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GLOBAL AND CHINA'S PV SILVER POWDER INDUSTRY

Definition and Overview of Silver Powder

Silver powder is a common metal powder with good electrical and thermal conductivity. The production methods of silver powder primarily include liquid-phase reduction, electrolysis and vapour deposition, among which the liquid-phase reduction method is the most commonly used method, which reduces silver ions into silver atoms through chemical reactions, and then aggregates them into powder.

Silver powder has extensive downstream applications including PV industry, electronics industry, chemical industry, medicine industry, among others. In PV industry, silver powder is used to manufacture PV silver paste, which is a crucial raw material of PV cells. In electronics industry, silver powder is used to manufacture conductive lines, conductive adhesives, among others. In chemical industry, silver powder is used to manufacture antistatic agents, coatings, among others. In medicine industry, silver powder is used to manufacture drug carriers. In addition, depending on different structures, silver powder can be mainly divided into spherical silver powder, flake-shaped silver powder, rod-shaped silver powder, among others.

The non-PV silver powder market in China is relatively fragmented. As of 31 December 2025, there were approximately 400 non-PV silver powder manufacturers in China. The production of non-PV silver powder requires high technical expertise in production technologies and mature production processes, with relatively high technical barrier and talent barrier. However, the sufficient industry experience of PV silver powder manufacturers can be applied to the production of non-PV silver powder, which enables PV silver powder manufacturers to expand into non-PV silver powder sector. Moreover, non-PV silver powder products have a wide range of applications such as electronics industry, which generally has higher gross profit margins.

Along with the continuous technological advancements, the non-silver powder for PV cells is expected to have broad development opportunities. Current silver alternatives in the PV field are mostly used in the production of low-temperature silver pastes, which accounted for less than 3% of the conductive materials of China's PV silver paste industry in 2025. The development of non-silver powder for PV cells raises high expertise requirements for technological innovations in material, process and equipment. Leading PV silver powder manufacturers have been dedicated to exploring new technologies in non-silver powder for PV cells to gain first-mover advantages and consolidate market positions.

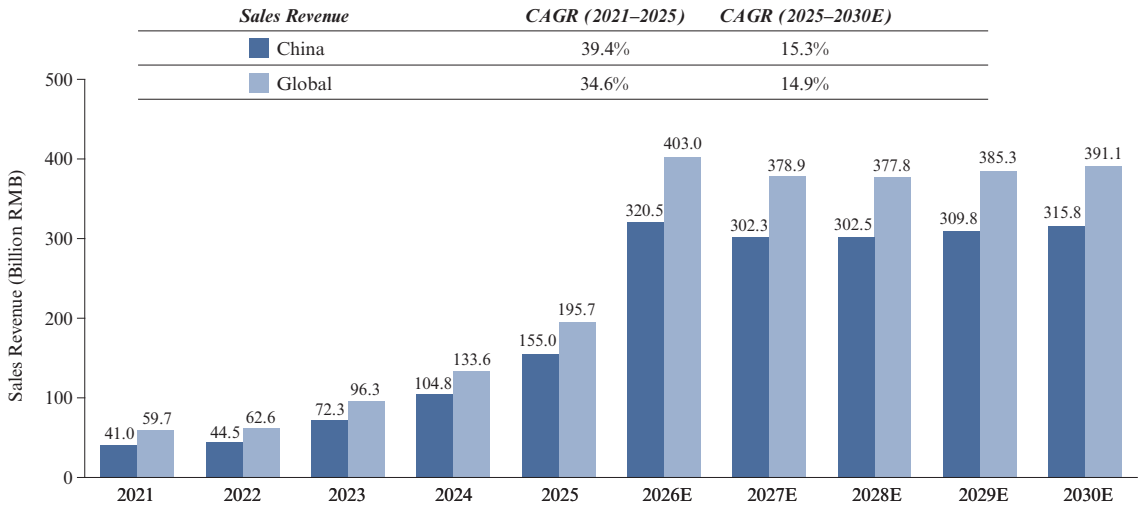
Global and China's Market Size of Silver Powder Industry

Due to the continuous increase in sales volume of silver powder, the global sales revenue of silver powder grew from RMB59.7 billion in 2021 to RMB195.7 billion in 2025, with a CAGR of 34.6%. During the same period, the sales revenue of silver powder in China increased from RMB41.0

billion in 2021 to RMB155.0 billion in 2025, representing a CAGR of 39.4%. Notably, the CAGR of sales revenue was higher than that of sales volume due to the increase in the average selling price of silver powder.

With the increasing sales volume of silver powder driven by growing demand from downstream industries as well as the increase in the average selling price of silver powder, the global sales revenue of silver powder is expected to reach RMB391.1 billion in 2030, representing a CAGR of 14.9% from 2025 to 2030. Meanwhile, the sales revenue of silver powder in China is expected to reach RMB315.8 billion in 2030, growing at a CAGR of 15.3% from 2025 to 2030.

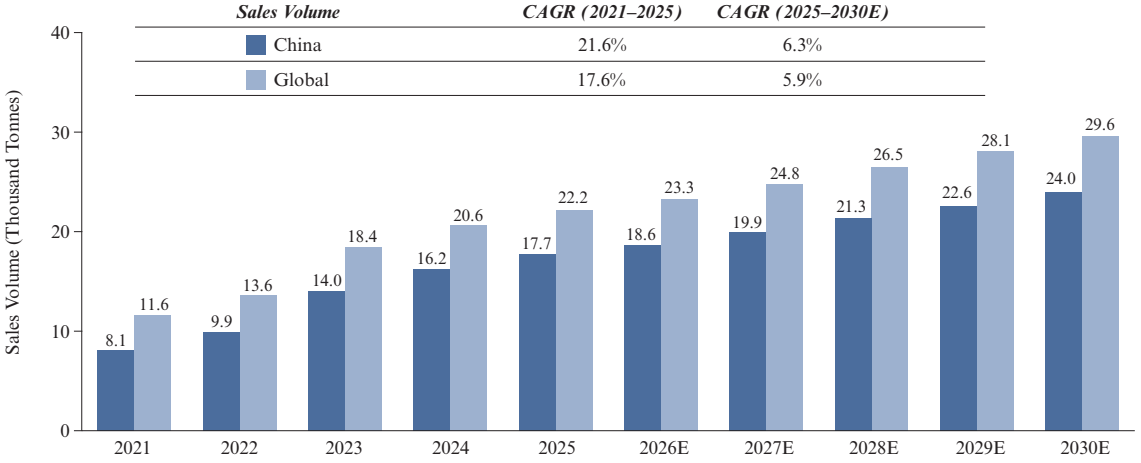
Sales Revenue of Silver Powder (Global and China), 2021–2030E



Source: China Photovoltaic Industry Association; Frost & Sullivan Analysis

The global sales volume of silver powder grew from 11.6 thousand tonnes in 2021 to 22.2 thousand tonnes in 2025, with a CAGR of 17.6%. During the same period, the sales volume of silver powder in China increased from 8.1 thousand tonnes in 2021 to 17.7 thousand tonnes in 2025, representing a CAGR of 21.6%. In 2030, the global sales volume of silver powder is predicted to reach 29.6 thousand tonnes, representing a CAGR of 5.9% from 2025 to 2030. Meanwhile, the sales volume of silver powder in China is projected to reach 24.0 thousand tonnes in 2030, growing at a CAGR of 6.3% from 2025 to 2030.

