



LONGI Solar

Mono is the Future

The Path to Achieve Lowest LCOE

LONGI Solar

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About LONGi Solar

A world leading mono-crystalline solar module manufacturer for achieving best LCOE (levelized cost of electricity)solutions.

LONGi Solar is a world leading manufacturer of high-efficiency mono-crystalline solar cells and modules. The Company is wholly owned by LONGi Group. LONGi Group (SH601012) is the largest supplier of mono-crystalline silicon wafers in the world, with total assets above \$1.7 billion. (2016)

Armed and powered by the advanced technology and long standing experience of LONGi Group in the field of mono-crystalline silicon, LONGi Solar has shipped over 1GW products in 2015 and is estimated to double the revenue by the end of 2016. The Company has its headquarters in Xi'an and branches in Japan, Europe, North America, India and Malaysia.

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

**The Path to
The Best
LCOE Solution**

LCOE

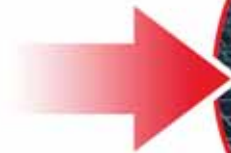
levelized cost of electricity

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

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

kWh Generated

More than the
Component Cost



MONO
is the
SOLUTION

Lower BOS

Lower EPC costs

Lower module costs

Lower Investment costs

High Reliability
(Stable harvest)

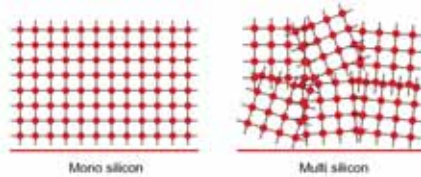
Maximum Energy Production

High Efficiency

Product Warranty

MONO VS MULTI TECHNOLOGY

Structure

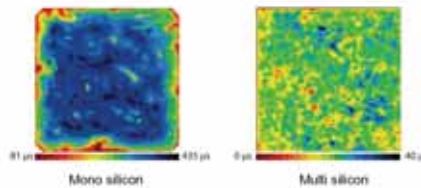


Performance

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

Items	Mono silicon	Multi silicon
dislocation density (cm ⁻²)	low, < 10 ⁴	high, 10 ⁵ ~10 ⁶
Fe impurity (cm ⁻³)	low, 10 ¹² ~10 ¹³	high, 10 ¹⁴ ~10 ¹⁵
O impurity (cm ⁻³)	low, (1~10)*10 ¹⁷	high, (5~20)*10 ¹⁸

Minority carrier lifetime

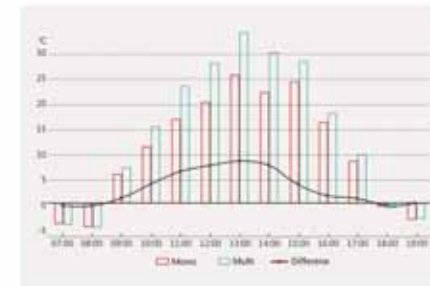


For minority carrier lifetime, mono silicon is an order of magnitude higher than Multi silicon.

Lower NOCT

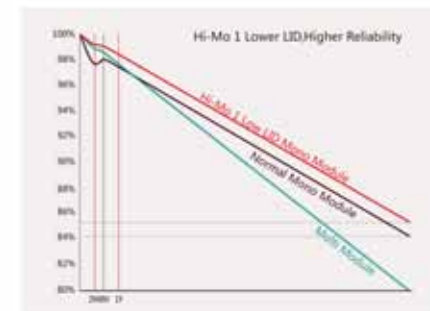
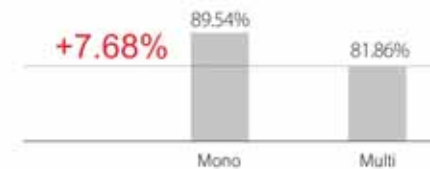
Mono-c-si modules generate less heat than multi-c-si module, because the carrier recombination, which convert the electricity to heat, is less in mono cells than in multi cells.

