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pv magazine webinars

Transparent advantage – Why transparent backsheet bifacial modules can beat out the cumbersome competition

6 April 2023

11:00 am – 12:00 pm | CEST, Berlin, Madrid
1:00 pm – 2:00 pm | GST, Dubai
5:00 pm – 6:00 pm | CST, Beijing

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Welcome!

pv magazine webinars

Do you have any questions? ? 

Send them in via the Q&A tab.  We aim to answer as many as we can today!

You can also let us know of any tech problems there.

We are recording this webinar today. 

We‘ll let you know by email where to find it and the slide deck, so you can re-watch it at your convenience.  

Transparent Backsheet, Perspective Future

Frank Wang

JOLYWOOD

Same sunshine, more value

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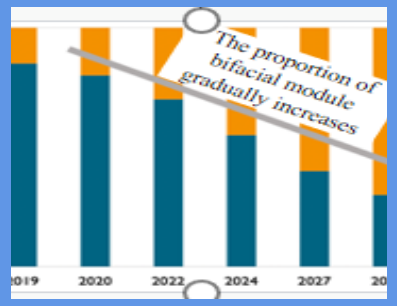
JOLYWOOD

Same sunshine, more value

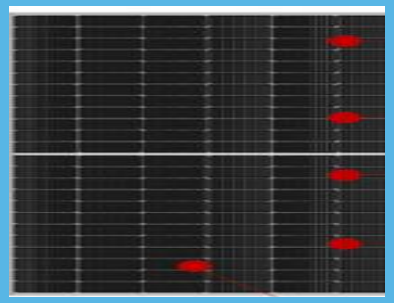
01 Product Overview

Uphold the mission of “less loss, more power generation” while being "an empowering developer of green energy"

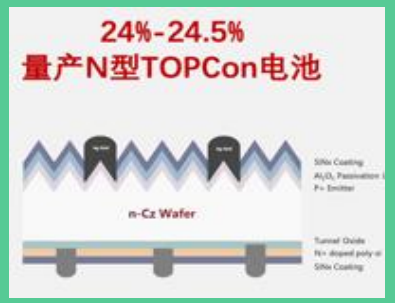
Development Trend of Solar Module



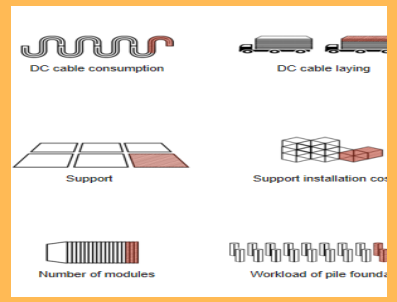
Bifacial



Large size

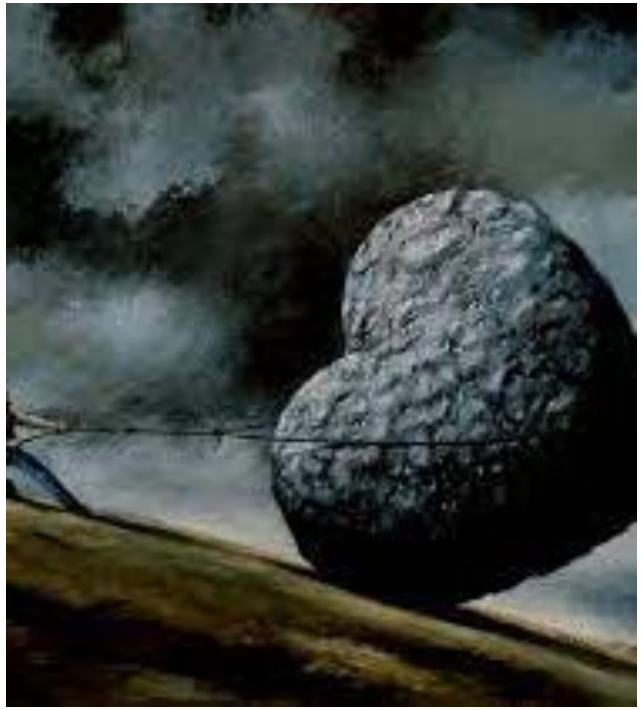


High efficiency

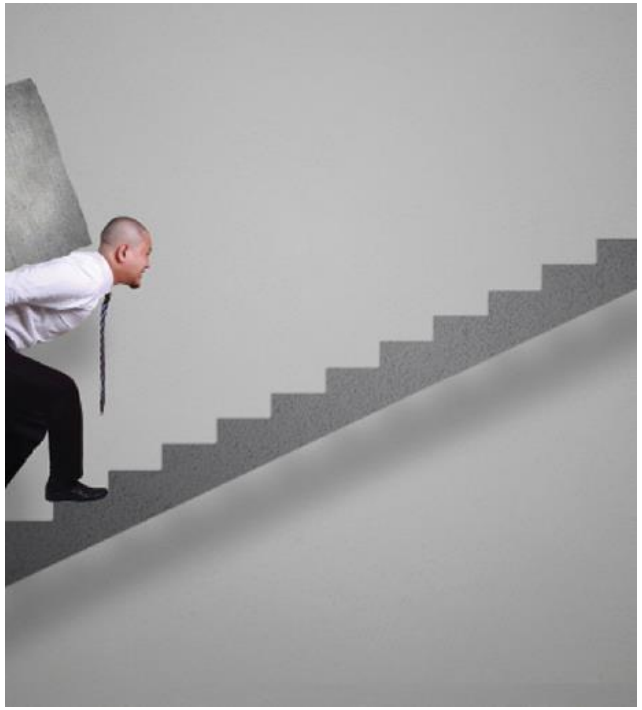


Low LCOE

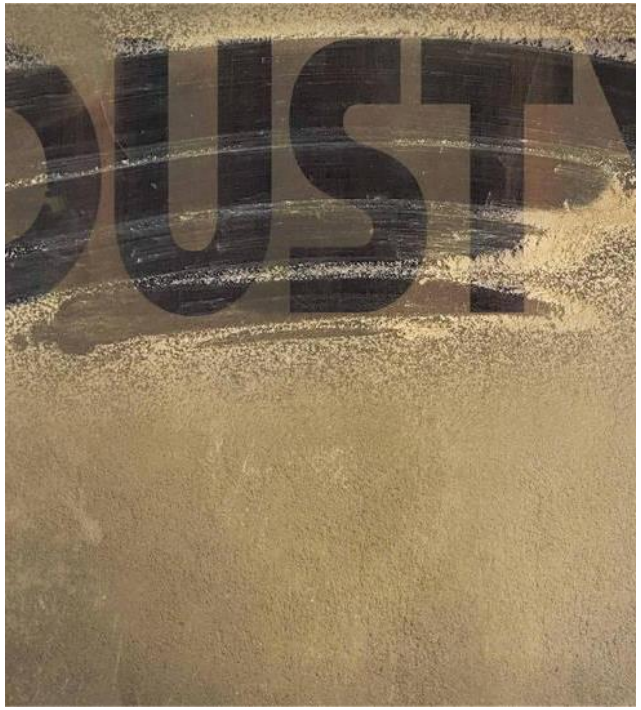
Development Trend of Solar Module



High weight



Cumbersome in Transportation and installation



Difficulty in Cleaning

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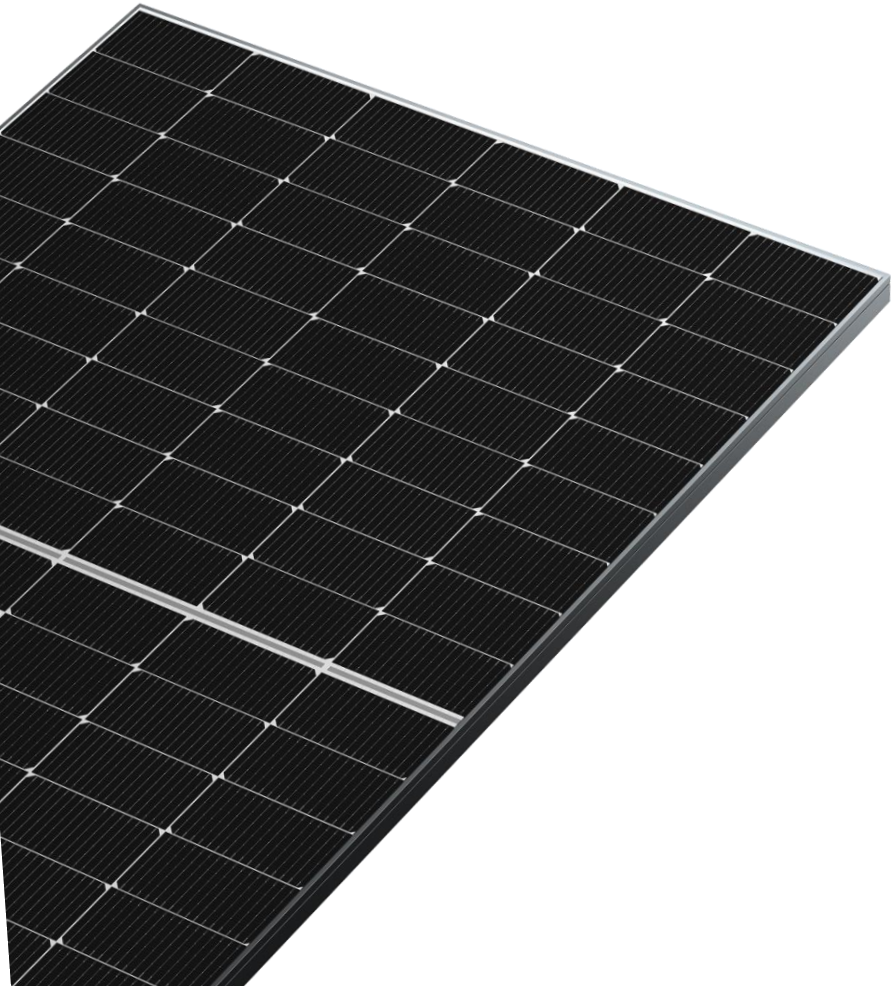


New Product

Transparent backsheet bifacial module

Original strong ability

High efficiency

Mass production efficiency breaks through 24.8%

Low degradation

Degradation by 1% in the first year. Linear degradation of bifacial modules by 0.40%

Low Temperature coefficient

-0.3%/℃ (power gain will be 1~2% in high temperature region compared with P-type)

Bright Spots?

Hauberk technology

Jolywood high-transmittance organic and inorganic nano-hybrid alloy material technology

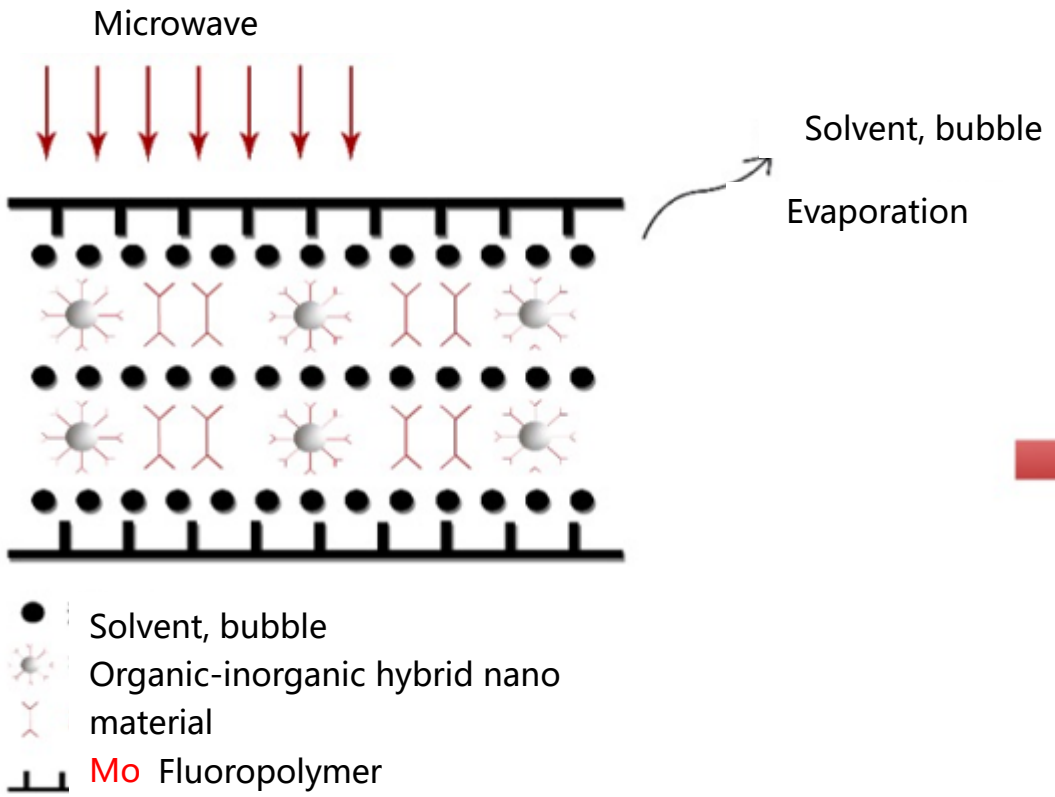
Jolywood Transparent Backsheet Structure

