pv magazine USA WEEK 2025 | Banking on solar

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Conquering the Elements: Bankable *Shield* Module Technology

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Trinasolar: Technology and Reliability Leadership

Founded in 1997, serving 180 countries with **25+ years** of technology leadership

From 2010-2025, achieved **35 world records** for PV cell efficiency and module output

As of June 2025

#1 globally with **200GW+** of 210mm module shipments

As of June 2025

PVEL Top Performer for **11 consecutive years** and RETC Overall Highest Achiever **5 times**

Tier 1 Module Manufacturer Per BNEF (Q3 2025) and S&P Global (Sep. 2025)

Granted **3400+ patents** including **500+ TOPCon patents**

Trina Vertex TOPCon Module Portfolio

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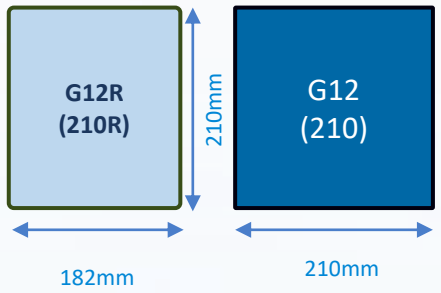

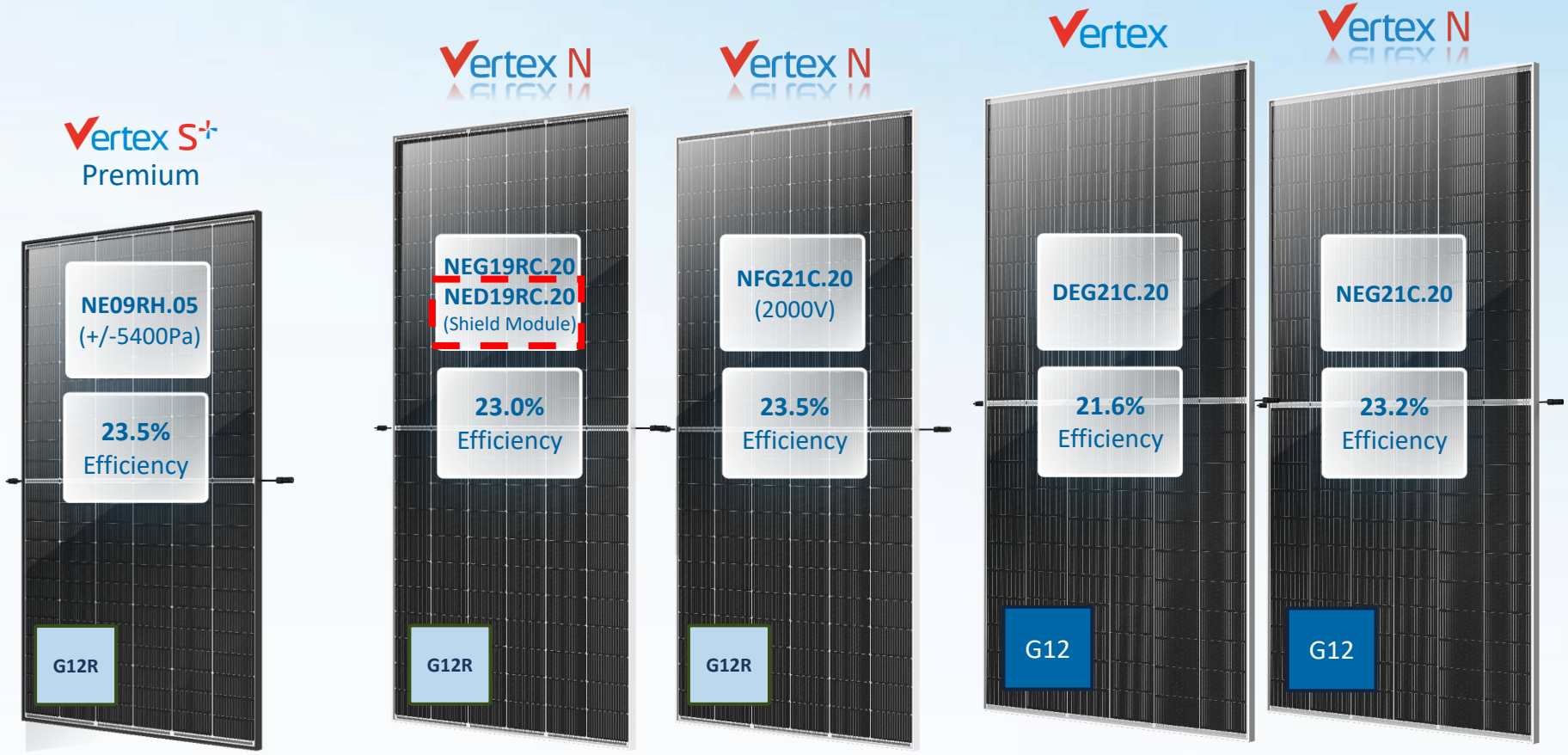

Up to 445W	Up to 620W	Up to 670W	Up to 720W
Small format module	Medium format module	Large format module	
Residential Rooftop	**C&I Rooftop, Ground-Mount, and Utility**	**Large-Scale Utility**	

Vertex N Shield Module: NED19RC.20

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High Power Capacity

- 620W Power and 23% Efficiency
- 80%±5 Bifaciality
- Excellent IAM and low irradiation performance

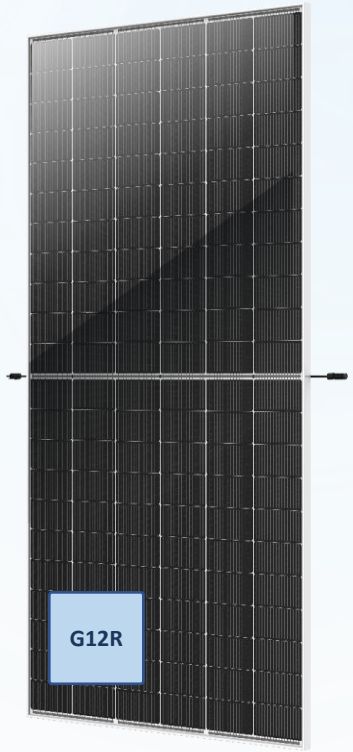
Superior Fire Protection

- IEC 61730-2 Type 30 Fire Rating (Class A+A)

