



REPORTS | **PV MODULE MANUFACTURER RANKING**

EDITION 1/2025





Welcome to this Edition 1 - 2025 version of the **SINOVOLTAICS PV Module Manufacturer Ranking Report.**

The Altman-Z Scores in this report has been calculated from March 2022 until December 2024, and provide detailed insight how the financial strength of PV manufacturers has evolved over the past 3 years.

What's the value of Altman-Z Scores?

Altman-Z Scores are calculated to understand which **PV module manufacturers are financially stable**, and which players are **at risk of going bankrupt**.

For any stakeholder involved in solar projects, the financial stability of the manufacturer is of crucial importance.

Employing solar PV modules from financially stable manufacturers provides for a better hedge against the potential risks of collapsing return of investment (ROI) of any PV project.

Why is financial stability important?

Ultimately, the **financial stability of a PV module manufacturer is geared to the validity and enforceability of the warranty policies** on its modules. Most people realize that today's PV module manufacturers will probably not be around in 25 years. However for the short to medium term, you want to be sure that warranties are in place.

In many years to come, lots of PV projects will likely face this tough question: whom to contact with performance complaints and replacement requests regarding a malfunctioning module after 2, 5 or even 15 years?

2022 - 2024: rating of PV module manufacturers worldwide

In this report we present you the **Altman Z-Scores of 60+ solar PV module manufacturers**. This report can be used to see how one manufacturer matches up to the other, and can be an important indicator when selecting your PV module manufacturer.

The Altman Z-Scores show you which PV module manufacturers are **financially strong**, and which manufacturers are in the **risk zone of going bankrupt within the coming 2 years**.

On the following pages you find the full table showing the Altman Z-Scores of the major, publicly listed Asian, European and American manufacturers.

The scores have been calculated by team Sinovoltaics with the use of publicly available financial data.

MANUFACTURERS	RANKING	TREND	MAR22	JUL22	SEP22	DEC22	MAR23	JUN23	SEP23	DEC23	MAR24	JUN24	SEP24	DEC24	LISTING
INSOLATION ENERGY	1	↑					4.22				17.38	31.29	32.02	36.35	BOM:543620
WAAREE RENEWABLE TECHNOLOGIES	2	↓	4.18		5.77	6.86	7.04	9.42	6.86	10.66	20.6	29.19	27.37	14.76	BOM:534618
SOLEX ENERGY LTD	3	↓	3.23				3.78				4.62	6.66	7.55	7.49	NSE:SMSOLEX
ETERBRIGHT (HIWIN)	4	↑	3.82	3.57	3.22	3.63	4.27	4.15	3.77	4.35	5.03	3.96	3.98	5.67	TPE:2049
FIRST SOLAR	5	↓	5.25	4.28	6.87	7.17	6.41	5.61	4.76	4.75	4.44	5.21	5.82	4.49	NAS:FSLR
BOVIET SOLAR (NINGBO BOWAY ALLOY MATERIAL CO)	6	↑	2.57	2.61	2.39	2.45	2.59	2.59	2.51	2.59	2.73	3.16	2.91	3.15	SHSE:601137
DMEGC SOLAR (DMEGC MAGNETICS GROUP)	7	↓	4.03	5.01	4.31	4.11	3.88	3.67	3.4	2.84	3.07	2.75	2.85	2.73	SZSE:002056
PHONO SOLAR (SUMEC)	8	↑	3.06	3.27	3.24	2.95	3.18	3.22	2.87	2.74	2.76	2.71	2.63	2.69	SHSE:600710
ERA SOLAR (YONGGAO GROUP)	9	↑	3	2.6	2.98	2.78	2.25	2.4	2.99	3.28	3.38	2.3	2.61	2.64	SZSE:002641
HT SAAE	10	↑	2.3	2.51	2.27	1.93	2.18	2.13	2.09	1.9	1.56	1.37	2.1	2.58	SHSE:600151
KYOCERA	11	↓	3		3.03	3	2.98	2.88	2.81	2.96	2.84	2.65	2.66	2.45	OTCPK:KYOCY
LG SOLAR	12	↓	2.46	2.46	2.47	2.3	2.47	2.45	2.35	2.24	2.3	2.34	2.35	2.26	XKRX:066570
TSEC	13	↓	2.78	2.47	2.8	2.68	3.33	3.14	3.04	3.2	3.11	3.17	2.63	2.25	TPE:6443
LINYANG ENERGY	14	↓	2.97	3.03	2.89	3.07	3.02	3.08	2.66	2.21	2.22	2.4	2.34	2.23	SHSE:601222
PENNAR INDUSTRIES	15	↓	1.9		1.74	1.91	1.96	2.04	2.09	2.2	2.26	2.3	2.58	2.16	BOM:513228
MISSION SOLAR (OCI)	16	↓	2.24		2.11	2.52	2.43	3.39	3.41	3.44	2.74	2.8	2.58	2.07	XKRX:010060
CHENGDU HUASUN TECHNOLOGY GROUP	17	↑	6.64		4.68	3.51	2.86	3.03	2.61	2.48	2.14	1.94	2.04	2.06	SZSE:000790
BHARAT HEAVY ELECTRICALS	18	↓	0.79		0.97	1.11	1.01	1.13	1.31	1.68	2.03	2.45	2.19	1.97	NSE:BHEL
TOPRAYSOLAR	19	↑	2.29	2.3	2.18	2.16	2.44	2.28	2.22	2.31	2.1	1.61	1.89	1.96	SZSE:002218
ADANI SOLAR (ADANI ENTERPRISES)	20	↓	2.6	3.13	3.79	4.2	2.23	2.71	2.74	2.63	2.94	2.75	2.75	1.93	NSE:ADANIENT

