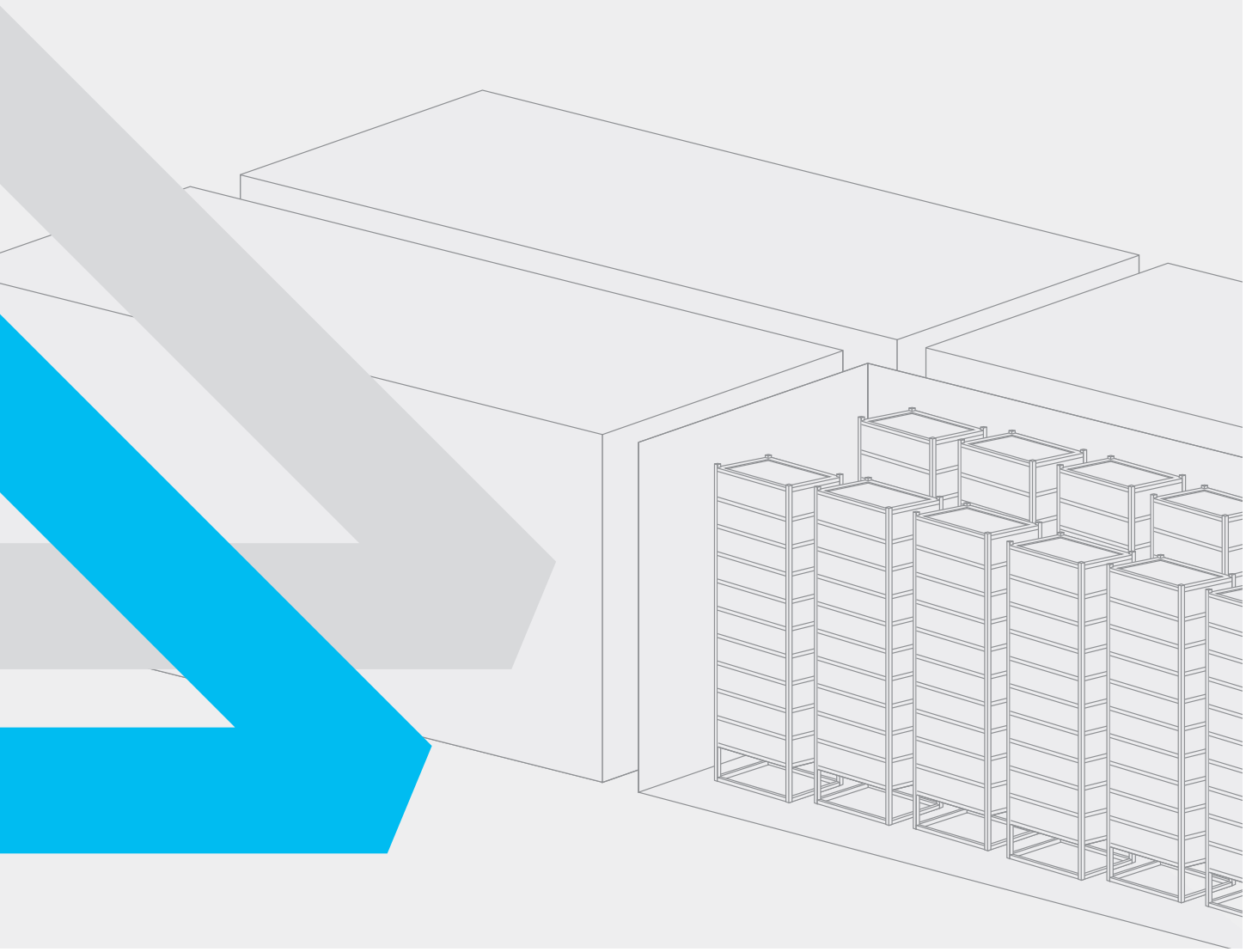
SIFANG

# ENERGY STORAGE PRODUCTS AND SYSTEM SOLUTIONS



www.sifang-electric.com

BEIJING SIFANG AUTOMATION CO., LTD.

BEIJING SIFANG ENGINEERING CO., LTD.

# LEADING PROVIDER OF POWER SYSTEM SOLUTIONS

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# ABOUT SIFANG

Sifang Automation Co., Ltd. was founded by Professor Yang Qixun, one of the first academicians of the Chinese Academy of Engineering, in 1994 as a leading enterprise in the field of power automation. The company has long been committed to the energy and power sector, providing relay protection, automation and control systems, power electronics, switchgear, smart IoT products, and solutions for power generation, transmission, distribution, consumption, and storage.

The company has always been dedicated to the mission of "making power safer, smarter, more efficient, and cleaner". Adhering to the concept of technological leadership and innovative development, driven by the "carbon neutrality and net-zero", it contributes wisdom and strength to the construction of a new power system and the realization of green and high-quality development, and is committed to becoming a dynamic and trustworthy international first-class enterprise.

**Prof. Yang Qixun**

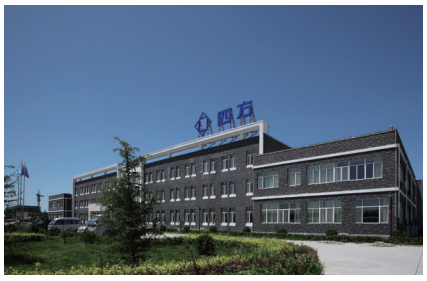
The developer of China's first microcomputer-based relay and one of the first academicians of the Chinese Academy of Engineering.


Over 1.7 million IEDs have been delivered and are operating stably in more than 80 countries.

Sifang is headquartered in Beijing and has research and production bases in Nanjing, Wuhan, Baoding, and Huzhou. It has overseas subsidiaries in India, the Philippines, Kenya, and other countries. It provides comprehensive solutions and services for the energy and power industry, large-scale public utilities, industrial enterprises, and various scenarios such as industrial parks and buildings.

## BEIJING


## BAODING/WUHAN

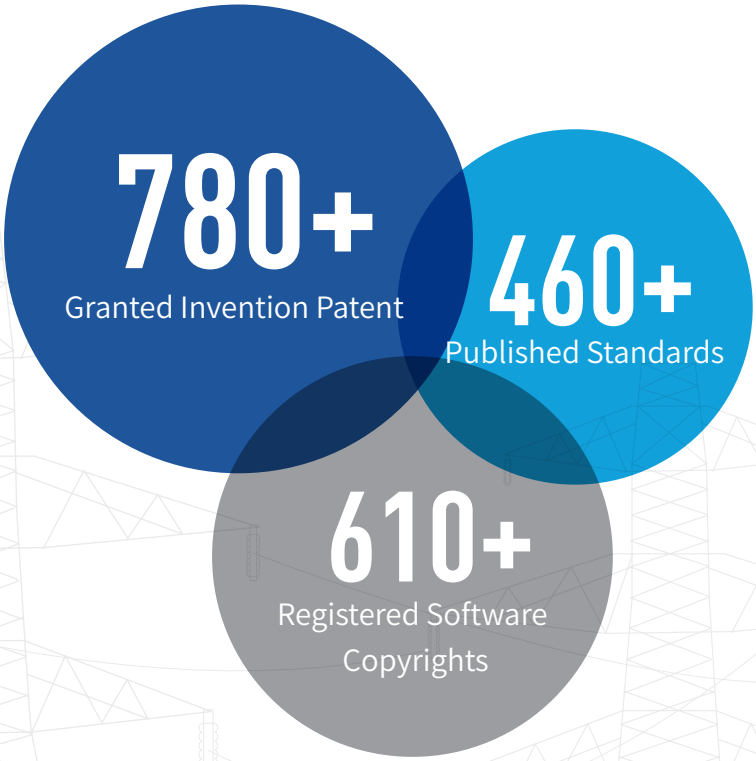



## NANJING / HUZHOU


## INDIA/PHILIPPINES KENYA

# TECHNOLOGICAL INNOVATION

Having important qualifications including national high-tech enterprises, national enterprise technology centers, national technology innovation demonstration enterprises, etc., it has won two second prizes for national scientific and technological progress, and has participated in more than 20 national key research and development projects.




