Trends of PV industry

20 April 2026, Snapshot of Global PV Markets and Industry Insights, Webinar

Izumi KAIZUKA, Co-Manager IEA PVPS Task 1/ Director, RTS Corporation
Junko Okazaki, Senior Researcher, RTS Corporation

Contents : Some updates after Trends Report

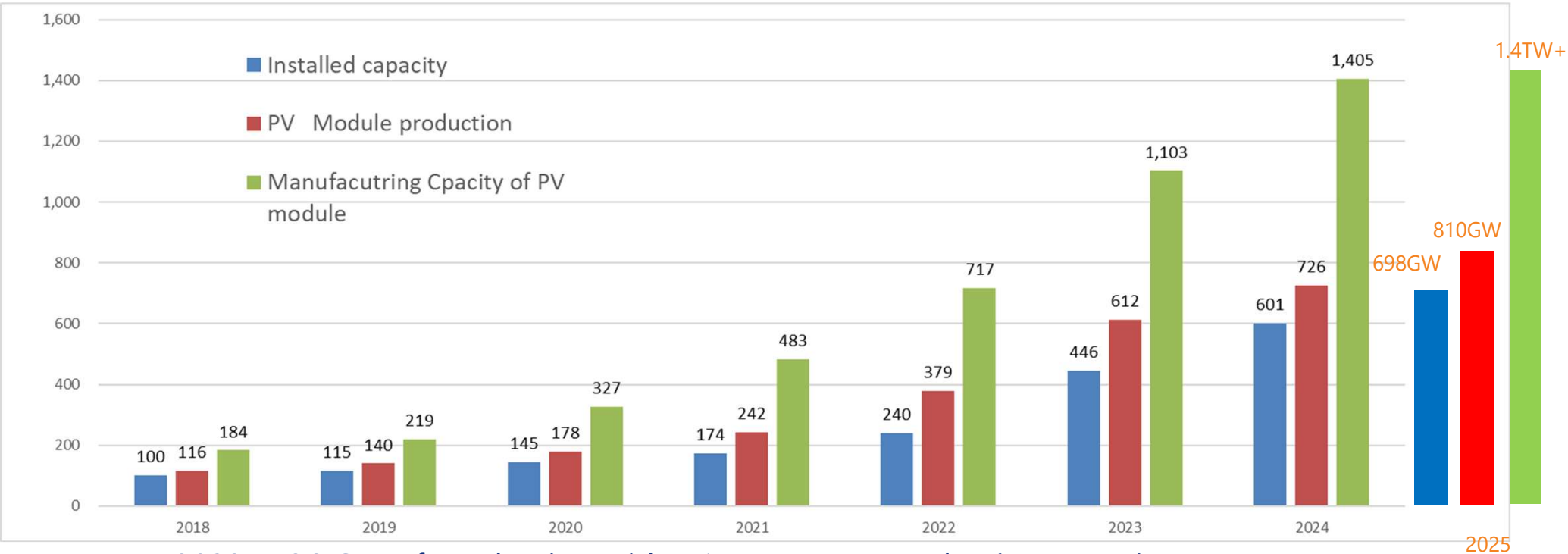
- Methodology
- 2025 preliminary production and capacity of PV modules and some trends
- Regional trends: China, India, USA and diversification of production bases
- Price trends with the impact of middle east crisis

Note: Detailed industry analysis is ongoing for Trends Report published in Autumn 2026

Methodology since 2012

- RTS Corporation, established in 1983, based in Tokyo. More than 40 yeas of PV market intelligence and consulting
- RTS conducts primary survey for production amount and production capacity with global partners in major manufacturing countries
- Task 1 experts and supplementary information from industry associations such as CPIA, SEIA and SolarPower Europe (SPE) also contribute the analysis

Installation, PV module production and capacity



- 2023 : 736 GW of production with >1.4 TW/year production capacity
- Capacity enhancement is slowing down in China. Active in USA and India
- Manufacturing capacity was almost flat

Source : IEA PVPS, Trends Report 2024

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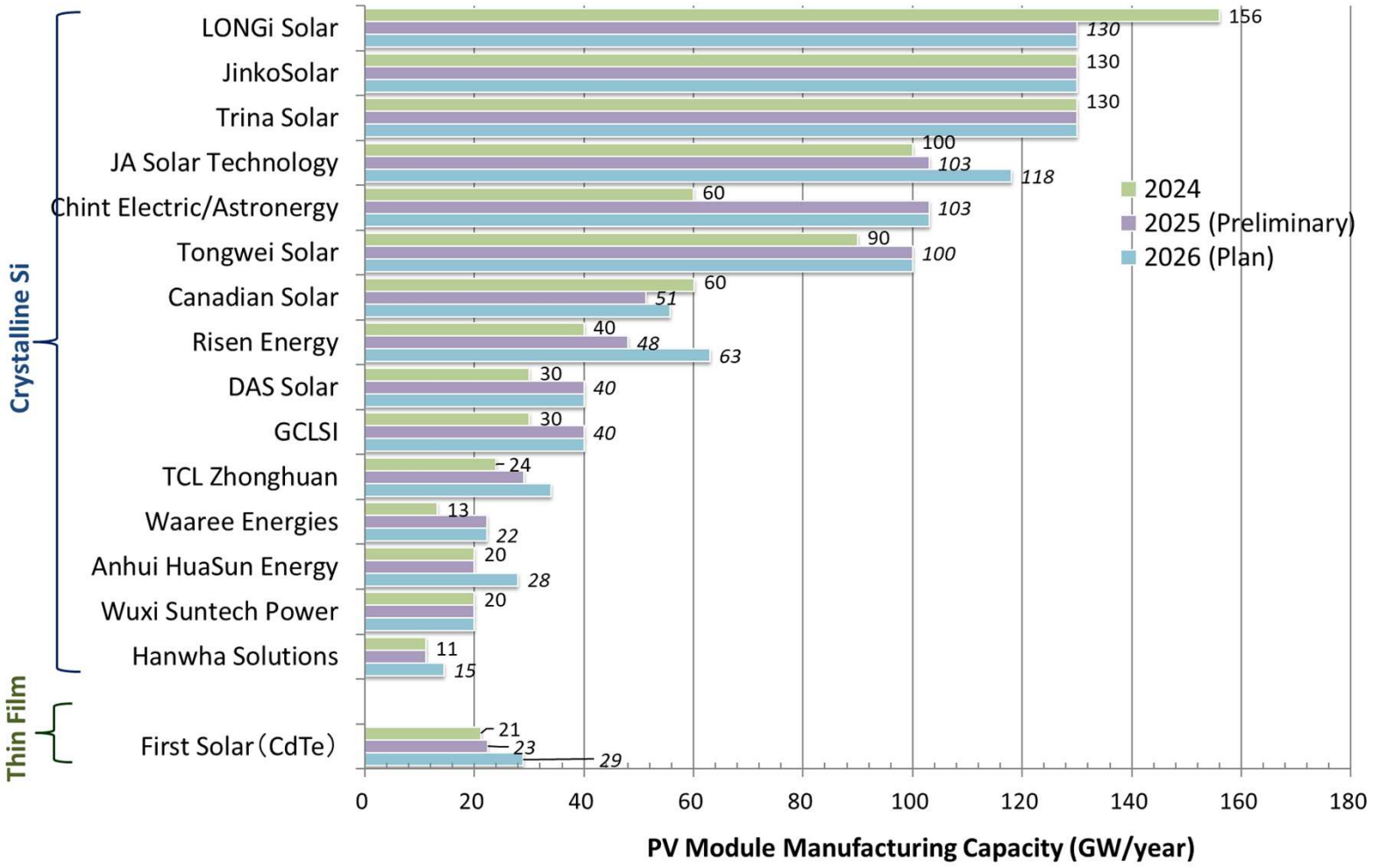
Production capacity by company



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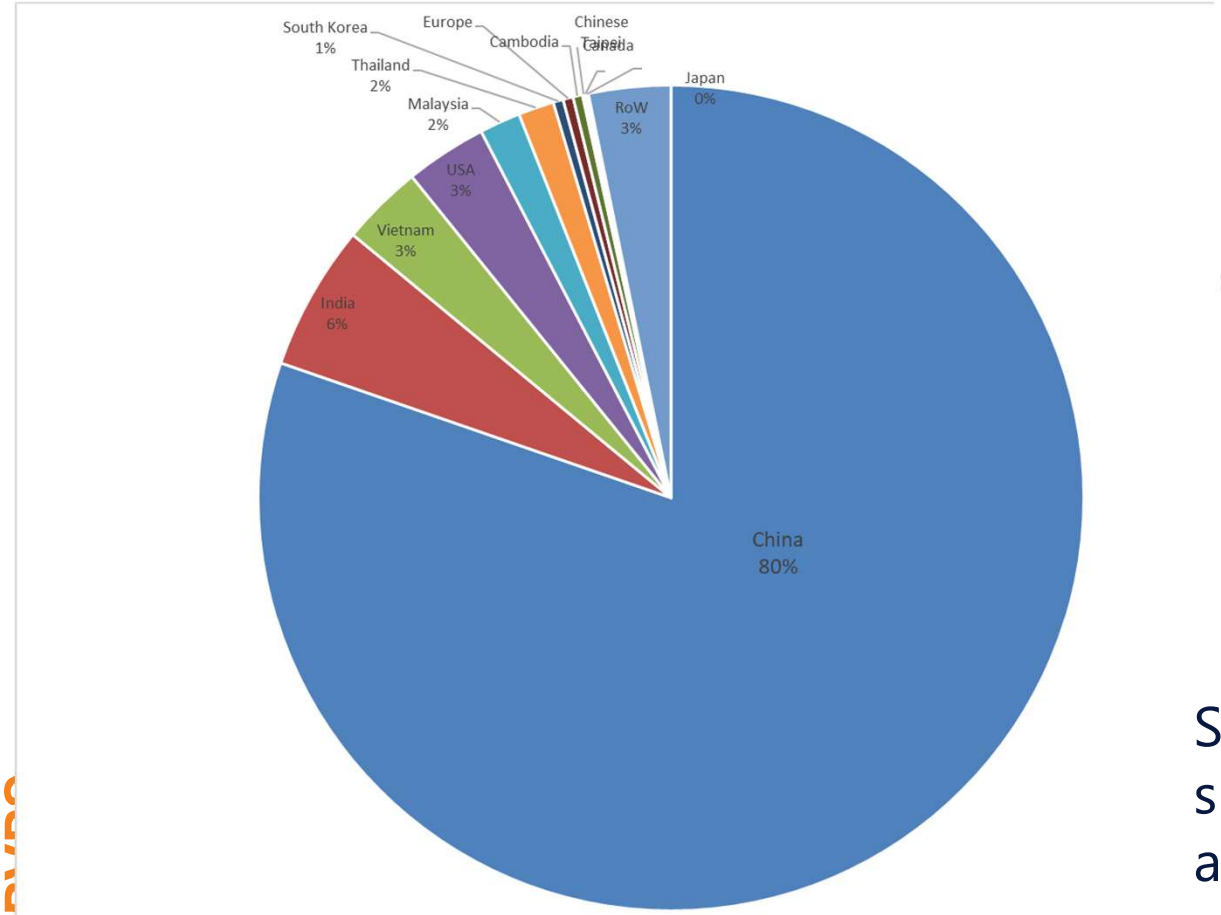
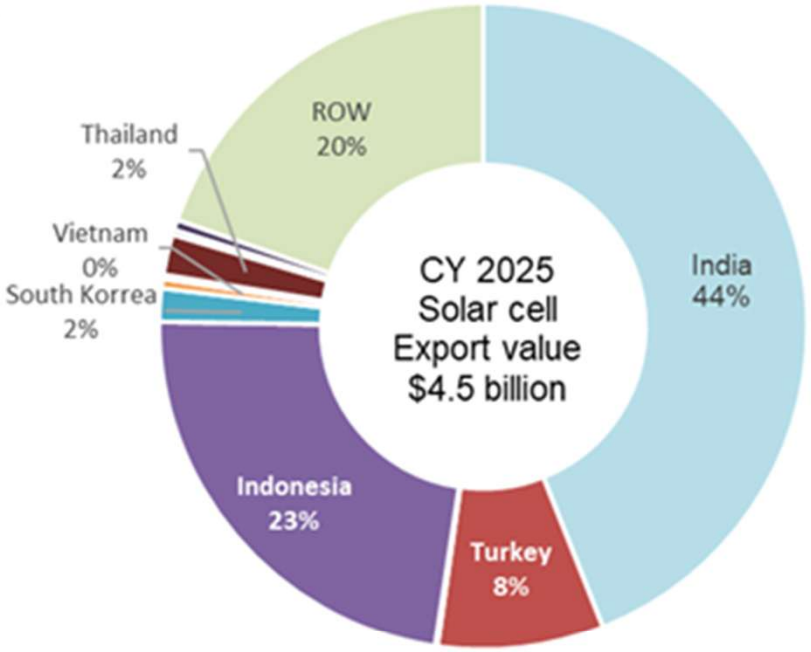
China accounts for 80% of PV module production in 2025

