Goldman Sachs 高盛

2025年1月20日 | 6:43PM CST

中国 电网科技

电网转型：从周期性过渡到结构性成长；可再生能源消纳和人工智能是两大利好因素 (摘要)

我们认为中国的电力系统即将迎来转型升级；我们预计，尤其是可再生能源消纳量的日益增长，加上来自数据中心和人工智能(AI)用电量的小幅贡献，有望在2024-2030年的新增投资中占据近60%，电网总投资的年均复合增速将达到8%的稳健水平，智能电网在电网总支出中的占比将从2023年的13.7%升至2030年的16%，投资重点在于可实时监控、调度及实时处理数据的智能系统，从而实现高效的电力分配。2025年，在强有力的逆周期政策支持和特高压建设周期加快推进的背景下，我们预计中国的电网投资，具体而言是由国家电网作出的投资，将达到人民币6,900亿元的创纪录水平（同比增长13%），略高于人民币6,500亿元的全年目标。

我们并非主张紧迫的电力短缺将带来投资机会，而是认为市场可能低估了中长期增长的可持续性。尽管中国的电网与欧美国家相比要新得多，但可再生能源在中国总发电量中的占比仅为15%，我们预计到2030年这一比例将升至35%。德国的经验值得借鉴：2011-2023年，德国可再生能源在总发电量中的占比从11%大幅升至39%，与此同时，电网输配电投资（由TenneT和E.ON等公司承担）增至期初的四倍。尽管由波动性和间歇性导致的电力中断在中国极少出现，但潜在的新能源并网对电网冲击不容忽视。此外，我们认为快速增长的AI训练与推理资本支出投资（与美国的趋势一致）以及智能设备普及带来的充电需求增长将带来进一步的潜在上行空间。我们预计数据中心在总用电量中的占比将从2023年的1.6%升至2030年的5%，其中AI大约占到其中的12%。

我们认为，这一电网转型升级的主要受益者是那些能够提升电网智能化和韧性的赋能企业，特别是国电南瑞（买入，参见报告链接），该公司能够提供智能电网所必需的软件和硬件，从业务规模和范围上看最有望获益。我们对阳光电源、时代电气H股、英维克和科华数据的评级也为买入，这些公司提供关键的储能系统、温控和电能转换技术，以促进可再生能源的整合。

证券研究报告
Research | Equity

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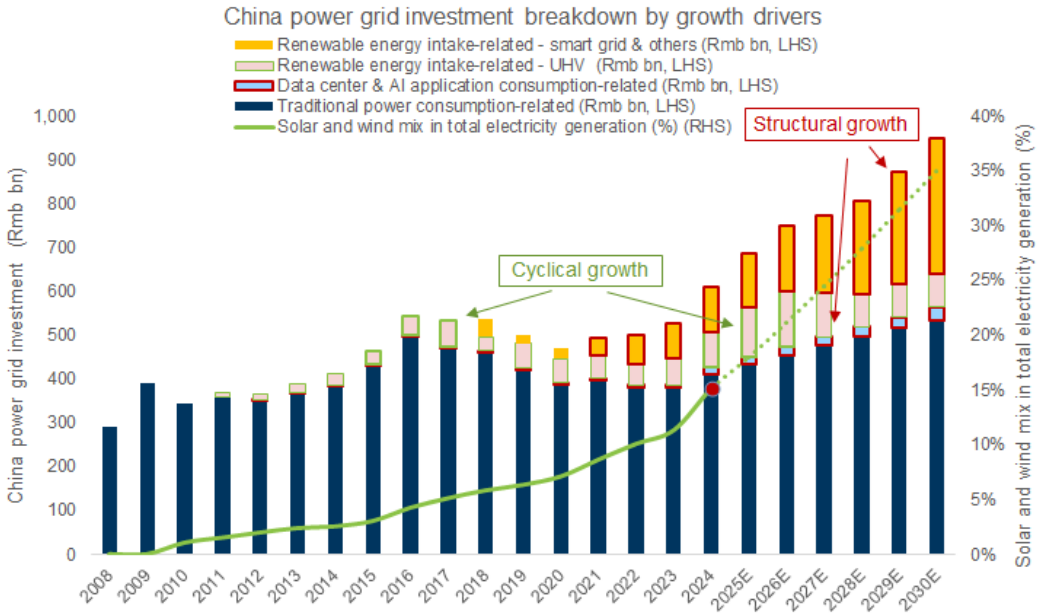


Note: China power grid investment refers to investments made by State Grid

资料来源：国家电网, 万得, 高盛全球投资研究部

*全文翻译随后提供

PM Summary: Robust China grid investment to stay; Buy Nari Tech

China grid investment to grow 13% yoy in 2025E

- We expect China's power grid investment, specifically that made by State Grid, in 2025E to reach a record high of Rmb690bn (+13% yoy) with continued fiscal support and accelerating UHV construction cycle, slightly above its announced annual target of Rmb650bn.
- Counter-cyclical impetus: Grid investment is not tied strictly to GDP growth. In some instances, it has served as a counter-cyclical economic policy tool, as seen in 2008-2009 and 2015-2016 in China. Amid the country's commitment to achieve peak carbon emissions by 2030, we believe there will be continued fiscal support to grid investment heading into 2025E. We note, that Southern Grid has pledged grid equipment upgrade investments totaling Rmb193.5bn in 2024-27, taking up 36-40% of the Southern Grid's total investments over the same period.
- Given China's green targets, in 2025E we believe UHV (Ultra-High Voltage) will be the fastest-growing power grid segment (+43% yoy). Beyond 2025E, we think investments toward smart grid infrastructure will become increasingly more structural vs. cyclical, particularly as renewable energy in-take continues to rise. Over 2025E-2030E, we foresee distribution investments growing faster than transmission, with its contribution to total investment rising from 56% to 59%.

China grid investment to continue growing at an 8% CAGR over 2024E-2030E

We forecast grid investment to grow at an 8% CAGR in 2024E-2030E, driven by grid upgrades to improve grid flexibility and reliability, which may be even more critical to facilitating renewable energy integration (i.e., reducing intermittent or volatile performance). We believe this could take up c.60% of incremental power grid investment from 2024E to 2030E:

- As of 2023, wind and solar energy accounted for over 15% of China's total electricity generation mix, crossing a critical threshold (i.e., when cost of power starts to increase rapidly per the International Energy Agency (IEA) and State Grid Energy Research Institute). We expect the mix to reach 35% in 2030E on continued solar/wind installation growth.
- For context, Germany experienced a rapid rise in renewable energy, from 11% to 39% of total generation from 2011 to 2023, while grid investment increased fourfold (we use Germany's primary transmission and distribution grid operators TenneT and E.ON as a proxy given they are the largest operators of the market over the same period), reconfirming the need for significant grid investments as renewable energy share increases.
- AI demand could drive further upside: With the recent success of Doubao (No.2 globally in terms of MAU), Bytedance and other CSP competitors appear to be embarking on a period of significant AI capex spending. We accordingly expect datacenters in China to fill an even more important role in power demand (5% in

2030E) with AI taking up c.12% of total data center power demand. Additional tailwinds, though contribution is likely to be relatively small by 2030E, could come from further proliferation of AI-embedded terminal devices (see report).

Integration of Renewable Energy: Pain points and respective grid tech solutions

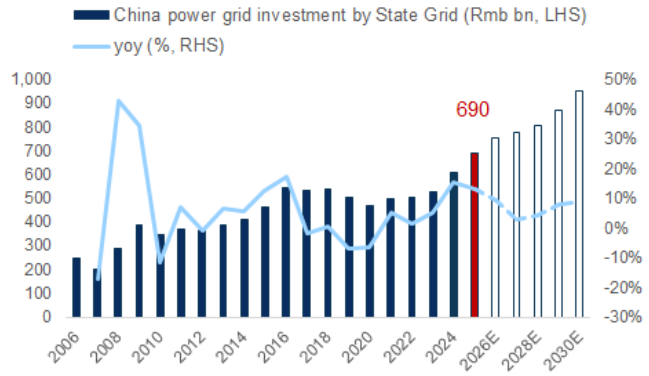
- UHV transmission
  - Pain points: Spatial mismatch between renewable resources and consumption centers necessitate efficient long-distance energy transmission.
  - Solutions: Expand Ultra-High Voltage (UHV) lines to link energy-rich western regions with demand-heavy eastern regions.
- Smart Generation
  - Pain points: Wind and solar energy are intermittent, requiring traditional energy sources like coal to balance peaks and troughs in power generation.
  - Solutions: Implement systems like Automatic Generation Control (AGC), Automatic Voltage Control (AVC), and Fast Frequency Response (FFR) to stabilize the grid amidst variable renewable energy outputs.
- Smart dispatch
  - Pain points: Solar and wind generation is less predictable throughout the day, requiring climate forecasts and flexible coal generation to fill the gaps between generation and electricity load.
  - Solutions: Upgrade dispatch systems to real-time, integrating renewable energy forecasts and complex grid data for precise control.
- Smart Substations
  - Pain points: Large-scale renewable integration can cause reverse power flows, overloading, and stability issues that require adaptive substations.
  - Solutions: Install reactive power compensation devices (e.g., SVC/STATCOM), tap-changing transformers, and relay protections to handle voltage instability and overload.
- Smart Distribution
  - Pain points: Distributed energy sources and electric vehicles increase load complexity, demanding active, automated, and responsive networks.
  - Solutions: Deploy DTUs, TTUs, FTUs, and RTUs for fault isolation, supply restoration, and bi-directional energy flow management.
- Smart Consumption
  - Pain points: Users with distributed solar and energy storage are transitioning from consumers to prosumers, sometimes making the electricity flow in both directions, requiring more sophisticated management systems.
  - Solutions: Enhance smart meter systems and integrate user-generated power into demand response markets for grid participation.

Stock Beneficiaries

We believe the key beneficiaries of China's grid transformation will include enablers of a smarter, more resilient grid, such as Nari Tech (Buy, see link), which stands out in our view both in terms of scope and scale to provide the necessary software/hardware for UHV and digitalization infrastructure. Moreover, Buy rated Sungrow, Times Electric H, Envicool, and Kehua also stand out, providing critical auxiliary ESS components, cooling systems, and power conversion technologies to facilitate renewable energy integration.

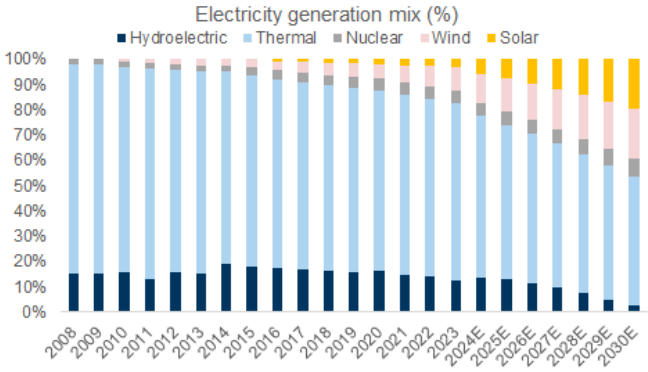
Key Thesis in Charts

图表 2: We expect China power grid investment by State Grid to record new high of Rmb690bn in 2025E, +13% yoy with 2024E-2030E CAGR staying strong at 8%
China power grid investment by State Grid



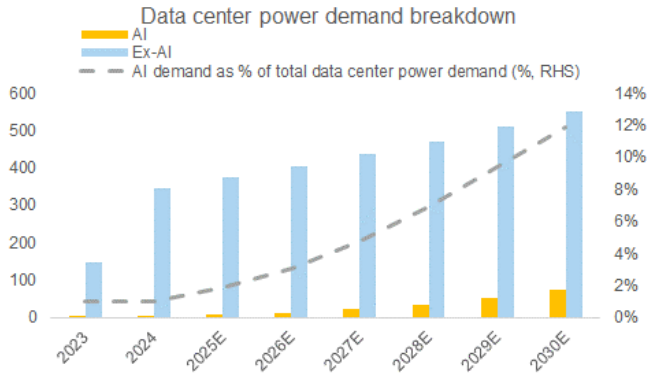
资料来源：State Grid, 万得, 高盛全球投资研究部

图表 3: China is going through a transformative electricity generation mix change, with the solar and wind contribution growing from 11% of total mix in 2023 to 35% in 2030E
China electricity generation mix change till 2030E



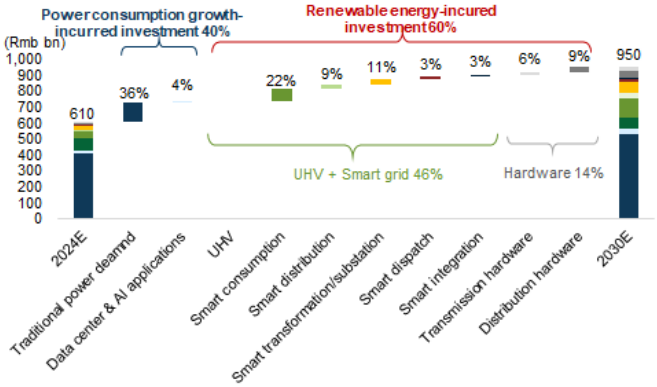
资料来源：万得, 高盛全球投资研究部

图表 4: Additional tailwinds could come from increasing data center power demand, with AI taking up to 12% of total
Data center power demand breakdown



