NOAH2

NOVEL SOE ARCHITECTURES FOR HYDROGEN PRODUCTION

Project ID	101137600
PRR 2024	Pillar 1 – Renewable hydrogen production
Call topic	HORIZON-JTI-CLEANH2-2023-01-02: Innovative solid oxide electrolysis cells for intermediate temperature hydrogen production
Project total costs	EUR 2 656 024.00
Clean H_2 JU max. contribution	EUR 2 655 084.00
Project period	1.12.2023–30.11.2026
Coordinator	Danmarks Tekniske Universitet, Denmark
Beneficiaries	Commissariat à l'énergie atomique et aux énergies alternatives, Genvia, Haute école spécialisée de Suisse occidentale, Idryma Technologias Kai Erevnas, Liberty Powder Metals, SINTEF AS

https://cordis.europa.eu/project/id/101137600

PROJECT AND GENERAL OBJECTIVES

The overall goal of the NOAH2 project is to provide a robust, cost-competitive, flexible and durable stack concept for hydrogen production at intermediate temperatures through innovative electrode, cell and stack designs. NOAH2 will boost the electrolysis performance of solid oxide cells and stacks significantly beyond the state of the art (SOA) through a combination of optimised structures and highly active materials, with a focus on reducing use of critical raw materials (CRMs) and improving manufacturability using well-established, large-scale routes for solid oxide technology. The NOAH2 stack architecture relies on a metal-based, monolithic concept with infiltrated electrodes.

NOAH2 will outline a path towards commercialisation, provide a sustainability classification with emphasis on substituting CRMs, provide an assessment of commercialisation potential compared with those of SOA SOEL, polymer electrolyte membranes and alkaline electrolysers, and identify potential industrial players for high-volume manufacture.

Specific technical objectives for NOAH2 are to:

- reduce the cost of SOEL stacks by 50 % compared with that of the SOA through (i) use of metallic instead of ceramic supporting components, (ii) integration of support layer / interconnect functionalities into a single layer and (iii) reduction of the stack volume by at least 20 % by developing a metal-based, monolithic structure;
- increase the hydrogen production rate (current density) by 20 % compared with that of the SOA, reaching 1.2 A/cm^2, through using innovative electrode materials and structuring with infiltration of materials of superior electrocatalytic activity at temperatures below 700 °C;
- demonstrate commercially viable durability with degradation rates below ~ 0.75 %/1 000 h at the stack level;
- reach SOEL operation in less than 6 hours from cold state and less than 240 seconds from hot state to enable fast dynamic operating modes, facilitated by the compact, metal-based, monolithic stack architecture and highly active electrodes.

NON-QUANTITATIVE OBJECTIVES

NOAH2 will:

- outline a path towards commercialisation in terms of projecting costs for large-scale manufacture towards the MW and GW scales, reaching the 2030 targets of capital expenditure of ~ EUR 520/(kg/day) and operational expenditure of ~ EUR 45/(kg/day)/year;
- provide a sustainability classification (life-cycle analysis) with an emphasis on replacing CRMs;
- provide an assessment of commercialisation potential compared with those of SOA SOEL, polymer electrolyte membranes and alkaline electrolysers;
- identify and engage with potential industrial players for high-volume manufacture and further uptake of the project results.

PROJECT TARGETS

Target source	Parameter	Unit	Target	Target achieved?	SOA result achieved to date (by others)
Project's own objectives	Cell current density	A/cm^2	1.2		1
	Hot idle ramp time	seconds	240		N/A
	Degradation rate	%/1 000 h	0.75		N/A
	Cold start ramp time	hours	6		N/A

Clean Hydrogen Partnership
Co-funded by the European Union