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Midea Industrial Tech.

CLOU Electronics

Global Energy Storage Case Studies

A Global Leader in ESS Commercialization

Utility Projects

Power-side AGC Frequency Modulation

Haifeng Project

Hengyun Project

Heyuan Power Plant Project

Industrial & Commercial User

Foshan Liyuan Project

The Lafayette Project

Chongqing Midea Industrial Park Project

Hefei Midea Industrial Park Project

Grid-side Energy Storage

Xuanhe Project

Danyang Project

The USA Texas Project

Indiana Christmas Eve Project

California Waterbottle Project

Power Supply-side New Energy Storage

China State Shipbuilding Corporation Project

South America Pangu Project

Cascade Utilization

Guangzhou Automobile Group New Energy Project

Microgrid

Qumalai Project

Tibet Shuanghu Project

Puerto Rico Project

Cape Verde Project

Rwanda Project

Hawaii Project

Caribbean Project

01

Haifeng Project

Power-side AGC Frequency Modulation Case Study-Haifeng Project

Project Overview

Investment Overview: RMB 80 million

Project Size: 30MW/15MWh

Building Location: Xiaomo Peninsula, Shenzhen-Shantou Cooperation Zone, Shenzhen, Guangdong Province

Construction Process: began in August 2018, and was synchronized to the grid for operation in August 2019.

Run time: 4 years by now

Cooperation Mode: the two parties share the incremental revenue from AGC on a specified ratio, with a 10 years contract.

Power-side AGC Frequency Modulation Case Study-Haifeng Project

Project Construction

15 complete sets of prefabricated battery cabin equipment （2MW/1MWh）

15 sets of prefabricated medium-voltage converter cabin equipment （2MW）

2 complete sets of ring net cage equipment（14MW、16MW）& a set of centralized control box

The project is on a 10 years contract, with its income derived from the incremental AGC compensation received from the power grid company following the operation of the contracted equipment and AGC frequency modulation. The parties share the incremental AGC income at a ratio of 85%:15% for the initial 5 years and 60%:40% for the subsequent 5 years, on monthly sharing. CLOU guarantees Haifeng Power Plant a minimum monthly income of 500,000 RMB.

Power-side AGC Frequency Modulation Case Study-Haifeng Project

Project & Equipment Operation

9627
Equivalent Cycle Count

139GWh
Total Station Charging Capacity

119GWh
Total Station Discharge Capacity

1231.1million MW
Total Accumulated Mileage

26.16million MW
Average Monthly Mileage

Prior to January 2021, the average comprehensive FM performance index was approximately 2.3, with an upper limit of 5 for the k1 index. After the implementation of the new policy, the average comprehensive FM performance index decreased to approximately 1.35, with an upper limit of 3 for the k1 index.

Annual Record of Charge & Discharge Capacities Cycle Counts (Unit: kWh)

Sequence No.	YEAR	Annual Charge Volume	Annual Energy Output
1	2019	17878800	15203040
2	2020	47434800	40778880
3	2021	44567760	38493360
4	2022	25339920	21730800
5	By August 2023	5211840	4278960
Total		138606720	119005920

Power-side AGC Frequency Modulation Case Study-Haifeng Project

Security Management

▶ Jointly develop operational procedures and maintenance management systems for energy storage

▶ Address the gaps in the operational management system for energy storage frequency modulation power stations

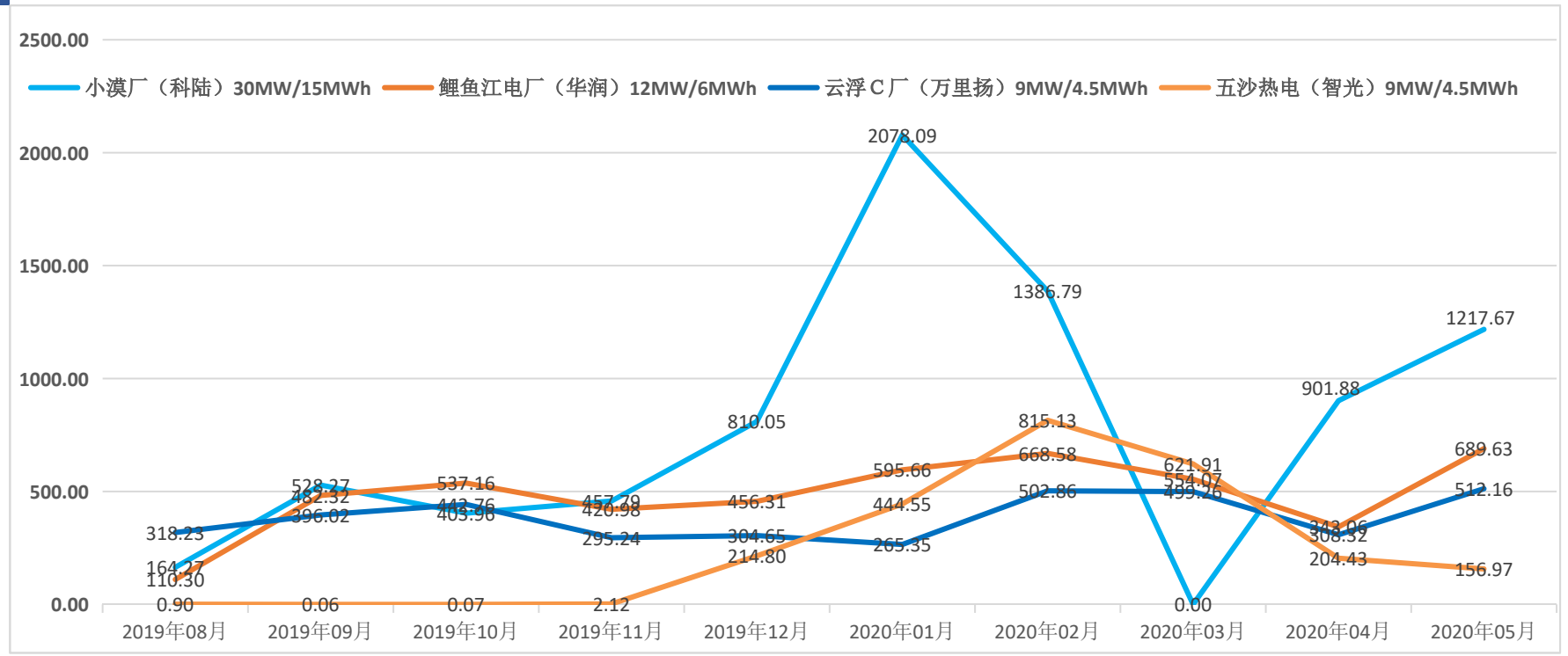
▶ Regularly conduct emergency drills and training sessions, enhance daily operation and maintenance as well as security management

▶ Since its commissioning, it has been continuously operated safely and stably for several years without any accidents

Power-side AGC Frequency Modulation Case Study-Haifeng Project

Returns & Benefits

The project's revenue is at the forefront of the regional FM market in the China Southern Power Grid. The revenue from 2019 to 2021 ranked 1st in the China Southern Power Grid's FM market, and the 4th in 2022. The following figure shows the revenue curve of some energy storage FM projects from 2020 to 2022:



Note: 1. FM mileage revenue = FM performance K * clearing price * mileage FM performance K = (2 * adjustment rate k1 + adjustment accuracy K2 + response time K3) / 4

2. According to the ancillary services market rules, the joint power plant share the revenue from frequency modulation (FM) ancillary services. In late 2020, the Southern Regulatory Bureau of the National Energy Administration issued the "Construction Plan for the Unified FM Auxiliary Service Market in the Southern Region," setting the maximum value of k1 at 5. In April 2021, the "Trading Rules for the FM Auxiliary Service Market in the Southern Region" was introduced on a pilot basis, limiting the upper limit of the power generation unit's adjustment rate index k1 to 3.

