BFH-CSEM Energy Storage Research Center

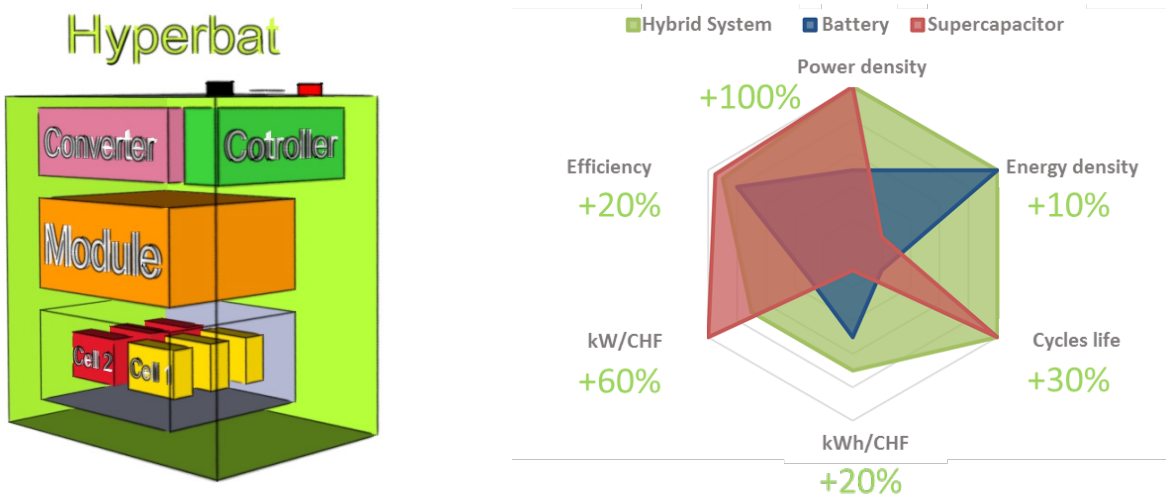
Battery Research

A hybrid battery solution

Battery Energy Storage Systems (BESSs) are considered as key elements for an effective integration of renewable energy sources in today's power systems. Despite a continuous reductions of the price of lithium ions battery cells, the part of a BESS in the final total system cost is still rather high and electrochemical battery systems do still have a high environmental impact. In this context the project HyperBat aims to reduce the cost and the environmental impact of electrochemical storages by means of a hybrid BESS, with the motivation to achieve a longer life time for the battery by supplying rather constant power in combination with a supercapacitor for power peaks.

Although the advantages of hybridization are not new in the industry, especially in the automotive field, the correct design of a hybrid system to attain the expected results is not trivial. The three main challenges related to the HyperBat research project are as follows:

- Identify the performances in terms of capacity, efficiency and life time in operation of the both storage tech-nologies.
- Define the optimium control strategies to split the energy and power demand.
- Build a simple and effective power conversion architecture to couple the different elements.



The HyperBat concept (left) and the expected advantages of this hybrid solution (right).

Based on the laboratory infrastructure available at the BFH-CSEM ESReC the performances of the selected storage technologies - lithium nickel oxide battery and lithium capacitor – are evaluated with suitable testing procedures. These measurements allow to define the capability chart for the selected storage systems, which is the basis for the definition of the control strategy for the hybrid system. A prototype with 100 V nominal voltage, 6 kWh nominal energy and 12 kW of peak power was realized and tested at CSEM.

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