European Hydrogen Innovation Cluster

9 EU-Funded Projects

Accelerating hydrogen innovation and delivering real-world impact

AndreaH

hyield

CARMA·H2

HERMES

Couple

APOLO

MEASURED

AMBHER

PYRAH2

Co-funded by the European Union

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Clean Hydrogen Partnership

Powering a greener Europe, together

Hydrogen is a key enabler of Europe's climate-neutral future. By 2050, molecule-based energy carriers are expected to cover around **30-35%** of final energy demand, with renewable hydrogen alone potentially supplying up to **10%**[1]. Turning this potential into reality requires stronger links between research, innovation, and large-scale deployment.

This is where the **European Hydrogen Innovation Cluster** comes in. We are a collaborative alliance of Horizon Europe projects advancing complementary clean hydrogen and ammonia technologies across the value chain. By **connecting expertise** in production, conversion, purification, storage and end-use applications, we foster knowledge exchange, coordination and joint communication. Our goal is to help project results gain visibility and deliver impact beyond individual initiatives.

Our shared goals

Working together to cut costs and boost efficiency in hydrogen purification and storage systems.

Validating solutions in industrial environments to ensure replication and impact, including plant visits and demonstrations.

Advancing alternative energy carriers through cross-project research, scientific collaboration, and joint publications.

Strengthening Europe's hydrogen value chain by building meaningful connections across projects, industry, SMEs, and potential future stakeholders.

[1] Study on sustainable supply chain and industrialisation of hydrogen technologies - Clean Hydrogen Partnership (p.12)

Total EU budget: €4,915,870

Duration: 48 months

Project coordinator: TECNALIA

Consortium & Plant site location:

Spain, France, Italy, Germany, the Netherlands, United Kingdom,

Partners:

Brief description

AMBHER addresses the short- and long-term hydrogen storage challenges associated with the increasing electrification of the energy system. The project combines green ammonia for seasonal energy storage with innovative nanoporous Metal Organic Frameworks (MOFs) and conformable cryo-vessels for short-term hydrogen storage. Through the development of advanced catalysts, membranes, and intensified 3D-printed reactors, AMBHER aims to provide cost-efficient and resource-effective storage solutions at lower temperatures and pressures, validated at TRL 5.

The project contributes to a more resilient and sustainable European energy system by facilitating the integration of renewable energy and supporting the decarbonisation of sectors such as transport and energy. By connecting material developers, technology providers, industry, and end-users, AMBHER also creates opportunities for industrial adoption and new business development across the hydrogen value chain. The project therefore supports reduced energy dependence, increased European competitiveness, and the wider uptake of innovative hydrogen storage technologies.

Project impacts

AMBHER addresses the short- and long-term hydrogen storage challenges

- Enabling more efficient short- and long-term hydrogen storage.
- Supporting seasonal renewable energy storage through green ammonia.
- Enabling local and economically viable power-to-hydrogen hubs and increasing applications in the energy and transport sectors.
- Supporting industrial adoption and the European hydrogen economy through validated solutions and relevant business cases.

"AMBHER upholds the short- and long-term hydrogen storage challenges."

Angela Mary Thomas, project coordinator from TECNALIA

Total EU budget: €2,980,361

Duration: 48 months

Project coordinator: TECNALIA

Partners:

Consortium & Plant site location:

Spain, the Netherlands, Italy, Denmark

Brief description

ANDREAH's main objective is to provide a quantum leap in the development of advanced ammonia decomposition technologies to produce ultra-pure hydrogen (>99.998%) by developing an innovative system based on a Catalytic Membrane Reactor (CMR) for the cracking of Ammonia. In this way, optimised heat management, improved conversion per pass and purification/recycling for more cost-efficient and resource-effective ammonia decomposition at lower temperatures (400-450°C) will be achieved. This goal will be achieved by

- Building a strong research and industrial network to advance ammonia-cracking technologies.
- Developing flexible, cost-effective, and sustainable technologies for green H_2 production from ammonia.
- Creating new business opportunities through advanced catalysts, membranes, and membrane reactors for distributed H_2 generation.

Project impacts

The ambition is to enable efficient and decentralised green hydrogen production from ammonia. Expected impacts include:

- High-purity (>99.998%) hydrogen production from ammonia.
- More efficient and lower-temperature ammonia cracking.
- Flexible and decentralised H_2 generation using ammonia as a hydrogen carrier.
- Supporting decarbonisation in transport, energy, and industry.
- New business opportunities in catalysts, membranes, and hydrogen technologies.
- Strengthening Europe's position in the hydrogen economy and creating over 25000 new jobs.

