

广州智光储能科技有限公司

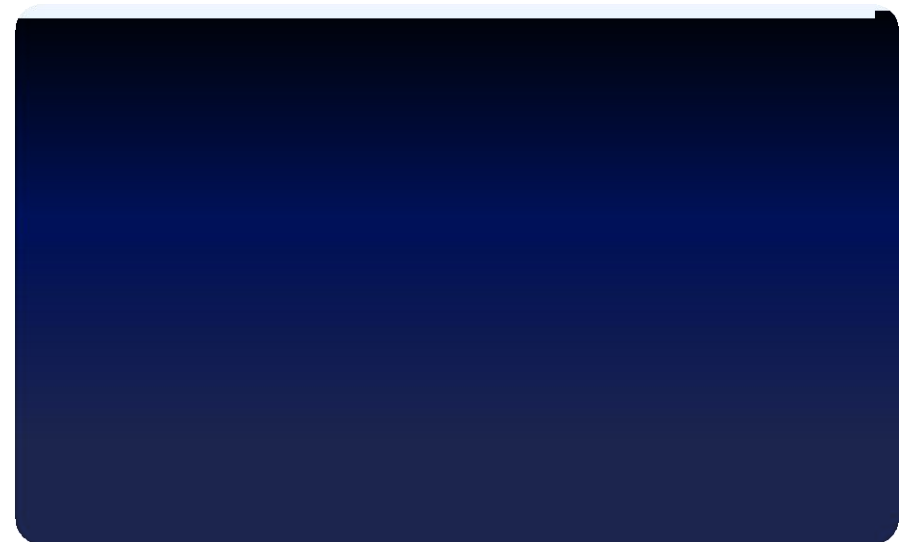
GUANGZHOU ZHIGUANG ENERGY STORAGE TECHNOLOGY CO., LTD.

2022 ()

CONTENTS









- Guangzhou Zhiguang Energy Storage Technology Co., Ltd., established in 2018, is a holding subsidiary of Guangzhou Zhiguang Electric Co., Ltd. [hereinafter referred to as Zhiguang], and is an important layout of Zhiguang in the strategic development direction of digital energy technology and integrated energy services. The company makes full use of the parent company's more than 20 years of research and application experience in power electronics technology, automation, and information technology, and smart energy technology, actively introduces senior research teams in the battery industry, widely carries out domestic and international university cooperation, and builds a professional research team in the fields of the battery pack, BMS, EMS, and PCS.
- The company not only provides services including energy storage investment, energy storage system integration, energy storage equipment sales, etc., but also provides core key technologies and equipment such as energy storage battery PACK integration, BMS, PCS and EMS, and can provide battery cell and battery PACK testing technology services.
- The company's energy storage product lineup includes power station-type large-capacity energy storage systems (cascaded high-voltage energy storage), demand-side energy storage systems (modular low-voltage energy storage) and mobile energy storage products.



Committed to the research and application of industrial technology in the field of energy storage



Guangdong Province, Guangzhou renewable energy industry energy storage leading enterprises

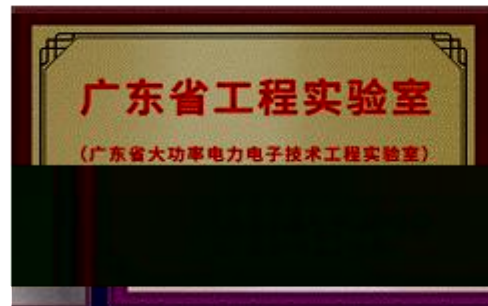
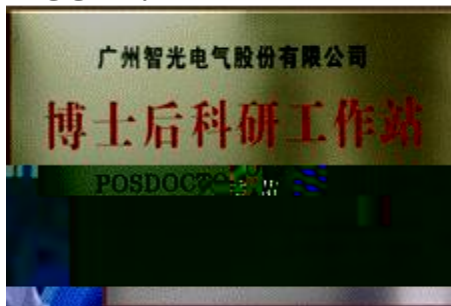


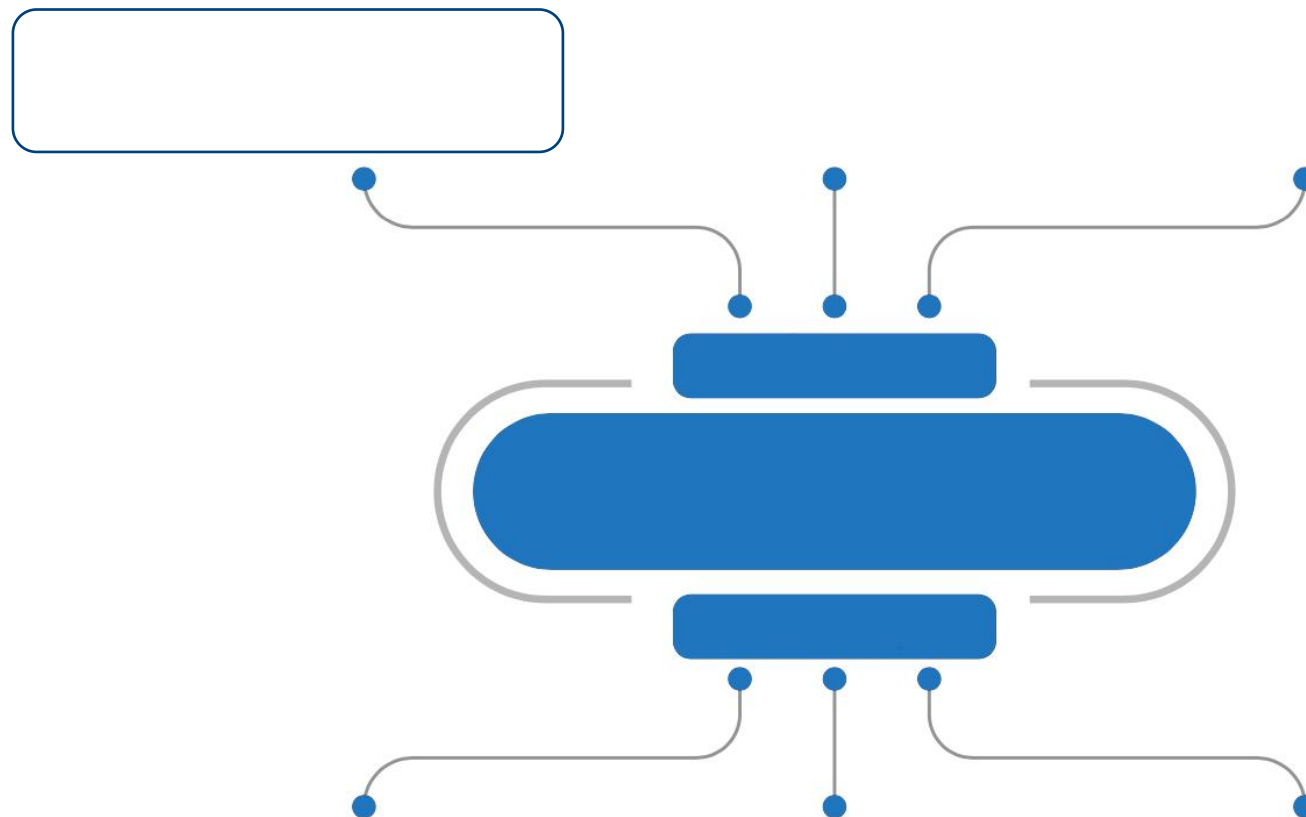
The first international cascaded high-voltage energy storage system, is the National 863 research project, developed by the company which is the international-leading level, leading the development of safe and efficient large scale energy storage technology.





