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China is aggressively scaling up its power generation capacity, an expansion that is increasingly serving as vital support for its pursuit of global artificial intelligence leadership as Beijing transforms a widening “electron gap” into a strategic counterweight to Washington’s export controls on advanced chips.

While the global AI race has long centered on high-performance semiconductors, industry experts suggest that the sheer abundance of low-cost electricity may shift the balance of power.

China’s massive energy surge is intended to offset those in hardware by fueling compute-intensive research and development with a scale of power that currently dwarfs other major economies, they said.

As power supply becomes a decisive factor in the US-China AI competition, Beijing is leveraging low-cost electricity as a strategic asset to fuel its data centers and compute-intensive R&D, said Lin Boqiang, head of the China Institute for Studies in Energy Policy at Xiamen University.

China’s massive energy surge is intended to offset Washington’s export controls on advanced chips, and the expansion is primarily fueled by a massive shift toward green energy, said Lin.

While the AI race has long focused on high-performance semiconductors like those from Nvidia, electricity may shift the balance of power, he said.

China’s total electricity consumption last year was more than double that of the United States, said the China Electricity Council.

China has further solidified its position as the world’s largest consumer of electricity, reaching a scale that dwarfs other major economies, said Jiang Debin, deputy director of the center of statistics and data of the China Electricity Council.

Renewables, such as solar and wind, also account for a much higher percentage of the new capacity, while China’s continuous efforts in stepping up other forms of clean energy, such as nuclear power, further accelerate the momentum, he said.

Electricity prices for Chinese data centers are approximately 3 US cents per kilowatt-hour, roughly one-third of the cost in the US, according to calculations by The Washington Post.

Industry experts suggest that China can achieve an advantage by utilizing massive amounts of low-cost electricity.

According to Jiang, China’s power system has achieved leapfrog development in recent years, characterized by high reliability, stable output and the maintenance of relatively sufficient reserve capacity.

Beyond generation, China has secured its lead through the world’s most comprehensive power equipment supply chain. The nation has emerged as the world’s largest producer of transformers, accounting for approximately 60 percent of global capacity.

China has established the most comprehensive production system globally with the “hard power” of a fully autonomous and controllable supply chain, said Cai Yiqing, secretary-general of the power equipment branch of the China Electricity Council.

“Our production capacity now accounts for approximately 60 percent of the global total. In 2025, China’s total transformer exports reached 60 billion yuan (\$8.72 billion), representing a year-on-year increase of over 20 percent,” he said.



Workers from Jiangsu Provincial Power Transmission and Transformation Co conduct equipment maintenance at a hybrid cascaded ultra-high voltage direct current converter station in Suzhou, Jiangsu province, on Nov 20. China is significantly scaling up its power generation capacity. SHI JUN / FOR CHINA DAILY

## Electricity may shift balance of power in AI race

Abundance of low-cost energy in China may prove to be counterweight to Washington’s export controls on advanced chips

According to Cai, the rapid evolution of AI has upgraded the transformer from a traditional piece of electrical equipment into a core component of computing infrastructure.

“AI supercomputing clusters demand exceptionally high-quality power, as voltage fluctuations can result in significant losses,” he said.

“Leveraging core technological advantages, Chinese enterprises have developed targeted solutions such as solid-state transformers and high-frequency transformers. These offer higher efficiency with reduced size and power loss, providing the essential support needed for the stable operation of AI computing clusters.”

While the US faces potential shortages, with Morgan Stanley predicting a 44-gigawatt shortfall for data centers by 2028, experts such as David Fishman from the Singapore-based consultancy Lantau Group assert that China’s abundant power supply will not constrain its AI development.

The advantages, however, are rooted in a State-led system that prioritizes long-term infrastructure over immediate corporate profit.

The National Energy Administration intends to push for appropriately advanced

construction of power grids, increasing investment at all levels to ensure a unified national electricity market, he said.

His voice is echoed by State Grid Chairman Zhang Zhigang, who said that the utility must play a “foundational and leading role” in stabilizing growth.

Investment should be “moderately ahead of demand” to support the nation’s major strategic projects and strengthen the resilience of the industrial supply chain, he said.

This “moderately advanced” construction strategy is backed by a record 5 trillion yuan investment over the next five years. While the US faces potential shortfalls, analysts suggest China’s State-led system ensures that power will not be a constraint for its AI development.

According to International Energy Agency forecasts, global IT loads are expected to see a cumulative increase of 106 GW between 2025 and 2030.

