Bin Yuan Capital All China Strategy – August 2024

Bin Yuan Opinion

Ultra-High Voltage (UHV) – The Bridge to China's Carbon Neutrality

In 2020, China set "dual carbon" goals: to reach peak carbon dioxide emissions before 2030 and to achieve carbon neutrality by 2060. In 2023, carbon dioxide emissions from power generation activities were about 3.9 bn tons, accounting for 33% of the total carbon dioxide emissions.

In order to achieve the "dual carbon" goals the following were prioritized:

- developing green energy from wind, solar, and hydro
- building a new type of power system which relies on more power generation from renewable sources

With the acceleration of the transition to green energy, it is essential for China to prioritize power grid expansion in order to dispatch, transmit and distribute clean energy to end users efficiently.

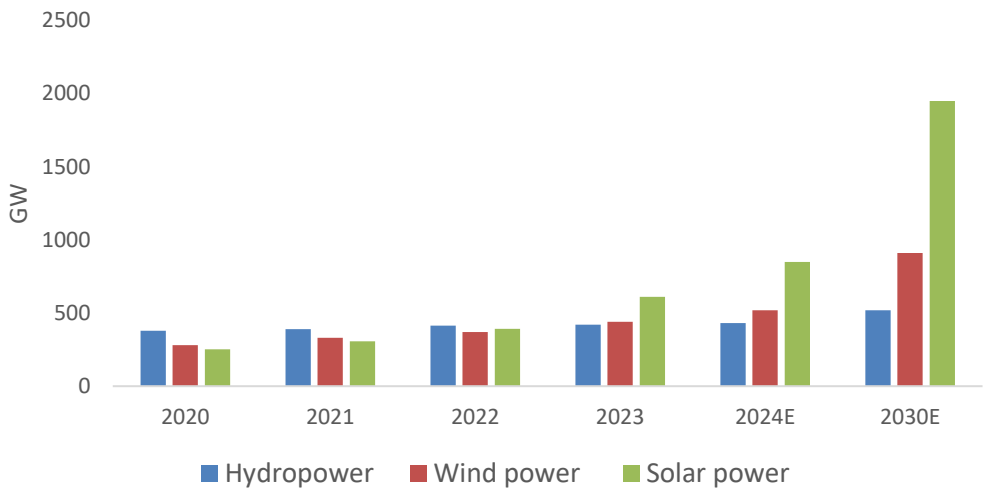
China is about to embark on a massive capital investment program to upgrade the electricity transmission network. During the first 6 months of 2024, China invested RMB 254 bn in power grid projects, a 23.7% YoY increase. Our review of the sector will highlight one of the key components, the UHV DC Converter Valve. This is a complex device with high barriers to entry and dominated by Chinese companies. The market size for these products in China is currently RMB 15bn (CY2023) and we estimate this will to grow to RMB 23bn in 2027.

Stable green energy transition process

Fossil fuel combustion is the main source of carbon dioxide emissions in China, and it mostly occurs in the power generation industry. Therefore, shifting from coal power to renewable sources is the key to realizing China's "dual carbon" goals. Since it first proposed its "dual carbon" goals, China has accelerated the development of green energy.

According to forecasts by the National Energy Administration, as shown in Chart 1, the installed capacity of hydropower, wind power, and solar energy is expected to reach 520GW, 910GW and 1,950GW respectively by 2030, with a corresponding CAGR of 3%, 10.9%, and 18% from 2023 to 2030.

Chart 1. Green energy installed capacity

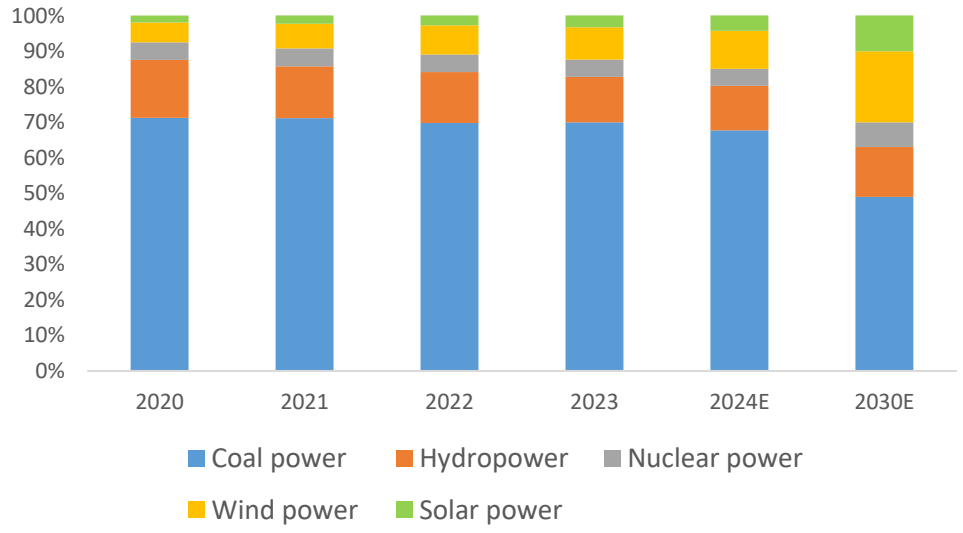


Source: National Energy Administration, Bin Yuan Capital

Chart 2 shows that the proportion of coal power decreased from 72% in 2020 to 67% in 2024 and we estimate it will further decline to 49% by 2030.

