HIGGS
Hydrogen In Gas GridS: a systematic validation approach at various admixture levels into high pressure grids

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HIGGS Hydrogen in Gas Grids

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Project Overview

Call year:
2019

Call topic:
Systematic validation of the ability to inject hydrogen at various admixture level into high-pressure gas networks in operational conditions - H2020 HORIZON FCH 02-5-2019

HIGGS

Project dates:
2020-2023

Total project budget:
2,107,672.50 €

% stage of implementation
01/11/2019: 95 %

Clean Hydrogen Partnership max. contribution: 2,107,672.50€

Other financial contribution: 0 €

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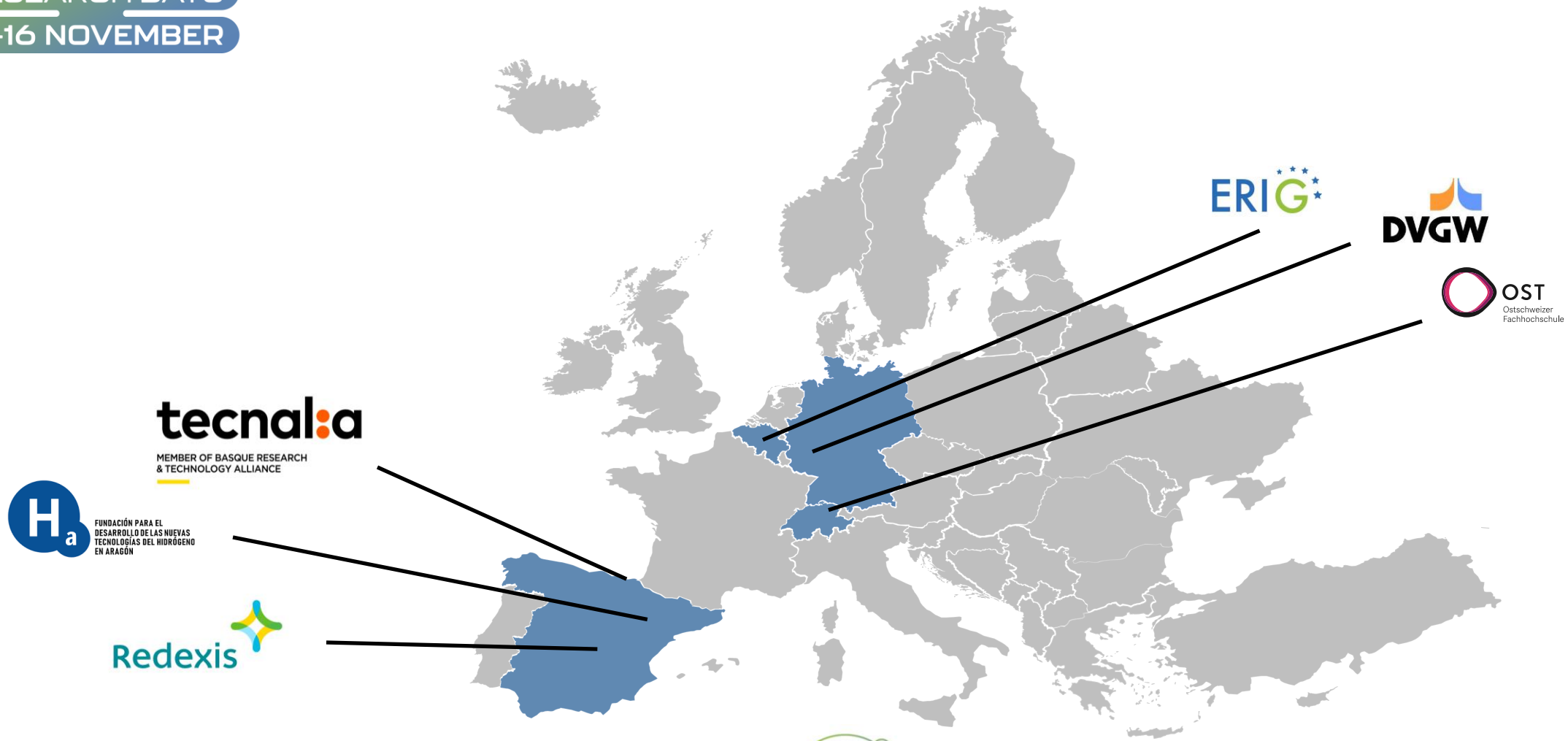
Partners



