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PINGGAO GROUP CO., LTD.



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Energy Storage System 储能系统

Henan, China
中国·河南

ABOUT PINGGAO

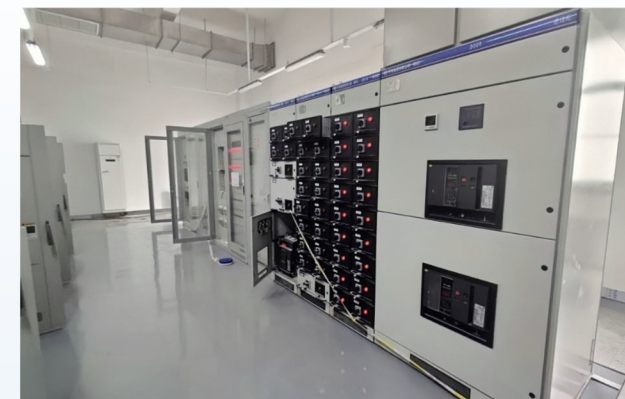
公司简介

Pinggao Group Co. Ltd, founded in 1970, it is the R & D and manufacturing base of China's medium and low voltage, high voltage, ultra-high voltage and ultra-high voltage switch major equipment. After 50 years of development, Pinggao ' business scope covers research and development, design, manufacturing, sales, testing, complete sets of related equipment, service and EPC. Meanwhile , Pinggao is actively developing new businesses such as operation, maintenance, GIL, power energy storage, integrated energy and so on.

As the pioneer and vanguard of large-scale electric energy storage technology in China, Pinggao has constructed and operated successively multiple energy storage projects in in Beijing, Tianjin, Henan, Jiangsu, Zhejiang, Guangdong, Shandong, Shaanxi, Tibet and other locations, which the capacity is more than 1GWh . Pinggao focuses on the R & D, design, manufacturing, operational service of energy storage products. Carry out the development, manufacture , sales and service in battery management systems, energy storage converters, battery energy storage systems, mobile energy storage vehicles, energy management systems and other products. Pinggao can provide customers with equipment supply, power station integration, EPC project contracting, total solution services.

平高集团有限公司，始建于1970年，是我国中低压、高压、超高压、特高压开关重大装备研发制造基地。经过50年的发展，目前业务范围涵盖输配电设备研发、设计、制造、销售、检测、设备成套与工程总承包，并积极发展运维检修、GIL、电力储能、综合能源等新业务。

作为中国大规模电力储能技术的开拓者和先行者，平高先后在北京、天津、河南、江苏、浙江、广东、山东、陕西、西藏等全国多个省市建设运营超过1GWh的储能项目。公司聚焦储能产品的研发设计、生产制造、运维服务，开展电池管理系统、储能变流器、电池储能系统、移动储能车、能量管理系统等产品的研制、销售和服务，可为客户提供设备供货、电站集成、工程总包、整体解决方案服务。



ENERGY STORAGE SYSTEM AND SOLUTIONS

储能系统及解决方案

1

Power side-Centralized Renewable Energy Grid Connection

电源侧 - 集中式可再生能源并网

In volatility and randomness of new energy sources such as wind power and solar energy power generation system, increase the energy storage system. It can smooth the power output, reduce the impact on the power grid, improve the ability of tracking the planned output, and reduce the phenomenon of wind and light abandonment.

在波动性和随机性较大的风能、太阳能等新能源发电系统中增加储能系统：可平滑发电输出，减少对电网冲击，提高跟踪计划出力的能力，减少弃风弃光现象。

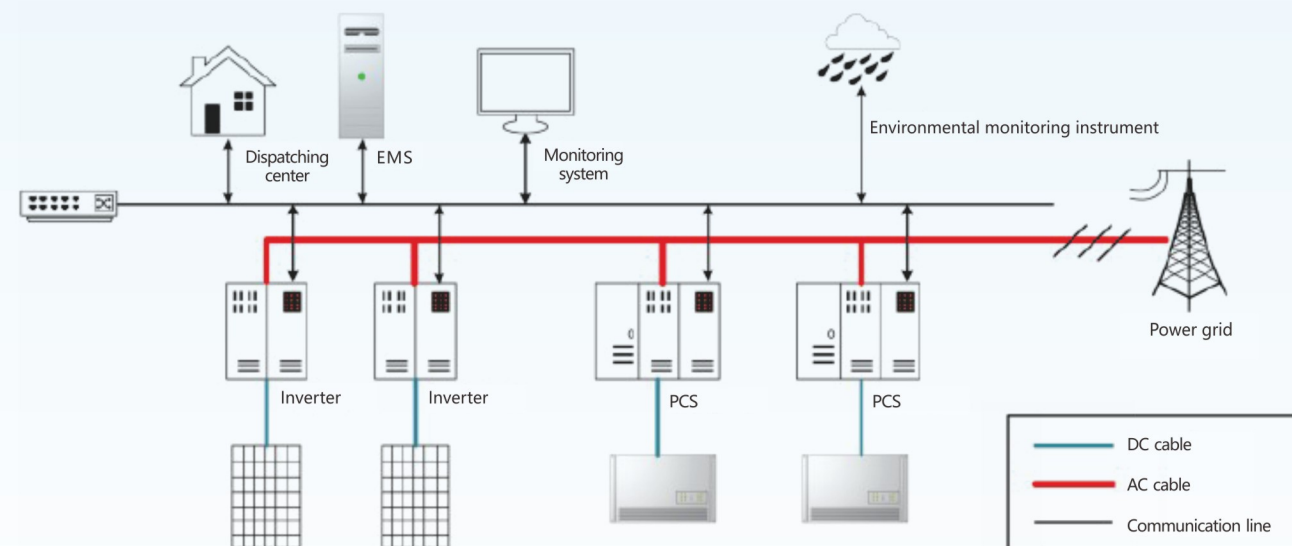


Advantage:

