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Project Abstract

The goal of the SEABAT project is to develop a full-electric maritime hybrid battery concept that is based on:

- Modularly combining high-energy batteries and high-power batteries,
- novel converter concepts and
- production technology solutions derived from the automotive sector.

The modular approach will reduce component costs (battery cells, convertors) so that unique ship designs can profit from economies of scale by using standardised low-cost components. The concept will be suitable for ships requiring up to 1 MWh of storage or more.

Public summary

The aim of this document is to describe the work done in task 4.3 from WP4. The main objective of WP4 is to design and develop the components for a modular and flexible hybrid-battery system towards low cost. The battery system will allocate high energy and high power batteries, focused on enhancing the energy density and efficiency of the system and reducing the cost of large waterborne transport battery systems. Apart from the design and development of the DC/DC converter, safety issues related with electronic devices and electrical and mechanical components have been evaluated and implemented within each component.

On the one hand, there are currently no international standards for battery installations in marine applications, although the International Electrotechnical Commission (IEC) is working on standards 62619 and 62620. In addition, classification societies, according to their experience, have developed specific rules and/or Additional Class notation to complement some international standards.

On the other hand, electronic components, due to the interaction among them, are prone to suffer from Electromagnetic Interferences (EMIs). These interferences are the (unwanted) coupling of signals from one circuit or system to another via conduction through parasitic impedances, power and ground connections, or via radio transmission. This phenomenon can cause the system to malfunction or even damage the system.

The scope of task 4.3 is to analyse the battery system security at component level. For that, the safety requirements of the battery system have been defined based on the analysis of the existing regulations (carried out in tasks 2.2, 2.3 and 2.4 from WP2). Moreover, the need for Safety Integrity Level (SIL) in the Battery Management System (BMS) and its implementation has been evaluated as well as Electromagnetic Compatibility (EMC) studies.

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1	FM	FLANDERS MAKE
2	DAMEN	SCHEEPSWERF DAMEN GORINCHEM BV
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4	RINA	RINA SERVICES SPA
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6	VARD	VARD ELECTRO AS
7	ABEE	AVESTA BATTERY & ENERGY ENGINEERING
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Appendix A - Table of Abbreviations

#	Abbreviation	
1	EMC	Electromagnetic Compatibility
2	EMI	Electromagnetic Interference
3	EMSA	European Maritime Safety Agency
4	FMEA	Failure Modes and Effects Analysis
5	HARA	Hazard Analysis and Risk Assessment
6	IEC	International Electrotechnical Commission
7	IMO	International Maritime Organization
8	SIL	Safety Integrity Level
9	SOLAS	Safety of Life at Sea
10	TR	Thermal Runaway
11	BTMS	Battery Thermal Management System
12	ESD	Electrostatic Discharge