*The trend column in the table reflects a comparison of the current quarter score to the previous one.

MANUFACTURERS	RANKING	TREND	MAR22	JUL22	SEP22	DEC22	MAR23	JUN23	SEP23	DEC23	MAR24	JUN24	SEP23	DEC24	LISTING
ALMADEN	21	↓	3.06	4.55	3.9	3.61	3.11	2.95	2.72	2.7	2.54	2.21	2.12	1.86	SZSE:002623
TANGSHAN HAITAI NEW ENERGY TECHNOLOGY CO LTD	22	↑	2.64		2.54	2.74	2.92	2.73	2.25		2.36	1.88	1.76	1.85	BJSE:835985
HANSOL	23	↑	2.44	1.83	2.01	1.99	2.04	2.1	2.22	2.32	2.04	1.9	1.77	1.8	XKRX:004710
LONGI SOLAR (LONGI GREEN ENERGY)	24	↓	5.72	6.3	4.71	3.88	4.4	3.73	3.37	2.91	2.78	2.04	1.97	1.78	SHSE:601012
MOTECH	25	↓	2.4	2.24	2.11	2.26	2.86	2.73	2.45	2.69	2.5	2.61	2.11	1.77	ROCO:6244
BYD	26	↓	2.54	2.98	2.23	1.83	1.95	1.86	1.79	1.74	1.61	1.76	2	1.76	OTCPK:BYDDF
TAINERGY	27	↓	1.55	1.1	1.38	1.47	6.32	6.42	6.5	6.72	5.2	4.51	3.52	1.75	TPE:4934
JINKOSOLAR	28	↓	1.87		2.17	1.92	2.21	2.22	2.02	2.07	2.03	1.85	1.91	1.73	SHSE:688223
SHINSUNG E&G	29	↓	1.47	1.76	1.94	1.91	2.42	2.6	2.37	2.25	2.15	1.93	1.83	1.6	XKRX:011930
ASTRONERGY (CHINT GROUP)	30	↑	2.18	1.98	1.67	1.77	1.96	1.96	1.65	1.59	1.58	1.53	1.48	1.52	SHSE:601877
RITEK	31	↑	0.86	0.9	0.89	0.88	1.02	1.06	0.97	0.97	0.96	1.18	1.23	1.5	TPE:2349
TOPSOLA (HONGRUN GROUP)	32	↑	1.4	1.33	1.28	1.16	1.47	1.47	1.35	1.37	1.35	1.26	1.28	1.37	SZSE:002062
HYUNDAI HEAVY INDUSTRIES	33	↑	1.08	0.77	0.94	1.1	1.28	1.3	1.27	1.13	1.17	1.18	1.23	1.28	XKRX:267250
TATA SOLAR (TATA POWER)	34	↓	1.13	1.09	0.92	0.96	0.93	0.99	1.32	1.22	1.38	1.63	1.73	1.27	NSE:TATAPOWER
TRINA SOLAR	35	↓	2.66	2.62	2.65	2.61	2.2	2.04	1.83	1.76	1.69	1.51	1.4	1.24	SHSE:688599
ULICA SOLAR (SHANSHAN GROUP)	36	↓	3.23	3.54	2.93	2.36	2.31	2.19	2	1.87	1.78	1.25	1.27	1.24	SHSE:600884
JA SOLAR	37	↓	2.89	3.32	3.19	3.04	3.78	3.82	2.62	2.07	1.98	1.4	1.26	1.21	SZSE:002459
CECEP	38	↓	1.32	1.3	1.38	1.5	1.53	1.53	1.43	1.38	1.36	1.28	1.25	1.21	SZSE:000591
AU OPTRONICS	39	↓	2.46	2.26	2.13	1.56	0.94	0.94	0.82	1.08	1.13	1.19	1.17	1.13	OTCPK:AUOTY
ALEO SOLAR (SINO-AMERICAN SILICON PRODUCTS)	40	↓	1.79	1.7	1.61	1.73	1.83	1.84	1.71	1.67	1.7	1.46	1.17	1.09	ROCO:5483