At the same time, the proportion of wind power should rise from 6% in 2020 to 20% in 2030 and solar power should rise from 2% to 10% over the same period.

Chart 2. Proportion of different forms of power



Source: National Energy Administration, Bin Yuan Capital

Green Energy Supply and Demand are unevenly distributed across China

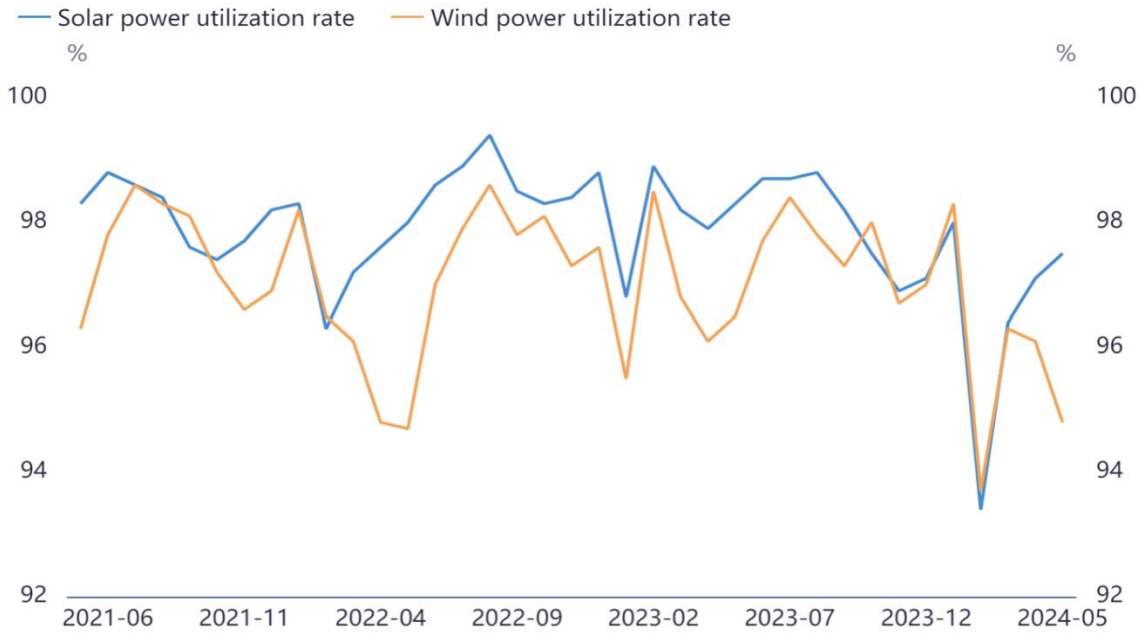
China's power resources and demand are unevenly distributed.

More than 80% of energy resources are in the western and northern regions, while over 70% of electricity consumption is concentrated in the eastern and central regions, a supply and demand distance ranging from 800 to 3000 km.

With the acceleration of the construction of large-scale wind and solar power bases, green energy consumption has become increasingly prominent.

In 2023, the utilization rates of wind power and solar power were 97.3% and 98%, respectively, and they are trending down since the beginning of 2023 due to the newly added capacity (Chart 3).

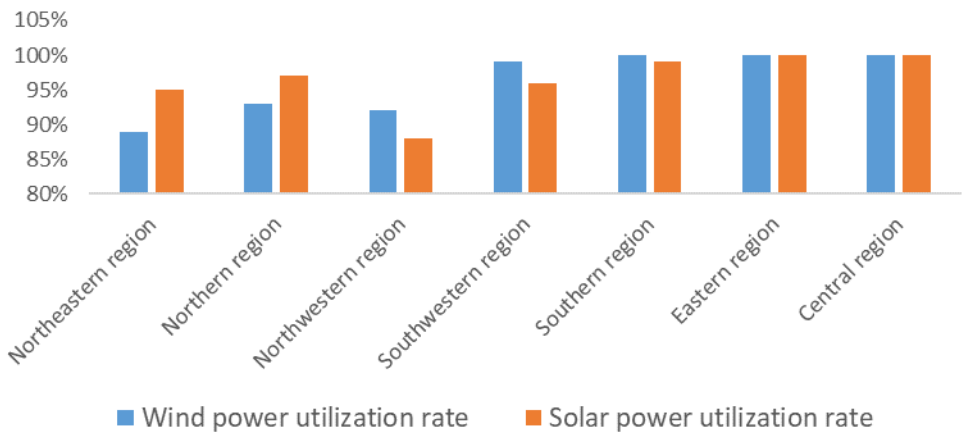
Chart 3. Solar power and wind power utilization rates



Source: iFinD, Bin Yuan Capital

Chart 4 shows that wind and solar power utilization rates are low in northeastern, northern, northwestern parts of China. These areas are rich in wind and solar power resources, but their economic development is relatively slow, and with low population density electricity generated in these areas is not fully consumed locally. For example, Gansu, located in the country's north-west, where most of the power generated by the region's solar farms is wasted during the day, is forced to purchase power from coal-fired power stations in neighboring provinces to meet demand in the evening.