- ◆ The core support unit of the postdoctoral workstation of the joint-stock company.
- ◆ The world's first cascaded direct high-voltage large-capacity energy storage technology, and identified as the international leading level.
- ◆ Guangdong Provincial Development and Reform Commission high-power power electronics engineering laboratory is the only listed unit.
- ◆ 10MW energy storage system stand-alone testing capability, 6~35kV large-capacity high-voltage laboratory, complete high-voltage power supply test conditions .
- ◆ The service and operation experience of high-power power electronic products in more than 30 countries around the world has more than 15,000 sets of high-power power electronic equipment with high temperature, low temperature, high altitude, high temperature difference, coastal and other climatic characteristics in more than 15,000 units of high-power power electronic equipment with voltage level of 6-35kV.









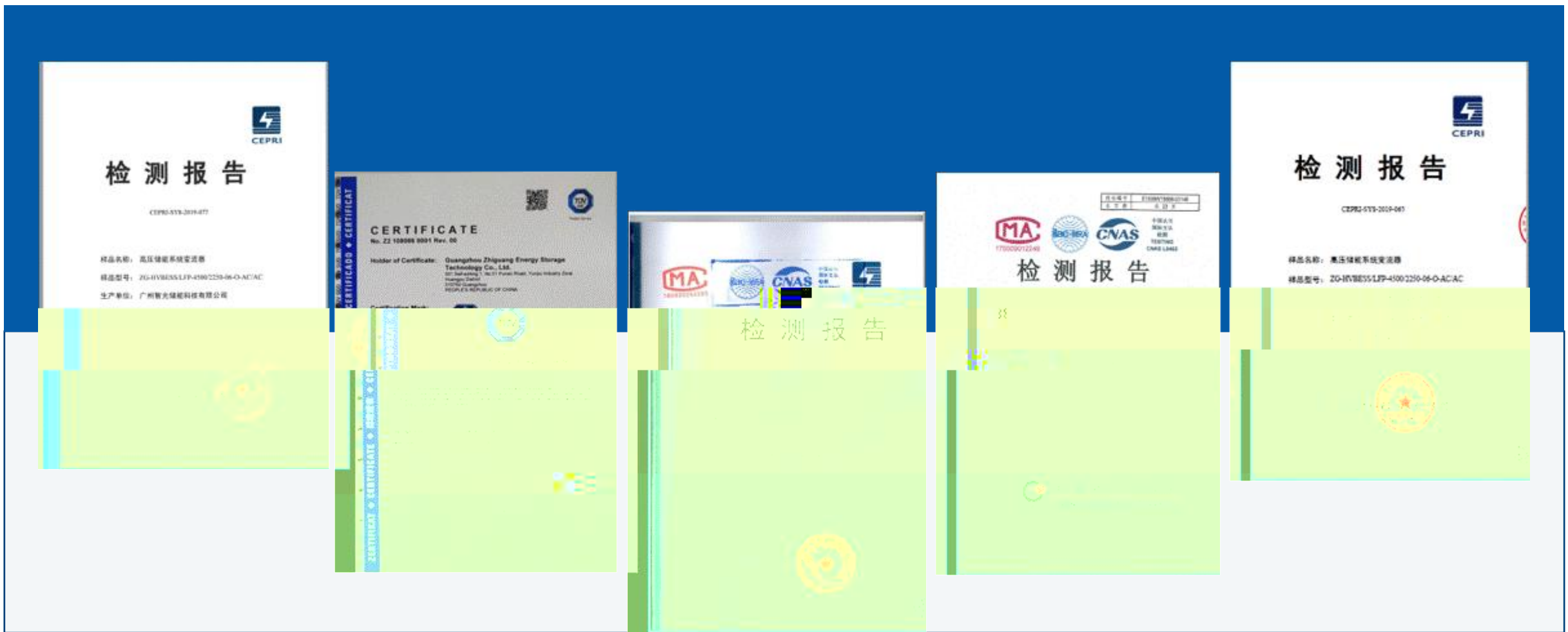
- 2018 the best system integration solution provider of Energy Storage in China.
- 2018 the best inverter supplier of Energy Storage in China.
- 2019 The best system integration solution provider in China's energy storage industry.
- 2019 The most influential enterprise in China's energy storage industry.
- 2019 Top 10 Energy Storage PCS Enterprises in China.
- 2019 The Third International Energy Storage Innovation Competition, "Energy Storage Technology Innovation Model TOP10".
- 2019 The winner of the 8th China Innovation and Entrepreneurship Competition (Guangzhou).
- 2020 Top 10 Energy storage PCS Enterprises in China.
- 2020 Top 10 Energy storage integrators in China.
- 2020 Energy Storage Cutting-Edge Enterprise Award.
- 2020 China energy storage industry most influential enterprise.

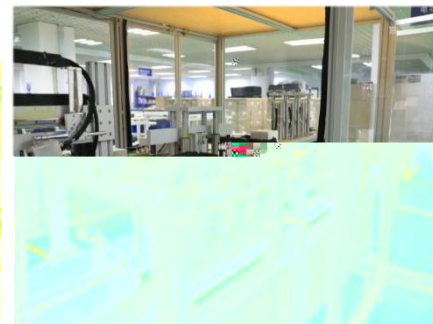
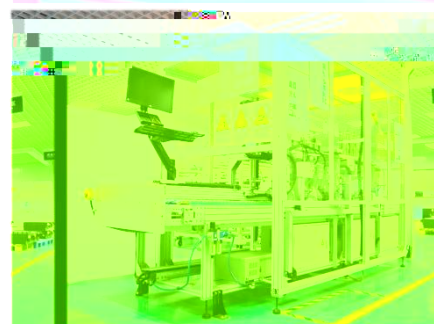
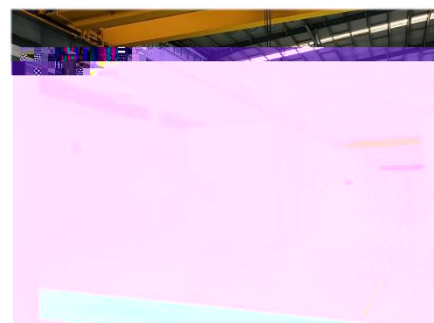
Technology patent accumulation

