



CONTRASTING OR CONVERGING INTERCONTINENTAL VIEWS ON THE IP PROTECTION OF TECHNOLOGY

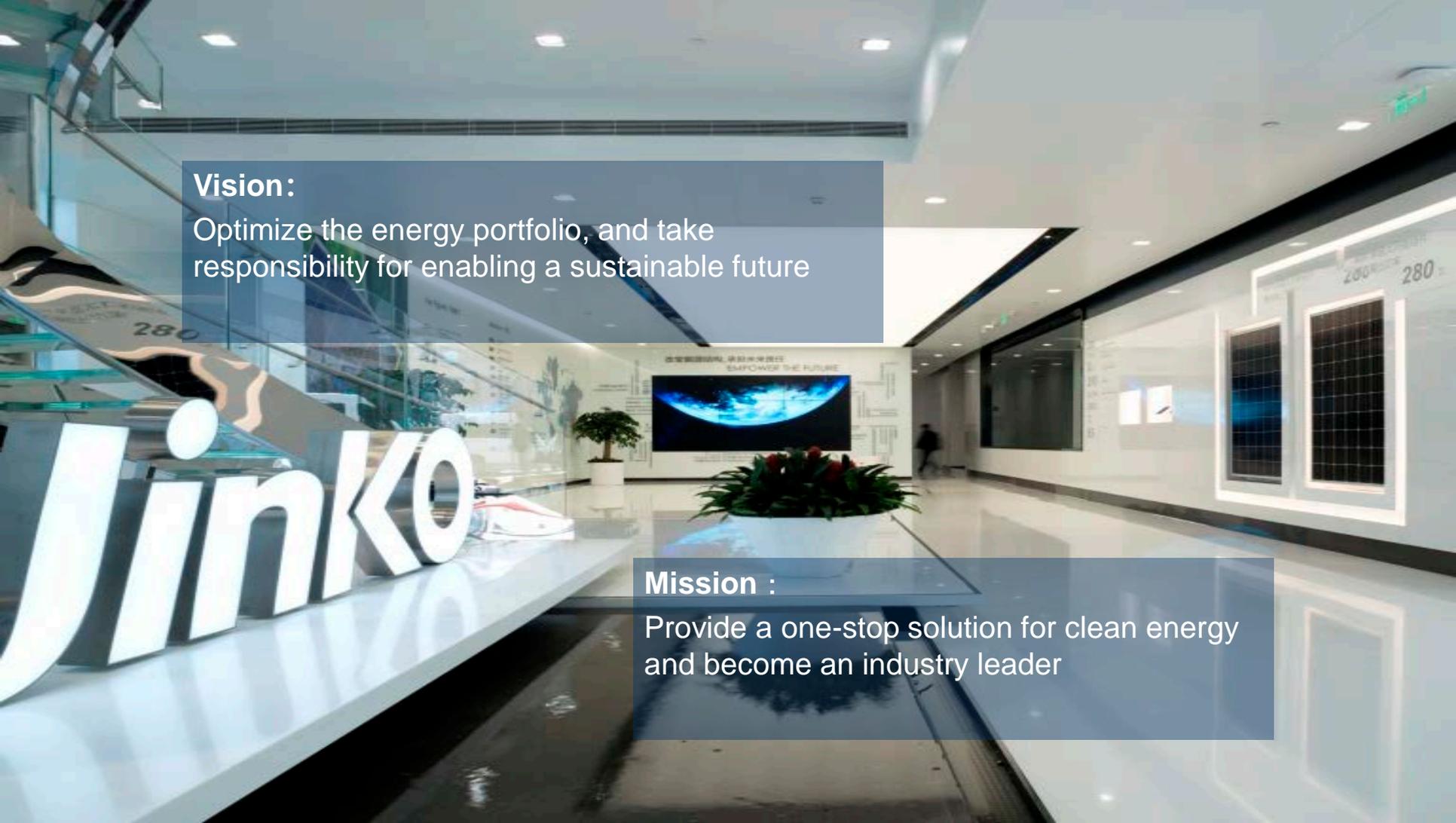
ANTONIO RUTA

Technical Service Manager Italy

Bocconi University, 11th of October 2018

JinkoSolar Co., Ltd.

Jinko Solar
Building Your Trust in Solar



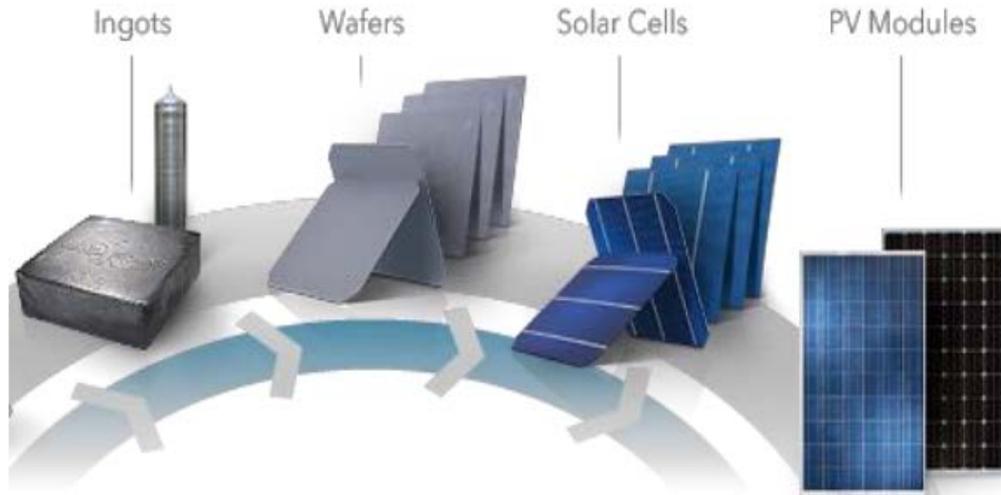
Vision:

