

广东省新型储能产业发展和南网科技实践

Development of New Energy Storage Industry in Guangdong Province and Practices of China Southern Power Grid Technology Co., Ltd.

南方电网电力科技股份有限公司

2025.12.03

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南网科技新型储能实践

Practices in New Energy Storage by CSG Technology

能源结构转型机遇

Energy Structure Transformation Opportunities

- 随着风电、光伏等新能源大规模接入电网，全球电力系统面临能源结构转型带来的多重挑战。

With the large-scale grid connection of renewable energy sources including wind and solar PV, global power systems are confronted with multiple challenges arising from energy structure transition.

- 新型储能凭借其灵活调节能力，成为支撑新型电力系统的关键力量。

New energy storage, by virtue of its flexible regulation performance, has emerged as a pivotal force underpinning the construction of new-type power systems.



可再生能源发展
Development of Renewable Energy

全球电网升级改造
Global Power Grid
Renovation and Upgrading



新型电力系统需求多样
Diverse requirements of
New-type power systems

解决方案：新型储能
Solution: New Energy
Storage



- 中国政府高度重视新型储能发展，制定《新型储能规模化建设专项行动方案(2025—2027 年)》，推动新型储能高质量发展。

The Chinese government accords high priority to the new energy storage, and has issued the *Special Action Plan for the Large-Scale Construction of New Energy Storage (2025–2027)* to drive its high-quality development.

- 广东省积极响应国家政策，形成 “1部顶层设计+N项配套落实+N个地市响应” 的新型储能产业政策体系。

Guangdong has proactively aligned with national policies and constructed a policy framework for the new energy storage industry based on the model of "1 top-level design document + N supporting implementation measures + N municipal response initiatives".



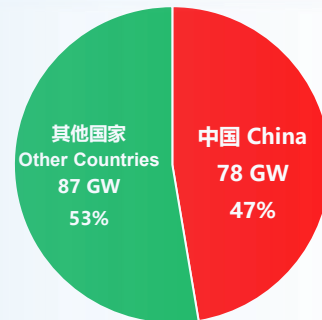
- 近年来，全球新型储能市场迎来爆发式增长。2024年底，全球新型储能总装机165GW，中国新型储能装机78GW，占比47%。

In recent years, the global new-type energy storage market has experienced a period of explosive expansion. By the end of 2024, the global installed capacity of new energy storage stood at 165GW, with China accounting for 78 GW, representing 47% of the global total.

近八年全球新增投运
新型储能项目装机规模
Installed Capacity of Newly Commissioned
Global New Energy Storage Projects in the
Last Eight Years

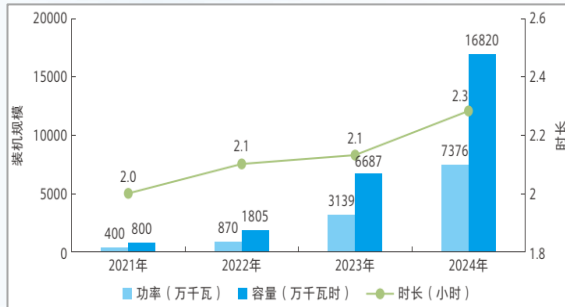


2024年全球新型储能
累计装机规模及占比
Cumulative Installed Capacity of Global New
Energy Storage (2024)

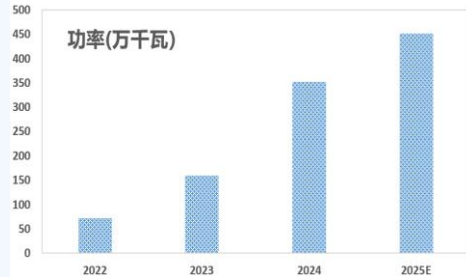


- 中国新型储能装机规模保持高速增长，截至2025年上半年中国装机规模达到94GW，预计至2027年底规模将达到180GW。
China's new energy storage installed capacity maintain rapid growth. As of the first half of 2025, the installed capacity of China stood at 94GW, and it is anticipated to reach 180GW by the end of 2027.
- 2024年底，广东省新型储能装机规模已达到3.52GW，同比增长22%。根据目标规划，在2025年底将新增规模1GW。
By the end of 2024, the installed capacity of new energy storage in Guangdong had reached 3.52 GW, a year-on-year increase of 22%. According to the target plan, an additional 1 GW will be added by the end of 2025.

