



# Tendencias en la industria fotovoltaica

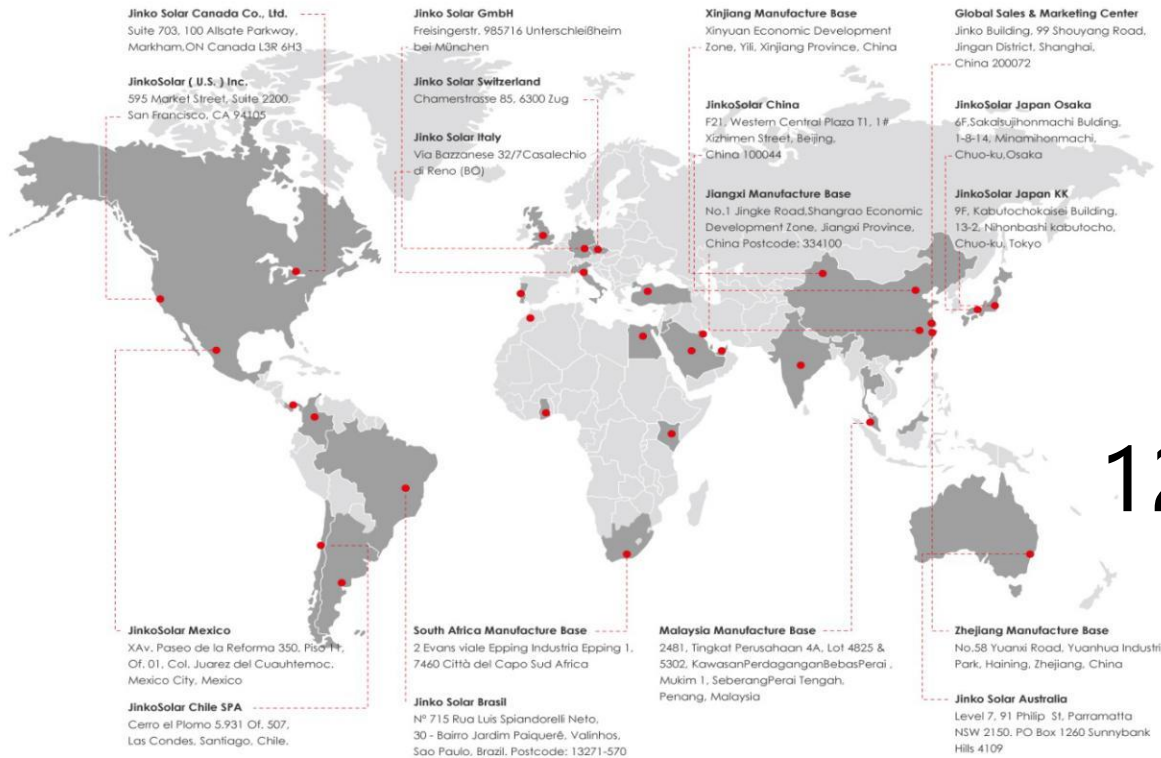
Nov 2018, Miguel Covarrubias, Gerente Comercial Zona Andina

**1 Jinko Solar, track record & quality oriented**

**2 Portafolio de productos, desafíos y tendencias**

**3 LCOE**

# Global Presence



**6** Global factories

**31** Subsidiaries/offices

**90** Countries with customers

**12,000** Employees

**9 GW**  
Capacity

**33.7 GW**  
Delivered

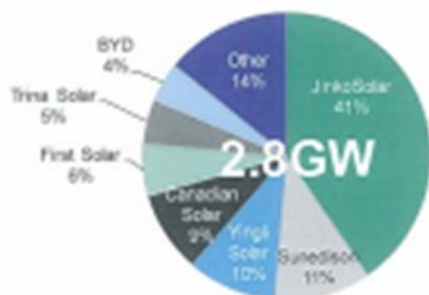
# Jinko Solar Presence in Latam Region



## LATIN AMERICA PV AND WIND MARKET SHARE, 2006-2016

**Bloomberg**  
NEW ENERGY FINANCE

Latin America PV module market share, contracts signed 2006-2016 (GW)



**JinkoSolar Market Share  
Latam  
2006-2016**

**41%**

Note: PV module and wind turbine market shares include commissioned and under-construction projects. Other PV module market share includes JA Solar, SunPower, Hanwha Q Cells, Suntech, 3Sun, GE and others. Other wind turbine market share includes Suzlon, IMPSA, WEG, Goldwind and others.






