

# TOP SOLAR MODULES 2022



## Overview & Analysis of Highest Efficient Commercial Solar Panels

Authors: Shravan K. Chunduri, Michael Schmela



*Solar*  
**JinKO**

# TIGER Neo + ESS

**No. 1** in Global Module Shipment:

Reach **150GW**



Residential | C&I | Utility

[www.jinkosolar.com](http://www.jinkosolar.com)

# Contents

01

Introduction 4

02

Methodology 7

03

TOP SOLAR MODULES 8

- Count of companies & products
- Top 3 efficiencies in 2022
- Top efficiency of each cell technology

04

Module Efficiency Developments 13

- Efficiencies >22.5%
- Efficiencies >22 - 22.5%
- Efficiencies >21.7 - 22%
- Efficiencies 21.5 – 21.7%

05

Module Efficiency Developments For Different Cell Technologies 21

- IBC
- TOPCon
- HJT
- PERC

06

Power 34

- Top 3 power ratings
- Top power of each cell technology

07

Companies' Technology Progress in 2022 38



© TaiyangNews 2023  
All rights reserved.  
TOP SOLAR MODULES 2022  
ISBN 978-3-949046-17-9

The text, photos and graphs in this report are copyrighted (cover photo credit: LONGi). TaiyangNews does not guarantee reliability, accuracy or completeness of this report's content. TaiyangNews does not accept responsibility or liability for any errors in this work.

**Publisher:**  
TaiyangNews UG (haftungsbeschränkt)  
An der Golzheimer Heide 23  
40468 Duesseldorf, Germany  
[www.taiyangnews.info](http://www.taiyangnews.info)

## Advertisers:

• Longi	Back Cover
• JinkoSolar	p. 2
• Trina	p. 5
• Aiko	p. 6
• JA Solar	p. 9
• Astronergy	p. 12
• DAS Solar	p. 16
• Huasun	p. 22
• Jolywood	p. 26
• Tongwei	p. 29
• Runergy	p. 33
• Solis	p. 35
• Risen Energy	p. 39
• SNEC	p. 42

# 1. Introduction

The module is the end product where all advancements must be reflected. Efficiency and output power are the two key characteristics of a solar module. While there are several ways to improve module power, such as employing larger cell sizes or integrating more cells into a module, it is efficiency that truly speaks to the solar device's ability to convert sunlight per area into power.

TaiyangNews has been covering the efficiency progress of solar modules through its annual reports on Advanced Module Technologies starting from 2017 and its annual conference as of 2020. Our latest Solar Module Innovations Report was published in May, 2022 (download report [here](#)) and the annual conference on Solar Module Innovations took place on Jan. 31, 2023 (access the presentations [here](#)). However, in the quickly changing solar sector a lot is happening over the course of a year – and to keep our readers updated about the efficiency progress more frequently, TaiyangNews has started a regular feature article on the most efficient commercial solar panels at the beginning of 2022.

Since January 2022, we have been updating the list on a monthly basis and publishing it on our website in a dedicated section called TOP SOLAR MODULES. The feature consists of a graph, table and an article covering the important changes from the previous edition. So far, we have published 16 editions, including the latest one for April.

Looking at each edition of TOP SOLAR MODULES only provides the ranking of each product, however, when looking at them collectively over a longer period reveals a lot of interesting trends and developments. That's what we have done for 2022.

First, the list has grown in terms of companies as well as product count. Then, how are the important parameters of module such as efficiency and power have progressed in a given period and how key characteristics of modules including cell technology, module technology, cell size and number of cells have contributed in this progress. This report essentially summarizes our analysis of the TOP SOLAR MODULES research from January to December 2022 that are published in February 2022 to January 2023.

***\*All TaiyangNews Reports and Market Surveys are available for free download at [www.taiyangnews.info](http://www.taiyangnews.info)***



微信公众号 WeChat

## Enjoy reading our report TOP SOLAR MODULES 2022



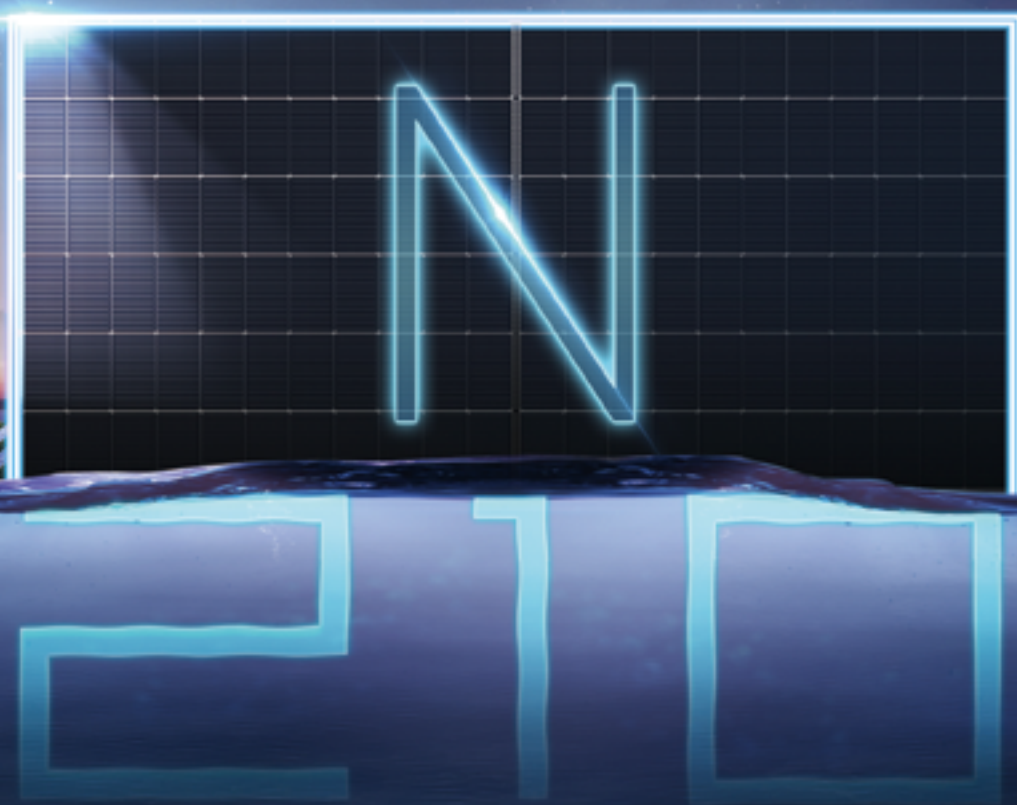
**Shravan K. Chunduri**  
Head of Technology, TaiyangNews  
[shravan.chunduri@taiyangnews.info](mailto:shravan.chunduri@taiyangnews.info)  
+91 996 327 0005  
Hyderabad, India



**Michael Schmela**  
Managing Director, TaiyangNews  
[michael.schmela@taiyangnews.info](mailto:michael.schmela@taiyangnews.info)  
+49 173 15 70 999  
Duesseldorf, Germany



Vertex N has arrived

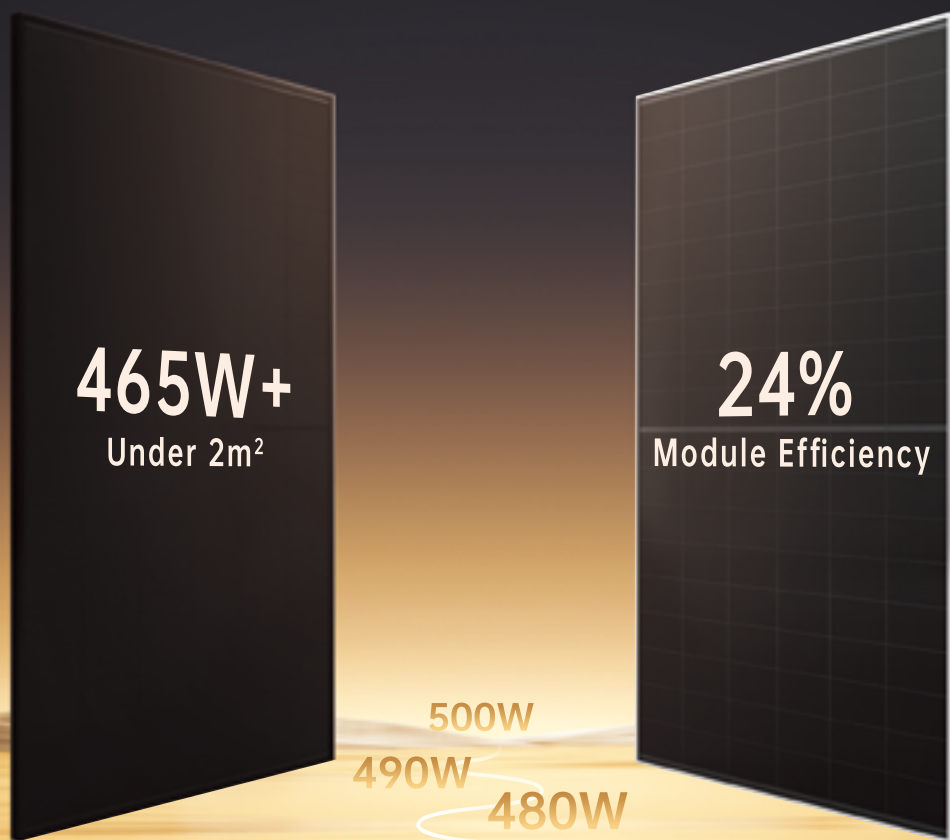


Vertex N



# No. 1 Solar Module for Efficiency\*

Aiko ABC Module Series



reddot winner 2023

**H**ow can we achieve 465Watt with a solar module under 2m<sup>2</sup>?  
Find out at Intersolar booth A3-110, FM.704/2 [www.aikosolar.com](http://www.aikosolar.com)

\*Source: TaiyangNews, Exowatt The photos and specifications presented in the advertisement could vary across different markets

## 2. Methodology

Before going into details, here is some background on the methodology and selection criteria: Since module efficiencies have been improving considerably in recent years, to make the list rewarding for technically advanced products we put the minimum efficiency to be included at 21.5%. We have listed only commercially available TOP SOLAR MODULES from each cell technology stream of one module maker. For example, if a company is offering 2 different product streams based on PERC technology that have more than 21.5% efficiency, then only the product with the higher efficiency is considered for this list. But if a module maker is offering, for example, products based on PERC and TOPCon that have efficiencies of 21.5% or above, then both the products are listed here. Efficiency is the only criteria for ranking in the list (whenever available in the specs, we have used two digits after the comma for efficiencies, otherwise one). However, as we see more often products with the same efficiency, in this case power determines the order. And when efficiency and even power are the same, we have listed the manufacturers in alphabetical order.

A commercially available module is considered a product for which the complete data sheet is listed on the module producer's website. The efficiency and power data listed here is taken from the data sheet available on the respective company's website. This also means we have not included any new product announcements without final technical data published as their modules specs often differ considerably from the products that are finally available for purchase, and some products presented at trade fairs are not even seeing the commercial light at all. Finally, we are only listing modules based on in-house produced cells of a respective module manufacturer, which means modules using externally sourced cells are not featured in this TOP SOLAR MODULES list. If module specs listed on websites seem to have 'conspicuously' high efficiencies, we ask for certificates from third-party test institutes among other information before we include a product in the list.



Source: Astronergy



### 3. TOP SOLAR MODULES

In the core section of this report, we analyzed the 12-months data of TOP MODULES listing with respect to efficiency and power, which are two critical attributes of solar modules, as well as companies' progress in these areas. We looked at how power and efficiency have improved in various categories, including efficiency bands and cell technology, as well as how different companies have advanced in terms of efficiency and power in different efficiency bands and also with respect to different cell technologies. However, the basic statistics offer valuable insights.

#### Count of companies & products

There has been an increased emphasis on efficiency in general, as evident from the number of commercially available products listed in the TOP MODULES section that meet the minimum efficiency criteria of 21.5%. This number has consistently increased from 20 in January to 34 in December. The number of companies offering such products has also increased from 19 to 23. However, the count of companies has not increased proportionately with products. This indicates that more and more companies are focusing on multiple technologies that ultimately result in module efficiencies above 21.5%. For example, in January, only one company

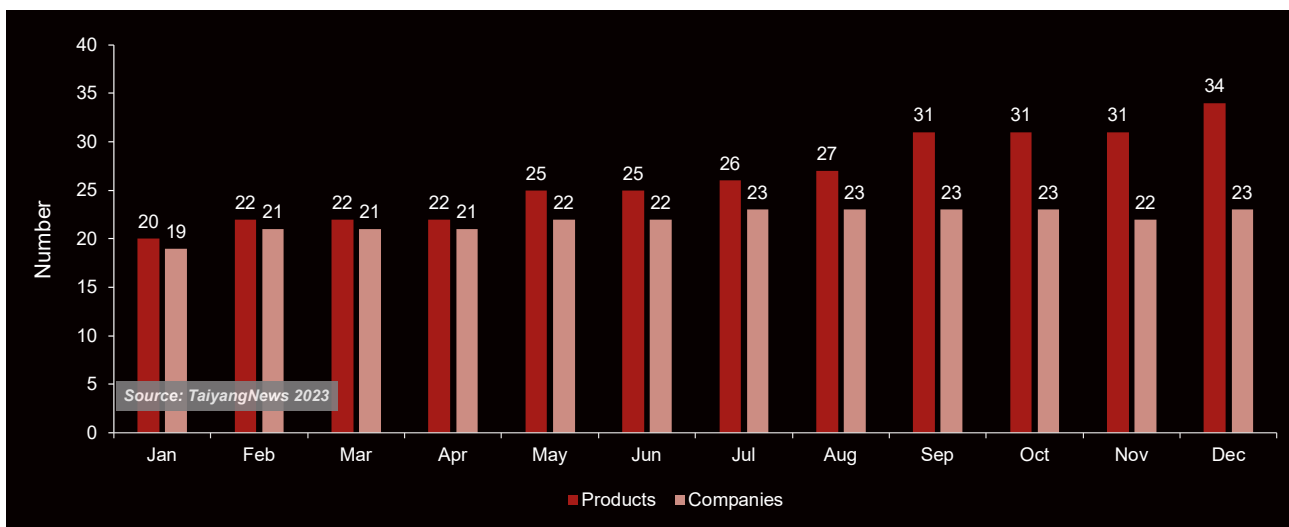
– Jinery – was offering two product platforms based on different technologies, PERC and HJT. In December, as many as 11 companies are represented in two cell technology segments.

#### Top 3 efficiencies in 2022

When it comes to efficiency, it is interesting to note that the highest module efficiency reported in our listing has only increased by 0.1% absolute – from 22.7% to 22.8% – over the course of 1 year. We further analyzed how the top 3 ranks in the listing have changed over the year, as depicted in the above graph.

Maxeon, Jollywood, and LG held the top 3 spots for the first two months with respective efficiencies of 22.7%, 22.53%, and 22.3%. While products from Maxeon and LG were based on IBC, Jollywood's module was based on TOPCon. Two developments took place in the March listing: Maxeon increased the efficiency of its module by 0.1% absolute to 22.8%, and LG's exit from the solar module supply market was also reflected in the same month. As a result, JinkoSolar's TOPCon module with an efficiency of 22.6% made it to the 3rd rank. While there was no change in April, Canadian Solar commercialized its HJT module with 22.5% efficiency, replacing

**TOP MODULES 2022 Products & Companies Count**



**More versatility:** While the leading module producers with integrated cell production now mostly offer panels with efficiencies meeting our commercial TOP SOLAR MODULES selection criteria of at least 21.5%, the number of products nearly doubled in 2022. This means that many quickly added high-efficiency cell technology based modules as only one product per cell technology for each company is included in the list.



