



LONGi Solar Technology Co., Ltd.

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LONGI GREEN ENERGY

THE WORLD'S LEADING SOLAR TECHNOLOGY COMPANY

LONGi leads the solar PV industry to new heights with product innovations and optimized power-cost ratio with breakthrough monocrystalline technologies. LONGi supplies more than 30GW of high-efficiency solar wafers and modules worldwide yearly, about a quarter

of global market demand. LONGi is recognized as the world's most valuable solar technology company with the highest market value. Innovation and sustainable development are two of LONGi's core values.

LONGi SOLAR

FOCUS ON PRODUCTION, SALES AND R&D OF MONO CELL **AND MODULE**

LONGi Solar is a subsidiary of LONGi Green Energy, focus on production, sales and R&D of mono cell and module.Factories are located in China: Jiangsu, Zhejiang, Anhui, Shaanxi, Ningxia and Malaysia.Kuching.LONGi Solar is committed

to provide the best LCOE solutions as well as promote the worldwide application of monocrystalline technology.

2000

Established

3.32B(\$)*

Total Revenue

5.78B(\$)*

Total Assets

57.58%*

Debt Ratio

65GW**

Wafer Capacity

The only AAA

24.06%

BNEF

TIER 1

PV-Tech Bankability Ratings***

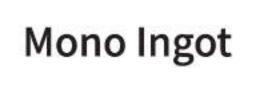
Module Capacity

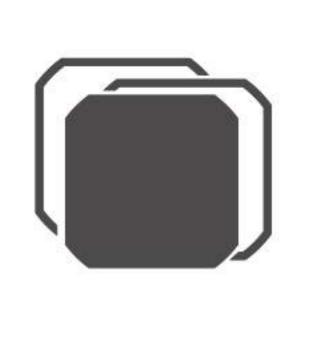
25GW**

PERC Cell Record

LONGI INDUSTRY CHAIN



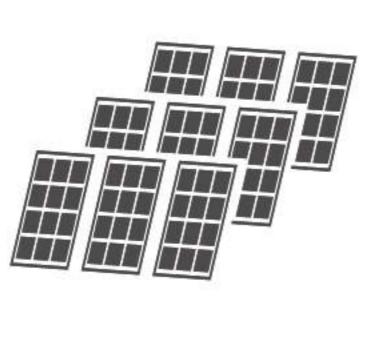




Mono Wafer

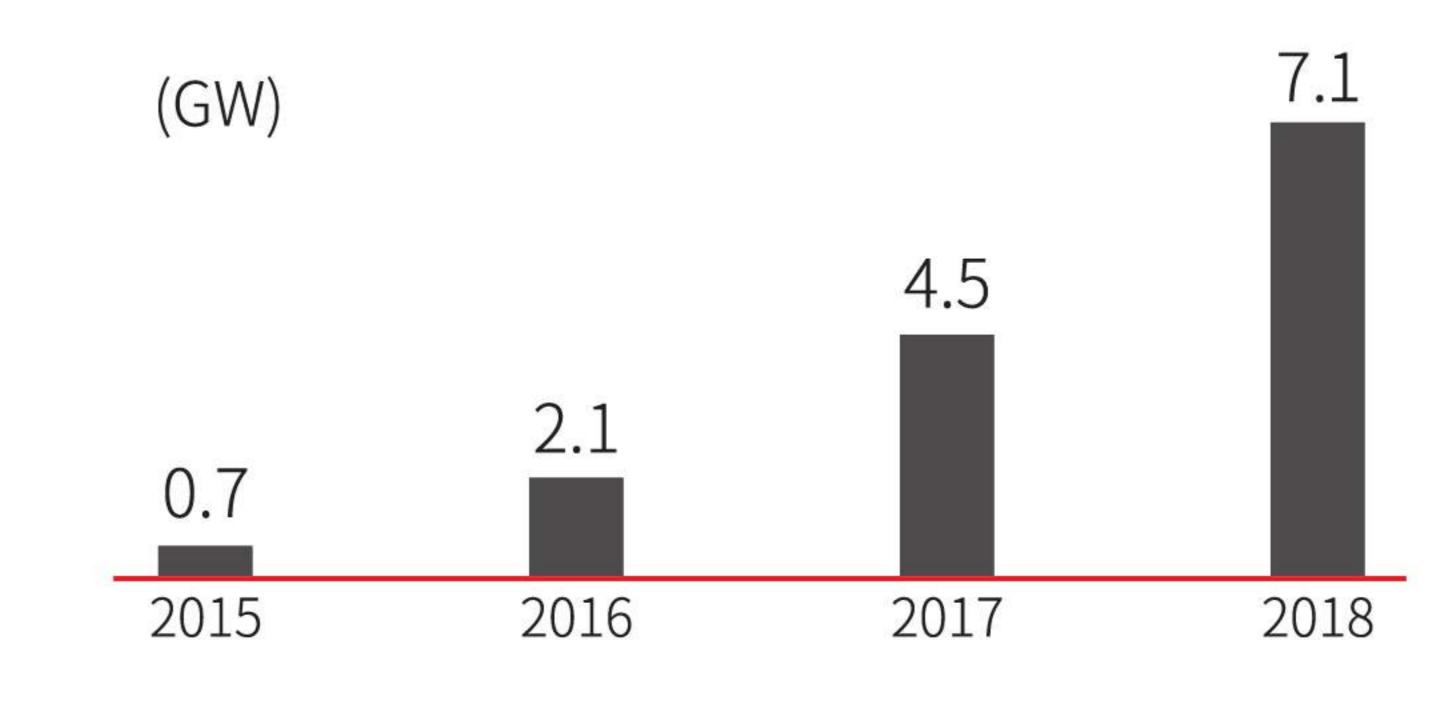


Mono Cell Mono Module - LONGi SOLAR -



Mono Photovoltaic **Power Station**

MODULE SHIPMENT OVER THE YEARS OF LONGI SOLAR



^{*}Based on the 2018 financial report of LONGi

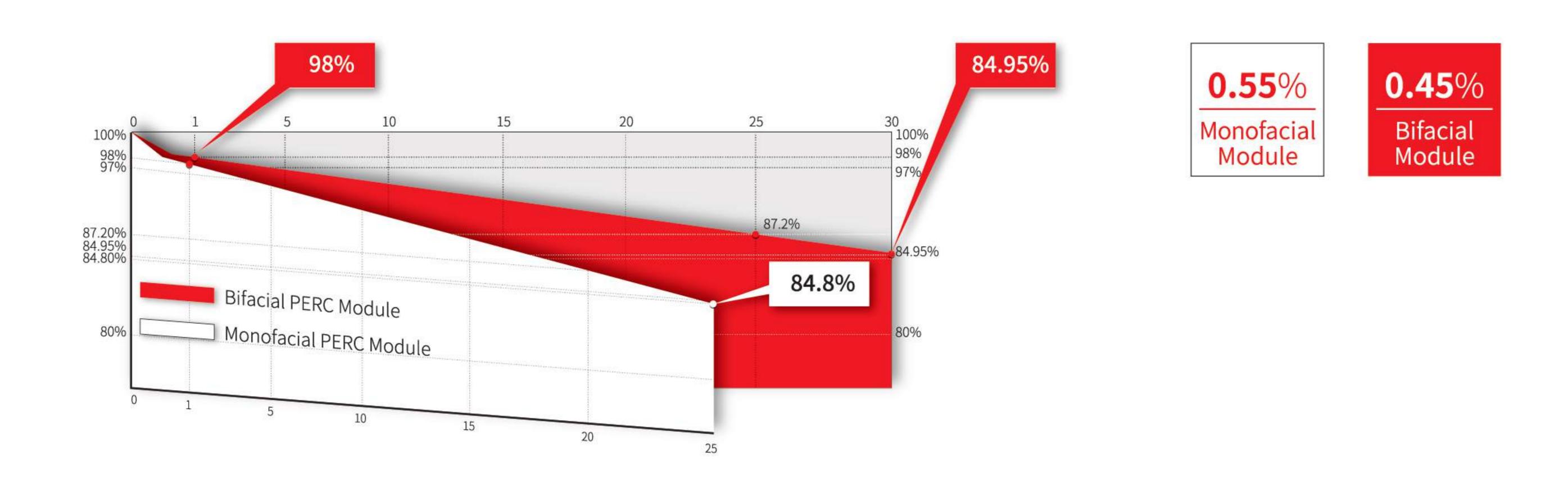
^{**} Wafer、 Module capacity by the end of 2020

^{***}The Q1 2020 PV ModuleTech Bankability Ratings

WARRANTY

FIRST-YEAR POWER WARRANTY OF ≥98% FOR PV MODULES

Based on the advanced mono wafer and anti-LID technology, LONGi offers a first-year power warranty of ≥98% for PV modules.

