EUROPEAN SOLAR MANUFACTURING COUNCIL

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Dr. Johan Lindahl, Secretary General of ESMC

Elmia Solar, February 2023

A SOLAR INDUSTRY IN CRISIS

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EUROPEAN SOLAR MANUFACTURING COUNCIL

Handelsblatt

Endspiel um Solar-Industrie in Deutschland hat begonnen

POLITICO

NEWS ENERGY AND CLIMATE

EU mum as solar industry time bomb ticks

South China Morning Post

European solar panel makers ask EU for 'emergency' steps to block China's 'significant oversupply'

FEATURES, INTERVIEWS, LONG READS

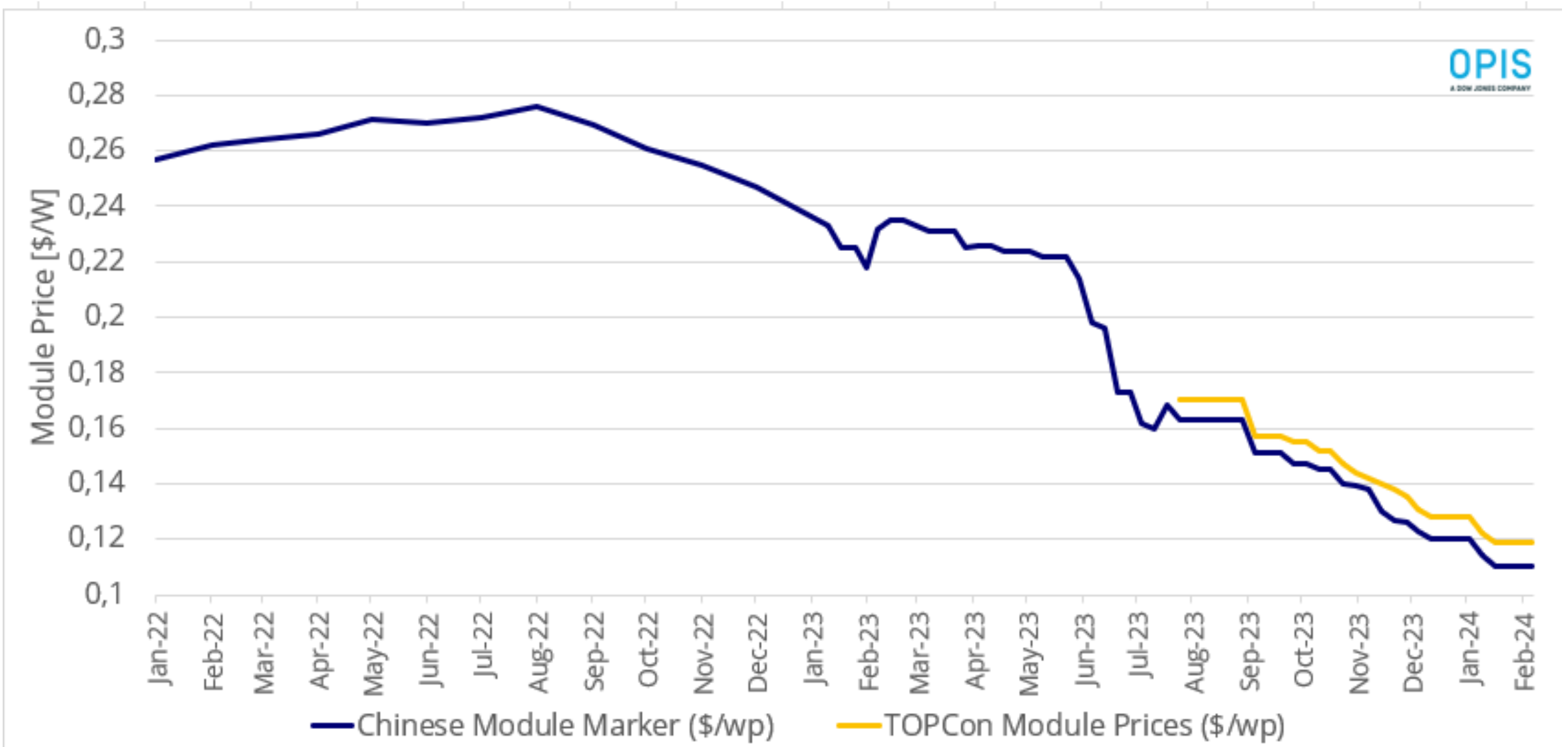
"We're about to lose the whole European PV manufacturing industry," says ESMC's secretary general

