

Munich 12.05.2022



FuturaSun®

*anticipate tomorrow*

ZEBRA

Stringing technology  
for IBC production

*Presented by:*

*Lisa Hirvonen*



# The Company

## About Us



- › FuturaSun was founded by a group of young industry experts in 2008.
- › It's an Italian company specialized in the manufacturing and sale of PV modules.
- › The commercial network is spread to more than 70 countries and has over 15 years of experience in the PV market.
- › 2 production plants situated in Taizhou, China with an annual production capacity of 1 GW.



# N-Type technology

## Back to the origins

The very first solar cell made of silicon was an **n-type back contact** solar cell and it was fabricated at the Bell Labs, USA, in 1954.

We are now **returning to the origins** of using N-type wafers to benefit the several advantages that this technology has to offer.

*The New York Times - April 25<sup>th</sup> 1954*

*“may mark the beginning of a new era, leading eventually to the realization of one of mankind’s most cherished dreams—the harnessing of the almost limitless energy of the sun for the uses of civilization.”*



# N-Type technology

## Differences P-Type Vs. N-Type

### P-Type (positive base)

- › Doped with boron
- › One electron less making it positively charged
- › **P-type cells suffer from LID** (Light Induced Degradation)
- › Higher degradation rates over time

### N-Type (negative base)

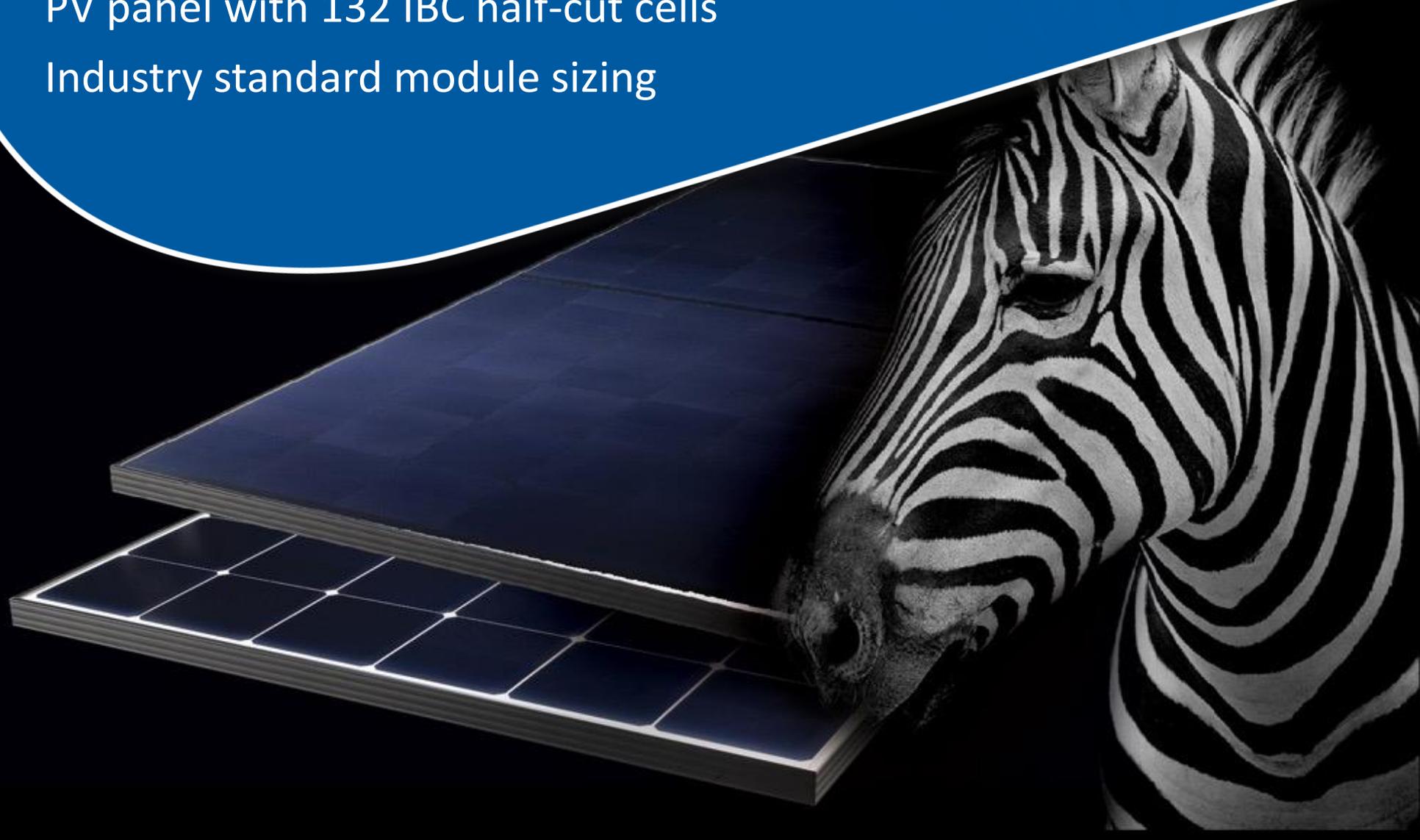
- › **Is doped with phosphorus**
- › With **one electron more** making it negatively charged
- › This extra electron is **boosting the efficiency**
- › **Resistant to LID and LeTID**
- › **Low temperature coefficient**
- › **More kWh per kWp**
- › A sustainable choice for your business plan



