



**LONGi** Solar

**MONO  
PERC  
BETTER LCOE  
SOLUTION**  
SOLUTION  
BETTER LCOE  
PERC  
MONO

**LONGi** Solar

**HEADQUARTERS**

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Economic and Technological Development Zone

[www.en.longi-solar.com](http://www.en.longi-solar.com)

**SHANGHAI OFFICE**

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## 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 \$5.2 billion. (2017) 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 6.5GW 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  
February 17, 2017  
Source: Q1 2017 Global PV Market Outlook -Bloomberg New Energy Finance

# 4.53GW

In 2017, The output of mono module has doubled to 4.53GW

March 28, 2018  
Source: LONGi 2017 Annual Report

# 56.58%

Gross revenue in 2017 was \$2.6 billion. Net profit was \$566 million. The Debt Asset ratio was 56.58%.

March 28, 2018  
Source: LONGi 2017 Annual Report

# 7%

Research and development investment accounted for 7% of revenue.

March 28, 2018  
Source: LONGi 2017 Annual Report

# 23.60%

**WORLD RECORD HOLDER**  
Mono PERC cell efficiency of 23.60%

February 28, 2018  
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

# No.1



## 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.5 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 TWO CONSECUTIVE YEARS IN 1<sup>st</sup> QUARTILE Z-SCORES PV MANUFACTURING

Source: PHOTON Consulting, LLC.  
Report date: October 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



# INDUSTRY CHAIN

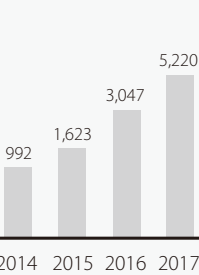


# STRENGTH FINANCIAL

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

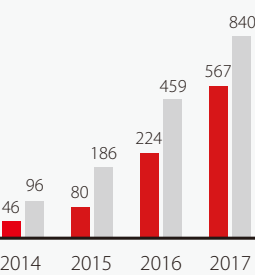
+71.5%

Total assets (Million USD)



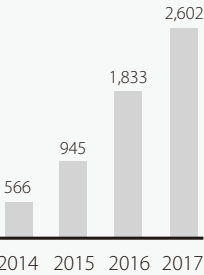
+130%

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



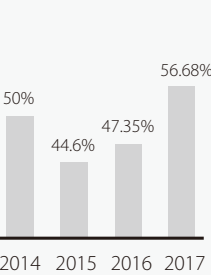
+41.9%

Revenue (Million USD)

