

LONGi Solar

**MONO
PERC**

**BETTER LCOE
SOLUTION**

BETTER LCOE
SOLUTION

PERC

MONO



About LONGi Solar

A world leading mono-crystalline solar module manufacturer which achieves the better LCOE (levelized cost of electricity) solutions.

LONGi Solar is a world leading manufacturer of high-efficiency mono-crystalline solar cells and modules. LONGi Solar focused on MONO 18 years and is the largest supplier of mono-crystalline silicon wafers in the world, with total assets above \$2.7 billion. (2016) It also plans to have 45 GW of monocrystalline wafer production capacity by the year 2020.

Armed and powered by advanced technology and long standing experience in the field of mono-crystalline silicon, LONGi Solar shipped approximately 4.5GW products in 2017, with over 100% rate of growth in three consecutive years. The Company has its headquarters in Xi'an and branches in Japan, Europe, North America, India, Malaysia, Australia and Africa.

With strong focus on R&D, production and sales & marketing of mono-crystalline silicon products, LONGi Solar is committed to providing the better LCOE solutions as well as promoting the worldwide adoption of mono-crystalline technology.

48%

In 2016, the output of mono wafer was 1.518 billion pieces, which accounted for a 48% market share.

Calculation based on the 2016 global installed capacity of Bloomberg statistics Feb 17, 2017
Source: Q1 2017 Global PV Market Outlook -Bloomberg New Energy Finance

16%

In 2016, The output of mono module was 2.34GW, which accounted for a 16% global mono module market share.

Calculation based on the 2016 global installed capacity of Bloomberg statistics Feb 17, 2017
Source: Q1 2017 Global PV Market Outlook -Bloomberg New Energy Finance

47.35%

Gross revenue in 2016 was \$1.67 billion. Net profit was \$224 million. The Debt Asset ratio was 47.35%.

March 11, 2017
Source: LONGi 2016 Annual Report

5%

Research and development investment accounted for 5% of revenue.

March 11, 2017
Source: LONGi 2016 Annual Report

23.26%

WORLD RECORD HOLDER
Mono PERC cell efficiency of 23.26%

October 27, 2017
Source: National Center of Supervision and Inspection on Solar Photovoltaic Product Quality (CPVT) Report

20.41%

WORLD RECORD HOLDER
Mono PERC module efficiency of 20.41%

January 18, 2018
Source: TÜV-SÜD



NEW CHINA NIFTY 50

Source: FactSet, Goldman Sachs Global Investment Research

Bloomberg

TIER 1

LONGi Solar on Bloomberg (BNEF) PV Module Maker Tier 1 List!
NO.7 in the world NO.2 in China
PV module brands used in most debt-financed projects

Source: Bloomberg New Energy Finance

Morgan Stanley

TOP INVESTMENT IDEAS

April 18, 2017

Source: Morgan Stanley Research | Prefer Cost and Technology Leaders Amid Dark Times for Solar

Photon CONSULTING

FINANCIAL HEALTH LISTED NO.1 IN 1ST QUARTILE

Z-SCORES PV MANUFACTURING

Source: PHOTON Consulting, LLC.
Report date: Oct 15, 2017



TOP MODULE SUPPLIER

LONGi Silicon Materials became the newest member of "Silicon Module Super League" in 2016

This exclusive industry grouping now consists of seven companies, each forecast to ship more than 4.5GW of modules during 2017

