NEMOSHIP

NEMOSHIP: DIGITAL PLATFORM FOR OPTIMAL BESS USE

February 6th 2026

Roberta Luca
Călin Husar

SIEMENS

OVERVIEW OF THE PLATFORM CAPABILITIES

NEMOSHIP

CONTENTS

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the European Union

NEMOSHIP PROJECT

PROJECT DATA

NEMOSHIP

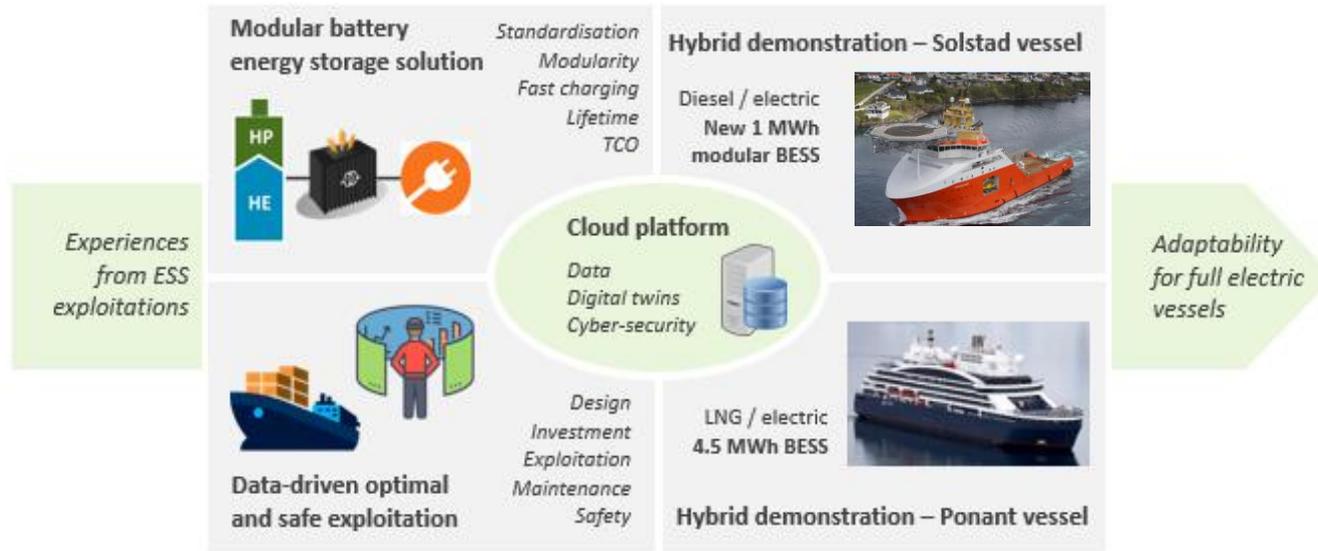| NEMOSHIP	https://nemoship.eu/
Title	NEw MOdular electrical architecture & digital platform to optimise large battery systems on SHIPs
Call ID	HORIZON-CL5-2022-D5-01-01 - Exploiting electrical energy storage systems and better optimising large battery electric power within fully battery electric and hybrid ships (ZEWT Partnership)
Type	Innovation Action
Lead	CEA
Duration	4 years - 01/01/2023 to 31/12/2026
Total cost	11.3 M Euros
EU contribution	7.9 M Euros

NEMOSHIP

Diagram

Modular battery energy storage solution

Standardisation
Modularity
Fast charging
Lifetime
TCO

HP
HE

Hybrid demonstration – Solstad vessel

Diesel / electric
New 1 MWh modular BESS

Experiences from ESS exploitations

Cloud platform

Data
Digital twins
Cyber-security

Adaptability for full electric vessels

Data-driven optimal and safe exploitation

Design
Investment
Exploitation
Maintenance
Safety

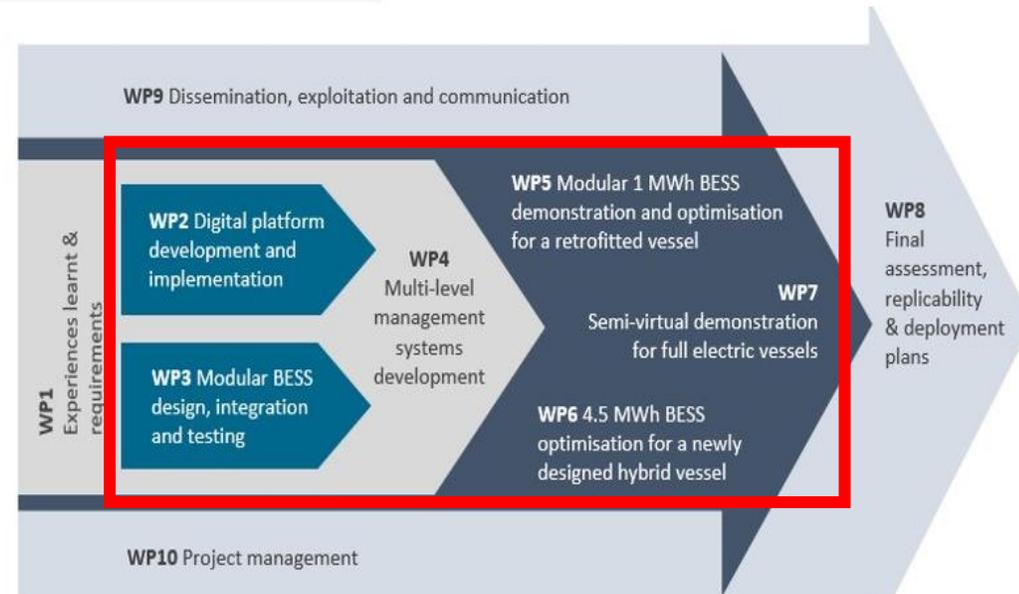LNG / electric
4.5 MWh BESS

Hybrid demonstration – Ponant vessel

2 main innovative solutions:

- A modular and standardised 1.1 MWh battery energy storage solution enabling to exploit different types of batteries (HE and HP)

- A cloud-based digital platform enabling a data-driven optimal and safe exploitation

Work Package Diagram

WP9 Dissemination, exploitation and communication

WP1 Experiences learnt & requirements

WP2 Digital platform development and implementation

WP3 Modular BESS design, integration and testing

WP4 Multi-level management systems development

WP5 Modular 1 MWh BESS demonstration and optimisation for a retrofitted vessel

WP7 Semi-virtual demonstration for full electric vessels

WP6 4.5 MWh BESS optimisation for a newly designed hybrid vessel

WP8 Final assessment, replicability & deployment plans

WP10 Project management

06/02/2026

Consortium:

- 6 countries

- 11 complementary partners

Covering the entire value chain:

- 3 Research Technology Organization (CEA, VUB, Cidetec)

- 1 SME (SDI)

- 7 private large groups (Siemens, Corvus, Elkon, Solstad, Equinor, Ponant, In Extenso)

06/02/2026

OBJECTIVES OF THE PROJECT

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1. **Flexible electrification solutions to exploit heterogeneous storage units for a wide range of needs**
   - Limit the number of system components
   - Widen the grid services provided by large battery systems
   - Decrease CAPEX thanks to hybridisation
   - Improve battery lifetime

2. **Standardisation of the battery systems integration process and interfaces within the vessels**
   - Decrease BESS installation costs around 40%
   - Contribute in LTI (Lost Time Incident / Injuries) reduction
   - Increase maintenance capability of the crew members

3. **Advanced tools for ship operators and owners to reach an optimal and safe exploitation**
   - Interface with existing third-party software used
   - improve global efficiency of ESS exploitation of above 10%
   - Decrease maintenance occurrences
   - Increase number of crew members trained