REUTERS®

Climate & Energy | Grid & Infrastructure | Solar | Climate Change | Clean Energy

Europe's solar panel manufacturers ask EU for emergency support

PV MODULE PRICE COLLAPSE IN JUNE



Source: OPIS APAC Solar Weekly Report

PV MANUFACTURING COSTS — JINKO

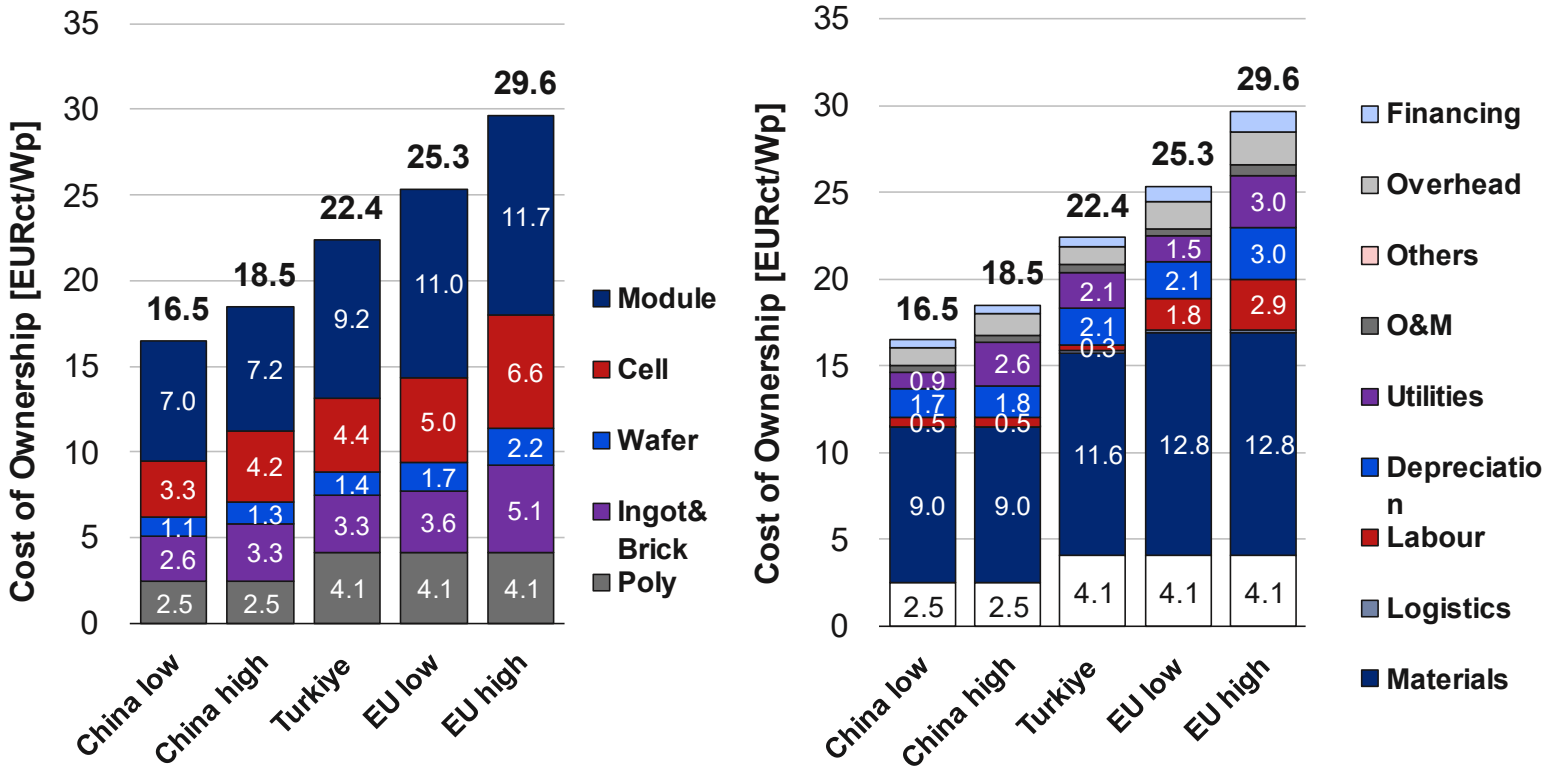
Disclosed by Jinko Solar	Q1	Q2	Q3
Revenues	$3 396 974 000	$4 224 860 000	$4 350 030 000
Costs	$2 808 557 000	$3 572 108 000	$3 522 622 000
Sales of Modules	13 308 MW	17 763 MW	21 384 MW
Sales of cells and wafers	1 452 MW	850 MW	1 213 MW

Since cells and wafers production (sold outside of Jinko) represents a only bit more than 10% of the total production, with a lower price than modules, one assigns an average market price to the cells/wafers to estimate the revenues from the modules sales with less risk of influencing the end result significantly.

Calculation	Q1	Q2	Q3
Cell prices from OPIS	~0,14 $/W	~0,12 $/W	~0,09 $/W
Amssumed Cell manufacturing costs	~0,10 $/W	~0,08 $/W	~0,07 $/W
Market price Cells & wafers	~$203 280 000	~$102 000 000	~$109 170 000
Manufacturing cost Cells & wafers	~$145 200 000	~$68 000 000	~$84 910 000
Revenues Modules	~$3 193 694 000	~$4 122 860 000	~$4 240 860 000
Costs Modules	~$2 663 357 000	~$3 504 108 000	~$3 437 712 000
Market price Modules	~0,240 $/W	~0,232 $/W	~0,198 $/W
Manufacturing cost Modules	~0,200 $/W	~0,197 $/W	~0,161 $/W

Source: JinkoSolar Quarterly....

PV MANUFACTURING COSTS — SIMULATED



From production costs to Average Selling Price (ASP)

Manufacturing costs must be augmented with Selling General and Administrative (SG&A) costs of approximately 7%, Research and Development (R&D) costs of up to 5% and transport costs — around 0,01 EUR/W_p.

In the case of Jinko Solar again, this positions the sales prices around 0.198 in USD/W_p Q3 2023.

Source: RCT Solutions, Becquerel Institute and Fraunhofer ISE

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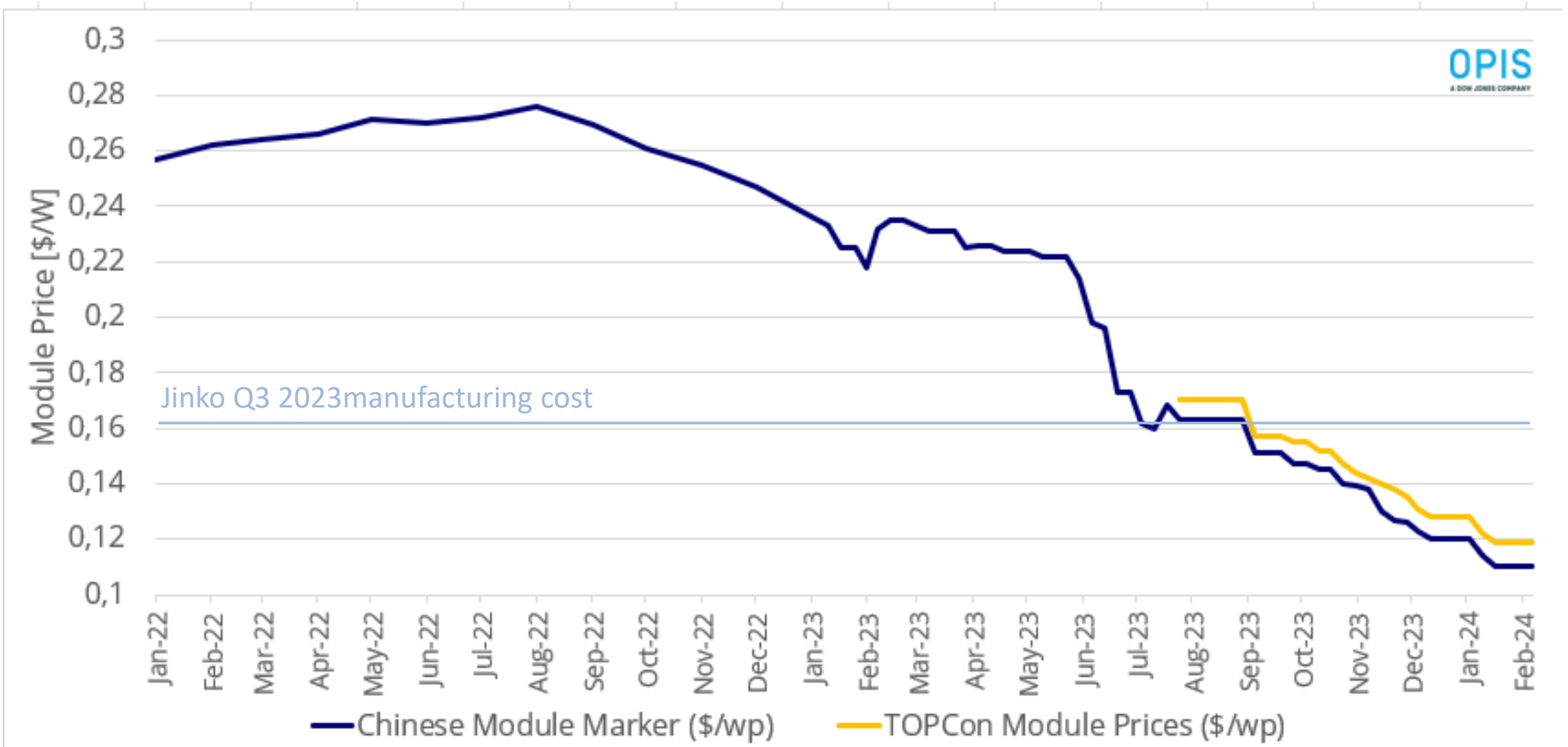