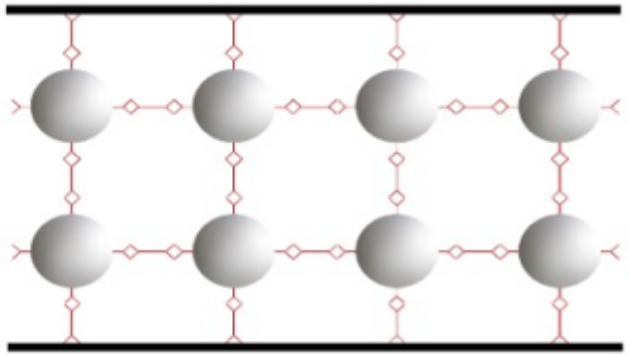
Air side: transparent organic-inorganic nano-hybrid material layer-20μm

Transparent PET substrate: 275μm

EVA side: transparent organic-inorganic nano-hybrid material layer-15μm

Forming Dense Alloy Network

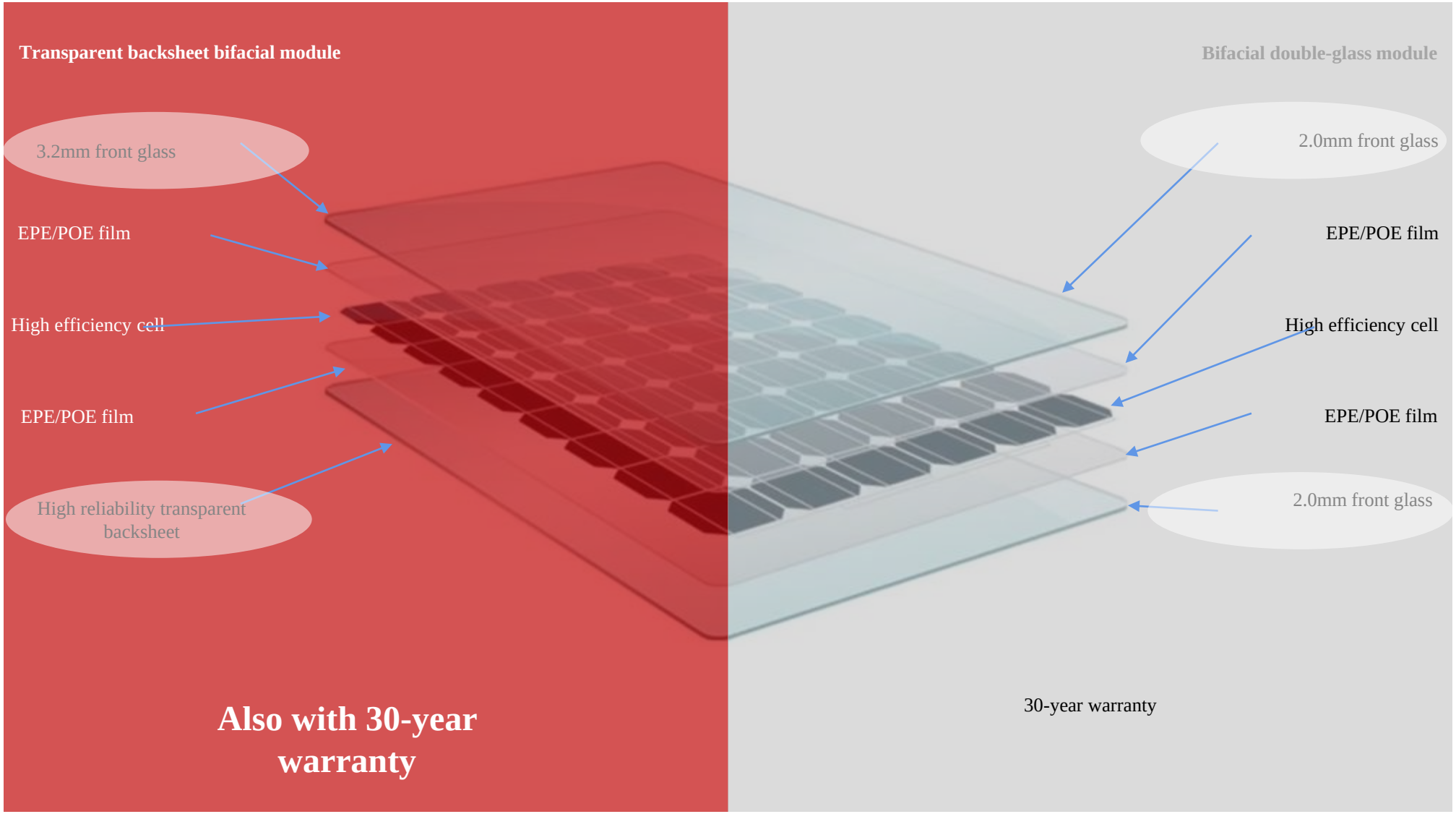


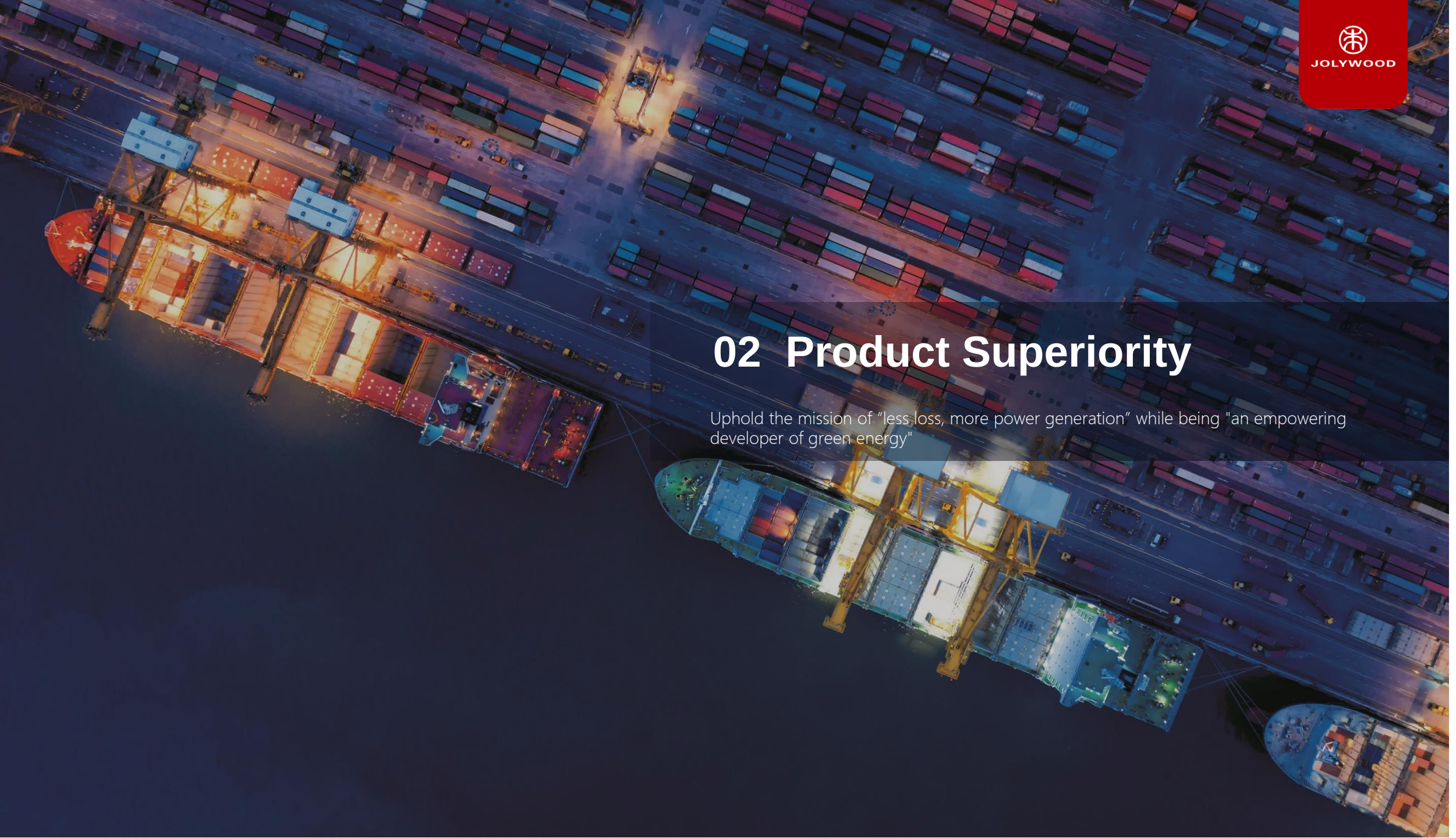


Dense alloy layer

The microwave curing process is adopted to form a dense alloy protective layer, thus becoming the transparent armor layer of the backsheet

Differences Between the Two Encapsulation Methods





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02 Product Superiority

Uphold the mission of "less loss, more power generation" while being "an empowering developer of green energy"

Summary

Same sunshine， more value

30 Years linear warrenty

Light Weight

The weight of the module is 17% lighter

Less use of bracket

High Light Transmittance

Self-clean Ability

Excellent self-cleaning effect,

no dust on the back

Long-term reliability

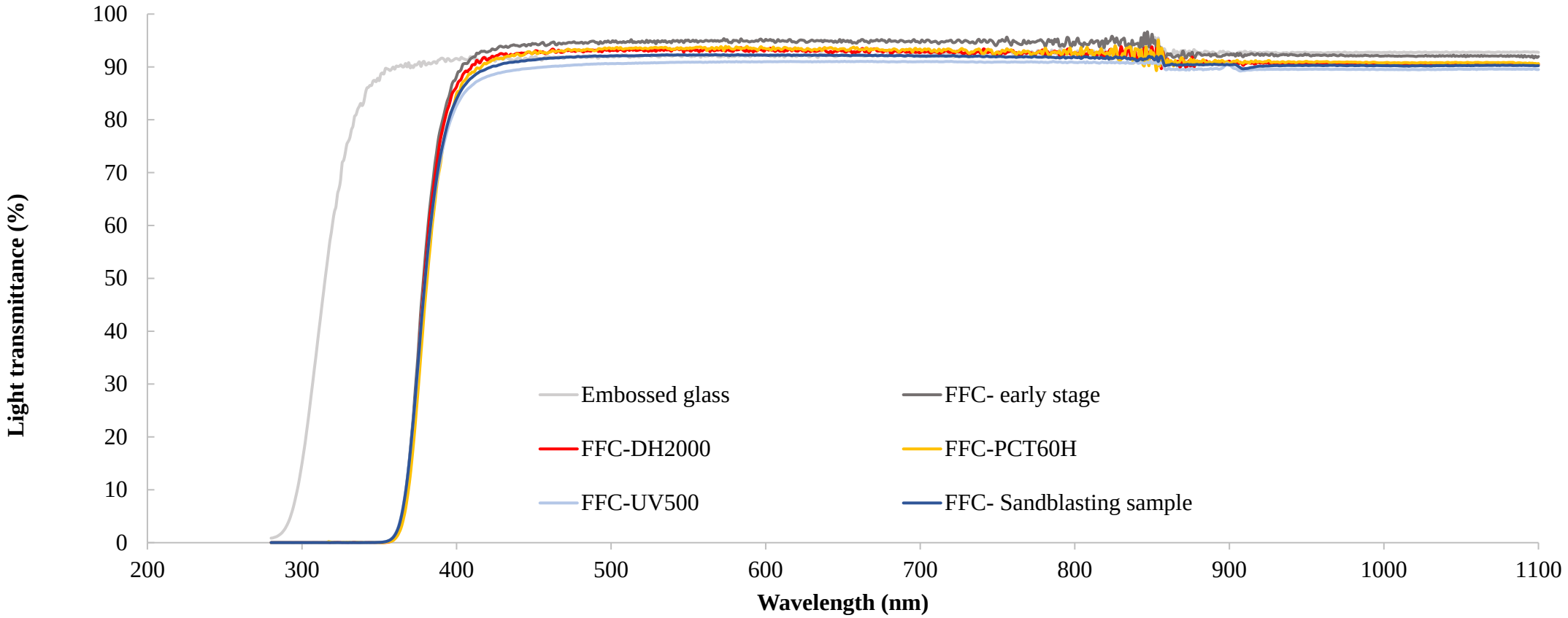
More income

The power generation is 1.29% higher .Equivalent to a system cost reduction of 0.025EUR/watt