# ZEBRA

PV panel with 132 IBC half-cut cells

Industry standard module sizing



# IBC Technology

Maximum light absorption



This new high-efficiency module stands out for its **IBC technology** with all electrical contacts on the back.

- › No metallization on front side
- › n+ and p+ doping on the rear
- › Industry leading cell efficiency +24%
- › European Intellectual Propriety
- › Bifaciality



# ZEBRA series

Standard White | FU420-430M

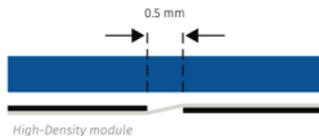
Total Black | FU415-425M



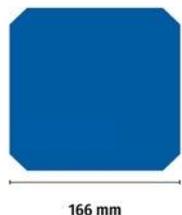
Superior module efficiency up to **21.84%**  
More energy on less space



Dimensions:  
1895x1039x35 mm



Cutting edge technology:  
132 **half-cut IBC**  
**ZEBRA** cells



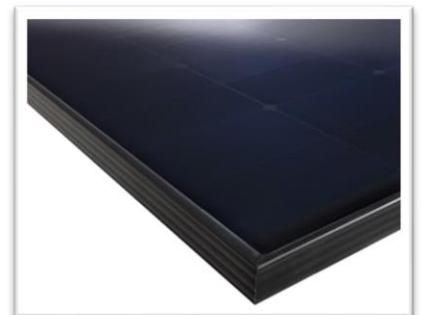
**Black frame** as standard for a better aesthetical appearance

# ZEBRA series

Total Black | FU415-425M



- › Available also with an elegant total **black design**
- › Particulary suitable for buildings with a **high architectural value**



# ZEBRA series

## Module layout

- › Innovative cell layout
- › Overlapping cells – full size cell appearance
- › Reduced cell to cell and string gaps
- › Optimized module size
- › **Module efficiency 21.84%**



