dilute industrial streams. The underlying Fuel Cell technology has already been commercialised for power generation. Within the CFCPILOT4CCS project, the technology will be piloted in Rotterdam to further develop and adapt it for CO2 capture at an industrial scale. The expected CO2 capture and storage of the pilot plant could result in a relative emission avoidance of 78%, based on Innovation Fund methodology. The CFCPILOT4CCS project aims to obtain data on performance and operability to improve the CFC technology and address technical issues that occur in a commercial environment. Additionally, it aims to better understand the costs of installing and operating a CFC plant for carbon capture. The pilot project is also planning to achieve about 46 000 tonnes CO2 equivalent of greenhouse gas avoidance during its operation. CFCs are differentiated from other commercially available technologies due to their unique ability to generate electricity, hydrogen and useful heat while capturing CO2. This feature increases the overall efficiency of the capture process and provides additional value streams that reduce the effective cost of carbon capture and storage. CFC technology is also modular, which enables more economical carbon capture at small and medium scales, compared to other commercial technologies, such as amine-based capture that has been developed for larger applications. Application of this technology at large scale will be enabled by increased market demand and associated volume-based manufacturing cost reductions of CFC modules. The unique features of the CFC technology increase the attractiveness of carbon capture projects and make such projects more accessible for widespread industrial application. The European Commission roadmaps towards 2030 and 2050 identified carbon capture and storage as a central low carbon technology and wider industrial application of the CFC technology would contribute to the EU's 2050 Greenhouse Gas emission reduction objectives. When the CFC technology is technically ready for larger scale implementation, it could offer economical solutions for customers from a wide range of industries. In addition, construction of large-scale factories would generate up to 600 direct jobs, while economic activity could create two jobs in society for every new job in a manufacturing facility.
ELYgator	Kickstarting a renewable hydrogen value chain for industry and mobility: highly integrated, flexible large-scale 200MW water electrolyser producing renewable hydrogen and oxygen.	The ELYgator 200 MW electrolyzer will be one of the largest electrolyzers in Europe. With a capacity to produce 15 500 tonnes of renewable hydrogen yearly, its impact in terms of greenhouse gases emission avoidance over ten years is 3.3 million tonnes. This renewable hydrogen will supply the so-called "hard-to-abate" sectors, such as industry and mobility. The project will demonstrate the feasibility and replicability of large-scale electrolysis and will combine two electrolysis technologies: proton exchange membrane and alkaline. The hydrogen production will follow renewable energy production to maximize efficiency and participate in stabilizing the electric grid.
EnergHys	EnergHys	The EnergHys project plans to produce clean hydrogen with a 300 megawatt (MW) electrolyser, located in the Vlissingen area, the Netherlands. This electrolyser system, powered by renewable energy from offshore wind farms, can produce up to 22 000 tonnes of renewable hydrogen annually. The overall objective of EnergHys is to become a world leading clean hydrogen hub, aiming to unlock wider environmental and economic benefits for hard-to-abate industrial customers and the mobility sector. The project will lead to a relative greenhouse gas (GHG) emissions avoidance of 99.86% compared to the reference scenario. The main innovation behind EnergHys lies in the mix of two electrolyser technologies that will be used to reach 300 MW in 2029. This value represents 10% of the Dutch goal of at least 3 gigawatts (GW) of electrolysis capacity by 2030. The mix of two electrolyser technologies allows a better management of renewable intermittency. Furthermore, EnergHys goes beyond the state of the art in terms of by-product valorisation (oxygen and heat). It also includes a commitment to reduce its environmental impact by minimising the water intake of the project, favouring the circularity of the materials used and by developing refurbishment and stack recycling with module suppliers. Another innovation is the Energy Management System which includes additional functionalities to increase the energy efficiency of the whole system and will contribute to developing key knowledge about real-time data tools