17% Lighter Compared with DG

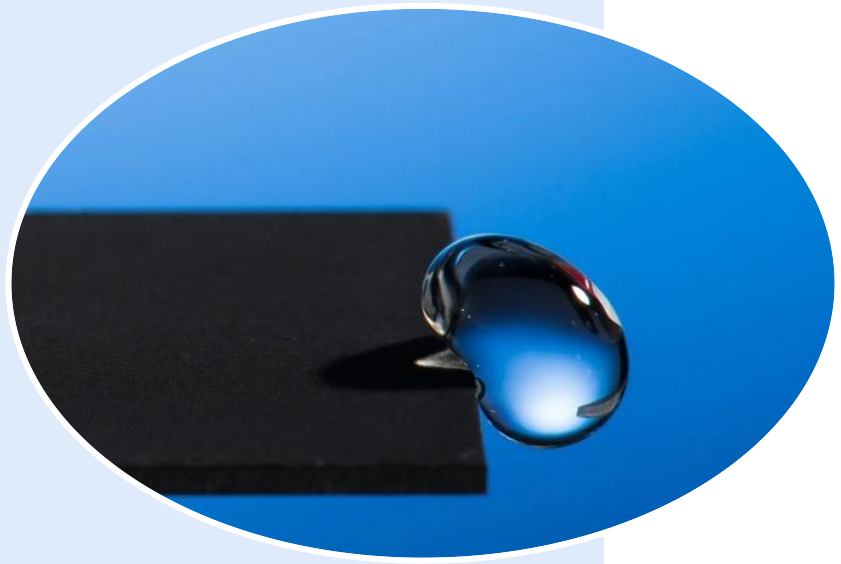
Manufacturer	Single glass/double glass	Dimensions (mm)	Weight (kg)	Weight difference (Kg)
GCL System Integration	Single glass transparent	2278*1134*35	27.8	4.9
	Bifacial double glass	2278*1134*30	32.7	
Ja Solar	Single glass transparent	2278*1134*35	30.19	3.42
	Bifacial double glass	2278*1134*30	33.61	
Chint	Single glass transparent	2278*1134*35	26.9	5.5
	Bifacial double glass	2278*1134*35	32.6	
	Bifacial double glass	2278*1134*30	32.4	
Canadian	Single glass transparent	2261*1134*35	27.8	4.3
	Bifacial double glass	2266*1134*35	32.2	
	Bifacial double glass	2266*1134*30	32.1	

Light Transmittance Exceeds 93%



	Embossed glass	Transparent FFC backsheet				
	Initial	Initial	PCT60H	DH2000	UV500	Sandblasting sample
400-1100nm	92.37	**93.70**	92.16	91.99	90.18	91.23
400-780nm	92.08	**94.53**	92.91	92.76	90.44	91.74

Excellent self-cleaning ability



The transparent back sheet has super hydrophobic properties:

Due to the adoption of newly developed organic-inorganic nano-hybrid technology, it has naturally super-hydrophobic properties, dust can not be attached to the glass surface;

Glass is easily contaminated with dust:

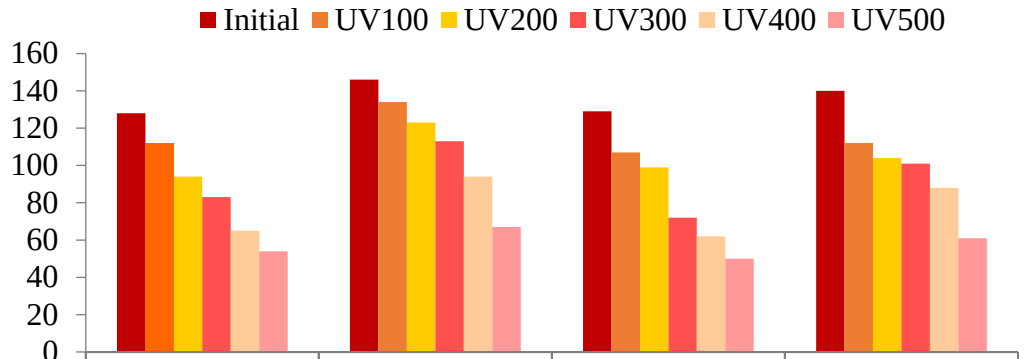
The back glass is easy to be contaminated with dust, dust condensates on the glass, which may form a hot spot effect, reduce the power generation of the system;



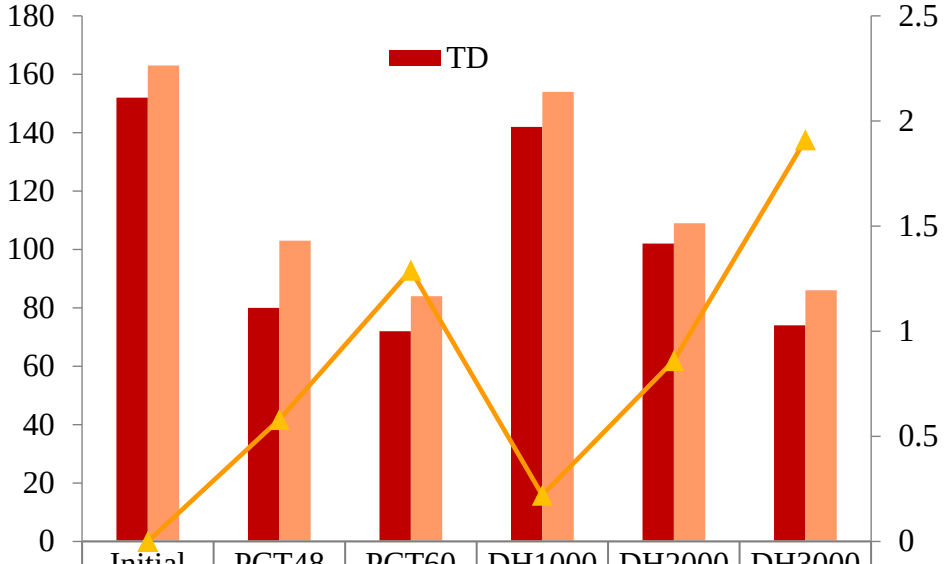
Doubts about Transparent Backsheet?

- Long-term reliability?
- Water permeability?
- How about the cost-benefit?
- Any mature cases?

High UV Resistance &Excellent Hydrolysis Resistance



	Transparent		White	
	TD	MD	TD	MD
Initial	128	146	129	140
UV100	112	134	107	112
UV200	94	123	99	104
UV300	83	113	72	101
UV400	65	94	62	88
UV500	54	67	50	61

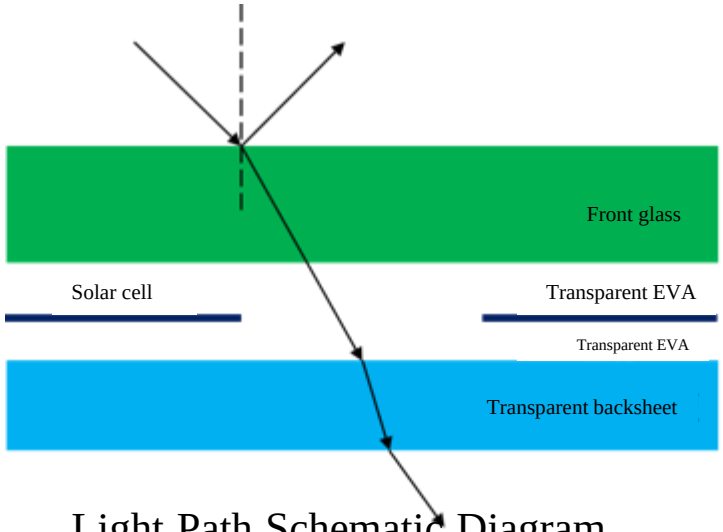


	Initial	PCT48	PCT60	DH1000	DH2000	DH3000
TD	152	80	72	142	102	74
MD	163	103	84	154	109	86
Yellowing △b	0	0.58	1.29	0.22	0.86	1.91

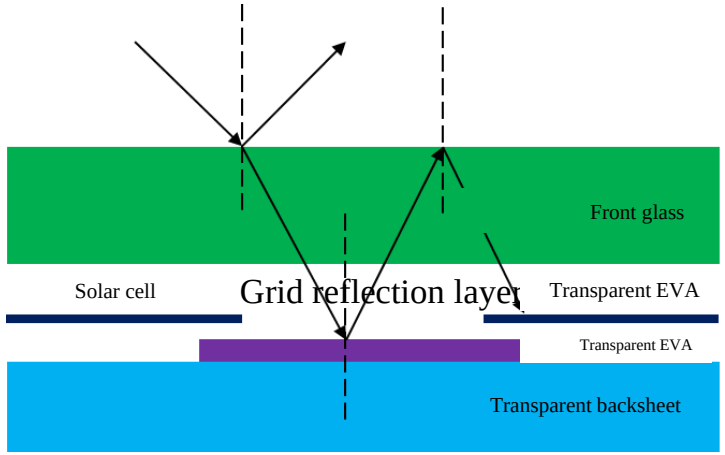
Excellent UV resistance, the elongation at break is > 50% after UV irradiation of 500KWh/m2

Excellent hydrolysis resistance, elongation at break after DH3000 hours and PCT60 hours aging is > 70%, which can meet the needs of outdoor use for 30 years

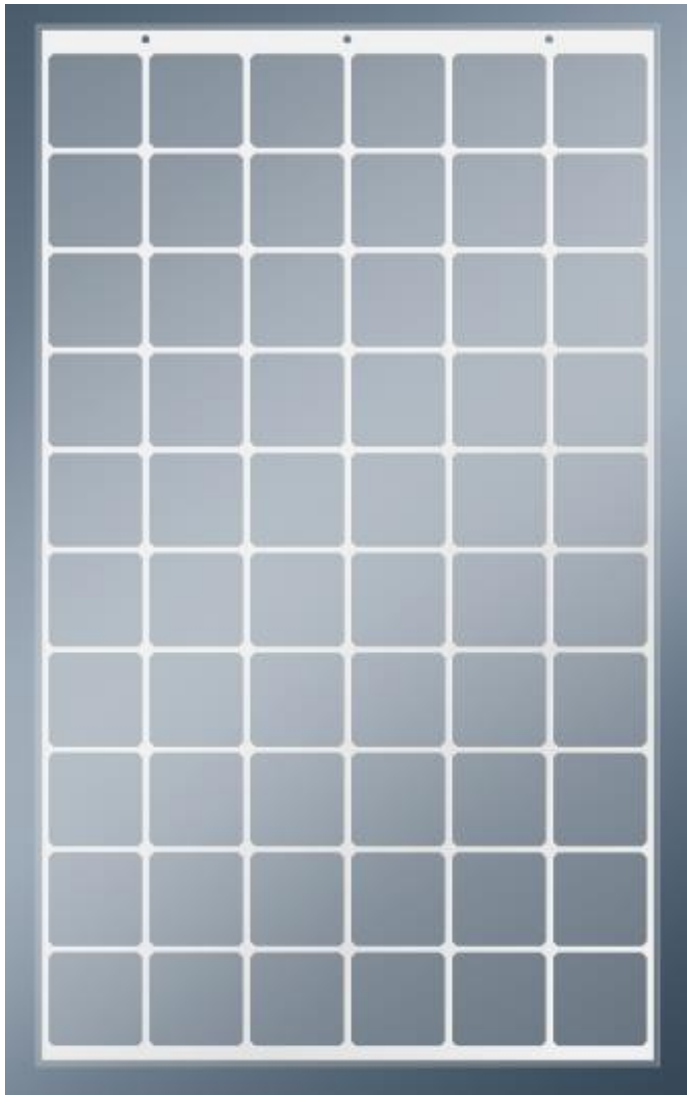
Increase the Reflection Grid and Improve the Module Power