Source: OPIS APAC Solar Weekly Report

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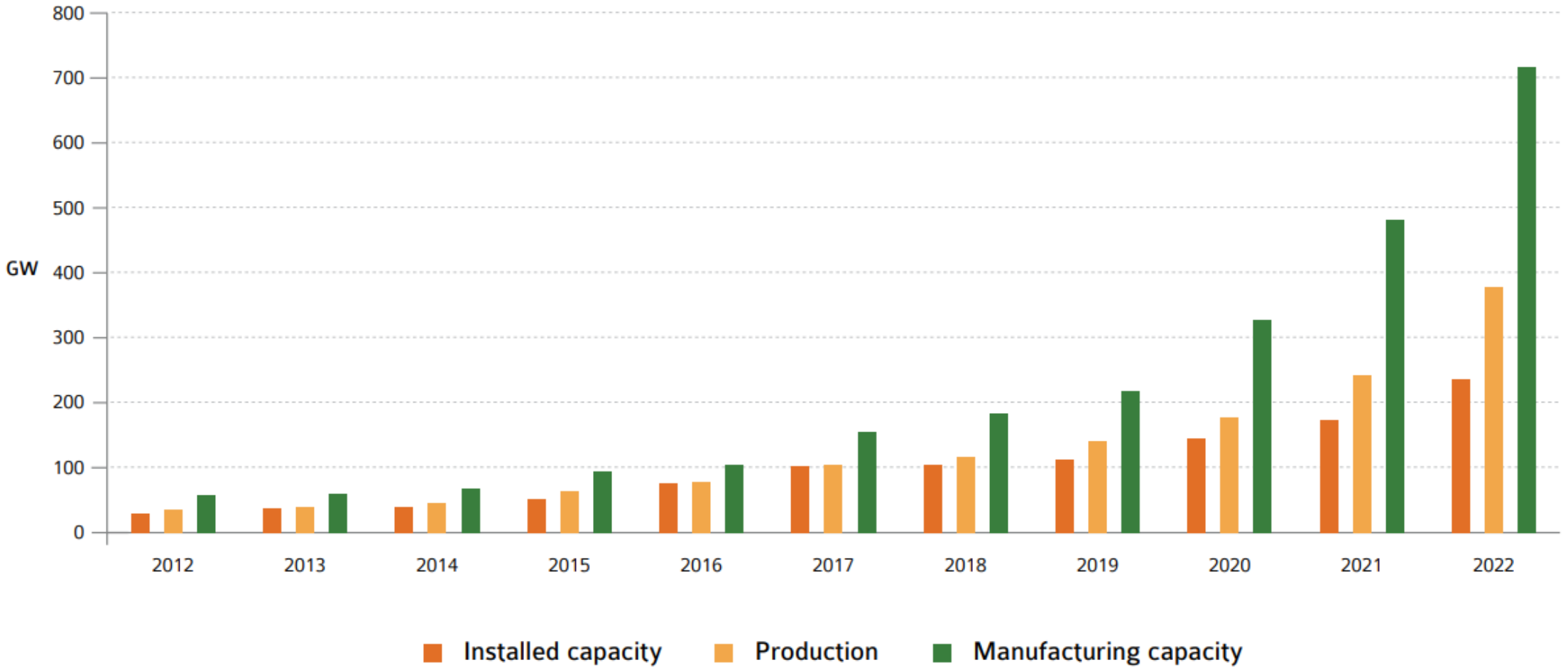
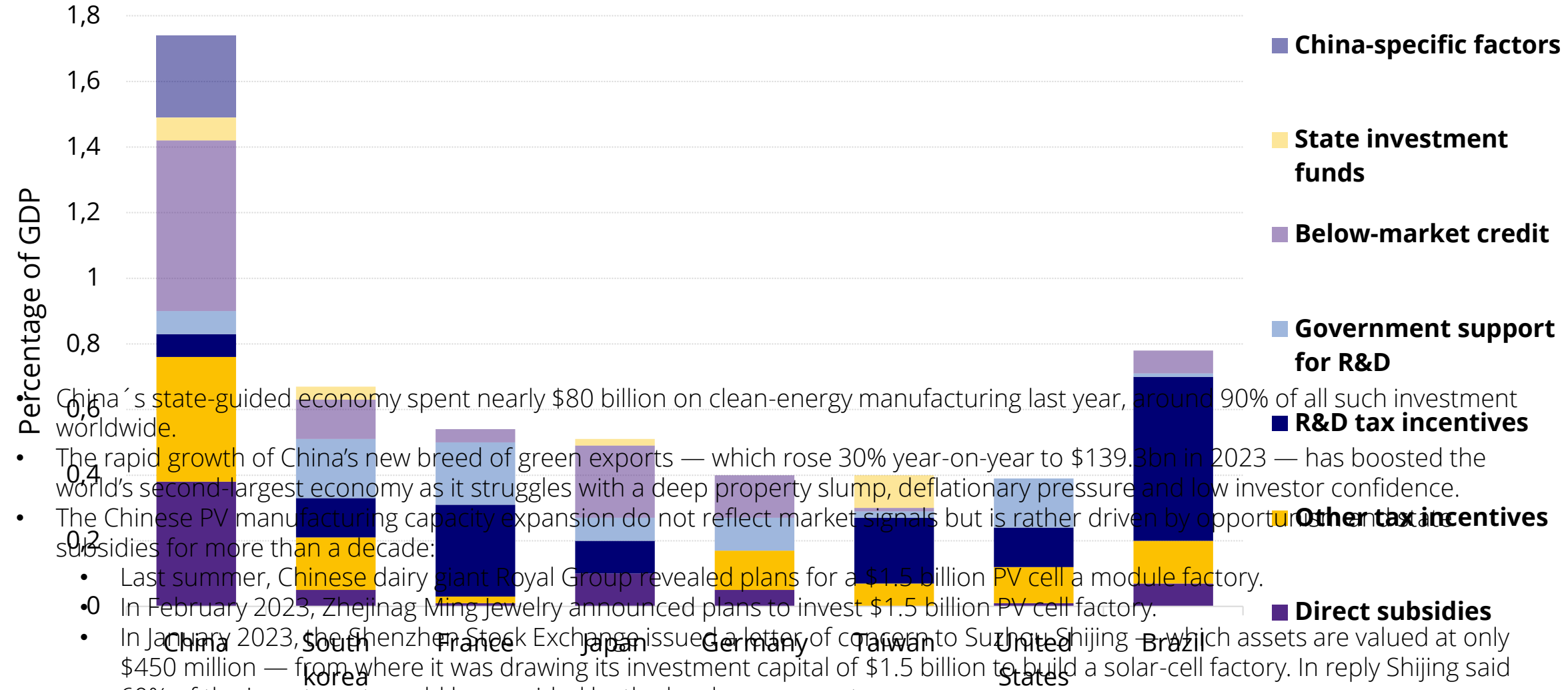


