

ECE Energy Integrated container energy storage system

2023.07.01

Product description



Product description

- The energy storage system includes LiFePO4 batteries, BMS, EMS, PCS, AC/DC distribution cabinets, fire protection systems, lighting systems, temperature control systems, etc.
- Energy battery packs store electricity when the electricity is in the "valley" period and discharge when the electricity is in the "peak" period, realizing peak-cutting and valley-filling of electricity. This can not only reduce the peak load of the power grid, but is also beneficial to the security of the power grid. Operation can also produce huge economic benefits.
- The energy storage system can also realize value-added service benefits of electric power "energy storage ": such as participating in demand-side response, emergency power support, transformer loss reduction, reactive power compensation and other value-added service values.

Features

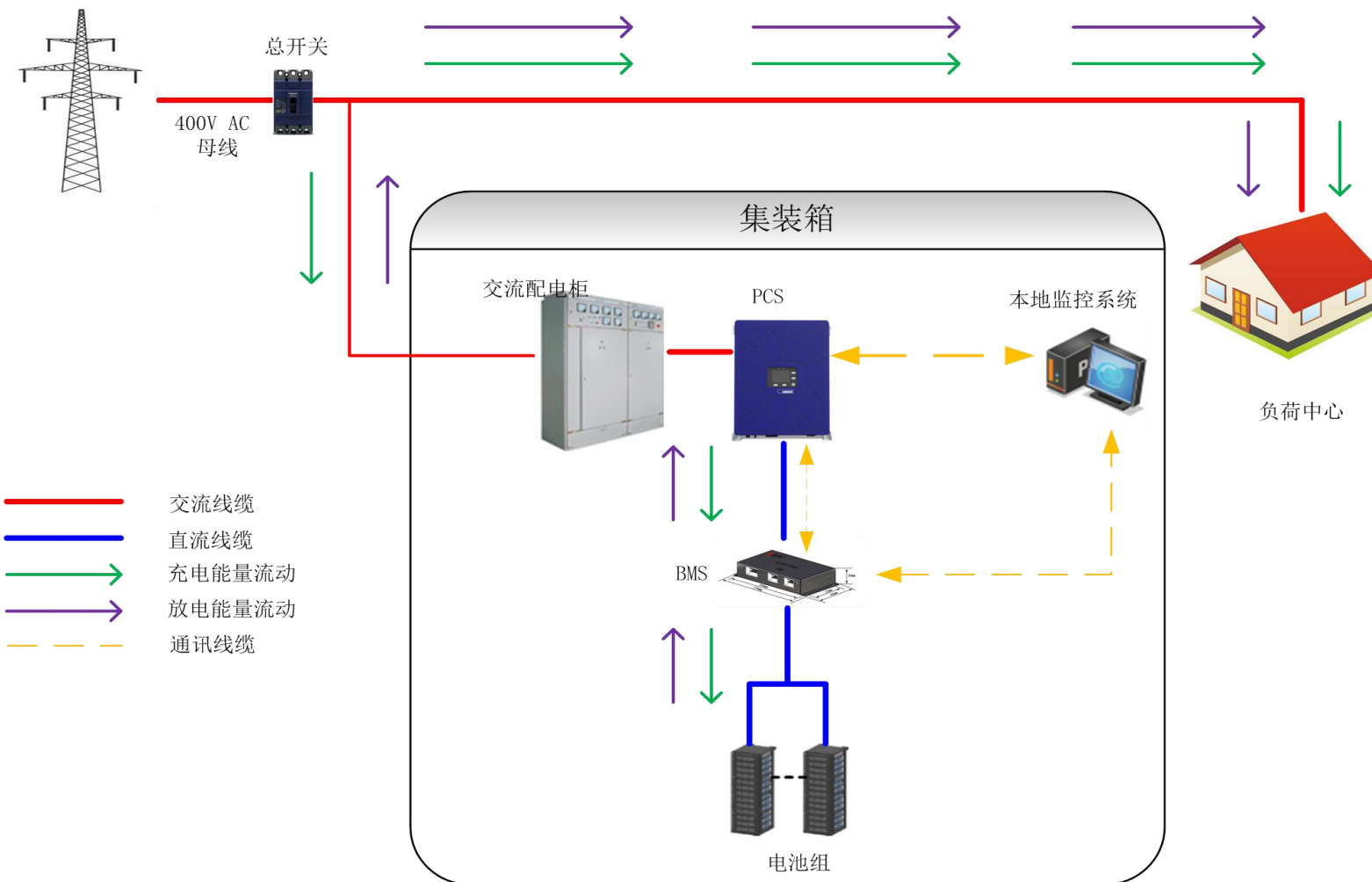
- It adopts container-type integrated equipment, with high integration, accurate measurement, real-time monitoring, safe and reliable operation, and simple installation.
- The PACK-level new fire protection system effectively prevents battery cells from re-igniting and more safe and reliable.
- EMS realizes power dispatching and intelligent load regulation within the station, and supports remote monitoring and operation and maintenance.
- Reverse power protection can be installed on the side of the grid-connected switch to monitor the reverse current and communicate with the EMS to control the discharge power, thereby realizing the anti-reverse flow function.
- Demand-side response: Participate in power demand-side response during peak hours to obtain government subsidy benefits; realize peak load transfer and improve terminal power consumption efficiency.
- Transformer loss reduction: By peak shaving and valley filling, the peak power loss of the transformer is transferred to the valley power part, thereby reducing the user's electricity cost.