Formulate national and industry standards

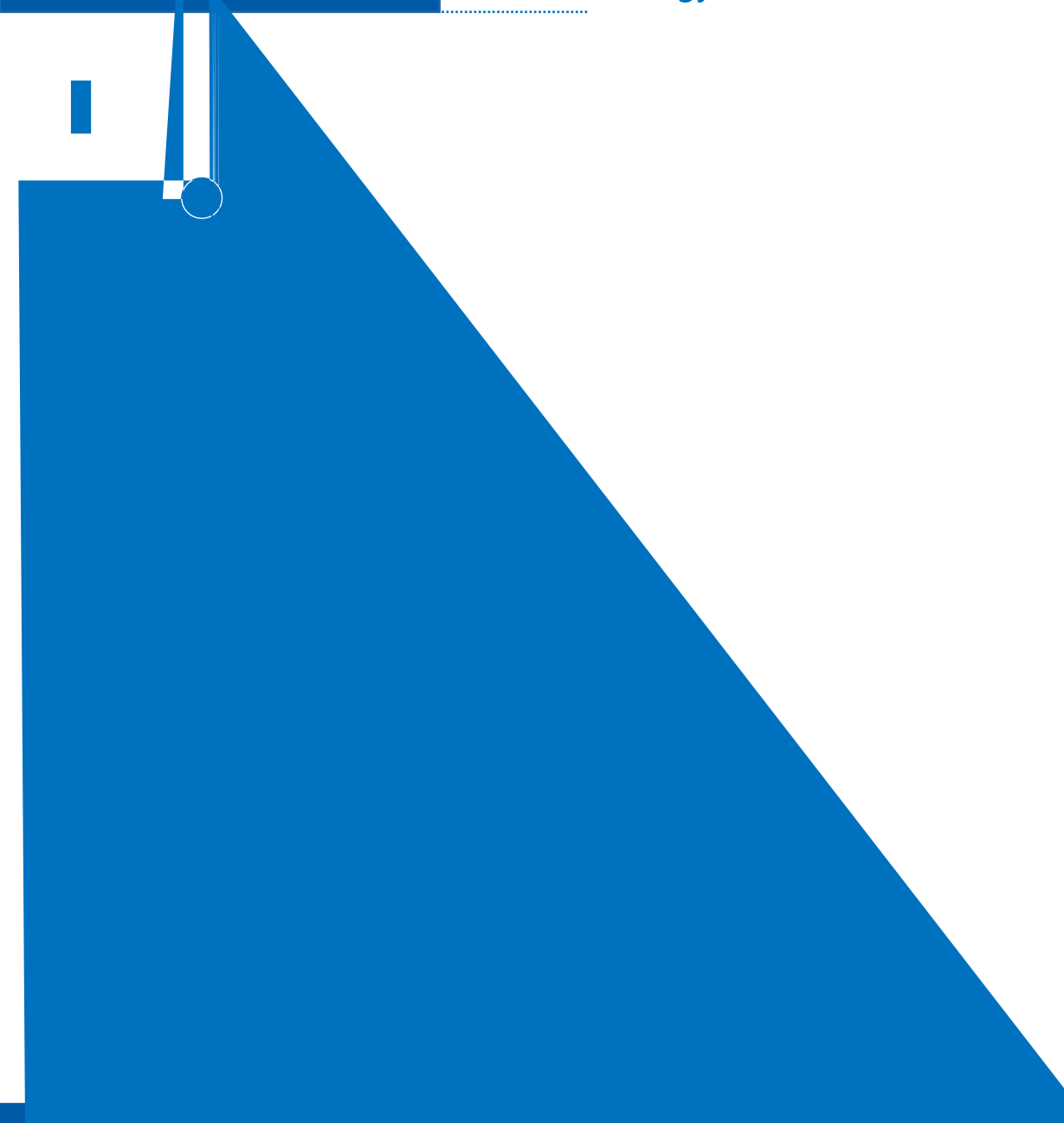


Before Guangzhou Zhiguang Energy Storage Technology Co., Ltd. was founded in 2018 , has already applied for more than , and was responsible for drafting or participating in more than before the end of 2021.





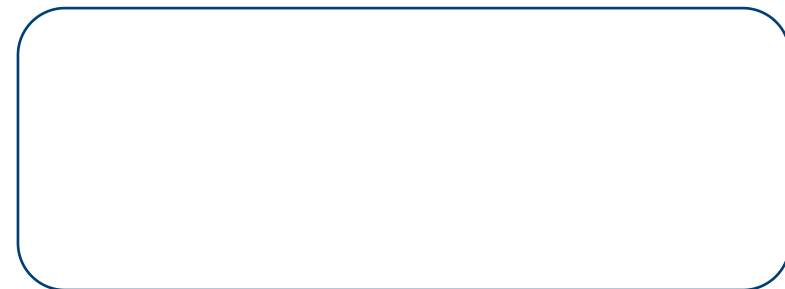








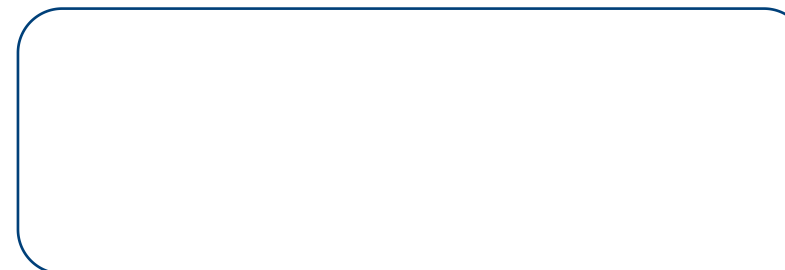
Cascade high voltage
large capacity energy
storage system



Modular Low
voltage energy storage
system



energy storage system
power guarantee and
battery operation and
maintenance



- The first batch of science and technology innovation (energy storage) .
- The first prototype creator with leading technology in the world, initiator and Pioneer of Cascaded High-voltage Large-capacity Energy Storage Technology, unique battery system application solutions.

The 6-35kV cascade high voltage energy storage system adopts the leading H-Bridge cascade power electronic topological structure in China. It can direct access to 6-35kV high voltage power grid without a transformer by several energy storage units and boost voltage through AC in series connect. which can reach 25MW power rating. It has repeatedly updated the single capacity record in the storage market. The efficiency of the whole energy storage system is 90~91%, which is the only technology in the world where the electrochemical energy storage cycle efficiency exceeds 90%. The product has the characteristics of no parallel connection on battery cell to cluster with the high power rating, high safety, high battery capacity utilization, and high efficiency, which can save more than 10% of the construction cost of a large energy storage power station.