Source: IEA PVPS — Trends in Photovoltaic Applications — 2023

CHINA´S SPENDING ON GREEN ENERGY

Industrial policy spending in key economics in 2019 in percentage of GDP



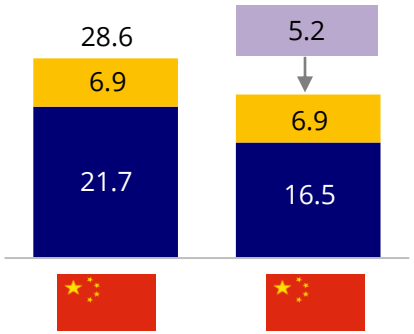
- China´s state-guided economy spent nearly $80 billion on clean-energy manufacturing last year, around 90% of all such investment worldwide.
- The rapid growth of China's new breed of green exports — which rose 30% year-on-year to $139.3bn in 2023 — has boosted the world's second-largest economy as it struggles with a deep property slump, deflationary pressure and low investor confidence.
- The Chinese PV manufacturing capacity expansion do not reflect market signals but is rather driven by opportunistic investments subsidies for more than a decade:
  - Last summer, Chinese dairy giant Royal Group revealed plans for a $1.5 billion PV cell a module factory.
  - In February 2023, Zhejinag Ming Jewelry announced plans to invest $1.5 billion PV cell factory.
  - In January 2023, the Shenzhen Stock Exchange issued a letter of concern to Suzhou Shijing — which assets are valued at only $450 million — from where it was drawing its investment capital of $1.5 billion to build a solar-cell factory. In reply Shijing said 60% of the investment would be provided by the local government.

Source: Estimating Chinese Industrial Policy Spending in Comparative Perspective, Center for Strategic and International Studies & The Wall Street Journal

IMPACT OF POLICY INCENTIVES ON LOCAL SOLAR MANUFACTURING COST ACROSS THE REGIONS

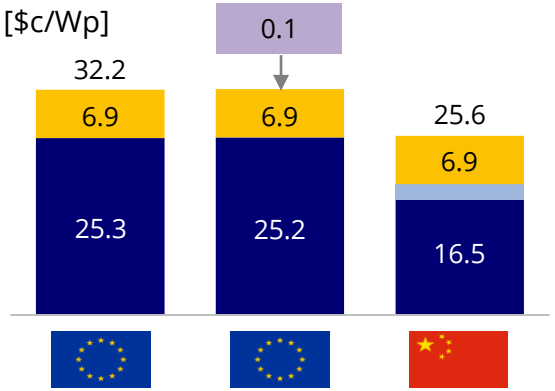
Delivered cost of modules in China

[$c/Wp]



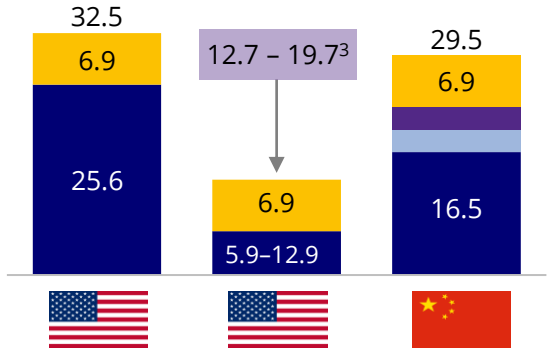
Delivered cost of modules in the EU[1]

[$c/Wp]



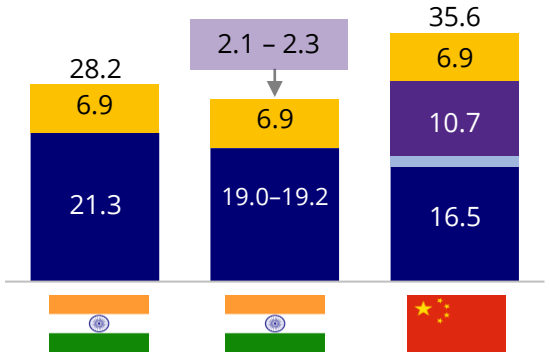
Delivered cost of modules in the US[1,3]

