

A stylized graphic of a ship's hull and superstructure in dark blue and teal, with a white lightning bolt striking the side. The background features a pattern of diagonal stripes in various shades of blue.

Flexible and modular large battery systems for safe on-board integration and operation of electric power, demonstrated in multiple type of ships

FLEXSHIP



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1. **FLEXSHIP Objectives**
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Duration: 2023-2026

Website: <https://www.flexship-project.eu/>





FLEXSHIP Objectives

Design, verify and validate onboard electric grid and control architectures.

Develop a modular, scalable battery system that can be optimized to the needs of different vessels and operation conditions and has high reliability and safety, long lifetime, and low weight.

Testing, verification, and system integration of flexible and safe onboard electrical configurations.

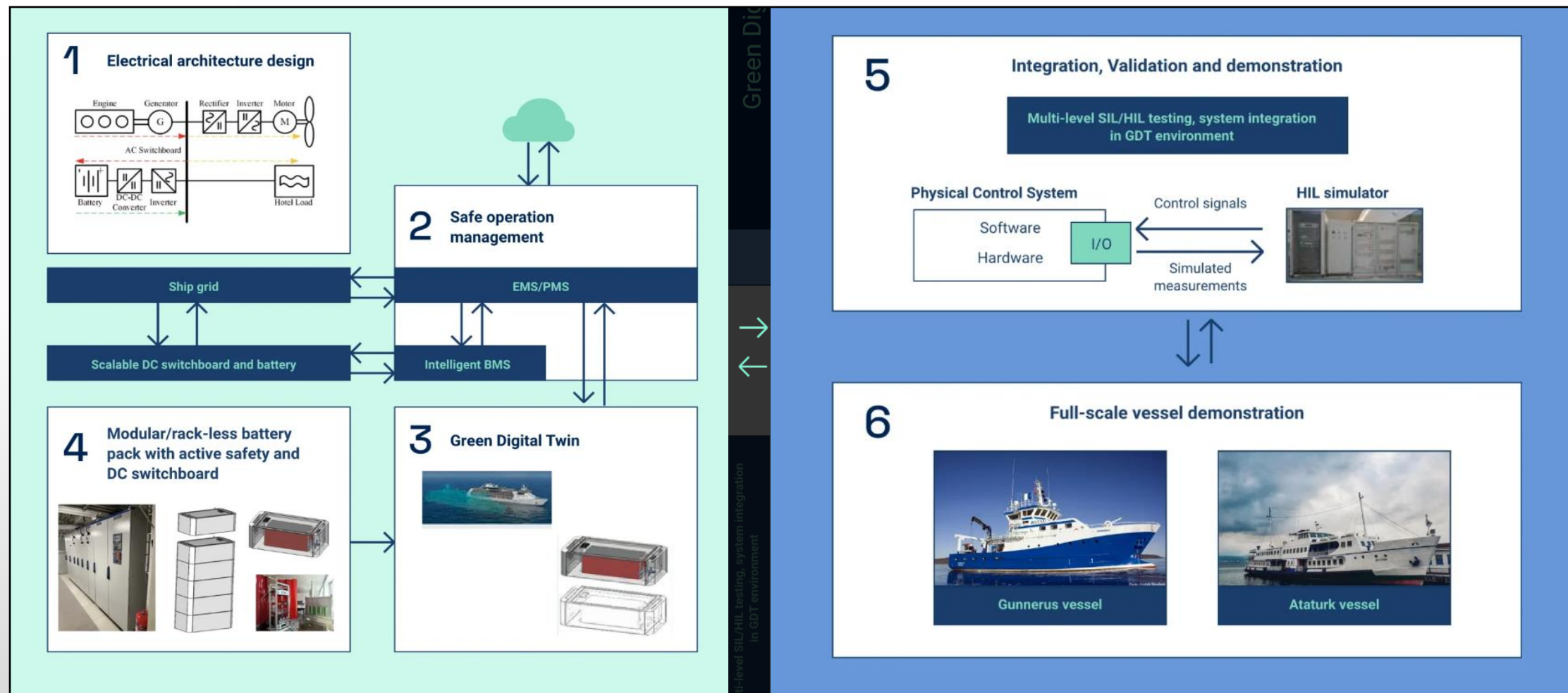
Demonstration of FLEXSHIP solutions onboard two full-scale vessel demonstrators and evaluation of the demonstrators' performance for the two use cases: 1) R/V Gunnerus, 2) Atatürk