**172+**

Major Technology Awards

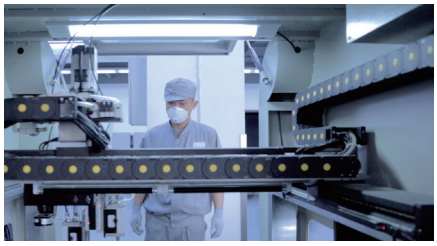
**23+**

National Key R&D Program

# MANAGEMENT SYSTEM

## Intelligent Manufacturing

Our company is building digital factory construction based on the smart IoT architecture in Baoding, Huzhou, and Nanjing. It horizontally and vertically integrates core systems such as MES/SCADA/WMS/PLM to achieve lean production capabilities in productivity, quality, and delivery time.



## Service System

Sifang service system has successfully obtained certification from the British Standards Institution (BSI). Sifang is constantly attentive to and strives to meet users' service needs, providing rapid responses and dedicated support.

**Service**

**The service network covers more than 80 countries worldwide, relying on domestic companies, overseas subsidiaries such as the Philippine subsidiary, Indian subsidiary, Kenya subsidiary, and various global partners.**

# Core Advantages

CORE BUSINESS

Sifang is one of the earliest manufacturers in China to engage in energy storage system research and application. It focuses on the development of core energy storage equipment and system integration. Its main advantages include:

## Leading R&D Capabilities

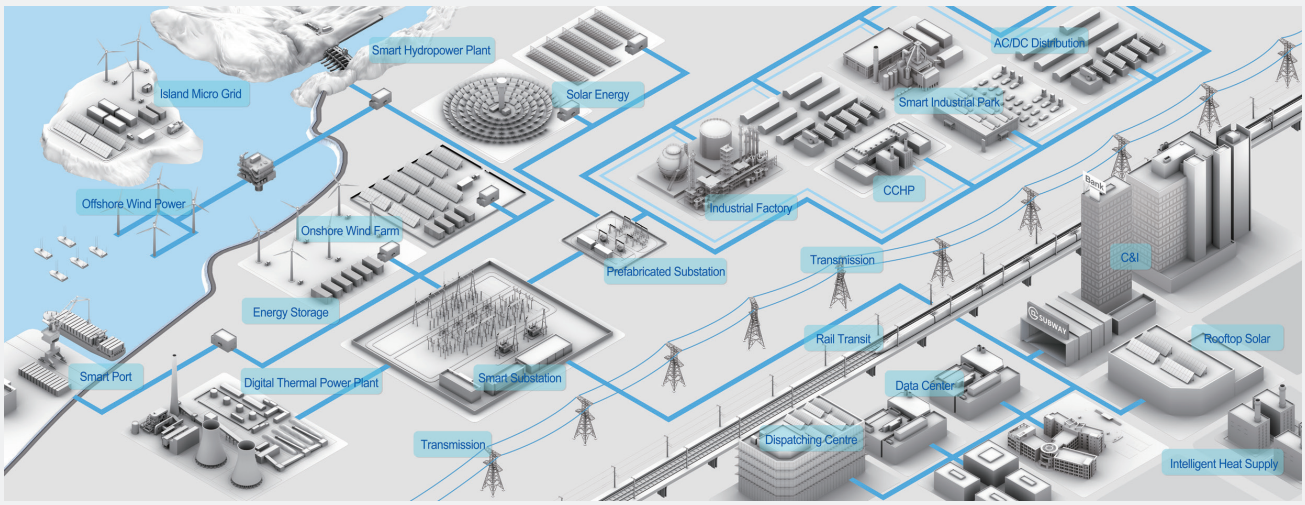
Leveraging its power system automation and power electronics technology, Sifang has independently developed core products such as energy management systems, PCS, and protection and control systems. It possesses outstanding technical capabilities in grid-friendly control.

## Rich Integration Experience

Sifang has been deeply involved in the energy field for more than 20 years, with comprehensive capabilities in engineering consulting and design, project management, core technology and equipment, and overall project implementation, providing customers with a one-stop energy storage solution.

# ENERGY STORAGE SYSTEM SOLUTIONS

Sifang energy storage solutions cover all areas including generation side, grid side and distribution side.

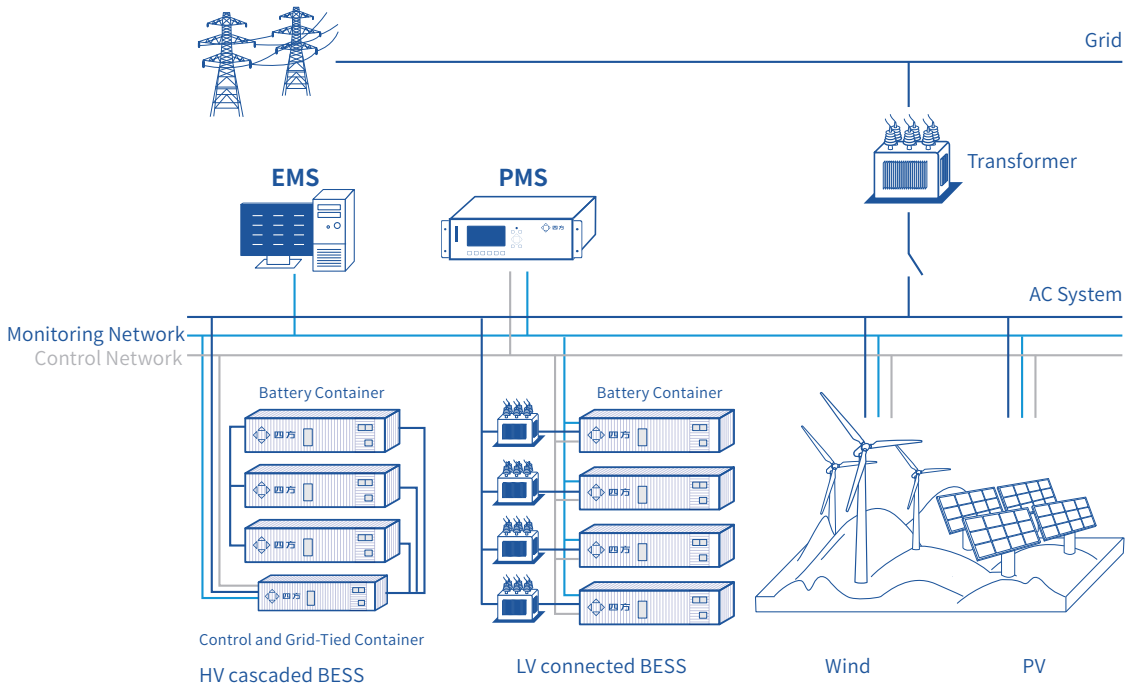


# 01 POWER GENERATION SIDE SOLUTION

## 01-1 Renewable Energy Storage Solution

Wind and solar power generation is characterized by intermittency and low inertia, large fluctuations in power output, insufficient peak and frequency regulation capabilities, and insufficient transmission capacity, leading to serious wind and solar power abandonment. Sifang relies on multi-source energy optimization and fast power control technology to help renewable achieve friendly grid connection.