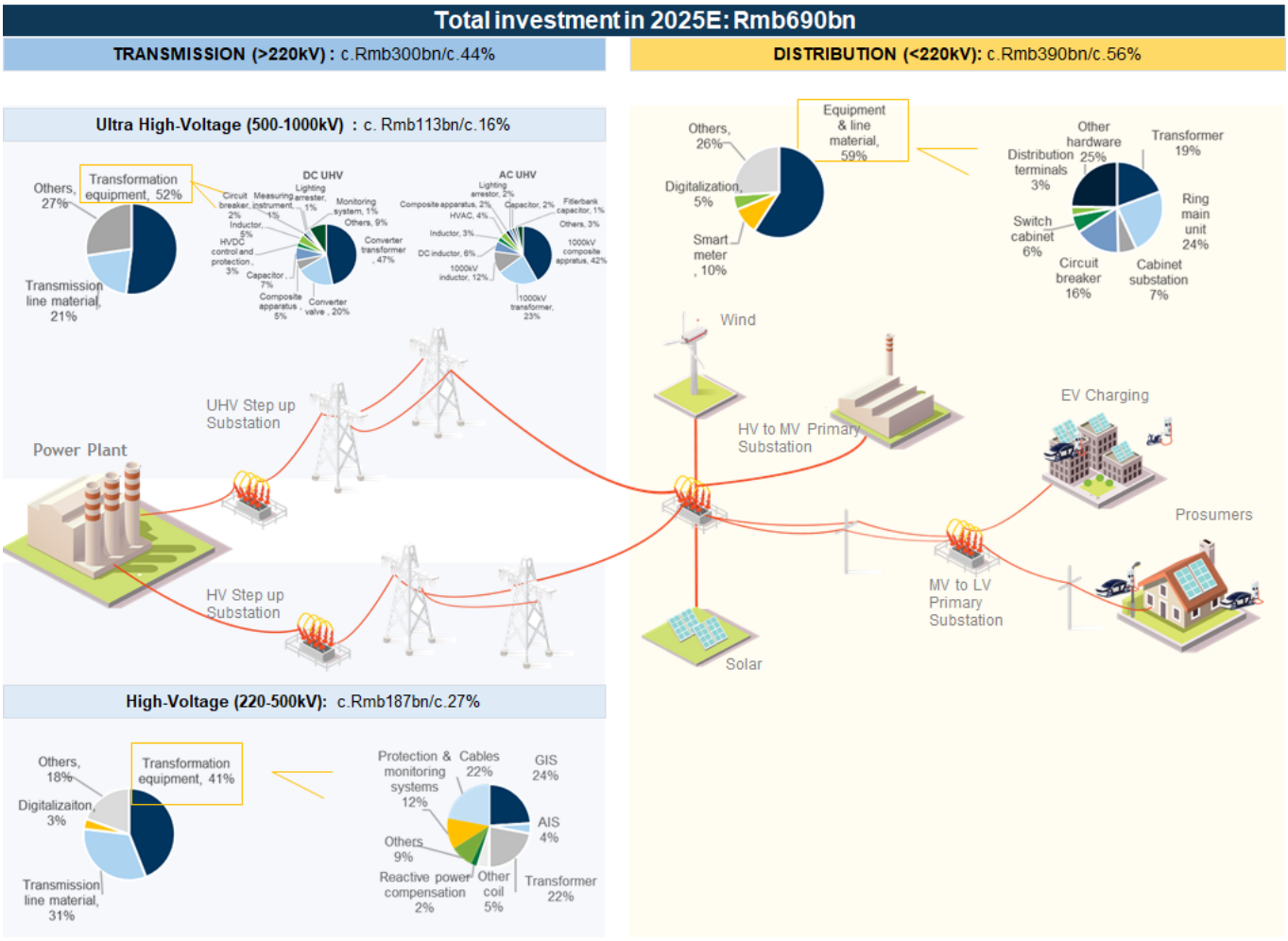
资料来源：China Computing Power Platform, 高盛全球投资研究部

图表 5: We expect 60% of incremental grid investment from 2024E-2030E will be driven by renewable energy intake
Breakdown of factors contributing to incremental power grid investment from 2024E-2030E



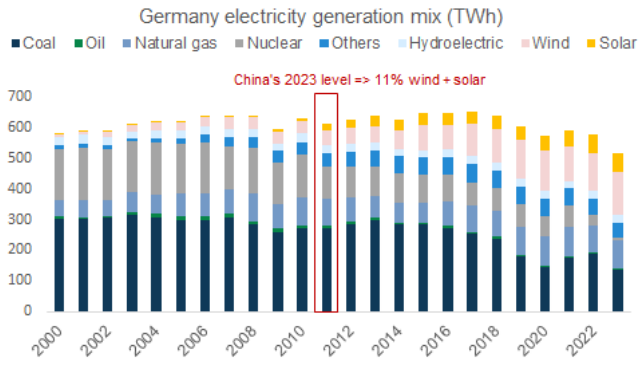
资料来源：State Grid, 高盛全球投资研究部

图表 6: Where will China’s power grid investment go toward in 2025E?
Breakdown of China’s power grid investment by State Grid



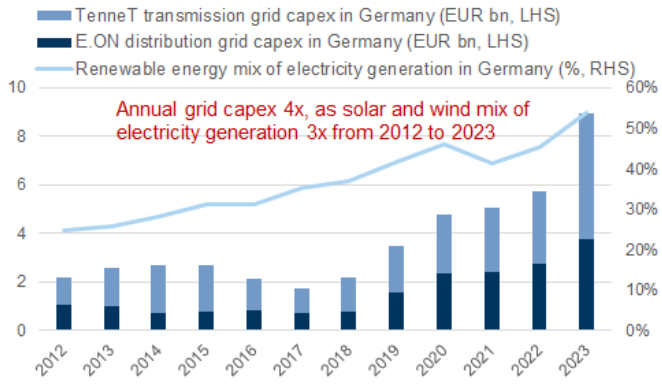
资料来源：State Grid, Data compiled by Goldman Sachs Global Investment Research

图表 7: Germany’s solar and wind mix was 11% in 2011, same as China’s 2023 level, and rapidly increased to 39% in 2023, with no power consumption growth
Germany’s electricity generation mix change



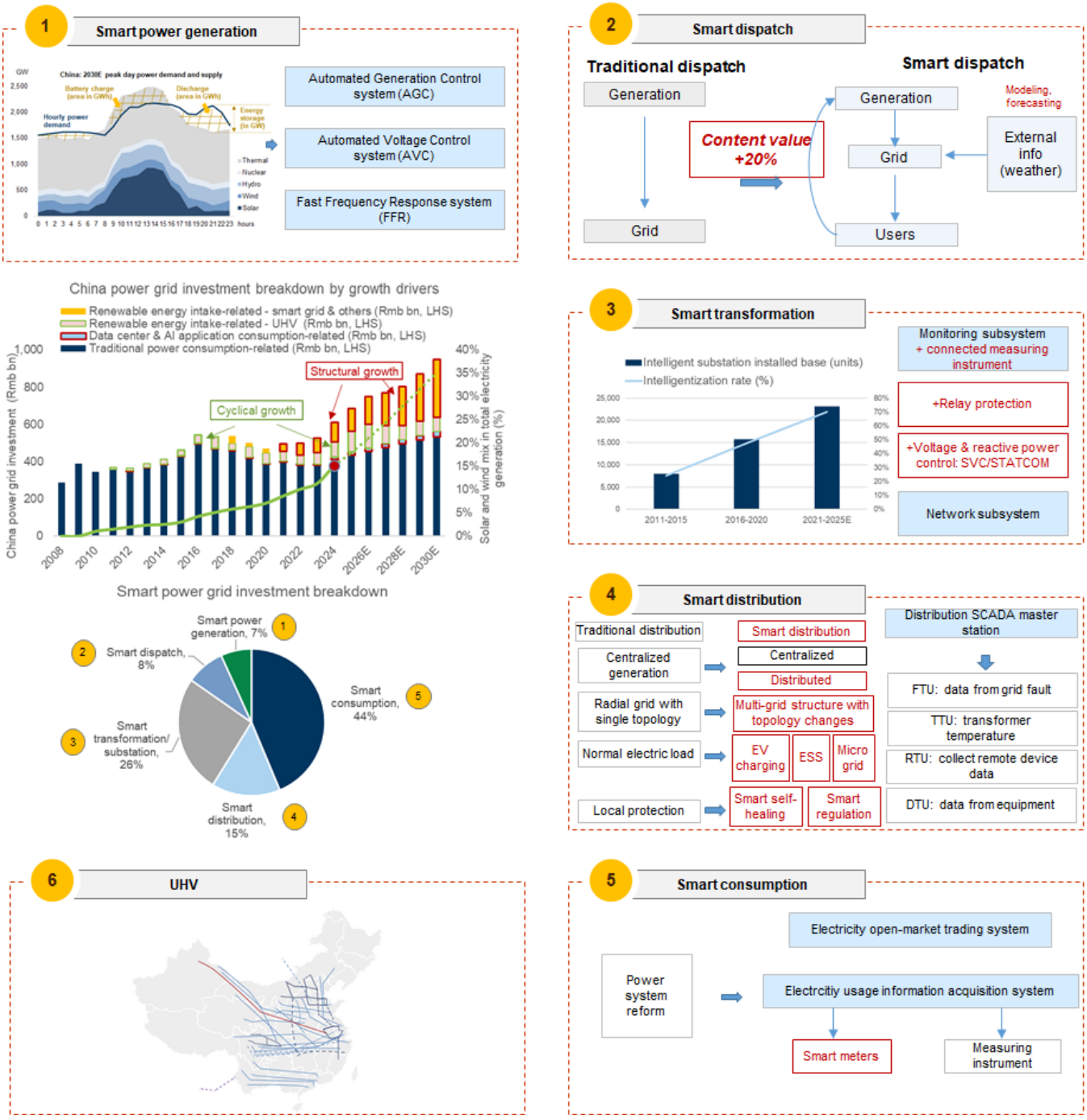
资料来源：Clean Energy Wire, Data compiled by Goldman Sachs Global Investment Research

图表 8: Germany’s grid capex nearly quadrupled from 2011-2023, driven not by consumption growth, but largely from the mix increase of solar and wind as well as grid upgrades
Germany grid capex from 2012 to 2023, represented by TenneT and E.ON



资料来源：公司数据, data compiled by Goldman Sachs Global Investment Research

图表 9: We believe UHV will be the fastest-growing segment in 2025E-26E, with power grid investments shifting more toward smart grid infrastructure in 2028E-2030E
Pain points of integrating renewable energy and the key grid tech solutions



Note: China power grid investment refers to investments made by State Grid

资料来源：Company data, State Grid, 高盛全球投资研究部

THE ECOSYSTEM OF GRID OF THE FUTURE

Grid

Digitalization

Dispatch
Nari Tech [600406.SS]
SGIT [600131.SS]
Dongfang Electronics [000682.SZ]
Sifang [601126.SS]

Other software
Nari Tech [600406.SS]
China Southern Power [003035.SZ]
Longshine [300682.SZ]
State Grid Information [600131.SS]
Suwen [300982.SZ]
Acrel [300286.SZ]
Rixin Tech [301162.SZ]
E-Techstar [300513.SZ]

Secondary equipment

SVC/STATCOM
Nari Tech [600406.SS]
Sieyuan Electric [002028.SZ]
Sifang Automation [601126.SS]
Xj Electric [000400.SZ]

Protective relay
Nari Tech [600406.SS]
Changyuan [600525.SS]
Sifang Automation [601126.SS]
Xj Electric [000400.SZ]
Dongfang Electronics [000682.SZ]

Network system integrator
Nari Tech [600406.SS]
SGIT [600131.SS]

Primary equipment

Composite Apparatus
Pinggao Electric [600312.SS]
China XD Electric [601179.SS]
Sieyuan Electric [002028.SZ]
Chint [601877.SS]
Changgao Electric [002452.SZ]

Circuit breaker
Sieyuan Electric [002028.SZ]
Pinggao Electric [600312.SS]
China XD Electric [601179.SS]
Changgao Electric [002452.SZ]

Transformer
China XD Electric [601179.SS]
TBEA [600089.SS]
Baobian [600550.SS]
Chint [601877.SS]
Sieyuan Electric [002028.SZ]

Capacitors
Sieyuan Electric [002028.SZ]
China XD Electric [601179.SS]

Converter valve
Nari Tech [600406.SS]
China XD Electric [601179.SS]
Xj Electric [000400.SZ]

Smart meters
Sanxing Medical [601567.SS]
Hexing Electrical [603556.SS]
Jinpan Technology [688676.SS]
Clou Elecctronics [002121.SZ]
Wahlap Technology [301011.SZ]
Sunrise Tech [603421.SS]
Waison Group [3393.HK]

Cables and line materials
Hengtong [600487.SS]
Orient Wires and Cables [603606.SS]
Zhongtian Tech [600522.SS]
Baosheng Science and Tech [600973.SS]

ESS system
Sungrow Power [300274.SZ]
CATL [300750.SZ]
BYD [1211.HK]

Converter
Sungrow Power [300274.SZ]
CRRC Times Electric [688187.SS, 3898.HK]
GoodWe [688390.SS]
Ginlong [300763.SZ]
Ningbo Deye [605117.SS]

Cooling systems & components
Envicool [002837.SZ]
Sanhua [002050.SZ]
AVIC Jonhon [002179.SZ]
Tongfei [300990.SZ]
Aotecar [002239.SZ]
Shenling [301018.SZ]
Songz [002454.SZ]
Goaland [300499.SZ]

Solar

Poly silicon
Daqo New Energy [DQ, 688303.SS]
Tongwei [600438.SS]
GCL Tech [3800.HK]
Xinte Energy [1799.HK]

Solar module
LONGi [601012.SS]
Jinko [JKS, 688223.SS]
JA Solar [002459.SZ]
Trina Solar [688599.SS]

Cell
Tongwei [600438.SS]
LONGi [601012.SS]
Aiko Solar [600732.SS]

Wafer
LONGi [601012.SS]
TCL Zhonghuan [002129.SZ]

Glass
Flat Glass [601865.SS, 6865.HK]
Xinyi Solar [0968.HK]

EVA film
Hangzhou First Applied Material [603806.SS]
Shanghai HIUV New Materials [688680.SS]

Module Manufacturing Equipment
HJT: Suzhou Maxwell [300751.SZ]
TOPCON: Shenzhen SC [300724.SZ]

Silver paste
Wuxi DK Electronic [300842.SZ]
Suzhou Good-Ark Electronics [002079.SZ]

Inverter
Sungrow Power [300274.SZ]
CRRC Times Electric [688187.SS, 3898.HK]
Kehua Data [002335.SZ]
Shenzhen Kstar [002518.SZ]
Sineng [300827.SZ]
Ningbo Deye [605117.SS]

Wind

Turbine
Ming Yang [601615.SS]
Xinjiang Goldwind [002202.SZ, 2208.HK]
Sany Heavy Energy [688349.SS]
Zhejiang Windey Co [300772.SZ]
Dongfang Electric [600875.SS]
Shanghai Electric Wind Power [688660.SS]

Converter
Sungrow Power [300274.SZ]
CRRC Times Electric [688187.SS, 3898.HK]

Grey text: Not rated or not covered by GS

We note that the list of companies presented in the ecosystem above may not be exhaustive, and the universe of companies involved is likely to be larger than what is presented.

We are Coverage Suspended on Longshine, Pinggao, Chint, Xj Electric, Orient wire, GoodWe, Ginlong, MingYang, and Goldwind.

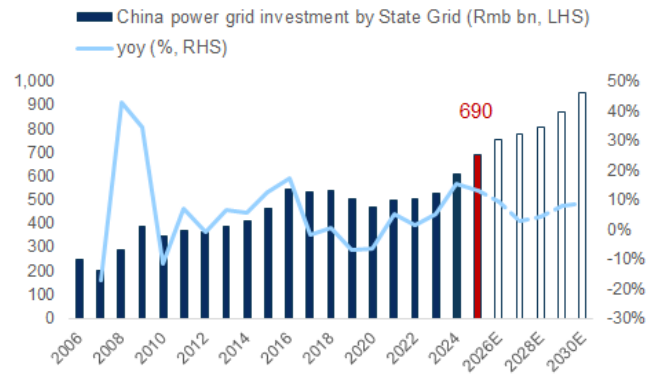
资料来源：公司数据, Data compiled by Goldman Sachs Global Investment Research

2025E grid investment to be supported by counter-cyclical policy and upgrade demand

We expect China’s power grid investment, by the State Grid, in 2025E to reach a record high of Rmb690bn, +13% yoy with continued fiscal support, slightly exceeding the planned investment announced by State Grid on Jan 15, 2025 of Rmb650bn. The pace of power grid investment is not strictly tied to GDP growth or power consumption growth, as it often serves as a counter-cyclical economic policy tool, as seen during periods like 2008-2009, 2015-2016, and the anticipated 2024-2025 period by our GS economist (see report).