Evaluation of the sustainable operation of the FLEXSHIP solutions, reduced noise and emissions, and roadmap to fully electric operation on routes of 300 nm by 2027.

Dissemination and exploitation of FLEXSHIP's technology through a business plan and strategy for development of skills and technology transfer.

2 FLEXSHIP Concept

The FLEXSHIP concept consists of six key elements





The FLEXSHIP solutions for vessel electrification will be characterized by their flexibility, modularity, and scalability. This will ensure that the solutions are relevant to a wide selection of vessel types as the same system concept can be optimized to fit the specific needs of the individual vessels by adding/removing battery modules and control units.





FLEXSHIP will build on best practices and lessons learned from electrification of other sectors, e.g., the road transport sector, where electrification has been ongoing longer than in the waterborne sector. FLEXSHIP will also utilize the knowhow and experience generated in the projects SEABAT and Current Direct (H2020 LC-BAT-11-2020).





Contribution to the expected outcomes of the call topic

Contributions to two full scale vessel demonstrators, hybrid and fully electric, by 2027 covering a sailing distance of at least 300 nm in the case of a fully electric vessel.

Development and validation of electrical architectures for large battery systems on-board.

Proof of the safe integration of battery systems into the ship's electrical grid for a relevant number of ship types (e.g., IWT, short sea vessels, cruise ships, ferries) and operational scenarios.

Verification of the architecture and the power management system for two cases: hybrid and fully electric.

Documentation of skills requirements for the crew.

In the short term, facilitate full battery electric transit for reduced noise and zero emissions on shorter routes (up to 100 nm) and during approach and harbour stay.



5 FLEXSHIP Use cases and demonstrations



The FLEXSHIP system will be demonstrated in two full-scale vessels.

DEMO-1:
R/V Gunnerus

Work Site
Trondheim, Norway

Genset Power
3 x 450kW

Electric Drive Motor Powers
2 x 500kW + 1 x 200kW

Propeller
2 main azimuths + 1 tunnel thruster

Operating Modes
Mapping and monitoring of marine resources. ROV tracking



Expected fuel and CO2 saving with FLEXSHIP system

Speed: 10.5 knots

Route: 30 nm (~3hrs.)

Power consumption: 320 kW

Fuel consumption: 80 (L/h)*3(h) = 240 L

MDO

CO2=2.69*240 = 645.6 kg CO2

DEMO-2:
Atatürk

Work Site
Kocaeli, Turkey

Genset Power
2 x 750kW

Electric Drive Motor Powers
2 x 1500kW

Propeller
2 main azimuths

Operating Modes
Passenger ferry in Kocaeli Metropolitan Municipality



Expected fuel and CO2 saving with FLEXSHIP system

Speed: 15 knots

Route: 296 nm (line 5 x 8 trip) (~14hrs.)

Power consumption: 600 kW

Fuel consumption: 120 (L/h) *14 (h) = 1680 L MDO

CO2 = 2.69*1680 = 4.515 T CO2

The demonstration of the system will be a multi-layer verification consisting of the modelling and simulation of the battery system optimised to fit the specific needs and specification of each of the DEMOs, lab testing of the system on small scale, and demonstration of the full system onboard each of the DEMOs in sea trials and dockside tests.



For more information about the FLEXSHIP project, please
feel free to contact us at

info@flexship-project.eu

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