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Jinko Solar

29 April 2020

8 AM – 9 AM	| CDT, México
9 AM – 10 AM	| EDT, New York
3 PM – 4 PM	| CEST, Berlin
9 PM – 10 PM	| CST, Beijing

Marian Willuhn

Editor | pv magazine

pv magazine webinars

Integrating bifacial - New system design and bespoke products

Kaushik Roy Choudhury

DuPont Photovoltaics and Advanced Materials

Andrea Viaro

Jinko Solar EU

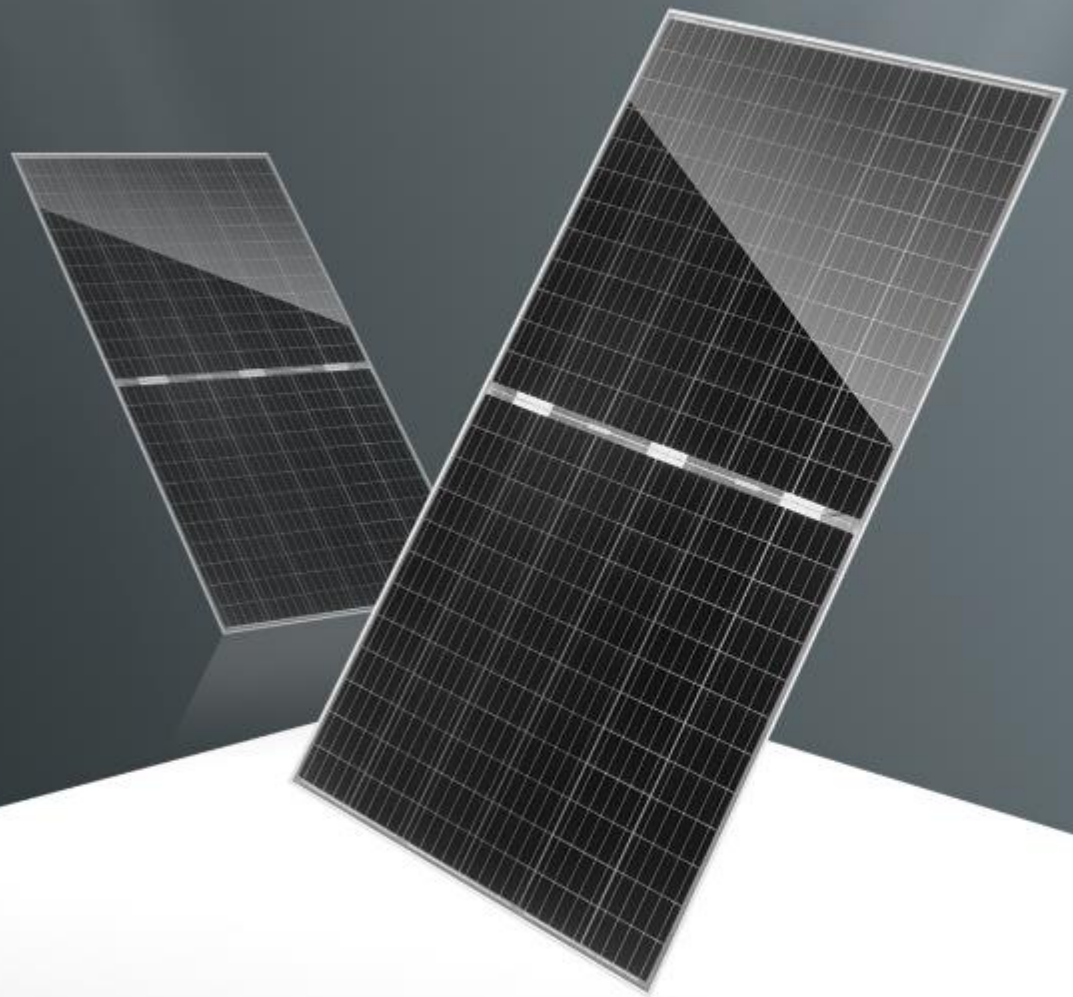
Corrine Lin

PV Info Link

Eric Kuo

NEXTtracker

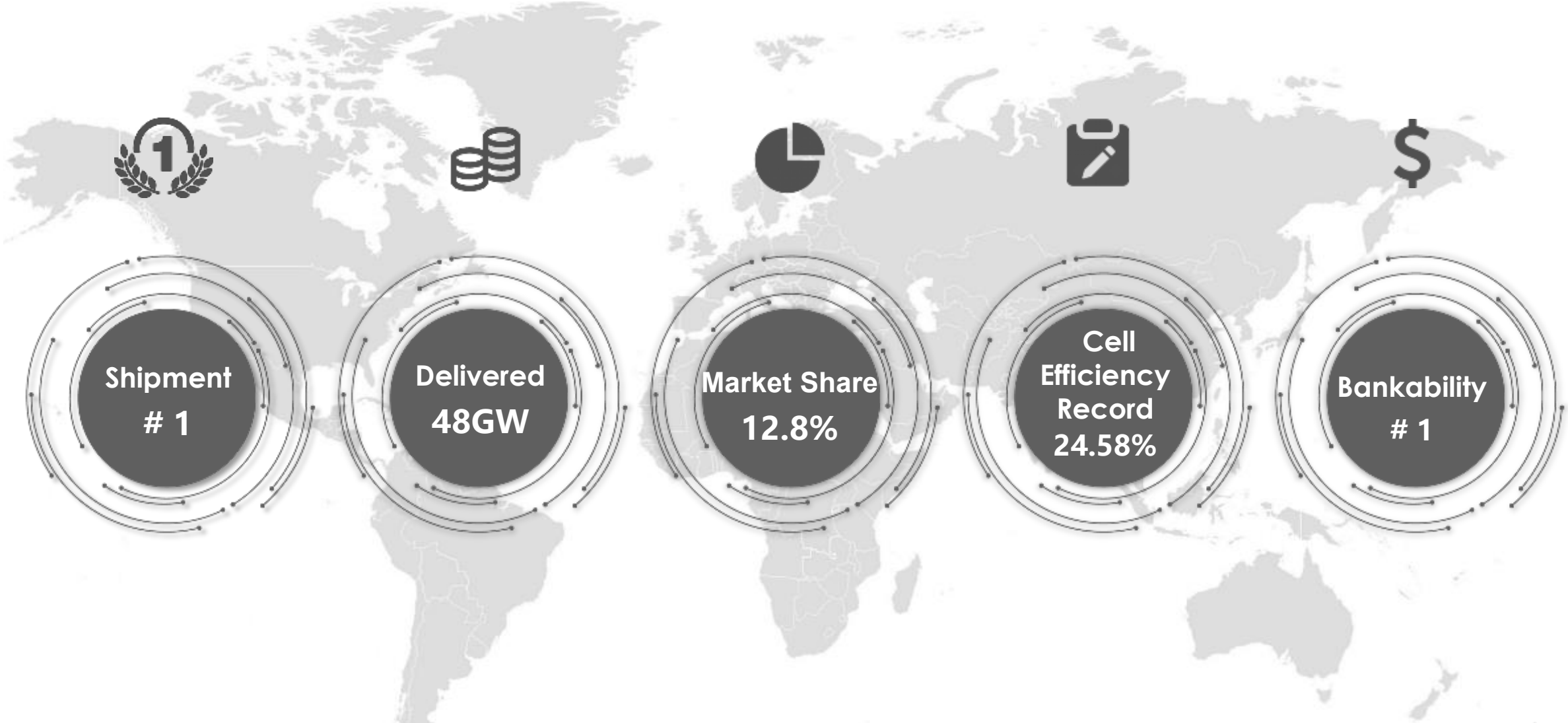
Swan Bifacial Module



JinkoSolar Co., Ltd.