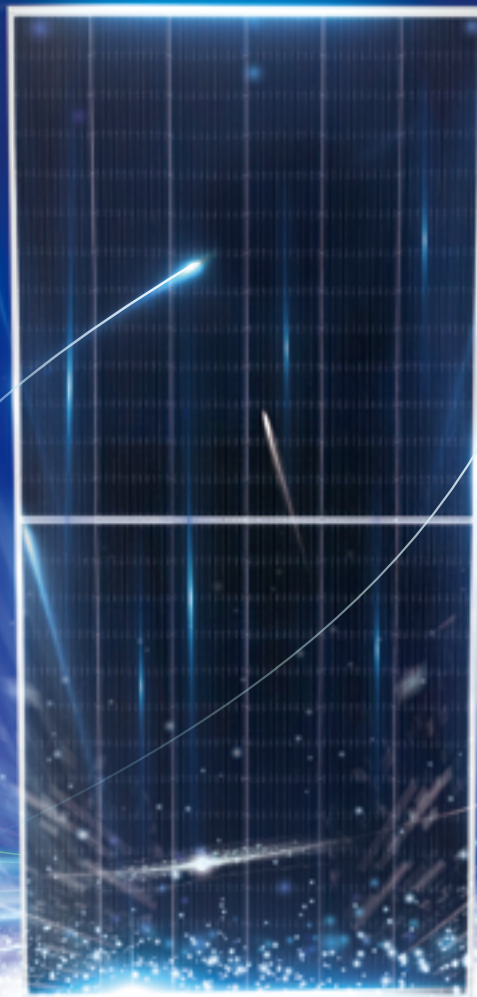
JA SOLAR | DEEP BLUE 4.0 ∞

DeepBlue,

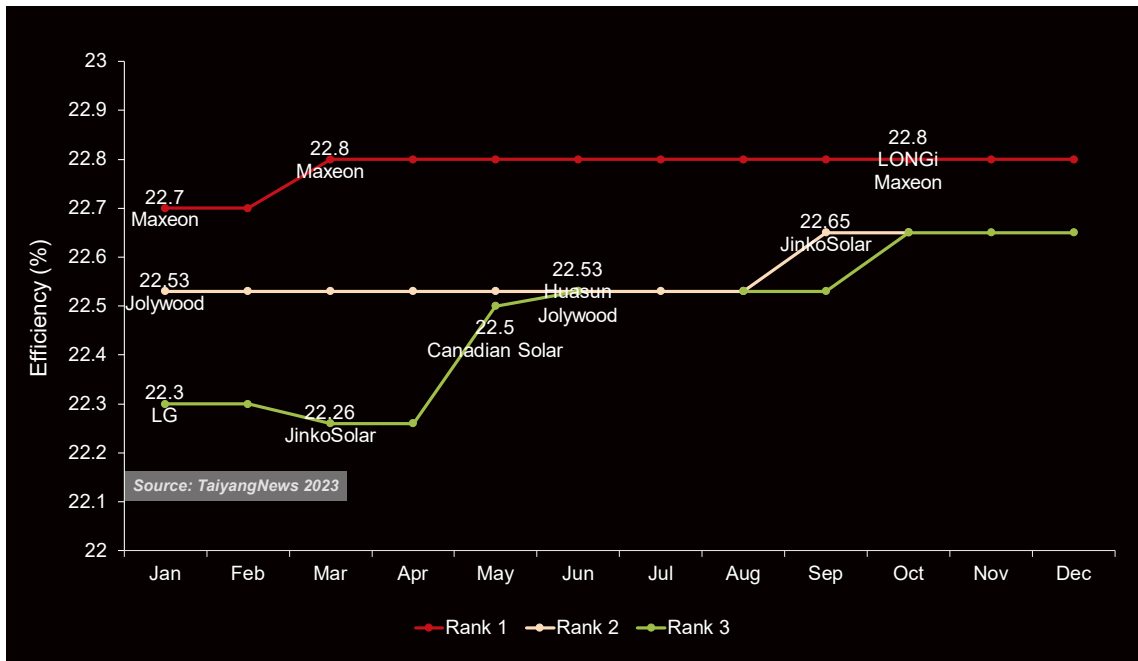
Tailored to Increase Customer Value

POWER : **625W** EFFICIENCY : **22.4%**

BOOTH: **N2 310**



## TOP 3 Commercial Module Efficiencies 2022



**2022 was the year when long-time module efficiency leader Maxon/SunPower had to start sharing its throne. LONGi introduced its Hi-MO6 module series, which reached the same efficiency level. With Maxeon and LONGi at the top, the next rank was No 3 taken by JinkoSolar.**

JinkoSolar's product. However, in the following month, Huasun commercialized its HJT module with 22.53% efficiency, the same as Jolywood's product, resulting in both products sharing the 2<sup>nd</sup> rank that remained unchanged until August. In September, JinkoSolar launched its next-generation TOPCon product with a rated efficiency of 22.65%, which qualified for the 2<sup>nd</sup> position, pushing products from Jolywood and Huasun down to 3<sup>rd</sup> rank. In the next month, LONGi introduced its Hi-MO6 module series based on its proprietary HPBC technology, which directly claimed the top spot, sharing it with Maxeon and pushing JinkoSolar's product to the 3<sup>rd</sup> position. This ranking has been maintained until the end of the year.

### Top efficiency of each cell technology

It is evident that module efficiency is mainly driven by the cell technology, and companies often rely on advanced cell architectures such as IBC, TOPCon, and HJT. The graph on next page summarizes the top efficiency product in all commercial cell structures. Maxeon had consistently been at the top efficiency among the commercially available modules. At the beginning of 2022, the company

represented the highest efficiency module product with an efficiency of 22.7% in the IBC category until March when it's Maxeon again that increased the efficiency to 22.8%, retaining its leadership position until September. In October, LONGi's introduced its Hi-MO6 product with an efficiency of 22.8%, sharing the top spot with Maxeon since then.

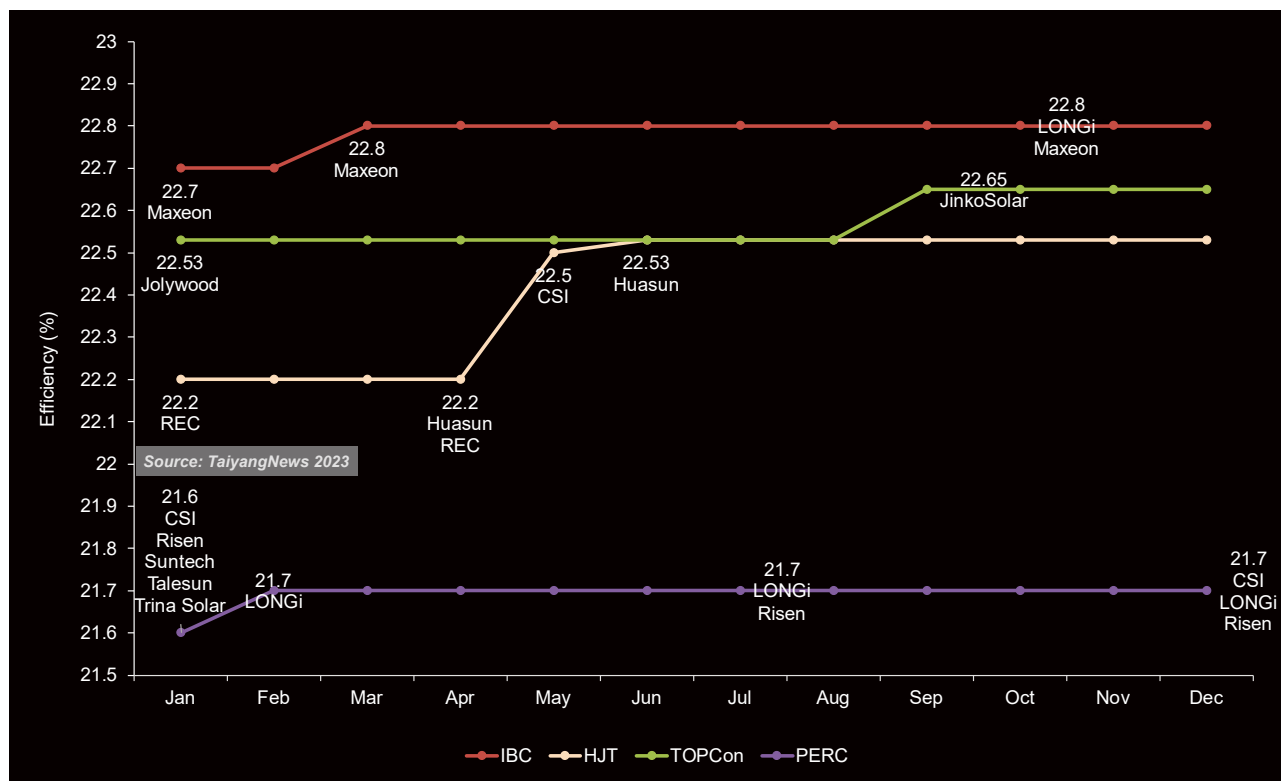
Jolywood was the top seed with an efficiency of 22.53% in the TOPCon segment, maintaining its status quo until September, when JinkoSolar surpassed it with a 22.65% product, which has not changed since. In the case of HJT, the top efficiency has improved three times. REC was promoting HJT modules with the highest efficiency of 22.2%, and in April, Huasun also started offering modules with the same efficiency. Canadian Solar began promoting its HJT module with an efficiency of 22.5% in May. The next month, Huasun started promoting a product with a slightly higher efficiency of 22.53%, which remained the top among the HJT products until the end of the year.

When it comes to PERC technology, the top efficiency has increased from 21.6% in January to

21.7% in February. At the beginning of the year, the top PERC efficiency of 21.6% was attained by four companies - Canadian Solar, Risen, Suntech, Talesun, and Trina Solar. The following month, LONG raised the bar to 21.7% and held the top spot

until June. In July, however, Risen also introduced a product with a similar efficiency, thereby sharing PERC's top position until November. Even in December, while the top efficiency remained at 21.7%, Canadian Solar (CSI) joined the club.

### Top Efficiencies For Different Cell Technologies - IBC, HJT, TOPCon & PERC - in 2022



**IBC still rules: When looking at cell technologies of commercial solar modules in 2022, IBC defended its first rank, though TOPCon, followed by HJT, got closer.**



For A Greener World

# Pioneer in n-type TOPCon PV Modules



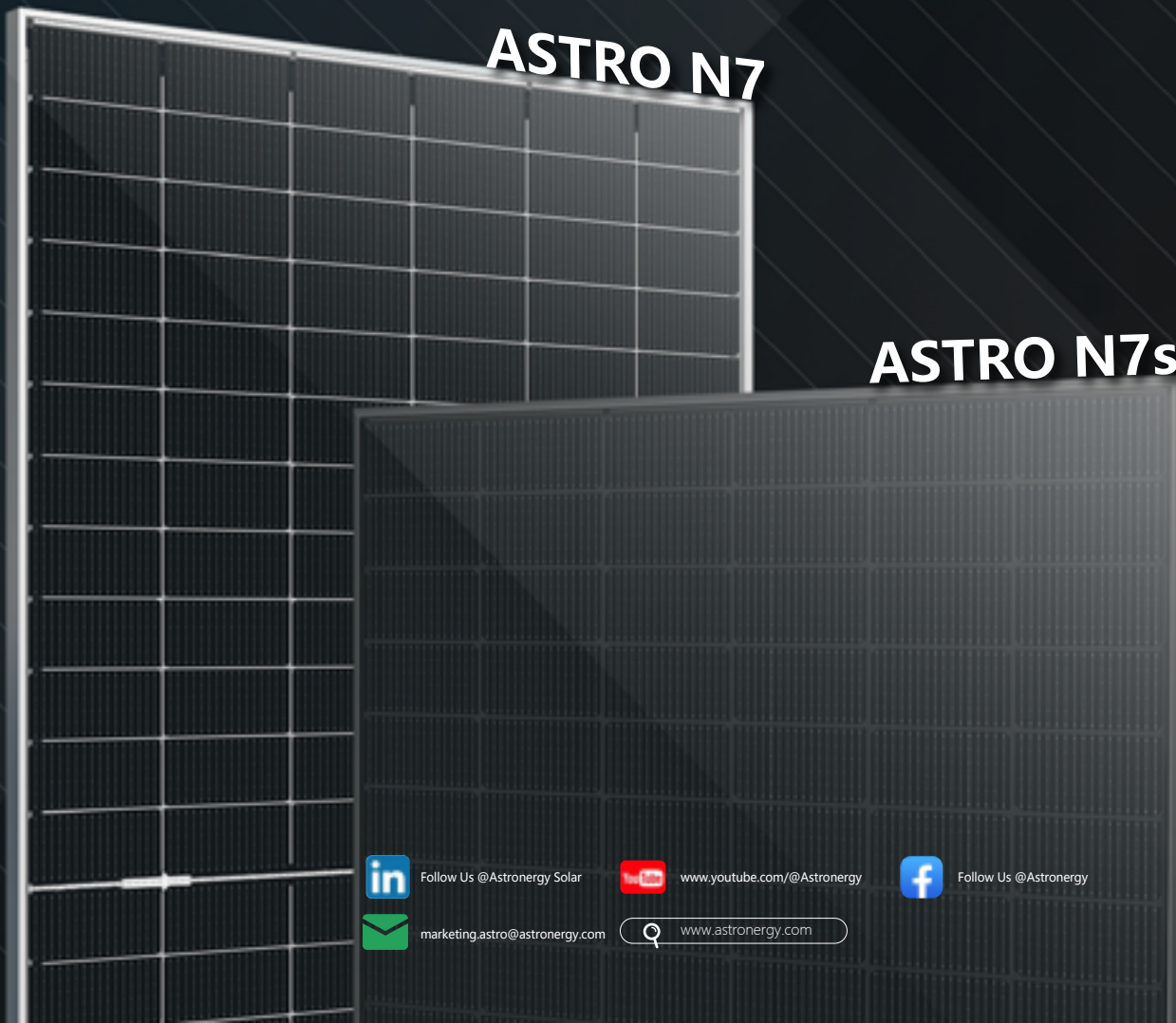
For a long time, Astronergy has been listed as the world's Tier 1 PV Module Maker by Bloomberg NEF



For 7 years, Astronergy has been honored by PVEL as "TOP Performer" among module manufacturers



TOP 7 shipment globally



Follow Us @Astronergy Solar



[www.youtube.com/@Astronergy](https://www.youtube.com/@Astronergy)



Follow Us @Astronergy



[marketing.astro@astronergy.com](mailto:marketing.astro@astronergy.com)



[www.astronergy.com](https://www.astronergy.com)



## 4. Module Efficiency Developments

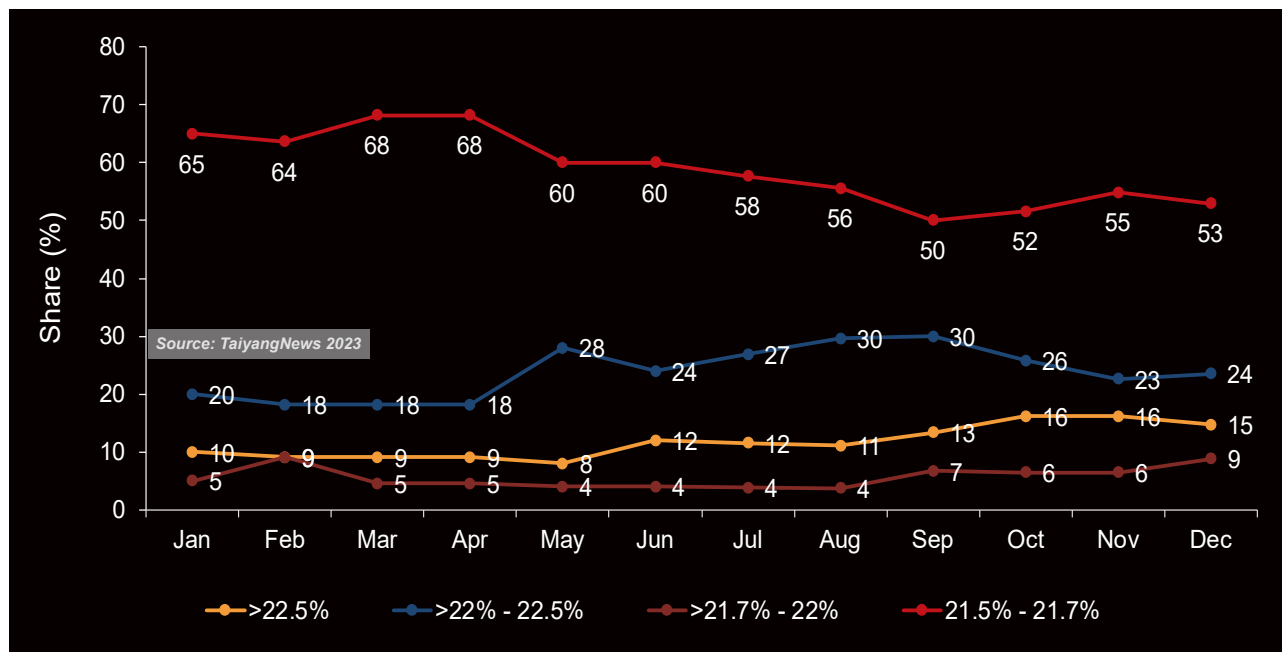
For easier analysis, as we dig deeper into the efficiency analysis, we've split the efficiency into 4 bands: >22.5%, >22 to 22.5%, >21.7 to 22% and 21.5 to 21.7%. In terms of the number of products in each band, the highest efficiency band of greater than 22.5% increased from 2 to 5, representing 10% of the total product count in January, which rose to 15% by the end of the year. The next band, from greater than 22% to 22.5%, doubled from 4 to 8 products in one year. However, this efficiency band only increased its share from 20% in January to 24% in December, relative to the total number of products. The third band had the lowest representation, with only 1 product in January and two products by the end of the year. Its share also started low at 5% but increased to 9% after 12 months. The 21.5% to 21.7% range is mostly represented by PERC, while only one HJT module falls into this window. The product count increased from 13 to 18, but its share in the total products decreased from 65% in January to 53%. This indicates that more and more companies are commercializing products based on advanced cell architectures.

