



**LONGi**

# Company and Product Introduction

## **LONGi HiMO4 Modules for Commercial Systems**

**April 29<sup>th</sup>, 2020**

Midsummer Mornings... your roadshow at home

- 5 mornings of webinar content
- More than 16 industry speakers
- Commercial New Build Domestic EV Off-Grid

[en.longigroup.com](http://en.longigroup.com)

# Agenda

## CONTENTS

- 1** Introduction
- 2 Product Portfolio
- 3** Upgraded HiMO4 / Innovations
- 4 Summary & Conclusions

## About LONGi

The world's leading solar technology company

LONGi leads the solar PV industry to new levels by **product innovations** and **optimized power-cost ratio** based on breakthrough monocrystalline technologies. LONGi supplied more than **30GW** of high-efficiency solar wafers and modules worldwide last year, 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**.



Y2000  
Established



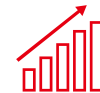
30.000+  
Employees



\$186 Million  
R&D Investment  
(5.60% of revenue, Y2018)



\$3.3 Billion  
Revenue  
(Y2018)



\$386.5 Million  
Net Profit  
(Y2018)



MIT Science and Technology Review  
50 Smart Companies



Forbes  
Asia's 200 Best Over A Billion 2019



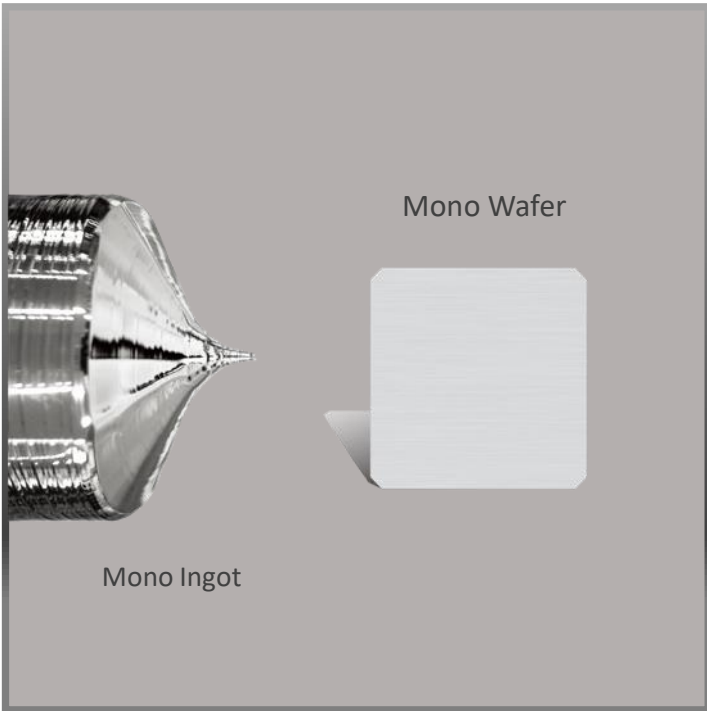
Fortune Magazine  
China's Top 500



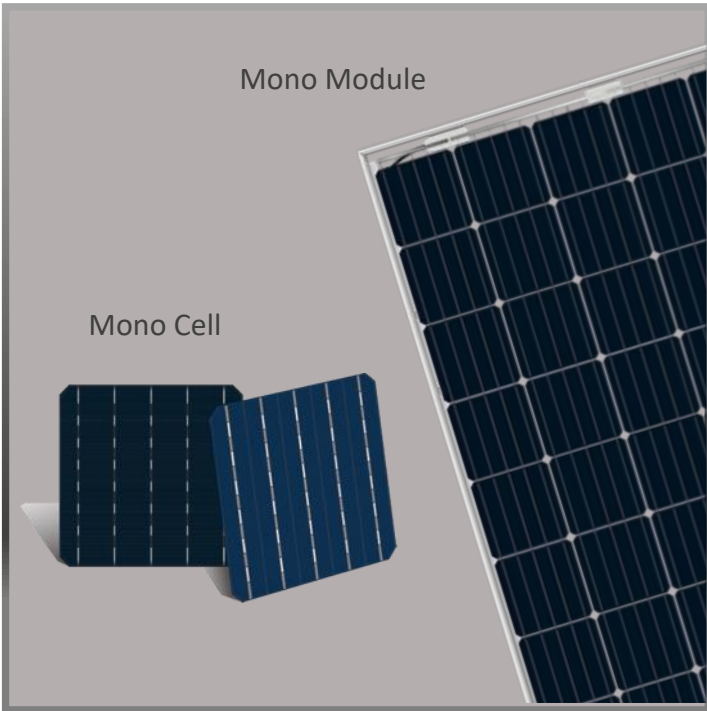
Goldman Sachs  
New China NIFTY 50  
(\*The Only New Energy Enterprise on the list)

# Introduction

LONGI Solar is known for developing and focusing on most cost efficient PV solutions  
LONGI's C-Si mono integrated industry chain includes ingot to wafers and cells to modules as well as power plants (China)



**LONGI** Silicon



**LONGI** Solar



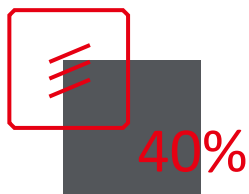
**LONGI** Energy

# Introduction

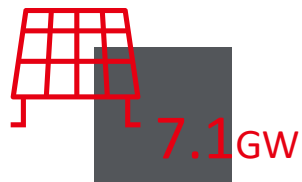
## Leadership

World's leading capacity of monocrystalline solar products

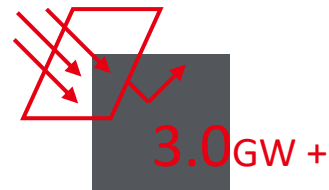
LONGi holds world record for **P-Type monocrystalline** cell and module efficiency and is the world largest by monocrystalline silicon wafers, monocrystalline modules and bifacial modules deliveries same time the world's healthiest solar company in financial strength, according to the latest BloombergNEF report. LONGi demonstrates its leadership in the PV industry in energy transformation. LONGi's products contributed **15% of new energy installations** in the world each year, and is the **world's largest supplier of power generation equipment in the PV sector.**



Total capacity of monocrystalline silicon wafers, ranked No. 1 worldwide in 2018



Total shipment of monocrystalline cell and modules, ranked No. 1 worldwide in 2018



Total shipment of bifacial modules, ranked No. 1 worldwide by December 2019



**BloombergNEF**

Altman-Z Score 3.60, highest of all manufacturers (Bloomberg NEF 4Q-2019 PV Outlook,)



**Photon**  
CONSULTING

No. 1 in Financial Health Index for successive quarters



**PVTECH**

AA Rating in the new PV ModuleTech Bankability (AA is currently the highest rating)

