

# Hydrogen: a vital element in decarbonising the gas grid



**The decarbonisation of the natural gas grid, from production and transport to end use, can help the EU reach its climate change targets. A range of projects funded by the Clean Hydrogen Partnership are demonstrating how green hydrogen can be safely blended with natural gas and transported using existing infrastructure.**

## Cleaner and greener

Europe needs to reduce its dependence on natural gas to achieve climate change targets and to avoid supply and price shocks. When produced in a sustainable way, hydrogen emits no greenhouse gas emissions over the whole production and use cycle. It can be fed into existing infrastructure and transported with natural gas and re-extracted for later use or combusted as a mixture with natural gas. The aim is to replace natural gas with hydrogen over the long term.

The HPEM2GAS and HIGGS projects are demonstrating how hydrogen can be safely injected into the natural gas grid. THYGA is looking at the effect that mixtures of natural gas and hydrogen will have on residential and commercial appliances.

Meanwhile, the HEAVENN (Netherlands) and GREEN HYS-LAND (Spain) projects are developing 'hydrogen valleys' that combine sustainable energy generation, hydrogen production, storage, transport and use in a specific region.

## Demonstrating the benefits

The Clean Hydrogen Partnership supports research and demonstration projects to perfect the separation and transport of hydrogen-natural gas mixtures, as these two gases will continue to be used alongside one another for the near future.

For example, HPEM2GAS built and demonstrated a 75-cell, 200 kW proton exchange membrane electrolyser in Emden, Germany. The pressure of the hydrogen produced was adapted to the operating pressure of the local natural gas distribution grid and successfully injected into it. This avoided having to change critical settings in gas supply and consumption. HIGGS, another project, studied the effect high levels of hydrogen could have on gas infrastructure and its components. An experimental site was built at the Aragon Hydrogen Foundation in Spain. The project identified technical, legal and regulatory barriers and enablers.

## THE BURNING QUESTION

Infrastructure operators need certainty – along with the necessary policies and regulations – to commit to long-term investments in hydrogen technology. They need to know that the natural gas grid and appliances in homes, businesses and factories can be used safely with increasing concentrations of hydrogen.

## BREAKTHROUGH TECHNOLOGY

Collaboration between SMEs, industry and research is helping to create breakthroughs in technology to make using hydrogen with natural gas viable in the short- to medium term. In parallel, work is being done to develop regulations and safety standards. **The goal?** To develop the market for hydrogen production and promote the large-scale adoption of hydrogen-natural-gas blends. **Key results?** HIGGS concluded that the high-pressure transmission gas grid is substantially hydrogen-ready, although parts of it need additional monitoring and testing. Even a low hydrogen blend can mean an important reduction in CO<sub>2</sub> emissions. The research done under the project determined that up to 20 % of the volume of natural gas can be replaced with hydrogen.



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## KEY ACHIEVEMENTS

### EUR 30 MILLION

combined subsidy from the Clean Hydrogen Partnership for the HEAVENN (Northern Netherlands) and GREENHYSLAND (Mallorca, Spain) hydrogen valleys, including plans for H<sub>2</sub> distribution infrastructure

### 23

Hydrogen valleys in Europe at various stages of development

### 100 KG HYDROGEN PER DAY

produced by the BIONICO catalytic membrane reactor

### 144 CELLS

in each of the two stacks in the HyGRID system

### 85 NM<sup>3</sup>/H

of gas mixture containing H<sub>2</sub> can be processed by the HyGRID system

### 7 %

reduction in CO<sub>2</sub> emissions when methane (the main constituent of natural gas) is replaced by a 20 % volume of hydrogen

## IMPACTS

### INJECTION OF HYDROGEN

into the natural gas grid demonstrated by HPEM2GAS

### LOW CAPEX

feasible for an electrochemical hydrogen purification system for use with biogas or industrial waste gas demonstrated in the MEMPHYS project.

### LARGEST

membrane reactor for hydrogen production from biogas in the world, built by BIONICO

### SUCCESSFUL TESTING

of a dedicated membrane-based hydrogen purifier sub-system in HyGRID

### FIRST PUBLIC

hydrogen refuelling station for trucks opened in Emmen, Netherlands as part of the HEAVENN project.



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