Jinko Solar
Building Your Trust in Solar

Short Introduction of JKS



7 Global Factories | ***34*** Sales Offices | ***80+*** countries where Modules are delivered | ***15.000+*** Employees

Data source: By the end of 2019

JKS Product Portfolio 2020

Cheetah FC

- Mono PERC Full Cell
- 5BB
- Up to 400 Wp

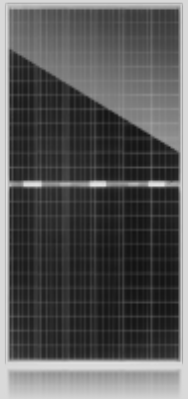
Cheetah HC

- Mono PERC Half Cell
- 5BB
- Up to 410 Wp

Cheetah

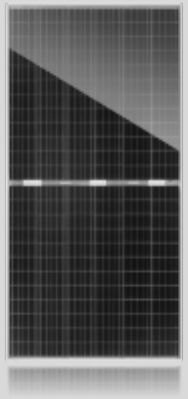
Swan Bifacial DG

- Mono PERC Half Cell
- 5BB
- Bifacial Dual Glass
- Up to 400 Wp (front only)



Swan Bifacial TB

- Mono PERC Half Cell
- 5BB
- Transparent Backsheet
- Up to 405 Wp (front only)



SWAN

Tiger Monofacial

- Mono PERC Half Cell
- 9BB
- Up to 470 Wp

Tiger Bifacial TB

- Mono PERC Half Cell
- 9BB
- Transparent Backsheet
- Up to 465 Wp (front only)

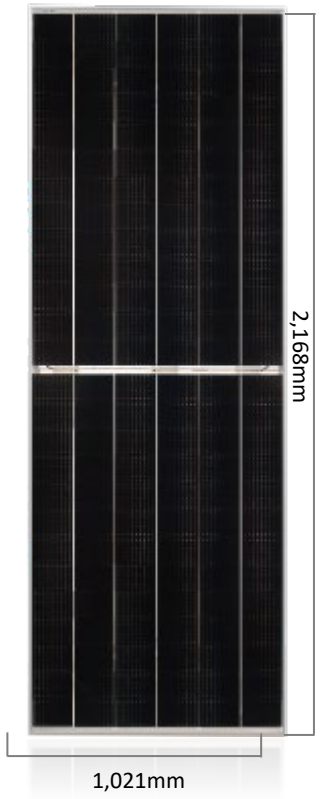
TIGER

SWAN

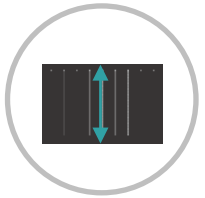
2020 flagship product – Tiger series

- ✓ EPC cost can decrease by 1.1%+ compared to that of 430W large cell PERC modules
- ✓ Land cost can decrease by 6.9%+ compared to that of 430W large cell PERC modules
- ✓ Electricity generation can increase by 1.6%+ compared to that of 5BB HC modules

Tiger Monofacial

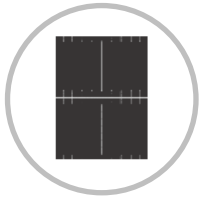


Tiger Bifacial Transparent Sheet

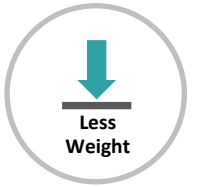


Half cell technology: improve shading tolerance

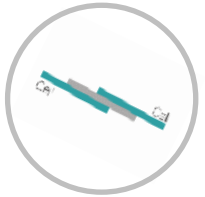
Electricity generation from the rear side (bifacial products): higher IRR



