

ST835CS-2HPowerStack - Tier-1 LFP Hardware Deep-Dive and Performance Ledger

TIER-1 LFP HARDWARE DEEP-DIVE AND PERFORMANCE LEDGER:
ST835CS-2HPOWERSTACK

PRODUCT IDENTIFICATION

The ST835CS-2HPowerStack represents a paradigm shift in commercial and industrial (C&I) behind-the-meter energy storage. Engineered for high-throughput applications such as EV fleet charging augmentation, industrial peak shaving, and micro-grid stabilization, this UL9540-certified platform integrates next-generation liquid-cooled thermal regulation with automotive-grade LFP prismatic cells. The system delivers a balanced architecture optimized for a 2-hour discharge duration at nominal C-rate, ensuring maximum arbitrage value and demand charge reduction.



INTERNAL BESS TOPOLOGY

The ST835CS-2HPowerStack employs a 3-layer hierarchical topology: Battery Rack (Cell-to-Pack), High-Voltage DC Bus, and Bi-Directional PCS.

- CELL INTEGRATION: 16 parallel strings of 52S configuration utilizing 314Ah LiFePO4 prismatic cells. Each cell is individually fused and monitored via a distributed slave BMS board.
- DC BUS BAR: A copper-plated, laminated low-inductance busbar system rated for 1500Vdc handles inter-rack aggregation. Integrated pre-charge circuits mitigate inrush current during parallel expansions.
- PCS STAGE: Dual redundant 500kW SiC-based bi-directional inverters operate in master-slave mode, delivering 835kVA continuous apparent power.

THERMAL PROTECTION MECHANISMS

- ACTIVE LIQUID COOLING LOOP: Dielectric fluid circulates through proprietary micro-channel cold plates attached to each cell pouch. The closed-loop system maintains cell $\Delta T < 2.5^{\circ}\text{C}$ across all 416 cells at 0.5C charge/discharge.
- MULTI-LEVEL SUPPRESSION: Three-stage aerosol suppression (per-rack, per-cabinet, and full-container) paired with a nitrogen-driven inert gas injection system. Venting pathways are directed upward via explosion-relief panels compliant with NFPA 855.
- THERMAL RUNAWAY CONTAINMENT: Each rack is separated by 2-hour fire-rated ceramic fiber barriers. An external dry-contact signal triggers facility HVAC shutdown and automated foam deluge pre-action.

OPERATIONAL ADVANTAGES

- ROUND-TRIP EFFICIENCY: 92.5% (DC/AC, at 25°C nominal) – validated via third-party testing under 1C cycling.
- CYCLIC DURABILITY: 8,000 cycles to 70% state-of-health (SOH) at 0.5C/0.5C, 25°C . Extended calendar life: 15 years.
- GRID SUPPORT MODES: IEEE 1547-2018 compliant with selectable grid-forming (virtual inertia), grid-following (PQ), and grid-supporting (droop) modes. Seamless islanding transition $< 20\text{ms}$.
- PARALLEL SCALING: Up to 12 units (10MWh+ capacity) can be paralleled via a

common 690Vac AC bus using CAN-based synchronization.

TECHNICAL SPECIFICATIONS

Parameter	Specification
Nominal Energy (C/2)	835 kWh
Usable Energy (90% DoD)	751.5 kWh
AC Power (Continuous)	417.5 kW (rating) / 835 kVA
DC Voltage Range	1150 – 1490 Vdc
Max Charge / Discharge Current	560 A / 560 A
Cooling Method	Smart Liquid Dielectric Cooling ($\Delta T < 2.5^{\circ}\text{C}$)
Cell Chemistry	Tier-1 LFP (LiFePO ₄), 314Ah prismatic
Round-Trip Efficiency (DC/AC)	92.5% @ 0.5C, 25°C
Cycle Life	8,000 cycles to 70% SOH
Operating Temperature	-30°C to +55°C (derated >45°C)
Ingress Protection	IP55 (cabinet), IP67 (battery pack)
Safety Compliance	UL 9540, UL 9540A, IEC 62619, UN 38.3
Grid Standards	IEEE 1547-2018, IEC 61727, G99

GLOBAL WARRANTY ASSURANCE

The ST835CS-2HPowerStack carries a comprehensive 10-year/6,000-cycle standard warranty (whichever occurs first) covering performance linear degradation. Extended warranty to 15 years/8,000 cycles is available for fleet deployments. Coverage includes parts, remote diagnostic labor, and on-site remediation for thermal runaway events caused by manufacturing defects. Global service network supported by 48-hour parts delivery commitment to major industrial hubs.