Power-side AGC Frequency Modulation Case Study-Haifeng Project

Project Value & Impact

The project was honored as one of the inaugural eight pilot demonstration projects for scientific and technological innovation (energy storage) by the National Energy Administration, received the Best Demonstration Project Award for China's Energy Storage Industry in 2020. It was designated as a key project for monitoring and evaluation in the "Implementation Plan for the Development of New Energy Storage in the 14th Five-Year Plan" jointly issued by the National Development and Reform Commission and the National Energy Administration in 2022.

- **MAXIMUM:** The project, which was the largest energy storage joint million-unit frequency modulation project (30MW/15MWh) in China at the time, significantly improved the frequency modulation performance by increasing the kp index from 0.8 to 2.3
- **FIRST:** The first energy storage project in Guangdong achieving millisecond-level response with wide-area direct and remote modulation and control capabilities; the first in Guangdong featuring independent frequency modulation
- **FIRST:** Achieved intelligent model evaluation and optimization of battery cloud maps in energy storage frequency modulation projects
- By applying VSG control technology, the energy storage power station serves as a plant-level security power supply, facilitating a 30MW-level black start for plant power, dual power supply configurations, and the switch between off-grid and grid-connected operations.
- The proprietary PCS group control management technology and EMS system have enabled AGC frequency modulation, millisecond-level wide-area direct control of energy storage systems, virtual synchronous machines, load dispatching and peak shaving, black start, among other functions. The industry-leading frequency modulation technology combines thermal and storage resources.

02

Hengyun Project

Power-side AGC Frequency Modulation Case Study-Hengyun Project

Project overview

Project Size: 15MW/7.465MWh

Building Location: No.8 Xiji Road, Huangpu District Development Zone, Guangzhou, Guangdong Province

Construction Process: Construction commenced in August 2019 and was connected to the grid for operation in October 2020.

Run time: 4 years

Power-side AGC Frequency Modulation Case Study-Hengyun Project

Project Construction

8 Sets

Complete Equipment
for Prefabricated Battery Compartments
Rated capacity of container 1-7: 2MW/995.328kwh
Rated capacity of container 8: 1MW/497.664kWh

8 Sets

Prefabricated Medium-Voltage
Converter Cabin Equipment Set
Containers 1-7, each set includes
1 high-voltage switch cabinet & four
500kw energy storage bidirectional converters & one
2200kVA step-up transformer
Container 8, contains two 500kw energy storage bidirectional
converters & one 2200kVA step-up transformer

2 Sets

Complete Ring Net Cage System
7MW、8MW

1 Set

Centralized Control Equipment

Project Type: Technology transformation

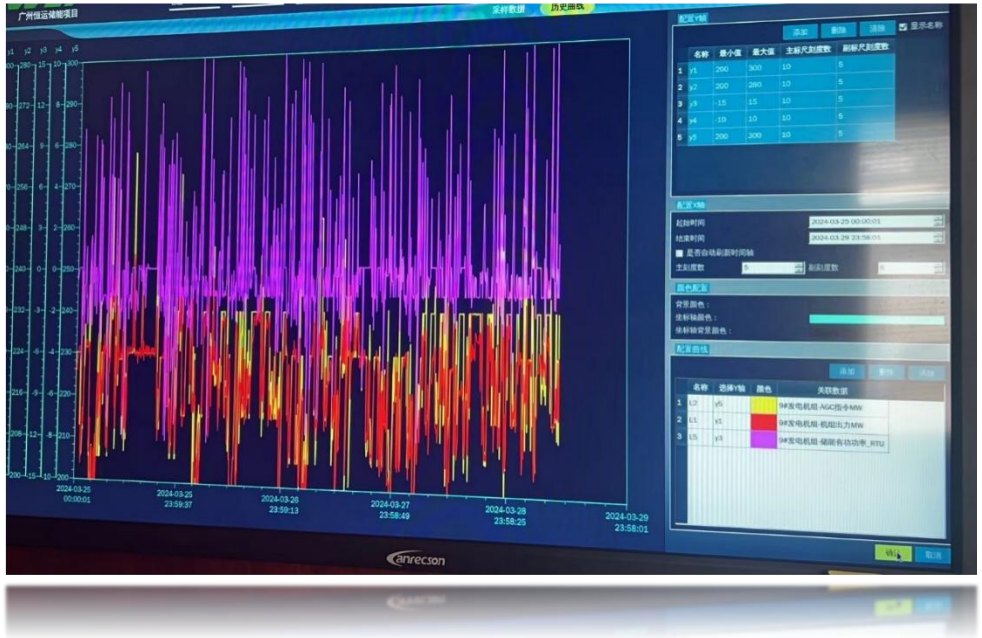
Technology Roadmap: Lithium iron phosphate battery technology 15MW/7.465MWh energy storage system

Technology Application: Collaborate with thermal power units to engage in the AGC secondary frequency modulation ancillary services, achieving a 15MW/2C output during system frequency modulation

Power-side AGC Frequency Modulation Case Study-Hengyun Project

Project Operation

- The equipment offers stable and reliable performance, with efficient on-site operation and maintenance, and a low failure rate
- The intelligent cloud platform system analyzes FM data to guide operation and maintenance, and continuously optimizes equipment testing
- By February 2024, the Hengyun Station has undergone 3,480 equivalent cycle times, with a total discharge capacity of 23,493 MWh
- It has maintained 4 years and 9 months of safe and accident-free operation since its commissioning



03

Heyuan Power Plant Project

Power-side AGC Frequency Modulation Case Study-Heyuan Power Plant Project

Project Overview

Project Size: 18MW/9MWh

Building Location: Heyuan City, Guangdong Province

Application Scenarios: Power side, conventional thermal power

Commissioning Time: April 2020

Power-side AGC Frequency Modulation Case Study-Heyuan Power Plant Project

Project Construction

It was 2nd-largest energy storage frequency modulation project commissioned in Guangdong Province at the time. The initial phase involved retrofitting two 600 MW units, namely #1 and #2. A 18MW/9MWh grid-level energy storage system, leveraging lithium iron phosphate battery technology, has been installed on the generator unit side. This system will collaborate with thermal power units to perform grid AGC frequency modulation operations, delivering a maximum power output of 18MW during frequency modulation. The 18MW energy storage frequency modulation system comprises two subsystems: 10MW and 8MW

It is the initial grid-connected frequency modulation project in Guangdong Province, taking 38 days to conduct the nation's first grid-connected performance test for a thermal power plant's energy storage frequency modulation system. The test was conducted in accordance with the newly issued national standards GB/T 36547-2018 "Technical Regulations for Connecting Electrochemical Energy Storage Systems to the Power Grid" and GB/T 36548-2018 "Test Specification for Connecting Electrochemical Energy Storage Systems to the Power Grid", encompassing all 13 test items and three grid-related tests stipulated by the national standards