Although this summary chart may appear complex, analyzing each efficiency band separately provides a clearer picture.

### Efficiencies >22.5%

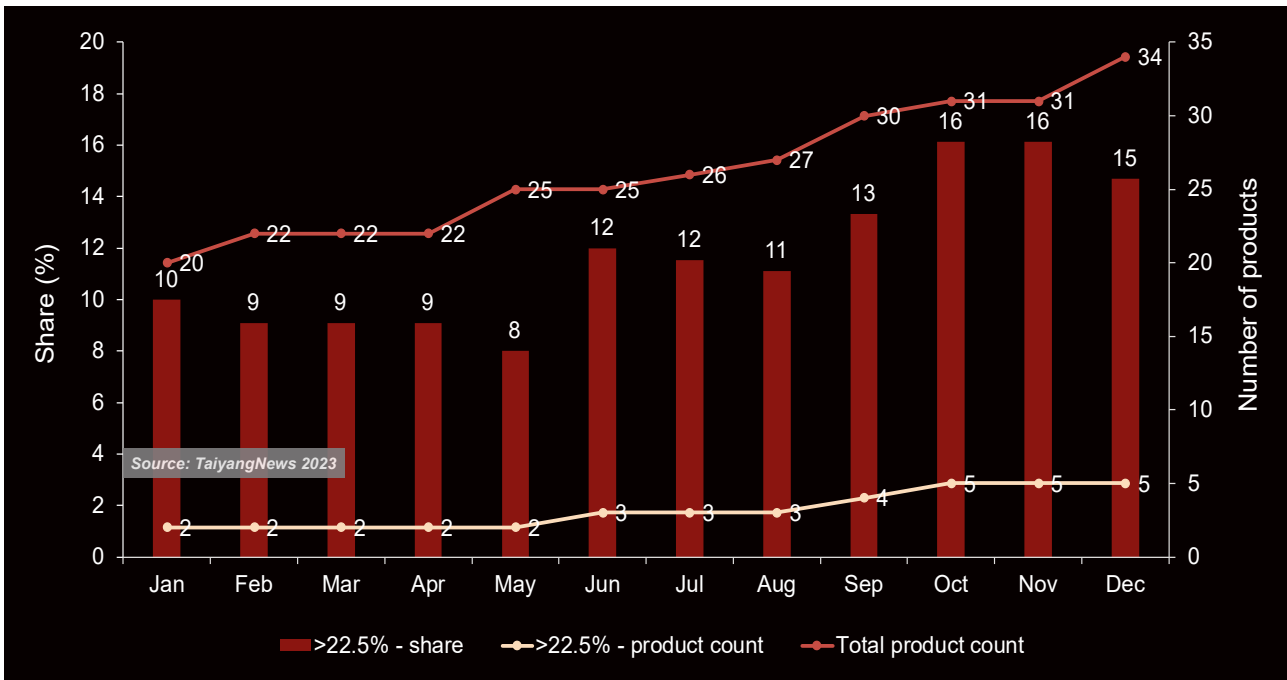
Continuing with the same chronology of high efficiency products first, in the highest efficiency band above 22.5%, only two companies, Maxeon and Jolywood, offered such products until June. Maxeon had an efficiency of 22.7%, which was later improved to 22.8% in April, while Jolywood offered a module at 22.53%. In July, Huasun joined the club with a 22.53% HJT module. In October, Jinko Solar entered the league with its TOPCon product, achieving 22.65% and taking the second place. Then in November, LONGi surprised the industry with its HPBC technology, realizing 22.8% efficiency, which was on par with Maxeon's module that had been number 1 for several years before we started this feature. Continuing with the same chronology of high efficiency products first, in the highest efficiency band above 22.5%, only two companies, Maxeon and Jolywood, offered such products until June.

**Product Shares Of Different Efficiency Bands**



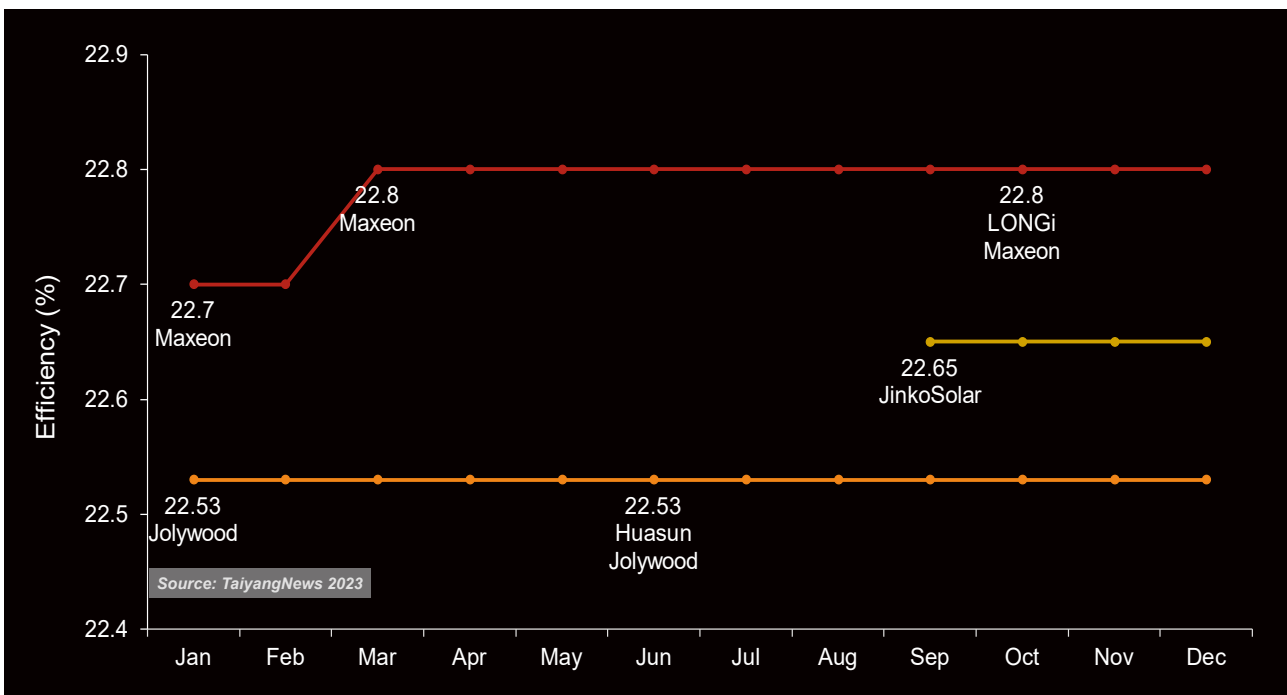
The share of the highest PV module efficiency band larger than 22.5% has increased over the course of the year - from 10% in Jan. 2022 to 15% in December. While the lowest band from 21.5% - 21.7% still dominates, its share reduced from about two thirds to a little over half over the course of the year.

### Module Count & Shares >22.5% Efficiency Band



Only 5 out of 34 products at the end of 2022 were offered in the top efficiency band category. However, they represented all high-efficiency cell technologies.

### Products with efficiencies >22.5



In Nov. 2022, LONGi surprised the industry with its HPBC technology, realizing 22.8% efficiency. While LONGi & Maxeon use back-contact cells for their top module series, Jinko focuses on TOPCon, like Jolywood. Only Huasun opted for HJT.

Maxeon had an efficiency of 22.7%, which was later improved to 22.8% in April, while Jolywood offered a module at 22.53%. In July, Huasun joined the club with a 22.53% HJT module. In October, Jinko Solar entered the league with its TOPCon product, achieving 22.65% and taking the second place. Then in November, LONGi surprised the industry with its HPBC technology, realizing 22.8% efficiency, which was on par with Maxeon's module that had been number 1 for several years before we started this feature.

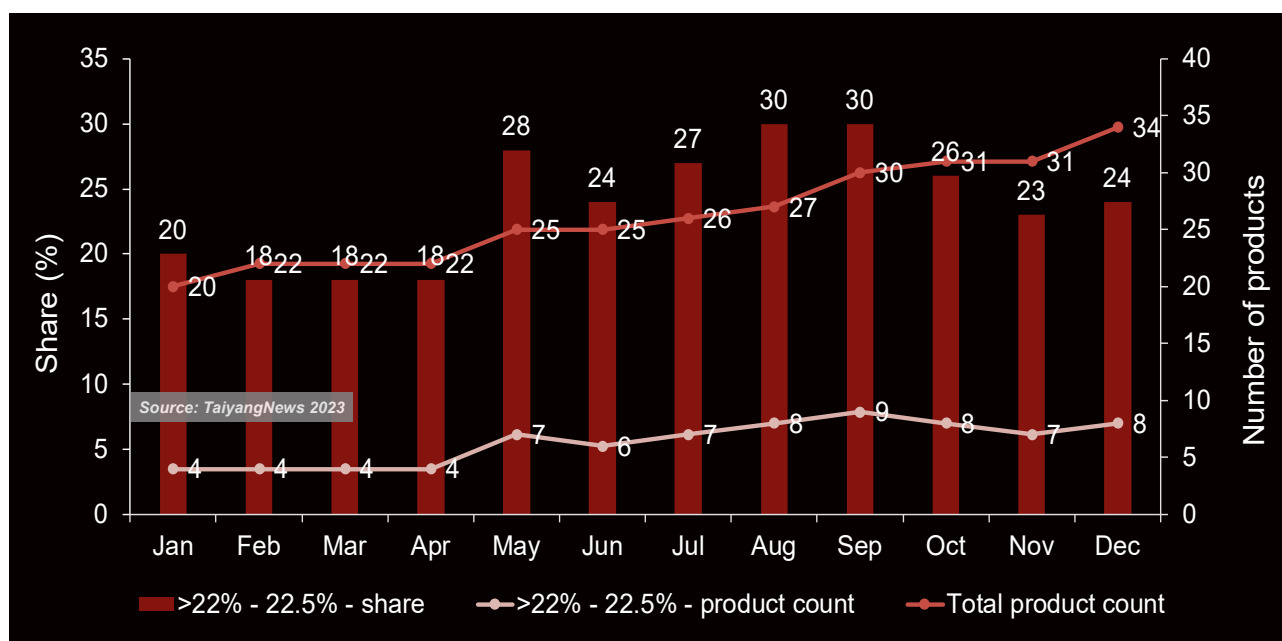
### Efficiencies >22 - 22.5%

In the efficiency range of greater than 22% to 22.5%, the number of products increased from 4 to 8. LG's IBC module topped the list in the beginning with an efficiency of 22.3%, followed by JinkoSolar's TOPCon product with 22.26% efficiency. Then, HJT products from Huasun and REC were also part of this efficiency group with 22.2% and 22.1% efficiency, respectively. The list remained the same in February, whereas in March, LG was delisted due to its exit from the PV market, but the product count remained the same as SPIC improved its TOPCon module efficiency from 22% to 22.1%, thus appearing in this band for the first time. The

only change in April was Huasun increasing its HJT module efficiency by 0.1% absolute to 22.2%.

Several changes have taken place in May; Canadian Solar came out with a 22.5% efficiency HJT module, Qcells and Astronergy commercialized TOPCon modules with 22.3% and 22.1% efficiency, respectively. REC upgraded its HJT module series to reach a 22.3% level. The only change in June was that Huasun improved its HJT module efficiency to 22.53%, beyond the scope of this band, thus the product disappeared from this efficiency range. In July, Akcome commercialized an HJT module with 22.5% efficiency, the same as that of another HJT product from Canadian Solar. The upgrade to SPIC's IBC product has also been reflected in July research; the company improved its IBC module efficiency to 22.3%, which is the same as that of the products from REC and Qcells. Eging's TOPCon module was added to the list in August, and its efficiency of 22.05% places it into this efficiency range. In September, JinkoSolar increased the efficiency of its TOPCon module beyond 22.5%, thus it is not listed here, while two new products were added to the list. JA Solar came out with its TOPCon module with 22.4% efficiency, and DAS Solar product also based

### Module Count & Shares >22 - 22.5% Efficiency Band



In the second highest efficiency range of greater than 22% to 22.5%, the number of products doubled in 2022, presenting about one quarter of the products in our list.



**DASOLAR**

# A Leader in N-type PV Technology



## **N-Type Series**

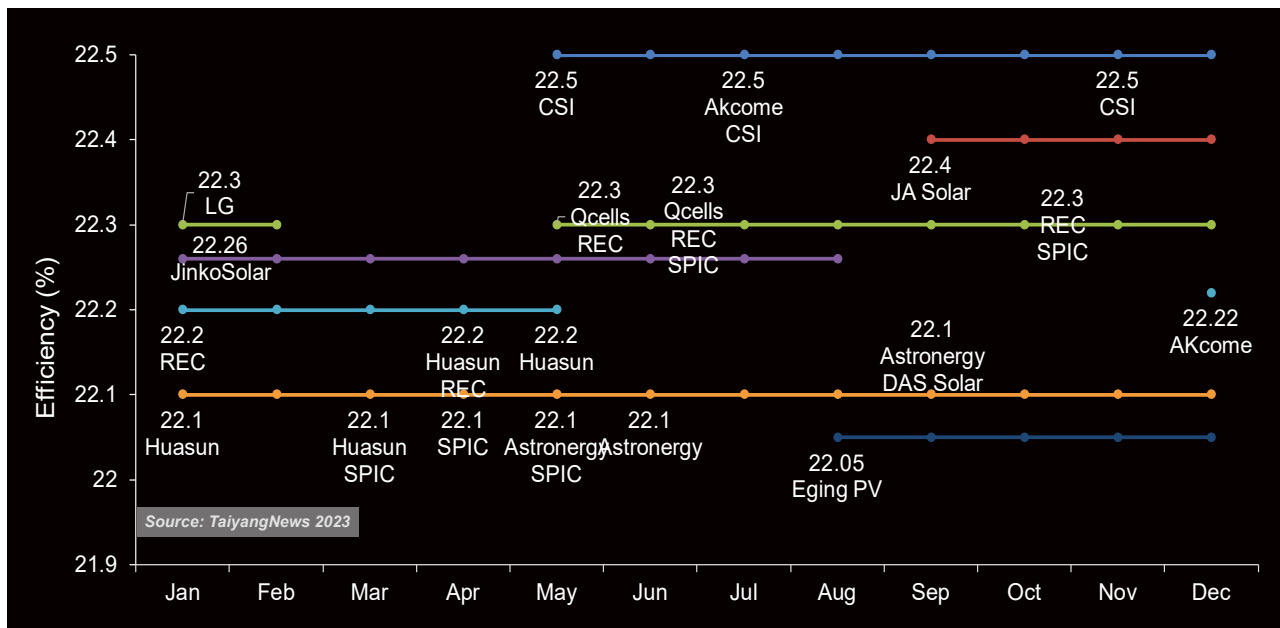
72/78 cell module for utility and commercial projects

54 cell module for residential projects

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



### Products with Module Efficiencies >22%- 22.5%



The modules in the efficiency range of greater than 22% to 22.5% in 2022 were mostly HJT and TOPCon modules with the most efficient product being an HJT panel from Canadian Solar.

on TOPCon had a slightly lower efficiency of 22.1%. In October, the products from Akcome and Qcells were not listed on their respective websites, thus were delisted, while the rest remained the same.

