



Shenzhen Polinovel Tech Co., Ltd

121KWH / 60KW

Outdoor Cabinet Battery Energy Storage System Design Reference



CBS120

Cost Reference & Important Notes

121kwh cost reference: 21850-23750US\$

Important Notes:

1. This design is only for reference, and the customer's technical configuration is subject to final communication;
2. For preliminary design and quotation, please help provide the following key information:
 - 2.1. Will the system be installed outdoors or indoors?
 - 2.2. What is the total power of the load and what device is included (Inductive load devices: e.g. motors, air conditioners, etc. Resistive load device: e.g. electric water heaters, rice cookers, etc.)?
 - 2.3. Is the system off-grid or on-grid? What is the grid standard (e.g. 3-phase, 380v)? What to use to charge the battery (e.g. the pv solar, diesel generator, or state grid etc.). What is the output standard (e.g. single-phase, 220v)?
 - 2.4. We appreciate it, if you could provide more information about your esteemed company.
 - 2.5. More project information, the more detailed it is, the better we can give you the most appropriate design plan.

After you provide the above information, we can proceed with preliminary technical design and quotation. We do not intend to create barriers to collaboration. On the contrary, we place a strong emphasis on collaboration, so project evaluations are taken seriously. We hope to get your understanding and cooperation. After we confirm all the technical details and sign the contract, our company will make a formal design document and send it to you for confirmation before starting production.

Product Introduction

The system integrates of Battery Units, BMS (Battery Management System), PCS (Power Conversion System) , EMS (Energy Management System), Power Distribution Unit, Fire Extinguishing System and Air Conditioning Auxiliary System etc.

It is easy to transport, install, use and maintain. This product can be used in new energy storage, smooth load fluctuations, peak shaving and frequency regulation for power grid, peak shaving and valley filling in industrial and commercial energy storage, improve power supply reliability of micro-grids and isolated grids.



Equipment Configuration List

Item	Specification/Description	Quantity
Battery unit	121kwh	1 set
PCS	60kw	1 set
EMS	With display screen	1 set
Power distribution unit	/	1 set
Air cooling system	Air conditioner	1 set
Fire extinguishing system	/	1 set
Auxiliary system	Ventilation temperature and humidity control	1 set

System Parameter

Item	Specification
Battery Parameter	
Battery cell	3.2V 150Ah Lifepo4
Battery module	115.2V 150Ah (1P36S) / 17.28kwh
Battery cluster	806.4V 150Ah (1P252S) / 120.96kwh
Battery rated voltage	806Vdc
Operating voltage range	655~920Vdc
Charge and discharge rate	≤0.5C
Cycle life	>6000 cycles (25℃ 0.5C 80%DOD)
AC Parameter	
Rated power	60kw
Max. power	66kw @10min; 72kw @1min
Rated voltage	3*230V/400V
Grid voltage range	400V±15%
Grid rated frequency	50/60Hz

Grid frequency voltage	47~52Hz/56~62Hz
Grid standard	3P+N+PE
Power factor	>0.99
Off-grid operation	Yes
Efficiency	
PCS max. efficiency	98.8%
System max. efficiency	88%
Protection	
DC input reverse protection	Yes
AC input reverse adaption	Yes
Insulation impedance detection	Yes
AC over current protection	Yes
AC over voltage protection	Yes
AC short circuit protection	Yes
Grid side surge protection	Yes
Grid abnormal automatic switching	Yes
Low voltage crossing	Yes
High voltage crossing	Yes
Communication & Man-machine Interaction	
Communication port	RS232/RS485S/WiFi/4G/Ethernet
Man-machine interaction	Touch screen / Indicator / APP
Other Parameter	
Weight	1.5T
Dimension (W*D*H)	1200*1200*1800mm
IP grade	IP55
Noise	≤70dB
Operating temperature	-20℃~50℃

