

# Brief Introduction of Astronergy

*High Quality, High Performance, High Efficiency*



**ASTRONERGY**

August 2023







# CONTENT

**01** **Our Positioning**

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**02** **Our Advantages**

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**03** **Our Products**

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**04** **Social Responsibility**

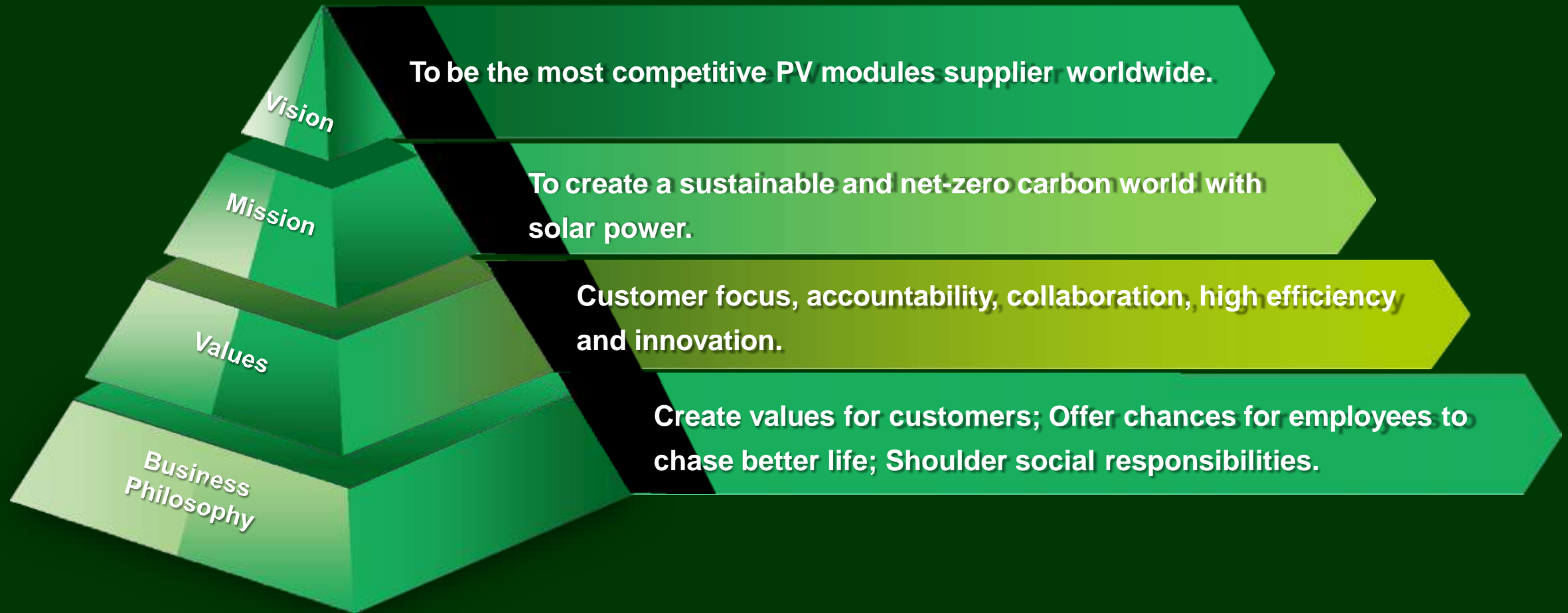
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# OUR POSITIONING