Power-side AGC Frequency Modulation Case Study-Heyuan Power Plant Project

Project Technology & Operation

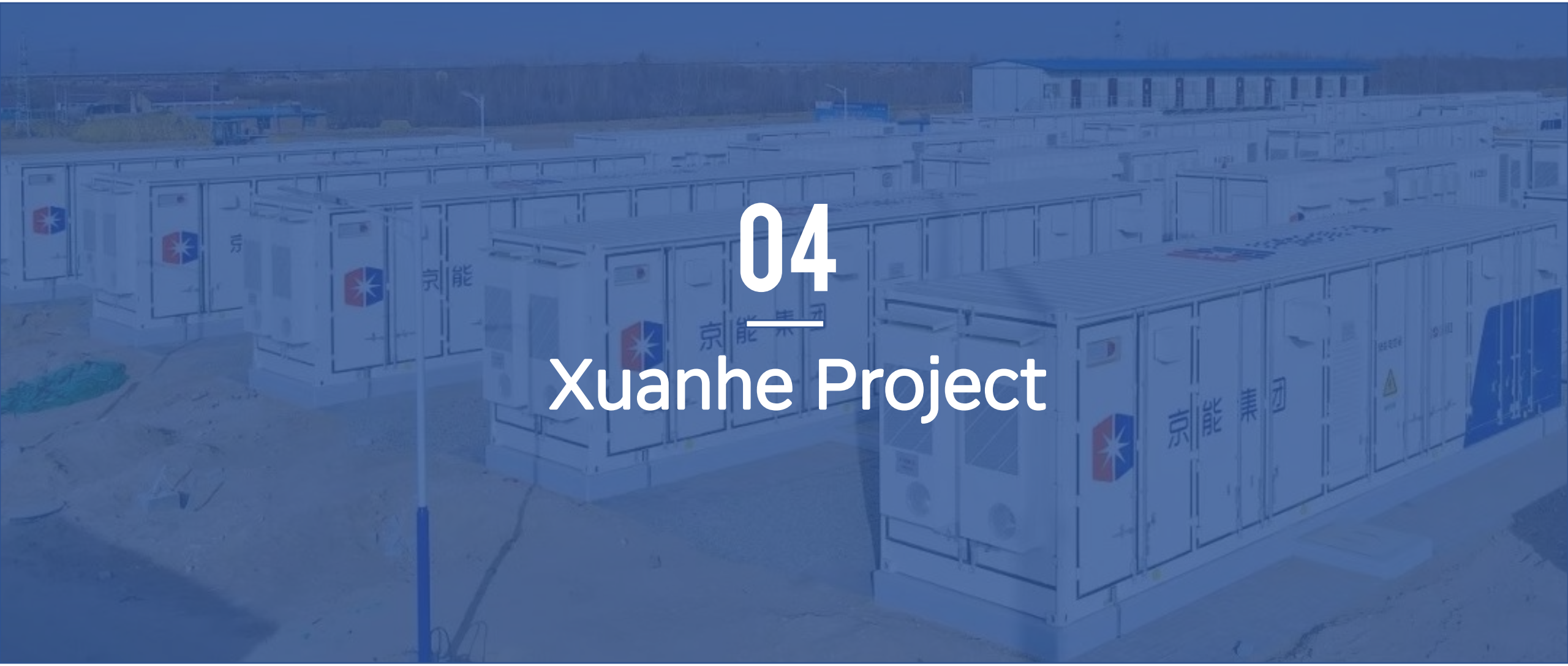
- The system utilizes a box energy storage architecture, employing high-safety lithium iron phosphate batteries as its storage components, to further enhance the thermal design of the system
- Equipped with a single 1000kW energy storage bidirectional converter, it utilizes three-level technology with a maximum efficiency of up to 99%. Compared to a 500kW system, the volumetric power density is increased by more than 35%, reducing costs for cables, containers, and construction by up to 50%, and lowering medium-voltage system costs by more than 8%
- Conduct a system upgrade for PMU and RTU, leveraging the synchronous phasor measurement unit (PMU) to implement the Wide Area Synchronous Phasor Measurement System (WAMS). This ensures real-time monitoring of dynamic changes across the entire station system, safeguarding its secure and stable operation
- The implementation of CLOU's proprietary BMS battery management system, PCS group control technology, EMS energy management system, and cloud-based fault diagnosis and maintenance system has successfully enabled auxiliary AGC frequency modulation, primary frequency modulation, virtual synchronous machine technology, and dispatching and peak regulation in two 600MW units
- The project is managed through an energy contract model, with the investor in charge of raising all necessary funds for the project

Power-side AGC Frequency Modulation Case Study-Heyuan Power Plant Project

Project Returns & Value

▶ The comprehensive FM performance index (Kp value) has been successfully raised from an original 0.75 to approximately 2.4, representing a threefold increase in performance. This project not only provides the power grid with high-quality and efficient AGC FM services but also secures substantial FM compensation benefits for Heyuan Power Plant

▶ After the successful commissioning of the project, it has become one of the premium frequency modulation (FM) power sources for Guangdong Power Grid. This is highly significant in enhancing the unit's competitiveness in the network-wide bidding, boosting the flexibility of grid dispatching, strengthening the safe, stable, and reliable operation of the grid, and improving the grid's capability to integrate renewable energy source.



04

Xuanhe Project

Grid-side Energy Storage-Xuanhe Project

Project Overview

Project Size: 150MW/300MWh

Building Location: Xuanhe, Zhongwei, Ningxia

Application Scenarios: Power grid side, new energy storage

Commissioning Time: December 2022

The Xuanhe Energy Storage Project is named Muhe Second Energy Storage Power Station, situated at an altitude of 1200 meters. The area is classified as a temperate semi-arid and semi-humid region, characterized by frequent spring sandstorms, limited summer heat, early autumn coolness, a prolonged cold winter, scarce snow and rain, ample sunshine, and strong evaporation. The annual average precipitation is approximately 300 millimeters.

Grid-side Energy Storage-Xuanhe Project

Project Construction

▶ A 110kV booster station was constructed within the power station, and the 110kV equipment utilized the TGOOD indoor fully enclosed SF6 gas GIS assembly

Install 1 main transformer manufactured by Shandong Taikai, with a capacity of 150MVA

Equip with a dynamic reactive power compensation device manufactured by New Wind and Solar, having a capacity of ±30Mvar

1 grounding/station transformer, manufactured by Zhejiang Rixin, has been installed with a rated capacity of 1250kVA, including a 400kVA station transformer

▶ The energy storage system is designed as a fully outdoor prefabricated cabin setup, featuring 60 prefabricated cabinets for energy storage batteries and 30 prefabricated cabinets for PCS boost converters positioned outdoors. The batteries are Ruipu 280Ah 3.2V lithium iron phosphate batteries, and the PCS is a Clouenergy NEPCS-1250 converter

The project commenced its construction in June 2022; the first concrete was poured on June 26, 2022; the first battery cabin was hoisted on September 4, 2022; the equipment installation was completed on November 29, 2022; and the grid connection was successfully completed on December 22, 2022.

Grid-side Energy Storage-Xuanhe Project

Project & Equipment Operation

- Compared with base stations of the same scale in Ningxia, the project consistently leads in all data metrics
- The project effectively mitigates the overload stress in the 330kV Slope double-circuit section, offering services such as peak shaving, frequency regulation, reserve capacity, black start, and demand response to enhance grid operations. It fully leverages the grid's peak shaving capabilities, facilitates regional power grid peak shaving, and significantly reduces power supply pressure

Grid-side Energy Storage-Xuanhe Project

Inspection Reports

检测报告

电站名称	穆和第二储能电站
检测地点	宁夏回族自治区中卫市沙坡头区宣和镇
委托单位	中电建宁夏工程有限公司
运行状态	正常运行
检测类别	委托检测
检测项目	死区试验、频率阶跃扰动试验、模拟实际频率扰动试验、防扰动性能校验、AGC 协调试验
检测依据	GB/T 40595-2021《并网电源一次调频技术规定及试验导则》

检测报告

电站编号	ZD4-23/01/09-001
检测数量	1
检测日期	2023 年 1 月 9 日~ 2023 年 1 月 14 日

检 测 结 论

电站编号	ZD4-23/09/20-001
检测数量	1
检测日期	2023 年 9 月 20 日~ 2023 年 9 月 21 日

Grid-side Energy Storage-Xuanhe Project

Project Returns & Value

- The project involves a large-scale energy storage power station on the transmission and distribution of the power grid. Leveraging the excess power output from regional large-scale wind and photovoltaic base stations, it fulfills the peak load regulation needs of the power grid. Integrating with the directives from the local dispatching center, it adjusts the charging and discharging strategy through AGC real-time follow-up instructions, ensuring the grid's peak load and frequency regulation demands are met, distributing electrical energy efficiently and optimally.
- The project income is composed of two parts. Besides the normal peak and valley electricity price difference income, it can also obtain additional subsidies from the state by compensating for the loss of energy such as wind and solar power curtailment, solving the problem of reasonable energy allocation.
- Beyond the two tangible benefits outlined, this energy storage power station can also enhance the transmission and distribution quotas for large-scale photovoltaic and wind power generation stations. This aligns with national standards for the ratio of wind and solar power generation to energy storage, ultimately maximizing returns.

