

IBC modules with novel stringing technology

LISA HIRVONEN

About us

- FuturaSun® was founded in 2008. Our HeadQuarters are located in Cittadella, Padua Province, Italy.
- The only Italian module manufacturer with exclusive property of its own factory in China.



About us

CITTADELLA (Italy) | Headquarters

ROME (Italy) | Solertix

VERONA & TRIESTE (Italy) | Warehouse

ROTTERDAM (NL) | Warehouse

HEPPENHEIM & BERLIN (Germany)
Project Office and Sales Office 2023

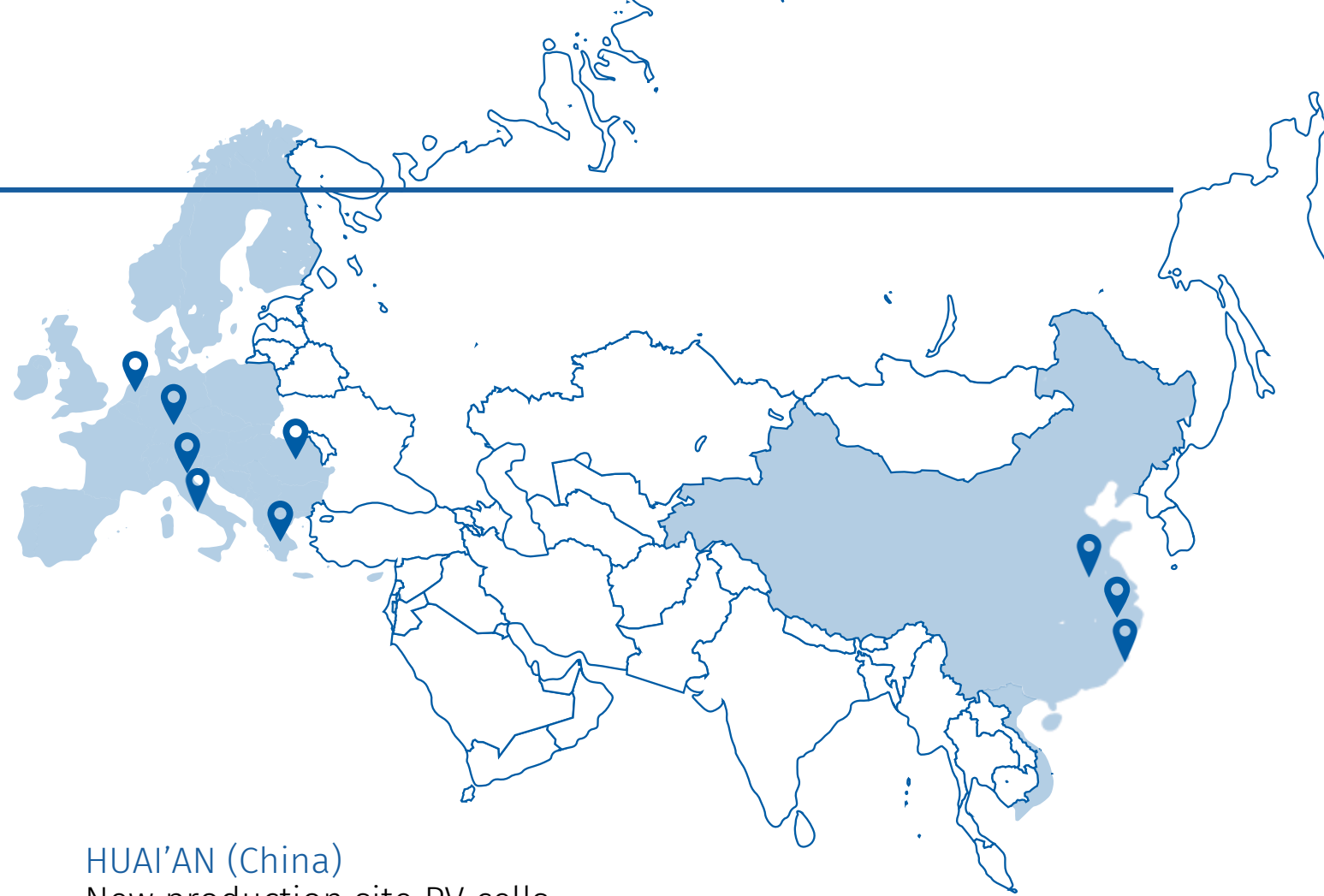
TULCEA (Romania) | Sales Office

ATHENS (Greece) | Sales Office 2023

TAIZHOU (China)
Production site PV modules and Warehouse

HUAI'AN (China)
New production site PV cells

SUZHOU (China)
PV modules and China Headquarter



About us

- Steady growth year on year
- Over 70 countries served
- Ongoing industrial development plan to create a highly efficient PV supply chain