Nine bus bars: decrease power loss



Weight of bifacial products close to that of monofacial modules



Tiling ribbon: Eliminate cell gap to increase module efficiency

Tedlar transparent sheet (bifacial products): easy to clean

JKS Swan Bifacial Features

158.75 mm
cell dimension

30 Years Linear
Power Warranty

Front side max
power **415 Wp**

Rear side**: plus 5-25%**
Power Gain

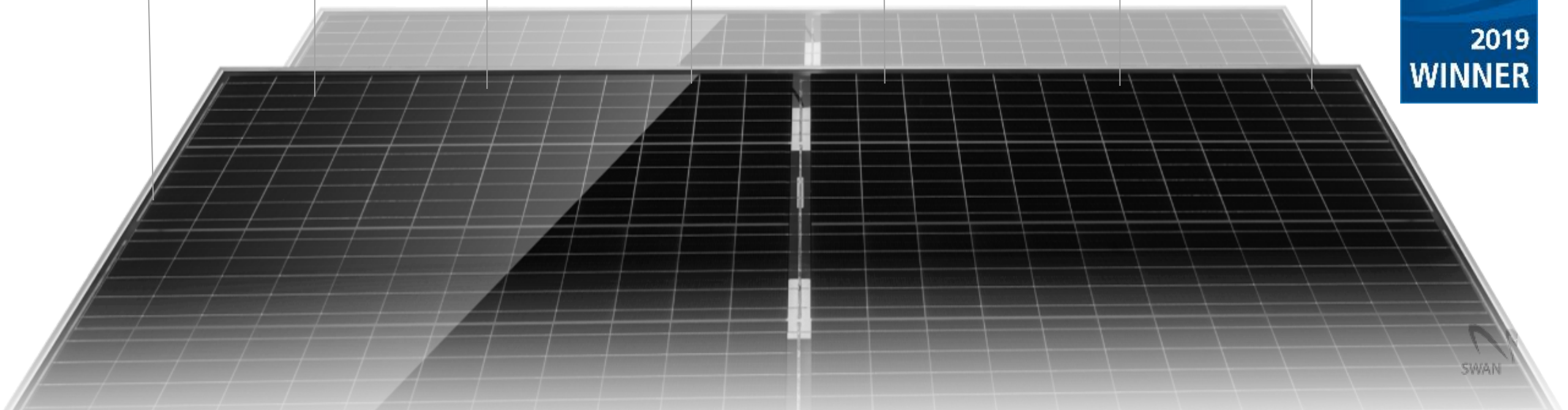
Bifacial Power
500+ Total Watt

Reduces BOS Cost by **3%**
Reduces O&M Cost by **5%**

CLEAR
DuPont™
Tedlar®
BASED BACKSHEETS

25% Lighter Compared to DG

inter solar award 2019 WINNER



Reliability of Modules with Tedlar® backsheet

35+ Years Field Proven Records of Modules with Tedlar® Backsheets

SUPSI Switzerland 1982
0.4% annual degradation

Nara, Japan 1983
0.2% annual degradation

Sacramento, US 1984
0.9% annual degradation

Guangzhou, China 1985
0.4% annual degradation

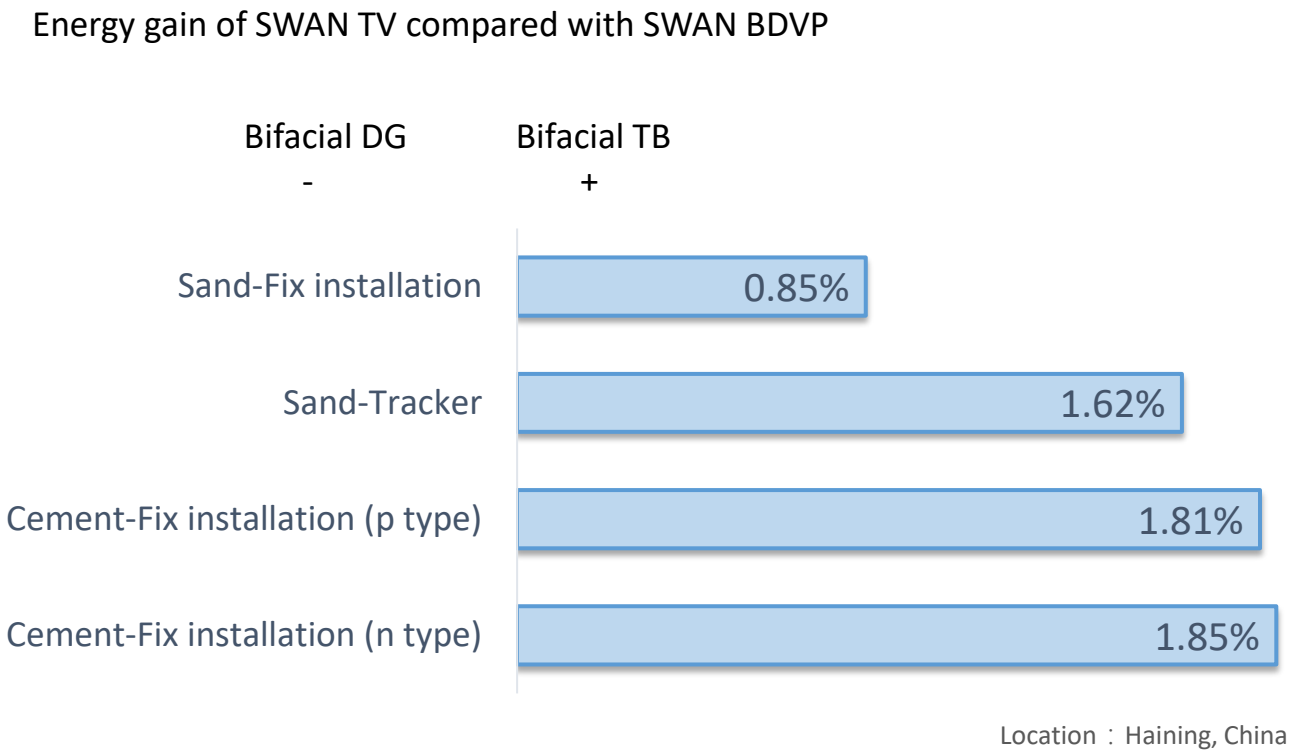
Mont Soleil, Switzerland 1992
0.3% annual degradation

Beijing, China1999
0.7% annual degradation

Courtesy of DuPont

Energy Generation

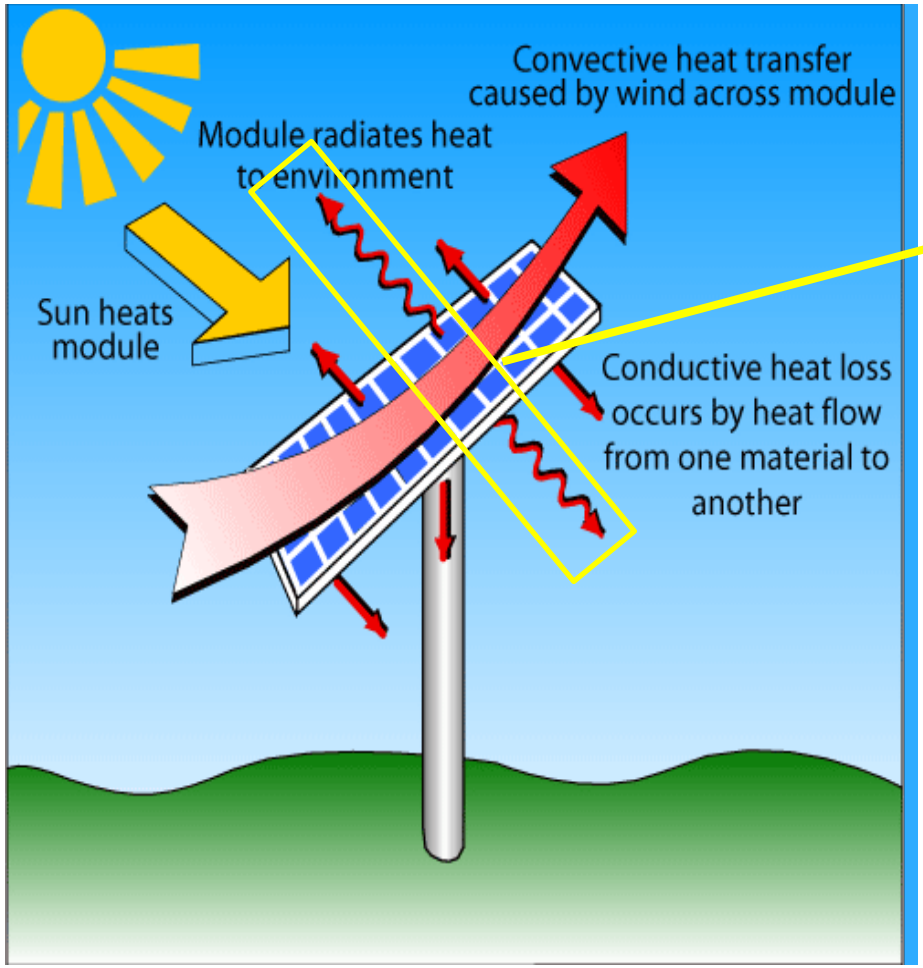
Clear Tedlar® backsheet or Dual glass --- Energy generation



- Bifacial with Clear Tedlar® backsheet in four different kinds of field test shows **0.85%~1.85%** higher energy generation compared with bifacial modules with dual glass.

