Robust cell-level modeling and control of large battery packs

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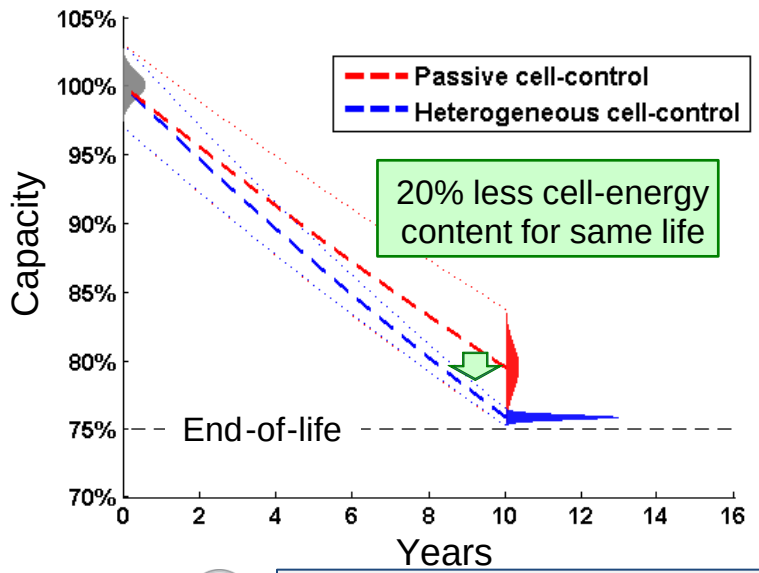
Technology

A unique approach for robust, high performance battery management has been developed through integration of advanced cell-level modeling, control algorithms, and hardware architectures. The approach applies adaptive electrochemical model-predictive and prognostic-coupled cell-level control algorithms to safely drive cells to non-conservative physical limits, and realizes the algorithms using a flexible, modular, cost-effective system architecture for coordinated cell-level dynamic control.



Advantage and Differentiation

The heterogeneous cell-control system is robust to cell manufacturing and runtime variability and brings all cells to a homogeneous end-of-life. This allows significant reduction in required battery pack size for the same performance and end-of-life and also increases the battery pack value for second use applications. These advantages are made possible through combination of real-time modeling and cell-level control to drive cells to their actual physical limits rather than being based on the conservative heuristic limits of traditional systems.

Performance Targets

Metric	State of the Art	Proposed
Battery pack lifetime	EOL limited by worst-case cell	20% longer life
Battery pack size (cost)	Limited by overdesign, cell degradation	20% reduction in required energy content
Charge rate	Cold temp limited	>1.5x higher charge rate at 0ºC

Please contact regarding: R&D collaboration, commercial development