
INDUSTRY OVERVIEW

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GLOBAL ENERGY AND ELECTRICITY INDUSTRY

Electricity is the fundamental energy source underpinning social operations and economic development, broadly supporting key sectors such as industrial and manufacturing, infrastructure, and telecommunication. From 2020 to 2025, global total installed power generation capacity increased from 7,795.0 GW to 11,771.4 GW, representing a CAGR of 8.6%, and is expected to reach 17,366.3 GW by 2030, with a CAGR of 8.1% from 2025 to 2030. Meanwhile, driven by capacity expansion and structural adjustment, the global energy system is accelerating its transition towards a cleaner electricity mix centered on solar and wind power.

As the penetration of new energy increases, power systems are accelerating the transition toward next-generation power systems characterized by a high proportion of new energy, coordinated interaction and flexible regulation across source, grid, load, and storage. Low-voltage electrical products are continuously upgrading breaking capacity, response speed and adaptability to demanding operating conditions. Driven by intelligentization, low-voltage electrical products are evolving into intelligent terminals equipped with power quality monitoring and active dispatch capabilities. As a result, low-voltage electrical products are closely linked to the development requirements of next-generation power systems and, through iterative interaction across the value chain of generation, storage, distribution and end use, jointly support the transition towards a cleaner energy structure.

LOW-VOLTAGE ELECTRICAL PRODUCT INDUSTRY

Overview

Low-voltage electrical products refer to components or devices used in electrical circuits with a rated AC voltage of up to 1,000V or a rated DC voltage of up to 1,500V that, in response to external signals and requirements, can manually or automatically make or break circuits in order to achieve the switching, control, protection, detection, conversion and regulation of electrical circuits or non-electrical objects. Low-voltage electrical products include power distribution electrical products, control electrical products, terminal electrical products, power supply electrical products, and electronic electrical products.

Low-voltage electrical products constitute a key foundational link in the electricity system, connecting energy supply with end-use electricity demand and enabling the ultimate distribution and utilization of electricity across industrial, commercial and residential scenarios. The performance and reliability of low-voltage electrical products are directly related to electrical safety and energy efficiency. Amid the transition toward the next-generation power system, low-voltage electrical products are evolving from standalone protection and control devices into integrated system-level products incorporating monitoring, communication and intelligent control functions.

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Value Chain

The upstream segment of the low-voltage electrical product industry mainly comprises manufacturers of metal materials, plastics and components. As low-voltage electrical products continue to evolve towards higher reliability and greater intelligence, demand for high-performance materials is also increasing.

The midstream segment mainly consists of low-voltage electrical product manufacturers with system integration capabilities and comprehensive solution providers. Leading enterprises are gradually engaging in downstream project solution design, system integration and coordinated operations, while leveraging automated and flexible manufacturing systems to achieve multi-product delivery across diverse scenarios. Low-voltage electrical products can be integrated into complete systems by panel builders or directly reach end customers and specific application scenarios through distributor channels.

The downstream segment covers application fields such as industrial and manufacturing, infrastructure, and energy. The industrial and manufacturing sectors generally impose higher requirements on product reliability and safety. The rapid development of new energy is further driving demand for low-voltage electrical products with higher performance, greater intelligence and stronger system coordination capabilities.

Market Drivers and Development Trends

1. ***Policy-driven smart grid upgrades.*** In recent years, major economies worldwide have been accelerating the upgrading and intelligent transformation of grid infrastructure through policy guidance and capital investment. In 2024, the European Commission proposed the Grid Action Plan, encouraging the accelerated construction and upgrading of transmission and distribution networks to support efficient grid operation and the energy transition. In 2025, Association of Southeast Asian Nations (ASEAN), in its ASEAN Plan of Action for Energy Cooperation (2026–2030), explicitly identified grid digitalization and intelligence as key enablers of energy transition, promoting smarter grid systems and data-driven electricity system operations. In the Middle East, Saudi Arabia continues to advance grid digitalization and distribution automation under the Saudi Vision 2030 framework, while the United Arab Emirates, represented by Dubai, is systematically promoting smart grid and distribution network modernization under the Smart Grid Strategy 2021–2035, thereby accelerating power infrastructure upgrades.