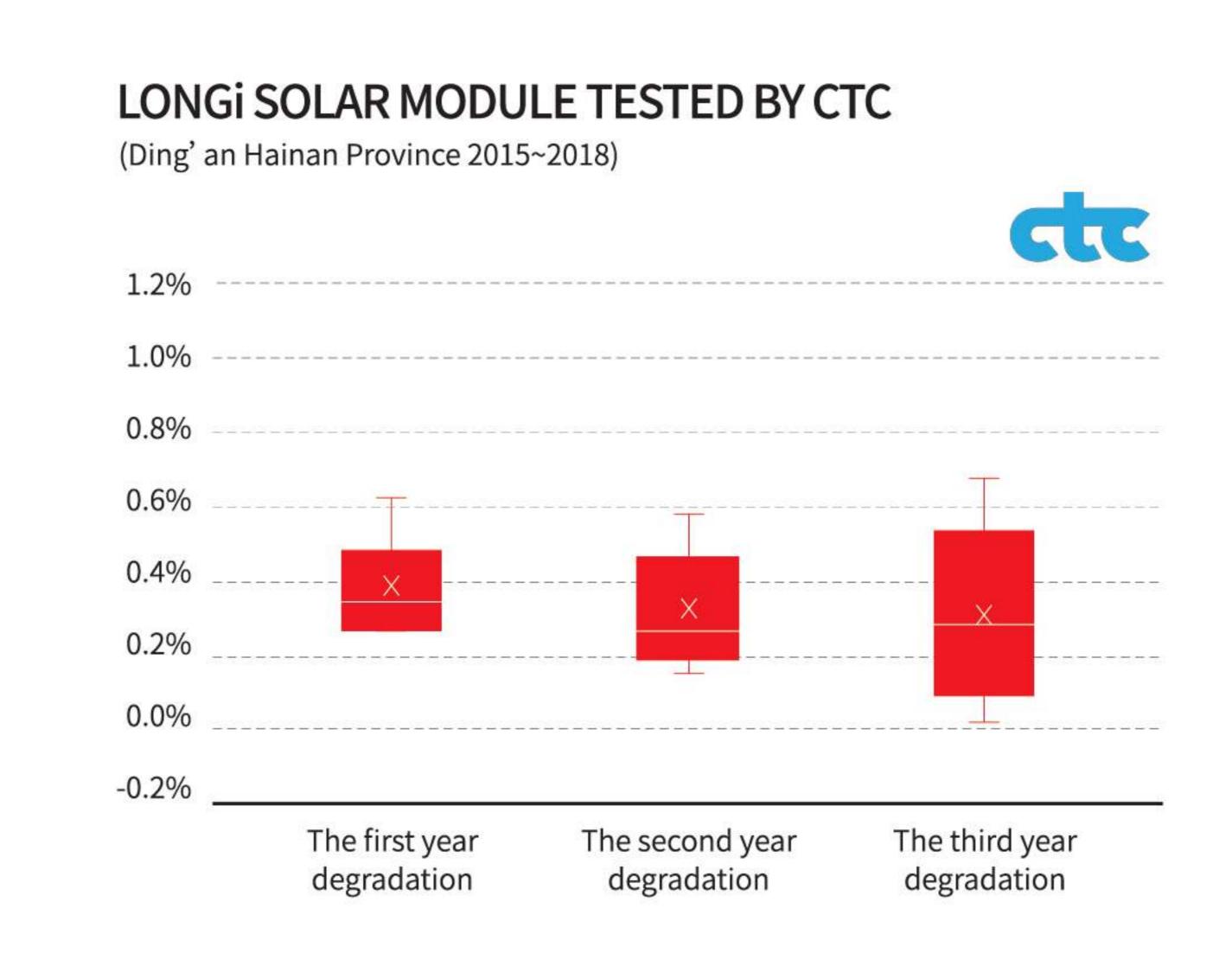


LONGi also provides a 10 years warranty for Material For th & Craftwork of PV modules, and a 25 years power years warranty with a linear degradation inferior to 0.55% year. per year for monofacial module.

For the Bifacial module, the warranty prolongs to 30 years with a linear power degradation of 0.45% per vear.

The low degradation property of lONGi's module is demonstrated by long-term outdoor test.

3.0% 2.5% 2.0% 1.5% 1.0% 0.5% 0.0% -1.0% Sanya Turpan Taizhou Taizhou Bifacial 350W

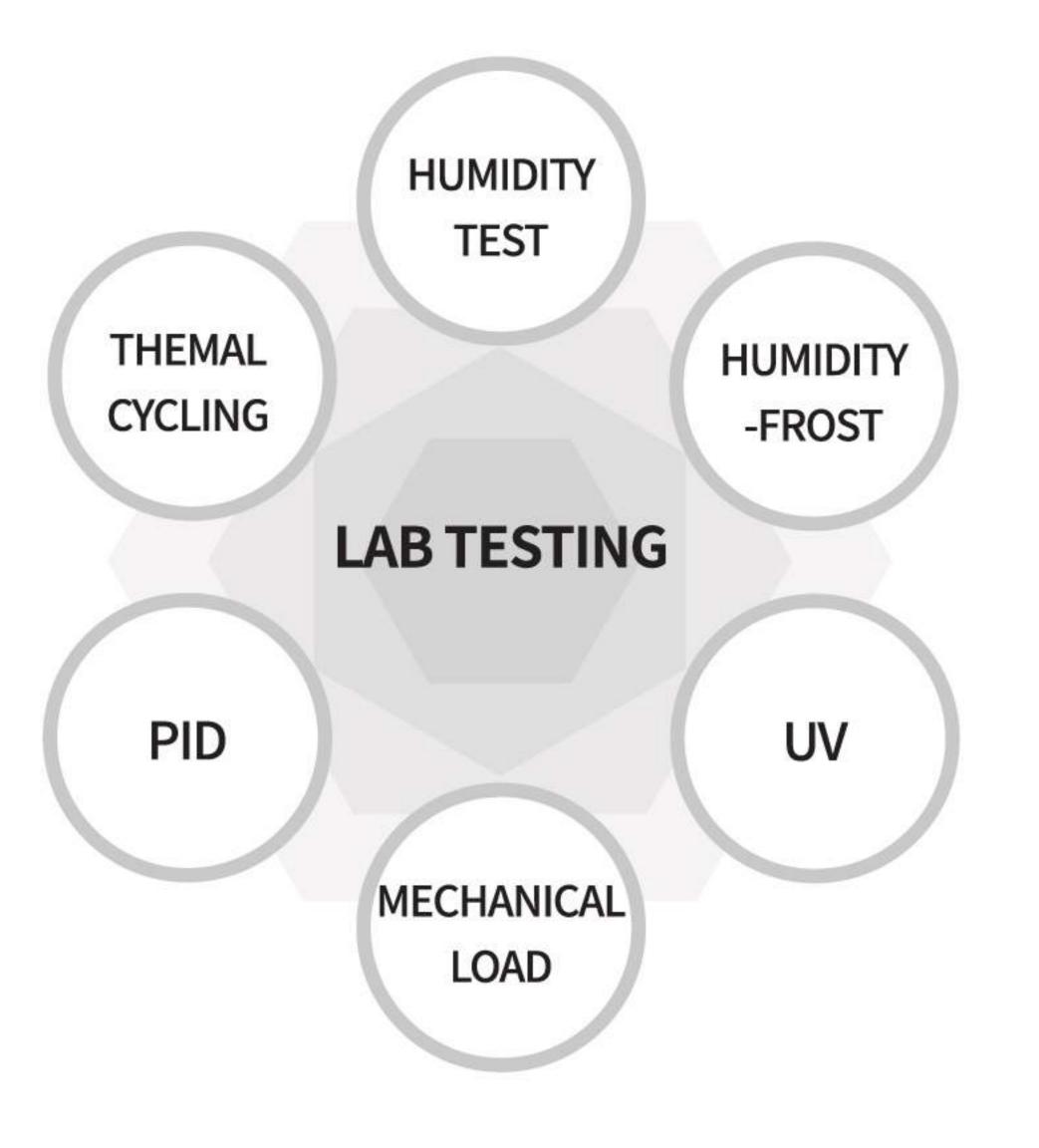


QUALITY

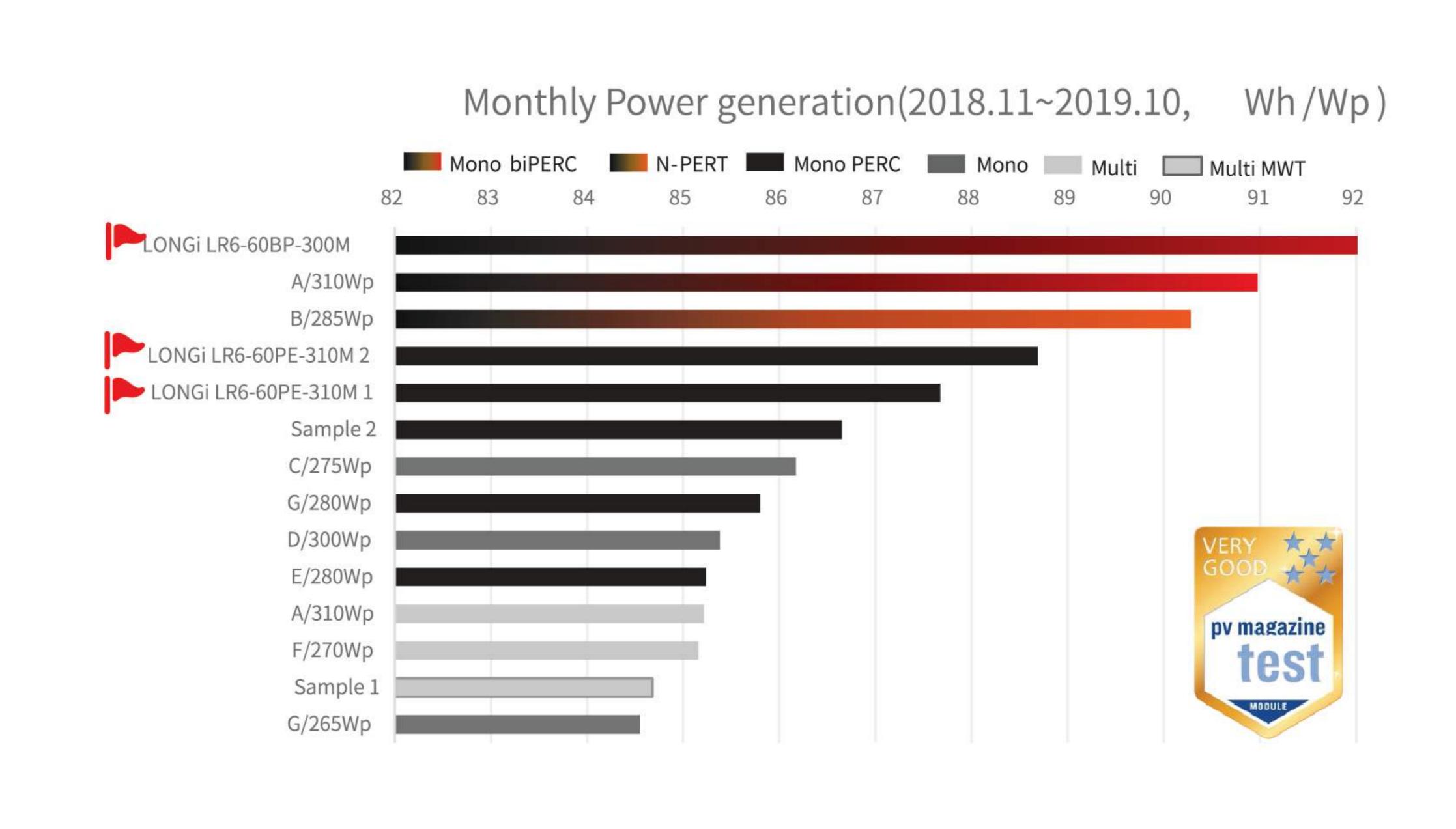
RELIABILITY TEST

LONGi's modules have passed routine test of IEC and UL, and have an excellent performance in rigorous third-party test.





