

INTELLIGENCE UPDATE

China: centralized rules for data center efficiency



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Like the US and Europe, China is striving for leadership in AI, while advancing digitization of its society. This demands the rapid development of energy-intensive computing resources.

China has set a target of reaching carbon neutrality by 2060 (with peak emissions by 2030). Operators are being encouraged to develop conventional data centers and AI facilities, but will be required to limit their environmental impact under policies demanding increased energy efficiency, lower PUE levels, greater use of renewable energy and reuse of resources.

In some respects, these measures are similar to those applied in other regions (such as the EU's Energy Efficiency Directive, EED). The Chinese government's centralized control of the economy, however, allows China to push these measures further, by setting a goal of rationalization, with older data centers being closed and consolidated in newer, more efficient new facilities.

China is starting to allow direct ownership of data centers by foreign investors, but these investors will encounter stricter environmental rules than in other regions, as well as directives guiding the placement of new facilities to locations where sustainable power is being developed.

Efficiency, decarbonization and finance

China's electrification is advancing rapidly. According to the International Energy Agency (IEA), electricity accounts for 28% of China's total final energy consumption — higher than the US (22%) and the EU (21%). To meet demand, it is rapidly growing both fossil and renewable capacity.

Data centers draw a smaller power load in China than elsewhere. According to IEA estimates, Chinese data centers drew 100 terawatt hours (TWh) in 2024 (around 1% of total demand), compared with 175 TWh in the US (4% of demand) and 70 TWh in the EU (2.5% of demand).

Data center power usage is predicted to double by 2027 in China (to around 1.7% of electricity consumption), but is still comfortably behind the share of power the IEA predicts the US (6%) and Europe (4%) will utilize by the same date.

Foreign investment in data centers is limited to four pilot areas: Beijing, Shanghai, Shenzhen and Hainan. Outside these areas, investors are required to follow restrictive joint venture rules.

China’s efficiency policies are dictated centrally by the National People’s Congress and are executed by five central government agencies: the National Development and Reform Commission (NDRC), the China National Institute of Standardization (CNIS), the Ministry of Industry and Information Technology (MIIT), the National Energy Administration (NEA) and the National Data Bureau (NDB).

These policies include specific targets for PUE, renewable energy use, the carbon and utilization efficiency of the IT infrastructure and the application of heat reuse technologies. Targets are administered by regions and provinces that have the flexibility to offer incentives and set timelines.

Policy requirements and targets

Efficiency measures

China has set targets for PUE, which are essential for operational approval and licensing in key regions. Newly built large and hyperscale data centers should have a PUE of less than 1.3 by 2025. New or retrofitted data centers in national hubs are required to meet a target of 1.25, or lower.

Existing data centers should all have a PUE below 1.5 by the end of 2025. Data from Uptime Institute’s 2025 global survey of data center managers indicates that data center operators have already been designing low PUE data centers: 35% of data centers that are less than 10 years old operating at a PUE of less than 1.3; and 84% are operating at a PUE below 1.5 (**Table 1**). While the survey had comparatively few responses from China, we can infer that the Chinese data center industry seems well positioned to meet these targets.

Table 1: Distribution of PUE by data center age in Chinese facilities

Age of data centers in China	Number of data centers				Total number of data centers	Percentage of data centers		
	PUE <1.3	PUE 1.3 to <1.5	PUE 1.5 to 1.7	PUE >1.7		PUE <1.3	PUE <1.5	PUE <1.7
1-10 years	13	18	4	2	37	35%	84%	95%
10-20 years	8	2	1	3	14	57%	71%	79%
Total	21	20	5	5	51	41%	80%	90%

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These targets must be met earlier than those proposed in the EU. For instance, Germany’s Energy Efficiency Act sets an overall PUE target of 1.5 by 2027 for all facilities, falling to 1.3 by 2030 (although newer facilities commissioned after 2026 are expected to achieve a stricter PUE of 1.2, within 2 years of commissioning). The 2025 update to the EU’s EED is proposing

minimum performance standards for PUE: a design PUE of 1.3 for data centers commissioned from 2027, with an operating PUE of 1.4 within three years of commissioning and an operating PUE of 1.5 by 2030 for data centers commissioned before 2027.