"ANDREAH will provide an innovative way to crack ammonia into hydrogen."

Jaione Ollo, project coordinator from TECNALIA

APOLO

Total EU budget: €7.511.266,25

Duration: 48 months

Project coordinator: TECNALIA

Partners: tecnalia, TU/e, Johnson Matthey, H2SITE, ASTANDER, LCC, NUVERA, Chalmers University of Technology, Bureau Veritas, CUBE, Fertiberia, Centro Nacional del Hidrógeno

Consortium & Plant site location:

UK, Spain, the Netherlands, Sweden, Italy, Austria

Brief description

APOLO aims to tackle the challenges of power conversion from ammonia and develop an efficient and flexible ammonia cracking technology. This technology will be coupled with fuel cells and engines to achieve complete decarbonization of the maritime sector.

As the main objective of the call is to demonstrate scalability beyond 3MW, the consortium will focus on showcasing the following demonstration units:

i) A 125kW power conversion system that utilizes an ammonia cracker coupled with a PEM fuel cell system, achieving an overall system efficiency of 51% to 54%. The ammonia cracker will be customized to work with different pressure conditions and efficiency levels of PEM fuel cells. A comparison of efficiency levels will be conducted to evaluate the flexibility of the cracking system for all types of PEM fuel cells.

ii) A 125kW partial ammonia cracker coupled with a 4-stroke engine, exhibiting an overall system Efficiency above 45%.

Project impacts

The ambition is to decarbonized the current maritime industry. Expected impacts include:

- To yield 13.45 MTn CO_2 eq. savings from 2032-2037.
- The demo units aim for increased energy efficiency (45 - 51%) with current fossil fuel-based solutions.
- Enabling innovative port infrastructure to achieve zero-emission waterborne transport.
- Enable safe and efficient fully automated and connected shipping (maritime and inland).
- Create 23,000 new jobs globally from 2032-2037.
- The resilience of power systems to fuel impurities and variable ship power demand will be validated.

"APOLO aims to revolutionize maritime decarbonization by developing advanced power conversion technologies."

Angela Mary Thomas, project coordinator from TECNALIA

CARMA·H2

Total EU budget: €9,954,419

Duration: 48 months

Project coordinator: AIN - Asociación de la Industria Navarra

Consortium and Plant site location:

Arazuri, Navarra (ES)

Partners:

AIN, CoorsTek Membrane Sciences, HERA, Mancomunidad Comarca de Pamplona / Iruñerriko Mankomunitatea, ICONS, Shell, CSIC Consejo Superior de Investigaciones Científicas, snam, SINTEF, NILSA

Brief description

CARMA-H2 aims to develop and demonstrate an innovative modular protonic membrane reformer (bioPMR) at the Arazuri wastewater treatment plant in Navarra, Spain. The system converts biogas from organic waste into high-purity, pressurised hydrogen and capture-ready, food-grade CO_2 with high energy efficiency, targeting a production of around 500 kg of hydrogen and 4,000 kg of CO_2 per day.

The bioPMR enables this dual production in a single, continuous process and is deployed within a fully integrated setup that includes a biogas pre-treatment unit, a CO_2 liquefaction system, and the existing waste-to-biogas infrastructure at Arazuri. This configuration ensures a streamlined, efficient, and scalable production process, supporting sustainable resource recovery.

Project impacts

- **Circular economy:** Supports green mobility and local industries through sustainable hydrogen and CO_2 production from waste.
- **Value for the community:** Puts local communities first by creating environmental and economic value from underused local resources.
- **EU-scale benefits:** Contributes to European climate and energy goals, reinforcing industrial capacity and promoting research excellence.

"CARMA-H2 gives us the chance to rethink waste – not as a problem, but as a starting point to explore innovative solutions that make energy production more circular and efficient"

Nancy Tarjenian Astour, project coordinator

Couple

Total EU budget: €5 997 390.10

Duration: 36 months

Project coordinator: CoorsTek Membrane Sciences AS

Partners:

CoorsTek Membrane Sciences

Universitat Politècnica de Catalunya BarcelonaTech

Hulteberg

RISK | RWTH Aachen University

Campfire AG

ICONS

SINTEF

GECRIO

Consortium and Plant site location:

Poppendorf, Germany

Brief description

COUPLE is a European research and innovation project developing a more efficient way to recover hydrogen from ammonia.

Hydrogen is key to decarbonising industry and transport, but it is hard to transport and store. Ammonia (NH_3) is a safe, hydrogen-rich carrier that uses existing infrastructure, yet converting it back into hydrogen is still energy-intensive and inefficient.