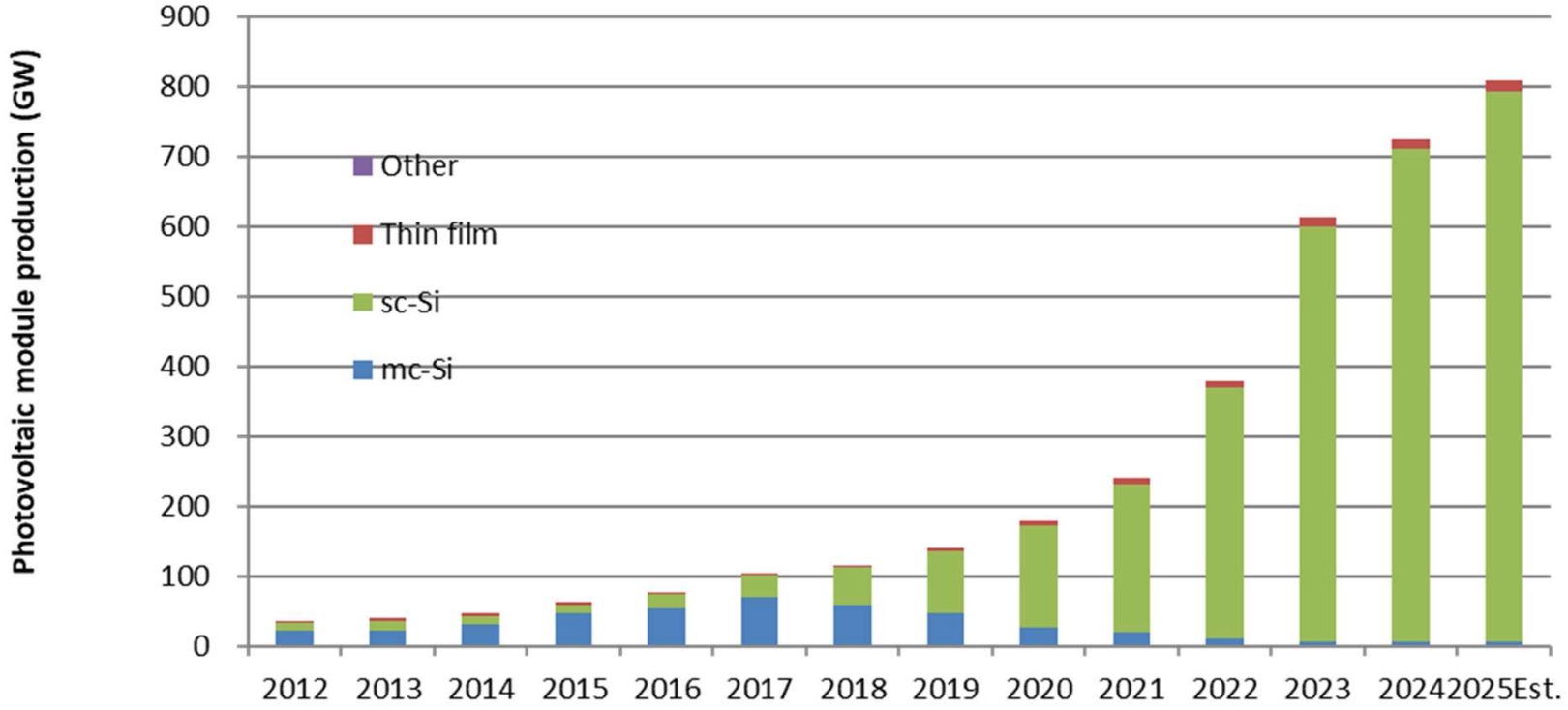
1st : China 80%, 2nd India 5 % 3rd : Vietnam, USA 3%





Solar cell destination from China shows where PV modules are assembled

Share of PV module technologies



- Crystalline silicon technology has been dominating the market
- Thin film production is less then 20 GW in 2025 (mainly CdTe)
- Perovskite PV module shipped for mainly for demonstration and reported amount is not visible in the chart

Companies conducting R&D of perovskite and tandem solar cells

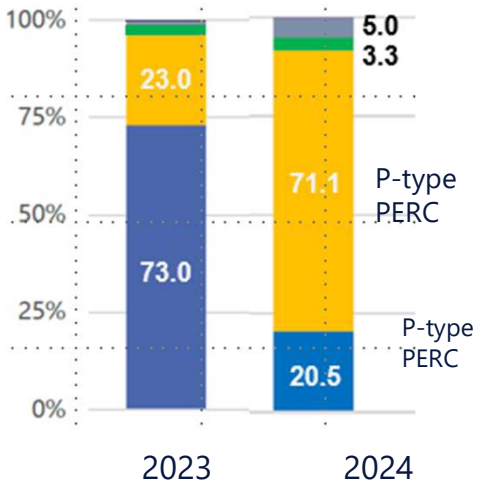
Source: Compiled by RTS Corporation from press releases, materials, and papers from various organizations (as of October 2025)

* Including ultra-thin glass

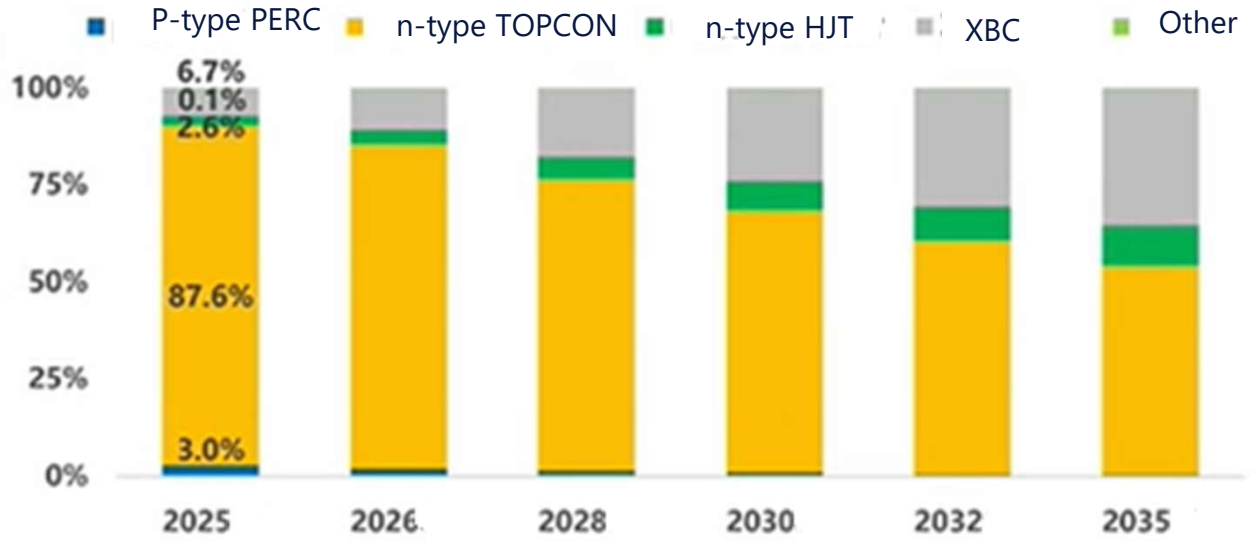
**When the top cell is not perovskite, indicate it in parentheses

Technology Trends

Technology Trends of Solar cell



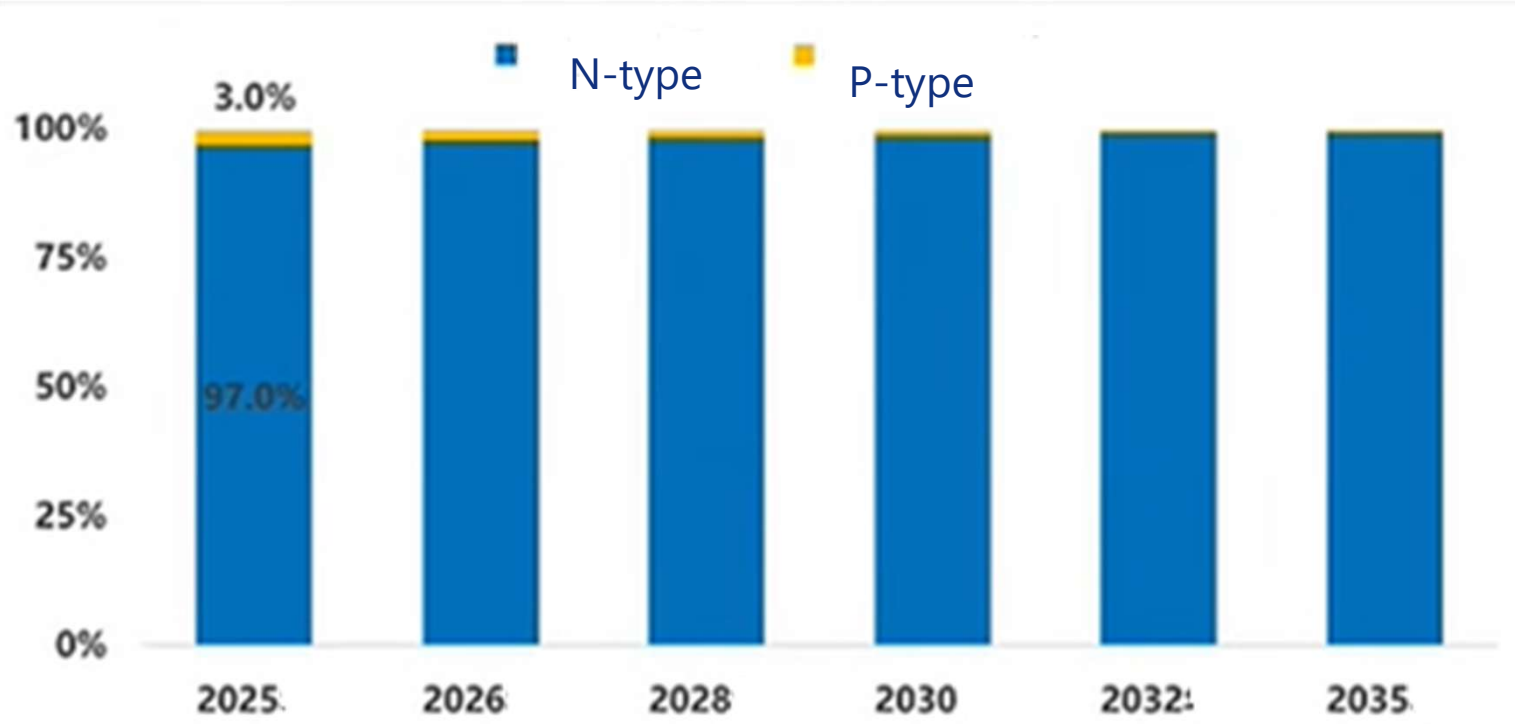
Source: Shanghai HIUV New materials(Feb. 2025)



