EMPOWER EVERY CUSTOMER WITH CLEAN AND INDEPENDENT ENERGY

INDUSTRIAL AND COMMERCIAL
ENERGY STORAGE CABINET PRODUCT—S1

PRODUCT MANUAL

INDUSTRIAL AND COMMERCIAL
ENERGY STORAGE EXPERT

浙江赛唯数字能源技术有限公司

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Website: https://en.sav-digitalpower.com

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Contents

1. Operating Instructions for the Manual

Note: Please read this manual carefully before installing or operating this product. Keep this manual properly stored for future reference.

1.1User Manual

• **Manual Content:** This manual primarily covers the safety precautions, product functions and specifications, delivery and storage, wiring installation, power-on and power-off procedures, human-machine interface operation, system maintenance, and quality assurance of the integrated outdoor smart energy storage cabinet.

• **Target Audience:** This manual is intended for professional technicians involved in the installation and maintenance of the integrated outdoor smart energy storage cabinet, as well as users responsible for daily operations. Readers should possess a basic understanding of electrical knowledge and principles.

1.2 Applicable Products

This manual applies to the S1-200 model product. The product name and system model details are as follows:

•**S1**——Series name

•**200**——Battery capacity (The actual equipment capacity is subject to the physical product)

Symbol	Explanation
	Danger: Indicates a high-level risk that, if not avoided, could result in death or serious injury.
	Warning: Indicates a medium-level risk that, if not avoided, could potentially result in death or serious injury.
	Attention: Indicates a low-level risk that, if not avoided, could potentially result in minor or moderate injury.
	Notice: Used to convey warnings about equipment or environmental safety. If not avoided, it could lead to equipment damage, data loss, reduced performance, or other unpredictable outcomes. “Notice” does not involve personal injury.

1.3 Production Introduction

Function overview：

This product is an integrated outdoor cabinet for energy storage systems, providing users with functions such as peak shaving and valley filling, demand reduction, renewable energy integration, demand response, and backup power supply. It is widely applicable in commercial and industrial settings such as charging stations, office buildings, and manufacturing facilities.

• **Optional Models:**

This outdoor integrated cabinet integrates battery modules, BMS (Battery Management System), PCS (Power Conversion System), distribution systems, fire protection systems, and air conditioning systems. Various models can be configured based on different combinations of these modules.

Symbol markings

This manual may contain the following symbols to emphasize important information. To ensure the personal and property safety of users during the installation of this product and to facilitate the efficient use of this manual, please read carefully.

Abbreviations

To facilitate presentation, references to the following products in this manual are abbreviated as follows:

BMS	Battery anagement System
BMU	Battery Management Unit
BOL	Begin of Life
SOC	State of Charge
SOE	State of Energy
SOP	State of Power
SOH	State of Health
EOL	End of Life
CC	Constant Current
CCCV	Constant Current Constant Voltage
CP	Constant Power
CPCV	Constant Power Constant Voltage

2. Safety Precautions

2.1 General Safety Principles

This chapter outlines the safety considerations for the energy storage outdoor cabinet and the necessary safety precautions to be strictly followed during installation, operation, and maintenance. This product is a high-voltage DC and three-phase AC combination system and should only be operated by authorized personnel.

Danger
• There are lethal high voltages inside the product; please adhere to and carefully read the warning labels on the product. Do not touch the internal electrical network or connected terminals to prevent the risk of fatal electric shock! • Ensure that there are no electrical connections to the product before installation. • Appropriate insulated protective equipment that complies with safety regulations must be worn during installation. • Battery damage may result in electrolyte leakage. If electrolyte leakage occurs, do not contact the leaked electrolyte or volatile gases, and immediately contact the after-sales service team for assistance.
Warning
• Only qualified electricians or authorized personnel may operate and connect this product. • Installation work must be assigned to dedicated operators.
Attention
• Any actions or risks that could damage the battery system or cause personal injury are strictly prohibited. •Users are not allowed to replace modules; the company will not be liable for any losses resulting from such actions.

2.2 Operator Qualifications

A qualified operator is defined as a person who possesses the necessary knowledge, professional training, and experience, such as:

• Only qualified personnel familiar with local standards and relevant electrical system safety regulations are permitted to connect this product.

• Operators should have received specialized training in the installation and commissioning of electrical equipment and possess the ability to respond to emergencies or unexpected situations that may arise during installation or trial operation.

• Operators should have a certain level of knowledge in electronics, electrical circuits, and mechanical principles, and be familiar with electrical and mechanical schematics.
• Operators should be fully acquainted with equipment protection and standard maintenance practices, and their operations should comply with established safety standards.

2.3 Environmental Safety Requirements

• Do not install or operate this product in environments where the temperature is below -30°C or above 50°C (with derating above 45°C).
• Do not install or operate this product near any heat sources or flammable materials.
• Do not install or operate this product in areas with frequent human traffic.
• Do not expose the product to corrosive gases or liquids.
• Ensure the product is installed and used in locations inaccessible to children and animals.
• The maximum installation altitude of the product should not exceed 3000m, with derating applied above 2000m.
• Ensure sufficient space around the product during installation to allow for adequate ventilation.
• Installation must include safety barriers to prevent unauthorized personnel from entering the site.

2.4 Installation Safety Requirements

Before installation:

⚠ Warning
Lifting and Transportation • When using construction machinery such as forklifts on site, it must be operated by qualified personnel. Installation Inspection • Before installation, be sure to check if the product has sustained any damage during transportation.

During Installation:

⚠ Warning
Personnel Conduct Guidelines • When connecting the power supply on-site, a designated supervisor must be assigned to safeguard any switches that need to be turned off. • Every completed task must be inspected at least once, with cross-checking

performed during the installation process.
• Equipment installation must be carried out sequentially, and no steps should be skipped.
Installation Inspection
• Before installation, always check for any damage to the product during transportation.
Wiring Device Specifications
• Appropriate measuring equipment must be used, and the relevant standards and instructions must be followed.
• Before conducting any measurements, be familiar with and adhere to the measuring equipment's operating manual.
• Only use equipment specified by SAV; failure to use SAV-approved equipment may compromise protection and result in personal injury.

Attention

Personnel Conduct Guidelines
• Do not alter the size or rating of fuses during installation.
• During wiring, no more than one operator is allowed to connect a single wire at the same time.

2.5 Safety Requirements for Use

• Operators must ensure they understand all essential information and step-by-step instructions before commissioning and shutting down the circuit breaker, with particular emphasis on strictly adhering to safety guidelines for assembly and installation.
• Operators must wear protective clothing and use specialized tools in accordance with local laws and regulations.

Danger

Battery Protection Safety
When installing, maintaining, and servicing the equipment, ensure that:
• The battery is thoroughly disconnected.
• Clear warning signs are placed at the disconnection point to prevent accidental reconnection.
Ground Fault Protection Safety
• In the event of a ground fault in the integrated energy storage system, previously non-energized parts may carry high voltage, posing a risk of electric shock! Ensure there are no ground faults before operation and take necessary protective measures.
Live Measurement Safety
• This equipment operates at high voltage, so when performing live measurements, ensure you protect yourself (e.g., wear insulated gloves)

and have someone accompany you to ensure your safety.
Arc Flash Protection Safety
• Avoid the risks of arc flash, fire, and explosion due to improper operation:
• Do not touch uninsulated energized cable ends.
• If power cables become loose or screws or other components accidentally detach, do not attempt to operate the equipment; it must be handled by qualified professionals to avoid further faults.

Warning

Installation and Trial Operation
• The system may only be operated after confirmation by qualified personnel and approval from the local electricity authority.
• Before starting operations, all distribution circuit breakers must be turned off, and it is strictly prohibited to disconnect any connections while the machine is running.

2.6 Daily Operation and Maintenance

• All operations of the energy storage system must follow the instructions in the user manual. Any damage to the equipment resulting from violations of these instructions will void related responsibilities and warranties.
• If necessary, please contact SAVI customer service for repairs.

Warning

Daily Operation and Maintenance Requirements
• The software, enclosure, and components of the equipment must not be changed without authorization from the manufacturer. Any changes will void the corresponding responsibilities and warranties.
• Do not remove or alter the nameplate.
• Do not open the cabinet doors during inclement weather, such as rain or strong winds.

2.7 Product Aging

• When the product as a whole or individual internal components age or become damaged and need to be discarded, they cannot be treated as regular waste. Some internal parts of the product can be recycled and reused. Improper handling of certain components may lead to environmental pollution.
• Please contact a qualified local recycling organization for proper disposal of the product.

3. Product Description

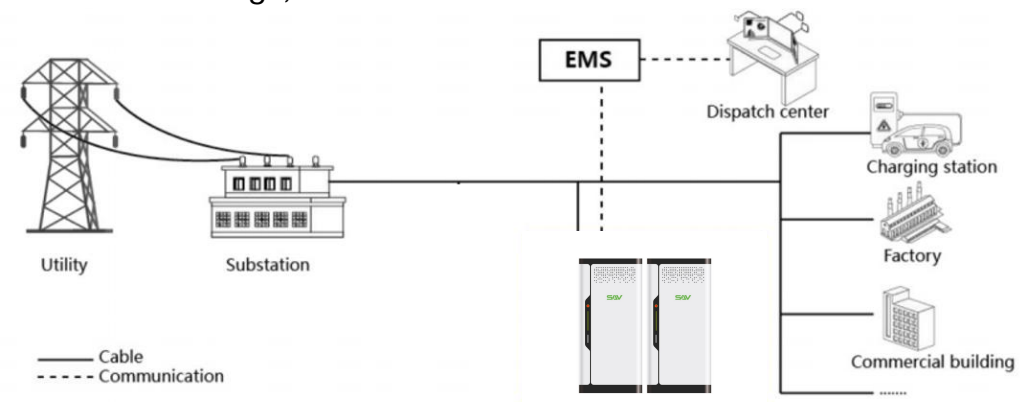
3.1 Production Functions

The SAV Energy Storage Cabinet-S1 delivers efficient, reliable, and environmentally friendly energy solutions for the global commercial and industrial sectors through technological innovation and optimization. It provides various values such as peak shaving and valley filling, as well as seamless grid switching, catering to the diverse needs of different commercial applications, which will be detailed in Section 3.6.

Peak Shaving and Valley Filling: During off-peak hours when time-of-use electricity rates are low, the energy storage cabinet automatically charges and stands by once fully charged. During peak hours when electricity rates are high, the cabinet automatically discharges to capitalize on the price difference.

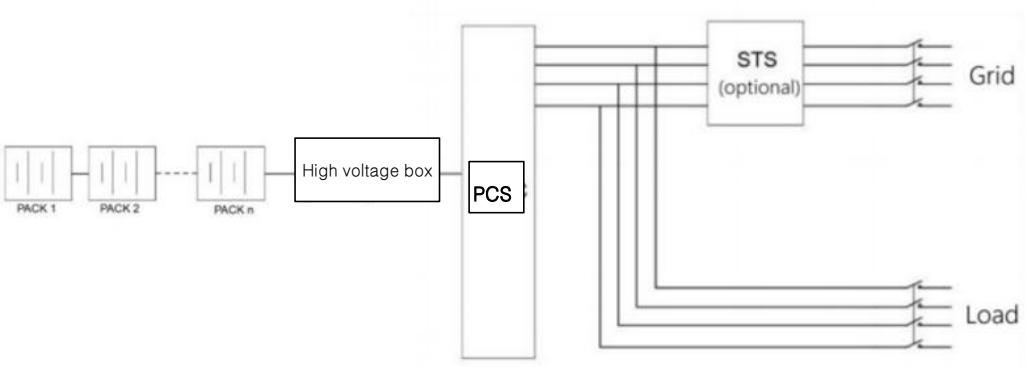
Backup Power (Customized): In the event of a grid failure or planned switching, the system can swiftly and smoothly transition from one operating mode to another, ensuring continuity and stability in power supply.

This product offers a complete outdoor energy storage system solution for commercial and industrial users. It manages, stores, and utilizes electricity through battery storage technology, balancing energy fluctuations between supply and demand while improving energy efficiency. Its primary function is to distribute AC electricity from the grid to the battery and inverter output, providing services such as peak shaving, demand response, and backup power. It can be widely applied in charging stations, factories, industrial parks, commercial buildings, and other scenarios.



This product enables integrated delivery, intelligent operation and maintenance

management, and comprehensive safety assurance. As an AC energy storage cabin, it can independently achieve energy storage, conversion, and release once connected to the grid. The system features a modular design, allowing for flexible capacity configuration. Its safety design ensures the efficient and long-life operation of the battery. When paired with the STS, this product offers an integrated solution for both grid-connected and off-grid applications, supporting seamless switching between these modes.



3.2 Product Features

Flexible Configuration

• Covers a wide power range of 100kW to 4MW

• Multiple energy capacity options available for 2 hours and above

Convenient Installation

• Integrated transport, simple on-site construction (construction guidance manual)

• C3~C5 corrosion resistance grade, suitable for various application environments

Intelligent and User-Friendly

• Cloud technology support for remote maintenance and monitoring

• Built-in EMS with multiple operating modes to enhance profitability

Economical and Reliable

• 100% DOD deep discharge, 6000 cycle life under standard operating conditions

• Efficient thermal management and graded linkage protection to ensure system safety

3.3 Product Specification

The following are the typical configuration specifications for the S1 series outdoor cabinet energy storage system, with actual supply subject to the technical agreement.

Product Model	S1
Battery Data	
Battery Technology	LFP
Nominal Capacity (kWh)	200 kWh
DC Voltage Range(V)	600～817.6V
Charging/Discharging Rate	0.5p
Battery Life Cycle	≥6000 time @25°C±2°C 90%DOD 0.5p charge/discharge 70% SOH
Maximum System Efficiency	≥90%
PCS Data	
Opreating Voltage Range(V)	615~950（3W+PE）/640~950（3W+N+PE）
Max DC Current(A)	170A
Rated AC Power(kW)	100 kW
Max AC Power(kW)	110 kW
Max AC Current(A)	167 A
Rated AC Line Voltage(V)	400 V (-10%~+15%)
Rated AC Line Frenquency (Hz)	50 /60Hz
Grid Connection Data (On Grid)	
AC Output Power(kVA)	100kVA
Max. AC Output Power(kVA)	110kVA
Nominal AC Voltage(V)	230/400（-10%~+15%）V
Nominal Grid Frequency / Grid Frequency Range(Hz)	50/60 (-2.5~2.5) Hz
Max. AC Output Current(A)	167 A
THDi	<3% (At nominal power)
Rated Power Factor	> 0.99
Adjustable Power Factor	1 leading - 1 lagging
AC Output Topology	3W+PE/3W+N+PE
Grid Connection Data (off Grid)	
AC Output Power (kVA)	100kVA
Max. AC Output Power (kVA)	110kVA
Nominal AC Voltage (V)	230/400V
AC Voltage THD	< 3 %(linear load)
Nominal Grid Frequency / Grid Frequency Range(Hz)	50/60Hz
Max. AC Output Current (A)	167A
AC Output Topology	3W+N+PE
General Data	
Maximum System Efficiency	92%
Dimensions (W*D*H) (mm)	1150x1280x2400 (mm)
Weight (kg)	≤2100 kg
Lightning Protection	Type II
Transfer Between on/off Grid	Manual(Default) / Automatic(Optioanal)

Protection	IP55
Operating Temperature Range(°C)	-30 to 50°C (> 45°C derating)
Relative Operating Humidity	0 ~ 95 % (non-condensing)
Operating Altitude(m)	4000m (> 2000m derating)
Cooling Method	Intelligent air cooling
Fire Protection	Active forewarning, Aerosol
Communication Interfaces	RS485, Ethernet,CAN
Communication Protocols	Modbus RTU. Modbus TCP
Certification	CE, IEC 61000，IEC62619，NRS 097-2-1:2017

3.4 Product Description

3.4.1 Product composition

• System Composition: This energy storage system mainly includes battery modules, BMS (Battery Management System), PCS (Power Conversion System), distribution system, fire protection system, and air conditioning system.