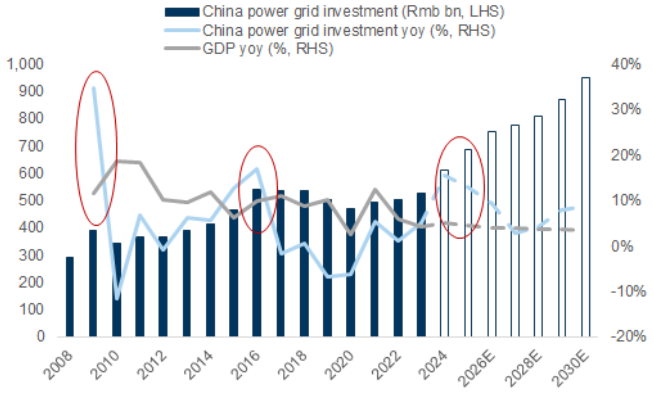
On Aug 21, 2024 the National Development and Reform Commission (NDRC) and the National Energy Administration (NEA) issued a notice titled “Implementation Plan for Large-Scale Equipment Upgrades in Key Energy Areas”, which aimed to increase the scale of energy equipment investment by 25%+ to 2027E compared to 2023, ranging from power transmission and distribution equipment, wind, solar, and hydropower sectors. Southern Grid also is actively promoting large-scale grid equipment updates, planning to invest a total of Rmb195.33bn from 2024 to 2027, Rmb40bn/46bn/52bn/57bn in 2024E/25E/26E/27E (c.36-40% of its total investment). The key investment areas are disaster prevention and mitigation, digital grids, energy conservation, efficiency enhancement, distribution network reliability, and rural grid improvements. The goal is to achieve a 52% increase in grid equipment investment by 2027 compared to 2023.

图表 10: We expect 2025E China power grid investment by State Grid to reach a record high of Rmb690bn, with 24-30E CAGR at 8%
China power grid investment forecast



资料来源：State Grid, 万得, 高盛全球投资研究部

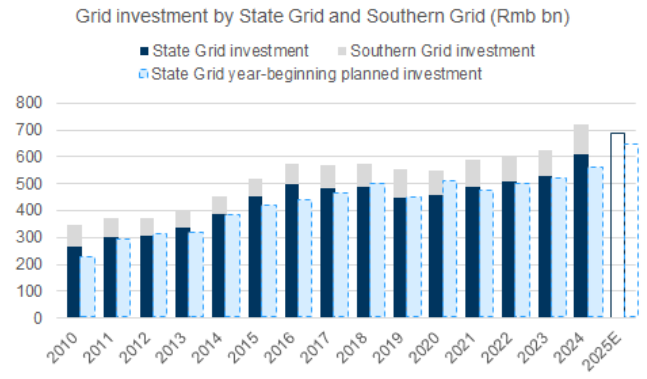
图表 11: The pace of power grid investment may be not be in tune with GDP growth each year, as it is often used as counter-cyclical growth policy tool (similar to in 2008-09, 2015-16, and 2024-25E)...
China power grid investment growth vs GDP growth



Note: China power grid investment refers to investments made by State Grid

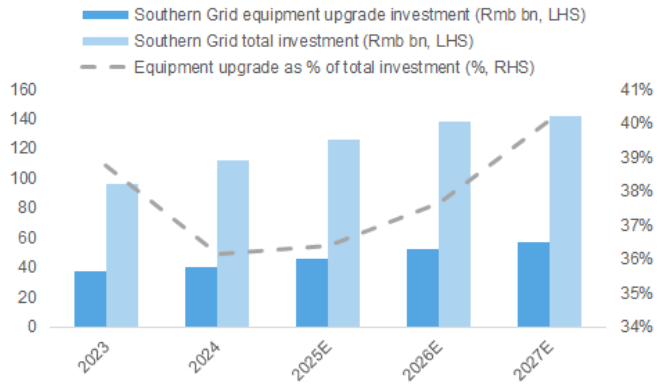
资料来源：万得, State Grid, 高盛全球投资研究部

图表 12: ...with State Grid taking up the majority
Grid investment by State Grid and Southern Grid



资料来源：State Grid, Southern Grid

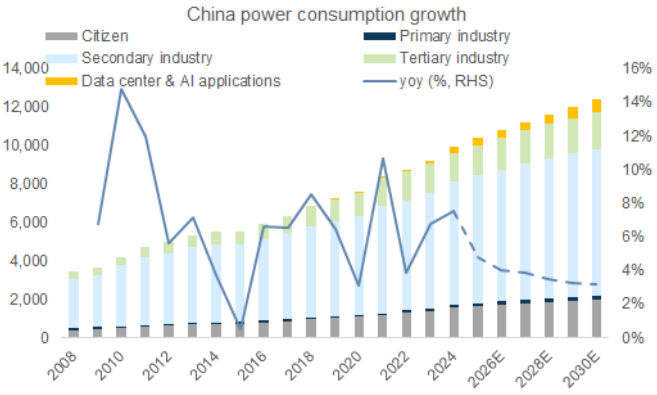
图表 13: Southern Grid already plans to invest a total of Rmb195.3bn for grid upgrade, which is about 36-40% of its total investment
Equipment upgrade investment as % of total Southern Grid investment



资料来源：Southern Grid, 高盛全球投资研究部

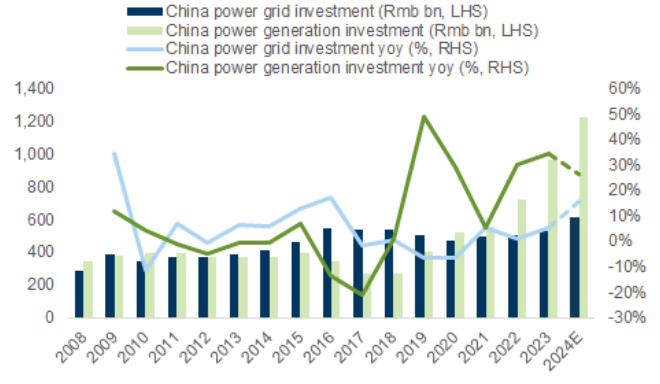
China renewable power generation investment has run ahead of grid investment in the past few years. Power generation investment is mainly market demand driven. The preparation phase for renewable energy projects typically takes about a year, with a construction period of six months, making the entire project cycle around two years. In contrast, investment on the grid side is primarily driven by planning. Grid construction projects must first be included in the national power planning by the National Energy Administration (NEA). Then, they need to be incorporated into the development plans of State Grid Headquarters and the annual plans of local companies before progressing to budgeting, design, and construction stages. The project cycle for grid construction typically averages three to five years, meaning that grid-related construction often lags behind the pace of generation-side development.

图表 14: Grid investment was primarily driven by power consumption growth (5.7% CAGR in 2013-2023), and we expect it to slow to a 3.8% CAGR in 2024-30E though data center & AI applications emerge as new drivers
China power consumption breakdown, 2008-30E



资料来源：万得, Data compiled by Goldman Sachs Global Investment Research

图表 15: China power grid investment growth has been lagging behind power generation investment in the past three years
China power grid investment and generation investment, 2008-2024E



Note: China power grid investment refers to investments made by State Grid

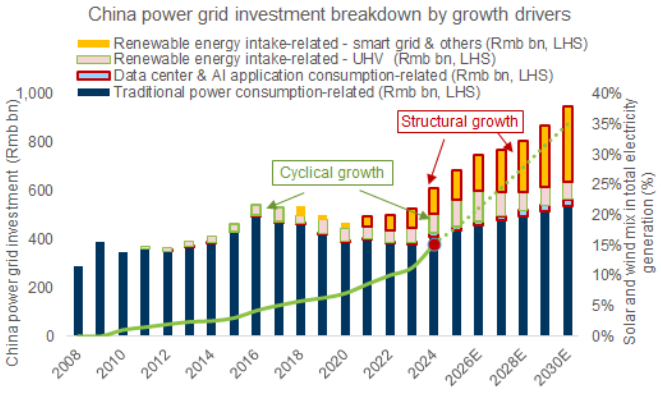
资料来源：万得, 高盛全球投资研究部

Intake of renewables key driver of grid investment growth till 2030E

We believe that a significantly higher proportion of grid investment moving forward will serve to integrate renewable energy, accommodating China's ambitious transition in its energy mix. More specifically, we expect nearly 60% of the incremental grid investment during 2024-2030E will be focused on renewable energy integration, underscoring China's commitment to ensuring stable and efficient renewable energy utilization, as renewable energy mix increases from 15% in 2024 to 35% in 2030E. There is a pressing need to accelerate grid investment to intake renewable energy, as upstream installation momentum remains strong, while downstream absorption issues emerge, especially when the share of renewable energy reaches 15% according to research by the International Energy Agency (IEA) and State Grid Energy Research Institute. In China, our solar and wind penetration in total electricity generation mix surpassed 15% in 2023, crossing this critical threshold. Specifically:

- We anticipate UHV transmission lines to remain the fastest-growing segment in 2025E, given their critical role in transporting renewable energy from remote generation bases to urban load centers. We expect UHV investment to grow by 43%/13% yoy in 2025E/26E as project approval pace accelerates;
- The integration of digital technologies such as power generation control, dispatch software, smart transformation station, smart meters will also see substantial growth. Investments in digitalization will drive the growth in 2027-30E, serving to enhance grid flexibility, forecast accuracy, and operational efficiency to manage variable renewable energy.
- We expect distribution network investments to grow faster than transmission over 2024-30E, with distribution investment contribution increasing from 56% of total in 2024E to 59% in 2030E. This shift is driven by the need to modernize local grids to handle distributed energy resources (DERs), such as rooftop solar and energy storage systems; expansion of microgrids and enhancements to accommodate the increased use of electric vehicles and other decentralized loads; efforts to improve power reliability and reduce outage rates, aligning with the need for higher-quality electricity supply.

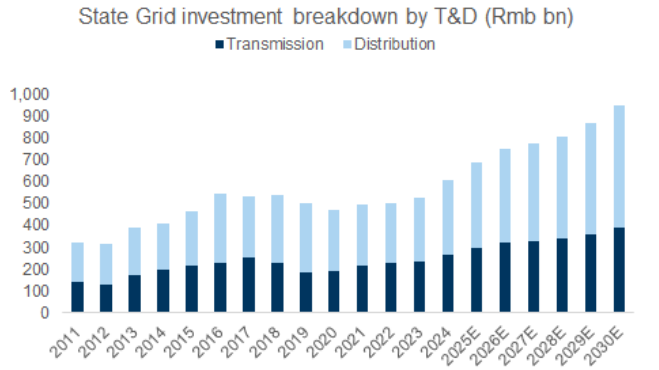
图表 16: We believe a significantly higher proportion of grid investment going forward will serve to incorporate renewable energy, with emphasis on UHV first, and then shift to smart grid and others
Renewable energy intake-related investment as % of total



Note: China power grid investment refers to investments made by State Grid

资料来源：State Grid, Data compiled by Goldman Sachs Global Investment Research

图表 17: We expect distribution investment to increase the contribution of total State Grid investment from 56% in 2024E to 59% in 2030E, rising from 48% in 2011
State Grid investment breakdown by T&D

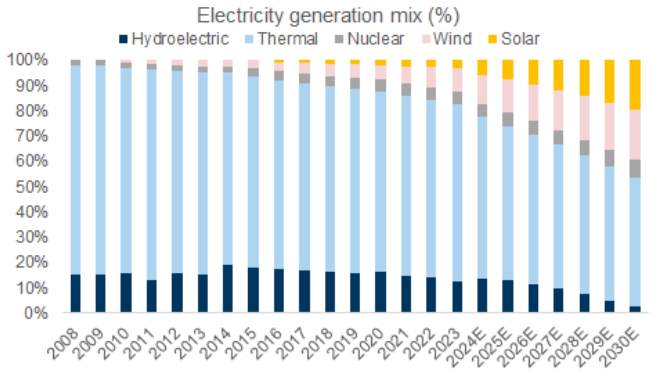


资料来源：State Grid, Data compiled by Goldman Sachs Global Investment Research

Accompanying the drastic increase of solar and wind installations, there has been severe solar and wind curtailment issues as the grid was not well-prepared for renewable intake. In 2018, the Clean Energy Consumption Action plan (2018-2020) issued by NDRC and NEA proposed to limit the curtailment to 5%, which was effective in reducing the curtailment to 2%/3.7% for solar/wind in 2023. However, the solar/wind curtailment ratio is a lot higher in key western power generation provinces such as Tibet at 29.6%/16.5%, Qinghai at 9.8%/6.9%, and Xinjiang at 8.3%/6.3%. Though official curtailment data seems low, we think extra solar capacity might be idle. The actual utilization hours (implied by electricity generated by installed solar capacity) indicates annual utilization hours, which dropped from 583 hours in 2022 to 482 hours in 2023, still well below the reported utilization hours of 1,200-1,300 hours, which might be only taking account of solar capacity that is in use.

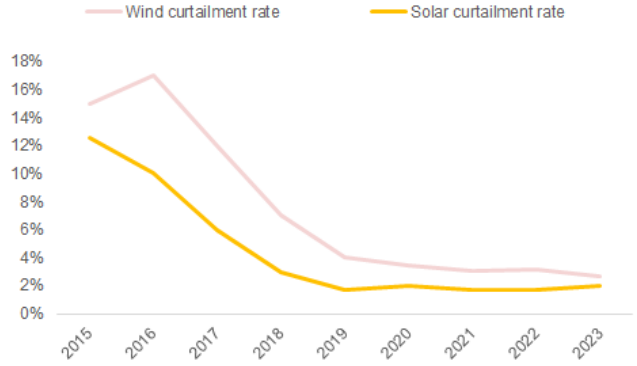
As renewable energy continued its fast growth (solar/wind installation grew +47%/+19% yoy as of Jan-Nov 2024, with solar new installation likely to continue at +15% CAGR from 2024 to 2030E per GSe), the intake problem is likely to resurface. During the 15th Five-Year Plan (2026E-30E), we expect China’s renewable energy installed capacity to continue its solid growth, leading to another round of intake challenges, making necessary grid infrastructure a continued high priority. In May 2024, the National Energy Administration (NEA) issued the Notice on Promoting the Consumption of Renewable Energy and Ensuring the High-Quality Development of Renewable Energy. This policy aims to address renewable energy integration challenges and supports the acceleration of grid upgrades to match the rapid expansion of solar and wind capacity. The notice emphasized optimizing grid connection processes and accelerating project construction timelines. It introduced a “green channel” for integrating key national projects, such as large-scale wind and solar power bases and water-wind-solar integrated bases, into the grid planning process. This streamlined approach aims to expedite the inclusion and implementation of supporting grid infrastructure projects for renewable energy.