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MANUFACTURERS	RANKING	TREND	MAR22	JUL22	SEP22	DEC22	MAR23	JUN23	SEP23	DEC23	MAR24	JUN24	SEP24	DEC24	LISTING
TONGWEI SOLAR (TONGWEI GROUP)	41	↓	3.85	4.71	4.57	3.88	3.95	3.79	3.62	2.84	2.83	1.8	1.26	1.02	SHSE:600438
GCL SYSTEM INTEGRATION TECHNOLOGY	42	↑	0.66	0.53	0.57	0.26	0.97	0.95	1.11	0.97	0.95	0.68	0.8	0.9	SZSE:002506
TCL TECHNOLOGY	43	↓	1.06	0.92	0.79	0.77	0.75	0.76	0.78	0.85	0.89	0.83	0.8	0.74	SZSE:000100
CANADIAN SOLAR	44	↓	1.36	1.22	1.41	1.44	1.42	1.55	1.37	1.29	1.26	0.96	0.89	0.73	NAS:CSIQ
JOLYWOOD	45	↓	2.06	1.6	1.47	1.43	1.61	1.56	1.41	1.52	1.44	1.19	1.01	0.66	SZSE:300393
JIAWEI RENEWABLE	46	↓	2.02	1.95	2.77	2.99	4.14	3.03	2.48	1.74	1.48	1.27	1.08	0.65	SZSE:300317
RISEN ENERGY	47	↓	1.32	1.47	1.44	1.39	1.61	1.56	1.34	1.21	1.17	0.99	0.77	0.56	SZSE:300118
ANJI TECHNOLOGY	48	↓	1.61	1.55	1.51	1.43	1.42	1.45	1.39	1.32	1.11	0.93	0.76	0.56	TPE:6477
HANWHA Q-CELLS (HANWHA SOLUTIONS)	49	↓	1.36	1.33	1.41	1.35	1.65	1.55	1.37	1.32	1.13	0.85	0.67	0.54	XKRX:009830
HUANSHENG PV (ZHONG-HUAN SEMICONDUCTOR)	50	↓	3.03	4.1	3.12	2.64	2.26	2.33	2.07	1.75	1.62	1.08	0.85	0.51	SZSE:002129
S-ENERGY	51	↓	1.09	0.81	0.85	0.67	0.87	0.67	0.85	0.73	0.6	0.52	0.47	0.39	XKRX:095910
EGING PV	52	↓	1.02	0.98	1.36	1.03	1.85	1.91	1.67	1.41	1.35	0.83	0.63	0.38	SHSE:600537
HY SOLAR (HOYUAN GREEN ENERGY CO)	53	↓	4.06		4.81	5.09	4.46	3.31	2.15	1.19	1	0.5	0.5	0.3	SHSE:603185
RENEW ENERGY GLOBAL	54	↑	0.48		0.48	0.41	0.36	0.28	0.31	0.32	0.3	0.3	0.27	0.28	NAS:RNW
REC	55	↓	2.56		1.93	1.16	0.9	0.95	0.8	1.57	1.42	1.16	0.89	0.21	OSL:RECSI
URE	56	↓	1.26	2.24	2.35	2.2	2.2	2.1	1.66	1.39	0.64	0.54	0.35	0.19	TPE:3576
AIKO SOLAR	57	↓	2.62	4.33	3.21	3.63	3.67	4.17	2.99	2.2	2.02	1.06	0.5	0.13	SHSE:600732
AKCOME	58		2.14	1.84	1.07	0.84	0.93	0.81	0.78	0.63	0.56	-0.62	-0.62	-0.62	SZSE:002610
SOLARTRON	59	↓	-0.97	-1.12	-1.19	-1.39	-0.18	-0.84	-0.56	-0.56	-0.48	-1.02	-1.15	-1.19	BKK:SOLAR
JG SOLAR (GANSU JINGANG SOLAR CO.)	60	↓	2.39	3.34	2.85	1.56	1.15	0.6	-0.13	0.28	0.12	-0.93	-1.13	-1.44	SZSE:300093