## Leadership

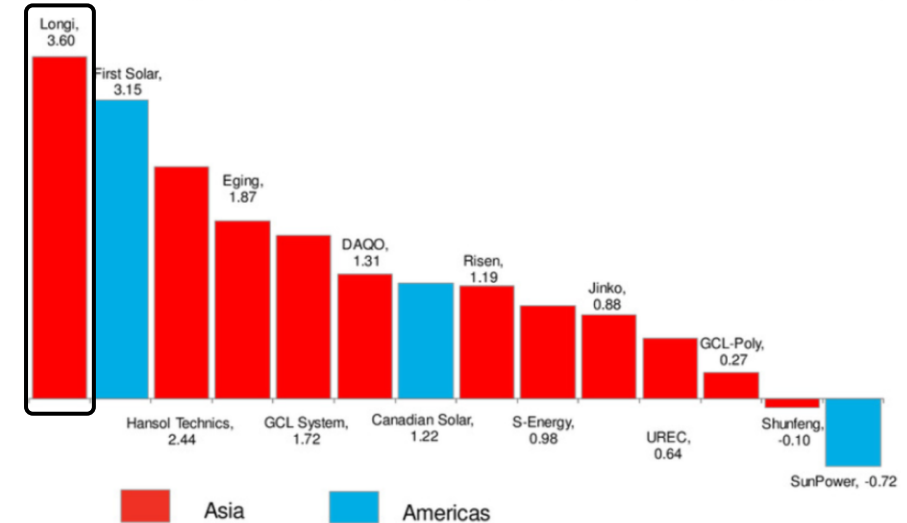
Industry leading financial health

Adhering to the philosophy of **stable operation** and **sustainable development**, LONGi has maintained a low asset-liability ratio through the years. The strong return on asset, **good profitability and proven bankability** has been validated and recognized by industry authorities.

Table 3: BloombergNEF Tier 1 module maker list as of 4Q 2019

Firm/ brand	Annual module capacity, MW/year	Firm/ brand	Annual module capacity, MW/year
Jinko*	16,000	SunPower/ Maxeon*	2,400
<b>Longi*</b>	<b>15,000</b>	Sumec/ Phono Solar	2,000
Hanwha Q-Cells*	10,700	Jinneng/ Jinery	2,000
JA Solar*	10,500	Waaree	2,000
Canadian Solar	9,400	REC Group*	1,800
Risen Energy	9,100	HT-SAAE*	1,500
Trina Solar*	8,000	Adani/Mundra*	1,500
GCL Systems*	7,200	Vietnam Sunergy (VSUN Solar)	1,500
First Solar*	6,200	Vikram Solar*	1,100
Talesun	5,800	Jolywood	1,100
Seraphim*	5,000	Hengdian DMEGC	1,000
Chint/Astronergy*	4,200	Boviet*	1,000
Wuxi Suntech*	3,900	S-Energy	530
Renesola	3,650	Recom	500
ZNSHine*	3,500	Hansol Technics	480
Akcome	2,600	Shinsung	300
Eging	2,600	Hyundai	600
LG Electronics*	2,500	Sharp	210
BYD	2,400	Win Win/ Winalco	200
		<b>Total</b>	<b>149,970</b>

Figure 14: Altman-Z scores of selected quoted solar manufacturers, 2Q or 3Q 2019

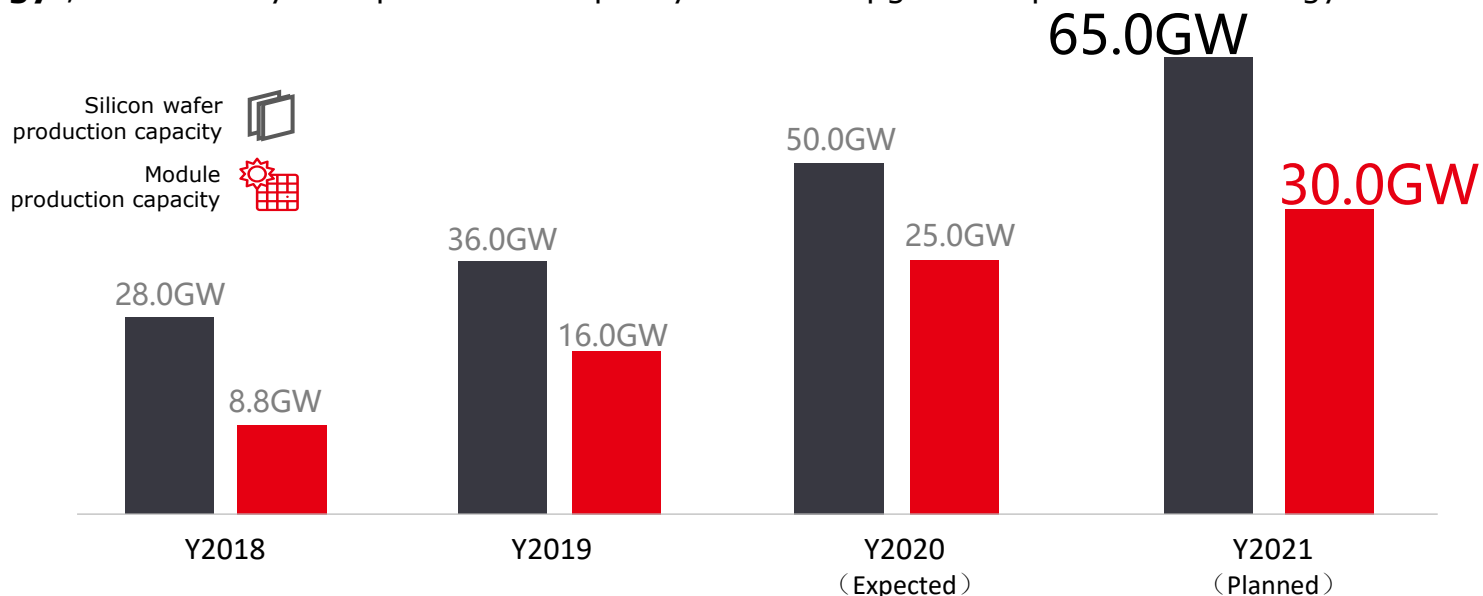


Source: BloombergNEF

## The Future of LONGi

### Expansion to meet the needs of energy transition

Solar power became largest new source of electricity installed each year, grid parity is achieved in most regions. **The trend is accelerating.** As the pace of transition from fossil fuels to electricity increases, the world's demand for electric energy is also undergoing a new round of transformation. In order to meet this strong, continuous demand, LONGi has made **an ambitious capacity expansion plan**, adhering to the business philosophy of "**leading, expanding production with advanced technology**", where every new production capacity is a new upgrade of product technology.