- ◆AC busbar connection, suitable for centralized management;
- ◆Reduce the PV and wind curtailment to improve economy;
- ◆Tracking planning dispatching and smoothing power output;
- ◆Improve the accuracy of power generation prediction and grid-connected friendliness.

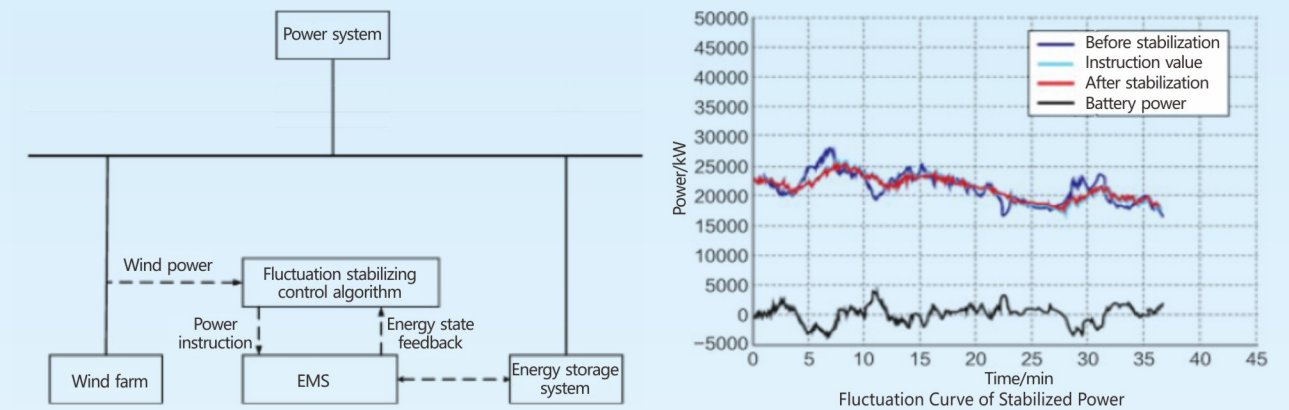
优势：

- ◆交流母线连接，适合集中管理；
- ◆减少弃光、弃风，提高经济性；
- ◆跟踪计划调度，平滑功率输出；
- ◆提高发电预测精度，提升并网友好性。



Smooth renewable energy generation output

平滑可再生能源输出

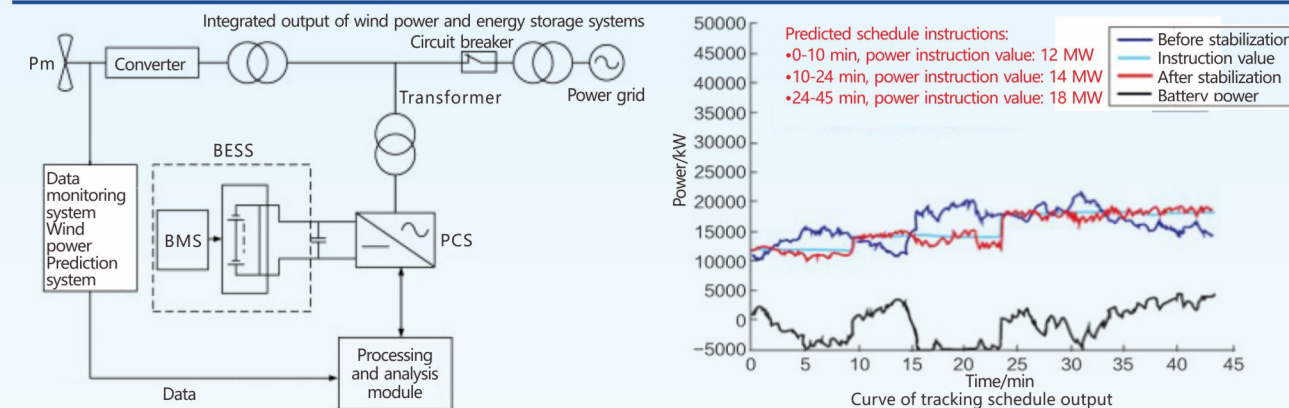


Based on the real-time wind electricity power data and the energy state of the energy storage system, the power instruction to be compensated by the energy storage system is obtained. Through the power compensation of the energy storage system, the total output power of the wind power system and energy storage system is stabilized.