Sales Volume of Silver Powder (Global and China), 2021–2030E



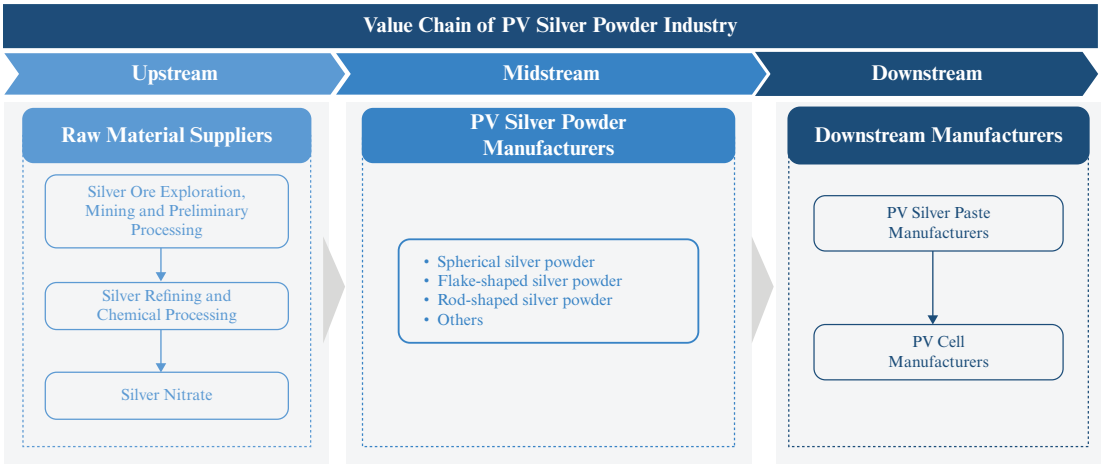
Source: China Photovoltaic Industry Association; Frost & Sullivan Analysis

PV silver paste is one of the major downstream applications of silver powder, accounting for approximately 29.2% in terms of global sales revenue of silver powder in 2025, and accounting for approximately 33.9% in terms of sales revenue of silver powder in China in 2025.

Value Chain of PV Silver Powder Industry

The value chain of PV silver powder industry is primarily composed of upstream raw material suppliers, midstream PV silver powder manufacturers, and downstream PV silver paste manufacturers and PV cell manufacturers.

The upstream of PV silver powder industry is the exploration, mining and preliminary processing of silver ore resources, followed by the silver refining and subsequent chemical processing to produce silver nitrate. The midstream PV silver powder manufacturers produce silver powder with excellent conductivity. The downstream PV silver paste manufacturers procure PV silver powder as the major raw material to produce PV silver paste, and then PV cell manufacturers use PV silver paste to produce PV cells through precise printing, sintering, and other production processes.



Source: Frost & Sullivan Analysis

Global and China's Market Size of PV Silver Powder Industry

Production Volume of Global and China's PV Silver Powder Industry

The global production volume of PV silver powder increased from 3.2 thousand tonnes in 2021 to 6.7 thousand tonnes in 2025, with a CAGR of 20.3%. During the same period, the production volume of PV silver powder in China increased from 1.0 thousand tonnes in 2021 to 6.0 thousand tonnes in 2025, representing a CAGR of 56.5%. As the technical level of China's PV silver powder manufacturers gradually approaches the international advanced level, the localisation rate of China's PV silver powder industry experienced a continuous increase.

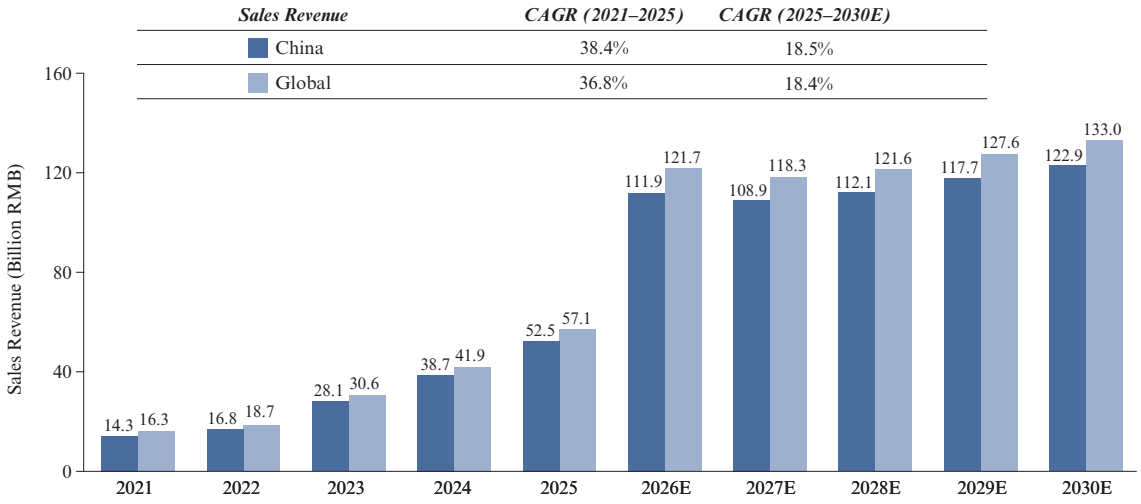
In the future, the global production volume of PV silver powder is expected to reach 10.2 thousand tonnes in 2030, representing a CAGR of 8.8% from 2025 to 2030. Meanwhile, the production volume of PV silver powder in China is expected to reach 9.3 thousand tonnes in 2030, growing at a CAGR of 9.2% from 2025 to 2030.