*\*According to the current projection, the production capacity of silicon wafers will be reached one year ahead of schedule, achieving 65GW by the end of 2020.*

# Introduction

## Innovations

Continuous technology innovations on open platforms

LONGi's innovations are not just limited to technology. The company targets to **integrate innovations and create an open, collaborative platform**. This is essentially a new way to connect with industrial partners, universities, research institutes, PV start-ups, as well as customers and colleagues. In a **ecosystem**, all elements come together in active collaboration and interaction that enables us to design **innovative solutions** to drive **the solar-led energy transformation**.



Industrial Partner



Research Partners





## Global Footprint

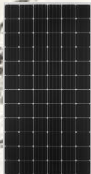
Regional support for local markets

Customer satisfaction is one of LONGi's core values. LONGi has photovoltaic manufacturing bases for **global scale in production** and a **worldwide marketing network** that provide customers with **localized services and support**, such as technical consultancy, project support, design approvals, local cooperations, distribution partners, and logistics services.



# Product Portfolio

Hi-MO 1



2016.5 released  
PERC technology & Lower  
degradation technology



**M1,M2 wafer Spec leading  
industry direction**

Hi-MO 2

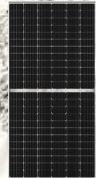


2017.4 released  
Bifacial PERC technology,  
glass-glass encapsulation



**Bifacial PERC  
leading direction**

Hi-MO 3



2018.5 released  
Monofacial and bifacial PERC with  
half-cut technology increase module  
power and reliability

Hi-MO 4



2019.5 released  
Introduced M6 wafer to  
highly increase the module  
power



**M6 wafer leading  
industry direction**

# Product Portfolio



## Hi-MO 1

1

60 Cells

300-325 Wp

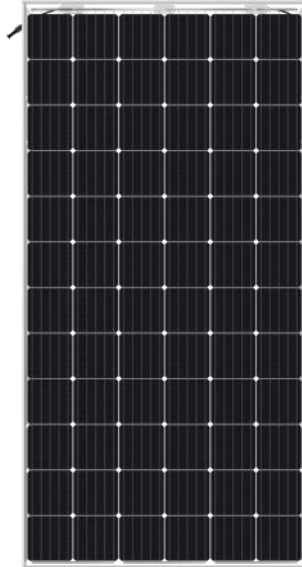
72 Cells

360-385 Wp

Phase Out 2019

Cell

Full-Cell M2  
Monofacial



## Hi-MO 2

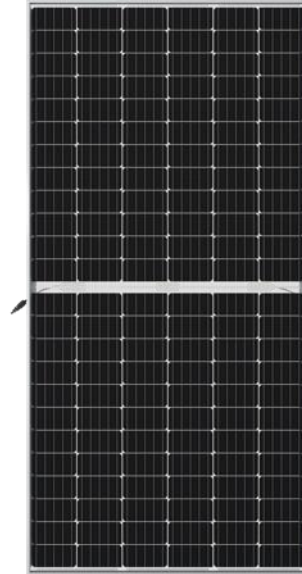
2

295-320 Wp

355-380 Wp

Phase Out 2019

Full-Cell M2  
Bifacial



## Hi-MO 3

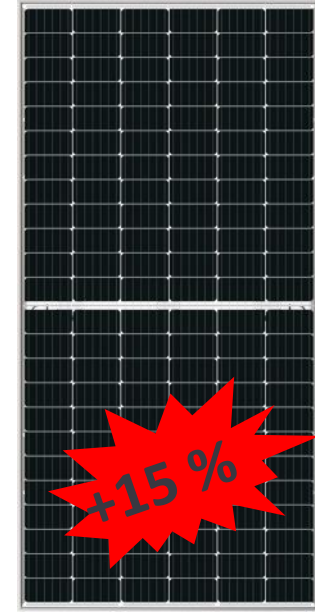
3

305-330 Wp

365-390 Wp

Actual Product

M2 Half-Cut  
Mono-/Bifacial



## Hi-MO 4

4

**350-370 Wp**

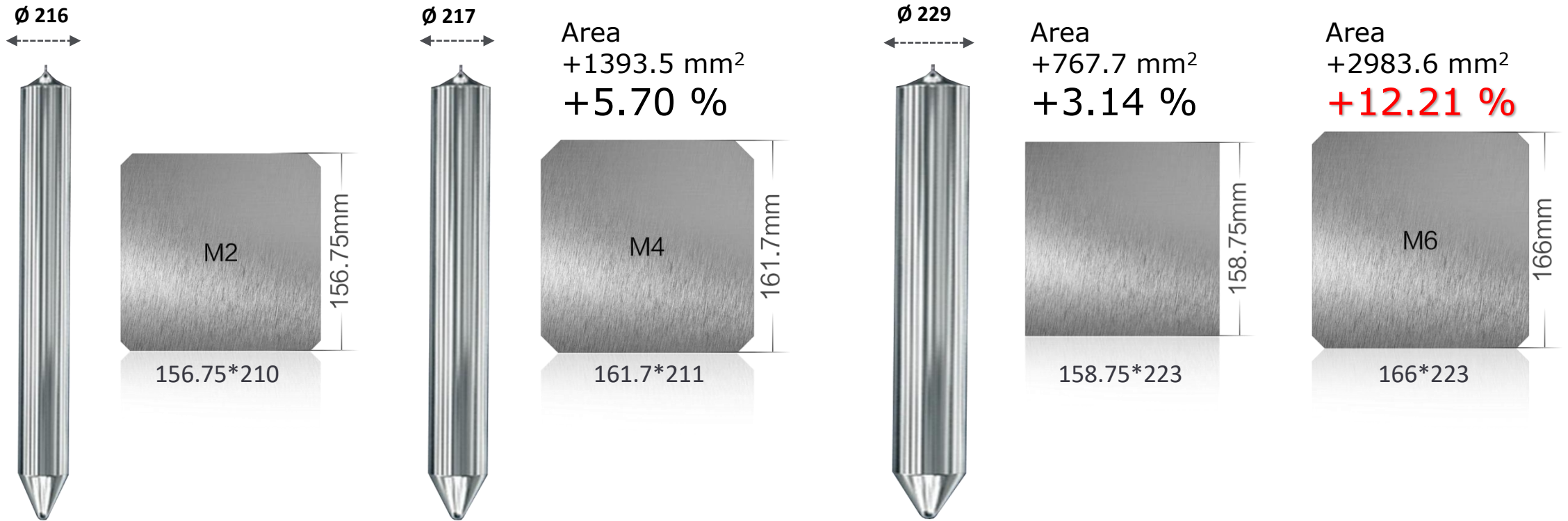
**420-455 Wp**

**As from Q3 2019**

**M6-Half-Cut  
Mono-/Bifacial**

# M6 Wafer compared to previous Versions

+12,21% surface area with only 5.9% width increase



# M6 Wafer compared to previous Versions

+12,21% more power of module and cell using M6 wafer format

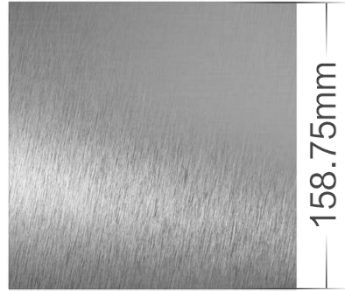
**392W**

Reference



**404.3W**

+3.14%



**414.3W**

+5.70%



**440.0W**

+12.21%



- Using M6 Wafer and Mono PERC cell PV Module >440W per module can be achieved
- Module Efficiency of 440W Bifacial ~20.0%.
- LONGi Product Range (M2 based) HiMO3 and (M6 based) HiMO4