Heavy Snowfall Resistance

- Passed IEC 62938:2020 Non-Uniform Snow Load Test at 6600Pa

Vertex N Shield



- 2.5/2.5mm fully tempered glass
- 2382mm x 1134mm x 30mm

Severe Hail Durability

- Withstands 55mm hail at 0^{o}
- Withstands 75mm hail at 45^{o}

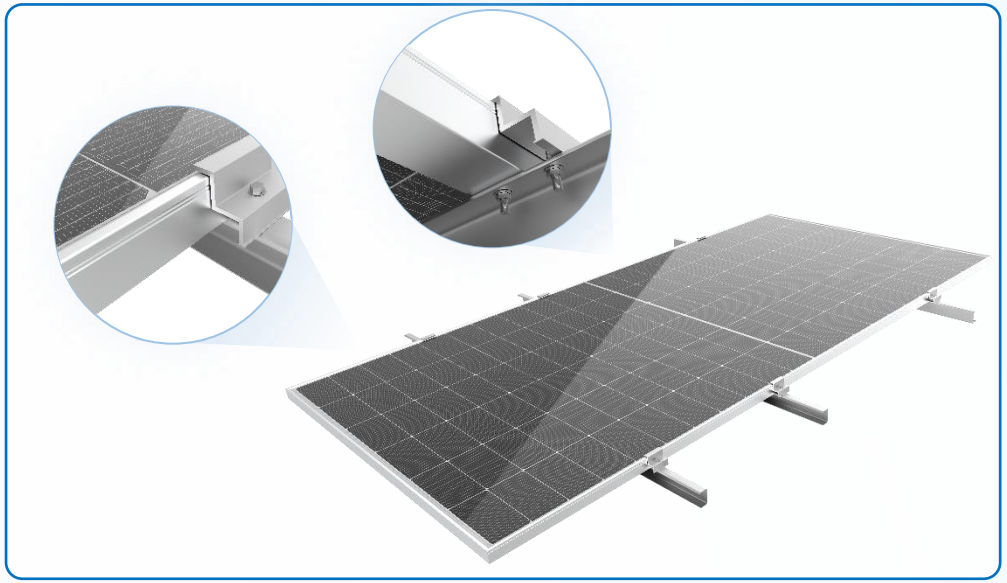
Extreme Wind Capacity

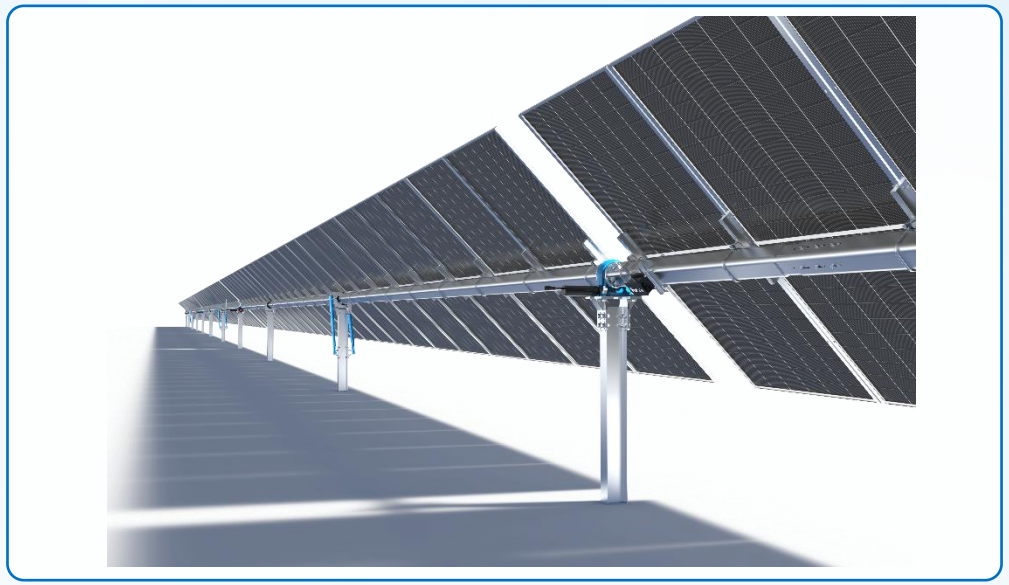