China is positioning smart grids and grid upgrading as key infrastructure for the energy transition and the modernization of electricity systems. In September 2025, the National Development and Reform Commission and the National Energy Administration issued the Implementation Opinions on Promoting “AI+” Energy High-Quality Development (關於推進“人工智能+”能源高質量發展的實施意見), encouraging the intelligent construction and management of grid projects and the enhancement of intelligent capabilities in key products such as transmission and transformation. Meanwhile, State Grid announced that its fixed-asset investment is expected to reach RMB4 trillion during the period between 2026 and 2030, significantly advancing the construction of new power systems. Against this backdrop, demand for distribution network upgrading, intelligent transformation and end-use electricity management continues to increase, directly driving volume growth in low-voltage electrical products such as circuit breakers and contactors and promoting the industry’s shift toward intelligent, system-level solutions.

2. ***Expansion of new energy integration driving demand for low-voltage electrical products.*** The cumulative installed capacity of photovoltaic power and wind power as a percentage of the cumulative installed capacity of global power mix is expected to increase from 33.4% in 2025 to 54.3% in 2030. The increasing penetration of new energy is continuously driving demand for power distribution systems and low-voltage electrical products. On the other hand, energy storage systems are rapidly penetrating the market, with global cumulative installed lithium battery energy storage

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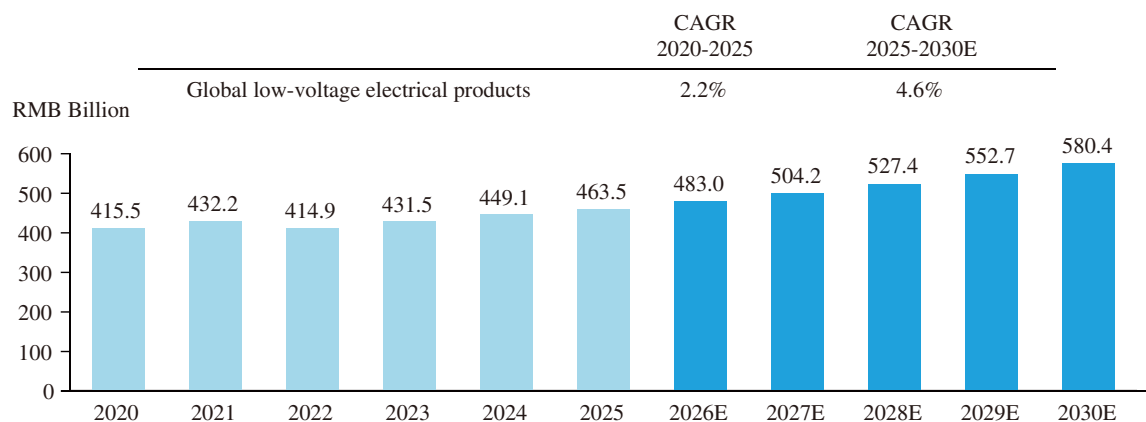
capacity increasing from 32.9 GWh in 2020 to 714.5 GWh in 2025 and expected to reach 4,855.6 GWh by 2030. As energy storage applications continue to expand across generation, grid and end-use scenarios, both the unit value and volume of low-voltage electrical products used in energy storage systems are expected to increase.