Source: CPVIA Roadmap (Feb. 2026)

- In 2023, major technology was PERC. Since 2024 Topcon took over the majority
- Share of HJT and XBC (back contact technologies) are gradually increasing
- Production capacity as of the end of 2025 (estimated by RTS)
  - TOPCon : 988 GW/year, HJT : 100 -150 GW/year, XBC: 70 GW/year

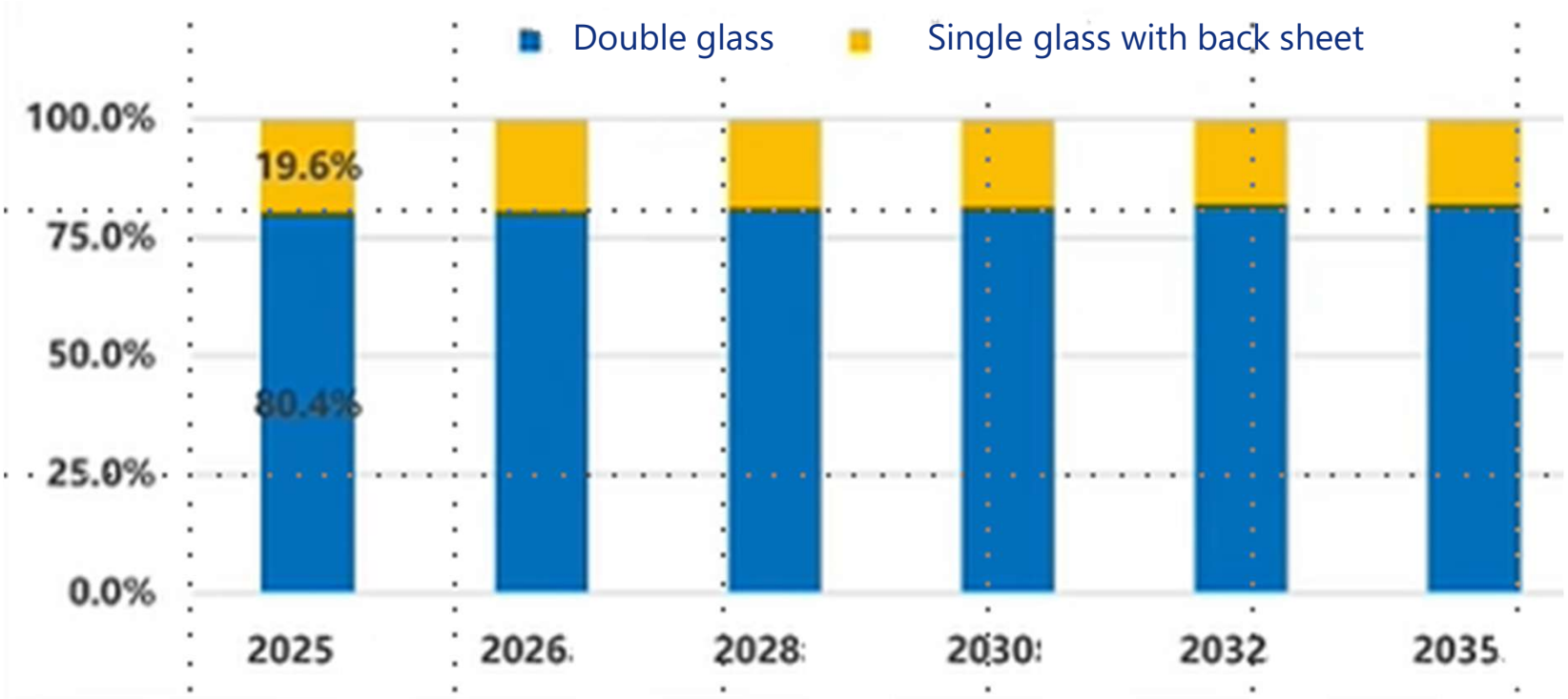
Technology trends : n-type or p-type



Source: CPVIA Roadmap (Feb. 2026)

- N-type dominates in the market because of higher efficiency cells
- P-type share remains very small but space application needs p-type silicon with better radiation resistance. With the increase of space market, production amount is expected to increase

Trends of PV module: double- and single- glass



- 80% of PV modules are double glass. Advantages of power generation increase with bifacial cells, longer lifetime (25 years, 35 years)
- Need to consider logistics, recycling, etc.
- Glass break failure needs to be addressed for hail, heavy wind, etc.

Regional Trends

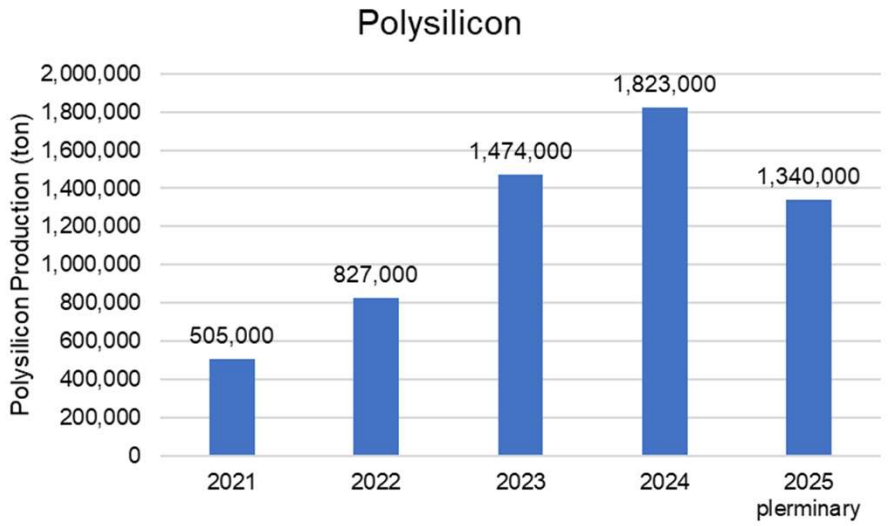
- The government has announced it would implement measures to address the intense internal competition within the industry
- The government plans to proceed with measures such as eliminating excess production capacity
- Starting April 1, 2026, the 9% value-added tax (VAT) refund on exported products will be eliminated, price rise of exported products is expected.
- Costs of raw materials such as silver is increasing, PV manufacturers hope to increase price but weak domestic market may affect lowering level price

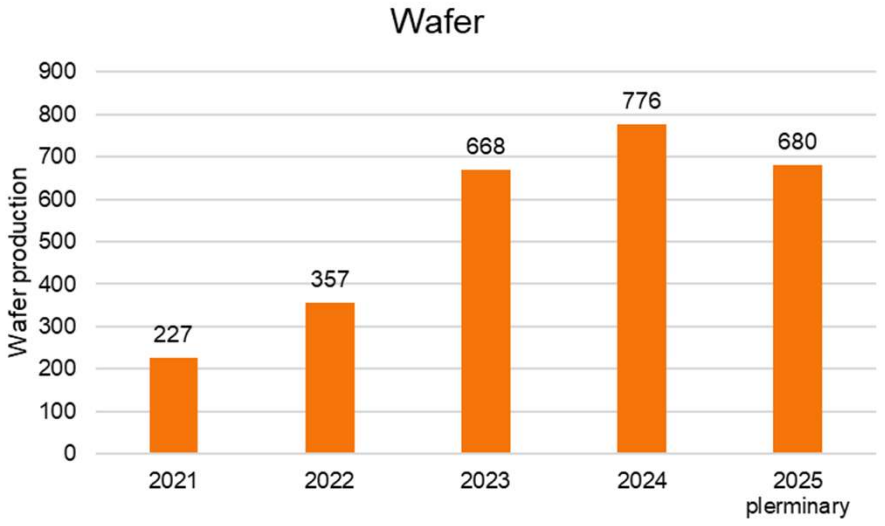
- By the end of 2025, production capacity is expected to grow to more than double domestic demand, raising concerns about oversupply
- Wafer and cell production capacity also expected to increase.

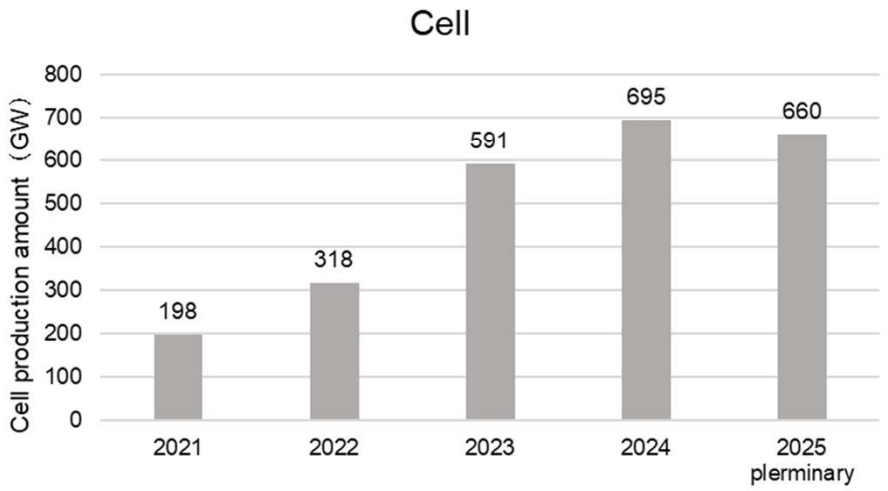
- Production capacity for PV modules sufficient to meet domestic demand by the end of 2025
- Wafer and cell manufacturing started