*The trend column in the table reflects a comparison of the current quarter score to the previous one.

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Graph overview

Graph #1 - The latest PV module manufacturers ranking, recorded December 2024

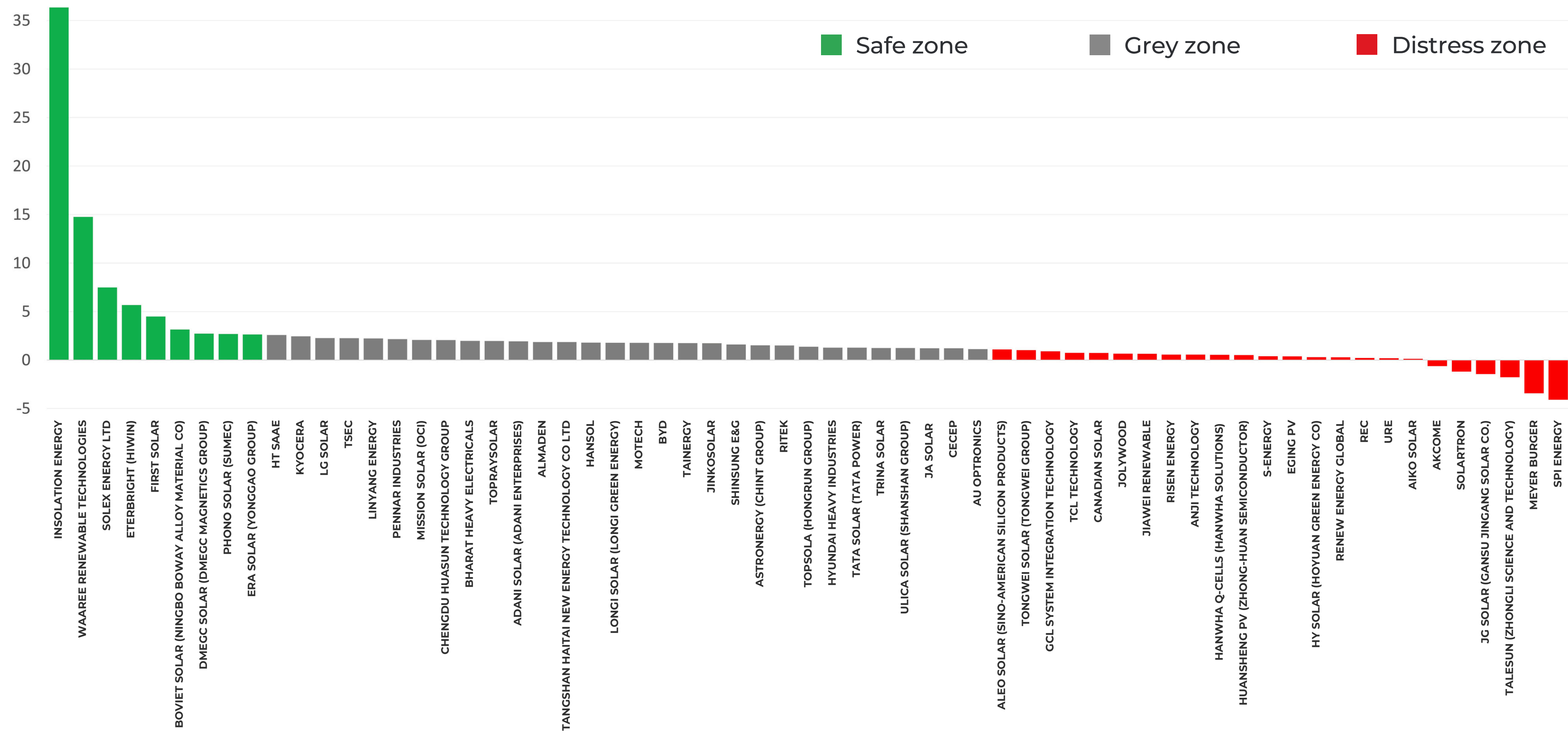
Graph #2 - PV module manufacturers that are currently in the Safe Zone