依据实时的风电功率数据和储能系统的能量状态得到储能系统需补偿的功率指令，经过储能系统的功率补偿，风电和储能系统的总输出功率得到平抑。

Tracking schedule output

跟踪计划出力

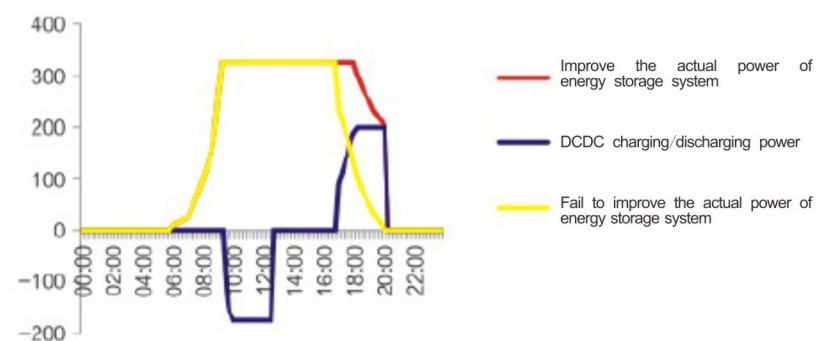
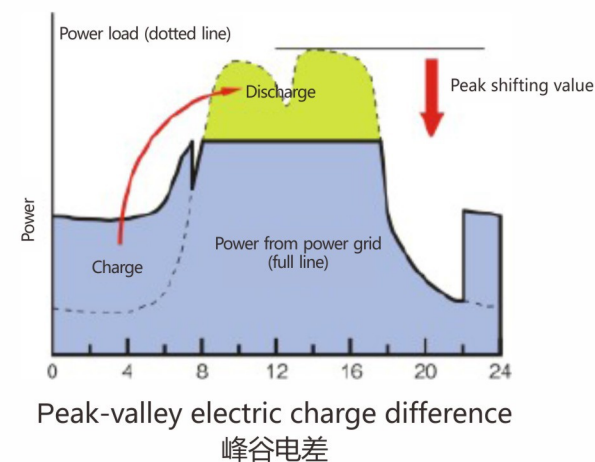


The bidirectional power capability of the battery energy storage system is used to make up the overflow or insufficiency of the actual wind power, so that the maximum daily prediction error between the integrated output power data of wind power and energy storage systems and the wind power prediction data meets the standard requirements.

利用电池储能系统的双向功率能力弥补实际风电功率的溢出或不足，使风储合成出力功率数据与风电功率预测数据之间的日预测最大误差满足标准要求。

Reduce the PV and wind curtailment

减少弃光、弃风现象



The Generation Condition of a PV Power Station after Increasing Its Energy Storage Systems
某光伏电站增加储能系统后发电情况

2

Grid side-Frequency Modulation Service

电网侧 - 调频服务

Traditional power systems have the disadvantage of slow response to the stability of the power grid. After the battery energy storage system is introduced, traditional power systems and AGC equipment can be assisted to quickly respond to frequency modulation and voltage regulation instructions and improve the stability of the power grid.

传统电力系统在稳定电网方面存在响应慢的缺点，引入电池储能系统后，可辅助传统电力系统及AGC设备，快速响应调频、调压指令，提高电网稳定性。



Advantage:

- ◆Support primary or secondary frequency modulation
- ◆Improve the frequency stability of the power grid;
- ◆Fast dynamic response.

Application:

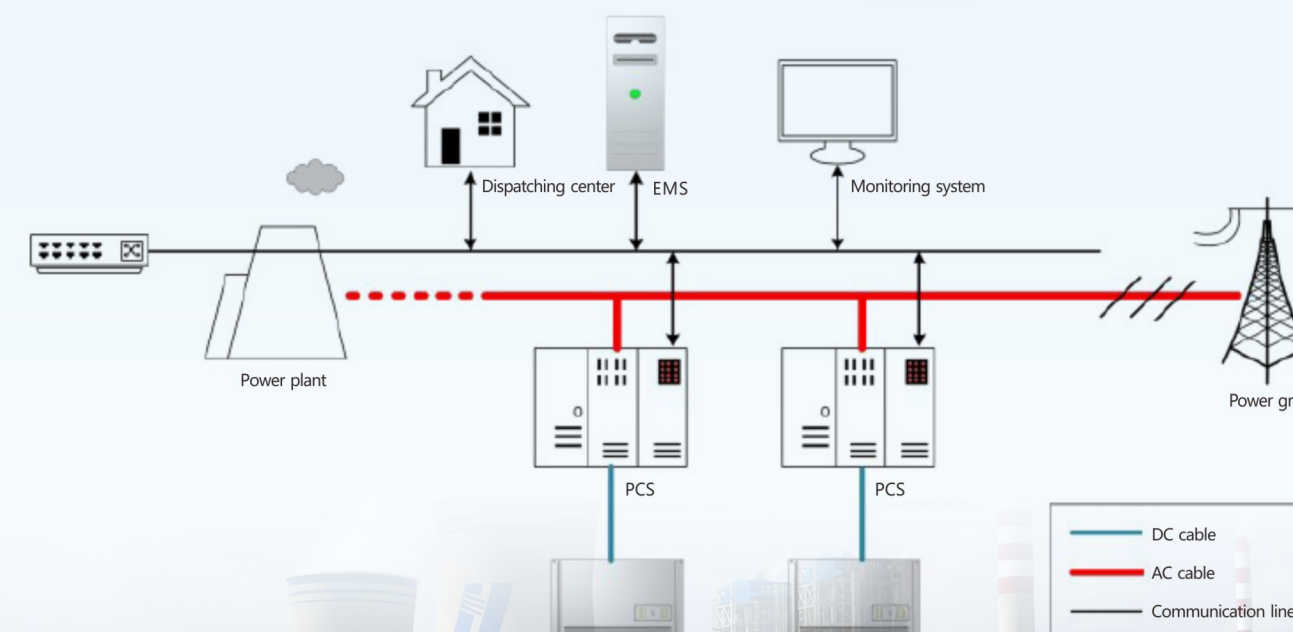
- ◆Peak adjustment and frequency modulation of power grid
- ◆Relieve transmission and distribution congestion
- ◆Delay capacity expansion of transmission and distribution equipment
- ◆Reactive power support