2008

Establishment of FuturaSun with headquarters in Cittadella (PD) in the Italian photovoltaic district.



2013-2015

Expansion of the sales network in Italy and development of large photovoltaic parks in Romania.

Development of photovoltaic plants in Germany and the United Kingdom.



2017-2019

Brand success on a European scale. Growth of sales in Africa, Asia and Brazil.

Expansion of production capacity to 1 GW.



2023

Strategic Expansion

FuturaSun broadens its production capabilities with a new gigafactory in China for PV cells and two facilities in Suzhou and Italy for PV panels.

2023

Vertical Integration

FuturaSun expands its operations in the PV supply chain, spanning perovskite R&D, PV cell production, modules, inverters, and batteries, and operating seamlessly across the entire value chain.

2023

Group

FuturaSun becomes an international Group, including R&D subsidiaries, offices in Europe and China, and projects worldwide - spanning both on-grid and off-grid solutions.

Industrial development

- October 2022, Formal signing ceremony for a 55,000 sqm industrial site in Suzhou, Jiangsu Province, China that will add an **additional 2 GW module production capacity**
- March 2023, Acquisition of a 24,000 sqm plot of land in the industrial area of Cittadella, Padova Province, Italy to establish a **new Italian module Gigafactory**
- May 2023 announcement to start **PV cell production with 15 GW capacity** in Huai'an, Jiangsu Province, China
- June 2023 FuturaSun acquires **Solertix**, an Italian start-up specialized in **Perovskite Solar Cells** research and upscaling for industrial application

FuturaSun announces new 2 GW solar module factory in Italy

FuturaSun, an Italian solar panel manufacturer, has acquired land for its new 2 GW solar module plant in an industrial area near Padua, Italy.

MARCH 9, 2023 **EMILIANO BELLINI**

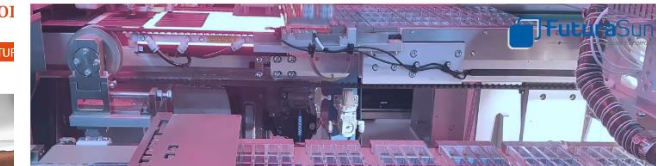
HIGHLIGHTS **MODULES & UPSTREAM MANUFACTURING** **ITALY**

Futurasun acquires perovskite star

Futurasun, an Italian module manufacturer based Solertix. It now aims to bring cell technology closer to commercialization.

