

EUH₂STARS

EUROPEAN UNDERGROUND H₂ STORAGE REFERENCE SYSTEM



Project ID	101137798
PRR 2025	Pillar 2 – H ₂ storage and distribution
Call topic	HORIZON-JTI-CLEANH ₂ -2023-02-01
Project total cost	EUR 27 228 904.25
Clean H ₂ JU max. contribution	EUR 19 655 460.13
Project period	01-01-2024 - 30-09-2029
Coordinator Beneficiary	RAG AUSTRIA AG, AT
Beneficiaries	AXIOM POLSKA SP ZOO, TRINITY CAPITAL SL, AGGM AUSTRIAN GAS GRID MANAGEMENT AG, MAGYAR FOLDGAZTAROLO ZARTKORUEN MUKODO RESZVENYTARSASAG, EBN BV ENERGIE BEHEER NEDERLAND BV, AXIOM ANGEWANDTE PROZESSTECHNIK GES.M.B.H., ENERGIEINSTITUT AN DER JOHANNES KEPLER UNIVERSITAT LINZ VEREIN, LINZ STROM GAS WARME GMBH FUR ENERGIEDIENSTLEISTUNGEN UND TELEKOMMUNIKATION, SHELL GLOBAL SOLUTIONS INTERNATIONAL BV, MONTANUNIVERSITAET LEOBEN, NEDERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK TNO

<http://euh2stars.eu>

PROJECT AND GENERAL OBJECTIVES

EUH₂STARS (European Underground Hydrogen STorAge Reference System) is an ambitious, industry-driven flagship project with the motto 'Paving the way towards the future of European underground hydrogen storage'. EUH₂STARS aims to demonstrate competitive, complete and qualified underground hydrogen storage (UHS) in depleted porous natural gas reservoirs at technology readiness level (TRL) 8, by the end of the decade. RAG Austria AG contributes with an existing UHS pilot facility, developed to TRL 6 within the Underground Sun Storage 2030 project. EUH₂STARS combines implementation experience from the Underground Sun Storage 2030 project, with UHS project experiences from consortium partners to develop and define overarching rules and recommendations for UHS development across Europe. Furthermore, EUH₂STARS addresses the conversion of existing underground natural gas reservoirs into underground hydrogen storages and their integration into the future European hydrogen infrastructure. This will be demonstrated via several UHS replicator sites located in Austria (RAG), Hungary (HGS), The Netherlands (SHELL), and Spain (TES). In this way EUH₂STARS aims to deliver the following key results:

- Demonstration of the storage of pure hydrogen in depleted, porous reservoirs by operating four seasonal storage cycles at RAG's demonstrator and two storage cycles at HGS's replicator site. Each storage cycle considers different operational characteristics to demonstrate market-driven UHS operation at the project's end.
- Development of a beyond state-of-the-art hydrogen purification system and integration into the withdrawal process of RAG's demonstrator with the objective to demonstrate a successful separation of impurities from hydrogen within a real-world set-up.

During gas withdrawal from the demonstrator standardised hydrogen purification levels (e.g. hydrogen grade A or better) should be achieved.

- Achievement of a relevant green hydrogen certification for the demonstrator's power to hydrogen electrolysis and engage actively in green hydrogen certificate trading.
- Provision of guidelines to successfully manage all environmental, safety, legal and (future) regulatory, societal and market-related aspects to ensure a successful implementation of UHS facilities in Europe.
- Execution of an active stakeholder engagement strategy including an external expert advisory board to consider third parties' opinions and maximise public acceptance, transparency, visibility and exploitation of the project results.
- Set-up of a generic framework on the topic of health, safety, environment and quality, including a facility site monitoring plan to ensure UHS at an 'as low as reasonably practicable' risk level when operating RAG's demonstrator, the replicator and future commercial UHS sites.
- Presentation of transformation pathways to replicate demonstrator findings in full-scale commercial settings, both at existing underground natural gas storage facilities and at newly developed UHS sites in depleted natural gas reservoirs across Europe. This includes subsurface design, surface facilities engineering, and a comprehensive CAPEX assessment.
- Provision of best practice examples on how to integrate UHS facilities into regional, national and European energy infrastructure and markets by showcasing specific use cases in Austria, Hungary, the Netherlands and Spain, including integration into the European Hydrogen Backbone.



PROGRESS, MAIN ACHIEVEMENTS AND RESULTS

- EUH₂STARS started with a kick-off meeting.
- WP1 specified the to-be-used Societal Embeddedness Level methodology and guidelines for implementation.
- WP2 published a measurement, monitoring and verification plan for the UHS Rubensdorf demonstration facility and a Hydrogen safety planning.
- WP4 started initial works on UHS scale-up studies.
- In WP6 a communication and dissemination plan as well as a stakeholder survey and mapping including stakeholder engagement plan were developed.
- In WP6 a report on hydrogen value chain programs and structures, and on European

development projects was created.

- In WP7 the Data Management Plan as well as a project homepage and project folder were created.

FUTURE STEPS AND PLANS

In 2025 the consortium will physically meet in the Netherlands, allowing an in-person exchange between the partners across several topics. The project is expected to progress according to the Grant Agreement. Communication, exploitation and dissemination activities are expected to be carried out according to individual plans and gain traction as more results become available. After finalising and submitting the Rubensdorf operations plan, RAG's 100% hydrogen storage demonstration facility will commence its first of four seasonal storage cycles under the EUH₂STARS project in 2025.

PROJECT TARGETS

Target source	Parameter	Unit	Target	Target achieved?
Project's own objectives	Hydrogen purification achieved at exit of hydrogen purification unit	%	98 - Grade A according to ISO 14687	
	Hydrogen Recovery factor	%	95	