Optimize the energy portfolio, and take responsibility for enabling a sustainable future

Mission :

Provide a one-stop solution for clean energy and become an industry leader

What We do



Quality Guaranty along the
complete value chain



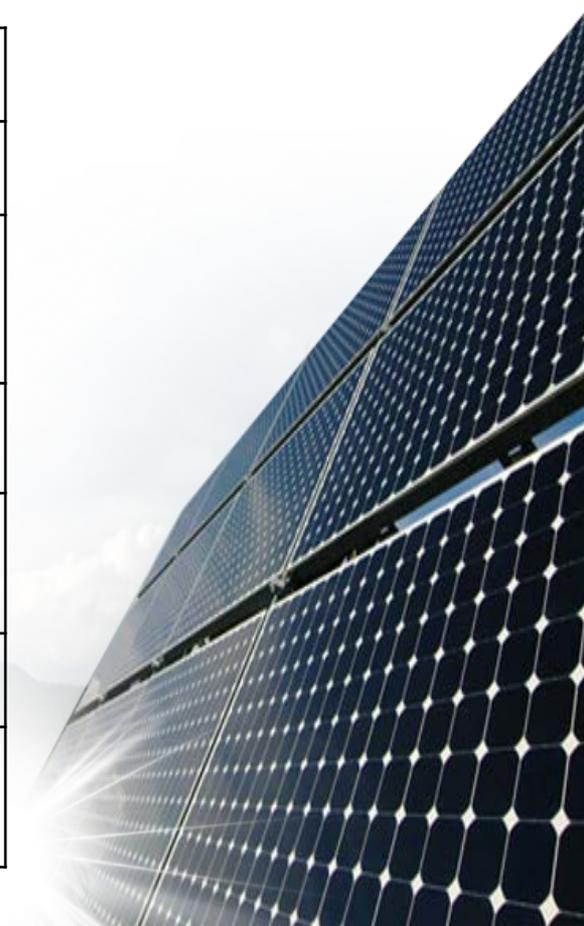
Ideal supply chain mgmt.
with top-class components



Optimized cost structure
with 10 years of experience

Major Milestones

2006	<ul style="list-style-type: none">• JinkoSolar Co., Ltd. established
2010	<ul style="list-style-type: none">• Listed on New York Stock Exchange (NYSE)
2012	<ul style="list-style-type: none">• World First solar company passing 85-85 PID test• Ranked No.2 in Photon Lab Test• Rank No. 4 in the PV Sustainable Growth index by PwC
2013	<ul style="list-style-type: none">• Launched module manufacturing facility in South Africa• Reached > 6 GW shipments
2015	<ul style="list-style-type: none">• Launched module manufacturing facility in Malaysia• Signed strategic collaboration agreement with DuPont Photovoltaic Materials
2016	<ul style="list-style-type: none">• Bankable with over 58 major international bank
2017	<ul style="list-style-type: none">• Largest producer of solar modules worldwide with 9.5 GW capacity per year



Key Figures

- World's **Largest** Solar Module Manufacturer
- **10 GW** shipped in 2017
- **29 GW** deployed worldwide
- **#1** Bankability ranking according to Bloomberg New Energy Finance
- **#1** Power Generation in TÜV Rheinland All Quality Matters Simulation (Poly Group)
- World Record 60-cell poly module output of **347.6 W**
- World Record 60-cell mono module output of **370 W**
- **1st** Chinese PV manufacturer to receive qualification plus Q+ certification from TÜV Rheinland
- **Top PV Brand** in Australia, Germany, and Austria according to EuPD Research



Technology-World Record Power Output

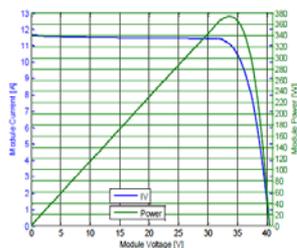
Model 单晶PERC多主栅
Ser.No DC2018sc4008
Area 244.48 cm²
Isc 10.187 A
Voc 0.690 V
F.F 83.32 %
Pm 5.855 W
Eff 23.95 %
D Temp 25 °C
D Irr 100 mW/cm²
File B20180423134805



P型PERC单晶电
池片 效率世界
纪录: **23.95%**

Appendix 3: Measurement report (IV curves)