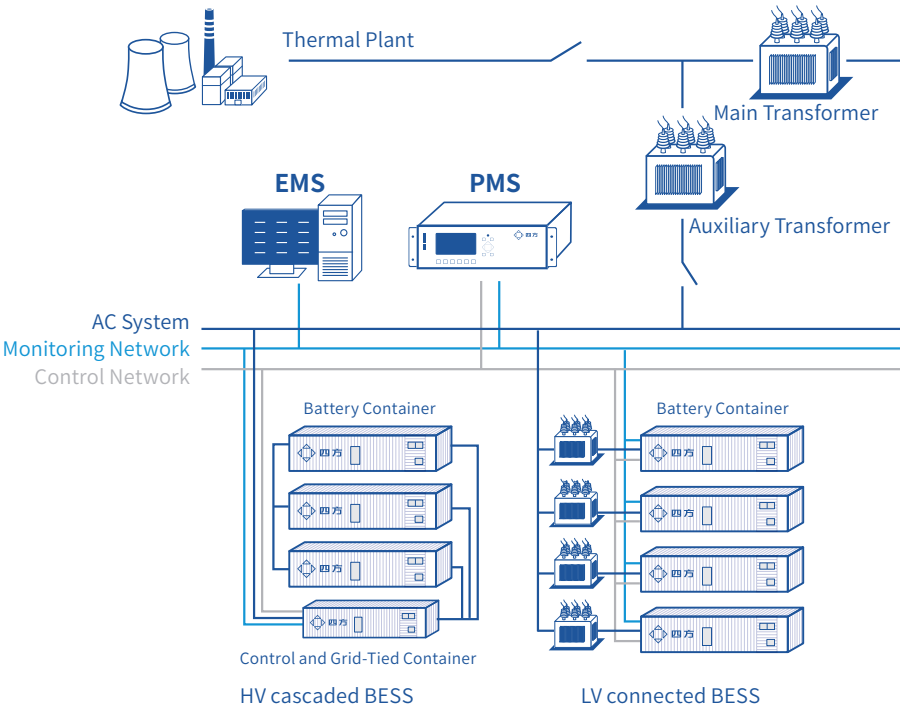
- Achieve smooth output and power tracking for renewable energy, addressing the issues of intermittency, fluctuation, and energy accommodation.
- Realize primary frequency regulation and virtual inertia control strategy to strengthen safe and stable operation of the power grid.
- Enhance the peak shaving and frequency regulation capabilities of renewable energy plants, and improve the coordinated interaction between wind, solar, energy storage and the regional grid.
- Achieve integration with systems such as electricity market and power generation forecasting to enhance the operational performance of renewable energy plants.



# 01-2 Combined Thermal Power and Energy Storage Frequency Regulation

Traditional thermal power has the characteristics of slow adjustment speed, long response time, and low adjustment accuracy in frequency regulation. In addition, frequency regulation will increase the loss of thermal power, reduce their operating efficiency, and frequent participation in frequency regulation will reduce the service life of the generators. Sifang 's Combined Thermal Power and Energy Storage Frequency Regulation solution can effectively reduce the frequency regulation burden of thermal power and improve the frequency regulation capability of thermal power plants.

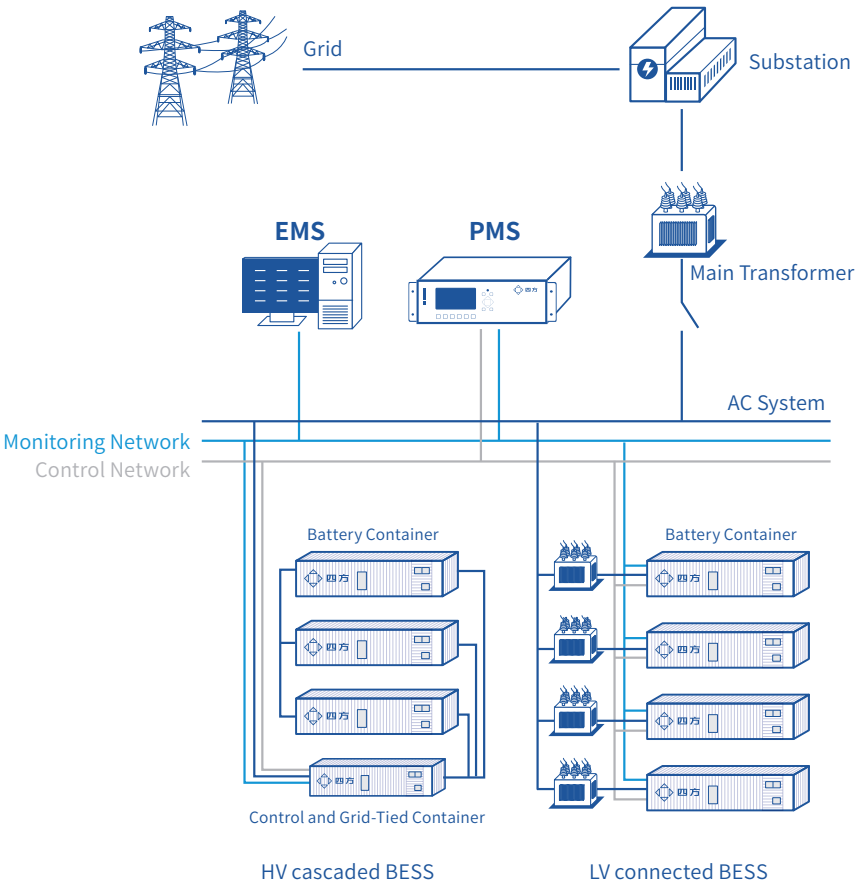
- Improve the AGC frequency regulation capability of the generators, increase compensation benefits, and reduce assessment costs.
- Enhance the operational economy, reduce frequent start-stop cycles, improve the conditions for economical operation, and decrease raw material loss.
- Reduce equipment loss, extend the lifespan of generators, and enhance the return on investment for thermal power plants.
- Equipped with black start capability, it can serve as backup auxiliary power, increasing power supply reliability.




# 02 GRID SIDE SOLUTION

The power grid currently faces challenges such as a continuous increase in electricity load fluctuations, the rise of power electronic devices, and the ongoing need for long-distance transmission. Key issues include increased supply pressure and insufficient emergency power support capacity. Sifang offers an integrated energy storage solution for the grid side, participating in overall system optimization to support the construction of a new power system.

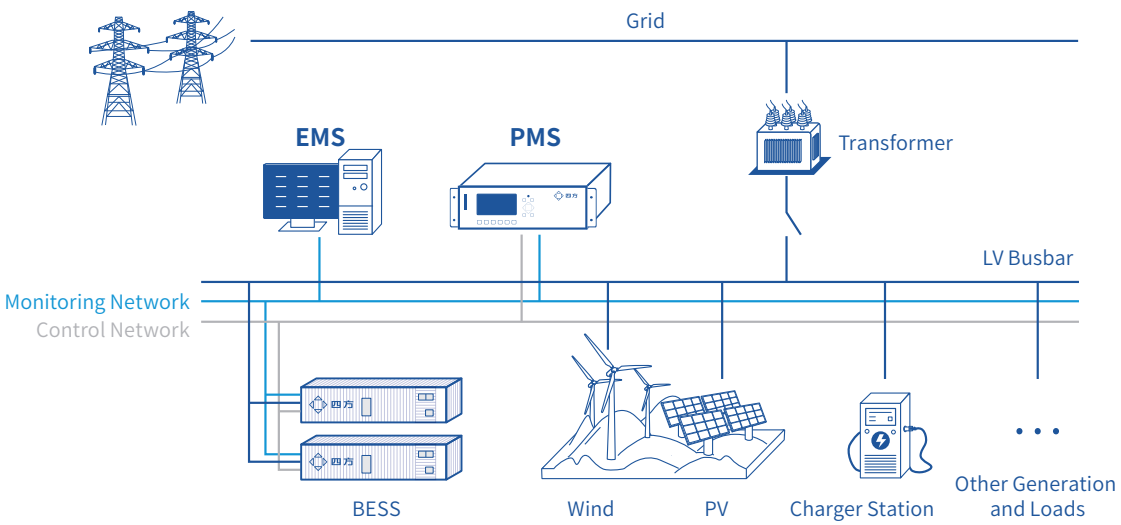
- Through system peak shaving, relieve supply pressure on the grid and enhance the stability of the power system.
- Provide rapid emergency power support in the event of faults in ultra-high voltage transmission lines or power generation, improving the reliability of the grid.
- Accept unified regulation from power dispatching agencies and participate in overall system optimization, creating systemic and holistic advantages for energy storage.



