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China's AI Power Play: Cheap Electricity From World's Biggest Grid

Push for power supremacy transforms Inner Mongolia; tech leaders worry about U.S.-China 'electron gap'

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ULANQAB, China—The U.S. invented the most powerful artificial-intelligence models and controls access to the most advanced computer chips, but China has an ace to play in the global AI contest.

China now has the biggest power grid the world has ever seen. Between 2010 and 2024, its power production increased by more than the rest of the world combined. Last year, China generated more than twice as much electricity as the U.S. Some Chinese data centers are now paying less than half what American ones pay for electricity.

"In China, electricity is our competitive advantage," Liu Liehong, head of China's National Data Administration, said in March.

The push for power supremacy is transforming remote expanses of Inner Mongolia, a Texas-like landscape of wide-open spaces now dotted with thousands of wind turbines and crisscrossed by transmission lines. They provide electricity for what officials describe as a new "cloud valley of the grasslands," with more than 100 data centers in operation or on the way.

That is just the beginning. Morgan Stanley forecasts that China will spend some $560 billion on grid projects in the five years through 2030, up 45% from the previous five years. Goldman Sachs predicts that by 2030, China will have about 400 gigawatts of spare capacity, about three times the world's expected data-center power demand at that time.

The U.S.-China "electron gap," as OpenAI now calls it, has become a major preoccupation for American tech leaders. Microsoft Chief Executive Satya Nadella has said his company is worried it won't have enough power to run the enormous number of chips it is buying. Some companies want

Washington to do more to cut red tape or provide financial support to modernize America's power grid.

In the next three years, U.S. data centers could face an electricity shortfall of 44 gigawatts, the equivalent of New York state's summertime capacity, Morgan Stanley has forecast, posing a "daunting challenge" for the nation's AI ambitions.

In China, inexpensive power has helped AI companies, including DeepSeek, develop high-quality AI models more cheaply than U.S. competitors. It also has helped China overcome challenges posed by its inferior domestic computer chips. By bundling those chips together in large numbers, China could come close to matching the performance of advanced chips made by Nvidia, but the process requires much more electricity.

On Monday, President Trump announced he would ease restrictions that have blocked Chinese companies from buying some Nvidia AI chips, allowing the U.S. company to export its H200 chips to China—not Nvidia's best but more powerful than the best Chinese chips.

Inner Mongolia is crisscrossed with power transmission lines, including around the city of Ulanqab.

China's power push stems from a plan unveiled by the government in 2021, known as "East Data, West Computing." It calls for harnessing abundant power resources in the nation's west to meet AI-driven demand from the populous east. China also aims to connect hundreds of data centers to build a shared nationwide compute pool—what some describe as a "national cloud"—by 2028.

The billions of dollars of planned spending, together with some underused power and data-center capacity, have raised concerns about overcapacity and a market bubble, as in the U.S. Chinese officials are hoping that state planning can help mitigate those risks.

The challenge for both countries is that data centers, including the many needed for AI, are consuming more power than ever, and it is hard to know how much will ultimately be needed. Developing AI is an electricity-hungry process, and every query by a chatbot user requires power for an AI model to answer.

As soon as in 2030, China's data centers are expected to eat up as much power annually as the entire electricity consumption of France.