## Hi-MO 3 Family (M2 Wafers)



**Bifacial**

**Monofacial**

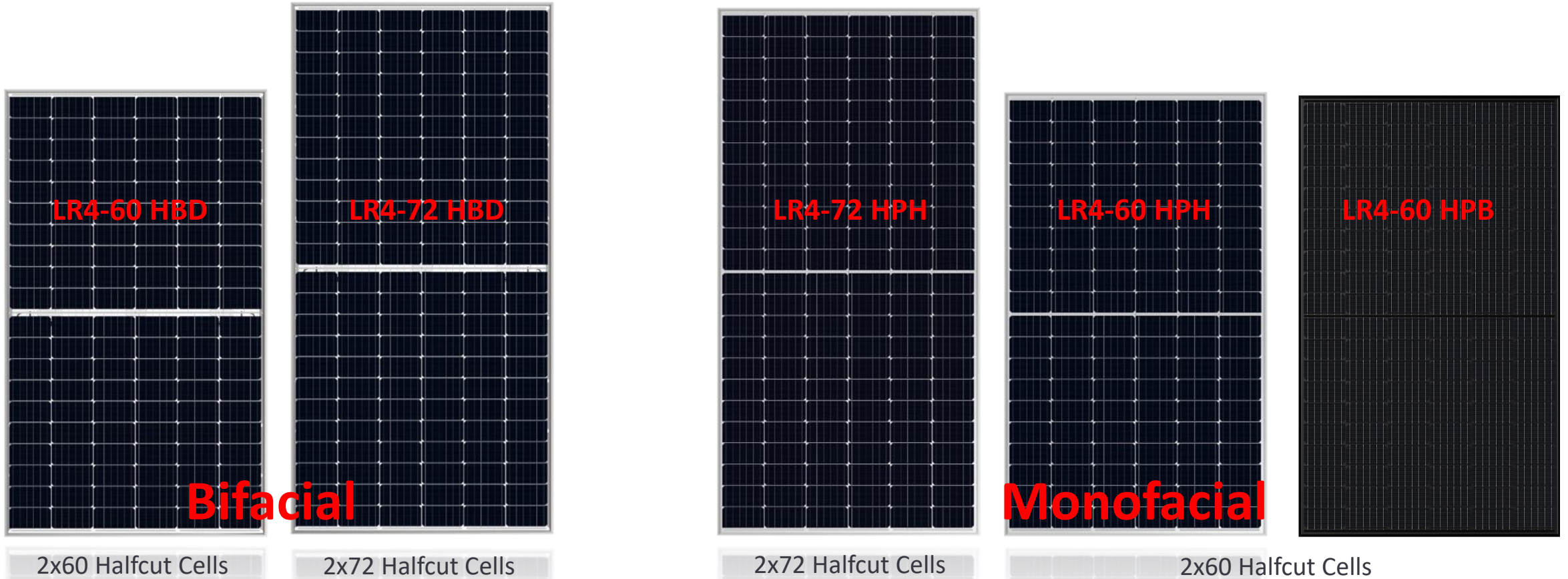
2x60 Halfcut Cells

2x72 Halfcut Cells

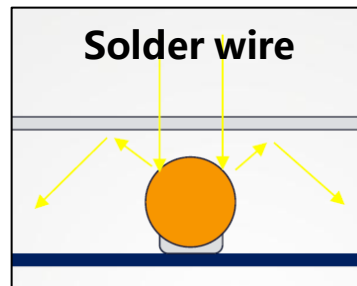
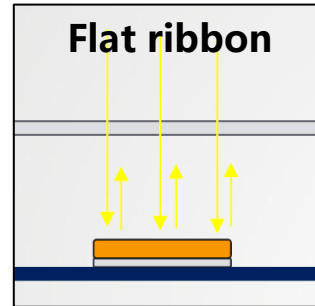
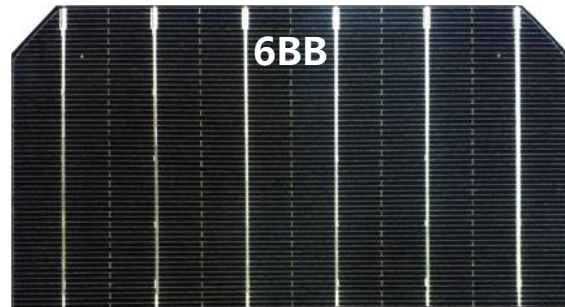
2x72 Halfcut Cells

2x60 Halfcut Cells

# Hi-MO 4 Family (M6 Wafers)



# Upgraded Hi-MO4 (2<sup>nd</sup> Generation)



- 9BB further improves module performance
- Higher current transmission, lower serial resistance
- Further improved weak light performance
- Lower influence of cell micro crack on the module
- 3S2P design with half cells reduces temperature coefficient of module
- Low operation temperature (2-3°C lower compared to standard module)
- Higher yield in high temperature environment (lower TC)
- Reduced hot spot impact (10-20°C lower temperature)



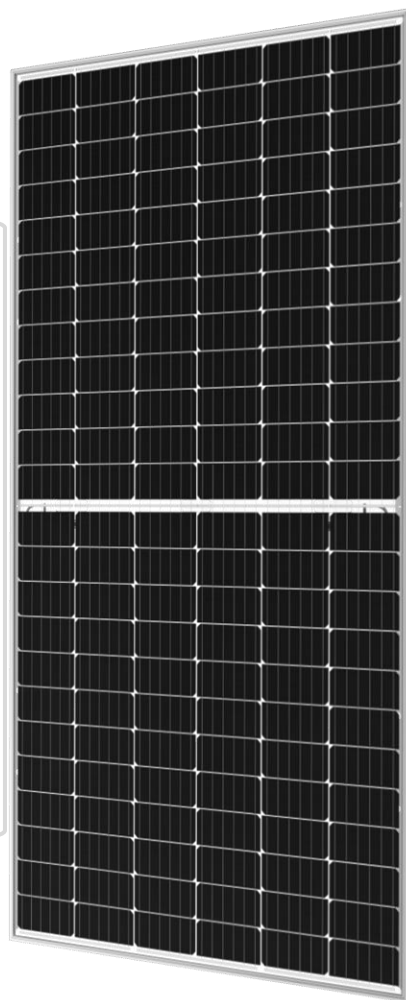
# Upgraded Hi-MO4 (2<sup>nd</sup> Generation)