for a greener economy. One example of increased energy efficiency is the valorisation of residual heat of EnergHys (~220 GWh per year) to heat nearby greenhouses with an area of 62 hectares (ha) – comparable with approximately 90 football fields. The project is expected to avoid 2 million tonnes of CO2 equivalent of GHG emissions over the first ten years of operation. EnergHys, coordinated by TotalEnergies Renewables Nederland B.V., contributes to the ambitious European objective of climate neutrality by 2050 by kickstarting a complete hydrogen value chain in the Vlissingen area near the industrial harbour facilities and the future hydrogen (H2) backbone. In addition, the replicable modular design will allow scale up and cost optimisation which will contribute to the deployment of domestic renewable hydrogen production in line with the European Hydrogen Strategy. With the realisation of the 300 MW electrolyser in Vlissingen area, world-class engineering studies will be needed in the development phase. During construction phase, labour-intensive operations with the highest industry standards will be carried out. In the operations phase high skilled people will be needed, it is estimated that 22 direct jobs and 140

Acronym	Title	Description
		indirect jobs will be created for the management, maintenance and technical operation of the industrial assets. The lessons that will be learnt through the EnergHys project will positively impact all sectors of the value chain, from offshore wind to H2 mobility activities, by providing them with practical data and knowledge. Furthermore, the project will accelerate the maturity curve and consequently help to lower costs and to move towards a circular economy. The project also has the potential to be scalable to 600 MW, with further replicability potential at the European level.
FUREC	FUse, REuse,ReCycle	The Project FUREC (FUse, REuse,ReCycle) transforms non-recyclable solid waste streams into hydrogen and provides circular feedstock to the chemical industry. First, the waste is converted into pellets in a waste treatment plant by sorting, drying and pelletising. The dry pellets are then sent to Chemelot, a major chemical cluster, for conversion into hydrogen. Finally, this hydrogen is supplied to OCI N.V.'s ammonia production plants. The FUREC process uniquely combines torrefaction, milling and entrained flow gasification, followed by the transformation of CO (Carbon monoxide) and water, through synthetic gas, to CO2 and hydrogen. The FUREC plant will produce 54 000 tonnes of hydrogen per year while avoiding 101% of greenhouse gas emissions compared to the reference scenario during the first ten years of operation.
FirstBio2Shipping	First Bio-LNG to Marine Shipping	To contribute to the energy transition in the shipping industry, 3 parties have joined forces to close the supply chain of renewable fuels and show how the marine industry can meet the increasing CO2 abatement goals. Attero, a large Dutch waste processing company with an existing organic waste digester, will supply biogas that will be converted into Bio-LNG with the innovative iLNG technology developed by the Dutch SME Nordsol. The high-quality Bio-LNG will be delivered to the marine industry via the infrastructure of Dutch SME Titan LNG as 100% drop-in fuel. Nordsol has spent over a decade to develop the state-of-the-art technology in this project up to TRL7. The goal of this project is to demonstrate the Zero-series of a commercialized fully integrated flexible/scalable design (to fit any biodigester in Europe), with zero-emissions (resource efficiency of liquefaction process is 100%) and increased energy efficiency (20%). This project is a giant leap forward and brings the technology to TRL8. The FirstBio2Shipping project directly enables the following impacts: - Annual valorisation of 6 million cubic meters of biogas into high-quality low-carbon fuel - Annual production of 2,445 tons of bio-LNG substituting 3,019 tons of heavy fuel oil (HFO) - Annual avoidance of 8,776 tons of CO2-eq The project is very mature, having all relevant permits in place and feedstock and existing digestor in place. Technology is largely off-the-shelf and validated in previous projects to enhance replication, cost efficiency and scalability. Letters of support for Bio-LNG offtake contracts are in place. Goals is to reach financial close within 3 months after signing the grant agreement and start production within 21 months. Attero and Nordsol are highly experience in the realization of projects of comparable size and nature and will jointly invest in the hardware and operate it for 10 years and beyond. Titan has the proven experience to deliver LNG to any maritime customer.