Cascade High Voltage Energy Storage System



	8×630kW	1×5MW	Large capacity, simple control
	0.4kV or less	10kV	Transformerless, high efficiency
	6	1	No Cluster Parallel Connection, high safety
	1161kWh	193kWh	Less battery capacity management, high safety
	> 1300	224	No battery parallel connection
	Due to the influence of operating temperature difference, resistance difference of battery cluster, and other factors, the consistency of cell operation is affected, part of the cell will be overcharged or discharged, and the degradation battery will accelerate.	No parallel connection on battery cluster. No influence on resistance difference of battery clusters, strong consistency. The cluster degradation slow	High battery consistency, battery cluster lifecycle is almost the same as a single battery cell, battery cell overcharge avoids
	< 80%	90%	Battery installation capacity reduce 10% , investment cost saving
	Yes	No	Transformerless, high efficiency
	2(2.5MW per Unit)	1	20% construction and grid connection costs saving
	~85%	≥90%	High efficiency
	100ms	<5ms	Fast response, strong grid support
	Difficult to coordinate multiple machines in parallel	Easy, direct control ESS	Easy to control, simplify equipments and improving reliability

Due to the retirement battery having a unified voltage, and discretization parameter, under the standardization design and commercial customer requirement, a modular ESS system is necessary for development, which uses small rating PCS to achieve cluster level direct control. It can avoid parallel connection and solve cluster circulation current issues and minimize the potential risk, and achieve active equalization to balance the cluster energy balance.

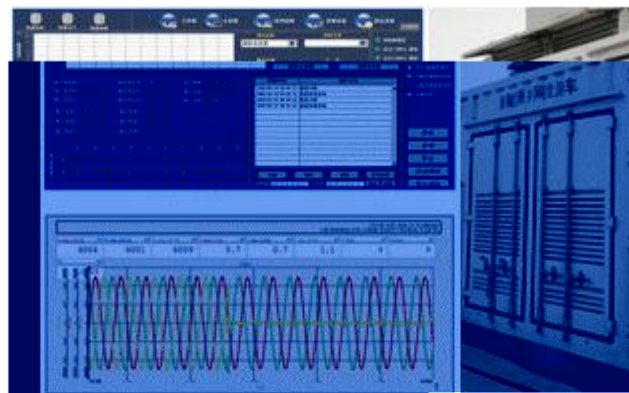
This modular ESS (standard capacity: 250kW/500kWh) can expand by parallel connection on the AC side and can support DC 1000V and 1500V with 60kW, 125kW, and 180kW diversified power ratings.



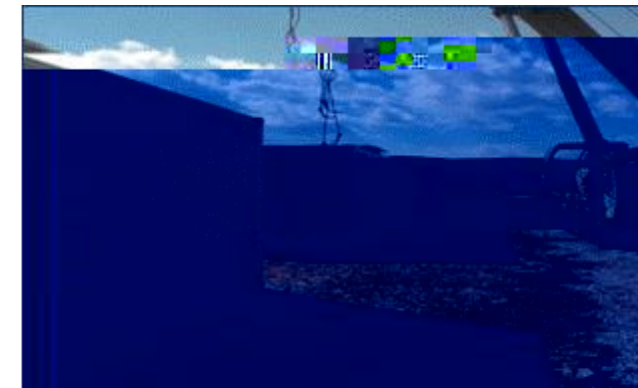
Modular LV ESS System



移动式储能测试平台



6/10kV/6MVA 储能测试平台



35kV/4MVA新能源测试平台

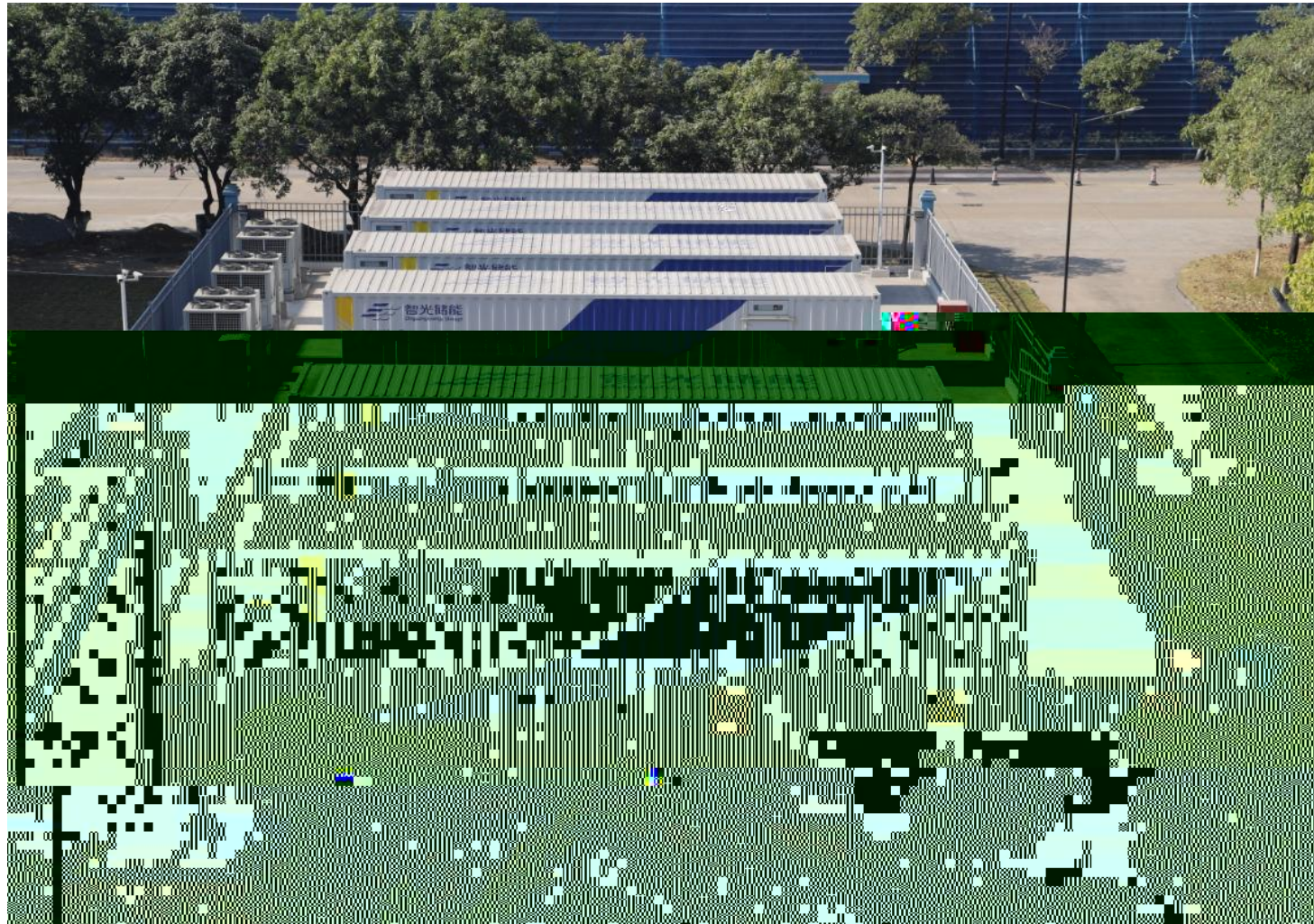
The mobile energy storage test platform, with a four-quadrant converter as the core, has such functions as high and low voltage ride through, grid adaptability (frequency, voltage, and power quality adaptability (harmonics, internal harmonics, fluctuation and flicker, and three-phase unbalance)), and primary frequency modulation test ability. The mobile energy storage test platform adopts the H-bridge cascading topology, which has high amplitude and frequency accuracy of output voltage and low harmonic. The platform adopts a special rainproof structure design, which can operate all day without being affected by rain or snow. A voltage and current acquisition interface are reserved on the platform, which can integrate the test recording instrument and automatic test report analysis software for convenient testing. The platform takes 10kV/6kV as the core and can expand to 35kV, 600V, 400V, and other voltage levels according to customer requirements.