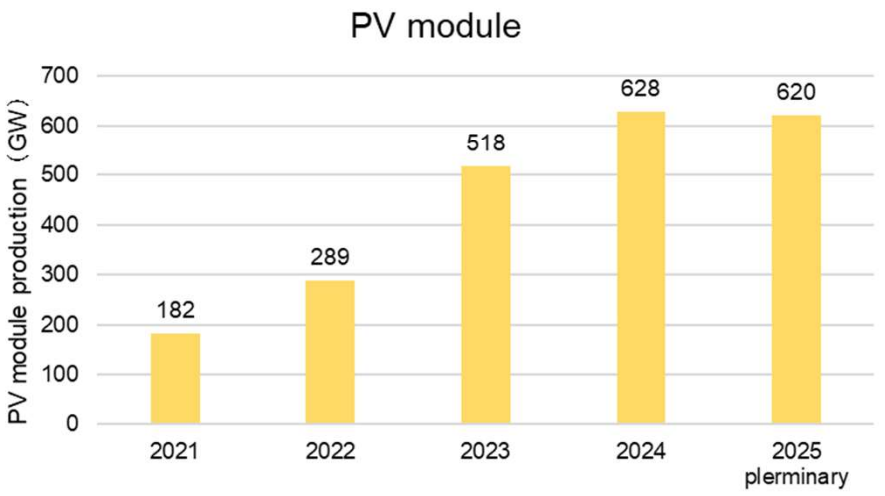
- Starting in 2026, under the Net-Zero Industry Act (NZIA), non-price criteria are expected to be imposed on tenders in EU member states, leading to an anticipated increase in demand for locally produced goods

Production in China









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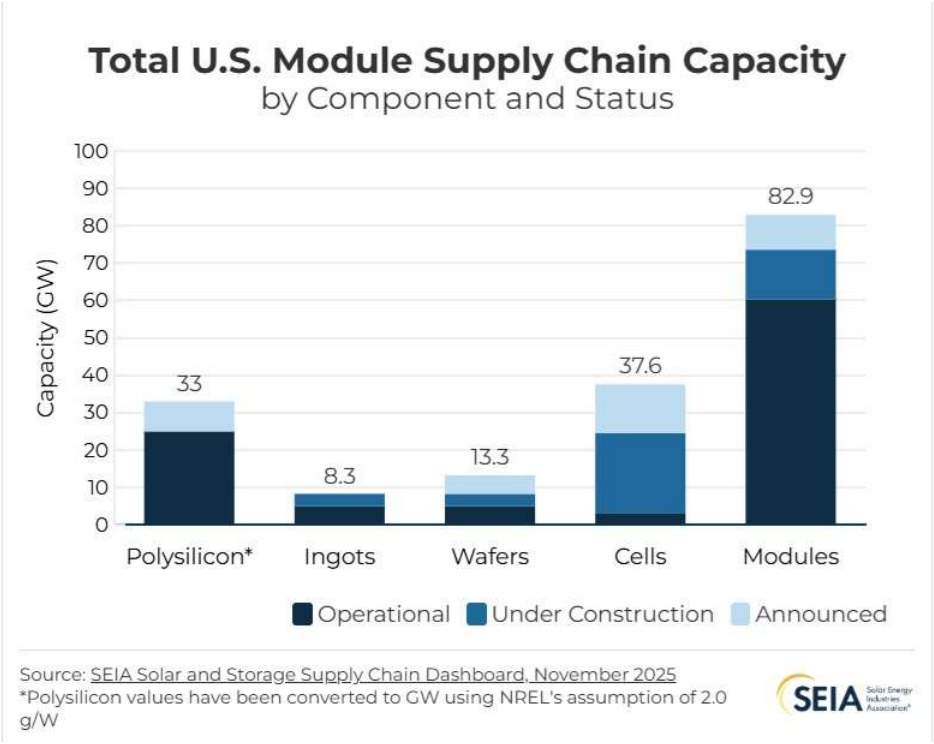
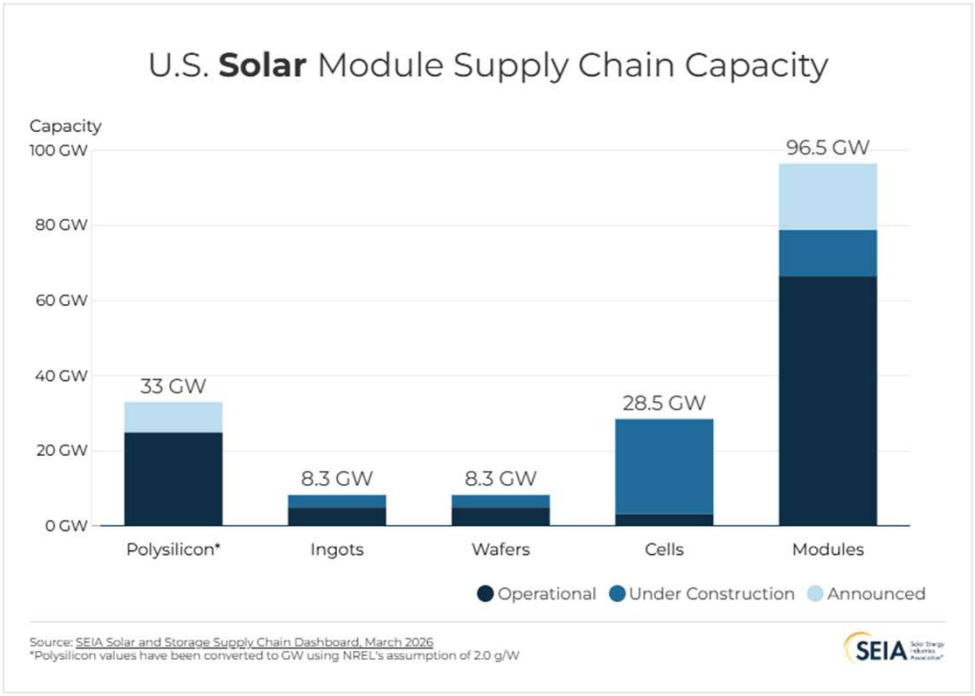
Outlook of Net income attributable to shareholders of major PV manufacturers

Company	Net income attributable to shareholders in 2025	
Jiangxi Jinko (A major manufacturing company of JinkoSolar)	▲5.9 billion - 6.9 billion RMB	▲860 million - 1 billion USD
LONGi Green Energy Technology	▲6 billion – 6.5 billion RMB	▲870 million - 940 million USD
JA Solar Technology	▲4.5 billion – 4.8 billion RMB	▲653 million - 696 million USD
Trina Solar	▲6.5 billion - 7.5 billion RMB	▲940 million - 1.1 billion USD
Tongwei　Group	▲9 billion - 10 billion RMB	▲1.3 billion - 1.45 billion USD
CSI Solar (A major manufacturing company of Canadian Solar)	▲0.9 billion　- 1.1 billion RMB	▲130 million – 160 million USD
GCL System Integration Technology（GCLSI）	▲0.89 billion – 1.29 billion RMB	▲130 million – 187 million USD
Risen Energy	▲2.3 billion – 2.9 billion RMB	▲334 million – 420 million USD

- From January to March, demand for exports has increased ahead of the abolition of the value-added tax, but domestic demand in China remains sluggish.
- Due to the continued slump of prices, major PV manufacturers are expected to report significant net losses in their 2025 financial results.

Local Production: USA





- SEIA's estimation of cell capacity is 3.2 GW/year with Corning's announcement
- Wafer production also started in USA
- Some manuactuing plans were cancelled: Wafer and cell production capacity decreased!

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US imposing duties to PV cell/modules

- US imposes duties to imported solar products
- Trump administration2.0 imposed duties on products from Southeast Asia
- Due to reciprocal tariffs, imported PV products are now subject to multiple layers of duties.
- However, as the reciprocal tariffs and measures imposed under the International Emergency Economic Powers Act (IEEPA) are currently being challenged in the U.S. court, the future trajectory of these policies remains uncertain.

World wide
- Reciprocal duty (depending on country)
- Safeguard Duty（14% in 2025）
- Section 232 National Security Investigation of Imports of Polysilicon and Its Derivatives (under investigation

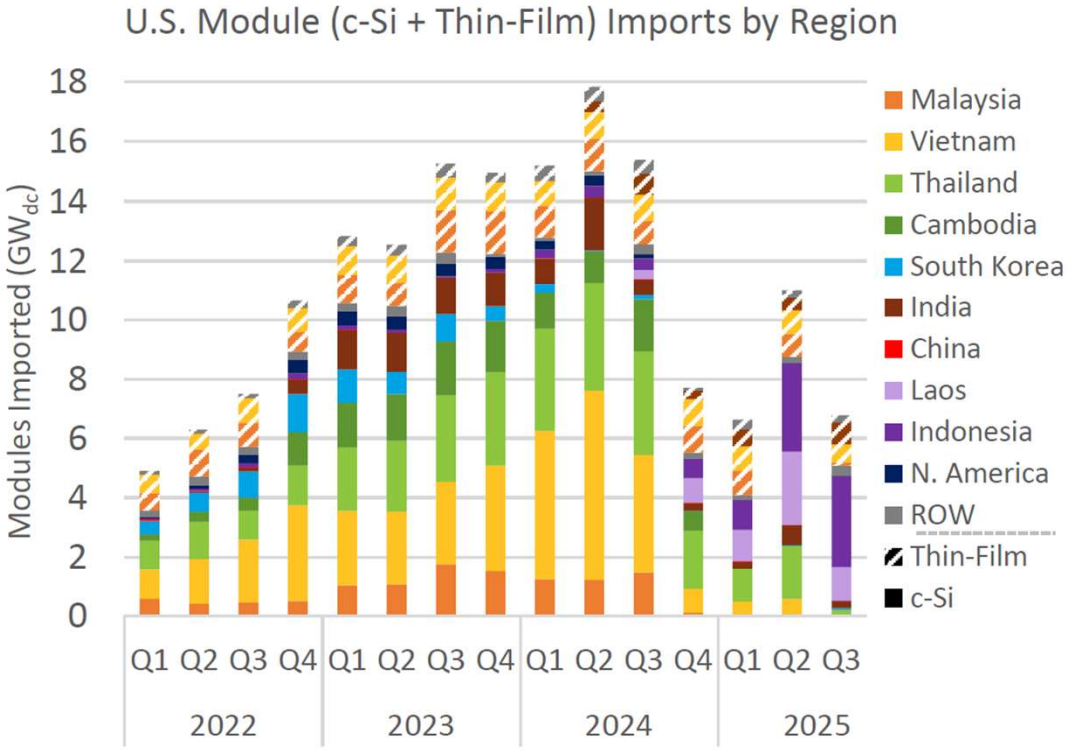
China
- AD and CVD (2012, 2014(China+Chinese Taipei))
- Sanctions against China under Sec. 301 of the U.S. Trade Act
- Tariff Measures under the International Emergency Economic Powers Act (IEEPA)