图表 18: China is going through a drastic electricity generation mix change, with solar and wind contribution growing from 11% of total mix in 2023 to 35% in 2030E
China electricity generation mix change, 2008-2030E



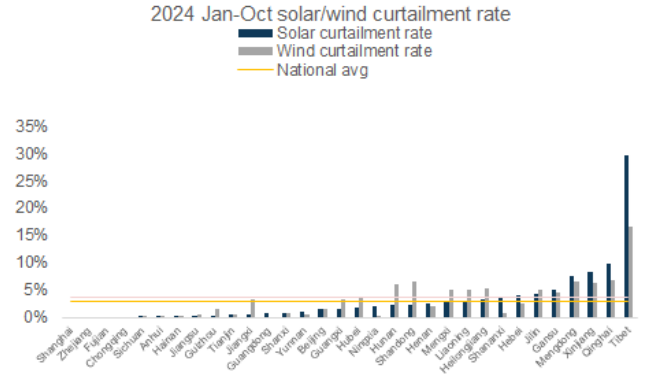
资料来源：万得, 高盛全球投资研究部

图表 19: We have effectively reduced solar/wind curtailment rate to 2%/2.7% in 2023
Wind and solar curtailment rate, 2015-2023



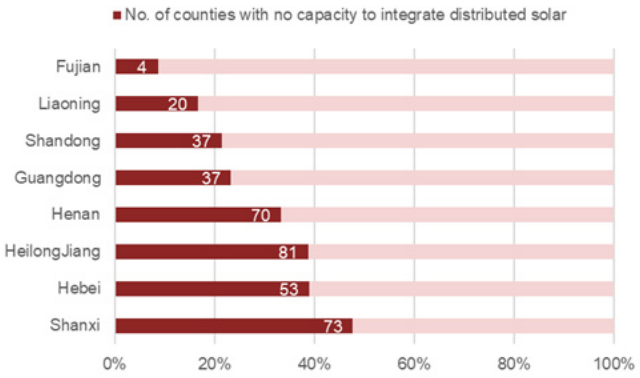
资料来源：国家能源局, Data compiled by Goldman Sachs Global Investment Research

图表 20: ...however, the ratio is a lot higher in key western power generation provinces such as Tibet, Qinghai and Xinjiang
2024 Jan-Oct solar/wind curtailment rate across different provinces



资料来源：National New Energy Consumption Intake Early Warning Center, Data compiled by Goldman Sachs Global Investment Research

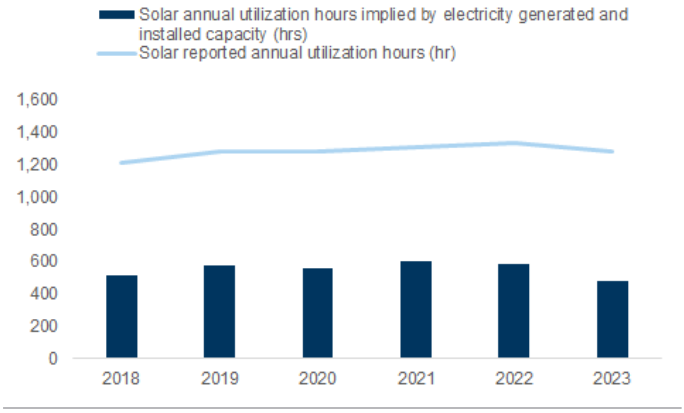
图表 21: Separately, over 370 counties across 8 provinces declared limited capacity to intake distributed solar
Number of counties with no capacity to integrate distributed solar



Heilongjiang/Fujian/Shandong/Hebei as of Dec 2023; Liaoning/Henan/Shanxi/Guangdong as of Mar 2024/Apr 2024/Apr 2024/Jun 2024

资料来源：News, Data compiled by Goldman Sachs Global Investment Research

图表 22: There is still a gap between actual solar utilization vs theoretical achievable utilization
Solar annual actual utilization hours (implied by electricity generated and installed capacity) vs reported



资料来源：国家能源局, 万得, Data compiled by Goldman Sachs Global Investment Research

Below we detail the key technologies needed to enable a smarter grid:

1. Smart power generation

Unlike traditional coal power, renewable energy represented by wind and solar is highly volatile and intermittent, placing higher demands on the grid’s adjustment capabilities. For example, photovoltaic (solar) power generates more output during sunny days and less in the mornings and evenings, while peak electricity usage occurs during those times. To accommodate the volatility in renewable energy output, traditional energy sources like coal power take on the task of adjustment, reducing or stopping output during renewable energy peaks and increasing output during troughs, thus achieving peak shaving and valley filling, as well as frequency and load balancing. Coal power is often adopted as the flexibility adjustment tool, as hydropower has high environmental requirements, nuclear power prioritizes production safety, and gas power is constrained by limited resources.

The flexible control of renewable energy and flexibility adjustment for coal power requires new systems, such as AGC (Automatic Generation Control) to monitor grid load and adjust generator’s power output; AVC (Automatic Voltage Control) to regulate grid voltage levels, as maintaining voltage within a proper range is crucial for power quality and equipment operation; as well as Fast Frequency Response (FFR) system, to adjust active power output when grid frequency deviates from the rated value, limiting changes and maintaining stability.

2. Smart dispatch

To enhance renewable energy integration, dispatch systems have evolved from offline to online, moving from scheduled to real-time control. This requires real-time risk warning, fault identification, and precise control. Forecasting the power generation capacity of renewable energy is foundational for intelligent dispatch. For instance, wind farms must submit medium- and short-term power forecasts twice daily, as well as ultra-short-term forecasts every 15 minutes. Solar plants follow similar protocols. The forecasting

process involves gathering raw meteorological data, refining it through modeling, and calculating short-term power predictions for integration into grid dispatch systems. According to Nari Tech, a new dispatch system that integrates more complex information has a 20% higher content value than the previous version.

3. Smart substation

Substations must adapt to the volatility of renewable energy. The integration of distributed renewable energy leads to issues like reverse power flow, overloading, and voltage instability. For centralized large-scale renewable integration, it can result in insufficient system rotational inertia, and reduced voltage and frequency stability. For distributed renewable integration, reverse power flow can cause equipment overloading and thermal stability issues. Excessive distributed renewable capacity can lead to voltage rise, especially at points close to the distribution network’s end. Grid-side solutions include reactive power compensation devices (SVC/STATCOM), inverter power factor control, on-load tap-changing transformers to regulate voltage levels, and relay protection. In case of equipment overloading, some capacity upgrades for transformers may be required.

4. Smart distribution

Distribution networks are transitioning from “passive and one-directional” to “active and bidirectional” systems. Distributed solar and electric vehicles introduce diverse loads at the distribution level, increasing the urgency for automation upgrades. Intelligent equipment plays a crucial role in modernized distribution systems: DTU (Distribution Terminal Unit) to monitor equipment in substations, identifies faults, and controls switches for fault isolation, supply restoration, and backup power deployment; TTU (Transformer Terminal Unit) to monitor distribution transformers in real time, providing data for load forecasting and fault analysis; FTU (Feeder Terminal Unit) to monitor overhead equipment and enables remote interaction between substations and terminals, allowing centralized distribution control; RTU (Remote Terminal Unit) to send field data to SCADA systems for centralized decision making.

5. Smart consumption

The role of electricity users is transforming in the new power system. Users now participate in both energy consumption and generation, with distributed solar enabling them to sell power while consuming it. Distributed energy storage can act as both a power source and a load, participating in demand-side response and auxiliary service markets.

Data collection and analysis systems use smart meters and remote sensing to provide comprehensive power consumption insights. Integrated communication networks support multi-source data processing, enabling intelligent decision-making for energy integration, dispatch, and management.

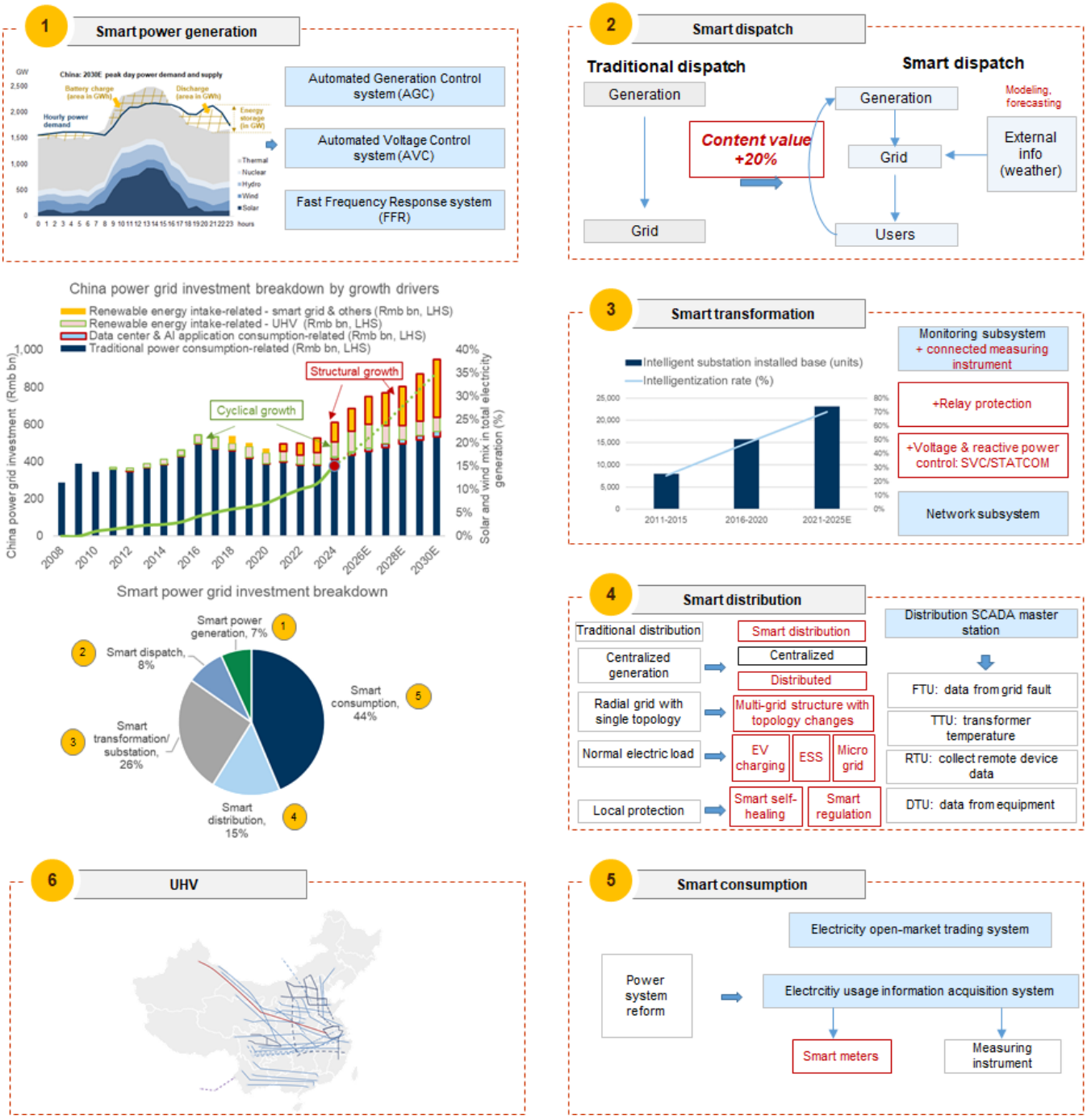
6. UHV transmission

China’s clean energy and load centers are geographically mismatched, with economic and load centers in the coastal regions and abundant energy resources in the Northwest

and Southwest. Through Ultra-High Voltage (UHV) transmission systems, large-scale clean energy is transported from resource-rich areas to demand centers. During the 14th Five-Year Plan, China will establish several wind, solar, hydropower, and supporting coal power bases, forming nine major land-based clean energy bases and five offshore wind power bases. UHV transmission channels maximize grid optimization, balance inter-provincial power supply and demand, and enhance western clean energy absorption and eastern power stability.

图表 23: We believe UHV will be the fastest-growing segment in 2025-26E, while investments shift more towards the smart grid infrastructure in 2028-30E

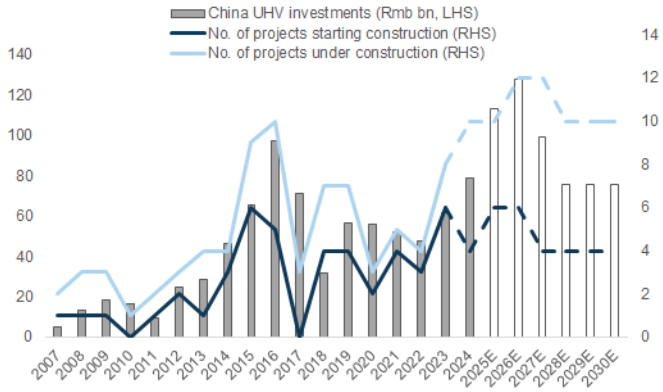
Pain points of integrating renewable energy and the key grid tech solutions



Note: China power grid investment refers to investments made by State Grid

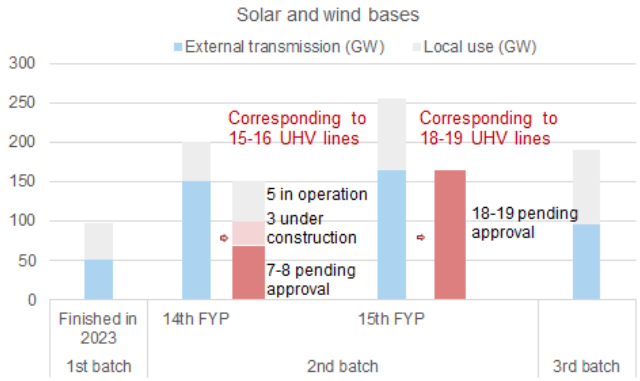
资料来源：State Grid, 公司数据, 高盛全球投资研究部

图表 24: We expect UHV investment growth to peak in 2025E/26E (with 6 projects starting construction each year) and investment to stay heighted till 2030E though growth likely to slow
China UHV investments and No. of projects starting/under construction, 2006-2030E



资料来源：State Grid, 高盛全球投资研究部

图表 25: Among the 15-16 UHV lines needed for solar and wind bases under 14th FYP, 3 lines are under construction, and 7 lines are pending approval; 18-19 lines are required for 15th FYP
Three batches of solar and wind bases and corresponding demand for UHV lines



资料来源：State Grid, Data compiled by Goldman Sachs Global Investment Research

In Jan 2022, NEA announced 3 AC lines and 9 DC lines to be constructed in the 14th Five Year Plan (2021-2025), among which three lines haven’t started the construction process yet. This is one of the reasons that we expect a pick up in approval pace in 2025E. At the 2025 National Energy Work Conference (Dec 15, 2024, link), China announced plans to prioritize the approval and construction of several key UHV projects in 2025, including corridors from Western Inner Mongolia to Beijing-Tianjin-Hebei, Southeastern Tibet to the Greater Bay Area, Gansu’s Badain Jaran Desert to Sichuan, and Southern Xinjiang to Sichuan-Chongqing. Additionally, State Grid has also announced reserve projects of 5 AC line and 9 DC lines that will sustain the UHV construction pace beyond 2025E.