PERFORMANCE TEST





LONGi's product center will also testify energy yield and degradation of various PV modules in out-door stations.

INGOT PULLING

RENDER PERC CELLS WITH HIGH EFFICIENCY AND LOW LID

As a leading company in monocrystalline industry, LONGi focus on reducing production cost by larger silicon loading, higher pulling speed. The RCZ technology was first successfully commercialized by LONGi. Also LONGi has improved the quality of silicon wafers by reducing oxygen content, carbon content and metal impurity, which render PERC cells with high efficiency and low LID.









Low LID

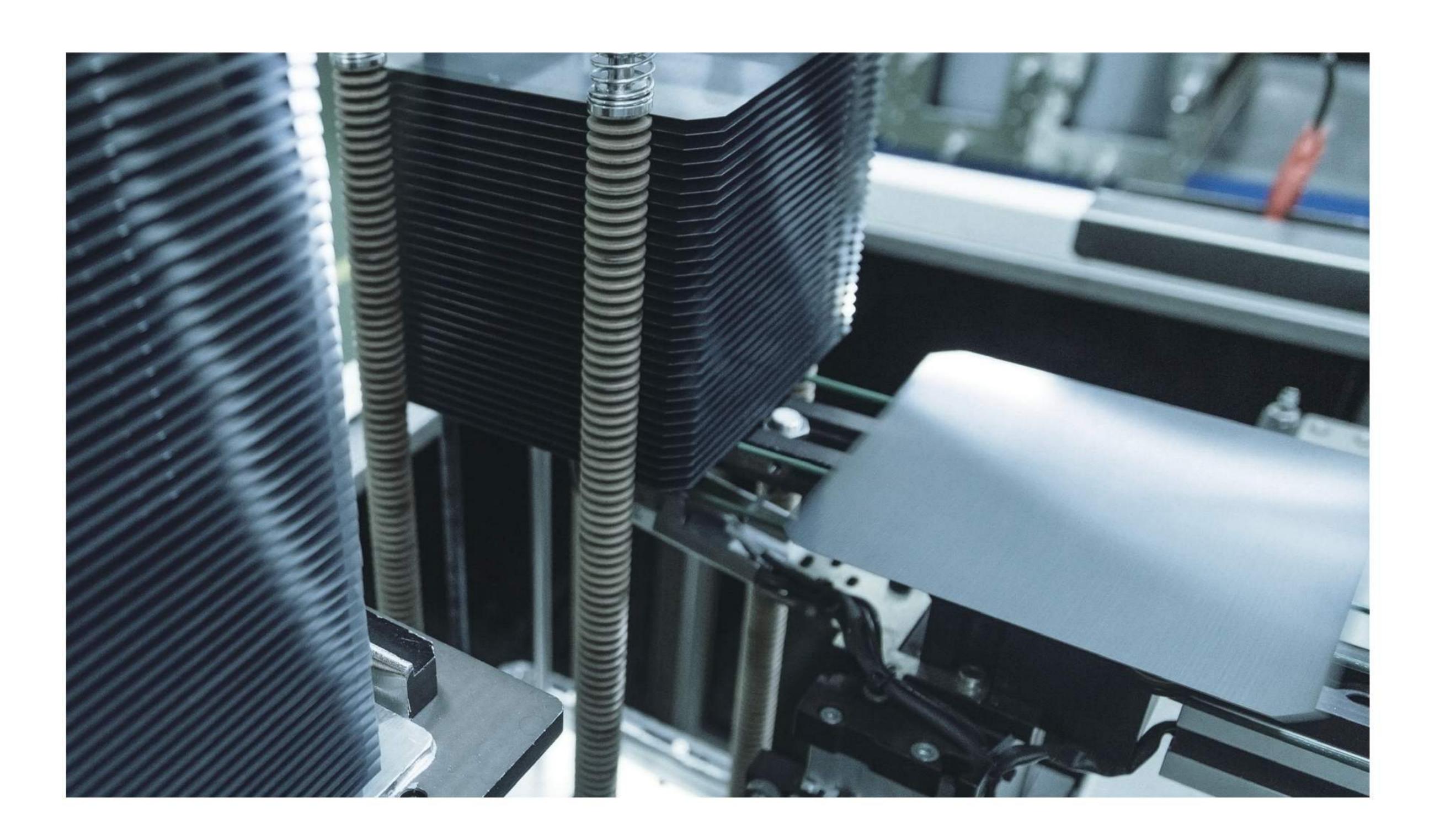


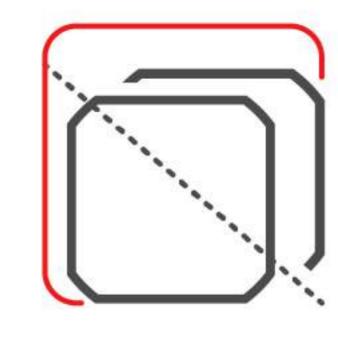
High Minority Carrier Lifetime & Low Resistivity

DIAMOND WIRE SLICING

SIGNIFICANTLY INCREASES WAFER OUTPUT PER UNIT MASS

LONGi took the lead in diamond wire slicing technology, which significantly increases wafer output per unit mass.LONGi promoted the M2 standardization of monocrystalline wafer in the industry.LONGi has launched the M6 standard wafer in 2019, which can reduce module manufacturing cost and BOS cost and bring more value for customers.