## 1 Compatible for production

- M6 fully compatible with silicon ingot and wafer manufacturing process
- Only simple modifications for cell production needed
- Fixture tools and assembly line adopted for larger module production

## 2 High power & efficiency

- Choosing M6 wafer, 72 cell module power can exceed even 450W
- Hi-MO4 efficiency >20%



## 3 BOS cost saving

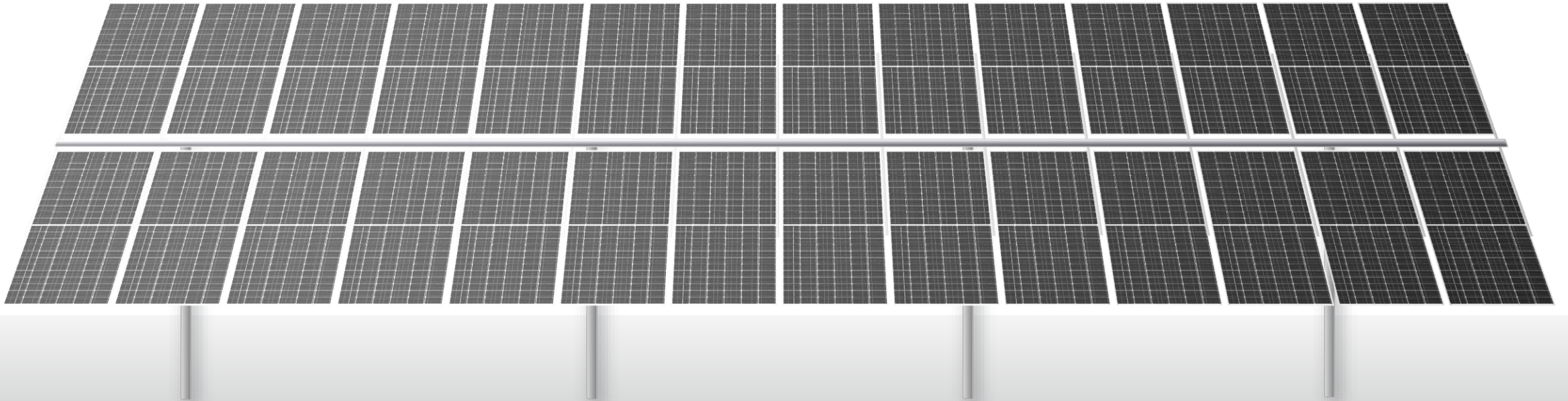
- Compared with module using M2 (158.75mm) wafer, Hi-MO4 can save 5 to 8 cents/Wp

## 4 Application compatible

- Easy handling and installation
- Compatible with input current of existing inverters
- Same string voltage / length

## Upgraded Hi-MO4 (2<sup>nd</sup> Generation)

- Since the voltage of Hi-MO4 module remain same, number of modules in one string will remain same, thus improve the power of one string greatly.
- For same Park Capacity BOS saving result in: mounting structure, cabling, number of inverters, time & labour



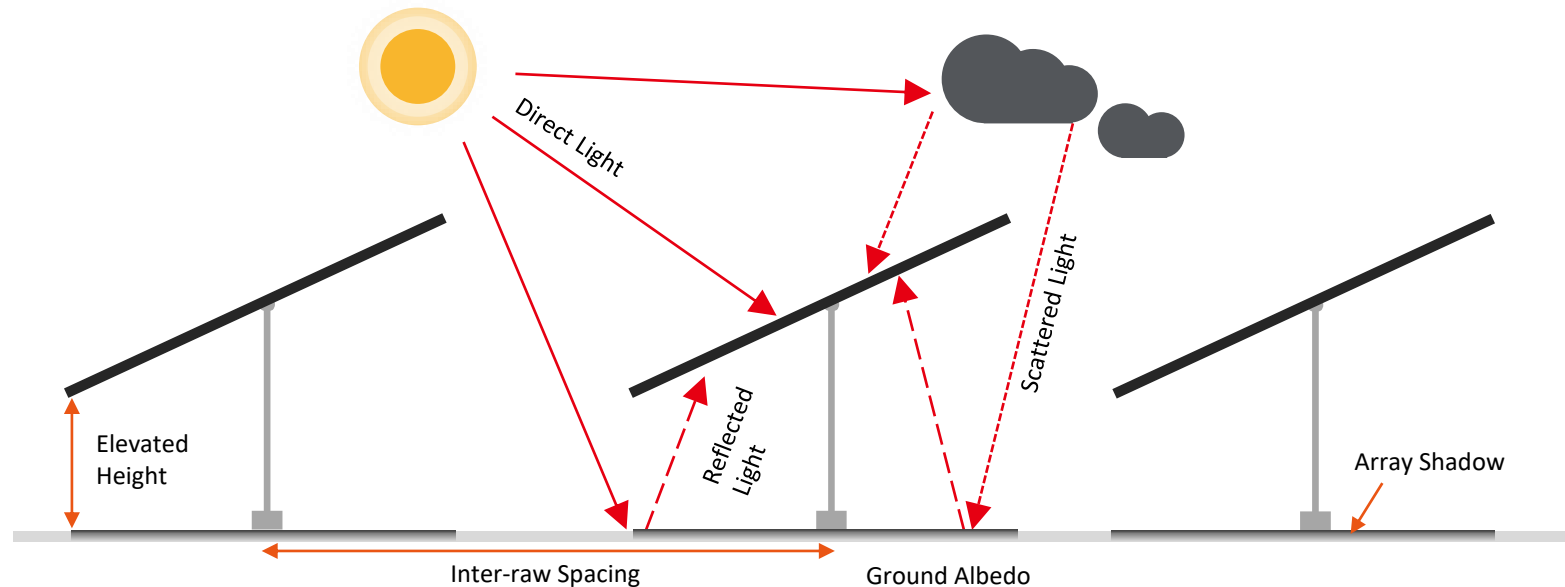
Schematic figure: modules per string 28, mounting system  $14 \times 2$ , 12.460 kW (445 Wp modules)

Typical string length is 26-28 in 1500V system

# Bifacial Technology Option for Hi-MO series

#1 in bifacial modules worldwide shipments

The best cost-performance ratio of bifacial modules is achieved with **P-type mono PERC technology**. Additional yield coming from scattered and reflected light caught by module rear side of double glass construction modules.