The company has provided large-scale high-voltage test power supply devices for China Southern Grid Technology Co., Ltd. and China Electricity Research Institute of State Grid, which are the two major power grid companies in China.

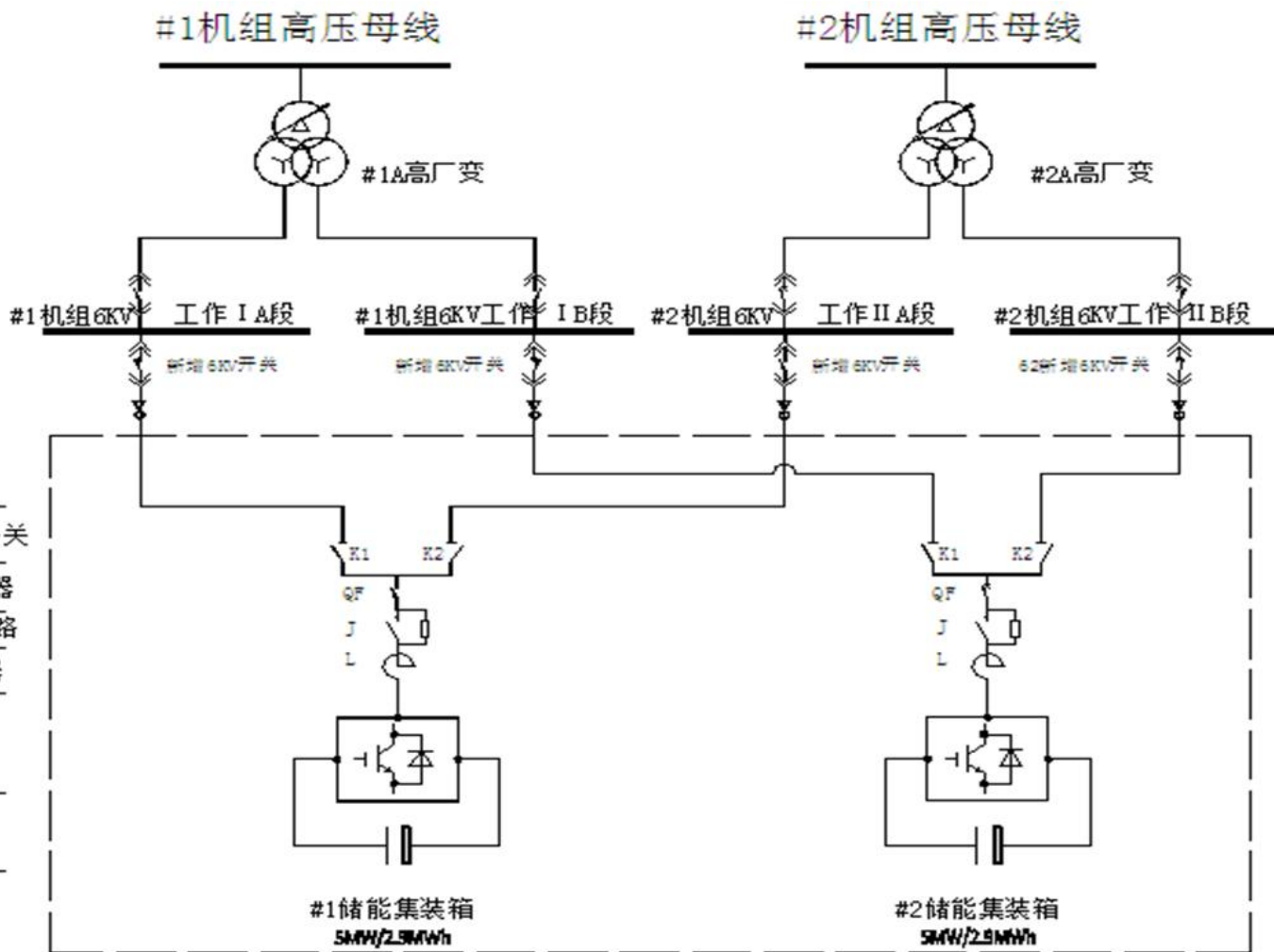




- Zhiguang cascade high-voltage energy storage system has been applied to the State Grid, China Southern Power Grid, Huaneng Group, Huadian Group, CTGNE, China Energy Group, Guangdong Energy Group, and other customers, and the cumulative construction and commissioning projects by the end of 2021 exceed 400MW/450MWh. The project of Desheng Power Plant (Wusha Power Plant) in Shunde, Guangdong province was included in the first batch of scientific and technological innovation demonstration projects of the National Energy Administration.
- In 2022, the company successfully researched and developed 35kV cascading high-voltage energy storage, with 20MW/40MWh and the round trip efficiency is up to 91% which provides a more efficient, safe, and simple energy storage power station solution for large-scale shared energy storage power stations.
- Zhiguang has been leading the development of cascade high voltage and large capacity energy storage technology.