4. **Extending zero emission ability for both hybrid and full-electric ships**
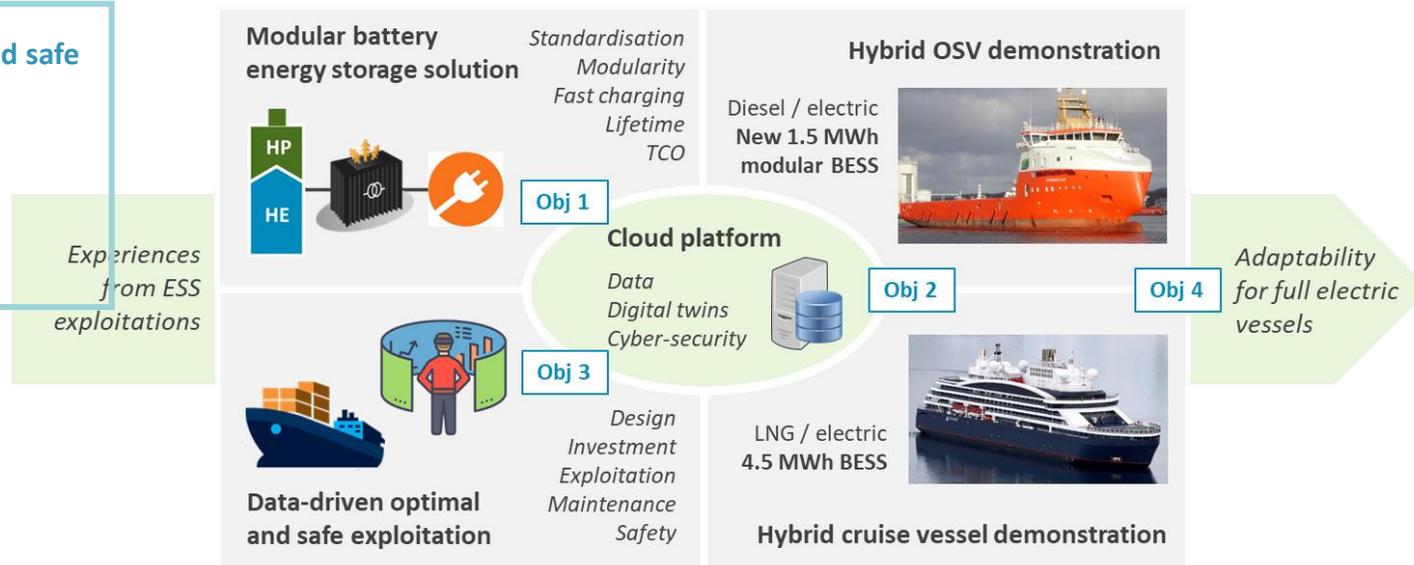   - Increase zero-emission transit
   - Decrease CII (Carbon Intensity Index) for each vessel
   - Improve full-electric arrangement sailing distance

➢ **Outcome 1:** Development and validation of a 1.5 MWh modular BESS and its BPMS for a retrofitted hybrid vessel

➢ **Outcome 2:** Provide integration methodologies and standards thanks to a Formal Safety Assessment

➢ **Outcome 3:** Development and validation of a cloud-based digital platform enabling a data-driven exploitation

➢ **Outcome 4:** Two real hybrid demonstration vessels reaching above TRL7 and two virtual full-electric demonstrations reaching TRL6 in laboratory

Modular battery energy storage solution — Standardisation, Modularity, Fast charging, Lifetime, TCO — Obj 1

Cloud platform — Data, Digital twins, Cyber-security — Obj 2

Data-driven optimal and safe exploitation — Design, Investment, Exploitation, Maintenance, Safety — Obj 3

Experiences from ESS exploitations

Hybrid OSV demonstration — Diesel / electric, New 1.5 MWh modular BESS

LNG / electric 4.5 MWh BESS — Hybrid cruise vessel demonstration

Obj 4 — Adaptability for full electric vessels

DIGITAL MODELS

Simcenter Amesim

DIGITAL TWINS

NEMOSHIP

Le Commandant Charcot

Icebreaking cruise ship

Normand Drott

Offshore supply ship

Full Electric Vessel

Virtual use case

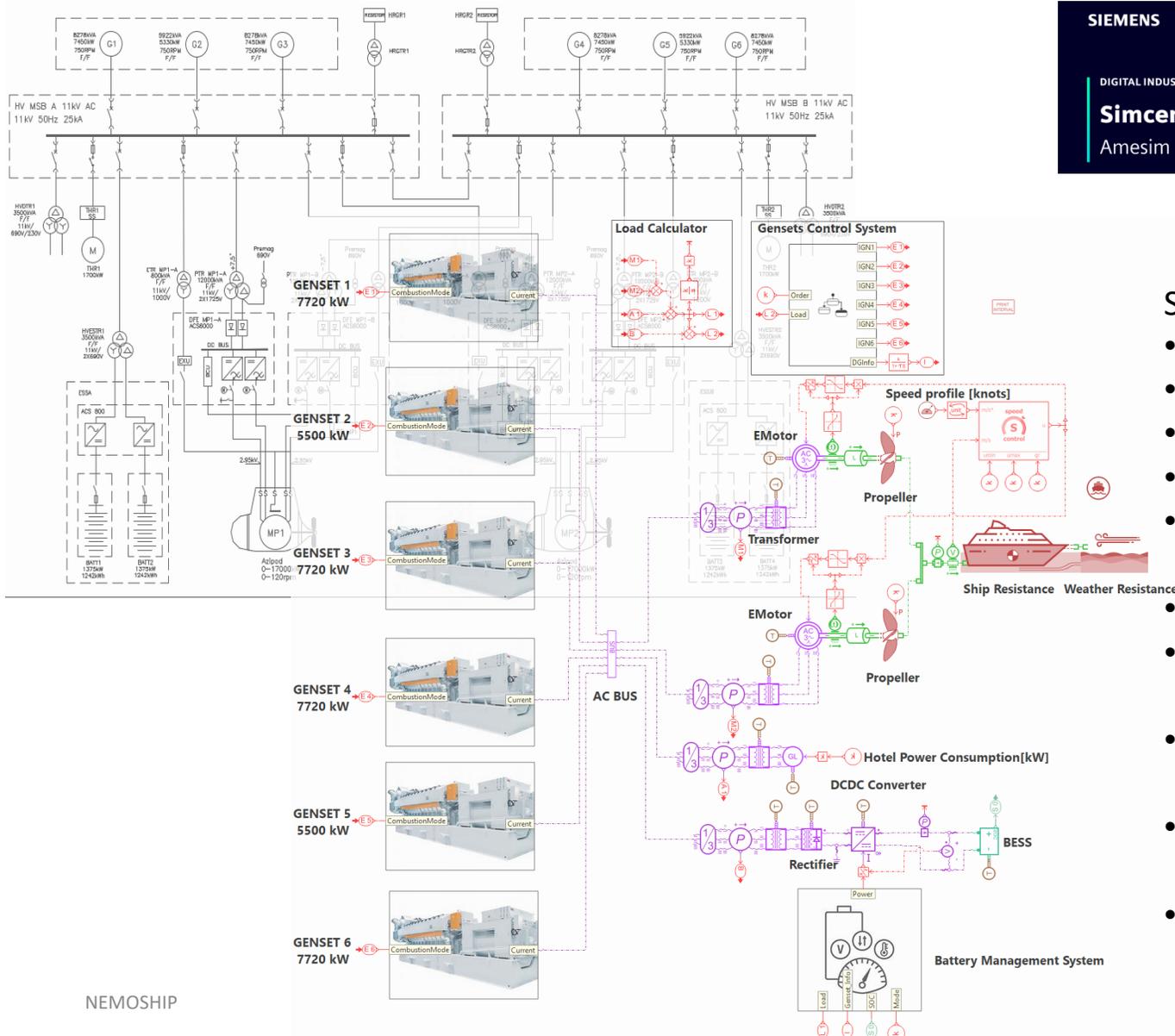### Fuel Cell Vessel

Virtual use case

Digital Twin

A **1D simulation** for a specific use case, developed using a **virtual platform** and fed with *real data*
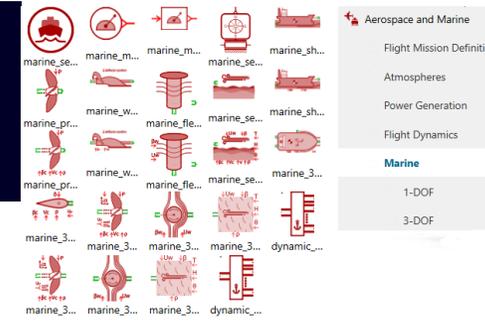
STANDARD DIGITAL TWIN FOR PONANT USE CASE

Standard Digital Twin for Ponant use case contains:

- Ship resistance model + Weather resistance component
- 2 propellers
- 2 electric motors
- 4 transformers, one rectifier and one DC/DC converter
- Speed control components – converts the the speed profile into torque command for electric motors
- BESS - 4520 kWh Corvus Orca equivalent
- BMS with 4 battery modes: Peak Shaving, Charging, Discharging, ZEO.
- 6 gensets – 2 x Wartsila 31DF V10 5500 kW
  – 4 x Wartsila 31DF V14 7720 kW
- Genset control system – ensures automatic starting and stopping of the gensets
- Load calculator – used to calculate power demand
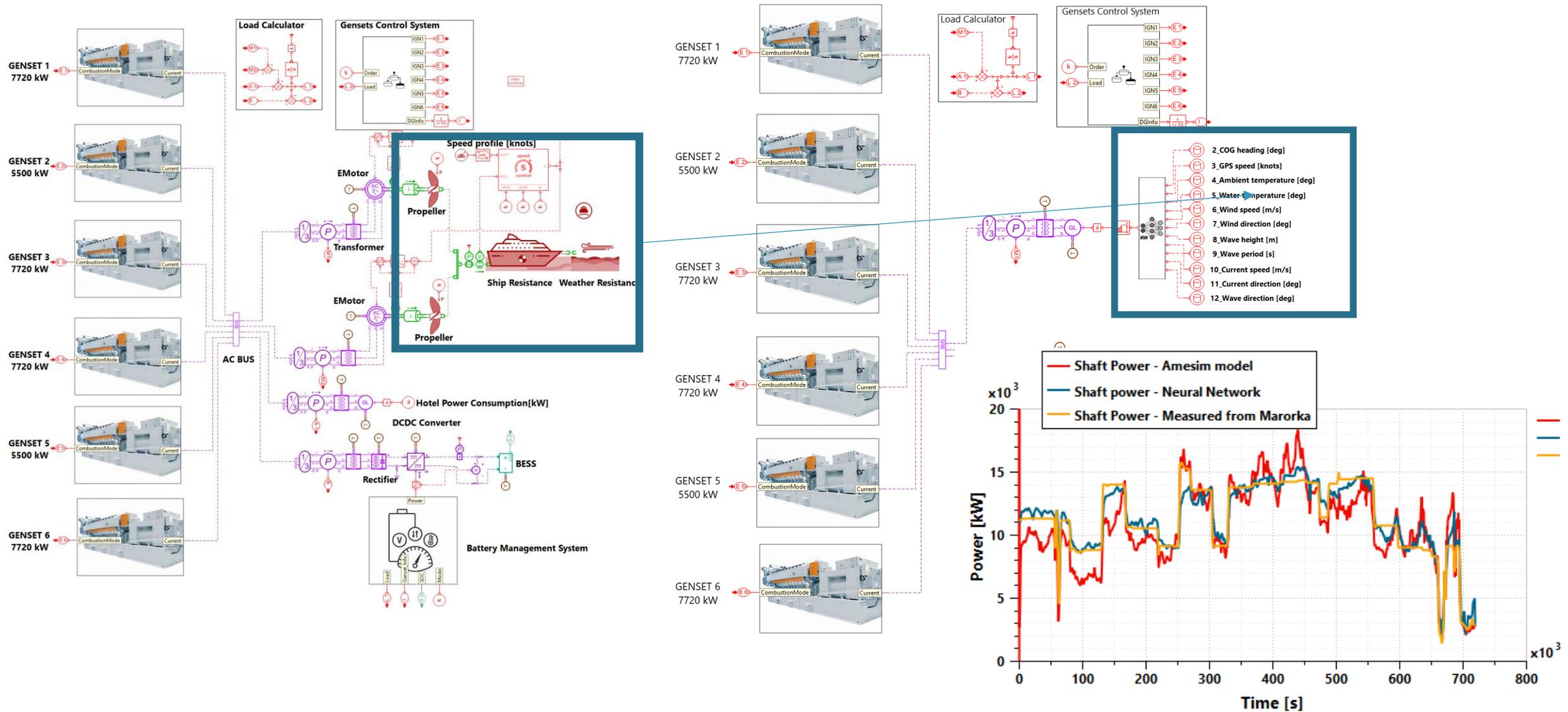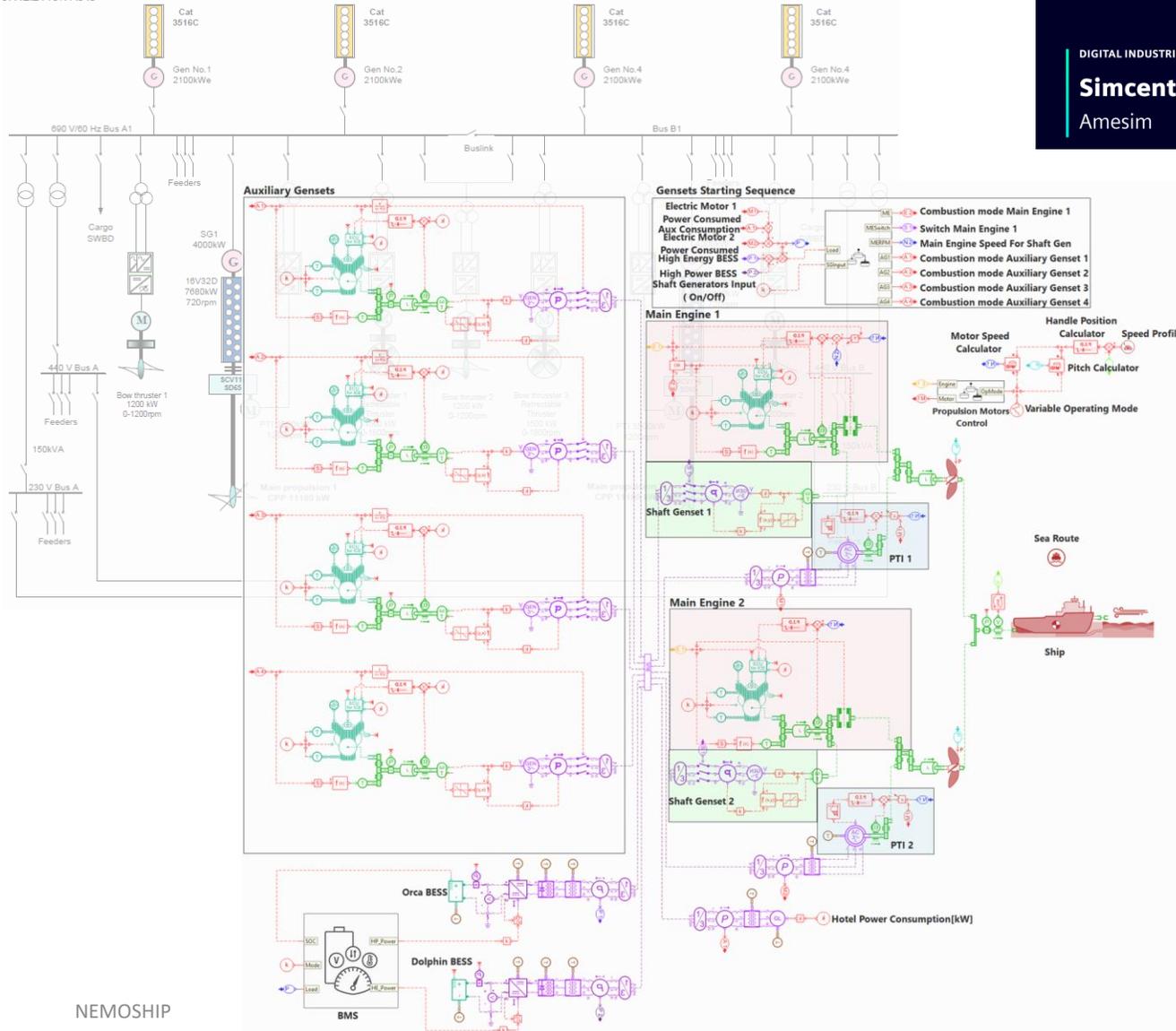
# STANDARD DIGITAL TWIN FOR SOLSTAD USE CASE
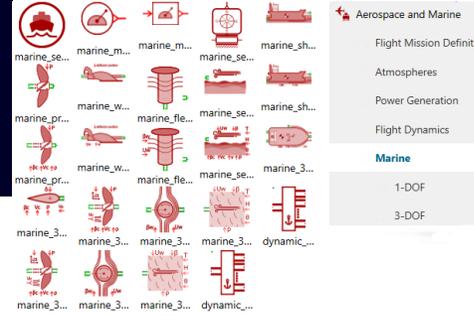

Standard Digital Twin for Solstad use case contains:

- Ship resistance model + Weather resistance component
- 2 propellers
- 2 Main Engines with shaft generators + 2 PTIs
- 4 transformers, 2 rectifier and 2 DC/DC converter
- PTI speed and pitch calculator
- BESS - HP - 746 kWh Corvus Orca equivalent
    - HE - 361 kWh Dolphin Energy NxtGen equivalent
- BMS with one battery mode: Peak Shaving
- 4 Auxiliary gensets – Caterpillar 3516c
- Genset control system – ensures automatic starting and stopping of the gensets
- Load calculator – used to calculate power demand