3. ***AI data centers driving demand for intelligent and customized low-voltage electrical products.*** Global data centers are evolving towards higher power density, larger capacity and greater modularization. Capital expenditure in the global data center market is expected to increase from USD585.0 billion in 2025 to over USD3,000.0 billion by 2030. Intelligent low-voltage electrical products can effectively meet the requirements of modular power distribution systems in data centers, supporting system upgrades and capacity expansion without disrupting existing operations. In addition, intelligent low-voltage electrical products enable real-time data acquisition and remote monitoring of distribution parameters. Combined with AI-based data analysis and decision support, such products are evolving into system nodes with proactive monitoring and coordinated control capabilities. As rack power density increases and power architectures shift towards high-voltage direct current, higher requirements are imposed on low-voltage electrical products, thereby driving the industry towards higher-grade, more intelligent and more customized solutions.
4. ***Industrial upgrading and urban renewal expanding application scenarios for low-voltage electrical products.*** On the one hand, industrial enterprises, in the course of upgrading automated production lines, developing smart factories and improving the energy efficiency of energy-intensive equipment, are placing higher requirements on power control, distribution protection and energy management systems. On the other hand, urban renewal, new infrastructure development and upgrades to building electrical systems continue to expand, including smart parks, the renovation of old buildings and the rollout of charging infrastructure. These scenarios require the large-scale deployment of low-voltage distribution and control products to enhance power supply safety, operational reliability and energy utilization efficiency.

Market Size

From 2020 to 2025, the global low-voltage electrical product market size increased from RMB415.5 billion to RMB463.5 billion, representing a CAGR of 2.2%, and is expected to reach RMB580.4 billion by 2030, with a CAGR of 4.6% from 2025 to 2030. In terms of regional breakdown, China, the Americas and Europe accounted for 19.9%, 32.6% and 30.9% of the global market size of low-voltage electrical product, respectively, in 2025. Going forward, the regional distribution of the global low-voltage electrical product market is expected to remain broadly stable.

Market size of global low-voltage electrical products, in terms of revenue, 2020–2030E



Sources: German Electro and Digital Industry Association (ZVEI), National Electrical Manufacturers Association (NEMA), Low-Voltage Electrical Product Branch of China Electrical Equipment Industry Association, Frost & Sullivan

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Competitive Landscape

In 2025, the global low-voltage electrical product market size was RMB463.5 billion, with the top five low-voltage electrical product companies accounting for a combined market share of 48.4%. Our Company ranked fifth in terms of global revenue of low-voltage electrical product. In 2025, the market size of China’s low-voltage electrical product industry was RMB92.1 billion, with the top five companies accounting for a combined market share of 48.7%. Among them, our Company ranked second and was the largest domestic low-voltage electrical product company in China.

**Top five ranking of global low-voltage electrical product market,
by revenue of low-voltage electrical products, 2025**

Ranking	Company	Global Market Revenue (RMB Billion)	Market Share (%)	Headquarters
1	Company A	89.0	19.2%	France
2	Company B	51.0	11.0%	Switzerland
3	Company C	40.0	8.6%	Germany
4	Company D	26.5	5.7%	Ireland
5	Our Company	17.9	3.9%	China
Top 5		224.4	48.4%	

Sources: Annual Reports of Listed Companies, Frost & Sullivan

**Top five ranking of China low-voltage electrical product market, by revenue of
low-voltage electrical products in China, 2025**

Ranking	Company	China Market Revenue (RMB Billion)	Market Share (%)	Headquarters
1	Company A	13.7	14.9%	France
2	Our Company	13.3	14.5%	China
3	Company E	8.0	8.7%	China
4	Company B	5.5	6.0%	Switzerland
5	Company C	4.2	4.6%	Germany
Top 5		44.7	48.7%	

Sources: Annual Reports of Listed Companies, Frost & Sullivan

1. Company A was established in 1836 and is headquartered in France, with its shares listed on Euronext Paris. It provides low-voltage electrical products, data center solutions and digital energy solutions.
2. Company B was established in 1988 and is headquartered in Switzerland, with its shares listed on the SIX Swiss Exchange, Nasdaq Stockholm and the New York Stock Exchange. It provides low- and medium-voltage distribution, motors and drives, and automation solutions.
3. Company C was established in 1847 and is headquartered in Germany, with its shares listed on the Frankfurt Stock Exchange. It focuses on digital industries, smart infrastructure, mobility and healthcare technology.
4. Company D was established in 1911 and is headquartered in Ireland, with its shares listed on the New York Stock Exchange. Its principal business covers low-voltage power distribution, industrial control, and power quality solutions.
5. Company E, a private company, was established in 2007 and is headquartered in China. Its principal business covers power distribution, industrial automation and building electrical products.