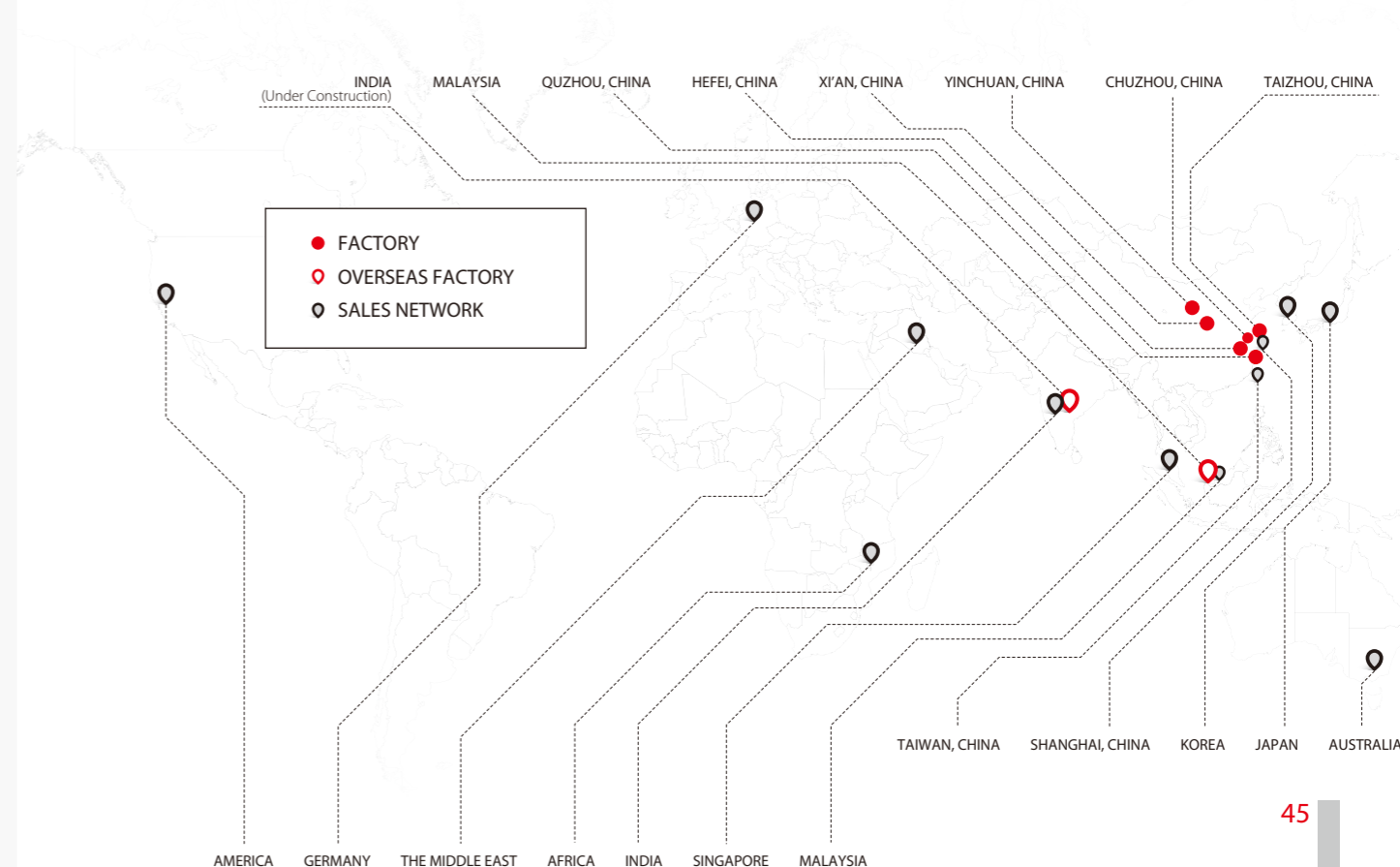


No.1

INDUSTRY CHAIN



STRENGTH CAPACITY & NETWORK

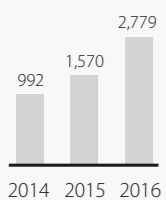


STRENGTH FINANCIAL

The Photon Financial Health Index of LONGi Solar rank first in PV industry

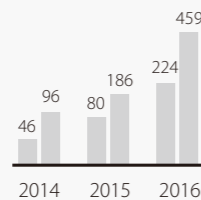
+77%

Total assets (Million USD)



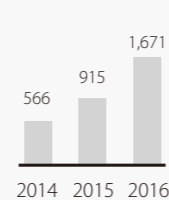
+180%

Net Profit (Million USD)
Gross Profit (Million USD)



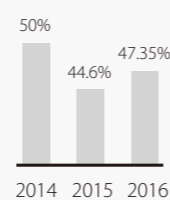
+82.6%

Revenue (Million USD)



