Reshoring a Sustainable and Resilient PV Manufacturing in Europe

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INTRODUCTION

Global context

- Exponential growth of renewable energy over the last decade
- Rapid expansion of the photovoltaic industry via the gigafactory model

Problem

- Centralization of manufacturing in Asia
- Supply chain dependence and regional imbalances

Objective of the intervention

- To analyze the evolution of the market and technological innovations
- Identify the challenges and opportunities for reshoring in Europe

The solar value chain & current statuts in manufacturing

SOLAR VALUE CHAIN – WHAT IS IT EXACTLY ?

Solar plant/installation

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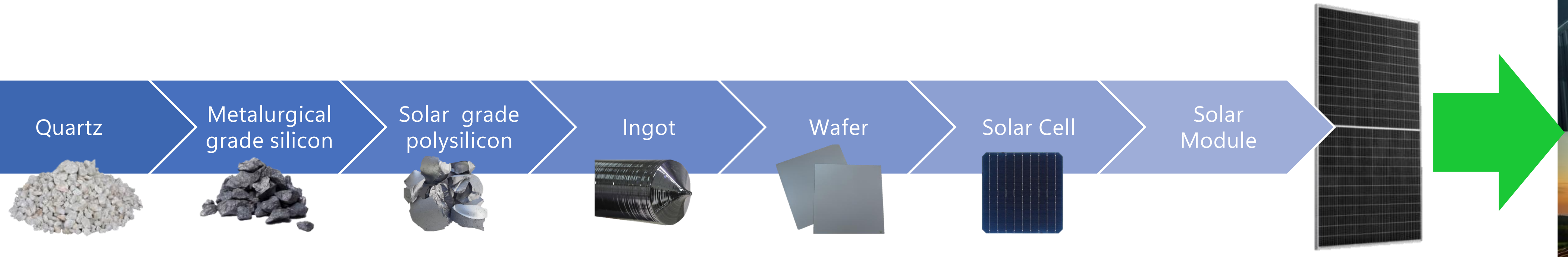

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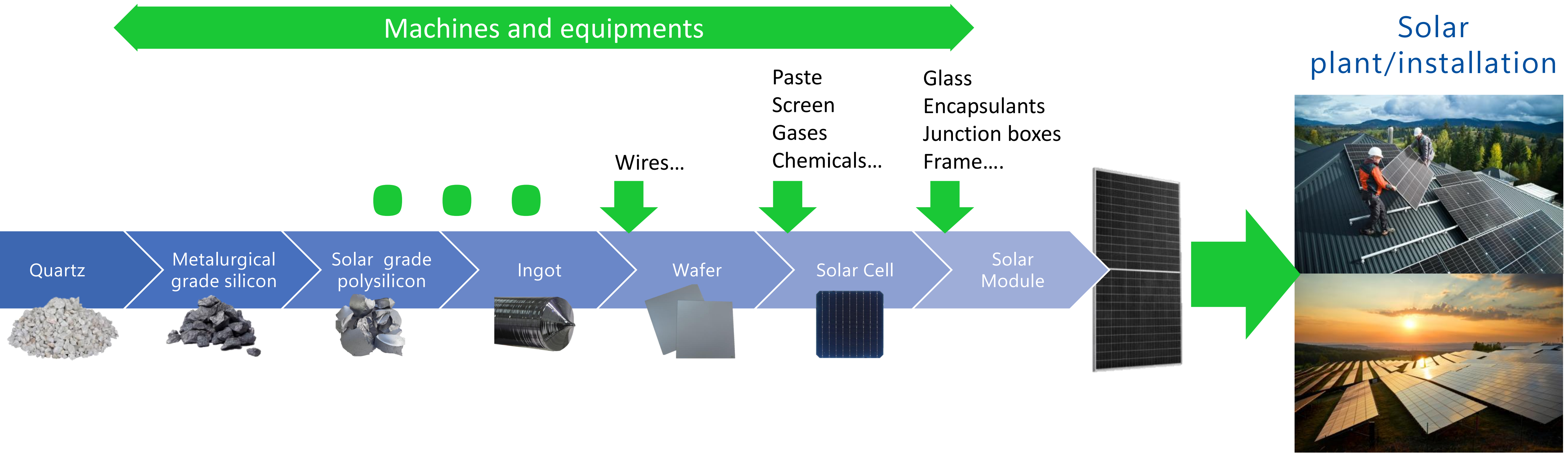

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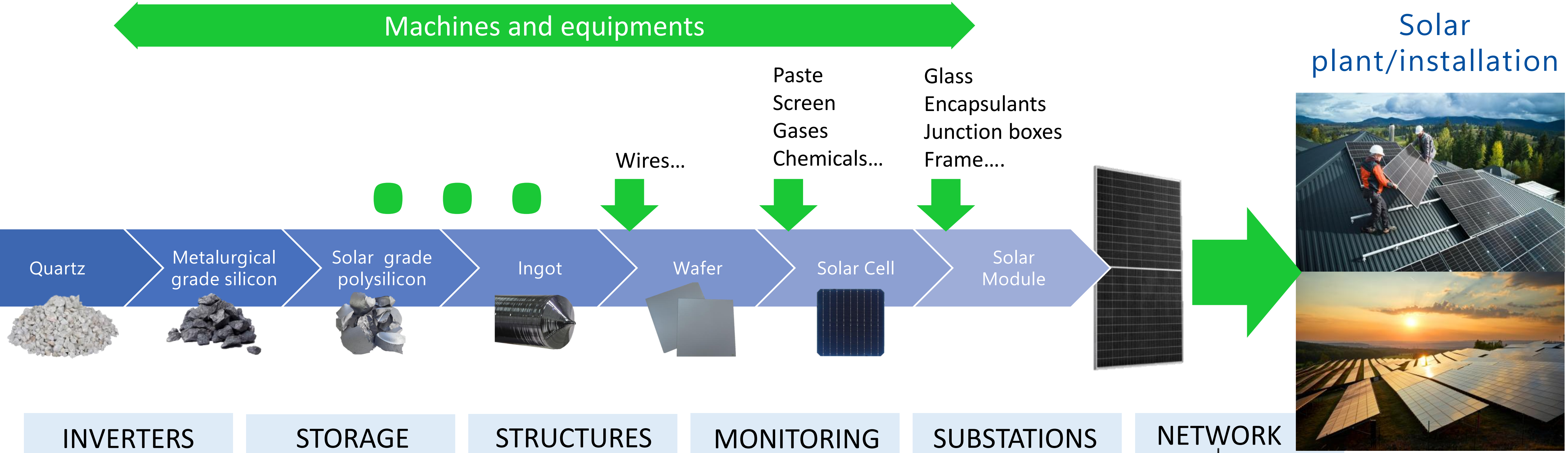