COUPLE solves this by combining two advanced membrane technologies, the Palladium Membrane Reactor (PdMR) and the Proton Ceramic Electrochemical Reactor (PCER), with heat integration in a single continuous process, recovering high-purity hydrogen with less external energy and at lower cost. The technology will be demonstrated under real industrial conditions in Poppendorf, Germany.

Project impacts

By making ammonia-to-hydrogen conversion more efficient and affordable, COUPLE strengthens a key link in the clean hydrogen value chain. Expected impacts:

- Over 99.9% ammonia conversion, sustained for more than 5,000 hours of continuous operation.
- Higher energy efficiency and lower operational costs through integrated heat recovery.
- Technology matured from TRL 5 to TRL 7, on the path to commercialisation.
- Hydrogen stored and transported at scale using existing infrastructure.
- Safe, stable operation ensured by an advanced control system.
- A better understanding of the social acceptance of ammonia as a hydrogen carrier.

"COUPLE is built on the results of past European projects to deliver a scalable real-world solution to Hydrogen extraction from Ammonia"

Gautier PAPON, project coordinator

Total EU budget: €9,999,964

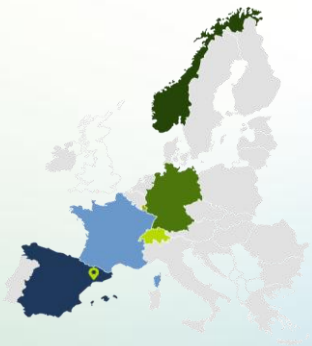
Duration: 48 months

Project coordinator: Magtel, co-coordiantion with Inveniam Group

Partners: Magtel, inveniam, CEMEX, WtEnergy, H2SITE, VEOLIA, eurecat, SINTEF, AristEng, CSIC, CETAQUA, ArcelorMittal, enagas, Mincatec Energy, Synhelion

Consortium & Plant site location:

Alcanar, Tarragona (ES)



Brief description

HYIELD - A novel multi-stage steam gasification and syngas purification demonstration plant for waste to hydrogen conversion

The HYIELD project aims to develop Europe's first industrial-scale waste-to-hydrogen plant. It focuses on converting organic waste into clean hydrogen using advanced steam gasification, Water-Gas-Shift membrane reactors, low-pressure metal hydride storage, and AI-driven digital twins to optimize the process.

The project will demonstrate this technology at a 3MW scale in a Spanish cement plant, with plans for broader replication across Europe. Key benefits include high hydrogen purity, significant energy efficiency, competitive hydrogen costs, and reduced greenhouse gas emissions.

The project is carried out by a consortium from Spain, France, Germany, Norway, and Luxembourg.

Project impacts

The ambition is to pave the way for replication across Europe, accelerating the closure of landfills and decarbonization of sectors such as shipping, aviation and heavy industry. Expected impacts include by 2040:

- Green hydrogen production: 72,000 tH_2/year
- Waste treated: 1.2Mt/year
- Greenhouse gas reduction: 291,000 tCO_2-eq/year
- Levelized cost of hydrogen: 2.19€/kg
- Jobs created: 330

"HYIELD shows how waste can become a reliable, scalable source of clean hydrogen, helping Europe decarbonise hard-to-abate sectors through real industrial demonstration."

Álvaro Sánchez Sánchez de Puerta , project coordinator

HERMES

Total EU budget: € 5.943.423,08

Duration: 48 Months

Project coordinator: HYDROGEN ONSITE, SL

Partners:

H2SITE

tecnalia

CENTER FOR SUSTAINABLE ENERGY
FONDAZIONE BRUNO KESSLER

snam

TU/e Sustainable Process Engineering

Tüpraş

intract

Consortium and Plant site location:

TÜPRAŞ (Türkiye),

SNAM (Italy)

Brief description

HERMES (HYDROGEN EFFICIENT PURIFICATION USING MEMBRANES IN INDUSTRIAL GAS STREAMS) is a Horizon Europe project focused on the development, scale-up, and industrial demonstration at TRL7 of advanced membrane technologies for hydrogen separation and purification. The project develops two innovative membrane systems—Palladium-based membranes and Carbon Molecular Sieve (CMS) membranes—to recover high-purity hydrogen from various industrial gas streams with low energy consumption and reduced operational costs. HERMES will design and validate two industrial prototypes in Türkiye and Italy, targeting hydrogen purification capacities of 100 kg/day across different industrial use cases. The project also includes comprehensive assessments related to safety, environmental impact, techno-economic performance, and social acceptance, supporting the deployment of efficient and sustainable hydrogen technologies in industrial applications.