Diamond Wire Slicing



M2 Standardize Wafer



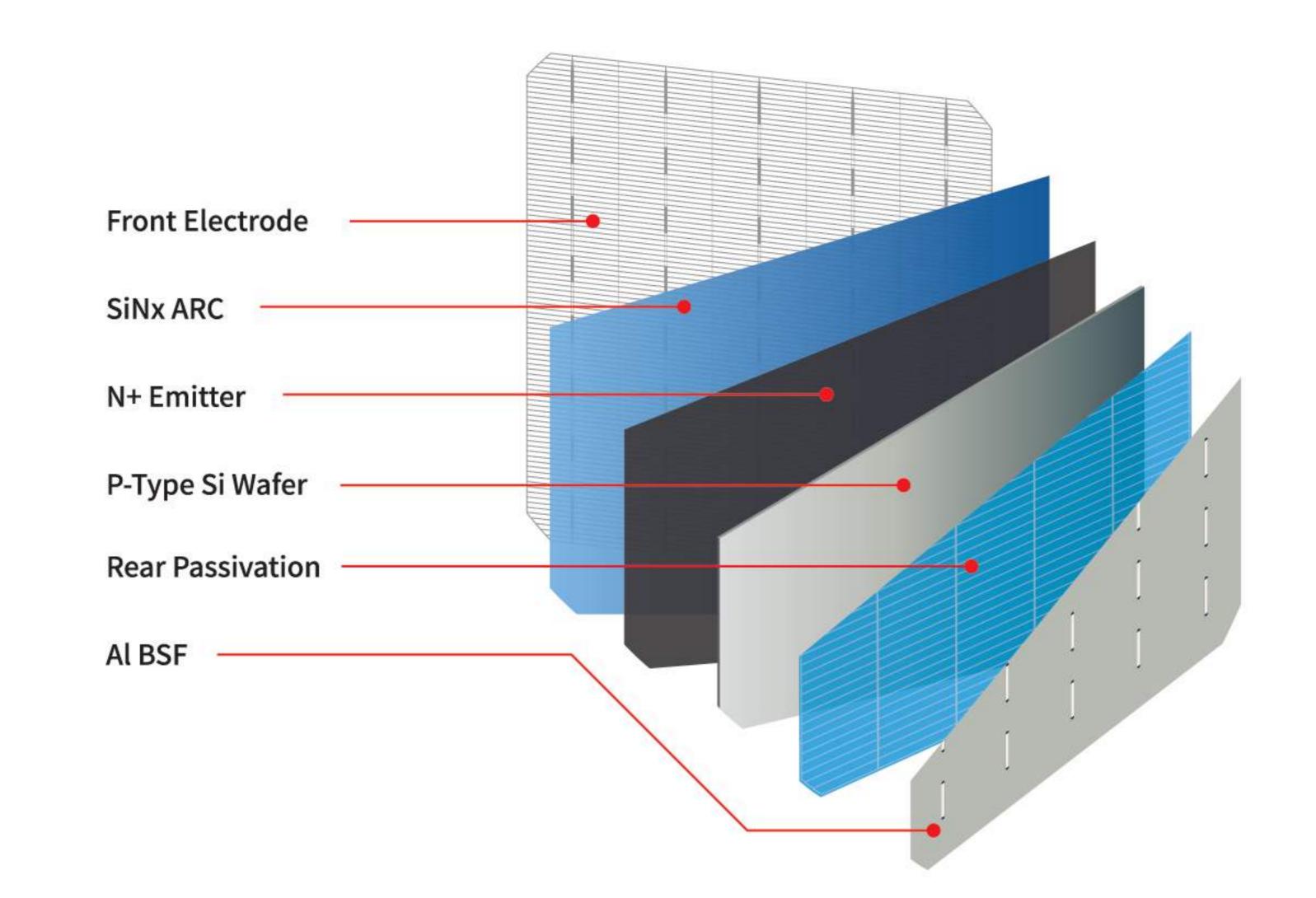
M6 Standardize Wafer

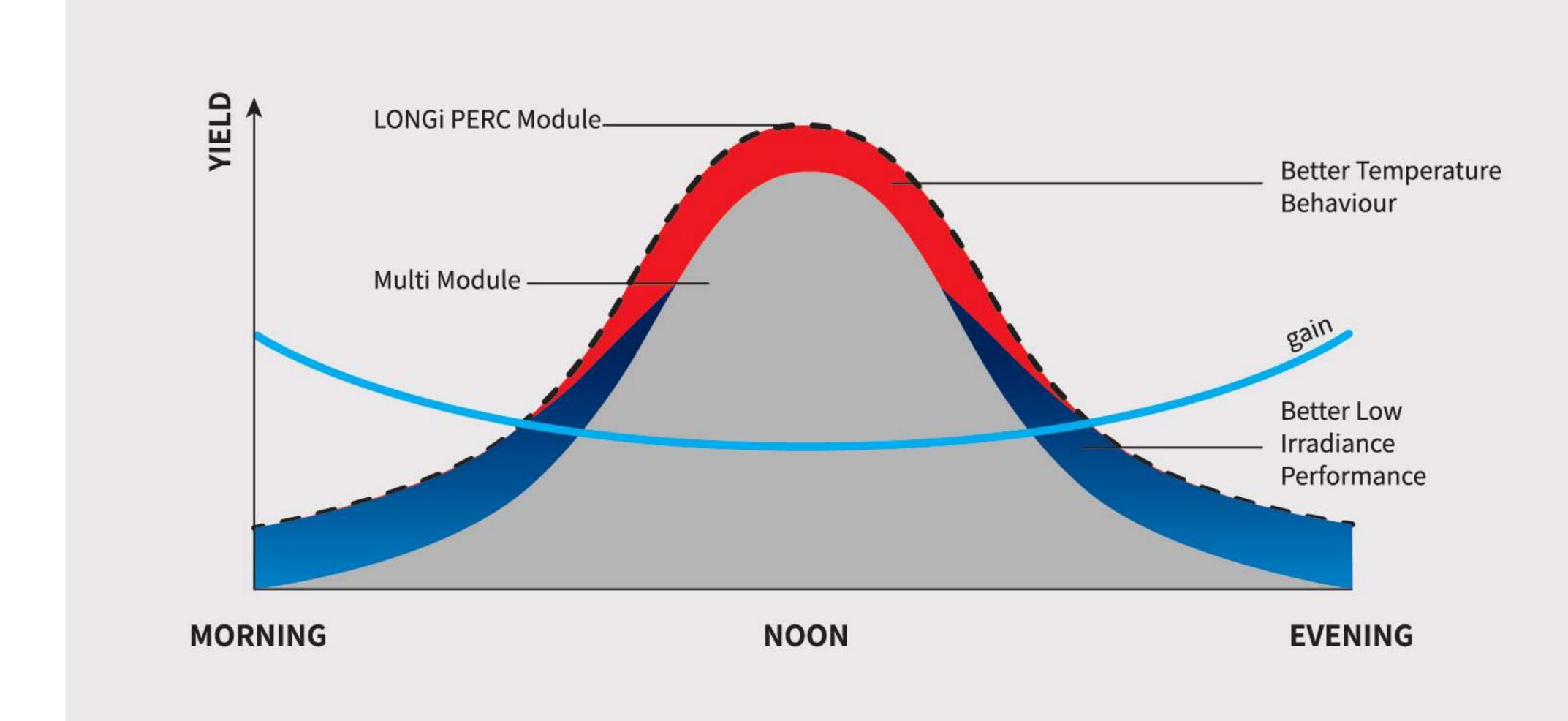
PERC TECHNOLOGY

HIGH EFFICIENCY & MORE ENERGY YIELD

The PERC cell has a passivated rear side and a laser grooving process, which significantly improves the cell efficiency.

In 2016, LONGi released the Hi-MO1 module with PERC and Anti-LID technologies. At present, the cell efficiency has been increased from 21% to over 22.5%.





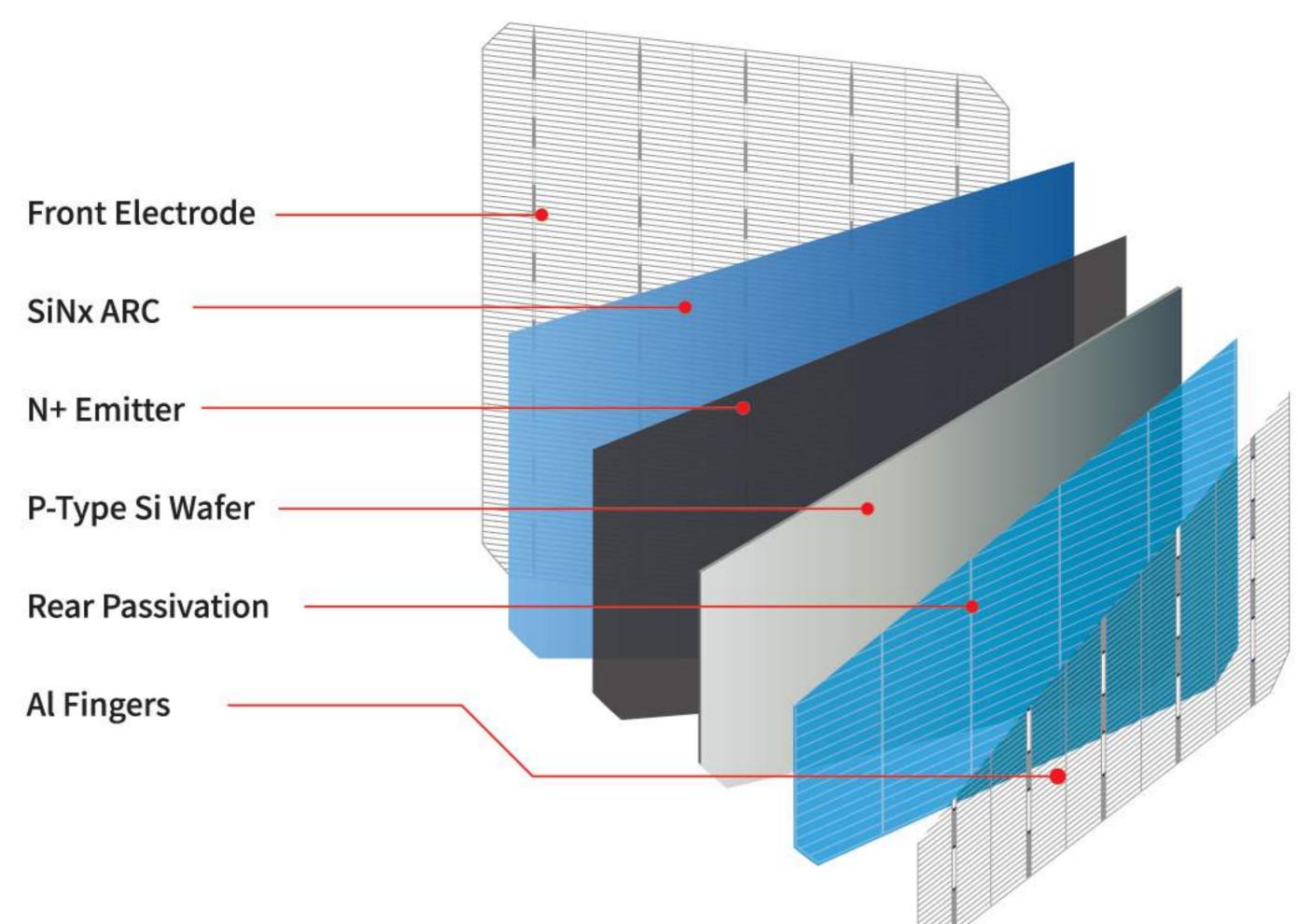
Outstanding low irradiance
performance, low power-temperature
coefficient, low operating
temperature, all these technologies
lead to a high energy yield.