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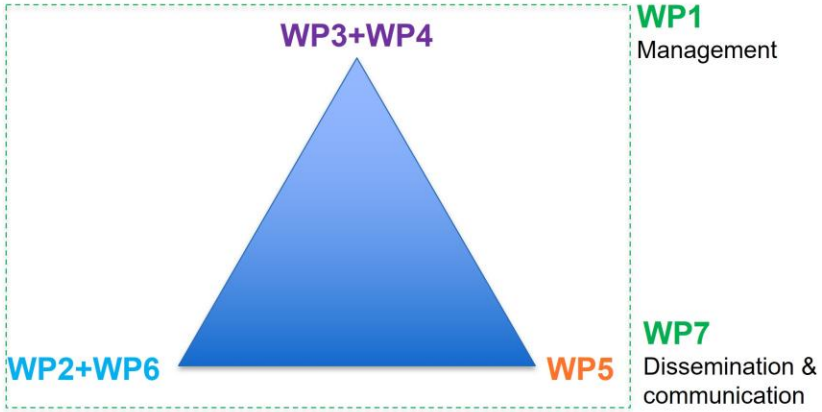
Project Summary

Goal

HIGGS project aims to pave the way to **decarbonisation of the gas grid** and its usage, by **covering the gaps of knowledge of the impact** that high levels **of hydrogen** could have **on the gas infrastructure**, its components and its management.



Specific objectives

- Mapping of technical, legal and regulatory barriers and enablers ☑
- Testing and validation of systems and innovation ☑
- Techno-economic modelling to develop operation strategies ☑

➔ **Defining a set of conclusions as a pathway towards enabling the injection of hydrogen in high-pressure gas grids** UNDER CONSTRUCTION

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Experimental testing campaign on tightness Progress/Actions - Completion

Achievement to-date

0% completed

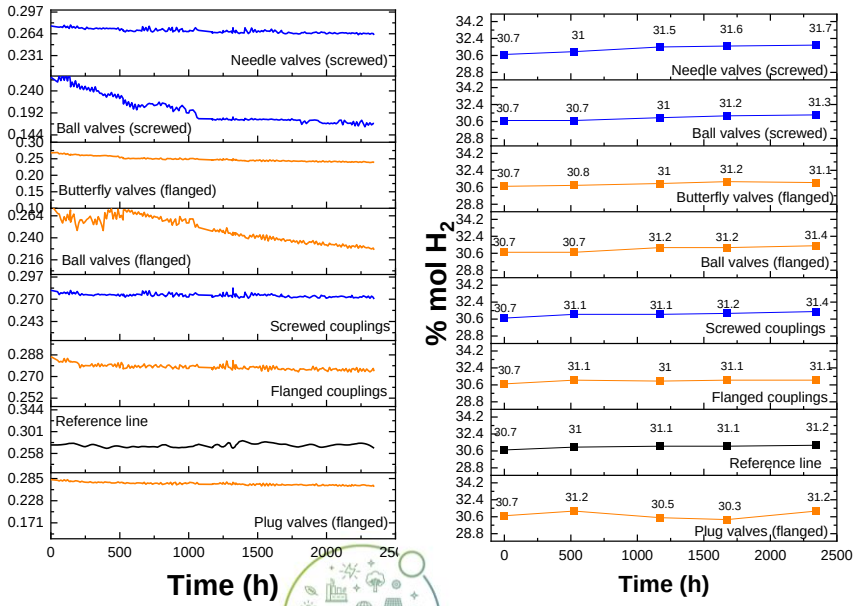
$20\%H_2$ $20\%H_2$ +impurities $100\%H_2$