Chart 4. Wind power and Solar power utilization rate by region



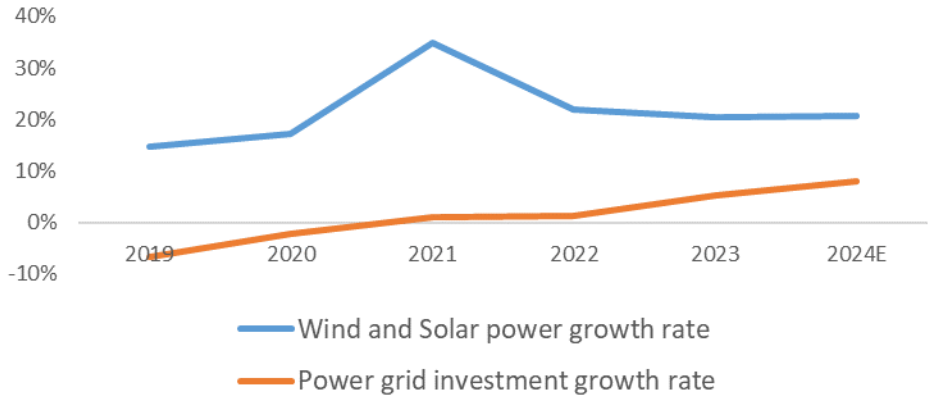
Source: iFinD, Bin Yuan Capital

Increasing investment in power grid

As the energy transition accelerates, with the increase in wind and solar power installations, an increasing amount of clean energy is being generated from wind and solar power bases located in the western and northern regions.

Chart 5 shows that in recent years the growth rate of power grid investment has been significantly slower than the growth rate of green energy generation. Electricity generated from wind and solar power grew at a CAGR of 20% over the past 5 years, compared to the 3% growth in grid capital spending. The mismatch between the rapid increase in green energy resources and the slower construction of power grids has led to the wastage of green energy. Therefore, it is essential to expand the power grid, accelerate the grid capital spending to accommodate, transmit and distribute green energy efficiently.

Chart 5. Green energy growth rate vs Power grid investment growth rate

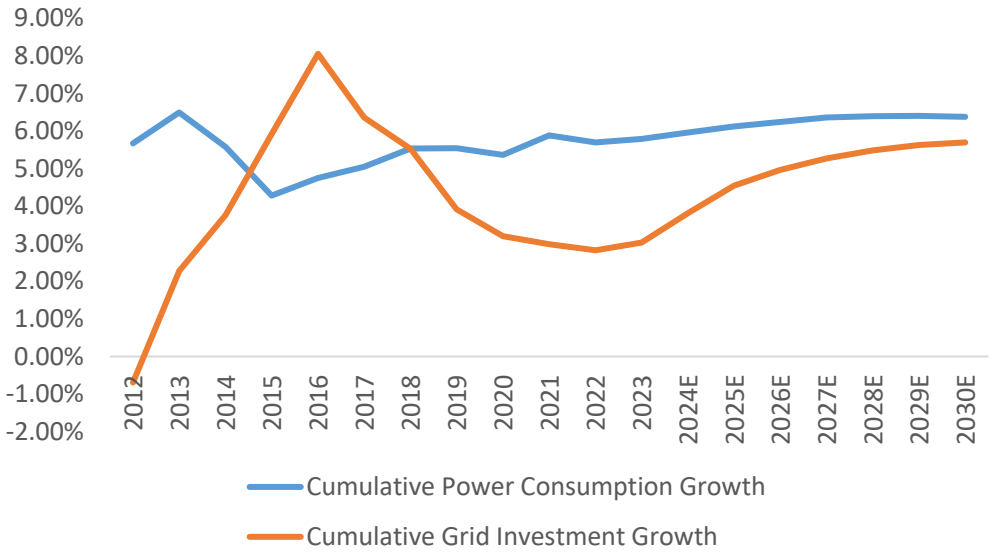


Source: National Energy Administration, iFind, Bin Yuan Capital

Investment in the power grid must be maintained at a high level to meet the increasing demand for power.

Chart 6 shows that the cumulative growth of investment in the grid fell behind the growth in power consumption over the past 5 years.

Chart 6 Cumulative power consumption growth vs Cumulative grid investment growth



Source: iFind, Bin Yuan Capital

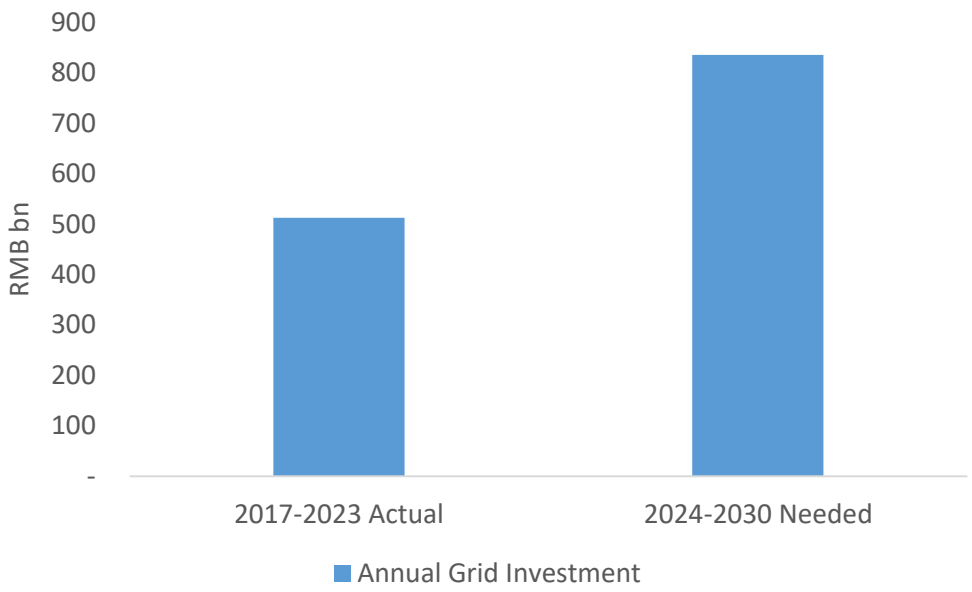
We expect investment in the power grid will increase in the 2024-2030 period to reach RMB 835 bn annually. This compares to the average investment of RMB 512 bn in the 2017-2023 period (Chart 7).