图表 26: There is an ample pipeline of UHV projects awaiting approval
A list of announced/planned projects of UHV lines for 14th Five-Year Plan and State Grid reserve projects

Project EN	Project CN	Project type	Status	Approval time	Construction start	Operation start	Transmission power (GW)	Investment (Rmb mn)	Length (km)	Power (kV)
14th Five-Year Plan: 3 AC lines and 9 DC lines										
Zhangbei - Shengli	张北-胜利	AC	In operation	Sep-22	Sep-23	Oct-24	8	6,786	366	800
Chengdu - Chongqing	甘孜-天府南-成都东、天府南-铜梁 (川	AC	Under construction	Aug-22	Sep-22	Jul-25	2	28,800	658	1000
Jinshang - Hubei	金上-湖北	DC	Under construction	Dec-22	Mar-23	Apr-25	4	33,484	1,901	800
Longdong - Shandong	陇东-山东	DC	Under construction	Feb-23	Aug-23	Jun-25	8	20,200	934	800
Ningxia - Hunan	宁夏-湖南	DC	Under construction	May-23	Jun-23	Dec-25	8	28,100	1,619	800
Hami - Chongqing	哈密-重庆 (疆电入渝)	VSC-DC	Under construction	Jul-23	Mar-24	Sep-25	8	28,600	2,290	800
North Shaanxi - Anhui	陕北-安徽 (途径河南)	DC	Under construction	Feb-24	Jun-24	Jun-26	8	20,500	1,069	800
Gansu - Zhejiang	甘肃-浙江	VSC-DC	Under construction	Jul-24	Dec-24	Jun-26	4	35,300	2,370	800
Datong - Huailai - Tianjin North South	大同-怀来-天津北-天津南	AC	Under construction	Oct-24	Jan-25	Sep-26	6	22,480	770	1000
Mongolia West - Beijing/Tianjin/Hebei	蒙西-京津冀	VSC-DC	Waiting for approval							
Tibet Southeast - Guangdong/HK/Macao	藏东南-粤港澳	VSC-DC	Waiting for approval							
Shaanxi - Henan	陕西-河南 (途径山西)	DC	Waiting for approval							
State Grid Reserve Projects: 5 AC lines and 9 DC lines										
Badan Jilin - Sichuan	巴丹吉林-四川	VSC-DC	Waiting for approval							
Xinjiang South - Chuanyu	南疆-川渝	DC	Waiting for approval							
Qinghai outbound	青海海南外送	DC	Waiting for approval							
Huabei Dalate - Mengxi	华北达拉特-蒙西	AC	Waiting for approval							
Ulaanbuh - Jingjinji	乌兰布和-京津冀	DC	Waiting for approval							
Kubuqi - Shanghai	库布奇-上海	DC	Waiting for approval							
Datong-Bayannur	大同-乌兰察布-包头-巴彦淖尔	AC	Waiting for approval							
Datong-Baotou	大同-达拉特-包头	AC	Waiting for approval							
Mongolia - Jiangsu	内蒙古-江苏	VSC-DC	Waiting for approval							
Songliao - Northern Area	松辽-华北	DC	Waiting for approval							
Panxi-Tianfu South	攀西-川南-天府南	AC	Waiting for approval							
Tenggeli - Jiangxi	腾格里-江西	DC	Waiting for approval							
Yanwei	烟威	AC	Waiting for approval							
Jiuquan - Eastern Area	内蒙古-华东	DC	Waiting for approval							

资料来源：国家能源局, State Grid, Data compiled by Goldman Sachs Global Investment Research

Additionally, we are positive on UHV construction due to the imminent need to transmit the electricity generated from solar and wind bases in remote northwest region of China to areas with heavy electricity consumption needs in the middle-eastern region of China. With the first batch of solar and wind projects already incorporated into the power grid, the second batch is starting construction, with the biggest bottleneck being the shortage of UHV power grids. An UHV line with transmission power of 4-8GW on average can transmit 10-11GW of renewable energy and 3-4GW of supporting energy. The second batch of projects planned in 14th FYP (150GW of external transmission) will require 15-16 UHV lines, relying on 5 lines already in the installed base, and 10 additional new lines (7 lines pending approval). The second batch of projects planned in the 15th FYP (165GW of external transmission) will accordingly require 18-19 UHV lines. We believe the 15th FYP projects, combined with the third batch (40GW of external transmission) provide strong demand support to continued UHV construction.

图表 27: Second batch of 14th FYP solar and wind projects will rely on 5 UHV lines in the installed base and 10 additional lines
Corresponding UHV lines for 14th FYP solar and wind bases and their status

Bases	Solar and wind projects	New energy transmission (GW)	Supporting energy - coal (GW)	Designated consumption region	Transmission line	Status
Kubuqi Desert 库布齐沙漠 Ordos 鄂尔多斯	Ordos new energy project	4	6	Northern	Installed base West Mongolia - Tianjin South 蒙西-天津南	Started operation in 2016
	Ordos mid-northern new energy project	10	4	Northern	**New West Mongolia - Jingjinji 蒙西-京津冀**	Environmental assessment
	Ordos southern new energy project	10	4	Middleeastern	**New Kubuqi - Shanghai 库布奇-上海**	**Pending**
	Ordos mid-northern new energy project	5		Local	Local line	
	Ordos mid-northern new energy project	5		Local	Local line	
	Ordos southern new energy project	5		Local	Local line	
Ulaanbuh Desert 乌兰布和沙漠 Alxa 阿拉善	Alxa new energy project	10	4	Northern	**New Ulaanbuh - Jingjinji 乌兰布和-京津冀**	**Pending**
	Alxa new energy project	5		Local	Local line	
	Alxa new energy project	6	2	Local	Local line	
Tengger Desert 腾格里沙漠	Tengger Desert Southeastern new energy project	11	3	Middle	**New Ningxia - Hunan 宁夏-湖南**	Under construction
	Tengger Desert Southeastern new energy project	11	4	Middleeastern	**New Helanshan - Middleeastern area 贺兰山- 中东部**	**Pending**
	Tengger Desert Hexi new energy project	11	4	Eastern	**New Hexi - Zhejiang 河西-浙江**	**Pending**
	Tengger Desert Southeastern new energy project	6	2	Local	Local line	
	Tengger Desert River-west new energy project	6	2	Local	Local line	
Badain Jaran Desert 巴丹吉林沙漠	Jiuquan West new energy project	11	4	Middleeastern	**New Jiuquan - Middle East 酒泉-中东部**	**Pending**
	Alxa new energy project	6		Local	Local line	
	Hexi Corridor Jiajiu new energy project	6	2	Local	Local line	
Sinked land from coal mining 采煤沉陷区	Northern Shaanxi Sinked Land new energy project	6	4	Middle	Installed base 陕北-湖北	
	Ningxia Sinked Land new energy project	6	4	Eastern	Installed base 宁夏- 浙江	
	West Mongolia Ordos Sinked Land new energy project	4	8	Northern	Installed base 上海庙-山东	
	Northern Shaanxi Sinked Land new energy project	3	6	Northern	Installed base 府谷、锦界电厂	
	Northern Shaanxi Sinked Land new energy project	5	2	Eastern	**New North Shaanxi - Anhui 陕北- 安徽**	Under construction
	Northern Shaanxi Sinked Land new energy project	5	2	Middle	**New Shaanxi - Henan 陕西-河南**	Under construction
	Northern Shanxi Sinked Land new energy project	8	2	Northern	**New Datong-Huailai-Tianjin North-Tianjin South**	Environmental assessment

资料来源：国家发改委, 国家能源局, Data compiled by Goldman Sachs Global Investment Research

Putting China into global perspective, the lesson of Germany

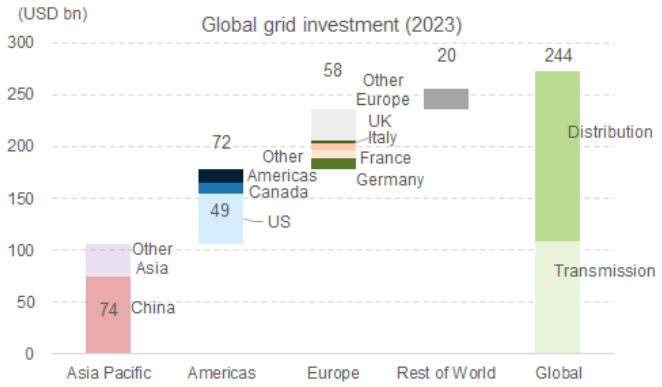
China continues to lead the world in grid investment, allocating a remarkable US$74 billion in 2023, outpacing the spending of the Americas and entire Europe (including the UK). Looking ahead, we expect China to remain one of the fastest-growing grid networks globally, driven by a combination of three factors: 1) the need to further enhance the grid reliability; 2) power consumption growth; and most importantly 3) the intake of renewable energy.

Despite already having the largest and relatively advanced grid network in the world, China's grid reliability, as measured by average outage hours per year, remains lower than that of developed nations such as the United States and Germany. The pace of China's energy transition is different from that in the US in our view, where changes in the power generation mix have been more gradual, and overall investment has also stayed relatively stable.

Germany provides a useful case study for understanding the challenges and opportunities of renewable integration. In 2011, solar and wind contributed 11% to Germany's power generation mix, a level comparable to China's share in 2023. By 2023, this proportion had risen sharply to 39%, even as overall power consumption remained flat. This rapid growth in renewables, along with the need to upgrade a nearly 40 year-old grid network, necessitated a nearly fourfold increase in Germany's grid capital expenditure between 2011 and 2023 (evidenced by TenneT and E.ON, the two primary transmission and distribution grid operators). Unlike China, where grid investments are driven by both consumption growth and renewable integration, Germany's capex expansion was primarily a response to the higher penetration of solar and wind energy as well as upgrade demand. In particular, transmission network operator TenneT emphasized investing in flexibility to balance demand and supply and managing grid congestion. As part of their operations, they mentioned the importance of using digital tools to improve planning of replacement of end-of-lifetime assets, which can contribute to improved grid availability and fewer unplanned outages. The distributed network operator E.ON emphasized its investments in smart infrastructure to ensure a smart and reliable energy flow in order to manage more volatile and less predictable renewable energy, targeting 100% observability and 20% controllability for medium voltage grids by 2026E, mentioning specific progress in adopting smart substations and smart meters each year. Our European Utilities analyst, Alberto Gandolfi, estimated that in the past, about 40% of the grid capex went into smart generation or smart distribution (renewable energy source connections and charging points), and about 20% of the grid capex went into smart substations.

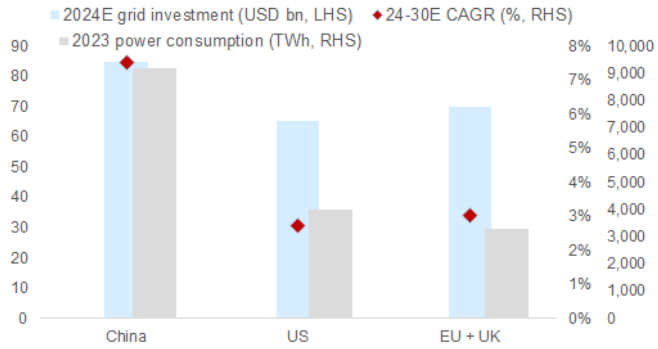
As China transitions to a grid with renewables as the primary energy source, with solar and wind energy accounting for 11% of total generation in 2023 (we expect this to climb to 35% by 2030E), combined with the dual challenge of growing power consumption demand and the rising contribution from renewable energy, we believe it will amplify the need for large-scale grid investments.

图表 28: China has the highest grid investment among the globe, at $74bn, larger than Americas/Europe (including UK)
Global grid investment by countries



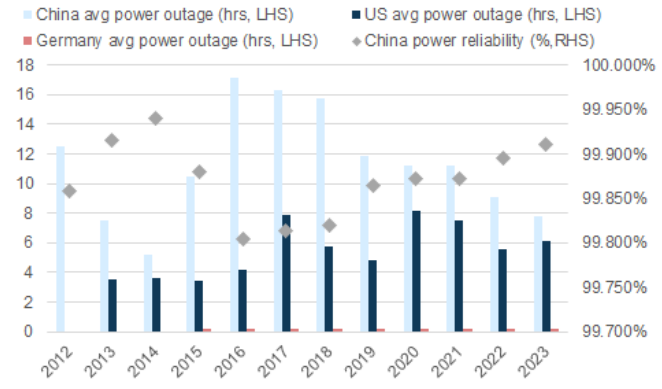
资料来源：彭博新能源财经, State Grid, S&P Global Market Intelligence, Data compiled by Goldman Sachs Global Investment Research

图表 29: We expect China to maintain as one of the fastest growing grid network by 2030E
2024E grid investment size, 24-30E CAGR for China, US, EU+UK



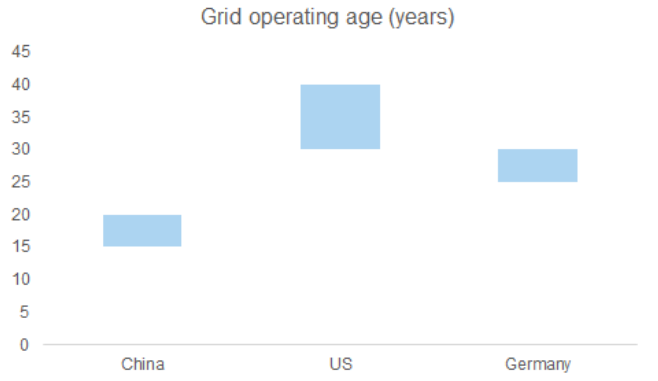
资料来源：彭博新能源财经, S&P Global Market Intelligence, 高盛全球投资研究部

图表 30: China’s grid reliability (as evidenced by average outage hours) is quite advanced but still lags behind developed countries such as US and Germany
China/US/Germany average power outage hours and China power reliability, 2012-2023



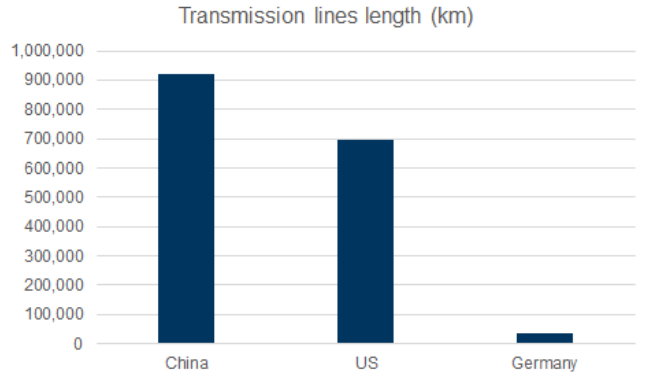
资料来源：EIA, 国资委, VDE, Clean Energy Wire

图表 31: US/Germany grid has been operating for 30-40/25-30 years, whereas China grid on average has operated 15-20 years
US/Germany/China grid operating age



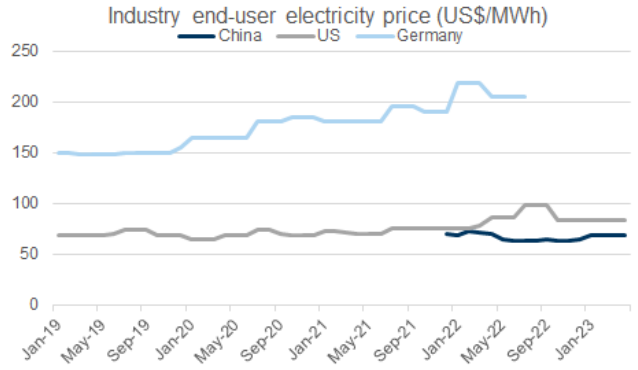
资料来源：US Department of Commerce, Breakthrough Energy, State Grid

图表 32: China’s operating transmission lines exceeded 920,000km as of 2023, vs c.695,000km/35,000km for US/Germany.



