

TRANSNATIONAL ACCESS USER PROJECT FACT SHEET

| USER PROJECT | |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Acronym | LiBRE |
| Title | Efficiency Characterisation and Interoperability Validation of Lithium-Battery-Based Hybrid Power Plant for Rural Areas Electrification |
| ERIGrid Reference | 04.009-2018 |
| TA Call No. | 4 |

| HOST RESEARCH INFRASTRUCTURE | | | |
|------------------------------|-------------------------------------------------------|-------------------|----|
| Name | Centre for Renewable Energy Sources and Saving (CRES) | | |
| Country | Greece | | |
| Start date | 25.07.2018 | N° of Access days | 20 |
| End date | 22.08.2018 | N° of Stay days | 29 |

| USER GROUP | |
|-----------------------|---------------|
| Name (Leader) | Platon Baltas |
| Organization (Leader) | Enfinity |
| Country (Leader) | Belgium |

1. USER PROJECT SUMMARY (objectives, set-up, methodology, approach, motivation)

This project deals with the operation analysis of a commercial hybrid system. This device is based on Lithium Iron Phosphate battery (LiFePO₄) technology that allows an efficient and reliable usage of RES energy in both on-grid and off-grid applications. The tests were planned in order to verify the high efficiency and reliability of the LiFePO₄ battery, while, at the same time, the reliable and efficient operation of the system as a whole had also to be validated. Last but not least, the characterisation of the communication protocol of the Battery Management System was one of the goals of this project.

Figure 1 depicts the basic experimental setup

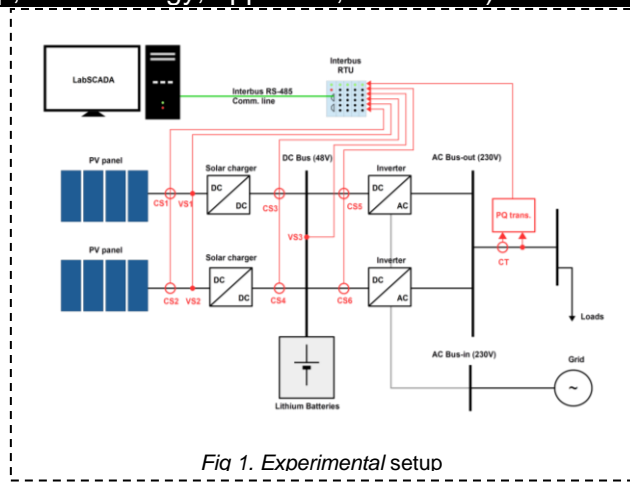


Fig 1. Experimental setup

used during the implementation phase for the efficiency measurement of the system. The setup made use of a number of current and voltage sensors at various points of the hybrid system in combination with an AC power transducer used to monitor the AC load consumption. All signals are collected by a RTU used as a data logger which communicates with a SCADA system via Interbus.

2. MAIN ACHIEVEMENTS (results, conclusions, lessons learned)

Through tests the duration of which ranged from 2 days to one week it was possible to verify that the LiFePO₄ batteries present high round-trip efficiency value (above 90%). This is in line with the data provided by the battery manufacturer as well as data from other manufactures and scientific publications. In conjunction with the high efficiency, the battery voltage showed small variation around the nominal value, verifying that the battery is reliable in terms of supplying DC loads. The profile of the voltage for one of the tests is shown in Figure 2. In addition to that, in order

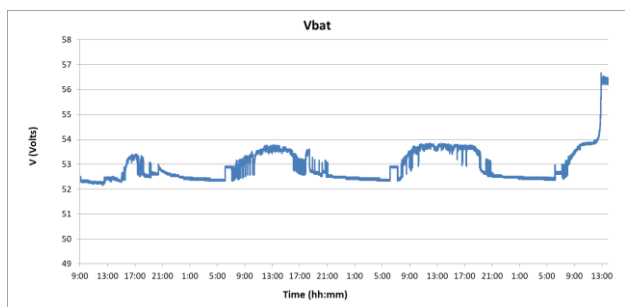


Fig 2. Battery voltage profile during a 3-day test

to validate the performance of the technology, individual LiFePO₄ cells were tested. The results of these tests showed that the efficiency of these batteries remains high and nearly constant at 97.5% on average for a wide range of operating conditions (charging/discharging current). Also, the interoperability tests showed that it is possible to integrate the BMS with any commercial SCADA by using open source software platforms such as Node-RED.

3. PLANNED DISSEMINATION OF RESULTS (journals, conferences, others)

Rather than producing new insights in terms of storage and hybrid systems the specific project's goal was to verify existing technology and, in particular the technological maturity of the specific product. Therefore, the dissemination of the results through scientific publications is not of top priority but it will be possible for the users to submit one or two papers to international conferences.