How Can BMS Improve Safety and Operability of Your DER?

Battery storage stands as a solid illustration of a Distributed Energy Resource (DER), where energy is stored in rechargeable batteries and can be deployed for on-site power generation, load balancing, or backup power during power outages. To maximize battery performance, safety and durability in various applications, battery management is an essential aspect. This whitepaper is intended to highlight key battery management priorities, focusing on operator safety, protecting cells from damage, extending battery life, maintaining functional and optimal utilization. Figure 2, represents the overall diagram of the battery management system (BMS).

Figure 1. Battery Storage
Source: https://www.energy-storage.news/ontario-industrial-battery-project-completed-to-capitalise-on-big-power-cost-savings/

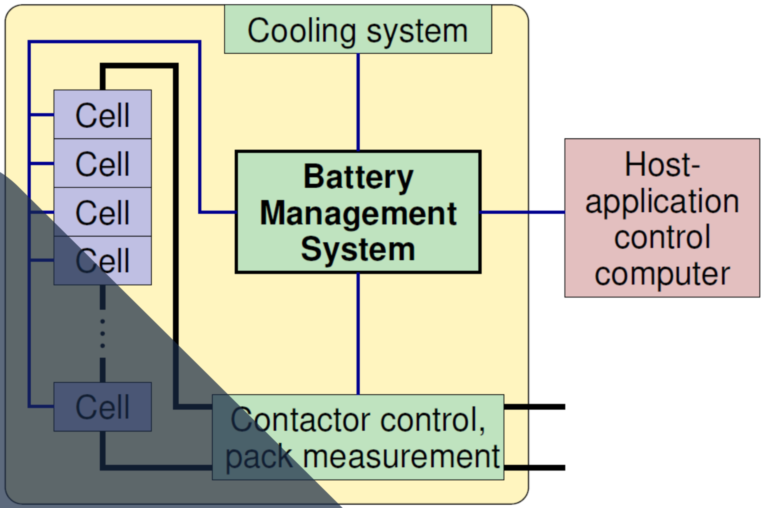

Figure 1. BMS Diagram

1. Protecting the Safety of the Operator and Responding to Unsafe Operating Conditions:
BMS plays an important role in providing the safety of both operators and the host. The BMS monitors the parameters of battery continuously and detects if any hazardous operating conditions appears. These conditions are mostly overvoltage, undervoltage, overcurrent and overheating. Various functions are taken into considerations to deal with these conditions. For instance, disconnecting the battery from the load, activating the protection circuit, and activating the alarm system.

2. Protecting Battery Cells from Damage in Abuse/Failure Cases:
Protecting battery cells from failure situations is the second priority for effective BMS. The battery management system employs safety features including heat management, overcurrent prevention, and short circuit protection in order to reduce undue strain on the battery cells. These precautions support maintaining cell integrity, avoiding catastrophic failure, and extending the battery's total lifespan.

3. Prolonging Battery Life in Normal Operating Cases:
All BMS strategies try to focus on prolonging the battery's life time under normal operating conditions. To prevent deep discharge and overcharging, which can reduce the battery's capacity and lifespan, the battery management system guarantees adequate charge and discharge regulation. The BMS aids in maximizing the cycle life and general health of the battery by adopting the best charging algorithms.

4. Maintaining Battery to Fulfill Functional Design Requirements:
A practical BMS guarantees that the battery always remains in a condition where it can fulfil the host application's functional design specifications. In order to make sure the performance of the battery meets the requirements of the application, a continuous monitoring is performed by the battery management system to check characteristics such as voltage, current, and temperature. This results in the ability to reliably feed all the power without exposing its performance or safety to risk.

5. Informing the Host-Application Control Computer for Optimal Utilization:
As discussed earlier, battery management systems transmit critical data to the host-application control unit, enabling optimal utilization of the battery pack. State of Charge (SoC), State of Health (SoH), and power limits are the most important information which are transferred to the control computer by BMS. This information guides the host application to make decisions regarding output power, load balancing, charging strategies, and overall system optimization.

Conclusion:
BMS is essential to ensure optimal performance, safety, and longevity of batteries. In this white paper five priorities including operator safety, cell protection, battery lifespan, functional requirements, and efficient utilization are introduced. Battery management systems play a crucial role in maximizing the overall effectiveness of battery-powered applications. By implementing robust battery management strategies, organizations can achieve improved performance, extended battery life, and enhanced safety.