MefHySto - Metrology for Advanced Hydrogen Storage Solutions

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"Hydrogen will play a major role in energy storage systems – the project will secure correct metrology of hydrogen and hydrogen blends"

MefHySto addresses the need of large-scale energy storage, which is required for a shift to renewable energy supply. Such storage is required to supply energy at peak times when renewable sources fluctuate and can be realized with large-scale use of hydrogen. Three different methods of storage are envisaged:

- reversible storage in solids by hydrides or adsorption in porous media.
- underground storage in geological cavities
- insertion into the natural gas grid

Metrological traceability in the energy infrastructure for hydrogen storage is crucial. Thus, improved knowledge of chemical and physical properties of hydrogen as well as traceable measurements and validated techniques are imperative.

Project Duration
01.09.2020 - 31.08.2023

Project Budget
Total Budget: €
Funding: €

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Project Website
www.mefhysto.eu

Objectives

1 Power-to-Hydrogen

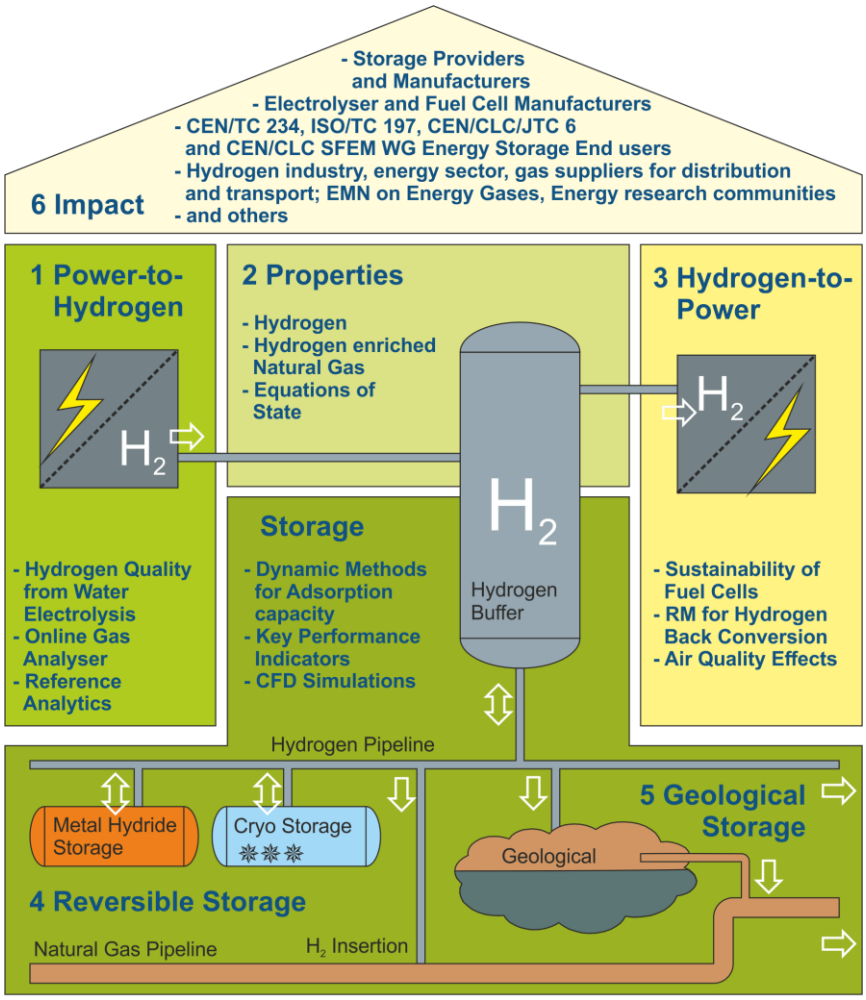
Assess the quality of hydrogen produced from proton-exchange membrane (PEM) water electrolysis during rapidly imposed transient use periods (0–100 %, 200 % peak) with online gas analysers for measuring key impurities (including water vapour and oxygen).

2 Properties

Improve the reference equations of state (EoS) used for modelling hydrogen injection up to 20 % vol. for energy metering by providing traceable density measurements with a target uncertainty of between 0.03 % to 0.5 % as the basis for accurate determination of calorific values of energy gases.

3 Hydrogen-to-Power

Investigate sustainability and reliability of fuel cells (FC), whose performance is affected by impurities in hydrogen and air, by conducting loss-of-performance tests on single-cell and short-stack FCs and to give specification and recommendations for air quality sensors needed for monitoring FC systems.



4 Reversible Storage

Provide a validated method for measuring and calculating heat conductivity of hydrogen ab/adsorbed in an intermetallic material or porous materials as a function of temperature, pressure, hydrogen absorption capacity and rate, considering dynamic heat flux impact and to develop a harmonised method (< 1 % uncertainty) for stored hydrogen.

5 Geological Storage

Tackle metrological and thermodynamic issues in the large-scale storage of hydrogen in underground gas storages (UGS) and the conversion of existing UGS from natural gas to hydrogen.

6 Impact

Facilitate the take up of the technology and measurement infrastructure developed in the project by the measurement supply chain (water electrolyser manufacturers, metal hydride tanks manufacturers), organisations engaged in developing standards, end users and energy research.

Uptake

1 Impact on industrial and other user communities

The gas industry and energy storage operators require reliable measurements of quantities, quality and energy content at the transfer points/hubs in the energy network. The project will allow operators of gas networks and gas storage facilities to select suitable measurement technologies for the traceability of national standards.

2 Impact on the metrology and scientific communities

The project will impact the current methods and standards, such as ISO 14687 (Grade A), EN 16723-1 or ISO/TR 27921. Work instructions developed in the project will be used as input for standards used by specialty gas manufacturers and analytical laboratories working according ISO 17025 and 17034 (RM production).

3 Impact on relevant standards

The project will improve methods on measuring hydrogen physico-chemical properties for energy gases with varying hydrogen content. The work will improve current analytical methods for gas composition and purity analysis in a number of standards committees.

4 Longer-term economic, social and environmental impacts

In general, the project will support a more sustainable economy and a reduction in the use of fossil energy resources. The establishment of metrology for hydrogen storage by the project will help to provide greater confidence for national and EU funding bodies, industry and private investors to roll out the infrastructure required to deliver the transition to large-scale use of hydrogen as an energy vector.

Project Partners

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CZECH METROLOGY INSTITUTE

BAM Bundesanstalt für Materialforschung und -prüfung

Universidad de Valladolid

DVGW

NPL National Physical Laboratory

ERIG

MAHYTEC

Ha FUNDACIÓN PARA EL DESARROLLO DE LAS NUEVAS TECNOLOGÍAS DEL HIDRÓGENO EN ARAGÓN

reganosa

PTB Physikalisch-Technische Bundesanstalt Braunschweig und Berlin

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