JUNE 1, 2023 **PILAR SÁNCHEZ MOYA**

MARKETS **MODULES & UPSTREAM MANUFACTURING**



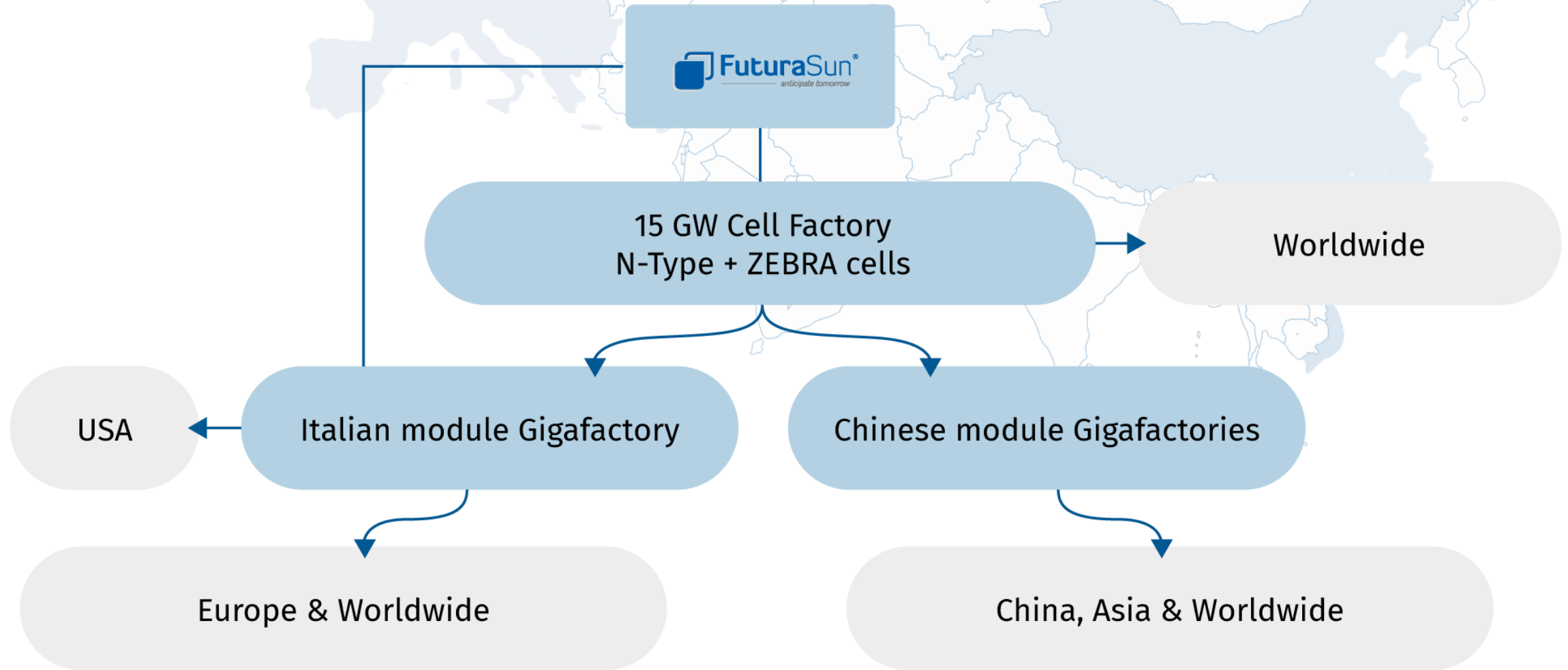
vertical integration strategy with the new 2 GW solar module factory in Huai'an, China. It aims to start production in 2024.

UCCI

MODULES & UPSTREAM MANUFACTURING **TECHNOLOGY**
OPENING **ITALY**



A worldwide supply chain



Industrial development - China



CELLS PRODUCTION SITE



HEADQUARTERS AND HUB



CURRENT MANUFACTURING



Solar cell production – Huai'an

The project



Another pivotal milestone for FuturaSun in the **vertical integration** of its photovoltaic supply chain