# 03 DISTRIBUTION&LOAD SIDE SOLUTION

The energy storage solution for the distribution and end user side includes urban distribution system, industrial and commercial parks, and microgrids. These systems face challenges such as continuously increasing load demand and complex upgrades. High-power short-duration loads, like charging stations, can easily lead to transformer overloads, and issues such as low voltage caused by long distance power supply also exist in distribution system. On one hand, critical loads require energy storage to ensure reliable power supply; on the other hand, through arbitrage of peak and off-peak electricity prices and demand control, overall electricity costs can be reduced, providing a return on investment. Leveraging its technical advantages in the field of distribution power electronics, Sifang has developed an energy storage solution for the distribution and end user side.

- By configuring energy storage, transformer capacity can be increased, reducing the maximum load on transformers.
- During maintenance of lines or transformers, energy storage can supply power to the distribution area, enabling maintenance without power interruptions.
- Installing energy storage at the end of the line improves low voltage issues caused by long distance power supply and enhances power quality.
- Arbitrage of peak and off-peak electricity prices and demand control.
- Enhance supply reliability by providing emergency power to critical loads during external failures.
- Smooth out power imbalances caused by fluctuations in renewable energy output and load within the microgrid.
- Achieve multi-energy complementarity, offering users reliable, high-quality, and cost-effective green energy.
- Optimize the coordination of hierarchical control and protection networks to ensure the stable and economical operation of the microgrid.



# ENERGY STORAGE CORE PRODUCTS

## 01 MULTI-LEVEL MONITORING AND ENERGY MANAGEMENT SYSTEM

### 01-1 Energy Management System

Energy Management System (EMS) for energy storage power plants can achieve centralized management of storage stations, ensuring safe operation, response characteristics, and economic benefits for the entire plant.

It has functions such as real-time supervisory control and data acquisition (SCADA), energy optimization management, and power coordination control, realizing intelligent operation of energy storage stations.

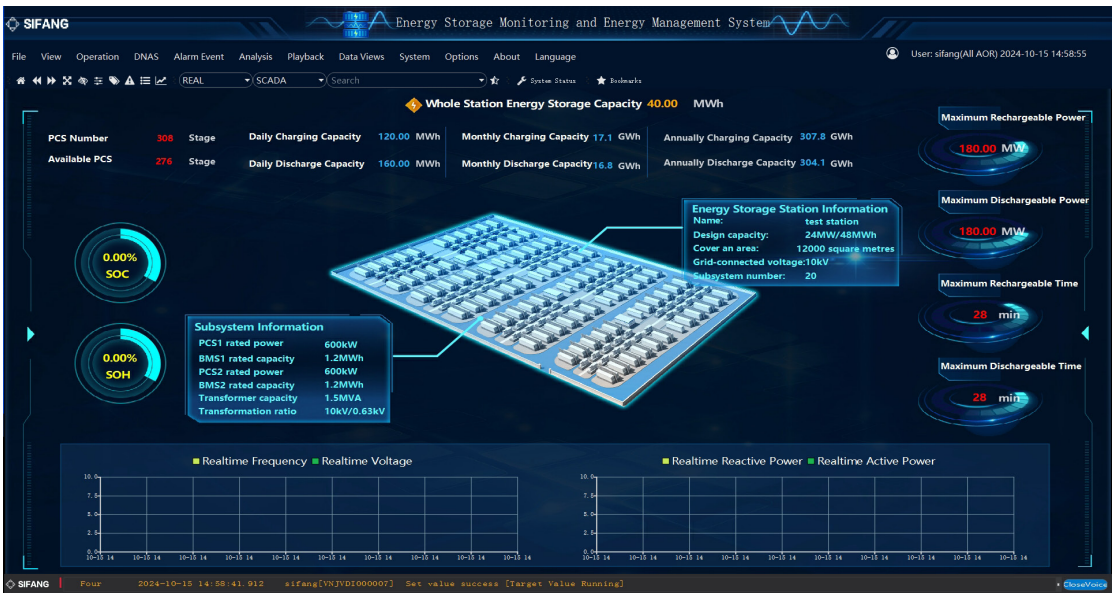
**Core Functions:**

**Panoramic surveillance:**

Establish a hierarchical model, automatic topology and graphing techniques, select key information for display, information management based on hierarchical architecture, one-click query for key information.

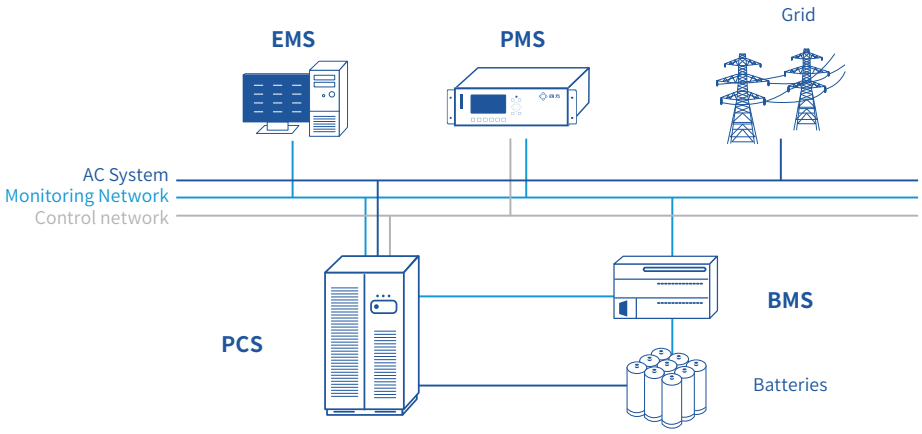
**Energy management:**

AGC control, AVC control, system peak shaving, peak power supply, coordination and optimization of wind and solar energy storage, peak load shifting, economic operation, and other multi-objective coordinated energy management strategies, to achieve system optimization scheduling and flexible control.



**Features:**

- Large-capacity distributed system expansion solution, supporting the access of tens of millions of massive data points.
- Based on hierarchical architecture information management, navigation-style browsing experience, clear presentation of key information, quickly locate faults, and solve the problem of difficult monitoring and operation and maintenance of tens of millions of information in energy storage stations.
- Hierarchical standard modeling technology and automatic mapping technology, achieve plug-and-play, improve engineering efficiency.
- Based on multi-index clustering analysis, the battery health status dynamic tracking and hidden danger warning technology provides a safe operation guarantee for energy storage power stations.




