Project Overview

- Call year: 2018
- Call topic: FCH-02-5-2018: Hydrogen carriers for stationary storage of excess renewable energy
- Project dates: 01.01.2019 - 31.07.2023
- % stage of implementation 01/11/2023: 100%
- Total project budget: 1,999,230 €
- Clean Hydrogen Partnership max. contribution: 1,999,230 €
- Other financial contribution: 0 €
- Partners: UNIVERSITA DEGLI STUDI DI TORINO (Italy), ENGIE (France), GKN SINTER METALS ENGINEERING GMBH (Germany), TECNODELTA SRL (Italy), STÜHFF MASCHINEN- UND ANLAGENBAU GMBH (Germany), FONDAZIONE BRUNO KESSLER (Italy), HELMHOLTZ-ZENTRUM GEESTHACHT ZENTRUM FUR MATERIAL- UND KUSTENFORSCHUNGGMBH (Germany), CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS (France), INSTITUTT FOR ENERGITEKNIKK (Norway)
Project Summary

- High quantity of stored hydrogen \( \geq 50 \text{ kg} \)
- Low pressure \(< 50 \text{ bar}\) and low temperature \(< 100^\circ\text{C}\)
- Low footprint, comparable to liquid hydrogen storage
- Innovative design
- Hydrogen storage coupled with thermal energy storage
- Improved energy efficiency
- Integration with an electrolyser (EL) and a fuel cell (FC)
- Demonstration in real application
- Improved safety
- Techno-economical evaluation of the innovative solution
- Analysis of the environmental impact via Life Cycle Analysis (LCA)
- Exploitation of possible industrial applications
- Dissemination of results at various levels
- Engagement of local people and institution in the demonstration site
Project Concept

H₂ Absorption

H₂ Desorption

H₂ flow

H₂ flow

MH

PCM

H₂

H₂

heat flow

heat flow

HyCARE
Project Progress/Actions

Temperature and pressure

Achievement to-date

**COMMERCIAL ALLOYS**
- $< 70 \, ^\circ\text{C}$
- $< 100 \, \text{bar}$

**HyCARE FeTi alloy**
- $55 \, ^\circ\text{C}$
- 25-2 bar

Safety
- $< 30 \, \text{bar}$
- Low pressure storage

Safety
- $< 70 \, ^\circ\text{C}$
- Low temperature storage
Project Progress/Actions

Amount of stored hydrogen

Achievement to-date

LAB SCALE COMMERCIAL TANKS
< 1 kg

HyCARE
46 kg

25%  50%  75%  100%

50 kgH₂

High quantity of stored hydrogen
Project Progress/Actions

Energy efficiency

Achievement to-date

- COMMERCIAL TANKS NO HEAT RECOVERY
  - 25%
- HyCARE HEAT RECOVERY WITH PCM >90%
  - 100%

Efficiency

- >70% Total round trip energy efficiency
- <5.0 kWh/kg H₂ External energy source with innovative design for large scale storage and use of non-critical raw materials

Co-funded by the European Union

Clean Hydrogen Partnership

European Hydrogen Week
Project Progress/Actions

Integration

Achievement to-date

25% 50% 75% 100%

NO COMMERCIAL SYSTEMS

HyCARE INTEGRATED SYSTEM

HyCARE Exhibition Meeting
Paris, April 21°, 2023
Exploitation Plan/Expected Impact

Exploitation

Impact

Co-funded by the European Union
Communications and Dissemination Activities
HyCARE
Hydrogen CArrier for Renewable Energy Storage

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