

SO-FREE

SOLID OXIDE FUEL CELL COMBINED HEAT AND POWER: FUTURE-READY ENERGY




Solid oxide fuel cell combined heat and power:
Future-ready Energy

Project ID	101006667
PRR 2024	Pillar 4 – H ₂ end uses: stationary application
Call topic	FCH-02-4-2020: Flexi-fuel stationary SOFC
Project total cost	EUR 3 045 355.00
Clean H ₂ JU max. contribution	EUR 2 739 094.00
Project period	1.1.2021–31.8.2024
Coordinator	Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile, Italy
Beneficiaries	AVL List GmbH, Elcogen Oy, Fraunhofer-Gesellschaft zur Förderung der Angewandten Forschung EV, ICI Caldaie SpA, Instytut Energetyki, Kiwa Ltd, Kiwa Nederland BV, Polska Grupa Energetyczna SA, Università degli Studi Guglielmo Marconi

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PROJECT TARGETS

Target source	Parameter	Unit	Target	Achieved to date by the project	Target achieved?	SOA result achieved (by others)	Year in which SOA result was reported
Project's own objectives	Durability of stack	kh	> 30	N/A		30	
	CAPEX	€/kW	< 3 000	N/A		10 000	
	Thermal efficiency	% (LHV)	40–55	N/A		30–55	
	Electrical efficiency	% (LHV)	55–60	N/A		35–50	2020
	Availability	%	> 98	N/A		97	
AWP 2020	Degradation	%	< 1	N/A		0.4 % / kh degradation rate for Elcogen E350 stacks has been measured with a fifty-fifty H ₂ -N ₂ mixture and 100 % natural gas	
	Efficiency of H ₂ consumption	%	48	0.53		47	

PROJECT AND GENERAL OBJECTIVES

The development and demonstration of a fully future-ready system based on solid oxide fuel cells (SOFCs) for combined heat and power generation allows for an operational window of 0–100 % of H₂ in natural gas, with additions of purified biogas. Furthermore, SO-FREE will endeavour to realise a standardised stack–system interface, allowing the full interchangeability of SOFC stack types within a given SOFC combined heat and power system.

NON-QUANTITATIVE OBJECTIVES

SO-FREE aims to realise a unique, standardised stack module–system interface for flexible system integration. The initial alignment of two stack modules with a single interface has been proposed.

PROGRESS AND MAIN ACHIEVEMENTS

- Those involved in the SO-FREE project have set up two identical test stations for independent stack validation and designed a unique stack module–system interface for flexible system integration.
- Stack validation and mapping were completed in February 2023, and the final design of the system in April 2023.

FUTURE STEPS AND PLANS

- Stacks will be produced and delivered in April 2024.
- System demonstrations are planned for October 2024.