# 01-2 Power Management System

The power management system (PMS) of the energy storage power station is implemented by the coordinating control device, which adopts high-performance hardware platform, redundant switching technology, and network storm prevention and error prevention technology. It is the execution unit for fast coordinating control, helping energy storage to effectively support the operation of the power grid.

## Core Functions:

**Fast power management functions:** frequency regulation, inertia control, emergency voltage regulation, power control of interconnection line, real-time smoothing of power generation fluctuations.

**Coordinated control function:** Based on the key operating information of the energy storage system, it performs coordinated allocation of active power, reactive power, and operating modes for hundreds of PCS.

Power Management System（PMS）

## Features:

- Equipped with high-speed fiber optic Ethernet interfaces, supporting GOOSE networking for rapid communication with a communication interval of ⩽ 2ms.
- Millisecond-level processing speed, based on fast communication, measurement, and control technologies, ensures the ability to achieve control functions such as smoothing generation fluctuations, providing inertia support, primary frequency regulation, and dynamic reactive power adjustment, with an emergency power regulation closed-loop cycle of ⩽ 80ms.
- A single device can support a maximum of 128 PCS coordinated control via GOOSE, featuring an intelligent SOC balancing control algorithm that significantly enhances overall system generation.

# 01-3 Energy Storage Control Center

The energy storage control center realizes centralized control of multiple energy storage power plants and renewable power plants such as wind and solar, optimizes the operation status of the wind-solar energy storage complementary power generation system in real time, reduces the power fluctuation of the complementary power generation system by coordinating the control strategy of energy storage, supports the tracking of power generation plans and power dispatching of the entire grid, improves the reliability of wind farms and PV plants, and enhances the ability of the power grid to accommodate wind and PV plants.

## Core Functions:

**Panoramic Centralized Control:** Integrated monitoring of wind, solar, and energy storage, with intelligent alarms and categorized fault information display.

**Integrated Optimization Control of Wind, Solar, and Storage:** Coordinated optimization control of plants, optimization control under market, multi-operational mode control for wind, solar, and storage, and assessment of new energy and storage adjustment capabilities.

**Grid Operation Control:** Virtual inertia and primary frequency regulation, peak power supply, gain energy acquisition, coupled energy storage forecasting, economical operation, and smoothing power fluctuations.

## Features:

- Multi-service and multi-scenario integration, suitable for centralized control integration platforms of large-scale renewable energy bases, achieving diverse data access, multi-application deployment configuration, cross-security zone messaging systems, and integrating substation and wind, solar, and storage monitoring with intelligent auxiliary control functions.
- User-friendly grid connection technology that enables grid support interaction, multi-level optimization of generation plans, intelligent coordination for real-time power distribution of renewable energy and storage, and supports frequency and voltage regulation to facilitate the consumption of renewable energy.
- Centralized monitoring and optimized operation of plants, enabling coordinated operation control for smooth output of different combinations of wind, solar, and storage across various time scales, including plan tracking and peak shaving.

# 01-4 Energy Storage Cloud O&M

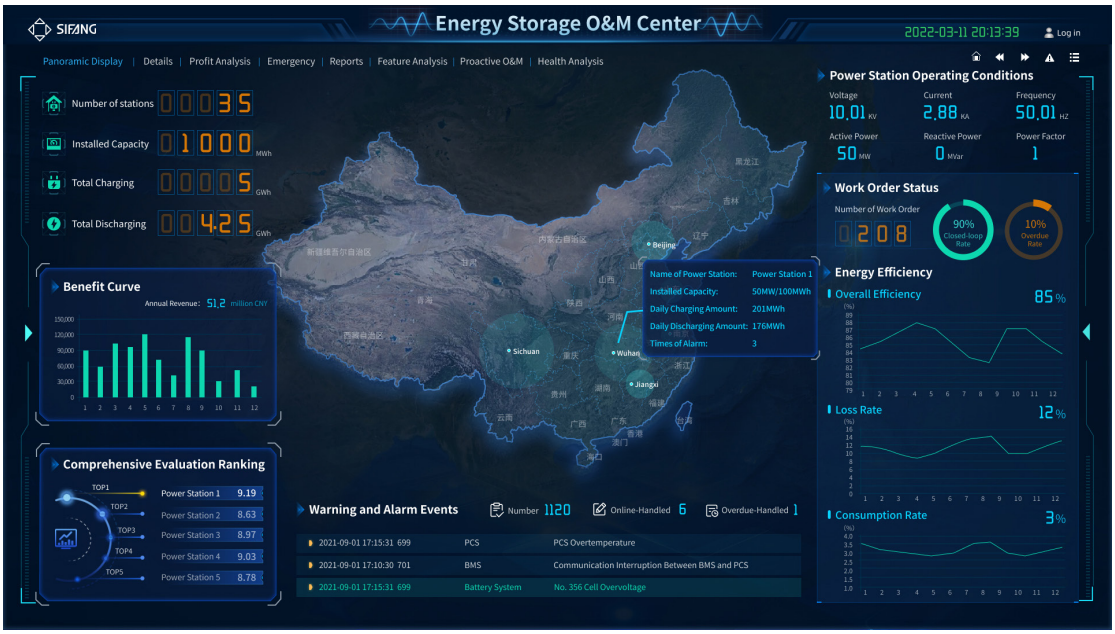
The energy storage cloud operation and maintenance platform enables remote centralized monitoring and maintenance of the operating status of various energy storage stations. Utilizing digital information technology, IoT technology, cloud computing technology, and data analysis technology, it offers five core applications: panoramic monitoring, fault diagnosis and warning, operational characteristic analysis, emergency response plan management, and intelligent operation and maintenance management. This enhances the efficiency of energy storage station operations and maintenance, reduces O&M costs, and improves return on investment.

## Core Functions:

- The platform utilizes 3D graphics to present a panoramic view of energy storage stations, providing a multi-level monitoring interface navigation for maintenance personnel based on application scenarios.
- It computes vast amounts of historical data collected from the big data platform, pushing alert events at different levels to meet the production analysis needs of various departments.
- Emergency response plans are automatically triggered based on alert information and related details of events, quickly communicated and published through SMS, phone calls and other methods.
- The intelligent operation and maintenance platform allows maintenance personnel to perform on-site work through applications such as online fault troubleshoot, online knowledge databases, and online work instructions.

## Features:

- Achieve real-time notifications of panoramic data through multiple channels, providing alerts for critical events and ensuring comprehensive intelligent monitoring.
- Utilize various information and intelligent technologies, such as fault work orders, maintenance task lists, and equipment dynamic history management, to help maintenance personnel quickly identify and resolve faults and report defects, aiming for a lean team and efficient operations.
- Implement battery state monitoring and early warning technologies to proactively identify potential hazards.



# 02 POWER CONVERSION SYSTEM

Power Conversion Systems (PCS) are devices that connect battery systems to the grid, enabling bidirectional energy conversion and allowing for control and management of battery charging and discharging. When integrated with an energy management system, they can facilitate "peak shaving and load leveling" as well as "fast frequency regulation," effectively smoothing the volatility of intermittent renewable energy sources like wind and solar power. Additionally, they provide reactive power support. During island mode operation, PCS can deliver stable voltage and frequency to loads and other distributed energy sources within the island.

Sifang's grid-forming control technology enables PCS to operate with characteristics similar to synchronous generators, featuring inertia characteristics, frequency and voltage regulation capabilities, as well as on-grid and off-grid operation functionalities. This effectively meets the new power system's demands for energy balance and synchronous voltage sources, demonstrating outstanding grid performance.