Therefore, the nominal operating cell temperature (NOCT) for mono cell is less than multi-cell. In other words, the mono-module works at lower temperature, which leads to more energy generation.



generates about **2%** more energy

Spectral response for cell under low irradiance



Lower LID

Lower initial light induced degradation (LID), higher reliability
More energy production than normal mono and multi modules

MONO VS MULTI OUTPUT POWER

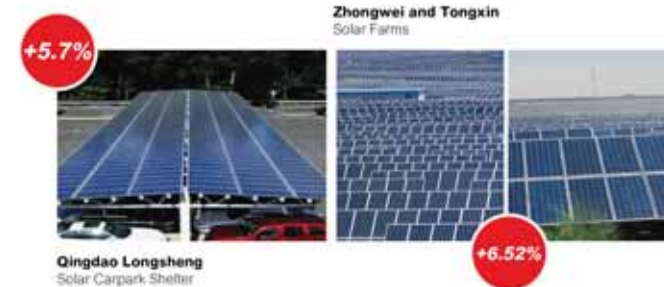


More Reference



The actual testing data - (Golmud, Qinghai, China)

Power Yield of 10MW Mono-cr Si Solar Farm 5.12% higher than 10MW Multi-cr Si Solar Farm.



MONO VS MULTI INVESTMENT

Taking 100MW project as an example

Mono modules save more in land area, BoS cost, soil&concrete and manpower cost.



Land area

To save more than 8000m²



Soil and concrete

To save around 4.7% soil and concrete



BOS Cost

To save around 320t solar racking and 80km cables



Manpower

To save around 5% manpower cost

MONO VS MULTI LONG TERM RELIABILITY

Mono is the only solution with 25+ years proven track record

1982

Switzerland

10KWMono Solar Power System

The annual power degradation is **0.4%**



1984

California, US

1MW Mono Solar Farm in Desert

The annual power degradation is **0.9%**



1984

Lanzhou, Gansu, China

Solar Wind Hybrid Power System
(Mono modules deployed)

The annual power degradation is **0.37%**



1994

Ningbo, Zhejiang, China

Mono Solar Power Plant
The accumulated power degradation
is **13.1% over 21 years.**



1995

Yunnan, China

Civil Mono Solar Power System
The annual power degradation is
0.38%



1997

Beijing, China

Rooftop Mono Solar Power System
The annual power degradation is
0.65%



1991

Qinghai, China

Mono Solar Power System for
Telecom Tower
The annual power degradation is
0.3%



1986

Shiping, Yunnan, China

Civil Mono Solar Power System

The annual power degradation is **0.53%**

1995

Baingoin, Tibet, China

Civil Mono Solar Power System
Field-proven operation at the high altitude for
20 years.

1983

Nara, Japan

Mono Solar Power Plant

No quality defects so far.

