



C&I Energy Solution

INNOVATE - ENJOY

Smart energy, Sustainable Solutions.

C & I ESS Solution:

Why HanchuESS 215/418S ?

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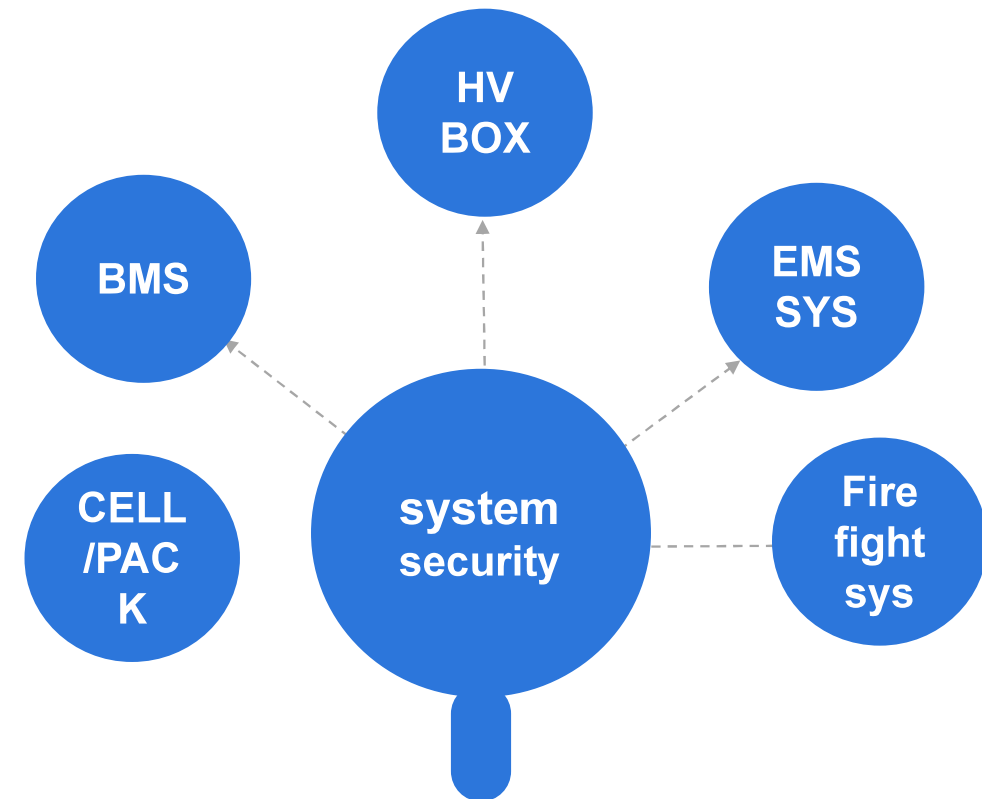


Commercial ESS

CESS-418K-S

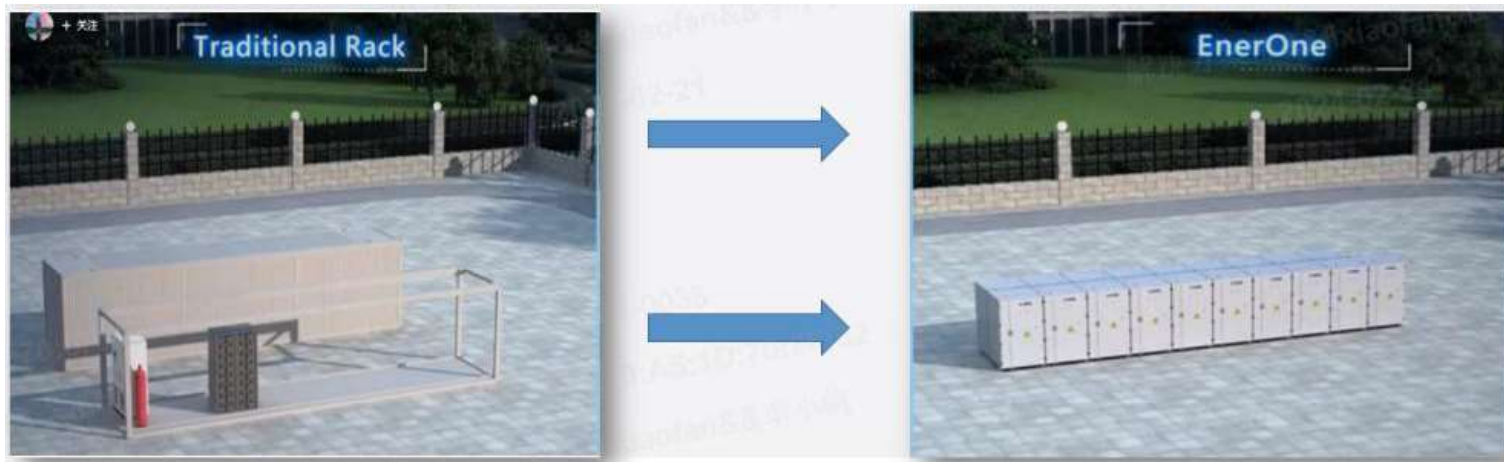
Reason 1 - High security from cell

- The battery system ensures **multi-level security**, from the cell to pack, to rack, then to stack.
- The battery cells are of high quality, **cell brand CALB**
- A **two-stage BMS** management monitors temperature and voltage of each cell continuously for safe and stable operation.
- **Built-in DC contactor** and fuse provide hardware protection for the battery cluster's safety.
- **European EMS partner**
- **IP rate IP54 -- outdoor level**
- Equipped with a complete **fire protection** system using non-toxic perfluorohexanone gas, ensuring no harm to electrical equipment during an eruption.