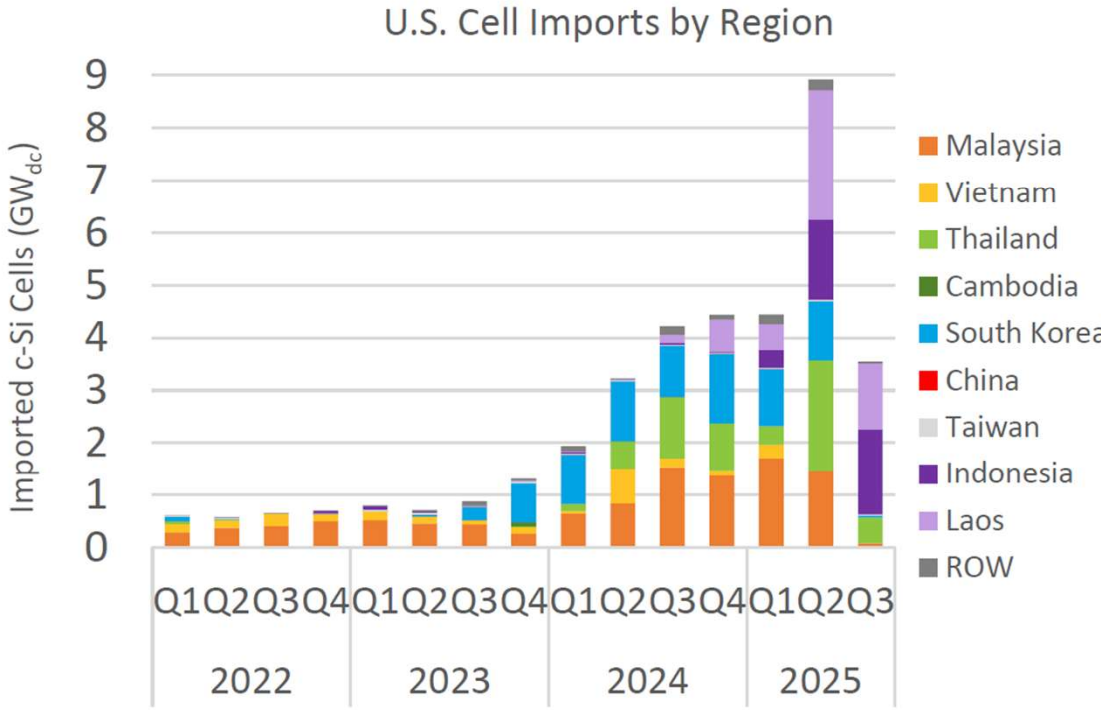
Cambodia, Malaysia, Thailand and Vietnam
- Anti-circumvention measures : AD and CVD

India
- CVD
- Additional sunction tariff for importing Russian crude oil 25%→ 18%

Indonesia, Laos
AD and CVD under investigation

US Cell/Module imports by region





Source: D. Feldman, et. al., NRL, "Fall 2025 Solar Industry Update", Nov. 2025

- Because of the imposed duties, exported countries to USA changing significantly

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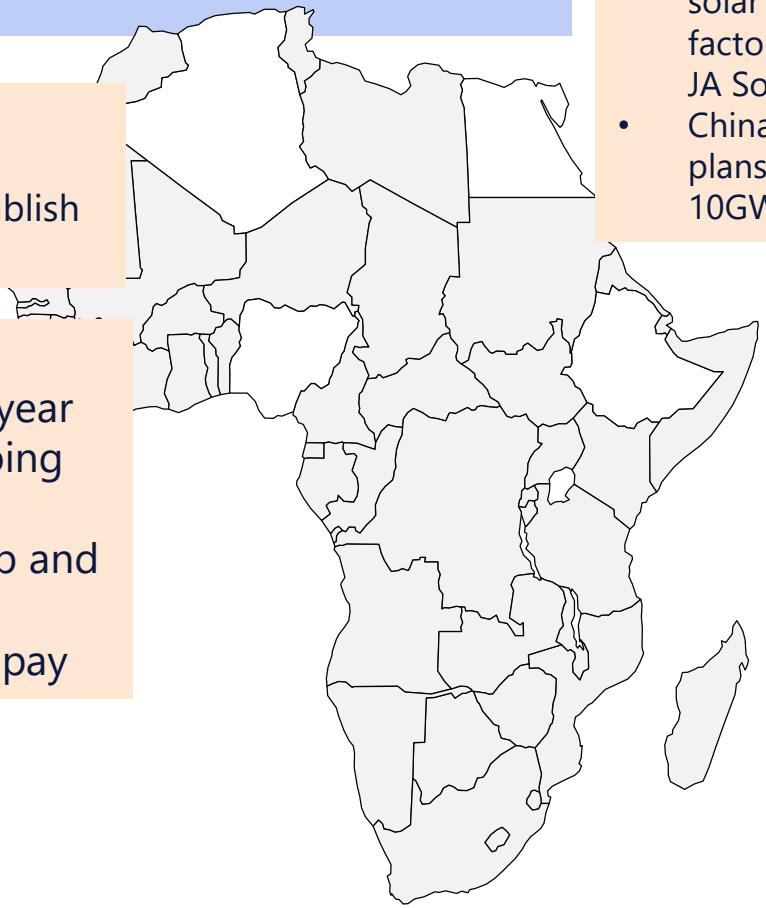
Manufacturing projects in Africa

According to Sinovoltaics, the Middle East and Africa region could reach solar module production capacity of 62.12 GW/year and cell production capacity of 52.55 GW/year by 2030. 。

Egypt：
- Plans are underway to establish a 2GW/year solar cell factory and 2GW/year PV module factory 2GW, and a BESS factory with 1GWh/year. JA Solar and other companies invest.
- China's Sungrow Power Supply has announced plans to establish a battery factory with 10GW/year of production capacity.

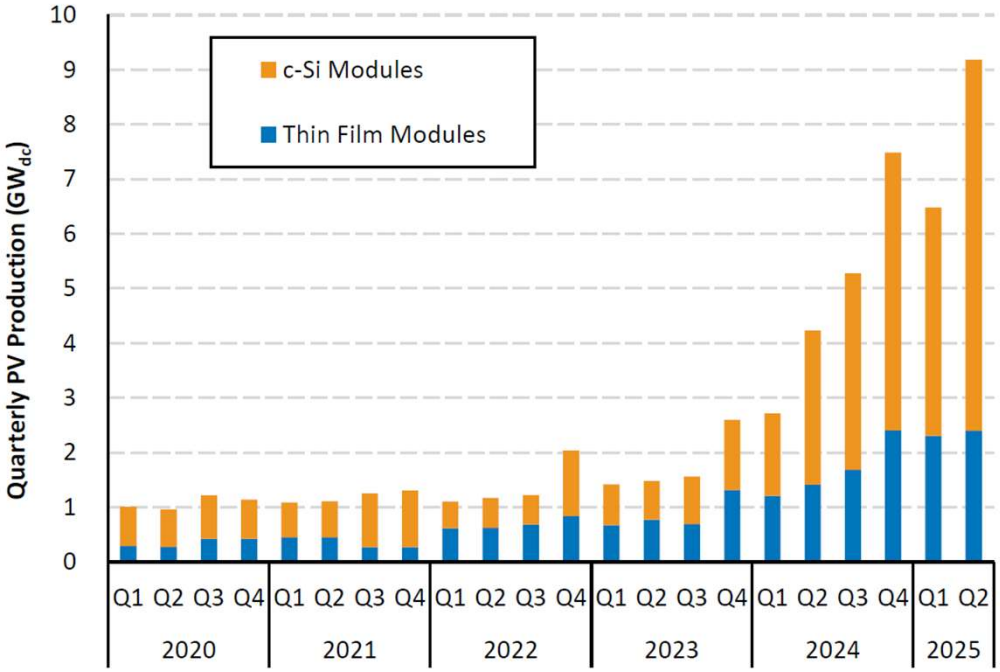
Algeria：
- Discussion is underway with Kibing Group (China) to establish PV module glass factory



Nigeria
- Plan to establish 1GW/year module factory is ongoing
- Rural Electrification Agency(REA) , InfraCorp and Solarge (Netherland) established a joint compay

Ethiopia:
- Japan's TOYO owns a solar cell factory
- Shipments in the first half of 2025 will reach 1.6 GW
- An additional 2 GW/year factory is preparing for operation, scheduled for full production in Oct. 2025
- Products are already sold out through the first half of 2026

Trends of PV module production



Source: D. Feldman, et. al., NRL, "Fall 2025 Solar Industry Update", Nov. 2025

- SEIA/WoodMackengy reported that the United States manufactured
- Approximately 15.7 GWdc of PV panels in first half of 2025, up 126%, y/y, and 440% over the past two years.– Thin-film module production has been relatively flat since Q4 2024,while c-Si module production has generally grown, q/q.

Local Production in India

Year-wise Solar Manufacturing Capacity (2022-2025)

- Incentives (and also the optimism about solar in India) has galvanized manufacturing of solar in India

Year	Module Capacity (GW/year)	Cell Capacity (GW/year)	Ingot/Wafer Capacity (GW/year)
2022	25	5	0
Incentives Announced			
October 2025	116	27	0
2028 (forecast*)	220	100	?
2030 (forecast**)	279	171	?

* PV Magazine
https://www.pv-magazine.com/2025/11/04/india-solar-module-capacity-seen-reaching-220-gw-by-fiscal-2028/?utm_source=Global+%7C+Newsletter&utm_campaign=fb9bfaa1cd-dailynl_gl&utm_medium=email&utm_term=0_6916ce32b6-fb9bfaa1cd-160015070

** PV Tech
https://www.pv-tech.org/india-has-171gw-279gw-solar-cell-and-module-manufacturing-capacity-under-construction/

- Since domestic requirement till 2030 will be ~ 30-40 GW/year, **India can emerge as a major exporter,** with a potential of **~ 200 GW/year** by 2030. In 2023 and 2024, **exports from India to USA surged,** but are likely to decline in 2025.

This rapid growth of solar manufacturing owes to the latent availability of **expertise and manpower since the 2000's and early 2010's**

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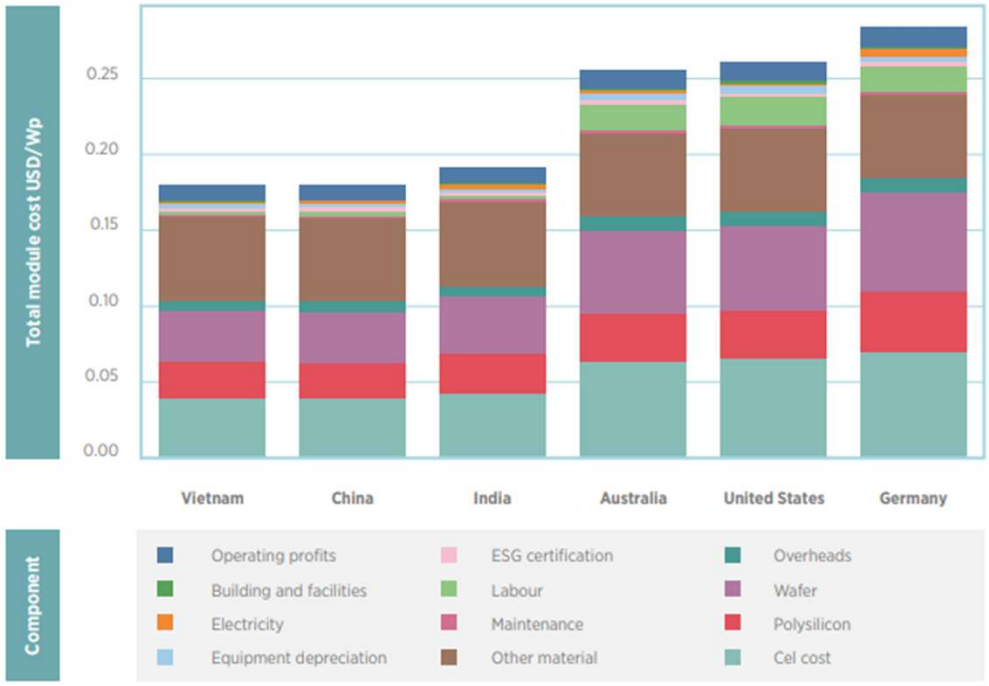
Source: Juzer Vasi, et. al., "Commemorating 50 Years of Solar PV in India: Achievement" and Challenges Ahead", PVSEC-36, Bangkok, November 2025