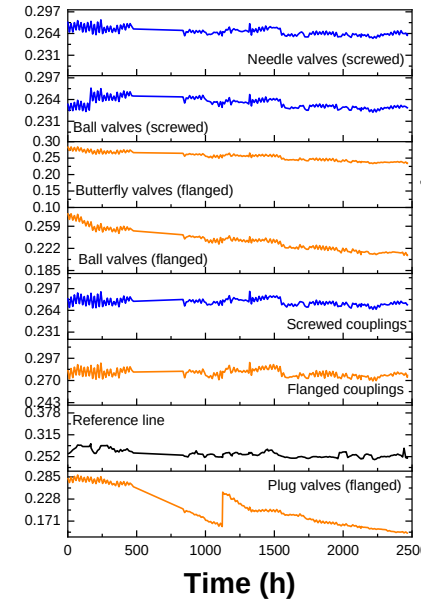
100 % completed

$30\%H_2$ +impurities

Main conclusions

- No critical pressure losses during the tests
- Oscillation in H_2 concentration <1%mol
- Max. average leakage rate of hydrogen 1 Nml·h^{-1}per valve.
- No preferential hydrogen permeation over methane





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Experimental testing on steels Progress/Actions – Completion

Achievement to-date

0% completed

$20\%H_2$ $20\%H_2$ +impurities $100\%H_2$

100 % completed

$30\%H_2$ +impurities

Main conclusion

- No signs of embrittlement C-ring or 4pb specimens
- No noticeable crack propagation in CT-Wol specimens
- Further validation in SSRT tests ongoing

Specimens of X70 steel

Tecno-economic modelling Progress/Actions - Completion

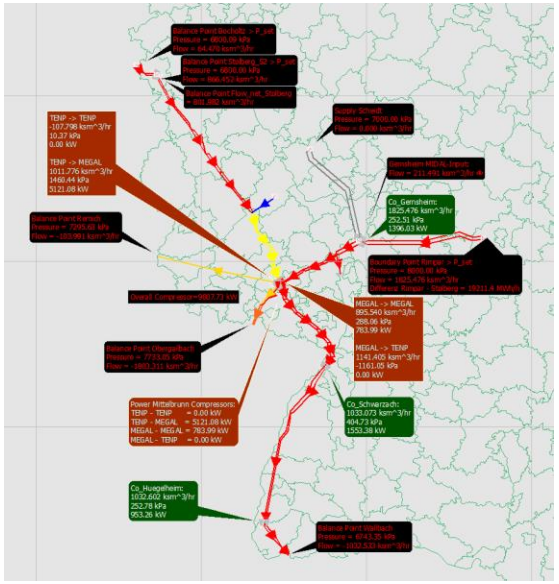
Achievement to-date

0% completed

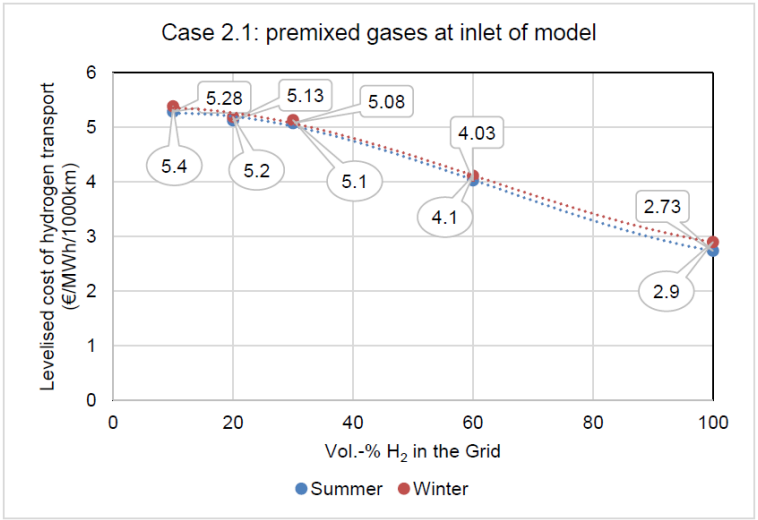
$20\%H_2$ $30\%H_2$ $60\%H_2$ $100\%H_2$

