

ST10030kWh-2500kW-MV-4h - Tier-1 LFP Hardware Deep-Dive and  
Performance Ledger

## PRODUCT IDENTIFICATION

Product Designation: ST10030kWh-2500kW-MV-4h

System Classification: MWh-Scale Grid-Tied & Off-Grid Commercial Energy  
Storage Solution

Chemistry: Tier-1 Lithium Iron Phosphate (LFP) – Zero Cobalt, UL 1973  
Certified Cells

Nominal Energy (DC): 10.03 MWh

Nominal AC Power: 2.5 MW (MV Step-Up Integrated)

Duration: 4 Hours @ Rated Power

Key Applications: Peak Shaving, Arbitrage, Micro-Grid Black Start, Renewables  
Firming, Demand Charge Management



## INTERNAL BESS TOPOLOGY

The ST10030kWh-2500kW-MV-4h platform integrates a turnkey medium-voltage (MV) skid, combining battery racks, power conversion system (PCS), liquid cooling distribution, and a 34.5 kV / 0.69 kV step-up transformer into a single outdoor-rated enclosure. The DC busbar architecture supports multi-rack parallel connection via active current-sharing logic, minimizing circulation losses. High-voltage DC switching (up to 1500 Vdc) reduces resistive losses across 4-hour discharge cycles. The bi-directional PCS utilizes three-level topology to achieve efficiency of >98.5% at nominal load.

## THERMAL PROTECTION MECHANISMS

Liquid Cooling Strategy: Distributed coolant flow through individual battery

module cold plates maintains cell temperature delta  $\Delta T < 3^{\circ}\text{C}$  across all racks, directly extending cycle life to  $>8,000$  cycles at  $0.5\text{C} / 0.5\text{C}$ . The chiller-integrated thermal management unit (TMU) operates from  $-30^{\circ}\text{C}$  to  $55^{\circ}\text{C}$  ambient. Fire Suppression: Dual-stage aerosol + FM-200 (or equivalent clean agent) connected to a centralized BMS trigger. Passive containment: Each module features intumescent fire seals and directed venting pathways. IP55 chassis rating prevents ingress from external dust or water jets, while C5 corrosion-resistant coating suits coastal or industrial installations.

#### OPERATIONAL ADVANTAGES

- 10 MWh single-unit capacity reduces balance-of-system (BOS) costs and land footprint.
- Integrated MV transformer eliminates external procurement and lowers installation complexity.
- $< 10$  ms islanding detection and seamless transition (on-grid ↔ off-grid) via grid-forming PCS.
- Remote firmware-over-the-air (FOTA) updates for EMS and BMS algorithms.
- Black start capable: self-energizes local micro-grid without external generator.



## SPECIFICATION MATRIX

Parameter	Specification
Nominal Energy (DC, MWh)	10.03 (0.5C discharge, +25 ° C, EoL 70%)
Usable Energy (AC, MWh)	~9.15 (Inverter + aux losses included)
Rated AC Power (MW)	2.5 (grid-forming / grid-following)
System Peak Efficiency (DC/AC)	≥ 89.5% (4-hour full cycle)
Cooling Method	Smart liquid cooling, $\Delta T < 3 \text{ }^\circ \text{C}$ inter-module
Cell Chemistry	Tier-1 LFP, prismatic, 314 Ah nominal
Operating Voltage Range (Vdc)	1120 – 1500 (nominal 1300 Vdc)
Round-trip Efficiency (DC/AC)	≥ 89% @ 0.5C, +25°C

Cycle Life (70% SOH)	≥ 8,000 cycles (0.5C / 0.5C, 25°C, 90% DoD)
PCS Topology	Three-level NPC, SiC hybrid
Grid Interfacing Voltage (kV)	34.5 (customizable 10 – 35 kV)
Enclosure Protection	IP55 (battery & PCS), C5 corrosion resistant
Fire Suppression	Aerosol + clean agent, dual-stage, BMS controlled
Ambient Operating Temp (°C)	-30 to +55 (derated > 45°C)
Dimensions (LxWxH, mm)	12192 x 2896 x 2896 (40ft ISO container + MV skid)
Total Weight (approx., metric tons)	48 (fully loaded)
Standards Compliance	UL 9540, UL 9540A, IEC 62619, IEEE 1547, NFPA 855
Communication Protocol	Modbus TCP, IEC 61850, MQTT, OCPP 2.0.1 (for EV integration)
Black Start Capability	Yes, self-energizing in < 60 sec

## REGULATORY COMPLIANCE

- UL 9540 (Energy Storage Systems and Equipment) – Certified

- UL 9540A (Thermal Runaway Fire Propagation) – Tested Level 4
- IEC 62619 (Secondary Cells for Industrial Applications)
- IEC 62477-1 (PCS Safety)
- IEEE 1547 / IEEE 2030.5 (Grid Interconnection, Smart Inverter Profiles)
- NFPA 855 (Installation compliance ready)
- UN 38.3 (Transportation safety)
- CE / UKCA marked (Low Voltage, EMC, Machinery Directives)

#### DELIVERY & WARRANTY

Factory Acceptance Test (FAT) performed at ISO 14001:2015 & ISO 45001 certified facility. Standard warranty: 10 years / 8,000 cycles (70% end-of-life capacity retention) with optional performance guarantee extension to 12 years. Remote diagnostics included via the manufacturer' s cloud platform (ISO 27001 certified).