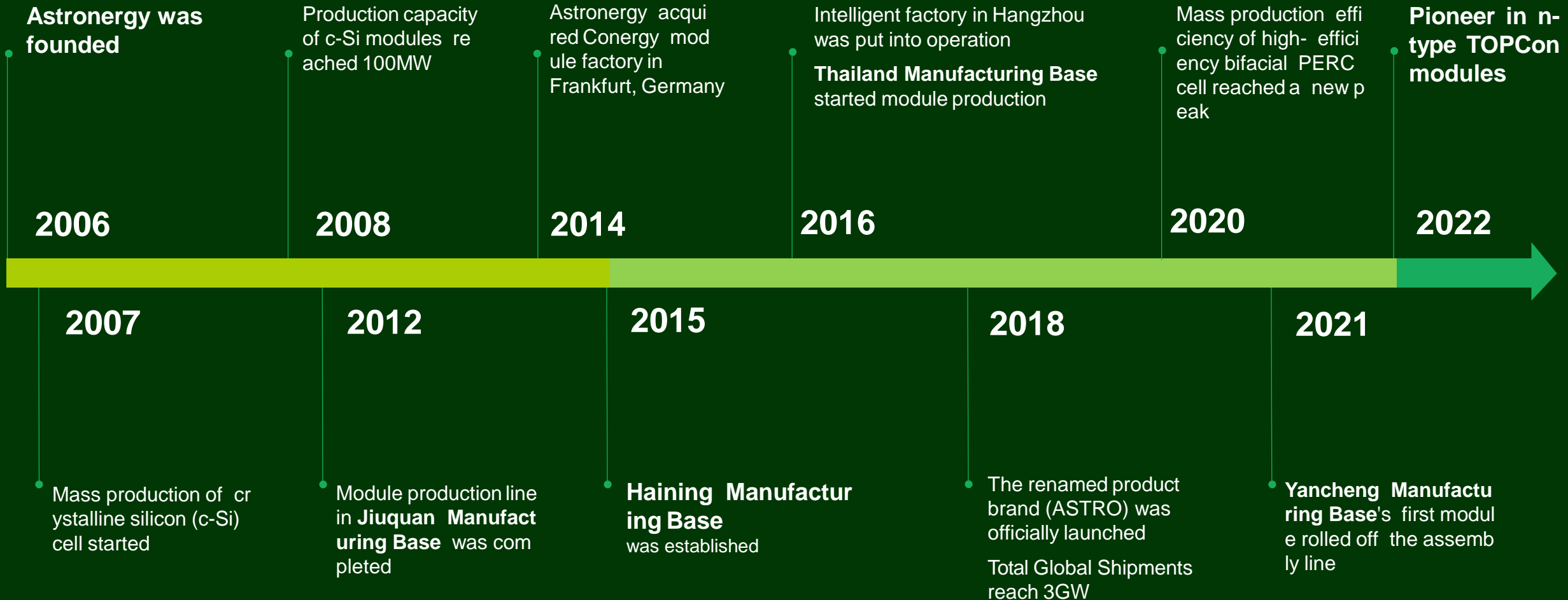
ASTRONERGY



# MILESTONES



ASTRONERGY





## About CHINT Group

Founded in 1984, CHINT Group is a leading global provider of smart energy solutions. It is actively deploying in industrial sectors including smart electrics, green energy, industrial control and automation, smart home and incubator, forming an integrated whole industry chain of “power generation, storage, transmission, transformation, distribution, sales and consumption”.

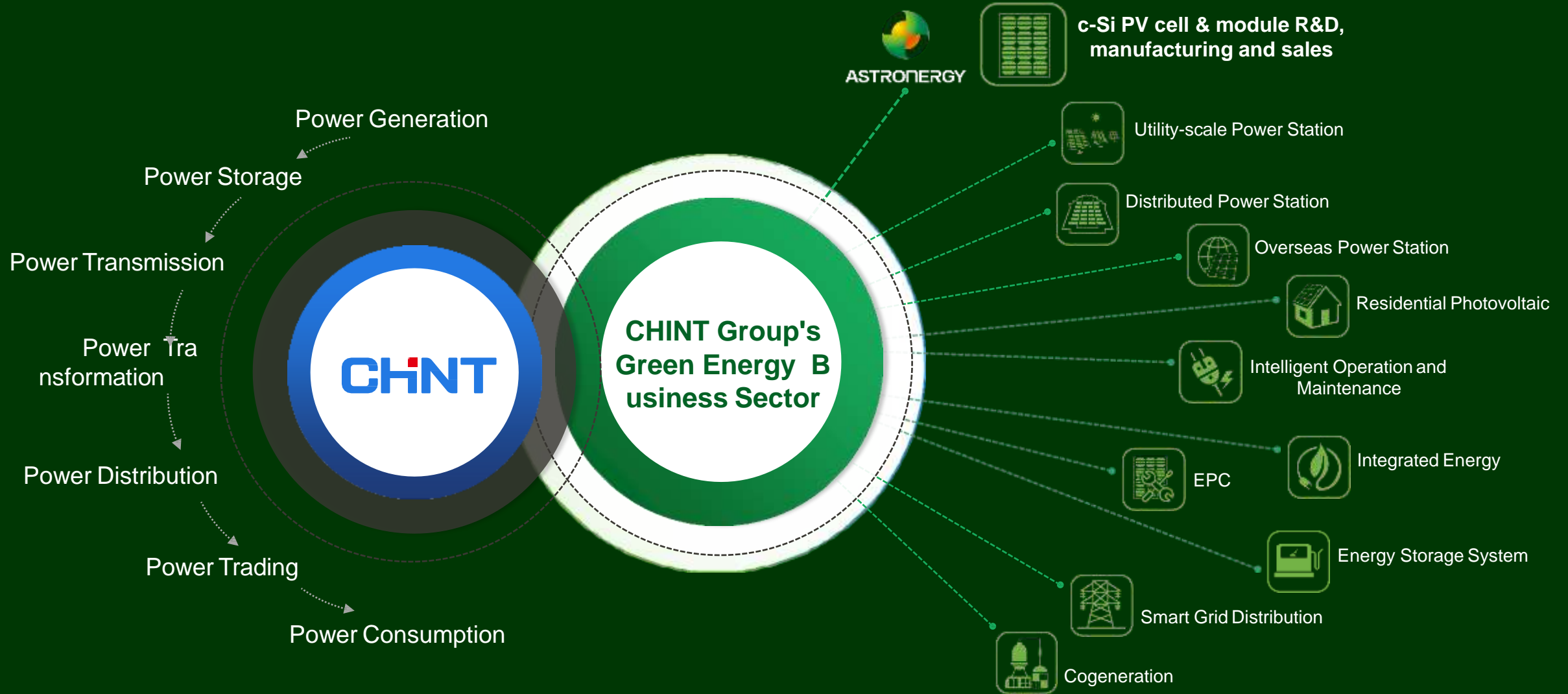
## About Astronergy

Focusing on PV cells and modules, Astronergy is an intelligent manufacturing company under CHINT Group, with its photovoltaic business started from 2006. Astronergy is committed to the R&D, production and sales of high quality, high performance and high efficiency crystalline silicon solar cells and modules, and has been a pioneer in n-type TOPCon PV modules.

