POWER STORAGE IN D OCEAN

D4.2. EESS Engineering Design which includes fabrication drawings, bill of materials, schemes, etc.

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1. ELECTRICAL SCHEMES

This chapter refers to the first annex [A1], that is the preliminary electrical scheme of the system, and it is intended to help in reading it.

A) SHEET 1

Title page

B) SHEET 2

On this sheet it is depicted the DC/DC conversion stage. The EESS will take in input the 850V DC line provided from the customer, that, through a 1000V 500A fuse, will feed the TGPS power module (GEMMN0101 in the scheme). On the output side there is the filter made up by 3 inductors (5mH 100Arms) and a capacitor. Then another fuse, identical to the first, is placed between the filter and the SC Bank. In this sheet there are also represented the DCCT for measuring the current flowing through the power module, and the two DCVT: one measuring the voltage on the input of the power module, and the other measuring the voltage at the terminals of the SC bank.

C) SHEET 3

On this sheet it is depicted the scheme of the SC storage bank, it will be configured as a parallel of two series of 15 SC modules each. The cabinet will have two power terminals (+ and -) to which the conversion stage will be clamped, and a connector for the interface management through which the SC cabinet will interact with the DC/DC conversion stage of the system.

D) SHEET 4

On this sheet it is depicted the control architecture, consisting in a CompactRIO that will be fed through a 24V 60W DC supply (supplied from the 230V AC provided by the customer).

2. BILL OF MATERIALS

The preliminary Bill of Materials is reported in Table 1. Only the main components have been included, the ones that are relevant at this stage of the project, either because of the volumetric impact they have on the system or due to the importance they have in the power sizing of the system.

Table 1 Prelimnary Bill Of Materials

DRAWING REFERENCE	QUANTITY	DESCRIPTION	
G1	1	24VDC SUPPLY	MDR-60-24 24V 60W Meanwell OR EQUIVALENT
U2	1	SC BANK	CapTop Cabinet
U3	1	CONTROL	CompactRIO
U4	1	DCCT	LEM HAS 400-S OR EQUIVALENT
U5, U6	2	DCVT	LEM LV 25-P OR EQUIVALENT
F1, F2	2	FUSES	BUSSMAN 170M1833 OR EQUIVALENT
Cf	1	FILTER CAPACITOR	TDK B25690C1308K103 OR EQUIVALENT
LPWM1,2,3	3	FILTER INDUCTORS	5mH_100Arms
U1	1	DC/DC CONVERTER	**INCLUDING** ↓
	3	IGBT 1700V 600A	Mitsubishi CM600DX-34T OR EQUIVALENT
	1	CONTROL BOARD	SESPN0045 Board F397 TGPS Control
	12	LOCAL DC LINK	DCH85 C 40uF 1450V Ducati Energia

The complete Bill of Materials including the smaller components, will be released in a second moment, when all the details of the system will be defined.

3. FABRICATION DRAWINGS

In Figure 1, a mechanical sketch of the EESS is reported. These are preliminary drawings, they are mainly intended to give an idea of what are the main subsystems and what is the foreseen occupied volume inside the 20' container.