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Entry Barriers

The low-voltage electrical product industry is characterized by relatively high and comprehensive barriers to entry, including technological capabilities, channel networks, supply chain management, global manufacturing capacity and brand accumulation. At the technical level, the evolution of products towards intelligence, modularization and communication is placing increasing demands on system integration and hardware-software coordination. At the channel and customer level, leading enterprises typically establish stable sales and service networks through long-term project cooperation. At the supply chain and manufacturing level, leading players leverage global sourcing systems and large-scale production capabilities to achieve advantages in cost control and delivery stability. In addition, brand reputation built through long-term engineering applications and quality management leads downstream customers to prefer established suppliers in critical electricity usage scenarios. These factors collectively create relatively strong entry barriers, making it difficult for new entrants to establish competitive advantages in the short term.

GLOBAL NEW ENERGY INDUSTRY

Overview

Against the backdrop of the ongoing transformation of the global energy structure and the pursuit of carbon neutrality, new energy systems represented by photovoltaics, wind power, energy storage and hydrogen energy are becoming an increasingly important component of global energy supply. Countries are promoting energy structure transformation. The European Green Deal aims to achieve net-zero greenhouse gas emissions by 2050, while China’s dual-carbon strategy targets carbon peaking by 2030 and carbon neutrality by 2060. Driven by both policy support and technological progress, new energy is evolving to a comprehensive energy system integrating wind, solar, energy storage and hydrogen. Hydrogen energy and its derivatives, such as green ammonia and green methanol, are considered important technological pathways for achieving deep decarbonization in industries, transportation and chemicals.

Photovoltaic power stations are important energy infrastructure assets that use photovoltaic power generation systems as their technological foundation and convert solar resources into electricity through project development, engineering construction and continuous operation. Photovoltaic power stations can generally be classified into distributed and ground-mounted types. Distributed photovoltaic power stations mainly include residential and commercial and industrial forms. Residential photovoltaic power stations are usually deployed on residential rooftops, while commercial and industrial photovoltaic power stations are mainly located in industrial parks and commercial buildings.

Value Chain

New energy projects span the entire lifecycle from planning and development to long-term operation and can broadly be divided into two core phases: the development and construction phase and the operation and management phase.

- The development and construction phase mainly encompasses preliminary planning and development, engineering design, equipment manufacturing and procurement, engineering construction, and grid connection and commissioning. First, the development entity needs to conduct resource assessments and feasibility studies, combined with on-grid conditions, land

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resources, policy environment and economic analysis to determine the project development plan. Based on this, the project enters the engineering design and approval phase, including the overall power plant design, electrical system design and related administrative approvals and financing arrangements. Subsequently, the equipment procurement and engineering construction phase begins, involving the production and supply of core equipment such as photovoltaic modules, wind turbines, energy storage systems and hydrogen production equipment, as well as construction, system installation and on-grid testing under EPC (engineering, procurement and construction) or BT (build-transfer) models.

- The operation and management phase focuses on the long-term operation and value realization of the power plant or energy system, mainly including operation and maintenance management, asset management, electricity trading and value-added services. After a project is put into operation, the operator needs to monitor operating status in real time through digital monitoring systems and carry out equipment inspection, performance optimization and preventive maintenance through a professional operation and maintenance team to ensure stable system operation. Against the backdrop of ongoing electricity market reform, revenue sources can be expanded through green certificate trading, participation in power market transactions and dispatch-related services. In the photovoltaic power plant sector, companies may participate in project investment and obtain long-term power generation revenue through the develop-to-hold-to-transfer model or the build-own-operate model.