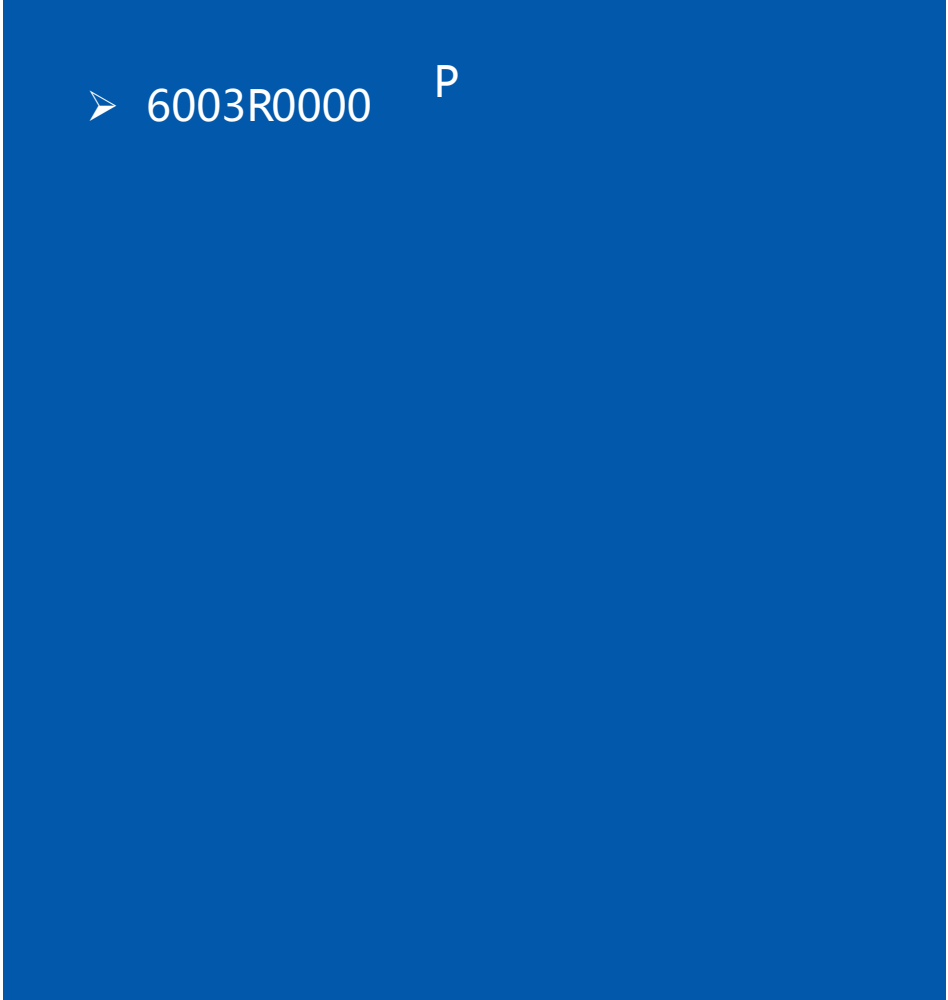


- 330MW Frequency modulation of coal power plant
- COD by 2019.11
- 9MW/4.5MWh
- AGC and Primary frequency modulation
- Maximum K-value up to 2.9
- GB/T36548-2018 test complete with excellent performance



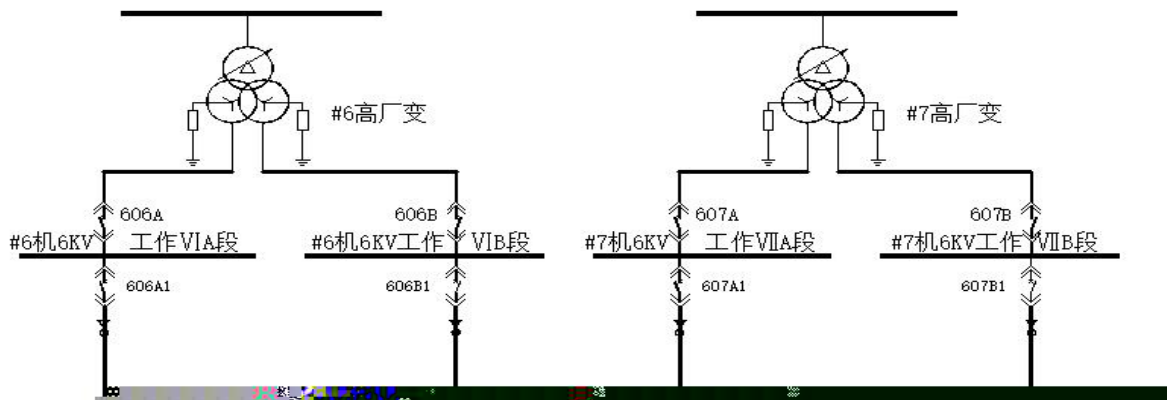
The total scale of the ESS for auxiliary frequency modulation in the coal power plant is 9MW/4.5MWh, consisting of six battery and power conversion containers and one central control container.

The energy storage system is connected to coal power plant unit 1 and unit 2 through the 6kV cable to the transformer Section A and B busbar. Through rapid and accurate charging and discharging, the secondary frequency modulation performance is greatly improved, and improve the frequency modulation income.



➤ 6003R0000 P





The total scale of the ESS for auxiliary frequency modulation in the coal power plant is 20MW/10MWh, consisting of 12 battery and power conversion containers, 2 central control containers and 1 master control container.