## 02-1 LV PCS

Sifang's low-voltage PCS utilize two technological approaches: modular and centralized. The modular PCS has a single module capacity of 90 kW, allowing for flexible configurations ranging from 90 kW to 1 MW. The typical capacity of centralized converters is 630 kW and 1.7 MW.

**Features:**

- Advanced three-level topology with a maximum efficiency of 99%.
- Fast power response with charging and discharging conversion times of less than 20 ms.
- Features include Virtual Synchronous Generator (VSG), Voltage Frequency (VF), Power Quality (PQ), black start capability, low and high voltage ride-through, voltage damping, and rapid frequency regulation, providing strong adaptability to the grid.
- High-speed communication with various options, integrating RS485, CAN, and fiber optic interfaces, and supporting the IEC61850 protocol.
- Equipped with anti-islanding protection to ensure grid operational safety, along with comprehensive protection features for overcurrent, overtemperature, overvoltage, and lightning grounding.


Modular PCS


Centralized PCS

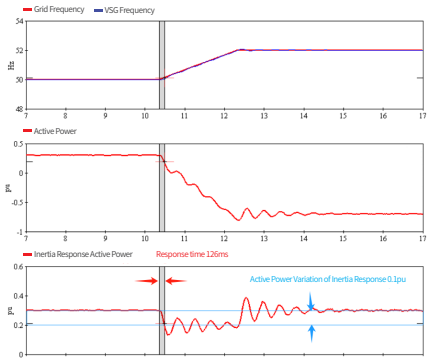
| Parameter | CSD-5831A | CSD-5831B | CSD-5831C |
|---|---|---|---|
| Maximum DC power | 1403kW | 1936kW | 3871kW |
| Maximum DC current | 1403A | 1936A | 3871A |
| DC voltage operating range | 1000V-1500V | 1000V-1500V | 1000V-1500V |
| AC output power | 1250kVA@ 45°C<br>1375kVA@30°C | 1725kVA@ 45°C<br>1898kVA@30°C | 3450kVA@ 45°C<br>3795kVA@30°C |
| Dimensions(W*D*H) | 1080×1300×2400mm | 1080×1300×2400mm | 2300×1300×2400mm |
| Total weight | 1350kg | 1500kg | 2800kg |
| Maximum operating altitude | 5000m (customized above 3000m) | | |
| Permissible ambient temperature | -35°C ~60°C (operation reduced above 45°C ) | | |
| Maximum efficiency | 99% | | |
| Overload capacity | 1.1 times continuous, 1.2 times for 1 minute | | |
| Communication interface | RS485, CAN, Ethernet, optical port | | |
| Communication protocol | CAN2.0B, Modbus, IEC61850, GOOSE | | |
| Protection level | IP55/IP65 | | |

# 02-2 Grid-Forming PCS

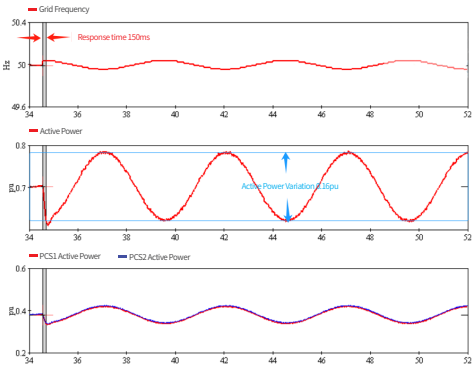
Grid-forming PCS can enhance system inertia, stabilize voltage and frequency, strengthen power supply, accelerate fault recovery, improve wide-frequency damping, and reduce oscillation risks.

## Features:

- **Stability of Systems:** Employing self-synchronizing voltage source outer loop control technology to address stability issues.
- **Voltage Source AC Fault Ride-Through Control:** Utilizing virtual impedance modeling technology to develop a control strategy for voltage source AC fault ride-through.
- **High-Frequency Oscillation Suppression:** Implementing unique nonlinear filtering techniques to optimize PCS impedance characteristics.
- **Stable and Reliable:** Capable of handling three times the rated current for 10 seconds for short-term overload, equipped with wide-frequency oscillation suppression capabilities, and supporting Multiple units parallel black start and island operation functions.




Inertia response waveform




Damping control waveform

## CSD-5831F-A

| | | | |
|---|---|---|---|
| Maximum DC power | 2100kW | Maximum efficiency | 99% |
| Maximum DC current | 2100A | Connection method | Three-phase three-wire |
| DC voltage operating range | 1000~1500V | Overload capacity | 1.1 times long-term, 1.2 times 10 minutes, 3 times 10 seconds |
| Rated AC power | 700kVA@ 45°C | Permissible ambient temperature | -35°C ~60°C (operation reduced above 45°C ) |
| Maximum AC power | 2100 kVA | Maximum operating altitude | 5000m (customized above 3000m) |
| Maximum AC current | 1757A | Noise | 80dB |
| Rated output voltage | 690V | Dimensions(W*D*H) | 1080×1250×2400mm |
| AC voltage range | 607~759V | Total weight | 1400kg |
| Rated grid frequency | 50/60Hz | Protection level | IP65 |
| Current total harmonic distortion | ＜ 3% (at rated power) | Cooling method | Intelligent forced air cooling |
| Reactive power range | -100% ~ 100% | Communication interface | RS485, CAN, Ethernet, optical port |
| Power Factor | >0.99 (rated output power)/ -1 (leading) ~ 1 (lagging) | Communication protocol | CAN2.0B，Modbus，IEC61850，GOOSE |

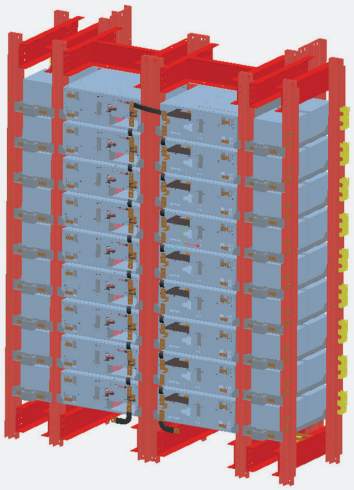
# 02-3 High Voltage Cascaded PCS

The medium and high voltage PCS is directly connected to the 6kV, 10kV and 35kV medium and high voltage AC systems. The product capacities contains 5MW~10MW for 10kV，and 20MW~40MW for 35kV.

## Features:

- Direct connection of medium and high voltage systems eliminates the need for transformers, resulting in high conversion efficiency ideal for large-scale energy storage applications.
- Reduces battery parallel connections, enhancing the safety of the battery system.
- Fast power regulation response with good consistency, facilitating frequency response adjustment.
- Automatic bypass for module faults, with dual redundancy in the control system, ensuring high system reliability.
- High space utilization with a small footprint.
- Supports IEC61850 protocol and fiber optic communication, featuring functions such as Virtual Synchronous Generator (VSG), Voltage Frequency (VF), Power Quality (PQ), and black start capability.

| Description | CSD-5805 |
|---|---|
| Rated Power (kW) | 5000kW |
| Max. Power (kW) | 5500kW |
| Rated Grid Voltage (V) | 3Phase 3Wire,10kV |
| Grid Voltage range (kV) | 8.5kV～11kV |
| Rated Frequency (Hz) | 50Hz |
| Total Harmonic Distortion of Current(THD) | <3% (Rated Power) |
| Charge and Discharge Transition Time (ms) | <20ms |
| Maximum Achievable Efficiency | 99% |
| Overload Capacity | 1.1 times for long term,<br>1.2 times for 10 minutes |
| Maximum Voltage of DC Module (V) | 1000V |
| DC Voltage Ripple Factor (%) | <2% |



High Voltage Cascaded PCS

# 03 COMMERCIAL & INDUSTRIAL ENERGY STORAGE SYSTEM

Equipped with Sifang's self-developed high-safety air-cooled PACK and PCS products, it offers flexible power configurations from 100kW to 500kW and supports multi-units parallel expansion. A distributed monitoring and energy management unit has been developed for user-side energy storage, ensuring stable and reliable operation with strong environmental adaptability, and supporting cloud-edge collaboration.