中国新型储能装机规模
Installed Capacity of New Energy Storage In China



广东新型储能装机规模
Installed Capacity of New Energy Storage in Guangdong



Regional Advantages and Industrial Foundations Opportunities

- As a reform and opening-up pioneer, Guangdong has solid power system foundation, sound new energy equipment manufacturing system, and strong tech R&D & innovation capabilities.**



储能产业发展基础坚实，前景可期。



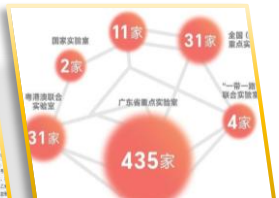
风光储协同发展

新能源汽车产业带动 NEV Industry-Driven



电力系统建设基础优势

完善的产业生态体系
Complete Industrial Ecosystem



强大的技术研发能力
Strong Tech R&D
Capabilities

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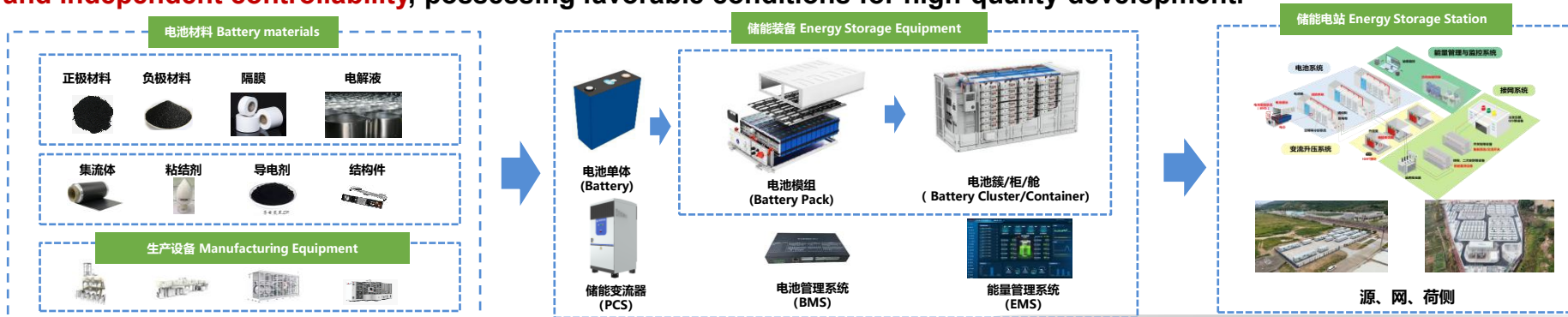
三

南网科技新型储能实践

Practices in New Energy Storage by CSG Technology

- 广东新型储能产业基本形成覆盖电池材料、储能电芯、变流器、系统集成和回收利用的储能电池全产业链。产业链**高度细分、高度专业化，总体自主可控**，具备高质量发展的良好条件。

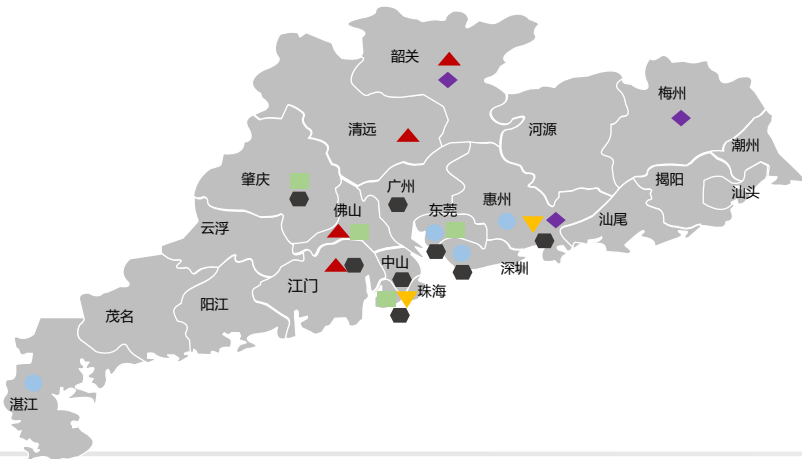
The new energy storage industry of Guangdong has formed a full energy storage battery industrial chain (covering battery materials, cells, converters, system integration & recycling). The chain features **high segmentation, specialization and independent controllability**, possessing favorable conditions for high-quality development.