优势:

- ◆一二次调频;
- ◆提高电网频率稳定性;
- ◆快速动态响应。

适用场景:

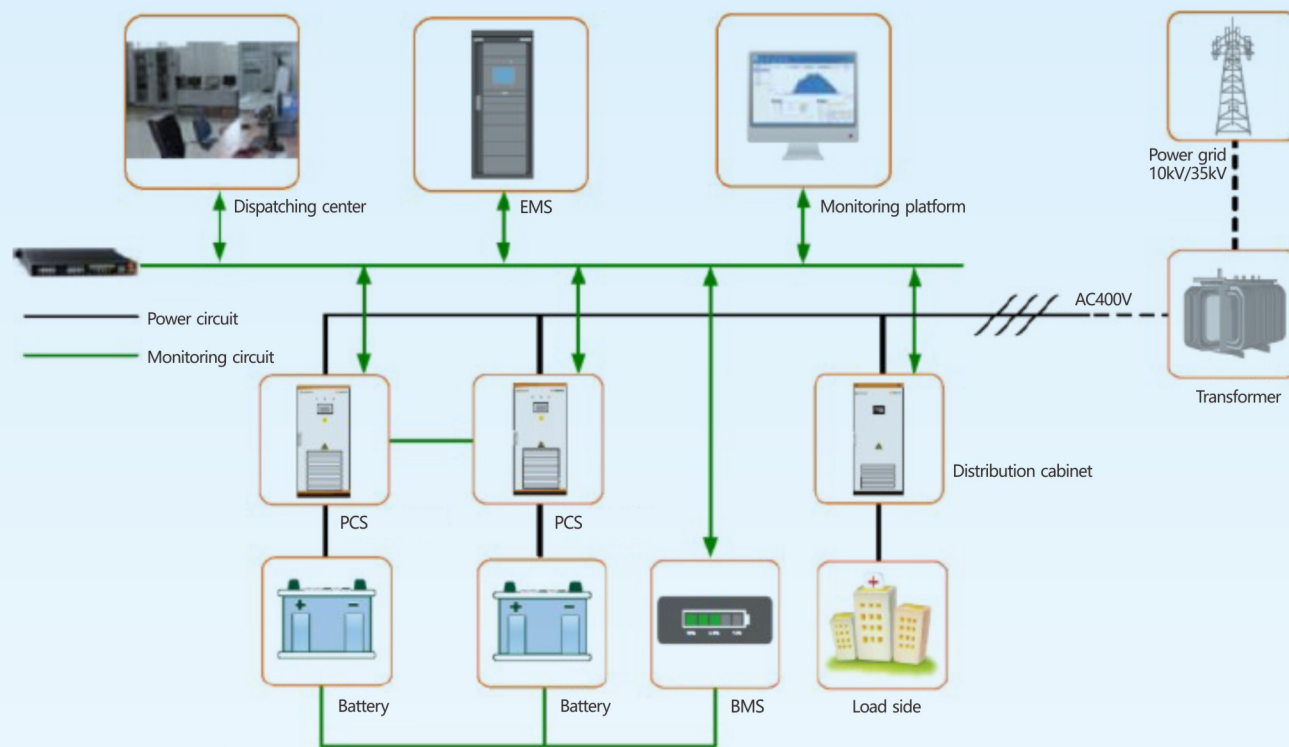
- ◆电网调峰、调频
- ◆缓解输配电阻塞
- ◆延缓输配电设备扩容
- ◆无功支撑



2

Grid side-Peak load shifting

电网侧 - 削峰填谷



Application

适用场景

Industrial and commercial users 工商业用户

- ◆ Save electricity bills;
- ◆ Save the cost for upgrading and transformation ;
- ◆ Arbitrage by Peak-valley electric charge difference price;
- ◆ Ports, subway stations and high energy-consuming enterprises, etc.
- ◆ 节省电费 ;
- ◆ 节省升级改造费用 ;
- ◆ 峰谷电价差套利 ;
- ◆ 港口 , 地铁站 , 高耗能企业等。