Full Electric Vessel

- 100 nautical miles
- Speed: 17 knots

Fuel Cell Vessel

- 300 nautical miles
- Speed: 17 knots
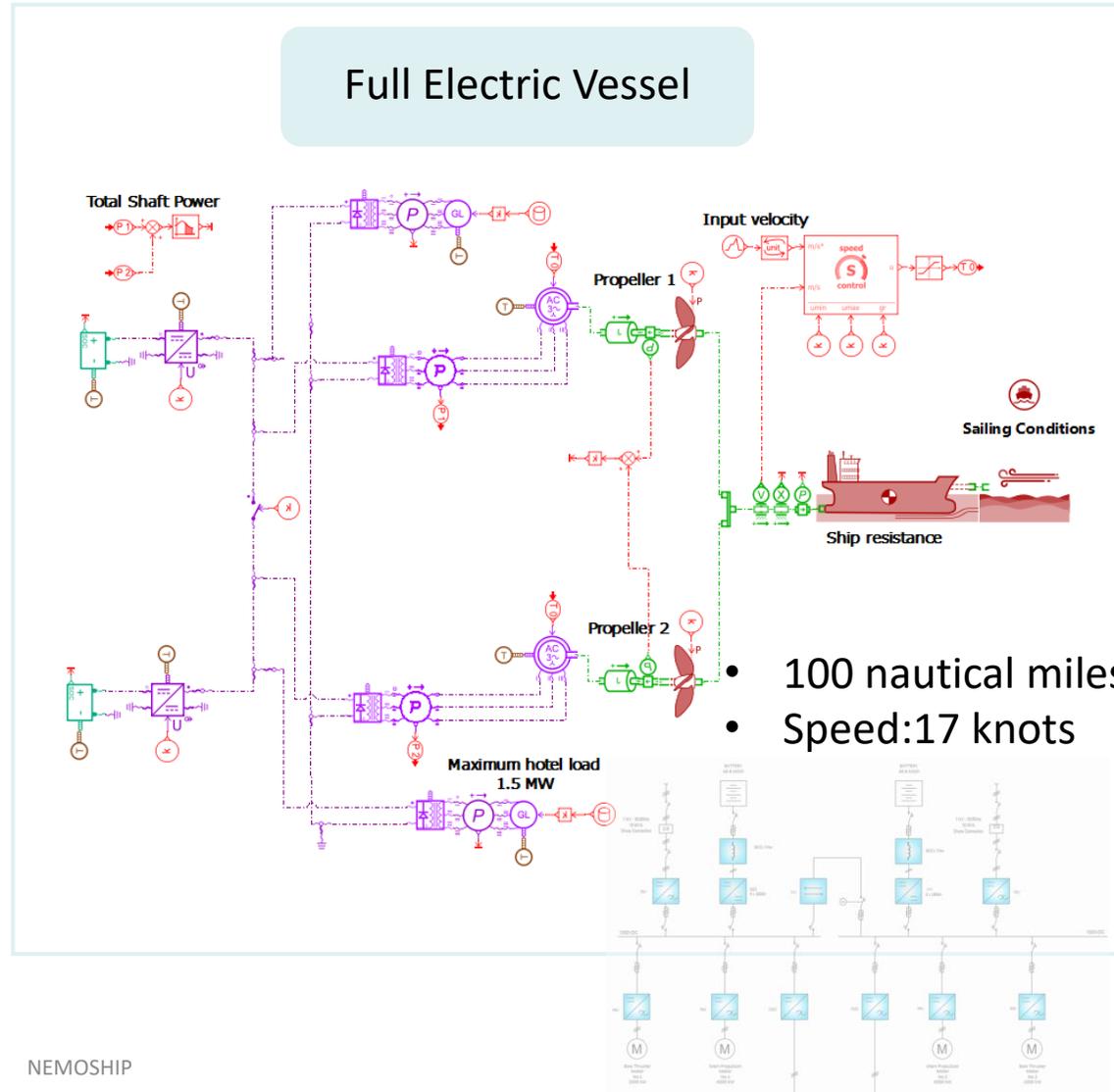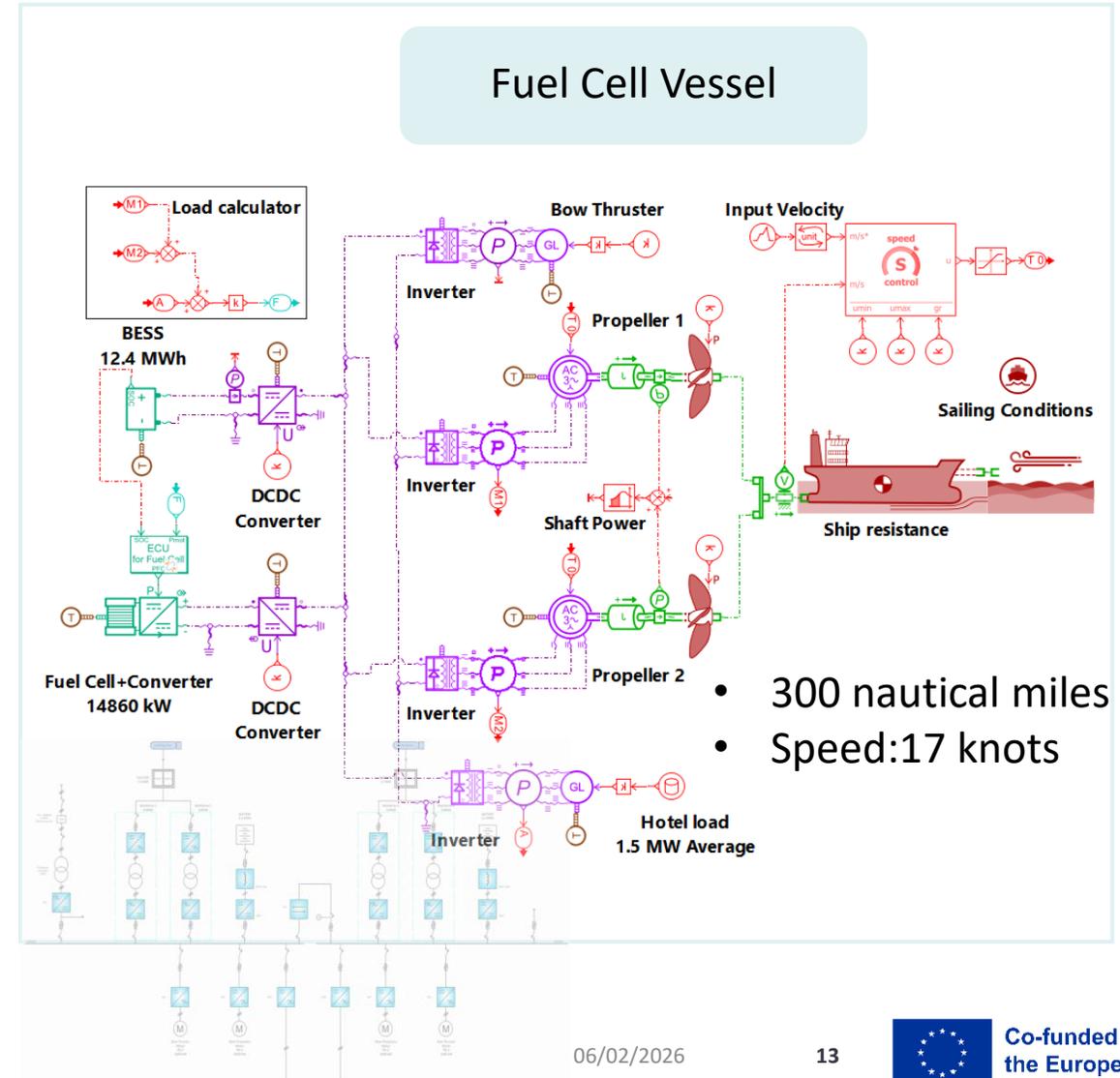
NEMOSHIP DIGITAL CLOUD PLATFORM

nemoship.azurewebsites.net

ROLE OF THE DIGITAL PLATFORM

NEMOSHIP

Trains crew members to evaluate how different onboard configurations during past trips may have affected key performance indicators (KPIs), such as fuel consumption, power, and emissions. All results are archived for easy access and future reference.

Offers guidance to the crew on the operation of generators and the battery system for a future trip in order to minimize costs, emissions, or both of them.

Provides visualization and export capabilities for the simulation results.