Heat Dissipation

Illustration of Heat Dissipation of PV Module



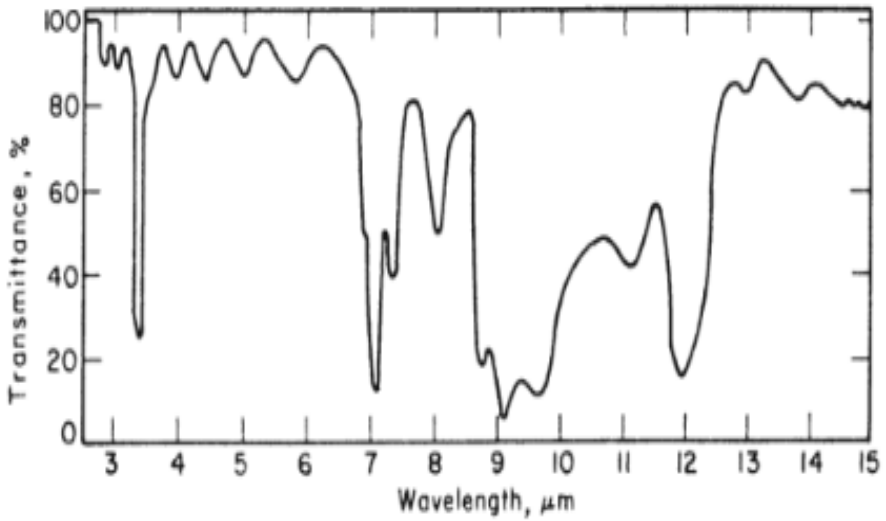


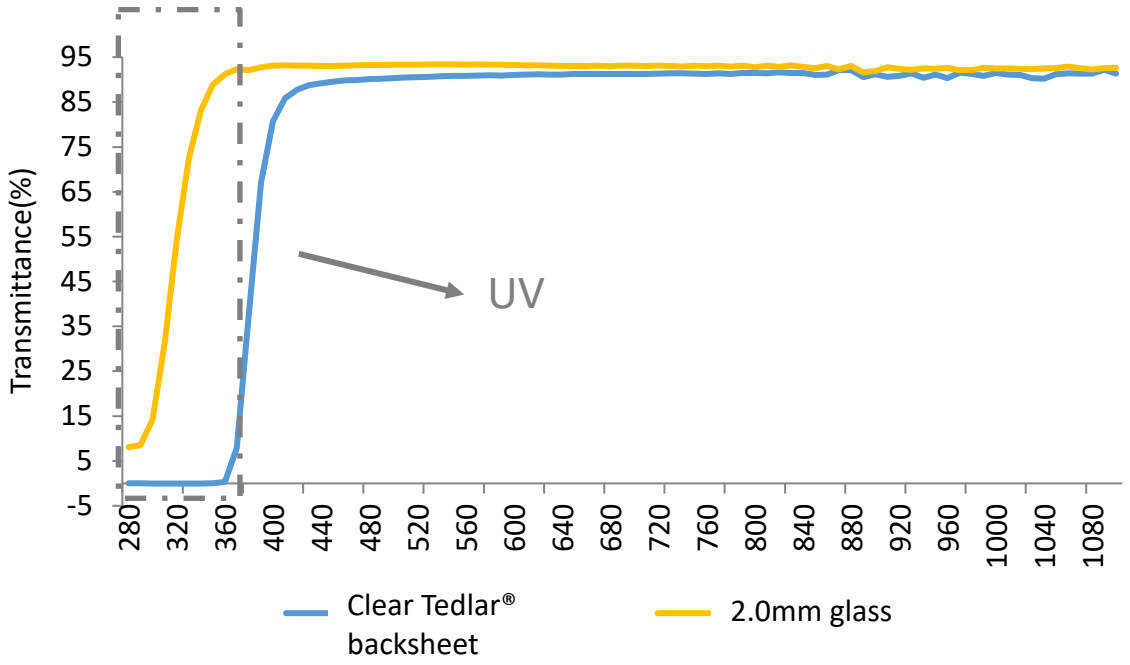
Figure 5.7.2 Infrared spectral transmittance of Tedlar film. Courtesy of du Pont.

- Glass becomes opaque at wavelength longer than approximately 3 μm.
- Clear Tedlar® film in the infrared spectrum is transparent to the heat dissipation of solar cells from the back of the bifacial module

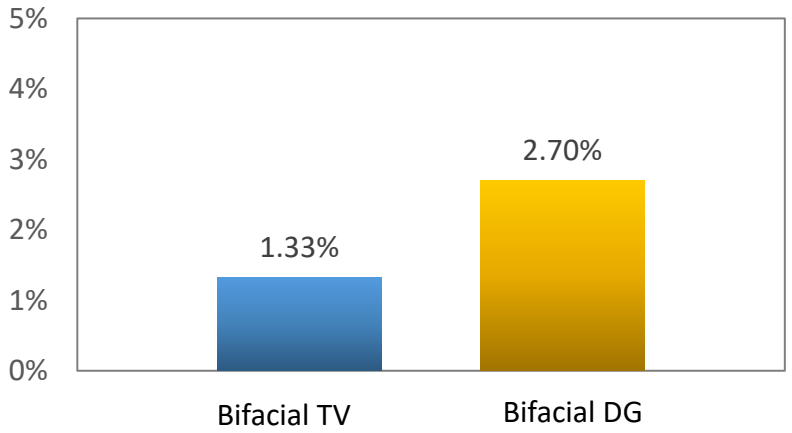
SWAN TV has lower operating temperature.