China is pursuing other efficiency measures beyond PUE and calling for efficient data center layouts that will utilize 60% of power capacity. It is also asking data centers to achieve "internationally advanced" levels of IT infrastructure efficiency (work per unit of energy) and carbon efficiency (work per metric ton of carbon) by 2030.

NDRC, CNIS and MIIT have been tasked with setting the minimum performance standard (MPS) values needed for operators to execute against these broad objectives. Better energy efficiency evaluation tools and standards for servers and data centers are needed to assess the IT infrastructure work and carbon efficiency performance. Ideally, these should be compatible with existing and emerging global standards, but there is a strong likelihood that China will build a China-specific regulatory framework.

Reference documents mention technologies including liquid cooling, free cooling, evaporative cooling, and heat pipes, as well as power distribution options such as high-efficiency transformers and DC power distribution, as well as ultra-low-loss optical fiber communications (see **Appendix 1**).

Operators are encouraged to collaborate with grid operators on demand-side power management. They are also instructed to improve levels of heat recovery by building their own heat recovery systems for use in parks, urban heating and agriculture, if necessary.

Data center operators can also form joint ventures with industrial sites, such as power plants, to share power, steam, water and other resources, such as the "waste cooling" available at gasification stations for liquid natural gas (LNG).

Renewable energy consumption

China's policy requires operators to increase the utilization rate of renewable energy in their data centers by 10% annually. Data centers in national hub regions should use at least 80% renewable electricity by 2030. To achieve this, they will purchase and retire China's national energy attribute certificates (EACs), also known as green energy certificates (GECs). In 2025, stricter reporting standards were introduced, making GECs the sole official means of verifying renewable energy consumption.

Water conservation and circular economy

National limits for water utilization effectiveness (WUE) are still under development, but local governments in water-stressed areas are already taking proactive measures. Shanghai and Beijing have both reportedly applied caps on water consumption by specific facilities. Data center operators are encouraged to use recycled water and adopt water-saving cooling innovations.

Recycling, renovation and reuse of key energy-consuming equipment is encouraged.

Central planning

Early digital development in China focused on population centers in the east such as Beijing and Shanghai, but land and power are expensive in these regions, while renewable power generation is more readily available in the west.

In 2021, the NRDC announced the East-West Computing Resources Transmission (EWCRT) project, widely referred to as the Eastern Data Western Computing initiative. This defined the national data center clusters and hubs where high environmental standards would be applied.

Figure 1 Proposed regional computing hubs in China's East-West Computing Resources Transmission project



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The project defines 10 clusters of interconnected facilities with coordinated power supplies, each located in a single administrative area. These are organized into eight computing hubs where a sustainable ecosystem is planned:

- **Eastern clusters.** These include the Zhangjiakou cluster close to Beijing, the Yangtze River Delta sustainable ecosystem near Shanghai, and the Shaoguan cluster close to Shenzhen/Hong Kong.
- **Western clusters.** These include new developments such as Zhongwei and Qingyang, as well as existing developments, such as the Guian New Area in Guizhou and the Chongqing cluster in Chengdu.

China plans to allocate non-real-time batch processing and AI training to its western regions and

is developing fast communications between western and eastern regions. Large-scale wind and solar projects are planned at all hubs.

Projects in the east and west are encouraged to pair up and develop computing enclaves. Educational institutions and industry bodies are to be involved to assist in researching new ideas and promoting best practices.

Regional powers

In principle, the formation of additional clusters is prohibited. Provinces and regions are encouraged to eliminate existing, inefficient old, small and scattered facilities and reorganize the work into new hubs. The energy consumption of the new project should be equal to, or less than, that of the old facility.

China aims to develop a comprehensive system that enables regional powers to evaluate the resource usage of data centers, including energy efficiency, carbon efficiency and water efficiency.

To improve or phase out older facilities, provincial energy conservation authorities are expected to research the energy efficiency of equipment and create a plan for improvement projects, as well as time limits for renovation. New projects are to be supported in succession. By the end of 2025, the new hubs will account for 10% of new computing power in China.

Provincial authorities can offer tiered electricity prices that offer lower prices to new projects planning to meet efficiency targets. They can also offer financial support to energy-saving projects, including preferential tax policies and green finance, which encourages financial institutions to issue green bonds to operators.