The power needs of U.S. data centers are even greater. Last year, American data centers accounted for 45% of global data-center electricity consumption, according to the International Energy Agency, compared with 25% for China.
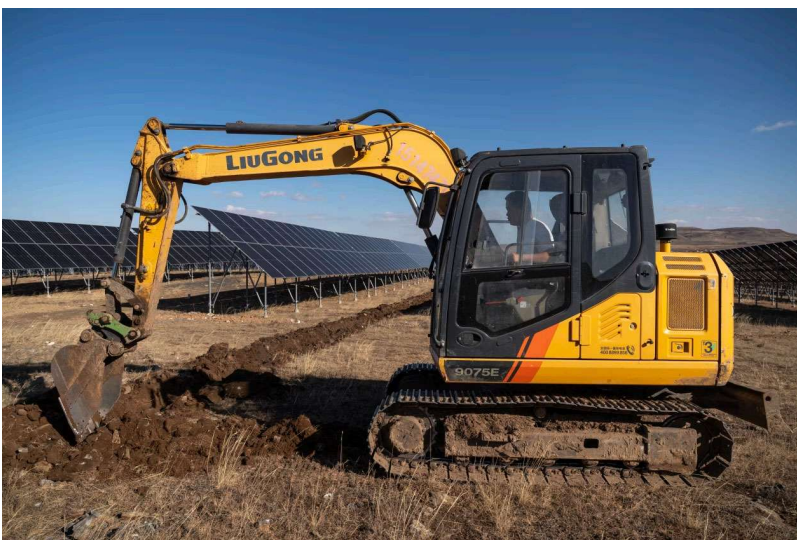
China has financed solar and wind farms and hydroelectric projects. A solar farm outside Ulanqab.

Power play

China's campaign to expand its power grid dates back to the 1970s. Communist Party leaders, worried that electricity shortages would hamper the nation's development, steered state-owned companies to build hundreds of coal-fired power plants. Later, they bet on renewables, bankrolling enormous hydroelectric projects, solar fields and wind farms.