Light Path Schematic Diagram of Conventional Transparent Backsheet



Light Path Schematic Diagram of Transparent Grid Backsheet

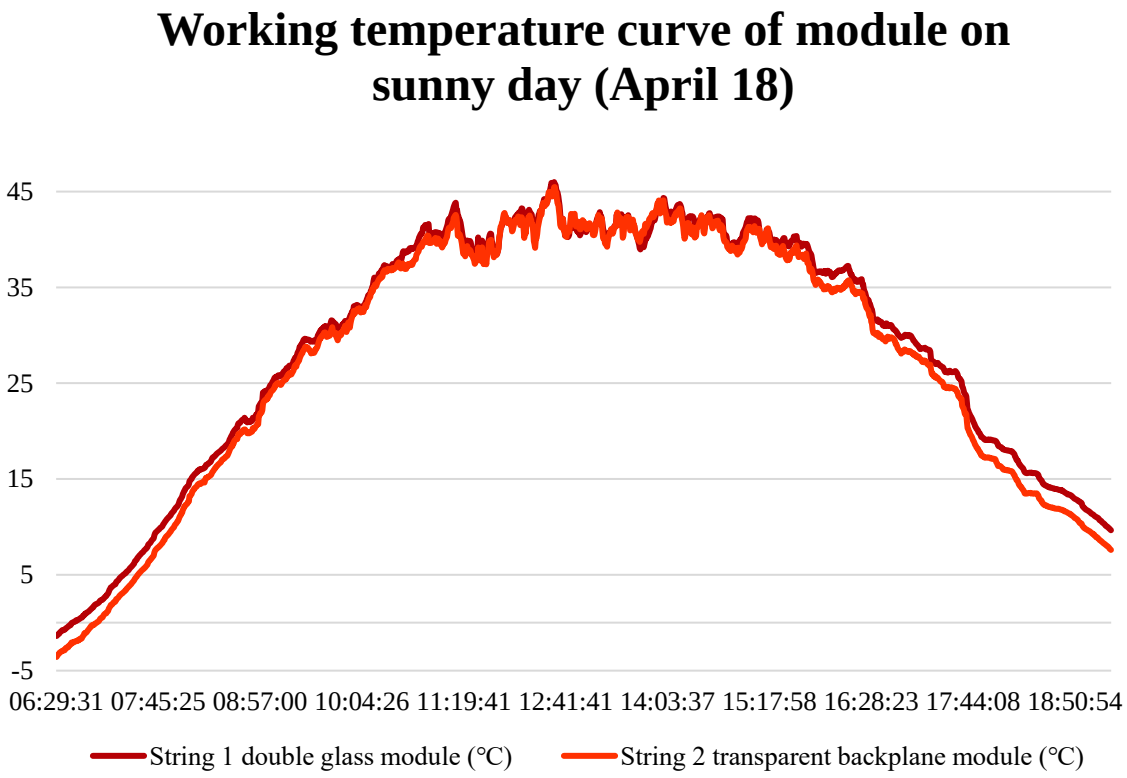


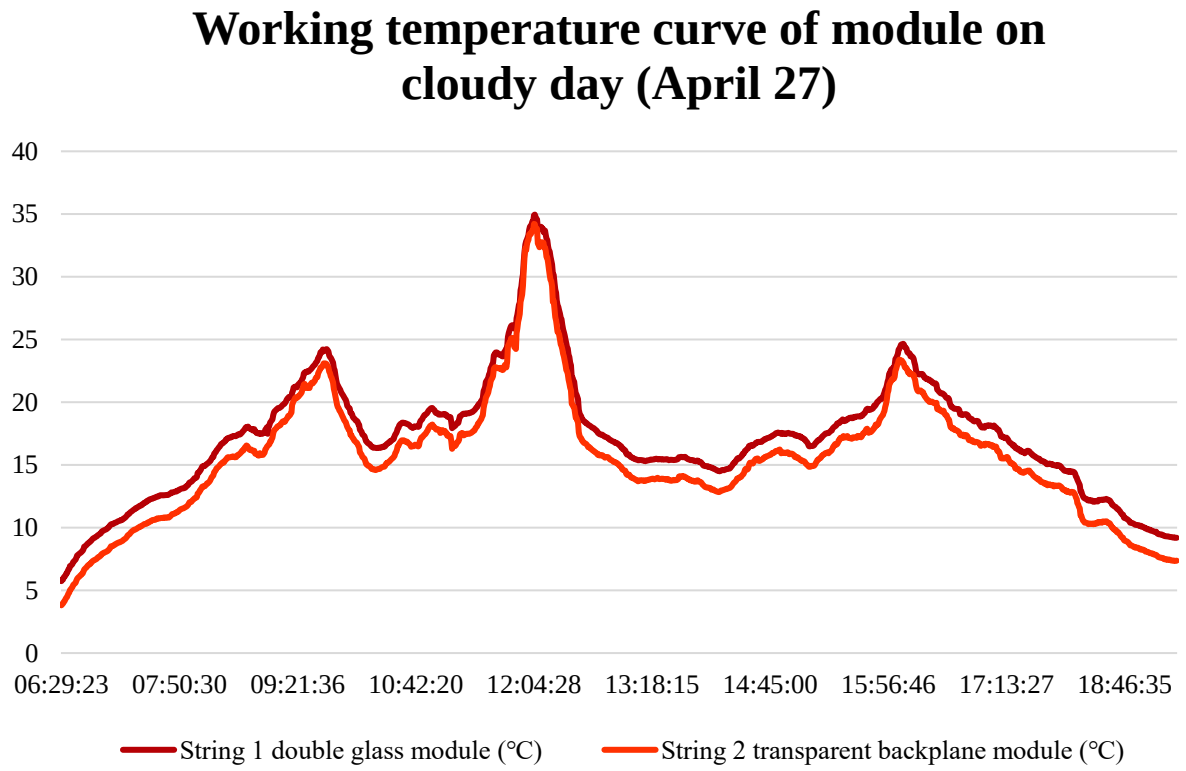
A layer of grid achieves dual effects of increasing power and improving weather resistance

Jolywood and Wuxi National Photovoltaic Quality Inspection Center CPVT Yinchuan Empirical Project

- Yinchuan City of Ningxia: The core position at the most extensive photovoltaic concentration area in China.
- Temperate continental climate: dry heat, large temperature difference, altitude 1100 m
- Solar energy resource class I area, the solar spectrum is close to the standard AM1.5 (matching degree 95.47%)
- The duration with annual irradiation intensity of 500W/m2 and above is more than 2000 hours, the daily average direct irradiation amount is 5.75kWh/m2, and the ultraviolet component is high.

The operating temperature is 1.13℃ lower than DG product’ s

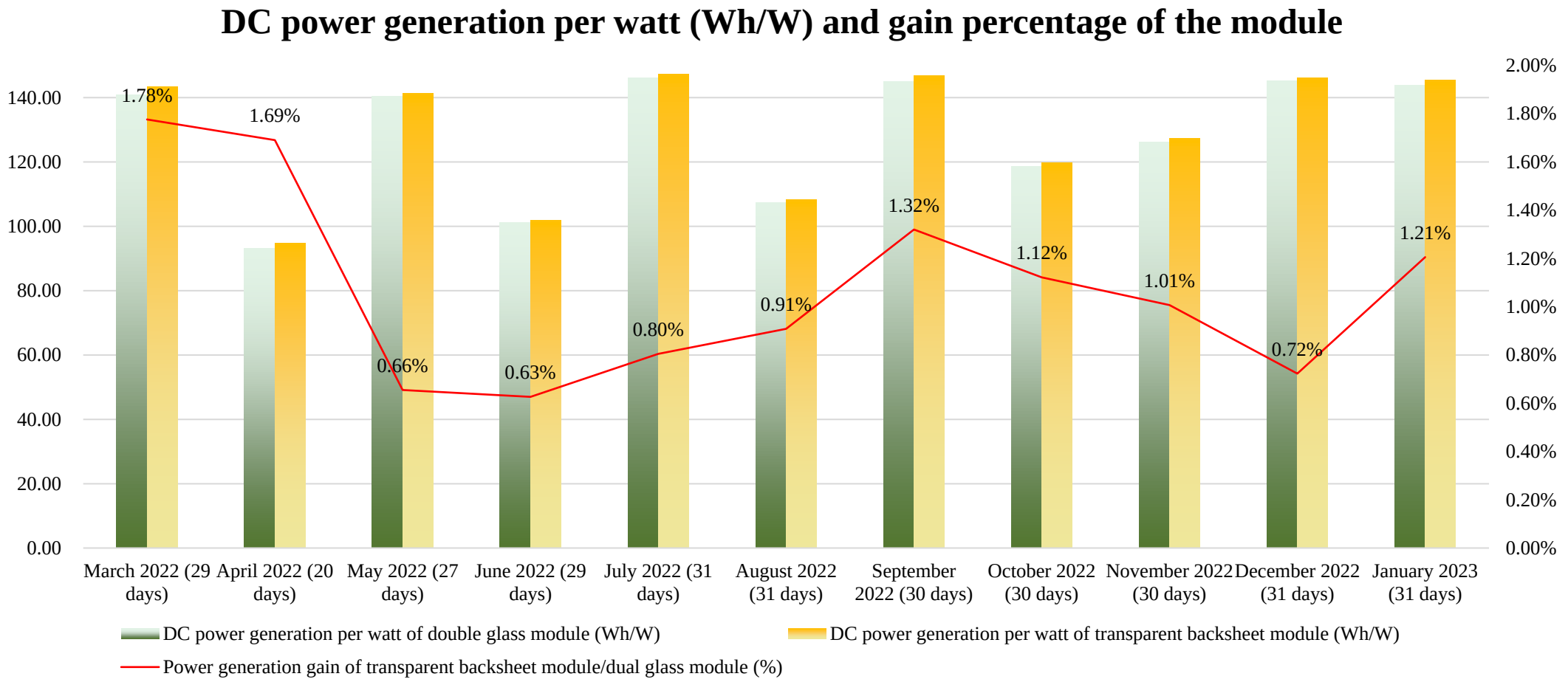




Weather	Temperature difference = double glass module temperature - transparent backsheet module temperature	
	Maximum temperature difference of module (℃)	Average temperature difference of module (℃)
Sunny day (April 18)	2.24	1.13
Cloudy day (April 27)	2.25	1.57

Same sunshine, more value

The average power generation of transparent backsheet modules increases by 1.29%



Assumption in a 100MW Guangdong Project

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
Double-glass Guangdong (yuan)	50,200,000	49,999,200	49,799,203	49,600,006	49,401,606	49,204,000	49,007,184	48,811,155	48,615,911	48,421,447	48,227,761	48,034,850	47,842,711	47,651,340	47,460,735
Single glass transparent Guangdong (yuan)	50,847,580	50,644,190	50,441,613	50,239,846	50,038,887	49,838,732	49,639,377	49,440,819	49,243,056	49,046,084	48,849,899	48,654,500	48,459,882	48,266,042	48,072,978
Gain (yuan)	647,580	644,990	642,410	639,840	637,281	634,732	632,193	629,664	627,145	624,637	622,138	619,650	617,171	614,702	612,243

Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	The 22nd year	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30
47,270,892	47,081,808	46,893,481	46,705,907	46,519,083	46,333,007	46147674.86	45963084	45779232	45596115	45413730	45232076	45051147.20879	44870943	44691459
47,880,686	47,689,163	47,498,407	47,308,413	47,119,179	46930702.7	46742979.86	46556008	46369784	46184305	45999568	45815569	45632307.01	45449778	45267979
609,795	607,355	604,926	602,506	600,096	597,696	595,305	592,924	590,552	588,190	585,837	583,494	581,160	578,835	576,520

Assumptions:	
Electricity price in Guangdong (yuan/kwh):	0.502
Power generation of transparent backsheet module than double glass (%)	1.29%
Annual power generation of 1MW module in Guangdong (kwh)	1,000,000
Annual Guangdong degradation (%)	0.40%

20-year total income

12,471,053 yuan

Income: 0.1247 yuan/watt

25-year total income

15,435,719 yuan

Income: 0.1544 yuan/watt

30-year total income

18,341,565 yuan

Revenue 0.1834 yuan/watt

Energy yield gain 1.29%
Based on 30-year system income, equivalent to a system cost reduction of 0.18 yuan/watt. (≈0.025EUR/watt)