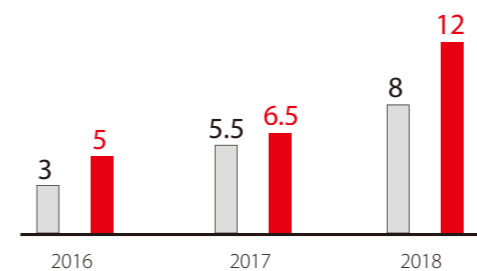
47.35%

Debt Ratio

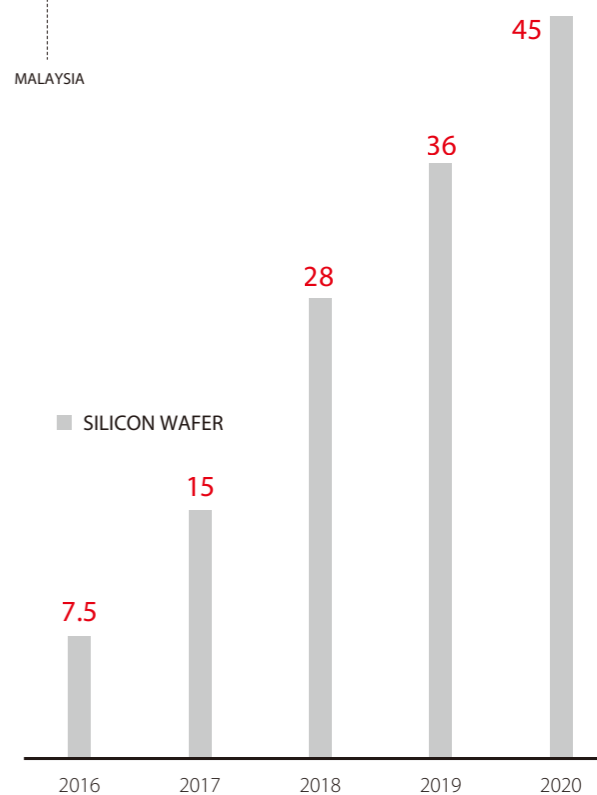


CAPACITY PLAN (GW)

■ CELL ■ MODULE



■ SILICON WAFER



STRENGTH R & D

Research and development investment accounted for 5-7% of the revenue

5-7%

R & D Investment

5-7% of total revenue is invested in R&D

430+

Technical Team

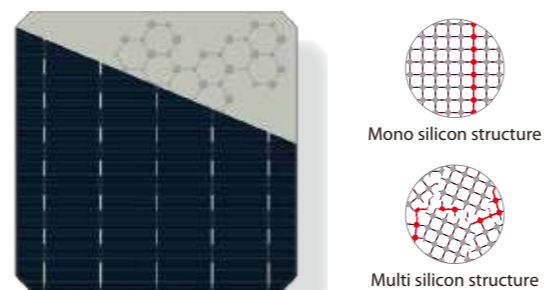
More than 700 technical staff working on ingot, wafer, cell, and module development

275

Patents

Has developed 190 patents on ingot, wafer, cell and module technology

MONO

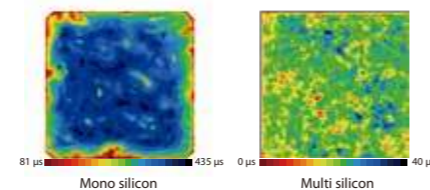


PERFORMANCE

Dislocation density and Fe impurity affect minority carrier lifetime which is concerned with performance. Low O impurity determines a good LID performance.

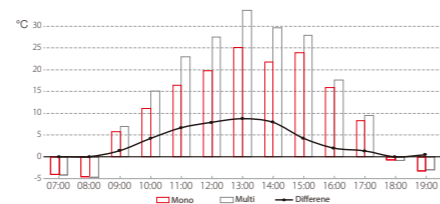
MINORITY CARRIER LIFETIME

For minority carrier lifetime, mono silicon is an order of magnitude higher than multi silicon.



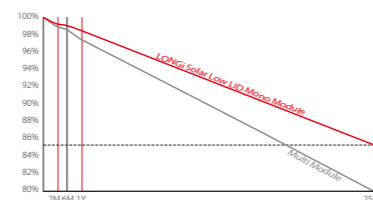
LOWER NOCT

Mono-C-Si modules generate less heat than multi-c-Si modules. Therefore, the nominal operating cell temperature (NOCT) for a mono cell is lower than for a multi-cell. By operating at a lower temperature, mono cells and modules generate more energy.