Sales Revenue of Global and China's PV Silver Powder Industry

The global sales revenue of PV silver powder grew from RMB16.3 billion in 2021 to RMB57.1 billion in 2025, with a CAGR of 36.8%. During the same period, the sales revenue of PV silver powder in China increased from RMB14.3 billion in 2021 to RMB52.5 billion in 2025, representing a CAGR of 38.4%. The increase in average selling price of silver resulted in a higher growth rate of sales revenue than sales volume of PV silver powder.

With the continuous development of PV industry, the growing demand for PV silver powder and the increase in the average selling price of PV silver powder lead to an increase in the sales revenue. In 2030, the global sales revenue of PV silver powder is expected to reach RMB133.0 billion, representing a CAGR of 18.4% from 2025 to 2030. Meanwhile, the sales revenue of PV silver powder in China is projected to reach RMB122.9 billion in 2030, growing at a CAGR of 18.5% from 2025 to 2030.

Sales Revenue of PV Silver Powder (Global and China), 2021–2030E

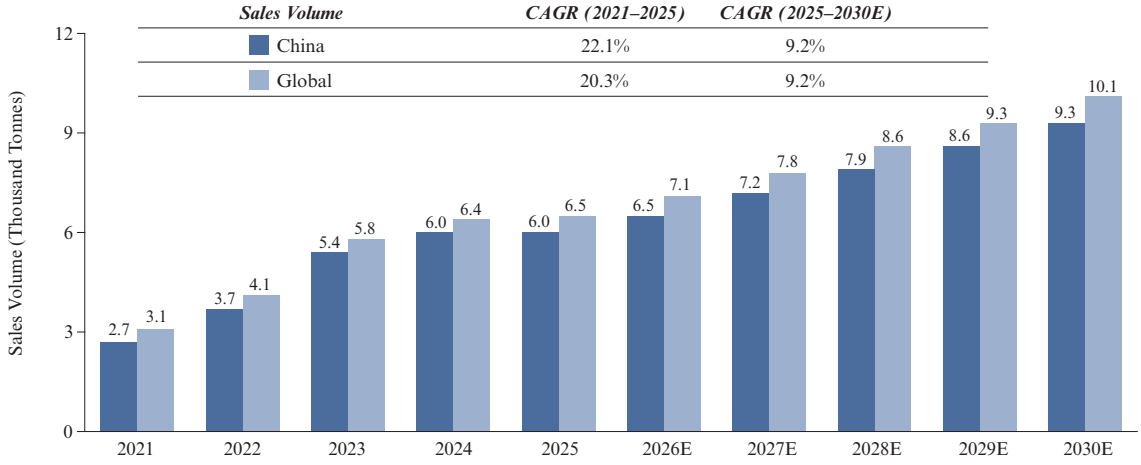


Source: China Photovoltaic Industry Association; Frost & Sullivan Analysis

The global sales volume of PV silver powder increased from 3.1 thousand tonnes in 2021 to 6.5 thousand tonnes in 2025, with a CAGR of 20.3%. During the same period, the sales volume of PV silver powder in China increased from 2.7 thousand tonnes in 2021 to 6.0 thousand tonnes in 2025, representing a CAGR of 22.1%. As China is the largest country of PV cell manufacturing, the sales volume of PV silver powder in China accounted for approximately 92.3% of the global sales volume in 2025. Due to the growing demand from PV silver paste, the sales volume of PV silver powder is

expected to maintain a rapid growth in the future. In 2030, the global sales volume of PV silver powder is predicted to reach 10.1 thousand tonnes, representing a CAGR of 9.2% from 2025 to 2030. Meanwhile, the sales volume of PV silver powder in China is projected to reach 9.3 thousand tonnes in 2030, growing at a CAGR of 9.2% from 2025 to 2030.

Sales Volume of PV Silver Powder (Global and China), 2021–2030E

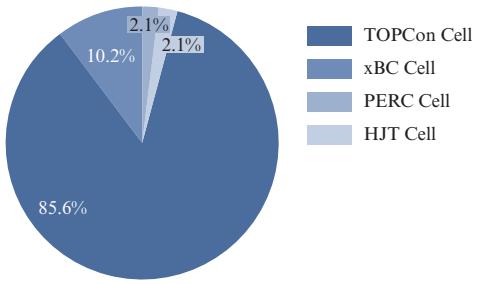


Source: China Photovoltaic Industry Association; Frost & Sullivan Analysis

Breakdown of China's PV Silver Powder Industry

By different applications, TOPCon cell dominated the sales volume of PV silver powder in China in 2025, capturing a significant share of approximately 85.6%. Additionally, xBC cell, PERC cell and HJT cell contributed to the sales volume with respective shares of approximately 10.2%, 2.1% and 2.1% in China's PV silver powder industry in 2025.

Sales Volume of PV Silver Powder (China), by Applications, 2025



Source: China Photovoltaic Industry Association; Frost & Sullivan Analysis

Moreover, by product types with different structures, spherical silver powder accounted for over 95.0% of the total sales volume of PV silver powder in China in 2025.

Import Volume of China's PV Silver Powder Industry

In the early stage, China's PV silver powder industry mainly relied on imports. However, with the continuous technological advancements, the quality and performance of PV silver powder by domestic manufacturers have gradually approached international level, leading to a decreasing trend in import volume of PV silver powder. From 2021 to 2025, the import volume of PV silver powder in China decreased from approximately 1.7 thousand tonnes to 0.2 thousand tonnes, with a CAGR of –41.4%. The proportion of import volume in the total PV silver powder consumption in China decreased from 63.0% in 2021 to 3.3% in 2025. As TOPCon cell technology has gradually matured

and achieved mass production, domestic manufacturers developed PV silver powder that can satisfy the requirements of TOPCon cell manufacturers. Consequently, domestic PV silver powder has replaced imported products, leading to a decline in PV silver powder imports since 2024.

In the future, the import volume of PV silver powder in China is expected to remain at a low level. With the further development of the PV industry and the growing demand for PV silver powder, the domestic PV silver powder manufacturers with strong technical capabilities are expected to have growth opportunities, which contributes to further increase in the localisation rate of PV silver powder.

Overview of Advanced PV Silver Powder

Advanced PV silver powder refers to the PV silver powder that is applied in the production of PV silver pastes for the front-side fine grid in PERC cells, front-side fine grids and rear-side high-copper paste in TOPCon cells, as well as conductive grids in HJT cells and xBC cells. As PV silver pastes for the front-side fine grid in PERC cells and TOPCon cells, as well as conductive grids in HJT cells and xBC cells generally have higher requirements for the conductivity and stability, the silver powder is required to have uniform particle morphology and stable consistency between batches accordingly.

Leading domestic PV silver powder manufacturers have been dedicated to developing advanced PV silver powder to realise domestic substitution. The localisation rate of advanced PV silver powder in China in terms of sales volume was 93.9% in 2025.