Module Name	Functionality
Battery Module	Used for energy storage
BMS	Collects battery information and controls battery charging and discharging
PCS	Bidirectional AC/DC conversion
Fire Protection System	Timely warns of battery thermal runaway and provides correct indications
Air Conditioning System	Regulates battery operating temperature to ensure optimal performance
Distribution System	Includes circuit breakers, wiring harnesses, fuses, etc.
EMS	Overall energy management and comprehensive control of the system
EMS Cloud Platform	Displays data overview statistics, platform data trends, fault alarms, site lists, and other information on the cloud platform

3.4.2 Appearance design

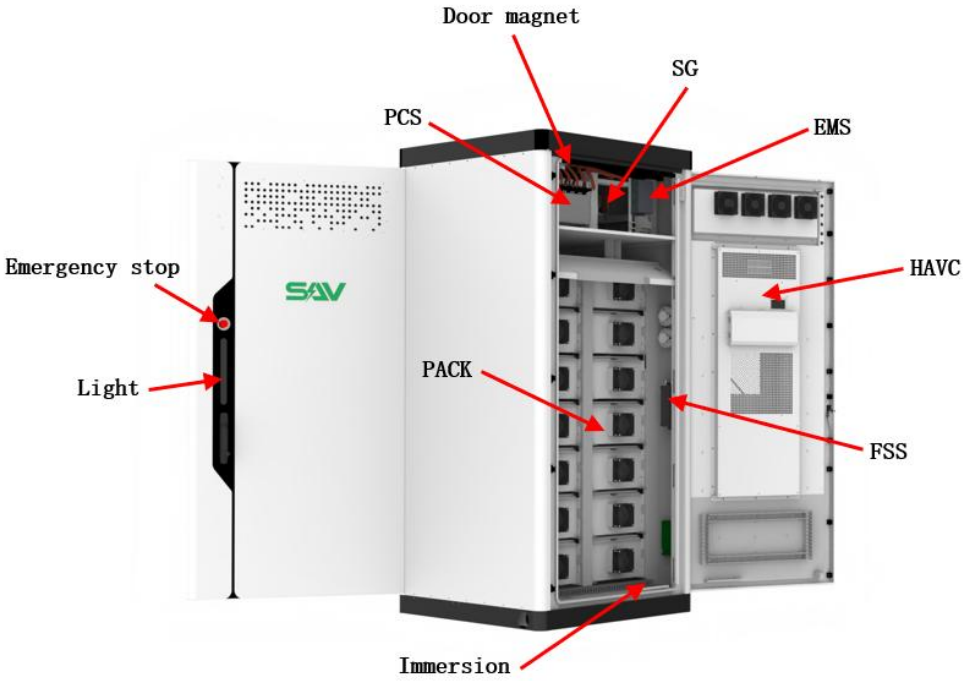
The appearance of the energy storage cabinet is shown in the figure below:

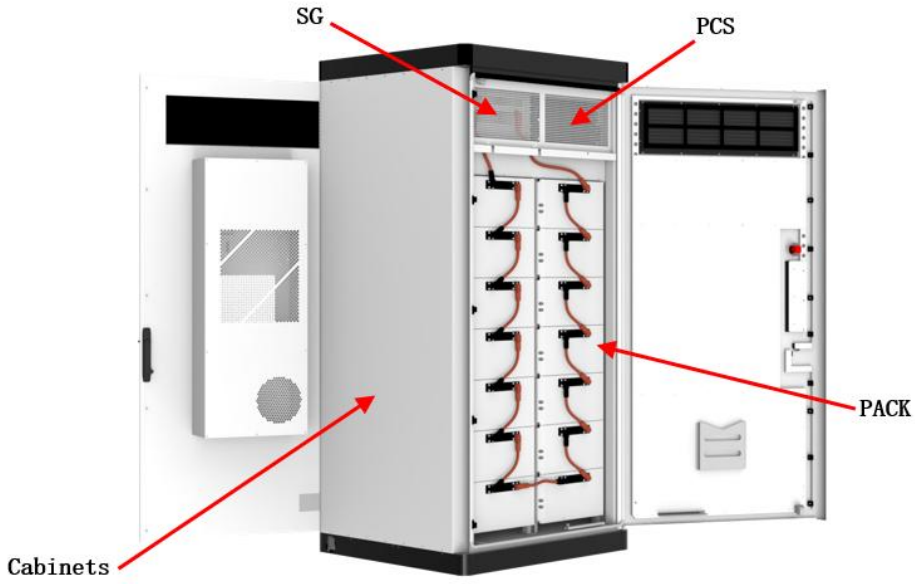
Indicator light description:

Indicator light	Color	Status	Description
Power indicator light	Green	Always on	Standby
		Always off	Shutdown
		Flashing	Discharge
Status indicator light	Yellow	Flashing	Charge
Fault indicator light	Red	Always off	Normal operation
		Always on	Fault

3.4.3 Internal design

The internal structure and component composition of the energy storage cabinet are shown in the figure below:





The internal structure of the energy storage cabinet and the functions of its components are as follows:

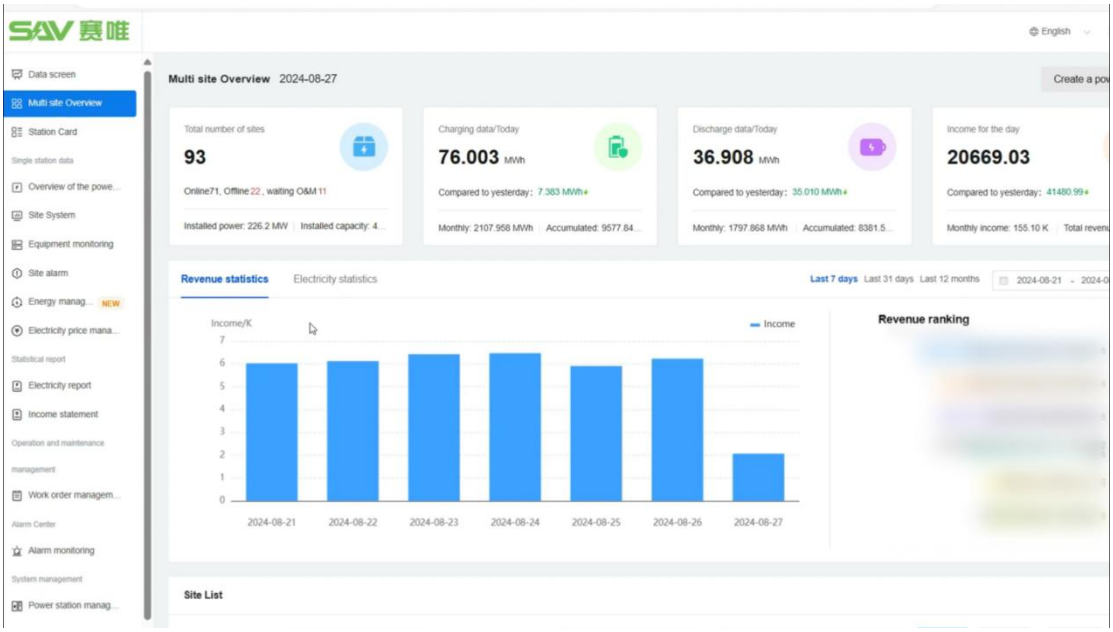
Name	Function
Battery module	**Used for energy storage**
Air conditioning	**Regulates battery operating temperature to**

	ensure the battery operates at optimal temperature
BMS	**Collects battery information and performs control**
PCS	**Bidirectional conversion between AC and DC**
EMS	**Energy management and comprehensive control of the entire system**
Grid switch	**Disconnects and protects the grid side**

3.4.4 EMS cloud platform

Platform functions

EMS cloud platform provides various account types, and the functions available on the cloud platform differ for each account. This section mainly introduces the range of functions that can be provided by the cloud platform administrator.



EMS cloud platform module function descriptions are as follows:

Category	Function	Description
Home page	Data dashboard	Unified display of real-time data resource status for all sites
	Multi-station overview	Displays data overview statistics, platform data trends, platform fault alarms, site lists, and other information within the cloud platform
Single	Power	Displays data overview statistics, platform

station data	station overview	data trends, site information, overall efficiency, discharge achievement rate, system list, and other information for a single site within the cloud platform
	Site system	Displays real-time data overview, energy flow diagram, power data trends, alarm status of devices, real-time operating trends, and real-time electricity revenue for systems within the site in the cloud platform
	Device monitoring	Displays real-time data of the devices bound to the system, with specific device types and quantities configured based on the actual project
	Fault alarm	Monitors the status and operating conditions of devices, displaying relevant fault information when abnormalities or failures occur
	Electricity price management	Electricity price management function primarily configures and manages the electricity pricing strategy for the power station
Statistical report	Electricity report	Electricity data status of the cloud platform system operation
	Revenue report	Revenue data status of the cloud platform system operation
System management	Power station management	Tools for managing and maintaining the power stations within the energy storage system
	Public template	Common templates for all accounts under the company's cloud platform system
	Account management	Used to create, manage, and maintain user accounts on the platform
	System management	Can be used to add, assign, and manage EMS systems

3.4.5 Core module

- **Battery module**

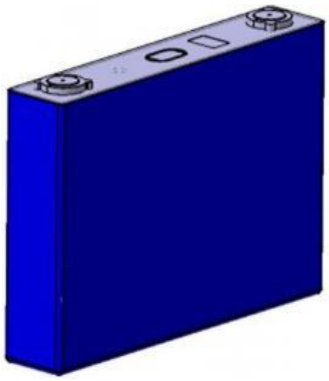
Danger
• When BESS is running, do not touch any battery modules.

• Only authorized operators may handle battery modules.
• End of life (should be retired, disassembled, and disposed of according to the provided recycling plan).

The battery system is equipped with a comprehensive battery management system, utilizing a two-tier management architecture that includes module-level and battery cluster-level management, ensuring comprehensive control, management, and protection of the battery system to guarantee its safe and stable operation. This product uses lithium iron phosphate battery modules, which have characteristics such as good safety, long service life, excellent temperature performance, high energy density, low cost, pollution-free modular assembly, high strength, high structural reliability, and low maintenance costs.

The appearance of the battery module is shown in the figure below:

Product appearance diagram



Square aluminum shell lithium iron phosphate battery cell

Using 3.2V 280Ah single battery cells, the cells feature a square aluminum shell design to avoid the possibility of mechanical damage to the cell surface that could lead to internal damage, thereby enhancing the product's safety performance. Each cell is equipped with a thin-film explosion-proof valve,

which ensures that in any extreme situation (such as internal short circuits, battery overcharging or over-discharging), the large amount of gas that rapidly accumulates inside the cell can be discharged through the explosion-proof valve, ensuring that the cell will not explode. Therefore, the selection and design of the cells fully consider the safety of both the cells and the system.

The conventional parameters of the single battery are as follows:

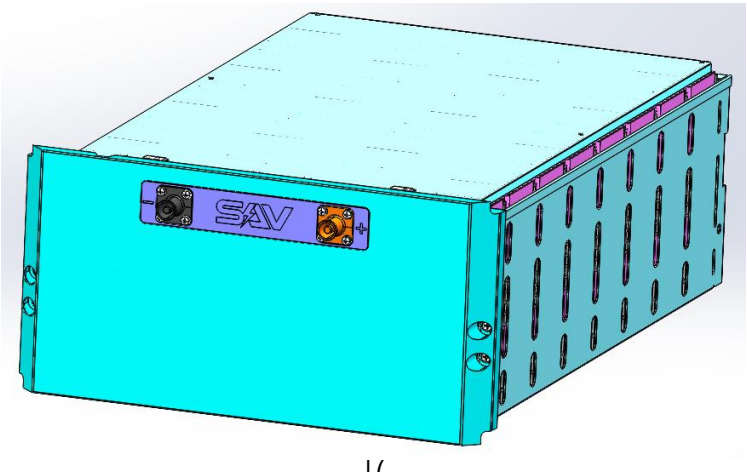
Project	Parameters	Conditions
Cell Type	Lithium iron phosphate cell	N.A.
Cell Model	LFP71173207/280Ah	N.A.
External Dimensions	71.65*174.7*207.11mm	
Cell Weight	5.43±0.20kg	After package blue film
Factory Internal Resistance (1kHz)	0.18±0.05mΩ	27% SOC, based on production line online testing data
Rated (Nominal) Capacity	280Ah	(25±2)°C, standard charge and discharge
Nominal Voltage	3.2V	(25±2)°C, standard charge and discharge
Rated Energy	896Wh	(25±2)°C, standard charge and discharge
Operating Voltage	2.5—3.65V 2.0-3.65V	Temperature T > 0°C Temperature T≤0°C
Shipping Voltage Range	3.28 ~ 3.30V	(25±2)°C, open circuit voltage of cell at 30% SOC
Energy Density	≥160Wh/kg	(25±2)°C, standard charge and discharge
Recommended SOC Operating Window	0% ~ 100%	N.A.
Monthly Self-Discharge	≤3.0%	Cells stored after three months of shipment should be charged to 27% SOC and stored at 25±2°C
Recommended Charging Power	0.5P	
Recommended Discharging Power	0. 5P	
Discharging Temperature Range	-30 ~ 50°C	N.A.

Charging Temperature Range	0 ~ 50°C	N.A.

Warning

When electrolyte leakage from the battery is detected
• When battery leakage occurs, please stop using it immediately.
• The electrolyte is non-toxic and odorless; however, it can be pathogenic upon skin contact, so keep it away from skin. When handling leaking batteries, ensure that the power connected to the battery is turned off to prevent fire and sparks, and wear rubber gloves while handling in a well-ventilated area.
• If the battery emits an irritating abnormal odor and it cannot be determined **whether there** is an electrolyte leak, please stop using it immediately and isolate the battery.
Disposal of electrolyte
• When electrolyte leakage occurs, use gauze (ordinary medical gauze) or other solid materials to absorb the liquid from the battery leak area.
• The handled battery should be isolated and cannot be reused.
• Do not directly contact the electrolyte; if accidental skin contact occurs, rinse with plenty of water.

The battery module is the smallest unit of maintenance for the energy storage battery system. This project's battery module features a standardized and user-friendly design for easier maintenance and replacement. The parameters of the battery module are as follows:
• Adopts 16 pieces of 3.2V 280Ah lithium iron phosphate cells
• Configured as 16 in series and 1 in parallel (16S1P) to form a 51.2V 280Ah battery module
The diagram of the battery module is as follows:



Battery module diagram

The battery module has the following features:

(1) Modular design for quick installation and maintenance.

(2) Clear markings on positive and negative output terminals for easy connection, inspection, and repair.

(3) Welding method: The connection between the battery and the conductive busbar uses high-power laser penetration welding technology, ensuring low impedance and high strength, which guarantees the reliability of the connection.