CELL OVERLAPPING

REDUCED CELL TO CELL DISTANCE

CELL OVERLAPPING

GLASS

ZEBRA CELL

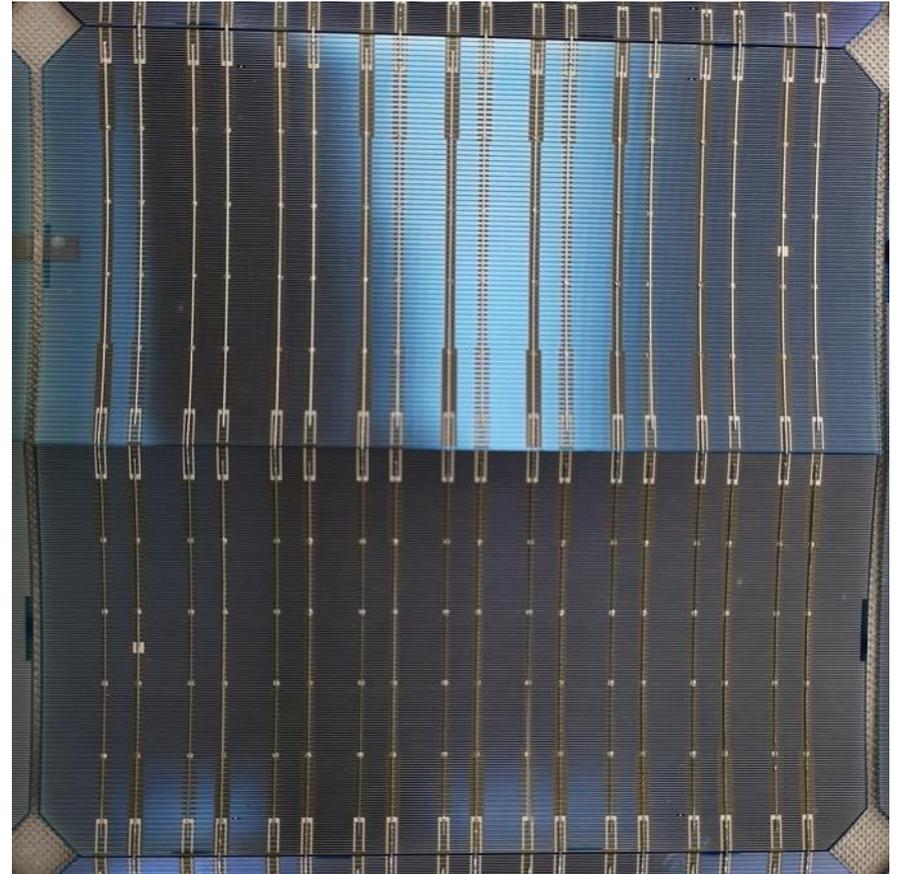
WIRE

BACK SHEET

# ZEBRA series

## Cell interconnection

- › Interconnection by «traditional» stringing
- › Traditional manufacturing process regarding module assembly
- › 9 bb becomes 18 bb



### DIFFICULTIES WITH A STANDARD TECHNOLOGY

- › Soldering of only the back side tends to create a notable bending of the cell due to the thermal return of the ribbon;
- › This problem exists also on normal cells but as both sides are soldered the consequences are less noted;
- › The mechanical tensions remain active during the module's lifetime and could create, in severe cases, quality problems



# ZEBRA series

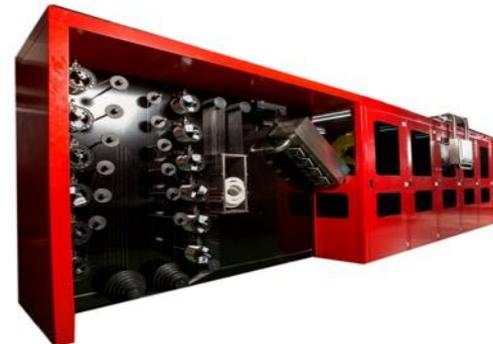
## Cell interconnection



### OUR SOLUTION

Patent EP3493278B1

- › The cells and the ribbon are withold by two conveyor belts;
- › During the forward movement of the conveyors the belt surface is curved mechanically;
- › The created curve is studied to be the opposite of the curve created during soldering;
- › The soldered string exits from the mated belts without curving and without mechanical tension