Market Drivers of PV Silver Powder Industry in China

Growing downstream demand. With the increasing emphasis on renewable energy and the continuous advancement of PV technologies, the production scale of PV cells and PV silver pastes continues to expand. From 2021 to 2025, the production volume of PV cells in China increased from 198.0 GW to 660.1 GW, with a CAGR of 35.1%, and is expected to reach 1,226.2 GW by 2030, with a CAGR of 13.2% from 2025 to 2030. From 2021 to 2025, the production volume of PV silver pastes in China increased from approximately 3.2 thousand tonnes to 7.2 thousand tonnes, with a CAGR of 22.5%, and is expected to reach approximately 11.3 thousand tonnes in 2030, growing at a CAGR of 9.4% from 2025 to 2030. The robust growth in downstream demand has promoted the development of PV silver powder industry.

Improving product performance. PV silver powder manufacturers have been dedicated to exploring and optimising production processes to improve their product qualities and performances, which can help downstream PV silver pastes and PV cells to improve the PV conversion efficiency and service life. With the growing downstream requirements, the PV silver powder industry faces an increasing demand for advanced PV silver powder products, which prompts manufacturers to continuously increase their investments in research and development to improve product performance, thereby driving the development of PV silver powder industry. With the improvement of technology and product performance, domestic PV silver powder can replace overseas products to achieve further localisation substitution.

Favourable policies. In recent years, the Chinese government has issued a series of policies to promote the development of PV and related industries. For instance, the "Classification of Strategic Emerging Industries (2018)" (《戰略性新興產業分類(2018)》) released in 2018, included silver powder manufacturing in the list of strategic emerging industries, which provides policy support and favourable environment for the development of China's PV silver powder industry. Further, PV related policies such as the "Notice on Promoting Collaborative Development of Photovoltaic Industry Chain and Supply Chain" (《關於促進光伏產業鏈和供應鏈協同發展的通知》) issued in 2022 and the "Action Plan for Accelerating the Establishment of a New Power System (2024–2027)" (《加快構建新型電力系統行動方案(2024–2027 年)》) released in 2024, not only facilitate innovation and upgrading in PV cell technologies, but also stimulate market demand for critical materials such as PV silver powder. Therefore, driven by favourable policies, the PV silver powder industry has

ushered in broader development prospects. The PV cell industry has recently faced intense price competition, prompting the China Photovoltaic Industry Association to propose a market guidance price to stabilise significantly fluctuating PV module prices. In August 2025, the China Photovoltaic Industry Association released the "Initiative on Further Strengthening Industry Self-Regulation and Jointly Safeguarding a Fair Competition-Oriented PV Market Order with Survival of the Fittest" (《關於進一步加強行業自律，共同維護公平競爭、優勝劣汰的光伏市場秩序的倡議》). The initiative proposes that enterprises shall strictly abide by laws and regulations such as the "Price Law of the People's Republic of China" (《中華人民共和國價格法》), the "Anti-Monopoly Law of the People's Republic of China" (《中華人民共和國反壟斷法》), the "Tendering and Bidding Law of the People's Republic of China" (《中華人民共和國招標投標法》), and the "Anti-Unfair Competition Law of the People's Republic of China" (《中華人民共和國反不正當競爭法》), and resolutely resist vicious competition through below-cost pricing. It also recommends that downstream power station enterprises optimize tendering and bidding rules by reducing the weighting of price-related factors and increasing the weighting of technical criteria in tender evaluation. Due to strengthened industry self-regulation, capacity adjustments and changes in market supply and demand, prices of PV cells showed an upward trend in the second half of 2025. This price recovery is expected to positively influence the PV sector by fostering a healthier and more orderly market environment. Furthermore, the commencement of large-scale projects in regions such as Xinjiang and Gansu in 2024, along with the policy "Guiding Opinions on Vigorously Implementing the Renewable Energy Substitution Action" (《關於大力實施可再生能源替代行動的指導意見》), is anticipated to support the growth in domestic PV installations.

Future Opportunities and Challenges of PV Silver Powder Industry in China

Expansion of application fields. China's silver powder manufacturers are actively expanding their applications to a wide range of industries, including electronics, chemicals, and medicine. The continuous development of these downstream industries is expected to stimulate the demand for silver powder. For instance, the market size of electronics industry in China in terms of revenue is expected to grow from RMB17.4 trillion in 2025 to RMB23.0 trillion in 2030, with a CAGR of 5.7%, providing broad development opportunities for silver powder manufacturers. By innovating technology and developing new products, silver powder manufacturers continue to improve their competitiveness and diversify their revenue sources by expanding their business portfolio.

Global business expansion. Driven by technological advancements and growing global demand, domestic PV silver powder manufacturers start to expand their business layout to overseas markets. They improve production capabilities and quality standards to meet international requirements and ensure their competitiveness globally. Domestic manufacturers are actively seeking partnerships and collaborations, including acquisitions and the establishment of new production bases, to facilitate their access and growth in overseas markets. Additionally, the global business expansion of downstream PV cell manufacturers and PV silver paste manufacturers also prompts silver powder manufacturers to expand business layout to ensure stable and timely supply.

Increasing localisation rate. During the exploring stage of China's PV silver powder industry before 2020, due to technical barriers, the consumption of PV silver powder in China mainly relied on imports. In recent years, an increasing number of domestic PV silver powder manufacturers have focused on independent research and development and production, and continuously improved their product qualities and performances to enhance their competitiveness. Therefore, PV silver powder by domestic manufacturers has gradually obtained market recognition, with the localisation rate of China's PV silver powder industry in terms of sales volume increasing from 37.0% in 2021 to 96.7% in 2025. In the future, with the further technological advancements, the localisation rate of China's PV silver powder industry in terms of sales volume is expected to further increase to 98.9% by the end of 2030.

Cost control. With the rapid development of China's PV silver powder industry, the competition has become increasingly fierce. In order to increase market shares, many domestic manufacturers attract and retain customers by reducing mark-up, which represents the processing margin for converting silver nitrate into silver powder, leading to a continuous decline in mark-up.

Meanwhile, the continued cost compression in the PV industry has led to higher requirements for cost control in the PV silver powder industry. Therefore, PV silver powder manufacturers have to continuously strengthen their cost control capabilities to maintain competitiveness.

