

AMON

DEVELOPMENT OF A NEXT GENERATION AMMONIA FC SYSTEM



Project ID	101101521
PRR 2024	Pillar 4 – H ₂ end uses: stationary application
Call topic	HORIZON-JTI-CLEANH2-2022-04-02: Ammonia powered fuel cell system focusing on superior efficiency, durable operation and design optimisation
Project total cost	EUR 4 293 653.75
Clean H ₂ JU max. contribution	EUR 3 998 028.75
Project period	1.1.2023–31.12.2025
Coordinator	Fondazione Bruno Kessler, Italy
Beneficiaries	Alfa Laval Aalborg AS, Alfa Laval SpA, Alfa Laval Technologies AB, Danmarks Tekniske Universitet, École polytechnique fédérale de Lausanne, European Fuel Cell Forum AG, Fachhochschule Zentralschweiz – Hochschule Luzern, Kiwa Cermet Italia SpA, Kiwa Nederland BV, Sapio Produzione Idrogeno Ossigeno SRL, SolydEra SpA, Teknologian Tutkimuskeskus VTT Oy

<https://amon-project.eu/>

PROJECT TARGETS

Target source	Parameter	Unit	Target	Target achieved?	SOA result achieved (by others)	Year in which SOA result was reported
Project's own objectives	Partial load operation	% of nominal load	Dynamic range of operation for 30–100 % of nominal load		N/A	N/A
	FC system tolerance to ammonia	%	System fed by 100 % ammonia as fuel		N/A	N/A
	Degradation at CI and FU = 75 %	%/1 000 h	≤ 2.5		4	2019
	Efficiency	%	70–65		52.1	2020
	Availability	%	> 90		N/A	N/A
SRIA (2021–2027)	CAPEX 5–50 kW _e	€/kW	5 000		N/A	N/A

NB: KPI, key performance indicator.

PROJECT AND GENERAL OBJECTIVES

AMON will develop a novel system for the utilisation of ammonia and conversion of it into electric power with high efficiency using a solid oxide fuel cell system. The project will deal with the design of the basic components of the system, including the fuel cell, an ammonia burner and ammonia-resistant heat exchangers; the engineering of the whole balance of plant; and the validation of compliance with ammonia use of all parts and components. Optionally, depending on system needs, an ammonia cracker and anode gas recirculation system will be developed.

The general objectives of the project are to:

- design and develop a fuel cell stack module at a scale of 8 kW_e, tested and certified to convert ammonia into power, possibly using the internal reforming capacity of a solid oxide cell operating at a high temperature and managing the power output through the control of the cell's fuel utilisation;

- certify all the components and related materials of a system as 100 % tolerant to ammonia;
- aim to make the system 70 % electrically efficient;
- certify the system for at least 3 000 hours' operation, demonstrating an ammonia availability of 90 % in the operating hours and a degradation rate less than 3 % with nominal power, measured over 1 000 hours of continuous operation.

NON-QUANTITATIVE OBJECTIVES

- Diversify and secure the energy supply.
- Unlock wide market potential and foster efficient conversion systems to decarbonise hard-to-abate sectors such as the maritime and autonomous power systems sectors, in which volumetric density and long-term storage solutions are key requirements.
- Raise industrial interest in ammonia and foster the development of new markets and new jobs.