(4) Insulation design: The cells themselves have a blue PE insulating film, and there are gaps between each cell. High melting point plastic insulation supports rated for 5000V are used for insulation and fixation between the cells, with a fully covered engineering plastic top cover to prevent touch and short circuits, ensuring the safety of battery usage.

(5) Safety design: Space is reserved above the cell pressure relief valve to prevent explosion due to excessive pressure during abnormal conditions.

(6) Heat dissipation design: The battery box design fully considers strength and ventilation capability, optimizing the fan installation position through fluid dynamics analysis.

(7) Safety design: A quick aerosol extinguishing device suitable for relatively enclosed spaces such as distribution cabinets. The heat released by the oxidizing agent through redox reactions decomposes the chemical coolant, allowing both the aerosol agent and the coolant to participate in extinguishing the fire. The installation of a quick aerosol fire extinguishing device inside the cabinet can absorb a large amount of heat in a short time, rapidly reducing the temperature of the fire source and achieving fire extinguishing effects.

(8) Thermal isolation design: The battery module with thermal isolation measures features a targeted design that optimizes the cell support structure, avoiding the outward diffusion of heat from failure points and the occurrence of cell short circuits. Additionally, the thermal isolation cell support is designed with reasonable ventilation space, ensuring that the airflow pathway in front and behind the battery module is unobstructed, allowing heat generated during normal cell operation to be effectively dissipated.

Battery module parameters:

Parameter items	Specifications
Cell model	LFP71173207/280Ah
Components	16 Cells
Combination method	16S1P

Nominal capacity (Ah)	280
Nominal voltage (V)	51.2
Weight (kg)	105±3
Working voltage range (V)	40V~58.4
Maximum continuous discharge power (kW)	7.16 (0.5P)
Terminal output	Connector
Dimensions mm (WDH)	468810232
Communication method	Daisy chain

- **Battery pack (cabinet) parameters**

In this solution, the battery is integrated within the cabinet and is equipped with a specialized BMS (Battery Management System). The battery cabinet has the following features:

(1) The cabinet is constructed with a frame structure. The connections between battery compartments are all established using power lines. Additionally, high and low voltages as well as signal lines are connected by unique connectors.

(2) The structure should be safe and reliable, with sufficient mechanical strength to ensure that components do not shake or deform after installation and during operation.

(3) The battery cabinet design must fully consider electrical clearance and creepage distance. When designing electrical clearance and creepage distance, factors such as system operating voltage, overvoltage category, pollution level, and insulating materials must be taken into account.

Battery Cluster Parameters

Item	Parameter	Conditions
Cell Capacity	280Ah	Standard charge/discharge
Series/Parallel Configuration	1P224S	N.A.
Nominal Voltage	716.8	Standard charge/discharge
Nominal Capacity	200kWh	Standard charge/discharge
Dimensions	1150x1050x2400(mm)	
Weight	＜2.1T	N.A.
Discharge Cut-off Voltage	630 V or any single cell voltage reaches 2.8 V	T＞0°C

Charge Cut-off Voltage	817.6 V or any single cell reaches 3.6 V	N.A.
Rated Charge/Discharge Current	140A	(25±2)°C
Operating Temperature Range	-30 ~ 50°C (discharge) 0 ~ 50°C (charge)	N.A.
Storage Temperature Range	-30 ~ 50°C	N.A.
Communication Method	CAN	N.A.
Shipping SOC (%)	20%~40%	(25±2)°C
Guaranteed Lifespan Operating Conditions	(25±5)°C	N.A.

- **EMS**

The Energy Management System (EMS) is a critical component of energy storage systems. It works in conjunction with the PCS, STS (optional), BMS, environmental monitoring equipment, fire protection system, meters, HVAC system, or access control systems to form the overall energy storage system. The EMS manages the entire system, enabling both on-grid and off-grid control, peak shaving and valley filling, demand control, smoothing of renewable energy fluctuations, dynamic capacity expansion, and optimization of energy storage profits. By collecting data and signals from local equipment and employing internal control strategies, the EMS ensures the safe, reliable, efficient, and economical operation of the energy storage system.

In an energy storage system, the EMS communication topology is divided into two layers: the upper layer is the regional centralized control system, while the lower layer consists of two zones controlled by a monitoring host. Multiple control nodes, 100kW PCS, and lower-tier equipment act as the subordinate hosts, connecting to meters, the Battery Management System (BMS), environmental monitoring equipment, fire protection system, HVAC system, and other systems.

The monitoring host handles network connections, conversions, data collection, local data processing, protocol conversion, command exchange, control strategies, and web server functionality. It facilitates the high-speed collection and transmission of large-scale real-time data, ensuring that the master station system can quickly and accurately receive all monitoring and control information, and promptly respond to system abnormalities and faults for fast diagnosis and recovery.

Functions

This project uses a self-developed Energy Management System with the following main features:：

The system implements load and energy storage control using a layered and distributed structure, with standard software interfaces and excellent scalability.

The system for large-scale energy storage ensures joint control of load and storage and complies with power monitoring system safety requirements.

A core control platform is established for the energy storage system, which achieves reliable communication and effective coordinated control between the central EMS and substation sub-EMS units at each energy storage site.

The energy control system for peak shaving and valley filling supports data collection and monitoring control, active power automatic control, and reactive voltage automatic control functions.

The system for load and energy monitoring in peak shaving and valley filling supports communication with the internal forecasting system and energy metering system .

The system for peak shaving and valley filling control is capable of communication and information exchange with grid dispatch agencies and remote centralized monitoring systems .

The energy control system, along with each energy storage subsystem, should possess independent intelligent energy control capabilities, as well as the ability to optimally respond to grid dispatch commands.

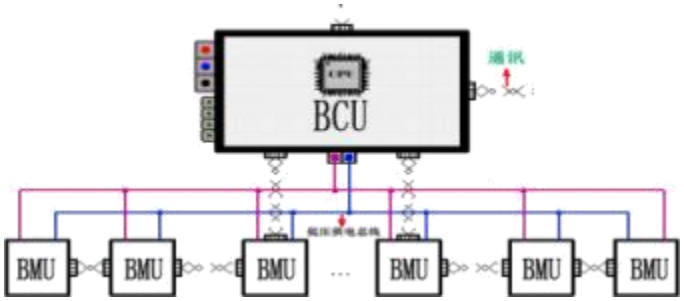
- **High-Voltage Box**

The high-voltage box module is a power management unit specifically designed for energy storage systems by our company. It serves as the intermediary unit connecting the battery pack to the energy storage converter and contains DC relays, fuses, current sensors, a Battery Management System (BMS), and power switches. It collects voltage and current from the battery pack and provides protective functions.

The BMS monitors battery status to stabilize and protect battery performance, ensuring battery consistency and prolonging battery life. In this system, the BMS can achieve real-time monitoring of individual cell and total battery voltage, temperature collection, thermal management, communication and alarms, data storage, etc. When a battery fault alarm is triggered, the BMS will display the corresponding fault code on the cloud platform and immediately report it to the upper-level control system. Appropriate measures will be taken according to the different fault states and levels.

At the same time, the BMS can detect and protect the charging and discharging voltages of the battery, while also balancing the individual cells. Given the multi-level nature of energy storage battery array systems, the BMS

adopts a distributed structure, consisting of Battery Module Management Units (BMU) and Battery Cabinet Management Units (BCU) as a two-level management system. The system supports refined management of multiple battery cells, enabling detailed sampling, analysis, and control of each cell.



BMS Communication Diagram

BMS Composition and Introduction:

Category	Name	Function Description
BMU	Battery Module Management Unit	Used for managing energy storage battery modules, supports up to 16 voltage collection channels
BCU	Battery Cell Management Unit	Oversees BMUs and manages the battery cabinet
	Strong Power Control System	Monitors and manages the main contactors of the battery string, responsible for current collection in the battery string
	Current Sensor	Detects current in the battery charge and discharge circuit
	Connection Harness	Harness for detection/communication/power/control

Battery Module Management Unit:

The BMU is responsible for collecting individual voltage and temperature information from the battery pack module, as well as for balancing and thermal management of each cell.

BMU Main Functions:

Function	Description
Individual Voltage Detection	Real-time detection of individual battery voltages.

Temperature Detection	Temperature sensors are placed inside the battery pack module for real-time temperature monitoring.
Communication	Uploads battery information to the BCU via a daisy-chain bus.
Balancing Management	Utilizes intelligent balancing control strategies to enhance consistency among cells and sets multiple protections such as temperature and balancing failure, ensuring the stability and reliability of the balancing function.
Thermal Management	Actively manages the battery's temperature based on the battery module's thermal status to prolong battery life and enhance safety.
System Expansion	The BCU itself supports both multiple relay and switch signal interfaces, and can also control high voltage control modules through CAN communication. The high voltage control modules then control the relays, achieving effective isolation between strong and weak currents, ensuring safety and reliability, while also meeting the diverse control needs of customers.
Data Storage	Stores information such as the voltage, temperature, charge/discharge amounts, charge/ discharge cycles, and charge/discharge times of the battery cabinet array. It also records alarm statuses, protection information, replacement, and scheduling events for reference.
System Self-Check	Upon power-up, the system can check components such as voltage, temperature, and storage to ensure proper operation.

- **PCS (Power Conversion System))**

The PCS is a bidirectional current-controllable device that connects the energy storage battery system to the power grid. Its primary function is to facilitate energy exchange between the battery and the grid, as well as to control and manage battery charging and discharging. It enables bidirectional conversion between DC and AC, allowing for AC-to-DC charging of the battery and DC-to-AC supply to loads or feedback to the grid.

The PCS utilizes the chopping capability of fully controlled power electronic switch devices combined with pulse width modulation technology to control the switching devices through flexible software algorithms, enabling bidirectional flow of electrical energy.

The PCS controller receives background control instructions via communication, controlling the rectifier to charge or discharge the battery based on the sign and magnitude of the power instructions, thereby regulating the active and reactive power supplied to the grid. It supports

MODBUS and TCP/IP communication, working in conjunction with the Energy Management System (EMS) and the Battery Management System (BMS) to monitor and protect the energy storage units.
The PCS and EMS system communicate over Ethernet, uploading relevant measurement and protection signals to the EMS system using the Modbus TCP protocol.

- **Cabinet Temperature Control Solution**

SAV uses air-conditioned duct temperature control, employing an industrial air conditioner with a cooling capacity of 3kW. The air conditioner is embedded in the outdoor cabinet door, and ducts are established inside the cabinet to enhance the cooling and heating effects transmitted to the battery.
Product Features:

· Designed for large spaces, particularly suited for integrated designs in elongated spaces, without requiring additional external protection.

· Features anti-blocking, corrosion resistance, and IP55 protection.

· Utilizes well-known brand industrial-grade components, ensuring high product reliability.

· Quick human-machine interface operation, real-time temperature display, and automatic precise temperature control.

· Equipped with multifunctional alarm outputs and RS485 communication capabilities.

· Uses environmentally friendly refrigerant R134a.

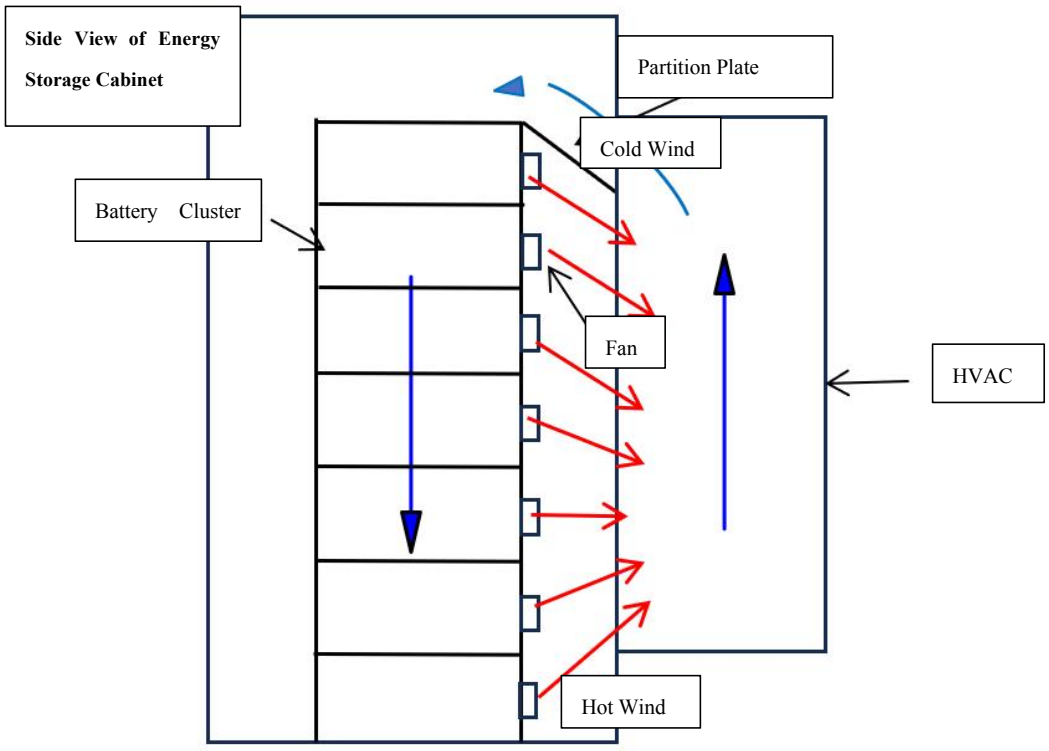
· Operating temperature range: -40°C to +55°C.

(1) Energy Storage Cabinet Air Duct Design
(2) The energy storage cabinet is equipped with an air conditioning system for both heating and cooling, ensuring smooth operation of the control system in both low and high temperature environments. The air duct design inside the energy storage cabinet optimizes the use of hot and cold sources, eliminating temperature stratification and reducing energy consumption.
(3) Cooling Strategy
(4) The cooling and heating alternate based on the set temperature, ensuring the internal cabinet temperature is maintained between 25°C and 30°C.
(5) System Cooling Structure Design

Energy Storage Cabinet Hot and Cold Stratification:

This project incorporates a well-designed air duct to ensure uniform ventilation of the battery modules, effectively organizing air circulation within the energy storage cabinet and reducing temperature differences between the upper and lower parts.

This solution optimizes the ventilation and cooling structure of the energy storage system by using air conditioning for cooling. A baffle structure is installed at the air conditioning return vent, and the air duct design inside the cabinet effectively utilizes the cold source to eliminate temperature stratification. Cold air is delivered from the top of the cabinet and descends from top to bottom, cooling the battery surface while relying on natural convection (cold air descending, hot air rising) to cool the battery clusters. When localized high temperatures are detected within the battery cluster, fans mounted on the battery cabinet can be activated to accelerate cooling, achieving rapid temperature reduction inside the energy storage cabinet and reducing air conditioning energy consumption.