According to the latest estimate by SGCC (the **State Grid Corporation of China)**, grid capital spending will reach RMB 600 bn for the first time in 2024, which is consistent with Bin Yuan's estimates.

We expect that power grid investment will accelerate in 2024-2025 and will reach a total of RMB 5,846 bn in the 2024-2030 period, a CAGR of 11.9%, due to the need for expansion, upgrading and modernization (Chart 8).

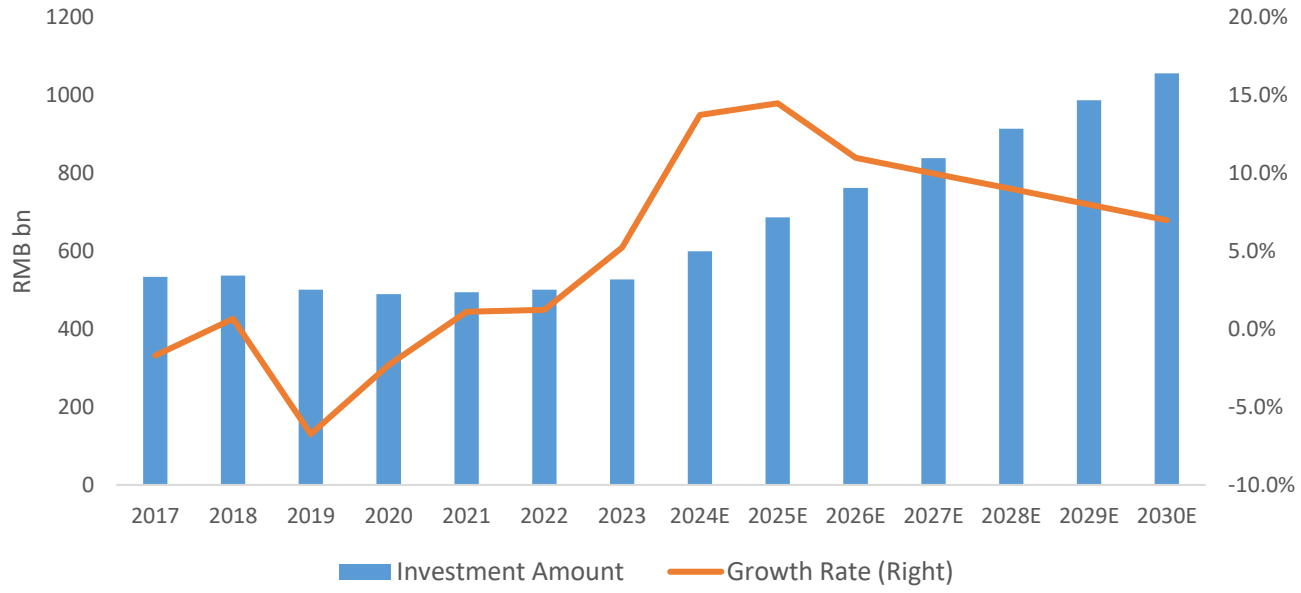
We estimate that 25% of total grid capital spending will be allocated to ultra-high-voltage lines (UHV), 15% will go to automation software that controls the electricity flow, 30% to local level distribution systems and the remaining 30% to building more transmission lines.