No changes were noticed in November, but Akcome started promoting an HJT module with a lower efficiency of 22.22% in December.

#### Efficiencies >21.7 - 22%

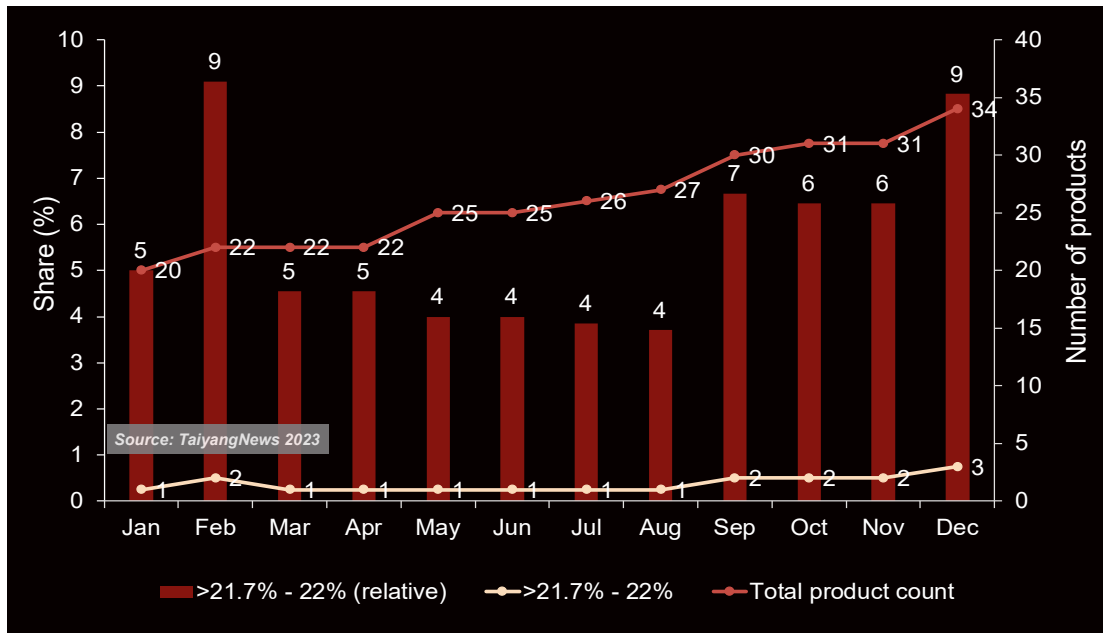
This efficiency band has the lowest representation, with a maximum of three companies. In January, the only product present in this efficiency range was the HJT module from Meyer Burger. Then, in February, SPIC's IBC module was also added to our listing, with a 22% efficiency. However, the very next month, the company improved its efficiency to 21.1%, thus jumping to the next class and leaving Meyer Burger alone in this efficiency range. It continued until September, when Trina Solar came out with

a TOPCon module with 21.9% efficiency, which remained the same until December. In the same month, Qcells' TOPCon module reappeared with a lower efficiency of 22%, increasing the product count in the month three.

#### Efficiencies 21.5 – 21.7%

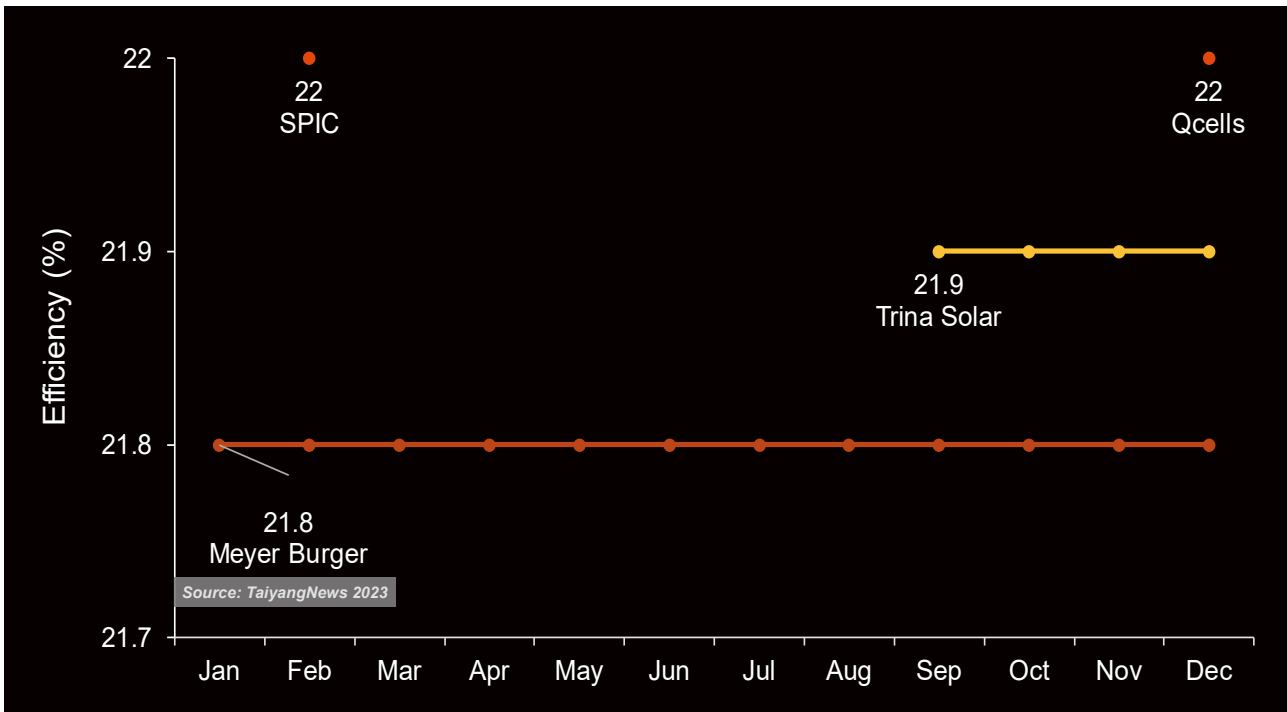
The efficiency range of 21.5% to 21.7% has the highest number of products and is mostly represented by PERC technology. The only exception being a HJT module from Jinergy that consistently

### Module Count & Shares > 21.7 - 22% Efficiency Band



Though the share increased over the course of the year, only 9% of all modules of the ranking were located in the efficiency range of greater than 21.7% to 22%.

### Products with Module Efficiencies >21.7 %- 22%



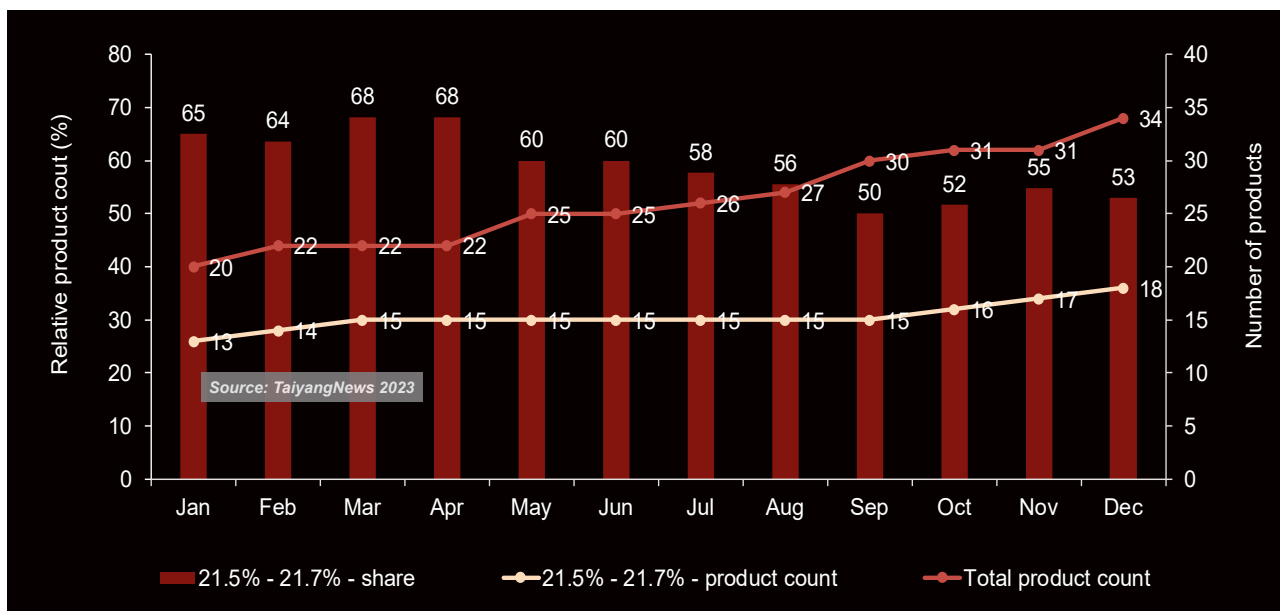
It seems this efficiency range larger than 21.7% and 22% is too high for the best PERC but too low for most of the premier TOPCon and HJT based module products.

features in this range throughout the year, with an efficiency of 21.68%. In January, products within this efficiency band had a 65% market share, which peaked at 68% in March and April before gradually decreasing. The dip towards the end of the year is because many companies have started focusing on new products based on advanced cell architectures that enable higher efficiencies above 21.7%. On the other hand, companies have also improved their PERC product efficiencies. At the start of 2022, the best PERC cell efficiencies ranged between 21.5% to 21.6%, but eventually this threshold was pushed to 21.7%. However, one third of the 18 products offered in this efficiency band end of 2022 were modules with 21.7% efficiency.

In January, a total of 13 products were listed within this efficiency range, with Jinery's module being the most efficient at 21.68%. Five other modules from Risen, CSI, Suntech, Talesun and Trina Solar were listed at 21.6%, with only one module from Eging at 21.57%. The remaining six modules from LONGi

Solar, JA Solar, Jinery, Astronergy, Q Cells, and TW Solar were at the lower limit of 21.5%. By the end of the year, the total number of products listed within this efficiency range had increased to 18. While none of the products reached 21.7% in January, three did so by December. The 21.68% efficient module were offered by 3 companies in December, while only one was available in January. The number of products listed at 21.6% increased from 5 in January to 6 in February and remained like that till June, before decreasing to 4 in December. The missing ones were actually replaced by products with higher efficiencies. There was only one product with 21.57% efficiency, which gradually increased to 4 by year end. In contrast, the count of products with 21.5% efficiency reduced from 6 to 4. This indicates that companies have been also pushing the efficiency for PERC modules. In an year span, the PERC module efficiency has been increased by about 1% absolute.

### Module Count & Shares >21.5 - 21.7% Efficiency Band



**The lowest efficiency range of the TOP SOLAR MODULE Ranking from over 21.5% to 21.7% shows the highest number of products and represented over half of all modules in the list end of 2022. Almost all products here are based on PERC technology.**

### Module Products With Efficiencies >21.5 - 21.7

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
21.7												CSI
							Risen	Risen	Risen	Risen	Risen	Risen
		LONGi	LONGi	LONGi	LONGi	LONGi	LONGi	LONGi	LONGi	LONGi	LONGi	LONGi
21.68												Akcome
										Jinko Solar	Jinko Solar	Jinko Solar
21.6	Jinergy	Jinergy	Jinergy	Jinergy	Jinergy	Jinergy	Jinergy	Jinergy	Jinergy	Jinergy	Jinergy	Jinergy
	Risen	Risen	Risen	Risen	Risen	Risen						
		JA Solar	JA Solar	JA Solar	JA Solar	JA Solar	JA Solar	JA Solar	JA Solar	JA Solar	JA Solar	JA Solar
	CSI	CSI	CSI	CSI	CSI	CSI	CSI	CSI	CSI	CSI	CSI	
	Suntech	Suntech	Suntech	Suntech	Suntech	Suntech	Suntech	Suntech	Suntech	Suntech	Suntech	Suntech
	Talesun	Talesun	Talesun	Talesun	Talesun	Talesun	Talesun	Talesun	Talesun	Talesun	Talesun	Talesun
	Trina Solar	Trina Solar	Trina Solar	Trina Solar	Trina Solar	Trina Solar	Trina Solar	Trina Solar	Trina Solar	Trina Solar	Trina Solar	Trina Solar
21.57											Jinergy	Jinergy
			Seraphim	Seraphim	Seraphim	Seraphim	Seraphim	Seraphim	Seraphim	Seraphim	Seraphim	Seraphim
		Yingli	Yingli	Yingli	Yingli	Yingli	Yingli	Yingli	Yingli	Yingli	Yingli	Yingli
	Eging	Eging	Eging	Eging	Eging	Eging	Eging	Eging PV	Eging PV	Eging PV	Eging PV	Eging PV
21.52								Jinergy				
	LONGi											
21.5	JA Solar											
	Jinergy	Jinergy	Jinergy	Jinergy	Jinergy	Jinergy	Jinergy		DASSolar	DASSolar	DASSolar	DASSolar
	Astronergy	Astronergy	Astronergy	Astronergy	Astronergy	Astronergy	Astronergy	Astronergy	Astronergy	Astronergy	Astronergy	Astronergy
	Hanwha											
	Q Cells	Q Cells	Q Cells	Q Cells	Q Cells	QCells	Qcells	Qcells	Qcells	Qcells	Qcells	Qcells
	TW Solar	TW Solar	TW Solar	TW Solar	TW Solar	TW Solar	TW Solar	TW Solar	TW Solar	TW Solar	TW Solar	TW Solar

**While no PERC module reached the 21.6% efficiency level in Jan. 2022, several improved over the course of the year to that level and 3 cell/module producers were even able to offer panels with 21.7% by the end of 2022.**



## 5. Module Efficiency Developments For Different Cell Technologies

While the previous chapter provides an overview of the efficiency distribution among the listed productions over a year, we have further analyzed the efficiency progress with respect to different cell technologies. While the previous chapter does provide a larger picture as every cell technology has a typical efficiency band, there are always exceptions. In this chapter, we aim to eliminate these exceptions and provide an analysis with respect to cell technology.

### 5.1 Efficiency shares

Starting with statistics, the chart below summarizes the cell technology distribution among the products of the top modules listed in each month. With all technologies binned together, the graph may appear somewhat complex. However, it becomes clearer when each cell technology is evaluated separately.

#### IBC

Starting with IBC, which is represented with the highest efficiency, on the other hand, it has the lowest product count with 2 in January and 3 in December, representing a 10% and 9% share in the total product count, respectively. This means only a few companies have mastered IBC technology. Initially, it was mainly two companies, LG and

Maxeon, with LG exiting the solar industry in April. In March, SPIC's IBC product based on ISC Konstanz' Zebra technology also entered the market. This left only Maxeon and SPIC as the only suppliers of IBC modules in commercial scale. However, in November, LONGI came out with its HPBC, also built on the IBC platform, thus increasing the number of products to 3 from then onwards.