Storage temperature	-25℃~55℃
Relative humidity	5~95% (non-condensing)
Fire extinguishing system	Perfluoro
Working altitude	<4000m (derating above 2000m)
Cooling method	Air conditioner intelligent air cooling

Battery Unit

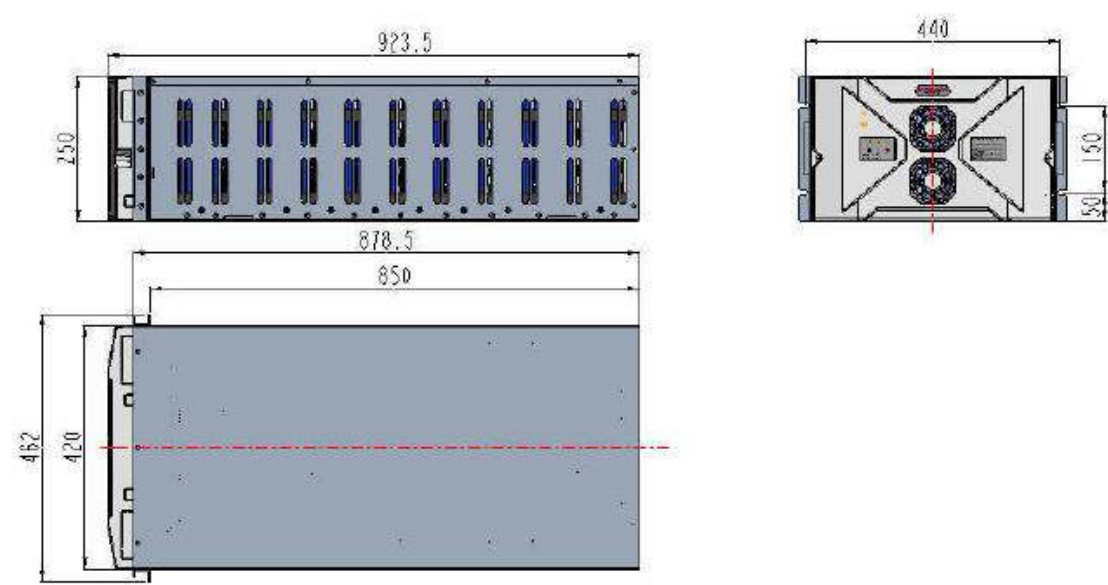
The energy storage cabinet contains 7 battery modules in series, along with a high-voltage control box (with CBMS) that receives data from the 7 BMUs in the cabinet. Each module consists of 3.2V 150Ah lithium iron phosphate batteries in a 1P36S configuration, managed by a BMU. A BMS is included to monitor the conditions of each battery cell for efficient management of the system.

Battery Cell

The project uses a lithium iron phosphate battery cell with a model of 3.2V 150Ah.

Battery Module

The battery module consists of 36 lithium iron phosphate cells arranged in series, giving it a nominal voltage of 115.2V and a capacity of 150Ah. It includes a Battery Management Unit (BMU) that collects data from the cells and transmits it to the Central Battery Management System (CBMS), as well as balances the individual cells based on CBMS instructions.



Item	Specification
Rated voltage	115.2V
Rated capacity	150Ah
Voltage range	93.6-131.4V

Energy storage capacity	17.28kwh
Weight	About 98kgs

Central Battery Management System (CBMS)

The Battery Management System (BMS) features a two-level architecture. At the cabinet level, the system is referred to as the Cabinet Battery Management System (CBMS). Its functions include current detection, data collection and analysis, alarm and protection control, and communication within the system. The CBMS is equipped with several essential components like a main circuit breaker, dual-circuit charge and discharge control switch, high-voltage isolation detection circuit, parallel processing circuit, a high-voltage power supply, and a DC starting circuit.

Multiple hardware protection mechanisms are implemented to manage various statuses and actions, such as over-charging, over-discharging, over-current, short circuits, and insulation detection. These mechanisms work together to ensure the safe and reliable operation of the entire system.

