



Battery control

Advanced ESS control strategy for end-users energy services

In a world characterized by an increasingly important concern about energy efficiency and a constant growth of the penetration of stochastic renewable energy sources, CSEM took up the challenge of developing a solution that can both help to solve the related technical issues and bring added value to the end-users. Relying on the inherent DC nature of most Energy Storage Systems (ESS) and Renewable Energy Sources (RES), the developed solution is able to provide several different services while minimizing the bill of material, thus doubling the potential benefits.

Based on the State-of-Charge (SoC) information taken out of the energy storage system, a local controller defines the power flowing through an interface with an upstream distribution network. This power can either be positive, negative or null, depending on the energy storage system SoC and the local balance between production and consumption.

The ESS capacity is virtually split in order to provide different services with a single energy storage system, benefitting from the use of the multi-objectives control strategy. The capacity repartition is fully configurable, enabling the user to privilege any of the following services, depending on his/her specific needs.

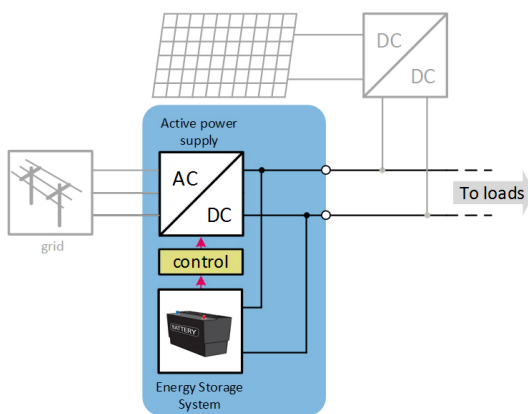
Increased self-consumption—The grid interface will be controlled in such a way that the potential excess of local production or the recovered energy will be

locally stored for later use instead of being rejected into the grid. This can be economically advantageous in a context of decreasing feed-in tariffs for energy produced by RES with low or zero marginal costs.

Peak-shaving—Should the amount of stored energy be not sufficient to supply the loads or too important to store more excess production, power will have to be exchanged with the distribution grid. The developed solution allows to limit this power exchange, using the ESS to manage the difference. Such a limitation is particularly useful for applications characterized by important power peaks, even more so that the power-related component of the electricity bill is bound to increase.

Smoothing power variations—The energy storage system can also be used to smooth the time variations of the power exchanged with grid, solving the problematics of in-rush currents and potential related instability issues.

The potential applications of this technology range from the power supply of industrial loads such as drives to the integration of RES-based power plants in the distribution grid. Moreover, the underlying principle can be extended to any energy vectors, such as heat or compressed air.



Working principle of the developed solution and illustration of the different provided services