/// Reason 2 - flexible system configuration and capacity

- Outdoor cabinet DC integrated design, each cabinet is relatively independent, and connect in parallel
- Flexible configuration, accurate capacity for project **under 20Mwh**



/// Reason 2 - flexible system configuration and capacity

- For example:

① 6Mwh project:

3.44Mwh container x2 sets=6.88Mwh

418S x 15 sets =6.27Mwh

② 2.8Mwh project

3.44Mwh container x1 sets=3.44Mwh

418S x7 sets =2.926Mwh

③ 1.5Mwh project

3.44Mwh container x1 sets=3.44Mwh

215K x7 sets =1.505Mwh



/// Reason 3 - Compact size, lightweight, and lower maintenance costs

40'x20'x7'2"

	3.44Mwh container	215K cabinet	418S cabinet
size (mm)	6058*2438*2896	1500*1200*2346	1250*1350*2346
weight	35 t	2.5 t	3.6 t
forklift	50 t	5 t	5 t
loading/40ft container	1 set	9 sets	9 sets
lead time	6+Month	3+ Month	3+ Month

Reason 4 - EU certified with shorter lead time

WSPOT 2022

	3.44Mwh container	215K cabinet	418S cabinet
IEC 62619	√	√	√
IEC 63056	2025	√	√
transport UN 3480	2025	Dec.2024	√
transport UN 38.3	2025	√	√
EMC	2025	Sep.2024	Sep.2024
LVD	2025	Sep.2024	Sep.2024

Reason 4 - Different Application Scenario

145-1070-2112

C&I storage- 215/418k	Utility storage --container
1. Utilization of peak-valley electricity price differences: By storing electricity during low-price periods and using or selling it during peak periods, the company's electricity costs can be reduced. 2. Demand-side management: The energy storage system can be used to adjust the company's electricity demand, achieve demand response, and improve the flexibility of energy use. 3. Renewable energy integration: Help companies better utilize renewable energy such as solar energy and wind energy to improve energy self-sufficiency.	1. Grid frequency regulation: Maintain grid stability by quickly responding to grid frequency changes. 2. Grid peak shaving and valley filling: Store electricity when there is excess power supply, release electricity when there is a power shortage, and balance grid supply and demand. 3. Cross-regional power dispatching: Realize power complementarity and optimal configuration between different regions.

Reason 4 - Different Application Scenario

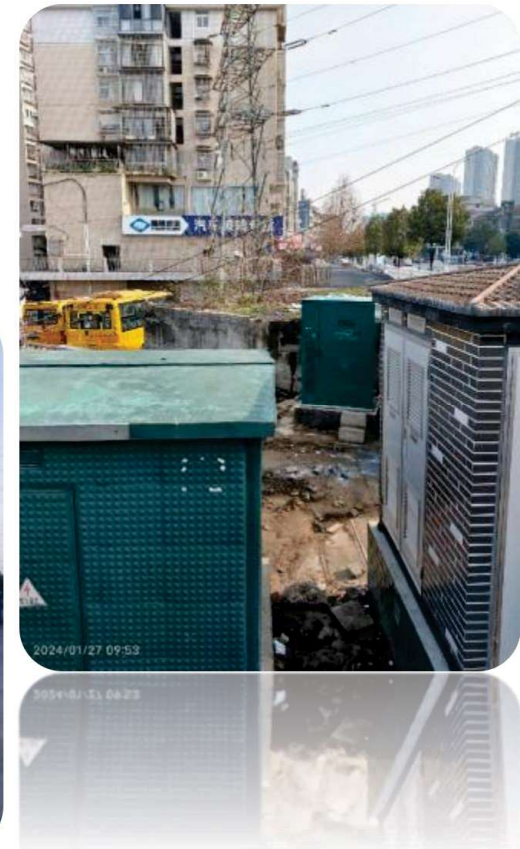
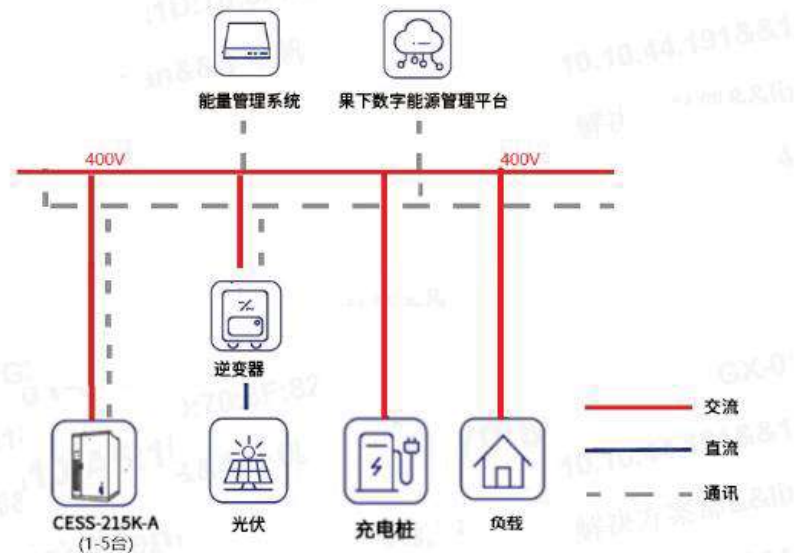
devided by power system segment		devided by demand scenario
before-meter	power supply side BESS	Utility storage --container
	grid-side BESS	
behind-meter	user-side BESS	C&I storage- 215/418k
		Residential battery

■ Typical Application -- Business model



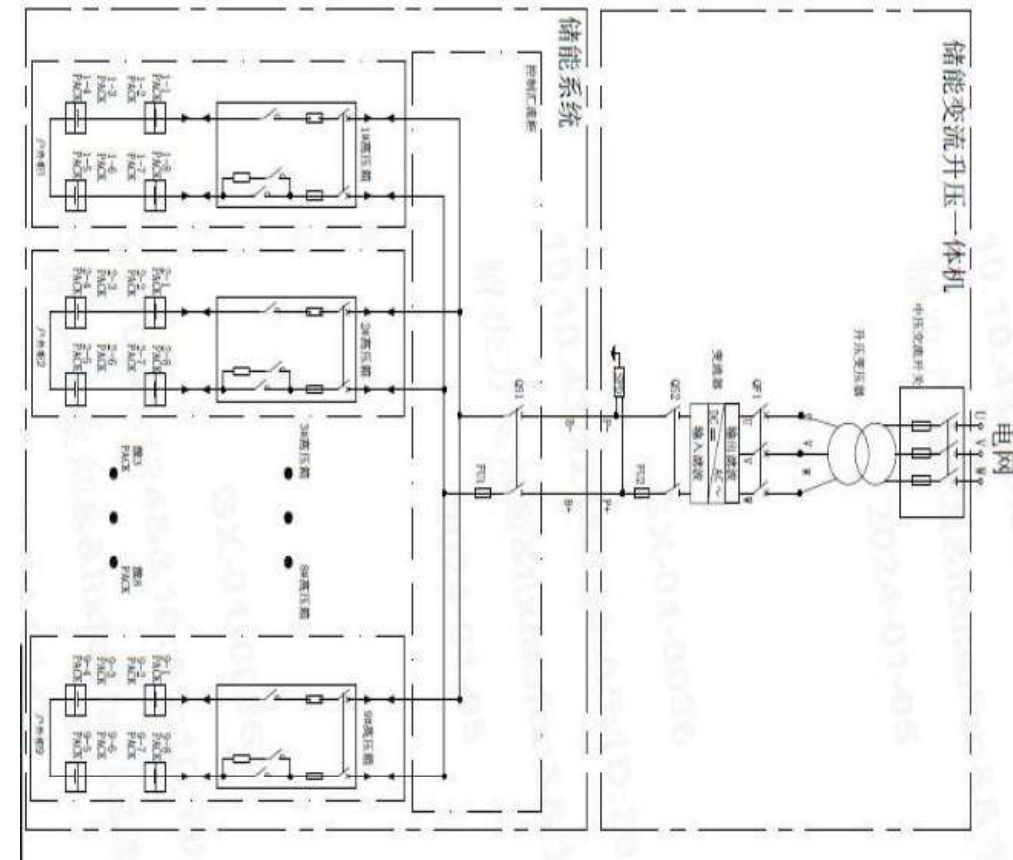
Typical Application Mode of Microgrids - Generation, Storage, and Charging with Light Energy