# THE ENTIRE INDUSTRY CHAIN



ASTRONERGY



To create a sustainable and net-zero carbon world with solar power





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# HONORS



ASTRENERGY

**No. 1** in "China's Top 100 Private Enterprises with Social Responsibility" in 2021

No. 82 in "2022 China's Top 500 Private Enterprises "

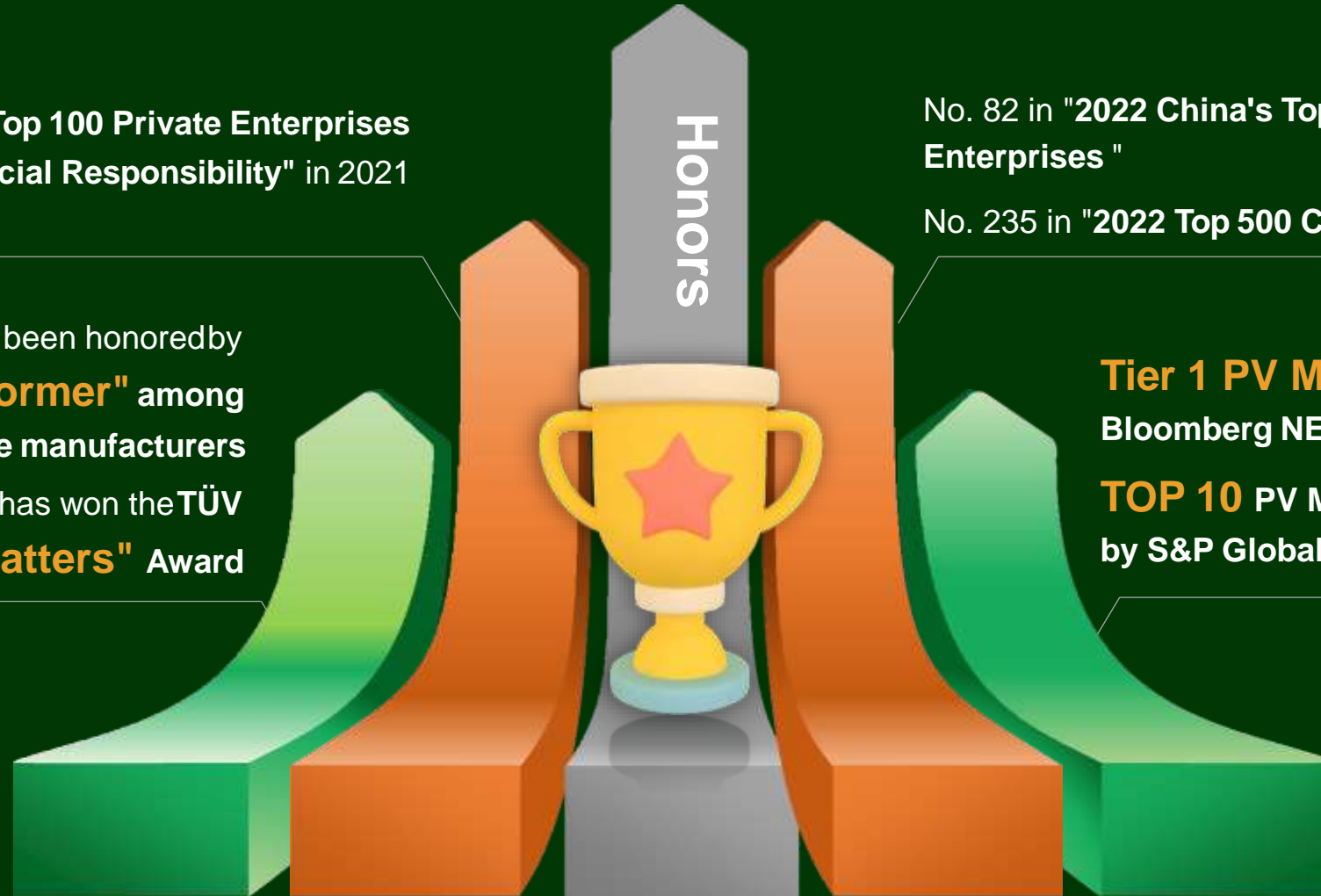
No. 235 in "2022 Top 500 Chinese Enterprises"

For 7 years, Astronergy has been honored by PVEL as **"TOP Performer"** among module manufacturers

For 3 times, Astronergy has won the TÜV Rheinland **"All Quality Matters"** Award

**Tier 1 PV Module Maker** listed by Bloomberg NEF

**TOP 10** PV Modules Suppliers released by S&P Global





# KEY FIGURES



ASTRONERGY



**18.34** Billion USD  
2022 CHINT Group Revenue



**40000+**  
Employees Worldwide



**140+**  
Countries and Regions  
Where Businesses  
Cover



**3.02** Billion USD  
PV Modules Revenue in 2022



**TOP 6\***  
2022 PV Modules  
Shipments among  
All Suppliers Worldwide



**20** GW  
2022 PV Modules Pr  
oduction Capacity  
Worldwide



**11** GW  
Cumulative Capacity of PV Power  
Stations Owned by CHINT Group



**8.3** Million Tons  
CO<sub>2</sub> Emissions Reduced  
per Year



**8.3** Billion kWh  
Green Electricity Provi  
ded for the Whole Soc  
iety per Year

# GLOBAL PRESENCE



ASTRONERGY

## 60 GW+

Total Global Shipments

## 140+

Countries



Haining, HQ R&D , MFG Center



Manufacturing Base In Yancheng



Manufacturing Base In Jiuquan



Manufacturing Base in Thailand

Global Headquarters

Global Sales Offices

Global Sales Channels

Global R&D Center

Global Manufacturing Bases (mass production)

Global Manufacturing Bases (under construction)