Source: Bloomberg New Energy Finance

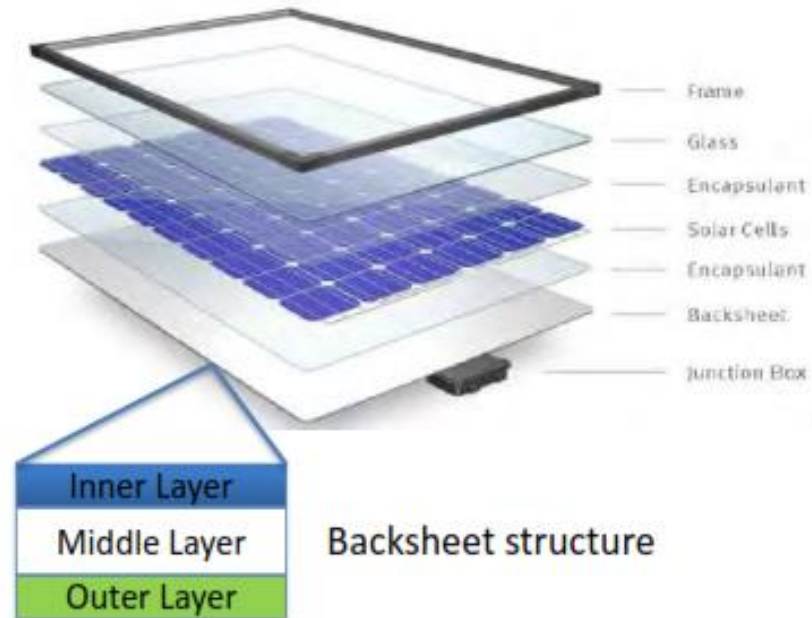
Quality driven



## Field Stress Envelop

### Stress Environment

	<b>Ultra Violet (UV)</b> <ul style="list-style-type: none"><li>• Transmitted</li><li>• Reflected</li></ul>
	<b>Temperature</b> <ul style="list-style-type: none"><li>• Peak</li><li>• Cycling</li></ul>
	<b>Moisture</b> <ul style="list-style-type: none"><li>• Humidity</li><li>• Precipitation</li><li>• Condensation</li></ul>
	<b>Corrosive Environment</b> <ul style="list-style-type: none"><li>• Atmospheric chemicals</li><li>• Ammonia</li><li>• Marine environment</li></ul>
	<b>Physical Protection</b> <ul style="list-style-type: none"><li>• Abrasion</li><li>• Impact</li></ul>



**Backsheet must provide reliable electrical protection of module over the expected lifetime (and beyond)**

# Tipos de Defectos en un Módulo FV



Coloración



Delaminación



Corrosión



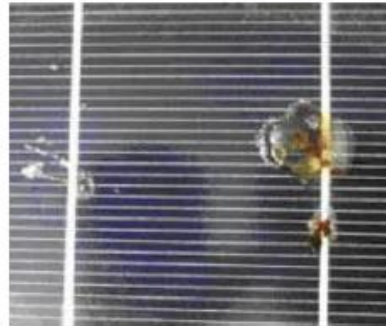
Fisuras



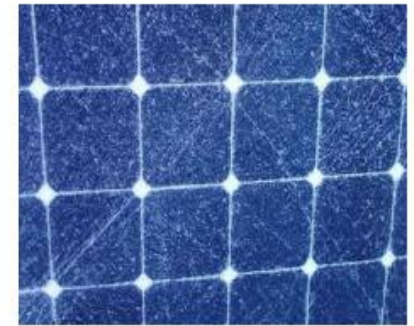
“Snail trail”