- Optical storage and charging integrated power station
AC bus solution is a commonly used optical storage and charging solution at present, which is widely used in charging station system expansion and system multi-energy complementary application.



Typical multi-parallel electrical extension diagram of system

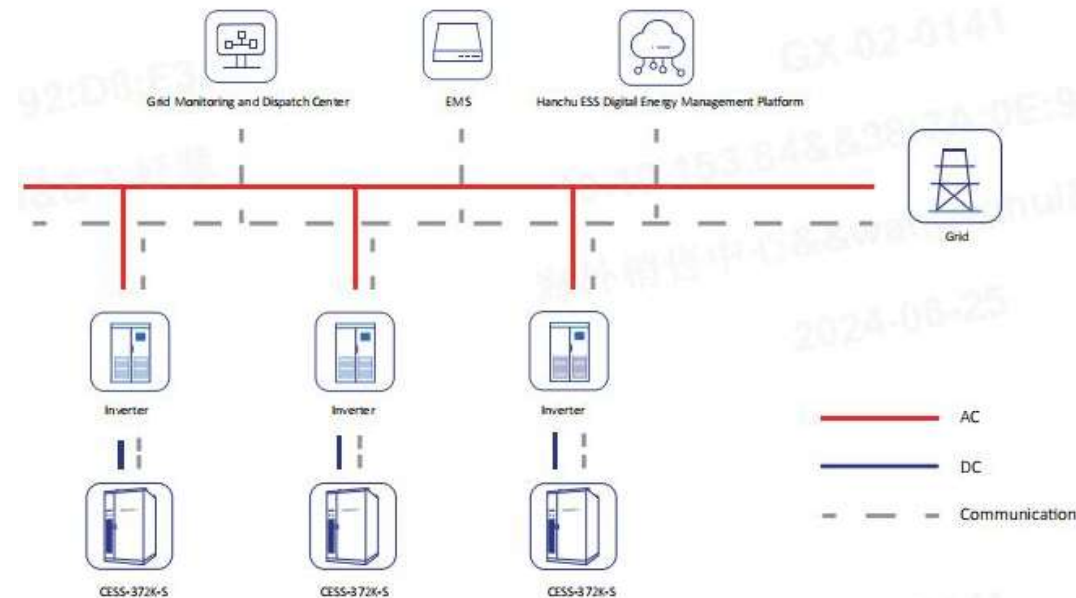
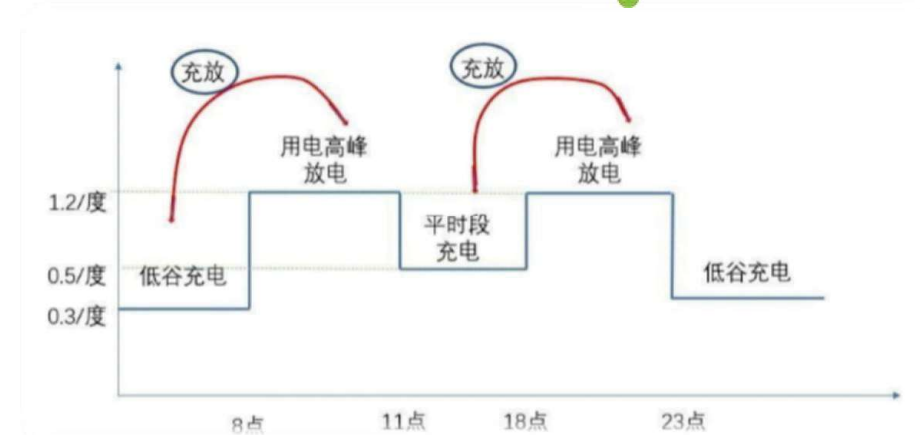
- If the single cabinet of the industrial and commercial split liquid-cooled outdoor cabinet only has the DC side, AC side equipment such as bus cabinets and inverters must be used to establish a complete energy storage system before usage.
- The system configuration of the outdoor cabinet offers relative flexibility and can be applied in various scenarios. The image on the right depicts a highly typical usage scenario, which can be configured for large-scale energy storage applications including new energy generation, power grid voltage regulation, frequency regulation, and large-scale industrial and commercial energy storage. This solution replaces traditional container-type energy storage systems with numerous advantages such as convenient transportation, small footprint requirements, and independence from each individual outdoor cabinet unit. Furthermore, outdoor cabinets can function independently or in conjunction with inverters or optical storage devices to form new energy microgrids and other systems catering to small-scale industrial and commercial scenarios.