[$c/Wp]



Delivered cost of modules in India[1]

[$c/Wp]



Key policy actions	Impact
Capital subsidies: cheap/free land, subsidized loan rate	2.1 c/Wp
Utility subsidies on electricity and water	2.0 c/Wp
Indirect supply incentives: relaxed labor laws, no input credits	1.1 c/Wp

Key policy actions	Impact[2]
Capital subsidies & grants (such as EU Innovation Fund[1], regional programs)	0.1 c/Wp

Key policy actions	Impact
Inflation Reduction Act incentives: $48B till 2032; primarily production linked	11 – 18 c/Wp[4]
State-level investment incentives (e.g., Arizona's Jobs Credit Schemes)	1.7 c/Wp
Section 201 import tariffs	14.5 %

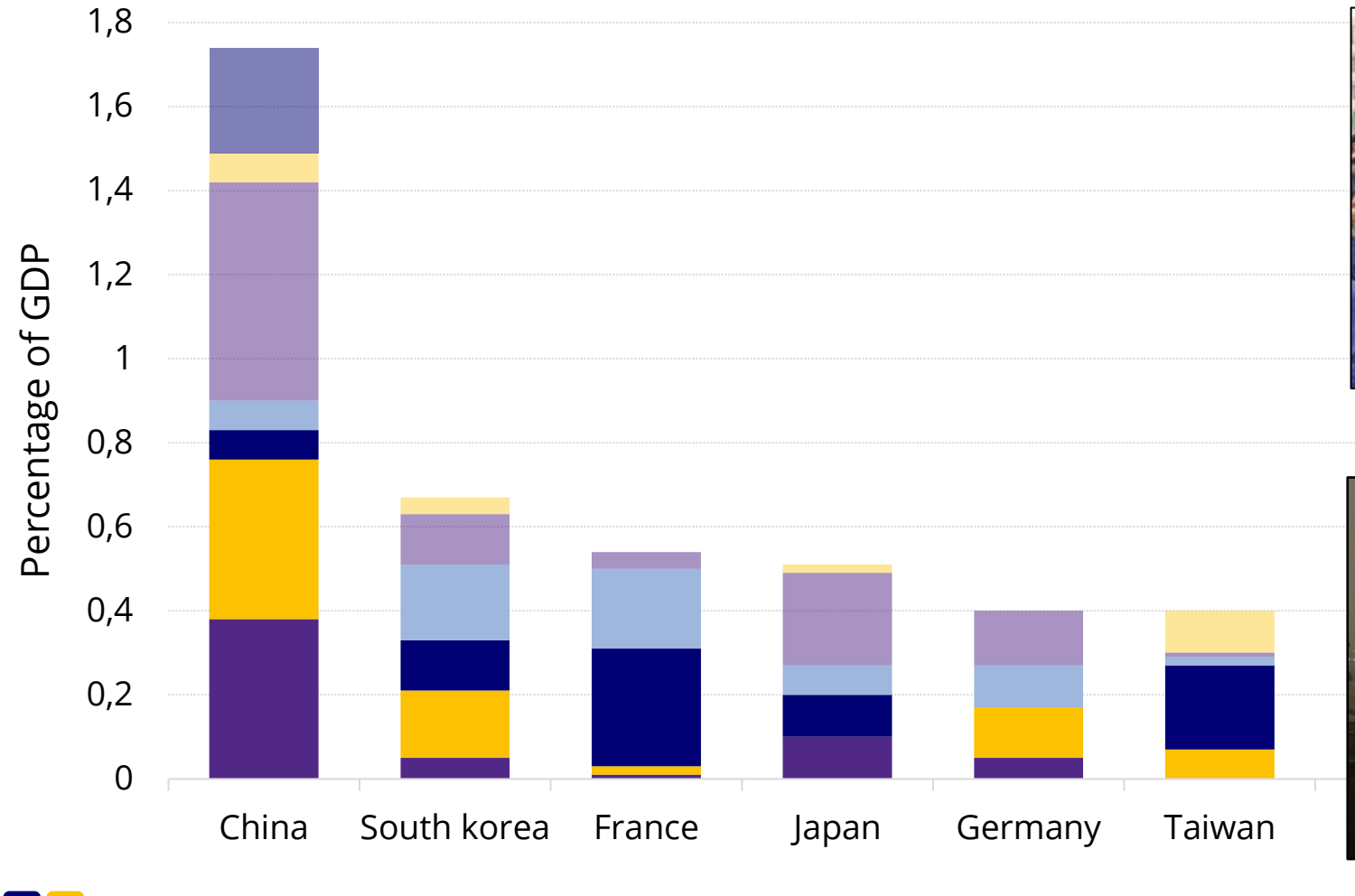
Key policy actions	Impact
Production-linked Incentive (PLI) Scheme: $3B for solar manufacturing	2.1 – 2.3 c/Wp[5]
Import tariffs: Make-in India safeguard duty (14.5 %), Basic Customs Duty (25-40 %)	40 – 55 %

[1] Assumption: shipping cost = 0, for locally manufactured solar modules
[2] For EU, incentive impact (depreciation spend saved) corresponds to Enel's (€118M) received for 3GW HJT solar mfg. unit through the EU Innovation Fund
[3] Impact range (incl. state incentives) depends on partial localization. Cells & modules:12.7 c/Wp vs. for full localization: 19.7 c/Wp
[4] IRA to provide 100% of the proposed incentive till 2029, phase-out linearly by 2033. Incentive breakdown: p-Si (1.5 c/W), wafers (5.5 c/W), cells (4 c/W) & modules (7 c/W). IRA's impact (avg NPV) range: 8.8 c/W (US cells & modules) –14.4 c/W (full US localization) till 2033
[5] PLI incentive value (range) primarily depends on module efficiency: 0 (< 19.5%), 2..25 INR/Wp (19.5-20%), & 2.75 INR/Wp (>20%)

Production cost | Margins | Shipping cost | Import tariffs | Incentive support

MAJOR STRUCTURAL DISADVANTAGE TO BE A WESTERN MANUFACTURER

Industrial policy spending in key economics in 2019 in percentage of GDP



Weak labour laws and slave work in Xinjiang

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Government support for R&D

Weak environmental laws

s

States

Source: Estimating Chinese Industrial Policy Spending in Comparative Perspective, Center for Strategic and International Studies

FORCED LABOUR IN THE CHINESE PV VALUE CHAIN

The Xinjiang region accounted for 42 % and 50 % of the national metallurgical-grade silicon and polysilicon production capacity in 2020. **On a global scale, in 2020 around 45% of the world's polysilicon originated in Xinjiang**. In Xinjiang the local population of Uyghurs have been subjected to arbitrary detention and forced labour by the Chinese government.