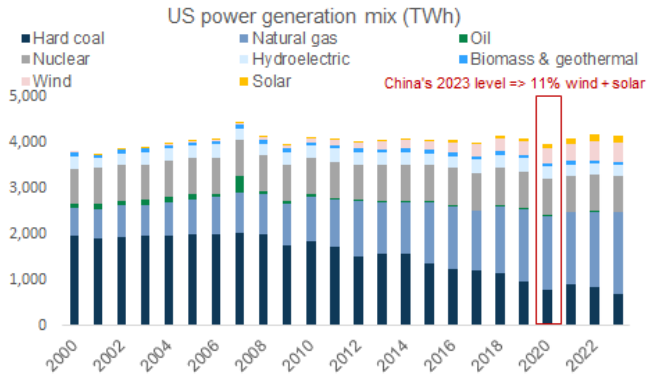
资料来源：Federal Ministry for Economic Affairs and Climate Action, NEO, Live-EO

图表 33: China electricity price is relatively lower compared to developed countries such as US and a lot lower as compared to Germany
Industrial end-user electricity price for China/US/Germany



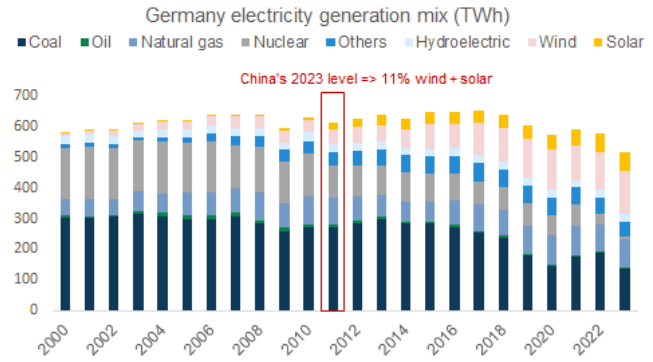
资料来源：IEA

图表 34: US power generation mix is going through a gradual change, one that might not be similar to China’s grid development pace
US power generation mix change, 2000-2023



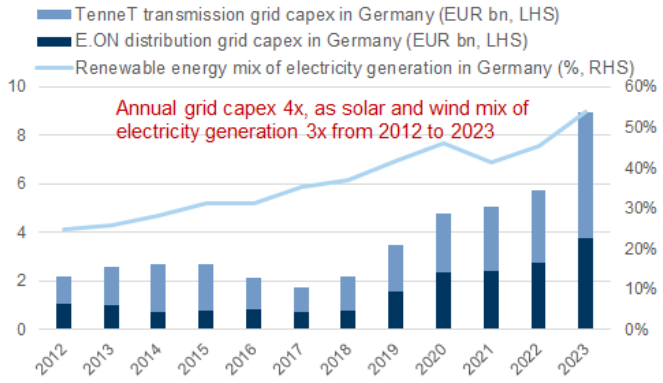
资料来源：Statistica, Data compiled by Goldman Sachs Global Investment Research

图表 35: Germany’s solar and wind mix was at 11% in 2011, same as China’s 2023 level, and rapidly increased to 39% in 2023, with no power consumption growth
Germany electricity generation mix change, 2000-2023



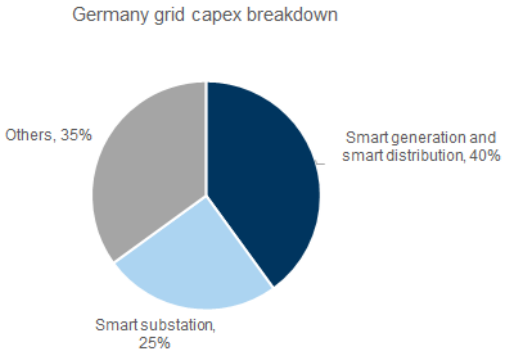
资料来源：Clean Energy Wire, Data compiled by Goldman Sachs Global Investment Research

图表 36: Germany grid capex nearly quadrupled from 2011-2023, driven not by consumption growth, but largely from the mix increase of solar and wind as well as grid upgrade
Germany grid capex from 2012 to 2023



资料来源：公司数据, 高盛全球投资研究部

图表 37: Our European Utilities analyst estimated for Germany grid capex, c. 40% were in smart generation and distribution, and c.25% were in smart substations (2024)



资料来源：高盛全球投资研究部

Further upside potential from AI demand

We expect global data center demand to grow 165% by 2030E compared to 2023, with its contribution rising from 1%-2% to 3%-4% of global power consumption. This is mainly due to AI queries consuming up to 10X more power than traditional queries (report link). Our GS team estimates that US data center demand will more than triple by 2030E, driven by hyperscalers' capex growth (report link).

Recently, there have been significant progress in China AI and large model space, and we expect AI to take up a more significant portion of total electricity consumption. With Doubao's (Bytedance's large model) MAU (monthly active users) rising to 60mn as of Nov 2024 according to AICPB, securing the No.2 spot globally and daily tokens reaching 40 trn (announced on the 2024 Volcano Engine Force Conference on Dec 18, 2024), Bytedance is set to embark on intensive AI capex investment in China (news). Bytedance's leading large model may prompt other customer service platforms (CSPs) to also expand their capex significantly.

The positive progress in model development and end applications could mark a start to an AI capex and application era in China, further boosting power demand. We expect data centers' contribution to total power consumption will rise from 1.6% in 2023 to 5% in 2030E with AI taking up around 12% on average within data centers.

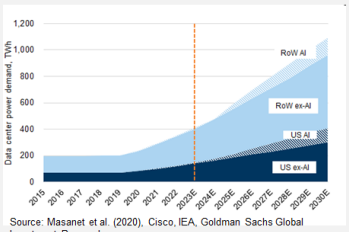
However, technological advances may increase AI model training efficiency. For example, DeepSeek-V3, developed by Chinese company Huanfang Quantitative, was launched on Dec 24, 2024 and is based on its self-developed Mixture of Experts (MoE) model architecture. The model increased its generation speed significantly vs. its V2.5, from 20 TPS (transactions per second) to 60 TPS, featuring 671bn parameters and was trained in approximately two months at a cost of US$5.58mn, utilizing far fewer computing resources than models developed by larger tech companies. The model only used 2.8mn hours of GPU compute (one tenth of that used by Llama 3).

Overall, despite the intermittent advances in AI model training efficiency and thus savings in power consumption, we still believe AI applications are in the early stage in China, poised for compute and inference growth, with rising power demand from AGI applications, as well as more energy-consuming terminal devices (such as AR glasses, humanoid robots, etc.) yet to come.

图表 38: We expect China’s data center power demand to rise from 1.6% of total in 2023 to 5% in 2030E, with AI taking up around 12% of data center power demand
Data center demand for global, US and China

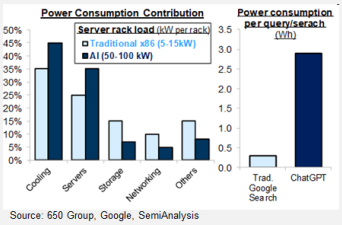
Global data center power demand grows 165% by 2030 vs. 2023, rising from 1-2% to 3-4% of global power consumption by 2030, per GS estimates

Global data center electricity consumption, TWh; includes AI and excludes cryptocurrency



Source: Masanet et al. (2020), Cisco, IEA, Goldman Sachs Global Investment Research

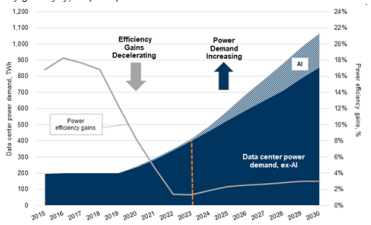
AI servers and ChatGPT queries could be up to 10x more energy intensive than traditional servers and traditional Google searches



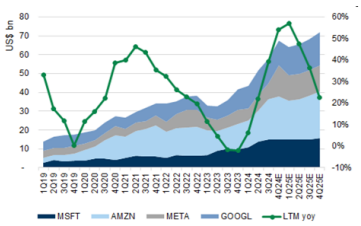
Source: 650 Group, Google, SemiAnalysis

US: Power demand from data centers will more than triple in 2030E vs 2020, rising to 8% of total power demand from 3% currently (with AI taking up 20% of data center power demand), lifting total power consumption from ~0% CAGR to 2.4%

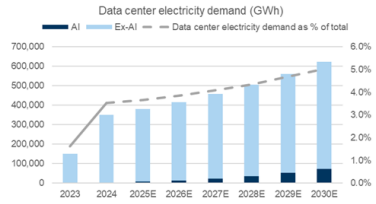
Data center electricity consumption, TWh (LHS) and 3-year rolling average power efficiency gains yoy, % (RHS)



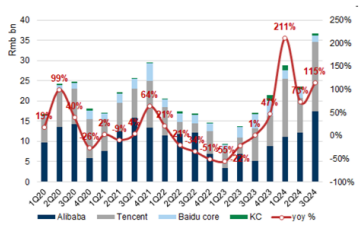
US cloud hyperscaler capex trend



China: We expect data center power demand to rise from 1.6% of total demand in 2023 to 5% in 2030E, with AI demand taking up around 12% of total data center demand

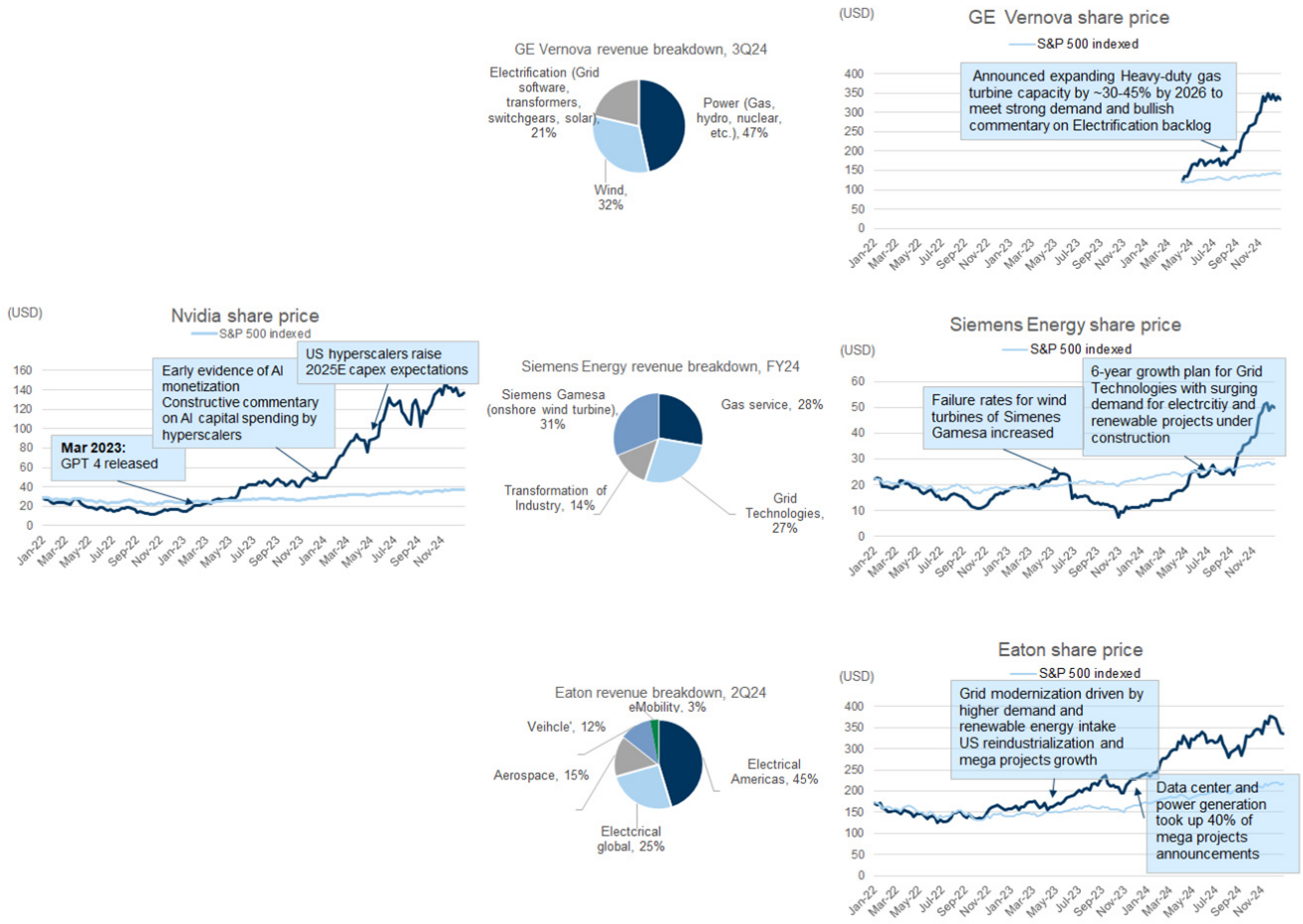


China's large internet companies/CSPs' capex reached record high in 3Q24 with 115% yoy growth partially boosted by Gen-AI related Capex



资料来源：Masent et al (2020), Cisco, IEA, 650 Group, SemiAnalysis, FactSet, Haver, S&P Global, Taiwan Energy Administration, Ministry of Economic Affairs (MOEAEA), 万得, 公司数据, 高盛全球投资研究部

图表 39: Since ChatGPT-4’s release in March 2023, US power equipment stocks have rallied in response to expanding electricity demand
US power equipment share price performance with AI-related power surge



资料来源：万得, 公司数据, Data compiled by Goldman Sachs Global Investment Research

Stock highlights

We believe the key beneficiaries of this grid transformation include enablers of a smarter, more resilient grid, especially Nari Tech (Buy, see link), which stands out both in terms of scope and scale to benefit by providing the necessary software/hardware for UHV and digitalization infrastructure.