- Static Load Capacity up to +8000Pa/-6000Pa
- Tracker Mount Capacity up to +3600/-3000Pa

Enhanced Reliability

- RETC-PVMI: Overall Highest Achiever
- Kiwa PVEL: Top Performer

Extreme Wind Capacity, Versatile Applications





High-Load Capacity: +8000Pa/-6000Pa

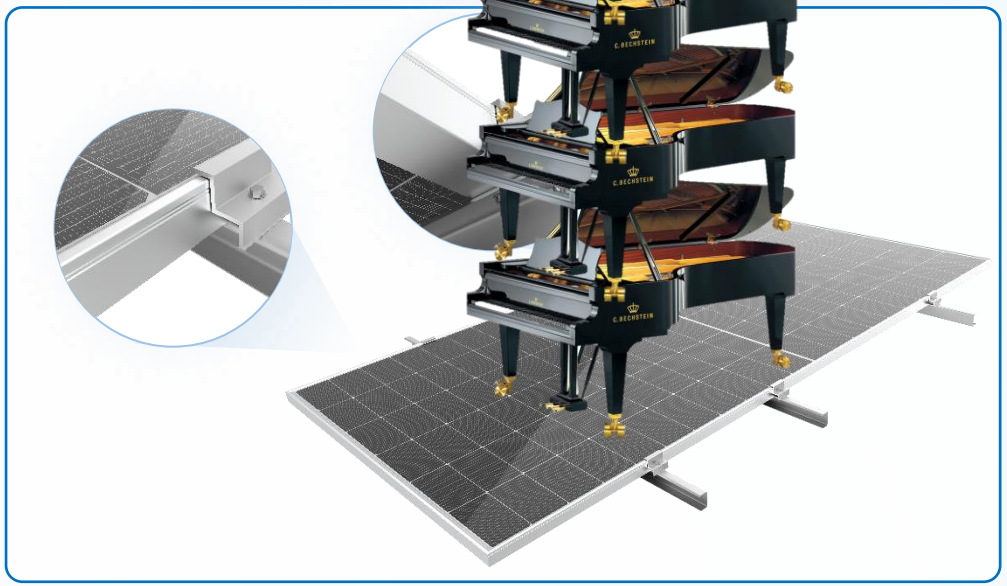
TÜVRheinland®
Precisely Right.