In the Xinjiang Uyghur Autonomous Region, the **United Nations (UN)** have reported **detention of large numbers** of ethnic Uyghurs and other Muslim minorities without being charged or tried, under the pretext of countering religious extremism. Estimations suggest that over the last few years, Chinese authorities have built or expanded over **380 re-education camps, detention centres and prisons**. **Up to 1.5 million Turkic Muslims are arbitrarily detained** in internment camps of various security levels while an additional **880,000 Uyghur children** had been placed in boarding facilities at the end of 2019.

During imprisonment in the camps, detainees are exposed to **physical and psychological torture, sexual violence**, and other forms of ill- treatment. Detainees have reported being forced to stay in **stress positions for hours every day, sleep deprivation**, lack of access to food, water, and sanitary conditions, being subjected to health-related procedures without their consent, **including mass sterilisation**

The situation extends beyond the geographical region of Xinjiang. According to civil society research, **more than 80,000 Uyghurs were transferred out of Xinjiang to work in factories across China** between the years of 2017 and 2019.

The extent of violations has prompted parliaments around the world to launch debates on the question of genocide. The French, Dutch, American, British, Canadian and Lithuanian **parliaments have voted to call it a genocide**.

Exposure	Company
HIGH	Canadian Solar
VERY HIGH	JA Solar—Southeast Asia/US
VERY HIGH	JA Solar—China
HIGH	Jinko Solar—Southeast Asia/US
HIGH	Jinko Solar—China
VERY HIGH	LONGi Solar—Southeast Asia
VERY HIGH	LONGi Solar—China
NONE (UNVERIFIED)	Maxeon 3/5/6 Module / Sunpower X-/A-/M-Series
NONE (UNVERIFIED)	Maxeon / Sunpower Performance Series
NONE (UNVERIFIED)	Meyer Burger Technology
VERY HIGH	QCells
NONE (UNVERIFIED)	REC Group N-Peak and Alpha
VERY HIGH	REC Group TwinPeak 4
HIGH	Tongwei Solar
NONE (UNVERIFIED)	Trina Solar—Southeast Asia
VERY HIGH	Trina Solar—China

Source: Sheffield Hallam University — Over-Exposed: Uyghur region exposure assessment for solar industry sourcing
Löning – Human Rights & Responsible Business Reducing Risks in Solar Supply Chains — What companies should know and what they can do