Set to produce cutting-edge bifacial n-type concepts

Solar cell production – Huai'an



14/9/23 The first symbolic stone

Air photo 02/10/23



Solar cell production – Huai'an



Factory status at 29/11/23

15 GW PRODUCTION CAPACITY
OF HIGH EFFICIENCY CELLS

266.000 SQM

3 YEAR RAMP UP

1500 EMPLOYEES (2026)

European Intellectual property

A revolutionary agreement for IBC-ZEBRA cell production

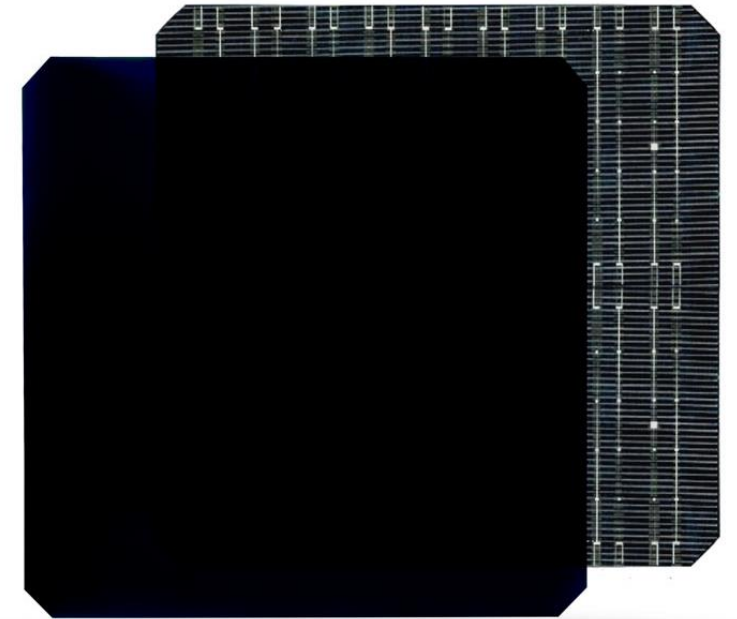
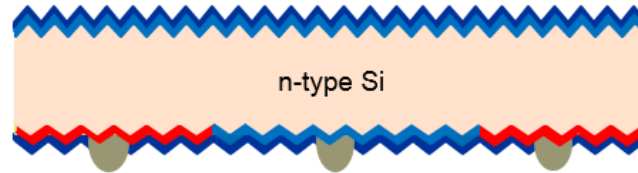


During Intersolar 2023, FuturaSun and ISC Konstanz announced to drive forward a comprehensive collaboration on ZEBRA back-contact technology.

This revolutionary collaboration will see FuturaSun producing ZEBRA IBC cells in its upcoming cell factory in Huai'an (Jiangsu)

European Cell Technology

- Innovative technology developed in Europe by ISC Konstanz
- No metallization on front side
- Maximum light absorption
- Actual Cell efficiency +24 %



NEXT STEP:

Upgrade to **Cu-poly ZEBRA** with an **efficiency potential >25 %** for a high efficiency at a low cost

ZEBRA Pro Series

ZEBRA Pro



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

- Low temperature coefficient
- Improved low light performance
- Improved behavior under partial shading
- Stable performance over time
- Lower hot spot risk
- Enhanced aesthetics for high architectural value

 kWh



China HQ and module factory in Suzhou

The Project



2 GW PRODUCTION CAPACITY OF
HIGH EFFICIENCY MODULES

NEW CHINESE HQ

55.000 SQM

300 EMPLOYEES (2026)

The Italian Gigafactory



The project

24.000 SQM

3 YEAR RAMP UP

2 GW PRODUCTION CAPACITY

n-TYPE MBB + n-TYPE IBC

+100 EMPLOYEES



PV ACADEMY

R&D CENTER

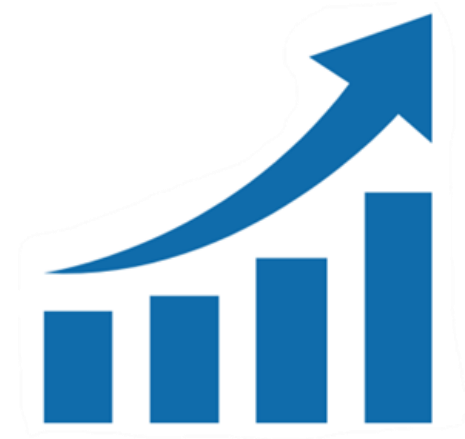
TECHNICAL
LEARNING HUB

RECOVERY ON
EXPERTISE



A Global PV growth

- Photovoltaics is proven to play a key role for the future global energy needs
- Spring 2022, The World installs its first TeraWatt
- The PV industry has, since the very beginning, seen an incredibly **rapid growth** that can lead to new challenges regarding material availabilities
- At the moment **silver** is the most critical metal subject to price and supply risks when PV production expands



Silver

- Silver is a fundamental material for the creation of photovoltaic modules
- The solar industry processes approx. **15%** of the silver mined
- Silver accounts for about **10%** of the manufacturing cost of a photovoltaic module



What might happen?

- The clean energy transition could see the cumulative installed capacity of photovoltaics increase from 1 TW before the end of 2022 to **15-60 TW by 2050**, creating a significant silver demand risk
- The current estimated silver consumption is too high to allow sustainable terawatt-scale production



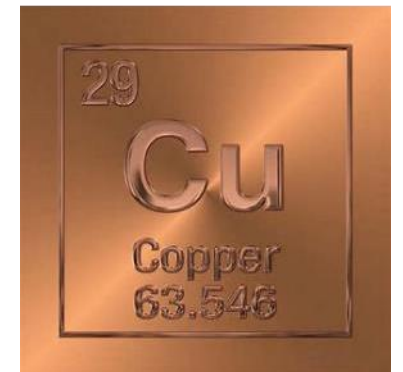
What can be done?