INVERTERS

Semiconductors
Printed circuits
IGBT…

STORAGE

Chemicals
Cell assembly
BMS…

STRUCTURES

Metal profils
Gear motors…

MONITORING

Captors
Electronics
Cables…

SUBSTATIONS

Transformer
High Voltage Cells
Switchboard

NETWORK

Cables
Substations…

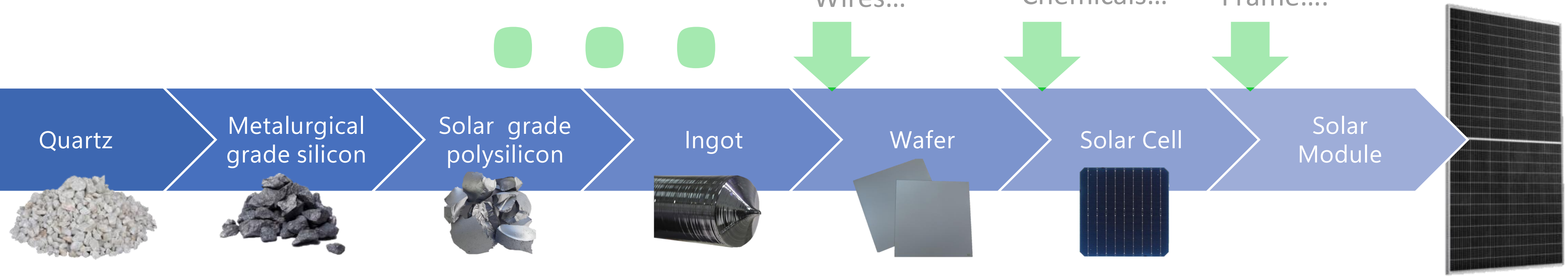
SOLAR VALUE CHAIN – WHAT IS IT EXACTLY ?

Machines and equipments

Wires…

Paste
Screen
Gases
Chemicals…

Glass
Encapsulants
Junction boxes
Frame….



Solar plant/installation

TODAY'S FOCUS

INVERTERS
Semiconductors
Printed circuits
IGBT…

Chemicals
Cell assembly
BMS…

Metal profils
Gear motors…

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Cables…

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NETWORK
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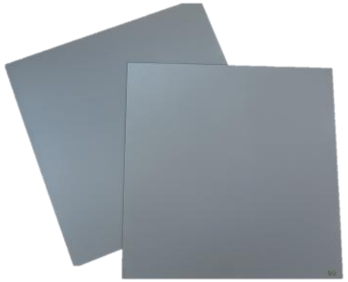
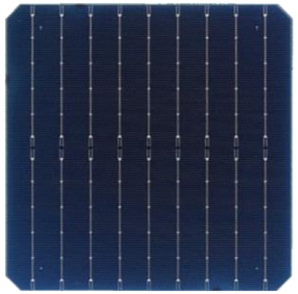
REPARTITION OF PRODUCTION CAPACITY AS OF 2022

Solar grade polysilicon → Ingot → Wafer → Solar Cell → Solar Module





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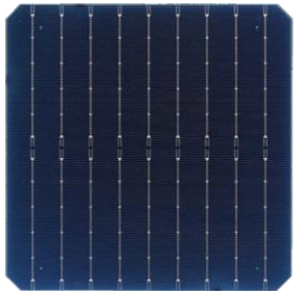


