NEMOSHIP

WP2 - Multi-layer digital platform development and implementation

D2.5: Digital twins for use cases : Ponant- Public Summary:

The ambition of the NEMOSHIP project is to develop, test and demonstrate innovative technologies, methodologies and guidelines to accelerate large BESS deployment and optimal exploitation toward 2030 on both hybrid and fully electric configurations. To help achieve this ambition, NEMOSHIP will develop a 1 MWh modular and standardised battery energy storage solution that is able to exploit heterogeneous storage units and a cloud-based digital platform to enable data-driven, optimised and safe exploitation. The project will demonstrate the maturity of these innovations at TRL 7 for hybrid ships as well as their adaptability towards fully electric ships.

The present deliverable is part of WP2 which focuses on the NEMOSHIP digital platform development and implementation. This WP includes the development of digital twins for each of the NEMOSHIP use cases, namely an offshore vessel from Solstad, a cruise vessel from Ponant and two semi-virtual full electric use cases. Simulation in the context of the NEMOSHIP project involves the creation of detailed, dynamic models that replicate the behavior of vessel energy systems under various conditions. These simulations are essential for predicting performance, identifying potential issues, and optimizing operations without the risks and costs associated with physical testing.

By involving advanced simulation tools and techniques, the digital twin can emulate the complexities of hybrid ship configurations, including aspects such as energy storage, distribution, and consumption.

This document describes the digital twin modelling for the NEMOSHIP use case linked to the demonstrator from Ponant, i.e. Le Commandant Charcot vessel. This vessel is a hybrid polar exploration passenger vessel (LNG/electric propulsion) built in 2021 and equipped with the latest technologies to reduce its carbon footprint. The cloud-based modelling uses results from the Amesim library from partner Siemens, fed with real data acquired from the field for a system validation and optimisation. Generic models developed from the project are considered as well, however the full integration into the digital twin will follow in a second version of the digital twin.

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These models will be ready to be used for testing and tuning the control algorithms in WP4, and tested and validated through the demonstrations and replicability use cases in WP5, WP6 and WP7.

First, the methodology for digital twin modelling is described, with the different steps followed specifically for the Ponant use case. Then, an overview of the vessel considered in the use case is provided, including the load and real data available. Different parts of the digital twin model are then described, with the diesel generator, hybrid propulsion and other system components, before showing the final outcome of the Digital Twin models in the last section.