China pushes computing–electricity synergy as data centers become dispatchable grid assets

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As artificial intelligence (AI) training and inference demand drives electricity consumption to record highs, China and the United States are converging on the same strategic question: how to keep data centers fed with clean, affordable power without destabilizing the grid. China has elevated "computing–electricity synergy" (suan-dian xietong) to national new-infrastructure policy, with the two grid giants — China Southern Power Grid (CSG) and State Grid Corporation of China (SGCC) — running cross-provincial dispatch pilots that turn data centers into flexible, curtailment-absorbing resources. The U.S., meanwhile, is scaling virtual power plants (VPPs) and using federal loan guarantees and executive orders to connect AI load to transmission and storage.[1]

FROM PARALLEL NETWORKS TO A COUPLED SYSTEM: CHINA'S POLICY PIVOT

For decades, China's electricity grid and its computing network — anchored by eight national computing hubs and ten data-center clusters planned under the "East Data, West Computing" (Dongshu Xisuan) initiative — operated as largely parallel systems. That changed in 2026, when the Government Work Report formally listed "computing–electricity synergy" among new-infrastructure projects and called for nationwide monitoring and dispatch of mega-scale intelligent computing clusters. A Politburo meeting in April 2026 further grouped the power grid, the computing network and the water network as key infrastructure to be planned together.[2,3]

The National Development and Reform Commission (NDRC) followed with an action plan that explicitly asks power-market price signals to guide data-center energy management and cross-network, cross-region workload shifting, and encourages computing facilities to participate in grid operation as demand-side flexible resources. In effect, non-real-time AI and big-data jobs are being reclassified from inflexible baseload load into a new kind of storage-like resource: "workload that can move in space and time."

CHINA SOUTHERN POWER GRID: THE DIANHONG OPERATING SYSTEM AND THE ELECTRICITY–CARBON–COMPUTING PLATFORM

CSG, which serves five southern provinces rich in hydro, wind and solar resources, has become the most visible executor of the strategy. Its flagship digital asset is DianHong (literally "Electric Hongmeng"), the country's first unified power-sector Internet-of-Things operating system, jointly released in late 2023 with the OpenAtom Foundation and built on the open-source OpenHarmony and openEuler kernels. DianHong provides a single communication and data model across vendors — from substation terminals and inspection robots such as the humanoid "Zhixingzhe No.1" and quadruped inspection dogs to edge controllers — giving the grid operator a uniform, security-certified layer on which flexible-load signals can be sent to millions of end-point devices. The DianHong open-source community, formally established in 2025, now gathers grid utilities, chip makers, terminal manufacturers and solution providers; in 2026 China Resources Power released the first enterprise distribution built on DianHong, signaling that the operating system is expanding beyond CSG's own footprint.

Layered on top of DianHong, CSG launched the country's first electricity–carbon–computing coordination and operation system in August



2025. The system uses a custom-built "power–computing mapping model" that quantifies the electricity and carbon footprint of each AI workload with reported power-forecast accuracy above 94% and computing-load forecast accuracy above 85%. Demand forecasts for flexible computing load exceed 90% accuracy.

The platform already runs cross-regional dispatch pilots in Guangdong, Guizhou and Jiangsu. In one documented case, elastic tasks from a data center in Suzhou (Jiangsu) were shifted to Guizhou during hours of surplus hydropower, absorbing excess green generation while cutting data-center electricity bills. CSG says that, across its pilots, shifting non-real-time computing jobs to low-price regions has reduced average electricity costs by about 48%. The utility frames this as a four-dimensional coordination — planning, construction, dispatch and trading — rather than a one-way "power supply to data centers."

STATE GRID: MEGAWATT-SCALE PILOTS THAT TURN DATA CENTERS INTO VIRTUAL POWER PLANTS

State Grid, which covers 26 provinces and hosts most of the Beijing–Tianjin–Heizhou and eastern load centers, is running a parallel and complementary set of pilots that more closely resemble how a VPP would operate in a Western market.

In September 2026, State Grid Jibei Electric Power — the grid arm covering Zhangjiakou, the 2022 Winter Olympics wind base — conducted what CCTV described as the country's first 100-megawatt scale computing–electricity regulation event. Operators deliberately trimmed and shifted data-center load during a peak period; utility executives described the result as equivalent to adding a peaking power plant, with "negative load equal to positive generation."