Annual Record of Charge & Discharge Capacities Cycle Counts (Unit: 10,000 kWh)

Sequence No.	YEAR	Annual Charge Volume	Annual Energy Output	Charging Frequency	Discharging Frequency
1	2022	42.24	41.36	/	/
2	2023	8197.1	7789.47	304	300
3	By March.2024	2119.09	2033.75	78.48	79.29
Total		10358.43	9864.58	382.48	379.29

By March 2024, the Jingneng Xuanhe energy storage power station has undergone 382.58 equivalent cycles. The total charging energy is 103.5843 million kWh, and the total discharge energy is 98.6458 million kWh. There have been 382.48 charging events and 379.29 discharge events.

05

Danyang Project

Grid-side Energy Storage-Danyang Project

Project Overview

Project Size：12MW/24MWh

Building Location：Zhenjiang, Jiangsu Province

Application Scenarios：Grid side, conventional thermal power generation

Commissioning Time：July 2019

Grid-side Energy Storage-Danyang Project

Project Construction

▶ The project utilizes a fully prefabricated cabin configuration, employing a segmented single-busbar system on the 10kV side

▶ The battery pack features a capacity of 12MW/24MWh, comprised of 12 groups of 40-foot battery energy storage containers, each set is at 1MW/2MWh and positioned outdoors.

▶ Twelve sets of PCS and step-up equipment are installed on-site, with each set comprising two 500kW PCS energy storage converters, one low-voltage incoming cabinet, one step-up transformer, and one 10kV ring main unit, and are arranged outdoors.

Grid-side Energy Storage-Danyang Project

Project Value & Significance

▶ Address the electricity consumption demands during the summer peak season, fulfill the peak shaving and frequency regulation requirements of Jiangsu Grid Corporation, enhance the reliability of the power supply, and ensure the safe and cost-effective operation of the power grid

▶ In summer, Danyang recorded an actual surface temperature exceeding 69℃, yet Kelu withstood the ordeal of high temperatures

▶ Delivered and started operation in 45 days only, successfully managing the summer peak demand

06

The USA Texas Project

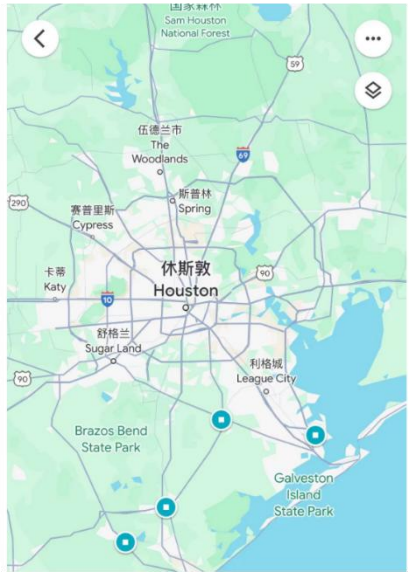
Grid-side Energy Storage-The USA Texas (TX10) Project

Project Overview

▶ The TX10 project in Texas, USA, is located in Houston and comprises 9 stations, with a capacity of 10MW/11MWH each

▶ Provide frequency regulation and demand-shifting services for community substations

▶ The project was contracted at the end of 2019, with the initial six sites being grid-connected in early 2021. The remaining three sites were grid-connected by the end of 2021. CLOU supplied DC-side energy storage systems for these sites



Grid-side Energy Storage-The USA Texas (TX10) Project

Project & Equipment Operation

Technology Advantage：stable and efficient active balancing technology

- The entire project employs a cell-level active balancing strategy, ensuring the voltage difference of the cells remains within 50mv, thereby enhancing the efficiency of cell charging and discharging.
- Optimize battery maintenance schedules, achieving a 90% cost reduction throughout the year.
- High-power 1C rechargeable battery cell
- Stable, long-duration operation, active balancing, short operation and maintenance time
- Excellent operational quality, with no significant degradation in battery capacity observed thus far

Project maintenance

Professional senior technical service engineers handle after-sales operation and maintenance

- Response within 6 hours, (CLOU Headquarters + US-based local team, both online and offline)
- Annual Capacity Assessment

Sequence No.	Project	Power Output	Capacity	No. of stations	Scene	Commissioning Date	Charging	Discharging	No. of Cycles	Proper Operation
1	Christmas Project	10MW	66MWH	6	frequency modulation/peak shaving	the earliest site commissioning date: November 23, 2021	100.8GWH	98.8GWH	approximately 2000 cycles/ per ESS	YES
2	Labour's Day	10MW	33MWH	3	frequency modulation/peak shaving	the earliest site commissioning date: Feburary 24, 2019	50.4GWH	48.4GWH	approximately 2000 cycles/ per ESS	YES

Grid-side Energy Storage-The USA Texas (TX10) Project

Project Earnings

The equipment availability is 98%, the actual charging and discharging efficiency is approximately 93%, and there are approximately 2000 cycles for each ESS

By 2024, the TX10 project will have undergone 1528 equivalent cycles, with the station's total charging capacity reaching 151.2GWh and total discharging capacity 140.3GWh. The average monthly mileage will be 2.8GWh.

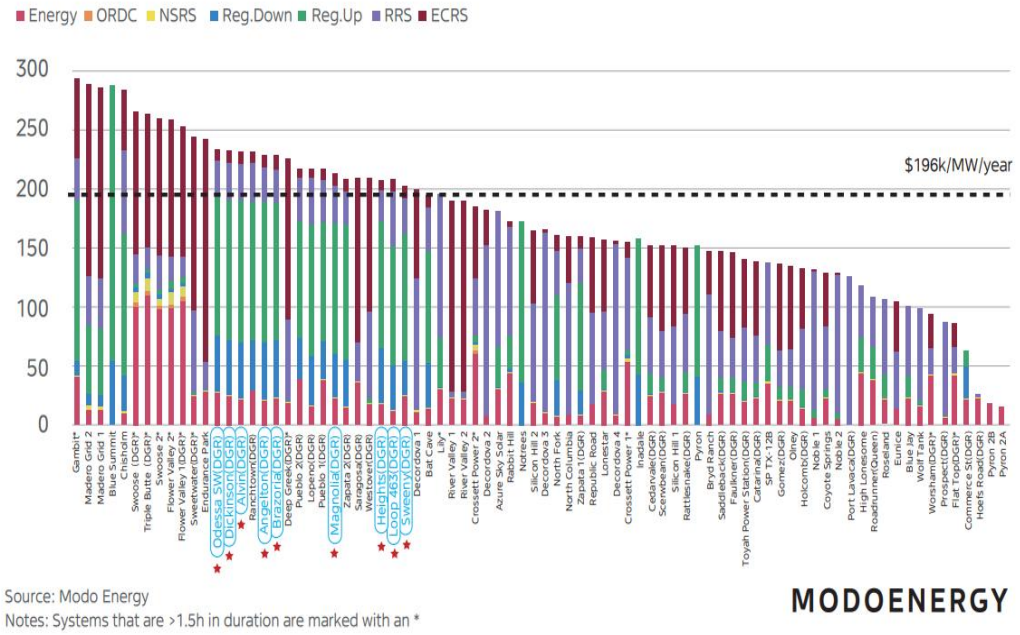
TOP30

User-friendly ROLE model

All stations have been listed on Revenue Texas

For the past 3 to 4 years, it has operated safely and stably, ensuring a reliable electricity supply for the vast majority of community users, minimizing power outages during peak periods, and generating tangible benefits for the owners of the grid operation business.