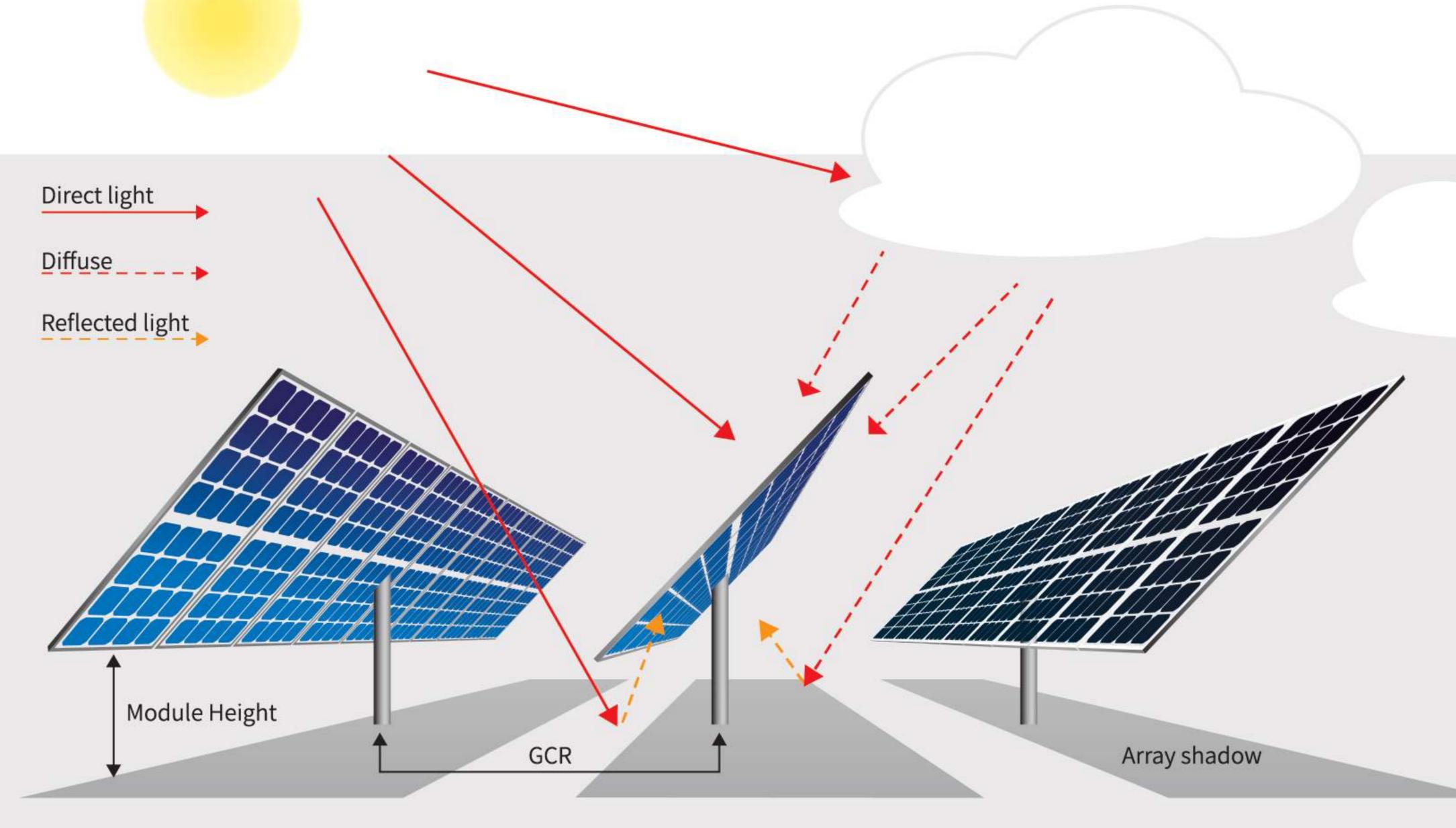
BIFACIAL PERC TECHNOLOGY

HARVEST MORE LIGHT

For a bifacial PERC cell, the Al back surface field is replaced by Al grid, hence render the majority of rear side transparent which enable the cell to absorb light and generate electricity from both sides.

In 2017 LONGi released the Hi-MO2 module with bifacial PERC and double-glass packaging. Hi-MO2 module can absorb light on rear side, thus reuduce the LCOE of power plant significantly.





The energy yield of bifacial module can be influenced by albedo, height of module, GCR and DHI etc.
Installation height of bifacial module is recommended to be higher than 1m. Shading from bracket and junction box should be avoided. At present, the power generation of bifacial module on fixed brackets and single axis tracker can be simulated with PVsyst. Investors can determine the DC / AC ratio of bifacial module system to minimize the LCOE.



1st Year Degradation, Anti-LID



Outstanding Low Irradiance Performance

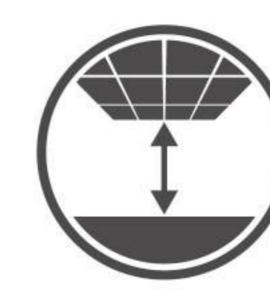


low Power Temperature Coefficient



Albedo

It has considerable gains on grass land, dry sand, especially in snowfield



Module Height

High module height will reduce the shading impact on rear side. A minimum of 1m is recommended



GCR

A low GCR will increase radiance on the rear side



DHI

Diffuse light can be absorbed by the rear side of the module. the higher proportion of Diffuse light, the higher is the bifacial gain.

HALF-CUTTECHNOLOGY

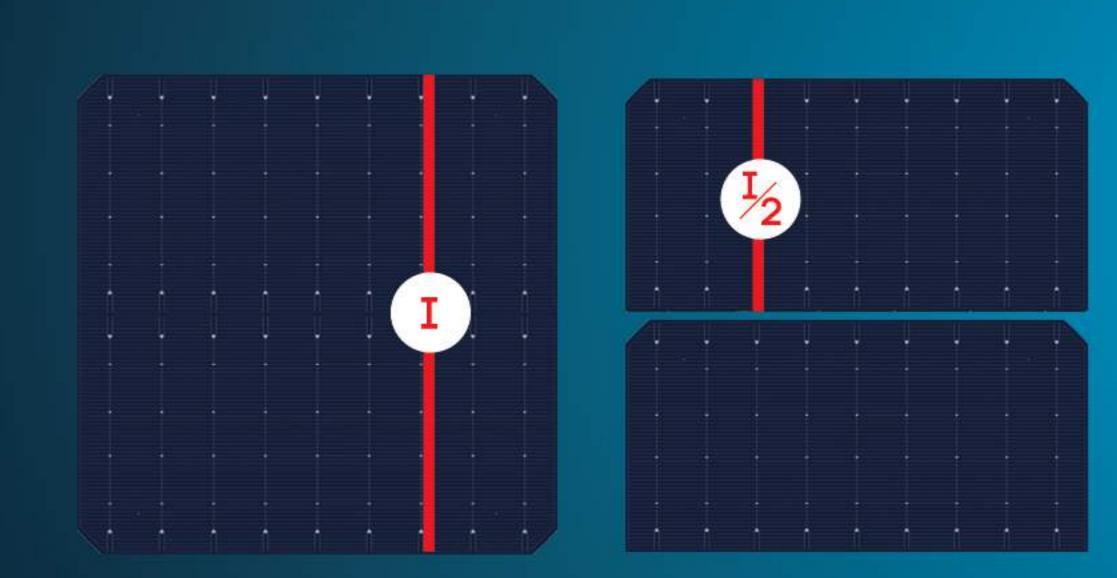
HIGHER POWER & MORE RELIABLE

Half-cut cell technology is to cut the cell into two seperate parts by mature infrared laser, hence halve the working current. The thermal loss on the ribbon will be remarkably reduced and the module's power increases by 2%. The reliability of module is also enhanced.

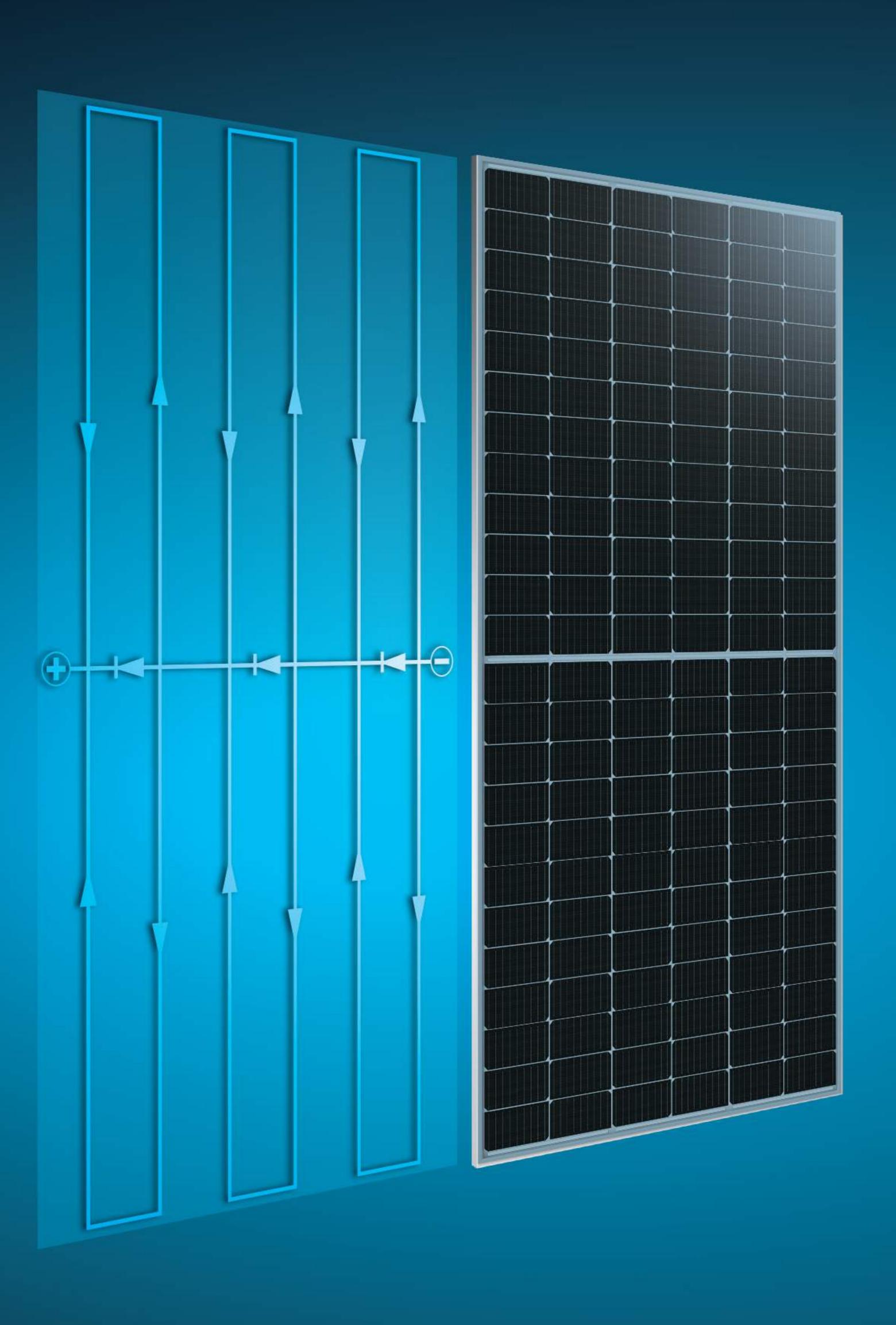
The combination of half-cut cell technology and bifacial module can amplify the gain over the effect of current-reduction.

LONGi released Hi-MO4, a bifacial half-cell module using M6 (166mm) standard wafer in May 2019.

By the end of 2019, the shipment of Hi-MO4 has reached 1.5GW, and intentional order of Hi-MO4 has excessed 10GW.



Monofacial or bifacial PERC cell module with half-cut technology has high power, the property of anti-PID、anti-LID (including LeTID)、low hot spot temperature、excellent low irradiance performance and low power temperature coefficient.



