

CPS: Synergy: Adaptive Management of Large Energy Storage Systems for Vehicle Electrification Kang G. Shin and Wei Lu EECS and ME, University of Michigan – Ann Arbor



Comprehensive management (i.e., discharging, charging, temperature and monitoring) of large-scale batteries with the joint consideration of peak power, operation time, and battery lifetime for vehicle electrification













REAL-TIME ENERGY STORAGE MANAGEMENT SYSTEM



operation time by 30%.

SHARE: SoH-Aware Reconfiguration to Enhance Deliverable Capacity of Large-Scale Battery Packs, ICCPS'15





Improve the capacity delivery of the battery by skipping weak cells from discharging, prolonging system operation by up to 94%.

- Resting Weak Cells to Improve Battery Pack's Capacity Delivery via Reconfiguration, submitted to ICCPS'16



Cooling or heating batteries based on their real-time conditions, trading off between operation time and lifetime. 58.4% improvement in operation time.

- Real-Time Battery Thermal Management for Electric Vehicles, ICCPS'14

- *Real-Time Discharge/Charge Rate Management for Hybrid Energy* Storage in Electric Vehicles, RTSS'14-CPS track



Hybrid energy storage system prototype





Provide an offline power-supply guarantee such that every power-demand operation completes its execution in time while total power demand does not exceed the power capability of the energy storage system at any time