Diodos



Puntos Calientes



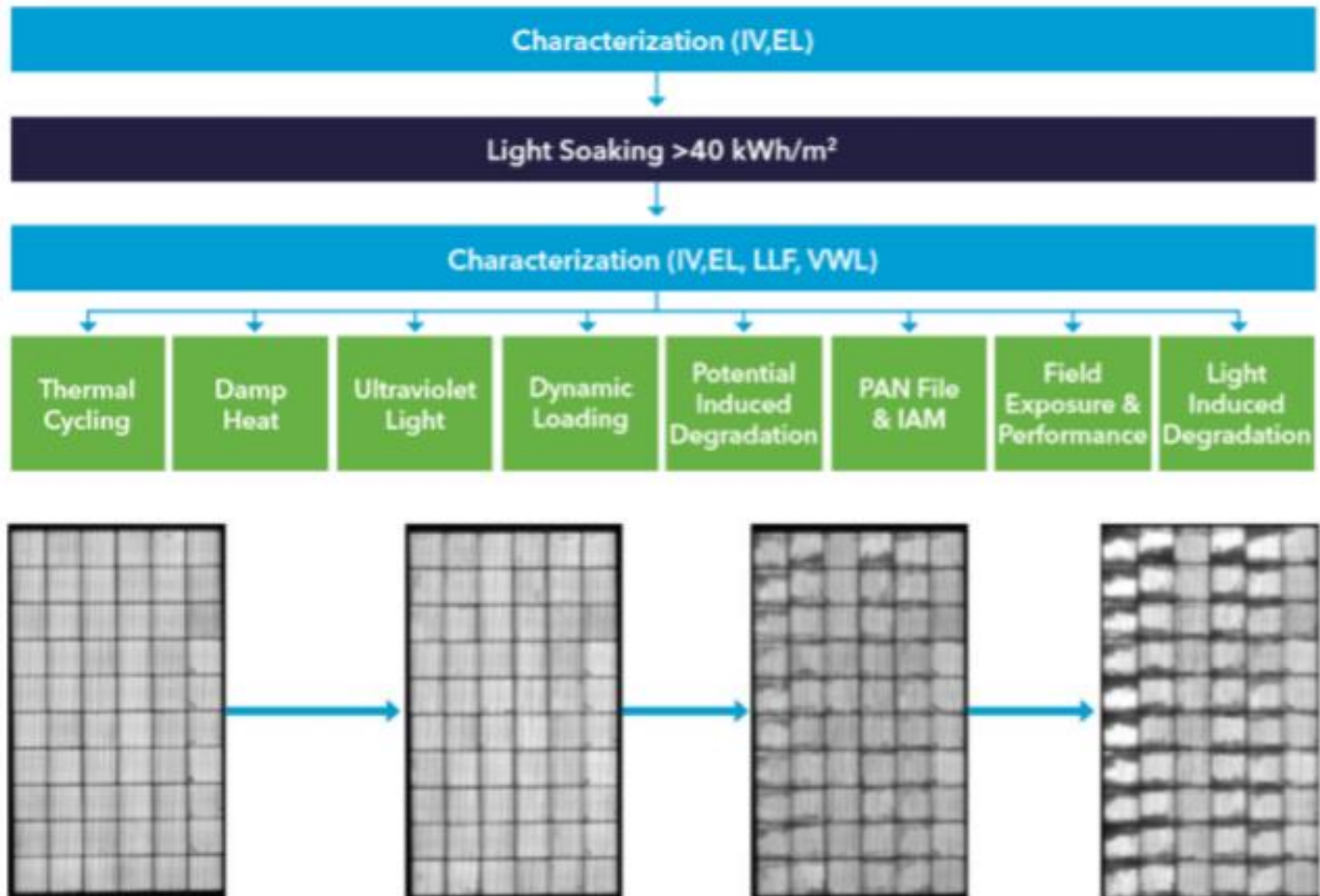
Rupturas

Mayor riesgo con temperatura, humedad, malas prácticas manipulación y montaje





## DNV GL – “Reliability Score Card”



“Top Performer” cuatro veces consecutivas



Jinko Solar



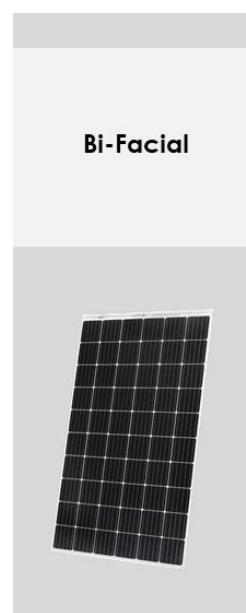
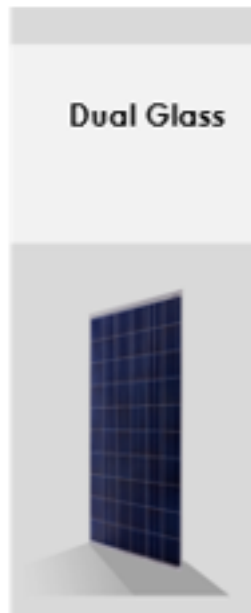
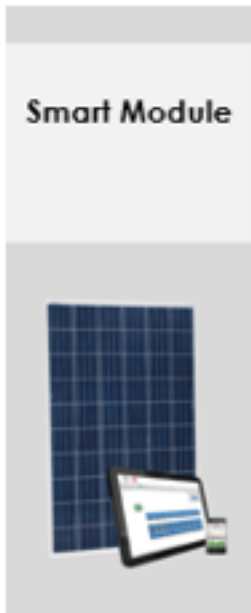
## THE PV MODULE PRODUCT QUALIFICATION PROGRAM

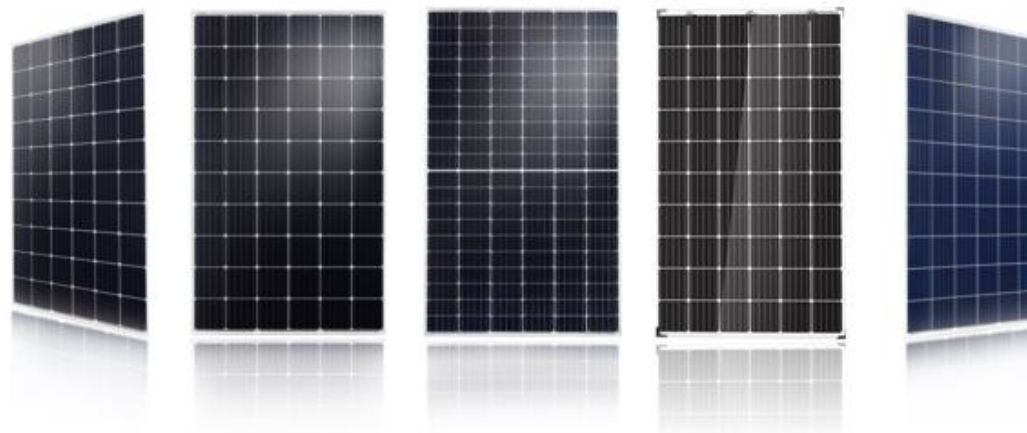
---

**1 JINKO SOLAR**

**2 Portafolio de productos, desafíos y tendencias**

**3 LCOE**





Tipo Módulo	72 Celdas (W)
Poly	320-340
Mono PERC	360 - 380
Mono PERC Cheetah	370 - 390
Bifacial P Cheetah	400 – 420*
HC	+5Wp