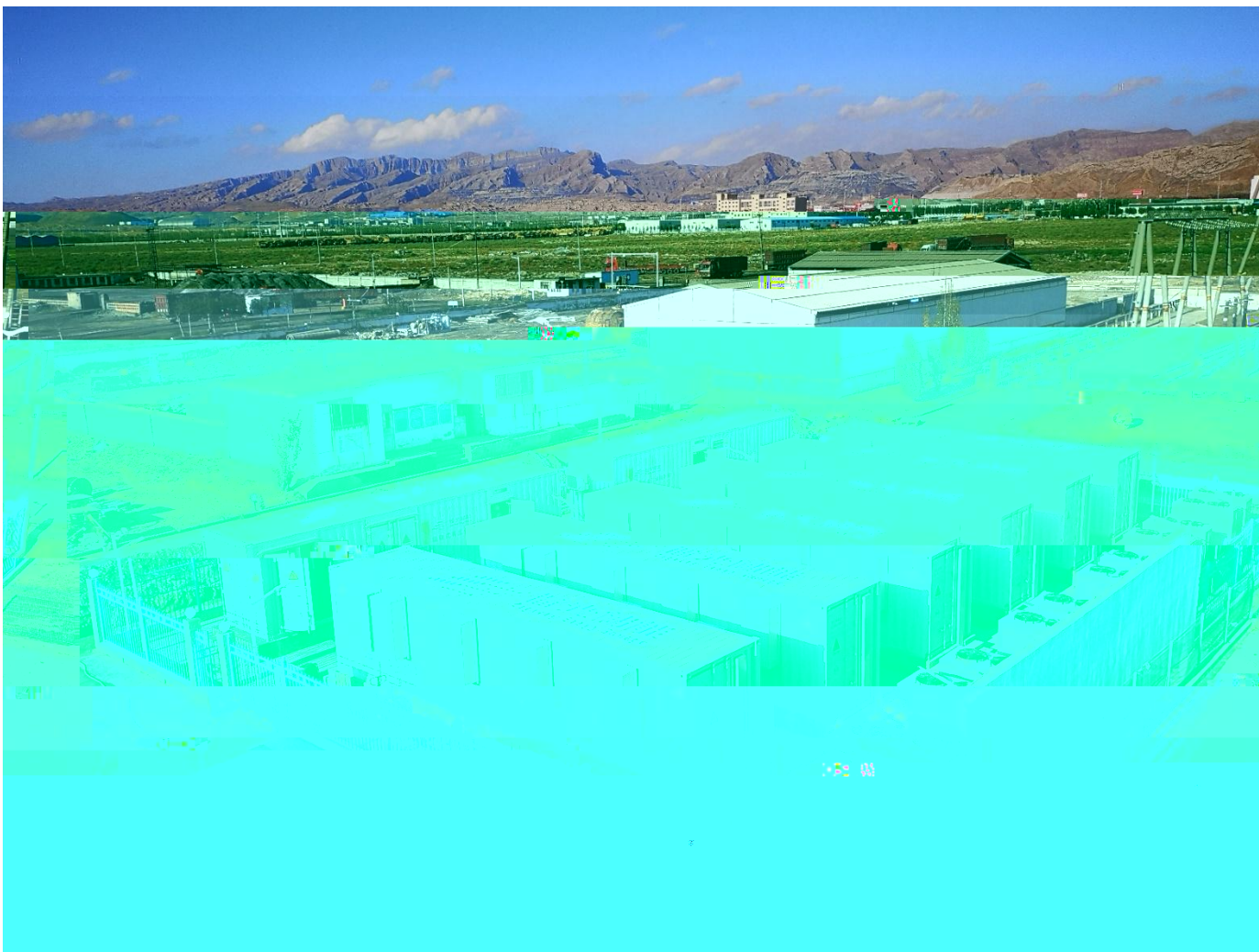
The storage system is connected to coal power plant unit 6 and unit 7 through the 6kV cable to the transformer. Through rapid and accurate charging and discharging, the secondary frequency modulation performance is greatly improved, and improve the frequency modulation income.