Product model

| | Model Specification | 1MW / 1MWh | 1.5MW / 1.5MWh | 2MW / 2MWh | 2.5MW / 2.5MWh | 3MW / 3MWh | 3.5MW / 3.5MWh | 4MW / 4MWh | 4.5MW / 4.5MWh | 5MW / 5MWh | 5.5MW / 5.5MWh | |
|----------------------------------|---|--|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Integrated Centralized Framework | Energy storage container | 20ft cabinet | 20ft cabinet | 25ft cabinet | 25ft cabinet | 30ft cabinet | 30ft cabinet | 35ft cabinet | 35ft cabinet | 40ft cabinet | 40ft cabinet | |
| | Battery Type | LFP | LFP | LFP | LFP | LFP | LFP | LFP | LFP | LFP | LFP | |
| | Maximum output power (MW) | 1MW | 1.5MW | 2MW | 2.5MW | 3MW | 3.5MW | 4MW | 4.5MW | 5MW | 5.5MW | |
| | Electricity (MWh) | 1MWh | 1.5MWh | 2MWh | 2.5MWh | 3MWh | 3.5MWh | 4MWh | 4.5MWh | 5MWh | 5.5MWh | |
| | Maximum output current on the DC side (A) | 280A | 280A | 280A | 280A | 280A | 280A | 280A | 280A | 280A | 280A | |
| | DC side voltage range(V) | DC500V-850V | DC500V-850V | DC500V-850V | DC500V-850V | DC500V-850V | DC500V-850V | DC500V-850V | DC500V-850V | DC500V-850V | DC500V-850V | |
| | AC access voltage(V) | Three Phase AC380V | Three Phase AC380V | Three Phase AC380V | Three Phase AC380V | Three Phase AC380V | Three Phase AC380V | Three Phase AC380V | Three Phase AC380V | Three Phase AC380V | Three Phase AC380V | Three Phase AC380V |
| | AC output frequency range | 50Hz/60Hz | 50Hz/60Hz | 50Hz/60Hz | 50Hz/60Hz | 50Hz/60Hz | 50Hz/60Hz | 50Hz/60Hz | 50Hz/60Hz | 50Hz/60Hz | 50Hz/60Hz | 50Hz/60Hz |
| | Scenarios | 1.Solar and wind power generation systems 2.Power system peak trimming and valley filling 3.Frequency modulation and load tracking | | | | | | | | | | |

System diagram



- 交流线缆
- 直流线缆
- 充电能量流动
- 放电能量流动
- - - 通讯线缆

| No. | Main components | Specifications and models | Quantity |
|-----|---------------------------------------|--------------------------------------|------------|
| 1 | Integrated container | standard box | 1 |
| 2 | Battery | Lithium Iron Phosphate | 8 clusters |
| 3 | battery management system | BMS | 3 sets |
| 4 | Energy storage bidirectional inverter | PCS | 3 units |
| 5 | local monitoring system | Station-level centralized monitoring | 1 set |
| 6 | Combiner cabinet | DC | 3 sets |
| 7 | Distribution Cabinet | communicate | 1 set |
| 8 | Temperature Control System | Air conditioning, air duct | 1 set |
| 9 | Fire Fighting System | Heptafluoropropane | 1 set |

Main components of the product

Battery system

Battery system-battery pack



The battery module is composed of 15 single cells, the specification is 1P15S, the power is 13.44kWh, and the nominal voltage is 48V.