Summary

Same sunshine， more value

30 Years linear warrenty

Light Weight

The weight of the module is 17% lighter

Less use of bracket

High Light Transmittance

Self-clean Ability

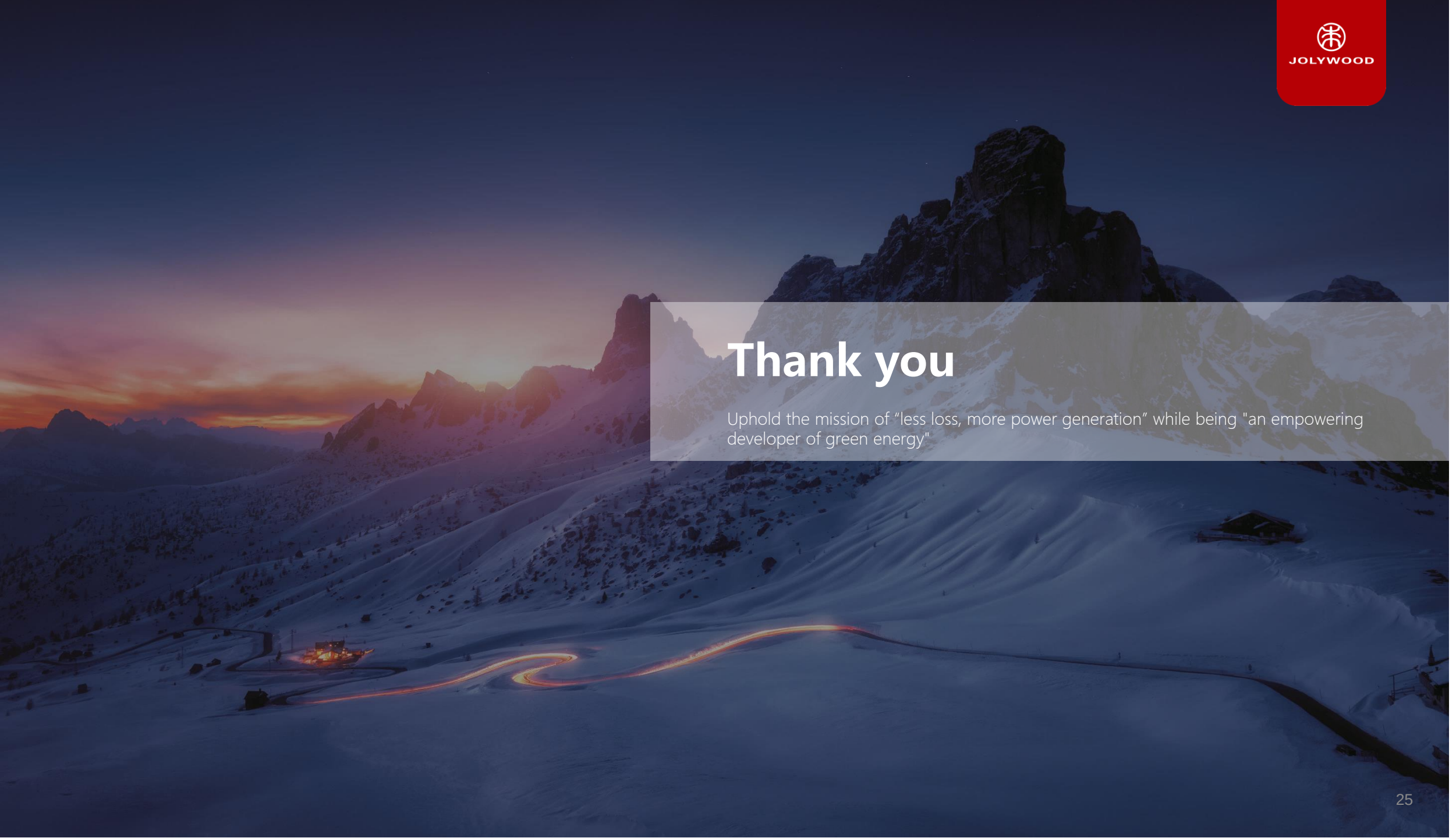
Excellent self-cleaning effect,

no dust on the back

Long-term reliability

More income

The power generation is 1.29% higher .Equivalent to a system cost reduction of 0.025EUR/watt



Thank you

Uphold the mission of “less loss, more power generation” while being "an empowering developer of green energy"

Development of Global solar market & Application of transparent back-sheet modules in large ground power plant

BRUNO PATRÓN SEVILLA

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Same sunshine, more value

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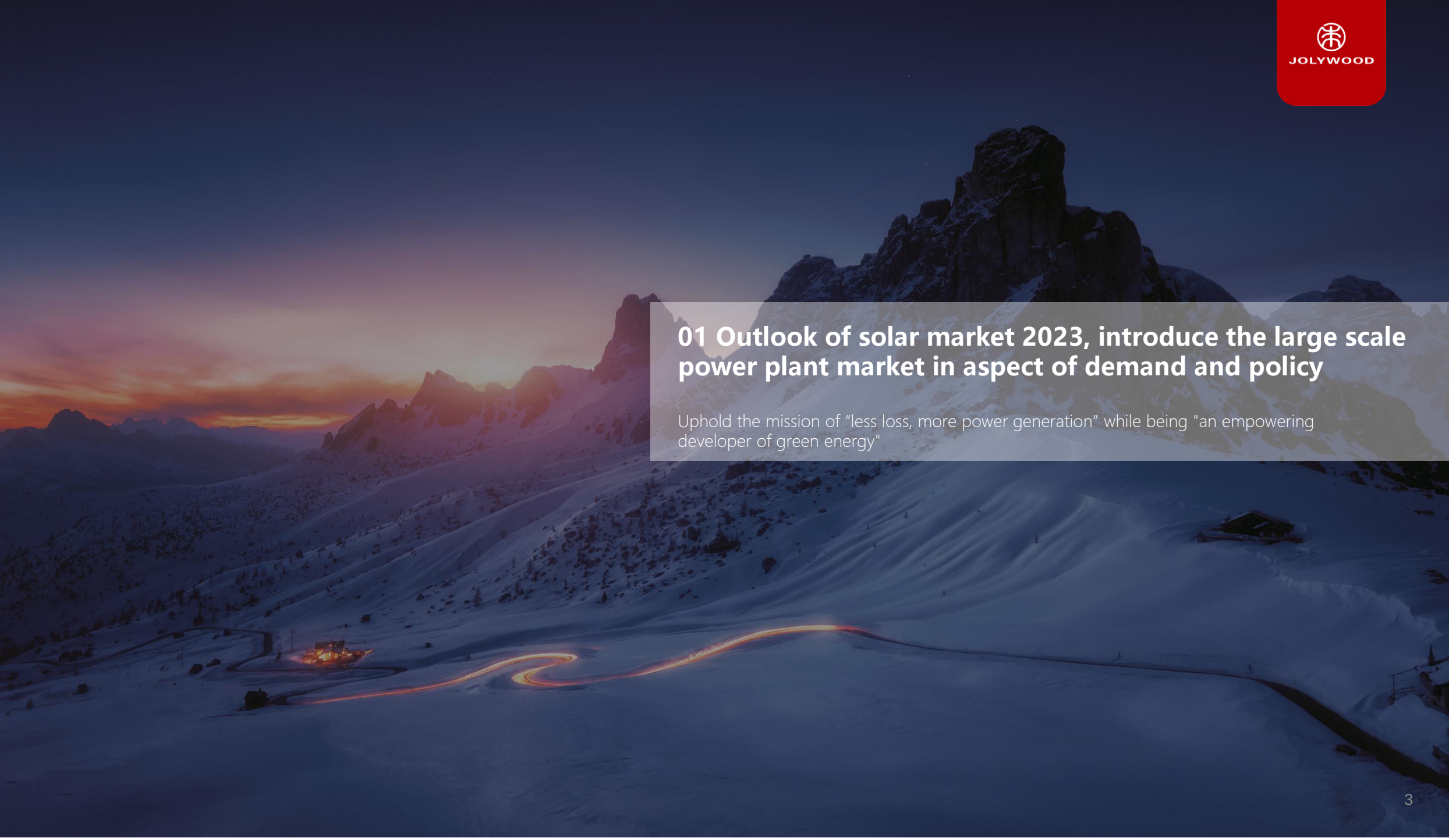

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01 Outlook of solar market 2023, introduce the large scale power plant market in aspect of demand and policy

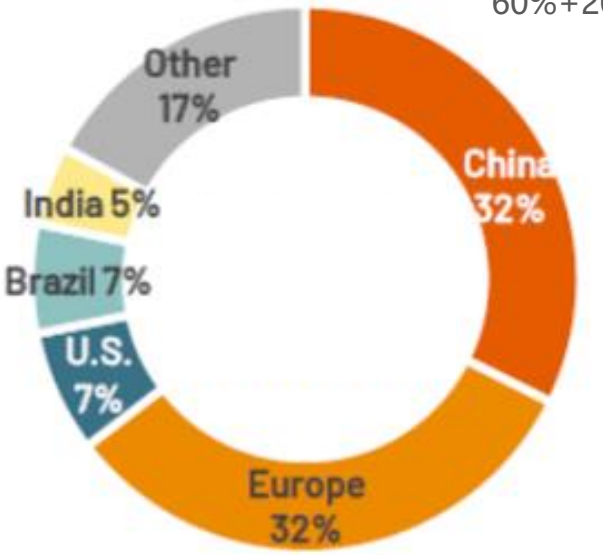
Uphold the mission of “less loss, more power generation” while being "an empowering developer of green energy"

Previous Period, 2022: Worlwide Solar Market Statistics

14GW DC
27%+2021

8,2GW DC
30%+2021

20,2GW DC
35%+2021



87,4GW DC
60%+2021

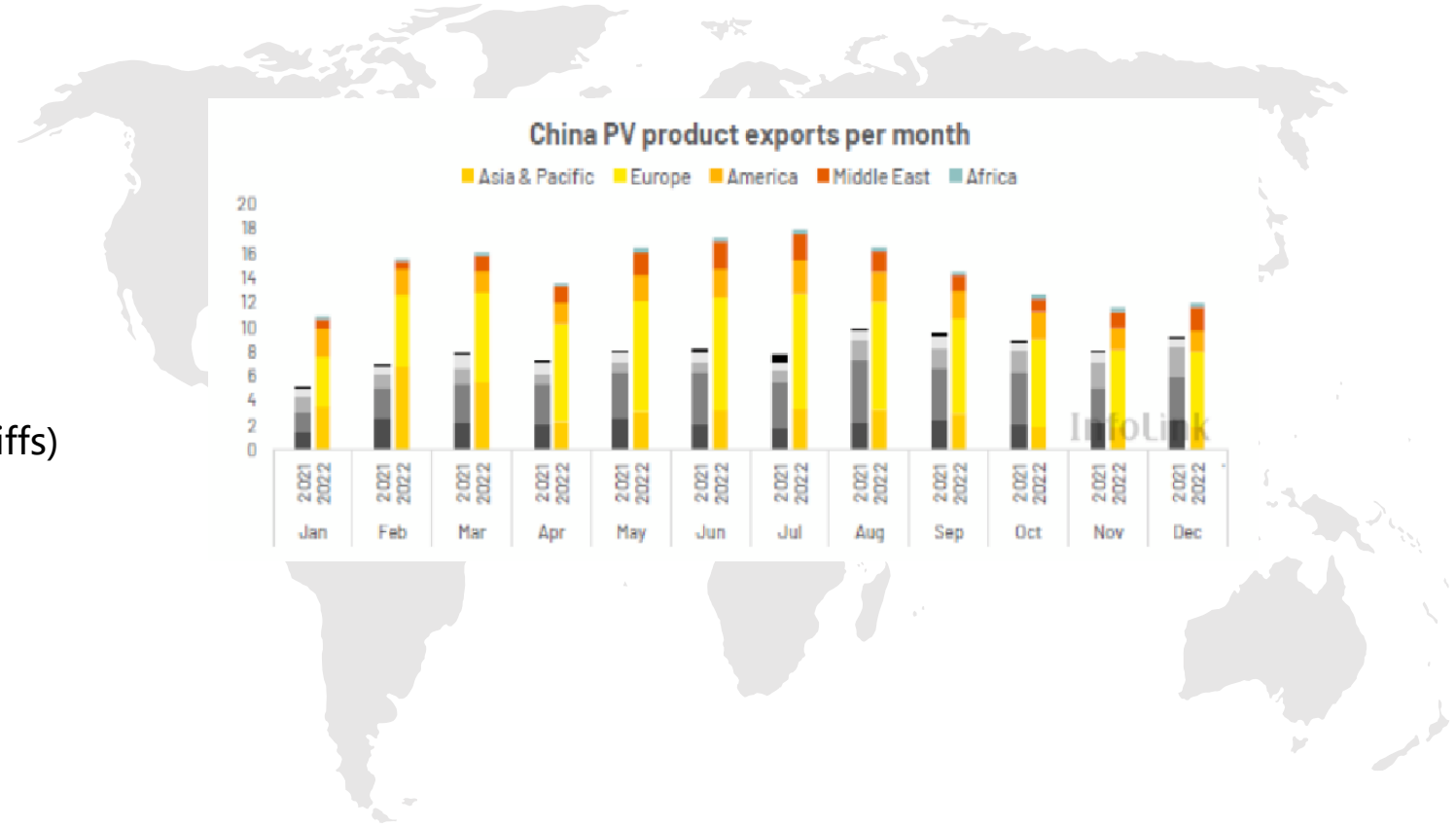
41,4GW DC
47%+2021

252GW DC

300GW Modules

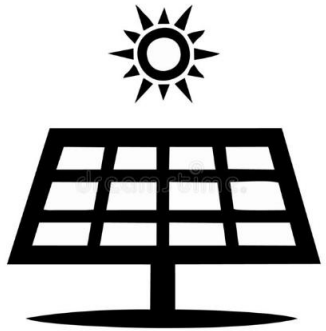
2022-2023: Market Concerns regarding Utility-Scale projects & Policies