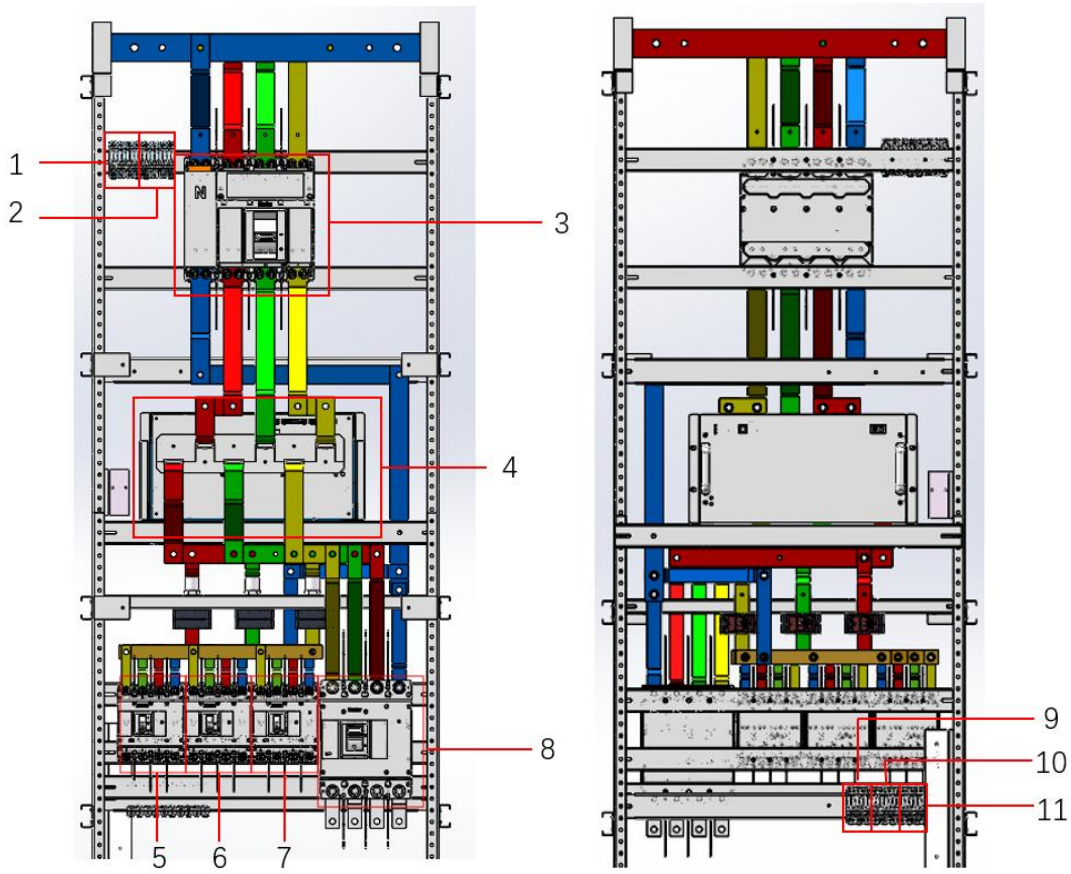
System Cooling Layout Plan

- **STS**

STS, or Static Transfer Switch, is an electronic switching device that achieves

rapid, contactless power switching through electronic component operations. In energy storage systems, STS is mainly used to control the connection and disconnection between the battery pack and the Power Conversion System (PCS), facilitating energy storage and release. Additionally, in the event of a fault in the battery pack or PCS, STS automatically switches to a backup power source to ensure the stable operation of the energy storage system.

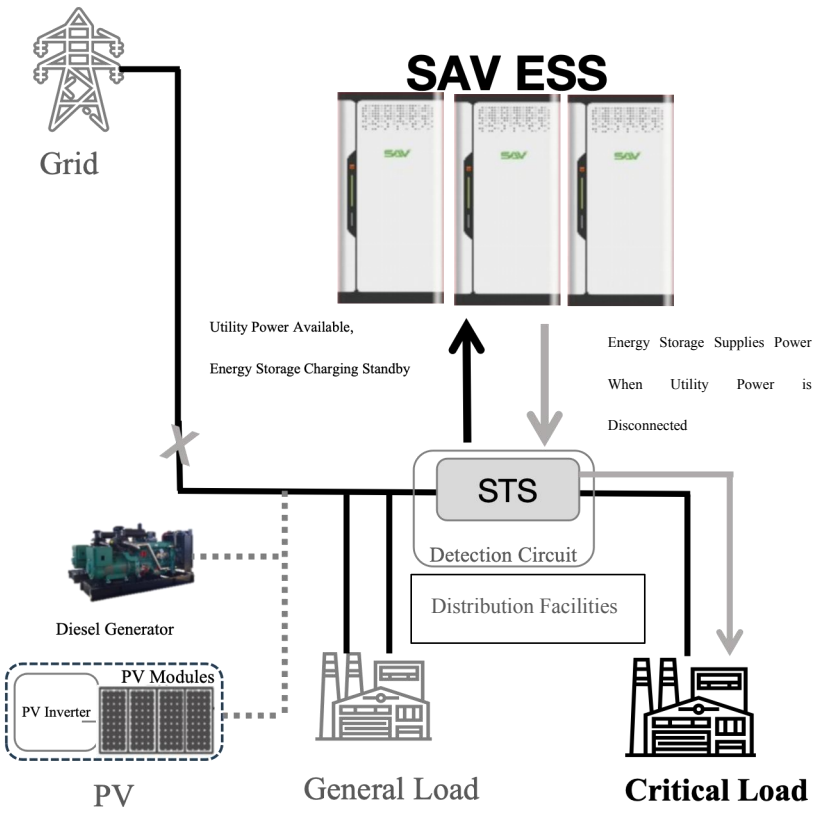
STS is frequently used in commercial and industrial enterprises, factories, office buildings, hotels, banks, and large shopping centers located in areas prone to power outages. It is also commonly employed to provide backup power for critical equipment such as computers, elevators, lighting, security, fire safety, and air conditioning systems.



Front and Rear View of STS Cabinet Doors

Position	Description
1	Surge Protector
2	Miniature Circuit Breaker
3/5/6/7/8	Molded Case Circuit Breaker
4	STS Module
9/10/11	Air Switch

During a power outage, the energy storage system supplies power to critical loads, with a switch time of <20ms, ensuring uninterrupted power supply.
The system can also integrate with diesel generators and photovoltaics for AC coupling.



STS System Architecture Diagram

STS System Parameters:

Item	Specifications
Dimensions (W×D×H) (mm)	800×800×2400
Protection Rating	IP55
Corrosion Resistance	C3/C5
Switching Time (ms)	≤20
Conversion Efficiency	≥99.5%
Installation Location	outdoors
Temperature Range	-25°C~55°C （derating >45°C）
Humidity Range	0%RH~95%RH， no condensation
Altitude	2000(derating >2000m)）

STS Specifications:

Specification	Applicable Scenario
STS-200kW	Core load max <100kW
STS-500kW	Core load max <300kW
STS-800kW	Core load max <500kW

SAV offers STS for customer selection and purchase. STS is sold as part of the energy storage system (ESS) package and is not available for standalone purchase. A separate order is required for STS.

- **Fire Protection System**

System Components

If the fire cannot be controlled in time, leading to its spread, the fast-acting aerosol fire suppression device will be activated to extinguish the fire. The built-in feedback signal quickly establishes communication with the station's energy management system, allowing personnel to respond promptly.

Fast-Acting Aerosol Fire Suppression Device

Product Overview:

The QRR0.15G/S-PFK fast-acting aerosol fire suppression device is suitable for relatively enclosed spaces, such as distribution cabinets. When a fire occurs, the suppression device is triggered by an electrical signal. The electrical igniter activates the aerosol-generating agent inside the device, which undergoes a redox reaction to release heat, causing the chemical coolant to decompose. The combined action of the aerosol-generating agent and the coolant suppresses the fire.

Technical Specifications:

Item	Specification	Item	Specification

Model	QRR0.15G/S-PFK	Net Weight	1110g±30g
Operating Temp	− 30°C ~ + 70°C	Dimensions	245mm×67mm×66mm
Relative Humidity	≤95%RH	Activation Type	Electrical
Discharge Time	≤15S	Activation Current	≥700mA
Delay Time	≤2S	Activation Temp	≥170°C
Nozzle Heat Distance	≤200°C at 400mm	Multi-unit Connection	Series
		Feedback Signal	Passive switch signal
Casing Surface Temp	≤150°C	Protection Area	3m³

3.5 Product Usage Instructions

a. The battery system must operate within the specified charging rate or power conditions, and the upper charging voltage must not exceed the product's technical specifications to prevent overcharging, which may affect the battery’s charge/discharge performance, mechanical properties, and safety.
b. The battery system must be used under the specified discharge rate or power conditions, and the lower discharge voltage must not exceed the product’s technical specifications to prevent over-discharge, which may affect the battery’s performance, mechanical properties, and safety.
c. The battery system must be used under specified environmental conditions. Extreme high or low temperatures can affect battery performance and safety.
d. The battery system must be stored or used in clean, well-ventilated environments, avoiding contact with corrosive substances and keeping it away from fire and heat sources.
e. The battery system must not be used or stored in areas with strong static or magnetic fields to avoid potential safety hazards.
f. Unauthorized disassembly or modification of this product is prohibited. Warranty will be voided, and the company will not be responsible for any safety accidents caused.
g. Batteries should not be mixed with metal objects to prevent short circuits and safety risks.Failure to follow these requirements will void the warranty, and the company will not be liable for performance damage or safety

issues.

3.6 Application Scenarios

3.6.1 Peak-Valley Arbitrage

This scenario is suitable for regions with significant differences between peak and off-peak electricity prices. Users can set peak and off-peak periods based on local time-of-use pricing policies, electricity usage habits, and consumption levels. The energy storage system charges during low-price periods and discharges during high-price periods, effectively shifting electricity usage and reducing user electricity costs.

3.6.2 Demand Control

This plan is suitable for industries with large-scale electricity consumption and a two-part electricity pricing system. Using energy storage stations, users can reduce their monthly fixed capacity or demand charges, lower basic electricity costs, and delay the need for capacity expansion, thus reducing investment costs.

3.6.3 Increasing Self-Consumption

This scenario applies to regions where distributed energy generation (such as solar or wind) is already installed or will be installed. During periods of low demand, the energy storage station prioritizes storing distributed renewable energy, and discharges it when appropriate, reducing the power input from renewables, increasing absorption rates, and maximizing user benefits.

3.6.4 Demand Response

Based on local policies, energy storage can be used as a controllable load/energy source, actively responding to grid dispatch requirements and earning response subsidies.

3.6.5 Backup Power

The energy storage system stabilizes user voltage and serves as an emergency backup power source, ensuring the safe and stable operation of critical loads, minimizing the impact of power quality issues or outages on production and daily life.

3.7 Product Maintenance

a. When the battery system is idle or stored for a long period, it should be kept at 30% to 40% charge.
b. If the battery system is idle or stored for a long time, it is recommended to recharge it every three months to prevent over-discharge. A full charge-discharge cycle should be performed every six months.

4. Delivery, Transport, and Storage

Note: Failure to transport and store the product as specified in this manual may void the warranty.

4.1 Unboxing Inspection

・Upon receiving the product, check the delivery against the "supply list" to ensure all components are present.

・Verify that the received cabinets and product models match the ordered models.

・Carefully inspect the product for any damage caused during transportation. If there are issues, please contact the company or the transport provider immediately.

4.2 Transportation Requirements

・All essential equipment is securely installed in the cabinet before leaving the factory, allowing for full transportation of the product.

・Confirm that the cabinet doors are securely locked before transport.

・Set up warning signs or barriers to prevent unauthorized personnel from entering the lifting or transportation area, minimizing the risk of accidents.

・Remove any obstacles, such as trees or cables, during transport.

・Choose favorable weather conditions for equipment transportation if possible.

4.3 Equipment Transport Mobility Requirements

The following conditions must be met during equipment transportation:

• Select the appropriate crane or lifting tools based on the site conditions. The selected tool must have sufficient load capacity, boom length, and rotation radius.

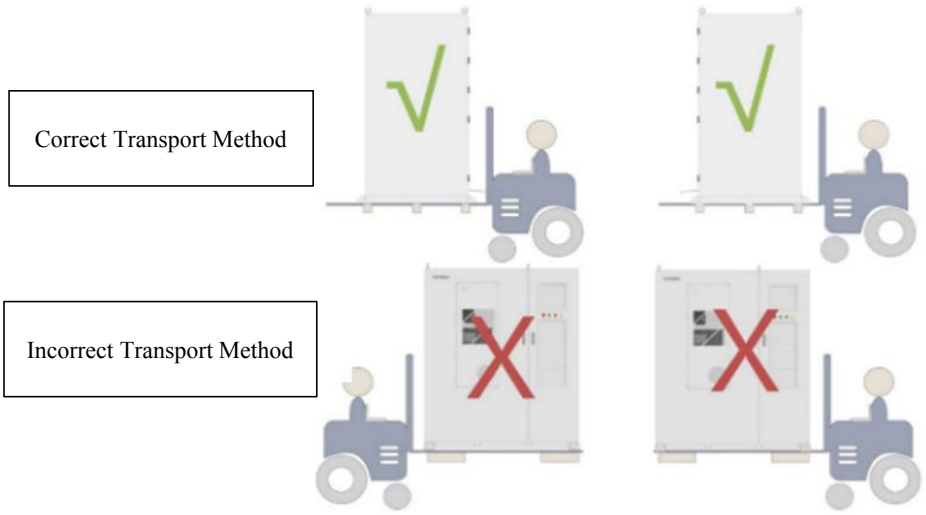
・Additional traction devices may be needed if the equipment needs to be moved on a slope. Use ropes to secure the equipment to the vehicle to prevent excessive tilting during transportation.

Warning

• Comply with local outdoor cabinet operation safety regulations throughout loading, unloading, and transportation.
• Ensure that all machinery used in operation is well-maintained.
• Personnel involved in loading, unloading, and bolting must receive appropriate safety training.

4.4 Forklift Transport

This product has forklift slots at the bottom, designed specifically for forklift transport. By removing the front and rear panels, the sockets are exposed, allowing the product to be moved through the slots. If the installation site is flat, a forklift can be used to move the product. Forklift transportation must meet the following requirements:
• The forklift must have sufficient load capacity.
• The length of the forks must meet equipment requirements.
• Insert the forks into the slots at the bottom of the cabinet.
• When transporting the product, movement and lowering should be slow and steady.
• The product should only be placed on a flat surface that is well-drained and free of obstacles or protrusions.
• Under no circumstances should the equipment be moved by inserting pins into places other than the designated forklift slots.



Lifting Requirements
Note: The energy storage system in this plan does not support lifting.

4.5 Storage Requirements

Storage Environment:

·To prevent internal condensation or submersion of the product's base during the rainy season, it should be stored on elevated ground.

· The product should be stored in a dry, flat, solid area that can bear the weight. The storage area must be level, free from water accumulation, without protrusions, and the flatness deviation should not exceed 5mm.

· Storage temperature: **-30°C to 50°C;** Relative humidity: 0–95%, with no condensation.

· Protect the product from extreme environmental changes, such as sudden cold or heat, and collisions that could cause damage.

· The product's air intake and exhaust should be effectively protected, and measures should be taken to prevent rain, sand, or dust from entering the cabinet.

Storage Operation Requirements:

· Do not tilt or invert the packaging box.

· Ensure that the cabinet door and internal equipment cabinet doors are securely locked before storage.

· The cabinet base must be raised; the height should be determined based on local geological and climatic conditions. In cold environments, provide heating for internal equipment.

· For long-term storage (over six months), open the cabinet for inspection, check for condensation on the exterior, and ensure the cabinet and internal equipment are undamaged. Perform a professional test before installation if necessary.