The battery module is equipped with the BMS acquisition module BMU, which is used to collect parameters such as voltage and temperature of the module, and has functions such as balancing.

| No. | name | Specification | Remark |
|-----|--|---|---------------------------------------|
| 1 | Module size | Box size: excluding connector 500mm(W)*600mm(D)*225mm(H) | ±2mm |
| 2 | Nominal capacity | 280Ah@0.5C,25°C | |
| 3 | Nominal voltage | 48V (15cells) | |
| 4 | Working voltage range | 37.5~54.75V | |
| 5 | Maximum continuous charging rate | 1C@25°C | 280A |
| 6 | Maximum continuous discharge rate | 1C@25°C | 280A |
| 7 | weight | <100kg | |
| 8 | Rated energy | 13.44kWh | |
| 9 | Insulation standards | 2570VDC, no breakdown, leakage current <5mA | Reference GB36276-2018 |
| 10 | Withstand voltage standard | 2830VDC, no breakdown, leakage current <5mA | Reference GB36276-2018 |
| 11 | Maximum charging voltage of single unit | 3.65V | Any cell |
| 12 | Single unit minimum discharge voltage | 2.5V | Any cell |
| 13 | Discharge overcurrent protection current | 280A@90min | |
| 14 | Charging high temperature protection | 55°C | Battery temperature in battery module |
| 15 | Discharge high temperature protection | 55°C | Battery temperature in battery module |
| 16 | Charging low temperature protection | 0°C | Battery temperature in battery module |
| 17 | Discharge low temperature protection | -20°C | Battery temperature in battery module |
| 18 | use environment | Indoor, dry, constant temperature | |
| 19 | waterproof level | IP20 | |
| 20 | Working temperature range (°C) | -20 ~ 55 | |
| 21 | Storage temperature range (°C) | -40 ~ 60 | |
| 22 | Storage environment humidity (RH) | 5% ~ 95% | |
| 23 | Working environment humidity (RH) | ≤85% | |