Industry-Coordinated Layout

- 广东布局多个储能产业集聚区，实现**产业链上下游高效联动、资源共享、技术交流。**

Guangdong has established multiple energy storage industry clusters, enabling **seamless collaboration, resource sharing and technological interaction across the entire industrial chain.**



- ## ▲ 正极材料 Cathode



- ## ● 负极材料 Anode



- 隔膜材料 Separator



- ## ▼ 电解液 Electrolyte



- ## ◆ 辅材 Auxiliary Materials



- **储能电池** Energy storage battery



- 储能控制产品及系统集成、先进装备制造**
Control Products, System Integration & Advanced Equipment Manufacturing



南网科技



SINEXCEL



- ## 🌱 电池回收利用 Battery recycling



- 在全球出货总量中，国产磷酸铁锂、负极材料、隔膜及电解液四大主材占比超80%。电解液出货量前三都是广东省企业，贝特瑞负极材料出货量连续14年全球第1，为广东省储能电池产业原料供应提供坚实保障。

China dominates global material market: >80% share for LFP, anode materials, separators & electrolytes. Guangdong leads electrolyte supply and BTR has maintained its position as the world's leading anode material supplier for 14 consecutive years, providing robust support for raw material supply to Guangdong's energy storage battery industry.

2024年中国电解液材料前十企业出货量排名：万吨



Top 10 Chinese Enterprises in Electrolyte Shipments (2024)

2024年中国负极材料前十企业出货量排名：万吨



Top 10 Chinese Enterprises in Anode Material Shipments (2024)

- 实现高压实磷酸铁锂、高压电解液、硅碳负极等高端原材料的研发与生产突破。

Achieved R&D and production breakthroughs in high-density LFP, high-voltage electrolytes, silicon-carbon anodes, and other high-end raw materials.

储能电池产业

Energy Storage Battery Industry

- 2025 上半年中国企业储能电池全球市场出货量达233.6GWh，占据全球90%的市场份额。

H1 2025: Chinese enterprises' energy storage battery global shipments hit 233.6 GWh, holding 90% of the global market share.

- 2025年1-10月，广东省锂离子电池出口金额为164.8亿美元，同比增长40.52%，全国第一。

From January to October 2025, the export value of lithium-ion batteries in Guangdong Province reached 16.48 billion US dollars, a year-on-year increase of 40.52%, ranking first in China.

原材料供应链保障

Material Supply Chain Security

技术突破

Technology breakthrough

海外布局

Overseas Expansion Strategy

序号	省市	出口额 (亿美元)			出口数量 (万个)		
		2025 年	2024 年	同比增	2025 年	2024 年	同比增
		1-10 月	1-10 月	长%	1-10 月	1-10 月	长%
1	广东省	164.80	117.28	40.52%	127031.02	111805.22	13.62%
2	福建省	151.26	134.09	12.81%	28276.67	21372.61	32.30%
3	江苏省	80.56	78.53	2.59%	75410.39	63618.10	18.54%

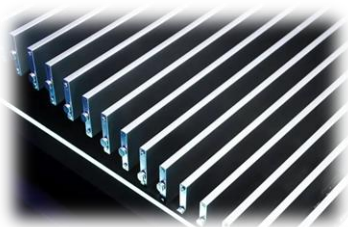


- 以锂离子技术为主要路线，朝着大容量、长寿命、高安全、低成本的方向迭代升级，持续推动储能系统成本优化。

Taking lithium-ion technology as the main technical route, we are iterating and upgrading toward larger capacity, longer service life, higher safety and lower cost, and continuously promoting the cost optimization of energy storage systems.

- 构建多技术协同发展格局，同时前瞻布局高安全半固态 / 全固态电池、宽温区钠离子电池、液流电池长时储能技术。

Multi-Technology Synergy Framework: making forward-looking arrangements for high-safety semi-solid-state/full-solid-state batteries, wide-temperature-range sodium-ion batteries, and flow battery-based long-duration energy storage technologies.