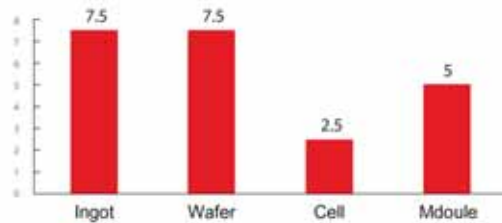


Specialized in Mono

Milestone

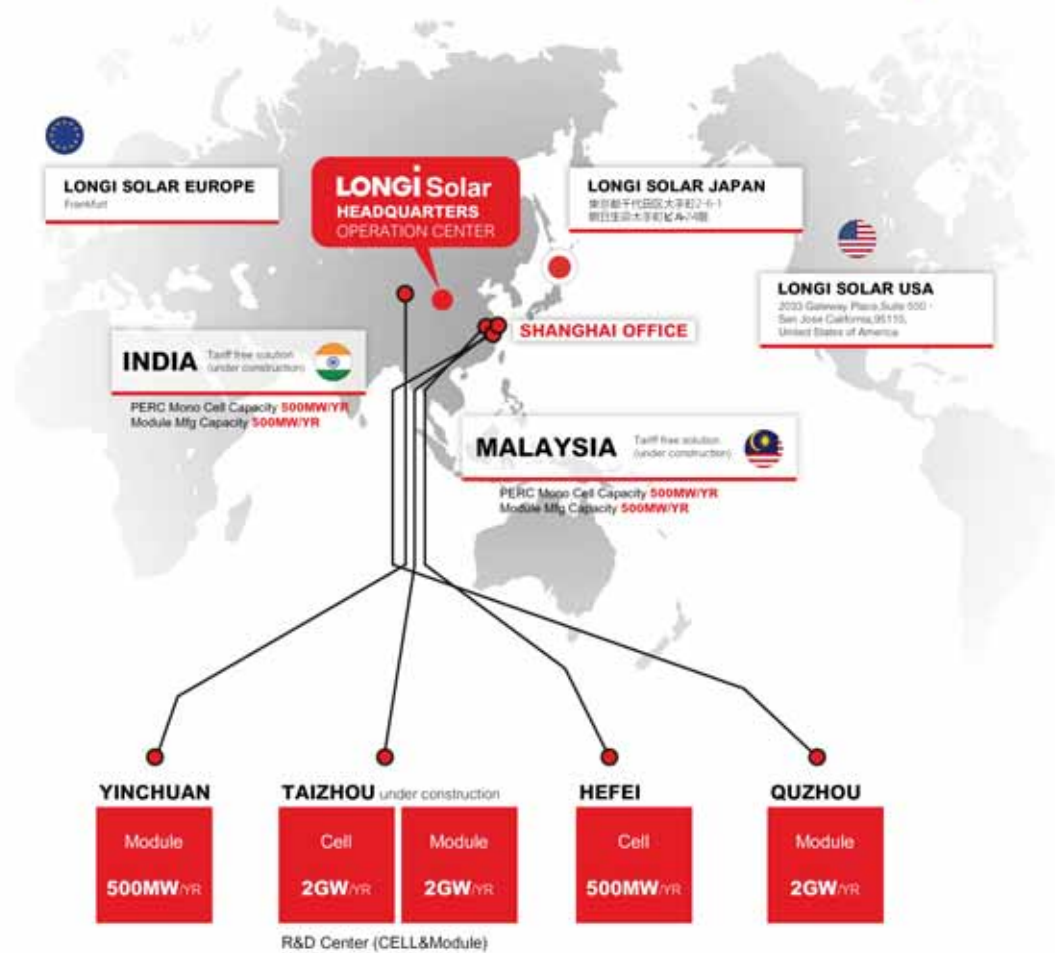
- 2000 Feb**
 Xian LONGI Silicon Materials Corp. was established
- 2007 Sep**
 LONGI's wholly-owned subsidiary-Ningxia
 LONGI-completes a silicon rod facility with 1000 ton annual capacity
- 2009 Nov**
 Slicing plant an annual 350MW Silicon project is completed
- 2012 April**
 Successful launch of LONGI's IPO on the Shanghai Stock Exchange,China
- 2014 Dec**
 Wafer shipments breakthrough 2GW
 Acquisition of LONGI Solar

2016

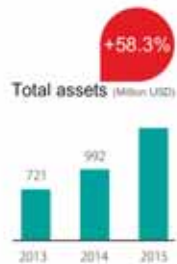


■ Production Capacity(GW) By the end of 2016

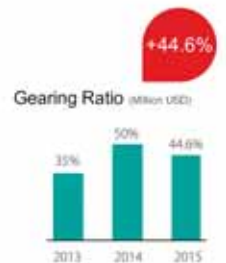
World Map



Reliability



Business Performance



Morgan Stanley's Top Investment Ideas

Investment ideas in light of industry

Long: 601012.00
Overweight: 22.1
Overweight: 14.66
Overweight: 51%

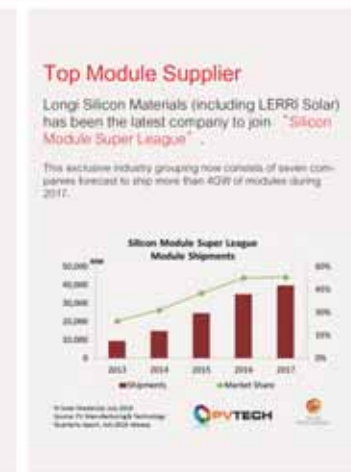
Top Investment Ideas – How to Navigate an Oversupplied Market

Exhibit 5: We highlight our top investment ideas in light of industry oversupply and technology trends.