According to the 2023 ERCOT market energy storage station revenue ranking released by Modo Energy, a battery energy storage analysis platform, the TX10 project stations revenue ranked 13th/14th/15th/17th/18th/23rd/27th/28th/29th



Source: Modo Energy

Notes: Systems that are >1.5h in duration are marked with an *

★ Service station operated by CLOU

07

Indiana Christmas Eve Project

Grid-side Energy Storage-Indiana Christmas Eve Phase I Project

Project Overview

Capacity Scale: 19.2MW/46.9MWh

Composition: 24 sets of 40-foot containers

Location: Indiana, USA

Application Scenarios: peak shaving on the grid side

Construction Time: 2021

Stations: two stations, with an average of 0.8 to 1.2 cycles each/ per day

Grid-side Energy Storage-Indiana Christmas Eve Phase I Project

Project Value

▶ **Industry Pioneer：** World's 1st Commercial 20-Foot Energy Storage Container and World's 1st 20-Foot Full-load Transportation Project, setting a New Standard in the Industry

▶ **Ultimate Cost Efficiency：** World-first implementation of the 20-foot combined container model, with an overall footprint comparable to a 40-foot container, cutting on-site installation costs by 75% and transportation costs by 50%

▶ **Fast Delivery：** 20-foot standard containers, shipped to the United States via an express ocean freight within 14 days, resulting in a 40% shorter delivery time, establishing a record for energy storage delivery

Grid-side Energy Storage-Indiana Christmas Eve Phase II Project

Project Overview

Capacity Scale: 21MW/63.3MWh

Composition : 24 battery containers, 12 power conversion systems (PCS) and medium-voltage containers

Location: Indiana, USA

Application Scenarios: peak shaving on the grid side

Construction Time: 2022

Stations: Three stations, with an average of 0.8 to 1.2 cycles each/ per day

Grid-side Energy Storage-Indiana Christmas Eve Phase II Project

Project Value

▶ Whole-station design, integration, and construction to achieve EP Package services throughout the entire lifecycle

▶ The new generation 4MW PCS-SKID platform is the first application in the project

▶ Ultimate delivery: from the arrival and unpacking of the goods to the completion of the entire station's acceptance, the debugging cycle took 28 days only, setting an industry record

08

California Waterbottle Project

Grid-side Energy Storage-California Waterbottle Phase I Project

Project Overview

Project Features:

Capacity Scale: 10MW/69MWh

Composition: 24 sets of 20-foot containers

Location: California, USA

Application Scenarios: UPS Emergency Power Supply

Commissioning Time: 2023

Grid-side Energy Storage-California Waterbottle Phase I Project

Project Value

▶ **Exceed the most demanding standards :** the site has achieved UL9540A fire safety certification in California, surpassing the most stringent environmental and security compliance standards in the United States.

▶ **Networking technology applications :** the implementation of an ultra-large backup power supply, leveraging networking technology, seamlessly integrates with the urban emergency power grid system, thereby supplying critical energy systems within the city.

Grid-side Energy Storage-California Waterbottle Phase II Project

Project Overview

Capacity Scale: 39MW/180MWh

Composition: 72 sets of 20-foot containers

Location: California, USA

Application Scenarios: peak shaving on the grid side

Construction Time: 2023

Grid-side Energy Storage-California Waterbottle Phase II Project

Project Value

▶ **The most stringent compliance : surpassing the rigorous IEEE693 certification** for seismic compliance in the United States, pioneering the seismic standards in the energy storage sector

▶ **The world's sole entity** to have secured the California Seismic Safety Certification program

▶ The vibration table measurement has been endorsed by a CA registered professional engineer

09

China State Shipbuilding Corporation Project

Power Supply-side New Energy Storage-China State Shipbuilding Corporation Project

Project Overview

The 100 MW wind power project of CSIC Wind Power Phase II officially commenced in May 2022, successfully completing the installation of 16 wind turbines by the year's end. In January 2023, the 1st wind turbine was successfully grid-connected and passed the power transmission commissioning stage. The booster station and energy storage station have completed their electrification commissioning, with all wind turbines connected to the grid by the end of February.

The 1st energy storage power station in the entire league, comprising 12 medium-voltage cabinets and battery cabinets, capable of storing 30/60MWh of electricity, with a grid-connected voltage level of 35KV.

Power Supply-side New Energy Storage-China State Shipbuilding Corporation Project

Project Construction

The energy storage system equipment features an integrated container design, accommodating the energy storage battery cluster, battery control cabinet, power converter, transformer, and distribution cabinet within a single container. The container system is equipped with an independent self-powered system (including a medium-voltage box self-powered transformer and an energy storage box UPS), temperature control system, fire alarm system, lighting for door control, safety escape system, emergency system, fire fighting system, along with other automatic control and safety assurance systems.

The energy storage equipment is designed with a modular approach, featuring a distinct hierarchy of battery cells, modules, racks, and systems, offering a clear structure and comprehensive functions. It incorporates a comprehensive battery rack, battery management system (BMS), air conditioning and temperature control system, lighting system, fire detection and automatic fire suppression system, security system, emergency system, surge protection device, grounding protection device, and grounding fault detection device, among others.

Power Supply-side New Energy Storage-China State Shipbuilding Corporation Project

Project Operation & Advantages

Efficient Frequency Modulation： the system can assist the wind turbine generator unit in responding to AGC commands, taking into account primary-side main switch information, AGC command tracking status, RTU data status, and energy storage summary information.

Utmost Safety： the energy storage system is equipped with comprehensive protection features, including battery protection, overcurrent and overvoltage protection, grid connection protection, and an explosion-proof design. The battery container houses an integrated fire detection and alarm system, along with a gas fire extinguishing system. The fire detection and alarm system is capable of promptly detecting anomalies within the container and initiating the gas fire extinguishing system either automatically or manually. The fire alarm system operates independently from the original building's fire alarm system, and it relays the alarm information to the switchyard's fire detection and alarm system via dry contact signals.

Intelligent Monitoring： the control system of the energy storage system offers sophisticated internal monitoring, fault protection and isolation, and event logging capabilities, including switching operations, operational mode control, equipment status, operating temperature, and environmental monitoring and control. The control system, signaling system, and fire protection system within the energy storage system are designed to function normally during power failures.

Power Supply-side New Energy Storage-China State Shipbuilding Corporation Project

Project Value & Impact

Enhancing the power generation efficiency of wind power stations: energy storage technology can store the excess power generated by wind turbines, minimize the waste generated during high winds, and thereby enhance the overall power generation efficiency of wind power stations.

Addressing the issue of wind power variability: energy storage technology can store excess power generated during periods of strong winds and release it during periods of weaker winds. This balances the supply and demand at wind power stations, mitigating the issues associated with wind power's variability.

Enhancing grid stability: energy storage technology can store the excess power generated by wind turbines and release it during power supply shortages, thereby enhancing the stability of the power grid.

10

South America Pangu Project

Power Supply-side New Energy Storage-South America Pangu Project

Project Overview

Project Size：485MWh

Building Location：Chile, South America

Application Scenarios：Peak shaving, energy consumption, and smooth power output

Commissioning Time：2023

The project comprises 168 sets of 20-foot containerized energy storage systems, complying with UL9540A certification.

Power Supply-side New Energy Storage-South America Pangu Project

Project Value

▶ Challenging harsh environments

The project is situated in the Atacama Desert of South America, a region that has experienced no rainfall for centuries. The project is meticulously designed to withstand the rigorous challenges posed by desert drought, intense windstorms, and extreme heat. The utilization of maintenance-free filters and sophisticated temperature control mechanisms ensures stable operation and superior performance.

▶ Large-scale deployment

The largest new energy power generation side light storage integration project in South America, Chile's first photovoltaic + energy storage pioneer project, fully demonstrates the ability of CLOU to deploy in complex conditions and new markets on a large scale, as well as the ability to replicate and deliver super-large projects

▶ "the Belt and Road" demonstration project

Highly recognized by the Chilean Minister of Energy, it has become a regional demonstration project of the Belt and Road

11

Foshan Liyuan Project

Industrial & Commercial User-Foshan Liyuan Project

Project Overview

Project Size: 1MW/2.8MWh

Building Location: Foshan, Guangdong

Application Scenarios: User side

Commissioning Time: January 2017

Industrial & Commercial User-Foshan Liyuan Project

Project Value

The initial commercial demonstration projects: the 1st commercial grid-connected energy storage projects which have been completed and are now operational, representing one of the 1st demonstration projects of their kind in China

The system is primarily designed to offer peak shaving services to the Foshan Liyuan Stainless Steel Distribution Center. The factory experiences a high power load during the day and a constrained power grid capacity, with reduced power usage at night. The newly installed energy storage system is employed to manage peak demand and supplement energy during off-peak hours, thereby enhancing the power grid's capacity to handle load during the day.