- Grid connection
- Land Permitting for Utility-scale projects
- Inflation & Higher Interest Rates due to conflict
- Trade Barriers between countries (High tariffs)
- Local production support against imports
- US 2022 · UFLPA regulation
- INDIA 2022 · PLI & BCD

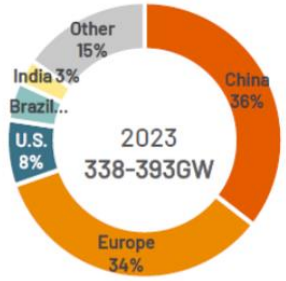


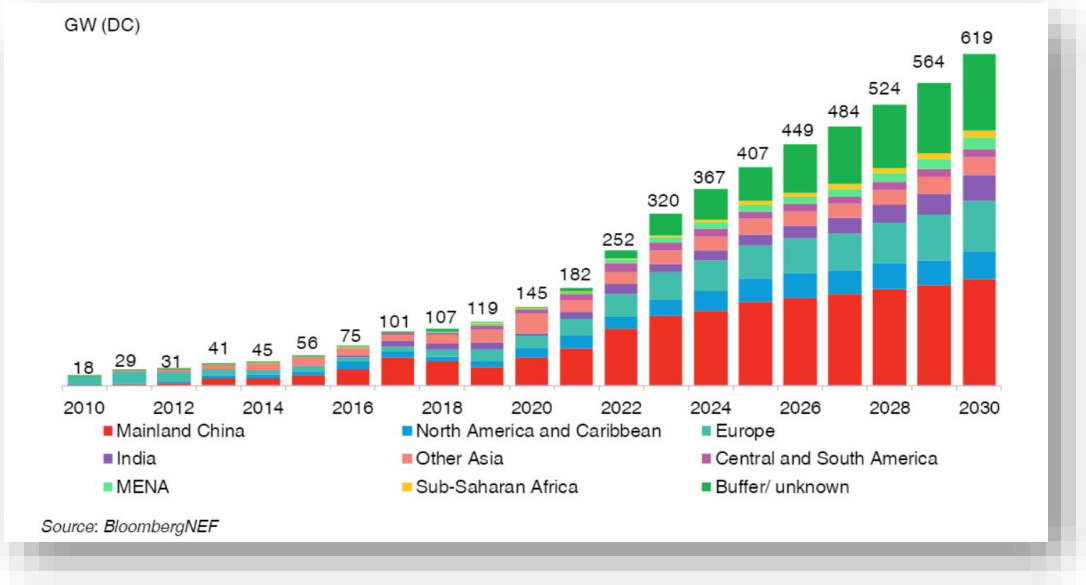
2023-2030: A greener and decarbonized period

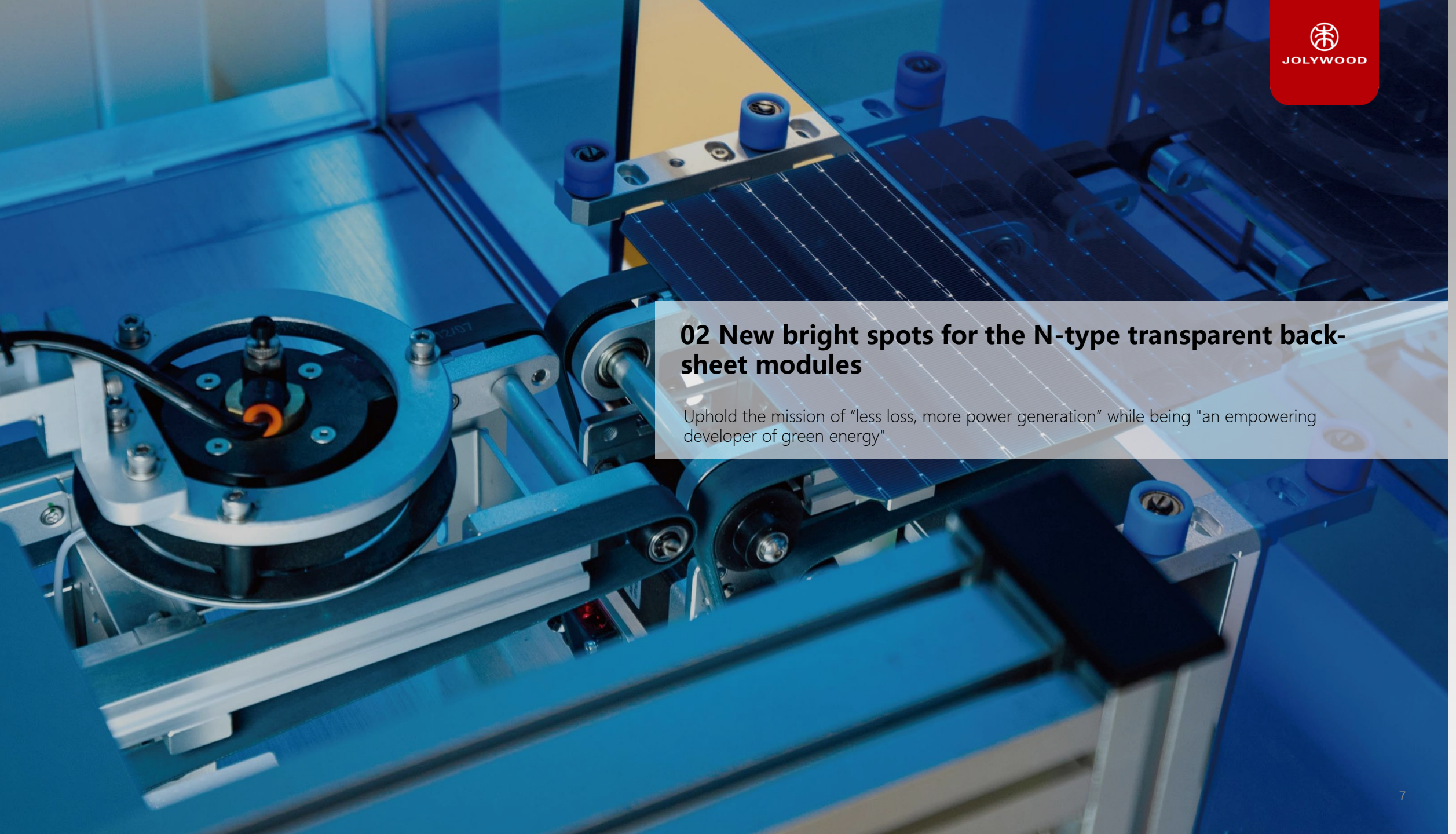
- Technology Forecast 2023: Rise of TOPCON → 18-20 % Market Share (8,3 % in 2022)
- Estimated Polysilicon Supply in 2023 for modules: 576 GW



Global PV Installation 2023: 320-390 GW







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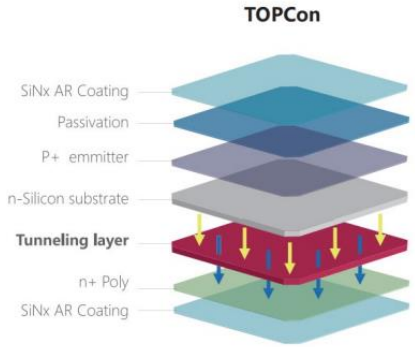
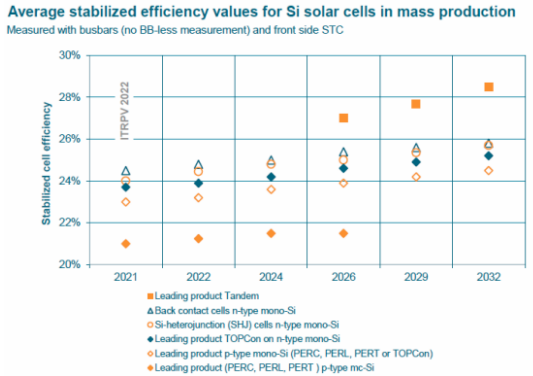
02 New bright spots for the N-type transparent back-sheet modules

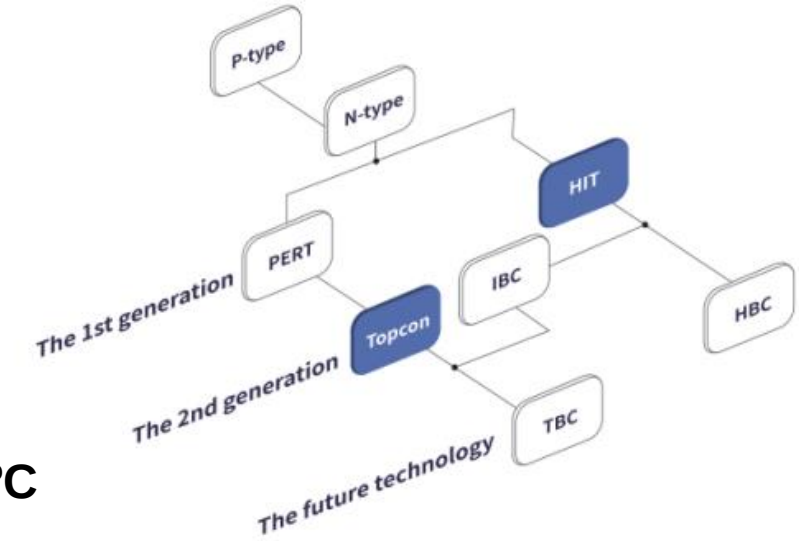
Uphold the mission of “less loss, more power generation” while being "an empowering developer of green energy"

Ntype main advantages vs PERC technology

Efficiency & Low Light Response →







Technology classification of N-type cells

Temperature & Bifacial Coefficients

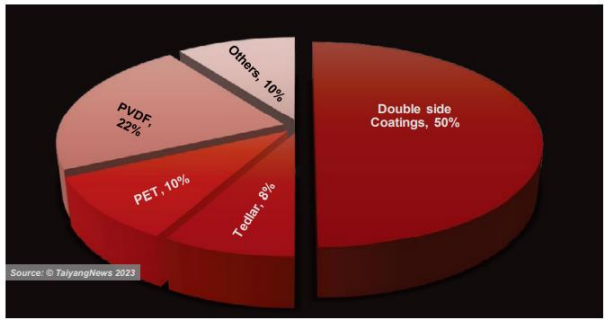
- TC: -0,35%/ºC vs -0,3%/ºC
- Bi: 70% vs -85%