Serial number: C38520180427110230700004



P型PERC单晶组件
功率世界纪录:
370W

4. Messergebnis

Measurement result

Kennlinienparameter des Messobjektes unter Standardtestbedingungen (STC) / IV curve parameter under Standard Test Conditions (STC):

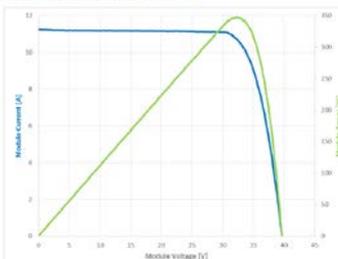
Leerlaufspannung / Open-circuit voltage:	V_{oc}	=	(671.7 ± 2.3) mV
Kurzschlussstrom / Short-circuit current (IEC 60904):	I_{sc}	=	(9.97 ± 0.19) A
Füllfaktor / Fill factor:	FF	=	(80.99 ± 0.59) %
Wirkungsgrad / Efficiency:	η	=	(22.04 ± 0.44) %
maximale Leistung / maximum power:	P_{max}	=	(5.42 ± 0.11) W



P型PERC多晶电池
片 效率世界纪录
: **22.04%**

Appendix 3: Measurement report (IV curves)

Serial number: 13C220170922110179290004 347.5W



P型PERC多晶组件
功率世界纪录:
347.6W

- **The continual improvement of our R&D capability is vital to maintaining our long-term competitiveness**
- **Jinko Solar continues to seek to protect our IP and proprietary knowledge by applying for patents for them.**
- **However China currently affords less protection to a company's intellectual property than some other countries, including the United States... Our lack of sufficient patent protection in and outside of China may undermine our competitive position and subject us to intellectual property disputes with third parties... We may be exposed to intellectual property infringement or misappropriation claims by third parties, which, if determined adversely to us, could cause us to pay significant damage awards and subject us to injunctions prohibiting sale of our products in certain markets.**
- **Our success depends on our ability to use and develop our technology and know-how, and to manufacture and operate our business in the solar industry without infringing the intellectual property or other rights of third parties.**



State Key Laboratory

- Overall **309** full-time technical staff at Jinko Solar (2017)
- In-house R&D center for solar cell research: over **7,000 m²** with **7** separate laboratory rooms and over **100** research equipment
- Close cooperation with global research institutes
- Granted **351 patents**, pending 285 in PRC (2017)
- These patents and patent applications relate to the technologies utilized in our manufacturing processes.

- For new technology and product, R&D will search patent during development stage.
- If any patent problems, R&D and legal will be involved for a solutions otherwise we will apply for new patent.
- Currently we have applied 923 patents from Shangrao and Haining factory. We have been authorized 512 patents including 51 invention patents and 456 utility model patents.
- Average yearly patents application is more than 180 including 70 invention patents and 110 utility model patents.
- Some example:
 1. A PV bifacial module, patent No. ZL201720408260.
 2. A PV dual glass module, patent No. 201520531746.5
 3. A PV module ribbon, patent No. ZL201620221271.4
 4. A PV kind of module, patent No. ZL201320833066.X

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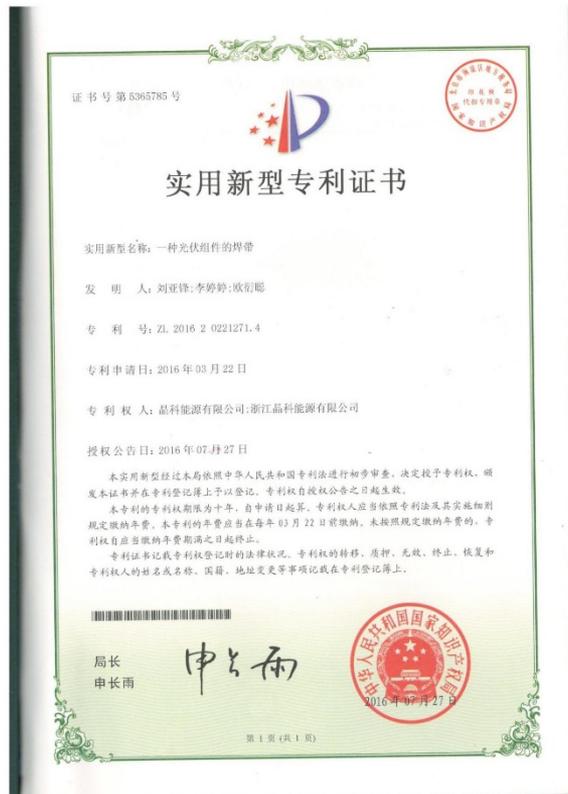
Refine Search: In field