Battery system

Battery system: battery cluster



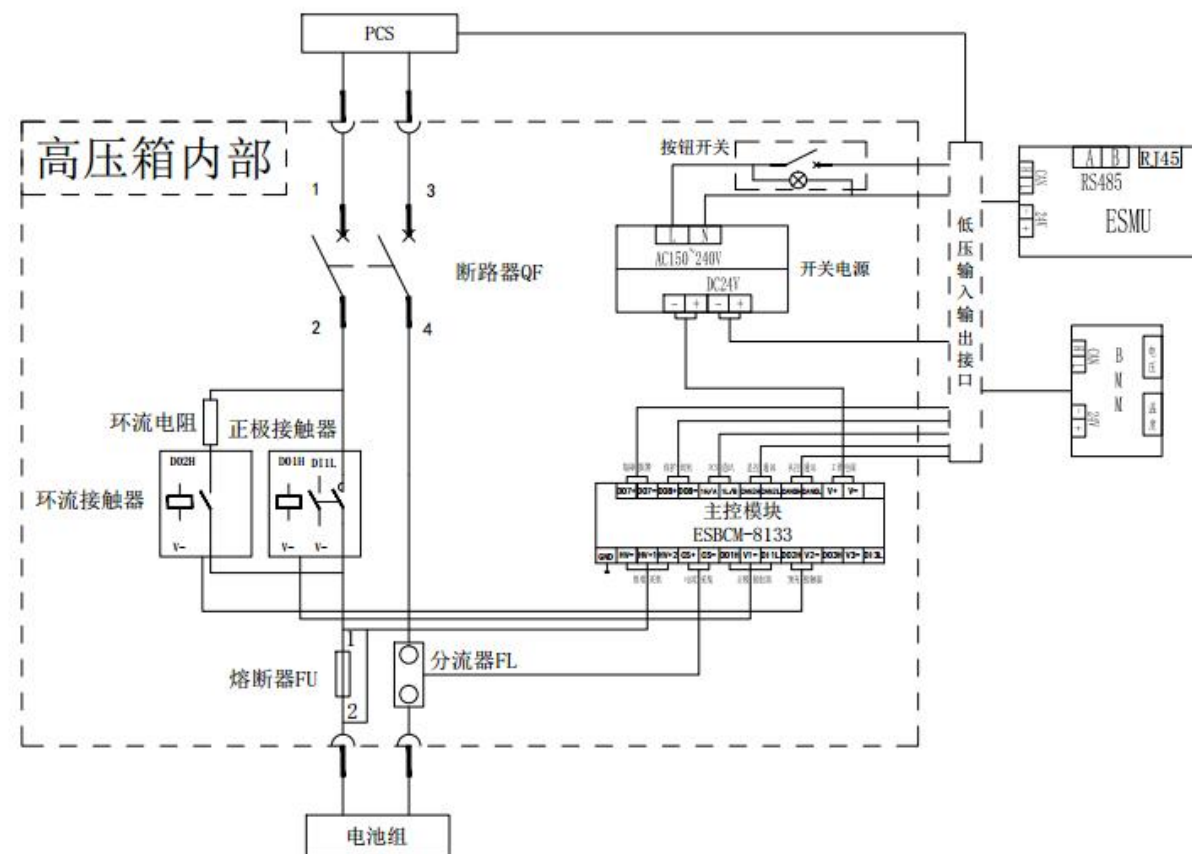
| No. | Parameter | Specification | Remark |
|-----|--|--|---------------------------------------|
| 1 | Battery cluster size | 1172mm(W)*630mm(D)*2065mm(H) | ±10mm, excluding connectors |
| 2 | Nominal capacity | 280Ah@0.5C,25°C | |
| 3 | Q | 720V | |
| 4 | Working voltage range | 562.5V~821.25V | |
| 5 | Maximum charging rate | 1C@25°C | 280A |
| 6 | Maximum discharge rate | 1C@25°C | 280A |
| 7 | Standard weight | ≤1.5T | Rack included |
| 8 | Standard energy | 201kWh | |
| 9 | Insulation standards | Battery box insulation resistance ≥500MΩ (1500VDC) | Reference GB36276-2018 |
| 10 | Withstand voltage standard | Battery box 2570VDC, no breakdown, leakage current <20mA | Reference GB36276-2018 |
| 11 | Maximum charging voltage of single unit | 3.65V | Any cell |
| 12 | Single unit minimum discharge voltage | 2.5V | Any cell |
| 13 | Discharge overcurrent protection current | 280A@90min | |
| 14 | Charging high temperature protection | 55°C | Battery temperature in battery module |
| 15 | Discharge high temperature protection | 55°C | Battery temperature in battery module |
| 16 | Charging low temperature protection | 0°C | Battery temperature in battery module |
| 17 | Discharge low temperature protection | -20°C | Battery temperature in battery module |

Battery system

Battery system: high voltage box



The high-voltage box contains the BMS main control unit and electrical components, which are used to manage and protect the operating status of the entire battery cluster.



High voltage box schematic diagram

Battery Management System



The battery management system (BMS) has a three-level architecture. Each battery socket is managed by the battery management unit BMU. The BMU is responsible for performing functions such as cell voltage, temperature collection, and balancing of the batteries. The BMU communicates using the CAN bus, and the battery's cell information (cell voltage, cell temperature, cell SOC, cell SOH, equilibrium status, etc.) is sent to the upper end by the BMU.

The battery cluster is equipped with a battery control unit (BCU), which collects the total voltage and current of the battery cluster and controls the battery pack contactor, and performs data communication (CAN communication) with it.

