



RESEARCH & INNOVATION KEY DRIVER OF THE HYDROGEN STRATEGY

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Hydrogen is getting a lot of attention as it is very versatile and **can be used as a fuel, an energy carrier and for storage**. It has many possible applications and most importantly, it **does not emit CO₂ when used**. In order to implement the climate ambition of the European Green Deal, the Hydrogen Strategy sets out a vision of how the EU can **turn clean hydrogen into a viable solution to decarbonise** different sectors over time, enabling the production, distribution and storage of clean hydrogen at scale.

THE ROLE OF RESEARCH & INNOVATION

With many new applications, the supply chain becomes more complex and continuous improvements (new materials, efficiency, reliability, lifetime, cost, safety) are still needed. Continuous research and development is required to ensure that hydrogen technologies are technically improved, highly efficient, and as competitive as possible. The scope of hydrogen applications is increasing from transport, Fuel Cells and electrolyzers expanding to include the energy sector (power, heating and gas), industry and new transport applications (maritime, aviation, rail, heavy transport).

FP7 AND HORIZON 2020

The EU framework programmes have supported research and innovation (R&I) on clean hydrogen for many years, mainly through **the Fuel Cells and Hydrogen public-private partnership**. The research and innovation programmes received around €985 million of EU funding for over 250 projects. Projects have played a key role in developing:

HYDROGEN-POWERED
VEHICLES
(IN PARTICULAR BUSES)

TRAINING TOOLS
FOR EFFICIENT & SAFE HYDROGEN
HANDLING

LOW-COST
ELECTROLYSERS
FOR OPTIMISED GRID MANAGEMENT

HORIZON EUROPE (2021 – 2027)

The Horizon Europe programme should see the launch of a new public-private partnership on Clean Hydrogen with an increased budget. This new partnership will support joint R&I activities with industry on supply, storage, transport and transformation of clean hydrogen for the whole economy. It will aim at establishing hydrogen's competitiveness and viability as **an energy source in place of fossil fuels**.



“Replacing fossil fuels, in particular in hard-to-decarbonise sectors, is a big challenge for Europe. The actions proposed in the Hydrogen Strategy will help reducing greenhouse gas emissions ahead of 2030. With Horizon 2020 Europe is already supporting a public-private partnership for research and innovation in this area. With Horizon Europe there is a renewed opportunity to lead and spread the benefits from the green transition across the European Union by creating economic value and qualified jobs.”

Mariya Gabriel, EU Commissioner for Innovation, Research, Culture, Education and Youth

Research and
Innovation

Selection of Horizon 2020 projects contributing to the Hydrogen Strategy



SOLAR ENERGY - POWER-TO-X - SUSTAINABLE INDUSTRY

PECSYS's goal is to develop a scalable integrated device, **using breakthrough materials and technology, for direct hydrogen production from sunlight**, and to test it under industrial settings. This solar generated hydrogen stores solar energy in a chemical form and releases it, as required for example at night, via a fuel cell.



REGULATION – CERTIFICATION

CERTIFYH marked the start of a new green hydrogen market by launching the **first-of-its-kind EU-wide “guarantees of origin” pilot scheme for green and low-carbon hydrogen**. Environmentally sustainable hydrogen is essential to decarbonise the energy system.



AVIATION

HEAVEN will allow **zero-emissions long-range flights thanks to the high power fuel cell and cryogenic hydrogen storage technology**. It will have an autonomy range of >800 kilometres for up to 19 passengers.



SUSTAINABLE INDUSTRY - STEEL PRODUCTION - HEAVY INDUSTRY

H2FUTURE uses excess electricity from renewables to **split water molecules via electrolysis, the resulting green hydrogen can be stored in fuel cells to supply power as needed**. The project has focussed particularly on deploying a large-scale electrolysis system operated for steel manufacturing. It demonstrated the increasing power of electrolyzers, highlighting their suitability for energy-intensive heavy industries.



REFUELLING STATIONS - HYDROGEN CARS – MOBILITY

H2ME helped to significantly expand the number of hydrogen vehicles and the refuelling network. H2ME deployed 29 hydrogen refuelling stations and 325 vehicles, while its follow-up project, H2ME2, is adding 20 hydrogen refuelling stations and over 1100 vehicles in Europe. Altogether, these projects are **kick-starting a pan-European hydrogen fuelling station network**.



PUBLIC TRANSPORT - SUSTAINABLE CITIES - BUSES – MOBILITY

JIVE and **JIVE2** contribute to the **increase of hydrogen buses in Europe to almost 400**. Hydrogen fuel cell buses provide multiple benefits and are popular with both the public and transport operators. They contribute to cleaner air in urban areas, and are much quieter than buses running on fuel. Their **ability to travel up to 400 kilometres without refuelling** also makes them a strategic choice for sustainability-seeking city councils.



MARITIME - PORT – INFRASTRUCTURE

H2PORTS aims to boost the transition of the European port industry towards an effective low-carbon/zero-emission and safe operating model with fuel cell technologies oriented to increase energy efficiency, decarbonisation and safety of port terminals. It will demonstrate and validate **two innovative solutions based on fuel cell technologies and a hydrogen mobile supply station** in real port operations.

More information on the projects funded by Horizon 2020 is available at cordis.europa.eu