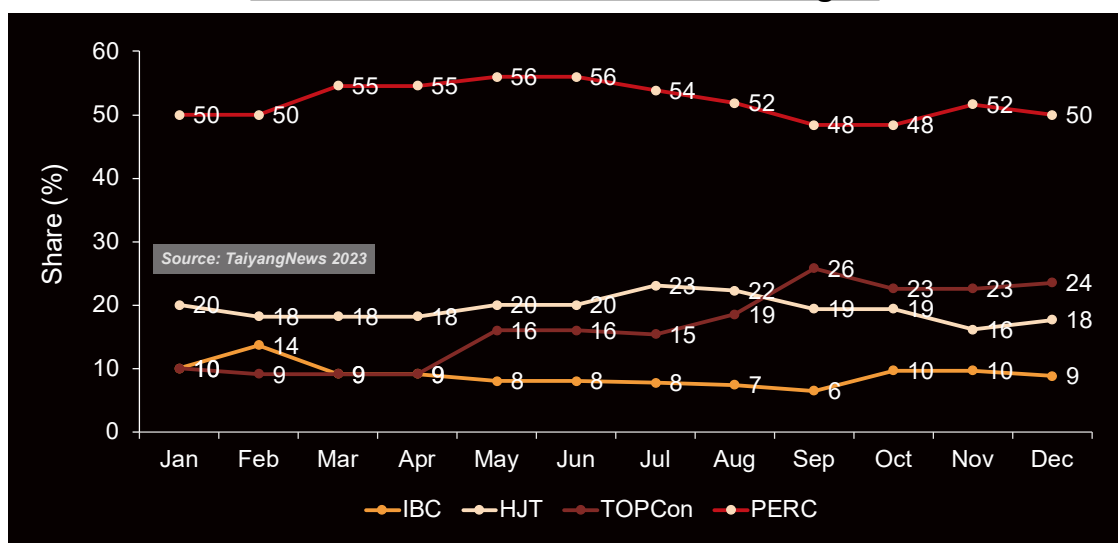
#### HJT

Moving on to HJT, the technology that was represented by four products in the beginning, has increased to six over the course of a year. However, the relative share of HJT products decreased from 20% to 18% during this period. Four companies - REC, Meyer Burger, Huasun, and Jinergy - were the initial players offering HJT modules commercially. In May, Canadian Solar entered the market with its HJT product, followed by AKCome in July. Although these companies continued to offer their products, the graph shows a dip in the product count to five, which was due to AKCome's website being inaccessible during that time. It reappeared in December, bringing the count back up to six.

#### TOPCon

On the other hand, TOPCon, which had little

**Product Shares of Different Technologies**



Interestingly, when looking at the large cell/module manufacturers covered in our ranking, over the course of 2022, PERC basically maintained its share of at least 50%. PERC's natural successor TOPCon gained most - growing from 10% to nearly a quarter of all products in the list in Dec. 2022.



HETERO  
JUNCTION  
TECHNOLOGY

inter  
**solar**  
connecting solar business | EUROPE

**A3.240**

www.huasunsolar.com  
sales@huasunsolar.com

Himalaya  
High-efficient HJT  
solar module

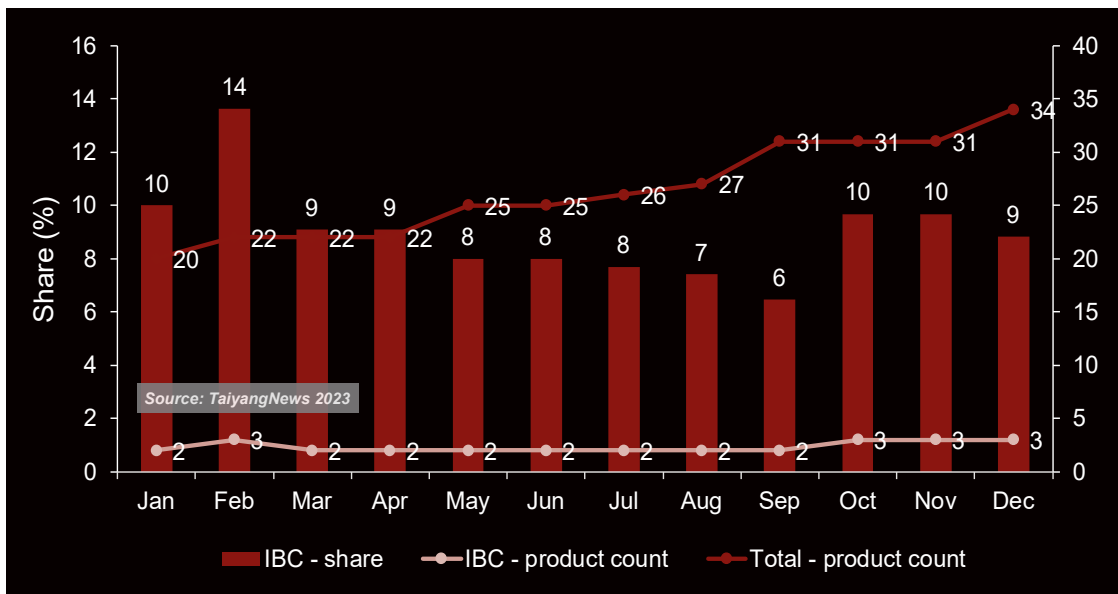
**220W**  
Highest module power

**340g** CO<sub>2</sub> eq/W  
Lowest carbon emission

The data is based on theoretical calculations using 100µm HJT wafer.

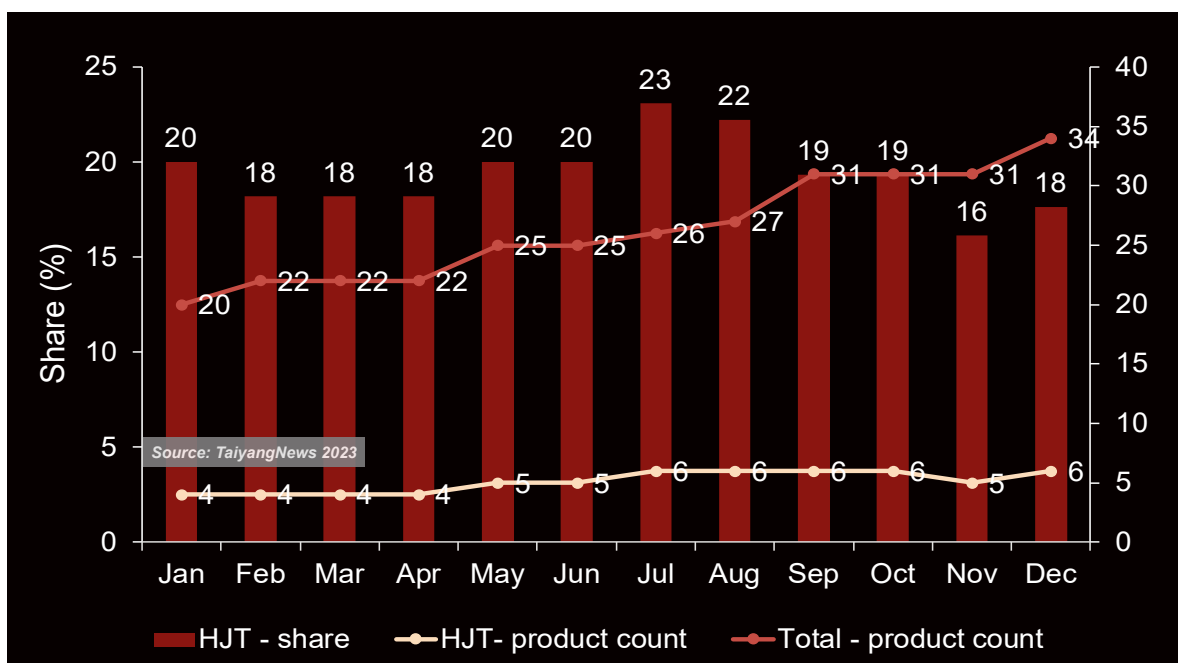


### Product Share Of IBC Module Technology In 2022



Like in the past, only few companies offered back-contact modules in 2022. However, the technology has been the key to the highest efficient solar module, for many years being held alone by SunPower (now through its spin-off Maxison), before LONGi reached their record level in Nov. 2022 too.

### Product Share Of HJT Module Technology In 2022



While the number of HJT products in our ranking increased by 50% from 4 to 6, the total share of the technology slightly decreased to 18% in 2022.

presence with only 2 products in Jan. 2022, quickly entered the commercial space and had 8 products on offer by December, increasing its share in listed products from 10% to 28%, as shown in the graph below. In January of last year, we first listed products from JinkoSolar and Jolywood, which remained the only pair of TOPCon module makers that could offer higher efficiency products. Later, in May, Qcells and Astronergy started offering such products. In August, Eging joined the stream, followed by JA Solar, DAS Solar, and Trina, which also commercialized TOPCon modules that were reflected in the September listing. However, in the subsequent two months, Qcells' product was not listed as its data was not accessible and only became available in December.

**PERC**

The share of PERC products remained more or less the same throughout the year, accounting for 50% of the listed products in January with a total of 10 products. It peaked at 56% in May and June before coming down to 50% in December with 17 products. The companies offering PERC modules commercially were CSI, Risen, Suntech, Talesun, Trina Solar, Astronergy, JA Solar, Jinergy, LONGI, and TW Solar in the beginning. In February, Yingli

was added to the list followed by Seraphim in March. The list remained unchanged in April. In May, Eging and Qcells joined the list. The next change took place in September when JinkoSolar began offering PERC modules above 21.5% efficiency. In November, Jinergy started offering such modules, while Akcome followed in December. Let's delve into the efficiency distribution and progress of each cell technology.

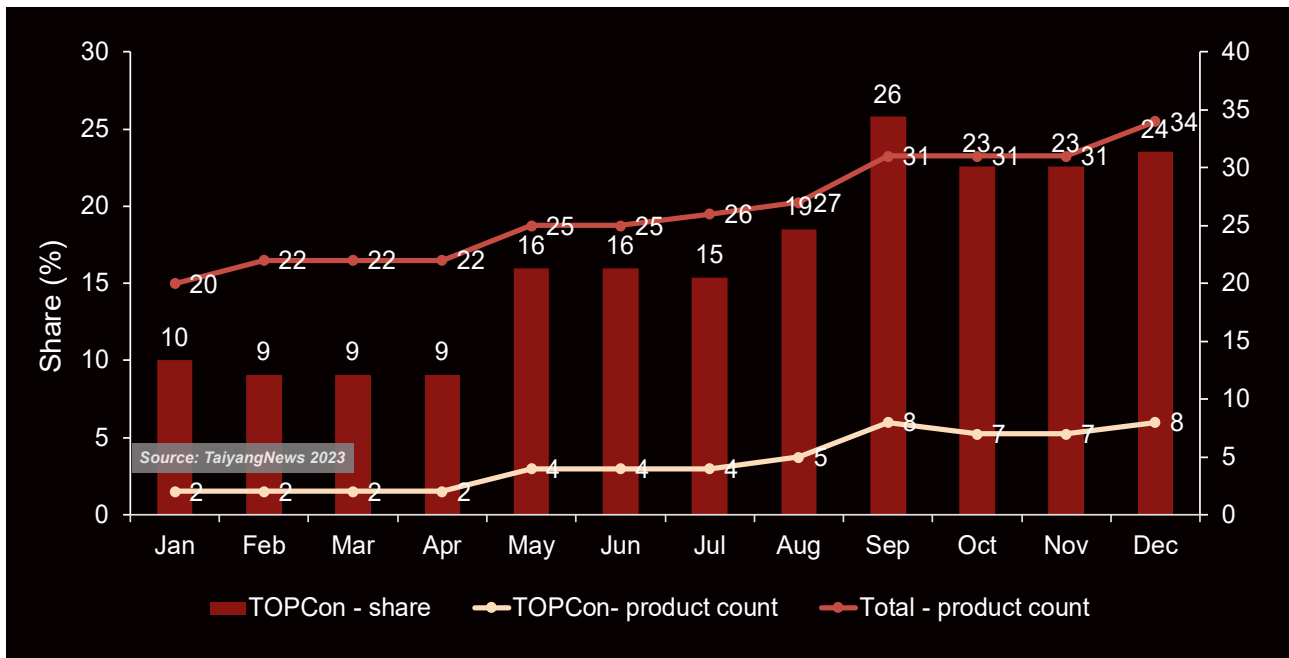
**5.2 Module efficiency developments for different cell technologies**

**IBC**

In January, the efficiency range for IBC was between 22.3% and 22.7%, with the lower limit extending to 22% in February. The efficiency band for IBC shifted by 0.1% at both the lower and upper limits to 22.1% and 22.8%, respectively, in March and remained unchanged until May. In June, the minimum efficiency increased again to 22.3% with no change in the maximum value, which continued until the end of the year.

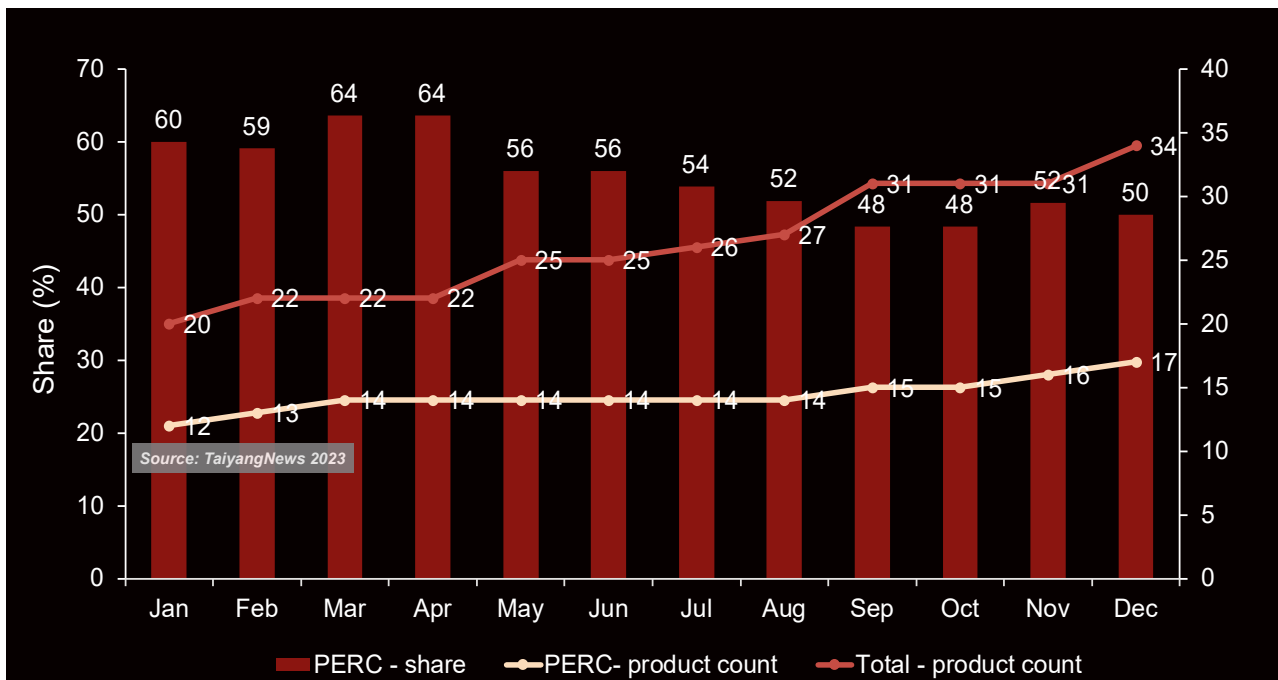
Moving on to the companies and their respective

**Product Share Of TOPCon Module Technology In 2022**



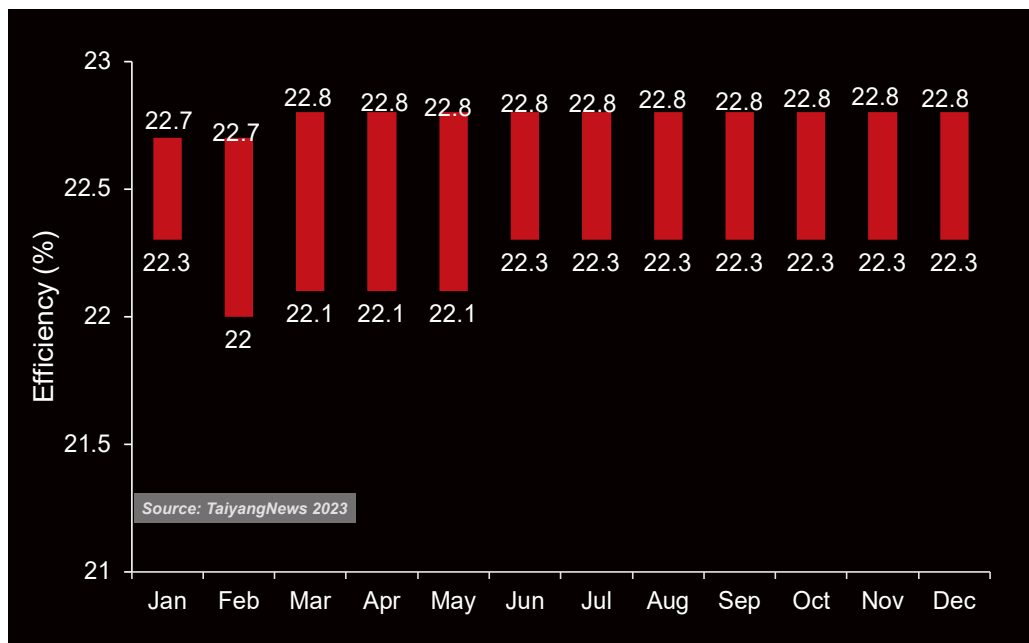
**The number of TOPCon modules quadrupled to 8 by year end as the technology's share improved dramatically. In Dec. 2022, nearly every 4th product in the efficiency listing was a TOPCon product.**

### Product Share Of PERC Module Technology In 2022



Although PERC modules were in the lowest efficiency band of our ranking, the technology strongly dominated the list in 2022 with all of the module leaders offering 'high-efficiency' PERC products.