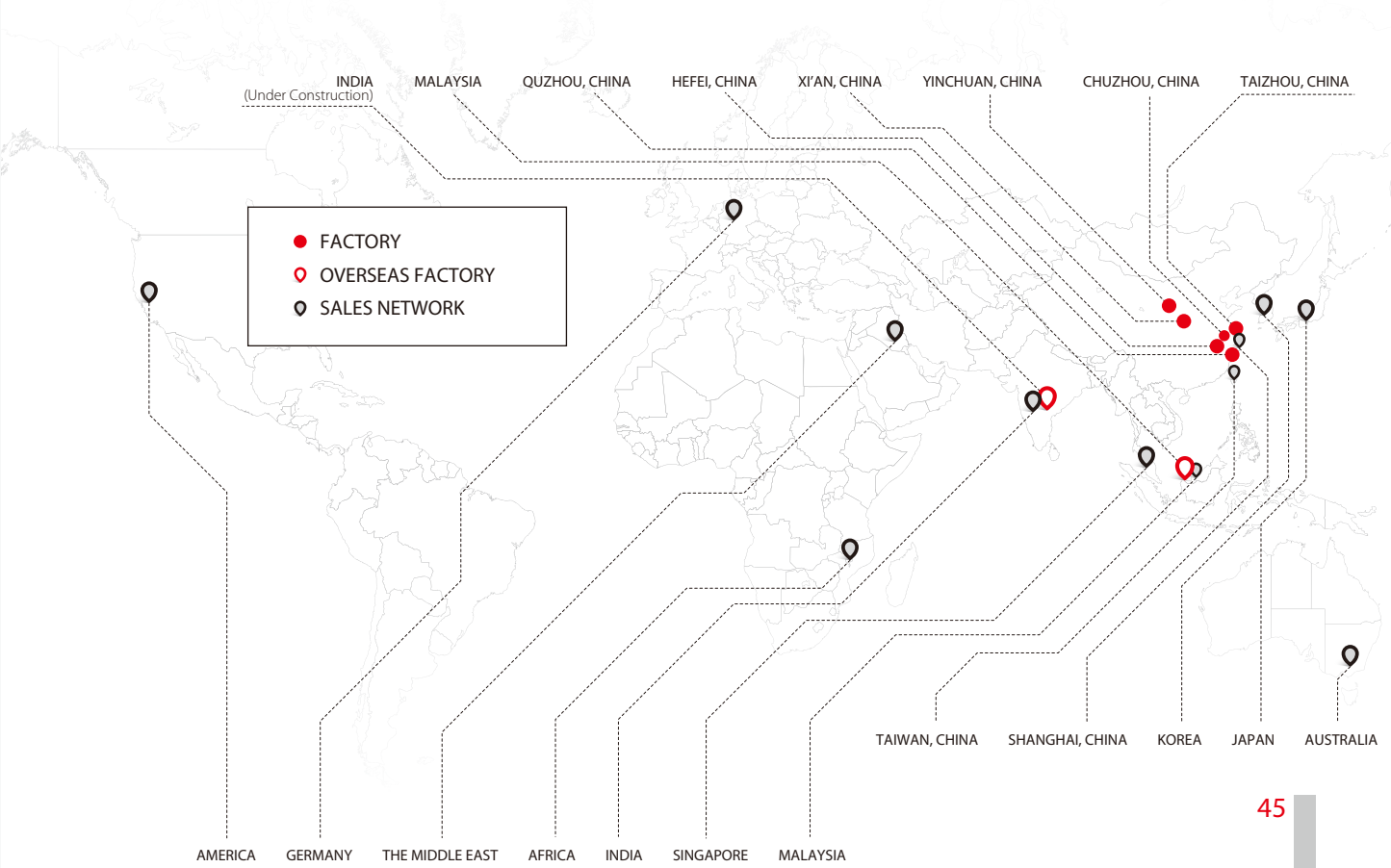


56.68%

Debt Ratio

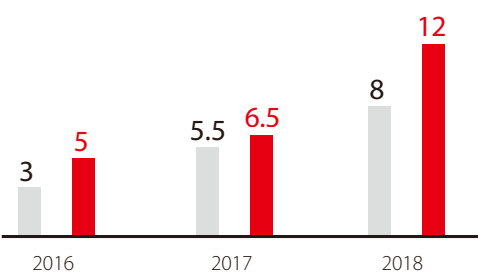


# STRENGTH CAPACITY & NETWORK

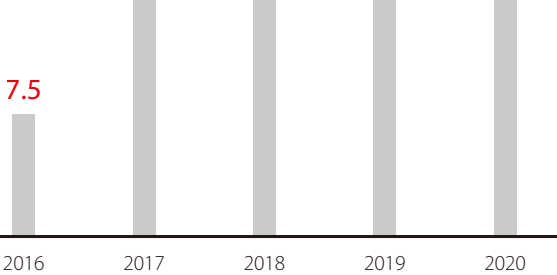


# CAPACITY PLAN ( GW )

CELL MODULE



SILICON WAFER



Source: LONGi 2017 Annual Report, March 28, 2018

STRENGTH  
R&D

97%

R & D Investment +97%  
R & D investment is up to USD 176 Million,  
+97% YOY

7%

R & D Investment  
7% of total revenue is invested in R & D

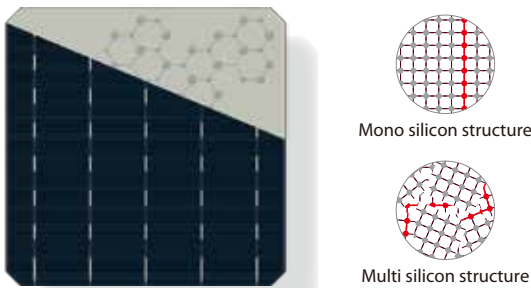
450+

R & D Team  
More than 450 of the 1,700 technical  
professionals force devoted to the R & D  
of ingot, wafer, cell and module

260+

Patents  
Has developed 260+ patents on ingot,  
wafer, cell and module technology

MONO

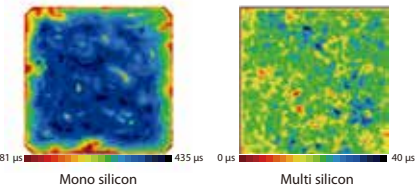


PERFORMANCE

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

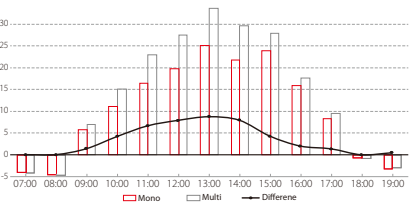
MINORITY CARRIER LIFETIME

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



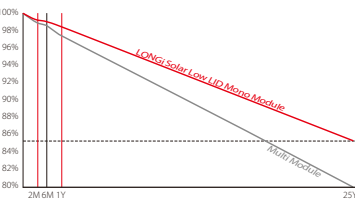
LOWER NOCT

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.