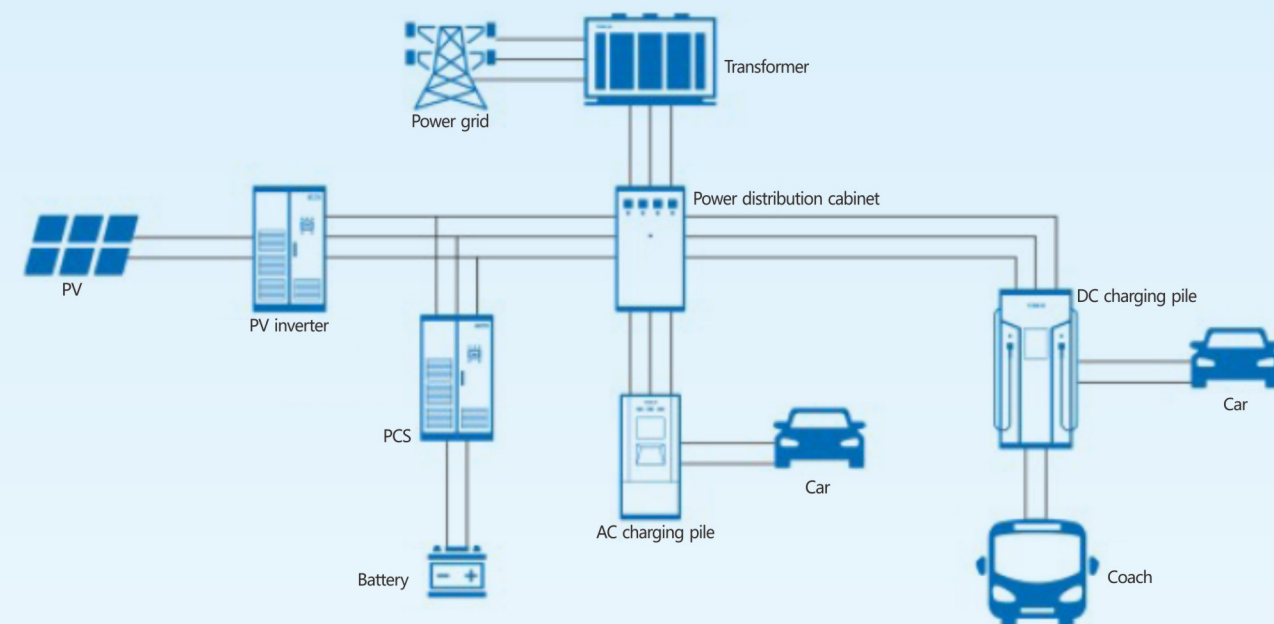
Power grid companies 电网公司

- ◆ Reduce the impact of load fluctuations on the power grid;
- ◆ Save the cost of maintaining the power grid;
- ◆ Do not aim at short-term investment returns.
- ◆ 降低负荷波动对电网的冲击 ;
- ◆ 节省维护费用 ;
- ◆ 不以短期的投资回报为目的。

3

Microgrid side-Energy Storage Power Station of Industrial and Commercial Parks

微电网侧 - 工商业园区储能电站



Advantage:

- ◆ Photovoltaic power generation combined with energy storage to provide reliable power;
- ◆ Photovoltaic power generation combined with energy storage to reduce impact on power grid;
- ◆ Seamless switching grid and off-grid operation;
- ◆ Provide the U/f source under the off-grid state;
- ◆ Realize the peak load shifting.

优势 :

- ◆ 光储结合提供可靠电力 ;
- ◆ 光储结合减少对电网冲击 ;
- ◆ 可无缝切换并、离网运行 ;
- ◆ 离网状态下储能系统提供U/f源 ;
- ◆ 削峰填谷。

3

Microgrid side-Integrated Power Station of PV, Energy storage and Charging

微电网侧 - 光储充一体式电站

PV is the main power supply under the operating state of the micro-grid. Energy storage is used to establish the grid voltage and supplement electricity when the PV generating capacity is insufficient, as well as supply power at night and in rainy days. When neither PV nor energy storage can conduct output, the system is connected to the power grid to supply power to the charger.

光伏作为微电网运行状态下的主电源，储能用于建立电网电压，并对光伏发电量不足时进行补充和夜晚、阴雨天时的供电。在光伏和储能都无法进行输出时，系统接入电网给充电机进行供电。

Advantage:

- ◆ Delay the capacity expansion requirements;
- ◆ Realize the peak load shifting.

优势：

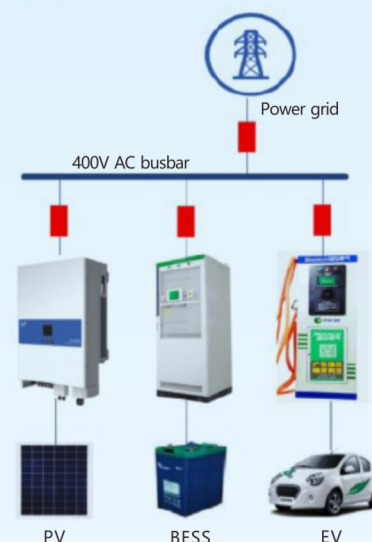
- ◆ 延缓扩容周期；
- ◆ 削峰填谷。

Application:

- ◆ Implementing the peak-valley electric charge difference and cut down expenses.

适用场景：

- ◆ 峰谷电差，节省费用。



4

User side-Household Energy Storage

用户侧 - 用户储能

The system composes of the solar battery, solar controller, grid-connected and off-grid converter, storage battery, battery management system and energy controller. It can achieve automatic absorption, conversion, storage and use of energy sources and save electric costs, as well as realizing the goal of green and environmental protection.

