

Flexible Resources Help Meet Summer Peak Demand:

—Suzhou's practice of energy storage and virtual power plants

Abstract: As an economically strong city, Suzhou is one of the cities with the highest electricity consumption in China, facing enormous pressure in meeting power demands during summer peak period. Suzhou has been promoting the local development of energy storage and virtual power plants (VPPs) as well as power market reforms. During the summer peak of 2024, the city met electricity demand without adding new coal-fired power capacity and imposing power rationing. Energy storage and VPPs, as new-quality flexible resources, have played a significant role in ensuring electric power security and increasing the share of renewable energy. This model serves as an example and reference for energy transition in other regions with high electricity demand.

Keywords: Energy storage; virtual power plants; power market reform; energy transition

I. Background

As one of China's leading economic powerhouses, Suzhou is also one of the country's highest electricity-consuming cities, with total consumption reaching 186.33 billion kilowatt hours (kWh) in 2024. That year, the city experienced an extended period of extreme summer heat, and the peak system load increased by 2.5 GW, up to 7.1% compared to the corresponding period in 2023, placing an unprecedented pressure on the power system during the summer peak. Therefore, Suzhou enhanced the resilience of its power grid and its ability to cope with extreme loads by deploying energy storage systems and operating VPPs to meet summer electricity demand effectively and ensure the safe and stable supply of electricity without adding new coal-fired power capacity and imposing power rationing.

II. Key Measures

(I) Large-Scale Deployment of Grid-Side Energy Storage to Strengthen Power Supply Resilience and Efficiency

· As of July 2025, Suzhou has connected grid-side energy storage power stations with a total installed capacity of 540 megawatts (MW), which has significantly enhanced Suzhou's peak shaving capabilities.

· Energy storage has delivered remarkable economic benefits as a substitute for coal-fired power in peak shaving. The full life cycle levelized cost of electricity (LCOE) for grid-side energy storage in Suzhou is approximately CNY0.37/kWh (about USD 0.051/kWh), lower than the CNY0.48/kWh (USD0.07/kWh) cost of coal-fired peak shaving.

· Replacing coal-fired peak shaving with energy storage can also yield substantial carbon reduction benefits. The city can reduce carbon dioxide (CO₂) emissions by an estimated 37,981 tons annually compared to coal-fired power units.



Figure 1 50 MW / 100 MWh Grid-side Energy Storage Project of Suzhou Shengneng
(Credit: Energy Foundation China)

(II) Unlocking the Potential of VPPs to Build a Demand-Side Regulating Network

· By the end of 2024, Suzhou's load-side flexible resources had an estimated regulation potential of approximately 4,548.8 GW.

· Suzhou has also established the largest VPP for electric vehicle (EV) charging and battery swapping among prefecture-level cities in China. Through technological innovation, 68 battery swapping stations have been integrated into a new-power load management system, delivering a combined regulation capacity of 20 MW.

· Based on an equivalence model of orderly EV charging and discharging and behaviour aggregation, Suzhou's charging infrastructure offers an adjustable capacity of approximately 475.1 MW.

(III) Deepening Electricity Market Reform to Create Space for the New Power System

· The market roles of new power system participants, such as VPPs and independent energy storage operators, have been clearly defined. VPPs are encouraged to participate in the market.

· Dispatch and settlement mechanisms are being optimized, and market-based incentives for energy storage are being refined.

III. Experience and Inspiration

The integrated model of grid-side energy storage and VPPs can simultaneously meet the green and safety needs during peak electricity demand and support power supply security and transition in high-load regions. Local governments should proactively plan for new power regulation resources to overcome dependence on traditional supply-side strategies and optimize market-based mechanisms and industrial support policies for the power sector. Looking ahead, such business models and practical experience can be promoted to other regions in China, and even the world, helping to achieve the coordinated goals of electricity demand growth, energy transition, and economic efficiency.