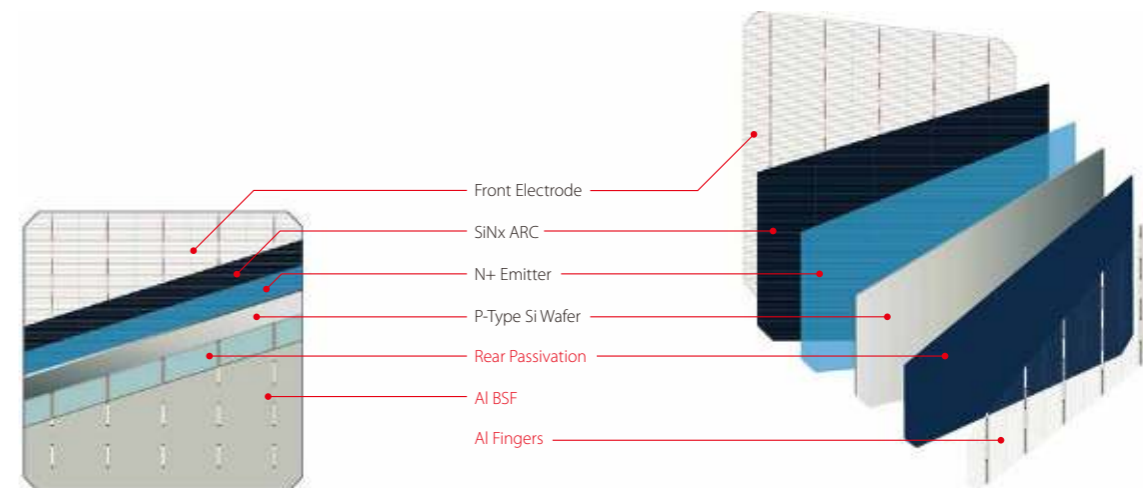


LOWER LID

Lower initial light induced degradation (LID), means higher reliability and more energy generated than standard mono or multi-crystalline modules.



PERC



MONO PERC

Al₂O₃/SiNx improves backside passivation and enhances long wavelength reflection, enabling higher cell/module efficiency. Mono wafers with higher bulk lifetime see larger efficiency improvement adopting PERC cell structure.

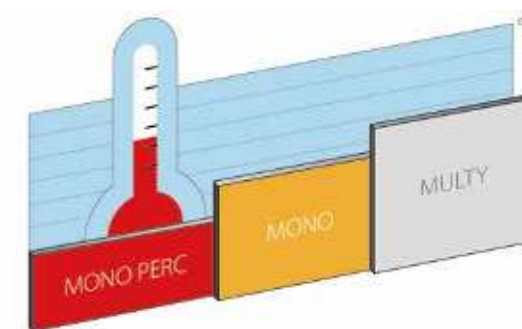
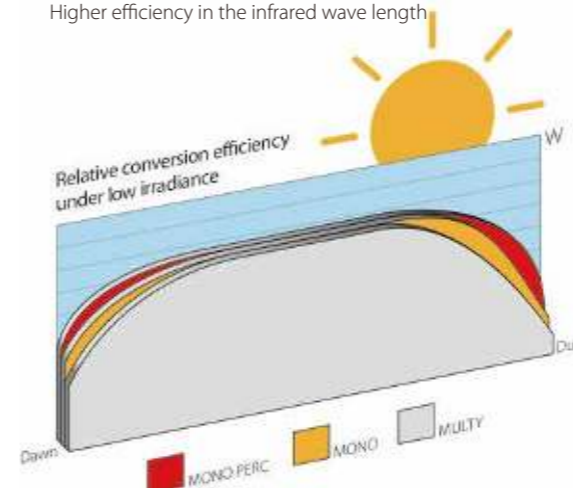
BIFACIAL MONO PERC

