EPHYRA

ESTABLISHING EUROPEAN PRODUCTION OF HYDROGEN FROM RENEWABLE ENERGY AND INTEGRATION INTO AN INDUSTRIAL ENVIRONMENT

Project ID	101112220
PRR 2024	Pillar 1 – Renewable hydrogen production
Call topic	HORIZON-JTI-CLEANH2-2022-01-08: Integration of multi-MW electrolysers in industrial applications
Project total costs	EUR 24 631 840.00
Clean H_2 JU max. contribution	EUR 17 757 002.50
Project period	1.6.2023–31.5.2028
Coordinator	Motor Oil (Hellas) Diilistiria Korinthou AE, Greece
Beneficiaries	Deutsches Zentrum für Luft- und Raumfahrt EV, Enertime SA, Envirometrics Technikoi Symvouloi Etaireia Periorismenis Efthynis, Ethniko Kentro Erevnas Kai Technologikis Anaptyxis, Instituto Tecnológico de Aragón, RINA Consulting SpA, Siemens Process Systems Engineering Ltd, Soluforce BV, Stichting New Energy Coalition

https://ephyraproject.eu/

PROJECT AND GENERAL OBJECTIVES

Ephyra will demonstrate the integration of a first-of-its-kind renewable hydrogen production facility at the industrial scale in south-eastern Europe by employing an improved electrolysis technology at a scale of 30 MW. The large-scale electrolysis technology will be integrated with industrial operations within Motor Oil Hellas's Corinth Refinery, one of the top refineries in Europe and the largest privately owned industrial complex in Greece. It will be operated for at least 2 years under commercial conditions and will supply renewable hydrogen to the refinery's processes and external end users.

The industrially integrated renewable hydrogen production will be developed around a circular economy, industrial symbiotic approach, as the electrolyser will be coupled with (i) renewable electricity production, (ii) an innovative waste-heat-harvesting technology, (iii) environmental optimisation of water use, (iv) valorisation of produced oxygen in Motor Oil Hellas's current refinery operations, (v) a digital twin and (vi) a dedicated energy management system. Ephyra will contribute to all electrolysis technology key performance indicators as detailed in the Clean Hydrogen Partnership strategic research and innovation agenda objectives. Therefore, the project will demonstrate the technology's reliability for green hydrogen production at the lowest possible cost, thus enabling the EU's renewable hydrogen economy, industry decarbonisation and uptake of zero-emission fuels.

NON-QUANTITATIVE OBJECTIVES

- Develop a detailed technology and integration concept for an enhanced electrolysis system.
- Optimise the synergies among H_2 production – use – complementary supply and the valorisation of waste streams (waste heat, oxygen, water) under the circular economy approach.
- Develop a digital twin, controls and automation of the H_2 plant and its (symbiotic) environment.
- Set up and operate the integrated H_2 production plant and complementary supply and valorisation streams (local circular H_2 economy), including standardisation and safety aspects.

PROJECT TARGETS

Target source	Parameter	Unit	Target	Target achieved?
Project's own objective	Capital cost	€/kW	≤ 480 ± 10 %	
	O_2 production (base case)	t/year	19 322	
	Current density	A/cm^2	> 0.6	
	Electricity consumption @ nominal capacity	kWh/kg	≤ 49	
	Operating hours per year (base case)	h/year	3 945	
	O_2 production (full load)	t/year	39 184	
	Cold start ramp time	seconds	≤ 900	
	CO_2 savings for project duration (base case)	kt/year	52.6	
	O&M cost	€/(kg/day)/year	≤ 43 ± 10 %	
	Availability (full load)	%	91	
	Degradation	%/1 000 h	≤ 0.11	
	H_2 production (full load)	t/year	4 898	
	H_2 production (base case)	t/year	2 415	
	CO_2 savings for project duration (full load)	kt/year	108.1	
	LCOH targeted (full load)	€/kg H_2	2.6	
	LCOH targeted (base case)	€/kg H_2	3.3	
	Use of critical raw materials as catalysts	mg/W	< 0.6	
	Availability (base case)	%	45	
	Hot idle ramp time	seconds	≤ 30	
	Operating hours per year (full load)	h/year	8 000	

Clean Hydrogen Partnership
Co-funded by the European Union