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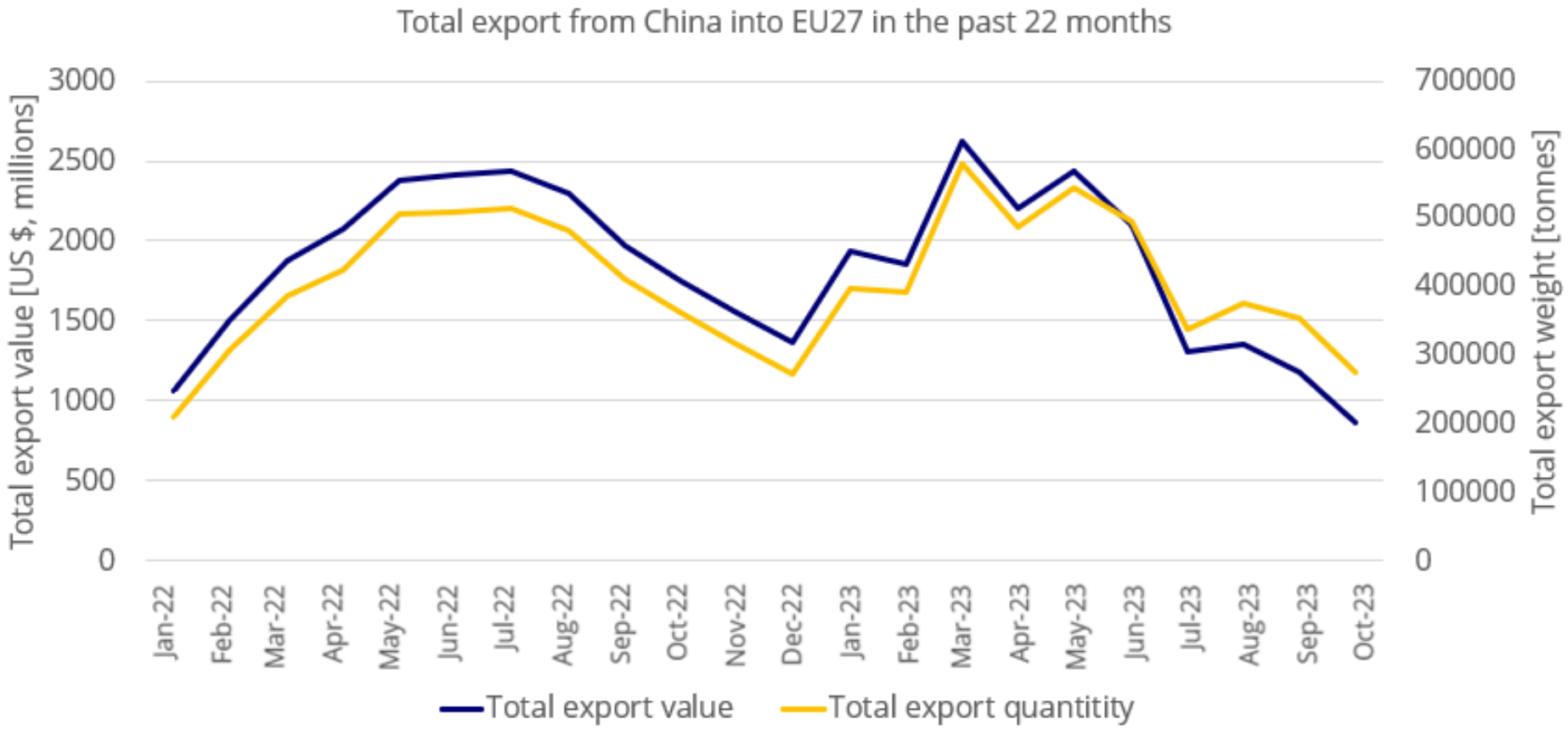
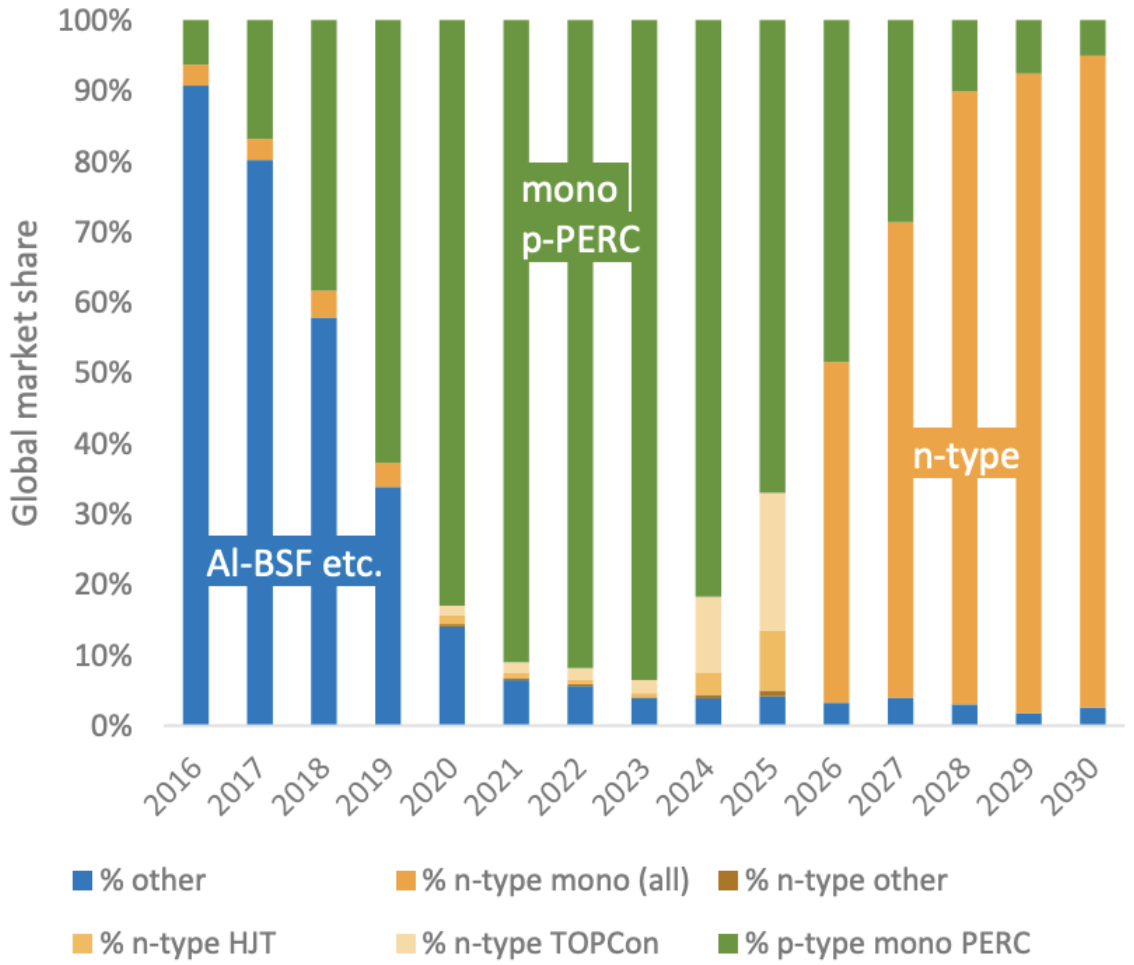


In 2022, the world's leading solar manufacturing nations exported modules worth $22.9 billion to EU countries, with the majority originating from China. In the first 10 months of 2023, these nations exported $18.1 billion worth of solar panels to the EU, despite considerable drops in module prices. **Consequently, between 80–90 GW of solar modules were imported to the EU in both 2022 and 2023 respectively**, possibly more, while **installations amounted to approximately 40 GW in 2022 and 56 GW in 2023** (source: SolarPower Europe). This means that approximately **85 GW of imported module capacity** is currently sitting in stock in EU.

Source: TradeMap, a database managed by the International Trade Centre (ITC) & Becquerel Sweden

THE GLOBAL TECHNOLOGY SHIFT



It is not so much the actual R&D efforts that's sets the pace of the PV technology shifts, but rather the pay-off time for investment in PV equipment and factories for the different technologies.

Source: NREL and ETIP PV

EUROPEAN MANUFACTURES UNDER SEVERE PRESSURE

In 2023, the EU's estimated PV module production capacities reached approximately 11 GW, with actual operational capacities accounting for roughly **6 GW of PV module production**. The additional 5 GW are assessed to be unmodern sleeping module lines, that have not been operational in 2023. **Only around 2 GW of PV modules have actually been produced in 2023, leaving 0.8–1 GW languishing in the inventories of European PV module producers**. Unfortunately, these stocks remain unsold due to the prevailing market conditions characterized by ultra-low pricing, a situation expected to persist at least throughout 2024.

In recent months, we have already witnessed the loss some of the larger European PV manufacturers, such as Norwegian Crystals, REC Norway, Norsun, Exasun, Valoe, Energetica, SunPower France, Flisom).

Without immediate intervention, the risk intensifies, and there is a looming danger of forfeiting an additional 3.5 GW (Meyer Burger, Heckert, Solarwatt, among others) of operational PV module production capacities within the coming weeks.

(Longi shut down 70%of cell lines because of the high OPEX, lay off more than 10k employees)

Source: How to address the unsustainably low PV module prices to ensure a renaissance of the PV industry in Europe

ESMC RECOMMENDATION FOR THE COMMISSION

1. Establishment of an EU level buy-out facility for accumulated EU PV module inventories.

2. Immediate modification of Temporary Crisis and Transition Framework (TCTF) to empower financing the projects with EU-produced PV modules or operational expenditures of the EU PV module producers.