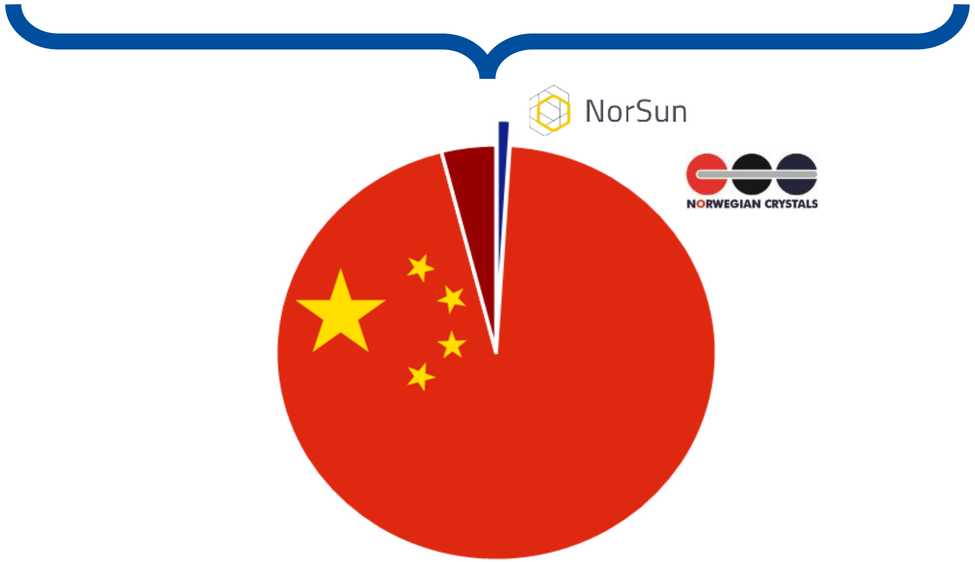

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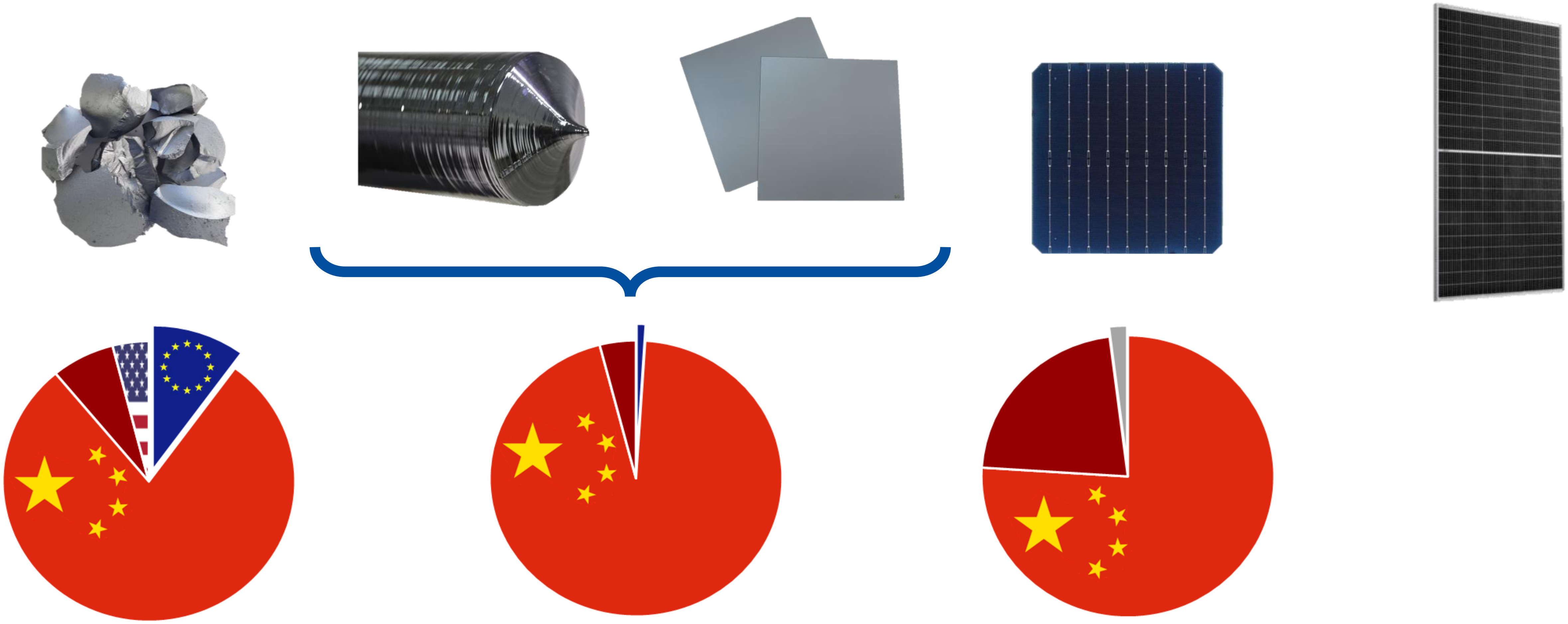

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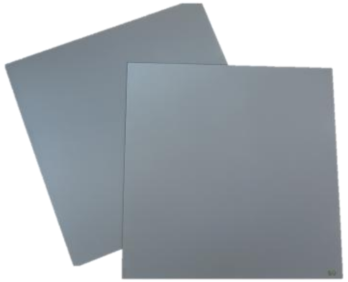
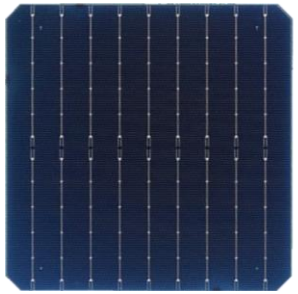
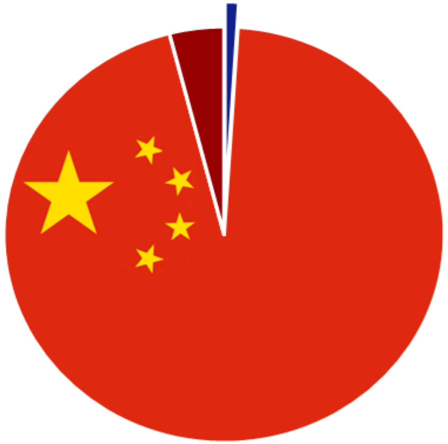
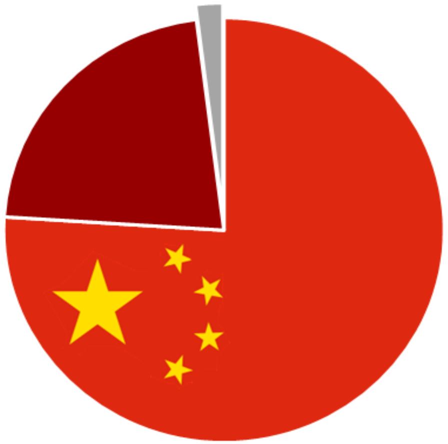
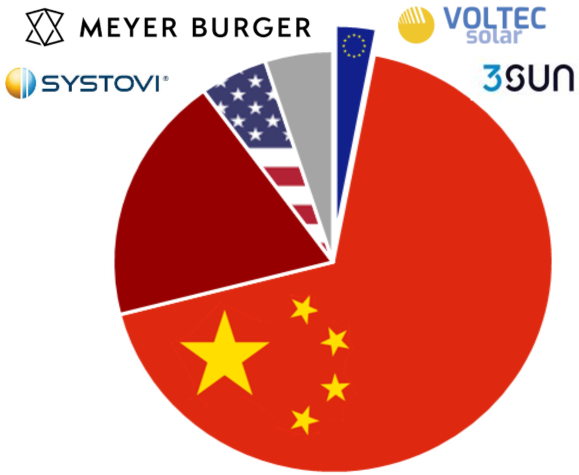










REPARTITION OF PRODUCTION CAPACITY AS OF 2022

EU players have had huge issues in the last years
Many bankrupcies
Delocalisation to the US

How did we come to this situation?

How did China become such a leader

THROWBACK AT 2000 AND 2010

Year	Global Module Manufacturing Capacity (GW)	Asia (%)	Europe (%)	North America (%)	Rest of the World (%)
2000	~1 GW	30%	50%	15%	5%

In 2000

- EU (and Germany) dominates PV market
- Asia manufacturing is almost exclusively made in Japan

THROWBACK AT 2000 AND 2010

Year	Global Module Manufacturing Capacity (GW)	Asia (%)	Europe (%)	North America (%)	Rest of the World (%)
2000	~1 GW	30%	50%	15%	5%
2010	~30 GW	60%	20%	15%	5%

In 2000

- EU (and Germany) dominates PV market
- Asia manufacturing is almost exclusively made in Japan

In 2010

- EU loses leaderships
- Aggressive investment of Chinese manufacturers
- China starts to overtake the global market

CHINA'S STRATEGIC POLICIES IN SOLAR MANUFACTURING

Government Support

- China's government has provided consistent support to the solar industry, including subsidies, tax incentives, and favorable policies, fostering rapid growth and development.