Market Driver and Development Trend

1. ***Policy guidance and energy transition resonate to solidify development of the new energy industry.*** In 2025, China issued the Administrative Measures for the Development and Construction of Distributed Photovoltaic Power Generation (分佈式光伏發電開發建設管理辦法) and advanced initiatives such as the Thousands of Households Bathing in Sunshine Action (千家萬戶沐光行動), accelerating the construction of distributed photovoltaics. In 2025, the European Grids Package proposed simplifying the approval and on-grid processes for small-scale new energy.

As for energy storage and wind power, in 2024, China issued the Guiding Opinions on High-Quality Development of Distribution Networks under the New Circumstances (關於新形勢下配電網高質量發展的指導意見), which proposed guiding distributed projects to reasonably allocate new energy storage or configure energy storage resources. In Europe, the Renewable Energy Directive III proposed promoting the participation of distributed energy storage in power system operation through aggregation. China's Energy Work Guidance 2025 (2025年能源工作指導意見) proposed promoting the construction of integrated hydropower, wind power and photovoltaic power stations and accelerating offshore wind power development. The continued implementation of policies enhances the carrying and regulating capacity of power systems for new energy.

2. ***Economic viability and application expansion of new energy sources accelerate industry implementation.*** As the scale of new energy industries such as photovoltaics and wind power continues to expand, according to International Renewable Energy Agency, the global levelized cost of energy for photovoltaic power generation decreased from USD0.42/kWh in 2010 to USD0.04/kWh in 2025, and is expected to further decrease to USD0.03/kWh by 2030. The global levelized cost of energy for integrated photovoltaic and energy storage projects is USD0.11/kWh in 2025, and is expected to decrease to USD0.09/kWh by 2030. Furthermore, the levelized cost of energy for onshore wind power decreased from USD0.11/kWh in 2010 to USD0.03/kWh in 2025, while offshore wind power declined from USD0.21/kWh to USD0.08/kWh over the same period.

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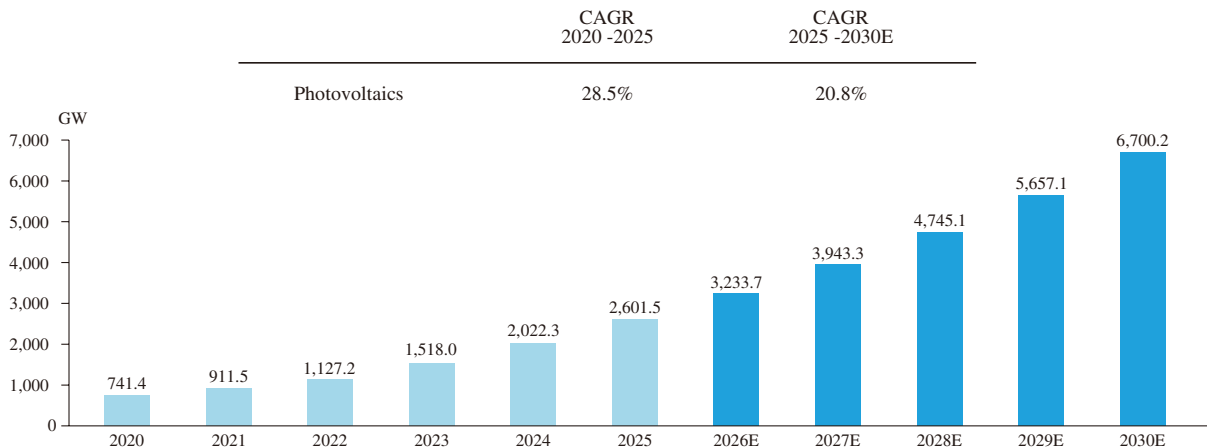
Against the backdrop of continuously declining levelized cost of energy, new energy application scenarios and business models are expanding. High-load electricity consumption scenarios such as AI data centers and advanced manufacturing are accelerating deployment, placing higher demands on local power supply and peak-shaving capacity. Integrated source-grid-load-storage solutions are also being implemented at an accelerated pace, enabling coordinated operation through energy storage configuration, load management and intelligent dispatch, thereby further enhancing the revenue stability and economic feasibility of new energy projects.