Below we provide a detailed breakdown of listed grid equipment companies by product category. We are Buy-rated on Sungrow/Times Electric H/Envicool/Kehua as they provide necessary ESS systems, cooling systems, and power conversion components as complementary products for renewable energy integration.

THE ECOSYSTEM OF GRID OF THE FUTURE

Grid

Digitalization

Dispatch
Nari Tech [600406.SS]
SGIT [600131.SS]
Dongfang Electronics [000682.SZ]
Sifang [601126.SS]

Other software
Nari Tech [600406.SS]
China Southern Power [003035.SZ]
Longshine [300682.SZ]
State Grid Information [600131.SS]
Suwen [300982.SZ]
Acrel [300286.SZ]
Rixin Tech [301162.SZ]
E-Techstar [300513.SZ]

Secondary equipment

SVC/STATCOM
Nari Tech [600406.SS]
Sieyuan Electric [002028.SZ]
Sifang Automation [601126.SS]
Xj Electric [000400.SZ]

Protective relay
Nari Tech [600406.SS]
Changyuan [600525.SS]
Sifang Automation [601126.SS]
Xj Electric [000400.SZ]
Dongfang Electronics [000682.SZ]

Network system integrator
Nari Tech [600406.SS]
SGIT [600131.SS]

Primary equipment

Composite Apparatus
Pinggao Electric [600312.SS]
China XD Electric [601179.SS]
Sieyuan Electric [002028.SZ]
Chint [601877.SS]
Changgao Electric [002452.SZ]

Circuit breaker
Sieyuan Electric [002028.SZ]
Pinggao Electric [600312.SS]
China XD Electric [601179.SS]
Changgao Electric [002452.SZ]

Transformer
China XD Electric [601179.SS]
TBEA [600089.SS]
Baobian [600550.SS]
Chint [601877.SS]
Sieyuan Electric [002028.SZ]

Capacitors
Sieyuan Electric [002028.SZ]
China XD Electric [601179.SS]

Converter valve
Nari Tech [600406.SS]
China XD Electric [601179.SS]
Xj Electric [000400.SZ]

Smart meters
Sanxing Medical [601567.SS]
Hexing Electrical [603556.SS]
Jinpan Technology [688676.SS]
Clou Elecctronics [002121.SZ]
Wahlap Technology [301011.SZ]
Sunrise Tech [603421.SS]
Waison Group [3393.HK]

Cables and line materials
Hengtong [600487.SS]
Orient Wires and Cables [603606.SS]
Zhongtian Tech [600522.SS]
Baosheng Science and Tech [600973.SS]

ESS system
Sungrow Power [300274.SZ]
CATL [300750.SZ]
BYD [1211.HK]

Converter
Sungrow Power [300274.SZ]
CRRC Times Electric [688187.SS, 3898.HK]
GoodWe [688390.SS]
Ginlong [300763.SZ]
Ningbo Deye [605117.SS]

Cooling systems & components
Envicool [002837.SZ]
Sanhua [002050.SZ]
AVIC Jonhon [002179.SZ]
Tongfei [300990.SZ]
Aotecar [002239.SZ]
Shenling [301018.SZ]
Songz [002454.SZ]
Goaland [300499.SZ]

Solar

Poly silicon
Daqo New Energy [DQ, 688303.SS]
Tongwei [600438.SS]
GCL Tech [3800.HK]
Xinte Energy [1799.HK]

Solar module
LONGi [601012.SS]
Jinko [JKS, 688223.SS]
JA Solar [002459.SZ]
Trina Solar [688599.SS]

Cell
Tongwei [600438.SS]
LONGi [601012.SS]
Aiko Solar [600732.SS]

Wafer
LONGi [601012.SS]
TCL Zhonghuan [002129.SZ]

Glass
Flat Glass [601865.SS, 6865.HK]
Xinyi Solar [0968.HK]

EVA film
Hangzhou First Applied Material [603806.SS]
Shanghai HIUV New Materials [688680.SS]

Module Manufacturing Equipment
HJT: Suzhou Maxwell [300751.SZ]
TOPCON: Shenzhen SC [300724.SZ]

Silver paste
Wuxi DK Electronic [300842.SZ]
Suzhou Good-Ark Electronics [002079.SZ]

Inverter
Sungrow Power [300274.SZ]
CRRC Times Electric [688187.SS, 3898.HK]
Kehua Data [002335.SZ]
Shenzhen Kstar [002518.SZ]
Sineng [300827.SZ]
Ningbo Deye [605117.SS]

Wind

Turbine
Ming Yang [601615.SS]
Xinjiang Goldwind [002202.SZ, 2208.HK]
Sany Heavy Energy [688349.SS]
Zhejiang Windey Co [300772.SZ]
Dongfang Electric [600875.SS]
Shanghai Electric Wind Power [688660.SS]

Converter
Sungrow Power [300274.SZ]
CRRC Times Electric [688187.SS, 3898.HK]

Grey text: Not rated or not covered by GS

We note that the list of companies presented in the ecosystem above may not be exhaustive, and the universe of companies involved is likely to be larger than what is presented.

Longshine, Pinggao, Chint, Xj Electric, Orient wire, GoodWe, Ginlong, MingYang, Goldwind’s coverage are suspended.

资料来源：公司数据, Data compiled by Goldman Sachs Global Investment Research

图表 40: Comp sheet for GS-covered stocks

Company	Ticker	PCY	Last closing price	12m-Target price	+/-%	Rating	Mkt Cap (USD bn)	P/E			P/B			EV/EBITDA			ROE		
								2024E	2025E	2026E	2024E	2025E	2026E	2024E	2025E	2026E	2024E	2025E	2026E
CATL	300750.SZ	CNY	251.50	378.0	50%	Buy*	151.0	22.1x	15.1x	10.9x	4.6x	3.6x	2.8x	10.9x	7.5x	5.3x	23%	26%	29%
Hangzhou First Applied Material	603806.SS	CNY	14.31	20.2	41%	Buy	5.1	26.9x	18.6x	13.6x	2.2x	2.0x	1.8x	15.7x	11.8x	8.8x	9%	11%	14%
BYD Co.	1211.HK	HKD	263.80	364.0	38%	Buy	98.7	19.4x	14.3x	10.7x	4.3x	3.5x	2.8x	6.6x	5.0x	3.7x	23%	25%	27%
Sungrow Power Supply Co.	300274.SZ	CNY	75.05	100.3	34%	Buy	21.2	14.2x	11.1x	9.4x	4.0x	3.0x	2.3x	10.4x	7.7x	6.3x	32%	31%	28%
NARI Technology	600406.SS	CNY	22.97	29.0	26%	Buy	25.2	22.9x	19.9x	17.7x	3.8x	3.5x	3.2x	16.4x	14.1x	12.5x	15%	16%	17%
Sanhua Intelligent Controls	002050.SZ	CNY	28.44	35.2	24%	Buy	13.9	32.9x	26.3x	21.7x	5.3x	4.6x	4.0x	22.9x	18.7x	15.5x	17%	19%	20%
Xinyi Solar Holdings	0968.HK	HKD	3.29	3.9	19%	Buy	3.8	32.2x	18.3x	8.0x	0.8x	0.8x	0.8x	7.0x	7.5x	4.9x	3%	4%	10%
Zhuzhou CRRC Times Electric Co.	3898.HK	HKD	29.75	33.7	13%	Buy	5.4	10.7x	8.6x	7.5x	1.0x	0.9x	0.8x	8.3x	7.1x	6.4x	9%	11%	12%
Flat Glass Group	6865.HK	HKD	11.76	12.9	10%	Buy	3.6	32.3x	39.8x	9.8x	1.2x	1.2x	1.0x	9.0x	10.7x	6.1x	4%	3%	11%
Daqo New Energy	DQ	USD	19.07	20.9	10%	Buy	1.4	n.m.	n.m.	136.8x	0.2x	0.2x	0.2x	n.m.	n.m.	n.m.	n.m.	n.m.	0%
Shenzhen Envicool Technology	002837.SZ	CNY	38.81	30.2	-22%	Buy	3.9	46.9x	32.1x	24.6x	9.6x	7.8x	6.3x	40.8x	27.5x	20.8x	23%	27%	28%
Kehua Data Co.	002335.SZ	CNY	31.55	22.2	-30%	Buy	2.0	37.0x	21.3x	16.6x	3.1x	2.7x	2.4x	17.0x	11.9x	9.6x	8%	13%	15%
LONGi Green Energy Technology Co.	601012.SS	CNY	15.16	16.5	9%	Neutral	15.7	n.m.	95.6x	25.1x	1.8x	1.8x	1.7x	22.8x	14.6x	8.4x	n.m.	2%	7%
Zhuzhou CRRC Times Electric Co.	688187.SS	CNY	44.63	46.4	4%	Neutral	8.6	17.1x	13.8x	11.8x	1.6x	1.4x	1.3x	14.0x	11.7x	10.4x	9%	11%	12%
AVIC Jonhon	002179.SZ	CNY	37.50	37.2	-1%	Neutral	10.8	25.5x	20.1x	17.1x	3.5x	3.2x	2.9x	20.7x	16.6x	13.9x	13%	15%	16%
GCL Technology Holdings	3800.HK	HKD	1.16	1.1	-5%	Neutral	4.2	n.m.	n.m.	n.m.	0.6x	0.7x	0.7x	n.m.	21.5x	12.8x	n.m.	n.m.	n.m.
Shenzhen SC New Energy Technology	300724.SZ	CNY	62.29	52.0	-17%	Neutral	3.0	9.1x	23.2x	27.5x	2.0x	1.9x	1.8x	6.5x	12.8x	15.7x	24%	9%	7%
Flat Glass Group	601865.SS	CNY	20.69	16.9	-18%	Neutral	6.6	60.4x	74.4x	18.3x	2.2x	2.2x	1.9x	16.0x	17.8x	9.9x	4%	3%	11%
Xinjiang Daqo New Energy Co.	688303.SS	CNY	23.29	18.7	-20%	Neutral	6.5	n.m.	n.m.	n.m.	1.2x	1.2x	1.2x	30.9x	n.m.	40.2x	n.m.	n.m.	n.m.
Shenzhen Kstar Science & Tech	002518.SZ	CNY	23.49	18.2	-23%	Neutral	1.9	26.1x	19.3x	17.9x	3.1x	2.7x	2.5x	19.4x	13.6x	12.4x	12%	15%	14%
Suzhou Maxwell Technologies Co.	300751.SZ	CNY	100.13	85.7	-14%	Sell	3.8	28.1x	24.4x	34.4x	3.6x	3.2x	3.1x	12.9x	14.1x	23.9x	13%	14%	9%
TCL Zhonghuan	002129.SZ	CNY	8.89	5.8	-35%	Sell	4.9	n.m.	n.m.	n.m.	0.7x	0.7x	0.7x	n.m.	12.0x	7.5x	n.m.	n.m.	n.m.
Tongwei	600438.SS	CNY	21.72	13.3	-39%	Sell	13.3	n.m.	n.m.	81.3x	1.5x	1.5x	1.5x	15.2x	9.3x	7.5x	n.m.	0%	2%
Median								**26.1x**	**20.0x**	**17.4x**	**2.2x**	**2.0x**	**1.8x**	**15.4x**	**12.0x**	**9.8x**	**13%**	**13%**	**13%**

Note: Pricing is as of Jan 17, 2025

资料来源：公司数据, 万得, 高盛全球投资研究部

Nari Tech (600406.SS, Buy)

Nari Tech is a leading power equipment player in China, holding dominant positions in UHV converter valves, grid digitalization, dispatch software, automation solutions, and secondary equipment such as SVC/STATCOM systems and relay protection at 34%-70% market share. We are positive on Nari Tech as a structural beneficiary of the incremental investment towards China’s power grid modernization needs, ensuring a smarter, more flexible and more reliable grid, particularly as the challenges of integrating intermittent and volatile renewable energy sources grow. We believe Nari Tech can deliver solid 10%/11% revenue/net profit CAGRs over 2024-30E, outperforming China’s grid investment of 8% CAGR as the company especially benefits from the structurally-growing smart grid investment. We expect the company to maintain its leadership in its product portfolio due to its dominant position in a stable market landscape and relationship with the State Grid. Key catalysts include State Grid’s work plans, the Two Sessions in March 2025 for energy policy direction, and the release of the 15th Five-Year Energy/Grid Plan in 2026, and AI-related capex growth news. Nari Tech is currently undervalued compared to its own historical track record as well as domestic peers. However, we expect the company’s strong financial profile (GPM/OPM at 28%/16% and a leading ROE of 18% expected in 2024-30E) and its software-heavy revenue mix (40% of total 2024E revenue) to support a valuation premium for Nari Tech among its China industrial tech peers, and hence we are Buy-rated on Nari Tech.

Our 12-month target price of Rmb29.0 is based on 25X 2025E P/E. Key risks include: 1) Lower-than-expected fiscal support and the State Grid announcement for 2025 budget, 2) UHV project approval pace falling behind its announced work plan.

Sungrow (300274.SZ, Buy)

Sungrow is a leading global solar inverter and ESS (energy storage system) provider with an extensive global footprint (54%/46% revenue from China/overseas in 2023). Our

conviction in Sungrow’s growth acceleration in 2H24E and long-term profitability is underpinned by (1) a solid and increasing order backlog with continued large-scale project wins across both DM (US, UK, Australia) and EM (Middle East, Latin Americas), leading to 35% ESS revenue CAGR in 2023-27E; (2) volume shipment of new-generation ESS product (PowerTitan 2.0) to support revenue growth picking up to 25%/55% yoy in 3Q/4Q24 (from +8% yoy in 1H24); and (3) sustainable EBITDA margin at avg. 16% in 2024-27E (vs. 12% in 2020-23) as a result of rising overseas contribution (with better margins vs. the China business) and raw material cost deflation. The stock is attractive, trading on 9x EV/EBITDA (close to 1sd below past 5-year average) against 20% 2024-27E EBITDA CAGR and 31% avg. ROE.

Our 12-month target price of Rmb100.3 is based on 10X 2027E EV/EBITDA discounted back to 2025E at a 10.1% CoE. Key risks include: 1) More intensified competition; 2) potential trade conflict risk; 3) solar power station management risk.