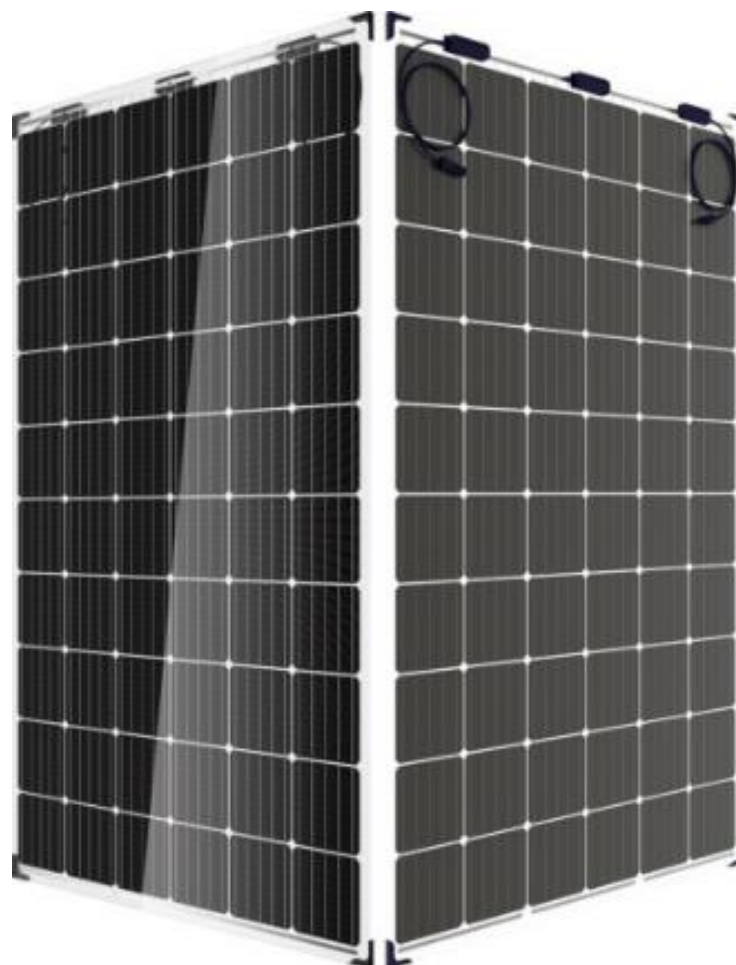
\*10% gain on the rear side



Product Type	Cell Type	Cell Dimen.	No. of Cells	Module Dim.
Mono PERC 72	Mono PERC	156.75x 156.75mm	72	1956x992x40mm
Cheetah 72	Mono PERC	158.75x158.75 mm	72	1979x1002x40mm

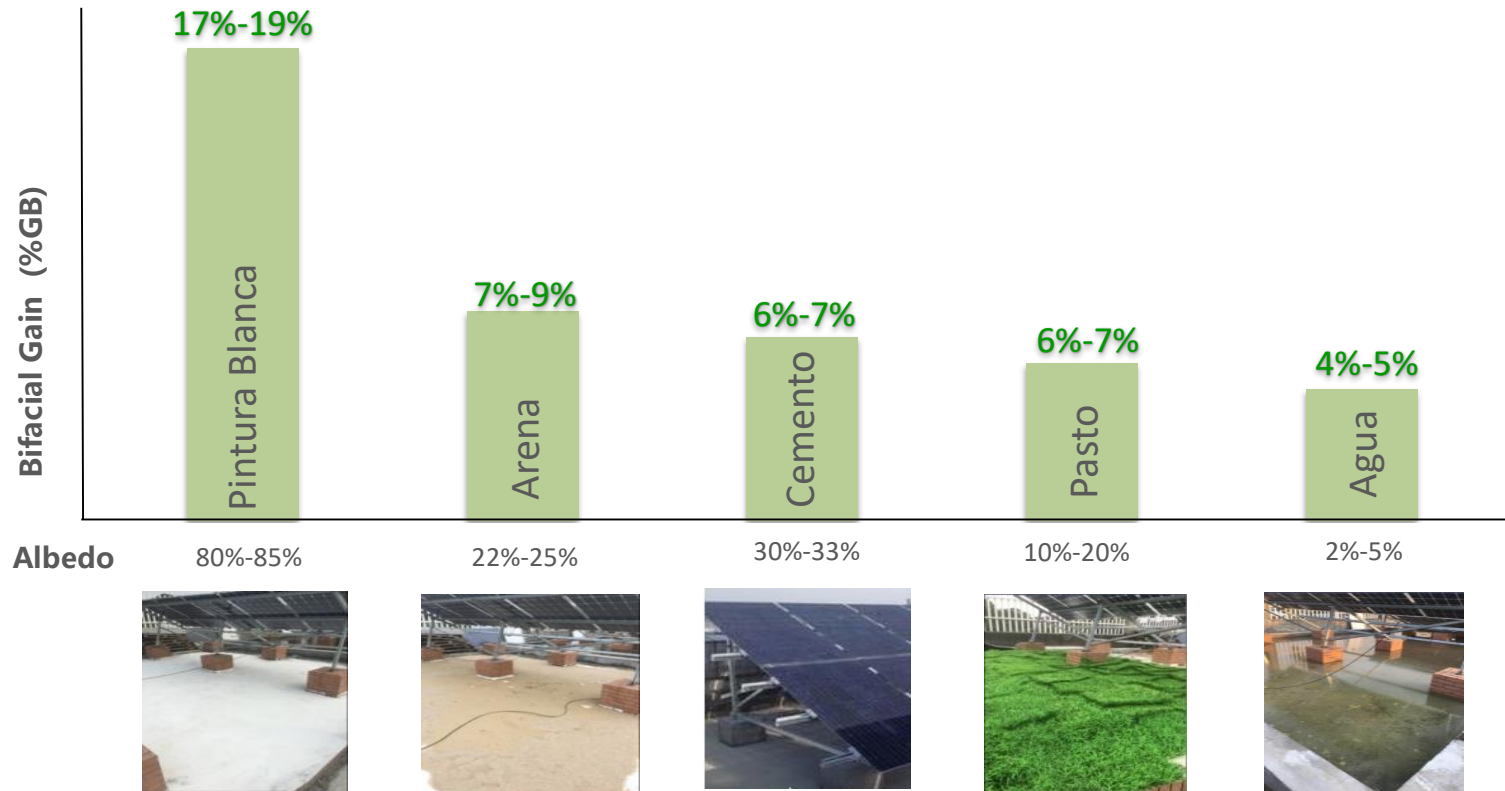
**Module:** Ancho aumenta 10 mm y Largo 23 mm