· Inspect the cabinet and internal equipment at least every two weeks for damage. Prevent infestation by insects or rodents. If any damage is found, replace the packaging immediately.

Warning

• If the product is stored for more than six months from the shipping date, perform a charge-discharge cycle to ensure the system's SOC reaches 30%-40%. Recharge it and maintain the SOC level.

5. Installation

Pre-Installation Check

Warning

Follow local safety regulations and operation rules during installation.
Only complete and undamaged equipment can be installed. Before installation, ensure:

- The product cabinet is intact and undamaged.
- All internal equipment is complete and in good condition.

5.1. Installation Environment Requirements

Site Selection Criteria:
Reference standards:

- GB 51048 Design Code for Electrochemical Energy Storage Stations
- NFPA 855 Standard for the Installation of Stationary Energy Storage Systems
- Local fire safety regulations.

The battery cabinet for industrial and commercial energy storage systems must be placed outdoors. General site selection requirements include but are not limited to:

1. The installation location should not be in low-lying areas prone to flooding. The installation surface must be above the region's historical highest water level.
2. The energy storage system or station should be installed in an area with no vegetation or flammable plants within 3 meters.
3. The distance from the top of the energy storage system to any flammable materials must be ≥2m.
4. For safety, the distance between the energy storage system and residential buildings must be ≥12m, and ≥30.5m from densely populated buildings like schools or hospitals. If this distance cannot be met, a fireproof wall must be built between the energy storage system and the

buildings.

5. The safety distance between the energy storage system and production buildings must comply with local fire safety regulations or standards. In China, refer to “GB 51048 Design Code for Electrochemical Energy Storage Stations,” which specifies:

   · The distance from the energy storage system to Category A production buildings must be ≥12m, to Category B buildings ≥10m, and to Category C, D, and E buildings with fire resistance ratings of Level 1 or 2 must be ≥10m. For buildings with a Level 3 fire resistance rating, the distance should be ≥12m. If the adjacent building's external wall is non-combustible and without windows, or exposed combustible eaves, the fire separation distance can be reduced by 25% from 3 meters. If the specified safety distances cannot be met, fireproof walls with at least 3-hour fire resistance should be installed for safety protection. The fireproof wall must extend 1 meter beyond the energy storage system's outer profile. Additionally, consider space for equipment transportation, installation, and maintenance.

   Outside China, refer to “NFPA 855 Standard for the Installation of Stationary Energy Storage Systems”：

   • Energy storage systems placed outdoors must be at least 10 feet (3.048m) from boundaries, public roads, buildings, flammable materials, hazardous substances, or unrelated grid infrastructure.

   · If the following conditions are met, the distance between the energy storage system and production buildings can be reduced to 0.914m, but space for equipment transportation, installation, and maintenance must still be considered.

   ·The energy storage system has a 1-hour fire-rated independent fireproof wall that extends 1.5m beyond the system's outer profile.

   · Non-combustible external walls with no openings or combustible exterior finishes and a fire resistance rating of 2 hours according to ASTM E119 or UL 263.

6. The energy storage system should be installed in environments free of explosion risks.
7. The site should have convenient transportation and reliable fire suppression equipment.
8. During installation, commissioning, and operation, fire safety principles must be followed: each unit should have at least two gas fire extinguishers nearby.

9. The exhaust system should be at least 4.6m away from any building's heating, ventilation, air conditioning intake, windows, doors, loading docks, or fire sources.
10. The site should provide a water-based fire suppression system interface.
11. The site must accommodate current needs and provide space for future expansion based on the system's lifecycle.
12. The energy storage system should be installed more than 30m away from third-party wireless communication facilities.
13. The location should have good ventilation.
14. The system should not be installed in areas with severe vibrations, dust, fog, or corrosive gases. If unavoidable, install the system upwind of these conditions.

Basic Requirements:

・The foundation must provide sufficient load-bearing support.

・The foundation height should be above the region's historical maximum flood level.

・Basic load-bearing capacity >3t/m²; service life >20 years; levelness ≤3mm/m².

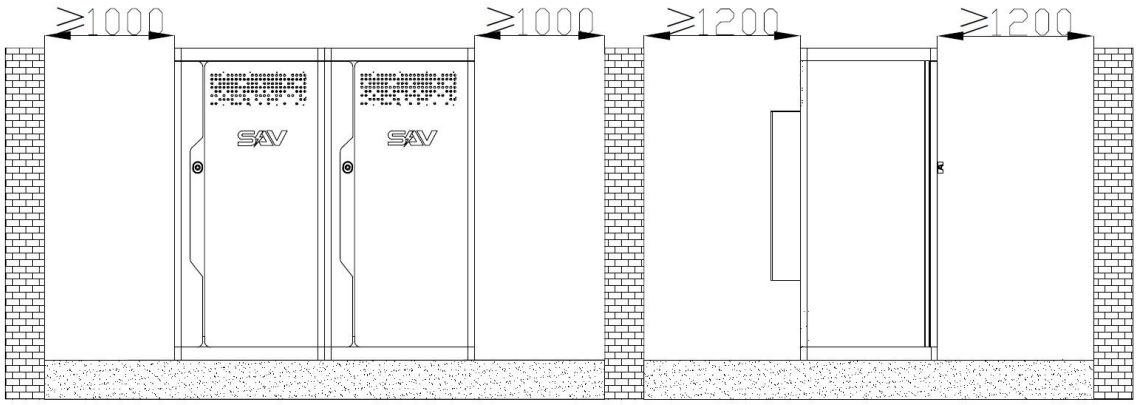
・The cabinet base should be elevated to prevent rainwater exposure, with a recommended installation height of 300mm-500mm above ground.

・Drainage measures should be set according to local geological conditions.

5.2 Space Requirements:

To ensure safe installation, maintenance, heat dissipation, and emergency evacuation, sufficient space must be left around the energy storage system. Two installation methods are available: multiple cabinets in parallel or a single cabinet installation. The system can be configured to scale up to MW-level capacities. The space requirements for both installation methods are as follows:

5.2.1 Multiple Cabinets in Parallel



When installing multiple cabinets, the space requirements are as follows:

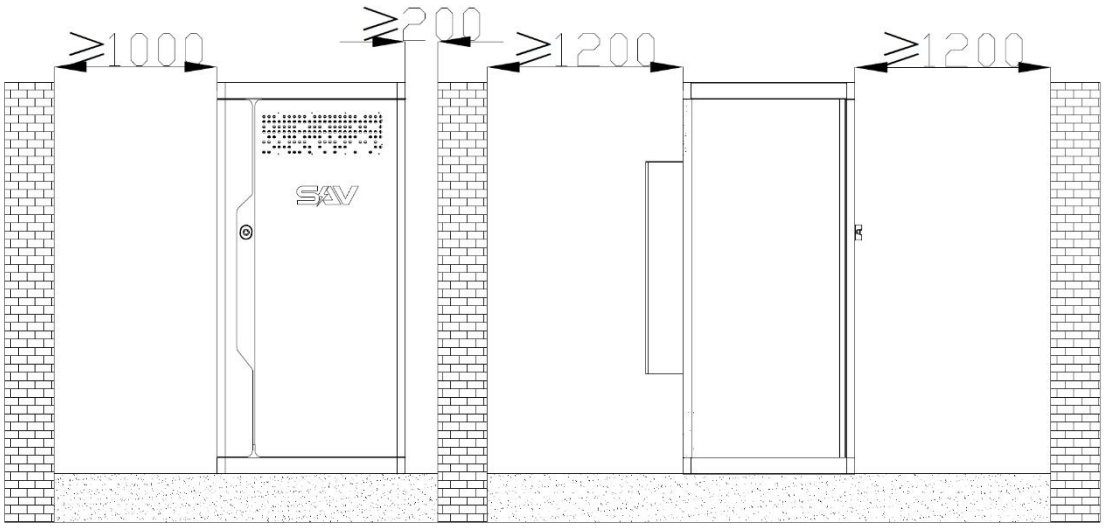
· For systems with 5 or fewer cabinets against a wall, maintain at least 1000mm on one side and ≥200mm on the other side.

· For systems with more than 5 cabinets, keep ≥1000mm on both sides.

· The systems can be placed closely together side by side.

·Maintain a gap of at least 1200mm between the front and back of the system and the walls.

5.2.2 Single Cabinet Installation

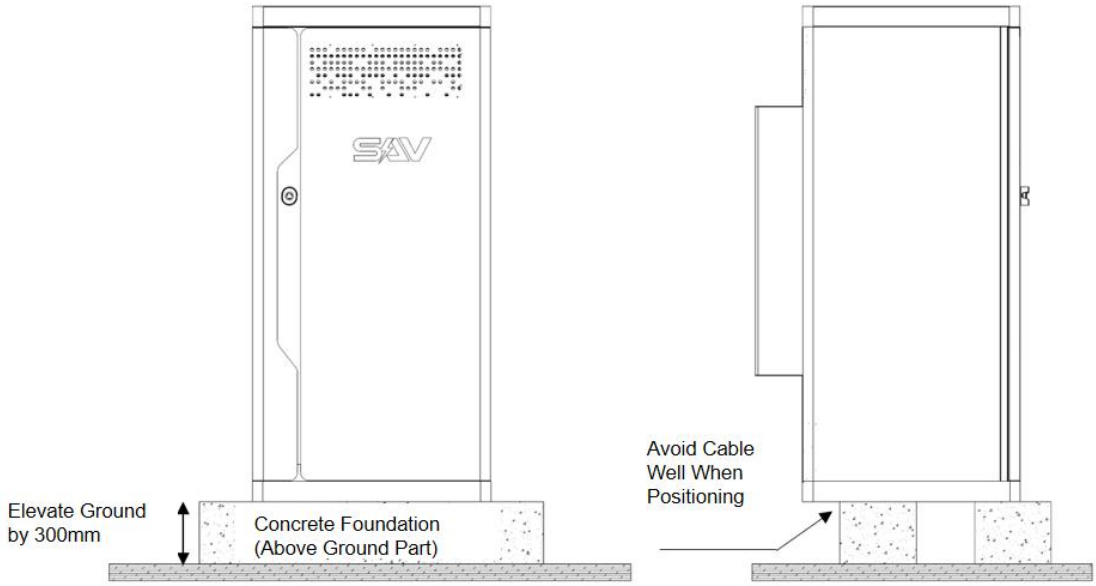


For single cabinet installation, the space requirements are:

· Maintain ≥1000mm on one side and ≥200mm on the other side when the system is installed against a wall.

·Maintain a gap of at least 1200mm between the front and back of the system and the walls.

5.3 Foundation Requirements



Energy Storage System Foundation Size Requirements

Foundation Design Requirements:

1. The energy storage system must be installed on concrete or other non-combustible surfaces. The installation surface must be level, firm, and flat, with sufficient load-bearing capacity. Depressions or slopes are not allowed.
2. The equipment foundation must be configured according to the total weight of the equipment (2.6T per unit). If the foundation's load-bearing capacity is insufficient, a review is required.
3. If excavation is required during foundation construction, ensure the pit bottom is compacted and leveled.
4. Water accumulation is prohibited after foundation excavation. If water disturbance occurs, excavation must continue, and the area must be refilled.
5. The elevation deviation of the top surface of the foundation pillars should not exceed 3mm. It is recommended that the foundation be raised about 300mm above the level of the installation site. If there is no foundation, construct one based on the recommended scheme in Figure 3-7.
6. Ensure that the equipment base is higher than the historical highest water level in the area to prevent water erosion of the battery cabinet's base and

interior.

7. The installation site should include a drainage system to avoid water immersion of the energy storage system's base or internal equipment during heavy rainfall. Cable routing for the energy storage system must also be considered, with reserved trenches or entry holes.
8. All reserved holes in the foundation and cable entry points at the bottom of the equipment must be sealed.

5.4 Grounding Requirements

1. The grounding impedance of the equipment should meet local electrical standards.
2. The equipment must be permanently connected to protective ground. Before operating the equipment, check the electrical connections to ensure reliable grounding.
3. After connecting the battery cabinet and combiner cabinet grounding points, apply anti-corrosion and anti-rust treatment.
4. Do not operate the equipment without the grounding conductors installed.
5. Do not damage the grounding conductors.
6. For high-contact-current equipment, connect the protective grounding terminal of the equipment casing before connecting the input power to prevent electric shock due to contact current.

5.5 Wiring Requirements

1. Cable selection, routing, and installation must comply with local laws and regulations.

   The current-carrying capacity of cables varies by manufacturer, even for the same model. At an ambient temperature of 40°C, the allowed working temperature of the cables is 90°C. The permissible current-carrying capacity of the cables can be found in the reference table.

Industrial and commercial energy storage system cabinet cables List.

Conductor Cross-Section)	Air-Laid Cable Long-Term Allowable Current (A)						Direct Buried Cable Long-Term Allowable Current (A)											
							Soil Thermal Resistivity 80(C, cm/w)						Soil Thermal Resistivity 120(C, cm/w)					
	Copper core			Aluminum Core			Copper core			Aluminum Core			Copper core			Aluminum Core		
	Single Core	Double Core	Triple-Core	Single Core	Double Core	Triple-Core	Single Core	Double Core	Triple-Core	Single Core	Double Core	Triple-Core	Single Core	Double Core	Triple-Core	Single Core	Double Core	Triple-Core
10	72	60	52	55	46	40	103	76	66	80	59	51	94	60	59	72	53	46
16	97	79	69	74	61	53	138	101	86	106	77	67	124	91	77	95	70	59
25	132	107	93	102	83	72	183	131	115	140	101	87	163	118	101	125	91	78
35	162	124	118	124	95	87	221	156	141	170	120	108	196	139	124	151	107	95
50	204	155	140	157	120	108	272	192	171	210	148	132	241	171	150	185	132	116
70	253	196	175	195	151	135	333	235	210	256	180	162	292	208	184	225	160	141
95	272	238	214	214	182	165	392	280	249	302	216	192	348	257	218	267	191	168
120	356	273	247	276	211	191	451	820	283	348	247	218	392	282	247	305	218	190
150	410	315	293	316	242	225	516	365	326	392	280	250	447	322	283	343	248	218
185	465		385	358		257	572		367	436		288	500		318	385		247
240	552		432	425		306	667		424	516		327	582		368	447		284
300	686			400			751			577			660			500		
400	757			580			876			678			773			593		
500	880			680			1012			766			876			670		
630	1025			787			1154			878			1000			767		
800	1338			934			1320			1012			1153			885		

Starting Point	Copper Cable	Endpoint 1	Copper Cable	Endpoint 2
Energy Storage Cabinet	ZCYJV-0.6/1kV 3*70+2*35	Version with 1 Grid-Connected Cabinet	ZCYJV-0.6/1kV 3*95+2*50	Distribution Room
		Version with 2 Grid-Connected Cabinets	ZCYJV-0.6/1kV 3*185+2*95	
		Version with 3 Grid-Connected Cabinets	ZCYJV-0.6/1kV 3*120+2*70 ZCYJV-0.6/1kV 3*120+2*70	
		Version with 4 Grid-Connected Cabinets	ZCYJV-0.6/1kV 3*185+2*95 ZCYJV-0.6/1kV 3*185+2*95	
		Version with 5 Grid-Connected Cabinets	ZCYJV-0.6/1kV 3*240+2*120 ZCYJV-0.6/1kV 3*240+2*120	

2. During the installation of power cables, ensure no coiling or twisting. If the cable is too short, replace it entirely—joints or welding points are prohibited.
3. All cables must be securely connected, well-insulated, and of appropriate specifications.
4. Cable trays and conduit openings should be free of sharp edges. Protective measures must be in place at conduit or cable entry points to avoid damage from sharp edges or burrs.
5. Monitoring cables must not be bundled with power or AC cables. They must not be entangled or cross-routed.
6. During construction, reserve adequate space for the AC side wiring channels based on the location and size of the cable entry/exit points at the bottom of the cabinet. Cable conduits should be pre-installed.
7. The specifications and number of conduits should be determined based on the type and quantity of cables. Temporarily seal both ends of all embedded conduits to prevent debris from entering, which could

complicate later wiring.