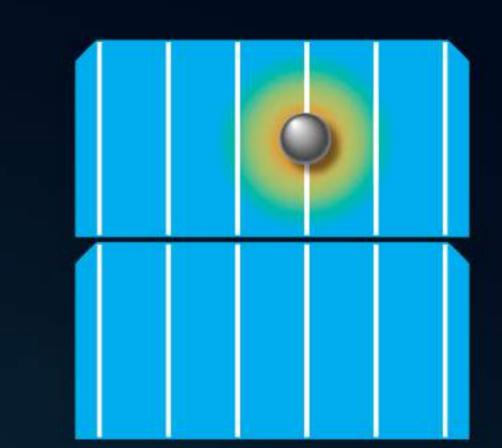
PROPERIES

A Lower Hot Spot Temperature

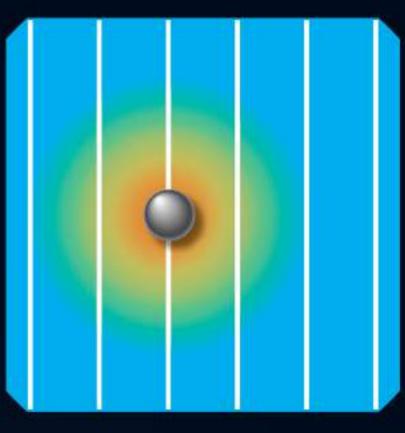
In field applications, small area shadings can cause the temperature of those parts extremely high. This phenomena is called hot spot. The long duration of hot spot could bring irreversible degradation of modules.

Because the string current of half-cell modules is half of full-cell modules, the hot spot temperature can be obviously reduced.

LONGi's experiments show that this reduction could be 10-20°C, which increases the module reliability.



Hot-spot



Half-cell Module Module Module Temperature (°C)

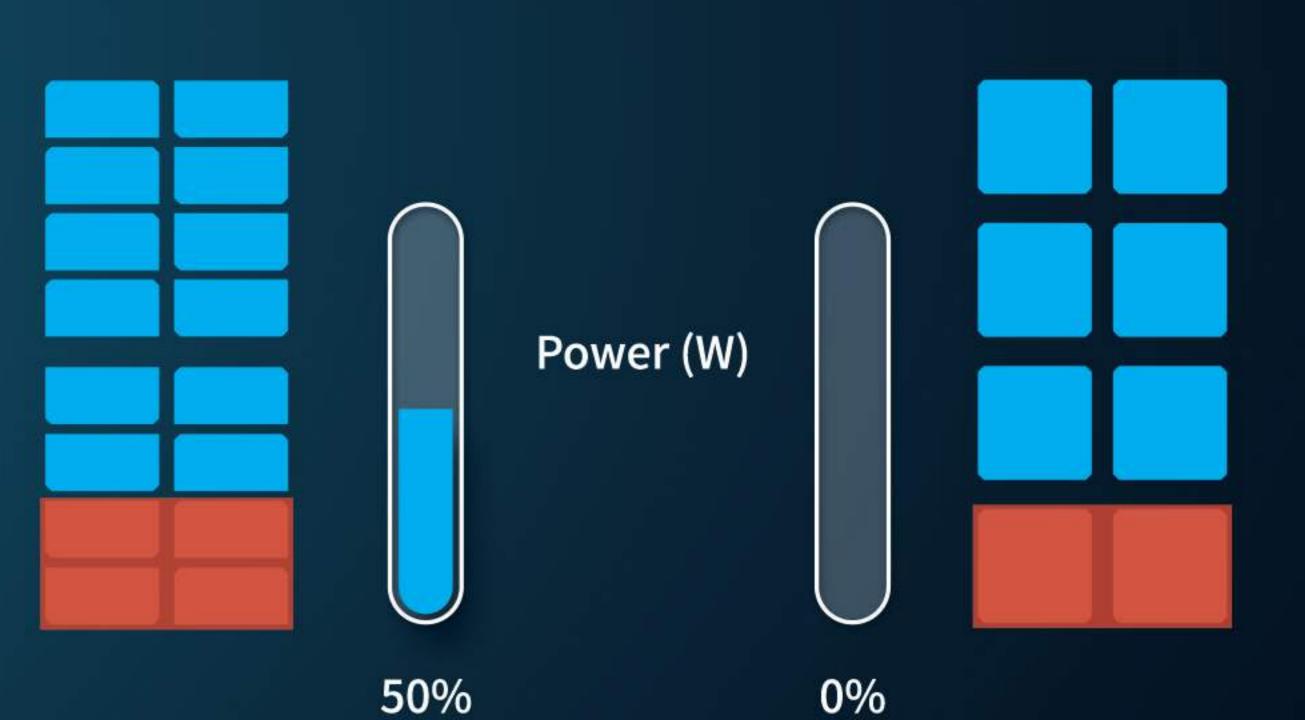
B Lower Operating Temperature

Half-cut cells have half of the working current, thereby the thermal loss is remarkably reduced. Operating temperature correspondingly decreases, and the reliability of module is improved as well as power gain.

C Lower Shading Loss

Because of the unique parallel connection design, half-cell modules still have 50% power output under the circumstance of array shading in sunrise or sunset when portrait installation.

In addition, half-cut technology can improve the output of bifacial module under non-uniform incident illumination on the backside.



Power Gain

D Higher Energy Yield Under High Irradiation Condition

Under high irradiation conditions, half-cell module, especially bifacial half-cell module, will have a higher energy yield compared with conventional module. Bifacial half-cell module will help to achieve the lowest LCOE in regions which is rich in sun radiation resources.

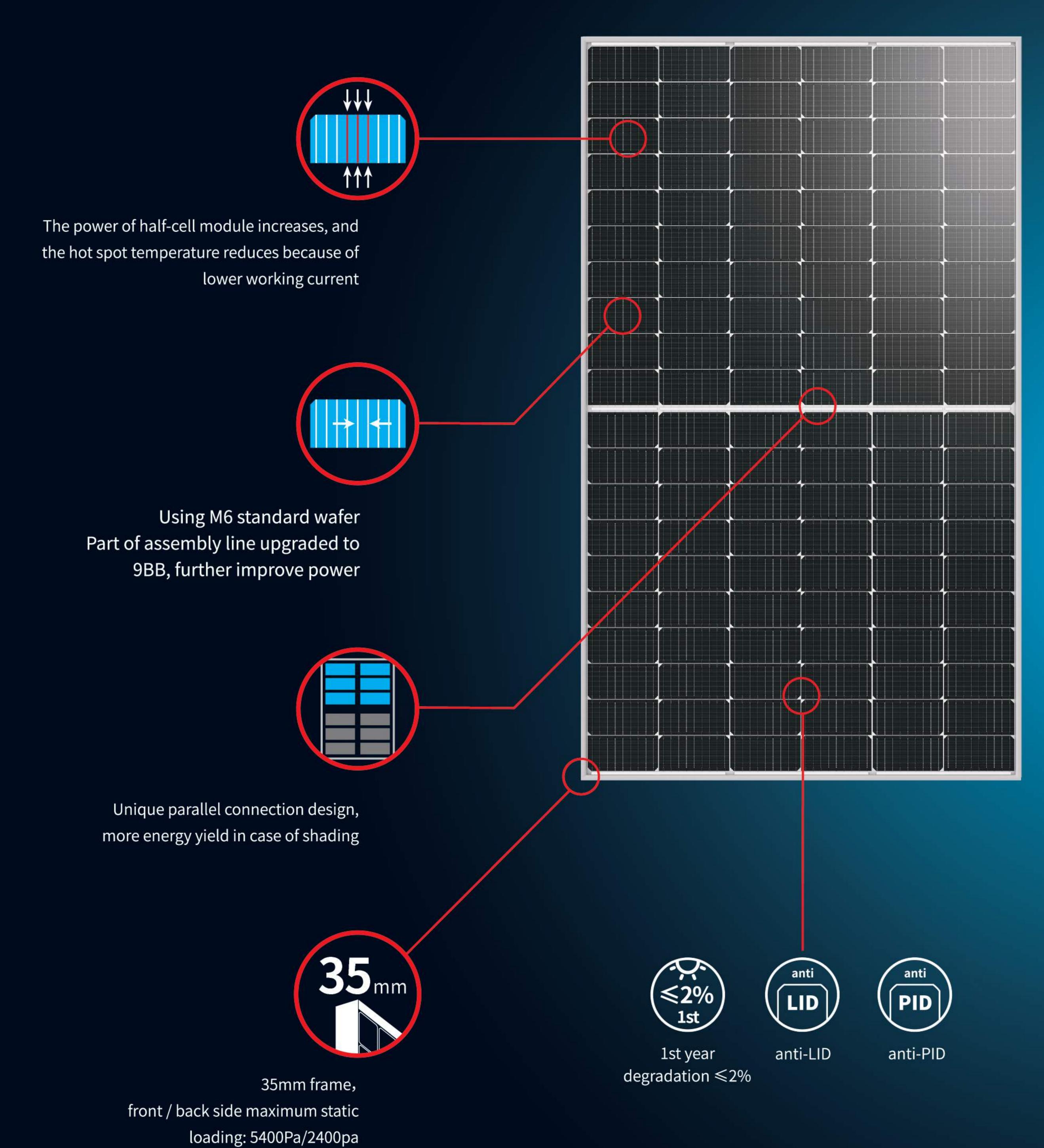
Hi-MO4m

HALF-CELL MODULE





Suitable for Residential and Commercial Installation





ELECTRICAL CHARACTERISTICS AT STC

Hi-MO4m			LR4-60HP		
Pmp (W)	365	370	375		
Voc (V)	40.7	40.9	41.1		
Imp (A)	10.68	10.76	10.84		
Eff (%)	20.0	20.3	20.6		
Size / Weight	1755>	1755×1038×35mm / 19.5kg			
Cell Arrangeme	nt	10×6×2			

Technical	data above m	entioned may b	e of modificati	on, please reque	est for the latest	datasheet.

Hi-MO4m			LR4-72HPH		
Pmp (W)	440	445	450		
Voc (V)	48.9	49.1	49.3		
Imp (A)	10.71	10.78	10.85		
Eff (%)	20.2	20.5	20.7		
Size / Weight	2094×1038×35mm / 23.5kg				
Cell Arrangement		12×6×2			

Technical data above mentioned may be of modification, please request for the latest datasheet.