Typical application mode of the system - peak shaving & valley filling

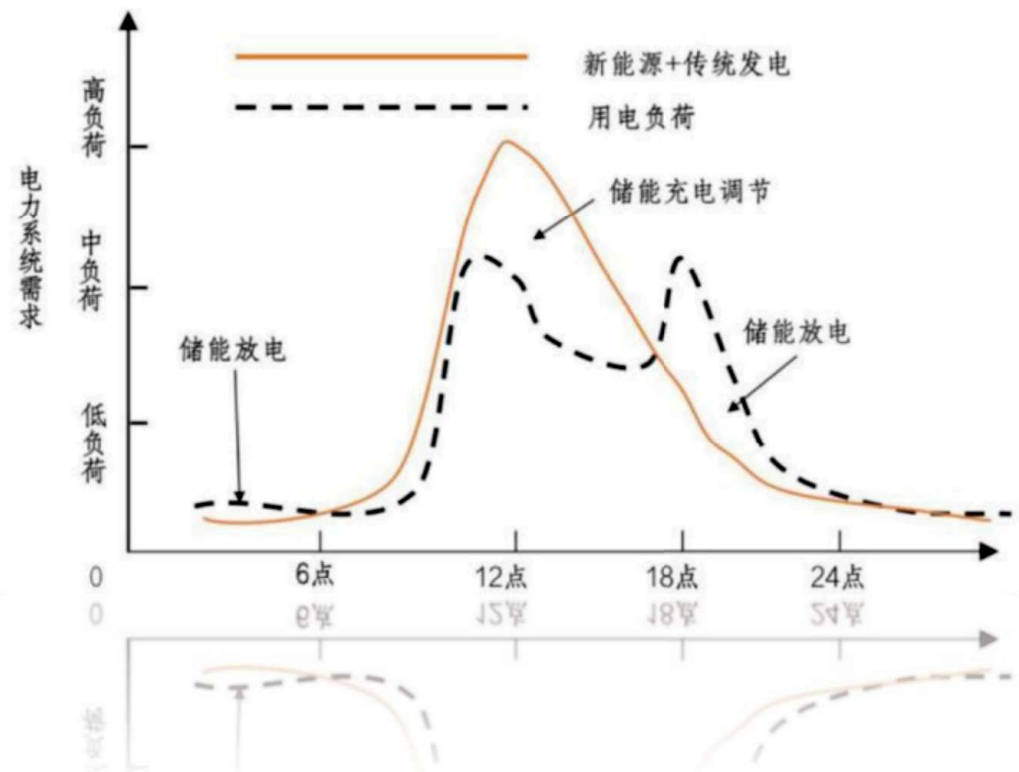
- Peak cutting and valley filling are the most basic benefits for 215K/418S
- The user can charge the energy storage battery at a cheaper valley price when the load is low, and the energy storage battery can supply power to the load when the load is high to achieve the peak.



System typical application mode - new energy consumption

- Photovoltaic power generation has a strong intermittent and volatility, spontaneous self-use, surplus power grid photovoltaic power generation exceeds the industrial and commercial users required electricity, excess electricity is sent to the grid at a lower price.
- When the power generation is not enough to cover the power needed by the user, the user has to buy electricity from the grid as a supplement. Therefore, in the case of only photovoltaic power generation, the cost of electricity for industrial and commercial users has not been maximized.

图表：电源侧，储能吸收过剩电力，减少弃电、增加并网



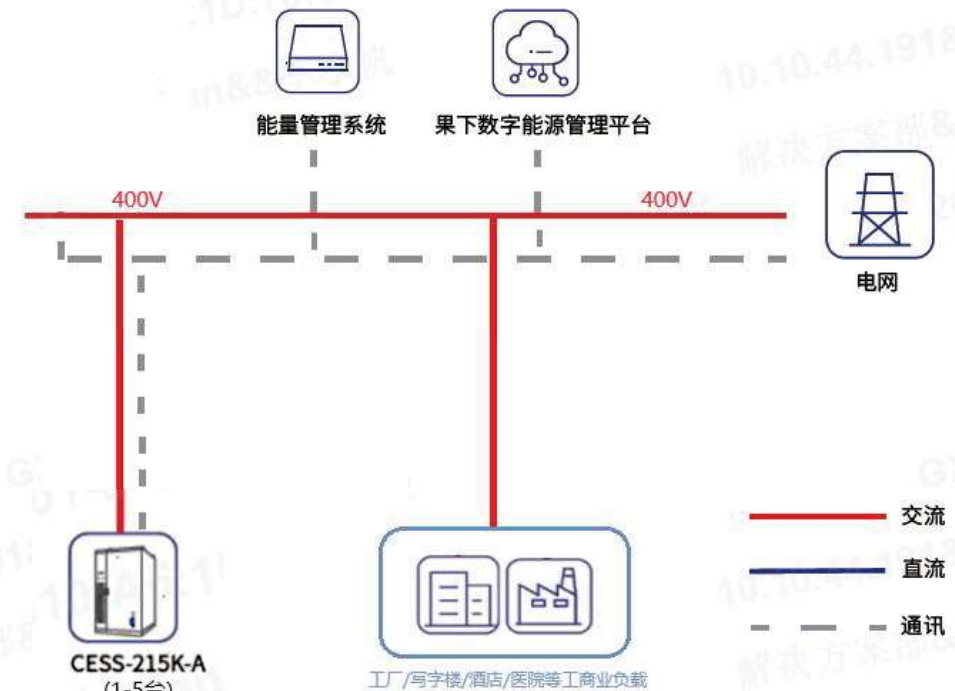
Typical application mode of the system - Power distribution capacity

- For example: for a certain park, school or village, the original transformer capacity is insufficient. With the increase of modern electrical equipment, the load increases, and the transformer capacity is insufficient, which leads to power quality problems such as the reduction of user-side voltage. The configuration of energy storage to discharge during peak hours is equivalent to increasing the transformer capacity and improving the power quality of the user-side.



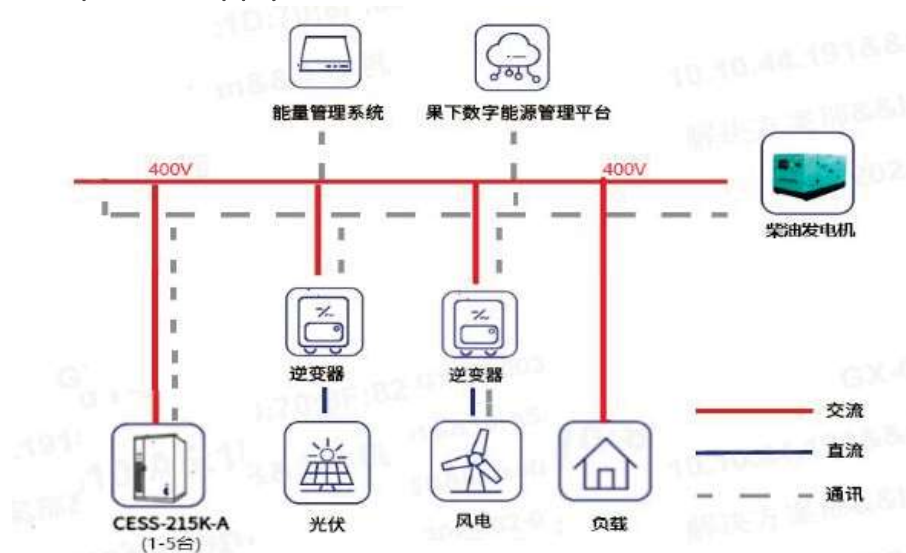
Typical application mode of the system - Distribution capacity increase

- Due to the increased production capacity requirements, the initial applied electrical capacity (usually calculated based on transformer capacity in KVA) is no longer sufficient to meet production and operational needs. Therefore, it is necessary to apply for an additional increase in capacity.
- In cases where the distribution capacity of industrial and commercial users falls short, energy storage systems can effectively charge during periods of high power demand that exceed transformer capacity, thereby meeting load energy demand requirements. This approach helps reduce costs associated with transformer usage, minimize investment in transformers, and shorten expansion cycles.