Times Electric H (3898.HK, Buy)

Times Electric is China’s largest railway traction system (or rail inverters) provider, with 50-60% China market share for locomotive/MU/subways as of 2023. We forecast 2023-27E revenue/net profit CAGRs of +15%/+16% on: 1) a 26% 2023-27E revenue CAGR from the emerging industries segment (58% revenue contribution by 2027E, from 29% in 2022), such as IGBT (top 3 locally), solar/wind/ESS inverter (top 3), EV drive systems (top 6), and sensors (leader in ASIC hall sensor locally); 2) 7% revenue CAGR for the main railway equipment segment (we expect the stable annual new railway mileage and the existing large installed base of locomotives/MUs to support steady new railway equipment revenue plus maintenance revenue); and 3) potential to decrease SG&A expense ratio (to 21.1% by 2027E from 21.3% in 2023) on its wide coverage of IGBT end-applications and expense control track record. We believe the H-share is undervalued and see catalysts as: 1) higher market share in IGBT, solar/wind/ESS inverters, EV drives; and 2) lower SG&A expense ratio. For Times Electric A, we believe the stock price has already priced in the upside risk on potential ICE locomotive replacement demand (into electric locomotive) by 2027E, where our sensitivity analysis indicates a 7%-24% locomotives replacement ratio (392-1,344 units per annum) during 2024E-27E or 0-15%/0-19% of incremental revenue/net income per annum. Therefore, we are Buy-rated on Times Electric H and Neutral-rated on Times Electric A.

Our 12-month target prices of Rmb46.4/HK$33.7 are based on a SOTP — in which we apply 9X/15X/15X/15X/15X 2025E P/Es for the railway/IGBT/industrial converters (including wind/solar/ESS)/sensors/EV drives segments, respectively. We then apply a holdco discount of 20% (based on the 10-25% range for TMT conglos as a reference).

Downside risks for Times Electric (H): 1) IGBT industry oversupply risk; 2 lower-than-expected MU/locomotive tendering; 3) lower-than-expected margins.

Upside/downside risks for Times Electric A: 1) higher/lower-than-expected IGBT market share; 2) higher/lower-than-expected MU/locomotive tendering; 3) more/less aggressive ICE locomotive retirement plan vs. our expectations; 4) higher/lower-than-expected margins; 5) better/worse export environment.

Kehua (002335.SZ, Buy)

Kehua Data is a leader in China’s Uninterruptible Power Supply (UPS) market, securing 13%/4% domestic/global market share in 2024, with globally competitive power management products supported by a technology-focused and stable core management team. Since the early 2010s, Kehua has been broadening its offerings beyond stand-alone UPS products to tailor-made power management solutions for various industries, notably rail transit, data centers, electronics, oil & gas, base stations etc. Thanks to early investment in ESS (Energy Storage System), Kehua has been the top 2 PCS (Power Conversion System) maker in China. We expect Kehua to ride on the tailwind of domestic utility-scale ESS industry growth, while expanding in C&I ESS and overseas revenue (both utility-scale, C&I, and residential). We expect Kehua to generate 15%/49% revenue/net income CAGRs in 2024E-26E, and view the shares as attractive vs. our coverage average. We are Buy-rated.

Our 12-month target price of Rmb22.2 is based on 2025 P/E of 15x. Downside risks: 1) downstream capex growth slowdown; 2) account receivables collection risks.

信息披露附录

申明

本人，杜茜，在此申明，本报告所表述的所有观点准确反映了本人对上述公司或其证券的个人看法。此外，本人薪金的任何部分不曾与，不与，也将不会与本报告中的具体推荐意见或观点直接或间接相关。

高盛要素概要

高盛要素概要部分通过将一只股票的主要指标与市场（即我们的覆盖范围）和可比同业相比较来评价该股的投资背景。四个主要指标是增长、财务回报、估值倍数（估值）和综合状况（增长、财务回报、估值倍数的综合情况）。增长、财务回报和估值倍数是运用每只股票具体指标的正常化排名计算。随后取这些指标正常化排名的均值并转化为相关指标的百分位。每项指标的具体计算方式可能随着财务年度、行业和所属地区的不同而有所变化，但标准方法如下：

增长指标是基于一只股票的预期销售增速、EBITDA增速和每股盈利增速（金融股仅采用每股盈利和销售增速），较高的百分位表示公司增长较快。财务回报是基于一只股票的预期净资产回报率、ROCE和CROCI（金融股仅采用净资产回报率），较高的百分位表示公司的财务回报较高。估值倍数基于一只股票的预期市盈率、市净率、股价/股息、EV/EBITDA、EV/FCF、EV/DACF（EV/经债务调整的现金流）（金融股仅采用市盈率、市净率和股价/股息），较高的百分位表示公司的估值倍数较高。综合状况百分位为增长百分位、财务回报百分位和（100% - 估值倍数百分位）的平均值。

财务回报和估值倍数使用高盛分析师在财政年度末对未来至少3个季度的预测。增长使用未来至少7个季度的财政年度预测与未来至少3个季度的财政年度预测的比较（所有指标均使用每股数据）。

如需了解高盛要素概要更具体的计算，请联络您的高盛代表。

并购评分

在我们的全球覆盖范围中，我们使用并购框架来分析股票，综合考虑定性和定量因素（各行业和地区可能会有所不同）以计入某些公司被收购的可能性。然后我们按照从1到3对公司进行并购评分，其中1分代表公司成为并购标的的概率较高(30%-50%)，2分代表概率为中等(15%-30%)，3分代表概率较低(0%-15%)。对于评分为1或2的公司，我们按照研究部统一标准将并购因素体现在我们的目标价格当中。并购评分为3被认为意义不大，因此不予体现在我们的目标价格当中，分析师在研究报告中可以予以讨论或不予讨论。

Quantum

Quantum是提供具体财务报表数据历史、预测和比率的高盛专有数据库，它可以用于对单一公司的深入分析，或在不同行业和市场的公司之间进行比较。

信息披露

评级分布/投资银行关系

高盛投资研究部的全球研究覆盖范围

	评级分布			投资银行关系		
	买入	持有	卖出	买入	持有	卖出
全球	48%	34%	18%	64%	57%	43%

截至2025年1月1日，高盛全球投资研究部对3,021种股票评定了投资评级。高盛给予股票在各种地区投资名单中的买入和卖出评级；未给予这些评级的股票被视为中性评级，根据FINRA的披露要求，这些评级分别对应买入，持有及卖出。详情见以下“公司评级，研究范围和相关定义”部分。投资银行关系表反映了高盛在过去12个月已提供投资银行服务的公司在各评级类别中所占的比例。

法定披露

美国法定披露

任何本报告中研究企业所需的特定公司法定披露见上文：包括即将进行交易的承销商或副承销商，1%或其他股权，特定服务的补偿，客户关系种类，之前担任承销商或副承销商的公开发行，担任董事，担任股票做市及／或专家的角色。高盛担任或可能担任本报告中所涉及发行方的债券（或相关衍生品）的交易对手。

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评级分布: 见上文评级分布披露。 价格表: 见上文价格表，其中包括之前的评级变化和价格目标的变化，若为电子报告，或本报告分析对象包含多家公司，请参阅高盛网站：https://www.gs.com/research/hedge.html。

美国以外司法管辖区规定的额外披露

以下为除了根据美国法律法规规定作出的上述信息披露之外其他司法管辖区法律所要求的披露。 澳大利亚: Goldman Sachs Australia Pty Ltd及其相关机构不是澳大利亚经授权的存款机构（1959年《银行法》所定义），因此不在澳大利亚境内提供银行服务，也不经营银行业务。本研究报告或本报告的其他形式内容只可分发予根据澳大利亚公司法定义的”批发客户”，在事先获得高盛许可的情况下可以有例外。在撰写研究报告期间，Goldman Sachs Australia全球投资研究部的职员可能参与本研究报告中所讨论证券的发行公司或其他实体组织的现场调研或会议。在某些情况下，如果视具体情形Goldman Sachs Australia认为恰当或合理，此类调研或会议的成本可能部分或全部由该证券发行人承担。如本报告内容包含任何金融产品建议，则该建议仅为一般建议，且高盛提出该建议时并未考虑客户的目标、财务状况或需求。客户在就此类建议采取行动之前，应结合其自身目标、财务状况和需求来考虑该建议的适当性。 高盛澳大利亚和新西兰的利益披露，以及高盛澳大利亚卖方研究独立性制度声明请参见 https://www.goldmansachs.com/disclosures/australia-new-zealand/index.html。 巴西: 与CVM Resolution n. 20相关的信息披露请参阅 https://www.gs.com/worldwide/brazil/area/gir/index.html。根据CVM Resolution n. 20第20条，在适用的情况下，对本研究报告内容负主要责任的巴西注册分析师为本报告开头部分标明的第一作者，除非报告末另有说明。 加拿大: 这些信息仅供您参考，在任何情况下都不应被理解为Goldman Sachs & Co. LLC对加拿大证券购买者进行有关任何加拿大证券交易的广告、要约或征求行为。Goldman Sachs & Co. LLC 未在适用的加拿大证券法规下注册为任何加拿大司法管辖区内的交易商，通常不被允许交易加拿大证券，并且可能被禁止在加拿大某些司法管辖区内销售某些证券和产品。若您想在加拿大交易任何加拿大证券或其他产品，请联系 Goldman Sachs Canada Inc. (高盛集团的关联机构) 或其他已注册的加拿大交易商。 香港: 可从高盛（亚洲）有限责任公司获取有关本报告中所研究公司的证券的额外资料。 印度: 可从高盛（印度）证券私人有限公司 （分析师 印度证券交易委员会(SEBI) 编号

INH000001493，地址951-A, Rational House, Appasaheb Marathe Marg, Prabhadevi, Mumbai 400 025, India, 公司编号 U74140MH2006FTC160634, 电话 +91 22 6616 9000, 传真 +91 22 6616 9001） 获取有关本报告中研究对象或所提及公司的额外资料。高盛可能持有本报告中研究对象或所提及公司的证券（1956年印度《证券合同(管理)法》条款2(h)之定义）的1%或更高比例。 证券市场投资会受到市场风险的影响。请在投资之前仔细阅读所有相关文件。在SEBI注册并获得NISM认证并非对该中间机构表现的担保，亦不能对投资者回报做出保障。高盛（印度）证券私人有限公司投资者支持部门电邮：india-client-support@gs.com。合规负责人： Anil Rajput |电话： + 91 22 6616 9000 | 电邮： anil.m.rajput@gs.com。 日本: 见下文。 韩国: 除非高盛另行同意，本报告无论以何种方式取得，仅供《金融服务与资本市场法》定义的“专业投资者”使用。可从高盛（亚洲）有限责任公司首尔分公司获取有关本报告所研究公司的额外资料。 新西兰: Goldman Sachs New Zealand Limited及其关联机构并非1989年新西兰储备银行法定义的“注册银行”或“存款机构”。本研究报告以及本报告的其他形式内容只可分发给2008年财务顾问法案定义的 “批发客户”，在事先获得高盛许可的情况下可以有例外。 高盛澳大利亚和新西兰的利益披露请参见 https://www.goldmansachs.com/disclosures/australia-new-zealand/index.html。 俄罗斯: 在俄罗斯联邦分发的研究报告并非俄罗斯法律所定义的广告，而是不以产品推广为主要目的的信息和分析，也不属于俄罗斯法律所界定的评估行为。 研究报告不构成俄罗斯法律法规定义的个性化投资建议，并非针对某个具体客户，在报告准备阶段也未分析客户的财务状况、投资特征或风险特征。高盛不对某个客户或任何其他人基于本报告可能做出的任何投资决策承担责任。 新加坡: 高盛（新加坡）私人公司（公司编号： 198602165W）（受新加坡金融管理局监管）为本研究报告承担法律责任，若有由本研究报告所引发或与本研究报告相关的任何事宜，请联系高盛（新加坡）私人公司。 台湾: 本信息仅供参考，未经允许不得翻印。投资者应当谨慎考虑他们自身的投资风险，投资结果由投资者自行负责。 英国: 在英国根据金融市场行为监管局的定义可被分类为私人客户的人士参阅本报告的同时应当参阅高盛以往对本报告研究企业的研究报告，并应当参考高盛国际已经发给这些客户的风险警告资料。该风险警告资料复本，以及本报告中采用部分金融辞汇的解释可向高盛国际索取。

欧盟和英国: 与欧盟委员会实施条例 (EU) (2016/958)（欧盟议会和欧盟理事会条例(EU) No 596/2014的补充条款,规定了有关投资建议或其他投资策略的推荐或建议之信息的客观陈述,以及对特定利益或利益冲突进行披露的技术安排应达到的监管技术标准；英国脱离欧盟和欧洲经济区之后该实施条例被纳入英国国内法律法规）第6(2)条相关的披露信息可在https://www.gs.com/disclosures/europeanpolicy.html上获取，该网址介绍在处理和投资研究有关的利益冲突时应参照的欧洲政策。

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公司评级、研究范围和相关定义

买入、中性、卖出： 分析师建议将评为买入或卖出的股票纳入地区投资名单。只股票在投资名单中评为买入或卖出由其相对于所属研究范围的总体潜在回报决定。任何未获得买入或卖出评级且拥有活跃评级（即不属于暂停评级、暂无评级、暂停研究或没有研究的股票）的股票均被视为中性评级。每个地区管理着地区强力买入名单，该名单选自各地区投资名单上评级为买入的股票，以总体潜在回报规模和/或实现回报的可能性为主要依据确立各自研究范围内的投资建议。将股票加入或移出此类强力买入名单，由各地区的投资评估委员会或其他指定委员会进行管理，并不意味着分析师对这些股票的投资评级发生了改变。

总体潜在回报： 代表当前股价低于或高于一定时间范围内预测目标价格的幅度，包括所有已付或预期股息。分析师被要求对研究范围内的所有股票给出目标价格。总体潜在回报、目标价格及相关时间范围在每份加入投资名单或重申维持在投资名单的研究报告中都有注明。

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暂无评级(NR)： 在高盛于涉及该公司的一项合并交易或战略性交易中担任咨询顾问时，或由于高盛参加一项交易而存在法律、监管或政策的限制时，或当该公司是一家处于初期阶段的生物科技公司时，并在某些其他情况下，投资评级、目标价格和盈利预测（如相关）根据高盛的政策未予提供或已经予以暂停。 暂停评级(RS)： 由于缺乏足够的基础去确定投资评级或价格目标，我们已经暂停对这种股票给予投资评级和目标价格。此前对这种股票作出的投资评级和目标价格(如有的话)将不再有效，因此投资者不应依赖该等资料。 暂停研究(CS)： 我们已经暂停对该公司的研究。 没有研究(NC)： 我们没有对该公司进行研究。 不存在或不适用(NA)： 此资料不存在或不适用。 无意义(NM)： 此资料无意义，因此不包括在报告内。

全球产品；分发机构

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