2710Ah储能专用刀片电芯

2710Ah Energy Storage-Specific Blade Cell



314Ah半固态储能电池量产

Mass Production of 314Ah
Semi-Solid-State Energy Storage Cells



高安全长寿命胶体储能电池

High-Safety & Long-Life
Colloidal Energy Storage Battery



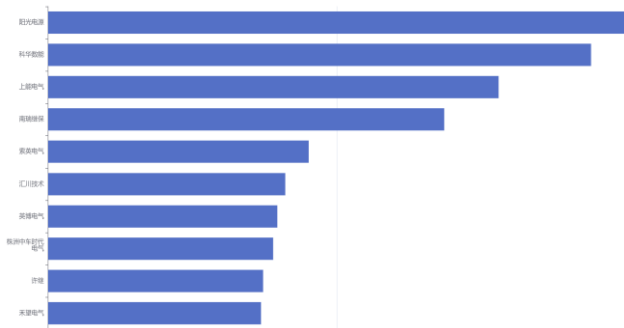
宽温区钠离子电池

Wide-Temperature-Range
Sodium-Ion Battery

储能变流器产业 PCS Industry

- 广东省企业的储能变流器产品占据全国四成市场份额，其中汇川技术、禾望电气的储能变流器全球出货量位列全国前十。

Guangdong enterprises hold 40% of national energy storage converter market. Inovance and Hopewind rank top 10 nationally in global PCS shipments.



2024年度全球市场储能PCS出货量前十中国企业

Top 10 Chinese Enterprises in Global Energy Storage PCS Shipments (2024)

技术路线 Technologies	优势 Advantages
集中式 Centralized Type	单机功率密度高，低成本 High power density, Low cost
组串式 String Type	可灵活部署，安全性高 Flexibility, High Safety
高压直挂型 High-Voltage Direct-Connected Type	低损耗，占地面积小 Low Loss, Small Footprint

- 引领组串式，高压直挂式拓扑和构网型储能技术发展。

Lead the development of string, HV direct-connected topologies and grid-forming energy storage technologies.

- 2025年前三季度，广东省储能系统集成商出货量超过40GWh。依托电池研发基础，广东省企业不断推动储能系统向高能量密度，高安全，高集成一体化，智能化方向发展。

In 2025 Q1-Q3, Guangdong's ESS integrators achieved shipments exceeding 40GWh. Relying on the R&D foundation of batteries, enterprises in Guangdong have continuously promoted the development of ESS toward the directions of high energy density, high safety, high integration, and intelligence.



储能单元容量突
破14.5MWh

Energy Storage
Unit Capacity
Breaks 14.5 MWh



储能系统通过UL9540A
箱体燃烧实验安全检测

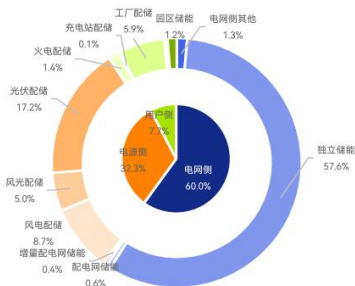
Energy Storage System
Passes UL9540A Enclosure
Combustion Safety Test

储能系统应用

Energy Storage System Application

- 从储能应用场景来看，电网侧储能是装机的主力军，占比达到60%。电网侧应用场景不断丰富。

From the perspective of energy storage application scenarios, grid-side energy storage is the main scene of installed capacity, accounting for 60% of the total. Grid-side application scenarios continue to expand.



2024年中国新型储能装机 应用场景分布

Distribution of China's New Energy
Storage Installed Capacity by Application
Scenario in 2024



储能系统应用

Energy Storage System Application

■ 电源侧储能建设加快，用户侧储能新场景不断拓展。

The construction of generation-side energy storage is accelerating, while new applications for user-side energy storage continue to expand.



■ 积极开展多元化技术路线示范应用。

We actively carry out demonstration applications of diversified technical routes.



宝湖电站：浸没式液冷技术

Baohu Station: Immersion
Liquid Cooling Technology



顺德实证基地：锂电+超容

Shunde Demonstration Base:
Lithium Battery + Supercapacitor

储能产业出海

Energy Storage Industry Going Global

- 面对海外合规壁垒、本地化服务需求等挑战，广东省企业以间接出海为基础，探索联合出海、直接出海与属地化布局新模式，实现产业链协同输出。

Facing challenges like overseas compliance barriers and localized service demands, Guangdong enterprises explore new models (joint/direct overseas expansion, local layout) based on indirect export to achieve industrial chain collaborative output.