Early Investment

- Significant investments in renewable energy technologies since the mid-2000s have positioned China as a leader in solar manufacturing.

Economies of Scale

- A vast domestic market, strong supply chains and the gigafactory model have enabled Chinese manufacturers to achieve economies of scale, reducing costs and increasing global competitiveness.

Innovation

- Continuous advancements in technology and manufacturing processes have allowed China to dominate the global solar market, now accounting for over 90% of global solar cell exports.

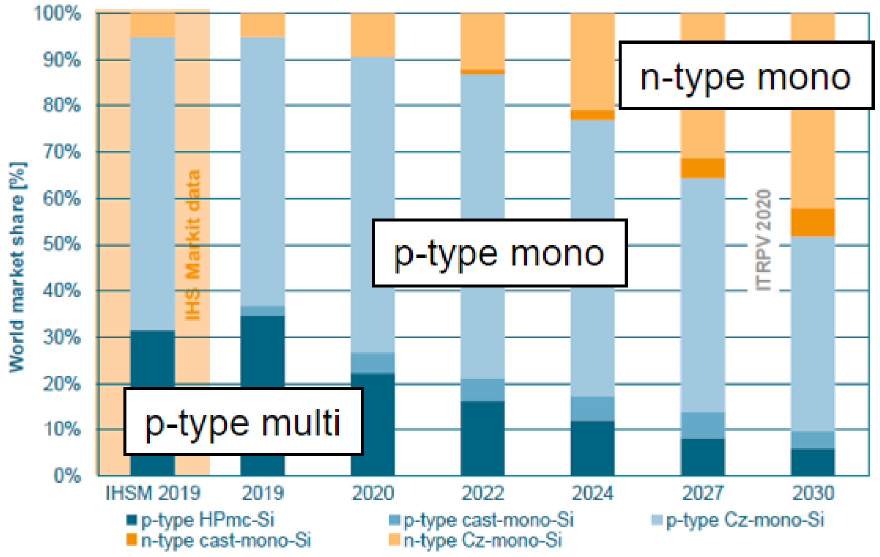
X. You, "The 'New Three': How China Came to Lead Solar Cell, Lithium Battery and EV", China Dialogue, November 7, 2023, available at: https://chinadialogue.net.

RECENT INNOVATION THAT RESHAPED THE MODULE MARKET

At the wafer level

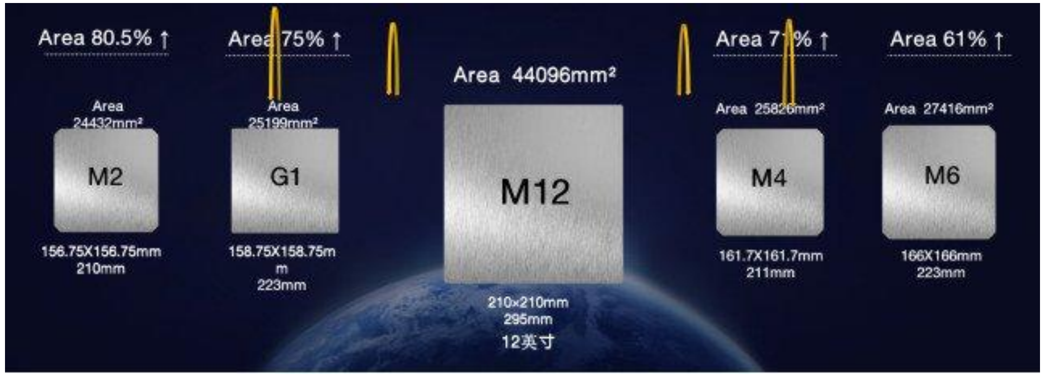
Shift towards moncristalline silicon

- Better quality of materials
- Economically viable process



Change in wafer size

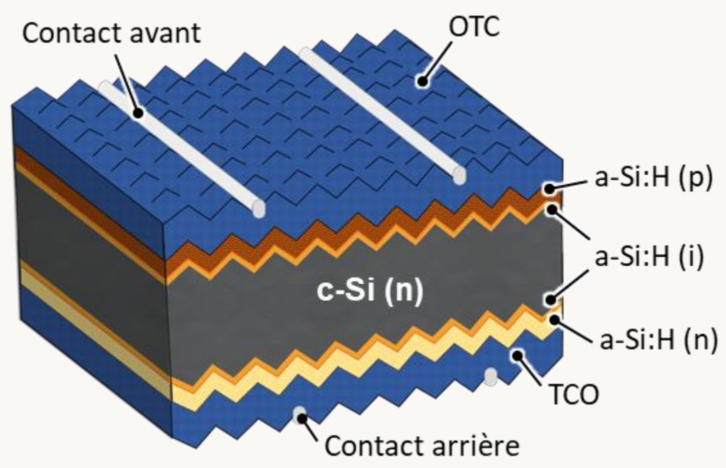
- Increased surface area and increased power
- Towards standardization: rectangular M10-G12



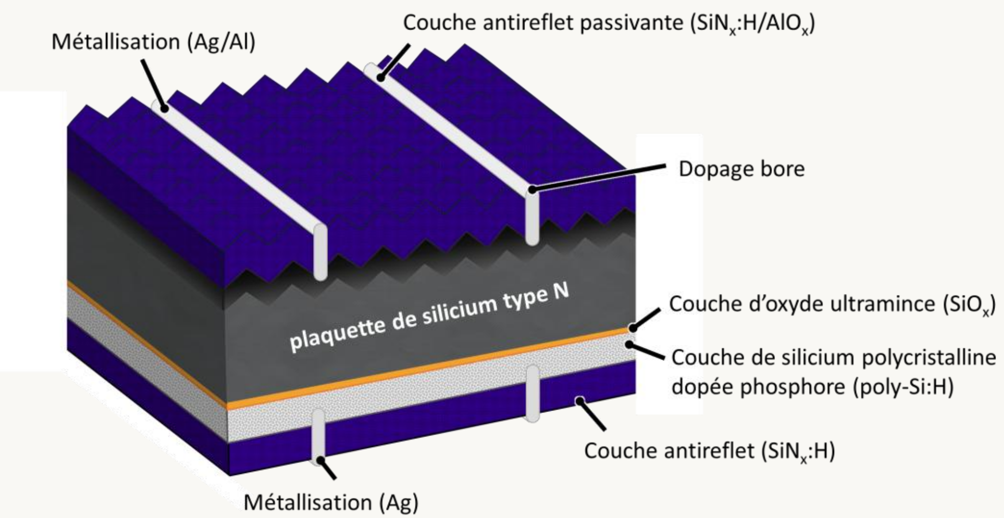
RECENT INNOVATION THAT RESHAPED THE MODULE MARKET

