SINGLE

ELECTRIFIED SINGLE STAGE AMMONIA CRACKING TO COMPRESSED HYDROGEN

Project ID	101112144
PRR 2024	Pillar 2 – H_2 storage and distribution
Call topic	HORIZON-JTI-CLEANH2-2022-02-04: Ammonia to green hydrogen: efficient system for ammonia cracking for application to long distance transportations
Project total cost	EUR 2 989 671.25
Clean H_2 JU max. contribution	EUR 2 989 671.25
Project period	1.5.2023–30.4.2026
Coordinator	CoorsTek Membrane Sciences AS, Norway
Beneficiaries	Consejo Superior de Investigaciones Científicas, Fondazione ICONS, Gea Energia Crio SL, SINTEF AS, Universitat Politècnica de Catalunya, Univerza v Ljubljani

https://singleh2.eu/

PROJECT AND GENERAL OBJECTIVES

Single will enable ammonia to be used as an energy carrier in the hydrogen value chain through the demonstration of a proton ceramic electrochemical reactor that integrates the ammonia dehydrogenation reaction, hydrogen separation, heat management and compression in a single stage. The combination of the four steps in a single reactor allows the technology to achieve unprecedented energy efficiencies and deliver purified, pressurised hydrogen (20 bar). Single will demonstrate the technology at a 10 kgH_2/day scale that will provide a pathway for future scaled-up systems, ranging from small (fuelling stations) to large, centralised (at harbours) structures.

NON-QUANTITATIVE OBJECTIVES

Single aims to disseminate information to relevant communities and maximise the outcomes and reach of the project.

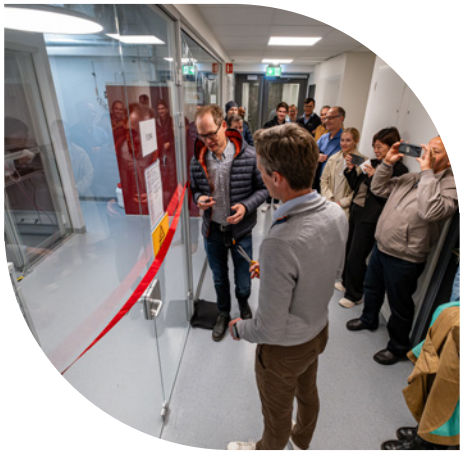
Those involved in implementing the project collaborate with standardisation organisations to valorise project results by contributing to the creation or revision of standards. To achieve this goal, Single has used HSbooster.eu's consultancy services to guide the project consortium to ensure the adoption of the right strategic approach and efficient contribution to the standardisation process.

PROGRESS AND MAIN ACHIEVEMENTS

- Ni and barium zirconium yttrium cerate support catalytic activity, and their stability has been studied to enable optimisation by infiltrating the active metal and changing the morphology of Ni and its interaction with the barium zirconium yttrium cerate support.
- Candidate alloy materials have been identified for constructing and safely operating reactor housing in the presence of ammonia.
- Cells, KETs and stacks have been manufactured.
- Single collaborated with Hsbooster.eu for 3 months to perform standardisation activities.

FUTURE STEPS AND PLANS

- The proton ceramic electrochemical reactor cell will be further optimised to improve its catalytic activity and electrochemical performance under relevant conditions.
- Stacks for 10 kgH_2/day module will be fabricated.
- The 10 kgH_2/day module will be designed, assembled, constructed and tested.
- The life cycle, value chain economics and critical raw materials of the system will be assessed.



PROJECT TARGETS

Target source	Parameter	Unit	Target	Target achieved?	SOA result achieved to date (by others)
SRIA (2021–2027)	Hydrogen-carrier-specific energy consumption	kWh input / kgH_2 recovered	17		20
	Hydrogen carrier delivery cost (for 3 000 km ship transfer)	€/kg	2.5		4

Clean Hydrogen Partnership
Co-funded by the European Union