Regions can also give priority access to GECs to operators meeting sustainability targets.

Case study: Horinger County, Inner Mongolia

A large cluster of data centers in Horinger County near Hohhot, which is part of the Inner Mongolia hub, illustrates the range of sustainable technologies being applied in data centers in China.

Hohhot has a cool climate with an average temperature of approximately 6°C, and is close to large-scale wind and solar plants, as well as the new Hohhot 1.2 gigawatt pumped storage hydroelectric plant, which opened in 2014. However, it also faces extremely high water stress, according to the World Resources Institute.

The data center external heat exchange systems are primarily indirect, adiabatic evaporative cooling systems that maximize the utilization of free cooling. One data center utilizes a pumped refrigerant system. The IT space systems vary based on the IT rack densities, and whether the data center uses air, hybrid air/liquid and full liquid cooling, as required for the specific rack density.

The Horinger cluster has around 42 data centers planned or built, holding up to 100,000 racks in a million square meters of space, over an area of approximately 10 square kilometers (3.9 square miles). Some of the projects in this cluster are detailed in **Table 2**.

Table 2 Projects in Horinger Cluster, Inner Mongolia

Company/project	External heat exchange system	IT space and rack cooling	Claimed PUE (if known)
China Mobile Intelligent Computing Center	Unknown	Cold-plate liquid cooling	1.15
China Telecom Cloud Computing Info Park	Indirect adiabatic evaporative cooling	Cold-plate liquid cooling, air–liquid hybrid cooling, and full liquid cooling tailored to rack densities.	1.15
China Unicom Hohhot Cloud Data Center	Unknown	Unknown	
Bank of China (BOC) FinTech Data Center	Indirect adiabatic evaporative cooling	Unknown	1.18
Agricultural Bank of China (ABC) Inner Mongolia Data Center	Indirect adiabatic evaporative cooling	Rack-level liquid cooling.	1.18
China Construction Bank (CCB) Horinger Data Center (HQ)	Indirect adiabatic evaporative cooling	Pumped refrigerant (fluorine pump) air cooling	1.2
Bank of Communications (BoCom) Horinger Data Center	Unknown	Unknown	
Huawei Cloud Horinger New Area Data Center	Direct air cooling with adiabatic assist	Air and liquid cooling based on rack densities.	

SINA FINANCE; VARIOUS ARTICLES; UPTIME INSTITUTE 2025



The Uptime Intelligence View

China is opening up its data center sector to foreign investors. Developers entering this market will find it to be rapidly expanding, but subject to tighter regulations than other regions, such as the EU’s EED. Central government policies aim to improve efficiency, eliminate older facilities and control the geographical location of facilities, to make best use of renewable power sources.

Operators are advised to adopt measures proactively to avoid being fined for non-compliance. Regional authorities have pledged that those not meeting the rules will be “severely dealt with”.

Appendix 1: Key policy reference documents

GXTBLJH [2025] No. 279 (Notice on Organizing the Recommendation of 2025 National Green Data Centers)

Sets out policies for sustainable data centers, from NDRC, MIIT, Ministry of Commerce, National Administration of Financial Regulation, National Government Offices Administration, and the

General Office of the National Energy Administration.

GB 43630-2023 (Tower and Rack Server Energy Efficiency Limits and Energy Efficiency Grades)

Sets mandatory minimum energy efficiency levels for tower and rack servers. It divides servers into three energy efficiency levels (with Level 1 being the most efficient) and applies to one-way and two-way general-purpose tower and rack servers, but not to blade servers, high-performance systems or storage devices. GB/T 44989-2024 (Green Data Center Evaluation)Evaluates environmental impact of data centers: current policies stipulate that facilities should, in principle, be Level 2 or higher.

GB40879-2021 (Energy Efficiency Limits and Energy Efficiency Grades for Data Centers)

Sets efficiency levels: current policies ask for Level 2 or higher, which implies a PUE of 1.3 or less.

T/CECA-G 0284-2024 (Evaluation Requirements for Energy Efficiency Leaders of Servers and Data Storage Equipment)

Sets grades for equipment regarded as leading in energy efficiency.

ABOUT THE AUTHOR



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