To ensure a stable and efficient power supply, distribution systems have become a critical component, now accounting for approximately 10 percent of total data center investment, the IEA said.

China has been stepping up investment in

key energy projects in recent years, which reached a historic milestone in 2025, surpassing 3.5 trillion yuan for the first time, a year-on-year increase of nearly 11 percent, significantly outperforming growth rates in the broader infrastructure and manufacturing sectors, according to the NEA.

As part of the investment, a major focus is on transmission capacity. China has been accelerating efforts to expand its cross-country power transmission capacity to 420 GW by 2030, as the world’s second-largest economy advances the strategic modernization of its electrical grid to harness a massive influx of renewable energy.

China’s grid has already evolved into the world’s largest and most advanced network in terms of transmission capacity, voltage levels and renewable integration, it said.

Domestic utility giants are also stepping up investments to safeguard energy security.

China is set to pour a record-high investment into its power grid over the next five years, a massive bet on new infrastructure designed to eliminate renewable energy bottlenecks and propel the nation toward its 2030 carbon peak goal.

The substantial capital injection will also serve as a vital macroeconomic ballast to stabilize national growth and accelerate industrial modernization.

State Grid Corp of China, the nation’s primary utility, said its fixed-asset investment rose to a record high of around 650 billion yuan in 2025. Total investment during the 14th Five-Year Plan (2021-25) rose to more than 2.85 trillion yuan, it said.

China Southern Power Grid, on the other hand, which serves the country’s southern industrial hubs, disclosed a 180 billion yuan budget for 2026 alone.

In contrast, US investment decisions are far more decentralized, with utilities following varied federal and state regulations, making it difficult to execute power infrastructure as a unified national strategy.

The AI competition is evolving into a battle of energy-intensive compute, said Lin. China’s ability to rapidly deploy massive, low-cost power infrastructure may provide a critical workaround to US-led chip sanctions, he said.

## Energy mix facing major structural transition

By ZHENG XIN

China’s energy landscape is poised for a significant structural shift in 2026 as the nation inaugurates its 15th Five-Year Plan (2026-30), a pivotal period for achieving its 2030 carbon peak goal.

According to a new report from global research firm Wood Mackenzie, the year will be defined by a transition toward market-driven pricing, a strategic recalibration of renewable installations and the evolving role of coal as a balancing resource.

Power demand is expected to maintain robust growth, with a projected year-on-year increase of 5.6 percent. For the first time, China’s total power generation is set to exceed the 10,000 terawatt-hour milestone, it said.

Within this massive output, renewable energy is expected to account for 39 percent of total generation, while the country’s total installed capacity is forecast to grow by 14 percent.

According to the global research firm, the year 2026 marks a crucial “policy reset” year, with industry leaders focusing on clarifying policy frameworks to reinvigorate the energy sector’s momentum, establishing moves toward full marketization.

Following the record-breaking installations of 2025, the pace of new renewable capacity is expected to moderate. Wood Mackenzie projects combined wind and solar additions to pull back to 318 gigawatts in 2026.

The pace of China’s low-carbon transition accelerated sharply last year. Consequently, renewable generation reached approximately 4 trillion kilowatt-hours, surpassing the total electricity demand of the 27 European Union member states, said Xing Yiteng, deputy director-general of the department of development and planning at the National Energy Administration.

The year 2025 marked the most successful period for energy security and supply since the start of the 14th Five-Year Plan (2021-25), Xing said.

The energy storage sector also saw explosive growth as Beijing seeks to stabilize its increasingly volatile grid. By the end of last year, installed capacity of new energy storage in the country surged 84 percent compared to the end of 2024. Nationwide, the installed capacity of new energy storage systems that had been built and put into operation reached 136 million kilowatts, marking a more than 40-fold increase compared to the end of the 13th Five-Year Plan period (2016-20), said the NEA.

However, as China’s photovoltaic industry is poised to enter a higher phase of quality-oriented growth, driven by a strategic transition from price-based competition to a paradigm in which leading enterprises leverage their core advantages in technology and scale to maintain global competitiveness, Wood Mackenzie expects installation of solar and onshore wind capacity to decline.

Offshore wind capacity, on the other hand, is set to double, fueled by a healthy pipeline of projects already under construction or approved, the consultancy said. Despite some of the headwinds, China maintains a formidable project reserve of over 1,200 GW in wind and solar, sufficient to meet demand for the next three years, it said.