UV Protection

- UV light transmittance of Clear Tedlar® backsheet is less than 1%, compared to 40%-50% of glass
- UV rays degrade the high-transmittance POE encapsulant and PV cells on the module rear side
- Thus bifacial DG shows 50% higher rear-side power degradation after UV exposure compared to bifacial TV
- Bifacial module with clear Tedlar® backsheet shows better reliability in high UV environment

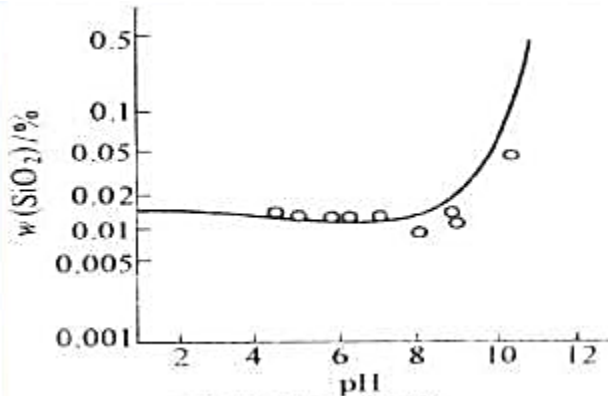


Rear-side power degradation after UV 30kWh/m²

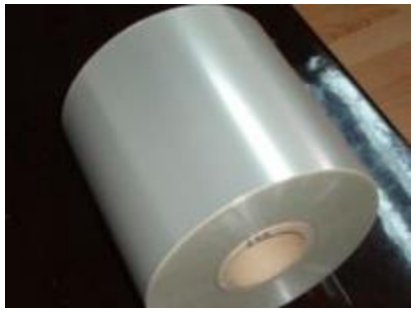


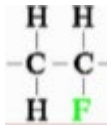
Corrosion Resistance to Saline and Alkali

- Glass might be slowly corroded and its light transmittance reduces during long-term operation in saline/alkali environment (seaside/greenhouse/saline-alkali soil), which leads to reduced back-side power
- Clear Tedlar® backsheet has good corrosion resistance to salt and alkali, thus bifacial TV has lower risk of power degradation

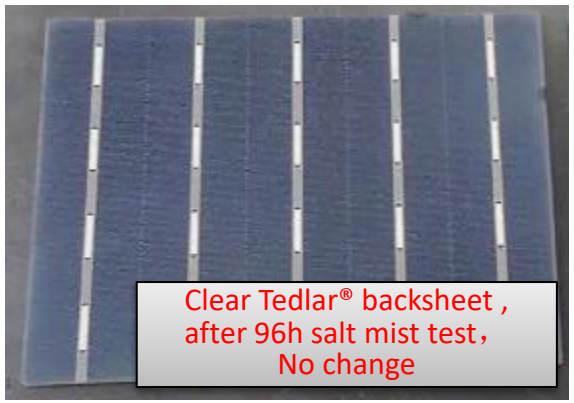


The main component of glass, silicate, is soluble in alkaline solution, so it can be corroded in saline alkali environment



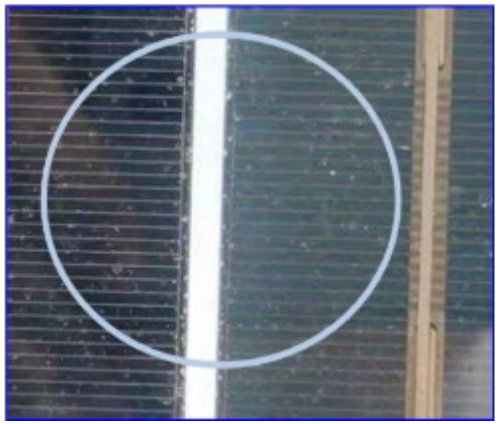


Clear Tedlar® film is PVF with excellent resistance to all kinds of corrosion agents



O&M: Anti-soiling and Easy-cleaning

Bifacial with dual glass :
There are dirt and mud spots which is not easy to clean

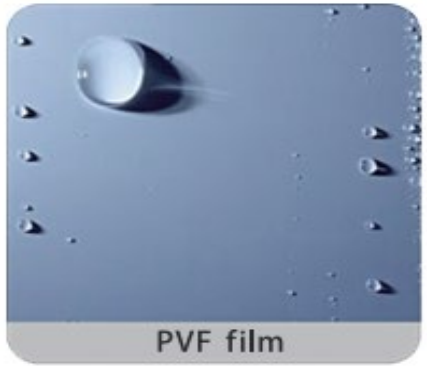


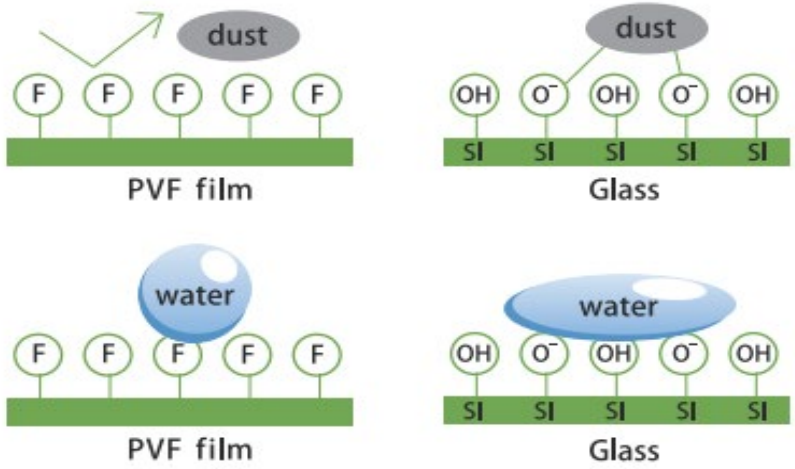
Bifacial with transparent backsheet :
There is no obvious dirt, and very little dust in the middle area

Soiling rate of the rear side is only 11.3% of the front side
(Field test result in Chile)

The frequency of bifacial rear-side cleaning is much lower than the front side

The hydrophobic surface of clear Tedlar® film offers excellent **anti-staining features**, making cleaning of the modules easier