# The importance of talking about kWh

## Improve your yield with ZEBRA

- › Resistant to LID and LeTID
- › Market leading power stability over time (93% at the 25th year)
- › Improved low light performance
- › Excellent temperature coefficient  $-0,29\% / C^{\circ}$
- › Better yield at various tilts
- › No shading on the cell
- › Improved behavior under partial shading
- › ZEBRA cells do not degrade under UV illumination
- › Bifaciality



 kWh

## SAY IBC THINK ZEBRA

- › Perfection in aesthetic design
- › Superior energy performance
- › **More kWh per kWp**
- › Reliability & Availability
- › Competitive cost compared to other high-end panels



# ZEBRA Warranties

Market leading power stability over time  
(93% at the 25th year)



## PERFORMANCE GUARANTEE

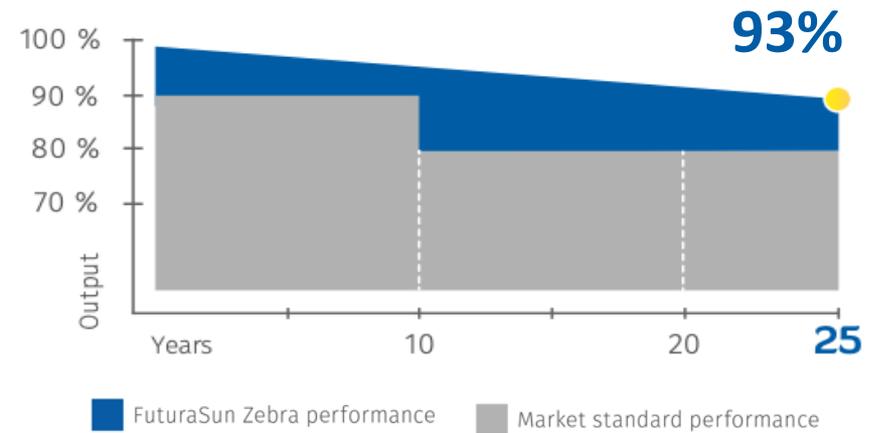
Max power decrease 0.25%/year

1<sup>st</sup> year degradation < 1,0%

99 % at the end of first year

93 % at the end of 25<sup>th</sup> year

Product guarantee 25 years



### THE PAST

- › **Europe was the main player** in the development of the photovoltaic industry in terms of **R&D** and **supply chain**
- › Europe had a **strongly incentivized market** for the **end user**
- › Quick spread of the photovoltaic culture as a **sustainable and profitable energy choice**



### **BUT WHAT HAPPENED IN LESS THAN A DECADE?**

BOOM → MATERIAL SHORTAGE →  
ASIAN SUPPLY CHAIN GROWTH →  
OVER CAPACITY → PLUMMETING PRICES  
→ END OF TARIFFS →

### **WHAT WENT WRONG FOR EUROPE ?**

**A strongly stimulated market but without adequate supports** for the industries present in Europe.

**GAME  
OVER**

**EU SUPPLY CHAIN**



### THE PRESENT

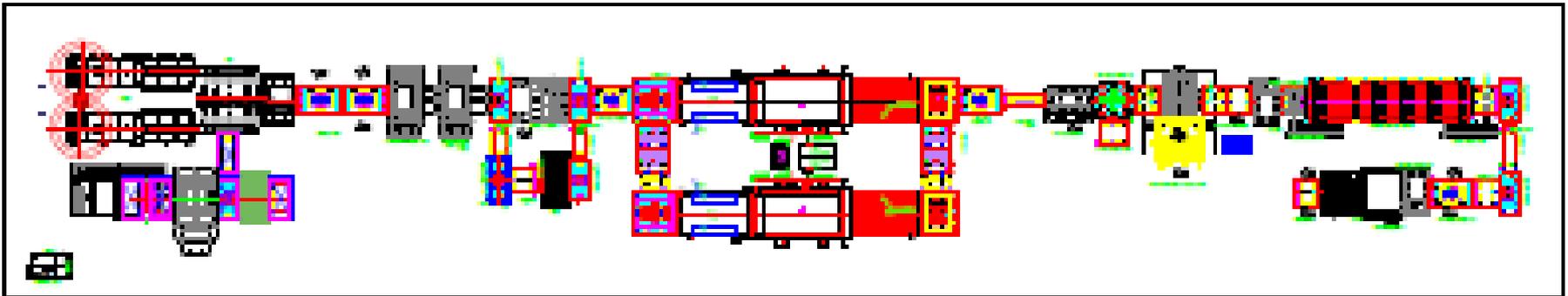
Never as today **energy independence** has been this important and with a future energy demand from renewable sources that will exceed the existing production capacity, **it will become strategic for Europe to restore the photovoltaic supply chain** to meet the decarbonization targets set for 2030.