Competitive Landscape of Global and China's PV Silver Powder Industry

The competition in global PV silver powder industry has intensified. Only a limited number of manufacturers are able to establish competitive advantages in technology, capital, and customer resources to capture market share. There were nearly 30 PV silver powder manufacturers in the world as of 31 December 2025. In terms of technology, manufacturers are required to achieve mass production of silver powder with high purity, uniform particle size, and regular morphology, and to continuously adapt to technological iterations such as N-type PV cells, resulting in high technical barriers. In terms of customer resource, the downstream customers are primarily PV silver paste manufacturers, which have stringent requirements for the stability and consistency of PV silver powder. A lengthy certification process is required, and upon passing certification, PV silver powder manufacturers typically establish long-term cooperative relationships with their customers, leading to strong customer stickiness. In terms of capital, large-scale production requires substantial investment in equipment and R&D. Small and medium-sized manufacturers generally find it difficult to bear the initial investment and subsequent costs of capacity expansion. Therefore, the PV silver powder industry is characterized by a relatively concentrated market structure with a limited number of participants.

In terms of sales revenue of PV silver powder in China in 2025, the top five manufacturers in China accounted for approximately 54.2%, among which our Group ranked third, with a market share of 9.3%.

Top Five PV Silver Powder Manufacturers by Sales Revenue in China, 2025

Ranking	Company Name	Headquarter Location	Listing Status	Sales Revenue (Billion RMB)	Market Share (%)
1	Company A	Hubei Province, China	Not Listed	11.1	21.1%
2	Company B	Jiangsu Province, China	Not Listed	6.9	13.1%
3	**Our Group**	**Shandong Province, China**	**—**	**4.9**	**9.3%**
4	Company C	Hubei Province, China	Not Listed	3.2	6.1%
5	Company D	Jiangsu Province, China	Not Listed	2.4	4.6%
Top 5					54.2%

Notes:

(1) The sales revenue of PV silver powder excludes silver powder generated as scrap or substandard products during the production and research processes, and silver powder manufactured and supplied through processing services.

(2) Founded in 2021 and headquartered in Hubei Province, China, Company A is mainly engaged in research and development, production, and sales of silver powder, copper powder, nickel powder and other metal powders, focusing on the customised silver powder for front-side silver paste of PV cells.

(3) Founded in 2012 and headquartered in Jiangsu Province, China, Company B mainly focuses on the research and development, production and sales of optoelectronic functional materials such as silver powder for various types of conductive silver pastes, rare-earth luminescent materials and advanced surface materials.

(4) Founded in 2017 and headquartered in Hubei Province, China, Company C mainly focuses on the research and development, production and sales of precious-metal materials, including silver nitrate, PV silver powder, electronic pastes, precious-metal salts and high-purity metals.

(5) Founded in 2008 and headquartered in Jiangsu Province, China, Company D mainly focuses on the research and development, production and sales of electronic materials and new chemical materials, the product portfolio includes conductive materials, silicone materials, and coating materials.

Source: Interviews Conducted by Frost & Sullivan with Experts from Leading Market Players; Frost & Sullivan Analysis

xBC cells can offer advantages such as higher power output, reduced front-side shading losses, lower degradation, and a favorable temperature coefficient, making them one of the important next-generation PV cell technologies with considerable growth potential. As the PV industry continues to pursue higher conversion efficiency, improved module performance, and differentiated product competitiveness, xBC technology is expected to achieve broader applications in the coming years. Meanwhile, xBC cells generally impose higher requirements on PV silver powder and metallization materials, particularly in terms of high sphericity, fine-line printing capability, electrical conductivity, contact performance and other properties. Therefore, the increasing adoption of xBC cells is expected to accelerate the upgrading of PV silver powder toward more advanced products. The sales revenue of xBC cell silver powders in China reached approximately RMB5.4 billion in 2025 and is expected to reach approximately RMB39.1 billion in 2030, representing a CAGR of 48.6%. The proportion of xBC cell silver powders in the total sales revenue of PV silver powder in China is expected to increase from 10.3% in 2025 to 31.8% in 2030. Driven by the continued increase in xBC cell production, demand for advanced PV silver powder is expected to grow rapidly, creating significant development opportunities for manufacturers with strong R&D capabilities and proven mass-production capacity in advanced silver powder products.

xBC cell silver powders refer to silver powder products that can be used in silver pastes applicable to xBC cells. In terms of sales revenue of xBC cell silver powders in 2025, our Group ranked first in China, demonstrating a leading position in advanced silver powder for xBC cells, an important next-generation PV cell technology.

Top Three xBC Cell Silver Powder Manufacturers by Sales Revenue in China, 2025

Ranking	Company Name	Headquarter Location	Listing Status	Sales Revenue (Billion RMB)
1	**Our Group**	**Shandong Province, China**	**—**	**2.5**
2	Company A	Hubei Province, China	Not Listed	0.3
3	Company E	Tokyo, Japan	Not Listed	0.2
Top 3				3.0

Notes:

(1) The sales revenue of xBC cell silver powder excludes silver powder generated as scrap or substandard products during the production and research processes, and silver powder manufactured and supplied through processing services.

(2) Founded in 2006 and headquartered in Japan, Company E is a company specialising in electronics materials. The company has three major businesses, including semiconductor, electronics materials and advanced fine materials. The electronics materials business produces and sells materials such as silver powder and silver oxide powder.

Source: Interviews Conducted by Frost & Sullivan with Experts from Leading Market Players; Frost & Sullivan Analysis

Entry Barriers of PV Silver Powder Industry

Technical barriers. The production technologies of PV silver powder have relatively high requirements, involving multiple aspects such as the ability to control particle size, crystallinity (結晶度), sintering activity (燒結活性), and dispersibility of silver powder, mass production capacity, single-batch production volume, and inter-batch consistency, as well as crucial product application characteristics including printability, conductivity, and reliability of the silver paste produced by

silver powder. Meanwhile, PV silver powder manufacturers need to have a talent reserve to quickly respond to changes in PV cell technologies. However, it is difficult for new entrants to have sufficient technical and talent reserve in a short period of time.