In the typical application of peak shaving and valley filling for energy storage, the use of lithium iron phosphate batteries in a series of energy-type boxed storage products yields significant benefits, including high energy density, long cycle life, and a highly integrated system design. The system integrates energy storage batteries, BMS, PCS, temperature control, fire protection, lighting, and other essential subsystems.

Modular design: housed within a standard 45-foot container, it is suitable for outdoor installation, facilitating convenient deployment, mobility, and maintenance

45-day delivery: by leveraging CLOU's Energy Management Cloud Platform, users can remotely monitor the operational status in real-time

12

The Lafayette Project

Industrial & Commercial User-The Lafayette Project

Project Overview

Project Size: 1MW/2.45MWh

Building Location: Beijing, China

Application Scenarios: Industrial & commercial user

Commissioning Time: June, 2017

Considering the system's discharge depth and conversion efficiency, the energy storage power station is housed within a 45-foot standard container (each unit measures 13716mm in length, 2438mm in width, and 2896mm in height). The container is equipped with two 500kW energy storage bidirectional converters and 16 sets of 175.104kWh lithium iron phosphate battery racks from CLOU

Industrial & Commercial User-The Lafayette Project

Project Value

The Beijing Lafayette Castle Hotel spans a substantial area, specializing in castle-themed accommodations, adjacent entertainment and leisure amenities. Operating round-the-clock, it maintains a consistent electricity usage pattern. CLOU is tasked with installing energy storage devices, aiming to cut electricity expenses and enhance the quality of the electricity supply.

▶ The 1st completed and operational energy storage power station, it is part of the 500MWh international procurement project for energy storage facilities aiming at peak shaving and valley filling applications.

▶ This project represented the successful implementation of the largest lithium-ion battery energy storage system on the demand side in Beijing at the time.

▶ It took 45 days only from order confirmation to delivery completion.

13

Chongqing Midea Industrial Park Project

Industrial & Commercial User-Chongqing Midea Industrial Park Project

Project Overview

Project Size：2MW/4MWh

Building Location：Chongqing

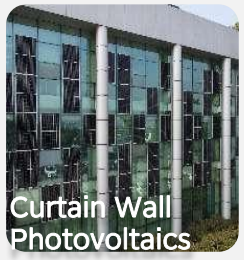
Application Scenarios：Industrial & commercial user

Commissioning Time：February 2024

Industrial & Commercial User-Chongqing Midea Industrial Park Project

Project Value

Green Solar Energy



Energy storage system

Storage/ release

Energy Efficiency in Production Lines

Phase I (carbon peak phase)

Construct a new 3MW distributed photovoltaic system (4# & 5# factories), representing 19% green electricity and reducing carbon emissions by 17.3%. The electricity price is discounted by 10%

Phase II (carbon neutrality stage)

A new 5MW distributed photovoltaic system and a 1 MWh energy storage system is established, with an annual power generation capacity of 6.2 million kWh, representing 55% green electricity, and reducing 5,323 tons of carbon emissions

Photovoltaic panel wall

Photovoltaic wall has been installed in front of the office building to reduce air conditioning energy consumption and generate electricity for office use

Energy storage system

In line with Chongqing's electricity pricing policy, which features two charge and two discharge cycles, the static investment payback period is 4.89 years

Solar-powered Street Lamp

The street lights at the south gate office building have been replaced with 15 solar-powered units, yielding an annual electricity savings of 5,000 kWh

Process Optimization in Production

Waste heat from the air compressor is utilized for drying purposes Plasma cutting has replaced traditional mechanical cutting, with Kuka's intelligent production systems

The Chongqing Economic and Information Commission's flagship low-carbon park demonstration and promotion initiative, combining energy production, consumption, management, and storage, with a focus on urban energy storage

Charging and Discharging Mode: **Two Charging Cycles and Two Discharging Cycles** Return on Investment: **Approximately 23%** Return Period: **4.89 years**

14

Hefei Midea Industrial Park Project

Industrial & Commercial User-Hefei Midea Industrial Park Project

Project Overview

Project Size: 3MW/6MWh

Building Location: Hefei, Anhui Province

Application Scenarios: Industrial & commercial user, the lighthouse factory

Commissioning Time: January 2024

The Midea washing machine factory in Hefei is a "lighthouse factory" rooted in "traditional lean manufacturing", aligning with the national "dual carbon" strategy, we embed green elements into the intelligent manufacturing system. Through green product design, integrated green supply chains, digital management platforms for energy systems, applications of green energy and energy storage, we are committed to building a green and transparent smart factory

Industrial & Commercial User-Hefei Midea Industrial Park Project

Project Value

▶ **Lower the electricity costs for the factory：** by implementing efficient operational control strategies, such as energy storage EMS, we achieved a significant reduction in the factory's **electricity** demand, cutting the bill from 7 million to 5 million

▶ **Achieve energy consumption structure optimization through 4 liters of increase and 1 decrease**

1. Enhancing the stability of green electricity： the energy storage system effectively mitigates the variability of photovoltaic power, ensuring steady utilization of green electricity even during rainy weather and at night, thereby increasing the share of green electricity. By utilizing CLOU's energy storage solutions, the share of green electricity has risen from 30% to 35%, actively contributing to the group's green strategy

2. Enhancing Electricity Consumption Safety： by implementing energy storage and microgrid control strategies, we can reduce electricity demand during peak usage periods in summer, prevent power cuts and the impacts of seasonal variations on factory efficiency, and ensure the continuity of production

3. Enhance electricity cost-effectiveness： by exploiting the arbitrage of peak and valley electricity prices, implementing a 2-charge, 2-discharge strategy, effectively mitigating the impact of the two-part tariff system, maximizing returns, and securing a favorable rate of return

4. Mitigate investment risks in green electricity： implement the energy performance contracting (EPC) model to significantly reduce investment risks for factories, which are required to provide only the site, with no impact on cash flow. Local governments offer subsidies for installation, charging, and discharging, with amounts reaching up to 2 million, further mitigating investment risks

15

Qumalai Project

Microgrid Case Study-Qumalai Project

Project Overview

Project Size: 7.203MWp/20.7MW/5MWh

Building Location: Qumalai, Qinghai Province

Application Scenarios: Off-grid systems, Microgrids

Commissioning Time: 2014

The Qumalai 7.203MWp distributed off-grid photovoltaic power station is situated in Qumalai town, in the southwest of Qinghai Province, with a total investment of RMB236.25 million. The CLOU 2MWh lithium iron phosphate energy storage system serves as the power station's backbone, with 1MWh lithium battery each housed in a standard 40-foot container. The container houses battery racks and accessories, a battery management system, DC combiner cabinet, fire protection system, air conditioning system, energy storage bidirectional converter, and a power distribution cabinet. All these components are crucial to the power station's smooth operation

Microgrid Case Study-Qumalai Project

Project Value

The world's largest： the world's largest off-grid photovoltaic power station at the time, utilizing a fully integrated photovoltaic and energy storage solution, with no other power sources involved in the off-grid mode

Microgrid applications： address the black start issue in photovoltaic power plants through energy storage batteries. During extreme conditions, such as prolonged rainy weather, the entire load of photovoltaic power plants can be sustained by batteries for 24 hours. Additionally, 50% of residents' daily electricity consumption is supported by energy storage batteries for 72 hours, while critical loads can be powered by these batteries for up to a week.