Today EU wants to support the industry but  
**it will take time to recreate a true European supply chain**

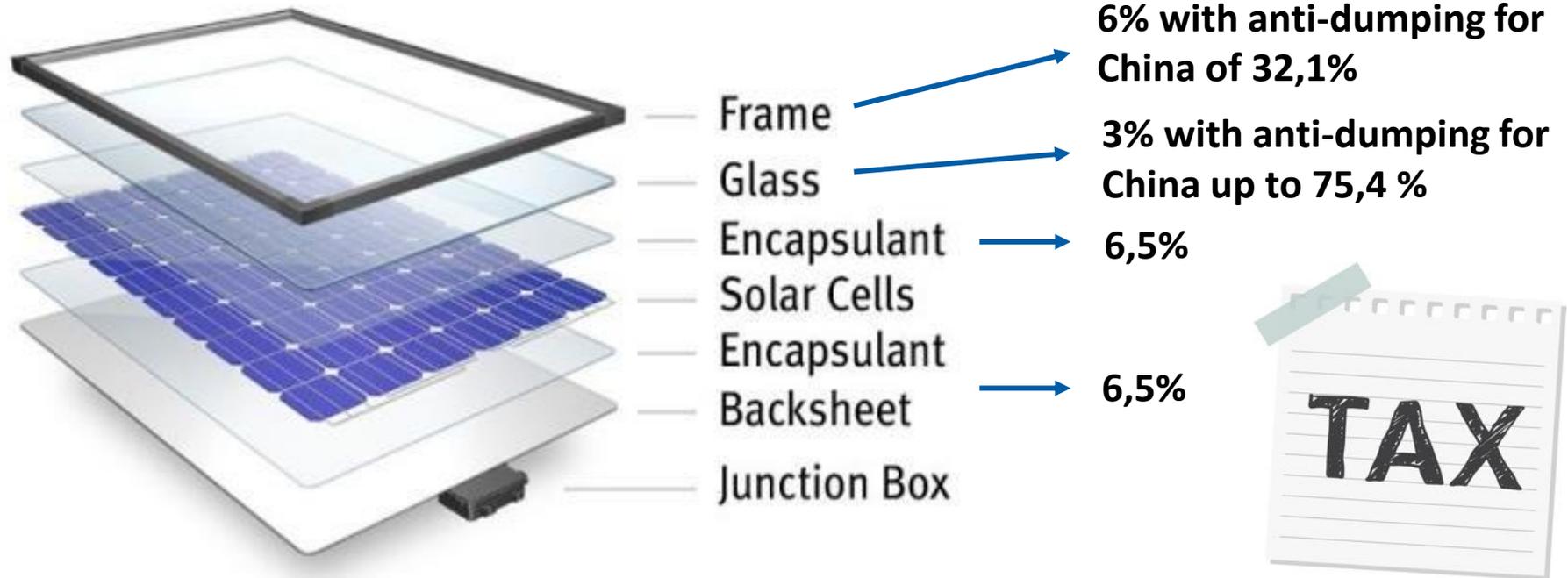
### OUR PLAN EUROPEAN ZEBRAS

- › Pilot line in Italy ~ Q1 2023;
- › Development of **bifacial glass-glass ZEBRA modules**;
- › ~ 2024 **European supply chain** also for **European ZEBRA cells** from **EURECA** partners
- › Pilot line turns into GIGA fab...