Chart 7. Annual grid investment



Source: National Energy Administration, Bin Yuan Capital

Chart 8. Investment amount in the power grid and growth rate

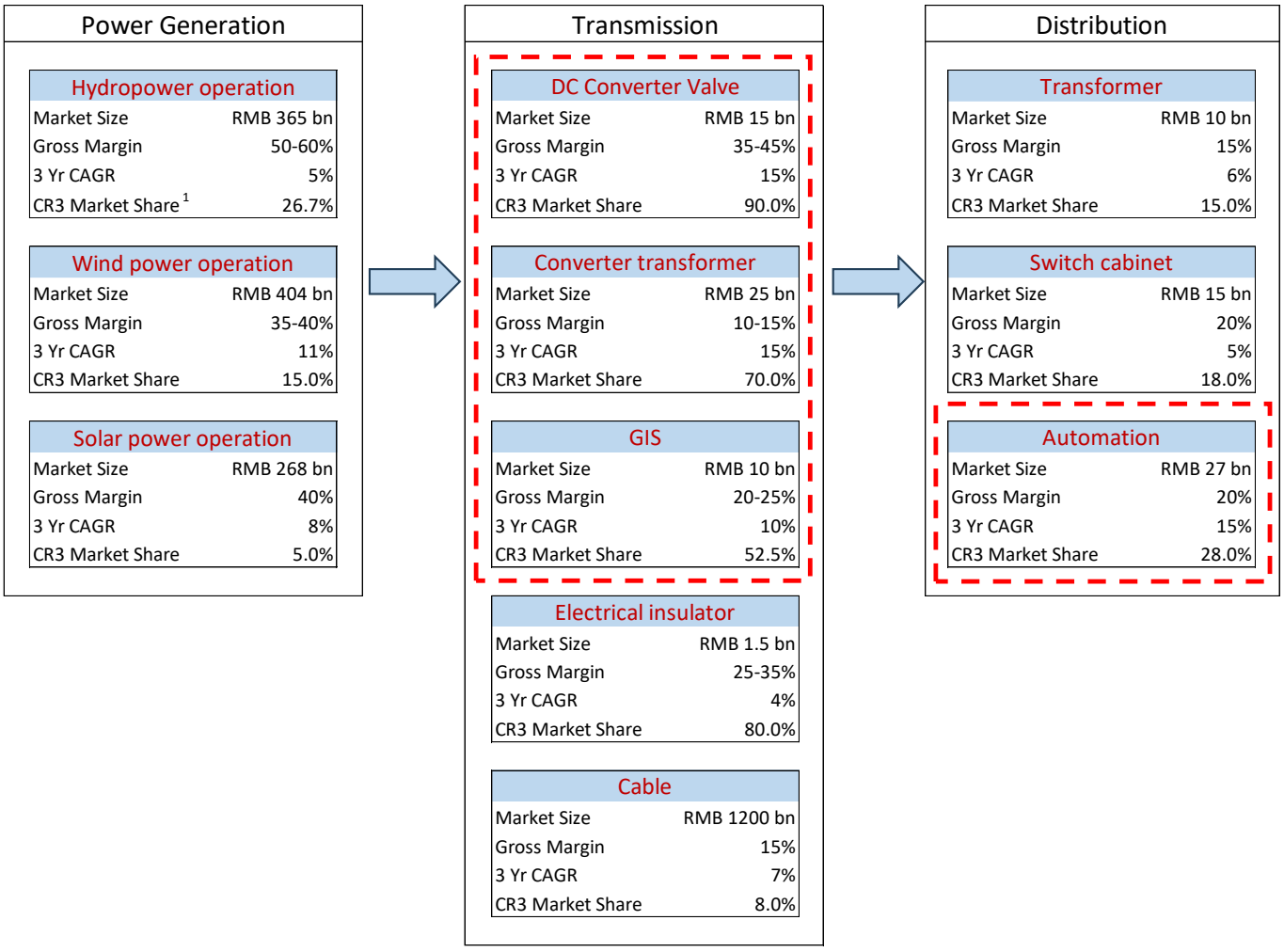


Source: National Energy Administration, Bin Yuan Capital

The transmission and distribution segments are the most attractive in power grid value chain

Electricity generated in the regions rich in hydro, wind or solar sources is transmitted over long distances after being stepped up in voltage. The voltage is then stepped down before being distributed to consumption units. According to our analysis of the power grid value chain (Chart 9), the transmission and distribution segment is the most attractive segment in which to invest due to its high technical barriers and high earnings growth potential. And, in the transmission and distribution segment, we believe the ultra-high-voltage and automation sub-segments are the most valuable sectors.

Chart 9. Power grid value chain[1]



Source: Bin Yuan Capital

[1] CR3 Market Share: The combined market share of the 3 largest companies within an industry.

1) **Transmission:** upgrading to Ultra-High-Voltage Direct Current (UHVDC) and Flexible Direct Current (DC).

   Today, most electricity is transmitted as alternating current (AC), which works well over short and medium distances. However, Ultra-High-Voltage Direct Current (UHVDC), representing a transmission voltage higher than 800 kV, is better suited for long distance transmission due to reduced transmission losses, lower material costs and land utilization. Upgraded technologies like flexible DC with its round transmission structure will be the focus of investment. Flexible DC transmission is an excellent solution for unstable and fluctuating power sources such as wind and solar.

2) **Distribution Automation (DA):** a high growth area for Secondary Equipment

   DA concerns the operational control of the grid, i.e. monitoring current and voltage in the distribution grid and issuing commands to remote units, such as switches and transformers for power dispatching. SGCC expects the investment in DA to accelerate in China over the next 6 years. As of 2023, the penetration rate of distribution automation was 70%. The penetration rate is expected to reach 98% by 2030, driven by the needs for the development of renewable energy, distributed power system and the "electrification of everything".

   With the goal of making the system "smarter", investment in DA is expected to grow from RMB 27 bn in 2023 to RMB 42 bn in 2027, a CAGR of 15%.