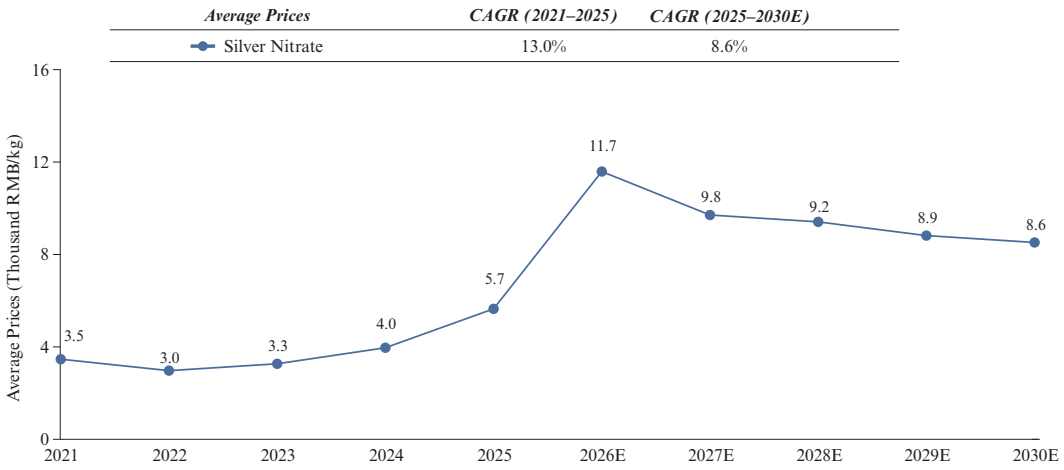
Capital barriers. The PV silver powder industry requires significant capital investment in production facilities, research and development, and procurement of raw materials such as silver nitrate. Therefore, leading participants with sufficient capital investment can better seize market opportunities in a fast-moving industry. For instance, they can optimise the production processes to improve their products in response to technological iterations of PV cells. However, new entrants may face great challenges to obtain sufficient capital support to maintain their competitiveness.

Brand and customer resource barriers. The downstream customers of PV silver powder manufacturers are primarily PV silver paste manufacturers, who raise high requirements for the quality and performance of PV silver powder and conduct stringent evaluations when selecting suppliers. Meanwhile, since the production of silver paste requires formulating different types of silver powders, PV silver paste manufacturers have the preference to cooperate with PV silver powder manufacturers who are familiar with their specific needs and can quickly respond to their technological changes. Established manufacturers enjoy strong reputations and long-term strategic relationships with downstream customers. However, it is difficult for new entrants to obtain customer recognition and build similar customer relationship within a short period of time.

Average Price of Raw Material

The average price of silver in China increased from RMB4.6 thousand per kg to RMB8.6 thousand per kg from 2021 to 2025, with a CAGR of 16.9%, and it is projected to reach RMB13.0 thousand per kg in 2030, growing at a CAGR of 8.6% from 2025 to 2030. Silver nitrate is the major raw material of PV silver powder and its average price is primarily affected by the average price of silver. From 2021 to 2025, the average price of silver nitrate in China increased from approximately RMB3.5 thousand per kg to RMB5.7 thousand per kg, with a CAGR of 13.0%. In the future, the average price of silver nitrate in China is expected to reach approximately RMB8.6 thousand per kg, growing at a CAGR of 8.6% from 2025 to 2030.

Average Price (Excluding VAT) of Silver Nitrate (China), 2021–2030E



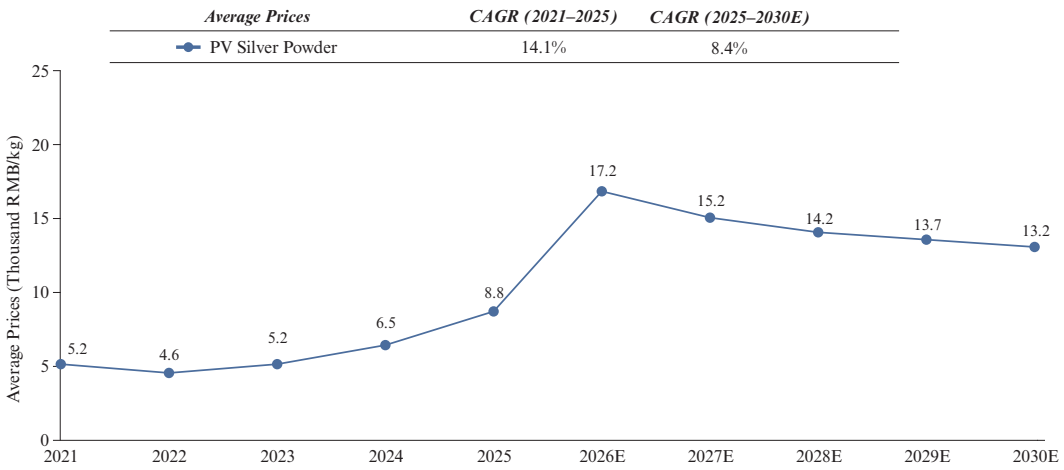
Source: London Metal Exchange; Shanghai Gold Exchange; Frost & Sullivan Analysis

Average Price of PV Silver Powder

The average price of PV silver powder in China is primarily affected by the average price of silver nitrate which is the major raw material, as well as the mark-up that accounts for the processing of silver nitrate into silver powder by PV silver powder manufacturers. The average price of PV silver powder in China demonstrated and is expected to maintain an overall upward trend mainly due to the increase in average selling price of silver nitrate. However, the mark-up by PV silver powder manufacturers experienced and is expected to maintain a decrease due to the intensified competition. The average price of PV silver powder in China grew from approximately RMB5.2 thousand per kg in 2021 to RMB8.8 thousand per kg in 2025, with a CAGR of 14.1%. In 2022, the average price of PV silver powder in China experienced a decline mainly due to the decrease in average price of silver nitrate.

In the future, the average price of PV silver powder in China is expected to reach approximately RMB13.2 thousand per kg, growing at a CAGR of 8.4% from 2025 to 2030.

Average Price (Excluding VAT) of PV Silver Powder (China), 2021–2030E



Source: London Metal Exchange; Shanghai Gold Exchange; Frost & Sullivan Analysis

CHINA'S PV SILVER PASTE INDUSTRY

Definition and Overview of PV Silver Paste

PV silver paste is a viscous slurry composed of high-purity silver powder serving as the conductive phase, glass oxide serving as the bonding phase, and resin and solvents serving as the organic carrier. PV silver paste is a crucial material for the production of metal electrodes in PV cells, and its product performance and production process directly influence the photoelectric conversion efficiency of solar cells. Among the major raw materials of PV silver paste, the quality of silver powder directly impacts the conductive performance of PV cells. Therefore, the selection of appropriate silver powder for the silver paste formulation is important.

The PV silver paste industry in China has high technical barriers, which imposes stringent requirements on research and development capabilities, production technologies, and quality control. As of 31 December 2025, there were more than 30 PV silver paste manufacturers in China, among which the top five manufacturers accounted for approximately 60.0% in terms of sales revenue in 2025.