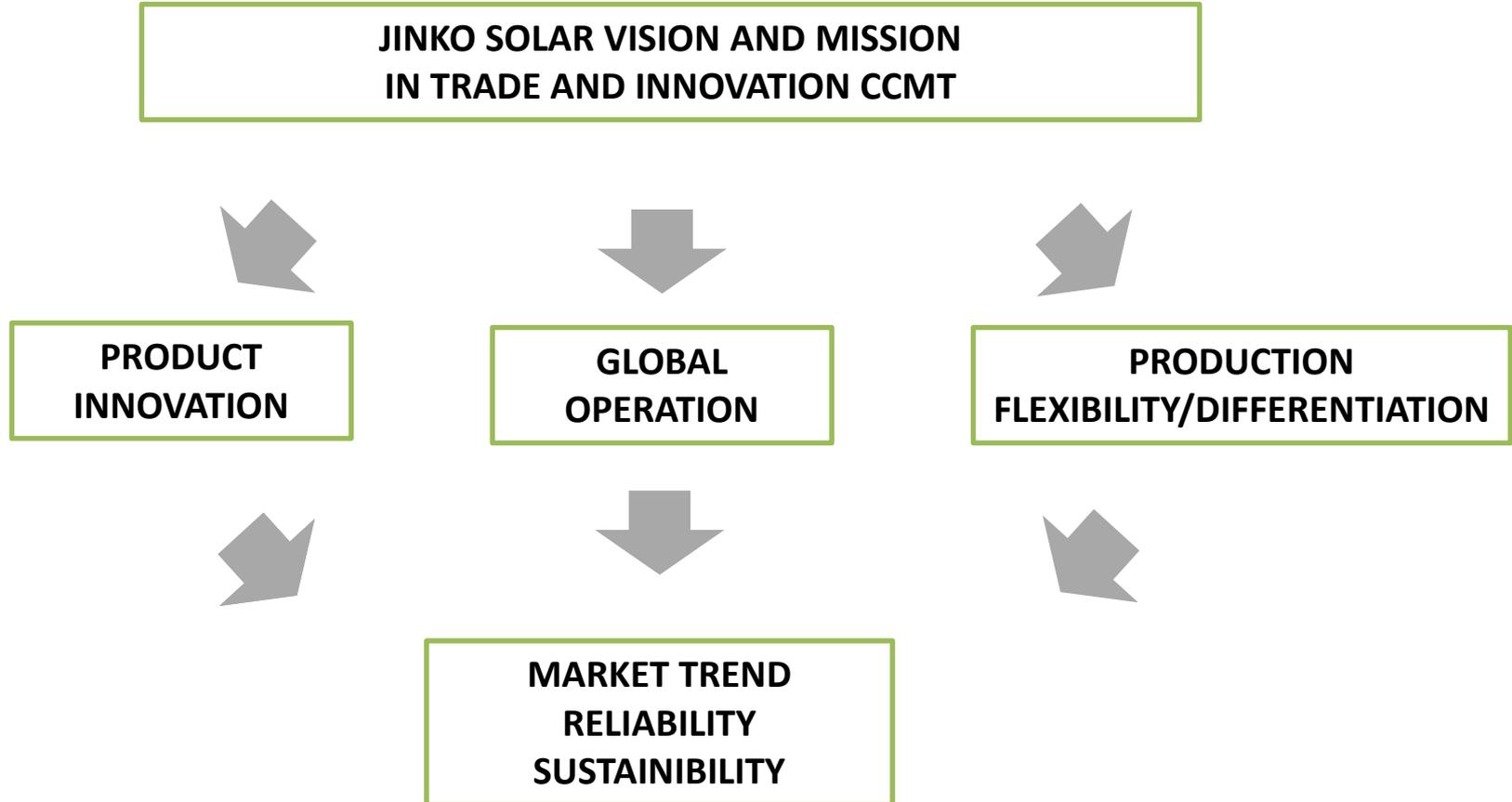


Search within results

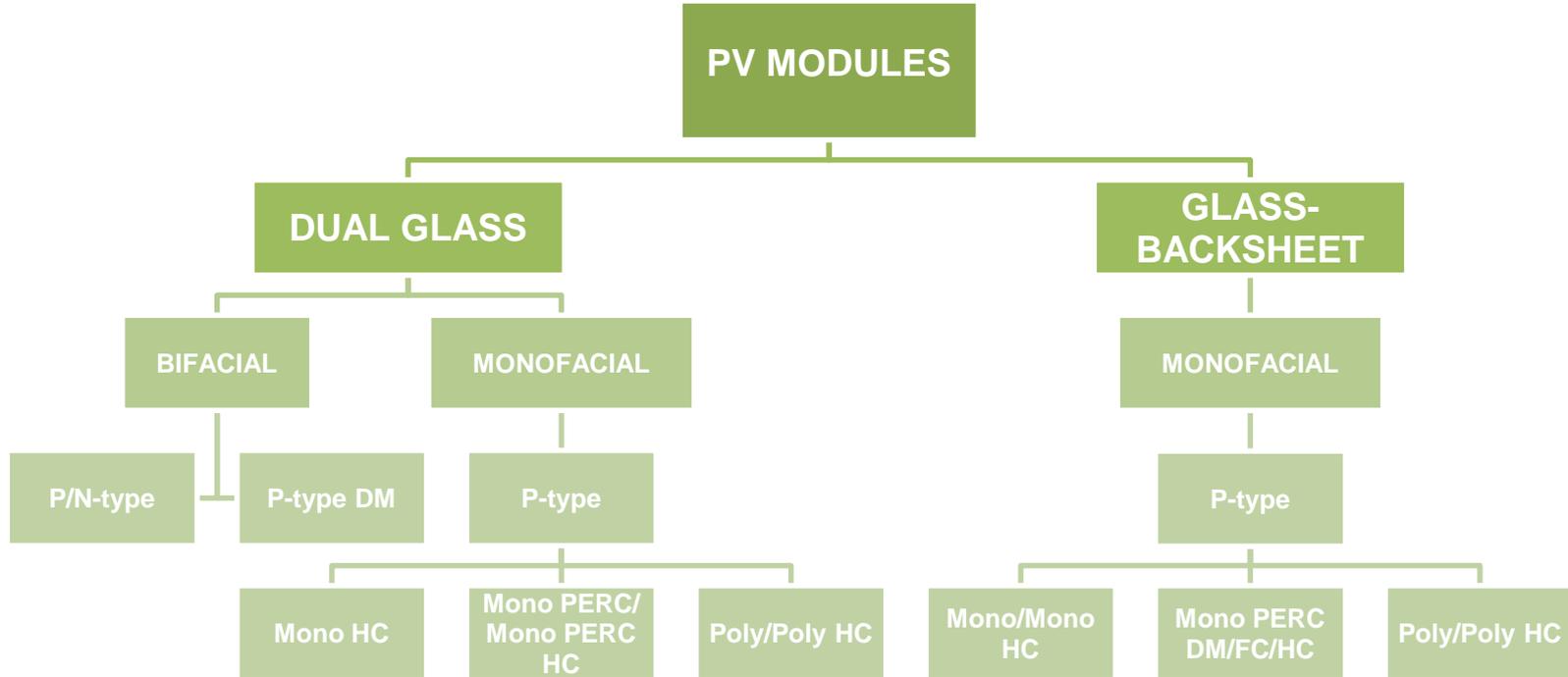
 All:760 Invention:358 Utility Model:402

SN	Appilcation Number	Title
1	200810144289	Technological method for slicing silicon
2	201010111336	Method for increasing charging capacity of single crystal furnace
3	201010114101	Deflection angle multi-line cutting method and cutting device thereof
4	201010237923	Method for detecting surface profile of wire wheel for multiwire saw wire cutting