### IBC Module Efficiency Range In 2022



A marginal efficiency improvement of 0.1% points to 22.8% could be observed for efficiency leading technology IBC in 2022. The minimum IBC efficiency also slightly improved, but that level was still 1.5% points lower than the maximum in December.

NIWA

 JOLYWOOD

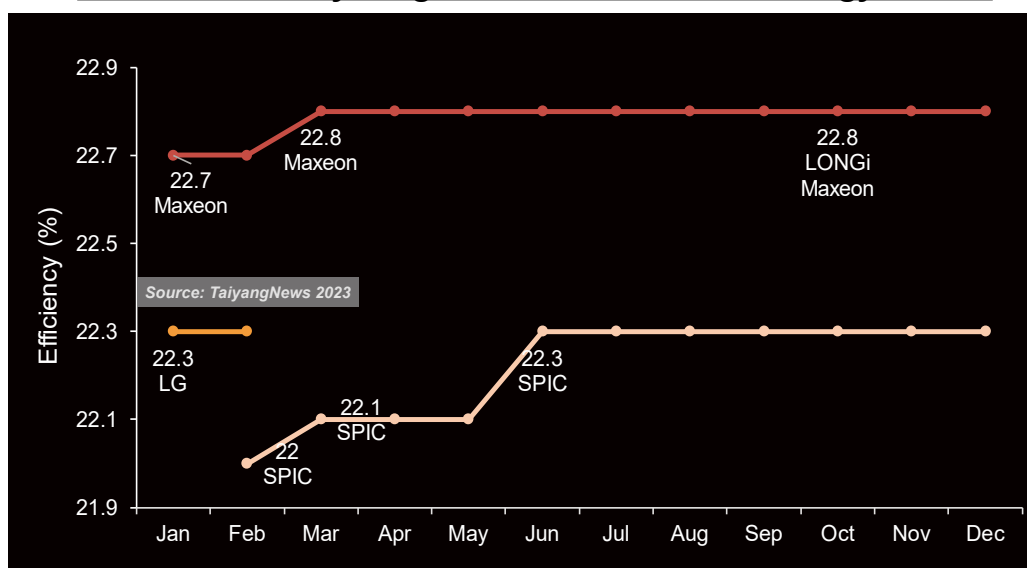
# ALL TYPE

## POWER YOUR HOME





## Module Efficiency Progress For IBC Cell Technology In 2022



**Maxeon's efficiency improvement didn't help to secure the top spot for itself. At the end of the year, it had to share the first rank with LONGi. SPIC's IBC cell, licensed from ISC Konstanz, is at an efficiency level below the top HJT and TOPCon products.**

efficiencies, Maxeon and LG had the highest efficiencies in the first month, with 22.7% and 22.3%, respectively. In February, SPIC entered with a somewhat lower level efficiency of 22%. In March, both Maxeon and SPIC increased their efficiency by 0.1%, and then SPIC alone increased it to 22.3% from 22.1%. While these efficiency levels remained the same, LONGi entered the list with its brand new HPBC technology, realizing 22.8%, on par with Maxeon's module.

### HJT

For HJT, the lower limit has been maintained at 21.68% though out the year, while best efficiency of 21.9% in January has been increased to 22.2% in February and remained at top till April. In May it is then increased to 22.5% and again marginally increased to 22.53 in July and remained at the same level, which has been maintained for rest of the year.

As for the companies, REC held the top spot at 22.2% until March, then in April, Huasun, which has been promoting a 22.1% HJT module commercialized an HJT product with 22.2% efficiency, sharing the top space with REC. In May, Canadian Solar entered the list with a 22.5% product, pushing REC down to second place with its HJT module at 22.3% efficiency, increased

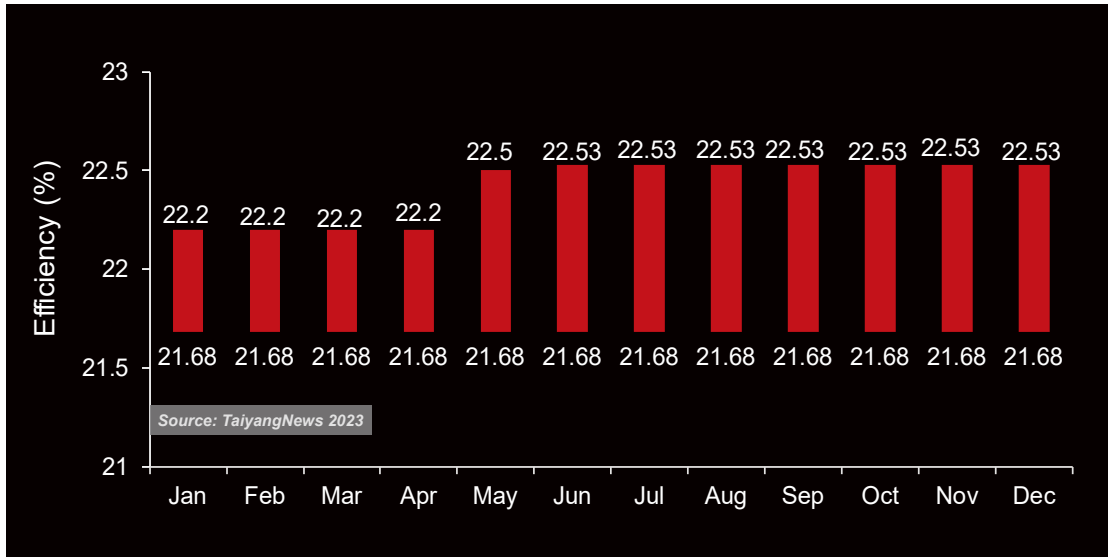
from 22.2%. In the very next month, Huasun commercialized its HJT module with 22.53%, which remained the top efficiency for the rest of the year. REC and Canadian Solar have also maintained the efficiencies of their HJT products at the same level – 22.3% and 22.5%, respectively - for the rest of the year. In June, Akcome entered our listing as an HJT maker with a 22.5% efficient module, which remained the same until October, while the product specs became inaccessible in November. In December, Akcome released a new HJT module, however, with a lower efficiency of 22.22%. Meyer Burger, a well-known HJT producer, maintained the same module efficiency of 21.8% throughout the year. Jinery's HJT module represented the lower limit of HJT modules at 21.68% throughout the year.

### TOPCon

In the TOPCon segment, the efficiency range began with 21.26% and 22.53%, with two products representing the lower and higher ends. The first change occurred in May, when the lower limit was extended to 22.1%, then further to 22.05% in August, and finally to 22.19% in September. However, the best efficiency for TOPCon was improved only once in September to 22.65%.

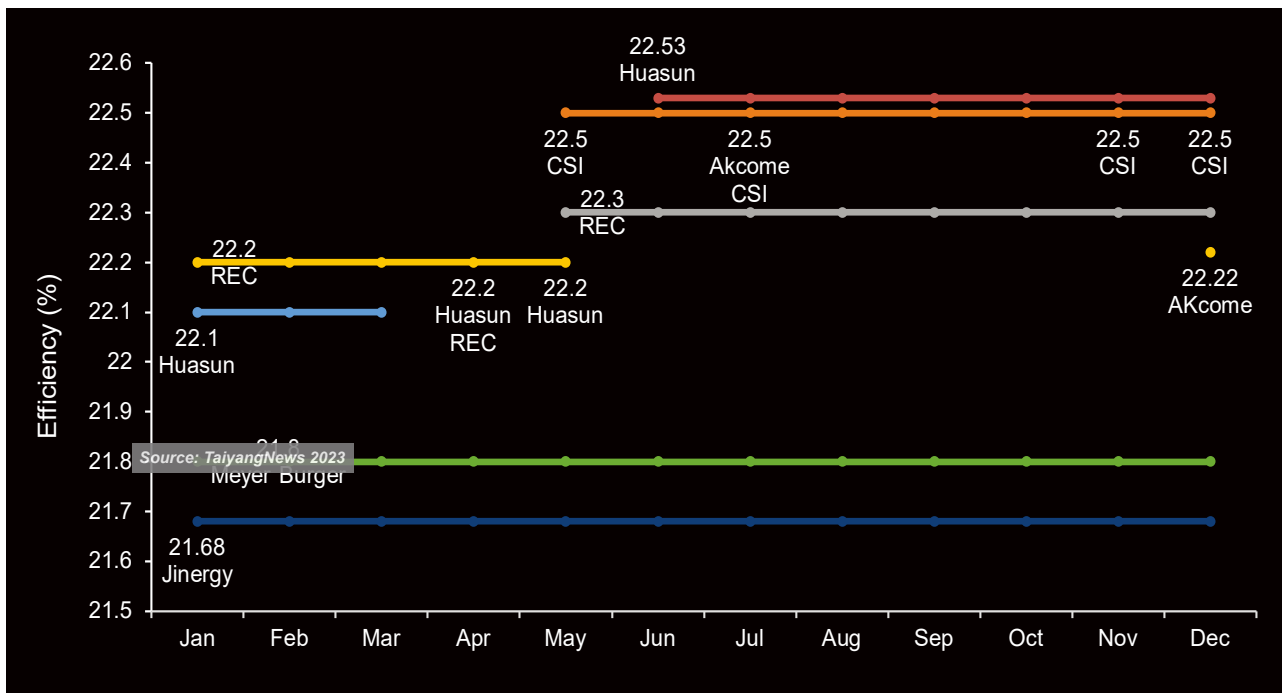
In terms of product-level details, Jolywood had

### HJT Module Efficiency Range In 2022



The best efficiency HJT products improved to 22.53% in 2022, while the minimum stayed at the same level of 21.68%.

### Module Efficiency Progress For HJT Cell Technology In 2022



Chinese HJT specialist Huasun quickly improved its products, pushing them up to reach the highest level for this technology last June at 22.53%.

# SMART MODULE BY TONGWEI

## TONGWEI PV INDUSTRY CHAIN

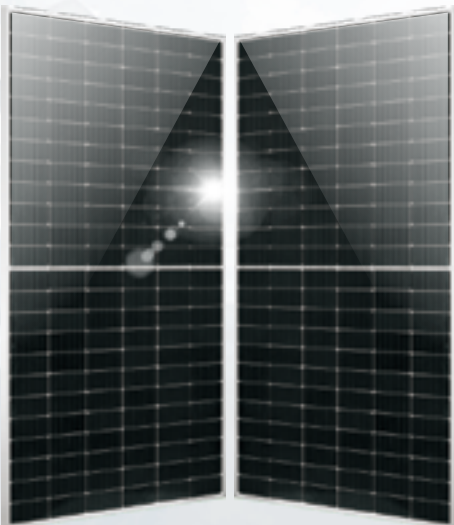
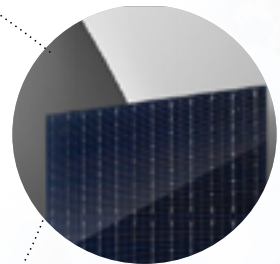


**No.1**

High-purity crystalline silicon shipments  
have ranked first in the world for 3 years

**100GW**

Cumulative shipments of cells have exceeded 100GW  
No.1 in the world for 6 years



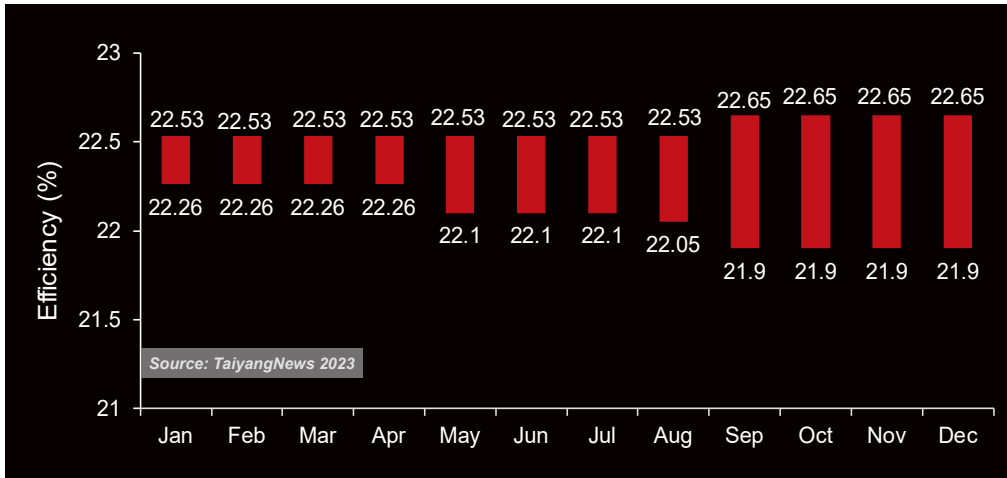
**80GW**

High-efficiency modules in 2023  
Predicted to reach 80GW

retained its leadership with its TOPCon module of 22.53% efficiency until September, which it continued to offer throughout the year. However, in

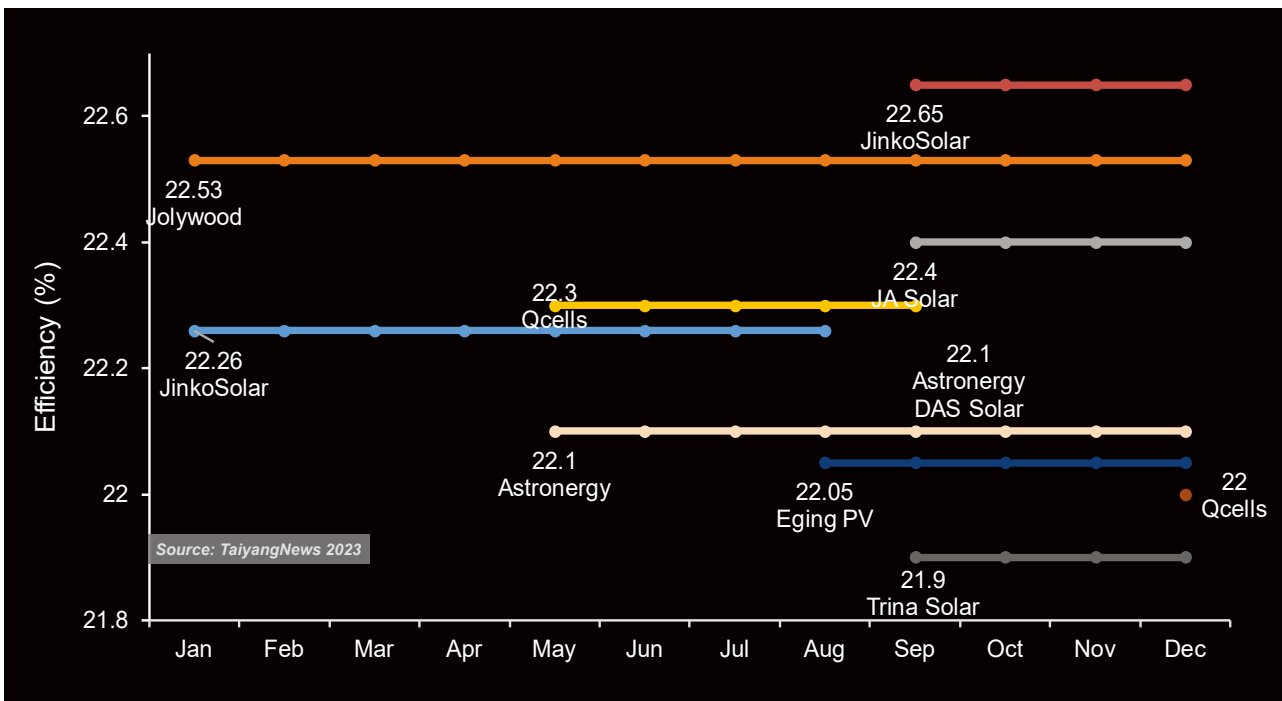
September, JinkoSolar, which has been offering a TOPCon module with an efficiency of 22.26% from the beginning, came out with a 22.65% efficiency

### TOPCon Module Efficiency Range In 2022



With more companies jumping on the TOPCon train the efficiency range widened over the course of 2022.