Typical application mode of the system - Off-grid microgrid

- The system's typical application mode is off-grid micro grid. In remote areas without electricity, where the population is sparse and far from the main power grid, a self-built power grid is needed. Photovoltaic and wind power generation can be combined with an energy storage system to create an off-grid micro grid for regional power supply.

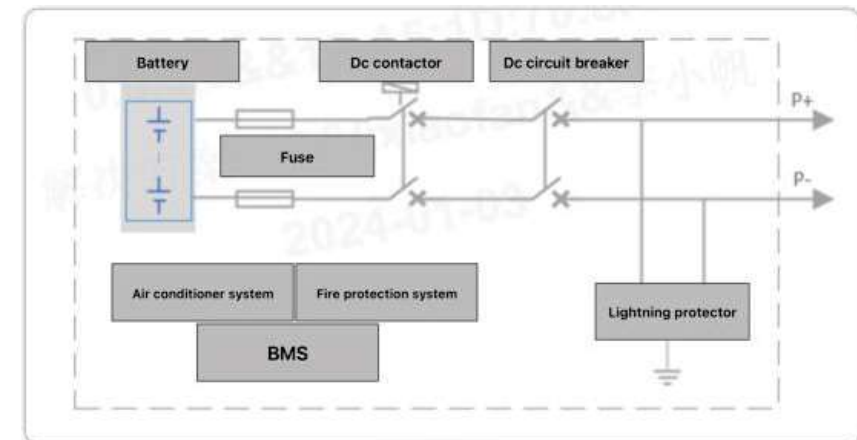
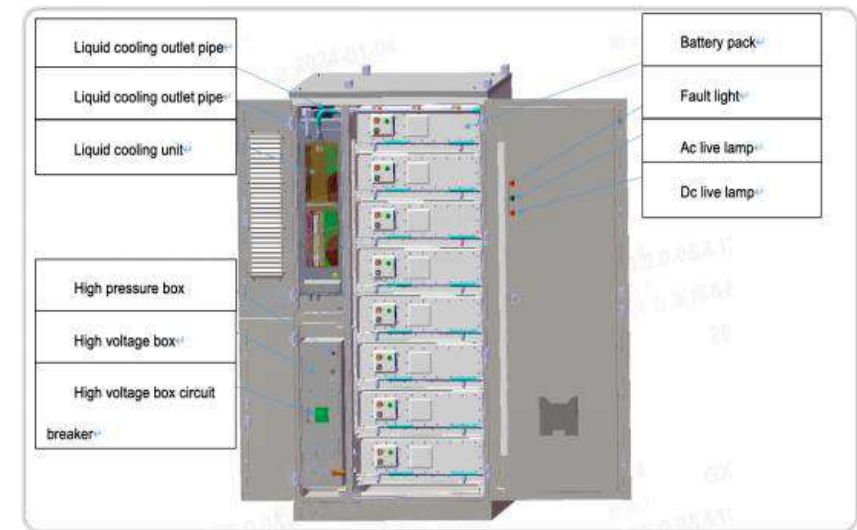


System introduction

The CESS series outdoor energy storage cabinet integrates various components for efficient and intelligent management, offering safety, reliability, rapid deployment, and low-cost operation. It enables flattening electricity prices, dynamic capacity increase, and microgrid integration to enhance economic benefits.

In common application scenarios, the operation strategy of the energy storage system is as follows:

- Reduce electricity prices: The energy storage cabinet automatically charges during off-peak hours or standby when fully charged. It also automatically discharges to take advantage of price differences during peak hours to improve economic benefits.
- Grid capacity increase: When the load is light, the battery charges; otherwise it discharges externally to increase peak load capacity and enhance distribution system capabilities.
- Microgrid integration: Combined with photovoltaic systems, charging systems, diesel power generation systems and other microgrids to coordinate energy balance promote efficient source consumption, dynamic capacity enhancement, and improve economic benefits.



Product specification



High Safety

- Utilizing LFP cells for stability and safety
- High-standard reinforced structural design
- Multiple levels of safety warnings and protection, from cells to the overall system, ensuring safety and reliability.

Modular Design

- Supports parallel operation of multiple units, covering a wide power range from 50 kW to 1 MW
- Multiple configuration options ranging from 2 to 5 hours

Flexible Combination

- Integrated outdoor cabinet design with a small footprint and flexible on-site configuration
- Convenient for multiple system installations

Thermal Insulation Design

- Liquid cooling system and insulation layer to ensure battery modules operate at suitable temperatures

Fire Protection Design

- Advanced dual fire protection system with fully fluorinated ketone fire suppression and water-based fire suppression, ensuring the safety and stable operation of the system

Excellent Protection

- Outdoor cabinet design with IP54 protection rating and battery pack with IP65 protection rating

Integrated Design

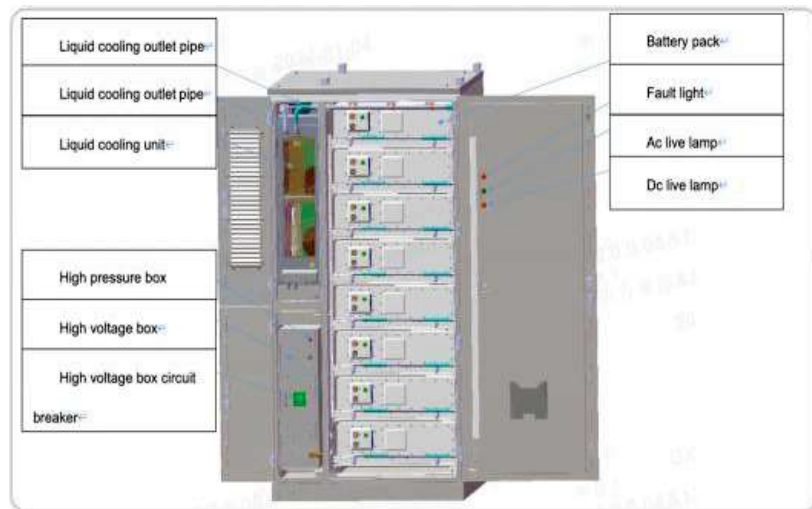
- Highly integrated design combining cells, BMS, EMS, and PCS