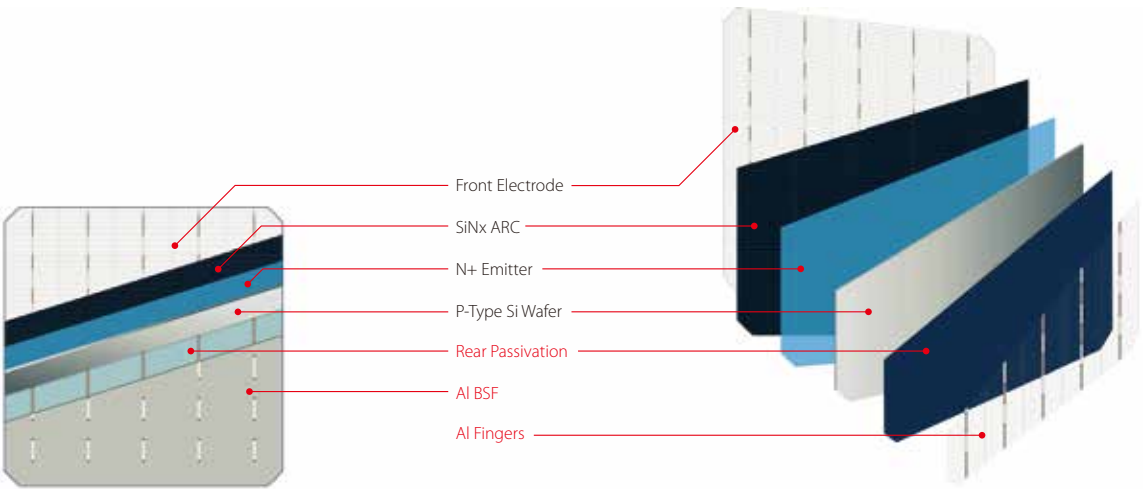


LOWER LID

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



PERC



MONO PERC

Al<sub>2</sub>O<sub>3</sub>/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.

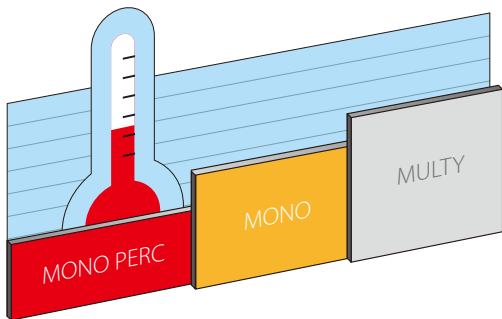
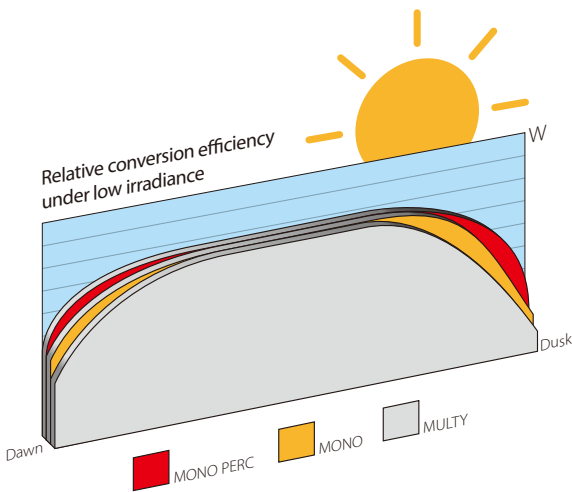
BIFACIAL MONO PERC