### Module Efficiency Progress For TOPCon Cell Technology In 2022



JinkoSolar's massive foray into TOPCon in 2022 not only made them the largest supplier but also the manufacturer of the highest efficient products.

product that remained at the top of the TOPCon listing until the end of the year.

As for new entrants into the segment, Q-cells entered our listing in May with an efficiency of 22.3% TOPCon module, which remained unchanged until September. However, the product was not available on the company's website for the next two months, and the company came out with a slightly lower efficiency product in December with an efficiency of 22%. Astronergy entered our list even before Q-cells with a 22.1% TOPCon module that maintained the same efficiency throughout the year.

DAS Solar also started offering a TOPCon module with the same 22.1% efficiency from August onwards, and the listed specifications remained unchanged until December. The same was the case with Eging PV's 22.05% efficient product. In September, Trina Solar commercialized its TOPCon module with 21.9% efficiency, which did not undergo any changes throughout the year. JA Solar was the last entrant to our TOPCon listing for the year with a module of 22.4% efficiency, which was reflected in our October list.

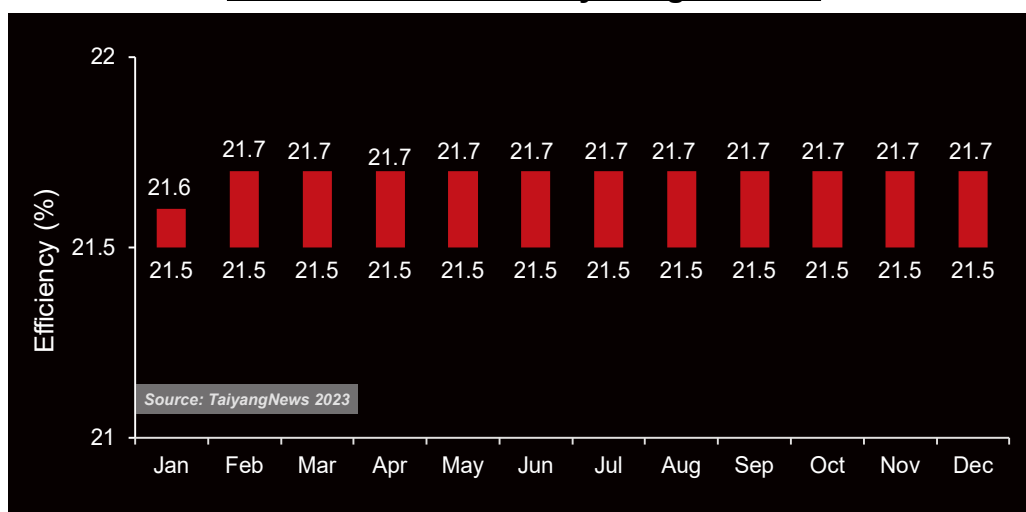
### PERC

In January, the PERC efficiency range was 21.5% to 21.6%, which quickly increased to 21.7% the following month and remained constant until the end of the year. Initially, there were 12 products listed in this PERC category in January. Five modules from Risen, CSI, Suntech, Talesun, and Trina Solar were listed at 21.6%, while only one module from Eging was at 21.57%. Six modules from LONGi Solar, JA Solar, Jinergy, Astronergy, Q Cells, and TW Solar were at the lowest threshold of 21.5%.

Towards the end of the year, a lot changed. In December, a total of 17 products were listed. In February, LONGi increased the efficiency of its PERC module to 21.7%, JA Solar's product improved to 21.6%, and Yingli entered the list with a 21.57% efficient module. The only change in March was Seraphim entering the list with a 21.5% module. From April to June, there were no changes. However, Risen introduced an improved product with an efficiency of 21.7% in July.

In August, Jinergy's product was listed with an improved efficiency of 21.52%, but the product spec was not accessible for the next two months.

### PERC Module Efficiency Range In 2022



**At 21.7% module efficiency as the maximum for commercial PERC panels end of 2022, the technology has reached a level probably hardly anyone believed this would be possible a few years ago.**



## Module Efficiency Progress For PERC Cell Technology In 2022

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
21.7												CSI
							Risen	Risen	Risen	Risen	Risen	Risen
		LONGi	LONGi	LONGi	LONGi	LONGi	LONGi	LONGi	LONGi	LONGi	LONGi	LONGi
21.68												Akcome
										Jinko Solar	Jinko Solar	Jinko Solar
21.6	Jinergy	Jinergy	Jinergy	Jinergy	Jinergy	Jinergy	Jinergy	Jinergy	Jinergy	Jinergy	Jinergy	Jinergy
	Risen	Risen	Risen	Risen	Risen	Risen						
		JA Solar	JA Solar	JA Solar	JA Solar	JA Solar	JA Solar	JA Solar	JA Solar	JA Solar	JA Solar	JA Solar
	CSI	CSI	CSI	CSI	CSI	CSI	CSI	CSI	CSI	CSI	CSI	
	Suntech	Suntech	Suntech	Suntech	Suntech	Suntech	Suntech	Suntech	Suntech	Suntech	Suntech	Suntech
	Talesun	Talesun	Talesun	Talesun	Talesun	Talesun	Talesun	Talesun	Talesun	Talesun	Talesun	Talesun
	Trina Solar	Trina Solar	Trina Solar	Trina Solar	Trina Solar	Trina Solar	Trina Solar	Trina Solar	Trina Solar	Trina Solar	Trina Solar	Trina Solar
21.57											Jinergy	Jinergy
			Seraphim	Seraphim	Seraphim	Seraphim	Seraphim	Seraphim	Seraphim	Seraphim	Seraphim	Seraphim
		Yingli	Yingli	Yingli	Yingli	Yingli	Yingli	Yingli	Yingli	Yingli	Yingli	Yingli
	Eging	Eging	Eging	Eging	Eging	Eging	Eging	Eging PV	Eging PV	Eging PV	Eging PV	Eging PV
21.52								Jinergy				
	LONGi											
21.5	JA Solar											
	Jinergy	Jinergy	Jinergy	Jinergy	Jinergy	Jinergy	Jinergy		DASSolar	DASSolar	DASSolar	DASSolar
	Astronergy	Astronergy	Astronergy	Astronergy	Astronergy	Astronergy	Astronergy	Astronergy	Astronergy	Astronergy	Astronergy	Astronergy
	Q Cells	Q Cells	Q Cells	Q Cells	Q Cells	QCells	Qcells	Qcells	Qcells	Qcells	Qcells	Qcells
	TW Solar	TW Solar	TW Solar	TW Solar	TW Solar	TW Solar	TW Solar	TW Solar	TW Solar	TW Solar	TW Solar	TW Solar

Source: TaiyangNews 2023

After LONGi started offering a 21.7% efficient PERC panel in Feb. 2022, it took a few months until others reached that level with their products as well. With many other leading companies offering products at 21.5% - our minimum acceptance criteria - or 21.6%, there is likely more PERC panels to reach that top level in the near future.

In September, DAS Solar entered the list with a 21.5% PERC module. In October, JinkoSolar, with no representation in PERC segment, i.e., the commercially available PERC products of the company not having efficiency of 21.5% or above, entered the list with a 21.68% product. Jinergy re-entered our radar with a product featuring improved efficiency of 21.57% in November.

The last two changes of the year in the PERC category were Canadian Solar coming out with a 21.7% efficiency module, and Akcome's PERC module entering the list for the first time with an efficiency of 21.68%.

# RUNERGY



Munich RE 



Max. Efficiency **22.6%**

N-Type Bifacial & Dual Glass

HY-DH144N8

**560-585W**



High Conversion Efficiency



Outstanding Anti-degradation



Excellent Energy Yield



Quality Guarantee

**Booth No. E12-310**

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



## 6. Power

Power is the most important characteristic of a module, next to efficiency, as it also serves as the primary sales metric for a PV panel. Furthermore, power indirectly determines the module's application since it is generally related to size, which, in turn, determines the module's applications. Although there is no hard-and-fast rule, solar modules are typically categorized into different applications based on their power rating. Modules with a power rating of less than 500 W are preferred for residential applications, 500 to 600 W for commercial and industrial (C&I) applications, and above 600 W for utility installations. We have also followed this same analogy for power analysis.

When we look at the product count of module products bifurcated into these three power classes, the top modules listing - which reflects the commercially available high-efficiency modules - is clearly dominated by high-power modules with a rating of greater than 600W. In one year, the number of products increased steadily from 6 to 14. The other classes are not too far apart. The count of products with a power rating falling between 500 W and 600 W has increased from 5 to 10, while the

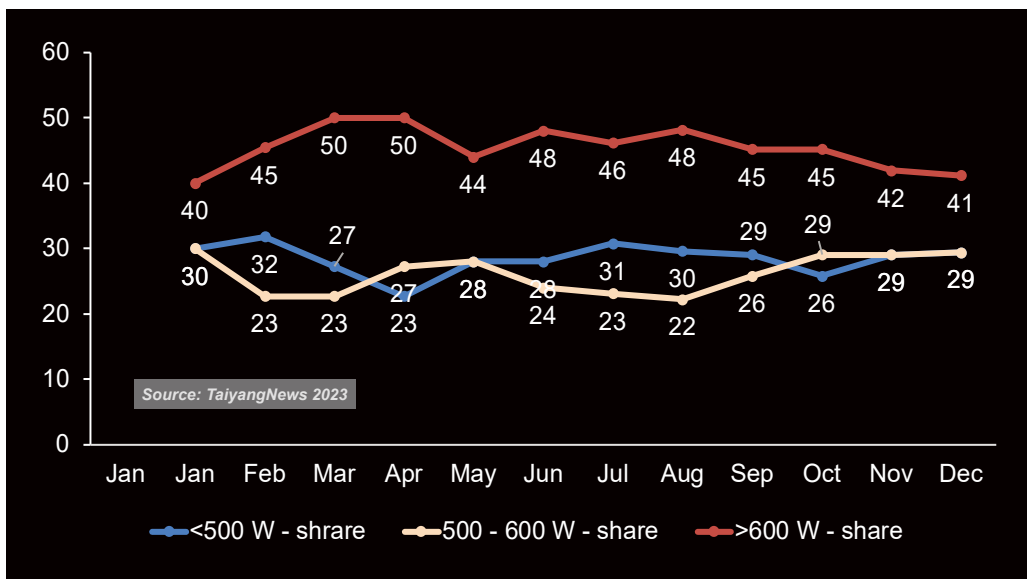
number of small modules has increased from 4 to 10.

When it comes to their share in the total product count, the highest power class products had a 40% share in January, hitting a peak in March and April with a 50% share before falling to 41% by the year's end. The share of the rest of the two power classes remained the same at the beginning and end of the year, with 30% and 29%, respectively. However, the share of lower power class modules has more or less remained at this level, while the mid-range of 500 to 600 W fluctuated according to the rise or fall of the product count of the top power class.

### Top 3 power ratings

Similar to efficiency, we have also examined the products in the top 3 ranks of power rating. Jolywood, with its TOPCon module rated at 700 W, has remained at the top position until October and was an exclusive promoter until May. The second position, at 670 W, was offered by as many as six companies, including Canadian Solar, Suntech, Talesun, Trina Solar, Risen, and Eging. Two more products were added to the same 670 W category

**Shares Of Different TOP Module Power Ratings In 2022**



**Higher efficient module make sense both for rooftop and ground-mounted installations. But the trend to higher efficient cells as**



# Solis Hybrid Inverter

## S6-EH1P8K-L-PRO

### Solis S6 Advanced Power Hybrid Inverter

- Generator connectivity with multiple input methods and automatic generator On/Off control
- Automatic UPS switching
- 10 second 200% surge power backup overload capability
- Supports 1ph and 3ph flexible connection with max 48kW in parallel
- Up to 190A max charge/discharge current
- 6 customisable charge/discharge time settings
- Compatible with lead-acid and lithium batteries, with multiple battery protection features
- Supports peak shaving control in both "self-use" and "generator" mode





in the following two months, qualifying for the second rank in power rating - Yingli in February and Seraphim in March.

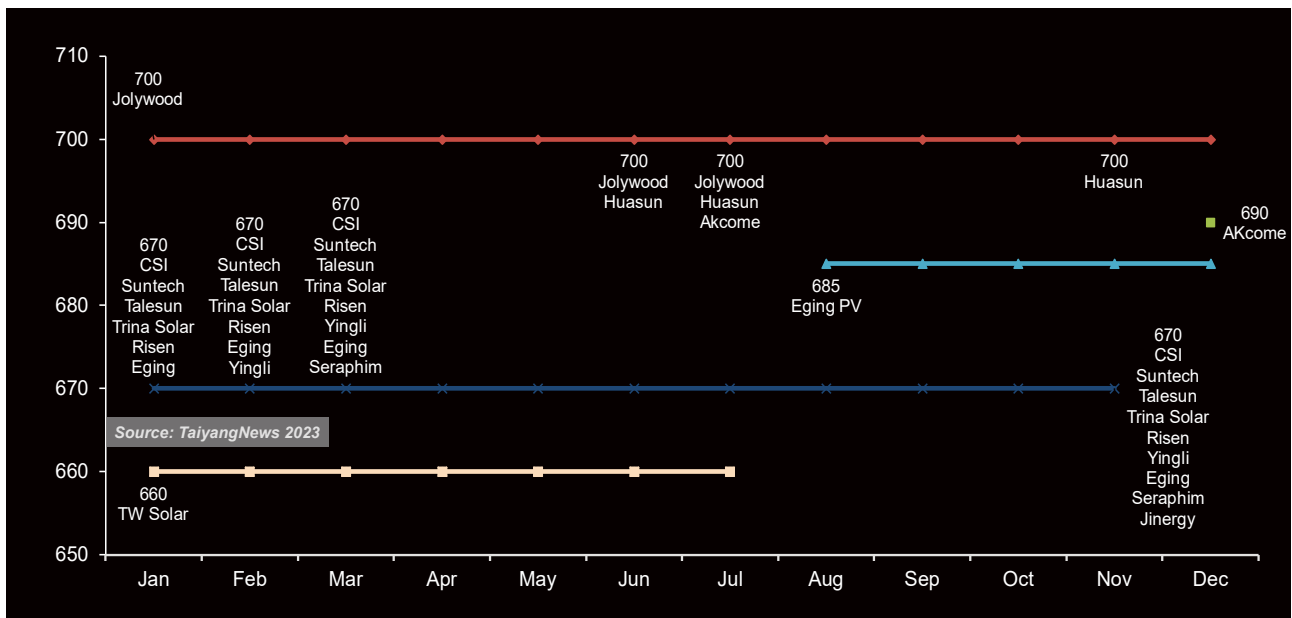
In June, Huasun introduced its HJT product with the same power rating as Jolywood's module, thus sharing the top rank with a 700 W power rating. Then in July, Akcome also introduced a higher power HJT module with a 700 W power rating, leaving no room for the third rank. Huasun, Jolywood, and Akcome have enjoyed the top position until October, as in November, products from both Akcome and Jolywood were not featured due to the non-availability of the product specs. Therefore, the 685 W TOPCon module from Eging took the second place, and all the 670 W PERC product companies, same as in June, resurfaced at the third rank. However, in December, Akcome reappeared in the listing with a somewhat lower power module of 690 W that qualifies for the second position, pushing Eging's product to third.

