

# CANDHy

## COMPATIBILITY ASSESSMENT OF NON-STEEL METALLIC DISTRIBUTION GAS GRID MATERIALS WITH HYDROGEN



Project ID	101111893
PRR 2025	Pillar 2 – H <sub>2</sub> storage and distribution
Call topic	HORIZON-JTI-CLEANH <sub>2</sub> -2022-02-01
Project total cost	EUR 2 607 481.25
Clean H <sub>2</sub> JU max. contribution	EUR 2 607 481.00
Project period	01-09-2023 - 31-08-2026
Coordinator Beneficiary	FUNDACION PARA EL DESARROLLO DE LAS NUEVAS TECNOLOGIAS DEL HIDROGENO EN ARAGON, ES
Beneficiaries	SUMNISTROS INDUSTRIALES DIVERSOS SA, GRTGAZ, REDEXIS GAS SERVICIOS SL, REDEXIS SA, GERG LE GROUPE EUROPEEN DE RECHERCHES GAZIERES, RINA CONSULTING - CENTRO SVILUPPO MATERIALI SPA, UNIVERSITA' DEGLI STUDI DI BERGAMO, FUNDACION TECNALIA RESEARCH and INNOVATION

<http://candhy.eu/>



### PROJECT AND GENERAL OBJECTIVES

- Performing a comprehensive review of the state of the art in European gas distribution grids, standards and testing codes for material compatibility with hydrogen, and hydrogen embrittlement mechanisms. The collected information will support the development of testing protocols to determine the properties of material classes studied in CANDHy under relevant operating conditions.
- Designing, developing and performing an experimental campaign to test the most relevant non-steel metallic materials found in CANDHy under different hydrogen levels in order to assess their tolerance towards this gas at operating conditions applicable for the distribution grid.
- Documenting and analysing the effect of hydrogen gas on the non-steel metallic materials tested in the aforementioned experimental campaign.
- Developing models for the prediction of hydrogen embrittlement mechanisms.
- Proposing guidelines, procedures and areas of development to support future standardisation of the testing and qualification of materials in the distribution network in the presence of hydrogen and natural gas blends.
- Developing a technical database on the hydrogen compatibility of metals as a tool to aid in the selection of materials for use in hydrogen gas distribution.

### PROGRESS, MAIN ACHIEVEMENTS AND RESULTS

- A thorough review of the state-of-the-art of grid materials has been performed by creating a questionnaire and distributing it among DSOs and gas associations to collect relevant data (i.e. type of materials, year of installation, pipeline length, etc.).

- A review of the state-of-the-art of relevant standards useful for studying embrittlement phenomena in non-steel metallic materials has been performed.
- A literature review about hydrogen dissociation, solubility and diffusion in non-steel metallic materials was performed.
- The information extracted from the different reviews allowed the selection of the most representative materials to carry out the experimental campaign. In addition, it allowed the design of the experimental matrix to be followed in the campaign, which is currently underway.
- Experimental test matrix along with main characteristics of materials selected and specimen geometries were collected.
- Testing platforms were adapted to the new operating conditions (pressure level 16 bar) and to allocate the new kinds of non-steel metallic components.
- The selected testing materials were acquired and machining is under progress. The first specimens for slow strain rate testing were distributed among partners and testing is ongoing.

### FUTURE STEPS AND PLANS

- Completing the machining of specimens for the Round Robin Test and begin the machining of specimens for individual testing.
- Continue with the experimental campaign, finish the Round Robin Test and start the complementary tests on non-steel metallic materials.
- Analyse the empirical testing results and start developing a semi-empirical method to relate the quantitative parameters obtained to the characteristics of each material.
- Create a database of gas grid metallic materials behaviour to serve as a repository of technical data.



## PROJECT TARGETS

Target source	Parameter	Unit	Target	Achieved to date by the project	Target achieved?
<b>Project's own objectives</b>	Inventory of distribution grid materials	Km	Collect as much information as possible from European DSOs	2 471 198.91	✓
	Review of SoA standards related to hydrogen embrittlement tests	Number of standards	Review as many standards as possible	9	
	Database with compatible non-steel metallic materials	Number	Create one database	-	⚙️
	Study the impact of hydrogen on non-steel metallic materials	Number of materials analysed	Cover at least 5 materials	-	
	Semi-empirical model	Number	Construct 1 model to anticipate embrittlement	-	
	Harmonised guidelines	Number	Propose harmonised guidelines for future standardisation	-	