8. Once all cable connections are complete, seal cable entry and exit points, as well as joints, with fire-resistant clay or other suitable materials to prevent rodents from entering.
9. During grounding wire installation, comply with local safety regulations and operating procedures.

6.System Installation Project

6.1 Summary

This chapter outlines the external conditions that should be met before system installation and the process of unpacking and inspecting the equipment.

6.2 Environmental Inspection

An inspection of the environment and related conditions before system installation.

6.3 Foundation Construction Inspection

Check the following items:
Verify the overall site layout plan and confirm that the preparation work for the site's infrastructure meets the requirements.
The concrete foundation must have completed its curing period before proceeding with system installation.

6.4 Power Supply Inspection

1. It is prohibited to perform live operations when connecting the system's power cables to the grid.
2. It is prohibited to perform live operations when connecting the power cables, monitoring cables, or AC working cables between the battery cabinet and the grid connection cabinet.

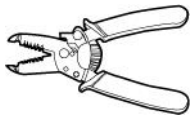
6.5 Grounding Inspection

Inspect the grounding points between the battery cabinet and the combiner cabinet.

6.6 Tools and Instrument Inspection

- The tools shown in the diagram are for reference only; refer to actual tools

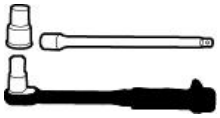
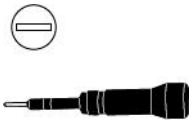
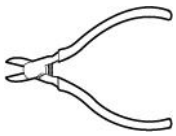
on-site.

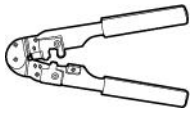
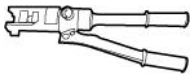
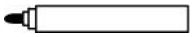
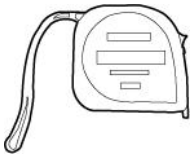
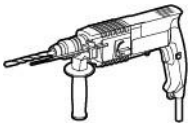
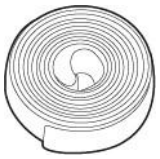
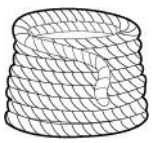
			
Wire Stripper	Wire Cutter	Rubber Hammer	Utility Knife

· Due to varying site conditions, the tool list may not include a few tools that might be needed. Installation personnel and users should prepare any additional tools according to the actual situation.

The tools and instruments required for installation operations are shown in the figure.

Installation Tools:

			
Insulated Cross Torque Screwdriver	Insulated Torque Socket Wrench (including extension rod) Socket specification: 7mm-19mm Socket depth ≥ 32mm Socket interface matches the torque wrench. Torque range: 1.2N·m-45N·m.	Insulated Flat-blade Torque Screwdriver	Diagonal Pliers

 Crystal Head Crimping Pliers	 Hydraulic Pliers	 Digital Multimeter DC voltage range: ≥1500V DC.	 Marker Pen
 Steel Tape Measure.	 Spirit Level	 Vacuum Cleaner	 Cordless Impact Driver
 Impact Driver BitΦ16mm	 Heat Shrink Tubing.	 Hot Air Gun.	 Cable Tie
 Insulation Ladder	 Crane	 Rope Length: ≥1845mm×4.	 Electric Forklift

 Manual Forklift	-	-	-

Personal Protective Equipment

 Insulating Gloves	 Protective Gloves	 Safety Glasses	 Dust Mask
 Insulating Shoes	 High Visibility Vest	 Safety Helmet	 Safety Belt

6.7 Unpacking and Inspection

1. To inspect the pallets or packaging boxes for any damages and make corresponding records.
2. To open the pallets or packaging boxes.
3. To check if the quantity of goods is correct according to the packing list attached to the pallets or packaging boxes and inspect the goods for any damage.If found, please contact the relevant personnel of our company in time.

7. On-site construction inspection and acceptance

7.1 Civil foundation engineering standardized delivery regulations

Basic Regulations:

1. For spread foundations and box foundations, the setting-out dimensions must be inspected prior to construction.
2. The quality acceptance of concrete structural engineering shall include the inspection of quality control data, visual quality and the inspection of structural entities.
3. Concrete structure engineering shall possess complete quality inspection records, and crucial processes shall have complete construction operation records.

Provisions for the handling of unqualified inspection lot：

1. Materials, components, utensils and semi-finished products shall not be used when their inspection lot are unqualified.
2. For unqualified inspection lot of construction quality prior to concrete pouring, rework and repair shall be performed and re-inspection shall be carried out.
3. For unqualified inspection lot of construction quality after concrete pouring, it shall be processed in accordance with the regulations in GB50204.

The regulations on installation of formwork:

1. The formwork joints shall be tightly sealed.
2. There shall be no sundries, ponding, etc. in the formwork.
3. The contact surface between formwork and concrete shall be flat and clean.
4. The release agent shall not stain steel rebars, embedded parts and concrete joints.

The stipulations of the installation of steel rebars:

1. Steel rebars should be straight and free from damage. There should be no cracks, oil stains, granular or flaky rust on the surface.
2. The bending arc inner diameter of steel rebars should comply with the

provisions of Article 5.3.1 in GB50204.

3. The shape and size of processed steel rebars should meet the design requirements.
4. The connection mode of steel rebars should meet the design requirements.
5. Steel rebars should be firmly installed. The installation position and anchoring method of stressed steel rebars should be in line with the design requirements.

The regulations of concrete construction:

1. The consistency of concrete mixtures shall satisfy the standard requirements.
2. After the completion of concrete pouring, curing shall be carried out promptly. The curing time and method shall comply with the requirements of the construction plan.

The requirements for cast-in-situ structures:

1. The quality acceptance of cast-in-situ structures should be conducted after formwork removal and before any trimming and decoration on the concrete surface.
2. For contents that are already concealed and cannot be directly observed and measured, the inspection records of concealed works acceptance can be examined.
3. The appearance quality defects of cast-in-situ structures are defined according to Table 1 based on the extent of their impact on structural performance and service functions.

Table 1 Definition of appearance quality defects of cast-in-situ structures

Name	Phenomenon	Serious Defect	General Defect
Steel rebars exposure	The steel rebars in the component are exposed without being wrapped by concrete.	Some of stressed steel rebars are exposed.	Some of other steel rebars are exposed.
honeycomb	The surface of concrete lacks cement mortar and make some stones exposed.	There is honeycomb on the main stressed parts of the component.	There is a small amount of honeycomb in other parts.
Void	Both the depth and length of the voids in the concrete exceed	There are voids on the main stressed parts of	There are a small number of voids in other parts.

	the thickness of the protective layer.	the component.	
Inclusion	There are inclusion in the concrete and the depth exceeds the thickness of the protective layer.	There is inclusion on the main stressed parts of the component.	There are a small amount of inclusion in other parts.
Looseness	There is local looseness in concrete.	There is looseness on the main stressed parts of the component.	There are a small amount of looseness in other parts.
Cracks	Cracks extends from the surface to the interior of concrete.	There are cracks on the main stressed parts of the component that affect the structural performance or function.	There are a small amount of cracks on the other stressed parts of the component that affect the structural performance or use function.
Defects in joints	There are defects in the concrete at the joints of components or the connecting rebar and connectors are loose.	There are defects in the joints that affect the structural force transfer performance.	There are defects in the connection parts that basically do not affect the structural force transfer performance.
Appearance defects	Missing edges and corners, unstraight edges and corners, warping and unevenness, flash and convex ribs, etc.	There are appearance defects that affect the use function or decorative effect.	There are a small number of appearance defects that do not affect the use function or decorative effect.
Surface defects	The surface of the component has pockmarks, peeling, dusting, and staining.	There are surface defects that affect the use function or decorative	There are a small number of surface defects that do not affect

		effect.	the use function or decorative effect.

4. In the case of emerged serious defects, the contractor shall propose a technical treatment plan. After being approved by the technical research institute, it shall be implemented. The treated parts shall be subject to re-inspection.
5. The acceptance of dimensional deviations and positional deviations of cast-in-situ structures shall comply with the provisions of Article 8.3.2 of "Code for Acceptance of Construction Quality of Concrete Structures" (GB50204).

The provisions of structural entity:

(1) The inspection of structural entity includes concrete strength, thickness of reinforcement cover, structural position and dimensional deviation as well as the content as agreed.
(2) The rebound method is used to inspect the strength of structural entity concrete.
(3) When inspecting concrete strength, the equivalent curing time can be taken as the time corresponding to the daily average temperature accumulating to 600°C·d day by day, and it should not be less than 14 days.
(4) The inspection of the thickness of reinforcement cover shall comply with the provisions of Appendix E of GB50204.

The regulations of inspection and appearance of the concrete foundation:

(1) The concrete surface shall be free from honeycomb pores and the horizontal error of surface flatness shall not exceed 3mm.
(2) After the removal of formwork and curing for the concrete foundation, it shall be evenly painted with black asphalt with the thickness no less than 0.5mm.
(3) The cable trench and cover plate at the rear of the concrete foundation shall be firmly fixed and uniformly painted with black asphalt with the thickness no less than 0.5mm.

Exemplary diagram of the appearance of concrete foundation

7.2 Electrical Installation Engineering

The requirements of lightning protection and earthing:

(1) The buried depth of the top surface of the earthing device must meet the design requirements.
(2) The welding of the earthing device shall be lap welding. The lap welding length shall meet the design specifications, and anti-corrosion measures must be taken for the welded joints.
(3) When the earthing trunk line passes through walls and floors, it shall be equipped with a protective sleeve. After the laying of the earthing trunk line, the pipe openings shall be sealed.
(4) At each connection part led out by the earthing trunk line, a yellow and green warning sign with a equal width ranging from 50 to 100mm shall be applied.
(5) The layout, installation quantity and connection mode of lightning protection down conductors shall conform to the design requirements.
(6) The exposed lightning protection down conductors shall be straight without abrupt bends and shall be fixed by dedicated brackets.
(7) The earthing wire shall not be utilized for other purposes.

The requirements of inspection and acceptance of cable installation:

(1) The cable specification shall be in accordance with the design requirements.
(2) Signboards shall be fully installed, correct and legible.
(3) Cable fixation, bending radius and relevant distances shall meet the design requirements.
(4) Cable joints shall comply with the relevant provisions of the current national standard “Code for Construction and Acceptance of Cable Lines in Electrical Installation Engineering" GB50168.
(5) All earthing contacts of the cable line and the earthing electrode shall be in good contact, and the earthing resistance value shall meet the design requirements.
(6) Fire prevention measures shall meet the design requirements.
(7) The electrical wiring standard is shown in the figure below:

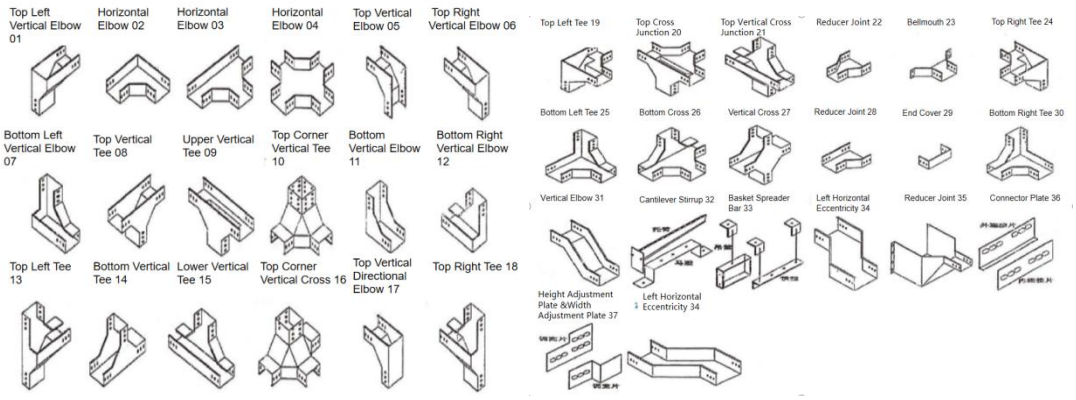
To use trays for laying cables:

For all kinds of turns in cable trays, customized elbows must be employed. Elbows made on site by the construction team that are unqualified are strictly prohibited. In principle, when selecting the specifications of trays and conduits, the space occupied by cables in the cable tray after laying should be less than 40%. Regarding the selection of tray routes, in order to save costs, in principle, the nearest routing is adopted to reduce the usage of trays. Additionally, for the nearest cable routing, after being converged as much as possible, the specification of the cable tray at the same location should be enlarged and the cables should be led out to the back-mounted equipment together.

For the outdoor part, considering the long-term heat dissipation of cables, tray-type cable trays are used. For the vertical part, ladder-type cable trays are used to facilitate cable fixation.

For communication cables (RS485 cables) with a short distance (<100 meters), they can be laid in the same cable tray, but they must be separately threaded through steel pipes and reliably fixed on the cable tray.

When laying AC cables, to ensure good heat dissipation in the cable tray, for AC cables with a larger diameter, only one layer of cables is laid in the cable tray and arranged neatly. Cross-stacking is prohibited.



Direct burial laying in cable trench:

The excavation depth of the cable trench must be no less than 800mm. The width should be increased correspondingly according to the cable diameter and quantity. Cross-stacking is strictly prohibited. A 100mm layer of fine sand should be laid at the bottom beneath the cables, and another 100mm layer of fine sand should be placed on the cables. The bricks for covering shall be closely laid out, with the edges extending 50mm beyond the cables. Subsequently, backfilling shall be conducted. Cable marker piles need to be inserted along the cable route.

The requirements of acceptance of installing complete sets of power distribution cabinets:

(1) The metal frame and foundation steel of cabinets, consoles, and boxes shall be reliably connected to the protective conductor. For the openable doors with electrical appliances, a yellow-green insulated copper-core flexible conductor with a cross-sectional area of not less than 4mm² shall be selected for connection between the door and the earthing terminal of the metal frame, and there shall be identification.

(2) Power distribution devices such as cabinets, consoles, boxes, and panels shall possess reliable protection against electric shock. The protective earthing (PE)conductor bar in the device shall have exposed terminals for connecting the external PE conductor and shall be reliably connected. When the design does not specify requirements, the minimum cross-sectional area of the connecting conductor shall comply with the provisions of the current national standard “Code for Design of Low-Voltage Electrical Installations"GB50054.

(3) The push-pull of trolley-type and drawer-type complete sets of power distribution cabinets shall be flexible without jamming or collision. The center lines of the moving contacts and the fixed contacts shall be consistent, and the contacts shall be close. When being put into operation, the earthing contact shall contact before the main contact; when being withdrawn, the earthing contact shall be disengaged after the main contact.