At the cell level

SHJ



TOPCon

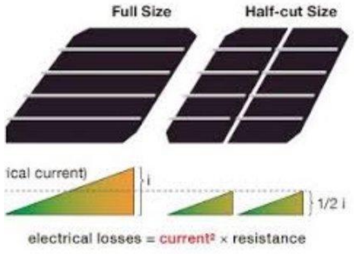


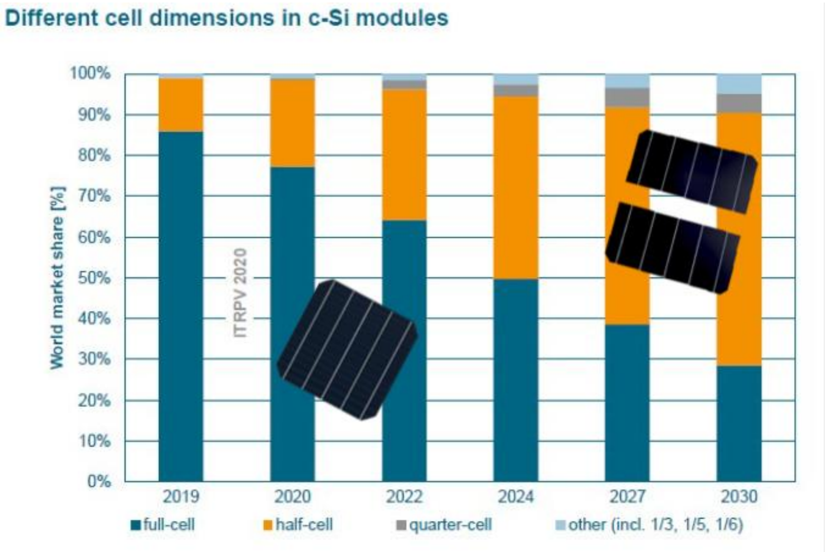
Key to Competitiveness	Main Drivers	PERC	TOPCon	HJT
Manufacturability	Capacity of equipment production	High	High	Low
	Component cost	Low	Low	Highest
Power / Efficiency	Current efficiency	20-21.5%	21-22.5%	21-23%
	Potential for high efficency	Low	V Good	V Good
Environmental, Social, & Governance	Low Carbon footprint	Yes	Yes	Yes
	Sustainable	Yes	Yes	Raw materials
Technological evolutivity	Allows for Tandem cells	Yes	Yes	Yes

At the module level

Shift to half cells:

- Cutting cells = reduces electrical losses
- Optimised gain for half-cut or two cut cells





Towards standardization of module dimensions:

- Agreements amongst manufacturers in 2023: 1134 mm wide modules

Is EU’s grasping the opportunity?

EU'S MARKET CURRENT STATUS

Market share

Market share	
20%	Local installers buying from distributors Driven by national subsidies Sensitive to locally sourced panels
30%	Developers Partially subsidized through FiTs and tenders Sensitive to ESG criteria
50%	Developers Usually driven through tenders Economic criteria ofter prevails

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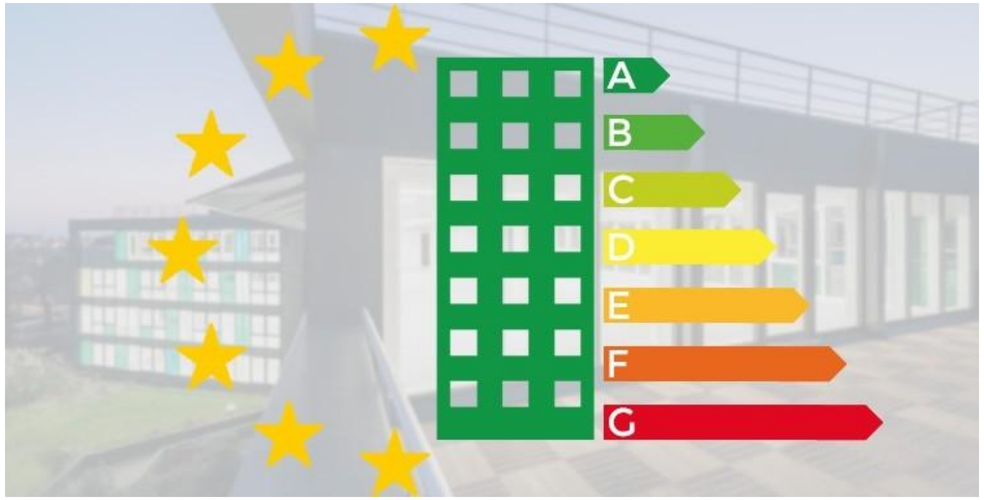
Net Zero Industry Act

Requires Member States to introduce rules in public support to reach **30 GW of European production of solar panels by 2030**

Energy Performance of Buildings Directive

Requires the **installation of solar panels on buildings**



APPLICATION PLANNING OF THOSE CHANGES

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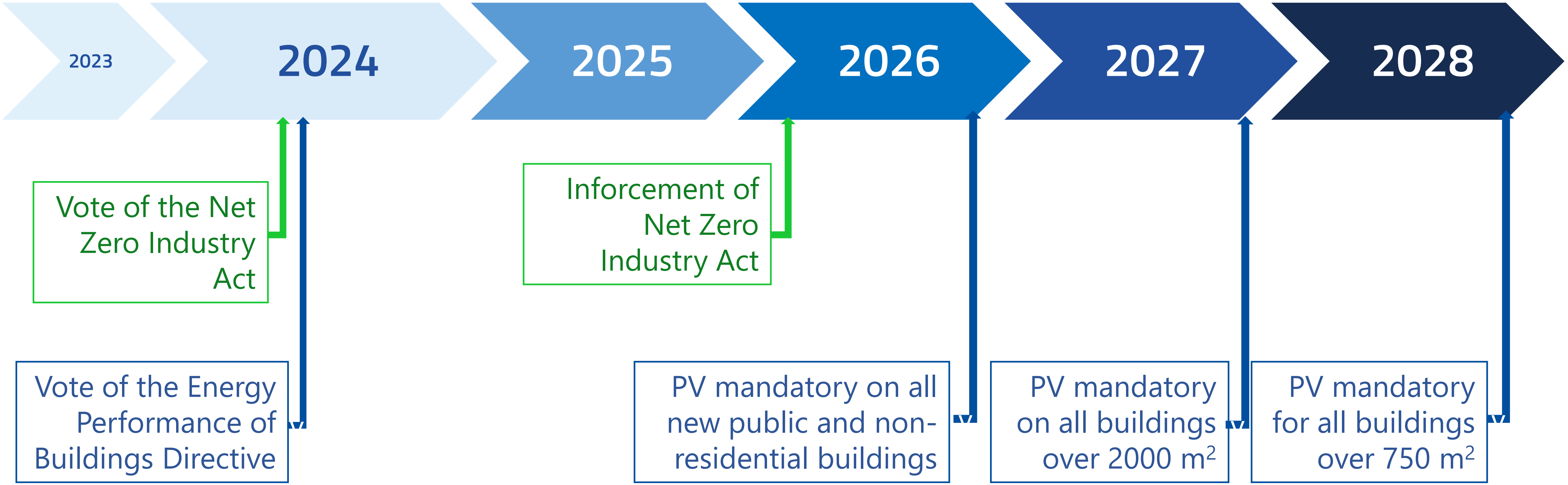