The battery cluster control unit (BCU) can upload battery information, fault alarms, data records, etc., and communicate with the PCS and monitoring background. It communicates with the PCS through CAN, and communicates with the background through the network port, using the standard MODBUS TCP/IP protocol.

| | | |
|----------------------------------|--|---|
| Voltage collection | Voltage detection range | <1000V |
| | Voltage detection accuracy | ±0.2% |
| | Voltage acquisition cycle | 100ms |
| Current collection | Current detection range | ±500A (according to Hall range) |
| | Current detection accuracy | ≤±0.5% (more Hall accuracy) |
| | Current acquisition cycle | 100ms |
| Temperature collection | Temperature detection range | -20 ~ 85°C |
| | Temperature measurement accuracy | ±1°C/±0.1°C(according to temperature sensing range) |
| | Temperature collection cycle | 100ms |
| Insulation resistance collection | Insulation resistance measurement accuracy | ±5% |
| | Insulation resistance collection cycle | 2s |
| Operating Voltage | 9~32Vdc | |
| Operating temperature | -20~65°C | |
| Operating power consumption | <2.1W | |
| Communication Interface | RS485*1, CAN*3 | |
| Communication baud rate | 9600bps, 250Kbps (default) | |
| DO (switch) | 2*2A/input power supply (9-30V) | |
| DO (active) | 6*2A/input power supply (9-30V) | |
| DI | 3*high level, 3*low level, 2*passive | |
| Input insulation resistance | ≥10MΩ,1500VDC | |
| Installation dimensions | 180*105*27.8mm (length*width*height) | |
| Installation method | framework | |

Power converter system



The PCS is composed of a DC/AC bidirectional converter, a control unit, etc., which controls the charging and discharging process of the battery, converts AC to DC, and directly supplies AC loads without a power grid.

The PCS controller receives background control instructions through communication, controls the converter to charge or discharge the battery according to the sign and size of the power instruction, and regulates the active power and reactive power of the grid.

The PCS controller communicates with the BMS through the CAN interface to obtain battery pack status information, which can implement protective charging and discharging of the battery to ensure safe battery operation.

| No. | Item | Parameter | Remark |
|------------------------|--|---|---|
| 1、 AC parameter | | | |
| 1 | Communication access method | Three-phase three-wire | |
| 2 | rated power | 500kW | |
| 3 | Overload capacity | 110%: long-term operation 120%: ≥10min | |
| 4 | Rated voltage | 380V | It can adapt to ±10% fluctuation of grid voltage. |
| 5 | Rated current | 957A | |
| 6 | Rated grid frequency | 50Hz | Consistent with the grid frequency. |
| 7 | Total current waveform distortion rate (THD) | <5% (rated power) | The total current waveform distortion rate is <5% under rated power. |
| 8 | Power factor adjustable range | -1 ~ +1 | |
| 9 | Reactive power response time | ≤30ms | |
| 10 | Power control deviation | ≤2% | When the power is 20% greater than the rated power, the power control deviation shall not exceed 2%. |
| 11 | DC component | 0.5% (rated current) | When running at rated power, the DC current component of the AC side current does not exceed 0.5% of the rated current. |
| 2、 DC parameter | | | |
| 12 | DC voltage range | 580V ~ 850V | |
| 13 | Voltage stabilization accuracy | ±5% | |
| 14 | Steady flow accuracy | ±5% | |
| 15 | Protection | low voltage ride through , high voltage ride through , Anti-islanding protection , AC overcurrent/short circuit protection , AC overvoltage/undervoltage protection , AC over/under frequency protection , AC line phase sequence error protection , DC overcurrent/short circuit protection , DC overvoltage/undervoltage protection , DC polarity reverse protection , Over temperature protection , Communication failure protection , Cooling system failure protection , Fault recording | |
| 3、 System | | | |
| 16 | Maximum conversion efficiency | ≥0.99 | |
| 17 | Power response speed | < 100ms | |
| 18 | Charge-discharge conversion time | < 100ms | The conversion time from charging at 100% rated power to discharging at 100% rated power. |
| 19 | Dimensions (width*depth) | 1110*827mm | |
| 20 | Weight | 1100kg | |
| 21 | Protection level | IP30 | |
| 22 | Noise | ≤80dB | 1m away from the device |
| 23 | Cooling method | air cooling | |
| 24 | Communication Interface | RS485, Ethernet | IEC61850, ModbusRTU |
| 25 | Wiring | In and out | |
| 26 | Working temperature | - 25°C ~ +55°C | |
| 27 | Storage environment temperature | - 20°C ~ +70°C | |
| 28 | Allowed relative humidity | 0 ~ 95% | |
| 29 | Altitude | No derating at altitude ≤ 2000m | |

Cloud monitoring platform



Panoramic signboard

Data Display
Revenue ranking
Accumulated power

Diagnose with energy

Power Quality
Hidden danger analysis
Diagnose report

Operation and maintenance management

Operation and maintenance plan
Operation and maintenance tasks
Scheduling operation and maintenance

Data sharing

Enterprise energy usage data
Enterprise demand data
Equipment life data
Data permission

Operations management

Revenue data
Power purchase management
Carbon Points Management

System Management

Rate management
Plan management
role management

Power plant management

Overall power plant information
Power plant event status

Asset Management

Carbon asset management
Equipment asset management
.....