Improve the structural and seasonal issues in the local power supply, and address the significant power generation shortfall during the winter and spring dry seasons in a hydropower-dominated energy mix

High altitude ： achieve the mode of immediate use, nearby consumption and efficient utilization of photovoltaic power generation in high-altitude western regions, improving people's livelihood and the quality of life

16

Tibet Shuanghu Project

Microgrid Case Study-Tibet Shuanghu Project

Project Overview

Project Size：13MWp/7MW/10.08MWh

Building Location：Shuanghu, Tibet

(the highest altitude town in the world)

Application Scenarios：Microgrids

Commissioning Time：January 2017

Microgrid Case Study-Tibet Shuanghu Project

Project Value

The renewable energy LAN project in Shuanghu town, Tibet is located in the northwest of Naqu District, Tibet. The main project includes a photovoltaic power station with an installed capacity of 13MWp, a 7MW energy storage converter, a 23.52MWh lithium-ion battery, two 1000kW diesel generators, and a Shuanghu town distribution network system. The system has a maximum voltage level of 10kV unconnecting to the large power grid. It is an independent renewable energy LAN system

▶ Challenging the peak, CLOU stores green and clean power for the world's highest town seat

▶ Achieved frequency and voltage modulation for the system and set up the fundamental power grid

▶ The design of the first-generation energy storage system has been adopted, achieving overall optimization in energy density, cost, and cycle life

▶ Effectively alleviate the severe power shortage in Tibet, make up for the deficiencies of the large power grid, ensure the safe and stable operation of the local area network in Shuanghu town, and guarantee customers with safe, stable, clean, and economical green electricity

17

Puerto Rico Project

Microgrid Case Study-Puerto Rico Project

Project Overview

Project Features:

▶ The inaugural commercial VSG project in the United States, serving as a paradigm for island microgrids

▶ The world's sole company having developed gas generator curves responsive to voltage and frequency variations, effectively addressing the challenges posed by insufficient inertia and monitoring difficulties in gas generator sets, successfully implementing VSG support

▶ The C & I project, which facilitates off-grid switching, employs an advanced monitoring algorithm, operates continuously 24/7, and meets stringent reliability requirements

Project Size: 3.6MW/3.06MWh
Building Location: Puerto Rico
Application Scenarios: Microgrids
Commissioning Time: 2022

18

Cape Verde Project

Microgrid Case Study-Cape Verde Project

Project Overview

Project Features:

The 1st lithium-ion battery energy storage project and the 1st photovoltaic energy storage companion project in Cape Verde, a highly unique application for a salt-spray island project

Project Size: 2MW/2.4MWh

Building Location: Cape Verde, Africa

Application Scenarios: Smooth power output, photovoltaic system support

Commissioning Time: September, 2022

19

Rwanda Project

Microgrid Case Study-Rwanda Project

Project Overview

Project Features:

▶ The project boasts high energy density and operates fully independently from the grid

▶ Significant social benefits: assisting developing countries in promoting green energy projects, fostering sustainable development in local communities, cultivating talent and providing local support in developing regions, offering training and guidance to enhance the skills of local personnel, and promo ting economic development and technological progress

Project Size: 3MW/3MWh

Building Location: Rwanda, Africa

Application Scenarios: Island mode, integrated solar energy storage

Commissioning Time: 2018

20

Hawaii Project

Microgrid Case Study-Hawaii Project

Project Overview

Project Size: 0.24MWp/0.1MW/0.75MWh

Building Location: Hawaii, USA

Application Scenarios: Microgrid, integrating photovoltaics & energy storage

Commissioning Time: 2015

This system exemplifies a typical grid-connected microgrid solution that integrates photovoltaic and energy storage, addressing the issue of high daytime electricity costs for customers. The primary role of energy storage is to smooth out power fluctuations within the microgrid, enhance power quality, and store surplus photovoltaic energy.

The project represented an early foray into industrial and commercial energy storage in Hawaii, initiating an advanced study a decade ago. Its successful implementation amply demonstrates CLOU's power in industrial and commercial energy storage and microgrid integration

21

Caribbean Project

Microgrid Case Study-Caribbean Project

Project Overview

▶ **Innovation Pioneer:** the world's 1st project to apply the Island Model, and Costa Rica's initial energy storage project

▶ **Full-stack intelligence:** integrating PCS, EMS, and BMS into a multifunctional energy storage solution, encompassing nearly all energy storage functions

▶ **Technological innovation:** innovative designs for the booster station and centralized control box among others, pioneering compatibility with grid dispatching protocols, establishing local grid dispatching protocols, and ensuring seamless integration with the grid

▶ **Scientific research demonstration:**

It has verified a series of functions such as black start, grid-off switch, and remote dispatching

Project Size: 3.3MW/4.128MWh

Building Location: Costa Rica

Application Scenarios: Comprehensive application

Commissioning Time: 2020

22

Guangzhou Automobile Group New Energy Project

Cascade Utilization Case Study-Guangzhou Automobile Group New Energy Project

Project Overview

Project Size: 100KW/300KWh

Building Location: Guangzhou

Application Scenarios: Cascade utilization

Commissioning Time: July, 2018

Cascade Utilization Case Study-Guangzhou Automobile Group New Energy Project

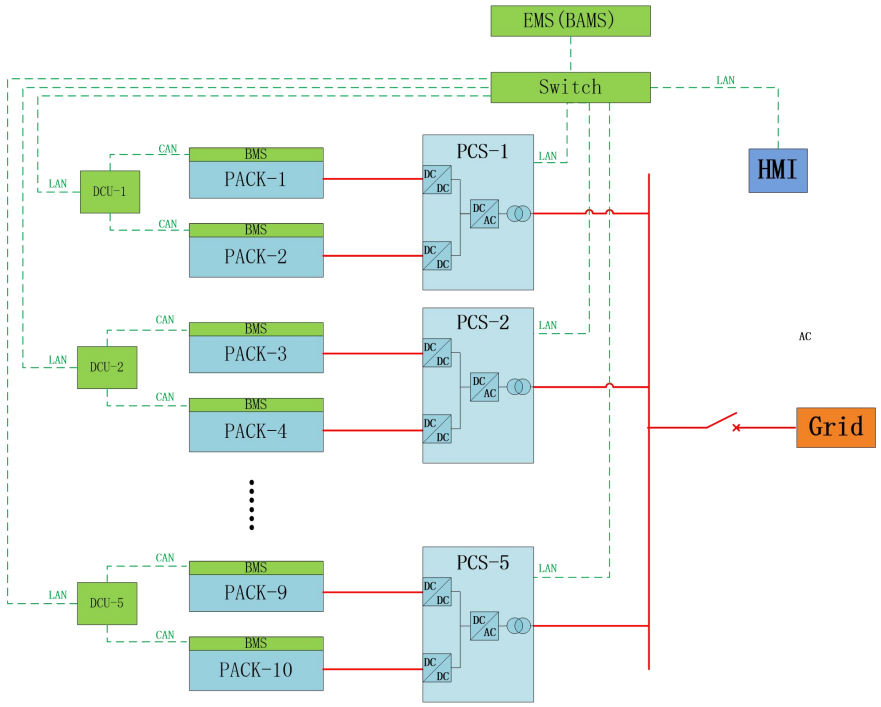
Project Value

▶ The system boasts a total capacity of 100kW, segmented into five 20kW energy storage units that are connected to the grid in parallel on the AC side. Each energy storage unit comprises two GAC tiered battery packs, a battery management unit DCU, and a 20kW PCS. A single PCS features two DC access paths, serving as charging and discharging interfaces for the two battery packs

▶ Participated in the "Technology for Health Status Assessment and Residual Value Assessment of Decommissioned Power Battery Cells and Modules" as mandated by the response guide for "Project 1", and researched models for health status assessment and residual value assessment of decommissioned cells and modules. These models can be applied to rapid sorting detection methods, sorting parameter sets, and cascade sorting evaluation thresholds

▶ Led the "Project 2" responding to the requirements of the "Technology for Rapid Sorting and Restructuring of Echelon-Utilized Power Batteries" as instructed by the guidelines, and conducted research on rapid sorting devices, battery module internal short-board battery isolation and restructuring technology, flexible access and system restructuring technology for echelon-utilized battery modules

▶ Engaged in "Project 5" and addressed the requirements of the "Echelon Utilization Power Battery Re-retirement Standards" along with the demonstration application assessment indicators, and researched the standards for the echelon utilization of retired power batteries.