Project impacts

HERMES is expected to contribute significantly to industrial decarbonisation and the advancement of the European hydrogen economy by enabling more energy-efficient and cost-effective hydrogen purification solutions. The project aims to reduce hydrogen purification energy consumption below 3.5 kWh/kg and purification costs below €1/kg, improving the economic feasibility of hydrogen use in industrial environments. Through industrial-scale demonstrations, HERMES will validate innovative membrane technologies under real operating conditions and support their future replication across additional industrial sectors and hydrogen value chains.

"Membrane reactors can unlock the value of hydrogen streams that today are wasted or underutilised. In HERMES, we want to prove that on-site separation is technically and economically viable across very different industrial environments.""

***Alejandro Barranco*, Project Coordinator**

hermes-h2.eu/ hermes-h2-project @hermes_h2_ Hermes-h2@intract.com.tr

MEASURED

Total EU budget: €7.971.409

Duration: 48 months

Project coordinator: Eindhoven University of Technology

Partners:

Consortium and Plant site location:

The Netherlands, Spain, Slovenia, Italy, Germany, France, Sweden

Brief description

MEASURED aims at developing and demonstrating advanced membrane materials for Pervaporation (PV), Membrane Distillation (MD) and Gas Separation (GS) technologies applied to acrylic ester production, membrane manufacturing and gas separation from a carbon capture & utilization (CCU) stream.

The MEASURED project addresses the call topic HORIZON-CL4-2022-RESILIENCE-01-14: Membranes for gas separations – membrane distillation, and has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement N° 101091887.

Project impacts

MEASURED is delivering a quantum leap in membrane technologies for pervaporation, gas separation and membrane distillation, paving the way for the commercialisation of greener solutions across the value chain. The project is bringing together leading industrial, academic and research partners to develop advanced membrane building blocks and align innovative materials with chemical industry needs. MEASURED is developing flexible, cost-effective and environmentally friendly ceramic, carbon molecular sieve (CMSM) and polymeric membranes, integrating them into new modules for three applications, with prototypes being validated at TRL7 and a CMSM spin-off being established. The project is scaling up manufacturing processes, guiding development through multiscale modelling towards a TRL9 roadmap, conducting LCA, LCC and HSE analyses, and preparing business cases and dissemination activities to maximise impact.

PYRAH2

Total EU budget: 7.958.550 €
Duration: 48 months
Project coordinator: ENERCORR

Partners:

enercorr, Necta, HyChem Química Sustentável, WtEnergy, terrawatt, plenesys, Politecnico Milano 1863, DTU, Goodyear, ArcelorMittal, AristEng, invenam

Consortium and Plant site location:

HyChem industrial site Póvoa de Santa Iria (PT)

Brief description

PYRAH2 aims to develop and demonstrate an integrated, renewable pathway that converts biogenic waste and renewable gases into high-purity hydrogen and valuable solid carbon. The project combines autothermal gasification and syngas conditioning, biomethanation, CO_2 separation, and plasma-assisted methane pyrolysis in a single process.

A full-scale pilot plant will be deployed at HyChem's industrial site in Portugal, advancing the technology from TRL 5 to TRL 7. The system targets a hydrogen production rate of 30 kg per hour at over 98% purity, while recovering up to 90% of the carbon in solid form. The resulting carbon will be assessed for applications in tyre manufacturing and steelmaking, creating new circular industrial value chains.

The project is carried out by a consortium from Spain, Portugal, France, Italy, Denmark and Luxembourg.

Project impacts

Renewable hydrogen production: 30 kg H_2/h at over 98% purity, producing approximately 90 tonnes during the demonstration phase.
Solid carbon production: Recovery of at least 50% of the initial carbon content for subsequent industrial valorisation.
Operational demonstration: At least 3,000 operating hours.
Greenhouse gas reduction: Around 2,958 tCO_2-eq avoided per year.
Levelized cost of hydrogen: Target below €3/kg H_2 by 2030.

"PYRAH2 gives us the opportunity to turn biogenic waste into a strategic resource creating clean hydrogen and valuable carbon while building more circular and resilient European industries."

Víctor Suñol del Río, Communication, Dissemination and Exploitation Manager

An open and evolving initiative

The European Hydrogen Innovation Cluster is open to dialogue and collaboration. EU-funded projects and interested stakeholders are welcome to get in touch to explore opportunities to join or engage with the Cluster.

To express interest, please contact one of the participating projects via the contacts provided in this brochure.

Stay connected!

Follow the European Hydrogen Innovation Cluster and its joint activities on social media using the hashtag #EUH2cluster