

Horizon Europe Work Programme



BIG LEAP

Next Generation of Battery Management Systems to increase Interoperability, bridge the Gap between 1st and SL-BESS, Extend Adaptability and emPower battery value chains

D2.2 -Strategies for interoperability and failsafe BMS operation

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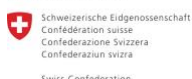
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Executive Summary

Deliverable D2.2 of the BIG LEAP project presents the outcomes of Task 2.2, focusing on strategies for enhancing interoperability and ensuring failsafe operation of Battery Management Systems (BMS). As the demand for energy storage systems (ESS) grows, particularly those incorporating diverse battery chemistries and Second-Life Battery Energy Storage Systems (SL-BESS), the need for advanced methodologies to address integration, safety, and operational challenges becomes increasingly critical.

This deliverable introduces innovative approaches to tackle these challenges. The report is structured into three main sections:

- **Interoperability Strategies:** This section outlines methodologies to enhance the adaptability of BMS systems across multiple chemistries. The Probabilistic Data Association (PDA) methodology enables automatic identification of battery chemistries, while battery impedance analysis offers precision in parameter estimation. Additionally, the enhanced decision unit integrates these advancements with the BIG LEAP algorithms, providing a robust foundation for interoperability.
- **Failsafe Design:** Safety and reliability are addressed through comprehensive failsafe mechanisms. Failure Modes, Effects, and Diagnostics Analysis (FMEDA) identifies potential risks and proposes remedies to mitigate them. Furthermore, innovations in cell balancing circuitry (CBC) ensure equal charge distribution across cells, while the development of optimal charging algorithms (OCA) balances performance and safety to prevent overcharging or overheating.
- **Integration Strategy:** The final section ties together the outcomes of Task 2.2 by outlining procedures for integrating the strategies into a cohesive BMS framework. This includes standardizing end-of-life (EOL) and safety diagnostics, ensuring readiness for deployment in SL-BESS and other applications.

This report provides a detailed account of the concepts, methodologies, and results associated with each strategy. These innovations are aimed at addressing the complexities of operating batteries with diverse chemistries and operational histories. By improving diagnostics, risk mitigation, and operational control, the deliverable contributes to the broader goals of BIG LEAP project in enabling adaptable and secure next-generation BMS solutions.