100 % completed

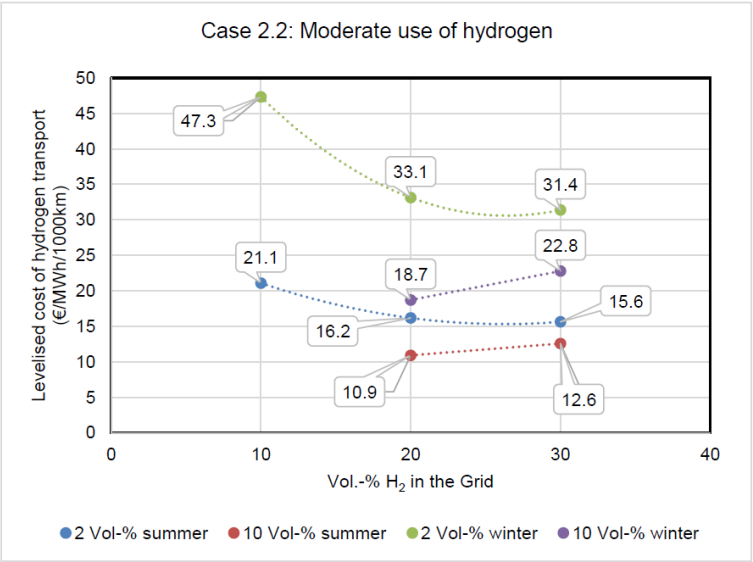
The TENP-MEGAL intersection



Costs w/o gas separation



Costs with gas separation



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Risks, Challenges and Lessons Learned

Lack of information on the European high-pressure gas grid

- TSOs not contributing with data either due to own projects or sorrows on the confidentiality
  - ➢ Use of public databases to validate and extrapolate results

Delay in assembly and maintenance intervals of the R&D platform

- Need for project extension (12 months)
- Failure in gas booster of the testing platform reported in HELLEN
  - ➢ New planning of experimental campaing
  - ➢ Run some tests in static mode

Risks, Challenges and Lessons Learned

Acquisition of network data for simulations

- There is no standardized method for such task
- It is very difficult to obtain solid data from TSO
  - ➢ Simplification of the model to pure CH_4 instead of natural gas

Clear gaps in standardisation towards hydrogen

- High dynamic process in Europe made difficult to make timeless statements
- Gas package has complicated the blending scenario in high-pressure grids
  - ➢ Adaptation to the latest trends
  - ➢ Trying to accommodate those TSOs still willing to blend

Dissemination Activities

What happened so far:

- Over **60 conferences, workshops,** and **events** have been attended
- Several deliverables on **Material testing** (D4.3, D4.3), on **techno-economic analysis** (D5.3, D5.4) and on the **potential of H_2 injection** in gas grids (D6.1) have been published: https://higgsproject.eu/downloads/

What is planned in 2023:

- **Closing Conference** during the EU Hydrogen Week 21st of November, 9:00-13:00 CET in Brussels https://erig.eu/higgs-closing-conference-during-eu-hydrogen-week-on-november-21st-2023-in-brussels/

- **Project Brochure** with the HIGGS results will be published on the 21st of November and can be accessed here: https://higgsproject.eu/higgs-project-brochure/

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Exploitation Plan/Expected Impact

Exploitation

6 KERs identified in HIGGS of different nature (experimental results, recommendations, modelling results, etc.)

Horizon Results Booster module C and Business Plan Development Service have assisted

Business model developed for the testing platform KER

Impact

Name of the Result	Expected time to impact	Target Group	Market maturity
Testing Platform	1-5 years	Policy-makers and authorities, international Standardisation Bodies Innovators	Emerging: Growing demand and few offerings
System for seperation of low concentration of hydrogen in natural gas	1-5 years	Industry/Business Partners	Emerging: Growing demand and few offerings
Design of injection sites	1-5 years	Industry/Business Partners	Emerging: Growing demand and few offerings
Recommendations on codes, standards adaption	1-5 years	Policy-makers and authorities, international	-
Recommendations and inventory list for adaptions of the gas grid	1-5 years	Industry/Business Partners	-
Adapted techno-economic models to include innovations and considerations for H2 admixtures	1-5 years	Policy-makers and authorities, international)	-

THANKS FOR YOUR ATTENTION!

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