Additional energy yield from backside light absorption

≥75%  
Bifaciality

BETTER LOW IRRADIANCE PERFORMANCE

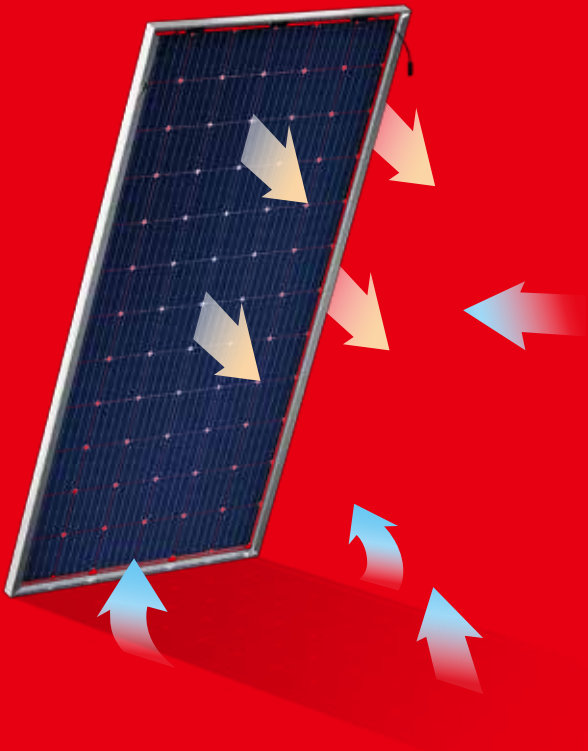
Higher efficiency under low irradiation  
Higher efficiency in the infrared wave length