HFP	Hybrid Furnace Project	Saint-Gobain's Hybrid Furnace Project (HFP) implements and validates the first hybrid glass wool furnace that receives 50% of its heating power from electricity (Boosting). HFP is the result of multiple years of research and development within Saint-Gobain. It provides a more environmentally friendly alternative to flame furnaces that are used to produce molten glass. HFP has been initially implemented at the Saint-Gobain Isover plant in Etten-Leur, the Netherlands. Here, it will lead to a relative greenhouse gas emission avoidance of 22% compared to the reference scenario and an annual reduction in natural gas consumption of around 50 gigawatt hours (GWh). Saint-Gobain has developed a more environmentally friendly alternative to full flame furnaces for the production of molten glass for its glass wool products. The HFP will implement and validate a glass wool furnace at industrial scale. The furnace consists of hybrid technology that electrically heats the glass wool furnace to an unprecedented level of 50% of the required temperature. For the remaining heat requirement, the furnace's combustion process is improved through the injection of pure oxygen, which is supplied by a separately implemented oxygen plant. The expected results from HFP include a reduction of greenhouse gas (GHG) emissions, a reduction of natural gas consumption of around 55% and an overall decrease in energy consumption by around 26%. The absolute greenhouse gas emission avoidance is about 100 000 tonnes CO2 equivalent over the first ten years of operation. Glass wool insulation is extensively used in buildings all over the world. As well as creating more comfortable homes, effective insulation is also important to create more sustainable homes. After all, effectively insulated buildings require less energy for heating thereby reducing greenhouse gas emissions. However, the production of glass wool insulation is also an energy intensive production process that emits considerable amounts of greenhouse gases if fossil fuels are used. Saint-Gobain acknowledges this problem and with the HFP it takes yet another measure to reduce its carbon footprint. The HFP meets both EU climate targets to reduce carbon emissions by 55% in 2030 (compared to 1990) as well as Saint-Gobain's roadmap to its net-zero carbon emission target in 2050. After its first implementation and validation at Saint-Gobain Isover's plant in Etten-Leur, the Netherlands, the HFP can easily be replicated within Saint-Gobain's network of glass wool plants that run flame furnaces. The potential impact of implementing the HFP at all of Saint-Gobain's plants in Europe would lead to an additional GHG emissions avoidance of circa 100 000 tonnes CO2 equivalent per year. In addition, the HFP's technology could also be deployed by other glass wool manufacturers, which would lead to a further decarbonisation of the sector, having a global impact.

Acronym	Title	Description
HH	Holland Hydrogen	Holland Hydrogen (HH) plans to build a 400 megawatt (MW) electrolyser in the Port of Rotterdam to produce green hydrogen, using renewable electricity from offshore wind farms in the North Sea. HH will be developed in two 200 MW phases and will be the first electrolyser project of this scale. Taken as a whole, the project will demonstrate a complete end-to-end integrated renewable hydrogen system proof-of-concept at an industrial scale developed with world leading sustainability credentials. The green hydrogen will be supplied to a refinery and later on to the mobility sector, allowing for about 100% relative greenhouse gas emission avoidance over the first ten years of operation.