Graph #3 - PV module manufacturers that are currently in the Grey Zone

Graph #4 - PV module manufacturers that are currently in the Distress Zone

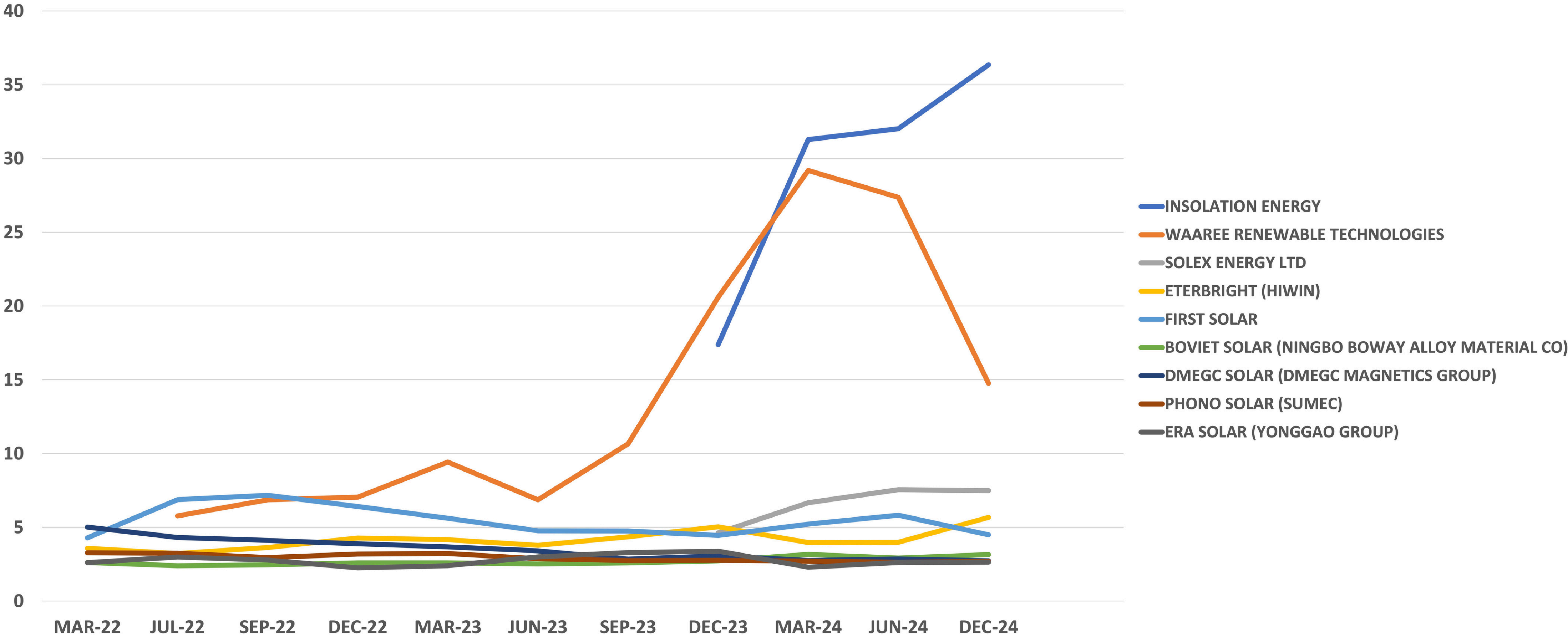
Graph #1 - Full ranking overview of PV module manufacturers