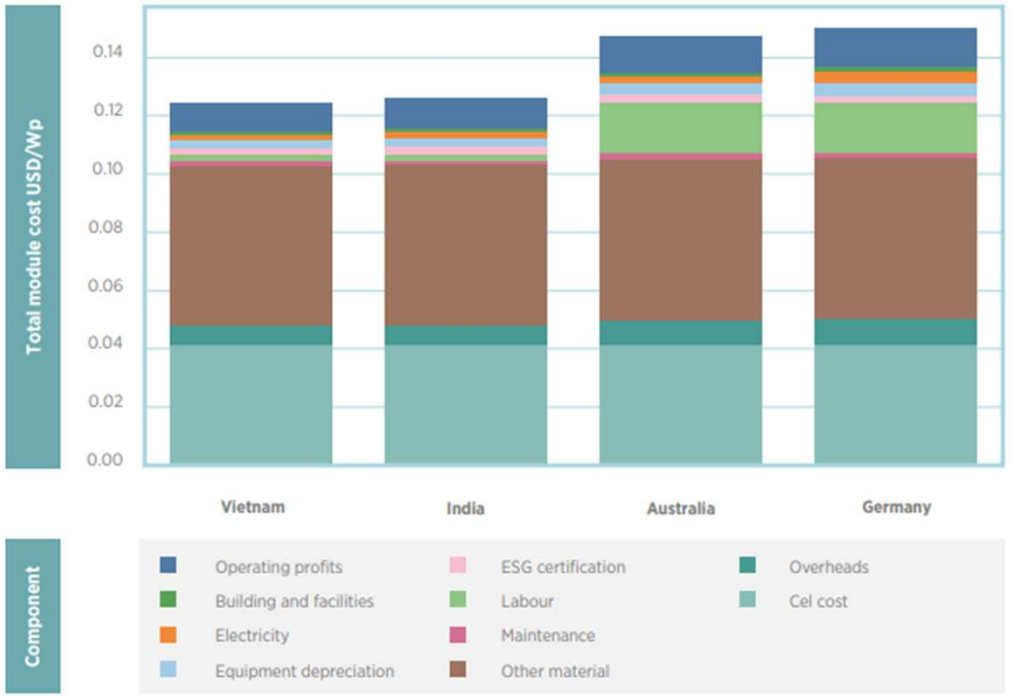
Cost Analysis by IRENA

Figure 17 Domestic PV manufacturing costs for all components



Notes: USD = United States dollar; Wp = watt peak; total module costs include ESG certification costs.

Figure 20 Domestic PV manufacturing with imported cells from China



Notes: USD = United States dollar; Wp = watt peak; total module costs include ESG certification costs.

https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2026/Feb/IRENA_TEC_Solar_PV_Supply_Cost_Tool_2026.pdf

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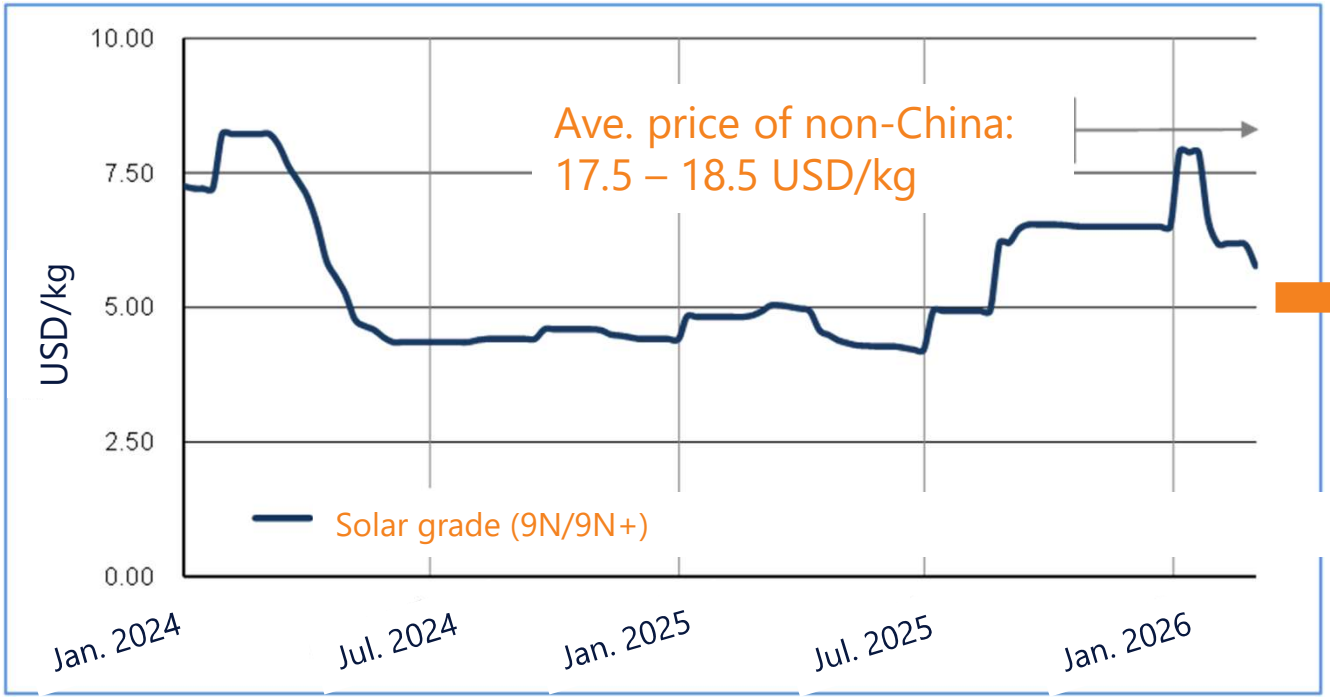
Price Trends: Polysilicon

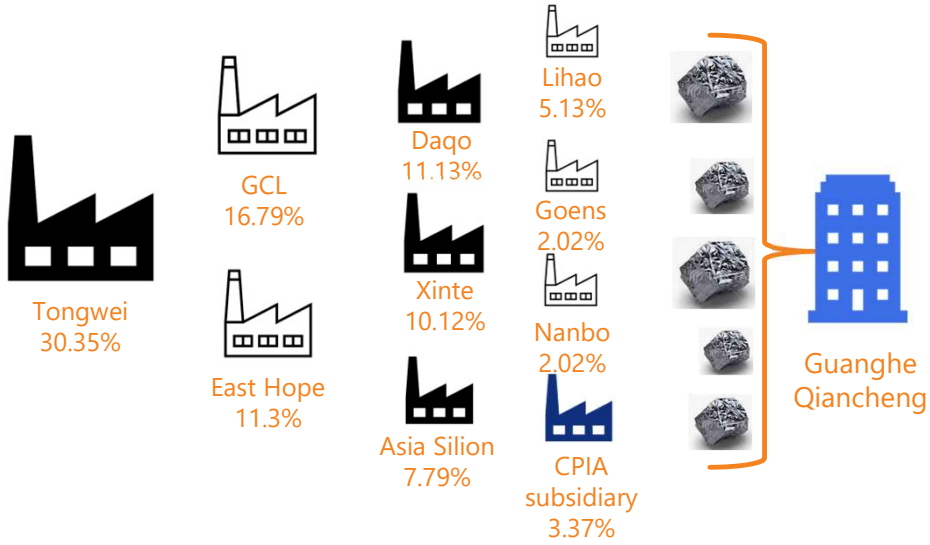


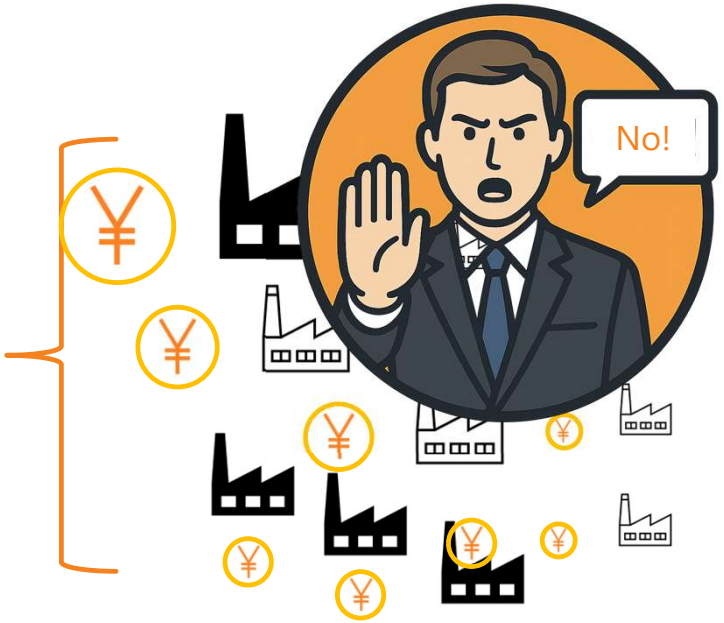
5.77 USD/kg
as of 4th March 2026

- Due to price increase of silver, cell production decreased in January
- Polysilicon demand and wafer demand also decreased
- Major polysilicon manufacturers significantly reduced operation ratio in February

Chinese Polysilicon manufacturers established a JV

- Beijing Guanghe Qiancheng Technology（Guanghe Qiancheng）was established with 9 poly manufacturers and CPIA in Dec. 2026
- The JV was expected to play a role of inventory storage platform to alleviate oversupply
- In Jan. 2026, The State Administration for Market Regulation has issued a warning regarding a potential violation of China's antitrust laws.　As the role of the joint venture has become unclear, prices are once again on a downward trend





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Source：Pvinsights, SolarZoom and other public information, compiled by RTS Corporation