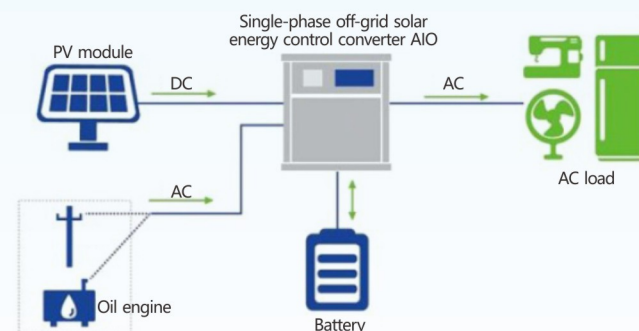
系统主要由太阳能电池组、太阳能控制器、并网逆变器、蓄电池组、电池管理系统、能量控制器等组成，可实现能源在吸收、转换、储存及使用环节自动化，节约用电成本，实现绿色环保的目的。

Advantage:

- ◆ High efficiency, high reliability, high intelligence and long power preparation time;
- ◆ Intelligent and unattended;
- ◆ Humanitarian;
- ◆ Remote wireless control;
- ◆ Interconnection network.

优势：

- ◆ 高效率、高可靠性、高智能，备电时间长；
- ◆ 智能化，无人值守；
- ◆ 人性化；
- ◆ 远程化；
- ◆ 互联化。



5

Other Applications

其他应用

Based on distributed energy stations and with energy management systems as the link, Pinggao Group relies on domestic advanced phase change energy storage technology to build a multi-functional and complementary regional energy supply system and provide integrated energy services.

The phase change heat storage system uses multiple composite phase change heat storage materials and combines original high efficient heat exchanger design. The product has advantages of large heat storage, low cost, zero discharge, modularizaion and automation.

Large heat storage: maximum heat storage of the single heat storage equipment can reach 2,500 kWh and heat can be provided for an area of 10,000 - 12,000 m2;

Rapid heat storage and discharge: the fastest (1-hour) storage and discharge can be reached;

Economic effectiveness: save operation fee by 40% - 70%.

平高集团依托国内先进的相变储能技术，以分布式能源站为基础，以能源管理系统为纽带，构建多能互补的区域能源供应体系，提供能源综合服务。

相变蓄热系统采用多元复合相变蓄热材料，结合独创的高效换热器设计。产品具有蓄热量大、低成本、零排放、模块化、自动化等特点。

蓄热量大：最大单体蓄热设备蓄热量达2500kWh，可供10000-12000平方米；

蓄热及放热迅速：最快实现1小时充放；

经济效益：节约运行费用40%-70%。



MAIN PROJECT PERFORMANCE

主要工程业绩



Hundred Megawatts of Henan Power Grid Battery Storage Demonstration Project
河南电网百兆瓦电池储能示范项目

This project is a supporting demonstration project of SGCC's science and technology project "Research and Application Demonstration of Aggregation Effect of Multi-point Layout Distributed Energy Storage System in Power Grid". The scale is 100.8MW/100.8MWh. The project adopts the technical scheme of "distributed layout, modular design, standardized access and centralized control" to build energy storage power stations in 16 in-transit substations in 9 prefectures and cities of Henan Province. The projects were all connected to the Grid on December 28, 2018.

The project not only improves the safe operation level of Henan Power Grid, but also promotes the establishment of applications such as electric energy storage participating in auxiliary services of power system and power transmission and distribution of power system, and promotes the establishment of a long-term mechanism for the consumption of renewable energy. Since the project was put into operation, it has participated in the power demand side response in Henan for many times, and completed advanced applications such as peak regulation across provinces and regions and precise load cutting in 2019, which greatly enriched the power grid regulation methods.

该项目是国网总部科技项目《多点布局分布式储能系统在电网的聚合效应研究及应用示范》配套示范工程，项目规模为100.8MW/100.8MWh，该项目采用“分布式布置、模块化设计、标准化接入、集中式调控”技术方案，在河南省9个地市16个在运变电站建设储能电站。于2018年12月28日全部并网投运。

项目运行后不仅提高了河南电网安全运行水平，也推动建立了电储能参与电力系统辅助服务和电力系统输电配电等应用，并促进建立了可再生能源消纳的长效机制。项目投运以来已多次参加河南地区电力需求侧响应，并在2019年完成跨省跨区调峰、精准切负荷等高级应用，极大丰富了电网调节方式。

Huanglong Energy Storage Power Station of Henan Power Grid Project
河南电网项目黄龙储能电站



Jiangsu Project Phase II Power Grid Side Energy Storage Project
江苏电网侧储能二期工程

The total scale of this project is 272.16MW/475.2MWh, of which Nanjing Jiangbei Station (110.88MW/193.6MWh) ranks first in the project, and is the grid-side electrochemical energy storage power station with the largest capacity and the highest power per station in China.

After the completion of the project, it can meet the peak load regulation, frequency regulation, voltage regulation, emergency response, black start and other application requirements of Jiangsu regional power grid, and provide a guarantee for the safe and stable operation of the local power grid during peak load period. At the same time, the project will also be included in the large scale "source network storage" friendly mutual aid system of Jiangsu power grid, realizing more varieties and larger scale advanced applications.