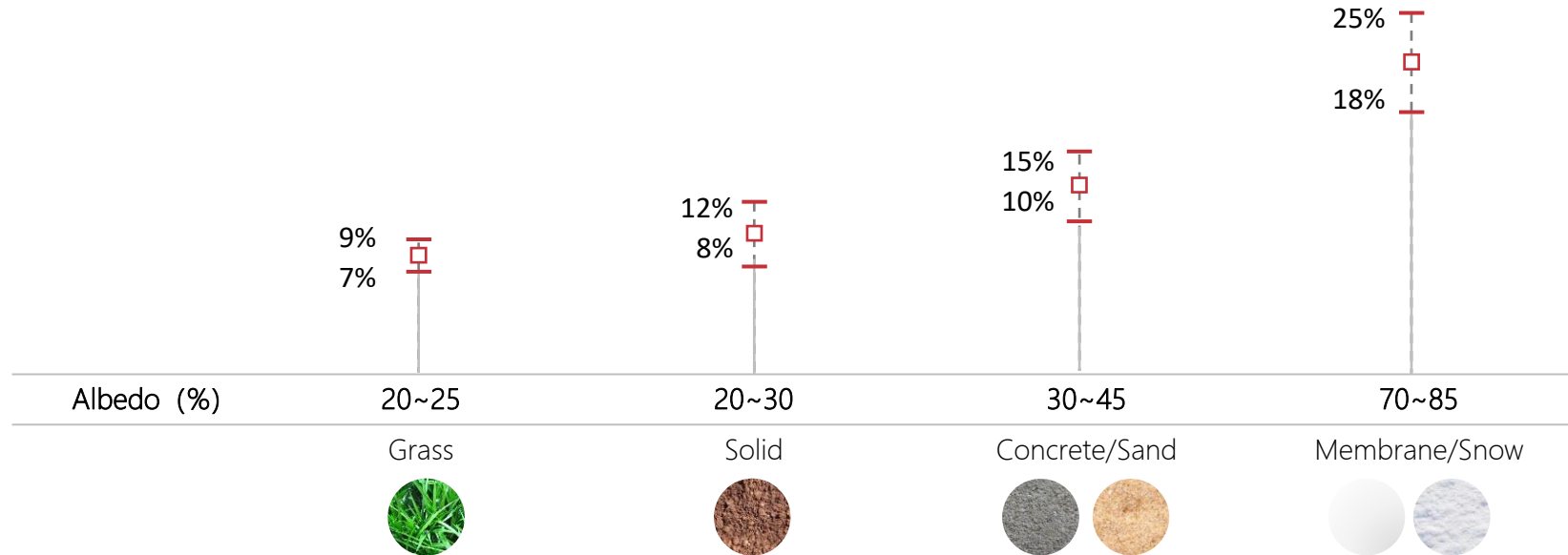


# Bifacial Technology Option for Hi-MO series

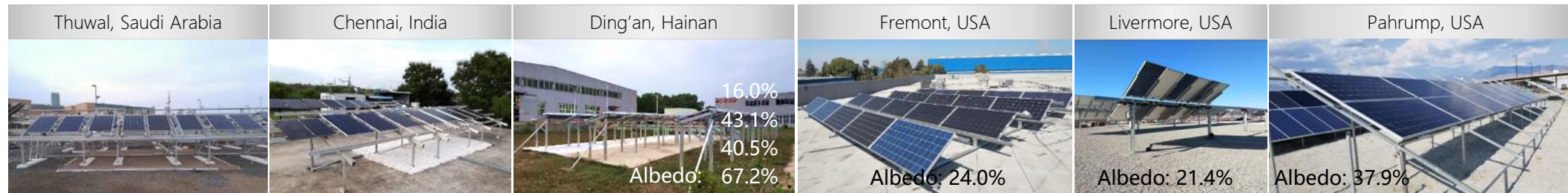
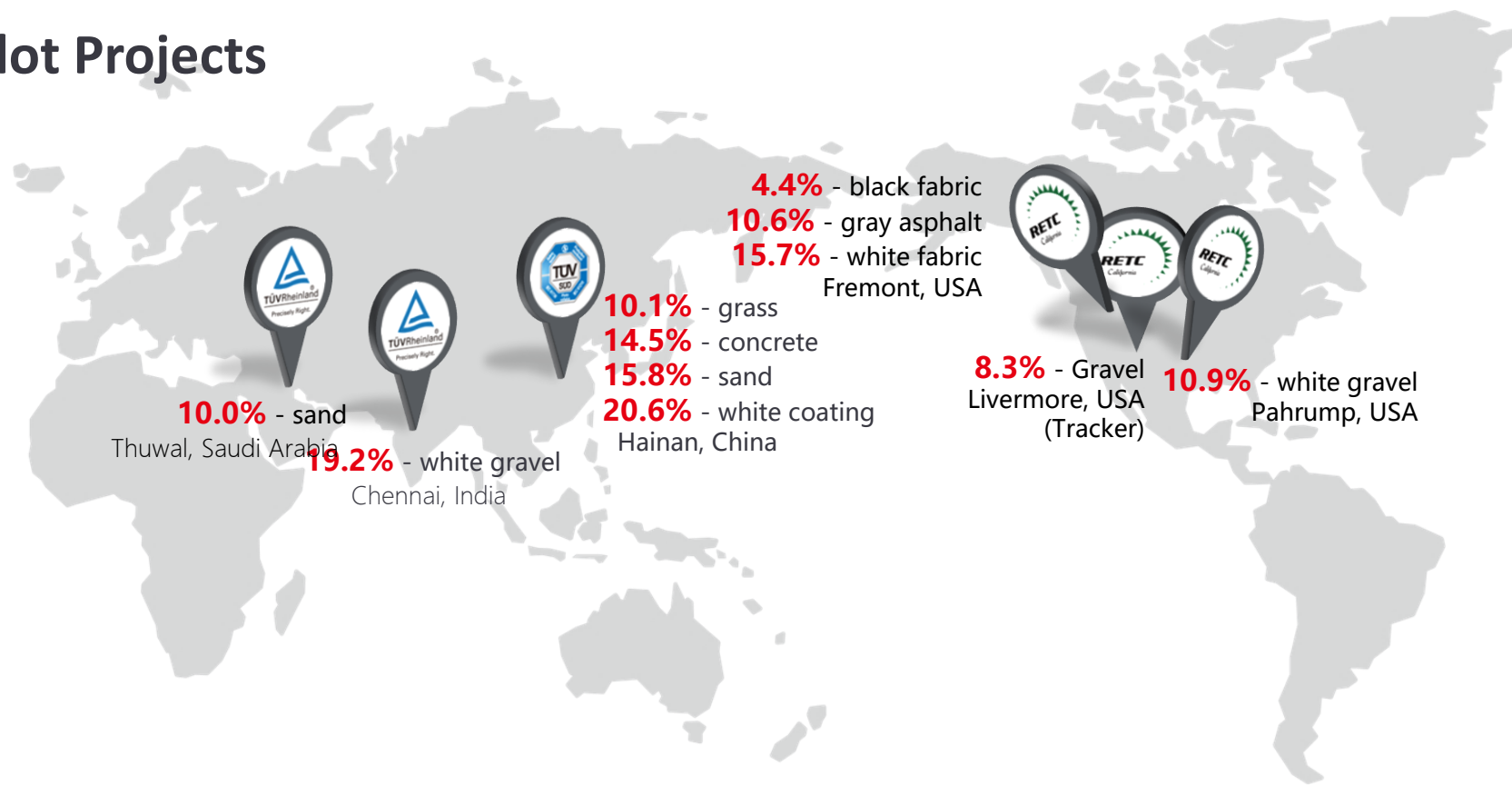
No. 1 in bifacial modules worldwide shipments