## MODULOS BIFACIALES



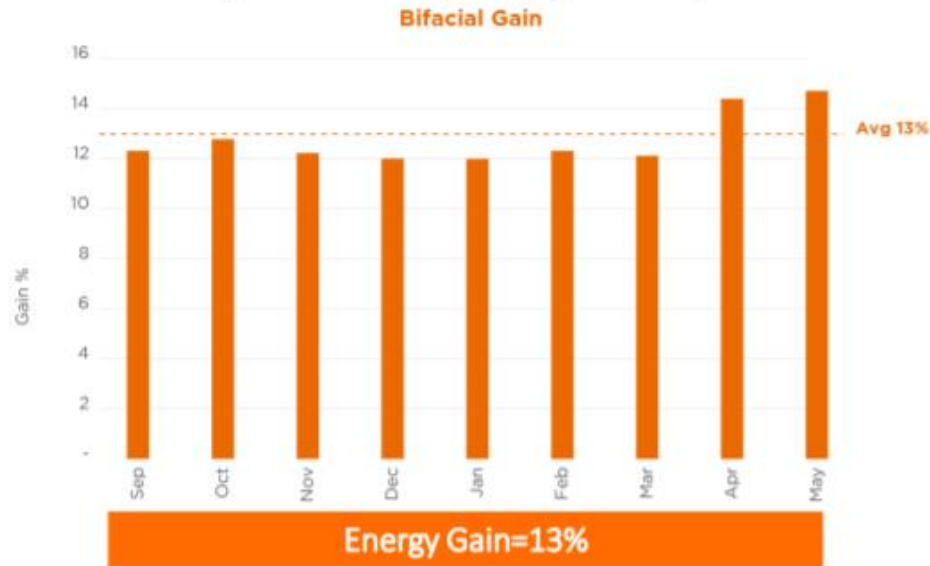
# Ganancia Bifacial

El incremento de Energía producida depende de la reflectividad del suelo (Albedo), la inclinación del panel y la altura del arreglo FV.





## Case Study: La Silla (Chile, 2015)

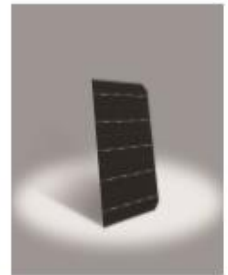


	Gain=12%	Gain=15%
$\Delta$ COE	-5.3%	-7.2%
$\Delta$ IRR	5.7%	9.1%

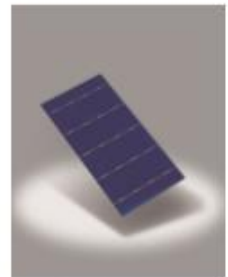


Source: Agnese Di Stefano, Giuseppe Leotta, Fabrizio Bizzarri, Enel Green Power SpA (2017) 'La Silla PV plant as a utility-scale side-by-side test for innovative modules technologies'. 33rd European Photovoltaic Solar Energy Conference and Exhibition.