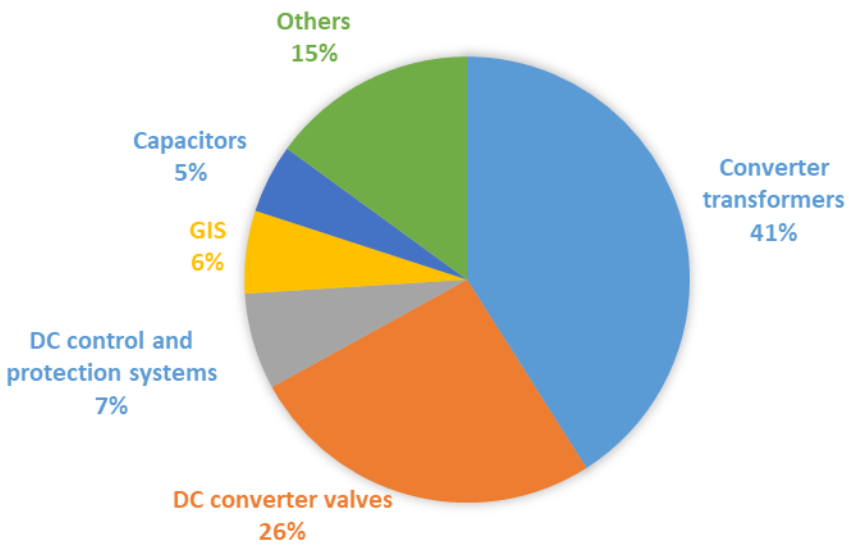
Accelerating construction of UHV

During the 14th Five-Year Plan (FYP) period (2021-2025), SGCC plans to construct 24 AC and 14 DC UHV projects, a total investment of RMB 380 bn. This corresponds to an annual investment of RMB 76 bn, up 7 % from the average of 2018-2020.

SGCC estimates that during the 15th Five-Year Plan (2026-2030), another 10 AC and 20 DC UHV projects will be constructed to increase the capacity of the power grid to distribute green energy. SGCC's estimates provide more visibility for the development of UHV industry over the next 5 years. We believe the investment by SGCC in UHV will boost the earnings of companies that have a strong market position in the industry by around 18% p.a.

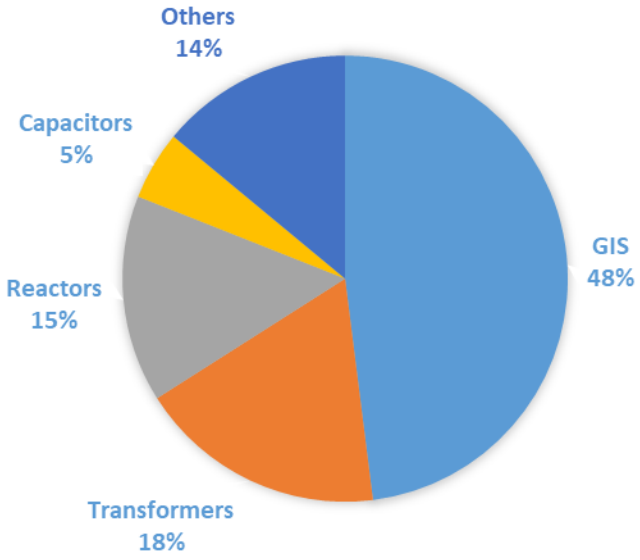
The cost of a single ultra-high voltage direct current (UHVDC) transmission line ranges from RMB 20 to 30 bn, with power equipment accounting for 25% of the total investment. Among the power equipment components, converter transformers, DC converter valves and DC control and protection systems have the highest cost, accounting for 41%, 26% and 7%, respectively, as shown in Chart 10. For ultra-high voltage alternating current (UHVAC) transmission lines, power equipment accounts for approximately 22% of the total investment, ranging from RMB 5-10 bn. GIS, transformers and reactors constitute the highest proportions, at 48%, 18% and 15%, respectively (Chart 11).

Chart 10. Power equipment in UHVDC



Source: Bin Yuan Capital

Chart 11. Power equipment in UHVAC



Source: Bin Yuan Capital

According to SGCC, there are 9 DC lines and 1 AC line remaining from the 14th FYP to be constructed over the next 2 years and 20 DC lines and 10 AC lines planned for the 15th FYP. Considering the amounts expected to be invested, power equipment used for ultra-high voltage direct current (UHVDC) has the greater potential for growth.

High technical barriers to entry and the high growth potential make the DC converter valve and DC control and protection system sectors the most attractive segments for investment. Intensive technology requirements in these two segments have led to a high market concentration, strong bargaining power and high gross margins.

1) **The DC converter valve**, also known as a converter or power electronic converter, is a crucial component in high-voltage direct current (HVDC) transmission systems. It facilitates the conversion from alternating current (AC) to direct current (DC) and vice versa.

2) **DC control and protection system** is responsible for the control, monitoring, or protective functions of primary equipment such as circuit breakers, valves, converter transformers, and switches in the converter station.

Table 1. Power equipment comparison

Power equipment	Entry Barrier	Growth CAGR	Bargaining Power	Gross Margin
Converter transformer	Low	6%	Low	13%
DC converter valves	High	15%	High	32%
GIS	Mid	10%	Mid	22%
DC control and protection system	High	18%	High	38%

