= iSTORMY =

EUROPEAN COMMISSION

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Interoperable, modular and Smart hybrid energy STORage systeM for stationarY applications

GRANT AGREEMENT No. 963527

Deliverable Report

D4.1 – Report on high-level EMS algorithm development

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Publishable summary

The iSTORMY project aims at developing an interoperable and modular Hybrid Energy Storage System (HEES) by demonstrating various Use cases and seamlessly interfacing the grid to provide multiple services. In this deliverable, the development of a standard high-level Energy Management System (EMS) is described. The purpose of this EMS is to dynamically allocate the power between the high-energy and high-power energy storage modules to provide the requested grid-services. For this purpose, a general state-machine has been designed and combined with specific functions to initialize, operate and stop the HESS in case of failure.

In the state-machine, a hardware and software commissioning protocol and a connection sequence have been defined to connect the HESS to the grid. An alarm mode of operation has been also defined to handle faults and to activate the protection systems when necessary. Other modes include the stopping and normal operation. In the latter, the purpose is to manage the power exchange to carry out functions such as the SoC restoration, or the provision of grid services.

In particular, the control functions to provide services have been developed for the three different use cases defined in D1.1, namely a Pan-European grid, an EV charging station and a microgrid. The grid services consist of an enhanced frequency response for Use case 1, a maximum power and ramp rate limitation for Use case 2, and a fast frequency response and daily shifting service for Use case 3.

The individual control functions as well as the complete standard EMS algorithm have been tested in simulation to check the correctness of the state-machine, the transitions between different modes of operation and an adequate operation of the control algorithms developed for the three use cases. The results demonstrate the validity of the proposed solution for the considered scenarios and will be used as a basis for the self-healing algorithms in Task 4.2 and the upscaling solutions in Task 4.4.

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Project partners:

#	Partner short name	Partner Full Name
1	VUB	VRIJE UNIVERSITEIT BRUSSEL
2	PWD	POWERDALE
3	CEG	CEGASA ENERGIA S.L.U.
4	CEA	COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES
5	MGEP	MONDRAGON GOI ESKOLA POLITEKNIKOA JOSE MARIA ARIZMENDIARRIETA S COOP
6	ZIG	ZIGOR RESEARCH & DEVELOPMENT AIE
7	EDF	ELECTRICITE DE FRANCE
8	TNO	NEDERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK TNO
9	PT	PRODRIVE TECHNOLOGIES BV
10	GW	GREENWAY INFRASTRUCTURE SRO
11	AIT	AIT AUSTRIAN INSTITUTE OF TECHNOLOGY GMBH
12	UNR	UNIRESEARCH BV

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