



Closure of EU-funded OPTHYCS project developing a new optic fibre-based sensor technology to increase the safety of hydrogen applications



- The **OPTHYCS** project concludes its activities after three years, involving seven entities from three European Union countries
- OPTHYCS has received €2.5 million from the **Clean Hydrogen Partnership**, a public-private partnership supporting research and innovation (R&I) activities in hydrogen technologies in Europe.

The **OPHYCS** project concluded its activities in December 2025. Over the last three years, the consortium has worked on developing a new optic fibre-based sensor technology to increase the safety of hydrogen applications. Applying this technology will facilitate the uptake of hydrogen by reducing the risks of leakage from production to storage and distribution.

The newly developed optic fibre-based sensors will be able to adapt to both existing gas plants and pipelines, and new infrastructure. Moreover, this technology can analyse and classify the types of hydrogen releases and sources based on risk, location, leak impact, probability of severity, and predictability, increasing the safety level for a major uptake of hydrogen.

Triple strategy

To achieve this innovative technology, the consortium has carried out its work in different phases, dividing OPHYCS' activities into three conceptual areas: the analysis of technological pillars and the definition of a new sensor technology, the validation of that technology through key cases, and aspects of the technologies derived from the use cases.

First, the partners focused on establishing the technologies they have developed during the project to detect H₂ leaks. To this end, the consortium designed a fibre optic-based sensor architecture, a process that included the design of sensitive materials and coatings. At the same time, optical interrogators and an interpretative software were developed to improve sensitivity, reliability and the capability to detect H₂ leaks.

These sensors were then integrated and validated under both real and controlled conditions through various representative use cases, involving pure H₂ and H₂ blended with natural gas (H₂/NG), in aerial and buried pipelines, refuelling stations (HRS), and midstream sites. These tests made it possible to evaluate the performance of the systems in terms of detection time, robustness against interference, behaviour in different environmental conditions and operational reliability.

Finally, the partners have coordinated to ensure that the results obtained in OPHYCS comply with the safety and environmental aspects aligned with the established legal framework. Also, the partnership has evaluated the techno-economic feasibility of the developed solutions, as well as their scalability and replicability.

Future steps

With the activities now completed, OPHYCS's findings will contribute to the uptake of hydrogen by infrastructure operators. In the medium term, OPHYCS will facilitate the industrial deployment of advanced hydrogen leak detection systems, significantly

improving operational safety, infrastructure reliability, and the adaptation of existing gas networks to the transport of hydrogen and H₂/NG mixtures. In the long term, the project will contribute to the consolidation of a safe, competitive and sustainable European hydrogen ecosystem, supporting the objectives of the European Green Deal and positioning European industry as a leader in monitoring technologies for the energy transition.

Nowadays, H₂ has emerged as a required fuel and commodity needed for the decarbonization of the generation, distribution, storage, and energy consumption. The uptake of H₂ may allow the reduction of carbon emissions and the decrease of global temperature, as it may have a “cooling effect” on the atmosphere, assuming the reduction of CH₄ emissions due to the switch to H₂. The current main issue regarding the use of hydrogen is its leakage, and that’s why projects OPTHYCS take importance in such a scenario, as developed solutions tackle this problem.

The results of the project are available on its website. [Through this link](#), you can access the public reports published by the consortium, which focus on areas such as the regulatory situation of the sector and the benefits that the project brings in terms of safety, economics and the environment.






Funding and consortium



The project has received 2.5 million in funding from the [Clean Hydrogen Partnership](#). The Clean Hydrogen Partnership is supporting research and innovation (R&I) activities in hydrogen technologies in Europe. It aims to accelerate the development of advanced clean hydrogen applications ready for market, across end-use sectors such as energy, transport, building and industry, while strengthening the competitiveness of the clean hydrogen value chain. The members of the partnership are the European Commission, the fuel cell and hydrogen industries represented by Hydrogen Europe and the research community represented by Hydrogen Europe Research.