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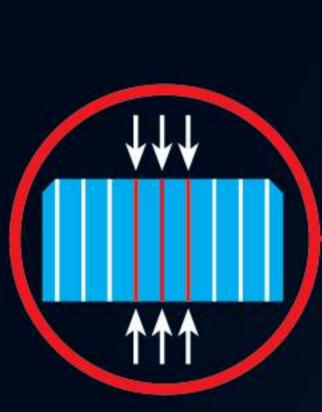
Hi-MO4

BIFACIAL HALF-CELL MODULE





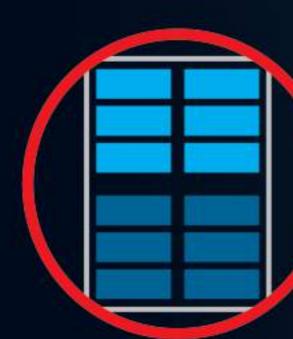
Suitable for Utility Station and Distributed Flat Roof Station with High Albedo



The power output of bifacial half-cell module increases and energy yield is higher under high irradiance condition because of Low working current



Using M6 standard wafer Part of assembly line upgraded to 9BB, further improve power



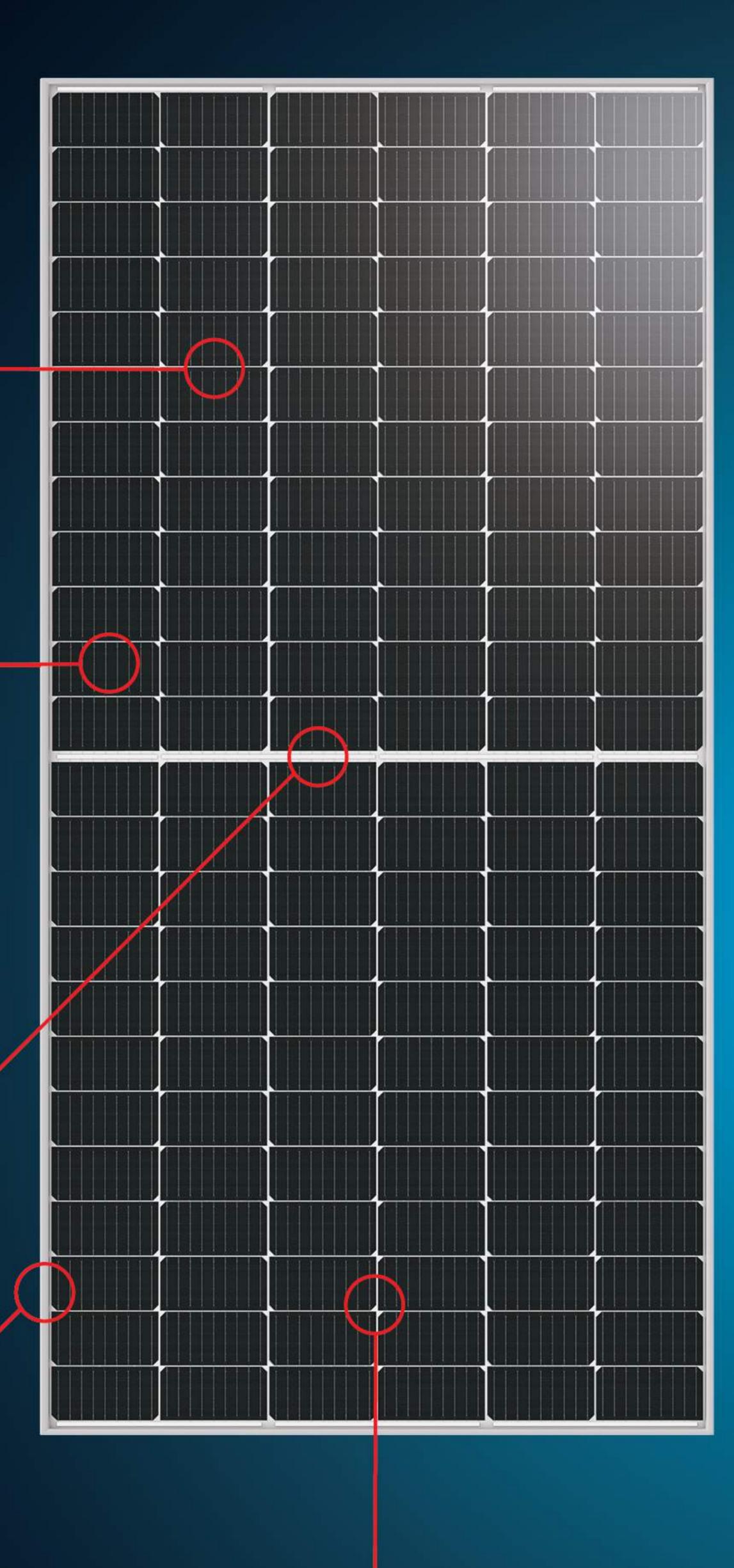
Unique parallel connection design, more energy output under non-uniform

Incident illumination on the backside



Framed module, front / back side maximum static loading 5400 / 2400Pa, suitable for tracker

Cost can be reduced using 60 cells frameless module in low load condition









1st year anti-LID degradation ≤2%

anti-PID

Design of short frame without C side can reduce the shading caused by Split junction box, Cable Length 300mm (can be Customized) Mounting holes with 400mm 400mm Tracker distance are added to match the horizontal single axis tracker Glass and junction box supporting 1500V 1500V system Reliable encapsulation using 2+2mm glass

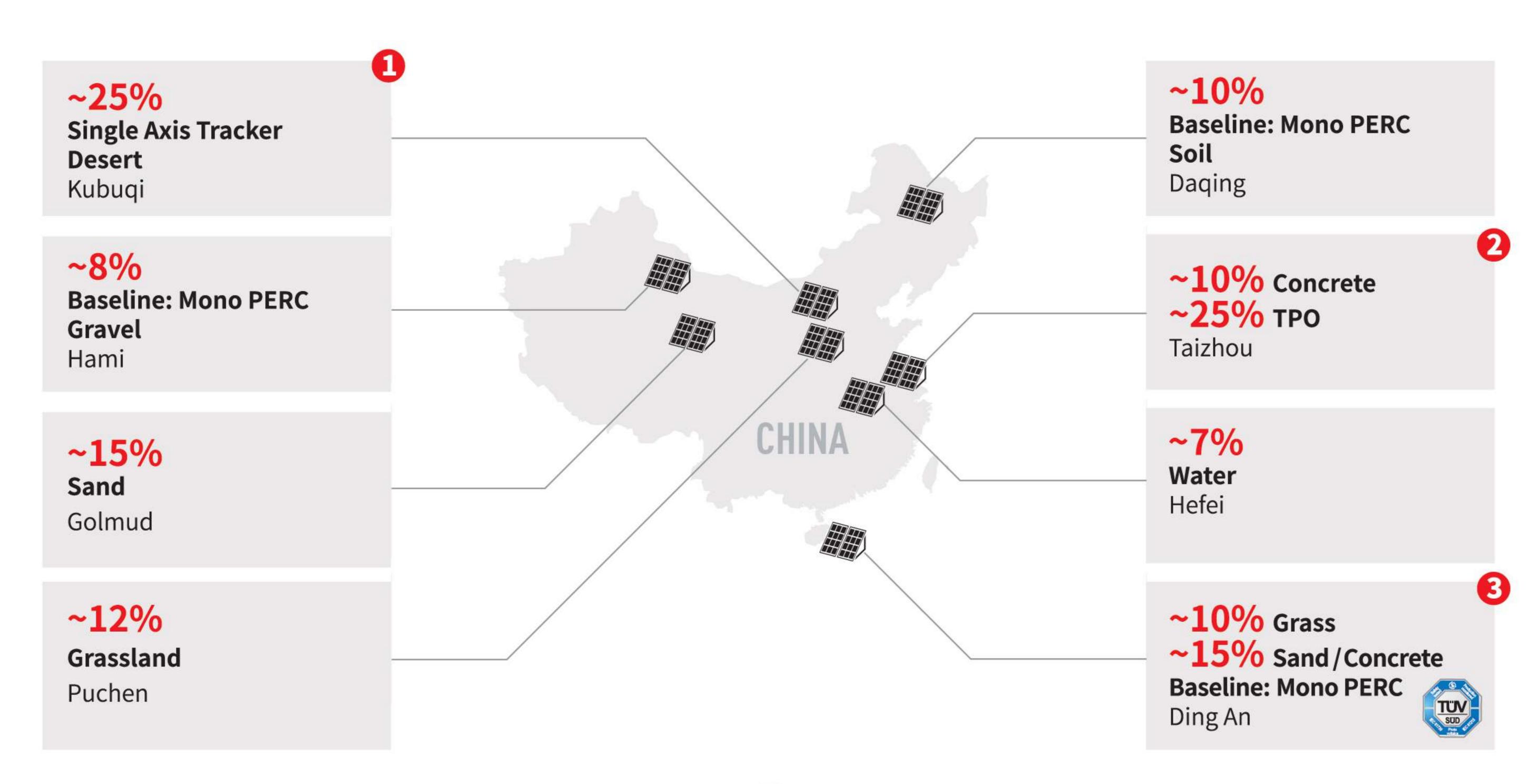
ELECTRICAL CHARACTERISTICS AT STC

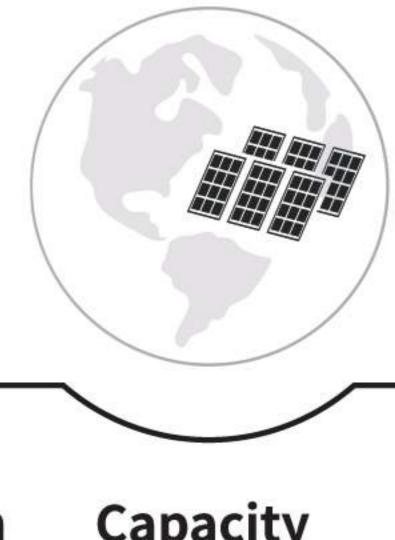
Hi-MO4			LR4-72HBD
Pmp (W)	440	445	450
Voc (V)	49.2	49.4	49.6
Imp (A)	10.73	10.80	10.87
Eff (%)	20.2	20.5	20.7
Size / Weight		2094×1038×35mm / 27.5kg	
Cell Arrangeme	nt	12×6×2	

Technical data above mentioned may be of modification, please request for the latest datasheet.