Additional energy yield from backside light absorption

≥75%
Bifaciality

BETTER LOW IRRADIANCE PERFORMANCE

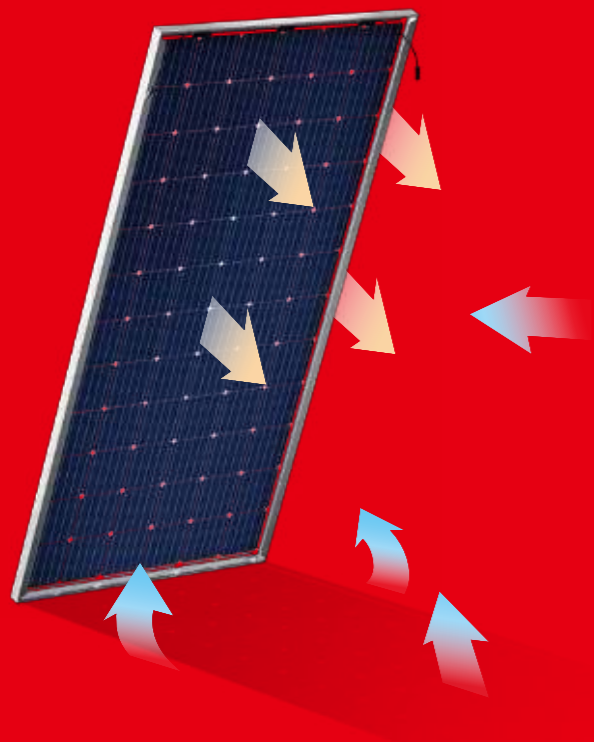
Higher efficiency under low irradiation
Higher efficiency in the infrared wave length



LOWER TEMPERATURE COEFFICIENT

High Efficiency → Low thermal loss
Higher Voc → Lower TempCo
Lower Power loss under high temperature environment

HIGHER POWER



EFFICIENCY

≥21.5%
Cell

≥18.34%
Module

POWER

≥300W
60pc

≥360W
72pc

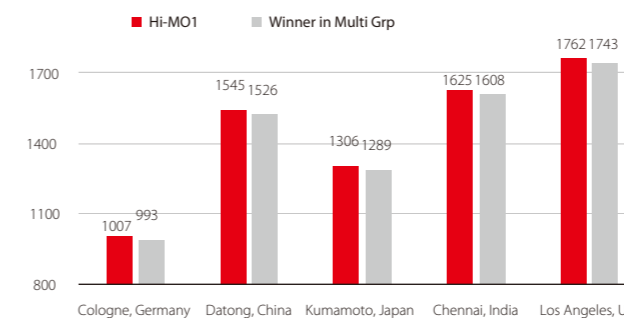
GAIN

Backside Power Gain	300W/60pc	360W/72pc
+5%	315W	378W
+10%	330W	396W
+15%	345W	414W
+25%	375W	450W

HIGHER ENERGY YIELD

HIGHER SIMULATED POWER GENERATION

Simulated Power Generation (kWh/kWp/year)



PAN files generated by TUV Rheinland with randomly selected modules samples from production shipment

Simulated energy yield in five different cities globally

Mono PERC Module of LONGi Solar won first place in mono group and among all modules

CASE



Pucheng, Shaanxi, China

Power generation by bifacial module + fixed tilt is **>12.4%** higher than Multi Module



Kubuchi, Inner Mongolia, China

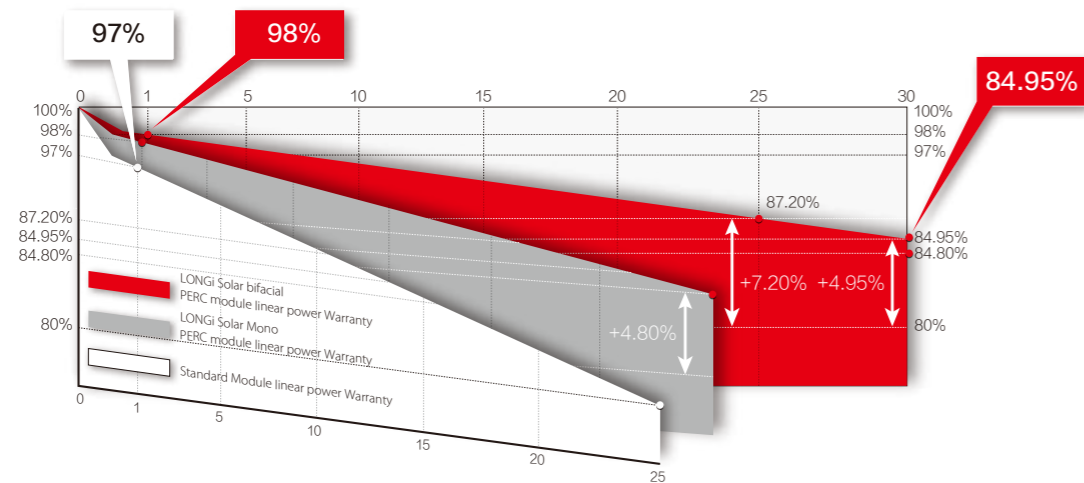
Power generation by bifacial module + tracker + sand is **>17.3%** higher than Multi Module