To create a sustainable and net-zero carbon world with solar power



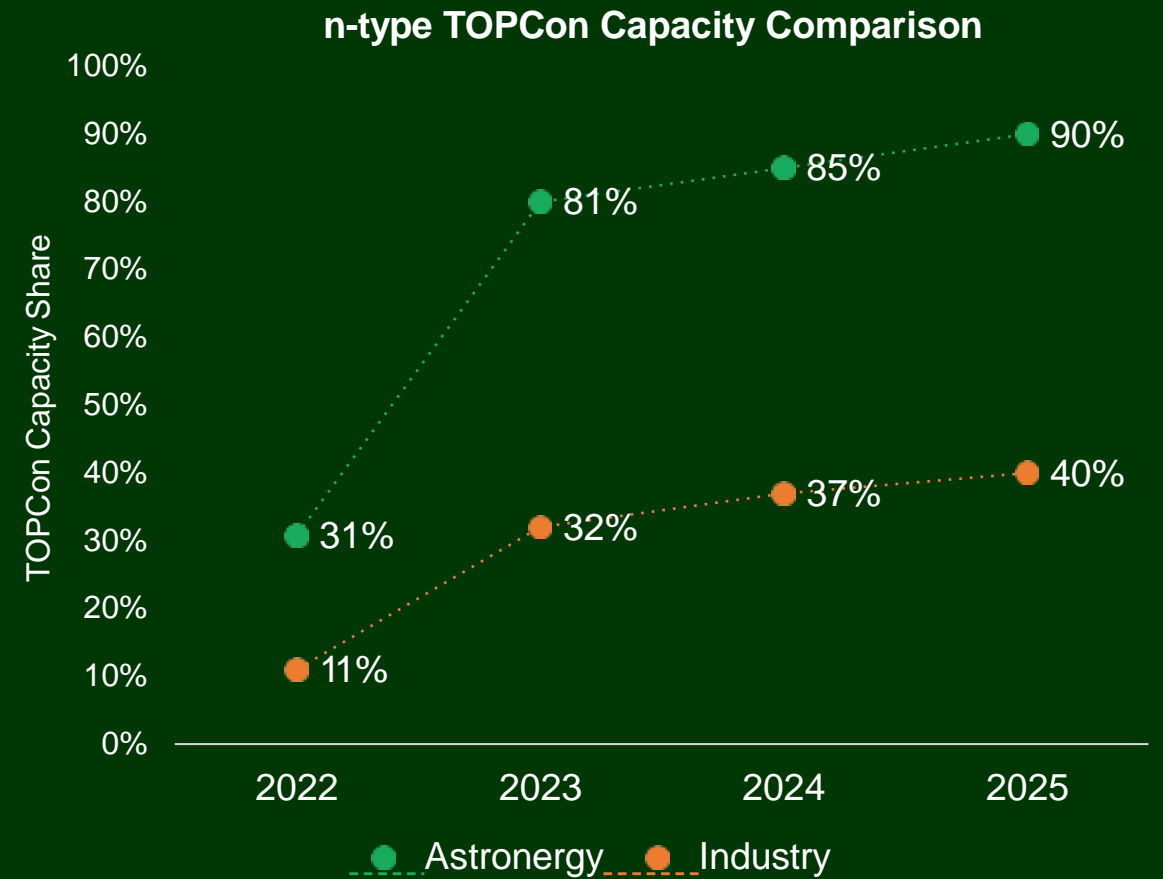
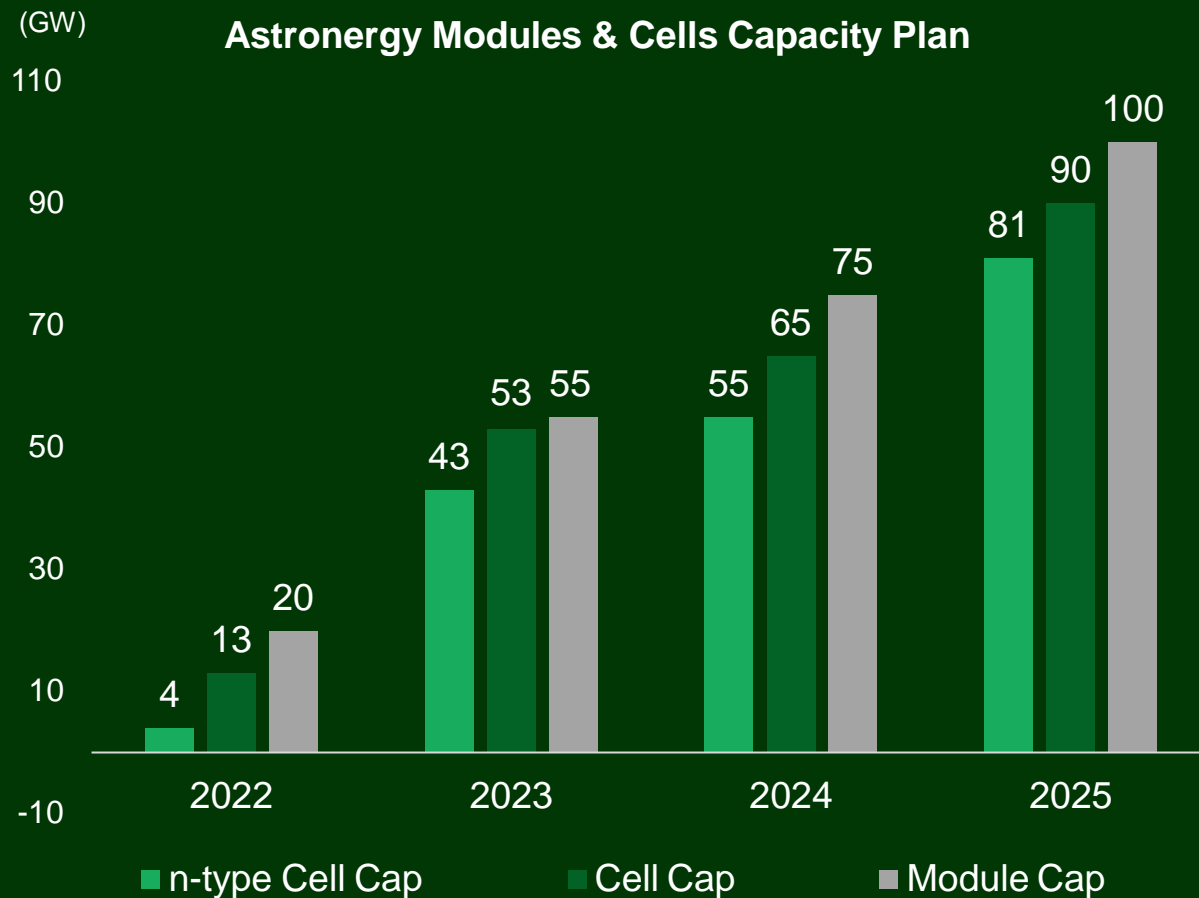
# CAPACITY PLANNING