Find an **ALTERNATIVE MATERIAL**

The PV community is working on addressing the silver issue by considering more abundant metals such as copper.

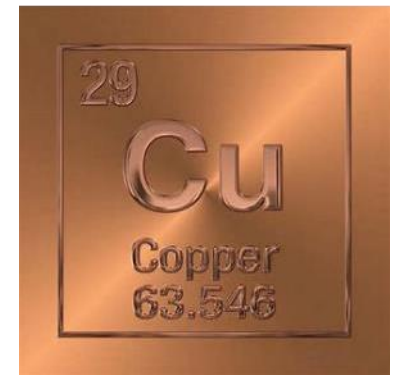
Copper has a **similar conductivity** as silver and is therefore a valid candidate but more than this...



Copper

...copper is many times **cheaper** and more **readily available** than silver.

It is not sustainable to subject the planet to a large demand for silver when there is an alternative like copper



European Project

Industrial projects on European Level



Start: 1.11.2022

Funding: Horizon Europe

Duration: 36 months

Project budget: 16.7 M€

17 members, 4 associated partners

Coordinator: ISC Konstanz

- Goals: bring **high efficiency, low cost, low silver-content IBC** to the market
- Strengthen/Rebuild EU-based PV value chain



This project has received funding from the Horizon Europe Programme for Research and Innovation (2021-2027) under grant agreement No 101084259

Project Partners



Associated Partners

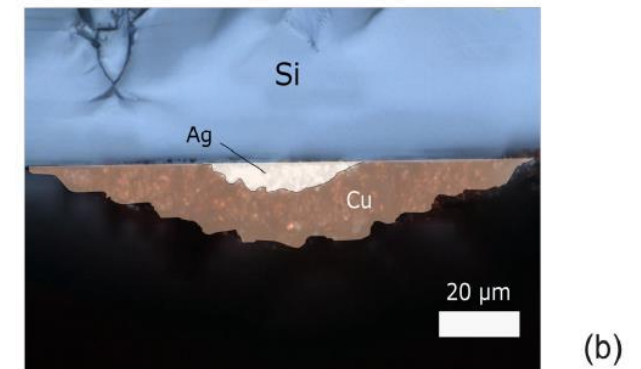
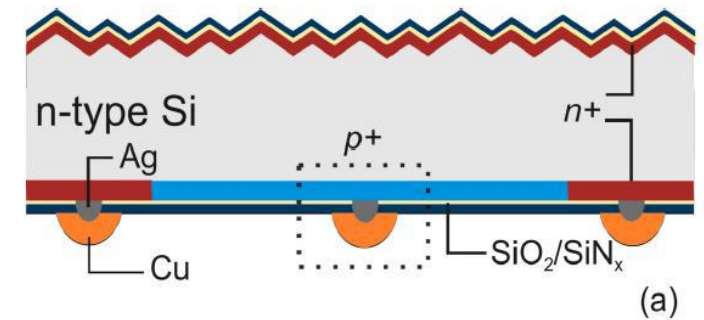


R&D for Industrial copper applications

ZEBRA Cells and Copper

IBC cells have a higher efficiency potential compared to many other technologies, but not only that, **IBC ZEBRA cells can evolve further** by significantly reducing the use of silver.

- IBC technology is ideal for Cu screen printing
- Consolidated technology from PCB
- Solderable by stringing