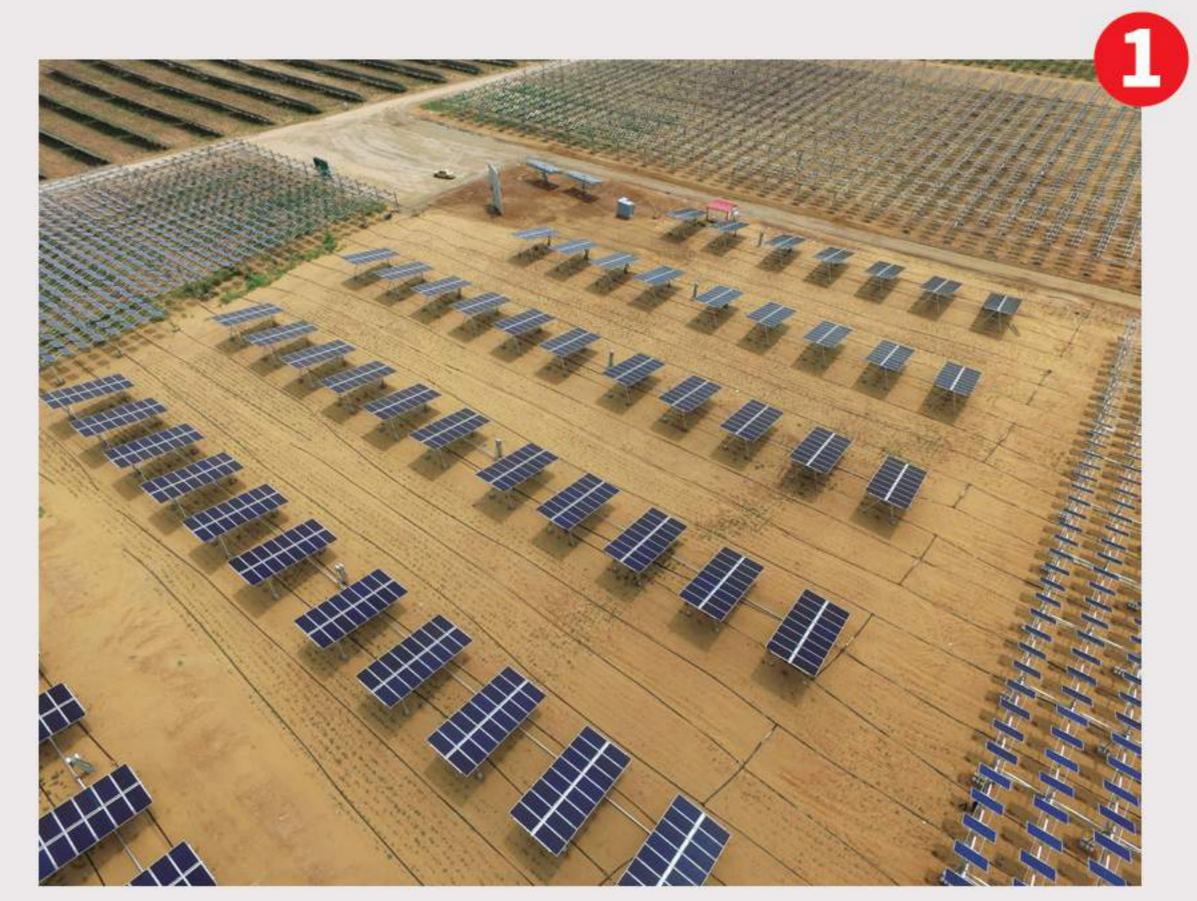
BIFACIAL CASE STUDY

BIFACIAL GAINS IN VARIOUS PLACES AND ENVIRONMENTS





Project location		Ground	Gain	Capacity	Baseline	Mounting	Statistical Period
Chennai, India 🕢	TÜVRheinland Precisely Right.	White Gravel	19.2%	600Wp	Mono PERC	Fixed	2018.09~2019.02
Thuwal, Saudi Arabia	TÜVRheinland Precisely Right.	Sand	10.0%	600Wp	Mono PERC	Fixed	2018.09~2019.02
Fremont, USA	RETC California	Light Asphalt	10.6%	1.8kWp	Mono PERC	Fixed	2019.05~2019.06
Livermore, USA	RETC California	Gravel	8.3%	2.1kWp	Mono PERC	Single axis tracker	2018.09~2018.10
Pahrump, USA	RETC California	Gravel	10.9%	2.8kWp	Mono PERC	Fixed	2018.10~2019.07



KUBUQI, ORDOS, INNER MONGOLIA, CHINA

Bifacial Module Type: 350Wp*960

Baseline: Poly module 310Wp, 80MWp

Installation: Bifacial module on tracker with 12 degree,

Poly module on fixed bracket

Completion Date: May.2017

Ground Condition: Desert

Module Height: The center height of oblique uniaxle is 2.9m

Energy Yeild: ~25%



TAIZHOU, JIANGSU, CHINA

Bifacial Module Type: 350Wp*8
Baseline: Poly module 270Wp*10
Installation: Fixed Bracket
Completion Date: Aug. 2017

Ground Condition: Concrete / TPO

Module Height: 1m / 2m Energy Yeild: ~10 / 25%



DINGAN COUNTY, HAINAN PROVINCE, CHINA

Bifacial Module: 300Wp*10

Baseline: Mono PERC 300Wp*9

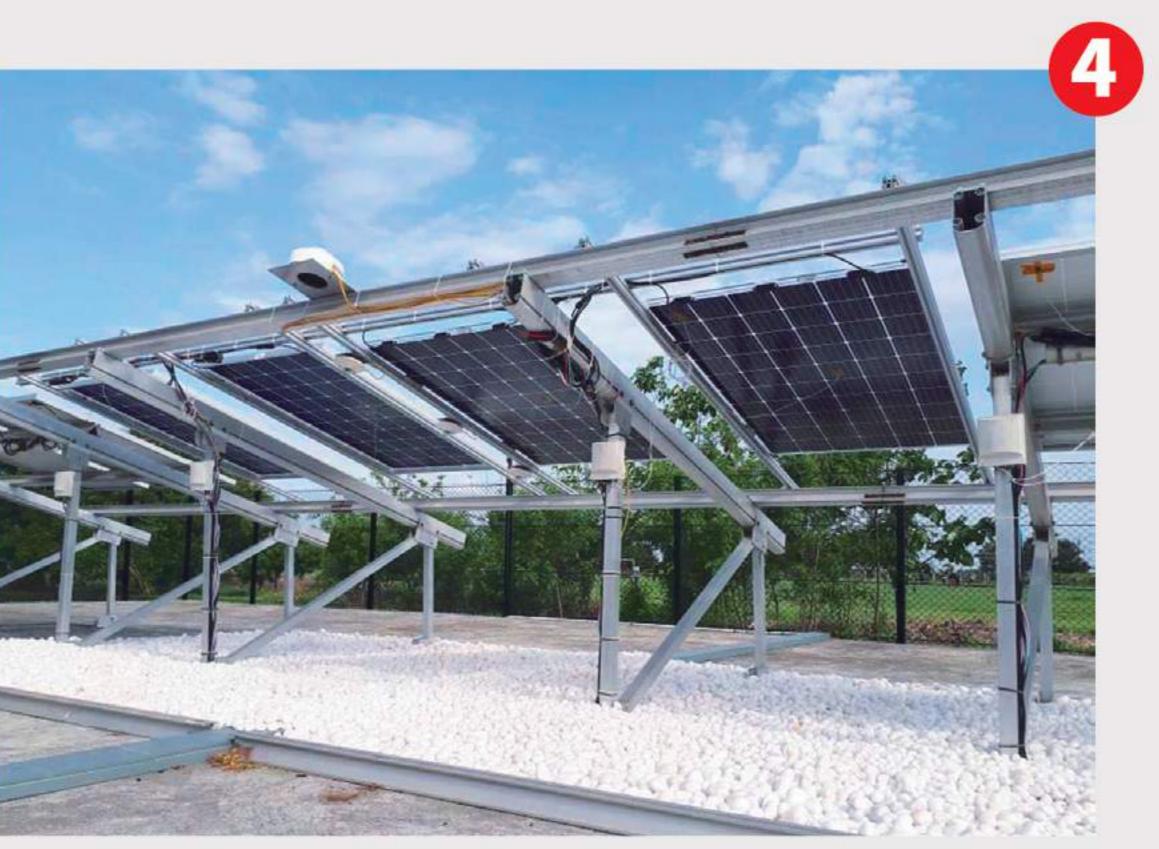
Installation: Fixed Bracket

Completion Date: Sep. 2018

Ground Condition: Grass / Concrete / Sand

Module Height: 1.5m

Energy Yeild: ~10% / ~15% / ~15%



CHENNAI, INDIA

Bifacial Module: 300Wp*2
Baseline: Mono PERC 310Wp*2
Installation: Fixed Bracket
Completion Date: Aug. 2018
Ground Condition: White gravel

Module Height: 1m Energy Yeild: ~19.2%

REFERENCE PROJECTS



CALIFORNIA, USA 7.5MWCompletion Date: Nov. 2017



SAN FELIPE, CHILE

3.6MW

COMPLETION DATE: JAN.2019



OOSTENDE, BELGIUM

529kW

COMPLETION DATE: JUL.2019



ANHUI, CHINA

150MW

COMPLETION DATE: MAY.2018



MAHARASHTRA, INDIA

135MW

COMPLETION DATE: JUN.2019



VICTORIA, AUSTRALIA
128MW
COMPLETION DATE: JUN. 2019



GEORGIA, USA

224MW

COMPLETION DATE: FEB.2020



HUNAN, CHINA

122MW

COMPLETION DATE: DEC.2019