IMPACT ON THE EU MARKET

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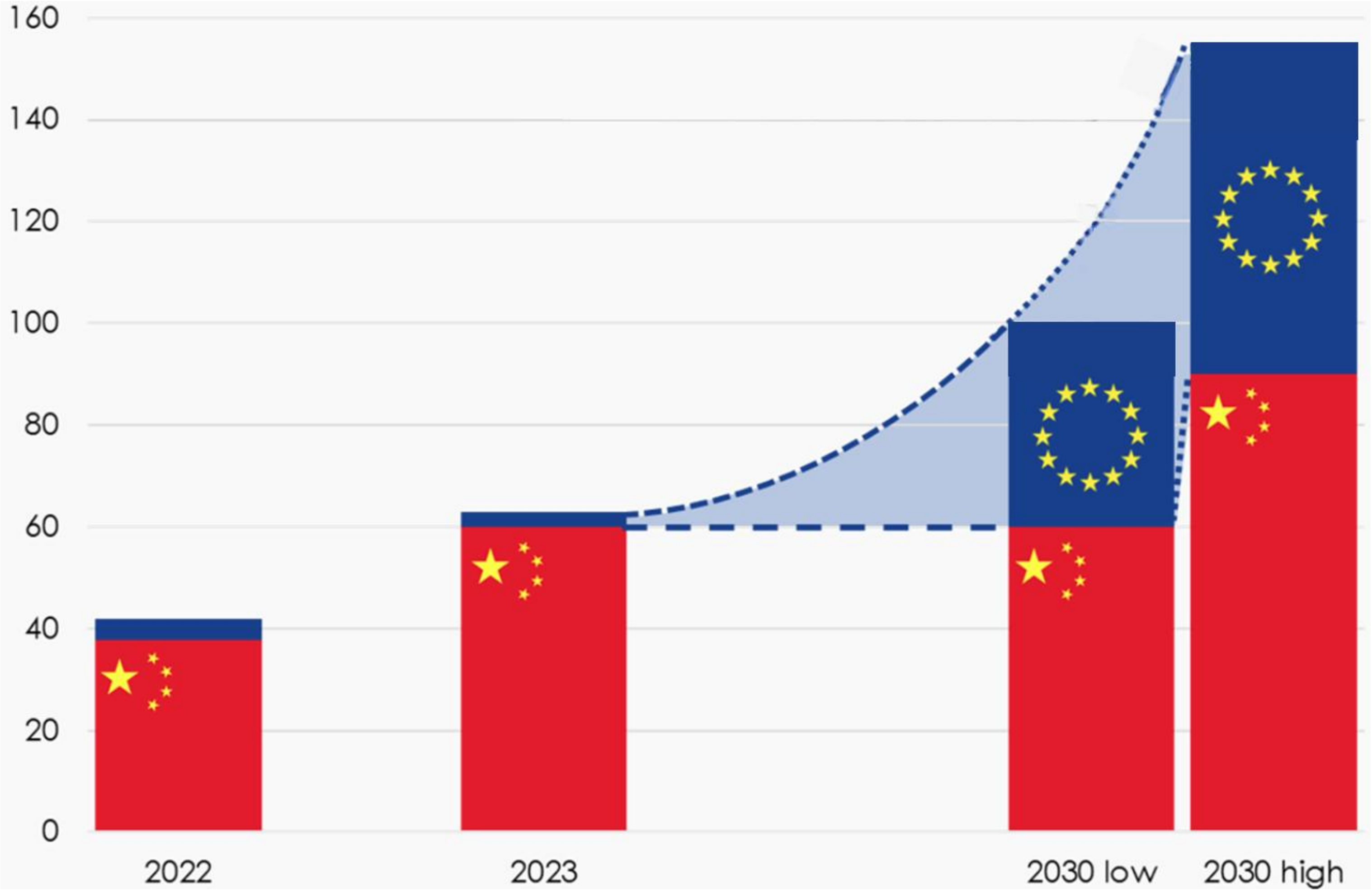
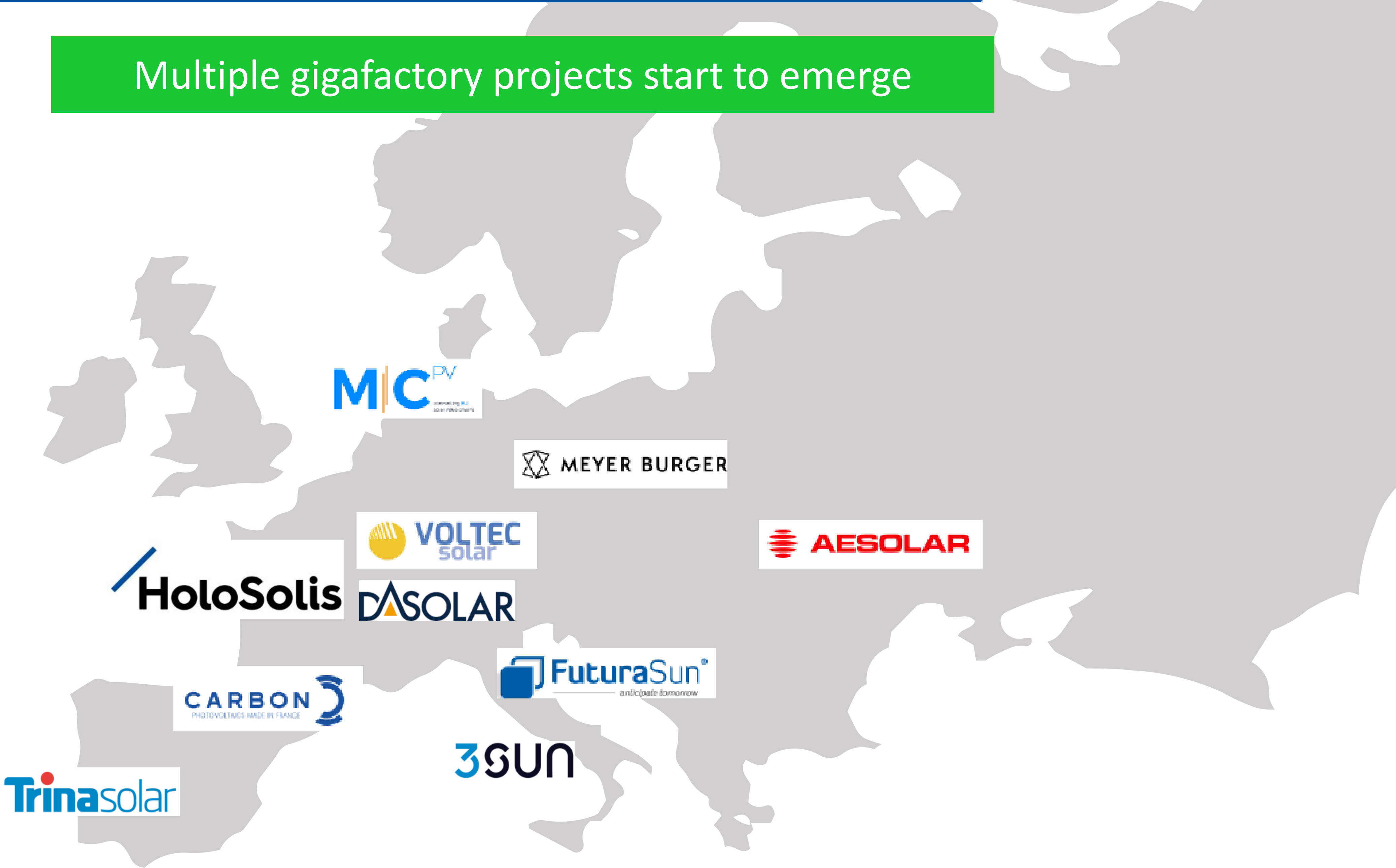