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

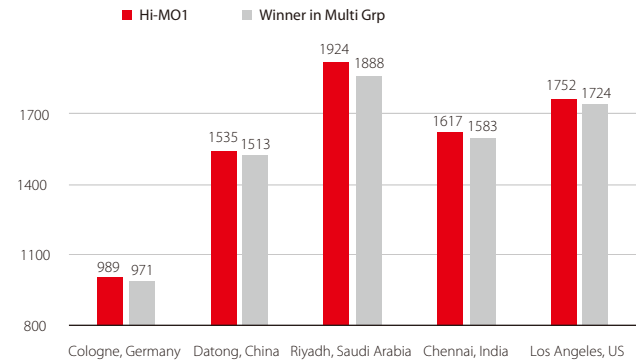
## GAIN

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**

March 15, 2018  
Source: TÜVRheinland



## 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

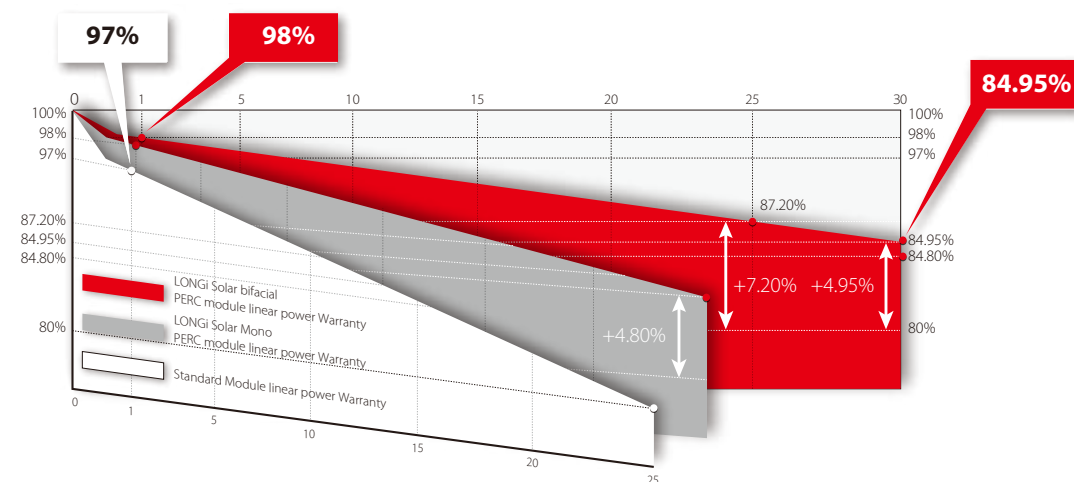


### Taizhou, Jiangsu, China

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

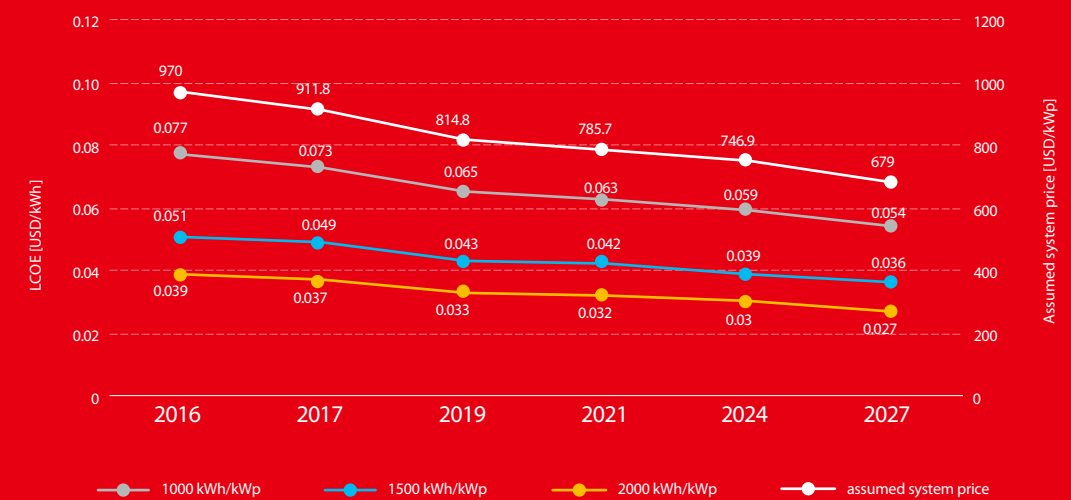


## WARRANTY

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

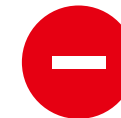
Σ System costs  
Capital costs  
O&M costs, etc.



kWh Generated

LOWER BOS

LOWER EPC  
COSTS



LOWER MODULE  
COSTS

LOWER INVESTMENT  
COSTS

BIFACIAL PERC MODULE IS THE SOLUTION

PRODUCT  
WARRANTY

HIGH  
EFFICIENCY



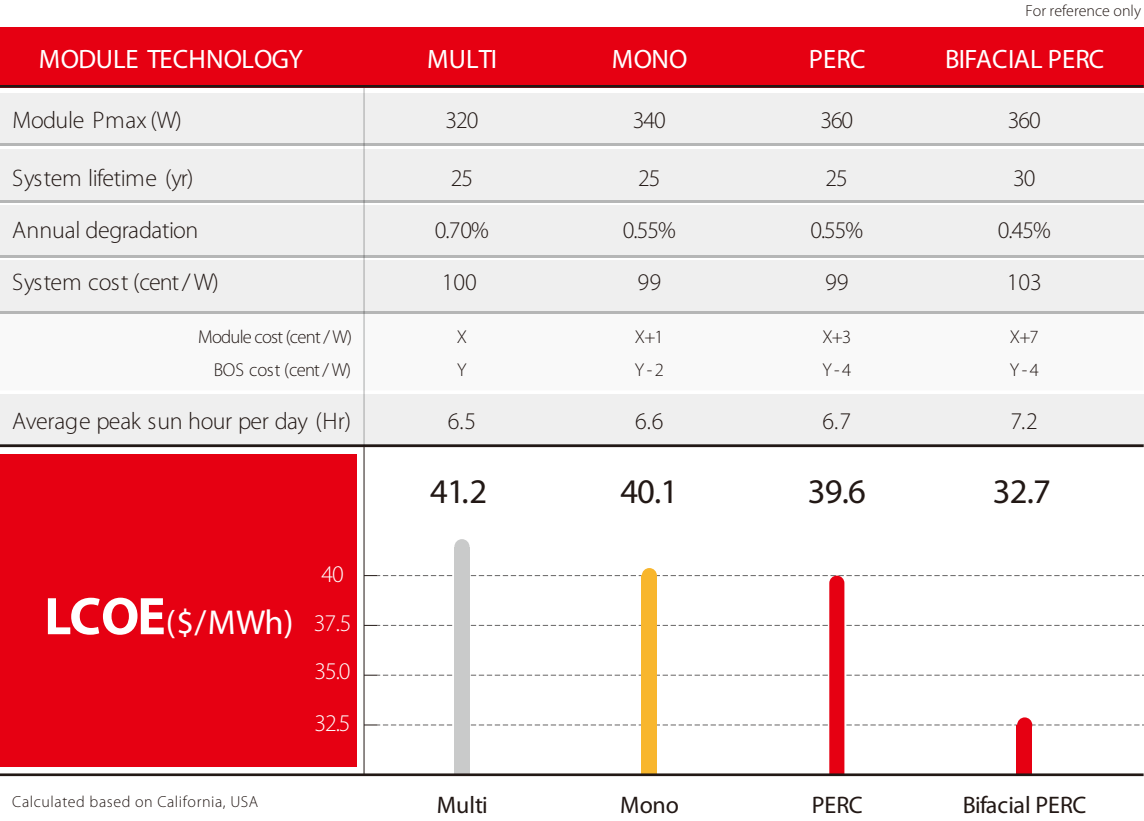
HIGH ENERGY  
YIELD PRODUCTION

HIGH  
RELIABILITY  
(STABLE HARVEST)





# BETTER LCOE



# 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

