

NIMPHEA

NEXT GENERATION OF IMPROVED HIGH TEMPERATURE MEMBRANE ELECTRODE ASSEMBLY FOR AVIATION



Project ID	101101407
PRR 2025	Pillar 3 - H ₂ End Uses - Transport
Call Topic	HORIZON-JTI-CLEANH ₂ -2022-03-08
Project Total Costs	4 942 898.75
Clean H ₂ JU Max. Contribution	4 942 898.50
Project Period	01-01-2023 - 31-12-2026
Coordinator Beneficiary	SAFRAN POWER UNITS, FR
Beneficiaries	ADVANCED ENERGY TECHNOLOGIES AE EREUNAS and ANAPTYXIS YLIKON and PROIONTON ANANEOSIMON PIGON ENERGEIAS and SYNAFON SYMVOULEFTIKON YPIRESION, UNIVERSITE DE STRASBOURG, Fundacion IMDEA Energia, SAFRAN SA, FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV, COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES, CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS

<https://www.nimphea.eu/>

PROJECT AND GENERAL OBJECTIVES

The overall objective of the NIMPHEA project is to develop and validate, at technology readiness level 4, a new-generation high-temperature membrane electrode assembly (MEA) addressing the challenging requirements of fuel cells for aviation. The MEA developed will operate above 120°C and thus overcome the thermal management issues of high-power systems.

NON-QUANTITATIVE OBJECTIVES

- Design the concept of the new-generation disruptive MEA operating above 120°C and develop its components.
- Upscale the small-scale MEA with a view to prepare for manufacturing and future integration at fuel cell stack level.
- Validate and demonstrate the performances of the new-generation MEA developed at TRL4.
- Evaluate and validate the suitability of the new-generation MEA by performing a complete life-cycle assessment.

PROGRESS, MAIN ACHIEVEMENTS AND RESULTS

- The technical specifications have been described for the new NIMPHEA MEA).
- The consortium has harmonised its testing strategy for all products.
- The components of the first-generation MEA have been developed and delivered for its assembly. The first generation of NIMPHEA MEAs has been produced and tested.
- The expected results have not been achieved, however, less platinum has been used in the catalysts compared to the project's state-of-the-art.
- Components have been identified for the second generation MEA, which shows an increasing performance at lab scale.

FUTURE STEPS AND PLANS

- Assembly and characterisation of the second-generation MEA.
- Development of the third generation MEA components.
- Maturation of the LCA model.

PROJECT TARGETS

Target source	Parameter	Unit	Target	Achieved to date by the project	Target achieved?	SoA result achieved to date (by others)	Year for reported SoA result
Project's own objectives	Power density (nominal conditions)	W/cm ²	0.75	0.13 (160°C, 0.75V)		0.1 W/cm ² (160°C, 0.65V)	2024
	Power density (optimal conditions)	W/cm ²	1.25	0.3 (180°C, 0.5V)		0.29 W/cm ² (180°C, 0.5V)	2024
	Degradation rate	µV/h	3-5	-			
	Membrane uniformity (thickness)	%	± 7	-		N/A	N/A
	GDE uniformity (PGM variation)	%	± 5	1.7			