Taizhou, Jiangsu, China

Power generation by Hi-MO2 + fixed tilt is **11.5%** higher than Hi-MO1; Hi-MO2 +1-axis tracker is **21.67%** higher; Hi-MO2 +2-axis tracker is **26.20%** higher

HIGHER RELIABILITY



30-Year
Power Warranty

<2%
First Year Linear Power Degradation

-0.45%
Linear Power Degradation

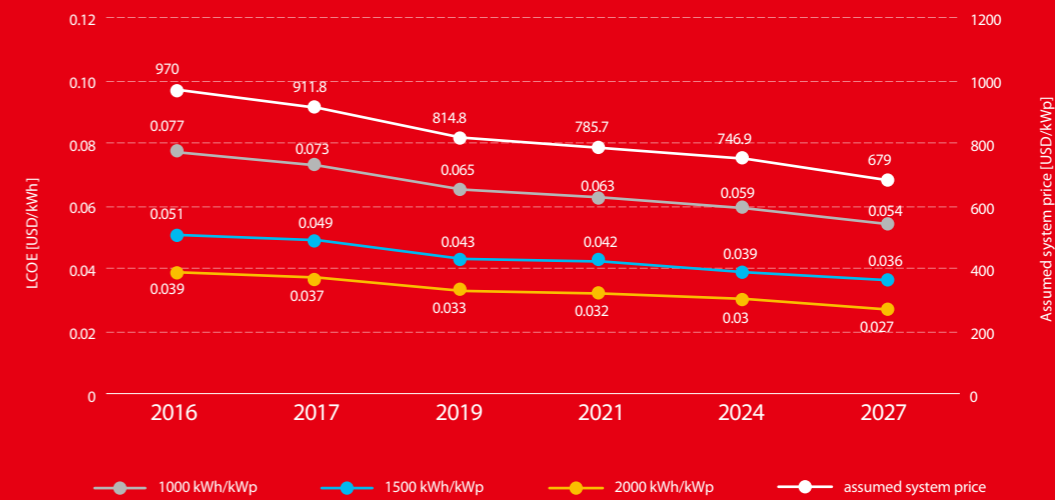


WARRANTY

10Y MATERIAL & CRAFTWORK / **30Y 84.95%** POWER-OUTPUT / **30Y** PG

BIFACIAL TECHNOLOGY

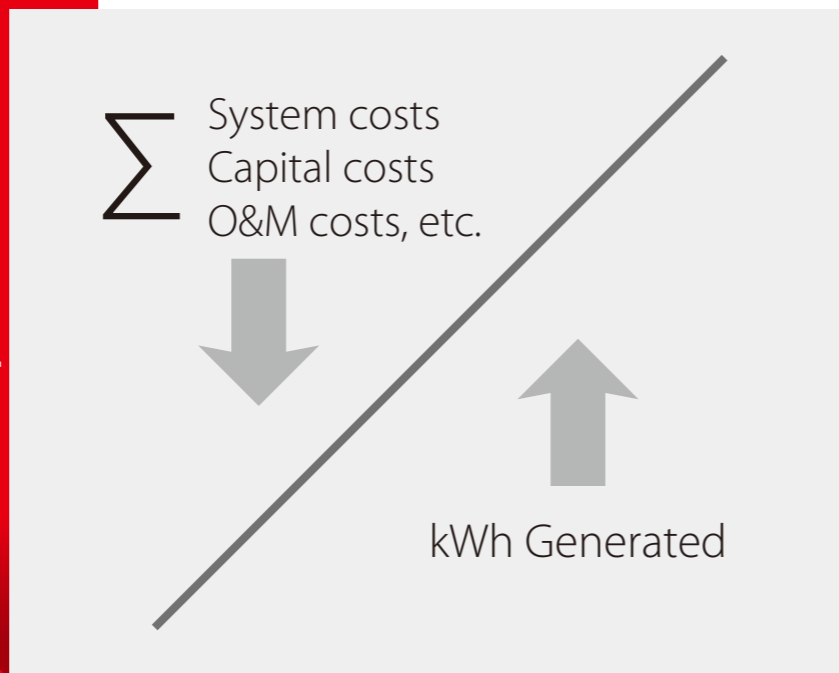
Will enable PV LCOE to drop below \$0.05/kWh for most regions sooner