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Astronergy's TOPCon cell production capacity will increase to **43GW** in 2023.

In 2025, the **TOPCon capacity share of Astronergy will be  $\geq 90\%$**  vs. **industry  $\leq 40\%$** .



# GLOBAL PARTNERS



ASTRONERGY





# FINANCIAL SUPPORT



ASTRONERGY

Actively involved in the financial investment sector, the company has established investment and financing companies such as **Zhejiang Civil Investment Bank, Wenzhou Civil and Commercial Bank, Zhesang Insurance, and CHINT Finance**, and has been investing in new energy, electrical and many other fields.

We have established comprehensive cooperation with major domestic and foreign financial institutions such as **China Credit Insurance, China Development Bank, Export Bank, ICBC, IFC, Standard Bank, Shinhan Bank, SCB, CITI, etc.**, with **financing ratio and financing cost leading in the industry.**







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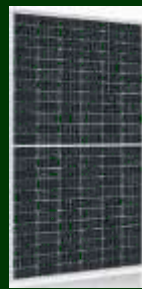

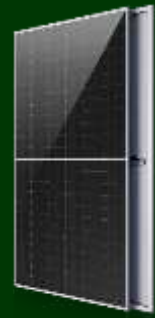


# MODULE PRODUCTS ITERATION & INNOVATION



ASTROENERGY

<p><b>4BB</b></p> <p>Polycrystalline PERC</p> <p>Black Silicon Technology</p>	<p><b>5BB</b></p> <p>High Efficiency Monocrystalline</p> <p>PERC Technology</p>	<p><b>G1 158.75</b></p> <p>PERC SE</p> <p>Half-cut</p>	<p><b>M6 166</b></p> <p>22.5%+PERC</p> <p>MBB</p> <p>Half-cut</p>	<p><b>M10 182</b></p> <p>23%+PERC+MBB</p> <p>Half-cut No n-destructive Cutting</p>	<p><b>G12 210</b></p> <p>23.2%+PERC+MBB</p> <p>Half-cut</p> <p>Non-destructive Cutting High-Density Encapsulation Design</p>	<p><b>n-TOPCon 182</b></p> <p>High Efficiency High Bifaciality</p> <p>Better Low-irradiation Performance, Low Temperature Coefficient, Low Degradation</p>
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## ASTRO 1      ASTRO 2      ASTRO 3      ASTRO 4      ASTRO 5      ASTRO 6      ASTRO N

<p>325~350W 17.8%</p> 	<p>375~390W 19.3%</p> 	<p>405~425W 20.7%</p> 	<p>440~460W 21.1%</p> 	<p>540~555W 21.5%</p> 	<p>650~670W 21.6%</p> 	<p>635W 22.7%+</p> 
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# MAIN PRODUCTS



ASTRONERGY

## ASTRO N7



- n-type **TOPCon 3.0** PV cell
- Light redirecting film ( for double-glass series)
- SMBB tech
- Higher power
- Higher efficiency
- Higher reliability
- Higher power generation per watt
- Lower BOS & Lower LCOE

## ASTRO N7s



- n-type **TOPCon 3.0** PV cell
- RSD device (Optional)
- SMBB tech
- Higher power
- Higher efficiency
- Higher reliability
- Higher power generation per watt
- Lower BOS & Lower LCOE





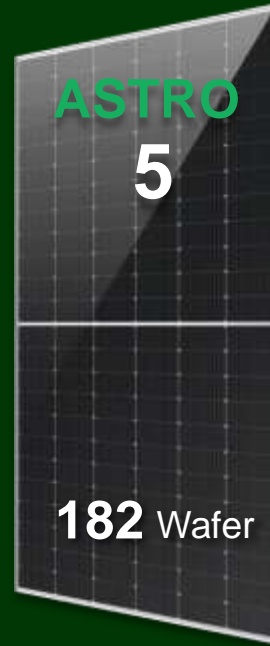
# MAIN PRODUCTS



ASTRONERGY



- n-type **TOPCon** cell
- The series includes two products to meet variable PV application scenarios



- High-efficiency **PERC+**
- Suitable for utility-scale power stations and distributed power stations