It is evident from the power analysis that PERC was not able to support power ratings beyond 670 W, and HJT and TOPCon are the only cell technologies that can lead up to 700 W module powers.

### Top power of each cell technology

When it comes to the top power in each of the cell technologies, **TOPCon** technology was at the top with a power rating of 700 W offered by Jolywood, which remained so till November. However, in December, the product was not reflected on the website and was thus delisted. As a result, Eging's 685 W became the most powerful module on the December listing. **PERC** technology takes the second position in power rating, and its top power of 670 W was maintained at the same level throughout the year. However, the companies offering such products changed over the course. A total of 6 PERC products featured in the January listing with a power of 670 W from Canadian Solar, Eging, Risen, Suntech, Talesun, and Trina Solar. One product was added in February from Yingli and one from Seraphim in March, and the list remained the same. The next change took place in November when Jinery also joined the club. However, in December, Canadian Solar introduced a 675 W module, which became the only PERC product to reach such a high-power rating for the month as well as for the year.

### The 3 Highest Power Ratings Over Course Of 2022



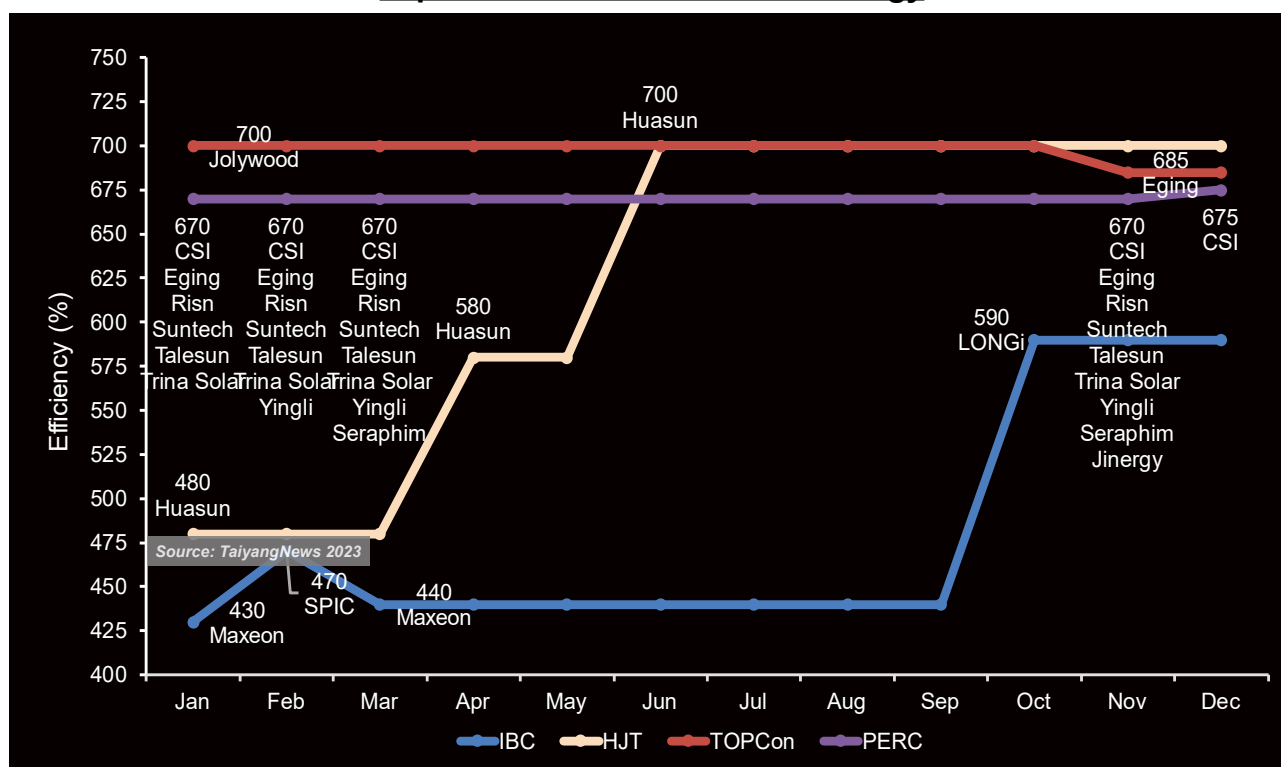
**While TOPCon and HJT cell technology based modules reached power ratings up to 700 MW in 2022, those panels relying on PERC were available up to 670 W.**

For **HJT** technology, while the power rating varied between 480 W and 700 W, it was only Huasun that has been offering such products. The most powerful HJT module had a rated power of 480 W till March, increased to 580 W in April and then again to 700 W in June with no further changes for the rest of the year.

Coming to **IBC** technology, the most powerful module in January was a 430 W module offered by Maxeon. In February, SPIC promoted a 470 W module, but

the product was delisted. Thus, Maxeon's slightly improved module with a power rating of 440 W again became the top product in March and continued its lead until September. In October, when LONGi entered the IBC league, its product not only had high efficiency but also high power of 590 W, as it was built on the M10 wafer format of 144 cell count.

### Top Power Of Each Cell Technology



After TOPCon pioneer Jolywood was the first to introduce a 700 W module, Huasun followed with a HJT based product for utility-scale applications. PERC products do not reach that level - here, the top products reach up to 670 W. High-cost IBC was traditionally used for smaller size panels for the rooftop segment until LONGi's back contact product was introduced to the market with a panel design nearly touching the 600 W level.

## 7. Companies' Technology Progress in 2022

While we have discussed the progress of efficiency and power in the prior chapters, below are the summary tables for each company with respect

to efficiency and power. These tables explain how the efficiency and power have progressed for each company in every cell technology segment.

TOP SOLAR MODULE Producers' Efficiency Progress For Different Cell Technologies In 2022														
Company	Technology	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Progress
Akcome	HJT								22.5	22.5	22.5	22.5	22.22	
Akcome	PERC												21.68	
Astronergy	PERC	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	
Astronergy	Topcon					22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1	
CSI	HJT					22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	
CSI	PERC	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.7	
DASSolar	PERC									21.5	21.5	21.5	21.5	
DASSolar	TOPCon									22.1	22.1	22.1	22.1	
Eging	PERC	21.56	21.56	21.56	21.56	21.56	21.56	21.56	21.56	21.56	21.56	21.56	21.56	
Eging	TOPCon								22.05	22.05	22.05	22.05	22.05	
QCells	PERC	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	
Qcells	TOPCon					22.3	22.3	22.3	22.3	22.3			22	
Huasun	HJT	22.1	22.1	22.1	22.2	22.2	22.53	22.53	22.53	22.53	22.53	22.53	22.53	
JA Solar	PERC	21.5	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	
JA Solar	TOPCon									22.4	22.4	22.4	22.4	
Jinergy	HJT	21.68	21.68	21.68	21.68	21.68	21.68	21.68	21.68	21.68	21.68	21.68	21.68	
Jinergy	PERC	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.52			21.57	21.57	
JinkoSolar	PERC									21.87	21.68	21.68	21.68	
JinkoSolar	TOPCon	22.26	22.26	22.26	22.26	22.26	22.26	22.26	22.26	22.65	22.65	22.65	22.65	
Jolywood	TOPCon	22.53	22.53	22.53	22.53	22.53	22.53	22.53	22.53	22.53	22.53	22.53	22.53	
LG	IBC	22.3	22.3											
LONGi	HPBC										22.8	22.8	22.8	
LONGi	PERC	21.5	21.7	21.7	21.7	21.7	21.7	21.7	21.7	21.7	21.7	21.7	21.7	
Maxeon	IBC	22.7	22.7	22.8	22.8	22.8	22.8	22.8	22.8	22.8	22.8	22.8	22.8	
Meyer Burger	HJT	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	
REC	HJT	22.2	22.2	22.2	22.2	22.3	22.3	22.3	22.3	22.3	22.3	22.3	22.3	
Risen	PERC	21.6	21.6	21.6	21.6	21.6	21.6	21.7	21.7	21.7	21.7	21.7	21.7	
Seraphim	PERC			21.57	21.57	21.57	21.57	21.57	21.57	21.57	21.57	21.57	21.57	
SPIC	IBC		22	22.1	22.1	22.1	22.3	22.3	22.3	22.3	22.3	22.3	22.3	
Suntech	PERC	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	
Talesun	PERC	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	
Trina Solar	PERC	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	
Trina Solar	TOPCon									21.9	21.9	21.9	21.9	
TW Solar	PERC	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	
Yingli	PERC		21.57	21.57	21.57	21.57	21.57	21.57	21.57	21.57	21.57	21.57	21.57	





**risen**

# Industry-leading PV & ESS integration



**2023 SNEC: N1-515**

---

**InterSolar Europe: A1.260**

June 14th - 16th, 2023

CONTACT US  
Stock Code: 300118



[www.risenenergy.com](http://www.risenenergy.com)



**TOP SOLAR MODULE Producer's Power Ratings Progress For Different Cell Technologies In 2022**

Company	Technology	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Progress
Akcome	HJT								700	700	700	700	690	
Akcome	PERC												560	
Astronergy	PERC	550	550	550	550	550	550	550	550	550	550	550	550	
Astronergy	Topcon					570	570	570	570	570	570	570	570	
CSI	HJT					440	440	440	440	440	440	440	440	
CSI	PERC	670	670	670	670	670	670	670	670	670	670	670	675	
DASSolar	PERC									555	555	555	555	
DASSolar	TOPCon									570	570	570	570	
Eging	PERC	670	670	670	670	670	670	670	670	670	670	670	670	
Eging	TOPCon								685	685	685	685	685	
QCells	PERC	590	590	590	590	590	590	590	590	590	590	590	590	
Qcells	TOPCon					400	400	400	400	400			395	
Huasun	HJT	480	480	480	580	580	700	700	700	700	700	700	700	
JA Solar	PERC	555	605	605	605	605	605	605	605	605	605	605	605	
JA Solar	TOPCon									625	625	625	625	
Jinergy	HJT	395	395	395	395	395	395	395	395	395	395	395	395	
Jinergy	PERC	550	550	550	550	550	550	550	550			670	670	
JinkoSolar	PERC									565	560	560	560	
JinkoSolar	TOPCon	575	575	575	575	575	575	575	575	585	585	585	585	
Jolywood	TOPCon	700	700	700	700	700	700	700	700	700	700	440	440	
LG	IBC	405	405											
LONGi	HPBC										590	590	590	
LONGi	PERC	550	555	555	555	555	555	555	555	555	555	555	560	
Maxeon	IBC	430	430	440	440	440	440	440	440	440	440	440	440	
Meyer Burger	HJT	390	390	390	390	390	390	390	390	390	390	390	390	
REC	HJT	410	410	410	410	430	430	430	430	430	430	430	430	
Risen	PERC	670	670	670	670	670	670	450	450	450	450	450	450	
Seraphim	PERC			670	670	670	670	670	670	670	670	670	670	
SPIC	IBC		470	435	435	435	440	440	440	440	440	440	440	
Suntech	PERC	670	670	670	670	670	670	670	670	670	670	670	670	
Talesun	PERC	670	670	670	670	670	670	670	670	670	670	670	670	
Trina Solar	PERC	670	670	670	670	670	670	670	670	670	670	670	670	
Trina Solar	TOPCon									425	425	425	425	
TW Solar	PERC	660	660	660	660	660	660	660	660	660	660	660	660	
Yingli	PERC		670	670	670	670	670	670	670	670	670	670	670	

Page left intentionally blank

TaiyangNews Virtual Conference

TAIYANGNEWS  
Virtual Conference

# Global PV System Technology Trends H1/2023

Takeaways from World's Largest Solar Trade Shows SNEC Shanghai & Intersolar Munich

June 27-28, 2023 | 09:30 - 13:30 CEST, Berlin



QR code for Registration

#SNECShanghaiIntersolarMunich

Free Registration at [TaiyangNews.info](https://TaiyangNews.info)

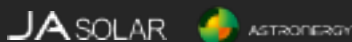
Diamond Sponsor :



Platinum Sponsor :



Gold Sponsor :



Silver Sponsor :





Dialogue & Conference & Exhibition

[www.snec.org.cn](http://www.snec.org.cn)

## 第十七届(2024)国际太阳能光伏与智慧能源(上海)大会暨展览会

17th (2024) International Photovoltaic Power Generation and Smart Energy Conference & Exhibition

# 2024年6月2-5日

上海新国际博览中心(浦东新区龙阳路2345号)



展览: 2024年6月3-5日

上海新国际博览中心

(浦东新区龙阳路2345号)

会议: 2024年6月2-4日

上海浦东嘉里大酒店

(上海市浦东新区花木路1388号)

## SNEC 第八届(2023)国际储能(上海)技术大会暨展览会

SNEC 8th (2022) International Energy Storage Technology Conference & Exhibition

## SNEC 第六届(2023)国际氢能与燃料电池技术和装备及应用(上海)展览会

SNEC 6th (2022) International Hydrogen and Fuel Cell Technology Conference & Exhibition

# 2023年10月31日-11月3日

上海新国际博览中心(浦东新区龙阳路2345号)

展览: 2023年11月1日-11月3日

上海新国际博览中心

(浦东新区龙阳路2345号)

会议: 2023年10月31日-11月2日

上海浦东嘉里大酒店

(上海市浦东新区花木路1388号)

◎主办单位: 上海新能源行业协会/上海伏勒密展览服务有限公司

◎承办单位: 上海伏勒密展览服务有限公司

地址: 上海市徐汇区宜山路425号光启城办公楼905-907室 邮编: 200235

展位预订: 021-64276991

E-mail: [info@snec.org.cn](mailto:info@snec.org.cn)

论坛电话: 021-33683167-809/810 E-mail: [office@snec.org.cn](mailto:office@snec.org.cn)

◎国际代理: Follow Me Int'l Exhibition (USA), Inc.地址: 2055 Junction Ave., Suite 225, San Jose, CA 95131

电话: +1.408.386.3373



The LONGi logo is positioned in the top left corner, featuring the brand name in white, bold, sans-serif capital letters against a solid red rectangular background.

**LONGi**



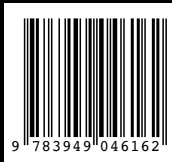
# TERAWATT ERA ZERO CARBON FUTURE

LONGi leads a greener world with innovation

Hall: **W1** Booth: **510**



**TAIYANGNEWS**  
ALL ABOUT SOLAR POWER



© TaiyangNews 2023. All rights reserved