间接出海

Indirect overseas



供货龙头出海企业

Supply to leading overseas expansion enterprises

直接出海

Direct overseas



沙特:微网智能光储解决方案

Saudi Arabia: Intelligent Microgrid PV-ESS Solution

联合出海

joint overseas



东南亚:光储EPC项目

Southeast Asia: PV-ESS EPC Projects

属地化布局

Local Layout



马来西亚: 电池工厂

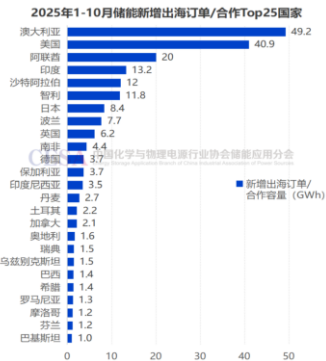
Malaysia: Battery Plant

储能产业出海

Energy Storage Industry Going Global

- 2025 年 1-10 月期间，中国储能企业面向澳大利亚市场的新增订单与合作项目总量达 49.2GWh，在同期中国企业对全球各国储能出海业务中，澳大利亚市场的合作规模位列第一。

During 2025 Jan to Oct, Chinese energy storage enterprises secured 49.2GWh of new orders/projects in Australia, ranking 1st globally in overseas business volume.



Top 25 Countries by New Overseas Energy Storage Orders & Partnerships (Jan–Oct 2025)



东莞港为储能系统出口澳大利亚
提供出港运输保障
Dongguan Port: Transportation
Support for EES Exported to Australia



液冷储能系统供货澳大利亚
最大储能项目 (1.6GWh)
Liquid-Cooled ESS Supplied to Australia's
Largest Energy Storage Project (1.6GWh)

- 广东省多家储能企业与澳方签约，推进本地化布局，共拓澳储能市场。

Guangdong energy storage enterprises sign deals with Australian partners, advance local layout to jointly explore Australia's energy storage market.

■ 从“规模扩张”转向“质量与价值提升”。

The energy storage industry transforms from the stage of "scale expansion" to that of "quality enhancement and value elevation"

技术攻关 Technological Research & Breakthroughs

突破钠离子电池、固态电池、长时储能关键技术研发。

Break through key R&D of sodium-ion batteries, solid-state batteries and long-duration energy storage.

与新一代信息技术深度融合，研发高性能储能变流器，智慧能量管理系统。

Integrate deeply with new-generation information technologies to develop high-performance energy storage converters and intelligent energy management systems.

加强产业协同创新，依托国家新型储能创新中心开展产学研用合作，加速科技成果转化。

Strengthen industrial collaborative innovation, conduct industry-university-research-application cooperation via National New Energy Storage Innovation Center, and accelerate tech achievement transformation.

■ 从“规模扩张”转向“质量与价值提升”。

The energy storage industry transforms from the stage of "scale expansion" to that of "quality enhancement and value elevation"

场景牵引产业升级Scenario-Driven Industry Upgrading

深化电网侧储能规模化应用，夯实新型电力系统稳定底座；加快工商业储能场景推广，释放用户侧多元价值；同时积极探索 V2G 等新兴场景，拓展储能产业发展新赛道。

Deepen large-scale grid-side ESS application to stabilize new power systems. Accelerate industrial & commercial ESS promotion to unlock user-side value. Explore V2G and other emerging scenarios to expand new industry tracks.

海外合作Overseas Cooperation

积极开拓“一带一路”路线东南亚、中东等新兴市场。

Explore emerging markets in Southeast Asia, the Middle East along the "Belt and Road".

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南网科技新型储能实践

Practices in New Energy Storage
by CSG Technology

南网科技-公司简介

CSG Technology - Introduction

南方电网
下属国有子公司

State-owned
subsidiary of China
Southern Power
Grid

首家电力行业科创
板上市公司

The First Power
Industry Company
Listed on the STAR
Market

公司定位：电力能源领域基于人工智能的**高端智能设备和高技术服务**综合解决方案提供商

Company Positioning: A comprehensive solution provider of **high-end intelligent equipment** and **high-tech services** based on artificial intelligence in the electric power and energy field

◆南网科技公司自2017年起开始开拓市场化储能业务，充分发挥**深刻理解电源和电网技术特性**的优势，提供整套储能系统解决方案。

CSG Technology has been developing its commercialized energy storage business since 2017. Giving full play to its advantage of having an **in-depth understanding of the technical characteristics of power sources and power grids**, the company provides a complete set of energy storage system solutions.