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LOGO	PARTNER
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	<p>Enagás (ES): Enagás is Spain’s TSO (Transmission System Operator) and Technical Manager of the Spanish gas system, with 50 years’ experience in the development, operation and maintenance of energy infrastructures. It has more than 12,000 kilometres of gas pipelines, three strategic storage facilities, eight regasification plants and operates in seven countries: Spain, the United States, Mexico, Peru, Albania, Greece and Italy.</p> <p>In accordance with its commitment to the energy transition, Enagás has announced that it is bringing forward its goal of becoming carbon neutral to 2040. The company is committed to the development of renewable gases (such as biomethane or green hydrogen), sustainable mobility and energy efficiency, among other areas. The company is a world leader in its sector in the main sustainability indices, as the Dow Jones Sustainability Index World, is included in the CDP Climate Change A List 2021, and has obtained the highest ESG rating in its sector in the FTSE4Good sustainability index. Enagás is leading the OPTHYCS project.</p>
	<p>NaTran (FR): NaTran is the new name for GRTgaz, an European leader in NG transmission and a world expert in gas systems. In France, the company operates more than 32,000 km of buried pipelines to transport gas from suppliers to consumers connected to its network. Within Natran, the R&D Center for Energy is the division dedicated to R&D in Research, Development and Innovation for gas infrastructure. NaTran provides tested and proven industrial applications, as well as technical offers based on the development and the sharing of innovative ideas, scientific knowledge and technical expertise developed within the framework of the gas infrastructure, covering 3 main areas: 1) Integrity of metallic and non-metallic networks; 2) Improvement of operational performance, industrial safety and asset management of industrial infrastructure, and 3) Analysis, odorization, detection and metering of gases.</p>
	<p>Tecnalia (ES): TECNALIA Research and Innovation is the first private applied research centre in Spain and the 5th in Europe. In the field of Hydrogen, TECNALIA has been working since 2002 on the development of several technologies within the whole value chain of hydrogen, including hydrogen generation, distribution, transport, storage, and end uses. Moreover, TECNALIA has a new department “Hydrogen Technologies”, with two objectives: 1) coordinating all the activities related to hydrogen at TEC, and 2) developing specific technological solutions for the hydrogen value chain. being Electrolysis technologies the key research line.</p>
	<p>Lumiker (ES): LUMIKER is an entity that has been developing advanced photonic sensors for biotechnology analysis, FBG and Brillouin critical location and distributed fibre optic solutions since 2010 and the first company in the world to develop the measurement of current utilizing the FARADAY effect with our own technologies. LUMIKER provides condition monitoring solutions based in photonic and fibre optic sensors for critical asset management.</p>
	<p>Febus Optics (FR): FEBUS manufactures distributed optical fibre sensing systems: DTS, DSS and DAS. FEBUS brings robustness, flexibility, and cost-effectiveness in all its monitoring solutions for real-time surveillance systems of different infrastructures. FEBUS provides solutions in several markets: Structural health</p>

	monitoring, integrated pipeline integrity monitoring, landslides and intrusion detection, umbilical, power cable and risers life cycle assurance.
	<p><u>Aragon Hydrogen Foundation (ES):</u> FHA is a private non-for-profit technological centre promoted by the Regional Government of Aragón (Spain), other public bodies and private companies. Its team manages R&D projects in cooperation with regional, national and EU companies. FH2A has been supporting the regional strategy for the uptake of hydrogen and fuel cell technologies, publishing the Hydrogen Master Plan in Aragón, and showcasing the whole H₂ chain from production to the efficient use, from renewable sources. FH2A also develop training from students to technicians and D&C activities.</p>
	<p><u>GERG (BE):</u> GERG (The European Gas Research Group), along with its member organisations, work with the European energy community to develop innovative solutions in the European gas infrastructure of the energy system. GERG is an association that represents R&D interests and coordinates corresponding efforts of its members on a EU level. GERG membership includes EU TSOs, DSOs, major NG suppliers, universities and research institutes, as well as international standardisation organisations.</p>

Contact

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