Allows the user to analyze the impact of using the batteries for past trips or a custom time period from the past.
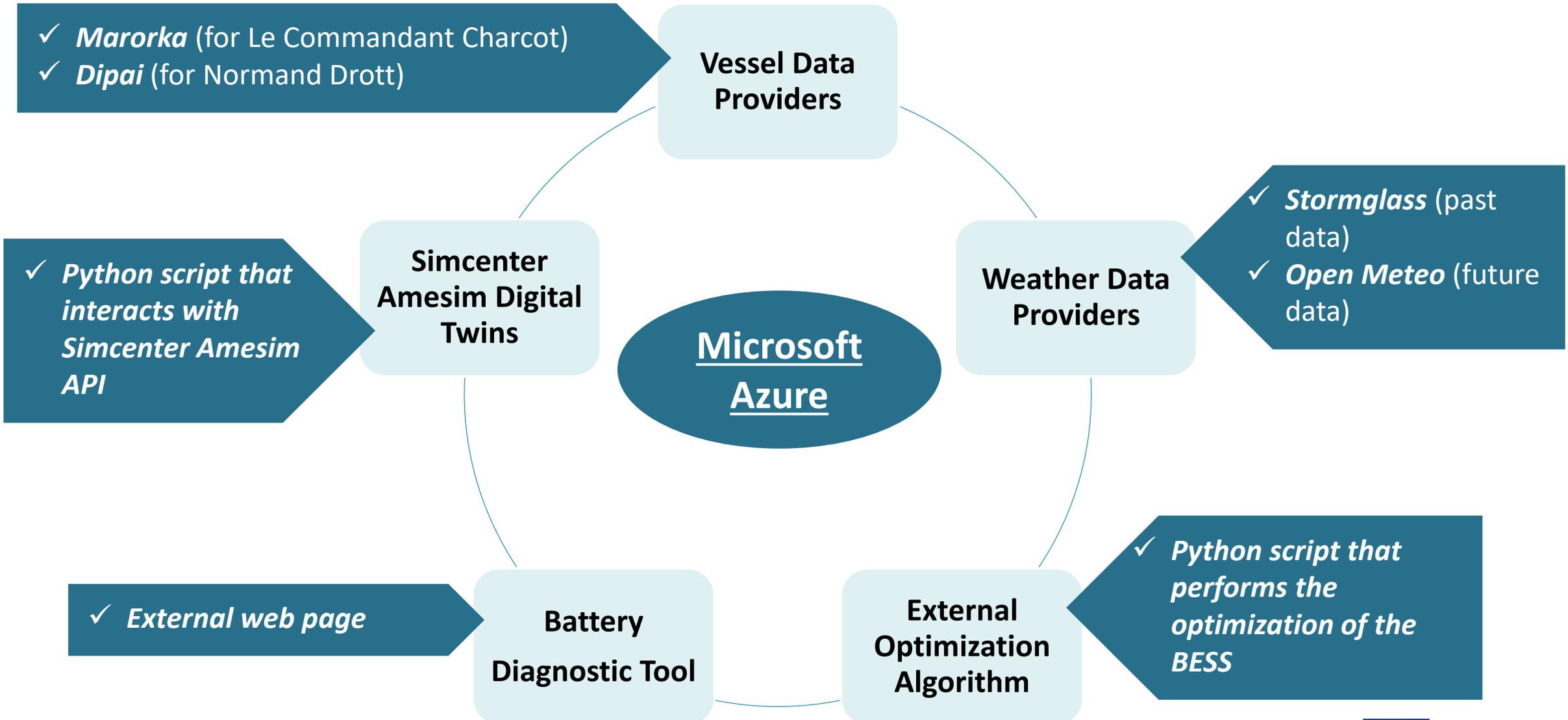
Facilitates access to a Battery Diagnostic Tool.

NEMOSHIP

API Gateway

Digital Twin Module

AMESIM Engine
(and neural networks)

SC
AME

Data Module

Python Interaction Module

Amesim API

Optimization Engine

NEMOSHIP Web UI

Microsoft Azure

NEMOSHIP

Vessel Data Providers

✓ *Marorka* (for Le Commandant Charcot)
✓ *Dipai* (for Normand Drott)

Weather Data Providers

✓ *Stormglass* (past data)
✓ *Open Meteo* (future data)

Simcenter Amesim Digital Twins

✓ *Python script that interacts with Simcenter Amesim API*

Microsoft Azure

External Optimization Algorithm

✓ *Python script that performs the optimization of the BESS*

Battery Diagnostic Tool

✓ *External web page*

FUNCTIONALITY

STATISTICAL ANALYSIS

Use Case

✓ *Le Commandant Charcot*

✓ Developed to assess **the impact of battery usage** over a defined period, focusing on various operational modes:
  ➢ *Zero Emissions*
  ➢ *Peak Shaving*
  ➢ *Spinning Reserve*

Objective

✓ Overview details for the full analyzed period
✓ Details per trip
✓ Details for a custom period

KPIs

✓ **Fuel Consumption**
✓ **GHG Emissions**
✓ **Methane CO2eq Emissions**

PAST SIMULATION AND TRAINING
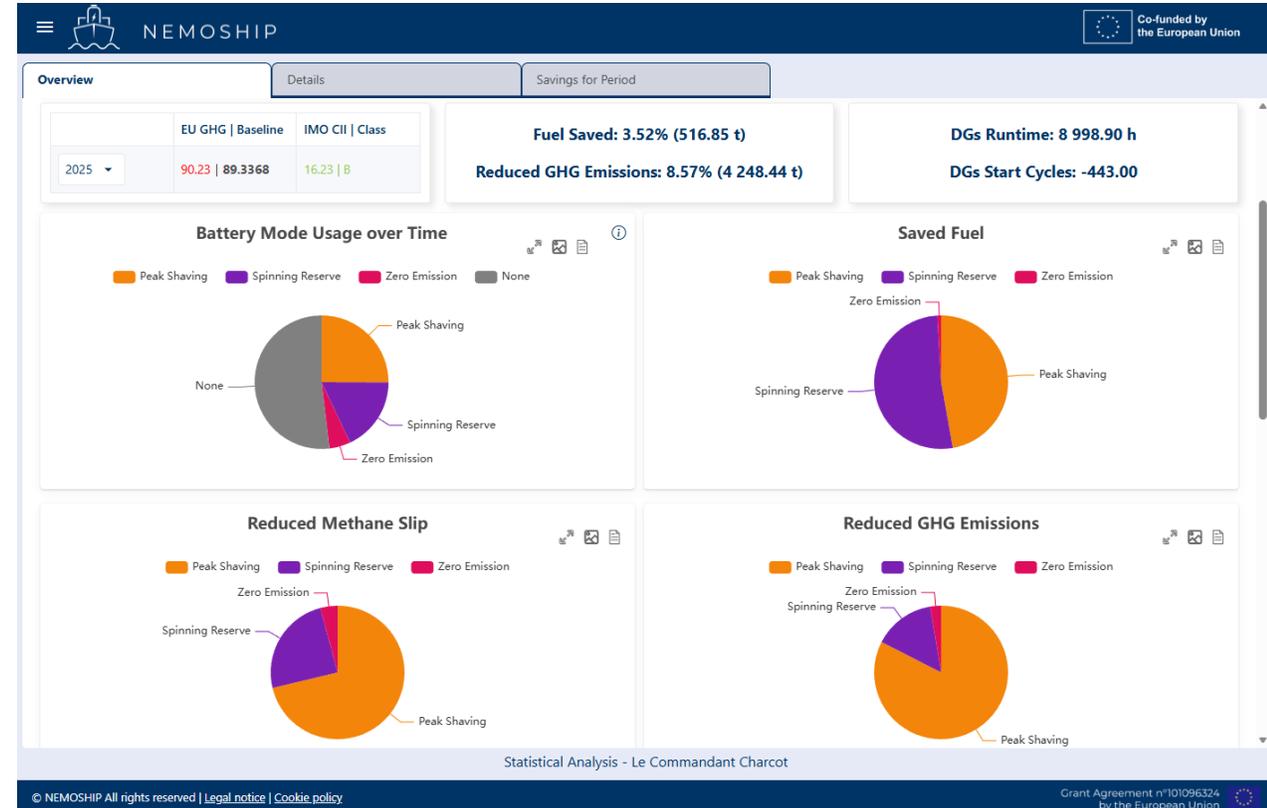
Use Cases

✓ *Le Commandant Charcot*
✓ *Normand Drott*

✓ Allows the user to select a past trip and **modify various parameters** to analyze their impact on key performance indicators

Objective

✓ The core objective is to explore "what-if" scenarios for performance and efficiency evaluation

Amesim

✓ At the heart of this module is a **Simcenter Amesim digital model**, ensuring robust and realistic system behavior modeling
✓ The digital model was validated against real-world data provided by the vessel data system (Marorka and Dipai, for each vessel)