该项目总规模272.16MW/475.2MWh，其中南京江北站（110.88MW/193.6MWh）规模为该项目之首，是国内单站容量最大、功率最高的电网侧电化学储能电站。

项目建成后能够满足江苏区域电网调峰、调频、调压、应急响应、黑启动等应用需求，为当地电网负荷高峰期间的安全平稳运行提供保障，同时该项目也将纳入江苏电网大规模“源网荷储”友好互助系统，实现品种更多、规模更高级应用。

Nanjing Jiangbei Energy Storage Power Station("Multi Station Integration" Demonstration Station)
南京江北储能电站（“多站合一”示范站）



10KV Reliability Improvement Project for Yanqing Competition Area of Beijing Yanqing Winter Olympic Games 北京延庆冬奥会延庆赛区 10kV 可靠性提升工程

The project is located in the Dongxingyuan Energy Storage Station, and Pinggao Group provided the whole station materials for the project. The total scale of the Winter Olympic Energy Storage Station is 14MW/14MWh, including 12MW/12MWh for the fixed energy storage system and 2MW/2MWh for the mobile energy storage system.

The Beijing Yanqing Energy Storage Power Station is connected to the "Big Cloud Moving Wisdom" Energy Internet of Beijing Power Grid Corporation, and constructs a holographic data information network to realize the three-dimensional energy information of the Winter Olympics venues, which plays a role in the situational awareness analysis of the energy system, coordinated optimization and regulation, and multi - guarantee of power supply for the Winter Olympics. By the end of 2019, the isolated network operation of the project was successfully realized, which can guarantee the stable and reliable power supply for the competition area independently when the power grid is abnormal.

该项目位于东杏园储能电站，平高集团为该项目提供整站物资，冬奥会储能电站总规模为14MW/14MWh，其中固定式储能系统为12MW/12MWh、移动式储能系统为2MW/2MWh。

北京延庆储能电站接入北京电网公司“大云物移智”能源互联网，构建了全息数据信息网，实现冬奥会场馆能源信息的立体化，为能源系统态势感知分析、协同优化调控、多维度保障冬奥会电力供应发挥作用。2019年底成功实现了项目的孤网运行，可保证在电网异常时，独立为赛区提供稳定可靠的电源。

Beijing Winter Olympic Games Yanqing Energy Storage Power Station
北京延庆冬奥会延庆赛区储能电站



Tianjin Binhai Energy Storage Project 天津滨海储能项目

This project is Tianjin Smart Energy Town Centralized Energy Storage Project, the construction scale is 10MW / 10mwh.

The project innovatively uses the space above the energy storage power station to build the photovoltaic power generation system, which not only reduces the influence of illumination on the equipment, but also reduces the power consumption rate of the energy storage power station. After the completion of the project, it will further improve the energy saving effect of the smart energy town, effectively reduce peak load and peak electricity consumption, relieve wind and light abandonment, and promote the consumption of clean energy.

天津智慧能源小镇集中式储能项目，10MW/10MWh。

项目创新性地利用储能电站上方空间建设光伏发电系统，既降低了光照对设备的影响，又降低了储能电站的站用电率。项目建成后将进一步提高智慧能源小镇节能效果，有效降低尖峰负荷和峰值用电量，缓解弃风弃光，促进清洁能源消纳。

Tianjin Binhai Energy Storage Project
天津滨海储能项目



Shandong Xintai Project
山东新泰项目

This project is the first photovoltaic energy storage project in China. The energy storage scale is 5MW / 10mwh. This project was connected to the grid on June 28, 2020.

新泰光伏配套储能项目为国内第一家光伏竞价上网配置储能项目。项目配置储能规模为5MW/10MWh，于2020年6月28日并网投运。

Tibet Gamba Photovoltaic Supporting Energy Storage Project of 40MW/193MWh
西藏岗巴光伏配套储能 40MW/193MWh 项目

This project is the largest photovoltaic energy storage project in China. The energy storage scale of the project is 40MW/193MWh, the altitude of the project is 4700m, the environment is harsh, and the technical requirements for the energy storage equipment and the stability of the energy storage system are higher. The project was connected to the grid on December 30, 2020.

该项目为国内最大的光伏配置储能项目。项目配置储能规模为40MW/193MWh，项目海拔4700m，环境恶劣，对储能设备的技术要求及储能系统的稳定性要求更高。于2020年12月30日并网。

Shandong Xintai Project
山东新泰项目



Tibet Gamba Photovoltaic Supporting Energy Storage Project of 40MW/193MWh
西藏岗巴光伏配套储能 40MW/193MWh 项目



PowerChina Anhui Herun Wuoyang Wind Energy Storage Station
中电建安徽和润涡阳风电储能站

The total scale of this project is 10MW/10MWh, which was built by Pinggao Group in EPC mode. The design ratio of energy storage power station is 1C, with excellent auxiliary frequency regulation and peak regulation ability, which can effectively smooth the output of wind farm and improve the power quality of wind farm.

该电站规模10MW/10MWh，由平高集团以EPC模式建设，储能电站设计倍率1C，具有出色的辅助调频、调峰能力，可有效平滑风电场输出、改善风电场电能质量。

SPIC Henan Sanmenxia Wind Power Storage Project
国电投河南三门峡风电配套储能项目

The total scale of this project is 4.8MW/4.8MWh, it is the first wind power supporting energy storage project in Henan Province, which plays an important demonstration and leading role in ensuring the safe and stable operation of Henan power grid and improving the capacity of peak regulation and new energy consumption of Henan power grid.

