Observatorio Tecnológico del Hidrógeno

Technical Workshop on **Hydrogen storage**

Conclusions

16th July 2024

16th July 2024

Technological challenges ahead for underground hydrogen storage, key for security of supply and decarbonisation targets

Highlights

- The **storage of hydrogen in salt caverns and porous cavities is technically viable and a competitive** option to integrate renewable hydrogen into the energy system
- Key for **security of supply and decarbonization** targets, **hydrogen storages present challenges that require further technological research and technical developments** in place, such as, initiatives for retrofitting existing assets for hydrogen compatibility
- **Tests are being carried out with very encouraging laboratory results**
- **Testing purification membranes under conditions that reflect real-world scenarios**, such as palladium and carbon membranes, have to **undergo rigorous examination**
- **Highly selective hydrogen purification systems reach and exceed the 99.5% maximum purity required**. The technology needs to be scaled up, but it will be ready at the moment when Underground Hydrogen Storages (UHS) facilities require it
- It is **important to maintain the current methane infrastructure** and boost and establish a serious timeline for the UHS facilities development

---

One of the conclusions of this first webinar of the Hydrogen Technology Observatory is that **hydrogen storage within salt caverns and porous substrates are, not only technically feasible, but also economically competitive** and these solutions play a crucial role in integrating renewable-source hydrogen into the existing energy framework.

"The importance of maintaining the current methane infrastructure and establishing a timeline for novel Underground Hydrogen Storage (UHS) facilities", as well as proactive measures at the European level are essential to catalyse the development of UHS capabilities, as stated Rosa Nieto, Engineering and Projects Director at Enagás during a dialogue with Emmanuel Kermarrec, Head of Geosciences and Solutions Mining at Storengy in the first workshop that took place at Enagás Headquarters.

Hydrogen storage presents challenges that require further research and development. These include **optimising injection and extraction cycles, ensuring hydrogen purity, and conducting site-specific analyses for porous media.**

16th July 2024

PureH2 Project: a purification technology to ensure hydrogen purity

The webinar also presented a **specific case of the technology used by the PureH2 project** for refining the purification systems through membranes within salt caverns, coordinated by Enagás and presented by H2Site. This initiative involves also the following partners: CRS, Trinity Capital and IBERPOTASH (ICL Iberia).

The PureH2 project is at the forefront of refining purification systems within salt caverns as it was presented by the Head of Innovation and Technology Development at Enagás and Coordinator of the Hydrogen Technology Observatory, Igor Pagazaurtundua.

This initiative aims to determine the efficiency of the membranes at different hydrogen compositions, production rates, and pressures. Its most innovative aspect involves **testing purification membranes under conditions that reflect real-world scenarios**. For this comparative analysis, both palladium and carbon membranes undergo rigorous examination. Additionally, the findings will shed light on the membranes' longevity and resilience under authentic conditions, as was mentioned by one of the partners of the project in charge of this membrane technological development, the Head of Product at H2SITE, Guillermo García.

The ongoing debate among European Hydrogen Transmission Network Operators (HTNOs) regarding the optimal purity level needed for hydrogen transportation within high-pressure pipelines was raised to Guillermo Garcia, and he stated that the **highly selective hydrogen purification systems are capable of reaching and exceeding the 99.5% maximum purity required**, that although the technology needs to be scaled up, it will be ready at the moment when Underground Hydrogen Storages (UHS) facilities require it.

This initiative has been recognised by the IDAE Institution for its pioneering approach to renewable hydrogen storage and has received funds.

About the Hydrogen Technology Observatory

The role of the Hydrogen Technology Observatory as a forum for dialogue between private, public, and academic stakeholders was explained at the opening and closing of the webinar by the General Manager of Engineering, Technology, and Digitalisation at Enagás, Susana de Pablo. She emphasised and mentioned its objective of fostering renewable hydrogen technology, and guiding key players in the sector towards informed decision-making, future strategies, and emerging needs.

Furthermore, Susana highlighted the importance of **underground hydrogen storage**, as **an essential infrastructure to ensure security of supply and effective management of the hydrogen network.**

She concluded the session by inviting the participants to actively participate and collaborate with the Hydrogen Technology Observatory.

Test in existing underground storages

Porous media are geological formations that contain interconnected spaces between the rock grains, where gas can be stored at pressure. These can be depleted gas fields, or deep saline aquifers. There are many UGS in porous media in Europe, however their feasibility for hydrogen must be proved site by site due to potential bacteria and chemical reactivity, fingering, tightness issues.

Regarding the option of salt caverns, both companies, Storengy and Enagás, **are at the forefront of several initiatives, retrofitting their assets for hydrogen compatibility to drive the energy transition**. Storengy, mentioned the FrHyGe project, supported and funded by the European Union via the Clean Hydrogen Partnership, coordinated by them, with several partners including Enagás. The project aims to test the injection and withdrawal of hydrogen in a natural gas storage facility in France, the target is to replicate it into other EU countries.

In the case of Enagás, at Yela underground storage where hydrogen tests are already being carried out, the company has obtained very encouraging lab results, with samples from water reservoir and from cores, that show very little bacteria reactivity.