产品研发制造
Product R&D
and
Manufacturing

工程总承包
Engineering,
Procurement &
Construction
(EPC)

并网测试
Grid-
connection
Testing

数字化储能系统：高安全、高可用、高收益

Digital Energy Storage System: High Safety, High Utilization Efficiency, High Returns

- 已建成储能电池 PACK、储能集装箱及 PCS三条核心产品线，产能规模与技术适配性行业领先。

We have built three core product lines including energy storage battery PACK, containerized systems and PCS, with industry-leading production capacity scale and technical compatibility.

电池Pack产线

Battery Pack Production Line

产线年最大产能3GWh，模组段自动化率80%+

Annual maximum production capacity 3GWh
Automation rate of 80% at the module process



箱式储能系统产线

Container Production Line

最大产能：600个的20尺集装箱/年

Maximum production capacity:
600 units of 20-foot container per year



储能变流器产线

PCS Production Line

最大产能：300台/年

Maximum production capacity:
300 units per year



- 一是针对全球范围内电池热失控安全事故频发的行业痛点，提供高安全、高效率的**液冷储能电池系统**解决方案。

First, addressing the industry pain point of frequent battery thermal runaway safety incidents worldwide, we provide a comprehensive solution for high-safety and high-efficiency **liquid-cooled energy storage battery systems**.

智能温控策略：液冷技术，电芯表面最高温度35.4℃，整簇温差<5℃

Intelligent Temp Control: Liquid Cooling | Max Cell Surface Temp: 35.4℃ | Cluster Temp Diff < 5℃

高安全模块设计：高品质磷酸铁锂电池，温度、电压100%监测覆盖

High-Safety Pack Design: Industry-leading LFP Batteries | 100% Temperature & Voltage Monitoring Coverage

电气安全防护技术：主动防护，被动保护，故障快速隔离

Safety Protection Tech: Active Protection | Passive Protection | Rapid Fault Isolation

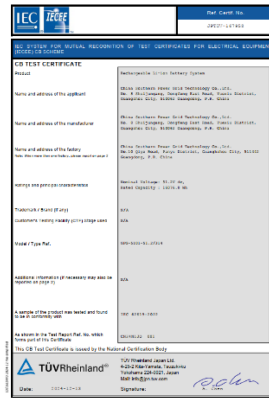
热失控防控技术：Pack级、舱级消防，消防多剂联用

Runaway Prevention Tech: Pack/Container-Level Fire Protection | Multi-Agent Fire Suppression



5MWh液冷储能电池系统

5MWh liquid-cooled energy storage container



通过IEC62619-2022认证

- 二是针对重大保供电场景，提供**高安全在线储能系统**解决方案。首创**“高可靠市电+新型储能在线”主供方案**保障十五运开幕式可靠供电。

Second, for critical power security scenarios, we provide **high-safety online energy storage system** solutions. Pioneering the **"high-reliability municipal power + new energy storage online" primary power supply** scheme, we ensured the reliable power supply for the opening ceremony of the 15th National Games.

- 该系统性能优异、运行稳定，不再使用大型柴油机作为微网主供，为大型赛事保供电开辟新路。国家发改委李春临副主任给予高度肯定，“这也是重大活动对新技术应用的场景”。

With outstanding performance and stable operation, the system has replaced large diesel engines as the main power supply for microgrids, pioneering a new path for large-scale event power security. Vice Minister Li Chunlin of the National Development and Reform Commission spoke highly of this, "This also serves as a scenario for the application of new technologies in major events."

- ✓ 主被动安全设计储能系统
Active-Passive Safety Designed ESS
- ✓ 远程智慧运维平台
Smart Operation & Maintenance Platform
- ✓ 基于AI的热失控预警模型
AI-Based Thermal Runaway Early Warning Model



- 三是针对高比例新能源并网稳定性难题，提供**构网型储能系统**解决方案，为电网提供主动支撑。

Third, to address the stability challenges arising from the high penetration of new energy into the power grid, we provide **grid-forming energy storage system** solutions to deliver active support for the power grid.