该项目规模为4.8MW/4.8MWh，是河南省首个风电配套储能项目，对保障河南电网安全稳定运行、提高河南电网调峰和新能源消纳能力具有重大示范引领作用。

PowerChina Anhui Herun Wuoyang Wind Energy Storage Station
中电建安徽和润涡阳风电储能站



SPIC Henan Sanmenxia Wind Power Storage Project
国电投河南三门峡风电配套储能项目



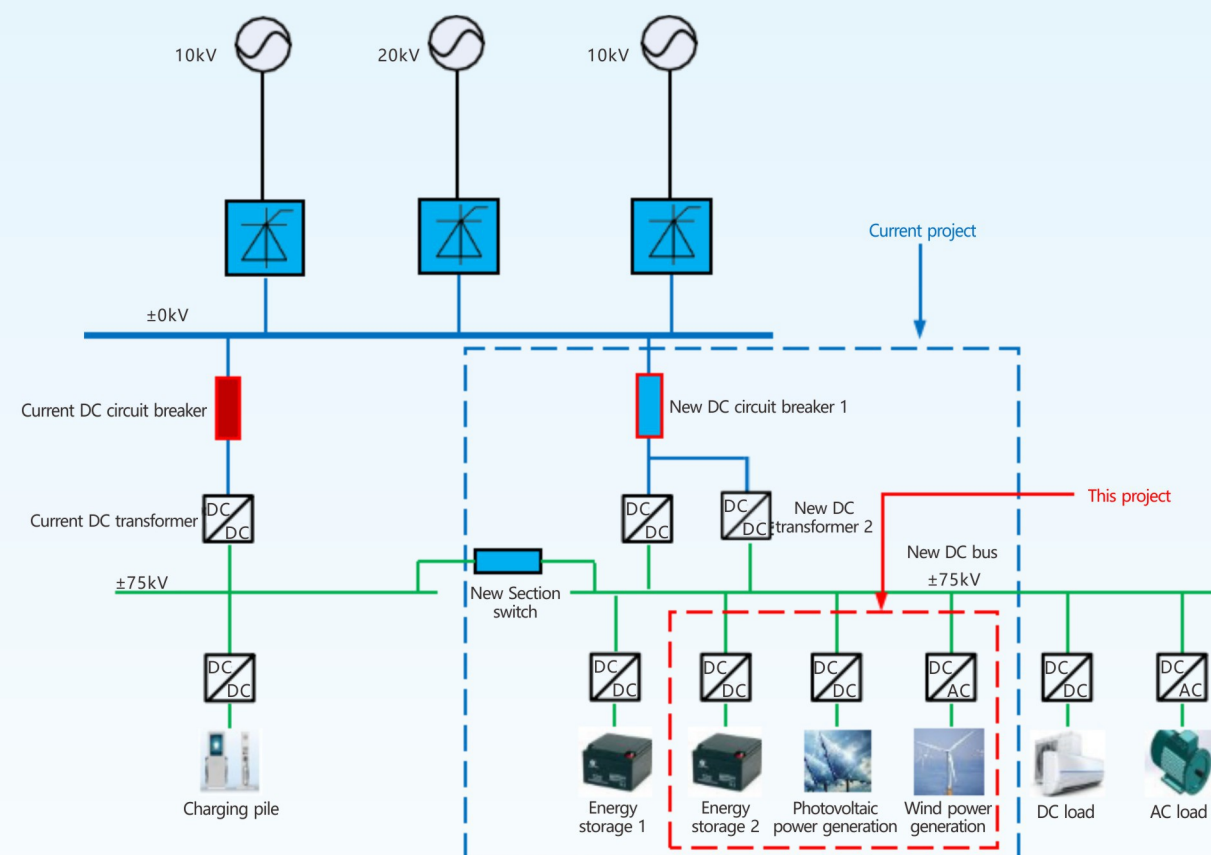
Zhejiang Dajiangdong DC Micro Grid Project 浙江大江东直流微网项目

The project is a micro grid project supporting the flexible DC demonstration work, with a total of 1.16mw of wind, light and storage new energy.

After the completion of the project, the utilization rate of regional new energy will be 100%, and the ratio of Distributed Renewable Energy installed capacity to peak load in microgrid is more than 70%. Microgrid can realize independent operation between various operation modes in grid connected and off grid state. In grid connected operation, the microgrid and distribution network can achieve a variety of coordinated interaction; In off grid operation, the maximum utilization of distributed energy can be realized on the basis of ensuring the power supply of important loads.

柔性直流示范工作配套微电网项目，风、光、储新能源合计1.16MW。

项目建成后将实现区域新能源利用率100%，微电网内分布式可再生能源装机与峰值负荷的比值大70%。微电网可实现并网和离网状态下的多种运行模式间的独立运行。在并网运行时，实现微电网与配电网的多种协调互动；离网运行时，在保证重要负荷供电的基础上，实现分布式能源的最大化利用。



Henan Power Grid 400 kVA UPS Power Vehicle 河南电网 400kVA UPS 电源车

In order to prevent and control power supply during the epidemic period, Pinggao group provided three 400kVA UPS power vehicle for Henan power grid, with the characteristics of uninterrupted, self starting, high protection, etc. providing uninterrupted and lasting emergency power supply, and the project was put into use in March 2020.

为了疫情防控保电，平高集团为河南电网提供3台 400kVA UPS电源车，具有不间断、自启动、高防护等特点，提供不间断的、持久的应急电力供应，于2020年3月已交付使用。