Because the best locations were often far away from population centers in the east, China also erected the world's biggest network of ultrahigh-voltage transmission lines, investing more than $50 billion since 2021, according to state media.

China now has 3.75 terawatts of power-generation capacity, more than double U.S. capacity. It has 34 nuclear reactors under construction, according to the World Nuclear Association, and nearly 200

others planned or proposed. In Tibet, China is building the world's largest hydropower project, which could produce three times the power of its Three Gorges Dam.

Power-generation capacity
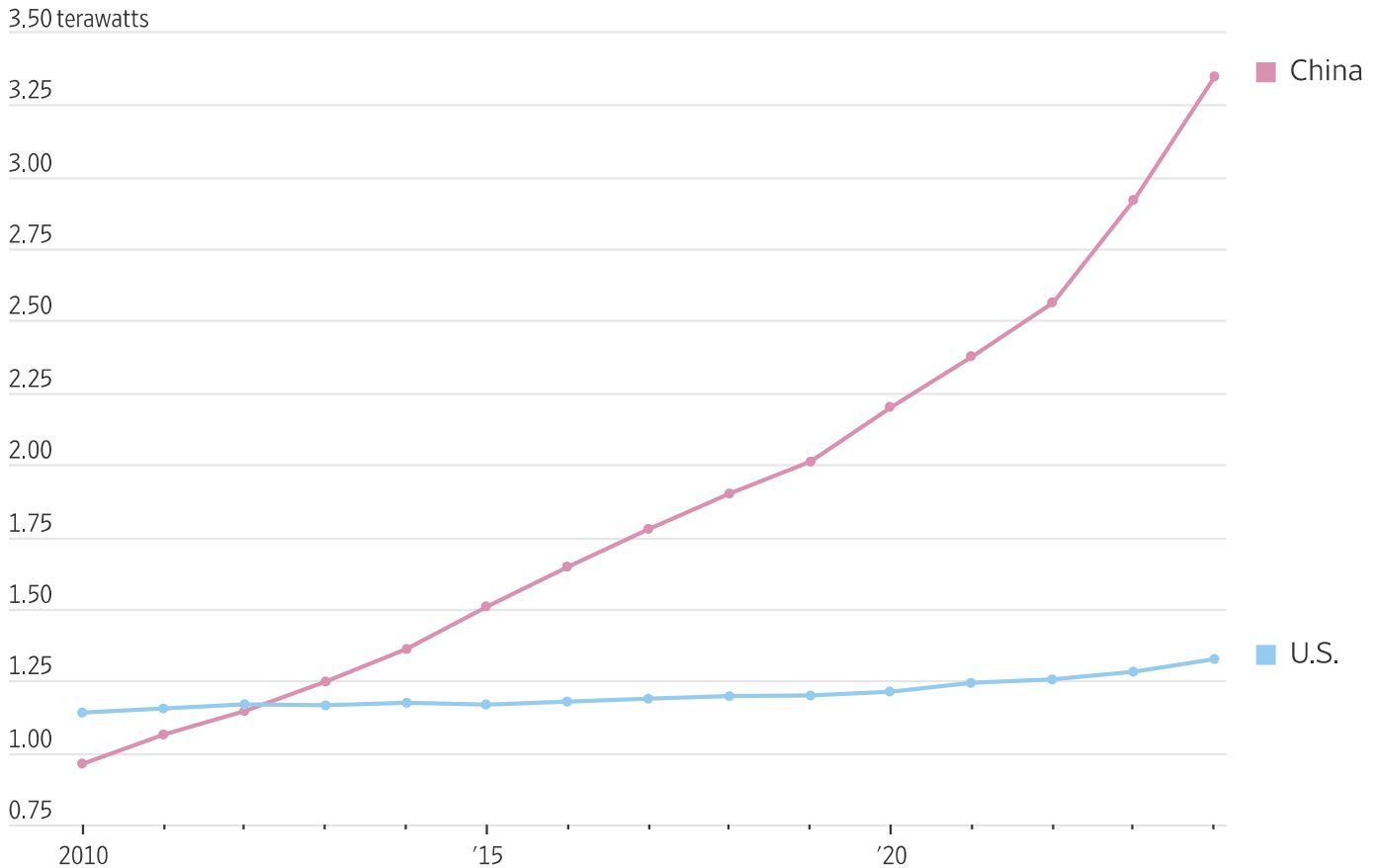
Source: Energy Information Administration (U.S.); National Bureau of Statistics (China)