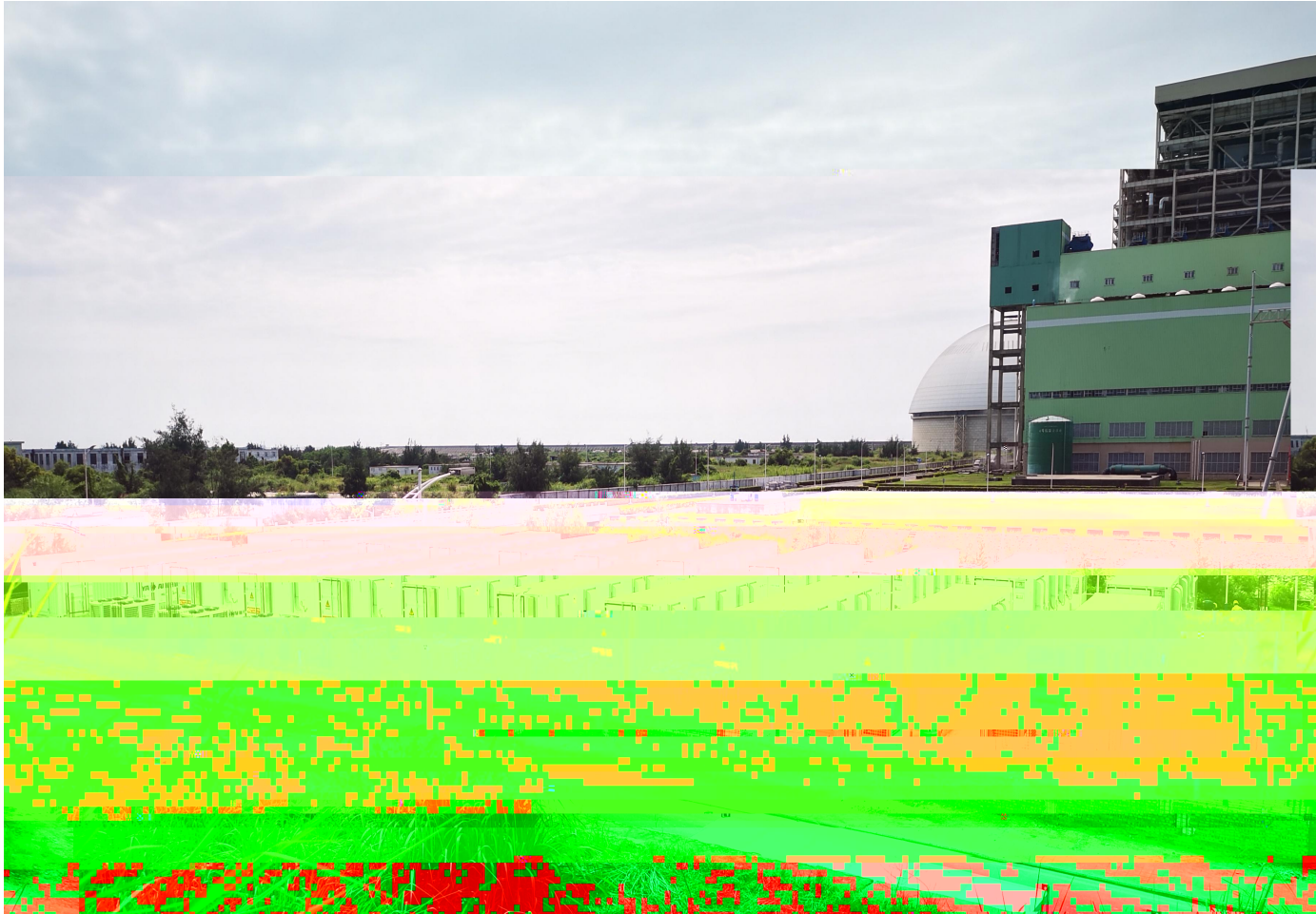
➤ 10MW/10MWh

➤ AGC,

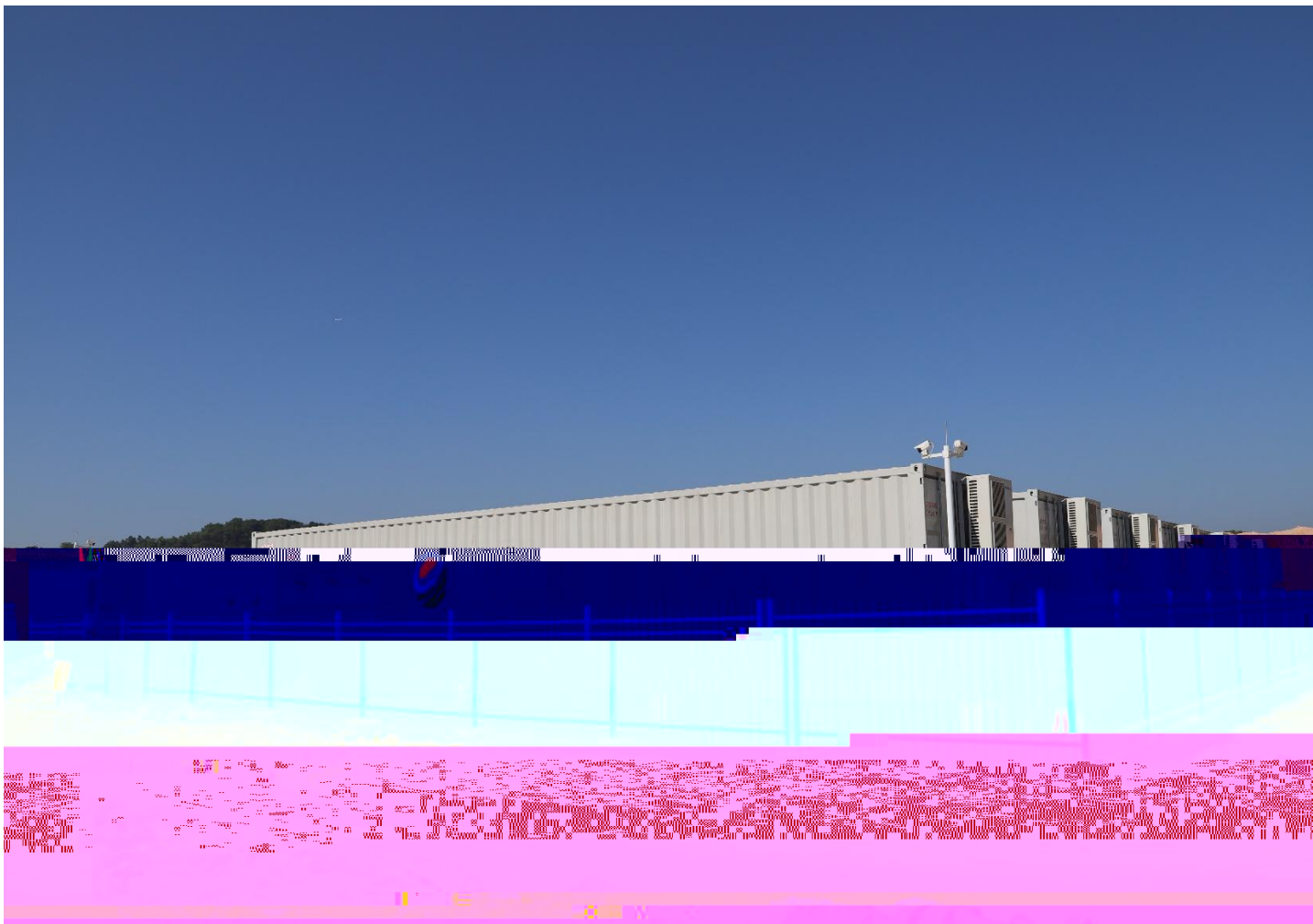
➤



- 9MW/4.5MWh
- AGC and
- First time applying the cascaded energy storage system in the cold region of north China

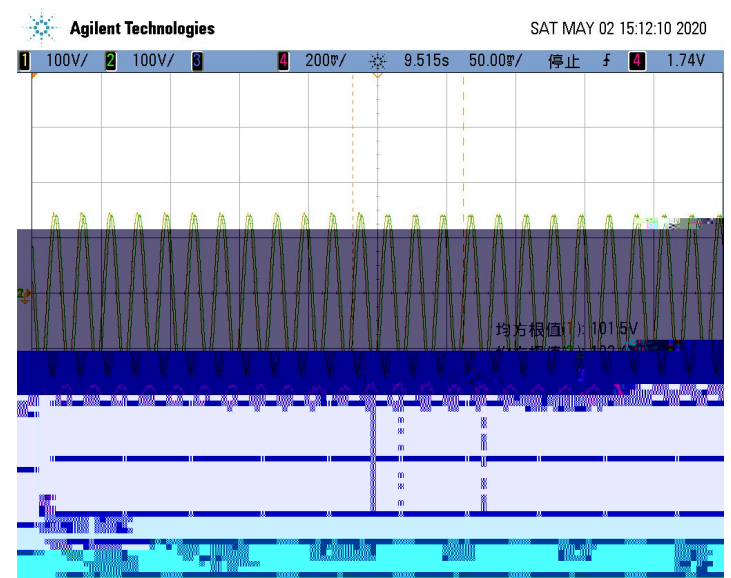
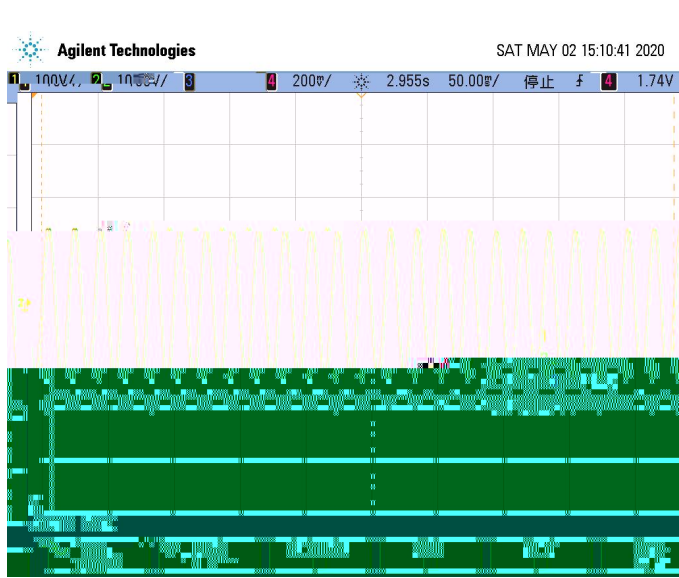


- 30MW/15MWh, new record of the cascaded high voltage energy storage system
- AGC and
- 1000MW Coal Power Plant frequency modulation



➤ 10MW/20MWh





The upper waveform here is the output voltage of the energy storage system, and the red and purple waveforms are the load current

- Seamless switching without disturbance
- Black-start operation
- It can support peak-load shifting and demand side response to save electricity



- 10MW/20MWh
- The first COD of hunan Power Grid Phase II renewable ESS project
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