## MODULOS HALF CELL

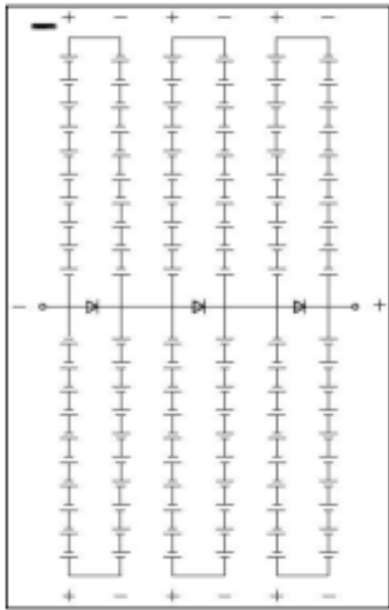


Mono PERC Half cell

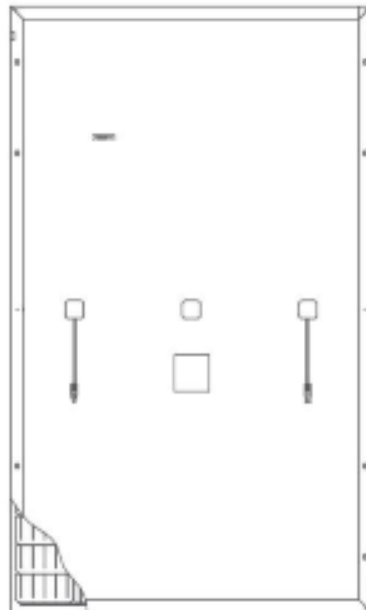


Poly Half cell

## Engineering Design

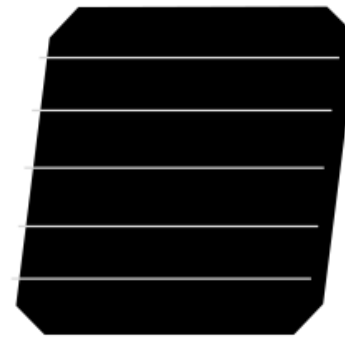


Front side

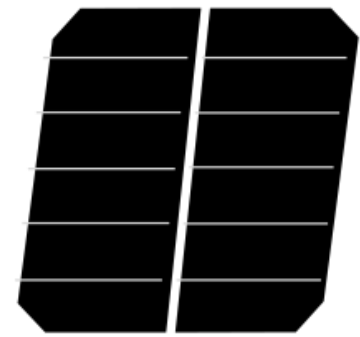


Rear Side

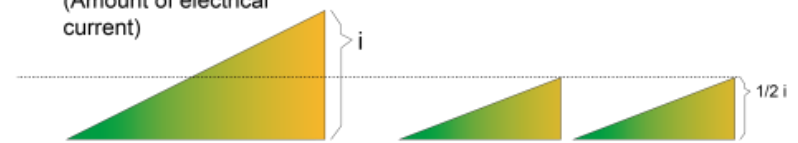
Full Size



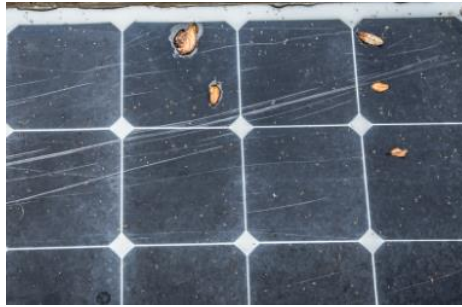
Half-cut Size



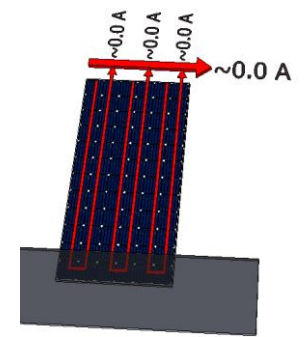
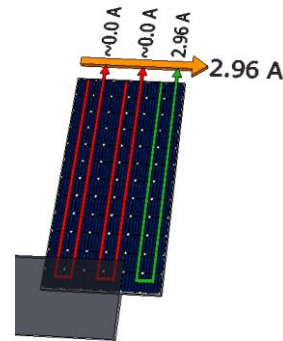
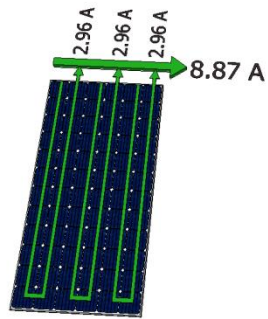
(Amount of electrical current)



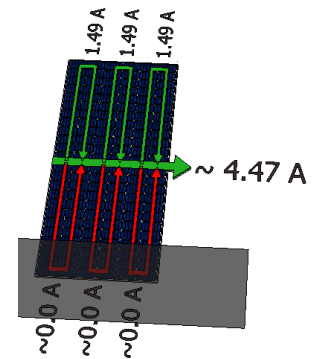
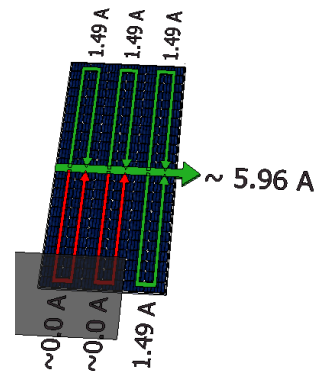
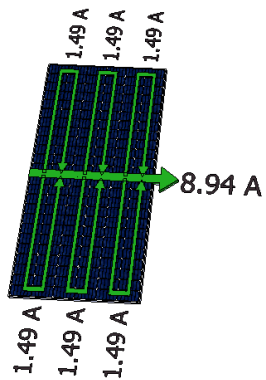
# Reducción de Pérdidas por Sombra



Standard



Half - Cell



# Reducción de Pérdidas por Temperatura



**Av. Temp. of  
Module: 40.1 °C**

**Ave. Temp. of  
Module: 38.7 °C**

**Coeficiente de temperatura:  
Half Cell - 0.36%  
Full Cell - 0.38%**

**~4% mas Energía**

**TRACK RECORD**

**DISEÑO**

**INSTALACION**

**COSTEO**

**BANCABILIDAD**

**1 JINKO SOLAR**

**2 Portafolio de productos, desafíos y tendencias**

**3 LCOE**

# Costo Nivelado de la Electricidad

Gen.	Tipo Módulo	#Mod	Potencia Mod. (W)	Potencia Planta (kW)	Producción (MWh/año)	Rendimiento (kWh/kWp)	Source
	Poly std	606.060	330	200.000,0	552.974	2.765	PVsyst
	Mono PERC Cheetah	512.820	390	199.999,8	550.907	2.755	
	Mono PERC Cheetah HC	505.352	395	199.614,0	554.346	2.772	
	Bifacial Cheetah	512.820	390	200.007,0	604.415	3.022	

Costos	Tipo Módulo	Modulos menos respecto a	% Ahorro BOS	US/Wp Modulos (referential)	Capex Modulos USD	BOS con ahorros US/Wp	Capex BOS USD	Full EPC USD	Full EPC US/Wp	Source
	Poly std	0	0	0,250	50.000.000	0,450	90.000.000	140.000.000	0,7000	Internal
	Mono PERC Cheetah	93.240	2,8%	0,260	51.999.948	0,438	87.500.131	139.500.079	0,6975	
	Mono PERC Cheetah HC	100.708	3,0%	0,265	52.897.721	0,437	87.131.528	140.029.249	0,7015	
	Bifacial Cheetah	93.240	2,8%	0,280	56.001.960	0,438	87.503.281	143.505.241	0,7175	

LCOE	Tipo Módulo	USD/MWh	Capex increase/decrease	LCOE USD/MWh increase-decrease	Source
	Poly std	8,44	0,00%	0	Internal
	Mono PERC Cheetah	8,44	-0,36%	0,0%	
	Mono PERC Cheetah HC	8,42	0,21%	-0,2%	
	Bifacial Cheetah	7,91	2,50%	-6,2%	

