

Topics in the call 2025

Hydrogen Storage and Distribution

D. Tsimis, P. Caloprisco



Hydrogen Storage and Distribution Overview



Main Focus

Hydrogen Storage

- Mined, Lined Rock Caverns

Hydrogen Distribution

- Flexible Hydrogen Compression System
- Scalable Ammonia Cracking



What is new

- New type of underground storage option addressed
- Scalability and size of the Ammonia Cracking Prototype $\geq 100\text{kgH}_2/\text{day}$

Hydrogen Storage and Distribution Overview

Topic	Type of Action	Budget (M€)
HORIZON-JU-CLEANH2-2025-02-01: Development of mined, lined rock cavern for gaseous hydrogen storage	RIA	5
HORIZON-JU-CLEANH2-2024-02-02: Development of cost effective and high-capacity compression solutions for hydrogen	RIA	5
HORIZON-JU-CLEANH2-2024-02-03: Demonstration of scalable ammonia cracking technology	IA	6*

***This is the maximum Clean Hydrogen JU contribution that may be requested – proposals requesting Clean Hydrogen JU contributions above this amount will not be evaluated.**

Hydrogen Storage - Topic

HORIZON-JU-CLEANH2-2025-02-01: Development of mined, lined rock cavern for gaseous hydrogen storage



Addressing the technical challenges through studies, tests and a combination of laboratory and field demonstrations (TRL 3→5)



- Address low-cycle fatigue and hydrogen embrittlement impacts on steel liners, concrete buffers, and surrounding rock in mined, lined rock caverns.
- Study steel corrosion, hydrogen effects, and alternative concrete binders to enhance durability and environmental sustainability..
- Simulate and test geological and operational impacts; develop advanced monitoring methods for early failure detection.
- Propose standardized designs, guidelines for risk management, and techno-economic analyses for various hydrogen storage applications.

Hydrogen Distribution - Topics

HORIZON-JU-CLEANH2-2025-02-02: Development of cost effective and high-capacity compression solutions for hydrogen

 Advancing Hydrogen Compression: Flexible, Efficient, and Scalable Technologies for Diverse Applications (→TRL 5)



- Develop a scalable and flexible compression technology for pressures ranging from 30-900 bar to support PtX applications, hydrogen refueling stations, and pipeline transport.
- Focus on novel materials, coatings, and cooling systems to enhance energy efficiency, durability, and reduce operational costs (targeting 0.2 €/kg).
- Design and test a full-scale compressor prototype (TRL5) under real-world conditions, achieving capacities up to 150 kg/h (HRS) and 5000 kg/h (pipeline).
- Plan pathways to market readiness, align with hydrogen standards, and explore integration with broader hydrogen infrastructure.

Hydrogen Distribution - Topics

HORIZON-JU-CLEANH2-2025-02-03: Demonstration of scalable ammonia cracking technology



Efficient Ammonia Cracking: Scalable Technology for Clean Hydrogen Production (TRL 5 →7)



- Develop a compact, modular, and scalable system to efficiently produce high-purity hydrogen (≥ 100 kg/day) for industrial and off-grid applications.
- Focus on novel catalysts, reactor designs, and process intensification for improved efficiency, scalability, and compliance with safety and sustainability standards.
- Prototype operation for 5000+ hours; assess scalability to 10 tonnes/day with comprehensive techno-economic, life-cycle, and sustainability analyses.
- Align with EU projects on renewable ammonia, hydrogen safety, and metrology to enhance competitiveness and industrial leadership.