Sinovoltaics PV manufacturer ranking - Edition #1 - 2025



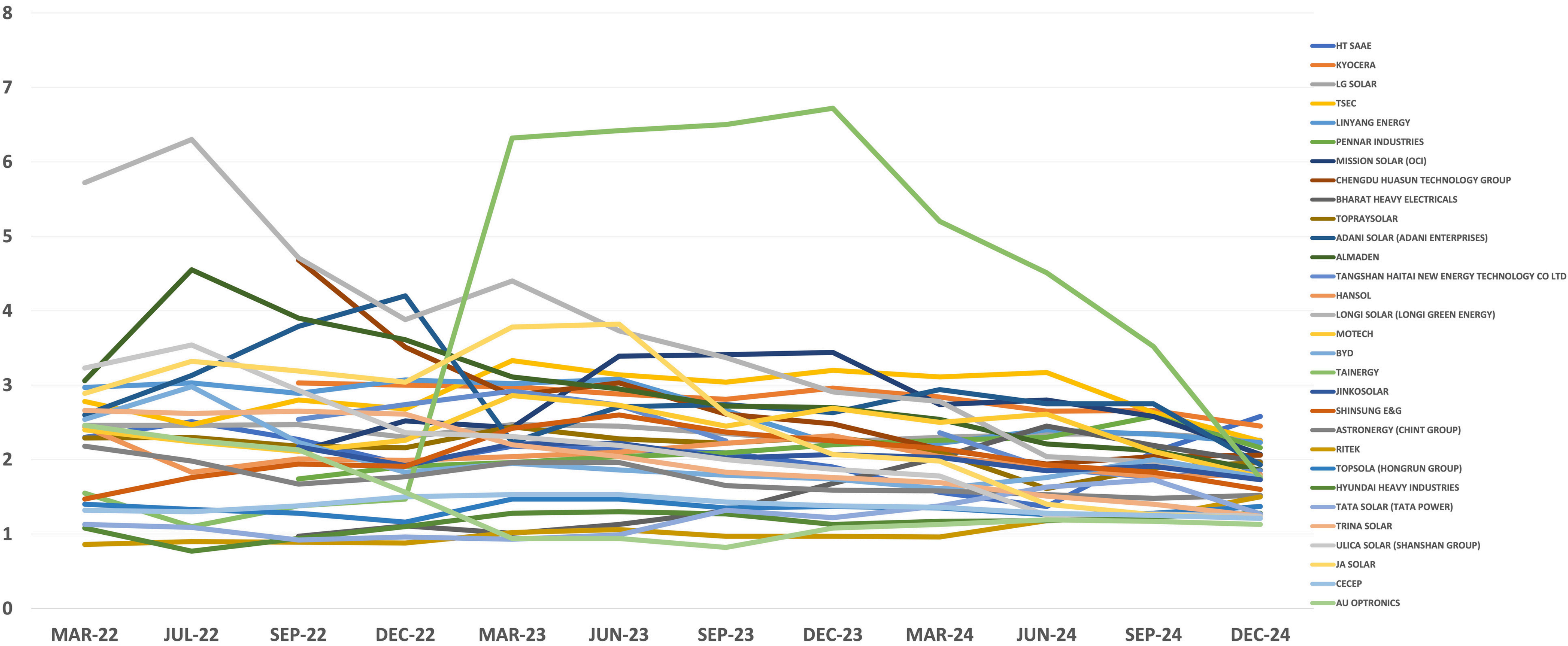
Graph #2 - PV module manufacturers – Safe Zone