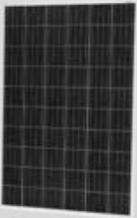
Diversified Module Portfolio



MORE THAN 300 BOM COMBINATIONS OF DIFFERENT CELL TECH, MODULE TYPE, ADD-ON SOLUTIONS

Product range

Eagle Poly



Smart
Module



Eagle Dual



Eagle Mono



Half-Cell



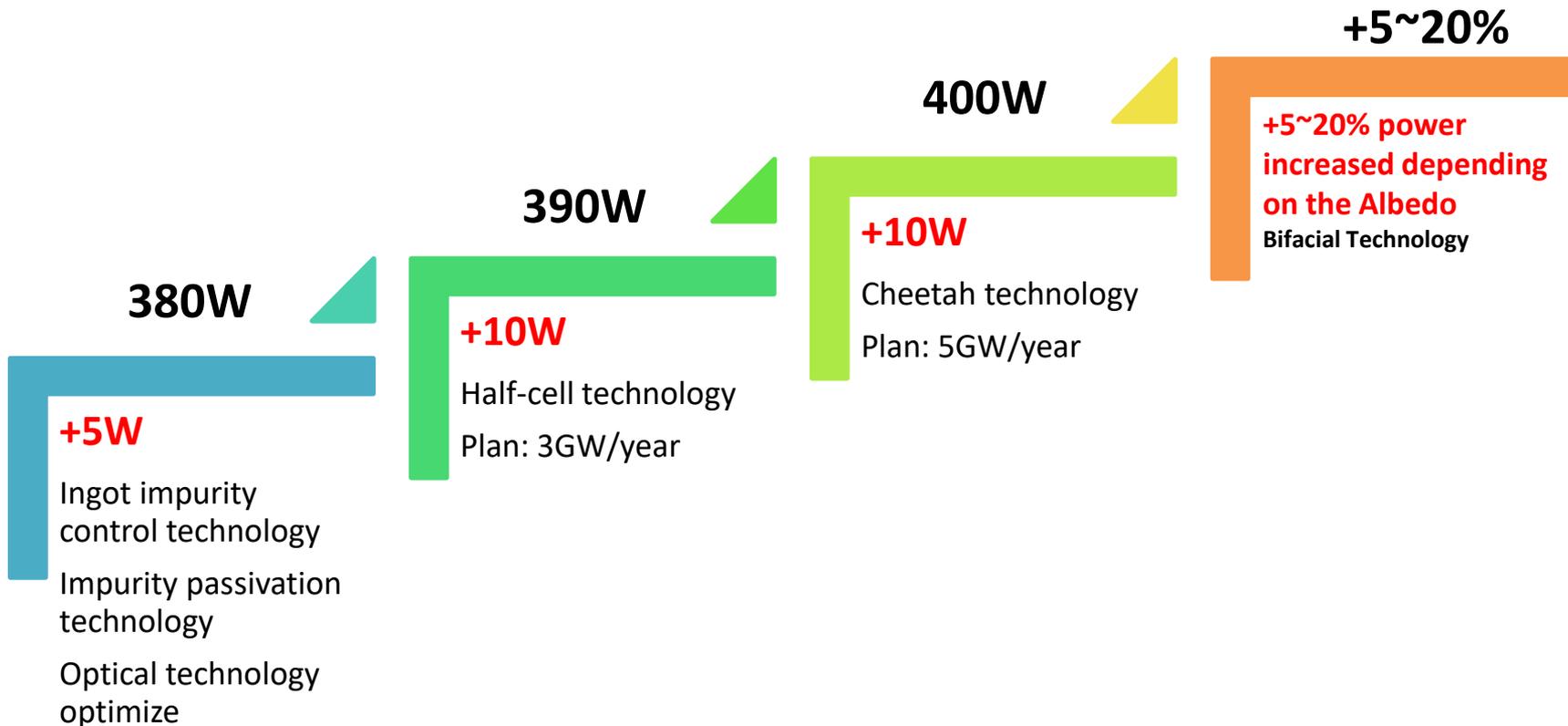
Bi-Facial



Cheetah



2018 Power Roadmap





The New *Jinko* Solar Cheetah

380W / 385W / 390W / 395W / 400W

(18.89% / 19.14% / 19.38% / 19.63% / 19.88%)

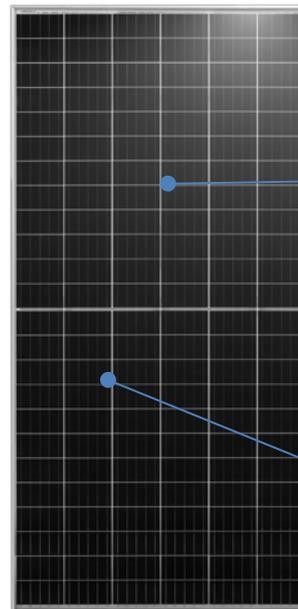
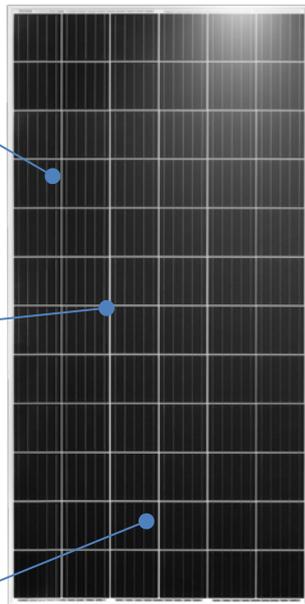
Cheetah Mono PERC Module Efficiency

Power roadmap

Industry leading cell tech.
(158.75mmx158.75mm)