Item	Specification
Max voltage	1000Vdc
Max current	150A
Communication port	RS485/CAN
Communication protocol	Standard Modbus, TCP/IP
Dimension (L*W*H)	440*600*270mm
Weight	About 30kgs
BMS power supply	DC/AC
Battery cluster over voltage protection	920Vdc (3.65V per cell)
Battery cluster low voltage protection	680Vdc (2.7V per cell)

This product features a distributed battery management system (BMS). Each layer of the structure includes a control device that manages its own independent functions. At the same time, it communicates with the devices above and below it via the CAN bus to exchange and transmit information.

Battery Cluster

The battery cluster consists of 7 battery modules connected in series, and integrates a high-voltage control box. The nominal voltage of the battery cluster is 806.4V and the capacity is 150Ah. The CBMS is located in the high-voltage control box and is responsible for the management of the battery cluster. It receives detailed data uploaded by the 7 BMUs inside the battery cluster, samples the voltage and current of the battery cluster, calculates and corrects SOC and SOH, completes the pre-charging and charge-discharge management of the battery cluster, and uploads the relevant data to GBMS.

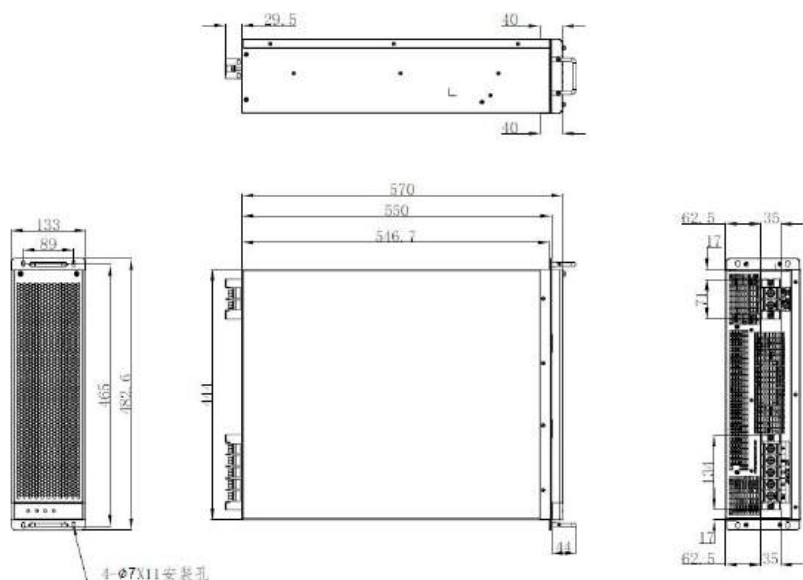
Item	Topology Graph	Specification	Remark
Battery cell		3.2V 150Ah / 0.48kwh	Single cell
Battery module		115.2V 150Ah / 17.28kwh	36pcs of cells connected in series (1P36S)
Battery cluster/rack		806.4V 150Ah / 120.96kwh	7pcs of modules connected in series (1P252S)

Power Conversion System (PCS)

PCS is a power electronic interface device that connects the power grid and the energy storage battery pack. It can realize the AC/DC bidirectional conversion function of voltage and current through control. It consists of the main power part, signal detection part, control part, drive part, monitoring display part, and auxiliary power supply. This energy storage cabinet uses a 60kW modular PCS to perform refined charge and discharge control on the battery, one cluster one management, eliminate inter-cluster circulation, reduce the unbalanced power loss of the battery cluster, and improve the battery charge and discharge capacity and life.

PCS Features:

- Technologically advanced, fully compliant with the access and control requirements of the power grid or load.
- Energy-efficient, highly integrated, and designed for an improved customer experience.
- Capable of both grid-connected and off-grid parallel functions, offering excellent scalability.
- Features low voltage and zero voltage ride-through capabilities for effective management of complex power grid conditions.
- Includes autonomous frequency and voltage regulation, as well as controlled frequency and voltage regulation functions.
- Achieves an impressive conversion efficiency of up to 98.9%.
- Designed for front maintenance and reliable wall installation, saving valuable equipment space.
- Utilizes an efficient PWM modulation algorithm to reduce switching losses.
- Offers a dual redundant power supply solution to enhance system reliability.
- Equipped with a comprehensive protection and fault alarm system for enhanced safety and reliability.