Global Groth of EU’s solar PV modules market
Increasign share of EU made solar modules

IMPACT ON FUTURE EU PRODUCTION CAPACITY

Multiple gigafactory projects start to emerge



IMPACT ON FUTURE EU PRODUCTION CAPACITY

Multiple gigafactory projects start to emerge

Tough situation still ongoing for existing producers (very low price, difficult to upgrade production capacities…

Introducing HoloSolis

HOLOSOLIS: EUROPE'S LARGEST PV GIGAFACTORY

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5 GW cell and module factory in Europe

10 million
solar panels per year

1 million
households equiped per year

> **2000**
jobs created by 2028

850 M€
investment

WHAT MAKES HOLOSOLIS UNIQUE

Strategic location

- Strong industrial background
- 85 % of the European market within 800 km

Cutting-edge technology

- Leveraging N-Type TOPCon
- Maximum efficiency and reliability
- Ultra-low carbon footprint products
- A data-driven factory

A 100 % European company

- Cells and modules 100 % manufactured in EU
- Fully aligned with EU's Net Zero Industry Act

Market demand

- ~5 GW offtake secured in Letters of Intent (LOI)

SITE ORGANIZATION

1 – Production : (a) cells ; (b) modules
2 – Innovation
3 – Offices, restaurant
4 – Warehouses
5 – Facilities
6 – Parking area with solar car ports
7 – Truck waiting area
8- Electrical substation

To see videos of the future HoloSolis' site scan those QR codes :

A DEFINED COMMERCIAL STRATEGY

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A clear market positionning

RESIDENTIAL

COMMERCIAL & INDUSTRIAL

GROUND MOUNTED

With a defined product strategy

- Performance
- Reliability
- Standard

TAPPING INTO EUROPE'S GROWING SOLAR MARKET

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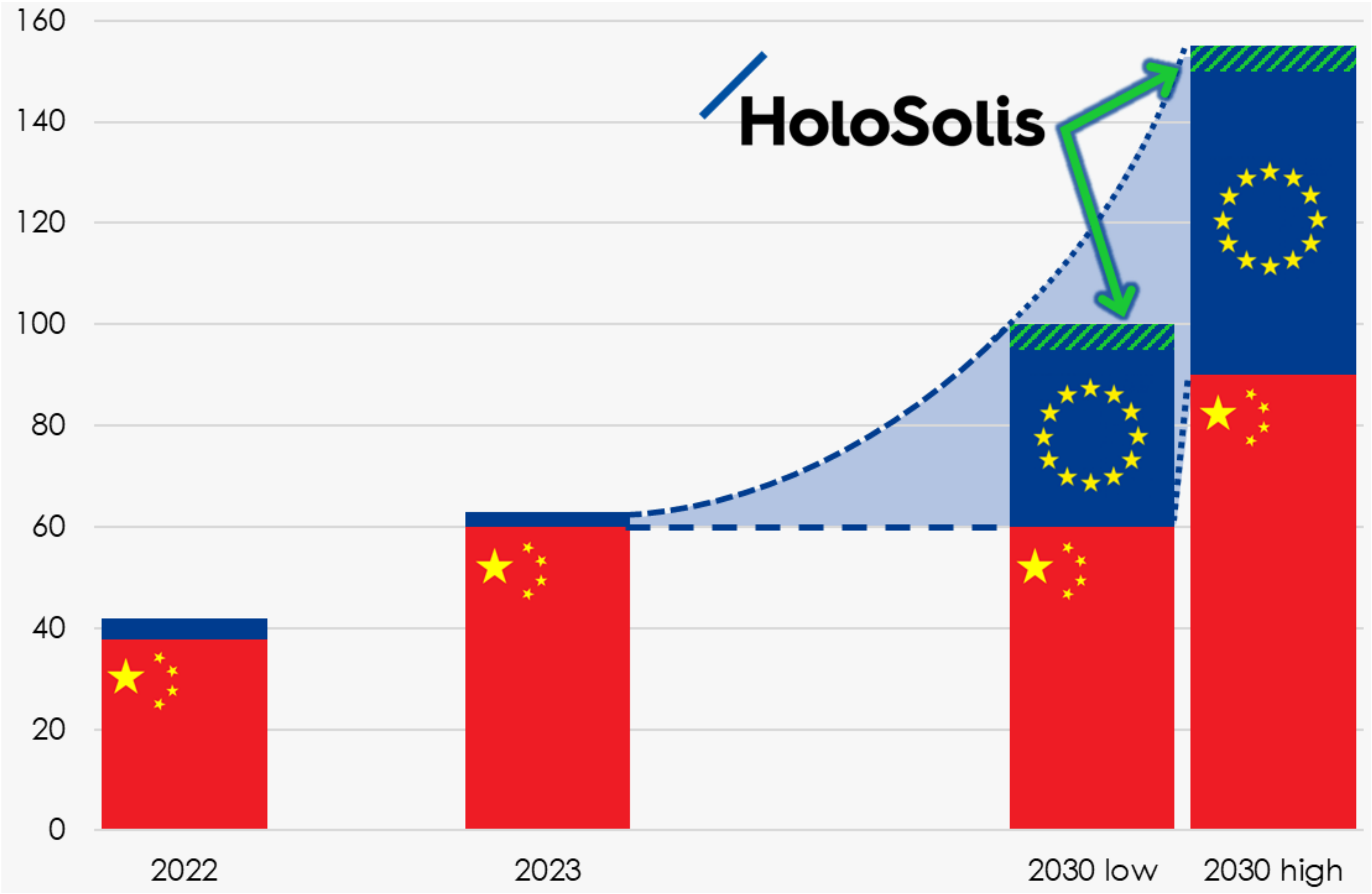
Annual Installed PV Capacity in Europe