Fire fighter system



Equipped with combustible gas detectors, fire detectors, gas fire extinguishing devices, combustible gas emission devices, intelligent detection and active exhaust before firefighting, the exhaust ventilation volume of the energy storage container meets the requirements of "Design Code for Electrical Equipment in Explosive Hazardous Environments" GB50058-2014, to avoid the accumulation of flammable gases, and remotely control the exhaust after firefighting to avoid explosions;

It has flood detection and linkage protection functions. It can cut off the power circuit immediately after flooding to avoid disasters such as electric shock, high-voltage short circuit and short circuit spread.

- One-button emergency stop function: It has a one-button emergency stop function (EPO function), which can manually and quickly cut off the main circuit of the energy storage system in case of accidents such as short circuit, electric shock, fire, etc. to avoid the spread of the accident.
- Combustible composite gas detection system:
- A gas detector is installed in the container to detect the concentration of combustible gases such as H₂ and CO.
- The gas volume range is below 10% of the lower explosion limit (LEL), and two-level flammable gas concentration action thresholds and two-level protective actions are set;
- The first-level threshold of the gas detector is set between 0.1% LEL and 5% LEL. When the combustible gas concentration is at this threshold, the first-level protection action is initiated and the combiner cabinet is shut down;
- The second-level threshold of the gas detector is set between 5%LEL and 10%LEL and above. When the combustible gas concentration is at this threshold, the second-level protection action is initiated, that is, the exhaust fan is turned on based on the first-level protection action;
- The gas detection and fire alarm output signals are simultaneously connected to the battery management system to ensure real-time monitoring and fire warning;
- Other requirements comply with the relevant gas detection regulations of GB15322 "Combustible Gas Detector".
- Intelligent detection fire protection system: Equipped with a centralized fire protection system, the energy storage container fire protection system consists of gas fire extinguishing agent cylinders, pipelines, nozzles, signal feedback components, fire detectors and controllers, emergency start and stop buttons, audible and visual alarms, and discharge Gas indicator light, etc.

Energy storage system cooling system



- The energy storage system adopts a constant temperature and humidity design.
- It has two built-in industrial air conditioning refrigeration and heating systems with a cooling capacity of 15KW. It adopts a distributed temperature control design and uses door-mounted air conditioners instead of traditional centralized air conditioners to avoid differences in heat dissipation effects caused by differences in physical locations within the container.
- The air duct design adopts an internal circulation upward air supply design. The air outlet pressure of the air conditioner and the suction force of the fan in the battery pack push the cold air through the battery pack, and the hot air then enters the air inlet of the air conditioner on the door to prevent external dust from entering the container and causing the inside of the container to The ambient temperature should be constant at $23\pm 5^{\circ}\text{C}$ (to ensure optimal working condition).
- Due to the low outlet air temperature, PEF insulation cotton is affixed to the top of the container to avoid condensation.

Case

180MW/720MWH project

- This project is the first battery energy storage test demonstration project approved by the National Energy Administration. This large-scale energy storage system will soon become the largest commercially operated energy storage virtual power plant in China;
- The energy storage system has two-way adjustment capability. Multiple box-type transformer integrated energy storage equipment operates in parallel, participates in frequency and voltage regulation of the power system, achieves stable grid connection, seamless switching between grid connection and off-grid, black start, and provides emergency power supply function. .



Case

Solar storage charging system of a charging station

Photovoltaic: 65KWp (40KWp rooftop photovoltaic

+25KWp carport thin film photovoltaic);

Energy storage: 100KW/200KWh energy storage integration

cabin;

Charging piles: 7KW AC charging piles*4+60KW AC charging piles*2