Wood Mackenzie also said grid constraints and environmental approval limits might push developers from standalone projects toward integrated solutions, such as combining industrial solar with energy storage. The report highlighted a paradoxical trend in coal power. Net new coal capacity will likely hit a record high in 2026 as projects approved since 2021 reach completion.

However, this is expected to be coal-fired power generation’s “last hurrah” in terms of capacity expansion. Between 2027 and 2030, new additions are projected to shrink at a negative compound annual growth rate of 38 percent, it said.

“Coal is undergoing a fundamental transformation,” said Lin Boqiang, head of the China Institute for Studies in Energy Policy at Xiamen University.

“It is shifting from being the primary power source to becoming a flexible, peak-shaving and balancing resource that ensures the stability of a grid increasingly dominated by volatile renewables.”

While energy storage capacity is projected to grow 30 percent in 2026, the industry faces a deepening contradiction between rapid scale expansion and weak profitability. Establishing a sustainable, market-based profit model will be a top priority for 2026 to encourage private capital participation, Wood Mackenzie said.

## China builds tech-savvy hybrid grid system

By ZHENG XIN

China has constructed the world’s largest and most technologically sophisticated alternating current / direct current hybrid power grid, establishing a massive infrastructure network that anchors the nation’s energy security and its rapid transition toward renewable energy, according to the authorities.

China’s total electricity consumption last year was more than double that of the United States. Furthermore, its annual power usage surpassed the combined consumption of the European Union, Russia, India and Japan, according to the China Electricity Council.

The sprawling system now serves as the primary backbone for the integration of more than 1.8 billion kilowatts of wind and solar capacity, said Liu Mingyang, deputy director-general of the electricity department of the National Energy Administration.

This leapfrog development in grid architecture has enabled Beijing to optimize resource allocation across vast distances. Despite the increasing complexity of a high-renewable energy mix, China has maintained a record of zero large-scale outages for several consecutive years, Liu said.

China boasts 45 ultrahigh voltage “power highways” that have boosted its west-to-east power transmission capacity to 340 million kW. This network effectively bridges the gap between resource-rich western provinces and the energy-hungry industrial hubs



A smart robot and workers inspect power supply equipment at a 220-kilovolt substation in Chuzhou, Anhui province, on Jan 6. SONG WEIXING / FOR CHINA DAILY

along the eastern coast. By optimizing resource allocation on a national scale, the grid has become the primary mechanism for mitigating regional power imbalances, he said.

Liu emphasized that the grid’s safety and supply capability have withstood rigorous testing. It provides a stable foundation for the nation’s industrial upgrading and the expansion of high-tech manufacturing.

As of 2025, the Chinese grid has evolved into the world’s premier platform for renewable energy consumption. The massive expansion played a critical role in helping China’s nonfossil energy consumption exceed 20 percent of the national total last year.

Ye Xiaoning, a senior engineer at the new energy department of the State Grid Energy Research Institute, said that China’s consistent upgrades to its grid and transmission infrastructure have drastically improved the nationwide optimization of renewable resources.

As the world’s leading producer and consumer of green energy, the country requires these systemic enhancements to manage its vast renewable output and ensure efficient power distribution, he said.

The development of an extensive ultrahigh voltage grid has been central to this shift, fundamentally reshaping China’s energy landscape, Ye said.

By enabling the efficient transport of electricity over long distances, this technology bridges the gap between remote renewable energy hubs and major demand centers, creating a more integrated and flexible national power architecture, he added.

These advancements have pushed China’s renewable energy utilization to a world-class 97.6 percent, staying above the 95 percent threshold for six consecutive years since 2018.

However, the rapid rise in renewable penetration brings new technical challenges. The NEA warned that future power systems will be characterized by “high intermittency and high randomness” in both supply and demand. This complexity necessitates a structural shift in how the grid is operated.

To address these challenges, the NEA’s new guiding opinions on promoting high-quality development of the power grid outline a three-tiered architecture, a combination of “aorta, capillaries and microcirculation”.

The main backbone, or the “aorta,” focuses on strengthening the framework and ensuring security, while the distribution network, referred to as the “capillaries,” will be upgraded to handle two-way interaction between the grid and consumers.

Smart microgrids will act as the microcirculation to promote local renewable consumption and improve reliability in remote areas or at the edges of the traditional network.

Looking ahead, the NEA plans to push for “moderately advanced” grid construction.

Beijing intends to significantly increase investment across all grid levels. The strategy reinforces the government’s view of the power grid not only as a utility, but as a core engine for new quality productive forces and a fundamental requirement for the country’s modernization, the administration said.