

# SHIPFC

## PILOTING MULTI MW AMMONIA SHIP FUEL CELLS



Project ID	875156
PRR 2024	Pillar 3 – H <sub>2</sub> end uses: transport
Call topic	FCH-01-2-2019: Scaling up and demonstration of a multi-MW fuel cell system for shipping
Project total costs	EUR 13 179 056.25
FCH JU max. contribution	EUR 9 975 477.50
Project start - end	1.1.2020–31.12.2025
Coordinator	Maritime CleanTech, Norway
Beneficiaries	Alma Clean Power AS, Capital-Executive Ship Management Corp, Clara Venture Labs AS, Eidesvik Shipping AS, Equinor Energy AS, Fraunhofer Gesellschaft zur Förderung der Angewandten Forschung EV, National Centre for Scientific Research 'Demokritos', North Sea Shipping AS, Persee, Star Bulk Shipmanagement Co. (Cyprus) Ltd, Sustainable Energy AS, University of Strathclyde, Wärtsilä Gas Solutions Norway AS, Wartsila Norway AS, Yara Clean Ammonia Norge AS, Yara International ASA

<https://shipfc.eu/>

### PROJECT AND GENERAL OBJECTIVES

ShipFC's main mission is to prove and demonstrate the case for large-scale zero-emission shipping through developing, piloting and replicating a modular 2 MW fuel cell technology using ammonia as fuel. The project will also prove the case for large-scale, zero-emission fuel infrastructure through a realistic business model. Currently, the fuel cells are being scaled up and going through laboratory testing.

### NON-QUANTITATIVE OBJECTIVES

- ShipFC aims to integrate ammonia fuel cell and fuel systems into ship power systems. The integrated ship design is now used in the ongoing approval process for the vessel. Initial discussions with key players from the industry are complete and follow-up actions have been identified. The vessel design and approval process will contribute to updating knowledge in the industry, as this is the first vessel with MW-scale ammonia-powered solid oxide fuel cells (SOFCs) on board.
- For the replicators, the fourth-generation design for the container ship is now established.
- Concept evaluations of bulk carriers are ongoing
- The project aims to demonstrate the wider use of the system and the scale-up of the system by 20 MW. The first-generation design for the 5 000 twenty-foot equivalent unit container ship has been established. As the detailed designs of all systems for Viking Energy progress, the container ship design will be modified several times.
- As part of the work, the project will also perform a safety assessment of the ammonia fuel gas system and of the SOFC system.

### PROGRESS AND MAIN ACHIEVEMENTS

- The project has signed an agreement for the delivery of green ammonia fuel for the duration of the project (not analysed or published).
- Detailed designs for the fuel system have been developed.

- The vessel design has been developed for the ammonia fuel cell installation, including the fuel gas system.
- The approval process for ammonia-powered vessels is ongoing with the class and the flag state.
- A purchase order for two MW SOFC stacks has been placed.

### FUTURE STEPS AND PLANS

- ShipFC will scale up and test the SOFC.
- The project partner Alma is currently performing laboratory-scale testing of SOFCs, and is preparing for the first large-scale SOFC test (100 kW), to be commenced in 2024.
- The project partner Sustainable Energy has set up the test infrastructure required to facilitate the 100 kW test, including the necessary ammonia tank and fuel gas system.
- The consortium will follow up and monitor the delivery of stacks for the 2 MW system. A further plan is to refine the design for the 2 MW system based on results from the 100 kW tests.



### PROJECT TARGETS

Target source	Parameter	Unit	Target	Achieved to date by the project	Target achieved?
Project's own objectives	GHG reduction by use of ammonia fuel	%	70	N/A	
	Power of ammonia SOFC system	MW	2	0.006	
	SOFC operational experience	hours	3 000	N/A	