3. ***Virtual power plant-driven business model innovation and digital-intelligent operation upgrade accelerate the market-oriented evolution of distributed power stations.*** China’s Notice on Deepening Market-Based Reform of Feed-in Tariffs for New Energy and Promoting High-Quality Development of New Energy (NDRC Price [2025] No. 136) (關於深化新能源上網電價市場化改革促進新能源高質量發展的通知(發改價格[2025] 136號)) provides that on-grid electricity from new energy sources should participate in the electricity market. Based on virtual power plant systems, distributed photovoltaic, energy storage and wind power resources can be aggregated and uniformly operated. By participating in market mechanisms such as demand response, ancillary services and electricity spot trading, virtual power plants can obtain flexible service revenue in addition to traditional electricity sales revenue. Furthermore, through intelligent operation and maintenance methods such as power station design optimization, operation monitoring and AI inspection, the transparency and controllability of power station operation can be significantly improved.

Market Size

From 2020 to 2025, global cumulative installed photovoltaic capacity increased from 741.4 GW to 2,601.5 GW, representing a CAGR of 28.5%. It is expected to further increase to 6,700.2 GW by 2030, driven by the accelerating energy transition, continued policy support and the declining levelized cost of energy. Over the same period, global cumulative installed wind power capacity increased from 745.0 GW to 1,325.0 GW, representing a CAGR of 12.2%. Looking ahead, supported by the large-scale deployment of offshore wind, ongoing grid infrastructure upgrades and a favorable regulatory environment, global cumulative installed wind power capacity is expected to surpass 2,000.0 GW by 2030.

Global Cumulative Installed Capacity of Photovoltaics, 2020-2030E



Sources: China National Energy Administration, IEA, Frost & Sullivan

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As a core component for enhancing grid flexibility, the energy storage market has experienced rapid growth. Global cumulative installed capacity of lithium-ion battery energy storage systems increased from 32.9 GWh in 2020 to 714.5 GWh in 2025, and is expected to reach 4,855.6 GWh by 2030, representing a CAGR of 46.7% from 2025 to 2030. The integrated hydrogen-ammonia-methanol solution converts gaseous green hydrogen into liquid green ammonia and green methanol, thereby connecting the entire new energy value chain from production, consumption, transmission and distribution to economy-wide decarbonization applications. Specifically, global green hydrogen production is 1.2 million tons in 2025, and is expected to reach 24.8 million tons by 2030, representing a CAGR of 83.0% from 2025 to 2030; global green ammonia production is 0.6 million tons in 2025, and is expected to exceed 20 million tons by 2030, representing a CAGR of over 100% from 2025 to 2030; and global green methanol production capacity is expected to increase from 1.2 million tons in 2025 to exceed 50 million tons by 2030, representing a CAGR of over 110% from 2025 to 2030.

Competitive Landscape

As of December 31, 2025, the global cumulative installed capacity of residential photovoltaics reached 453.1 GW. The top five global residential photovoltaic companies had cumulative completed residential photovoltaic installed capacity of 136.2 GW, representing 30.0% of the global cumulative completed residential photovoltaic installed capacity. Our Company ranked first globally in terms of cumulative completed residential photovoltaic installed capacity, reaching 58.0 GW. Furthermore, our Company ranked first globally in terms of residential photovoltaic installed capacity holdings, with 26.7 GW, and also ranked first globally in terms of total sold residential photovoltaic installed capacity, at approximately 30.0 GW, as of the same date.