Rating	Overweight	Overweight	Overweight	Equal-Weight	Equal-Weight	Underweight	Underweight
Trading Company	207	100	100	100	100	100	100
Price Target	28.1	27.8	27.2	28.9	17.8	14.2	9.88
Current Price	14.08	14.5	16.28	49.7	5.25	14.2	1.48
Upside/Downside (%)	97%	89%	66%	39%	71%	-19%	-35%
Market Cap (in USD mil)	4,291	2,213	240	4,312	100	100	2,284
Average Daily Volume (in USD mil)	38	47	6	122	9	47	21
52-Week High	22.7	21.5	22.4	72.4	17	22.4	14
52-Week Low	20%	10%	11%	20%	23%	7%	9%
52-Week Return	11.1	16.0	12.0	50.0	5.2	10.0	5.5
Dividend Yield	-20%	-20%	-20%	-20%	-20%	-20%	-20%
Dividend Date	0.7	0.7	0.7	0.0	1.0	0.1	0.0

Morgan Stanley Estimate	2015	2016	2017	2018	2019	2020	2021	2022
Revenue	14,200	16,400	18,200	19,800	21,500	23,200	24,800	26,400
EBITDA	3,800	4,400	4,900	5,300	5,700	6,100	6,500	6,900
EBIT	1,200	1,500	1,800	2,100	2,400	2,700	3,000	3,300
EPS	0.40	0.47	0.52	0.56	0.60	0.64	0.68	0.72

Report date Aug 2, 2015





Reliability

3 IEC Reliability Program

Power degradation <5% after DH3000,TC600,HF30,UV45....
 PID96h - PID300h and PID600h (85℃/85%RH)....
 Power degradation <3% Dynamic mechanical loading (1000cycles)+TC50+HF10

IEC	LONGI Solar
DH 1000	DH 3000
TC 200	TC 600
HF 10	HF 30
UV 15	UV 45

X3



Quality Control System

Product&Control Design

Comprehensive Quality system Design (ISO9001)
 New Product/Material Qualification
 Standardized Product Change Procedure
 3*IEC Requirement

Comprehensive Quality System Management

Vigorous Process Quality Control with 50+Check/Control Steps(FMEA,Control Pan,MSA)
 High Accuracy/Stability Measurement System

Customer Satisfaction

Recognition by Authorized Third Parties
 Continue improvement with Customer Feedback and internal FMEA
 Module performance tracing with customer

Continue Improvement

Whole Process Tracing by MES (Manufacturing Executive System)
 Completed Reliability Monitoring Procedure
 Co-working with industrial leading institutes and labs

1st-class Partners

We establish the strategic cooperation with the leading solar enterprises such as
 HUAWEI,TBEA,NDNE,DuPont and UNSW



Management System

- Internal Audit
- External Audit
- Product Audit
- Management Review
- Documents Standardization
- Process Audit



CUSTOMIZED SERVICES



WARRANTY

10Y MATERIAL & CRAFTWORK / **25Y83.8%** POWER-OUTPUT / **25YPG**

10 years warranty on material
25 years linear power output warranty
25-year non-cancellable term





CASES

Utility Solar Projects

Inner Mongolia 10MW Utility Project
Hailar, Inner Mongolia, China
10MW
Jun 2016



Joint Fishery-PV Hybrid Project
Nantong, Jiangsu, China
11.2 MW
2015



Sewage Water Treatment Plant
Taizhou, Zhejiang, China
0.78MW
2015



Ground Solar Power Plant
Nara Prefecture, Japan
66kW
Jun 2016



Eco-agri Solar Farm
Datong, Shanxi, China
100MW
Jun 2016



Eco-agri Solar Farm
Pucheng, Shanxi, China
40MW
Dec 2015

Commercial Rooftop Solar Projects



Nanchuan Industrial Park
Xining, Qinghai
10.1MW
May 2016



Xianhe Roof-mounted
Quzhou, Zhejiang, China
11.5MW
2014

Stuttgart, Germany
400kW
2011



Warnow, Germany
20kW
2011



Bremen, Germany
180Kw
2011

Residential Rooftop Solar Power Systems