SOL	Sugar Oil as sustainable marine fueLs	This project considers crude sugar oil (CSO™) as a fuel for internal combustion engines, specifically those that propel sea going vessels. CSO™ is produced from cellulose and a stable blend with fossil marine fuel is created through emulsification. The SOL project aims to validate the technical and economic viability of this fuel source whilst also achieving a greater than 80% relative greenhouse gas (GHG) emission avoidance during the first ten years of operation compared to the reference scenario. Globally, sugars are produced by photosynthesis at a scale of roughly 100 billion tonnes per annum, mostly in the form of cellulose (a polymer of glucose units). By contrast, a “mere” 5 billion tonnes per annum of fossil-based oil is pumped out of the ground. While sugars are abundant fuels in nature, SOL is the first project in the world to optimize and scale-up their use as transport fuels. This requires two process steps: I) the conversion of cellulose to crude sugar oil (CSO™) by means of dilute acid hydrolysis and II) the emulsification of CSO™ with heavy fuel oil (HFO). The use of dilute acid hydrolysis to convert cellulose to sugar dates back to the late 19th century. Historically, hydrolysis conditions were optimised to achieve a maximum sugar yield, since in nearly all commercial settings, the target product was ethanol. In SOL, the objective is to maximise the yield of CSO™, which also contains some sugar derivatives, notably levulinic- and formic acid, which would act as inhibitors to the fermentation of sugar to ethanol. CSO™, being a blend of sugar (derivatives) in water, does not readily blend with HFO so requires emulsification. Stable sugar-water-HFO blends are prepared with the aid of surfactants that allow for the polar sugar molecules to form a stable emulsion with apolar HFO. Currently cellulosic ethanol is the go-to transport fuel that is produced from cellulose. However, unlike cellulosic acid, sugars can be used directly in engines, without the need for downstream fermentation and distillation operations, which are both expensive and energy intensive. Bypassing the need for these processes results in greater GHG emissions avoidance. Moreover, the CSO™ process also offers superior atom economy, with more than 90% of the carbon in the cellulose feedstock ending up in the transport fuel compared to < 50% in the case of cellulosic ethanol. As a result, this process delivers more fuel calories per unit of biomass in the combustion process than competing ethanol technologies and therefore supports the decarbonisation targets for the maritime sector, as outlined in the ‘Fit for 55’ Section of the EU Renewable Energy Directive. The SOL project will increase the technical maturity and scale of this production technique from a 1 kiloton per annum (ktpa) demonstration plant to a 5 ktpa commercial plant in the Port of Rotterdam. When the project is complete the aim is to develop a full scale 250 ktpa plant in the same location.
Solvent2Energy	Solvent2Energy	The Solevent2Energy project aims to demonstrate a novel integrated system that converts solvents released as waste from flexographic printing into green gas through bio-treatment. The patented technology is unique thanks to it having been developed in co-operation with the University of Valencia and supported by two Horizon Europe research and innovation grants in 2010. These patents, jointly owned by Pure Air Solutions and the University, have granted exclusive commercial licensing rights across Europe and the Americas since 2015. The core of this groundbreaking technology lies in its bioreactor (anaerobic bioscrubber), referred to as ‘BONCUS’, which can be integrated into an existing production process. Notably, this system achieves 100% reduction in greenhouse gas (GHG) emissions in relative terms, marking a significant leap forward in sustainability. Currently, the flexographic printing industry operates as an energy-consuming procedure that produces pollutive air waste that comes from solvents released during the printing and ink drying processes. In present circumstances, the solvent waste is disposed of via Regenerative Thermal Oxidation (RTO), which contributes to air pollution due to the absence of alternative solutions, on top of consuming significant amounts of energy. Thanks to the innovative BONCUS technology, the industry can now capitalize on these solvents, primarily bioethanol, in two ways. First, they can be utilized for printing purposes, and second, they can serve as an energy source for production processes. This approach also eliminates the need for waste air incineration. The commercialization pathway, chosen by the project, is to implement this technology at Trioworld Harlingen facility, generating 700,000 m3 of biogas annually from what is considered ‘waste air’. Air incineration no longer being needed is a technological upgrade that would be a direct improvement of air quality for the already sensitive Wadden area. The project will contribute to the European objectives to reduce GHG emissions and is in line with the RePowerEU Plan. Cleaning of the air before emitting it to the atmosphere is regulated by EU directives 2010/75/EU that prevents photochemical SMOG. This technological improvement should have a considerable impact on improving air quality in the areas where flexocompanies choose to implement it. The company aims to grow around 5 systems per year between 2025-2030 , and anticipates to increase its personnel-base to 10 more persons. The Company is already commercially present in Germany, the Netherlands, France and Spain.