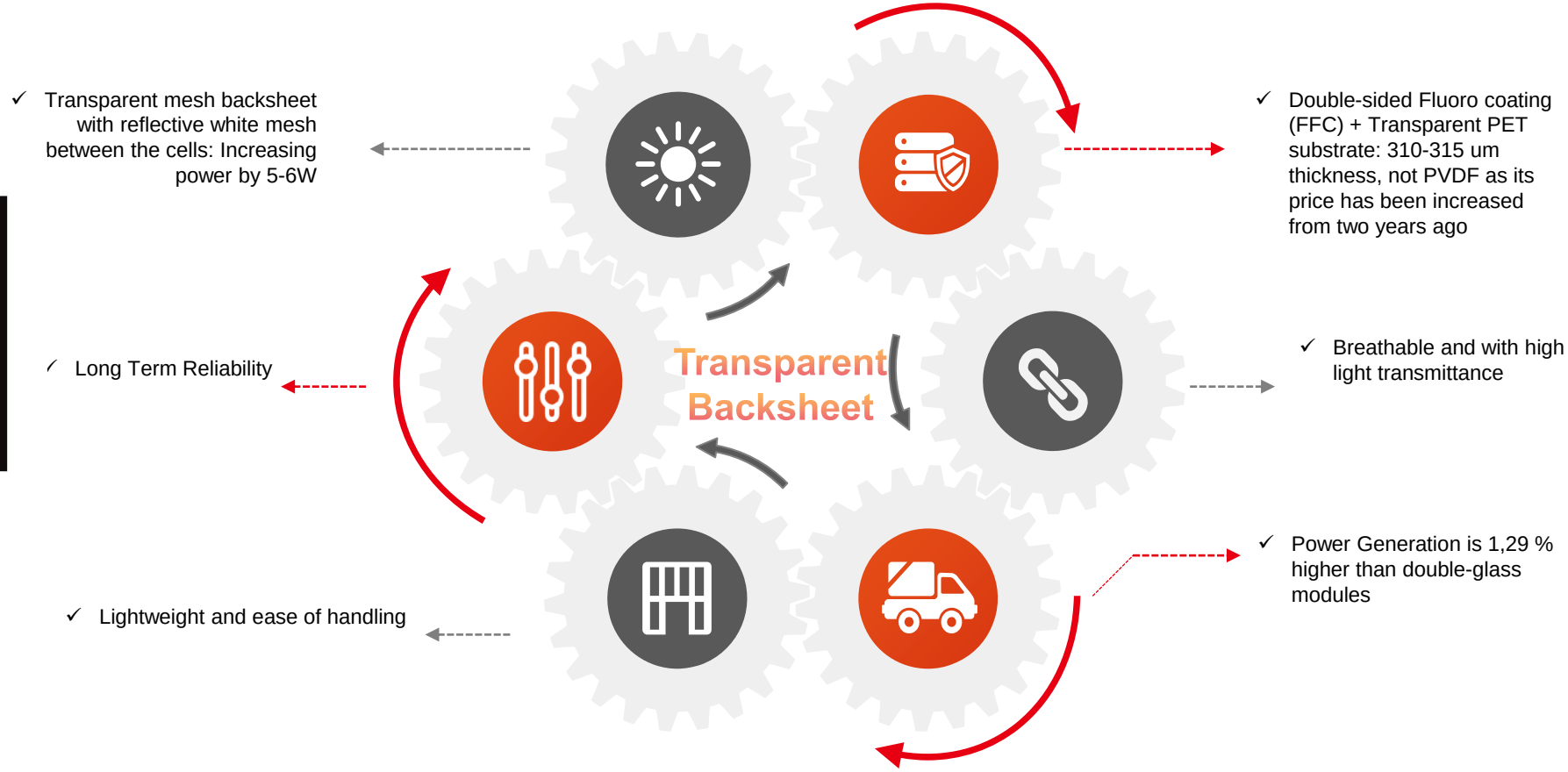
Degradation 30-year period → 1st Year: 1%, 2-30 year: 0,4%

Ntype Transparent backsheet modules

Main target → To Reduce LCOE of PV Bifacial Systems

Technology Shares of Backsheet Structures 2022





- ✓ Transparent mesh backsheet with reflective white mesh between the cells: Increasing power by 5-6W
- ✓ Long Term Reliability
- ✓ Lightweight and ease of handling
- ✓ Double-sided Fluoro coating (FFC) + Transparent PET substrate: 310-315 um thickness, not PVDF as its price has been increased from two years ago
- ✓ Breathable and with high light transmittance
- ✓ Power Generation is 1,29 % higher than double-glass modules

03 Application of transparent back-sheet modules in large scale power plant

Uphold the mission of “less loss, more power generation” while being "an empowering developer of green energy"

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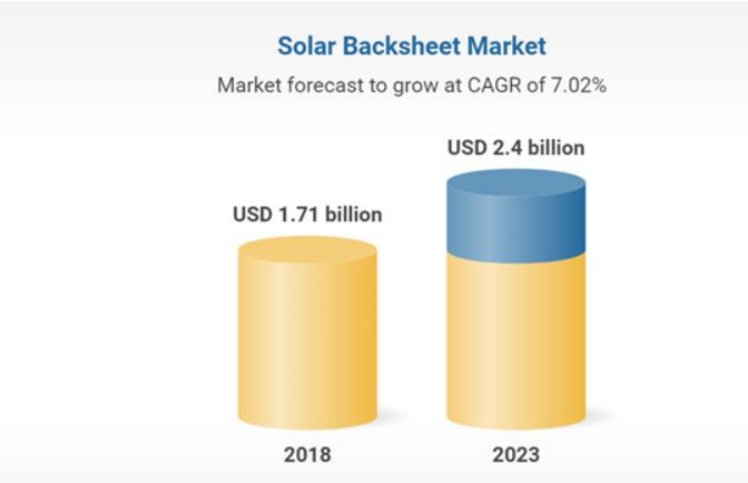
Same sunshine, more value

Forecast for the upcoming years regarding Transparent Backsheet Market



Main Causes for this market development

- Affected directly by Double glass market (Costs) and its forecast
- Where importing glass from China is a costly affair, transparent backsheet is better
- Transparent backsheet, replacing the glass in bifacial modules, has several advantages – less weight, better heat dissipation and requiring no changes to BOM and process. Also, improves power generation

2022 Statistics

- As for 2022, the total backsheet shipments was around 900 million m2 that is approximately 180 GW, 20% YoY.
- The share of the glass-glass module configuration in China was about 50-50 in 2021, it further increased to 60% in 2022. Out of the remaining 40% for backsheets, transparent backsheets are about a 10% share

Main Areas & Companies

- Asia Pacific to dominate this market globally due to increase in solar PV installation (China with 90% of backsheet capacity)
- USA & India as main markets for transparent backsheet
- China · JOLYWOOD (1º Mundial, as per double-side coatings, instead of PVDF), CYBRID & HANGZHOU MATERIALS
- Europe · COVEME (Italy), KREMPEL (Germany)

Limitations

- Proper design of the layers of the backsheets for increasing the stability of PET core layer under UV exposure is critical.
- Transparent backsheet is at par with glass at all aspects, while further cost down is necessary to its wide spread

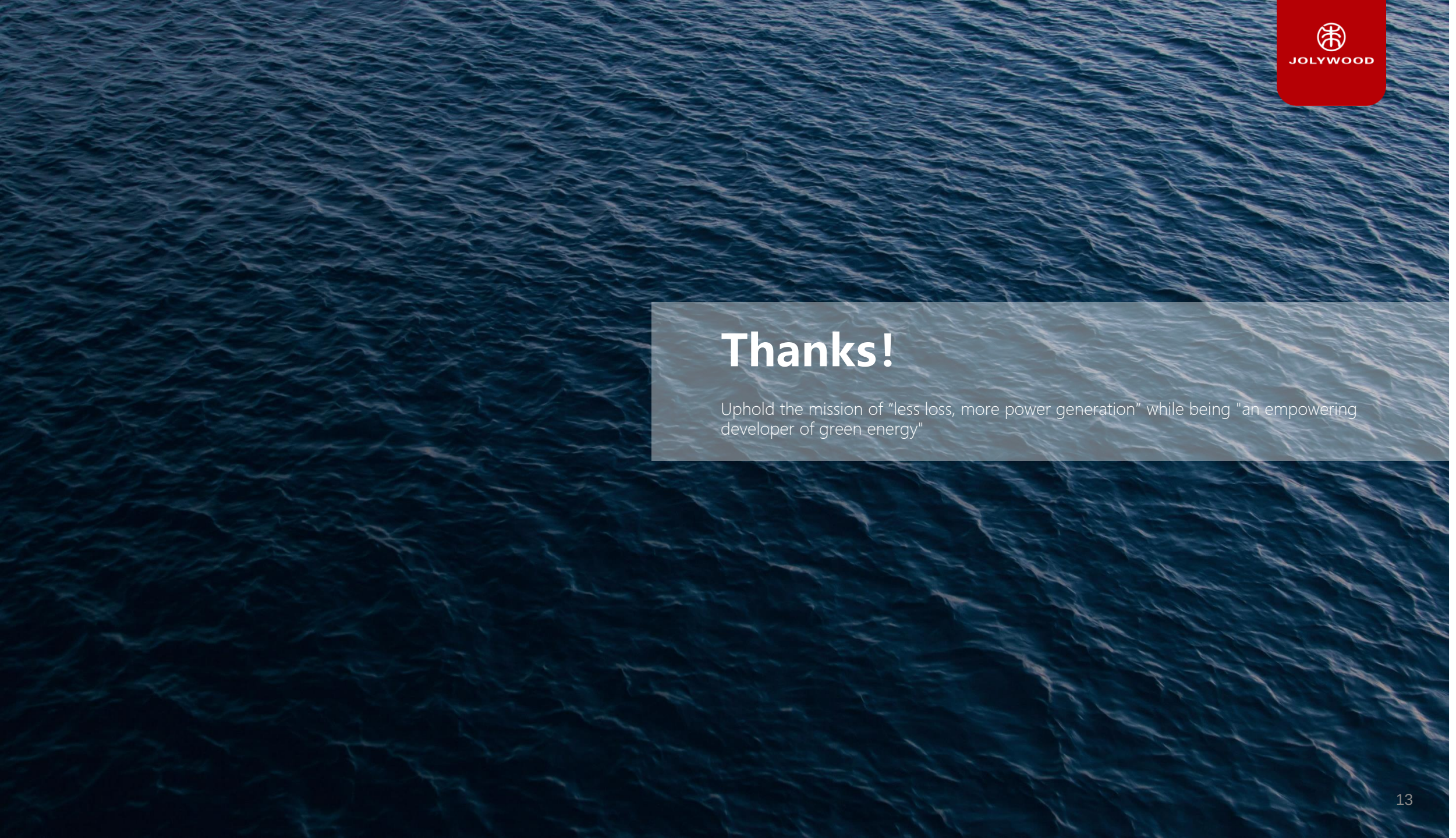
Advantages of its installation VS Double glass modules in large scale plants

Lighter Module, 17% of improvement → Easier for transportation and to be installed ON SITE → Reduction of Installation time, saving costs: BOS Cost Reduction

Due to its internal structure → Excellent self-cleaning performance (Avoiding reduction of module power generation due to dust deposition on the surface, hot spots)

Energy yield gain 1,29 % → For a 30-year system, Cost reduction of 0,025 €/W→ Economic Improvement

Transparent backsheet with reflective white mesh → Improving power gain compared with Bifacial option



JOLYWOOD

Same sunshine, more value

Thanks!

Uphold the mission of ”less loss, more power generation” while being "an empowering developer of green energy"