# ZEBRA

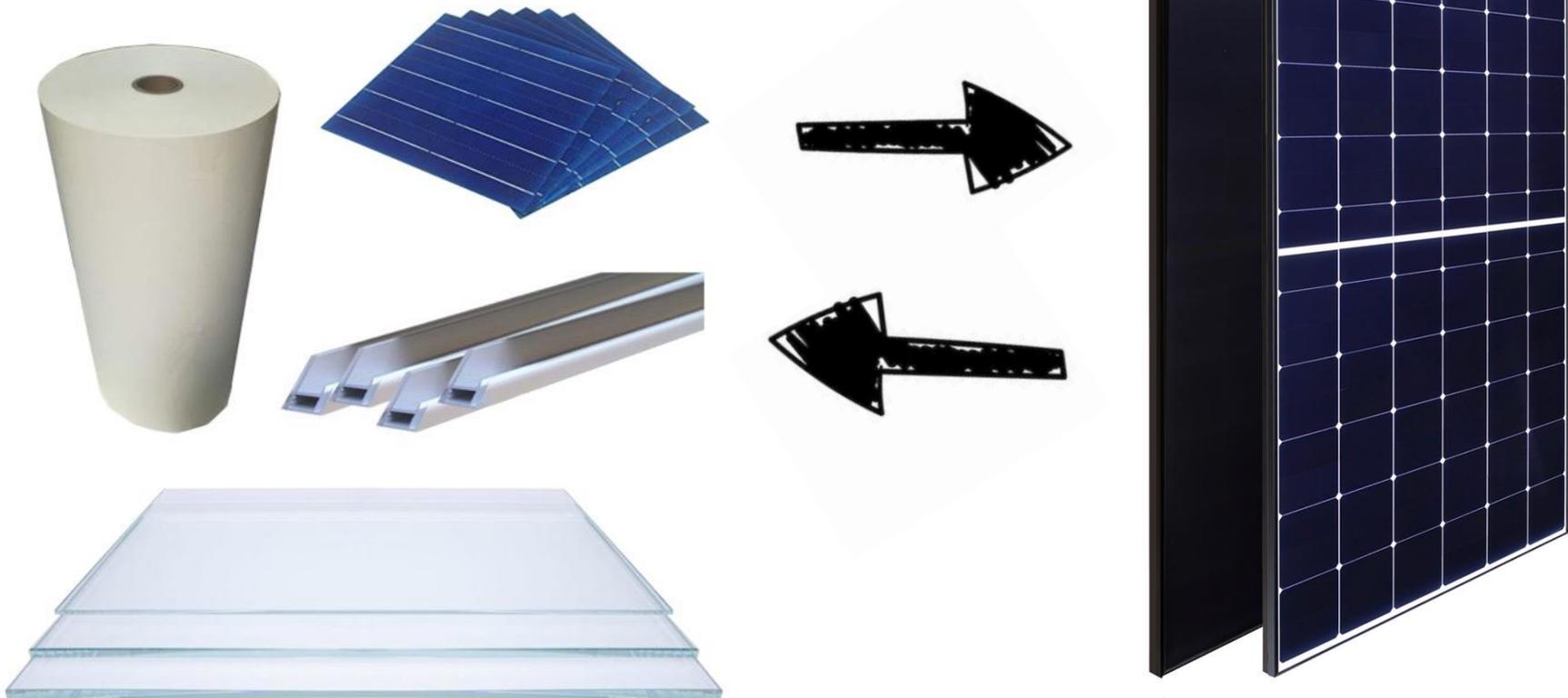
## Important considerations for a possible EU PV module manufacturing



**DUTIES, AN IMPORTANT OBSTACLE FOR AN IMMEDIATE PRODUCTION IN EUROPE**

# ZEBRA

## Important considerations for a possible EU PV module manufacturing



# Thanks for your attention!

For further information, please don't hesitate to contact us!



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Italian Company



State of the art certifications



Full range of PV solutions from stand-alone to utility scale



Worldwide installation track record



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