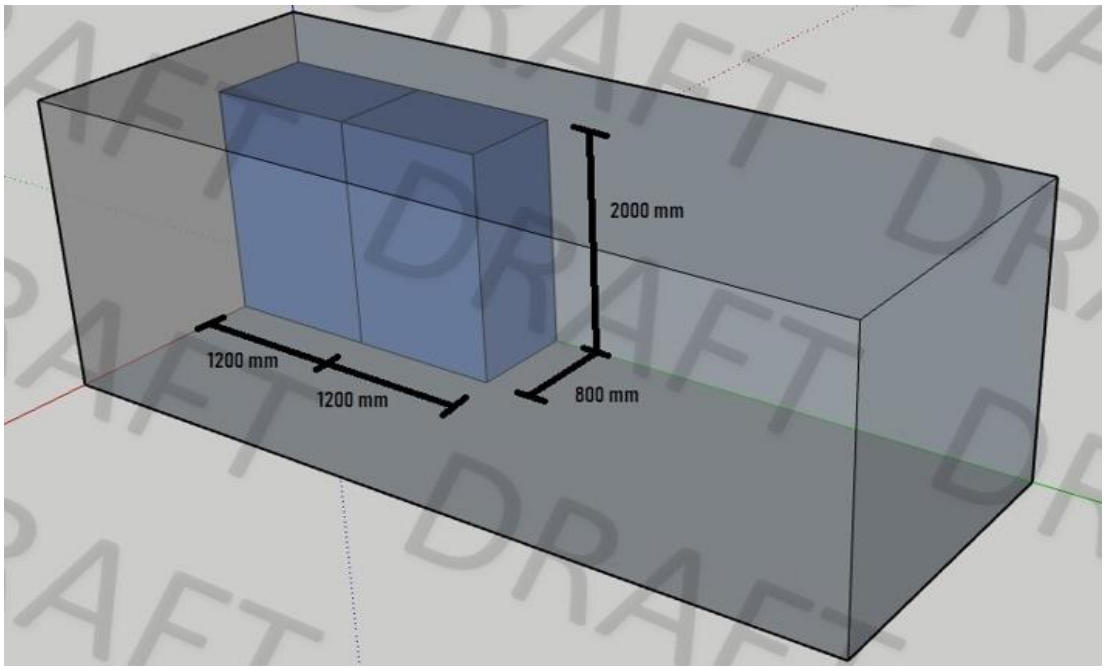

Figure 1 Volumes

The intention is to locate the supercapacitor bank in a cabinet and the DC/DC converter stage + control architecture in another identical cabinet, then to joint them through a lateral panel, obtaining a single cabinet having dimensions (W x L x H) 2400 x 800 x 2000 [mm].

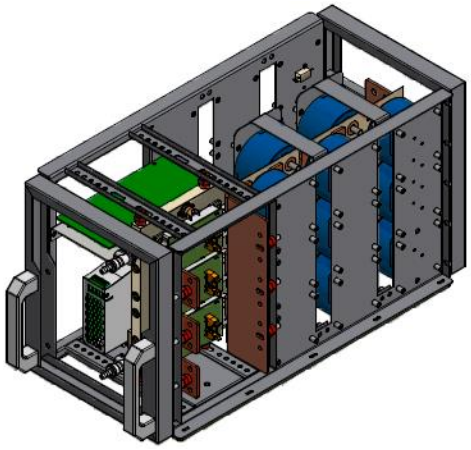

Figure 2 TGPS power module

In Figure 2 it is reported the 3D view of the TGPS power module that will be used for the DC/DC conversion. For the cooling of the TGPS it is required a water-cooling circuit, for this reason two pipes, one for the inlet and another for the outlet are needed (see [A2]). Furthermore, for some auxiliary equipment, a 230V AC (50Hz or 60Hz) line is required.

In the annex [A2] it is reported a mechanical drawing depicting the front view, the top view and a 3D view of the preliminary system, with also shown the inlet and outlet of the water-cooling network and the 230V AC line brought into the container.

As said, having a water-cooling network is of utmost importance, for this reason, if the circumstances do not allow the ship to make available pipes for the inlet and outlet of the water, a possible solution would be to implement a closed circuit for the water cooling, with a water to air exchanger or even a water chiller.

The last option, that would lead to a significative increase in costs and time for designing, would be to use an air-cooled power module with the addition of an air conditioning system fitted inside the 20' container.

4. ANNEXES

REFERENCE	TITLE
[A1] Electrical Drawings	PESY00074.0 – EESS FOR POSEIDON
[A2] System Mechanical Drawings	PESY00074.1 – EESS FOR POSEIDON
[A3] TGPS Mechanical Drawings	TGPS LAYOUT

5. CONCLUSIONS

The engineering design of the EESS for the POSEIDON project has been completed with the selection of key components and the development of preliminary electrical schemes and external mechanical layout. The proposed configuration, centered around the supercapacitor bank and DC/DC converter, ensures the system meets the performance and space requirements for marine applications. The next steps will focus on finalizing the detailed bill of materials and addressing any remaining integration aspects to ensure smooth implementation.