OPTIMIZATION

NEMOSHIP
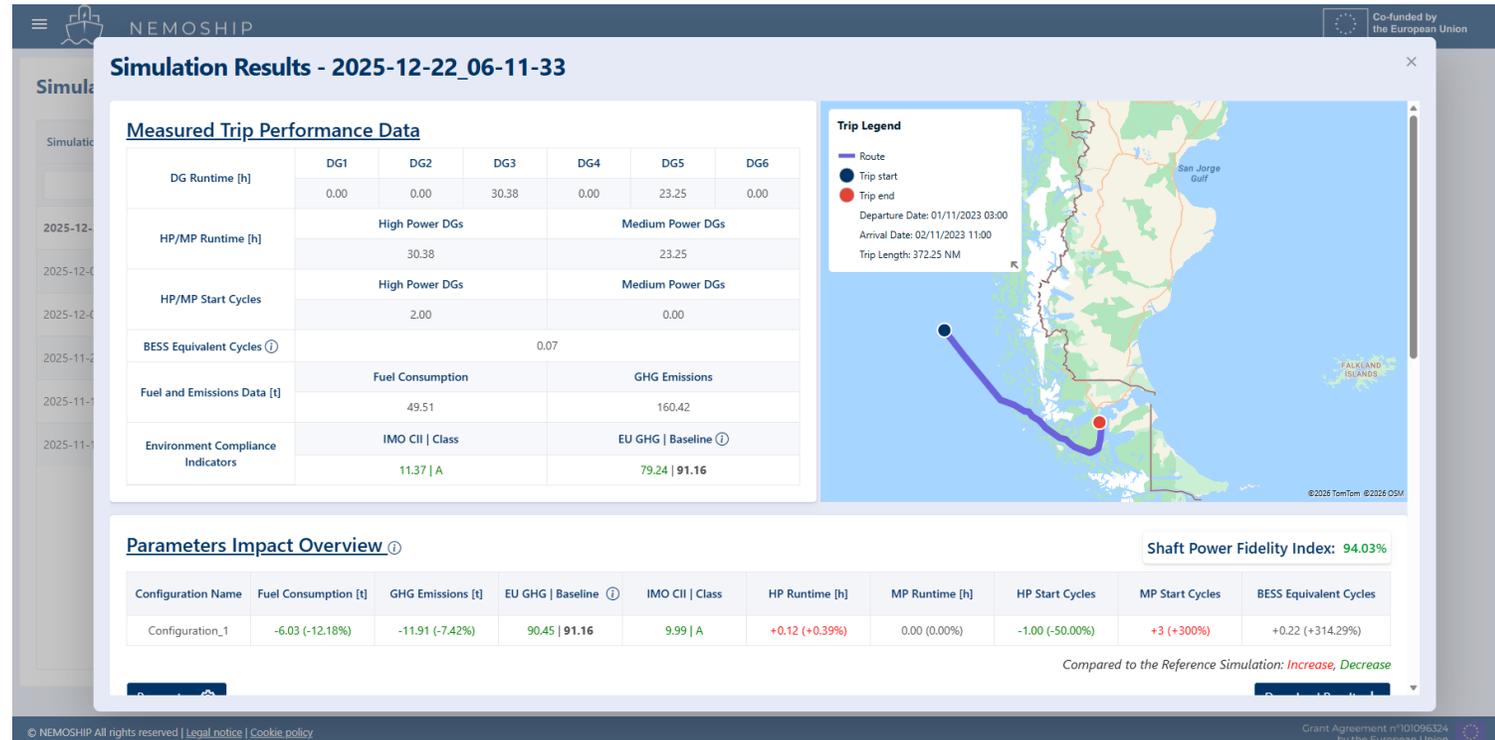
Use Cases
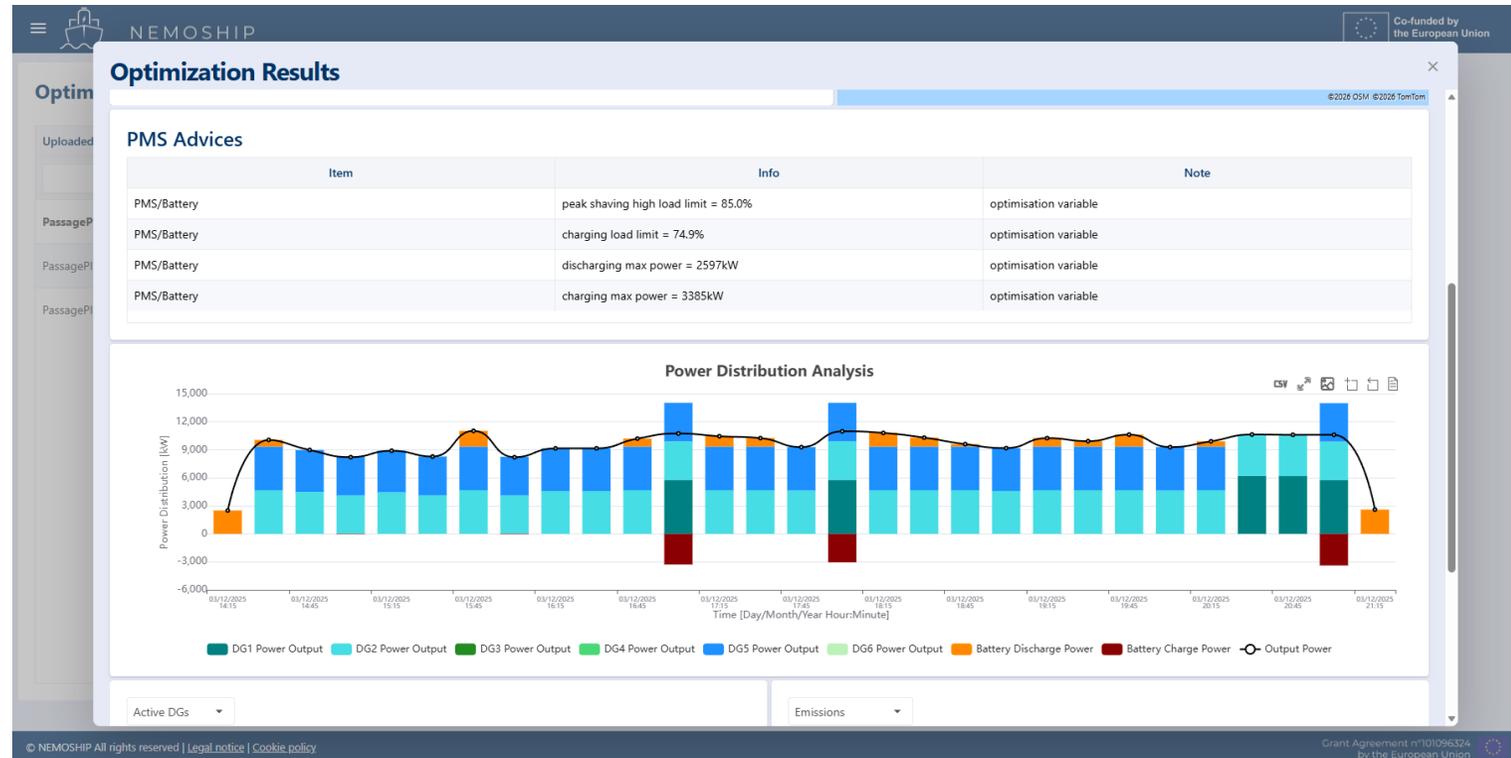- ✓ *Le Commandant Charcot*
- ✓ *Normand Drott*

✓ Designed to support the crew in **optimizing the Battery Energy Storage System** for upcoming trips, aiming to reduce costs and emissions

Objective

✓ The **power profile** for the imported route is generated by the **digital model** developed in **Simcenter Amesim** based on the route, weather conditions, and different activities defined by the crew

Optimization

✓ The optimization algorithm uses the power profile and the user-defined parameters as inputs to **minimize costs** and **emissions**