C&I Projects

Europe

Germany Project

Czech Republic Projects

Poland Project

Southeast Asia

Malaysia Project 1

Malaysia Project 2

Malaysia Project 3

China

Dongguan Project

Wuxi Proejct

Foshan Project

CLOU HQ Project

Germany Project

Midea Industrial Tech.

Project Overview

Location: Vaihingen an der Enz, Germany

Capacity: 110KW/ 233KWh

Commissioning Date: Feb 20th, 2025

Application Scenario: Energy Shifting with PV + Storage for Industrial Facilities.

Industrial power consumers install photovoltaic (PV) systems combined with energy storage to enable energy shifting. This ensures maximum self-consumption of PV generation and effectively reduces electricity expenses for the enterprise.

Czech Republic Project 1

Midea Industrial Tech.

Project Overview

Location: Brno, Czech Republic

Capacity: 660KW/ 1398 KWh

Commissioning Date: April 25th, 2025

Application Scenario: Peak Shaving, Demand Management, and Backup Power for High-Energy-Consuming Factories.

High-energy-consuming factories deploy energy storage systems to perform peak shaving and demand charge management, thereby reducing production electricity costs. With seamless on-grid to off-grid transfer capabilities, the system supports millisecond-level switching to ensure uninterrupted power supply for critical loads, enabling reliable off-grid backup functionality.

Czech Republic Project 2

Midea Industrial Tech.

Project Overview

Location： Prague, Czech Republic

Capacity： 110KW/ 233 KWh

Commissioning Date： June 24th, 2025

Application Scenario: Peak Shaving for Commercial Buildings

Energy storage systems charge during off-peak hours and discharge during peak periods, helping commercial buildings reduce electricity costs through peak-valley arbitrage. This effectively lowers energy expenses for clients.

Poland Project

Midea Industrial Tech.

Project Overview

Location: Poznań, Poland

Capacity: 220KW/ 466 KWh

Commissioning Date: During commisioning

Application Scenario: PV-Integrated Energy Storage for Optimized Utilization and Cost Savings.

Factories with existing photovoltaic (PV) systems install energy storage to prevent PV curtailment and maintain load balance. The storage system enables orderly consumption of solar energy while also capturing electricity price arbitrage benefits.

Standard System Image

Malaysia Project 1

Midea Industrial Tech.

Project Overview

Location： Bandar Baru Bangi, Selangor, Malaysia

Capacity： 50KW/ 150KWh

Commissioning Date： August, 2017

Application Scenario: During the day, rooftop solar panels in residential communities charge the energy storage system; at night, the stored energy is discharged to supply power to the residential community.

National-Level Demonstration Project by Tenaga Nasional Berhad (TNB), Malaysia's National Grid Operator.

Malaysia Project 2

Midea Industrial Tech.

Project Overview

Location： Petaling Jaya, Selangor, Malaysia

Capacity： 110 KW/ 233 KWh

Commissioning Date： July, 2024

Application Scenario: During the day, rooftop solar panels in residential communities charge the energy storage system; at night, the stored energy is discharged to supply power to the residential community.

National-Level Demonstration Project by Tenaga Nasional Berhad (TNB), Malaysia's National Grid Operator.

Malaysia Project 3

Midea Industrial Tech.

Project Overview

Location： Petaling Jaya, Selangor, Malaysia

Capacity： 110 KWh/ 233KWh

Commissioning Date： August, 2024

Application Scenario: Solar PV Consumption. During the day, the energy storage system absorbs solar power generated by photovoltaic panels. When the PV panels are not generating electricity, the energy storage system supplies power to the factory.

China Dongguan Project

Midea Industrial Tech.

Project Overview

Location： Donggaun City, Guangdong Province, China

Capacity： 0.55 MW/ 1.165MWh

Commissioning Date： November 2024

Application Scenario: Integrated PV-Storage-Charging Strategy.

By implementing peak shaving, valley filling, and maximizing photovoltaic (PV) self-consumption, the strategy enhances load management for EV charging stations.

China Wuxi Project

Midea Industrial Tech.

Project Overview

Location： Wuxi City, Jiangsu Province, China

Capacity： 0.55 MW/ 1.165MWh

Commissioning Date： November 2024

Application Scenario: Peak-Valley Arbitrage for High-Energy-Consuming Industries.

By leveraging electricity price differences between peak and off-peak hours, industrial users perform two charging and two discharging cycles daily. This strategy reduces energy waste and effectively lowers electricity costs.

China Foshan Project

Midea Industrial Tech.

Project Overview

Location: Foshan City, Guangdong Province, China

Capacity: 1.1MW / 2.33MWh

Commissioning Date: April 2025

Application Scenario: Peak Shaving and Backup Power with Energy Storage.

Energy storage systems help reduce electricity costs by shaving peaks, filling valleys, and capturing arbitrage value from peak-valley price differences. In off-grid or power outage scenarios, the system provides backup power to ensure uninterrupted supply to critical loads.

CLOU HQ Project

Midea Industrial Tech.

Project Overview

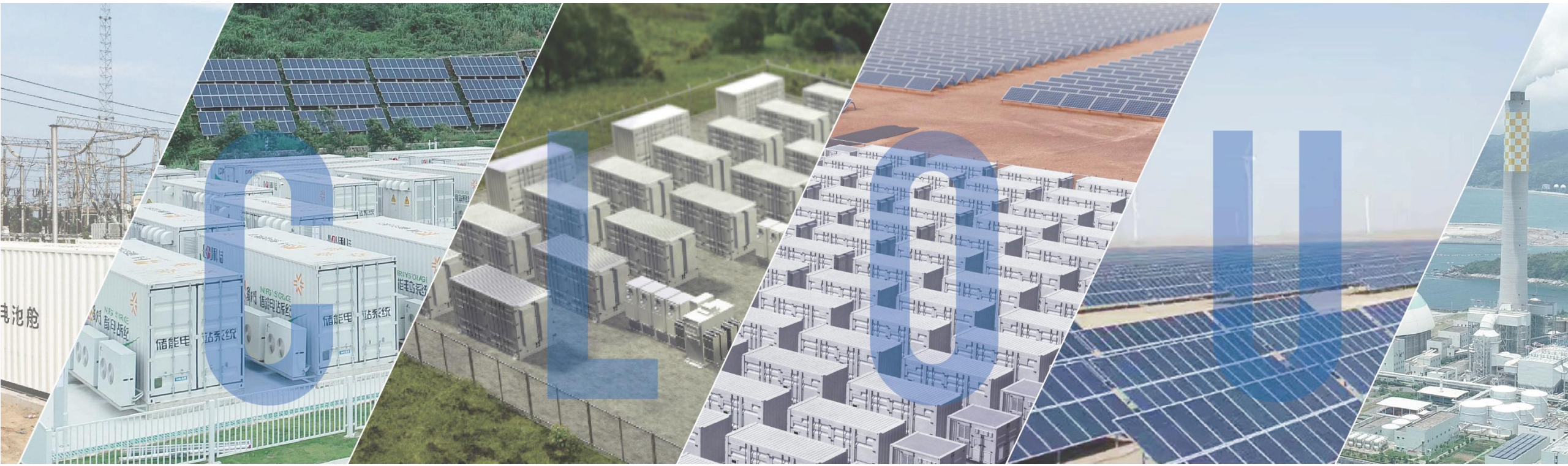
Location: CLOU HQ Building, Shenzhen, China

Capacity: 0.42 MW/ 0.932MWh

Commissioning Date: Year 2024

Application Scenario: Commercial Electricity Peak-Valley Arbitrage.

By participating in Shenzhen ' s Virtual Power Plant (VPP) demand response services, commercial users leverage energy storage systems for peak-valley arbitrage, significantly reducing electricity expenses. The payback period for such an investment is approximately 1.05 years.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