Chinese data centers can now secure power for as little as 3 cents a kilowatt-hour using longer-term purchase agreements, according to China's National Energy Administration. In the U.S., operators in markets such as northern Virginia typically pay 7 to 9 cents a kilowatt-hour, said Michael Rareshide, a partner in charge of the data-center practice at real-estate advisory Site Selection Group.

Data center power consumption

■ U.S.   ■ China   ■ Others

1,000 terawatt-hours
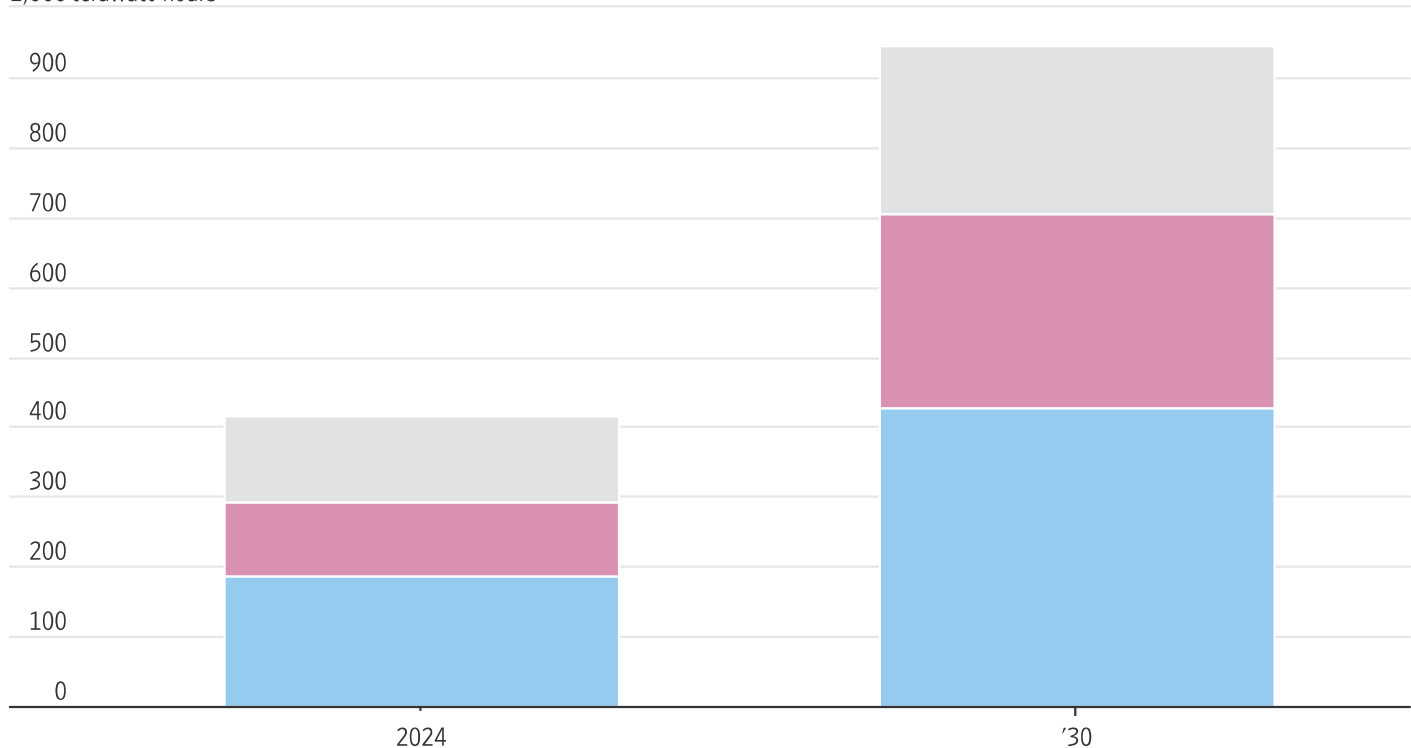
Note: 2030 figures are forecasts
Source: International Energy Agency

China's energy spending spree is contributing to a debt load that is becoming a drag on its economy. At State Grid, the state-owned grid operator, debt and other liabilities grew by more than 40% from the start of 2019 to year-end 2024, to around $450 billion.

In the U.S., where some tech companies are building their own power plants for data centers, Trump has pledged to match China's power build-out. A White House spokeswoman said the president's agenda would position the nation to "win the AI race while simultaneously lowering energy prices and increasing grid efficiency."

Expanding the grid is challenging. In a November letter, the Solar Energy Industries Association told the Energy Department that America's position as a global AI leader was "stymied by onerous and unstable permitting policies and insufficient transmission capacity." Eighteen states, including major hosts of U.S. data centers, have over half of their planned solar and storage capacity at risk of being blocked, the industry group said.

A monument in Ulanqab commemorating the Battle of Jining.

Cloud valley

The city of Ulanqab and neighboring Horinger County in Inner Mongolia, around 200 miles northwest of Beijing, were designated one of eight hubs in the government's "East Data, West Computing" program. Many of the areas were chosen for their access to inexpensive electricity. The program also aims to bring investment to poorer areas in China's interior.

Officials have told companies to build new data centers only in the hubs, giving priority to regulatory reviews and land acquisition for them. Data centers sometimes pay only half of their electricity bills, with the rest covered by government subsidies.

In Ulanqab, a lack of jobs in the area has contributed to its population falling by a quarter to 1.6 million people between 2019 and 2024. Today, many people smell opportunity.

The region's cool temperatures are ideal for data centers, reducing the need to cool them with air conditioning and water. The wide-open landscape is suitable for solar and wind farms.

"With all the future data centers being built here, things should get better every year," said Shen Zhiyong, who runs a restaurant near a cluster of data centers in Horinger.

Ulanqab's gross regional product has increased by 50% over the past five years. From 2019 through last year, electricity used by data centers and other information-technology services rose more than 700%. Local authorities have said that as of June, the city had attracted $35 billion of computing-industry investments.

A drive in November along national highway 110, east of Ulanqab's downtown, showed the rapid change. On one side of the road, buildings were half-deserted, except for a few hole-in-the-wall restaurants and shops selling cigarettes.