Specifications

Model	CESS-418K-S
DC Side	
Charge/Discharge Rate	≤0.5C
Nominal Capacity	417.99KWh
Cell Type	LFP-314Ah
Voltage Range	1164.8~1497.6V
Nominal Voltage	1331.2V
Maximum Charging Current	157A
Maximum Discharging Current	157A
Charging Temperature	0~55°
General Data	
Discharging Temperature	-20~50°
Humidity	≤95%
Cooling Method	Liquid Cooling
IP Rating	IP54
Communication	CAN/RS485
Safety Certification	IEC 62619/CE/UN38.3/MSDS/DGM
Dimensions (W*D*H)	1250*1350*2346mm
Weight	3600Kg

/// Main system parameters



Name	type	Unit	quantity	Remark
Battery system	314Ah, 417.99kWh	SET	1	With control box
Distribution system	Plastic shell, micro break, lightning protection, socket, indicator light	SET	1	
Air conditioning system	AC 220±15%VAC~50Hz, 8kW cooling,2kW heating	SET	1	Precision air conditioner
Fire protection system	Temperature sensing magnetic power generation device, smoke sensing, perfluorohexanone device	SET	1	Auxiliary equipment
Fire protection system	Water leakage sensor, limit switch, emergency stop button, lighting	SET	1	Auxiliary equipment

/// Battery Cell



314Ah battery cell

No.	Item	Parameter
1	Battery type	LFP
2	Nominal voltage/capacity	3.2V/314Ah
3	Nominal charging and discharging rate	0.5C
4	Range of cell voltage	2.5V~3.65V
5	Width	174.4±1.5mm
6	Thickness	71.4±1.5mm
7	Height (total height)	207.0±1.0mm
8	Height (body height)	200.2±0.5mm
9	Distance between poles	123.0±0.3mm
10	Cell weight	5.56±0.15kg

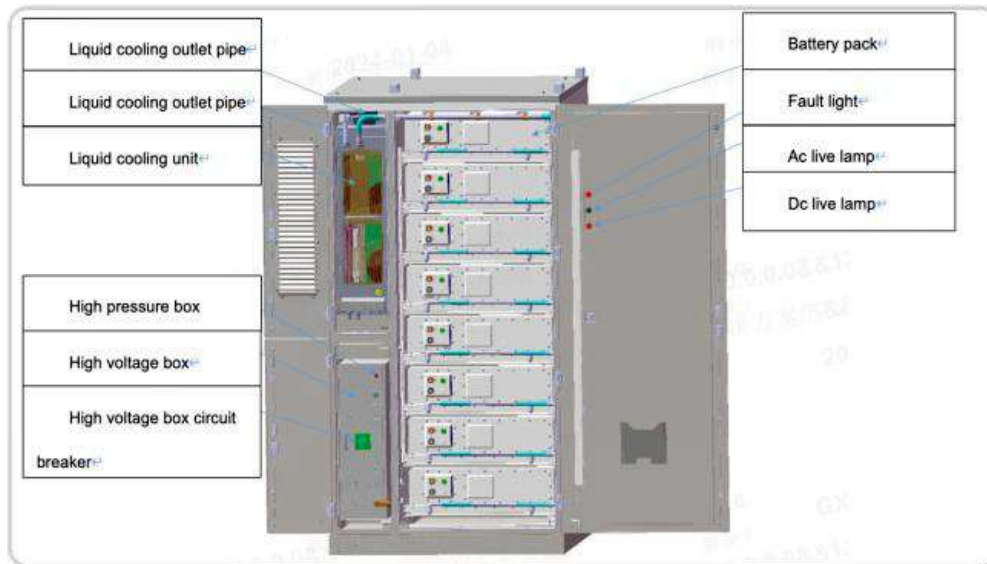


Battery PACK



1	PACK Parameter		
1.1	size	826mm(W)*1134.8mm(D)*243.5mm(H)	±2mm
1.2	Nominal Capacitance	314Ah@0.5C,25°C	Test capacity ≥98%, qualified
1.3	Nominal voltage	166.4V (52cells)	Shipping capacity30%~40%SOC
1.4	Operating voltage range	145.6~187.2V	Do not use out of range, which may damage the battery and cause safety risks
1.5	Max continuous charge ratio	0.5C@25°C	≤140A
1.6	Max sustained discharge rate	0.5C@25°C	≤140A
1.7	Weight	400kg	±3kg
1.8	Nominal energy	46.592kWh	25°C@1crated
1.9	*Insulation standard	Battery box insulation resistance > 1GΩ(1000VDC)	Refer to GB36276-2018
1.10	*Withstand voltage standard	3110VDC, No breakdown or flashover occurs	Refer to GB36276-2018
1.11	Max charging voltage of a cell	3.65V	Do not use out of range, which may damage the battery and cause safety risks
1.12	Min discharge voltage of a cell	2.5V	Do not use out of range, which may damage the battery and cause safety risks
1.13	Charging high temperature protection	45°C	Battery module temperature
1.14	Discharge high temperature protection	50°C	Battery module temperature
1.15	Charge low temperature protection	0°C	Battery module temperature
1.16	Low temperature discharge protection	-10°C	Battery module temperature
1.17	Ingress protection	IP65	
1.18	Operating ambient temperature range (°C)	0 ~ 40	Do not use out of range, which may damage the battery and cause safety risks
1.19	Storage temperature range (°C)	-30 ~ 45	Do not use out of range, which may damage the battery and cause safety risks
1.20	Storage ambient humidity (RH)	5% ~ 95%	Do not use out of range, which may damage the battery and cause safety risks
1.21	Working ambient humidity (RH)	≤85%	Do not use out of range, which may damage the battery and cause safety risks
1.22	work efficiency	≥92%	25°C±2°C 1C chargr/discharge @90%DOD

/// Battery Clusters



No.	Item		Parameter
1	Configuration		1P416S
2	Nominal voltage (V)		1331.2V
3	Voltage range	Minimum voltage (V)	1040
		Maximum voltage (V)	1497.6
4	Nominal capacity (Ah)		314
5	Nominal energy (kWh)		417.99kWh
6	Ingress protection level		IP54
9	Cooling type		Liquid cooling