- High-efficiency **PERC+**
- Featuring “light, efficient, quality and a esthetic”, especially for residential PV rooftops



To create a sustainable and net-zero carbon world with solar power



## The Thinking Factories

- Supported by Big Data
- AI Quality Inspection
- The 1st to Achieve AI Automatic Detection of EL Defects
- Automatic Monitoring of the Entire Process
- Fully Automated Production
- Automatic Batching by Unmanned Vehicles
- Localization of Production Equipment

## Top Level of Intelligent Manufacturing

2016: Sino-German Intelligent Manufacturing Demonstration Base

2020: Intelligent Photovoltaic Pilot Demonstration Enterprise

## The World's First PV "Internet + Transparent Factory"



Scribing Machine



Automatic Glass Laminating Machine



Intelligent Assembly Line



Automatic Feeding and Bar Code Sticking Machine



Series Welding Machine



Banding Machine



Laminating Machine



90 Degree Flip Inspection



Group Box All-in-one Machine





## Process Control

### MES

(Manufacturing Execution System)

- Collects, feedback and verifies statistics for the control of manufacturing abnormality.



### SPC

(Statistical Process Control)

- Monitors key quality control points, ensure process stability, timely alarm and avoid unqualified.



### Quality Control App

- Digital documents for statistic reserve and timely control.



### AI Quality Detection

- Intercepts and reports defects in production process to improve products quality.

# INTELLIGENT AI DETECTION

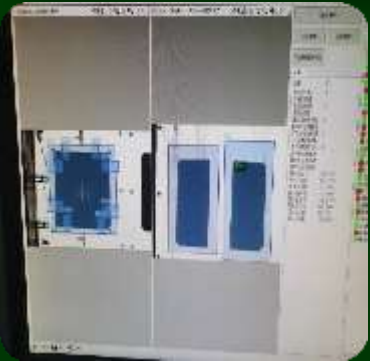


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## Key Process Detection

CCD Detection

Serial AI Detection



## Semi-finished Product Detection

Pre-lamination  
EL & VI Detection

Post-lamination  
Detection



## Finished Product Detection

Post-lamination EL Detection  
& Final Detection





# HIGH RELIABILITY & HIGH QUALITY



ASTRONERGY

- 25-30 Years Power Warranty
- Systemized Quality Control Measures
- Rigorous Testing Procedures
- Certificates with ISO9001, ISO14001 and OHSAS18001...
- World-class suppliers and partners



With strong testing capabilities, Astronergy has obtained the qualifications of **CNAS Laboratory**, **CSA Witness Laboratory**, **TÜV Rheinland** and **Witness Laboratory**, **Intertek "Satellite Program" Laboratory** and other qualifications, and **conducts more than 30 rigorous tests internally for PV modules.**

# LEADING TECHNOLOGY LEADS TO HIGH PERFORMANCE



ASTRONERGY

1<sup>st</sup>

## Tier 1

Mono-PERC cell efficiency is **23.4%**, leading in PV industry

The average efficiency of n-type TOPCon cells reaches **25.6%**,

and the average optimal efficiency of n-type TOPCon produced from pilot line hits **25.85%**.



## 20%

The number of R&D personnel with intermediate titles and above at the national level accounts for **over 20%**



## 311

**311** Patents: **232** Utility Model Patents

**72** Invention Patents

**7** Appearance Design Patents



Cell R&D



Module R&D



Advanced Application Research



Advanced Material Research



Management of Products and Tech Projects





# GLOBAL R&D COOPERATION



ASTRONERGY

Established R&D centers in North America, Europe, Asia Pacific, North Africa and other countries, and explored the “Industry-University- Research” integration model with Tsinghua University, CUHK (Shenzhen), New South Wales, etc. and universities and research institutions in the United States and Europe, integrating global innovation resources to promote R&D innovation, exploring high efficiency and high reliability PV modules technology.

modules technology.