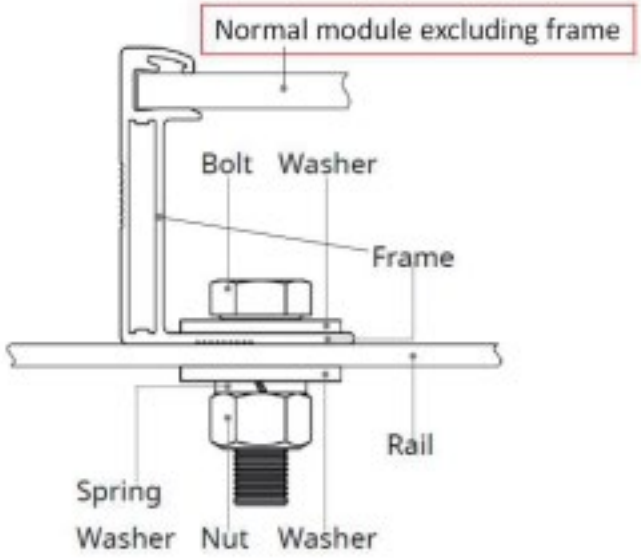




Installation and Maintenance Convenience

Frame Design → Common installation method

Module with aluminum frame



Installation convenience ↑ Labor Cost ↓ Mounting Construction Cost ↓

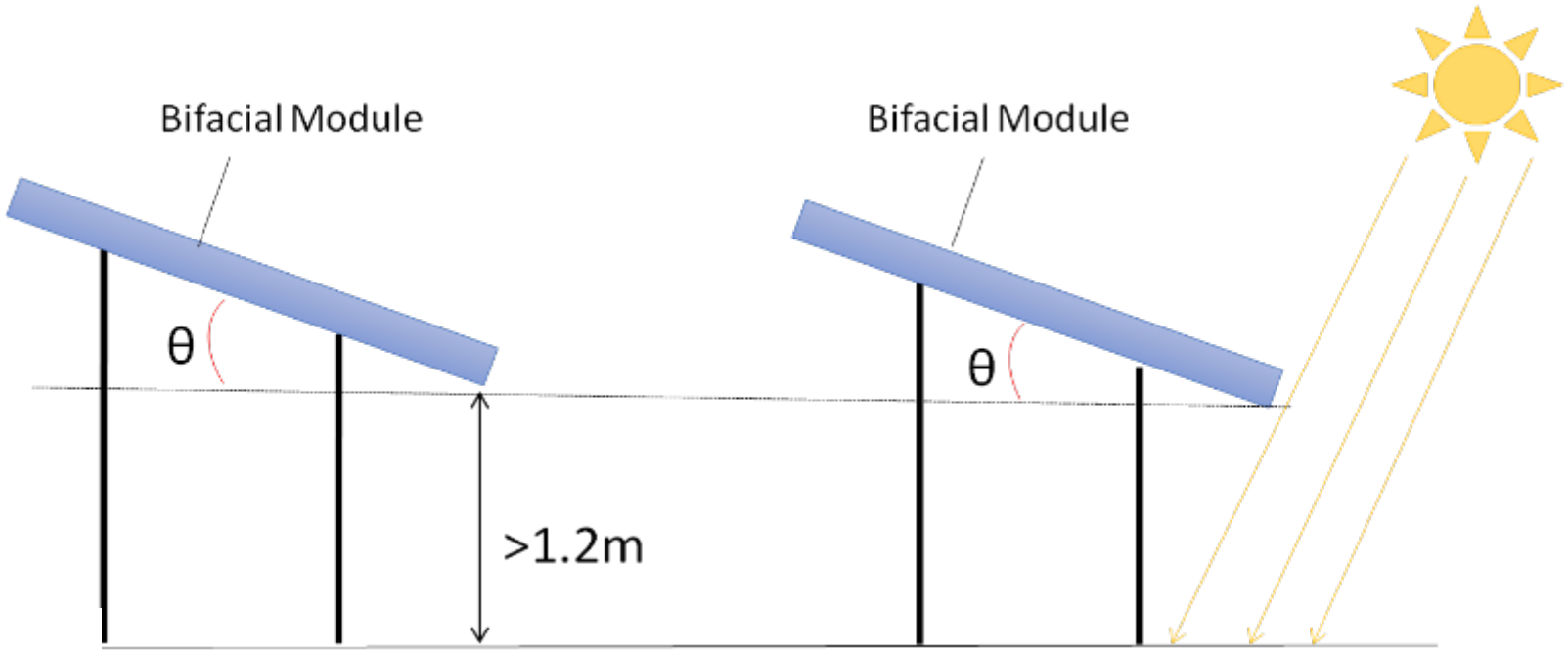
Bifacial modules with clear Tedlar® backsheet can save:

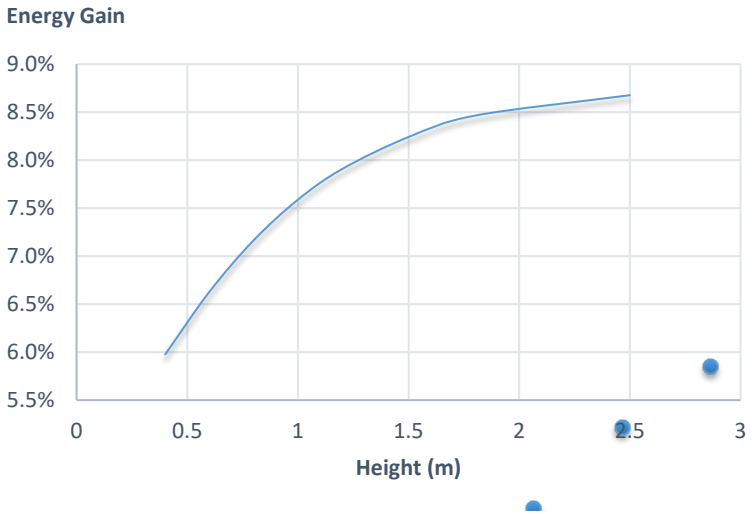
- **15% mounting construction costs**
- **20% labor costs, related to module installation**

Installation Design: Angle & Height

Install tilt Angle:

1. Latitude : 30 °(N)~30°(S)
   Θ=30 °
2. Latitude: >30°(N or S)
   Θ=latitude





Mounting Height:

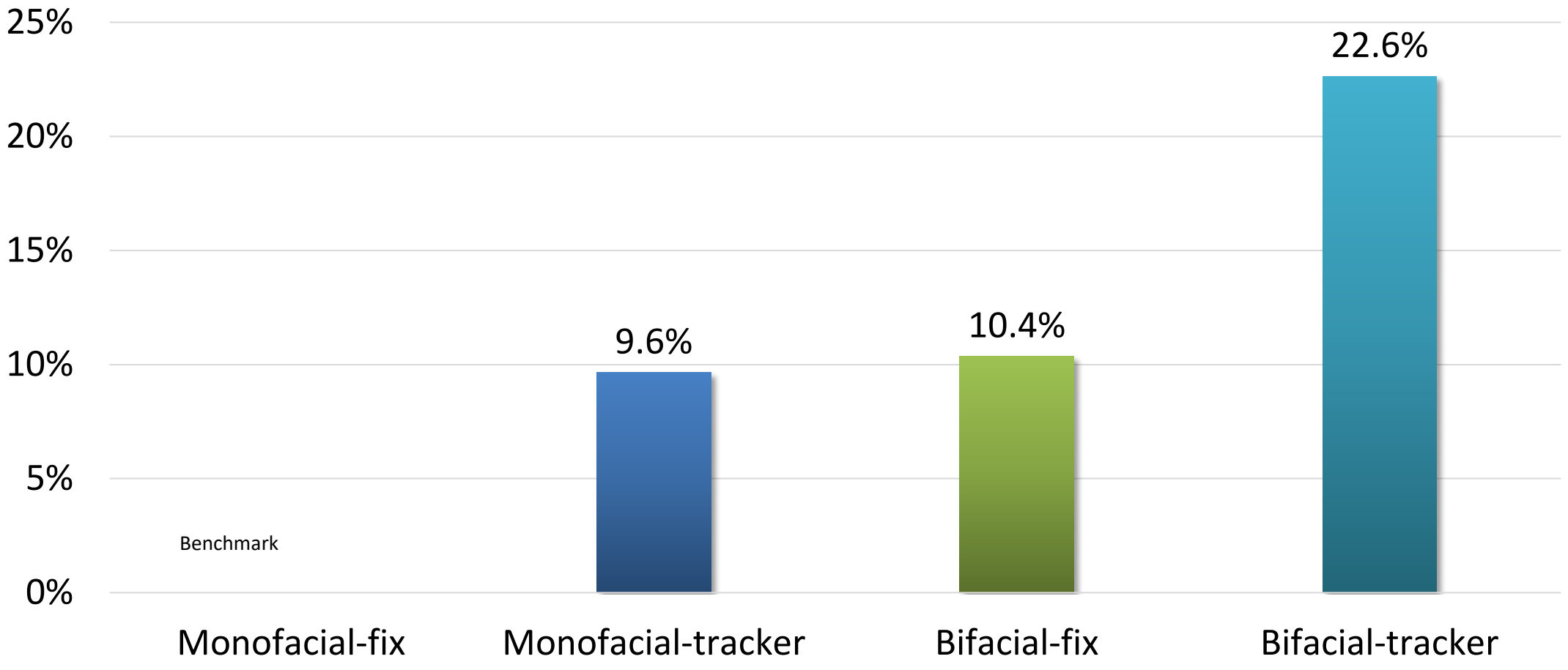
1.2 m is recommended for fixed racks and 1.5m for trackers