Item	Specification
DC Side Parameter	
Operating voltage range	580~1000V
Max. DC voltage	1000V
Max. DC current	105A
AC Side Parameter	
Rated power	60KW
Max. AC power	72KW
Max. THD (total harmonic distortion)	<3% (rated power)
Grid rated voltage	400V (±15%)
Grid rated frequency	50Hz (47.5~52.5Hz)
Full load power factor	>0.99
Isolation transformer	N/A
Max. efficiency	98.9%
General Parameter	
Dimension (H*W*D)	133*444*570mm
Weight	32kg
Operating temperature	-40℃~60℃
Shutdown self power consumption	<12W
Cooling method	Air cooling
IP grade	IP20
Relative humidity	0~95% (non-condensing)
Highest altitude	4000m (derating >3000m)
Display	LED+Web
Communication	Ethernet, RS485, CAN

Energy Management System (EMS)

EMS is a software-based platform for automating production process control. It facilitates the rapid construction of a comprehensive monitoring system by configuring data, graphics, distributed control, communication, and reporting based on the monitoring objectives and system requirements. This enables the system to monitor on-site operational equipment and perform various functions, including data collection, display, alarm notifications, equipment control, and parameter adjustments. The EMS is responsible for monitoring equipment status, managing energy, and generating statistical reports within the entire micro-grid system. It consists of a microgrid controller and an EMS server. The micro-grid controller communicates with components such as the energy storage system, photovoltaic inverter system, and load power systems within the micro-grid. It retrieves the real-time status of each system, implements energy management strategies, and issues commands for starting and stopping equipment as well as setting power levels.

EMS Features:

- Receive and monitor battery voltage, current, temperature, balance, and other information in real-time.
- Layered, graded, and classified alarm management with continuous real-time monitoring.
- Perform real-time diagnostics on the PCS system, BMS system, auxiliary system, and internal monitoring system status, along with automatic analysis report generation.
- Utilize a real-time multitasking operating system with robust data processing capabilities. - Implement hierarchical user authority management to restrict operations as needed.
- Offer web-based online display, providing customers with a comprehensive monitoring experience.
- Support communication devices such as switches, gateways, and GPRS, creating a powerful communication platform.

Item	Specification	Remark
Voltage/Current	$\leq 0.2\%$	Depends on PCS/BMS
Power	$\leq 0.5\%$	Depends on PCS/BMS
Remote signaling accuracy rate	$\geq 99.99\%$	
Accident alarm accuracy rate	100%	
Remote control and remote adjustment accuracy rate	100%	
Remote control command execution time	$\leq 3s$	
Telemetry data scanning time	1-5s	Adjustable
Computer communication real-time data synchronization	$\leq 2s$	
Accident inversion recording time	5~60min	Adjustable
Hot/standby computer switching time	$\leq 10s$	
Accident alarm accuracy rate	100%	

Auxiliary System

Auxiliary systems include fire extinguishing systems, temperature control systems, etc.

Fire Extinguishing System

The fire extinguishing system is designed to automatically detect fires, trigger alarms, and activate firefighting measures to ensure the safety of personnel and equipment.

Temperature Control System

The energy storage cabinet is equipped with an air-cooled temperature control system. When temperatures rise, the air conditioning system activates automatically to cool the battery cells. Conversely, when temperatures fall, the air conditioning system also activates to warm the battery cells. This process helps prevent extreme temperature variations that could negatively impact the performance and lifespan of the battery cells.

Additionally, the energy storage cabinet features rock wool insulation, which effectively minimizes the impact of external temperature changes, thereby enhancing the overall efficiency of the system.



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