(4) High-voltage complete sets of power distribution cabinets shall undergo handover tests as stipulated in Article 3.1.5 of GB50303 and must be of compliance.

(5) Regarding the insulation resistance value between lines and between lines and ground of the circuits among low-voltage complete sets of power distribution cabinets, boxes and control cabinets (tables, boxes), the insulation resistance of feeder circuits shall not be less than 0.5MΩ, and that of secondary circuits not less than 1MΩ. The voltage of withstand voltage test for secondary circuits should be 1000V. When the

insulation resistance value of the circuit is greater than 10MΩ, a 2500V megohmmeter should be employed instead. The test duration shall be one minute or as required by product technical documents.

(6) The connecting conductors of surge protection devices (SPDs) within cabinets, boxes and panels shall be straight and sufficiently short, with a length not exceeding 0.5m.

Safety and civilized construction inspection:：

To comprehensively promote safety and civilized construction management on construction sites and reduce safety accidents, construction contractor are required to adhere to the following basic requirements:

(1) Before the construction, the project department shall incorporate civilized construction into the engineering construction organization design, establish relevant organizations and improve various civilized construction measures, and ensure the effective implementation and enforcement of all systems and measures.

(2) At the main entrances and exits of the construction production area, construction warning signs (safety and civilized system, prohibitions) shall be installed. Personnel and equipment not related to construction are prohibited from entering the operation area. At dangerous operation sites, accident alarms and emergency evacuation channels shall be provided.

(3) Construction machinery and equipment shall be stored at designated locations. Equipment, raw materials, semi-finished products, and finished products shall be stored stably and neatly in categories with clear identifications. The construction site shall be thoroughly cleaned up after the completion.

(4) Fire protection equipment shall be complete and passages shall be unobstructed.

(5) Obvious warning signs shall be set up at dangerous locations on the construction site, and appropriate protective measures shall be taken.

(6) The safety and civilized construction inspection shall run through the entire construction process of the project and be conducted simultaneously in the inspection and acceptance of each construction step. For non-conforming situations, a “Correction and Prevention Measure Form" shall be issued, and rectification shall be carried out within a specified period. The acceptance process shall be closed-loop until the end of trial operation.

The basic requirements for construction site workers:

(1) Upon entering the construction site, to wear protective items such as safety helmets and work clothes,correctly use safety protection tools

such as safety ropes and safety belts in accordance with the regulations. It is strictly prohibited to enter the construction site wearing slippers, high-heeled shoes or barefoot.

(2) Abide by the post safety responsibility system and stay at one's own work post. Leaving the post without permission or engaging in activities unrelated to the post is prohibited. Do not assign one's own work to others or operate others' mechanical equipment without permission.

(3) All special operation personnel should be on duty with the “Special Operation Permit".

(4) The project department should establish a management record system for special personnel and make copies of their certificates for inspection. Ensure the validity of their certificates and the consistency between the person and the certificate.

(5) Walk on the stipulated routines by the owner when commuting, .

(6) Non-operating personnel are strictly forbidden from entering the operation ranges when construction machinery like cranes and excavators is in operation, .

(7) Throwing objects outward or downward are forbidden when operating at heights.

(8) Randomly pulling power supply lines and moving or starting electromechanical equipment at will are strictly prohibited.

(9) Moving, removing or damaging safety warning signs at will is not allowed.

(10) Resting in dangerous areas such as shaft openings and equipment operation passages is strictly prohibited.;

Project Commissioning and Acceptance

The requirements for project commissioning:

(1) Both the acceptance of the installation project and the grid connection acceptance by the power supply bureau (if applicable) must be qualified.

(2) The “User Manual for Energy Storage System" should cover product operation procedures, fault analysis and troubleshooting,etc..

(3) The tests and commissioning of relevant electrical equipment and lines should be completely finished and qualified with complete records.

(4) The power station should be grid-connected and operate at full capacity. It shall maintain operation for at least 24 hours. During the period, the system should work properly without any faults or abnormalities.

(5) The communication of the power station monitoring equipment should be normal.

Time：

The energy storage power station should operate continuously and stably

without any malfunctions for 15 days. And only when the performance indicators meet the design requirements can it be regarded as having passed the commissioning.

Extension:

(1) The communication of a single master machine (slave machine) is continuously interrupted for more than 2 hours.
(2) Abnormal charging and discharging of the energy storage system is found.

Commissioning exit:

If any of the following situations occurs, it is considered as fault time, and the power station will exit the commissioning operation with the commissioning time restarting subsequently.

If the power station operation is interrupted due to equipment quality, installation and commissioning or other reasons, and the resulting downtime exceeds 6% of the total commissioning operation time,the commissioning time will restart after the operation is restored.

Record Requirements:

During the commissioning operation, comprehensive records should be conducted for power station operation data, faults and defect elimination records, etc..

Conclusion of the trial operation of the energy storage power station:

During the commissioning, all performance indicators of the energy storage power station satisfy the commissioning operation requirements. After each item in the “Safety and Civilized Construction Site Inspection Record Form" is inspected and accepted as qualified, and the “Commissioning Operation Report" is signed and confirmed jointly by the project manager and the person in charge of power station operation and maintenance, the former can apply for the end of the commissioning acceptance.

Engineering Completion Inspection and Acceptance

The requirements for engineering completion inspection and acceptance:

(1) The commissioning acceptance is successfully completed.
(2) The construction process data are comprehensive and complete (confirmed by the filing and countersigning of the delivery department). The problems and defects discovered in each inspections should have

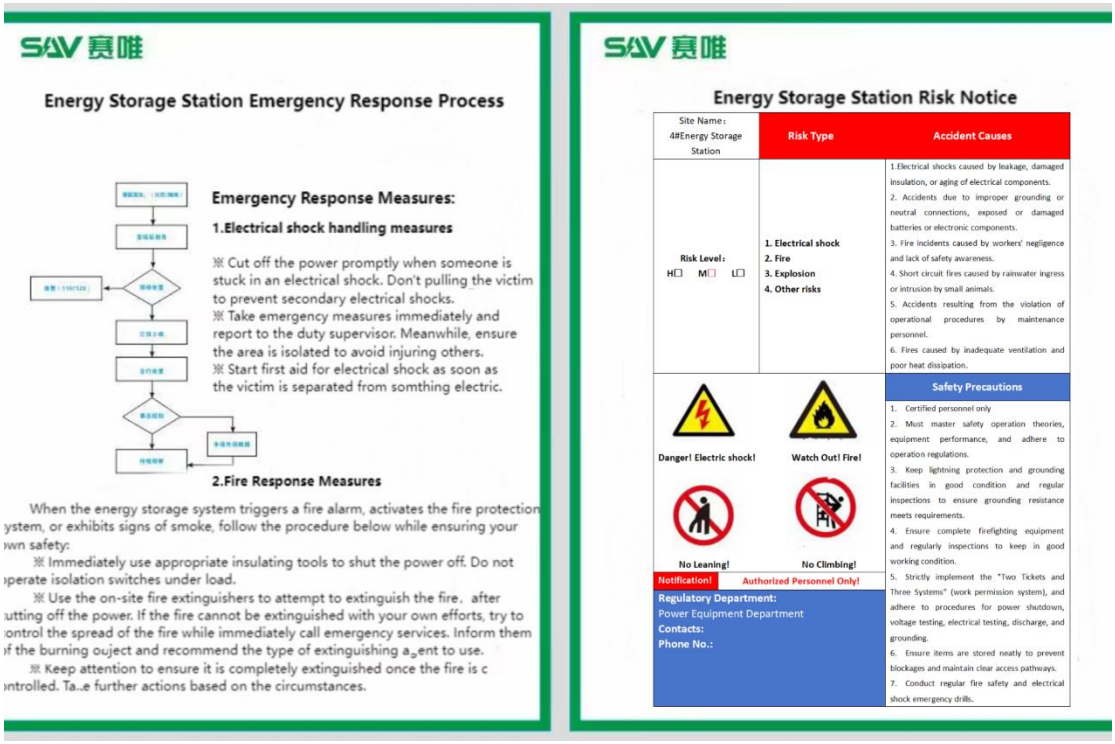
been rectified and completed.

The contents of engineering completion acceptance：

(1) The delivery department is responsible for organizing the engineering completion acceptance. The project manager of the construction contractor should cooperate on site in the acceptance.
(2) The “Project Completion Report" is considered as passing the acceptance only after being signed by the owner, the project manager, and the construction contractor.

Image engineering acceptance for engineering completion acceptance：

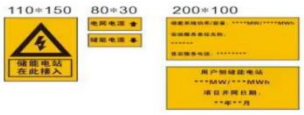
(1) After the project completion, the construction contractor must uniformly customize and purchase all power station fences from the manufacturer designated by our company. The fence is made of plastic-steel material with the height of 1.8m. The fences and fence posts uniformly adopt the color combination of “upper white and lower green", with a color-matching ratio of 1:1. The green part is light.
(2) The fence must be firmly installed and fixed without any sway. The spacing between the fence posts is uniformly set at 20cm. The bottom crossbeam is uniformly 30cm from the ground, and the top crossbeam 30cm from the top.
(3) After the installation of the fence, warning signs such as “Danger , Electricity!Keep clear！ ” and “No smoking. Electric shock risk.” need to be posted on the front of the fence. The warning signs made of aluminum plate are uniformly sized at 30cm in length and 25cm in width.
(4) Warning signs must be affixed to both the front and sides of the fence for energy storage power stations with a capacity of more than 800 kWh.
(5) For power stations of more than 800 kWh, signboards for the emergency handling process and risk notification of energy storage power stations must be posted. The signboards are uniformly sized at 100cm in length and 60cm in width. Please refer to the attachment for details.



(6) For power stations with a capacity of over 2 MWh, signs providing the introduction of the power station need to be displayed. At the grid-connected cabinet and grid connection point, signboards indicating grid-connected power station capacity, power output, grid connection point details, etc., must be affixed. The standardized color combination is a yellow background. As follows:

1000*800

110*150 80*30 200*100



7.3 Material Ordering and Receiving

Shipping List

The shipping list shall be based on the signed version of the planning output. The content of the shipping list cannot be altered orally. If any change is required, a change order must be issued and signed again for confirmation.

Receiving

(1) Ascertain whether the content of the shipping list complies with the construction requirements before shipping.

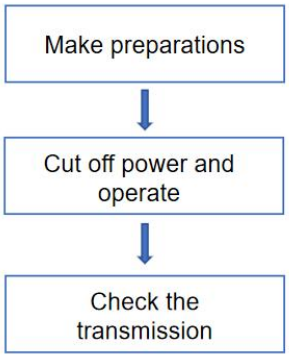
(2) Communicate with the owner in advance regarding the storage location of energy storage cabinets,etc. before the arrival of the goods.

(3) Confirm the truck models that can access to the site.

(4) Check the received materials in accordance with the shipping list and delivery receipt (such as inspecting major dents on the cabinet body and taking photos of the length note of the cable).

7.4 Grid Connection after Power Outage

7.4.1 Construction stages



Construction procedure:

7.4.2 Construction Preparations (carried out before power outage)

Technical Preparation: To know about the renovation content and conduct technical and quality briefing before construction to ensure that every worker masters quality standards, technical requirements, construction methods and precautions. To prepare wiring diagrams of connection cabinets, grid-connected cabinets and high-voltage cabinets, electricity meter manuals, etc..

Materials: materials required for panel installation such as cables, multimeters, galvanized bolts bolts for busbar connection, neutral wires and cable lug, phase-color insulation tapes, fireproof sealing materials, signboards, etc.

Personnel: technical staff, safety supervisors, and installation workers.

Tools: angle grinders, socket wrenches, electrician tools, earthing resistance meters, electric hammers, multimeters, electric drills, cable pliers, crimping pliers, various wrenches, temporary cables, five-finger heat-shrinkable tubes, fire extinguishers, lighting tools,etc.

Construction Preparations: All cables have be connected to the power distribution room. The wire stripping, heat shrinking of five-finger heat shrinkable tubes, and crimping of copper cable lugs have been completed.

7.4.3 Power Outage Operation

Cable laying:

To complete the grid connection within a limited period, thorough preparatory work must be carried out. For instance, ensure that the incoming cable has entered the cable trench. Check if the reserved length of the cable is adequate and if the length of the screws on the busbar is sufficient. The cable sheath should be stripped, and the installation of the five-finger heat shrinkable tube should be completed. If it is extremely urgent, it is necessary to estimate the length from the cable to the busbar and prepare the cable heads in advance. And then it can be done to carry out splicing and connection after the power outage.

When the cable enters the low-voltage incoming cabinet,effective protective measures should be taken for the secondary wires and circuit breakers inside the cabinet during the installation. After installation, it is crucial to carefully inspect for any loosening or detachment of these components.

The 485 communication cable should be laid synchronously during the power outage. When laying, it needs to pass through a steel pipe which must be firmly fixed.

Meter installation

Low-voltage anti-backflow meter: During installation, check the orientation of the current transformer coil and install A411, B411, and C411 in accordance with the order of yellow, green, and red. The voltage can be taken from the air circuit breaker(ACB) in the low-voltage power distribution cabinet. After installation, set the CT transformation ratio and check whether the power and various current and voltage values of the meters are normal.

High-voltage anti-backflow meter: During installation, check the orientation of the current transformer coil and install A411, B411, and C411 in accordance with the order of yellow, green, and red. Look for voltage from the A630, B630, and C630 tubes and it is normal as long as the measured voltage is 100V. After installation, set the CT transformation ratio and check whether the power and various current and voltage of the meter are normal.

Wiring

Only qualified electrical engineers are eligible to carry out electrical connections. Please follow the requirements in the “Safety Instructions" in this manual. We are not responsible for any personal injury or property damage caused by neglecting these safety instructions.

The installation design of the product must comply with the relevant standards or regulations of the country/region where the project is located.

If the installation is not carried out in accordance with the installation design requirements in this manual, correspondent product or system failure are not covered by the warranty.

RISKS
•Not touch on electrical components. •Ensure that neither the AC side nor the DC side is powered on before installation. All electrical connections must be carried out when the equipment is completely powered off. •Check the polarity of all input cables before wiring to ensure the correct polarity of each input channel. •Not place the equipment on a flammable surface.
WARNING
•Sand and moisture may damage the electrical equipment in the system.•The storage system might affect the performance of the equipment. •During sandstorm or when the relative environment humidity is over 95%, electrical connections should be cut. •When there is no sand and the weather is sunny, connection can restart. During the electrical installation, do not pull on cables or wires forcefully to avoid damaging their insulation performance.

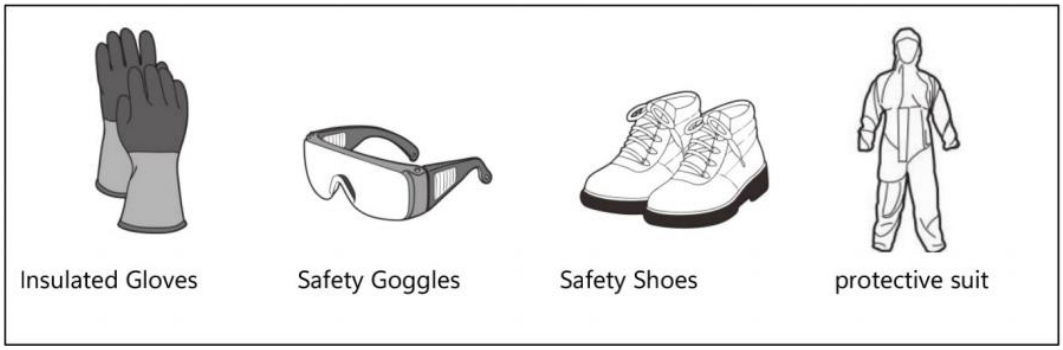
NOTICE

•Ensure that all cables and wires have a certain degree of elasticity.
•Take necessary auxiliary measures to reduce the pressure on cables or conductors.
•Check carefully after each wiring is completed to ensure that the wiring is correct and firm.
•Must carried out all electrical connection strictly in accordance with the wiring diagram.

