

# ENDURE

## ALKALINE ELECTROLYSERS WITH ENHANCED DURABILITY



Project ID	101137925
PRR 2024	Pillar 1 – Renewable hydrogen production
Call topic	HORIZON-JTI-CLEANH2-2023-01-03: Advances in alkaline electrolysis technology
Project total costs	EUR 2 492 868.75
Clean H <sub>2</sub> JU max. contribution	EUR 2 492 868.75
Project period	1.1.2024–31.12.2026
Coordinator	Stargate Hydrogen Solutions OÜ, Estonia
Beneficiaries	Fraunhofer Gesellschaft zur Förderung der angewandten Forschung EV, Fundación para el Desarrollo de las Nuevas Tecnologías del Hidrógeno en Aragón, Permascand AB, Université catholique de Louvain, Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg

<https://www.endureh2.com/>

### PROJECT AND GENERAL OBJECTIVES

The main objective of the Endure project is to bring the performance and durability of alkaline electrolyzers to a new level. More specifically, it aims to drastically decrease the degradation rate and increase the efficiency of alkaline cells and stacks through the development of hierarchically structured, flow-engineered, monolithic porous transport electrodes; design/material improvements at the stack level; and accelerated testing procedures.

If the electrolyser degradation rate could be reduced, it would result in twofold benefits:

- lower operating expenditure through lower energy consumption over an electrolyser's lifetime,
- lower capital expenditures through a lower level of oversizing of the balance-of-plant components needed.

Both would positively affect the levelised cost of hydrogen.

### NON-QUANTITATIVE OBJECTIVES

Endure aims to make the alkaline electrolyzers more durable – that is, it aims to drastically decrease the degradation rate of alkaline electrolysis cells and stacks to:

- reduce carbon emissions and mitigate climate change by enabling the widespread adoption of hydrogen as a clean and sustainable fuel source;
- reduce the cost of hydrogen production, making it a more competitive fuel source

and driving the growth of the renewable energy sector;

- contribute to the development of a more sustainable and resilient energy system that can balance intermittent renewable energy sources with the need for a stable and continuous energy supply.


### PROGRESS AND MAIN ACHIEVEMENTS

The Endure project will result in an innovative electrolyser stack design with innovative technological components. Endure will yield higher electrolyser durability thanks to the decreased degradation rate of alkaline electrolysis cells and stacks through electrode improvements, design and material innovation at the stack level and through the development of accelerated testing procedures. By the end of the project, the subcomponents and the short stack of at least five cells will be tested, validated and demonstrated at the lab scale.

### FUTURE STEPS AND PLANS

- Develop and provide a 10 kW short stack with Ni foam electrodes.
- Adopt a report on harmonised test protocols for Endure.
- Mount a stack in the test bench.
- Get input for 3D meshing for microscale computer simulations.
- Get the diaphragm test results under nominal and part loads.

### PROJECT TARGETS

Target source	Parameter	Unit	Target	Target achieved?
Project's own objectives	Stack durability data (cell voltage versus time at a fixed current density)	-	Two alkaline stacks (baseline and improved) tested for 500 hours at constant load	
	Use of critical raw materials as catalysts	mg/W	0	
	O&M cost	€/(kg/day)/year	35	
SRIA (2021–2027)	Current density	A/cm <sup>2</sup>	> 1.25	
	CAPEX	€/kW	150	
	Electricity consumption @ nominal capacity	kWh/kg	< 48	
	Degradation rate	%/1 000 h	< 0.1	