## Hangzhou Dianzi University

High-efficiency Monocrystalline PERC Cell Technology

## Shanghai Jiao Tong University

New Tunnel Passivated High-efficiency Solar Cell & Module Technology

## Zhejiang University

Key Technologies of Low-cost and High-efficiency Solar Cells



## UNSW SYDNEY

Hydrogen Passivation Project

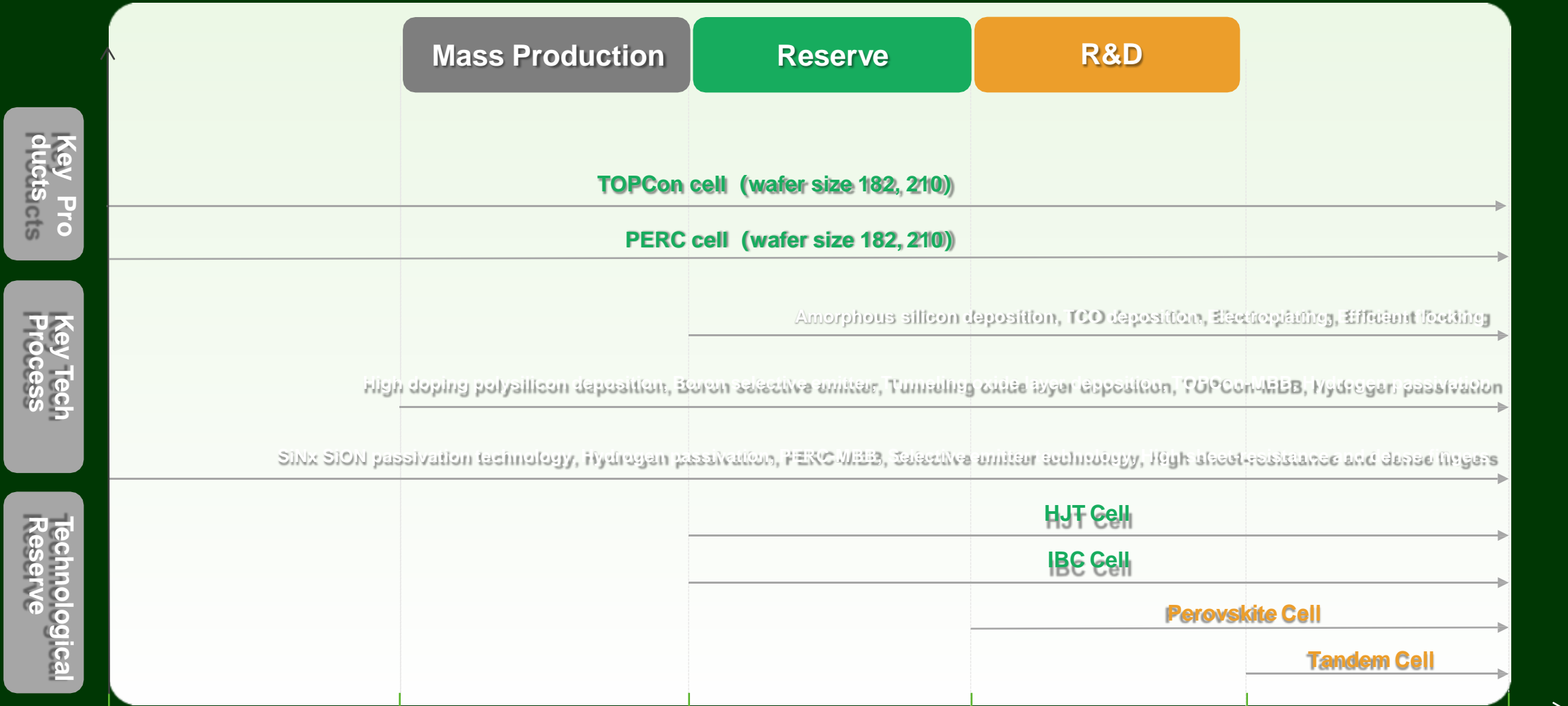
## Zhejiang University of Technology

n-type Passivated Contact High-efficiency Bifacial Crystalline Silicon Solar Cells

# R&D ROADMAP



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2021

2022

2023

2024

2025

To create a sustainable and net-zero carbon world with solar power



# APPLIED CASES



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## Utility-scale Power Stations

- Benban Solar Park Project in Egypt, 165MW
- Agriculture-Solar Hybrid PV Power Station in Wenzhou, 150MW
- Forest-Solar Hybrid Power Station in Jiangshan Quzhou, 200MW
- Utility-scale Project in Zhangjiakou, Hebei Province, 70MW
- Goonumbla Project in Australia, 89MW
- Barreiras Project in Brazil, 50MW
- Insua Power Station in Portugal, 48.5MW
- Utility-scale Project in Yongchang, Gansu Province, 200MW
- Utility-scale Project in Qiongjie, Tibet, 10MW
- Top Runner Project in Baicheng, Jilin Province, 100MW

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**Midden-Groningen Solar Park, one of the Largest Power Stations in the Netherlands**  
103MW | The Netherlands



**China's First Sand-Solar Hybrid Power Station**  
310MW | Kubuqi, Inner Mongolia, China



**The Largest Fishing-Solar Hybrid Project in Asia**  
550MW | Wenzhou, Zhejiang Province, China



**Claresholm Solar Farm, one of the Largest Solar Power Plant in Canada**  
132MW | Southern Alberta, Canada



# APPLIED CASES



ASTRONERGY

## Distributed PV Rooftop

### C&I PV Rooftop

- Logistics Warehouses Rooftop Solar Projects in Serbia, 10MW
- Hikvision Rooftop Project in Hangzhou, Zhejiang Province, 10MW
- Jintian Copper BIPV Power Station in Ningbo, Zhejiang Province, 30MW
- C&U Group Rooftop Project in Wenzhou, Zhejiang Province, 23MW
- Roof Project in Changxing Economic Zone, Huzhou, Zhejiang Province, 20MW
- Geely Automobile PV Rooftop Project in Linhai, Zhejiang Province, 10.3MW

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### Residential PV Rooftop

- Residential Project in Kecheng District, Quzhou, Zhejiang Province, 30MW

.....



**Roof Photovoltaic Power Station of Hangzhou East Railway Station**  
10MW | Hangzhou, Zhejiang Province, China



**Hangzhou Civic Center Podium Roof Photovoltaic Power Station**  
1.2MW | Hangzhou, Zhejiang Province, China



**Hervey Bay Rooftop**  
16 kW | Australia



**Project "Million Rooftops for Zhixi"**  
4MW | Quzhou, Zhejiang Province, China





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# CORPORATE SOCIAL RESPONSIBILITY



ASTRONERGY

In May 2023, Astronergy globally published its **2022 Environmental, Social and Governance (ESG)** Reports (hereinafter referred to as “the ESG Report”), delivering on its actions and results on promoting sustainable and stable development and practicing UN SDGs and UNGC 10 Principles to all stakeholders.