Sinovoltaics PV manufacturer ranking - Edition #1 - 2025 - Safe Zone



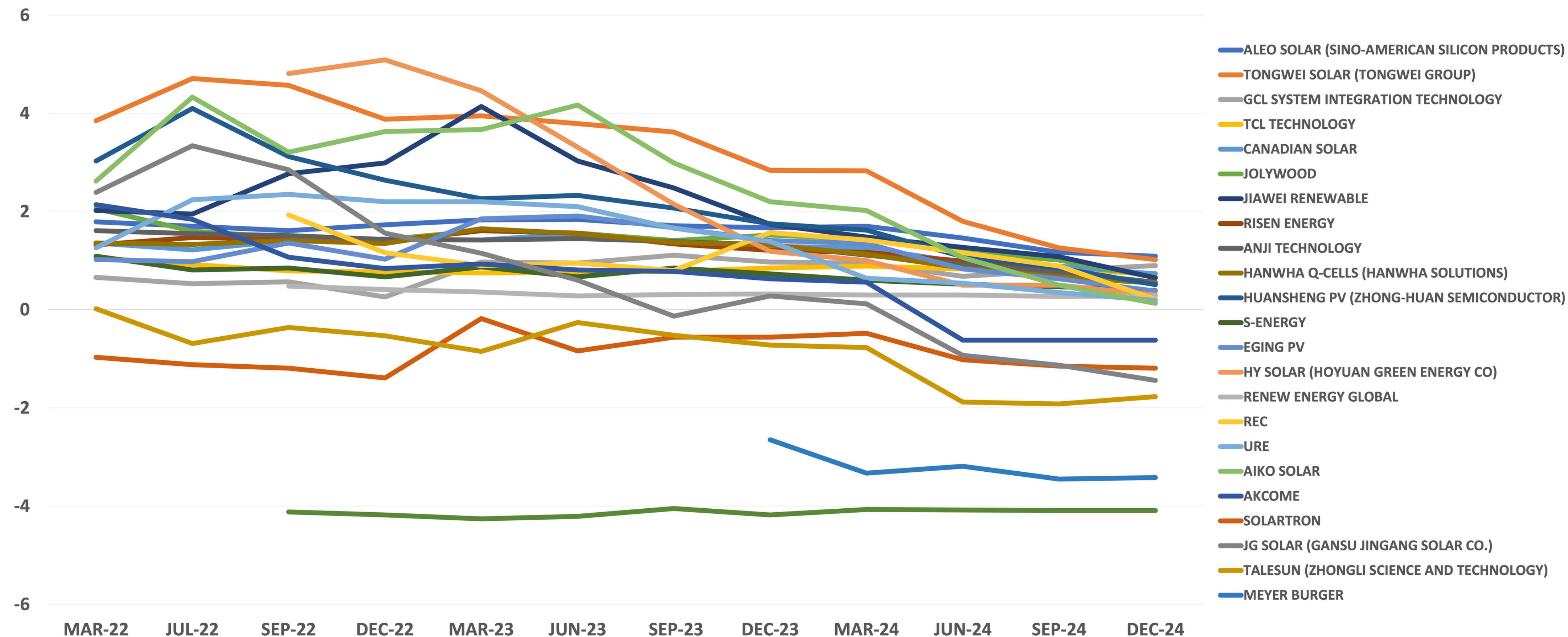
Graph #3 - PV module manufacturers – Grey Zone

Sinovoltaics PV manufacturer ranking - Edition #1 - 2025 - Grey Zone



Graph #4 - PV module manufacturers – Distress Zone

Sinovoltaics PV manufacturer ranking - Edition #1 - 2025 - Distress Zone



How is the Sinovoltaics Ranking Score calculated?

The Sinovoltaics PV Manufacturer Ranking Score is based on the Altman Z-Score

$$\text{Altman Z-Score} = 1.2A + 1.4B + 3.3C + 0.6D + 1.0E$$

The original formula is broken down as following:

A	Working Capital/Total Assets: measures liquid assets in relation to the size of the company.
B	Retained Earnings/Total Assets: measures profitability that reflects the company's age and earning power.
C	Earnings Before Interest & Tax/Total Assets: measures operating efficiency apart from tax and leveraging factors. It recognizes operative earnings as being important to long-term viability.
D	Market Value of Equity/Total Liabilities: adds market dimension that can show up security price fluctuation as a possible red flag.
E	Sales/Total Assets: a standard measure for total asset turnover.

How are the Altman Z-Scores interpreted?

The scores are categorized into 3 zones called the Safe Zone, Grey Zone and Distress Zone:

$Z > 2.6$	Safe Zone
$1.1 < Z < 2.6$	Grey Zone
$Z < 1.1$	Distress Zone

How to interpret companies in the ‘GREY ZONE’?

With a large number of companies in the 'Grey Zone', how to interpret these scores when selecting a manufacturer?