Loan 80%
Interest rate 5%
Discount rate 2%

Source: ITRPV 2017

$$LCOE = \frac{\text{Total System Cost}}{\text{Total Generation}} \text{ (\$/MWh)}$$



LOWER BOS

LOWER EPC COSTS



LOWER MODULE COSTS

LOWER INVESTMENT COSTS

BIFACIAL PERC MODULE IS THE SOLUTION

PRODUCT WARRANTY

HIGH EFFICIENCY



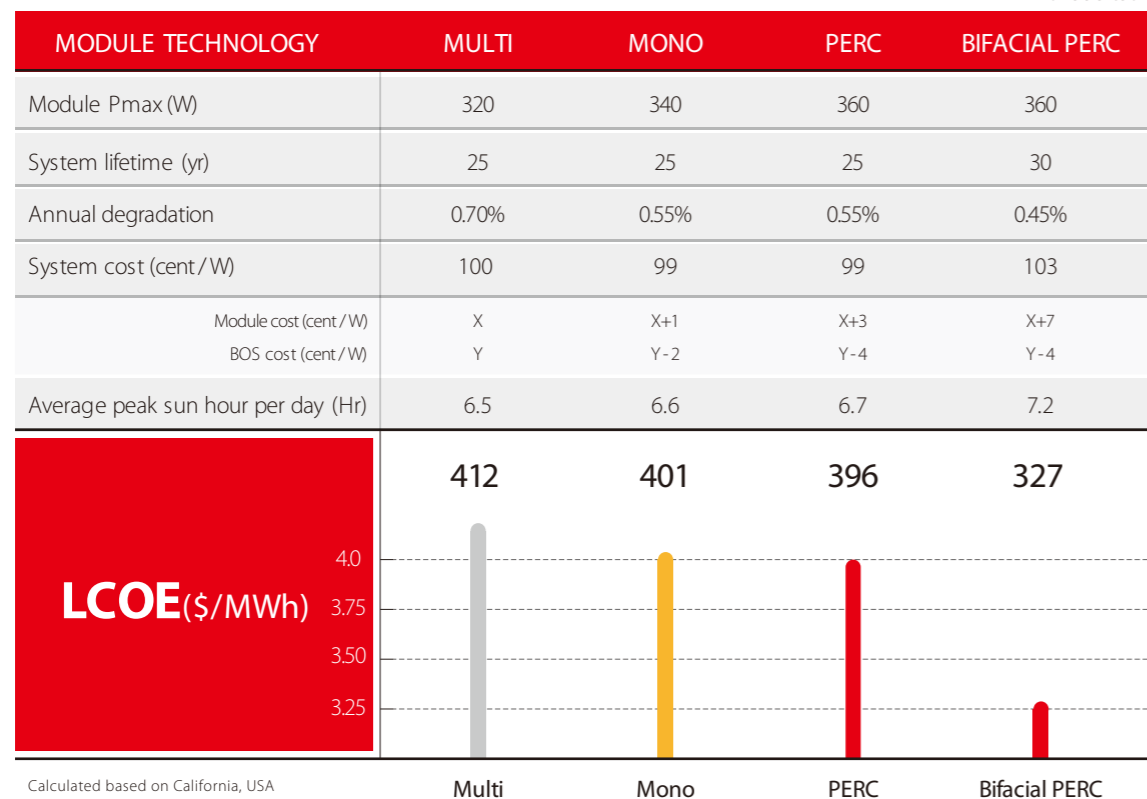
HIGH ENERGY YIELD PRODUCTION

HIGH RELIABILITY (STABLE HARVEST)



BETTER LCOE

For reference only



PARTNER

LONGi Solar has established strong strategic partnerships with equipment and material suppliers, leading research institutes and universities, as well as customers, to advance the development of ingot, wafer, cell and module technology.



1st-class Partners





LONGI Solar

HEADQUARTERS

Block B, Innovation Incubation Center, Xi'an Service
Outsourcing Industrial Park No. 8989, Shangji Road, Xi'an
Economic and Technological Development Zone

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