Design of underground hydrogen storage solutions in metal capsules – HY2CAPS.

PROJECT DESCRIPTION – ZL-2024/00578

HY2CAPS aims to develop a safe, efficient, and economically viable system for underground hydrogen storage using metal capsules. The project focuses on designing these capsules by evaluating different types of steel, in order to understand their behavior in the presence of hydrogen, anticipate potential leaks or embrittlement, and ensure long-term integrity. At the same time, research is being conducted into how the ground itself can act as a confinement element, providing stability to the system and enhancing storage performance. The interface between the capsule and the soil is also being studied, developing constructive solutions such as the use of injected concrete to ensure a secure and durable connection.

The project addresses not only the technical aspects of storage but also seeks a practical and scalable solution. The aim is to reduce costs through the use of common materials such as steel, standardize dimensions to facilitate transport, and simplify installation using conventional methods. Altogether, the goal is to offer a replicable, low-impact system that can be efficiently implemented without requiring large surface areas or specialized equipment.

TUBACEX INNOVACIÓN is playing a key role in the development of the project. Its involvement focuses on defining the technical requirements of the capsules for hydrogen storage, considering key parameters such as internal pressure, loading and unloading cycles, and gas purity. Based on these requirements, the company selects the most suitable steels for the expected working conditions and designs specific tests to evaluate their resistance to hydrogen embrittlement, including welded joints. TUBACEX INNOVACIÓN also performs a thorough analysis of the results using microstructural characterization techniques and finite element modeling. This work allows for optimization of the capsule's geometric design and closure system, ensuring gas tightness, structural integrity, and economic efficiency of the storage system. Its work makes a decisive contribution to the development of a safe, reliable, and competitive solution for high-pressure underground hydrogen storage.

CONSORTIUM

Coordinator:

- TEAM INGENIERÍA Y CONSULTORÍA S.L.

Partners:

- TUBACEX TUBOS INOXIDABLE S.A.U.
- VIUDA DE SAINZ, S.L.

Agents of the Basque Network of Science, Technology and Innovation (RVCTI):

- TUBACEX INNOVACIÓN, S.L.
- FUNDACION TECNALIA RESEARCH & INNOVATION

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- Duration: 2024 – 2025

Europar Batasunak kofinantzatua

Cofinanciado por la Union Europea

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