The city of Ulanqab is in one of eight hubs in the government's 'East Data, West Computing' program.

On the other side was a data center run by Centrin Data, which also erected windmills and solar panels in the region. The data center, which began operating just 16 months after ground was broken, provides cloud-computing services to clients in Beijing.

Apple, Alibaba and Huawei also have data centers in town, while companies including electric-car producer XPeng train AI models and process AI workloads there.

In Horinger, a roughly two-and-a-half-hour drive from Ulanqab, state-owned power giant China Huadian last year began developing power infrastructure for a cluster of data centers. This year, the $230 million project started powering data centers run by China's biggest telecommunications carriers and cloud-computing startup Paratera.

To compensate for domestic chips that are less advanced than American ones, Huawei, Alibaba, Baidu and other Chinese companies aim to boost computing power with systems that bundle together as many as thousands of Chinese chips.

Making so many chips work together efficiently requires cutting-edge networking technology and sophisticated dispatch algorithms—a task so challenging that Nvidia two years ago abandoned production of a system using 256 chips due to its cost, excessive power consumption and unreliability.

Under a popular metric for machine learning, Huawei's CloudMatrix 384 system, which bundles 384 of its Ascend chips, provides two-thirds more computing power than Nvidia's flagship system containing 72 Blackwell chips. But it consumes four times the power, according to research firm SemiAnalysis.
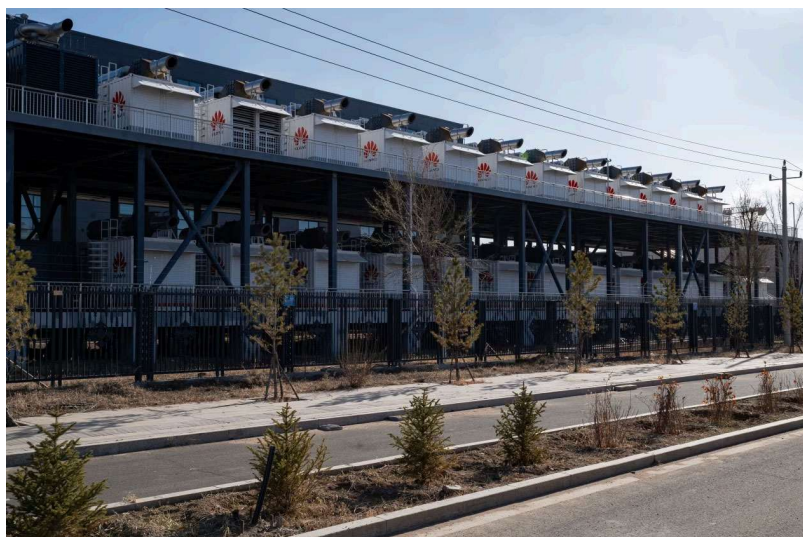
A Huawei data center in Ulanqab.

Engineers who have used the Huawei bundling system said it is complicated to install and operate, and, according to some, isn't useful and smooth enough for training large-scale AI models.

The main hurdle for this strategy to work, according to people at Chinese tech companies, is China's inability to produce its best chips fast enough. U.S. export controls also restrict access to advanced chip-making equipment. Chinese companies have developed ways to work around the export controls, including buying American chips through underground channels and tapping chips in data centers outside China.

Analysts predict shortages of high-end chips to persist for at least another few years. It is unclear how many of Nvidia's H200 chips China will buy, and how much the change in export restrictions will change the situation. China's government has said it is committed to developing its own advanced chips.

"For the near term, China's lack of leading-edge chip capacity is a tighter constraint than the U.S.'s power bottleneck," said Qingyuan Lin, a semiconductor analyst at Bernstein. China's power capacity, he said, at least keeps it in the game.

"The longer the AI race lasts," Lin and his colleagues wrote in a report, "the more opportunities there will be for China to close the gap."

—Grace Zhu contributed to this article.

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