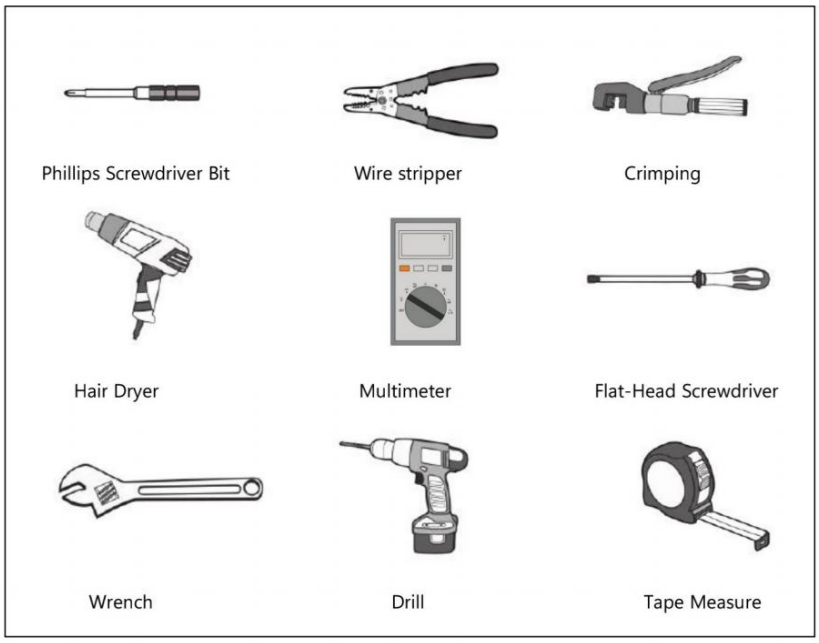
The equipment earthing impedance meets the requirements of GB 50054 and local electrical standards. Before connecting other cables of the battery cabinet and the combiner box, please first connect the cables at the earthing points of the battery cabinet and the combiner box.

Wiring instruments

Protective items are as follows：



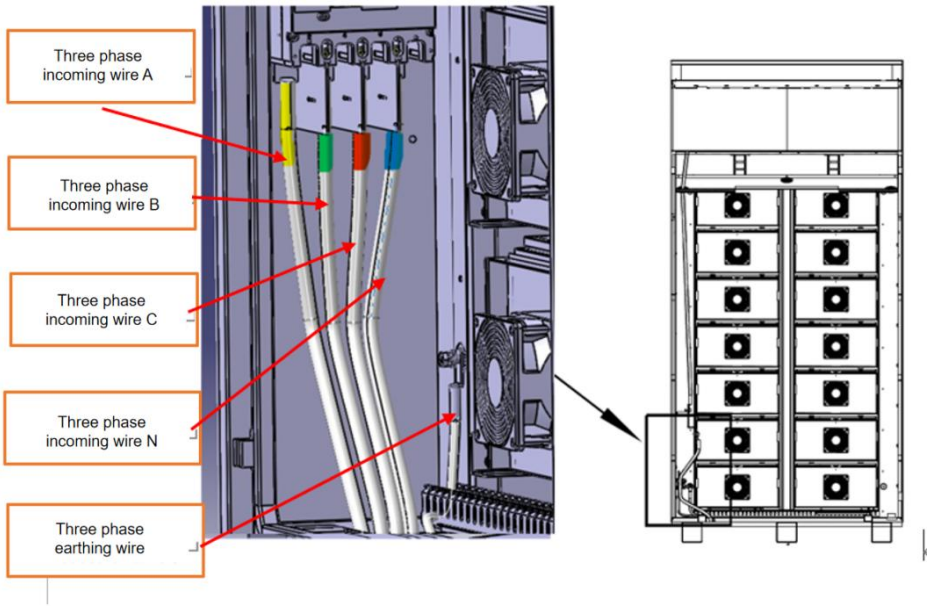
Wiring items are as follows



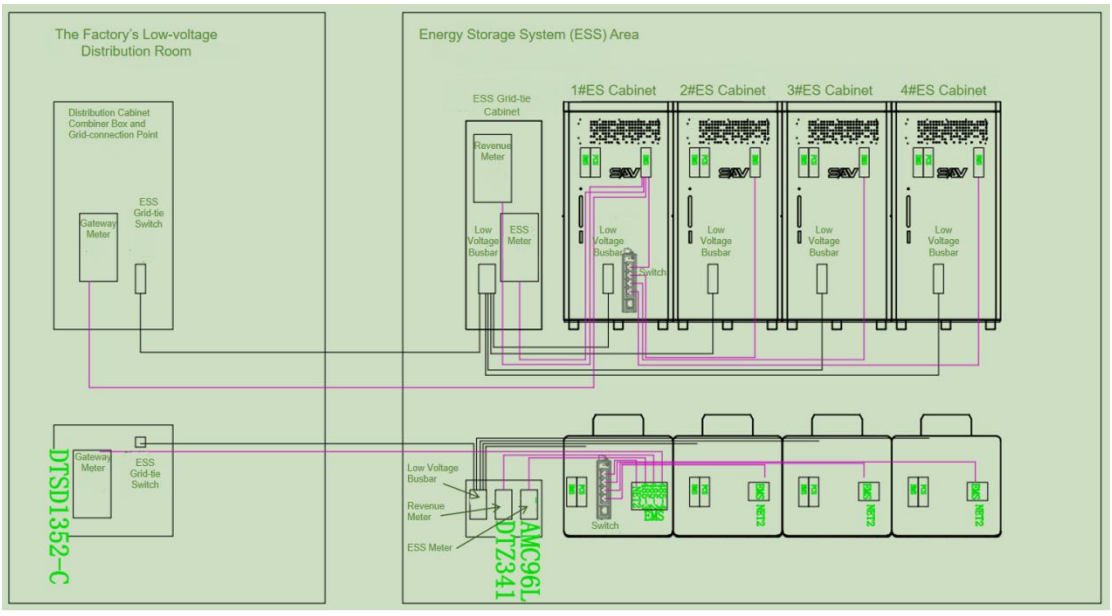
Wiring instruction

After receiving the energy storage cabinet, open the backdoor and you will see the wiring area in the electrical compartment as shown in the figure below:

Connect the three-phase incoming wires (yellow, green, and red three-phase wires) and the neutral wire and close all air circuit breakers below the backdoor of the cabinet.

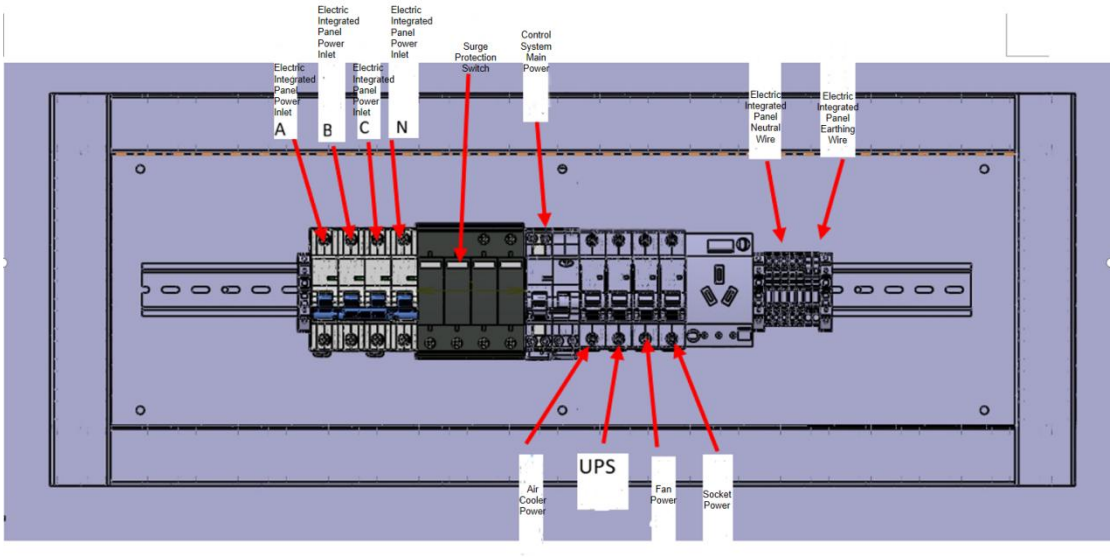


Single cabinet wiring diagram in an industrial and commercial grid-connected energy storage system

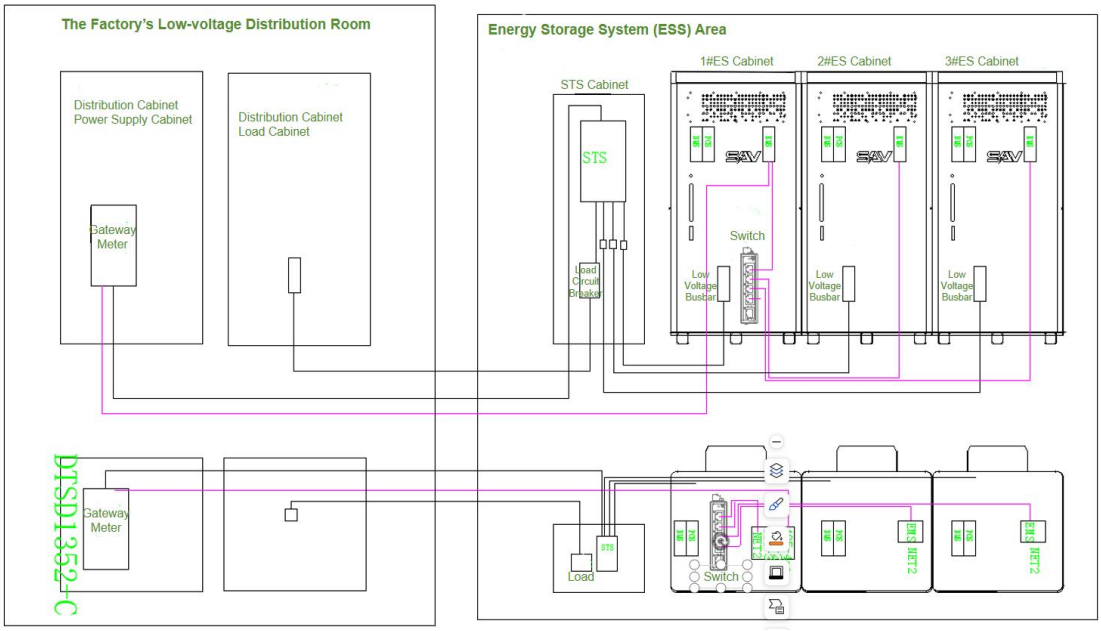


Cabinet wiring diagram of industrial and commercial grid-connected energy

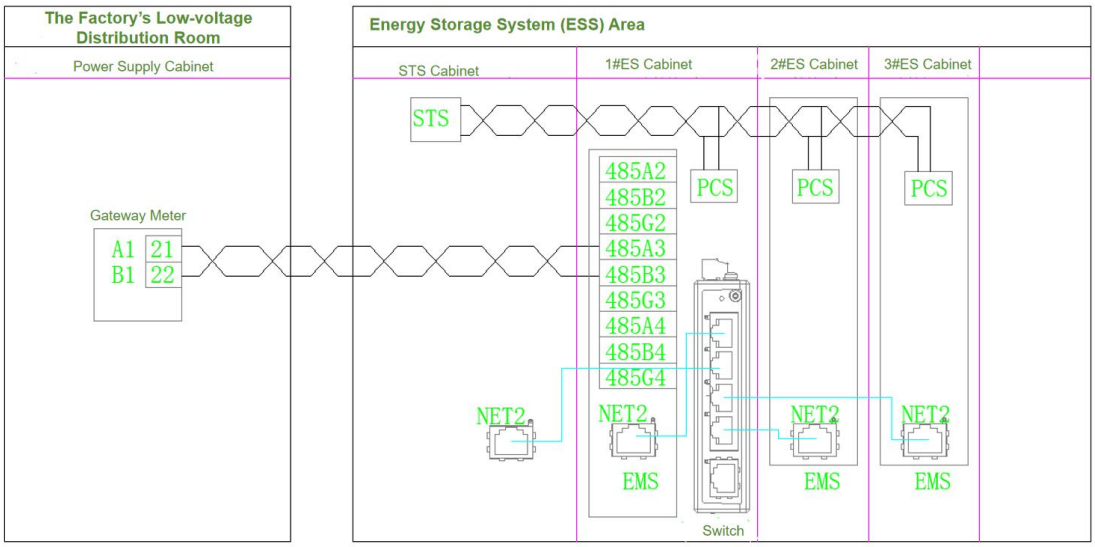
storage system



Electric integrated panel power wiring diagram of industrial and commercial energy storage system



Cabinet wiring diagram of industrial and commercial energy storage system



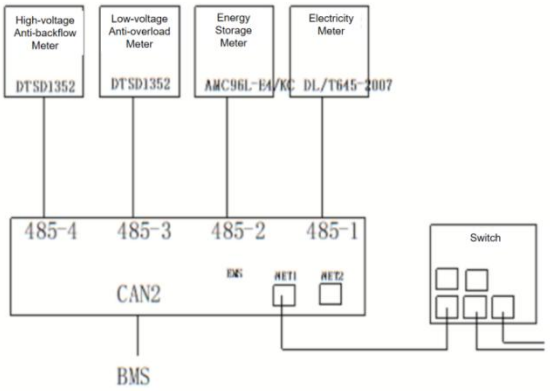
Cabinet communication interface diagram of industrial and commercial off-grid energy storage system

7.4 Power Supply Inspection

(1) Clean the access cabinets,check if there are any tools or screws left behind and ensure that the cable labels are complete.
(2) Clean up the generated garbage at the construction site.
(3) Retain relevant photos and videos of the construction process.
(4) Contact the factory electrician to supply power.

7.5 Equipment Debugging

1.Meter communication debugging
(1) Electricity meter
(2) To set up communication address and connect correspondingly 485 terminal on EMS.
(3) Energy storage meter
(4) To check the current transformer ratio, set up communication address and connect correspondingly 485 terminal on EMS.
(5) Low-voltage anti-overload meter
(6) To check the current transformer ratio, set up communication address and connect correspondingly 485 terminal on EMS.
(7) High-voltage anti-backflow meter
(8) To check the ratio of current transformer and voltage transformer, set up communication address and connect correspondingly 485 terminal on EMS.



1. Networking debugging between the main EMS and the slave EMS of the energy storage cabinet.
2. PCS debugging.
3. BMS debugging.
4. Charge and discharge test

(1) Discharge test at low power.
(2) Charge test at low power.
(3) Check the charge and discharge conversion rate.

7.6 Power Station Site Establishment

7.7 Connection of the Equipment to the Official Server