Introduction of Transparent PV Back-sheet used Niwa Light Series Solar Modules

Leo Yang

JOLYWOOD

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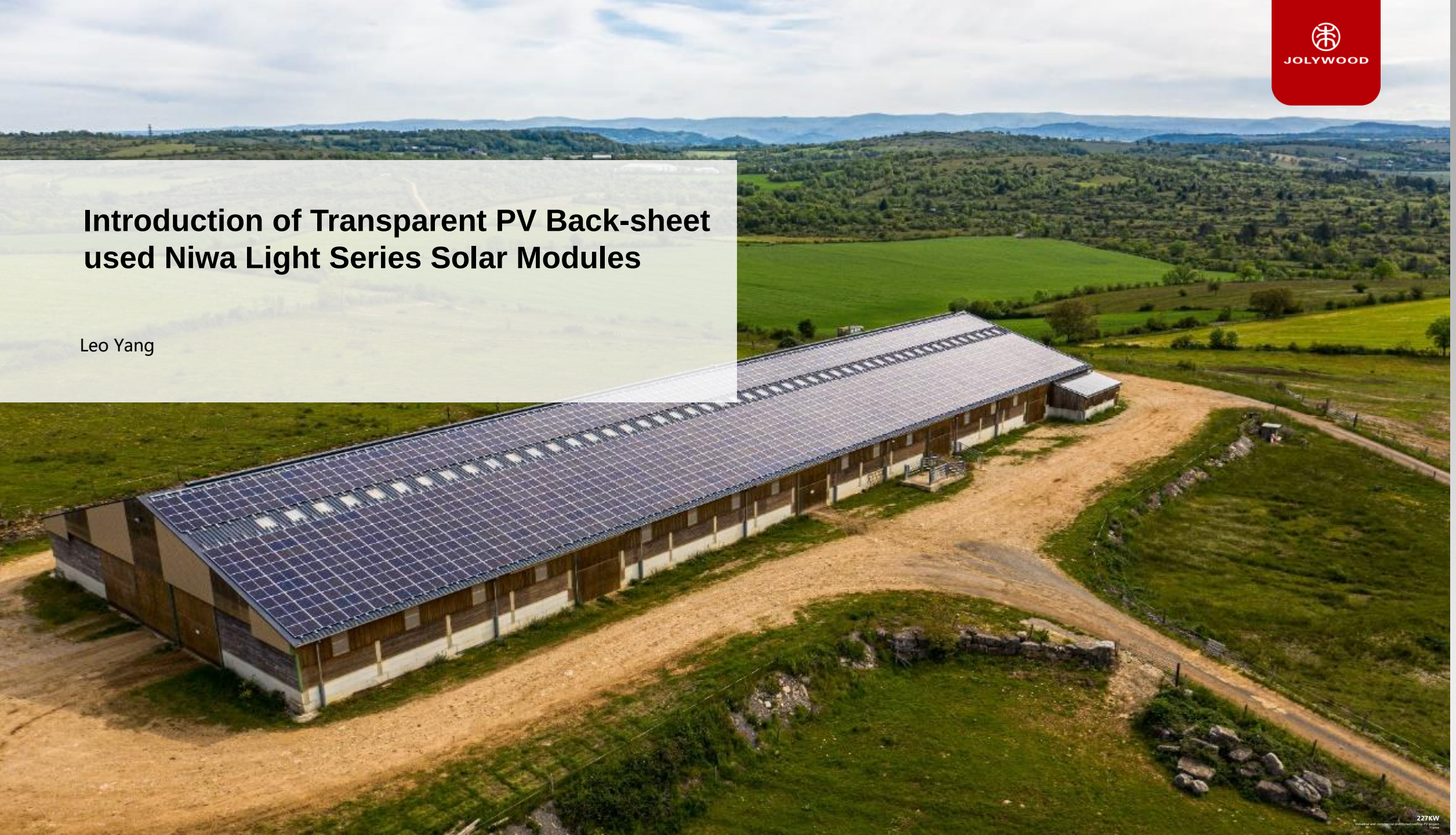
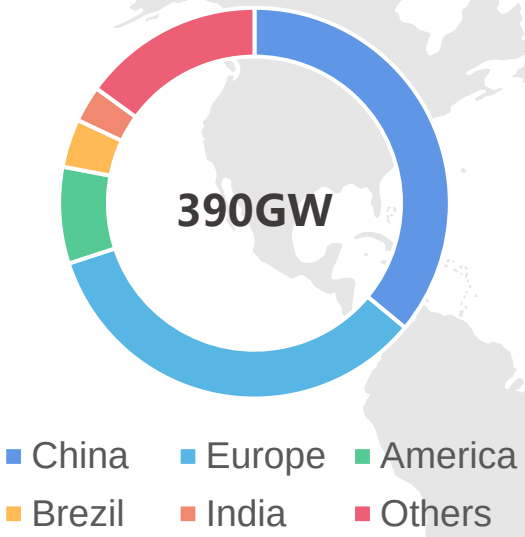


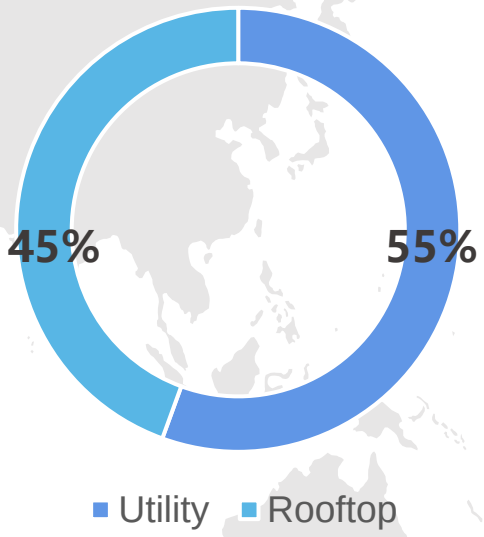
Overview of EU&Global Installations

With the vision of making solar power more valuable, Jolywood develops itself to promote N-type modules for industrial transformation

Estimated installations 2023



Rooftop Market Share in Europe 2023



In 2022, EU markets imported around 90GW solar cells and modules from overseas, the actual installations were around 40-45GW including almost 50% of these total capacities are residential and C&I rooftop projects. In 2023, The global markets' installations will reach 390GW in total.

Opportunities of Rooftop markets

With the vision of making solar power more valuable, Jolywood develops itself to promote N-type modules for industrial transformation

Energy Crisis

Currently European countries are seeking for energy independence;

Limited by energy shortage, gas and electricity prices had gone up a lot in 2022;

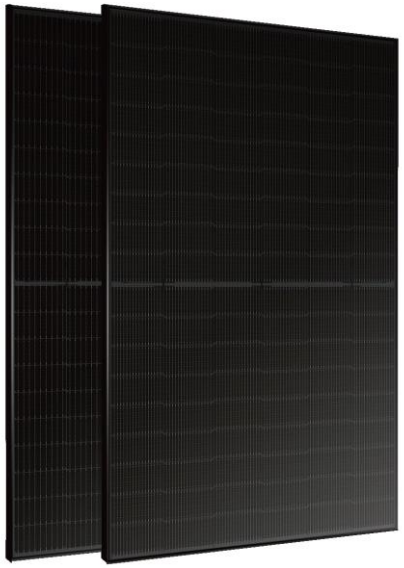
Electricity Price

System Price

PV system prices have been affordable and considerable for more and more families not only in West Europe.

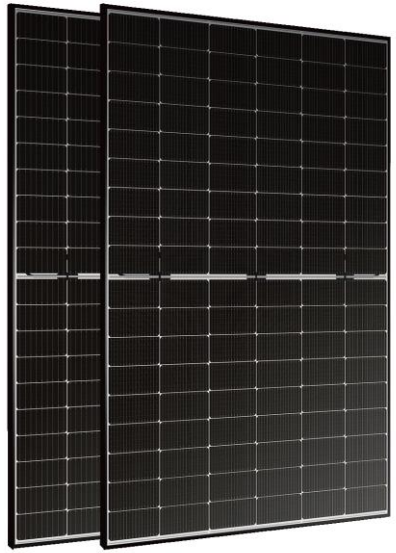
Adapt to Various Application

- High Power Output.
- ZERO LID (Light Induced Degradation)
- Better Weak Illumination Response
- Better Temperature Coefficient
- Outstanding visual appearance



NIWA Black

- Maximum power: 435W
- Maximum efficiency: 21.76%
- Real black modules

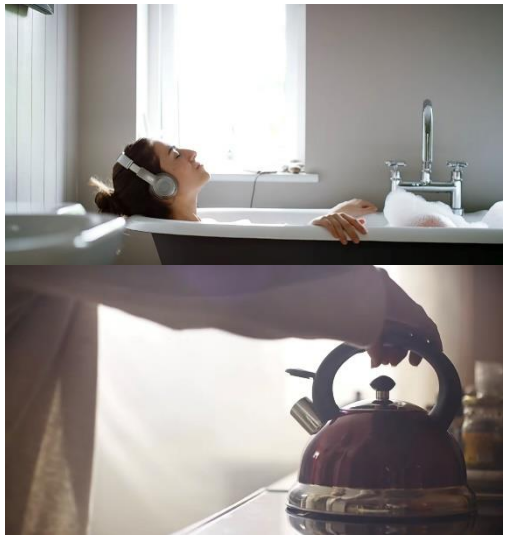


NIWA Light

- Maximum power: 440W
- Maximum efficiency: 22.53%
- Weight: 20kg

Application of using as rooftop

With the vision of making solar power more valuable, Jolywood develops itself to promote N-type modules for industrial transformation



Safe

Light

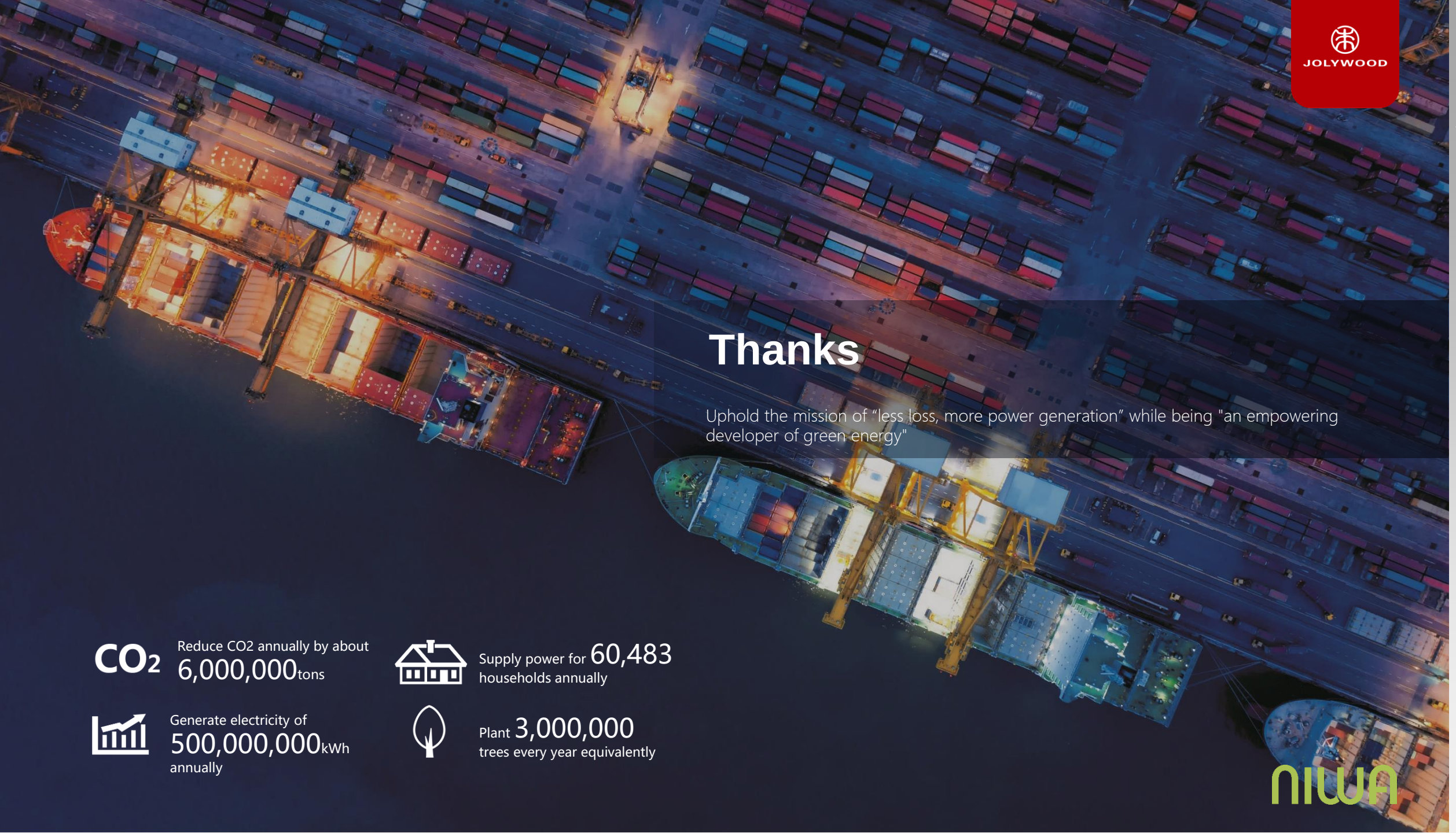
High Power

Artistic

Same sunshine, more value

Project Case of Niwa Module

With the vision of making solar power more valuable, Jolywood develops itself to promote N-type modules for industrial transformation



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Thanks

Uphold the mission of “less loss, more power generation” while being "an empowering developer of green energy"

CO_2 Reduce CO2 annually by about 6,000,000tons

Supply power for 60,483 households annually

Generate electricity of 500,000,000kWh annually

Plant 3,000,000 trees every year equivalently

NIWA

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pv magazine webinars

Transparent advantage – Why transparent backsheet bifacial modules can beat out the cumbersome competition

Q&A

6 April 2023

11:00 am – 12:00 pm | CEST, Berlin, Madrid
1:00 pm – 2:00 pm | GST, Dubai
5:00 pm – 6:00 pm | CST, Beijing

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10:00 am – 11:00 am EDT, New York City

New tracker design: Multiple motors to tackle multiple challenges

Tuesday, 2 May 2023
5:00 pm – 6:00 pm CEST, Berlin, Paris, Madrid
11:00 am – 12:00 pm EDT, New York City

Repowering old central inverters with new string inverters

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Tristan Rayner
Editor
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