Stringing of IBC ZEBRA cells

ZEBRA cell interconnection by stringing

DIFFICULTIES WITH A STANDARD TECHNOLOGY FOR ZEBRA CELLS

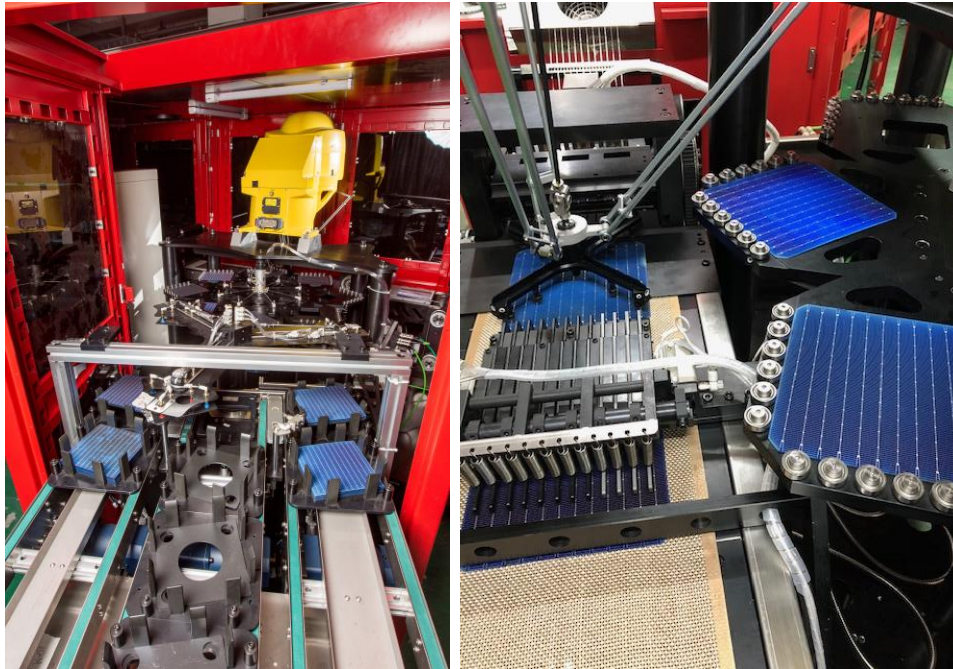
- Soldering of only the back side tends to create a notable bending of the cell due to the thermal return of the ribbon
- This problem exists also on normal cells but as both sides are soldered the consequences are less noted
- The mechanical tensions between the materials (cells and ribbon), either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



FuturaSun novel stringing technology

INDUSTRIAL PROJECTS ON EUROPEAN LEVEL

Patent EP3493278B1



FuturaSun's patented stringing solution

- Developed to simplify the soldering of MBB standard cells
- Flexible for cell sizes up to G12



The Concept

- Soldering under vacuum to guarantee a constant contact between cell and ribbon to secure a top quality soldering minimizing power losses