10-12 billion €

market opportunity for European manufacturers

8-12 %

market-share for HoloSolis on the EU-manufactured market

OUR ROADMAP TO 2028: KEY MILESTONES

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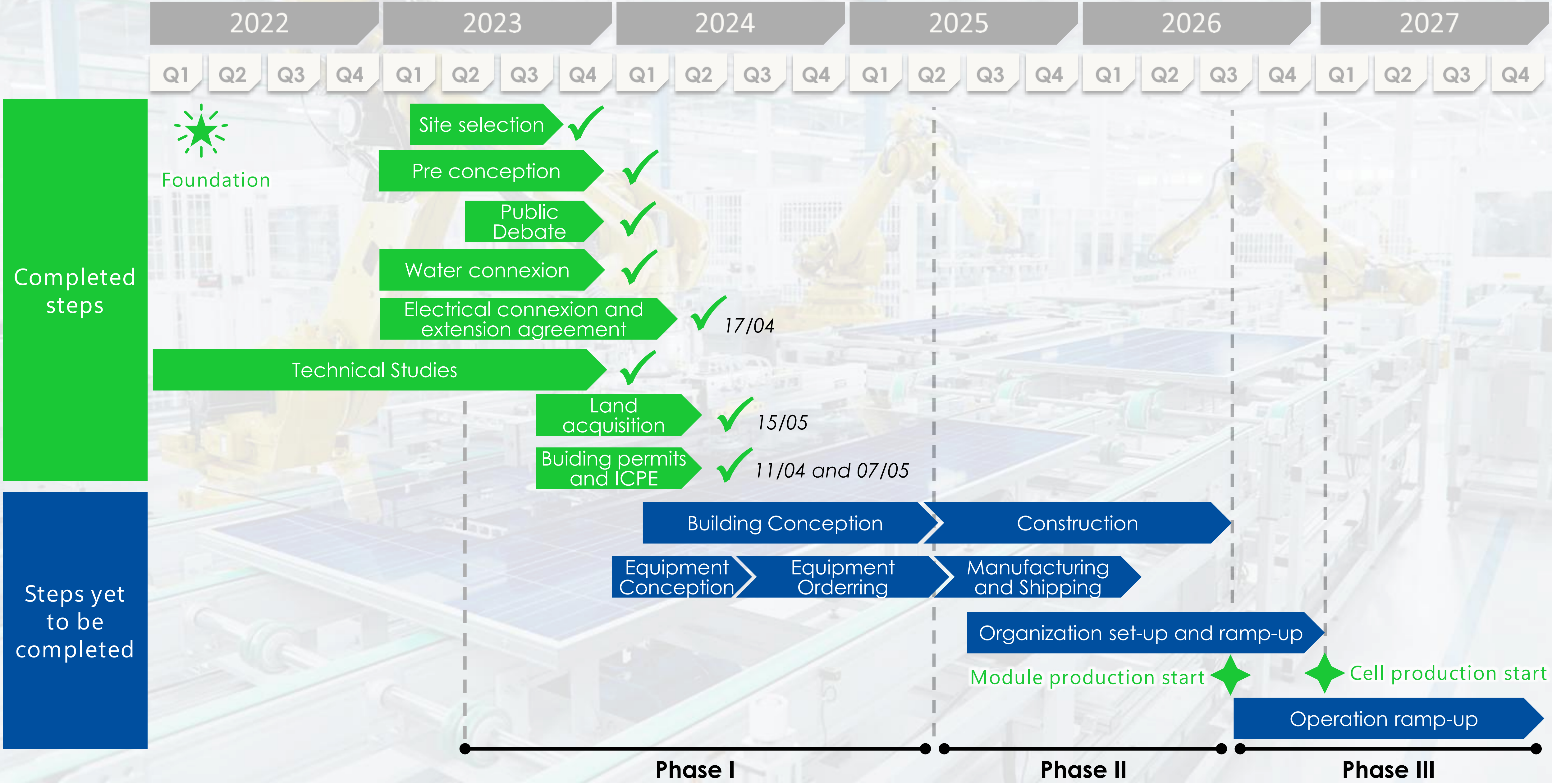

OVERALL SUMMARY

Chinese manufacturers lead the market

Opportunity and necessity to reshore the PV industry in Europe

With 5 GW of production starting in 2026 HoloSolis will be one of EU main manufacturers

To achieve EU's goals of production by 2030:

- ✓ Fast and long-term EU and national legislation required
- ✓ Need to create regulations on demand, funding and barriers
- ✓ Financing of next and existing project is key

Thank you for your attention

Elise Bruhat

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www.holosolis.com