Source: Bin Yuan Capital

Chart 12. Market share of DC converter valves

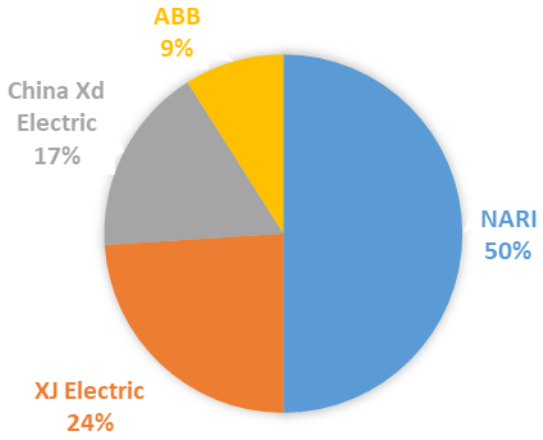
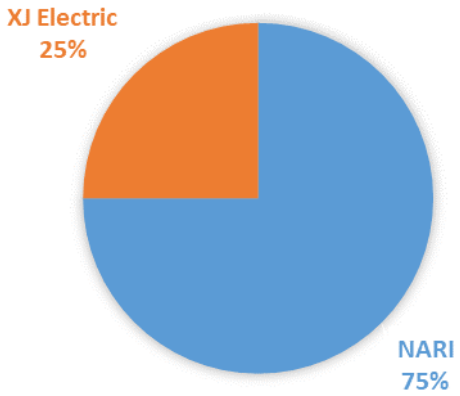


Chart 13. Market share of DC control and protection system



Source: iFind, Bin Yuan Capital

NARI operates in the second and third most valuable sub-sectors, DC converter valves and DC control and protection systems.

It's highly regarded products and services have helped to solidify its leading position in the industry. Backed by the SGCC, NARI serves as the industrialization platform for innovations originating from the State Grid Electric Power Research Institute (SGEPRI). In 2001, the NARI Group established NARI Technology, encompassing three major divisions, namely grid controls, system controls, and industrial controls. Subsequently, the company was listed on the Shanghai Stock Exchange in 2003 and grew to be the largest power grid constructor in China.

NARI's strong market position is demonstrated by the high number of bids it won in UHV DC converter valves tenders from 2014-2023. The company achieved complete bids in two lines and a 50% bid share in nine lines, with market shares of 50%/74.5% for DC converter valves/control and protection systems, maintaining a core position in the industry. We expect NARI's corresponding businesses to achieve increasing revenue growth in line with the uptrend in the UHV industry in 2024-2030.

XJ Electric is another core equipment supplier in the UHV industry, with more than 60% of its business in UHVDC related products, which makes it the largest beneficiary from the rapid development of UHVDC in China. Additionally, XJ Electric is one of the top players in the distribution industry, with products covering grid automation, control and protection systems, and smart meters. Since 2017, the company has consistently won the most bids on RFPs issued by the SGCC for smart meters and has maintained about 25% market share of DC control and protection systems over the past 5 years. Given its leading position in the UHV and distribution industry, we expect XJ Electric will also benefit from the increasing capital spending on the grid in China over the next 6 years.

Summary

In conclusion, it is critical for China to accelerate the construction of UHV to accommodate the fast pace of its transition to green energy in order to meet its dual carbon targets by 2030. We believe there are great investment opportunities in the DC converter valve and DC control and protection system sub-sectors. NARI and XJ Electric are our top picks among domestic players due to their overall competitiveness and leading market positions. They have proven their capability by delivering reliable products and services over the past 20 years. NARI delivered annual earnings growth rates of 15% over the past 3 years, and we expect it will grow at 17% over the next 3 years. XJ Electric should benefit even more and see earnings grow at 23% p.a. over the next 3 years.

Table 2： Revenue, Earnings and Valuation forecast

	Company	Financials	2024E	2027E
Chinese Players	NARI	Revenue (RMB bn)	57.7	80.6
		Earning (RMB bn)	8.1	11.8
		EPS (RMB)	1.01	1.47
		PE	22	16.2
		PEG	1.1	
	XJ Electric	Revenue (RMB bn)	19.7	30.2
		Earning (RMB bn)	1.2	2.3
		EPS (RMB)	1.19	2.28
		PE	21	12.2
		PEG	0.9	
Global Players	SIEMENS	Revenue (USD bn)	81.8	100
		Earning (USD bn)	9.7	11.1
		EPS (USD)	11.67	15.0
		PE	16	12.5
		PEG	2	
	GE VERNOVA	Revenue (USD bn)	34.9	42.3
		Earning (USD bn)	1.48	3.52
		EPS (USD)	4.81	11.54
		PE	38	16
		PEG	1.3	

Source: iFind, Bloomberg, Bin Yuan Capital

Sincerely,

Ping and the Team

September 6, 2024

Bin Yuan on the Road

August 5, 2024

We met the board secretary of an auto parts company. Their tire manufacturing business has been among the top ten globally since last year.

We visited to confirm the company's technological barriers and globalization progress. Their tire products currently have the highest grade of double A certification from the European label. The company's mining tires, which have undergone ten years of research, have entered Caterpillar's supply chain and other competitors have difficulty replicating this advantage. The company plans to expand its capacity in Southeast Asia and increase its market share in Europe and North America by providing high-quality tire products.

"We have the full-chain R&D advantage in materials, equipment, and manufacturing. We will accelerate our globalization layout this year." - Board Secretary Mr. Li

August 20, 2024

We visited AMEC's factory in Shanghai to check if the industry prosperity continues as expected.

We witnessed the assembly process of different types of etching equipment as well as the newly developed LPCVD equipment. The factory is fully operated to ensure the output. New orders in 2024H1 increased by more than 40% YoY and is expected to reach RMB 11-13 bn for the full year. The management are optimistic about the industry growth, and are confident to break through in high end equipment and to take more market share in respective areas. As the leading player in etching and thin film deposition equipment in China, AMEC will benefit the most from industry growth and increasing localization rate.