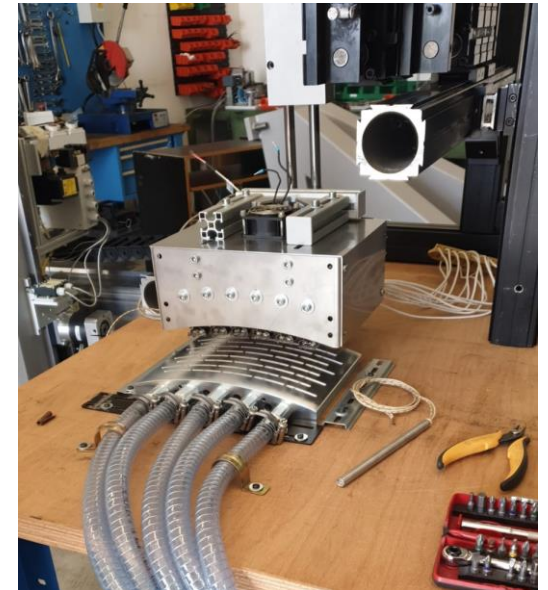
FuturaSun novel stringing technology

1. UPGRADE FOR INTERCONNECTION OF ZEBRA CELLS WITH AG BUSBAR

Main deliverable: Soldering without mechanical tension between ribbon and cells



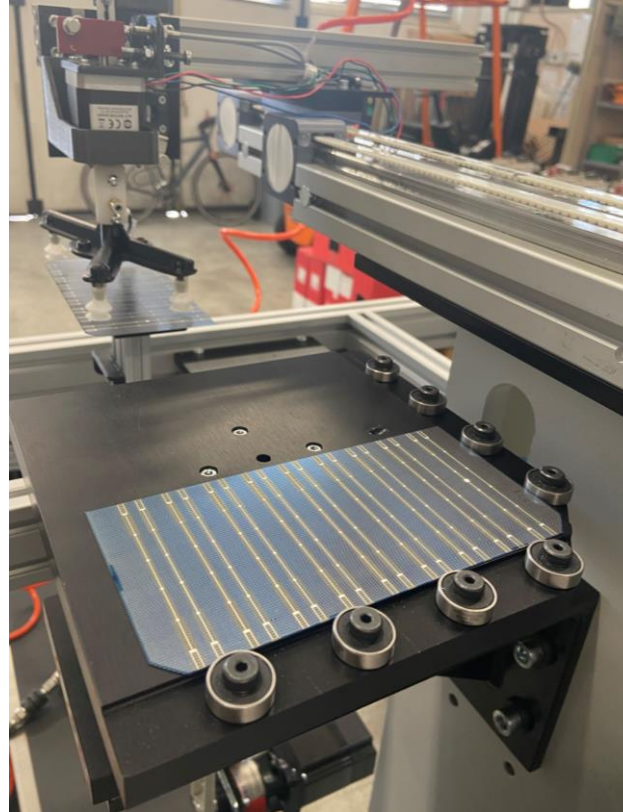
- The cells and the ribbon are distributed on the string movement unit
- The concept of the patented solution is maintained
- Creation of an opposite tension in order to neutralize the cell curve
- The soldered strings exit from the equipment without curving and most importantly, **without mechanical tension created between the cell and ribbon** reducing like this the risk of micro cracks and overall stress induced to the cell during the modules operating life



FuturaSun novel stringing technology

VERSATILE FEATURES

- Flexible equipment for most back contact concepts - Not only ZEBRA
- No limit for number of busbars and also busbarless
- No cell size limit
- Possibility to introduce different soldering systems to match the cell requirements



FuturaSun novel stringing technology

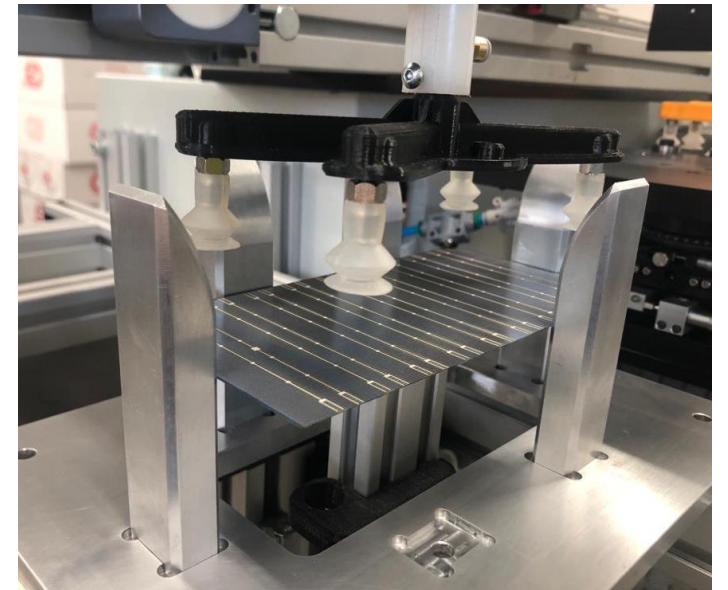
R&D FOR INDUSTRIAL COPPER APPLICATIONS

2. UPGRADE FOR INTERCONNECTION OF ZEBRA CELLS WITH CU BUSBAR

- ZEBRA cells are ideal for Cu screen printing
- Calculated Ag reduction ~ 75 %
- High throughput stringing - 10.000 cells / hour

3. UPGRADE FOR INTERCONNECTION OF ZEBRA CELLS WITH CU BUSBAR + CU RIBBON

- Integration of welding technology
- IBC cells open this opportunity thanks to one side welding only
- Removal of tin and lead from the ribbon for a welding Cu on Cu



FuturaSun stringing approach

INNOVATIVE STRINGING TECHNOLOGY ALSO FOR CELLS WITH REDUCED SILVER CONTENT

- KEY TAKEAWAYS



SIMPLICITY

- Thanks to the IBC structure of the cell



COST EFFECTIVE

- Low cost equipment
- Low cost solar cells
- High production yield



SUSTAINABILITY

- Possibility to reduce the silver content
- Possibility to solder tin free
- Possibility solder lead free

Thank you for your attention

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