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MS3. Building Energy Management System Completion

Project Report
Tecnalia, Acciona, R2M

Summary

This document contains the information related to the fulfilment of Milestone 3 of PVSITES project, as defined in the Grant Agreement, Annex 1 (part A), corresponding to the completion of the Building Energy Management System for each demonstration site.

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Disclaimer

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1 EXECUTIVE SUMMARY

1.1 Description of the milestone content and purpose

This document contains the information related to the fulfilment of Milestone 3 of PVSITES project, as defined in the Grant Agreement, Annex 1 (part A), corresponding to the completion of the Building Energy Management System for each demonstration site. The milestone was due for April 30th 2019 (after approval of last amendment) and has been completed by June 30th 2020, as a consequence of the delay on the set up of some demo sites.

1.2 Reference material

- PVSITES Grant Agreement.
- PVSITES Deliverable 6.4: Technical specifications for BIPV modules.

1.3 Abbreviation list

BEMS: Building Energy Management System

BIPV: Building-integrated photovoltaics

2 ISSUING OF BEMS COMPLETION FOR EACH DEMONSTRATION SITE

The Building Energy Management System developed in T6.4 of PVSITES project has been completed and it is fully operative in 3 demo sites: FORMATD2, EMPA and VILOGIA. In these demo sites, preliminary results have been obtained, demonstrating the feasibility and benefits of a predictive control of storage systems for a more predictable, grid-friendly and profitable BIPV self-consumption.

Actually, 4 of the demos were proposed to be equipped with a smart BEMS with local monitor and control equipment installed on site. These demos are FORMATD2, VILOGIA, CRICURSA and EMPA. Since BIPV excess is not expected in TECNALIA and EHG buildings due to their huge consumption and all the BIPV generation is directly self-consumed, no BEMS makes sense there.

Regarding CRICURSA building, BEMS has been completely implemented, but more difficulties than expected and barriers to interoperability were found among the different elements of the installation. In fact, battery control has not been achieved at the end avoiding the completion of BEMS in this building.

It is also important to note that the commissioning and validation of PVSITES BEMS was postponed until final implementation and operation of every demo site. This was quite delayed, particularly in VILOGIA and EMPA demo sites, where different concatenated issues arose regarding grid-connection protection devices and storage system placement, respectively. As a result, this milestone has been delayed from M18 to M52.

All the activity carried out is described in detail in deliverable D6.4. The document describes the implementation of the Building Energy Management System (BEMS) in each demo site. For this purpose, the architecture of the developed Building Energy Management System is firstly presented. Then, every single subsystem is described in detail explaining its particular design for each demo site:

1. Monitoring data acquisition system.
2. Real-time control system, in charge of monitoring and controlling BIPV generator, manageable loads and storage system.
3. Database, where all the monitoring information is collected. It also performs as the data hub for the interconnection of the different local and cloud subsystems.
4. Human Machine Interface (HMI), allowing the supervision of BEMS performance.
5. Energy strategy optimization algorithm, including BIPV generation and building consumption forecasting tools.
6. Building electrical loads management system, in charge of determining the consumption profile of manageable electrical loads.
7. Weather forecasting service, providing the predicted meteorological information required by the BIPV generation forecasting tool.

In section 4, the actual progress on the commissioning and validation of the PVSITES BEMS in the 4 proposed demo sites (FORMATD2, EMPA, CRICURSA and VILOGIA) is explained. Finally, section 5 gathers main conclusions and lesson learnt. As main conclusion, the innovative energy management strategies, based on forecasted BIPV production and building consumption and implemented in PVSITES project, have been demonstrated to improve economic savings from BIPV self-consumption and reduce its impact on the distribution grid.

To sum up, the current status of BEMS commissioning and validation in the demos sites is:

1. In FORMATD2 single-family house, in addition to the predictive control of the batteries, water heat pump is also managed to increase even more the self-consumption rate. Preliminary results are promising but further operating conditions must be tested.

2. In EMPA PVSITES, BEMS has been implemented on Energy Hub platform, though the stochastic and scarce EV charger consumption has avoided to extract great conclusions for the moment.
3. In CRICURSA, the main challenge has been dealing with the interoperability of all the local commercial equipment: PV inverters, storage inverters and electricity meters. Finally, remote control of battery inverter, and consequently PVSITES BEMS implementation, has not been feasible.
4. In VILOGIA, since BIPV system set-up has been achieved at the end of the project, only interoperability of all the equipment of PVSITES BEMS has been checked. Up to date, operating conditions made perform equally both, PVSITES BEMS and the conventional one, as expected.