<1.2 m → Decreasing rear side energy generation gain

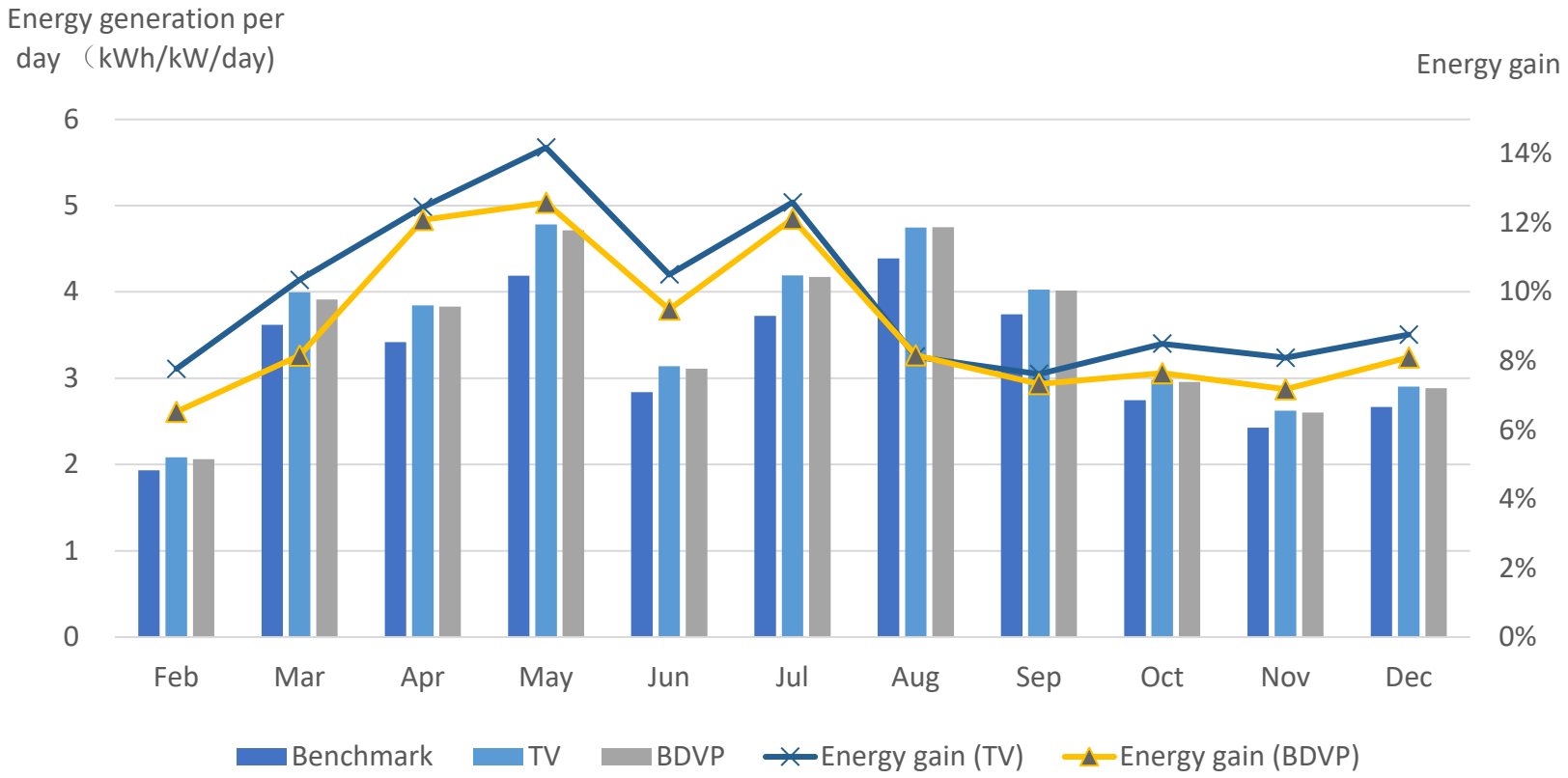
>1.2 m → Increasing mounting construction cost

