## POST-MORTEM SERVICES

#### CIC energi GUNE

MEMBER OF BASQUE RESEARCH \* & TECHNOLOGY ALLIANCE

### **POST-MORTEM SERVICES**

Battery ante-mortem and post-mortem analysis provide information about "the black box": this is how the cells were constructed, the materials that compose them, the manufacturing process. In storage systems, this represents relevant information that helps to understand the behavior of the system from "cradle to grave," closing the loop for decision-makers. A battery post-mortem study at the material science level offers invaluable information about the type of operation and the quality of control and monitoring of the cell that it has undergone during its life. In fact, battery ante-mortem and post-mortem comparative studies represent a step forward to generate advanced modeling tools to enhance their performance as much as possible.

This aging behavior depends on a wide range of parameters (e.g. state of charge-SOC, state of health-SOH, depth of discharge, charge/discharge rate, charge variability and temperature) closely link of the application condition that needs to be studied in order to better understand the effects of different parameters on aging (including user behavior).

Post-mortem studies of batteries are a crucial element for companies engaged in the development of second-life batteries for the stationary sector. These studies offer an accurate analysis of the current state of the cell and the remaining lifetime. Likewise, CIC energiGUNE's post-mortem services advise companies involved in the recycling of batteries and supercapacitors to take the best possible solution for the end of life of each of the elements that compose them.

#### WHAT WE CAN DO?

• Ante-mortem studies of cells (materials and fabrication process), as third party neutral contrast with technical specification.

- Ante-mortem and post-mortem comparative studies for advanced modeling tools. Parametrization for smart BMS and sensor development.
- Benckmark for batteries an supercaps technology selection.
- Assessment of cell (safety and limitation condition).
- Advice on operating conditions.
- Diagnosis of cells that will be used in second life.
- Failure mode identification of batteries an supercapacitors.
- Understanding of aging mechanisms for the improvement of battery materials and supercapacitors, and enchancing their lifespan.
- Complete physicochemical and morphological and electrochemical analysis, including surface analysis (electrode/liquid electrolyte interaction) of the system components.
- Rigorous research protocols that can be easily reproduced.
- Advice on cell recycling at the end of life.



#### WE OFFER

Third party analysis of technical specifications.

 Selection of the cell technology to fulfill the application requirement and enhance the battery pack performance.

- Storage, transport, operation and safety advisory.
- Identification of failure mode of cells in batteries an supercaps.
- Quality control and failure mode identification of the battery pack.
- Improving cell manufacturing processes of batteries and supercaps by refining their technology.
- Adapting the integration process with solutions for a more efficient battery management system.
- Improving the motorization of SOH and SOC induced by aging or use conditions.
- Second life battery referral.

• Batteries and supercars recycling and second life advisory reports.

#### HOW?









BATTERY AGEING ASSESSMENT UNDERSTANDING OF AGEING MECHANISMS ADVANCED MATERIALS (LAB SCALE)

NEW DESIGN

# **EQUIPMENT & TECHNIQUES**



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