Full-Cell

Half-Cell

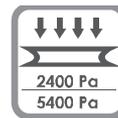


Avg. 7Wp power up compared to Cheetah full-cell

Less heat loss

Avg. 8Wp power up compared to 156.75mm Mono PERC

Less BOS cost

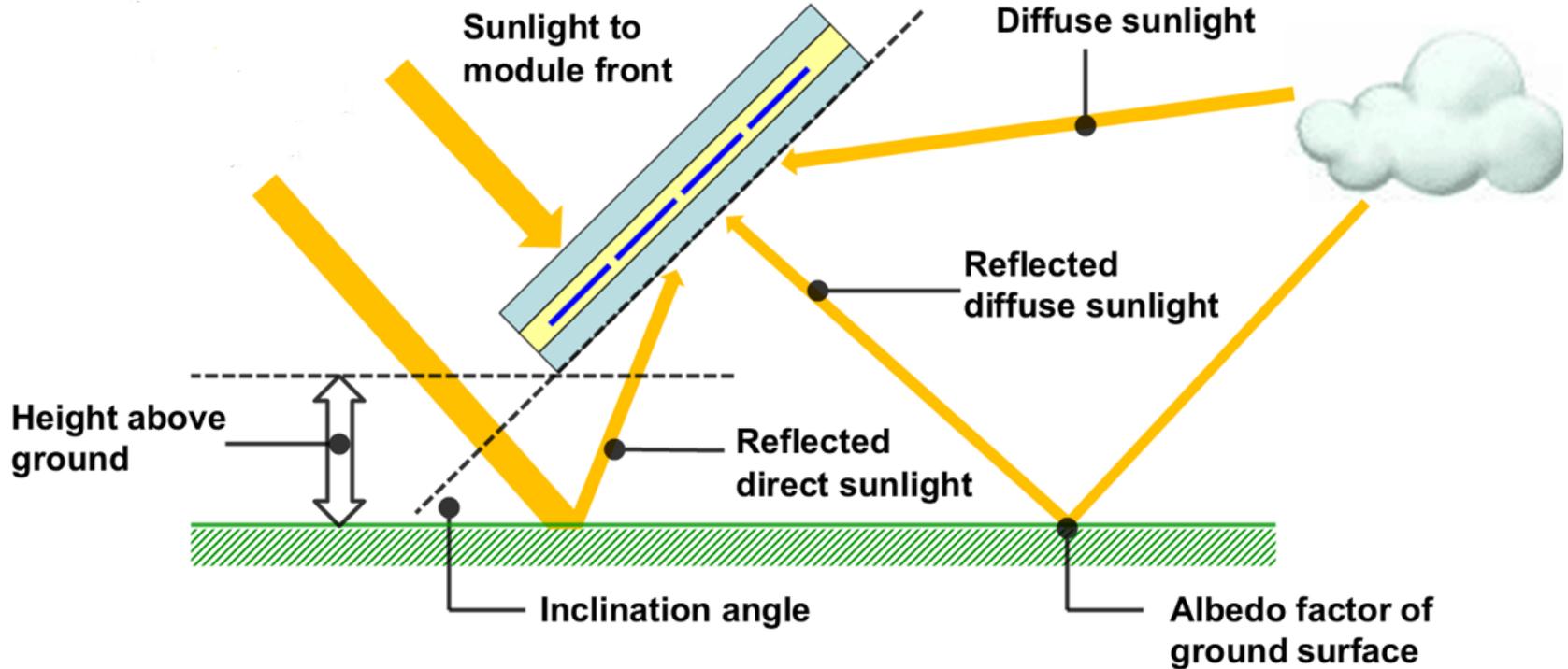


Bifacial



**+5~20% power
increased mainly
depending on the
Albedo**

Powering both sides

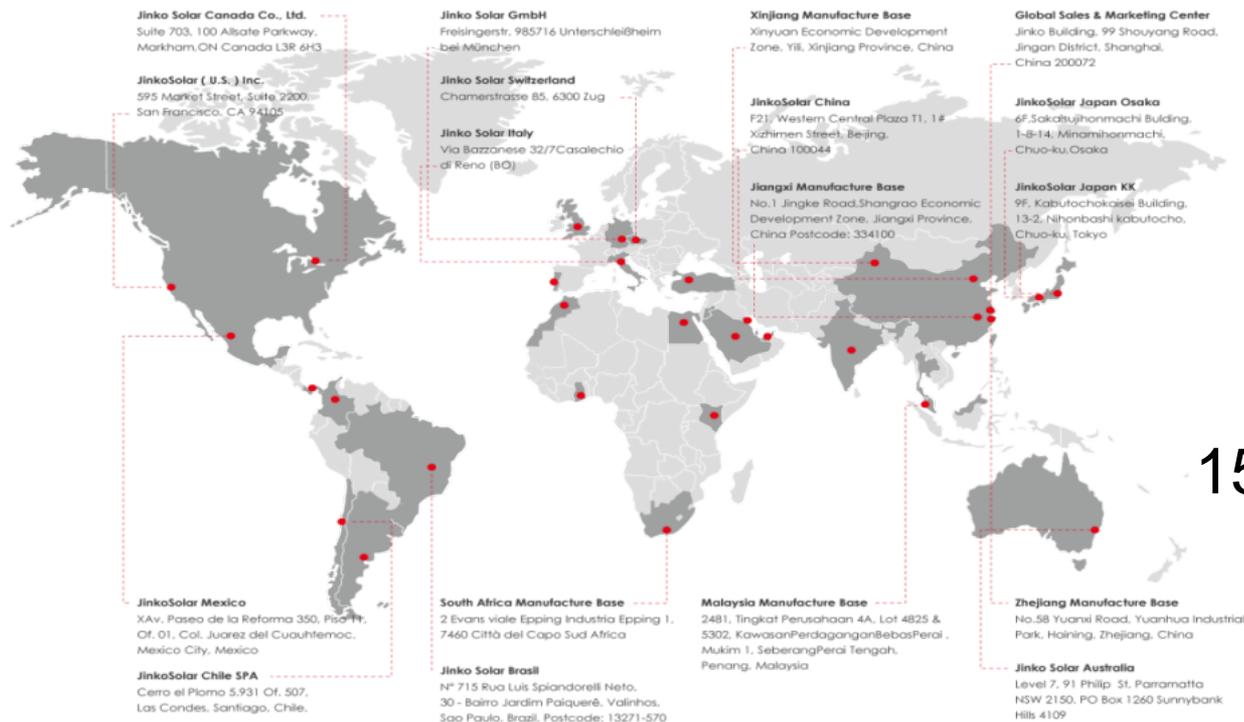


- **Creating non-Chinese operations that were geography, culture and sales-pipeline savvy, in exactly the correct global locations at any given time.**
- **Being able to juggle tactic and strategy effectively (flexible in-house, OEM, contract supply balancing).**
- **Seeing the Chinese market as low-priority, and being focused on being either number-one or number-two in all other major end-markets (regional or country-specific).**

source

<https://www.pv-tech.org>

JinkoSolar Operation



6 Global Factories

31 Subsidiaries

80+ Countries

15000 Employees

9.5 GW | 11,5 - 12 GW
Capacity 2017 | Capacity 2018 (est)

2018 Factory Capacity

Factory		MW/month
Chinese	Shangrao	415
	Haining	178
	Yunhuan	47
	(Yangzhou)Tiansheng	55
	OEM	619
Malaysia		196
America		27

Notes: OEM is just plan and not stability.