Diagram of multiple parallel entities

3.762Mwh Project



418 Outdoor cabinet No.1-9



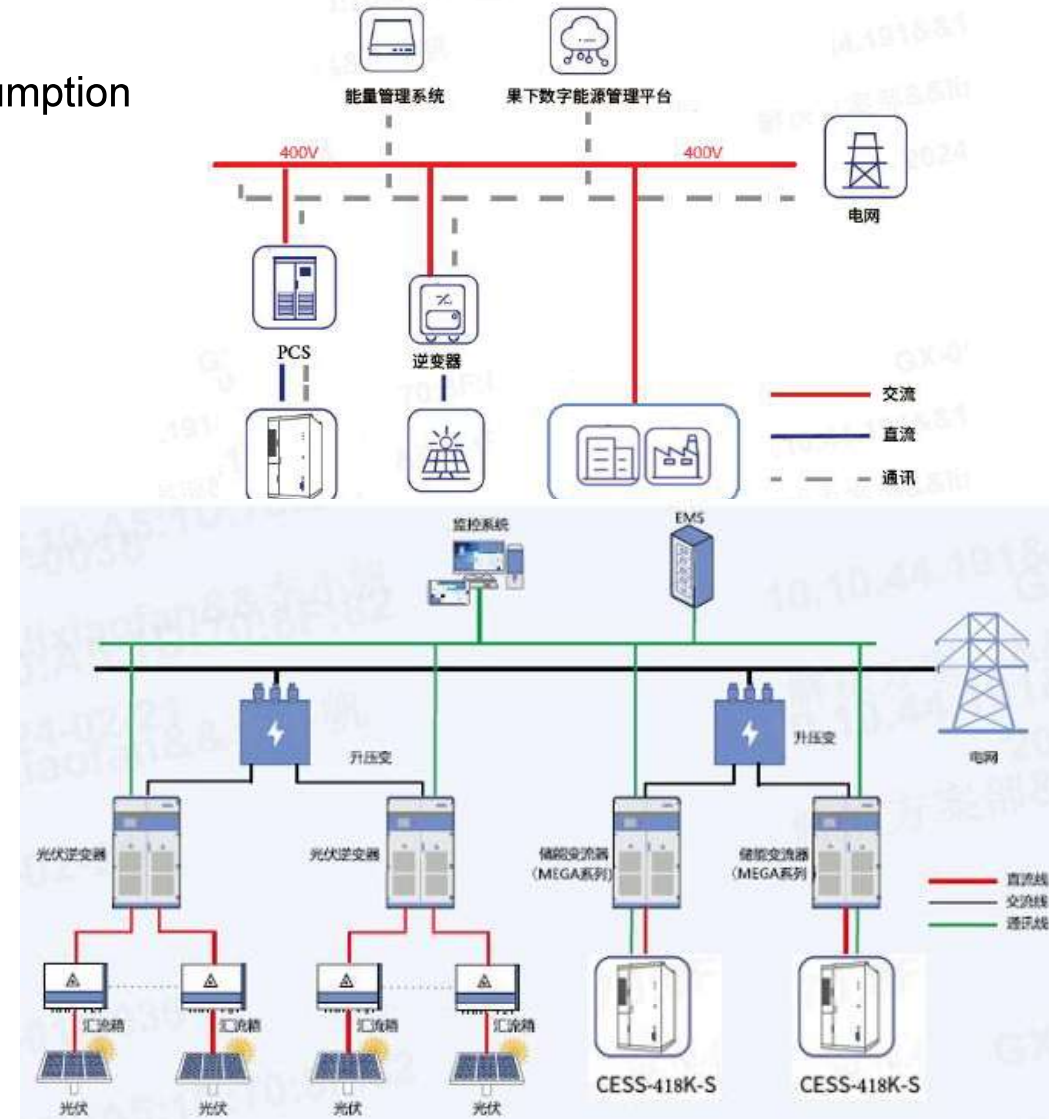
Dc combine cabinet



Kehua 1250kW PCS

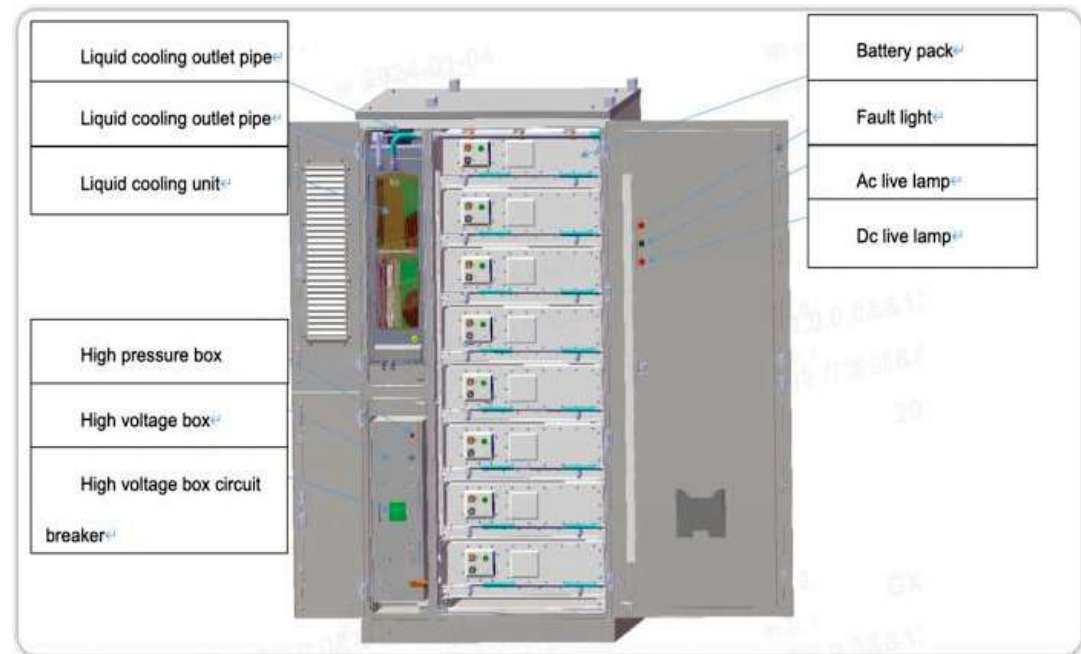
System typical application mode - New energy consumption

- After the configuration of the energy storage system, the photovoltaic power will be stored in the energy storage system first, and the rest power will be supplied to the load. When the photovoltaic power is insufficient, the energy storage will be used to supply power to the load. The energy storage system will smooth the generation and consumption of electricity, improve the absorption rate of photovoltaic power generation, and maximize the benefits of electricity consumption to the greatest extent.



/// Features of outdoor cabinets - Highly integrated and modular

- The system is highly integrated, with internal integration of energy storage battery system, PCS inverter, power distribution, air conditioning, monitoring, local EMS, fire protection system, etc.
- The outdoor cabinet fully considers post-maintenance and maintenance while ensuring a high degree of integration. The main components of the system are all modularized for convenient post-maintenance and replacement.