Top five ranking of global residential solar photovoltaic companies, by cumulative completed residential photovoltaic installed capacity, as of December 31, 2025

Ranking	Company	Cumulative Completed Residential Photovoltaic Installed Capacity (GW)	Market Share (%)
1	Our Company	58.0	12.8%
2	Company F	28.2	6.2%
3	Company G	20.0	4.4%
4	Company H	15.0	3.3%
5	Company I	15.0	3.3%
Global Top 5		136.2	30.0%

Sources: Annual reports of listed companies, Frost & Sullivan

1. Company F, founded in 1988 and headquartered in China, is listed on the Hong Kong Stock Exchange. Its main businesses include residential, commercial and industrial photovoltaic stations, as well as energy storage equipment.
2. Company G, founded in 1997 and headquartered in China, is listed on the Shanghai Stock Exchange. It focuses on the production of new energy equipment, such as photovoltaic modules and energy storage systems.
3. Company H, founded in 2018 and headquartered in China, is a private company. It focuses on smart terminal products and provides photovoltaic solutions.
4. Company I, founded in 1997 and headquartered in China, is listed on the Shenzhen Stock Exchange. It specializes in new energy equipment, including photovoltaic inverters, energy storage systems, and wind power converters.

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Entry Barriers

The new energy industry has high barriers to entry, mainly reflected in full-lifecycle service capabilities, technological capabilities, customer resources and financing capabilities. New energy projects typically cover the entire process from system design to equipment selection, engineering construction and operation optimization, involving various energy assets such as photovoltaics, energy storage and wind power systems. Leading companies establish a closed-loop business model across the development, construction and operation and maintenance phases. In terms of technological capabilities, the operation of new energy projects relies on digital monitoring, intelligent diagnostics and efficient operation and maintenance systems. Leading companies can continuously optimize algorithm models and operation and maintenance strategies based on long-term operational data accumulation. In terms of customer resources, companies with continuous project delivery capabilities and operation and maintenance experience are more likely to gain customer trust. In terms of financing capabilities, new energy projects involve large investments and long payback periods, and companies with stable cash flows are more likely to obtain support from financial institutions. By contrast, new entrants typically face limitations in end-to-end collaboration capabilities, technological accumulation, customer resources and financing channels.

RAW MATERIAL PRICE ANALYSIS

In the low-voltage electrical product industry, copper and silver are among the key raw materials. The average price of copper rose significantly from approximately RMB49,356 per ton in 2020 to approximately RMB81,076 per ton in 2025, and is expected to remain at relatively elevated levels with continued volatility, supported by strong demand from electrification. Silver prices increased from approximately RMB142.8 per ounce in 2020 to approximately RMB232.8 per ounce in 2025. The key raw materials of the new energy industry primarily include crystalline silicon photovoltaic modules and electronic components. The average price of crystalline silicon photovoltaic modules increased from RMB1.5/W in 2020 to RMB1.7/W in 2022 before declining to RMB0.7/W in 2025. This decrease was mainly driven by reduced costs of upstream polysilicon and wafers, advancements in manufacturing technology and economies of scale. The producer price index of China’s electronic components manufacturing industry reflects price fluctuations in electronic components. As industry capacity recovered and technological efficiency improved, such price fluctuations have gradually stabilized.

SOURCE OF INFORMATION

We commissioned Frost & Sullivan to conduct market research on the global energy and electricity industry, the low-voltage electrical product industry and the global new energy industry and to prepare the F&S Report. We have contracted to pay RMB500,000 to Frost & Sullivan for compiling the F&S Report. In preparing the F&S Report, Frost & Sullivan conducted detailed primary research, which involved discussions with certain leading industry participants regarding the status of the industry and interviews with relevant parties. Frost & Sullivan also conducted secondary research, which involved reviewing company reports, independent research reports and data from its proprietary research database. Frost & Sullivan derived the market size estimates through historical data analysis plotted against macroeconomic data, while also taking into account the industry drivers described above. Its market-engineering forecasting methodology integrates several forecasting techniques with a market-engineering measurement-based system and relies on the expertise of its analyst team in synthesizing the critical market elements identified during the research phase of the project. These elements primarily include expert-opinion forecasting methodology, integration of market drivers and restraints, integration of market challenges, integration of market-engineering measurement trends and integration of econometric variables. The F&S Report was compiled based on the following assumptions: (1) the social, economic and political environment is likely to remain stable during the forecast period; and (2) key industry drivers are likely to continue driving market development during the forecast period.