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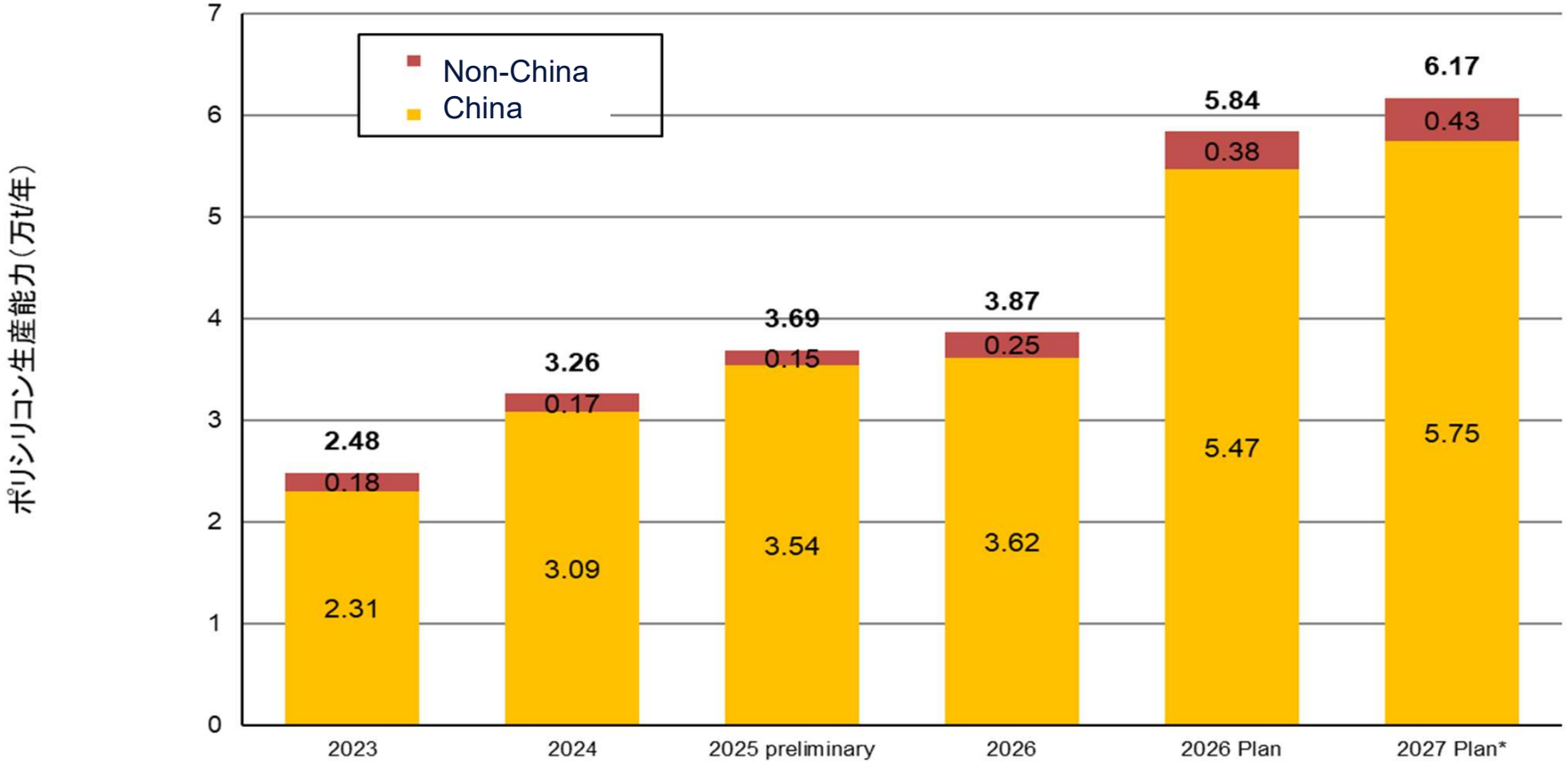
Production capacity by location



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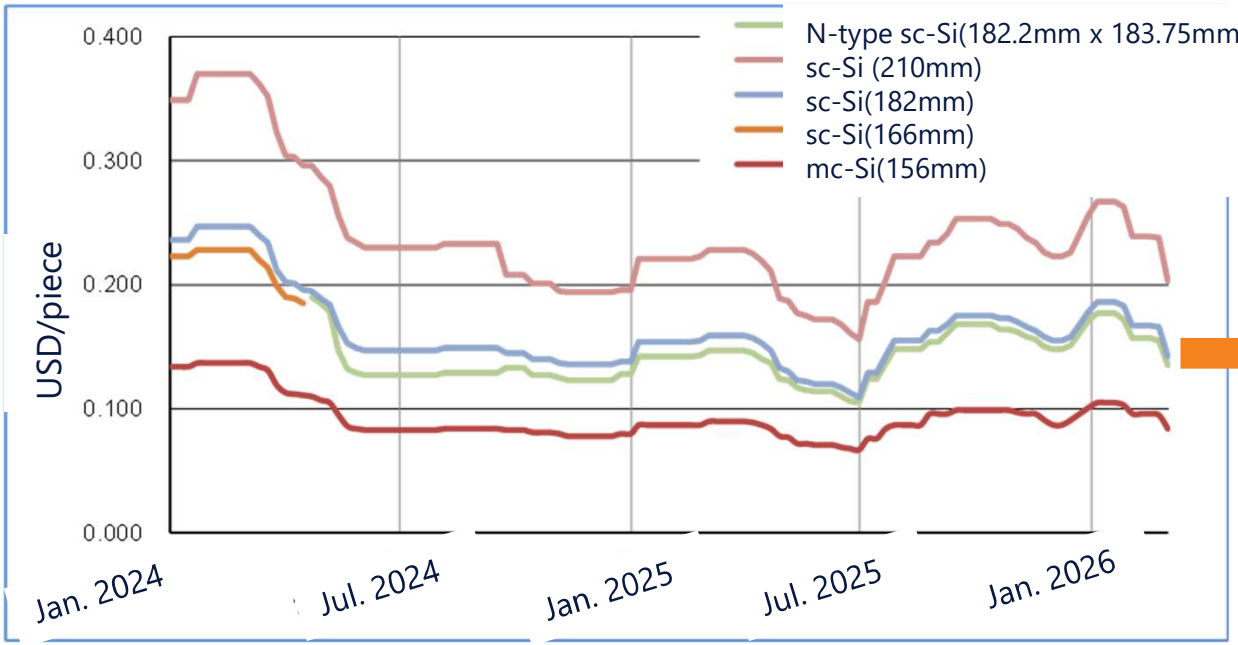
- US, Germany and Malaysia
- New manufacturing plan is on-going

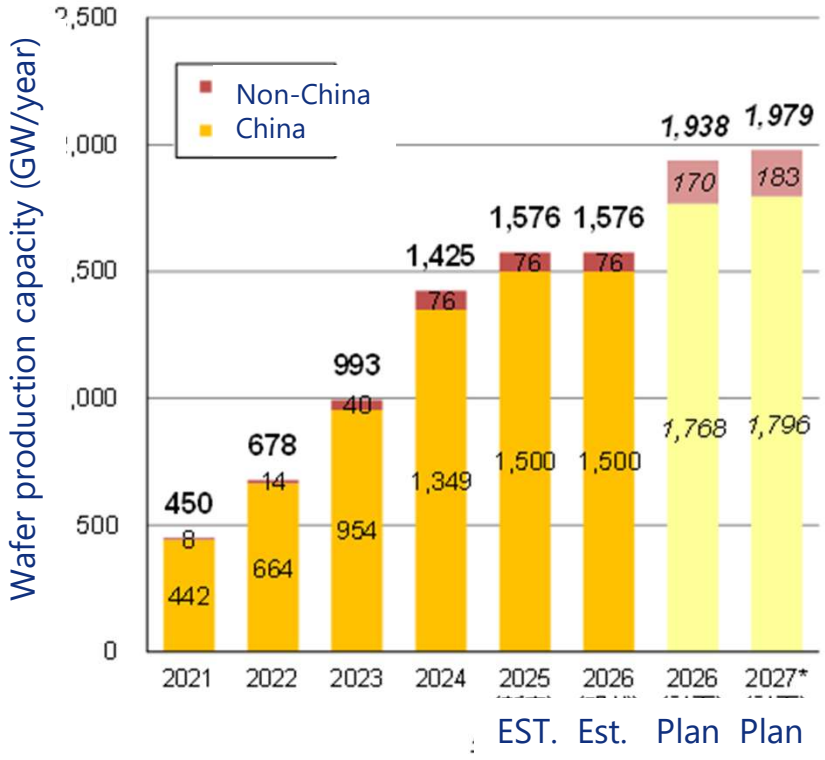
Price Trends: Wafer

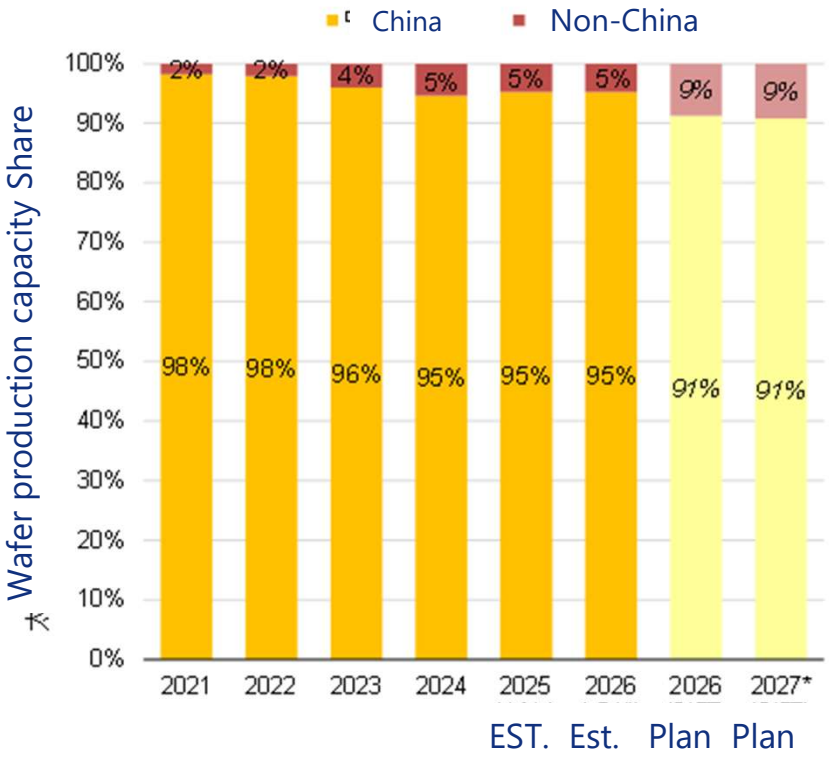


13.5 US cent/piece
As of March 4th

- The average price of N-type sc-Si wafers (182.2mm x 183.75mm) fell from 17.2 US cents/wafer at the end of January 2026 to 15.5 US cents/wafer at the end of February.
- Demand is decreasing because solar cell manufacturers are reducing production. Industry-wide inventories reached approximately 16.5 GW at the end of February, but there is no prospect of them being fully utilized.
- Although there is demand for exports from outside China before the abolition of value-added tax refunds, its impact is relatively limited, and with polysilicon prices expected to fall, silicon wafer prices are also expected to remain low.