Outdoor cabinet Features - Efficient thermal management

The outdoor cabinet is equipped with a specialized liquid-cooled air conditioning unit for energy storage. The selection of the air conditioning power and model is based on theoretical calculations and system thermal simulations. Compared to an air-cooled system, the liquid cooling heat dissipation efficiency is higher and more evenly distributed, effectively ensuring the temperature difference of the battery cells and enabling optimal operation within the battery system's temperature range

Item	Unit	Remark
Type		EMW90HDNC1A
Dimensions (H*W*D)	mm	275×1150×1040
Weight (without refrigerant)	kg	115
Installation methods		Plug-in type
Usage scenario		Outdoor
Connection type		DN20, quick coupling
Operating temp.	°C	-30~+55
Storage temp.	°C	-40~+70
Noise grade@L45/W18	dB(A)	75
grade of corrosion prevention		C3
Appearance color		Outdoor form orange peel grain RAL7035
IP protection level		IP54
Refrigerant		R134a
Secondary refrigerant		Pure water, 50% glycol solution
Refrigerating capacity@L35/W18	kW	8.0
Heating capacity	kW	2.0
Effluent temp.	°C	15
Argument		
Liquid temperature setting range	°C	10 ~ 35 (heating set point ≤ cooling set point)
Default cooling set point	°C	15
Default heating set point	°C	10
Communication mode		RS485
Communication protocol		Modbus RTU
Rated circulating water flow	L/min	50
Rated external cycle head	Kpa	90
Refrigeration input power@L35/W18	kW	4.3
Refrigeration input power@L45/W18	kW	4.7
Heating input power@Tu=10°C	kW	2.7
Self-circulating model (single pump operation) power	kW	0.5
Maximum power consumption	kW	4.8
Rated operating voltage	V, Hz	220V 50/60±3Hz
Support voltage range	V Hz	220+15% 50/60+3Hz

System degradation -SOH

According to the provided information, cell *L173F314* has a cycle life of 6000 cycles – under 25°C, 0.5C and 100% DOD – before its SOH drop to 80%. It is shown in the following table.

根据中创新航提供的电芯寿命信息，电芯 *L173F314* 的循环寿命，在 25°C、0.5C 以及 100% DOD 条件下衰减到 80% SOH 前可循环 6000 次。如下表所示：

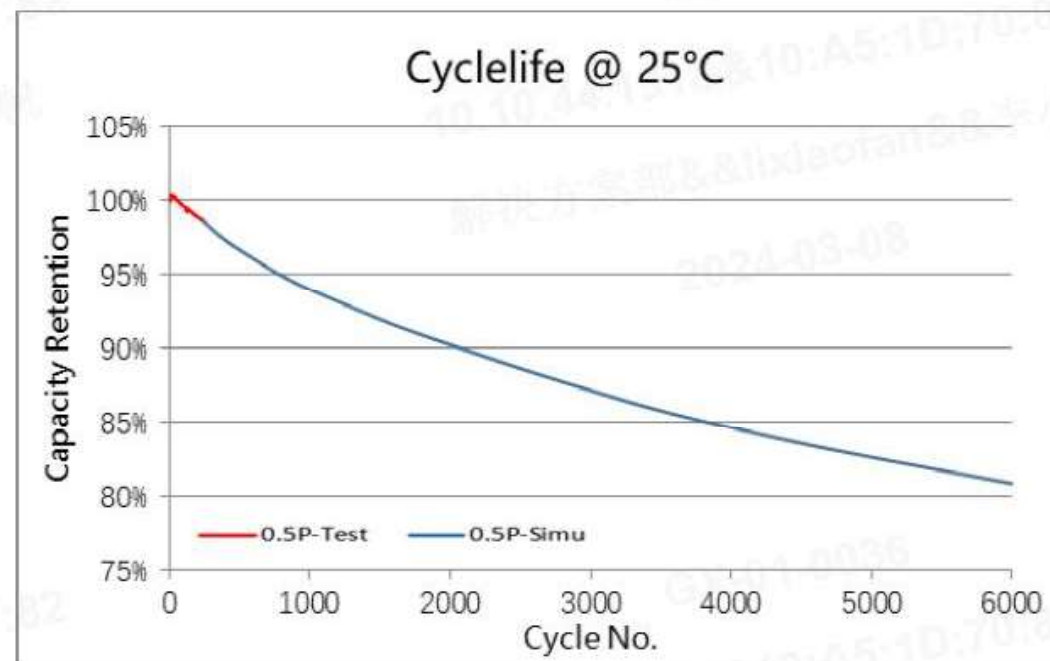


Figure 3.11 Cycle Life 循环寿命

/// The charge and discharge performance of cells

The charge and discharge performance of cells at different rates is an important parameter for battery operation. The energy capacity of L173F314 cell is greater than 1004.8Wh when it is charged or discharged at 0.5C at room temperature, with energy efficiency >94.5%; if at 0.25C, it is greater than 1011.08Wh, with energy efficiency >96.0%. The following charts show the cell's capacity when doing charging or discharging at different rate.

电芯不同倍率下的充放电性能是电池工作的重要参数。L173F314电芯以0.5C在常温下进行倍率充放电时，充放电能量均大于1004.8Wh，能量效率>94.0%；0.25C充放电能量>1011.08Wh，能量效率>96.0%。下图实验结果显示了电池在不同倍率充电放电的容量。

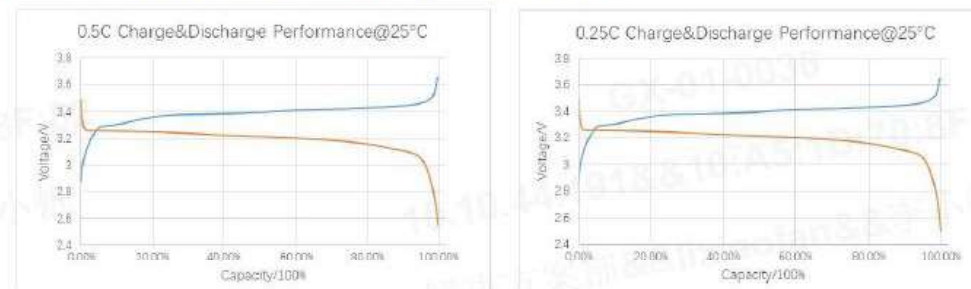


Figure 3.8: Capacity at charge and discharge at 0.5C and 0.25C 不同倍率充电和放电的容量



Figure 3.9 Capacity at different discharging rate 不同倍率放电的容量

THANK YOU

Jiangsu Hanchu Energy Technology Co. Ltd.