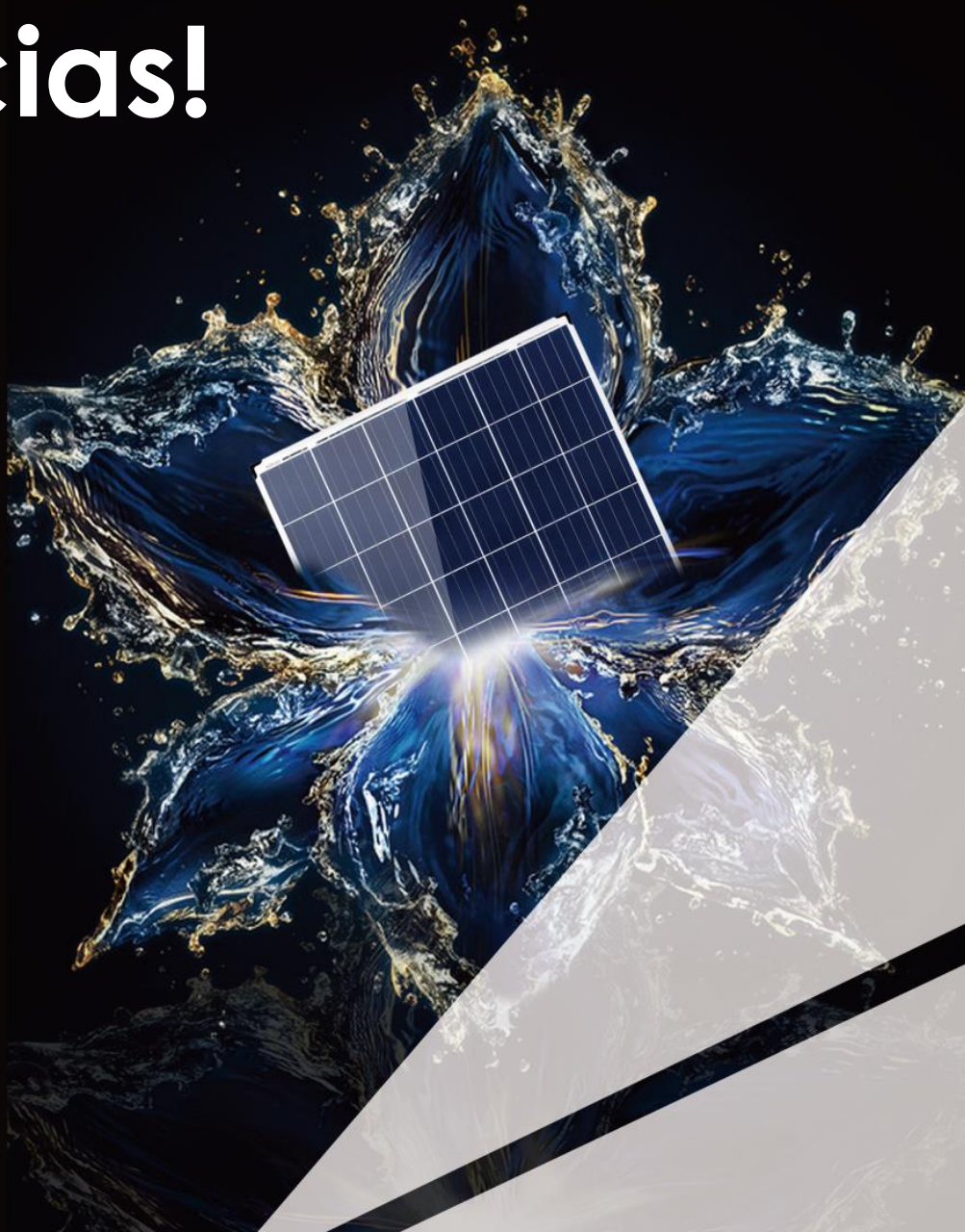
Assumptions		
Full EPC	0,7	US/Wp
BOS	0,450	US/Wp
Plant lifetime	30	years

\*O&M has not been included to simplify analysis



Miguel.Covarrubias@jinkosolar.com

**Gracias!**

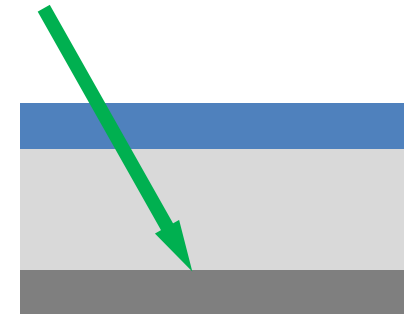


# Eagle PERC 72M

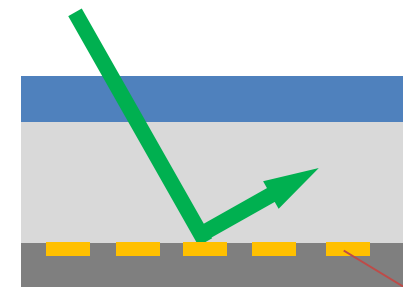
## 360-380 Watt

MONO CRYSTALLINE MODULE

- Eficiencia Módulo      18.55 a 19.58%
- Temp. Coeff.            **-0.37%**
- Degradación            3% 1st yr / 0.7% 2-25yr
- Empaque                624 mod./contenedor
- Peso                      22.5 kg
- Dimensiones            1956 x 992 x 40 mm
- Vidrio antireflejante/ Templado de alta transparencia