Corporate Governance  
Sustainable Management



**Goal 8**  
**Decent Work and**  
**Economic Growth**



**Goal 9**  
**Industry, Innovation**  
**and Infrastructure**



**Goal 16** **Peace**  
**Justice**  
**and Strong Institutions**

R&D investment over than  
RMB:

**250** million

Legal proceedings related  
to corruption and unfair c  
ompetition:

**0**

Conduct due diligence and e  
nvironmental assessment di  
mension screening in terms  
of supplier’s social impact:

**92.89**

Customer satisfaction score:

**100** %

# CORPORATE SOCIAL RESPONSIBILITY



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Climate Change  
Environment-friendly



**Goal 6**  
**Clean Water and Sanitation**



**Goal 7** Affordable and Clean Energy



**Goal 13** Climate Action

Scope I+II emission intensity:

**30.49** tCO<sub>2</sub>e/MW

Energy intensity:

**0.46**

tons of standard coal/MW

Environmental violations:

**0**

Achieved

**3** %

reduction in overall energy consumption



# CORPORATE SOCIAL RESPONSIBILITY



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Career Development  
Social Welfare



**Goal 3 Good Health and Well-Being**



**Goal 10 Reduced Inequalities**



**Goal 4 Quality Education**



**Goal 11 Sustainable Cities and Communities**



**Goal 5 Gender Equality**

Employee satisfaction score:

**82.49**

which has been on the rise for two consecutive years

Incidents of discrimination, harassment, forced labor or child labor:

**100** %

Factories awarded ISO 45001 and ISO14001 certificates:

**0**

# CORPORATE SOCIAL RESPONSIBILITY



ASTRONERGY



# CORPORATE SOCIAL RESPONSIBILITY



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The screenshot shows the United Nations Global Compact website. At the top, it says "10,000 companies + 4,000 non-businesses". Below that, there's a section for "Company Information" for CHINT GLOBAL/Zhejiang Chint Electrics Co. The company details include: Type: Company, Country: China, Sector: Electronic & Electrical Equipment, Ownership: Publicly Listed, Engagement Tier: Participant, Global Compact Status: Active, and Participant Since: 24 May 2021. Below this, there's a section for "Principles and Global Goals Addressed in their most recent CoP" with icons for various UN Sustainable Development Goals (SDGs) 1 through 17. At the bottom, there's a table for "Communication On Progress" with columns for PUBLISHED ON, TITLE, and LEVEL.

The screenshot shows the CHINT website. At the top, there's the UN Global Compact logo and the CHINT logo. Below that, it says "IN ZHEJIANG". The main headline is "Green energy solutions provider CHINT joins United Nations Global Compact". The date is "2021-06-21 15:10:18 source: CHINT". The text below the headline reads: "Zhejiang Chint Electrics Co. Ltd., a Zhejiang-based leading global provider of smart green energy solutions has recently joined the United Nations Global Compact (UNGC). Launched In 2000, the UNGC is the largest corporate sustainability initiative in the world, with more than 9,500 companies and 3,000 non-business signatories based in over 160 countries, and more than 70 local networks. It is a call to companies everywhere to align their operations and strategies with ten universally accepted principles in the areas of human rights, labor, environment, and anti-corruption, and to take action in support of UN issues embodied in its sustainable development goals (SDGs)."

## Joined the United Nations Global Compact (UNGC)

Appear on the official website of the United Nations, which endorses the CHINT brand and brings the following benefits:

- Share experiences and learn from each other with consensus companies and organizations.
- Expand CHINT's resources for **overseas public welfare activities**.
- Obtain the most **authoritative sustainable development policy** information and connection.
- Establish **partnerships with United Nations agencies**, including the International Labor Organization, the office of the United Nations High Commissioner for human rights, the United Nations Environment Program and the United Nations Development Program.
- Improve the **ECO VADIS** corporate social responsibility score of **10+** to maximize business opportunities.



# CORPORATE SOCIAL RESPONSIBILITY



ASTRONERGY

## Charity Activities in China

- CHINT Group has always been devoted to building an **extraordinary CSR management system** and improving social responsibility performance throughout all aspects of business operation.
- CHINT Group has **donated more than 54 million dollars** to social welfare such as precise poverty alleviation, school donation, epidemic relief, industry promotion and ecological protection.



Promote photovoltaic projects in the countryside to increase farmers' family income and protect environment.



Provide scholarship of 20 million dollars so far for educational institutions to help students in need and reward excellent students



Set up innovation award of more than 1 million dollars to encourage talents and promote development of the electric-power industry



Donated 1.5 million dollars of emergency supplies to the rescue operations in Henan flood



Collaborate with China Society for Promotion of the Guangcai Program and actively participate in targeted poverty alleviation



# CORPORATE SOCIAL RESPONSIBILITY



ASTRONERGY

## Overseas Charity Activities



Donated over 1,000 boxes of food and necessary living materials to more than 1,000 families in need in 40 underdeveloped areas in Egypt in April 2021.



"CHINT, Let Love Shine" continues to bring clean energy experiences to schools, hospitals and welfare institution around the world



CHINT associated with Fundación Frenó Al Icus, launching the "Pedal against stroke" virtual low-carbon challenge to draw attention to the problem of stroke and improve people's awareness and vigilance.



Global relay to fight the pandemic together. Donated overseas more than 200k masks, 10k protective clothes and 50 respirators.



Helped Rebuild Homes in the Earthquake Areas of Turkey by providing urgently needed materials



Launched an initiative to combat the devastation that caused by the storm Philomena: that is, donated 5% of the amount of CHINT surge protections sold on 15th to the tree recovery.



ASTRONERGY

*High Quality, High Performance, High Efficiency*

[www.astronergy.com](http://www.astronergy.com)



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