Wafer production capacity





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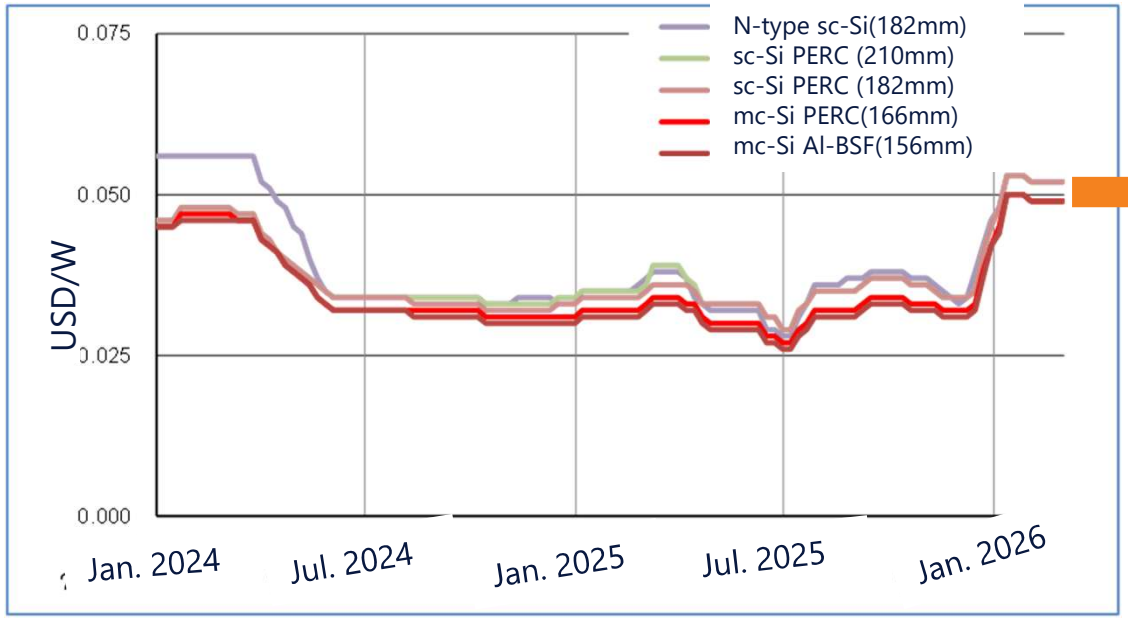
Price Trends : Cell

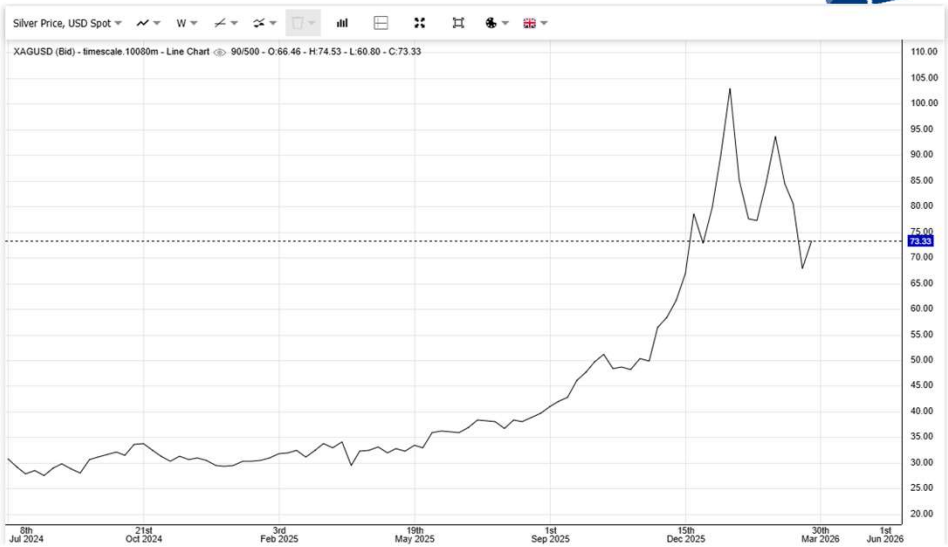


0.052 USD/W
as of 4th March 2026

- The spot price for n-type si-Si solar cells was $0.057/W for G10L (182 mm × 183.75 mm) .
- TOPCon cells price was +14% higher than PERC
- HJT cells: $0.06/W for G12 (210mm) half-cut cells with 30% silver-coated copper paste;
- To avoid the impact of rising silver prices, many solar cell manufacturers reduced production volumes. Some companies reportedly shifted to made-to-order production or OEM orders.*
- There is demand for exports outside China prior to the abolition of the value-added tax (VAT) refund.

Silver price trends and impacts

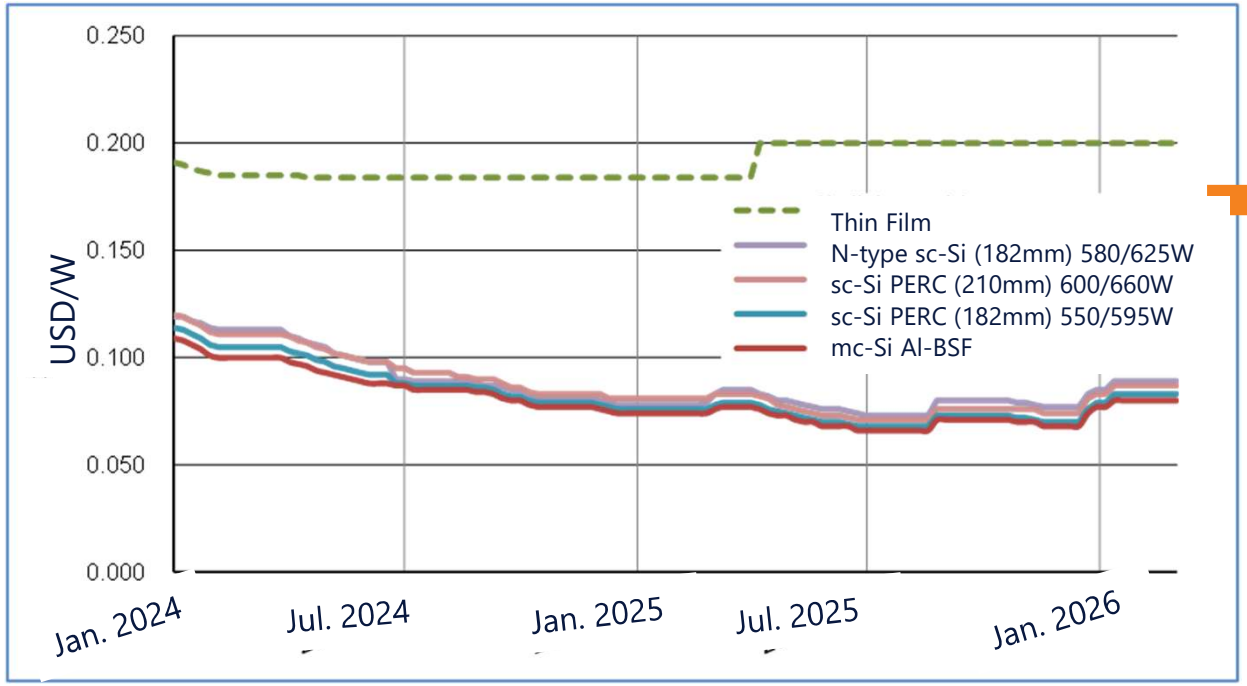
- On January 27, 2026, the average price of silver reached $113.55/ounce
- This represents an increase of approximately 270% from the price one year earlier (January 27, 2025), which was $30.20/ounce per ounce.
- Although the price of silver subsequently plummeted to the $80 per/ounce level range by the end of January 2026, it remains at a higher level compared to a year ago.
- At this price level, it is said that silver paste accounts for 20–30% of the production cost of TOPCon solar cells



https://silverprice.org/

- DKEM announced rolling out high-Cu conductive paste on a large scale by 2026. In October 2025, the company started mass production, operating at full capacity
- LONGi Green Energy Technology announced that it will begin mass production of its copper-based metallization technology starting in the second quarter of 2026
- . China's Tongwei Solar has obtained a patent for “equipment for manufacturing copper busbars for bifacial heterojunction (HJT) solar cells and equipment for manufacturing solar cells.”

Price Trends : Module



N-type sc-Si
0.089 USD/W
As of 4th March 2026

- Following the announcement of the abolition of the VAT refund, prices surged in early January and remained flat
- Due to the Chinese New Year holiday (February 17–March 3, 2026), trading volume was low and prices remained flat.
- Prices for modules using 182mm P-type monocrystalline wafers remained flat from 8.3 US cents/W at the end of January through the end of February, while prices for modules using 210mm wafers also remained flat from 8.7 US cents/W at the end of January.
- Prices for N-type crystalline silicon solar modules (using 182mm wafers) also remained unchanged from 8.9 US cents/W at the end of January through the end of February.

Impacts of Iran Crisis on PV industry

Supply Chain:

- **Materials derived from petroleum naphtha** are used in encapsulants, backsheets, and binders in Ag electrodes, a prolonged blockade of the Strait of Hormuz could lead to supply instability
- **Methanol**, used in the processing of AR coatings for front glass of PV module, is primarily produced in China. Although supplies from Iran are said to account for less than 8% of China's consumption, prices are rising
- **Helium**, used for SiC semiconductor manufacturing. Reports indicate that the supply of helium—used in the manufacture of SiC semiconductors for inverters—may be affected, as exports from Qatar, the largest producer, are becoming difficult.
- **Aluminum** price increased in the end of March, after **Emilates Global Aliminum (EGA)** and **Aluminium Bahrain** were attacked. These companies halted production while China has the largest share in production

International Shipping:

- **Rising crude oil prices** have already driven up shipping costs.
- Shipping to the Middle East is expected to become more difficult (for shipments to Europe, the route via South Africa—which bypasses the Suez Canal—has long been the standard). Cancellation or delay of the PV projects in the middle east

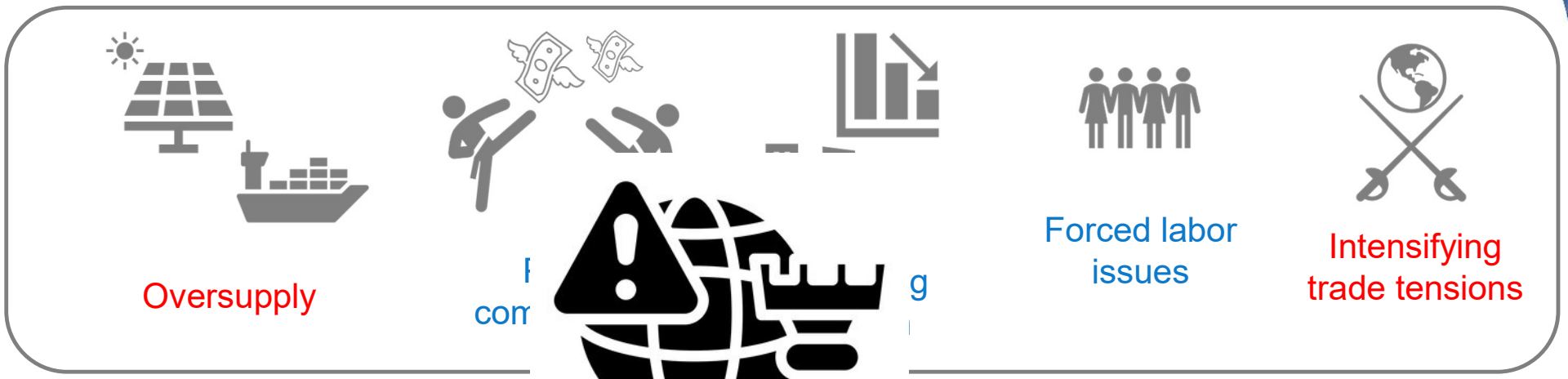
Demand：

- **Rising energy prices are likely to drive increased demand for distributed solar power systems.**
- **However, if long-term interest rates rise, this could affect financing.**

Aluminum price is increasing

PVPS

Summary of PV Industry status: changes from last meeting



PVPS

Copilot created the image of peace brought by PV

Thank you for your kind attention !

感谢您的关注

끝까지 경청해 주셔서 감사합니다

ご清聴ありがとうございました

Acknowledgement for the support of PVPS activities

NEDO New Energy and Industrial Technology Development Organization

Acknowledgement :
PVPS Task1　Colleagues

Contact : Izumi KAIZUKA, RTS Corporation, kaizuka@rts-pv.com