



Pre-normative research on Integrity assessment protocols of Gas pipes Repurposed to Hydrogen and Mitigation guidelines

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Clean Hydrogen Partnership

Introduction and Objectives

PilgrHYM is an interdisciplinary project which aims to contribute to the **decarbonization** of the energy sector by providing a **European roadmap** with comprehensive guidelines to assess the feasibility of **safely and efficiently integrating pure H₂** into existing natural gas infrastructure.

The **objectives** of the project are:

- Develop a database of material characterization testing on representative steel grades of the EU gas grids, including tensile, fracture toughness and fatigue crack growth (FCG) properties.
- Establish harmonized testing protocols to support the repurposing of natural gas lines to hydrogen.
- Develop a numerical modelling approach for simulating and predicting hydrogen assisted fracture and fatigue.
- Optimize a more realistic FCGR (Fatigue Crack Growth Rate) master curve for fitness-for-service assessment purpose, in particular for low ΔK values corresponding to the actual operating domain of the EU gas grids.
- Identify existing and/or innovative technologies for mitigation compatible with operational constraints.
- Engage with stakeholders to ensure cooperation and awareness.
- Facilitate the uptake and exploitation of PilgrHYM results by the academic community, technology developers and end-users.

Methods

- Inventory of the pipeline steels grades used on the European gas grids
- Survey of the operating conditions considered for hydrogen transportation among the European TSOs
- Selection of the steel grades to be included in the experimental campaign
- Review of the existing codes, standards, and recommended practices for definition of mechanical performance of steel materials in hydrogen environment
- Combined experimental and numerical approach to evaluate, improve, and validate an optimized experimental procedure for laboratory testing
- Literature review of existing and promising techniques to mitigate the effect of hydrogen embrittlement on pipeline steels
- Development of two guidelines for the RSC-SC

Expected Outcomes

- Definition of optimized testing procedures for hydrogen compatibility assessment of pipeline steels
- Assessment of novel time- and cost- effective experimental procedures for material qualification in hydrogen environment
- Development of database summarizing the characterized relevant properties of pipeline materials in hydrogen gas
- New and innovative models for hydrogen-induced fracture and fatigue cracking simulation
- Improved and more cost-effective FCG-master curves developed, with number of experimental tests reduced

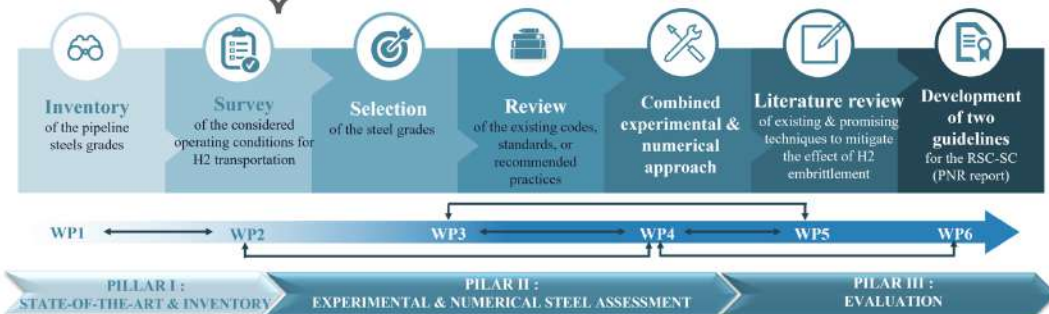


Figure 1. PilgrHYM structure in work packages and pillars

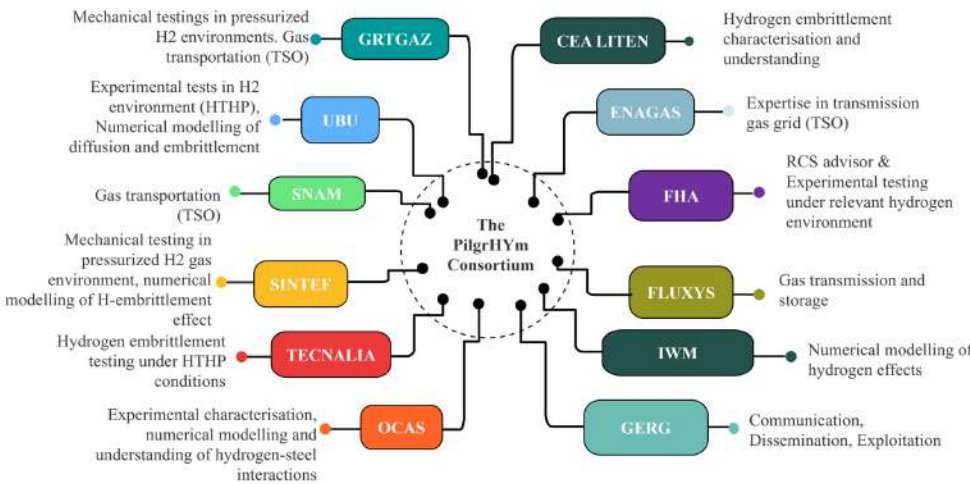


Figure 2. PilgrHYM interdisciplinarity and complementarity

About the project

Duration: 01/2024 to 12/2027
 Total budget: 3.99M€
 Website: www.pilgrhym.eu
 Project Coordinator: GRTgaz, RICE (Research and Innovation Center for Energy), 1-3 Rue du Commandant Estienne d'Orves, 92390 Villeneuve-la-Garenne, France
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