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NEXT-generation physics and data-based Battery Management Systems for optimised battery utilisation

NEXTBMS

NEXTBMS - Deliverable report

D1.3 BMS specification report

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Project summary

NEXTBMS will develop an advanced battery management systems (BMS) built on fundamental knowledge and experience with the physicochemical processes of lithium-ion batteries, which will enable the significant enhancement of current modelling approaches, including the readiness for upcoming lithium (Li) battery material developments. These modelling approaches will be further improved by optimising sensors and measurement techniques to meet modelling needs (and optimising models based on physical sensor data) and the physical cell configurations to form a framework that supports improving the battery state prediction and -control. By solving these challenges, NEXTBMS will ensure that the next generation of BMSs will enable higher performance, safety, and longer lifetime of the battery cells for an overall optimal utilisation of the battery system.

Publishable summary

The goal of the NEXTBMS project is to enhance the performance of battery electric applications. A major contributor to their performance and a key factor in maintaining performance and safety over the lifetime of the battery, is the Battery Management System (BMS). The NEXTBMS project aims to surpass contemporary BMS limitations by introducing physics-based and data-driven models and algorithms to the BMS itself.

Conventional BMS systems pose significant challenges that hamper battery pack performance optimization. These challenges include computational power, data acquisition, and availability, as well as conventional definition and parameter adaption. The report provides a comprehensive overview of the key components required for the development of a reliable and efficient BMS system.

The BMS system must include various sensors, processors, and communication modules that support efficient data exchange. The inclusion of predictive algorithms, balancing technique, and state estimation algorithms enhance battery pack optimization. The algorithms enable early fault detection, which improves battery lifespan while reducing maintenance costs.

The BMS specification report emphasizes the importance of safety and reliability as crucial components in the development of a high-performing BMS system. It provides an in-depth analysis of the fundamental components and specific requirements of an advanced BMS system.