Going beyond the standards



Jinko Solar



1. PV Module bankability assessment

Bloomberg NEF defines PV module bankability as the willingness of a bank to provide a term loan to a PV project that uses a specific module brand. Banks compile their own whitelists of module brands that they feel comfortable with, mostly based on the financial health of the manufacturer and track-record of modules used in the field.

The two main concerns for lenders regarding PV modules are the financial health and the track record of the manufacturer.

Figure 2: Top 20 PV modules used in term-loan financed projects, all time

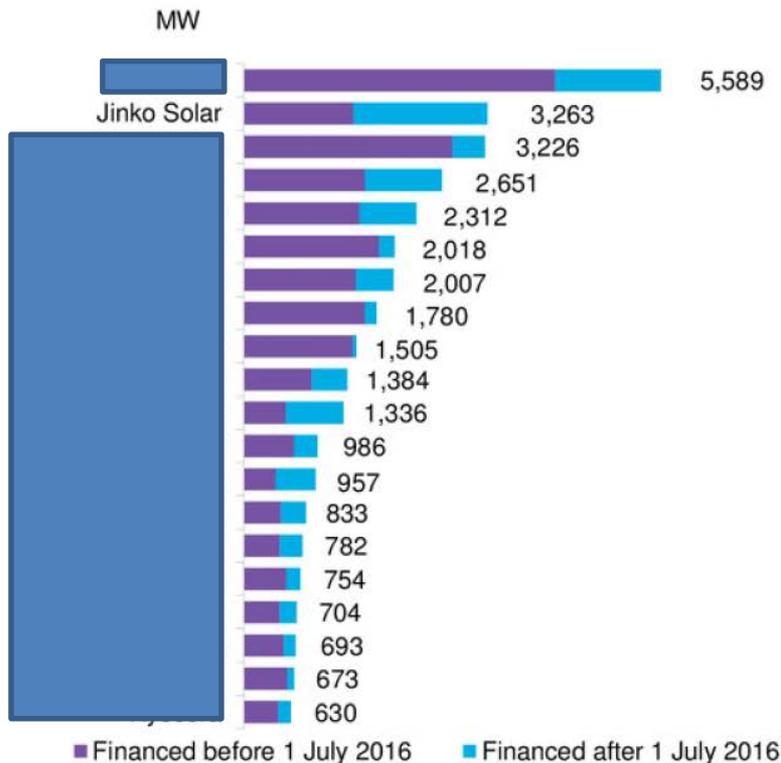
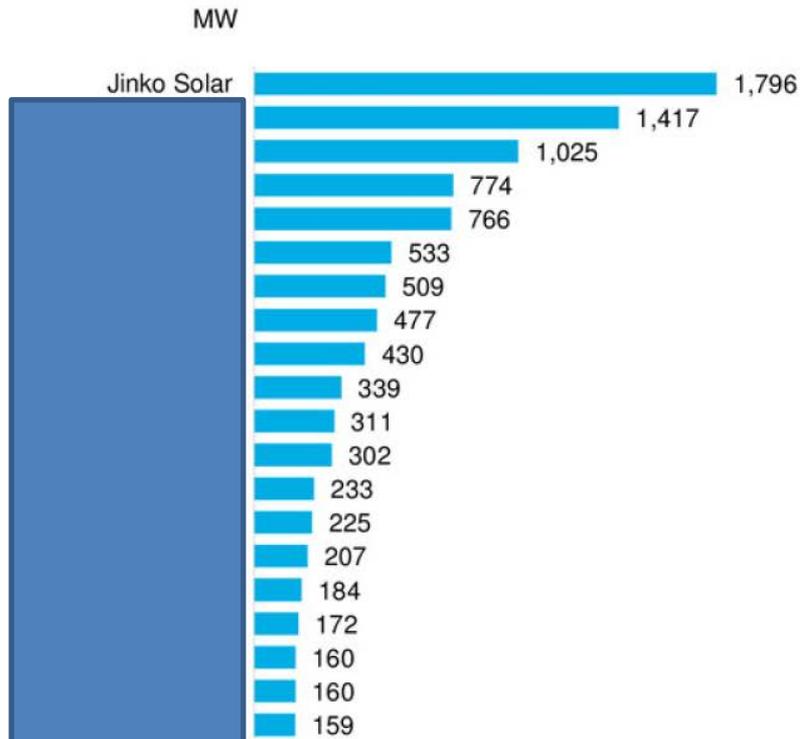


Figure 3: Top 20 PV module brands used in term-loan financed projects after July 1, 2016



- **Jinko Solar was the first Chinese firm to get the C2C certification**
- **This certification is a tangible sign of continuous improvement standard, and it is a sort of social/environmental product certificate.**
- **The silver score achieved is based on the scores reached for each category of assessment**

Cradle to Cradle Certified Product Scorecard	
MATERIAL HEALTH	Silver
MATERIAL REUTILIZATION	Gold
RENEWABLE ENERGY & CARBON MANAGEMENT	Silver
WATER STEWARDSHIP	Platinum
SOCIAL FAIRNESS	Silver
OVERALL CERTIFICATION LEVEL	Silver

Thank You!

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