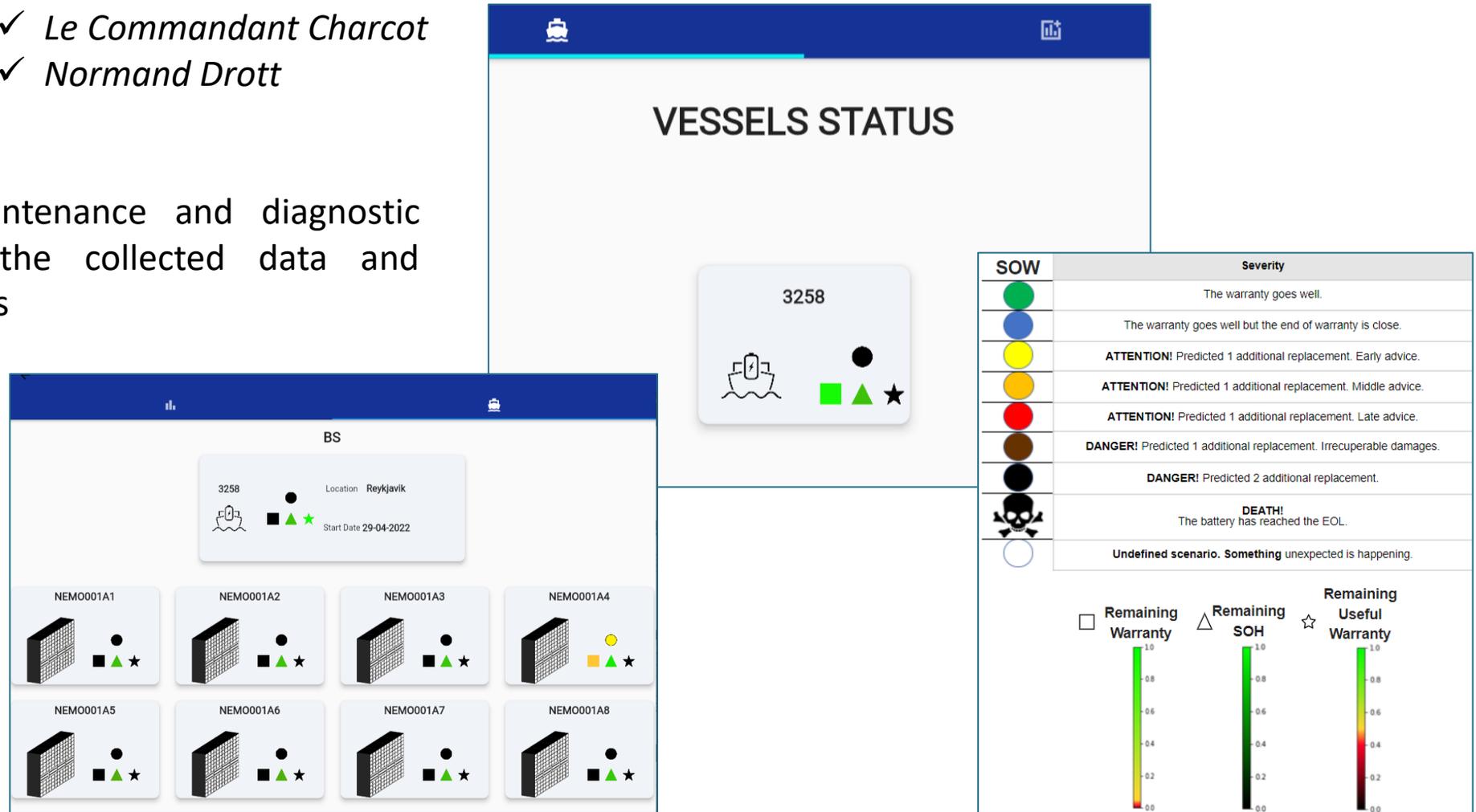# INTERACTION WITH THE BATTERY DIAGNOSTIC TOOL

Use Cases

- ✓ *Le Commandant Charcot*
- ✓ *Normand Drott*

- ✓ Defines predictive maintenance and diagnostic indicators based on the collected data and expected use of batteries
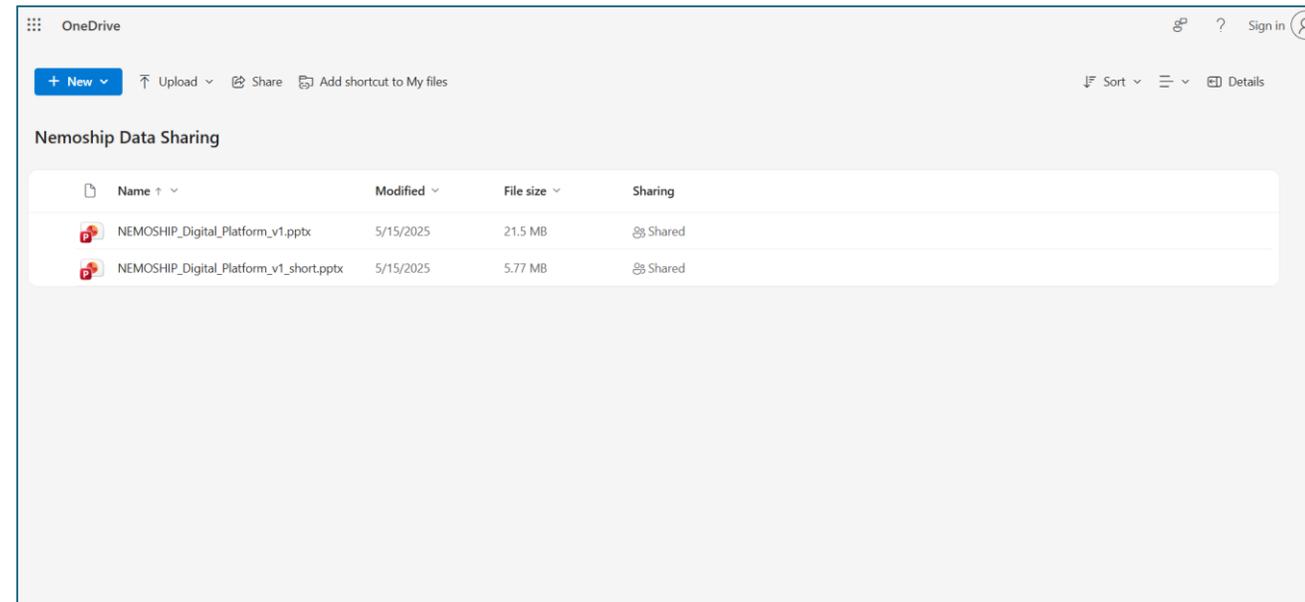
Objective

DATA SHARING SPACE

NEMOSHIP

Use Cases

✓ *Le Commandant Charcot*
✓ *Normand Drott*

✓ Provide allocated storage space for documents that users wish to retain for future analysis or share with partners, with the option to restrict access as needed
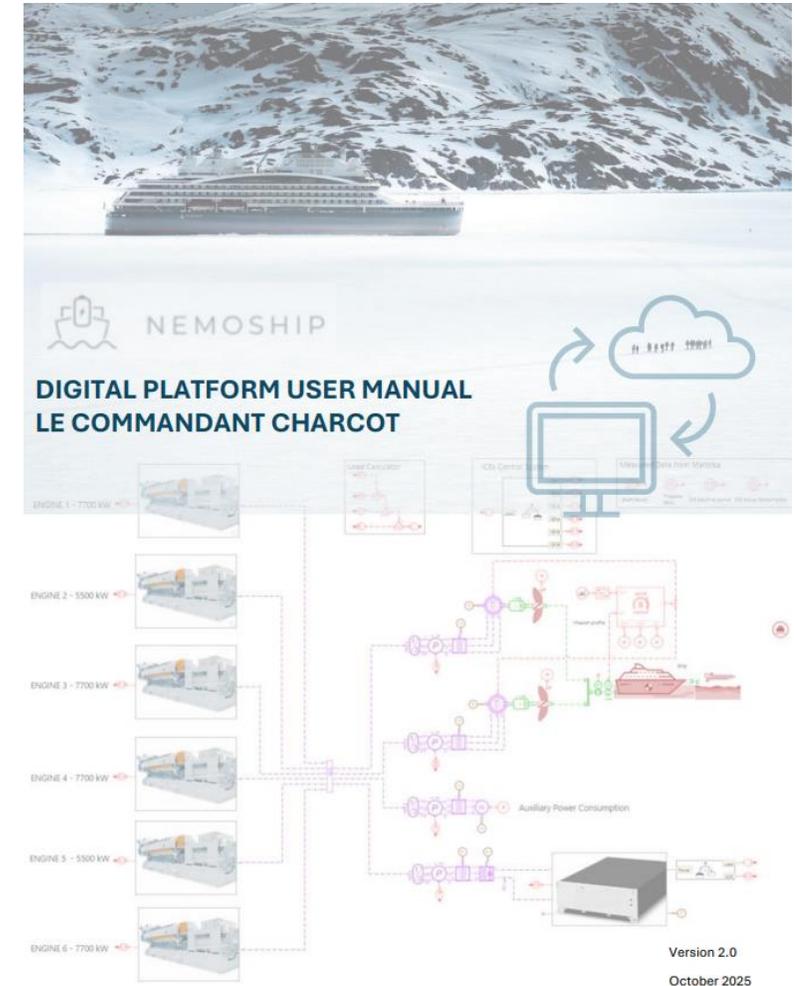
Objective