高效转换：三电平ANPC拓扑，最高效率99%

High-Efficiency Conversion: 3-Level ANPC Topology | Peak Efficiency 99%

极速响应：电压阶跃响应时间 < 100ms，功率响应动作时间 < 5ms

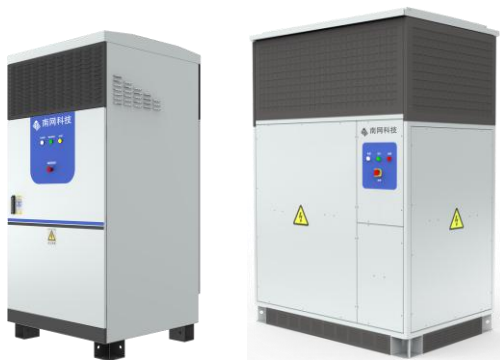
Ultra-Fast Response: Voltage Step Response < 100ms | Power Response < 5ms

电网友好：一次调频、惯量调节、无功支撑能力

Grid-Friendly Features: Primary Frequency Regulation | Inertia Adjustment | Reactive Power Support

安全可靠：故障录波及定位，主被动孤岛检测，多重保护

Safe & Reliable: Fault Recording & Localization | Active/Passive Islanding Detection | Multi-Layer Protection



1.25/1.75/2.5MW构网型储能变流器
1.25/1.75/2.5MW Grid-forming PCS



- ◆ 成功完成南方电网区域内首次百兆瓦时级构网型储能系统**黑启动**试验
- ◆ **Grid Black Start**

- 四是采用先进构网控制和能量管理策略，提供**中压电网“一机多能”灵活解决方案**，减少额外设备投入，提升设备效益。

Fourth, adopting advanced grid-forming control and energy management strategies, we provide **a flexible "multi-function in one" solution** for medium-voltage power grids, reducing additional equipment investment and improving equipment efficiency.

- ✓ 10kV线路高低电压、重过载治理

10 kV Line Regulation: Over/Under Voltage & Heavy Overload

- ✓ 新能源协同，平抑风光波动性

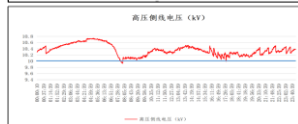
New Energy Synergy: Mitigate Wind & PV Fluctuations

- ✓ 高寒地区10kV线路不停电防冰融冰

Live-Line Anti-Icing and De-Icing for 10kV Lines in Frigid Regions

- ✓ 微电网组网（兼容水电、光伏等分布式能源）、黑启动、保供电

Microgrid Networking (Compatible with Hydropower, PV & Other DERs) | Black Start | Power Supply Guarantee



南网科技-储能解决方案

CSG Technology - Energy Storage Solution

- 五是针对调频场景，提供“超级电容器+锂电”的混合调频解决方案，显著提升电池寿命，经济效益显著。

Fifth, for frequency regulation scenarios, we provide a **frequency regulation solution of hybrid "supercapacitor + lithium battery"**, which significantly extends battery life and delivers remarkable economic benefits.



储能电站协调控制装置和能量管理系统
Coordination Control Device & EMS

- ✓ 超容-电池异步运行策略和分区协同控制
Supercapacitor-Battery Asynchronous Operation Strategy | Zonal Cooperative Control
- ✓ 源网侧调频，调峰
Grid & Generation-Side: Frequency Regulation | Peak Shaving
- ✓ 荷侧需量，防逆流控制
Load-Side: Demand Management | Anti-Reverse Power Control
- ✓ 电池智能分析诊断
Battery Intelligent Analysis & Diagnosis



“锂电+超级电容器”火储联调项目，累计收益超1亿元
“Lithium Battery + Supercapacitor” Hybrid Thermal-Storage Coordination Project
Cumulative Revenue > ¥100 Million

- 六是针对埃及电力供应紧张，经常性停电的实际情况，与埃及电力部门开展探索性合作，提供从需求分析到可行性调研到产品设计开发的全套**移动储能**解决方案。

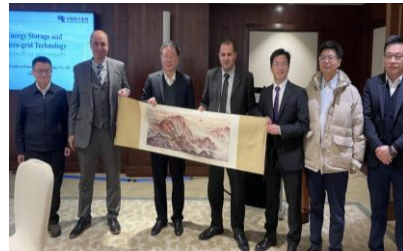
Sixth, in response to the actual situation of tight power supply and frequent power outages in Egypt, we have carried out exploratory cooperation with Egyptian power departments to provide a full set of **mobile energy storage solutions** covering demand analysis, feasibility research, and product design and development.