" We will keep investing on R&D to ensure our leading position in semiconductor equipment industry." - Chairman of the board

August 28, 2024

We visited PIOTECH's factory in Shenyang to learn about their long-term strategy to support China's semiconductor industry.

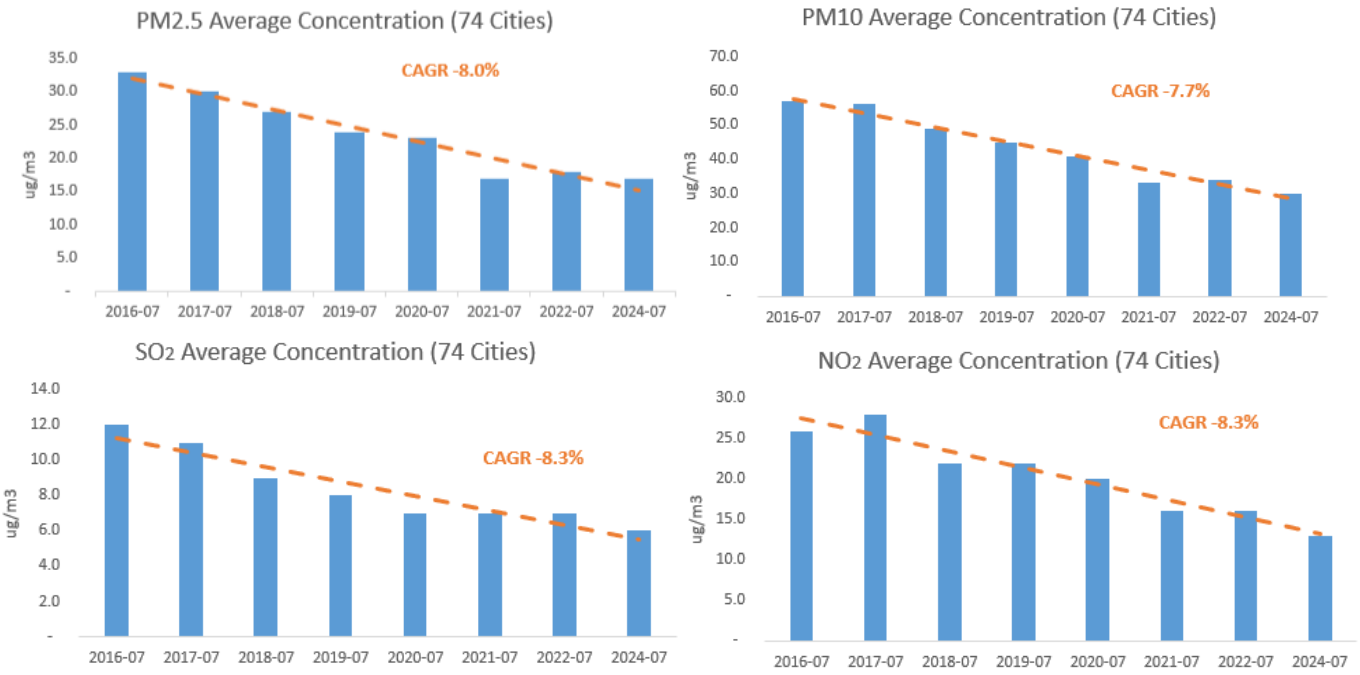
Piotech's main products are Plasma-Enhanced Chemical Vapor Deposition (PECVD) equipment which are widely used in integrated circuit manufacturing, as well as in TSV packaging, optical waveguide, Micro-OLED display and other technology fields. According to the management downstream demand is very strong, order growth rate in the second quarter exceeded 90%. With improving product performance and the diversification of product types, orders will continue to grow fast. They also indicated that most of the key components can be replaced domestically, and there will be no bottlenecks of supply chain.

" Chinese companies have the ability to produce globally leading semiconductor equipment in the future." - CEO

Bin Yuan Environment Tracking

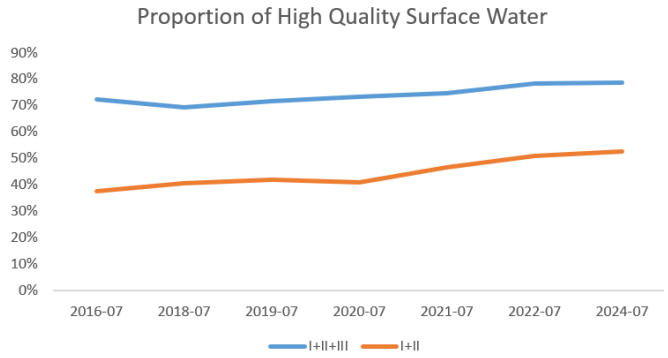
This tracking includes monthly air and water quality data, both showed steady improving trend in the last 5 years. Air pollution concentration dropped due to reduced coal combustion, increased proportion of new energy vehicles, and tightened emission control measures. Water quality improved mainly from the strengthen control of wastewater emissions since 2017.

China air pollutant concentration data June 2016-2024



**PM2.5, PM10 and SO_2 are mainly from fossil fuel combustion, and NO_2 is mainly from vehicle emissions.*

The proportion of high-quality water in China data June 2016-2024



**Water quality in China breaks down to 5 levels, with level I being the best and level V being the worst. Level I+II represents water that can be used for drinking purpose. Level I+II+III represents water that can directly contact human body.*

**Source: Ministry of Ecological Environment in China.*

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