3. Accelerated implementation of the EU PV producers' supportive elements outlined in the legislative initiatives of the Net-Zero Industry Act (NZIA) and Forced Labour regulation (FLR) from July 2024 by creating a simplified and effective resilience auctions system for a temporary period.

In the event that the proposed emergency measures would not be possible for a swift adoption within the next 2 months, we urge the activation of trade defence measures — starting with the safeguard investigation by applying provisional safeguard measures and potentially extending it to include other trade defence measures — as a last resort, but necessary, action.

Source: How to address the unsustainably low PV module prices to ensure a renaissance of the PV industry in Europe

POLICY INSTRUMENTS TO FOSTER EUROPEAN PV MANUFACTURING AND CURRENT STATUS

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EUROPEAN SOLAR MANUFACTURING COUNCIL

Temporary Crisis and Transition Framework (TCTF)

Lifted state aid rules unlocked opportunities for state aid support

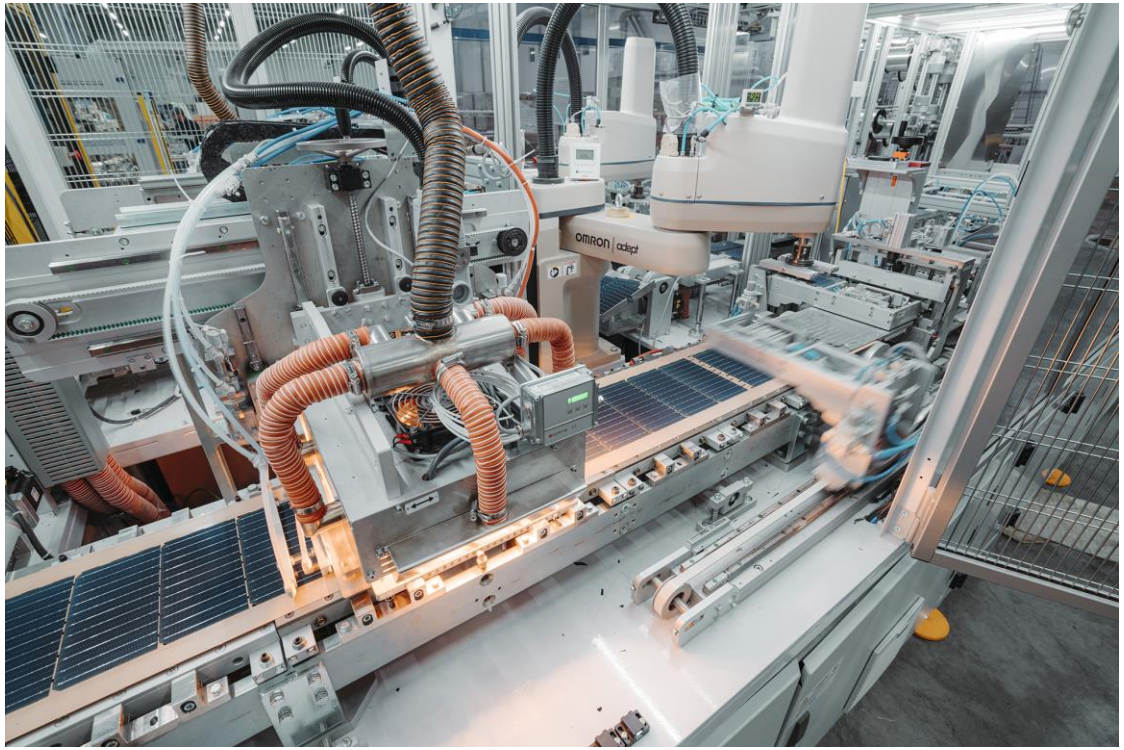
Through the General Block Exemption Regulation (GBER), and the proposed Temporary Crisis and Transition Framework (TCTF), following the aggression against Ukraine by Russia. The European Commission adopted the proposal on March 9 that EU Member States will be able to put support in place to clean tech production in Europe, including the PV manufacturing industry until 31 December 2025.

	Type of support	General support	Development area ("c" areas)	Development area with high needs ("a" areas)
Large enterprise	**CAPEX support**	15 %	20 %	35 %
	Tax advantages, loans or guarantees	20 %	25 %	40 %
Medium enterprise	**CAPEX support**	25 %	30 %	45 %
	Tax advantages, loans or guarantees	30 %	35 %	50 %
Small enterprise	**CAPEX support**	35 %	40 %	55 %
	Tax advantages, loans or guarantees	40 %	45 %	60 %

MEMBER STATE ENGAGEMENTS FOLLOWING

Lifted state aid rules unlocked opportunities for state aid support and examples of engagement from the Member states include:

- The German government call to build up to **10 GW along the value chain**, under the TCTF.
- The Spanish government have, likewise under the TCTF, announced **€1 billion dedicated to net-zero industries** and completed a call for interest.
- The Dutch government has allocated **€412 million euros** through the National Growth Fund for the PV program SolarNL, in support of large-scale production of PV cells and development solar technologies and related manufacturing in the Netherlands.



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PV MANUFACTURING PROJECTS GRANTS IN THE INNOVATION FUND

Innovation Fund
The Innovation Fund is a funding programme for the demonstration of innovative low-carbon technologies

ENEL's Catania 3 GW bifacial heterojunction project TANGO was granted €118 million in the 1st Large-Scale Call (LSC).

The 3rd Large-Scale Call had a budget of € 750 million for Innovative clean tech manufacturing and there were three approved PV manufacturing projects:

- **Meyer Burger Technology AG** successfully applied for €200 million euros in funding for 3.5 GW cell and module capacities in Germany and Spain.
- **NorSun AS** has been awarded €54 million for a 3 GW expansion of their current ingot and wafer capacity in Årdal in Vestland, Norway, which provides a quadrupling of current capacity.
- **Midsummer AB** has been selected for a grant of €32 million for a new 200 MW factory in Sweden that will produce CIGS thin

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Thank you for your attention!

Dr. Johan Lindahl, Secretary General of ESMC

Elmia Solar, February 2023