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Solutions for large batteries for waterborne transport

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D3.3 – Preliminary design of a 300 kWh battery for waterborne applications

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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 standardized low-cost components. The concept will be suitable for ships requiring up to 1 MWh of storage or more.

Public summary

The main goal of SEABAT is to develop a cost-effective hybrid energy storage system (HESS) architecture for large marine applications that is scalable to 1 MWh and beyond. Without loss of generality, the HESS design proposed by SEABAT will be validated at a level of 300 kWh, while taking into account virtual upscaling to 1MWh. To consolidate the design, the scalable system architecture developed in Deliverable 3.2 needs to be quantified and translated towards component level. The architecture of D3.2 expounded on the selected battery, distributed converter topology, with built-in DCDC-converter as selected by the consortium based on D3.1.

Within this deliverable, the description of the developed HESS architecture is therefore sized as a first step in the formal design. The architecture will be concretized by pinning down high-level performance specifications, that cascade down into component specifications. Rather than elaborate, domain oriented descriptions, the content is condensed, where possible, in summarizing tables and figures. The deliverable describes all facets of the preliminary design, starting at module level, by way of string level to overarching HESS level.

Also in this preliminary design, the cost reduction verification and scalability of the battery system are taken into consideration in separate sections. Cost analysis approach from the system architecture explained in D3.2 are further detailed and quantified in order to come up with the battery system cost at the level of 300 kWh. Likewise, a virtual technological assessment is made regarding system upscaling towards multiple MWh. The cost estimation at this stage is competitive with other market players, and budget uncertainties are reducing towards the final design. During the initial study regarding virtual upscaling in this deliverable, no problems were encountered in envisioning the system being used beyond 1 MWh. The preliminary design as presented here, based on the modular architecture, provides large technological margins, which enable HE solutions up to 19 MWh (5.6 MWh for HP), even without network modifications. When considering (parallel) network extensions, tens of MWh's still seem feasible.

Throughout the preliminary design, safety considerations from the system architecture are incorporated in the preliminary design. Special attention has been paid to way of mitigating and minimizing potential thermal runaway of battery cells, which is perceived as a core safety challenge.

Having quantified major flows in the system such as electrical, thermal and cooling as well as major component specifications, the partners in WP4 are equipped with both the architecture and the size dimensioning to commence the detailed design, which will be the output for the deliverables in WP4.

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Project partners:

#	Partner	Partner Full Name
1	FM	FLANDERS MAKE
2	DAMEN	SCHEEPSWERF DAMEN GORINCHEM BV, Incl Linked Third Parties DGS and DRDI
3	FCSI	FINCANTIERI SI SPA
4	RINA	RINA SERVICES SPA
5	SOERMAR	FUNDACION CENTRO TECNOLOGICO SOERMAR
6	VARD	VARD ELECTRO AS
7	ABEE	AVESTA BATTERY & ENERGY ENGINEERING
8	IMECAR	IMECAR ELEKTRONIK SANAYI VE TICARET LIMITED SIRKETI
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11	Fraunhofer	FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V.
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