Bifacial modules' low attenuation, high rearside energy and the **additional albedo gain** provide the optimal cost-performance ratio, making this one of the standardized product types today. As of December 2019, LONGi's shipments of bifacial PERC modules have exceeded **3.0GW in Q4 2019**, ranking **#1** in the world.

Additional theoretical power gain from bifacial module based on background type (%)

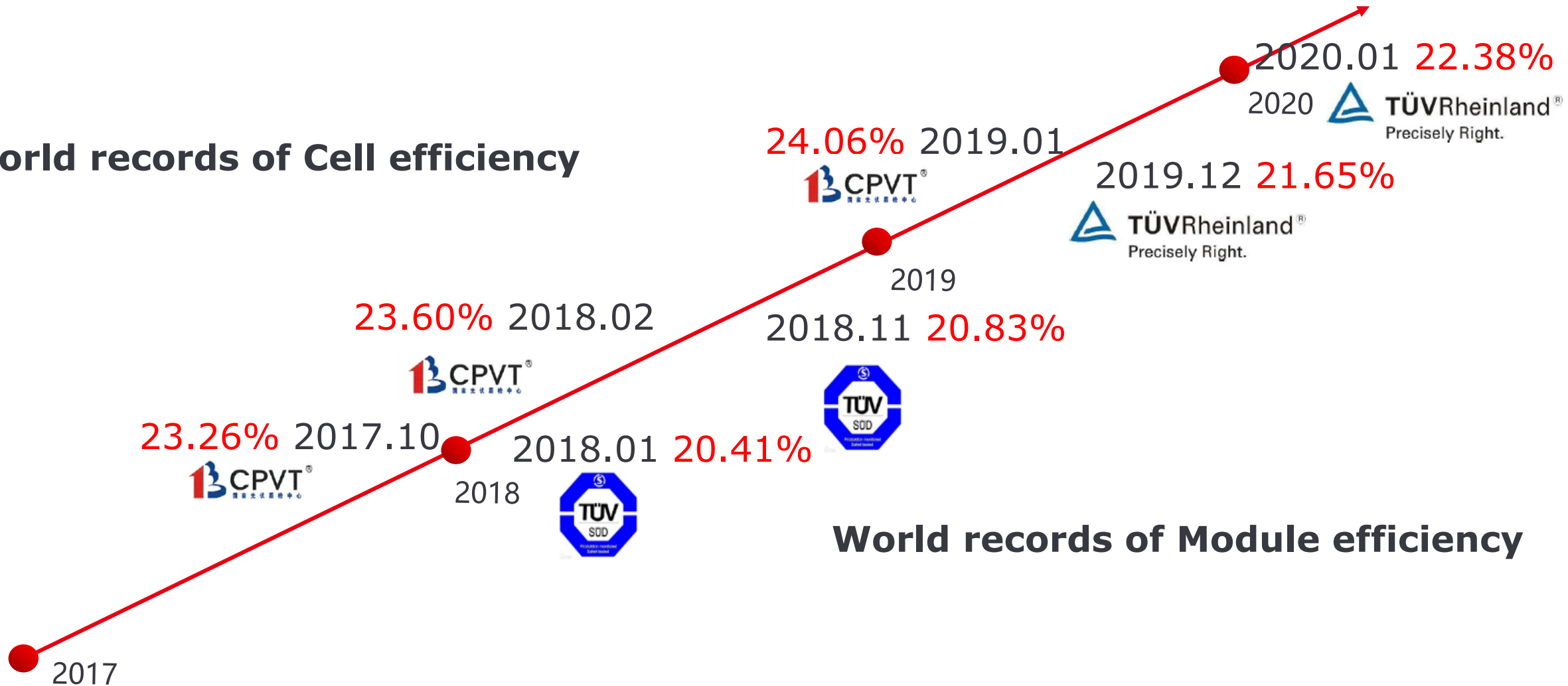


# Global Pilot Projects



Baseline: Monofacial PERC module

### World records of Cell efficiency



### World records of Module efficiency

## Quality Proven Value

In addition to IEC standard tests, LONGi's photovoltaic products demonstrated **excellent performance** in rigorous stress tests indoor and outdoor conducted by independent third party labs.



Ranked first in TÜV Rheinland PV module power generation simulation for two consecutive years 2016, 2017

First place in TÜV Rheinland PV energy simulation in the Monocrystalline group in 2018



RETC 2019 High Achievement Manufacturers



First rank in empirical power generation in PV Magazine outdoor power generation evaluation



Highest score in Module manufacturing technology (2019, PV-TECH)