OneDrive

+ New   ⬆ Upload   ⬈ Share   Add shortcut to My files   Sort ⌄   ☰ ⌄   Details

Nemoship Data Sharing

Name ↑ ⌄	Modified ⌄	File size ⌄	Sharing
NEMOSHIP_Digital_Platform_v1.pptx	5/15/2025	21.5 MB	Shared
NEMOSHIP_Digital_Platform_v1_short.pptx	5/15/2025	5.77 MB	Shared

USER GUIDES

NEMOSHIP

Use Cases	✓ *Le Commandant Charcot* ✓ *Normand Drott*

Objective	✓ Provides comprehensive instructions for the use of the NEMOSHIP Digital Platform

NEMOSHIP
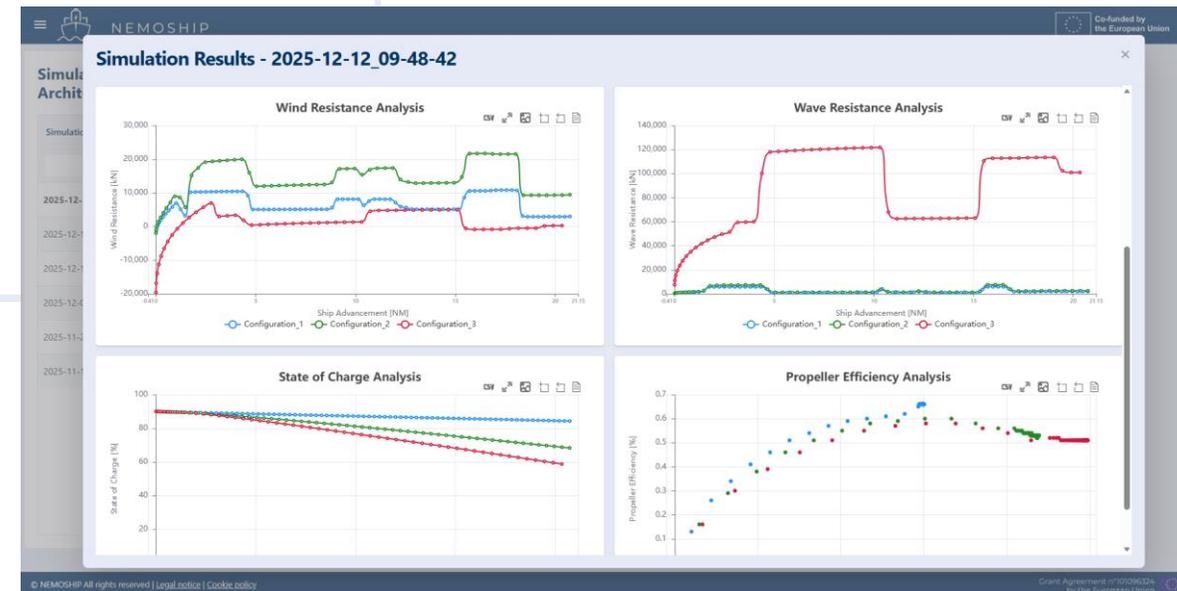
**DIGITAL PLATFORM USER MANUAL
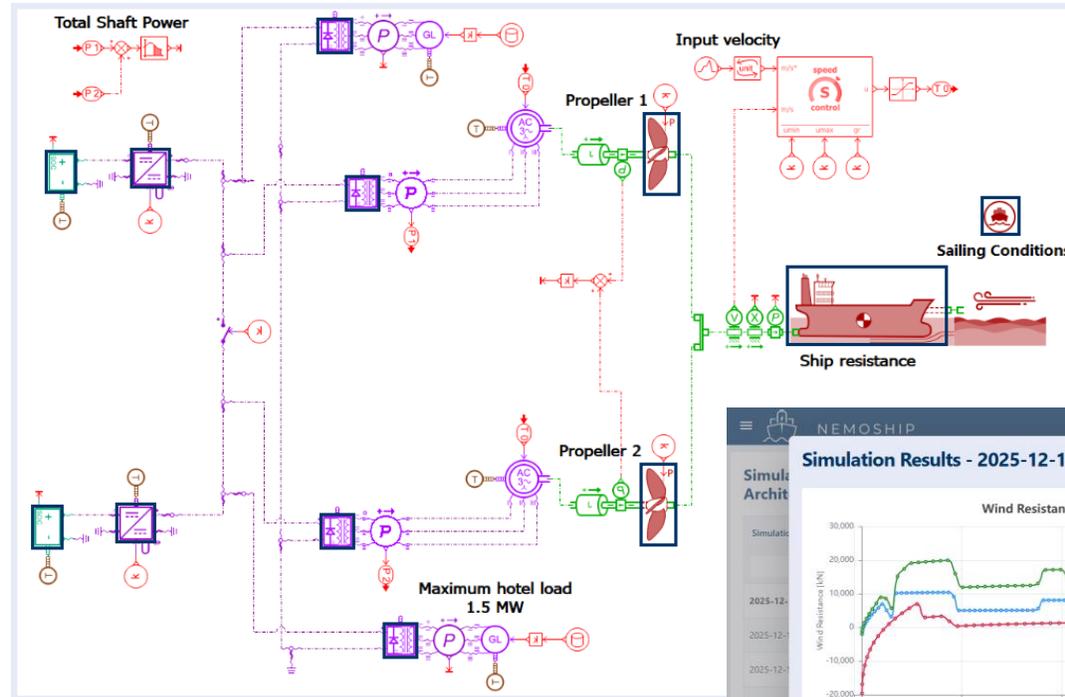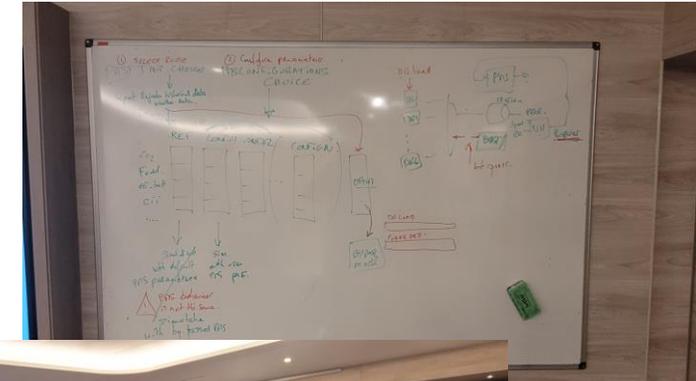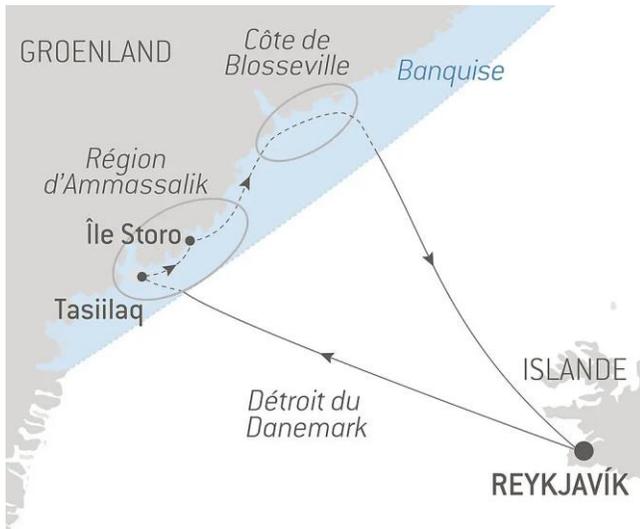LE COMMANDANT CHARCOT**

Version 2.0

October 2025

VIRTUAL USE CASES

Use Cases

✓ *Full Electric*
✓ *Fuel Cell*

Objective

✓ Allows the user to select a predefined trip and **modify various parameters** to analyze their impact on different key performance indicators
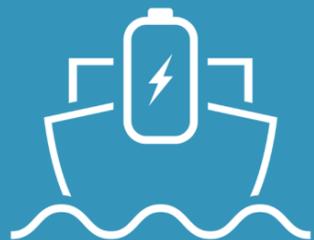
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NEMOSHIP

Purpose of the visit: gain practical insights into vessel operations, decision-making processes, and the energy management strategy

Key Activities

➢ Observed daily vessel operations
➢ Analyzed captain – chief engineer communication and decisions
➢ Reviewed Power Management System (PMS) setup and control
➢ Organized meetings with project partners and crew:
  ❑ Captain
  ❑ Chief engineer
  ❑ Planning officer

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Thank you
for your attention!

Contact:

calin.husar@siemens.com

roberta.luca.ext@siemens.com