While ideally, a manufacturer is in the 'Safe Zone', some companies have been consistently in the 'Grey Zone' for years.

Take for instance **ETERBRIGHT (HIWIN)**. Here’s a number of Altman Z-Scores over the years:

3.82 on Q1 2022

4.15 on Q2 2023

4.35 on Q4 2023

5.67 on Q4 2024

Currently stands at 5.67 (December '24)

These numbers show that **ETERBRIGHT (HIWIN)** has been stable for years. Add the fact that **ETERBRIGHT (HIWIN)** AZ score has seen a gradual improvement since 2022 and they may just as well be one of the most solid companies on the list.

You could argue the same for known players such as **DMEGC SOLAR (DMEGC MAGNETICS GROUP)** and **PHONO SOLAR (SUMEC)**. As you can see each of these companies has shown stable scores since 2022:

DMEGC SOLAR	PHONO SOLAR (SUMEC)
4.03 Q1 2022	3.06 Q1 2022
3.67 Q2 2023	3.22 Q2 2023
2.84 Q4 2023	2.74 Q4 2023
2.73 Q4 2024	2.69 Q4 2024



SINOVOLTAICS PV MODULE MANUFACTURER RANKING

CONTACT US: contact@sinovoltaics.com

Discover our **ZERO RISK SOLAR & BESS SERVICES**

QUALITY ASSURANCE



PV QUALITY INSPECTIONS

Hire our **PV specialized quality engineers** to inspect your PV components on-site at the factories in Asia.

TEST ALL PV COMPONENTS, INCLUDING:

- Solar modules
- Inverters
- BOS components
- Solar cells
- Energy Storage



FACTORY AUDITS

Make a **fully informed decision** on the factories you're procuring from. Our accredited auditors provide you with **full insights** in the manufacturing capabilities of any PV factory worldwide. Use our **audit scoring card** system to manage and compare your factory selection.

FACTORY AUDITS INCLUDE:

- Pre-manufacturing audit
- General qualification audit
- Factory benchmark
- Factory background check
- Financial audit



LABORATORY TESTING

Thoroughly test your solar PV components at our **accredited PV lab**. Inform about country and climate specific test procedures for your region

A SELECTION OF LAB TESTS:

- Potential Induced Degradation (PID) test
- Light Induced Degradation (LID) test
- EVA gel content test
- Damp heat testing
- Thermal cycling testing



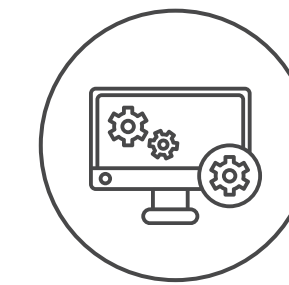
SOLAR FARM INSPECTIONS

On-site solar farm **inspections** and **troubleshooting** worldwide. Assess your existing solar farms and optimize performance.

SOLAR FARM INSPECTIONS INCLUDE:

- Drone infrared thermography
- I-V measurement
- Electroluminescence imaging
- Electrical safety tests
- Commissioning checks

SINOVOLTAICS EL MASS ANALYSIS (SELMA)



Eliminate **micro-cracks** and other cell-inherent defects and boost your solar power plant performance with **Sinovoltaics EL Mass Analysis (SELMA)**, our AI-driven electroluminescence Testing Software.

WHY CHOOSE SELMA FOR EL TESTING?

- Up to 99.9% accuracy
- Inspection of ALL modules (no sampling!)
- High-speed and on-the-fly analysis: avoid delays and easily keep up with the factory's production speed
- Identification and classification of up to 15 cell-inherent defect types
- Replace defective PV modules before shipment

QUALITY GUARANTEE

QUALITY ASSURANCE MEETS INSURANCE:

- With our Quality Guarantee, Sinovoltaics becomes a shared risk partner in our clients' PV projects.
- The Quality Guarantee enables the client to claim Liquidated Damages in case of a valid Warranty Claim with the factory.
- Eligibility: after performing our regular, 100% pre-shipment inspection on the client's PV modules at the factory, the client will be eligible for our Quality Guarantee for 3 years.
- Industry-wide unique protection and based on Sinovoltaics' Zero Risk Solar® framework the Quality Guarantee is backstopped by Munich Re.