

MARINER: Delivering 1 MW Fuel-Cell Powertrains for Zero-Emission Shipping



Validation and Demonstration of a Reliable, Efficient and Scalable PEM Fuel-Cell System.



Delphine Bresch-Pietri, Florent Di Meglio (Centre Automatique et Systèmes)

Pedro Affonso Nóbrega, Christian Beauger (Centre Procédés, Energies Renouvelables et Systèmes Energétiques)

MARINER Mission: bridging the gap between fuel-cell innovation and real-world maritime deployment

- design a modular multi-stack Fuel-Cell system for large vessels
- Validate a 200 kW prototype and scale it to a 1 MW demonstrator
- Demonstrate durability through 40 000h of Accelerated Stress Tests
- Extend system lifetime through digital twins, diagnostics and health-aware control
- Assess total cost of ownership, environmental impacts and safety
- Support market adoption with shipyards, operators and regulators



MARINER turns fuel-cell breakthroughs into deployable maritime powertrains, accelerating the moment when zero-emission shipping becomes the rational business choice.



Short-stack test bench of Centre PERSEE/Mines Paris PSL.

KIARA high-speed passenger ferry, serving routes in the Aegean sea.



Why the MARINER project matters

- Global shipping carries 90% of world trade produces 3% of global emissions,
- 99% of vessels ruse fossil fuels
- CO₂ emissions could rise by 50–250% by 2050;
- EU regulations tighten GHG-intensity limits, effectively banning fossil-only propulsion by 2050.

MARINER at a glance

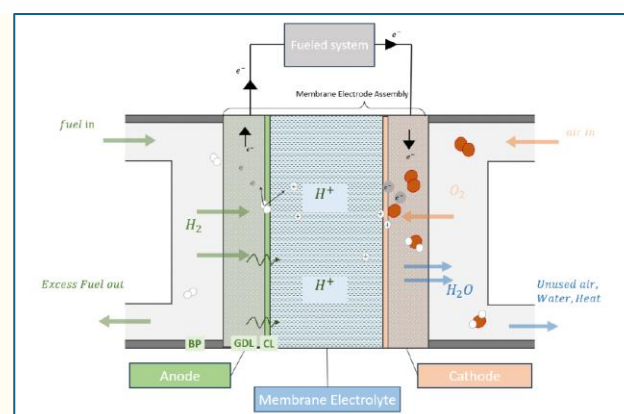
- 1 MW PEMFC demonstrator
- 200 kW prototype
- 40 000 h AST campaign
- Digital twins and health-aware control
- Zero-emission shipping

MARINER addresses a critical gap in maritime decarbonization by delivering a reliable, efficient, scalable and cost-competitive 1 MW PEM fuel-cell system ready for real ships.

MINES Paris - PSL Contributions in MARINER

- **Modelling:** physics-based PEM fuel cell models and degradation modelling
- **Control:** Monitoring and Health-aware control algorithms
- **Testing:** Short-stack characterization and Accelerated Stress Test protocols

Affonso Nóbrega, P. H., Jacob, A., & Beauger, C. (2026). A New 0D Physics-Based Model for Proton-Exchange Membrane Fuel Cell Performance Simulation. *Journal of The Electrochemical Society*.



Contact :
delphine.bresch-pietri@minesparis.psl.eu
pedro.affonso_nobrega@minesparis.psl.eu

Discover more about MARINER :
<https://cordis.europa.eu/project/id/101251528>



Co-funded by the European Union under Grant Agreement No. 101251528.

Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the Clean Hydrogen Partnership. Neither the European Union nor the granting authority can be held responsible for them.