Other pilots show the geographic breadth of the effort. State Grid Zhejiang operates the Jinshuitan Green Intelligent Computing Center, coupling hydropower peak-shaving, battery storage and elastic computing load. State Grid Fujian and State Grid Ningxia jointly ran a cross-province "follows-the-green-power" workload transfer, with China Mobile, to verify that Fujian data centers can shift flexible jobs to Ningxia during midday solar surplus. State Grid Qinghai, together with the National Supercomputing Center in Wuxi, ran batch workloads back to the Qinghai Plateau for summer peak shaving. In Shanghai, State Grid coordinated 16 data centers — including facilities operated by China Telecom, GDS Holdings, Shanghai Yidian and Alibaba — to cut up to 97.8 MW within two hours, the largest single-city demand-response event of its kind in China. In Ningxia, 10 MW of backup and batch data jobs are being moved into midday solar-surplus hours under hour-level green-power trading pilots.

State Grid summarizes its approach as three linked principles: strengthen computing with reliable power (yi dian qiang suan), build power infrastructure alongside computing clusters (dian sui suan jian), and flex computing load to follow grid needs (suan sui dian tiao). Across all pilots, the underlying message is the same: a modern data center should be able to ramp, defer or relocate workloads the way a battery ramps in and out.

UNITED STATES: VPP DEPLOYMENT TARGETS, FEDERAL LOAN GUARANTEES AND AI-GRID EXECUTIVE ORDERS

Across the Pacific, the U.S. does not have a single state-owned grid operator running national compute-to-power pilots. Instead, the U.S. strategy relies on aggregators, distributed energy resources (DERs), and federal financial and regulatory tools. The U.S. Department of Energy (DOE) has framed virtual power plants as a primary answer to load growth from AI data centers, electrification and re-industrialization.[4,5]

DOE's 2025 Virtual Power Plant Update states that deploying 80–160 GW of VPP capacity by 2030 — enough to serve 10–20% of national peak load — could support rapid load growth while lowering overall grid costs. The DOE Loan Programs Office (LPO) has begun turning that target into financeable projects. In January 2025, LPO closed a $289.7 million loan guarantee to Sunwealth Holdco 18 LLC for "Project Polo," which will deploy up to 1,000 commercial solar-plus-storage systems across 27 states and aggregate them into VPPs. Around the same time, LPO announced a conditional commitment of up to $705.1 million to Zum Energy Geo LLC ("Project Marigold") to deploy battery-electric school buses with vehicle-to-grid capability, effectively turning school fleets into mobile VPP assets.

The policy backdrop has also shifted rapidly. In January 2025, the Biden White House issued an Executive Order on Advancing U.S. Leadership in AI Infrastructure, directing DOE to report surplus interconnection capacity and to accelerate grid interconnection for AI sites. In April 2025, the Trump administration signed Executive Order 14262 on Strengthening the Reliability and Security of the U.S. Electric Grid, explicitly responding to AI and data-center demand, streaming emergency DOE actions and calling for maintained baseload. In July 2025, the White House released "Winning the Race: America's AI Action Plan," which treats energy infrastructure — permitting, transmission expansion and domestic capacity — as a core pillar. DOE's $1.9 billion SPARK (Speed to Power through Accelerated Reconductoring and Key Advanced Transmission Technology) program is funding faster, advanced transmission upgrades, and a DOE Data Center Resource Hub now coordinates federal support for large generation and transmission projects tied to AI load. Industry observers note that U.S. VPP programs to date have mostly aggregated residential thermostats, rooftop solar, behind-the-meter batteries and commercial demand response; explicitly bringing hyperscale data centers into VPP-style reliability markets — the functional equivalent of China's cross-regional compute shifting — remains an open market-design question, although several grid operators have begun pilot tariffs that pay large loads for curtailable capacity.

TWO MODELS, ONE DIRECTION

The Chinese and U.S. approaches differ in structure. China is using vertically integrated grid companies, a unified IoT operating system (DianHong), and direct cross-regional workload dispatch guided by wholesale power prices; data centers are treated as dispatchable, cross-provincial flexible resources. The U.S. is relying on competitive VPP aggregators, private DERs, federal loan guarantees and executive orders to connect AI demand to transmission, storage and vehicle-to-grid resources.

Yet the technical direction is converging. Both systems now assume that the kilowatt drawn by a GPU is no longer fixed baseload: it can be deferred, shifted, interrupted or relocated in response to price, carbon intensity or grid emergency. For researchers, grid operators and data-center developers, the next open questions are cross-border comparability of workload flexibility metrics, standardized power–computing mapping, carbon accounting per token of AI output, and the market designs needed to pay data centers for reliability service — the substrate on which both national strategies will ultimately be judged.

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DECLARATION OF INTERESTS

The author declares no competing interests.