移动储能车

Mobile Energy Storage Vehicle

- ✓ 机动、灵活
High Mobility & Flexibility
- ✓ 重要场所、重要负荷的应急保供电
Emergency Power Supply for Critical Sites/Loads
- ✓ 解决台区时段性电压低问题
for Distribution Transformer Area: Periodic Undervoltage



埃及合作交流

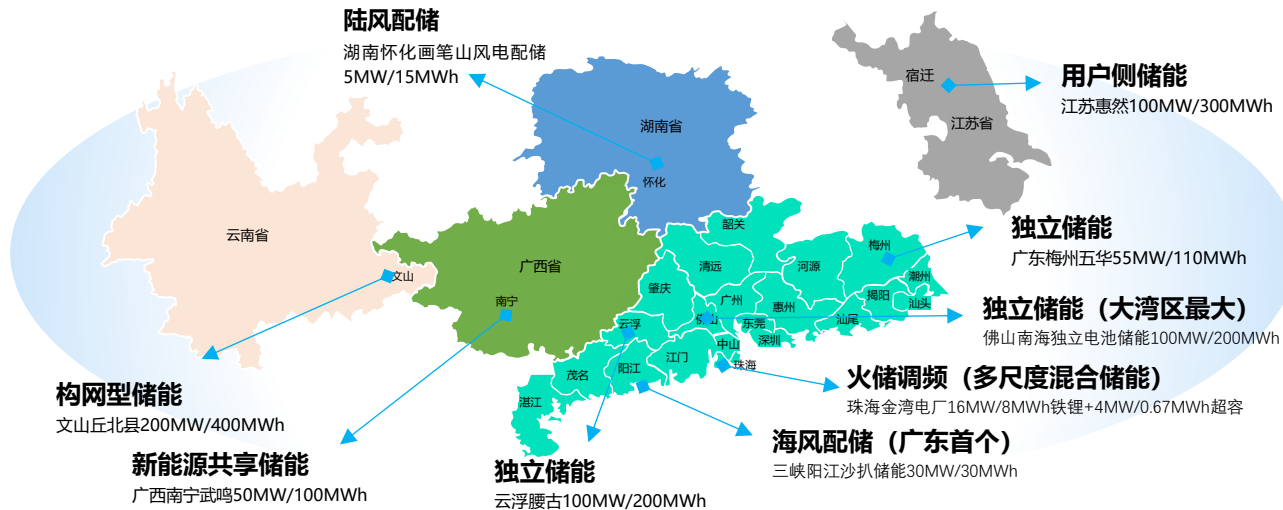
Cooperation and Communication with Egypt

南网科技-储能解决方案

CSG Technology - Energy Storage Solution

- 产品和技术在50多个典型项目落地，涵盖电源、电网、用户侧等多种应用场景。过去三年，相关业务累计创造营收 16 亿元。

Our products and technologies are now applied in more than 50 flagship projects, spanning power generation, grid and user-side scenarios. They have driven 1.6 billion RMB of cumulative revenue over the past three years.



- 研发团队技术过硬，具备成熟产品开发经验

R&D Team : Strong technical capabilities and mature product development experience

- 全产品线覆盖，可提供场景化全套解决方案

Full Product Chain : Scenario-based complete solutions available

- EPC 经验丰富，承接策划至建设全链条服务

EPC Expertise : Full-chain services from planning to construction

- 电网国企背景，深悉电网技术特性，保障规范与信誉

State-Owned Grid Background : Deep understanding of power grid technical features, with standardized operation and credibility guarantee



南网科技

我们期待携手全球伙伴
共同推动新型储能产业迈向更加卓越、健康发展的美好未来。

We look forward to collaborating with global counterparts
to drive the new energy storage industry toward a brighter future of excellent and healthy development