## Features:

- **Safety and Reliability:** The cabinet features excellent fire resistance, with fireproof side panels for isolation. It includes built-in smoke and temperature sensors and a fire protection system for real-time status monitoring.
- **Flexibility and Convenience:** The modular design allows for flexible configurations to meet various scene requirements. High integration enables plug-and-play functionality, reducing construction time.
- **Intelligent Temperature Control:** The cabinet employs bridge-breaking insulation technology for superior self-insulation performance, while the airflow system uses a patented bionic tree design for precise air distribution.


Commercial and industrial outdoor energy storage cabinet.

| Project description | Specifications | Description |
|---|---|---|
| Cell nominal capacity | 280Ah | |
| Battery cabinet nominal voltage | 768V | |
| Grouping method | 1P240S | 15 battery modules |
| Voltage range | 648~864V | |
| Stored energy | 215.04kWh | |
| Dimensions (Width*Depth*Height mm) | 800*1200*2320mm | |
| Charge/Discharge Rate | 0.5C | |
| Operating Temperature Range | Discharge: -20°C ~55°C ; Charge: 0°C ~55°C | |
| Cooling Method | Air Cooling | |
| Operating Temperature Range | -45°C～ +55°C | |
| Storage Temperature Range | -25°C～ +55°C | |
| AC Power | 90kW | Meets 1.1 times Long-term Operation |
| Fire Protection | Perfluorohexane/Aerosol Fire Suppression System | Cabinet-level Detection+ Cabinet-level Activation+ Cabinet-level Fire Suppression |
| Cloud Platform | Sifang IPOWER Cloud Monitoring Platform | |

# 04 Liquid-cooled Energy Storage Battery Pack

## LIQUID COOLED ENERGY STORAGE BATTERY MODULE

**CSD-5811-A**

Compatible with 280Ah/314Ah LiFePO Cells, single pack capacity up to 53.2kWh, adopting highly integrated and modular design, ensuring safe operation throughout the product lifecycle.


Liquid-Cooled Energy Storage Battery Module

### High reliability

Uses long-life thermal insulation and conduction materials with automotive-grade standards. The battery module has an IP67 rating and meets 8-degree seismic intensity requirements.

### High safety

New grid-based thermal insulation technology, directional pressure relief for flammable gases, graded protection design for electrical main circuits, and PACK-level fire protection and detection technology.

### Standardization

Standard-sized cell design with compatible module structure for battery modular assembly processes. Electrical design and assembly are standardized.

### Long lifespan

Uniformity control technology for module expansion force, bottom liquid cooling with dual serpentine channels, real-time SOC and SOH estimation technology, and intelligent charging/discharging control strategies for battery cells.

| Description | Specifications | Notes |
|---|---|---|
| Grouping method | 1P52S | |
| Rated Capacity (Ah) | 280 | Compatible with 314 Ah cells |
| Rated Voltage (V) | 166.4 | |
| Operating Voltage Range (V) | 130-189.8 | T ＞ 0°C |
| Recommended Operating Voltage Range (V) | 145.6-187.2 | T ＞ 0°C |
| Maximum Continuous Charging Power (kW) | 23.296 | |
| Maximum Continuous Discharging Power (kW) | 23.296 | |
| Energy Efficiency (%) | ⩾ 94 | 0.5P, 25±3°C |
| Self-discharge rate (%/month) | ⩽ 3 | BOL, 25±3°C , 50%SOC |
| Operating temperature | Charging: 0-55<br>Discharging: -20-55 | |
| Altitude (m) | <4000 | |
| Thermal management method | Liquid cooling | |
| Protection level | IP67 | Bottom cooling method |
| Product dimensions (mm) | 1160*810*248.5 | |
| Weight (kg) | 332±7 | |

# 05 CSD-5803/5804

# LIQUID COOLED ENERGY STORAGE CONTAINER

Sifang liquid cooling energy storage system, equipped with self-developed high-safety liquid cooling PACK, featuring a single cabin capacity of 3.35/5 MWh.

### High Integration

20-foot non-walk-in container with industry-leading overall energy density.

### Strong Safety

Capable of inter-cluster fire isolation and designed for effective flammable gas exhaust.

### Flexible Expansion

Three-sided maintenance access, support for container combination, and PACK module expansion.

### Intelligent Temperature Control

Parallel balanced liquid cooling pipeline design to effectively extend battery lifespan.


Liquid cooling energy storage container

## Parameter table

| | | |
|---|---|---|
| Model | CSD-5803 3.35MWh | CSD-5804 5MWh |
| Configuration | 416S9P (280Ah-52S1P*8) | 416S12P (314Ah-52S1P*8) |
| Rated energy | 3350kWh | 5016kWh |
| Rated voltage | 1331.2V | 1331.2V |
| Voltage range | 1164.8V-1497.6V | 1164.8V-1497.6V |
| Rated charge and discharge power | 0.5P | 0.5P |
| Size | 2500*6058*2896mm (20 feet) | 2550*6058*2896mm |
| Weight | 35 tons | 42 tons |
| Operating Temperature Range | -25° C to 55° C | -25° C to 55° C |
| Storage Temperature Range | -40° C to 60° C | -40° C to 60° C |
| Altitude | 3000m | 3000m |
| Structural form | Prefabricated cabin, non-walk-in | Prefabricated cabin, non-walk-in |
| Fire Protection | Perfluorohexane, cluster-level detection, PACK-level spraying | Perfluorohexane, cluster-level detection, PACK-level spraying |
| Communication Architecture | Three-tier Architecture | Three-tier Architecture |
| Communication interface | CAN/RJ45 | CAN/RJ45 |
| Communication protocol | CAN/Modbus/61850 (Dual Network) Dry Contact 1 Channel | CAN/Modbus/61850 (Dual Network) Dry Contact 1 Channel |

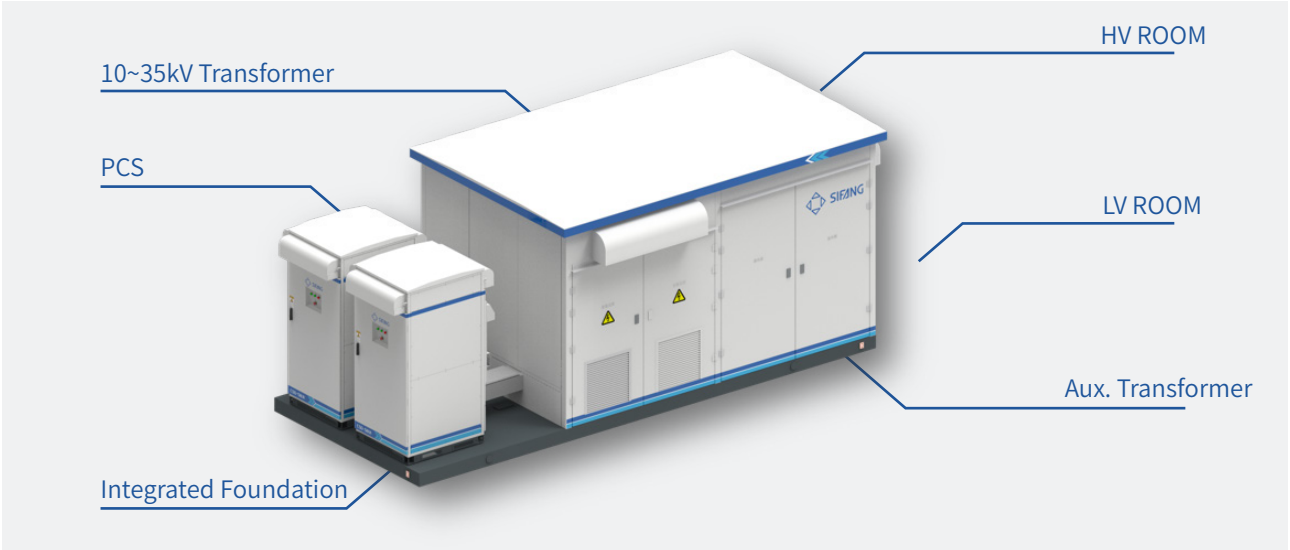
# 06 INVERTER BOOSTER INTEGRATED MACHINE