ESTÁNDAR



PERC

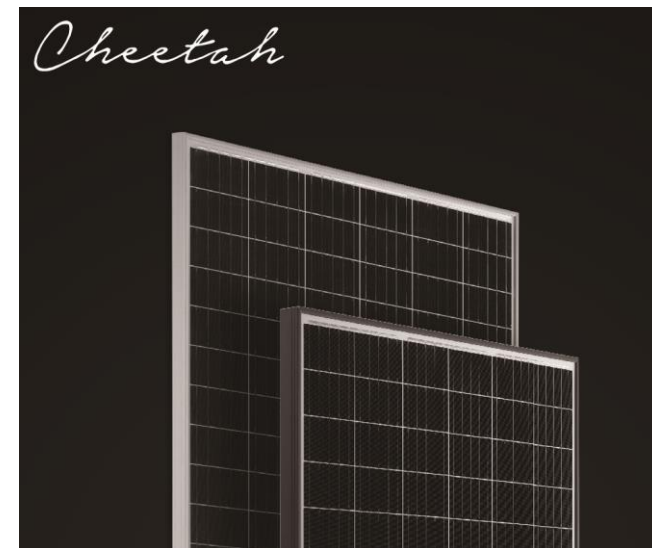
Capa Pasivada

# Cheetah 72M-V

## 370-390 Watt

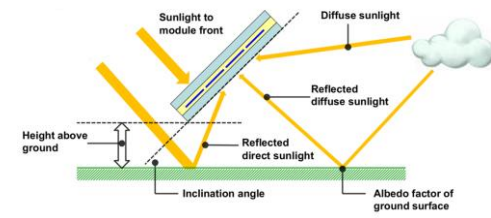
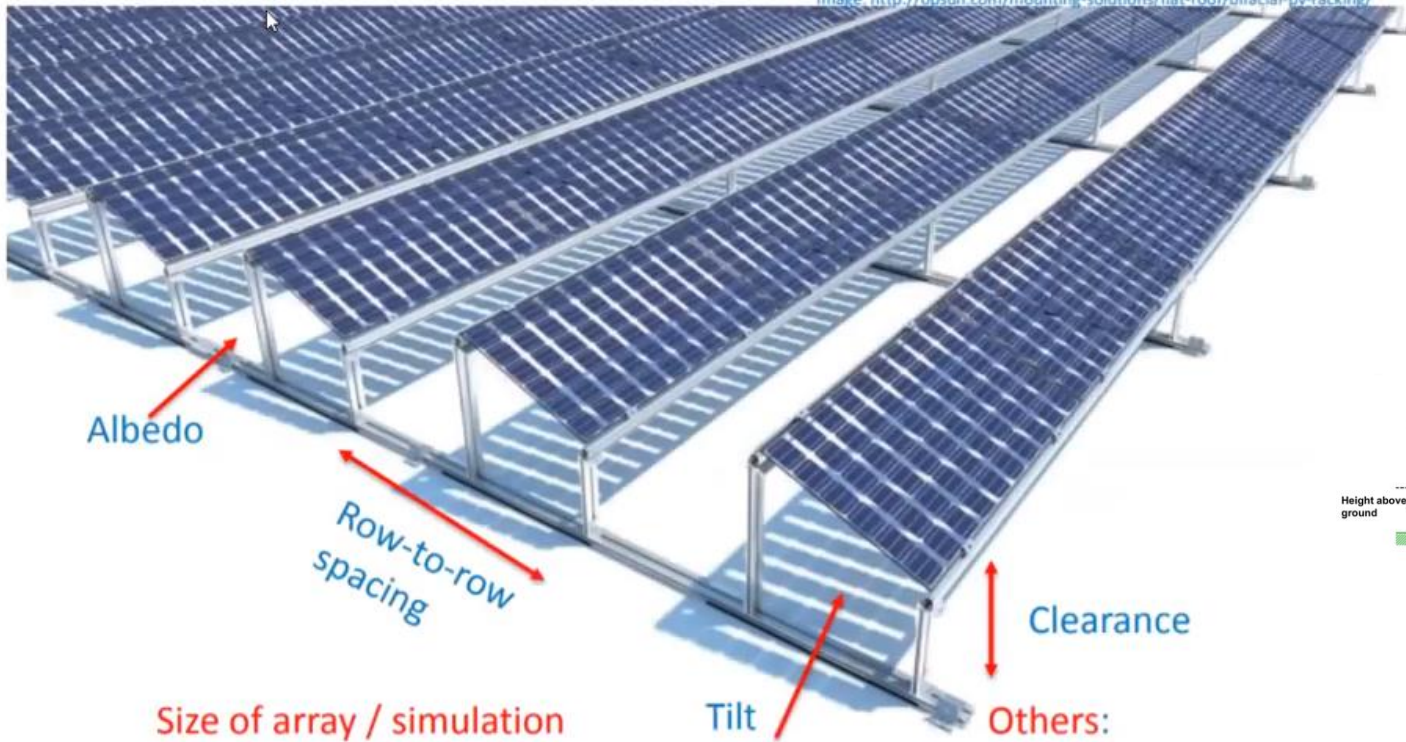
MONO PERC MODULE

- Eficiencia Módulo 18.66 a 19.67%
- Temp. Coeff. **-0.37%**
- Degradación 3% 1st yr / 0.7% 2-25yr
- Empaque 572 mod./contenedor
- Peso 22.5 kg
- Dimensiones 1979 x 1002 x 40 mm
- Vidrio antireflejante/ Templado de alta transparencia



# Environmental Albedo

Image: <http://opsun.com/mounting-solutions/flat-roof/bifacial-pv-racking/>



Size of array / simulation  
Location  
Weather  
Sky Diffuse Model

Others:  
Spacing between cells  
Shade obstructions