Installation Design: Fixed tilt or Tracking

Energy Gain (%)
Simulated, albedo 0.35
Location: Haining, China



Case 1: Sand-Fixed Installation



- TV---bifacial with transparent backsheet; BDVP—bifacial with dual glass

Location： Haining, China

Tilt： 30°

Installation height： 1.2m

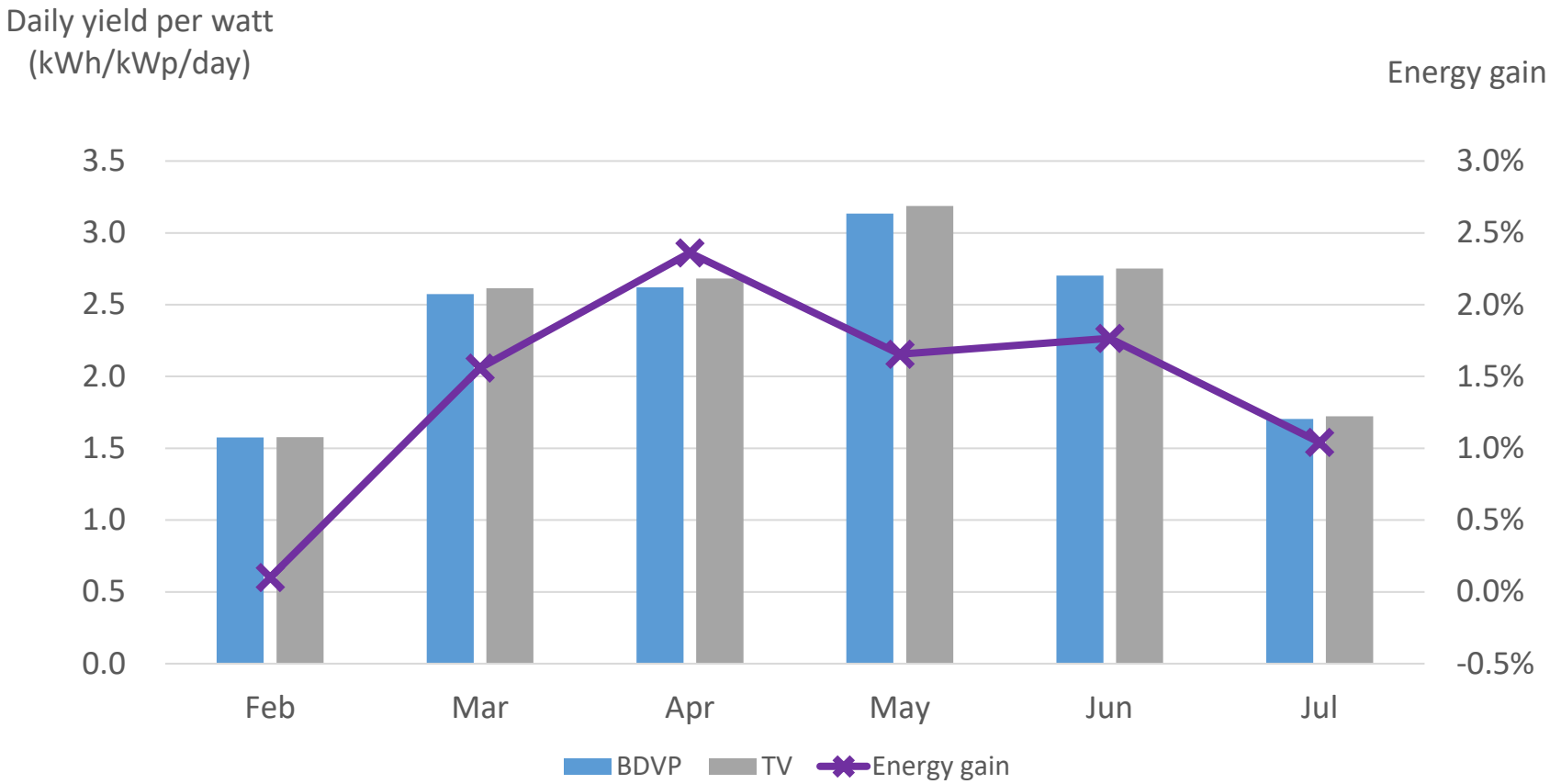
Ground type： Sand

Test period：

2019.2.1~2019.12.05

Swan bifacial with clear Tedlar® backsheet showed average bifacial gain of **10.22%,**
while bifacial with dual glass showed average bifacial gain of 9.37%.
Swan bifacial with clear Tedlar® backsheet generated **0.85% more energy** compared with bifacial with dual glass

Case 2: Sand-Tracker



Location： Haining, China

Tilt： +/-45°

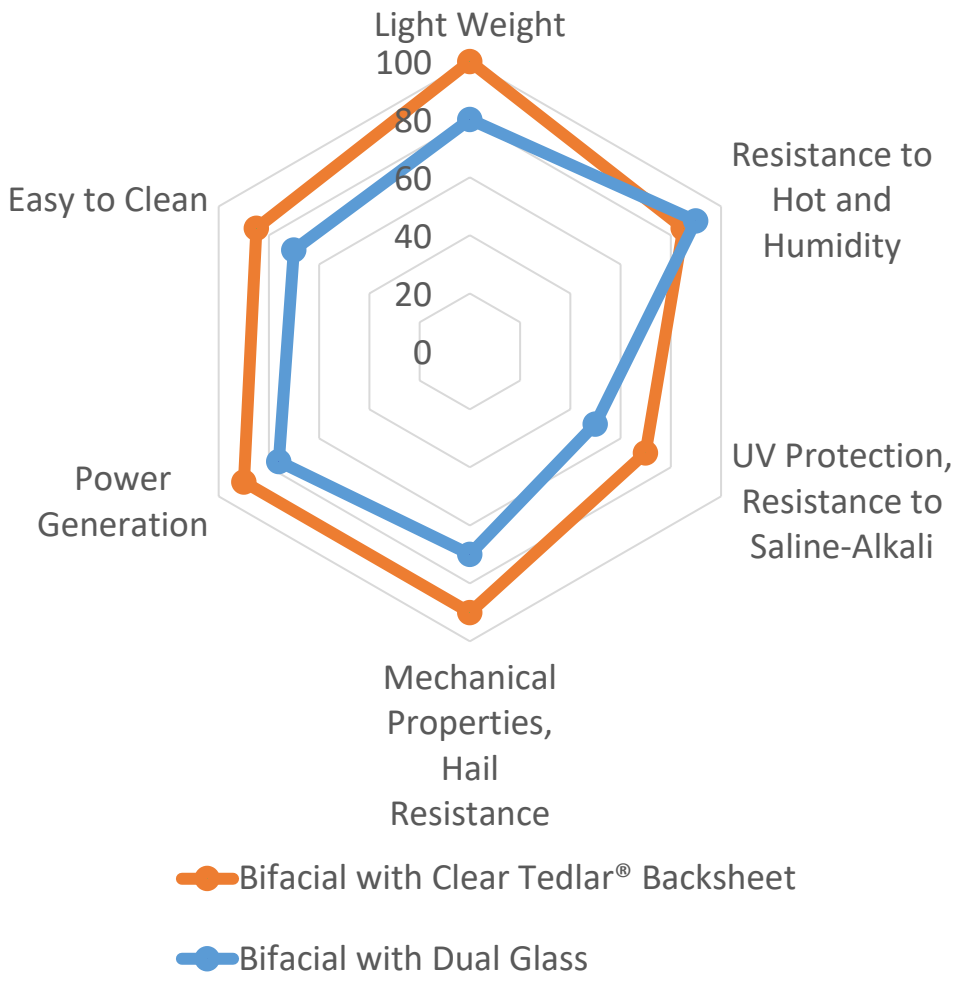
Installation height： 2.1m

Ground type： Sand

Test period： 2019.2.1~2019.7.31

Compared with bifacial with dual glass, bifacial with clear Tedlar® backsheet generate **1.62%** more energy.

Summary



Type	Bifacial with Clear Tedlar® Backsheet	Bifacial with Dual Glass
Recommended application area	1. On-ground PV station 2. High labor cost regions, like EU, Japan, Australia (light weight module can effectively reduce labor cost) 3. Commercial roof-top project	Most on-ground PV station, except areas with hail weather, strong UV rays, saline-alkali corrosion

Thank you!

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