Integrate inverter and transformer in one station, Integral commissioning from the factory, saving time for on-site installation

- **Efficient:** System efficiency exceeds 99%, making it highly efficient and industry-leading.
- **Flexible:** Comprehensive communication protocols suitable for various interfaces, with a wide range of application scenarios.
- **Reliable:** IP54 protection rating, ensuring excellent protective performance.
- **Safe:** The inverter and transformer components are relatively independent, allowing for partial isolation during fault handling.

## Parameter table

| | | | |
|---|---|---|---|
| DC-side parameters | Maximum DC voltage1500V | transformer | Transformer Vector Group Dry-type transformer |
| | DC voltage range1000V-1500V | | Rated power of transformer3450kW |
| | Maximum DC current1936A | | Voltage ratio0.69 (/ 10~35) kV |
| | Number of DC access routes2 | System characteristics | Protection level IP54 (inverter IP65) |
| AC-side parameters (grid connection) | Rated AC power 3450kVA@ 45°C 3796kVA@30°C | | Cooling method Intelligent forced air cooling |
| | Rated output voltage(10~35) kV | | Communication interfaceRS485, CAN, Ethernet, optical port |
| | Rated grid frequency50/60Hz | | Communication protocol CAN2.0B, Modbus, IEC61850, GOOSE |
| | Current total harmonic distortion < 3% (at rated power) | | Suitable for altitude.4000m (customizable above 2000m) |
| | Power Factor>0.99/ -1 (advanced) ~1 (lagging) | | Dimensions (W*H*D,mm) 7200×3000×3000 |
| AC-side parameters (off-grid) | Rated output voltage690V | | Total weight 18t |
| | AC voltage range607-759V | | Overload capacity 1.1 times continuous, 1.2 times for 1 minute |
| | Voltage Total Harmonic Distortion <3% (linear load) | | Permissible ambient temperature-35°C ~60°C (operation reduced above 45°C ) |
| | Rated Output Frequency50/60Hz | | Maximum efficiency99.1% |



# ENERGY STORAGE PACK PRODUCTION LINE AND LABORATORY

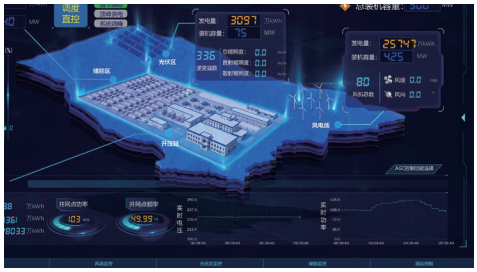
The energy storage PACK production line has a cadence of 12 ppm, achieving an annual production capacity of 2 GWh per shift. It facilitates automatic cell stacking, module welding, module DCR testing, leak testing, and product transfer, and is compatible with both liquid-cooled and air-cooled PACK production. The line is equipped with an MES system that real-time monitors and uploads key process parameters, testing data, and equipment parameters, enabling comprehensive quality monitoring, recording, and traceability throughout the entire process.

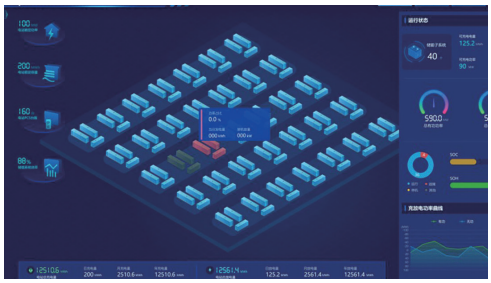
The energy storage laboratory covers an area of 400 square meters and is equipped with advanced battery and BMS testing equipment as well as environmental simulation devices. It has the capability to test battery cells, battery modules, and battery management systems. The laboratory provides comprehensive reliability testing and verification services for energy storage products, offering reliable data support for product functionality verification and R&D testing. In conjunction with our Laboratory Information Management System (LIMS), an efficient and interconnected workflow allows for the rational allocation of laboratory resources, further enhancing testing efficiency.

# TYPICAL PERFORMANCE

## Three Gorges Ulanqab New Generation Grid-Friendly Green Power Station Demonstration Project

The project has a total scale of 2000 MW, including 1700 MW from wind power and 300 MW from solar, along with a supporting 550 MW/1100 MWh energy storage system. Sifang provides the overall solution for the energy storage step-up substation's equipment system (140 MW/280 MWh) for the first phase of the project, as well as a centralized smart integrated control center.





## Laiwu Mengjia 100MW/200MWh Energy Storage Project

The project is one of five shared energy storage demonstration projects in Shandong in 2021.It contains 40 energy storage units of 2.5MW/5MWh and 160 PCS.Sifang provides energy management system and substation automation system for the project, realizing panoramic monitoring, intelligent alarm, and efficient control of the energy storage power station, empowering high-quality peak shaving and frequency regulation for the power station.

## Hebei Xinle Photovoltaic plus Energy Storage Project

The energy storage system and substation secondary equipment of the project are integrated and supplied by Sifang. The provided energy storage system consists of six 3.45MW/6.7MWh energy storage units, with a total capacity of 20MW/40MWh, which can effectively solve the intermittency and volatility issues of photovoltaic power generation and achieve off-peak and peak electricity usage.

## Zhejiang Ningbo Combined Thermal Power and Energy Storage Frequency Regulation Project

This project is with a total capacity of 20MW/20MWh. After the equipment is put into operation, it will significantly improve the AGC regulation capability of power plant generators and enhance the reliability and safety of the power grid.

## Shenzhen Baoqing MW-Level Lithium Battery Energy Storage Station

This project is the world's first lithium-ion battery energy storage station for peak shaving and frequency regulation, and the first megawatt-level battery energy storage station in China. With a total capacity of 10 MW/22 MWh, the supply range includes the entire station's CSGC-3000 energy management system and PCS.


## High Voltage Cascaded Energy Storage Project

This project features large-capacity high-voltage cascaded battery storage for scalable applications, with a capacity of 6 MW/11.2 MWh. It employs a compact design, allowing it to function as a large mobile energy storage station with plug-and-play capability.



## Baotang Grid-Side Energy Storage Station, Foshan, Guangdong

Sifang supplies two sets of 10kV/5MW/10MWh HV cascaded battery energy storage systems, showcasing the technology of HV directly connected storage systems competing alongside various other technological routes.

## Nanji Island Off-Grid Wind-Solar-Diesel Energy Storage Integrated System Project

The Nanji Island project is China's first megawatt-level off-grid renewable energy demonstration project and one of the two demonstration projects under the National 863 Program on "Key Technologies for Microgrids with Distributed Generation." Sifang Company's supply includes the CSGC-3000 energy management system and 3 MW PCS.

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