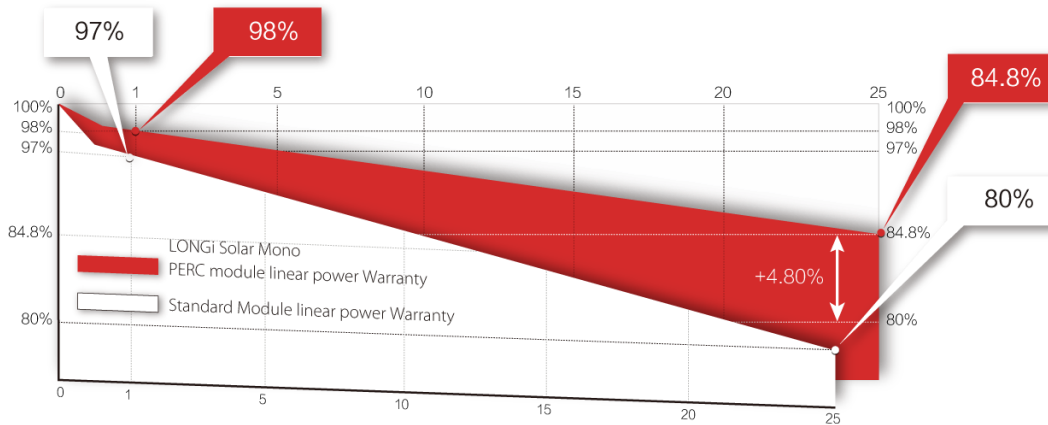


Top Performers for All extended reliability tests

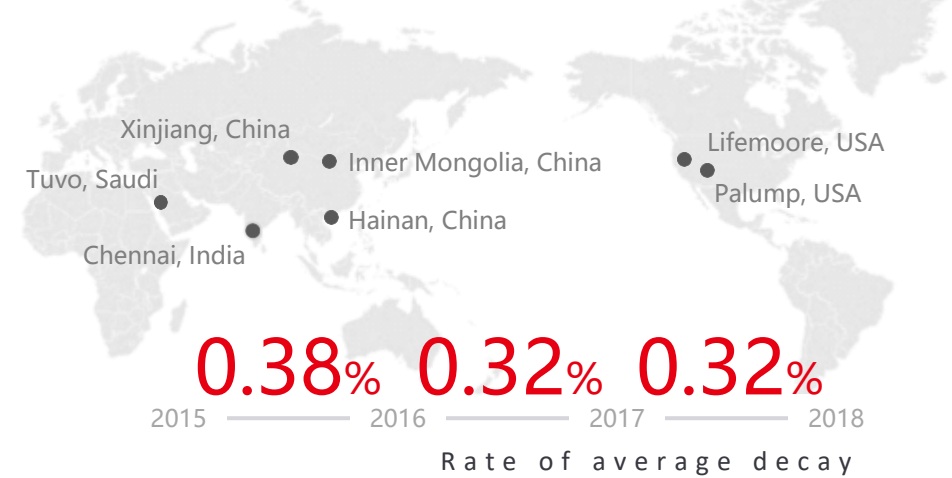
## Quality Proven Value

**High power generation** and **excellent reliability** throughout the product life cycle are fundamental to LONGi's products. From silicon wafer technology with lowest degradation to module design that can resist the harsh environments, LONGi tests product quality rigorously and verifies it by independent test labs. LONGi works with third-party organizations, set up demonstration power stations around the world and continuously tracks the performance of every product over their lifecycles.

LONGi offers a first-year power warranty of  $\geq 98\%$  for PV modules



Real degradation (LONGi's global demonstration power plants)





## Summary & Conclusions

### 20 GW Capacity & Strong Growth Plan

LONGi is #1 in monocrystalline global module shipments

### P-type mono PERC product portfolio

LONGi offers best LCOE solution for it's clients

### Sustainable and profitable

LONGi is #1 in financial health compared to all other global PV manufacturers

### Strong Focus on Technology

LONGi spends ~5% of annual revenue in R&D optimizing production, technology, and products

### Driver of Energy Transformation

LONGi has been driving the industry towards high-efficiency and low cost monocrystalline products

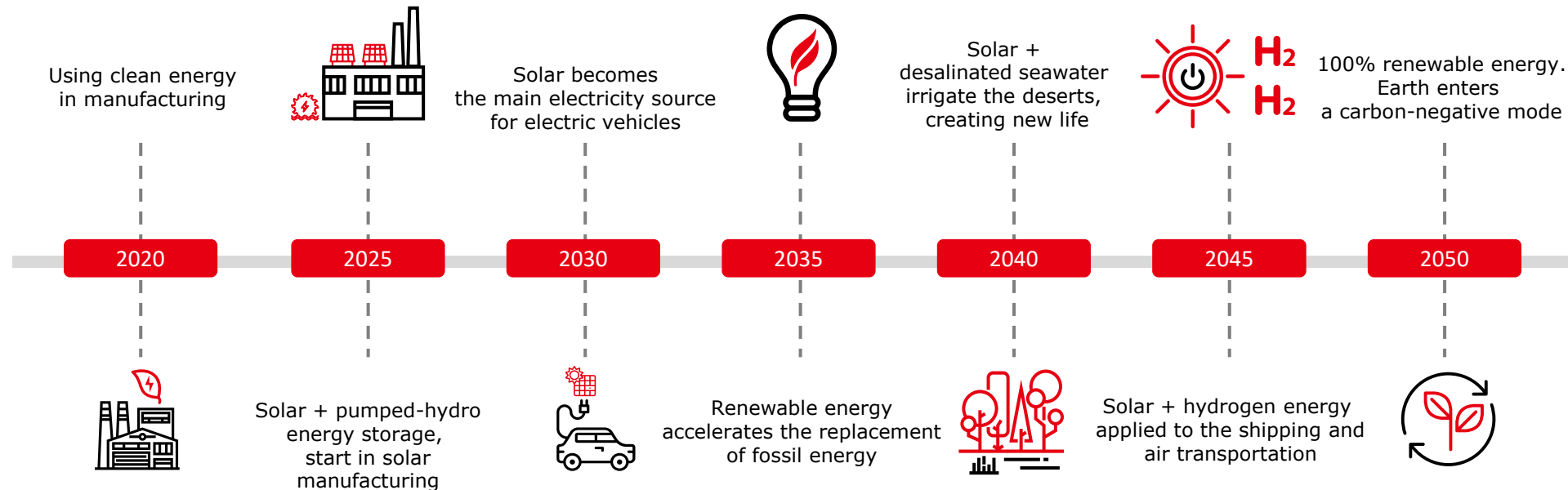
### Leader in new M6 wafer format

LONGi as #1 mono & ingot wafer producer leads transition to new cell formats with higher power

## LONGi's View on the Future

### Sustainable Development Strategy

With “Solar for Solar”, LONGi is building towards **100% clean energy consumption**. LONGi always had **sustainable management** as a core principle for business decision-making, including continuous investments in innovation and research, advocating an open corporate culture and promoting scientific institutional research. At the same time, LONGi has been leading continuous changes in electric power and energy, promoting the **sustainable development of the planet and mankind**. It is LONGi's vision and roadmap that Earth will be completely green and self-sustainable in the first half of this century.





*Thank You for Your Attention*

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Winfried Wahl	LONGi Solar Technology GmbH
Head of PM, Chief Engineer	Sebastian-Kneipp-Str. 41
<a href="mailto:winfriedwahl@longi-silicon.com">winfriedwahl@longi-silicon.com</a>	60439 Frankfurt
+49 175 5354021	Germany