Commercial UPS Alternative BESS Platform Specification & System Architecture Whitepaper

COMMERCIAL UPS ALTERNATIVE BESS PLATFORM SPECIFICATION & SYSTEM ARCHITECTURE WHITEPAPER

EXECUTIVE SUMMARY

This document serves as the definitive technical overview and datasheet for our Commercial UPS Alternative Battery Energy Storage System (BESS). Designed to bridge the critical gap between traditional Uninterruptible Power Supply (UPS) systems and modern grid-interactive energy storage, this platform delivers a superior value proposition for commercial and industrial (C&I) facilities. It provides the instantaneous power quality and seamless ride-through capability of a premium UPS, while simultaneously unlocking the full economic potential of energy arbitrage, peak shaving, and demand response participation.

The system redefines facility resilience, moving beyond a simple backup solution to become an intelligent, revenue-generating asset. By integrating Tier-1 LFP battery cells with advanced bi-directional PCS and a liquid-cooled thermal management system, we offer a solution that ensures power continuity for critical operations and optimizes energy costs through sophisticated software controls.

SYSTEM ARCHITECTURE & SAFETY

The architecture is founded on a modular and scalable design philosophy, enabling tailored configurations for diverse C&I loads. At its core, the system integrates three primary subsystems:

- Energy Storage Subsystem: High-density racks of Tier-1 LFP cells, managed by a three-level Battery Management System (BMS) for cell-level monitoring, balancing, and protection.

- Power Conversion Subsystem (PCS): A bi-directional, grid-interactive inverter with advanced features for grid-forming and grid-following modes, enabling seamless transition between on-grid, off-grid, and UPS operation.

- Control & EMS Subsystem: An intelligent Energy Management System (EMS) that serves as the platform's brain, optimizing dispatch schedules, managing

peak demand, and facilitating microgrid integration.

Safety is paramount and is engineered into every layer, from the intrinsically safe LFP chemistry to the comprehensive multi-level protection systems. This includes proactive thermal runaway suppression, IP54/NEMA 3R-rated outdoor enclosures, and integrated fire suppression systems, culminating in compliance with UL 9540 and IEC 62619.

KEY FEATURES

- True UPS-Grade Performance: Provides sub-20ms transition time, making it a direct substitute for traditional UPS while offering far greater storage capacity and economic value. It offers instantaneous backup and seamless grid switching to protect sensitive equipment.
- Hybrid Operational Modes: Operates in UPS, Peak Shaving, Load Shifting, and Grid-Forming modes, dynamically switching based on grid conditions and facility demand. This allows for maximum on-site generation self-consumption and optimized utility tariff management.
- Advanced Liquid Cooling: Guarantees precise cell temperature regulation within +/- 2°C, minimizing cell degradation and maximizing system longevity. This ensures superior performance and a longer cycle life, reducing the levelized cost of storage (LCOS).
- Grid Code Compliance: Enhanced grid support functionalities include reactive

power control (PF +/-0.9), harmonic compensation, and frequency regulation, ensuring stable and seamless integration with utility grids.

- Smart Communication & Control: Offers multiple standard industrial communication protocols including Modbus TCP, CAN, and IEC 61850 for full integration with facility and grid management systems.

[IMAGE_1]

COMPLIANCE & STANDARDS

The Commercial UPS Alternative BESS platform is engineered and tested to meet the most rigorous global safety and performance standards, ensuring bankability and peace of mind.

- Safety & Performance: UL 9540 (Energy Storage Systems and Equipment), UL 1973 (Batteries for Use in Stationary Applications), IEC 62619 (Secondary Cells and Batteries for Industrial Applications), and IEC 62477 (Power Converters).
- Grid Interconnection: IEEE 1547 / UL 1741 (Grid Interconnection), IEC 61000-6-2 / -4 (EMC Immunity and Emissions).
- Environmental Protection: IP54 (Indoor/Outdoor Installation) and NEMA 3R (Outdoor Installation) enclosure rating.
- Shipping & Transport: UN 38.3 (Transportation of Lithium Batteries).

[IMAGE_1]

TECHNICAL SPECIFICATIONS

The following parameters represent the base performance metrics of the standard unit. For project-specific engineering details, including custom voltage, capacity, and power ratings, please refer to the official project datasheet or contact our engineering team.

Parameter	**Specification**
Nominal Power (AC)	100 kW / 125 kVA
Nominal Energy (AC)	215 kWh / 372 kWh
Cell Chemistry	Tier-1 LFP (Lithium Iron Phosphate)
Cooling Method	Smart Liquid Cooling
Round-trip Efficiency	> 92%
Cycle Life	> 6000 cycles @ 25°C, 80% DOD
Transition Time (UPS mode)	< 20 ms
Enclosure Rating	IP54 / NEMA 3R

System Parameters

- Nominal Power (AC): 100 kW / 125 kVA (Scalable up to MW-scale via parallel units)

- Nominal Energy (AC): 215 kWh / 372 kWh (Selectable capacity per cabinet)

- System Voltage Range: 600 Vdc - 900 Vdc (Nominal 768 Vdc)

- AC Voltage (Grid Side): 400 Vac / 480 Vac, 3W + N + PE, 50/60 Hz

- AC Voltage (Load Side): 400 Vac / 480 Vac, 3W + N + PE, 50/60 Hz (with UPS-grade output)

- Max. AC Current: 144 A / 173 A (depending on voltage)

Battery Parameters

- Cell Chemistry: Tier-1 LFP (Lithium Iron Phosphate), Prismatic

- Cell Model: 280 Ah / 3.2 Vdc

- Configuration: 1P240S / 1P384S (selectable)

- Round-trip Efficiency: > 92% (at rated power, 25°C)

- Design Life: > 15 years

- Cycle Life: > 6000 cycles at 25°C, 80% DOD

- Depth of Discharge (DOD): Up to 90%

System Performance & Environmental

- Cooling Method: Smart Liquid Cooling (with active temperature control)

- Operating Temperature Range: -20°C to +50°C (derating above 45°C)

- Relative Humidity: 0-95%, Non-condensing

- Altitude: < 2000 m (derating above)

- Enclosure Rating: IP54 / NEMA 3R

- Noise Level: < 75 dB(A) @ 1 m

Protection & Interface

- BMS: Three-level (Module, Rack, System) with active cell balancing

- Fire Suppression: Aerosol / Inert gas (FM-200 / Novec 1230 equivalent)

- Communication Interface: Ethernet, Modbus TCP, CAN, IEC 61850 (optional)

- Communication Protocol: Modbus TCP, CANOpen, DNP3 (optional)

Mechanical (Standard Cabinet)

- Dimensions (W x D x H): Approx. 1600 x 1200 x 2200 mm (subject to variation)

- Weight: Approx. 2,500 kg - 3,000 kg (depending on configuration)