Market Size of PV Silver Paste Industry in China

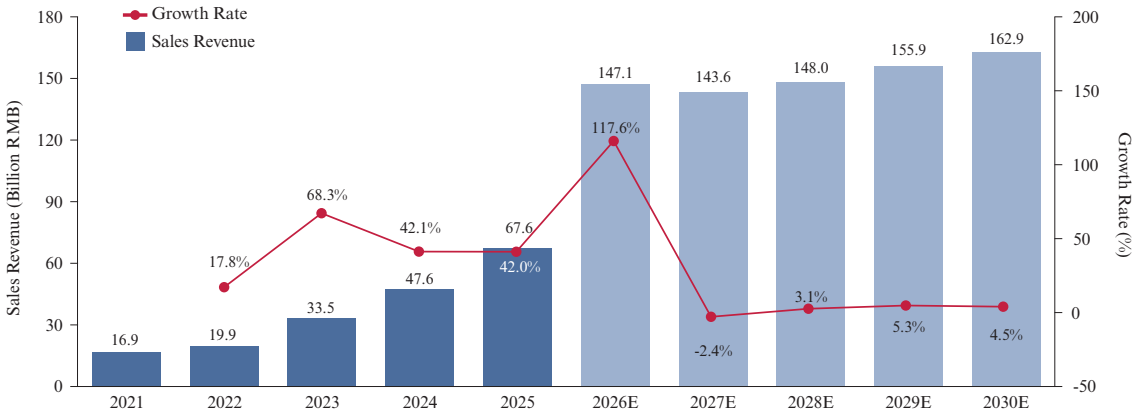
Driven by a surge in downstream demand from PV industry, rapid penetration of N-Type cells, and continuous technological innovation, the PV silver paste industry in China has experienced a rapid increase in recent years. Due to the continuous increase in sales volume of PV silver paste, the sales revenue of PV silver paste in China increased from approximately RMB16.9 billion in 2021 to RMB67.6 billion in 2025, growing at a CAGR of 41.4%.

Driven by the further development of PV cell industry, the sales revenue of PV silver paste in China is expected to reach approximately RMB162.9 billion, representing a CAGR of 19.2% from 2025 to 2030.

In 2021, the surge in installed capacity of PV cells boosted the demand for PV silver paste, which resulted in an increase by 39.7% of sales revenue in China's PV silver paste industry. In 2022, mainly due to a decline in the average price of PV silver paste, as well as the stabilized consumption of PV silver paste as PERC cell technology matured, the growth of sales revenue in China's PV silver paste industry slowed down, reaching 17.8%. In 2023, the sales revenue in China's PV silver paste industry experienced a significant increase by 68.3%, primarily due to the large-scale deployment of N-type cells, which consume more silver paste per unit than PERC cells, thereby driving a significant increase in demand for PV silver paste. In 2026, the sales revenue of PV silver paste in China is expected to witness a significant increase primarily due to a surge in the average price of PV silver paste.

Sales Revenue of PV Silver Paste (China), 2021–2030E

Sales Revenue	*CAGR (2021–2025)*	*CAGR (2025–2030E)*
China	41.4%	19.2%



Source: China Photovoltaic Industry Association; Frost & Sullivan Analysis

CHINA'S PV CELL INDUSTRY

Definition and Overview of PV Cell Industry

PV cells refer to semiconductor devices manufactured by processing silicon wafers, which can generate voltage under certain lighting conditions and produce current when there is a circuit, thus converting solar energy into electrical energy. According to the specific dopant elements employed, PV cells can be classified into P-type and N-type, with P-type represented by PERC cells and N-type encompassing various technologies such as N-type TOPCon cells, N-type HJT cells, and N-type xBC cells.

In recent years, P-type PERC cells have been the mainstream technology in the PV industry due to mature technologies and lower manufacturing costs compared with other types of PV cells in large-scale mass production. However, as the PV industry continues to grow and the efficiency of

P-type PERC cells approaches its theoretical cap, the challenges in meeting the evolving demands for enhanced efficiency and cost reduction in solar power generation intensify. Consequently, in seeking new industry breakthroughs, leading market participants have gradually turned their attention to N-type cells, which in turn led to a rapid increase in production and market adoption. In 2025, N-type cells reached a market share of approximately 96.9% in terms of production volume.

The PV cell industry in China is relatively fragmented. As of 31 December 2025, there were approximately 250 PV cells manufacturers in China, among which the top five manufacturers accounted for 31.2% in terms of sales volume and 40.1% in terms of sales revenue in 2025.

The PV cell industry in China is facing the risk of overcapacity, which typically leads to a decline in PV cell prices as manufacturers compete to offload their surplus stocks, initiating a price war that can substantially erode profit margins. To maintain profitability, PV cell manufacturers have been actively working to decrease raw material costs and impose stricter pricing and payment terms on their suppliers, potentially intensifying competition within the PV silver powder industry. Therefore, PV silver powder manufacturers in China have to adjust their payment terms and mark-up levels to maintain customer relationships and enhance their market presence. Simultaneously, efforts are being made to address the overcapacity in the PV cell industry in China. Intense competition over the past year has led to the removal of outdated production capacities (referring to the capacity that significantly lags behind the current mainstream industry standards in core indicators such as technological route, conversion efficiency, energy consumption, and environmental protection, lacks market competitiveness, and does not align with the direction of industrial development) and the exit of many small-scale enterprises from the market. In addition, as the clearance of outdated production capacity of PV cells accelerates, technological iteration has become the core driving force, fueling the rapid penetration of high-efficiency PV cell technologies such as N-type TOPCon, HJT, and xBC. The development trend of PV related industries is shifting from capacity expansion to technology-driven value enhancement, and market share is expected to increasingly concentrate in leading enterprises with strong technical capabilities and economies of scale.

Over the past few years, the PV cell industry has experienced significant technological iteration, shifting from P-type cells to N-type cells. In terms of PV cell production volume in China, the market share of N-type cells increased significantly from 26.5% in 2023 to 79.4% in 2024, and further increased to 96.9% in 2025. A similar technology transition has also been observed in the global PV cell industry, as China accounts for the majority of global PV cell production, representing approximately 90% of global production volume in 2025, and N-type cell technologies have become the mainstream technology route for global PV cell manufacturing. Such technological transition led to the gradual phase-out of obsolete production capacity, while manufacturers that strategically invested in new technologies at an early stage captured greater market share by leveraging their first-mover advantages and economies of scale. In terms of production volume, the market share of the top five PV cell manufacturers in China remained stable at approximately 30% in 2024 and 2025. Moreover, as China accounts for the majority of global PV cell production, the competitive landscape of the global PV cell industry is primarily driven by Chinese manufacturers. In terms of production volume, the market share of the top five global PV cell manufacturers remained stable at approximately 27% in 2024 and 2025. Therefore, as the transition from P-type cells to N-type cells became largely completed and outdated production capacity was gradually phased out, the consolidation of companies in China's PV cell industry has shown signs of stabilisation since 2025.

The increasing market concentration among leading PV cell manufacturers may enhance their bargaining power over PV silver paste suppliers to some extent, particularly in relation to pricing, payment terms and supplier qualification standards, and such pressures may in turn be transmitted upstream to PV silver powder manufacturers. However, such bargaining pressure is expected to be mitigated for leading PV silver powder manufacturers with strong technical capabilities, stable mass-production capabilities and established customer relationships, such as the Group. The primary reasons include: (i) PV silver powder is a key functional material that directly affects the performance of PV silver paste and the conversion efficiency of PV cells. PV silver paste manufacturers generally impose stringent requirements on product performance, quality consistency

and supply stability, and the introduction and verification cycle for qualified suppliers is relatively lengthy, resulting in strong customer stickiness; and (ii) PV silver powder products tailored for advanced cell technologies have relatively high technical barriers in areas such as particle size control, purity, morphology control, dispersibility and batch-to-batch consistency, thereby limiting the substitutability of qualified suppliers and reducing the likelihood of downstream customers switching suppliers solely based on pricing considerations.

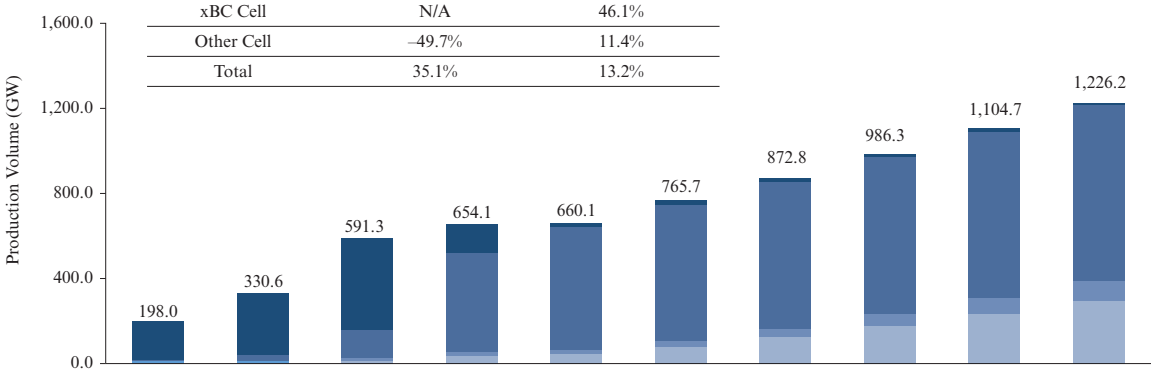
Market Size of PV Cell Industry in China

PV cells can be classified into P-type and N-type, with P-type represented by PERC cells and N-type encompassing various technologies such as N-type TOPCon cells, N-type HJT cells, and N-type xBC cells.

Driven by (i) carbon neutrality and energy security concerns, (ii) economic viability, technological progress and mass production, and (iii) integrated energy storage system providing complementary solutions, the PV cell industry in China has experienced a rapid increase in recent years. The production volume of PV cells in China increased from 198.0 GW in 2021 to 660.1 GW in 2025, with a CAGR of 35.1%. During the same period, the production volume of PERC cell, TOPCon cell, HJT cell and other cell in China grew at a CAGR of –42.4%, 234.8%, 71.2% and –49.7%, respectively. With the growing market demand, the production volume of PV cells in China is expected to reach 1,226.2 GW by 2030, with a CAGR of 13.2% from 2025 to 2030. During the same period, the production volume of PERC cell, TOPCon cell, HJT cell, xBC cell and other cell in China is expected to grow at a CAGR of –9.1%, 7.4%, 39.8%, 46.1% and 11.4% from 2025 to 2030, respectively.

Production Volume of PV Cell (China), 2021–2030E

Production Volume	*CAGR (2021–2025)*	*CAGR (2025–2030E)*
PERC Cell	–42.4%	–9.1%
TOPCon Cell	234.8%	7.4%
HJT Cell	71.2%	39.8%
xBC Cell	N/A	46.1%
Other Cell	–49.7%	11.4%
Total	35.1%	13.2%



	2021	2022	2023	2024	2025	2026E	2027E	2028E	2029E	2030E
Total	198.0	330.6	591.3	654.1	660.1	765.7	872.8	986.3	1,104.7	1,226.2
PERC Cell	180.5	290.9	431.6	134.1	19.8	19.9	19.2	17.8	15.5	12.3
TOPCon Cell	4.6	27.4	136.0	465.0	578.2	640.8	690.4	734.8	783.2	826.4
HJT Cell	2.0	2.0	15.4	21.6	17.2	27.6	40.1	55.2	72.9	92.0
xBC Cell	0.0	0.7	5.3	32.7	44.2	76.6	122.2	177.5	232.0	294.3
Other Cell	10.9	9.6	3.0	0.7	0.7	0.8	0.9	1.0	1.1	1.2

Source: China Photovoltaic Industry Association; Frost & Sullivan Analysis

SOURCE AND RELIABILITY OF INFORMATION

In connection with the [REDACTED], we engaged an independent market research consultant, Frost & Sullivan, to conduct an analysis of, and to prepare an industry report on the industries where we operate with a commission fee of RMB764,000. Founded in 1961, Frost & Sullivan is an

independent global consulting firm that conducts industry research and prepares industry report on a wide range of industries, among other services. The information from Frost & Sullivan disclosed in this document is extracted from the Frost & Sullivan Report with its consent.

In compiling and preparing the Frost & Sullivan Report, Frost & Sullivan used the following key methodologies to collect multiple sources, validate the collected data and information, and cross-check each respondent's information and expressions against those of others: (i) detailed primary research, which involved discussing the status of the industry with leading industry participants and industry experts; and (ii) secondary research, which involved reviewing published sources including reports of market participants, independent research reports and data based on Frost & Sullivan's own research database.

Frost & Sullivan adopted the following primary assumptions while making projections for preparing the Frost & Sullivan Report: (i) global and China's economy is likely to maintain steady growth in the next decade; (ii) global and China's social, economic, and political environment is likely to remain stable in the forecast period; and (iii) market drivers like growing downstream demand, improving product performance, favourable policies, among others.

Except as otherwise noted, all of the data and forecasts contained in this section are derived from the Frost & Sullivan Report. Our Directors confirm that after taking reasonable care, there is no material adverse change in the overall market information since the date of the Frost & Sullivan Report that would materially qualify, contradict, or have an impact on such information.