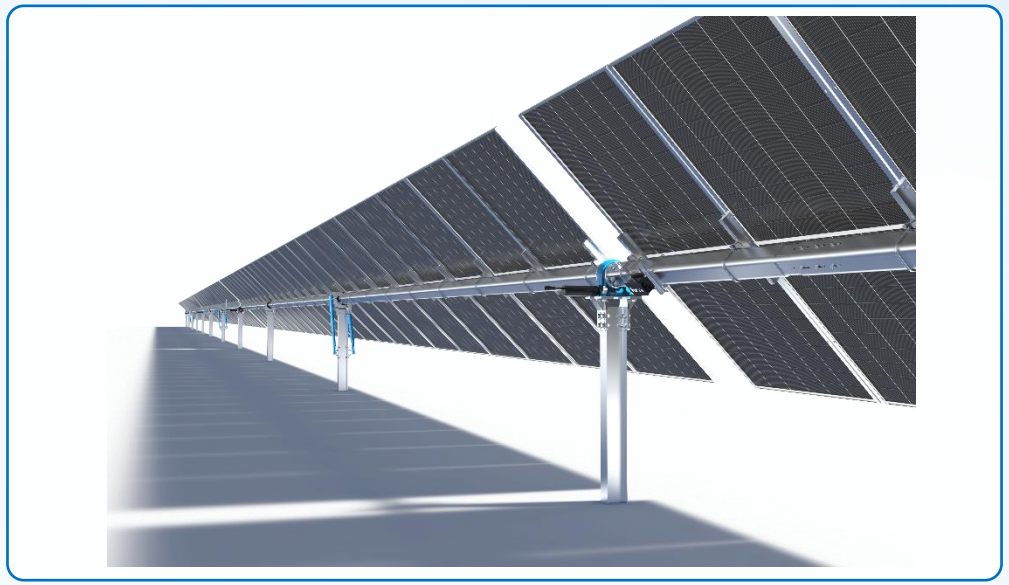
- Robust module paired with screw + clamp mount on 3-rail system offers extreme wind and snow resistance.
- Certified by TUV Rheinland 3rd party lab.
- Contact Trina Customer Service to evaluate similar high-loading scenarios.

Enhanced Tracker-Mounted Strength: +3600Pa/-3000Pa

- Achieved on 790mm spaced mounting holes.
- Enhanced strength correlates to shorter purlins and lower tracker cost.

Extreme Wind Capacity, Versatile Applications





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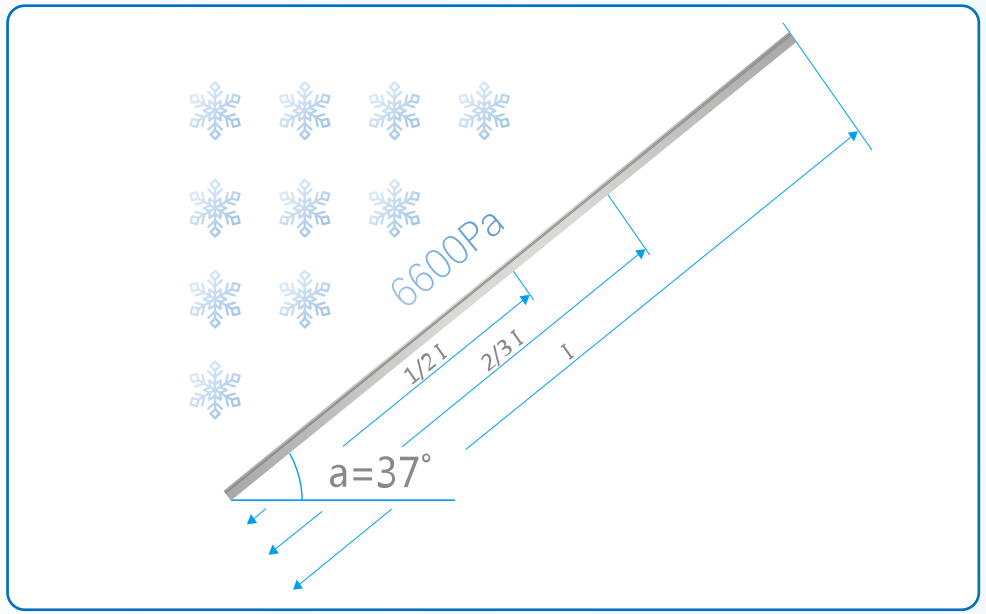
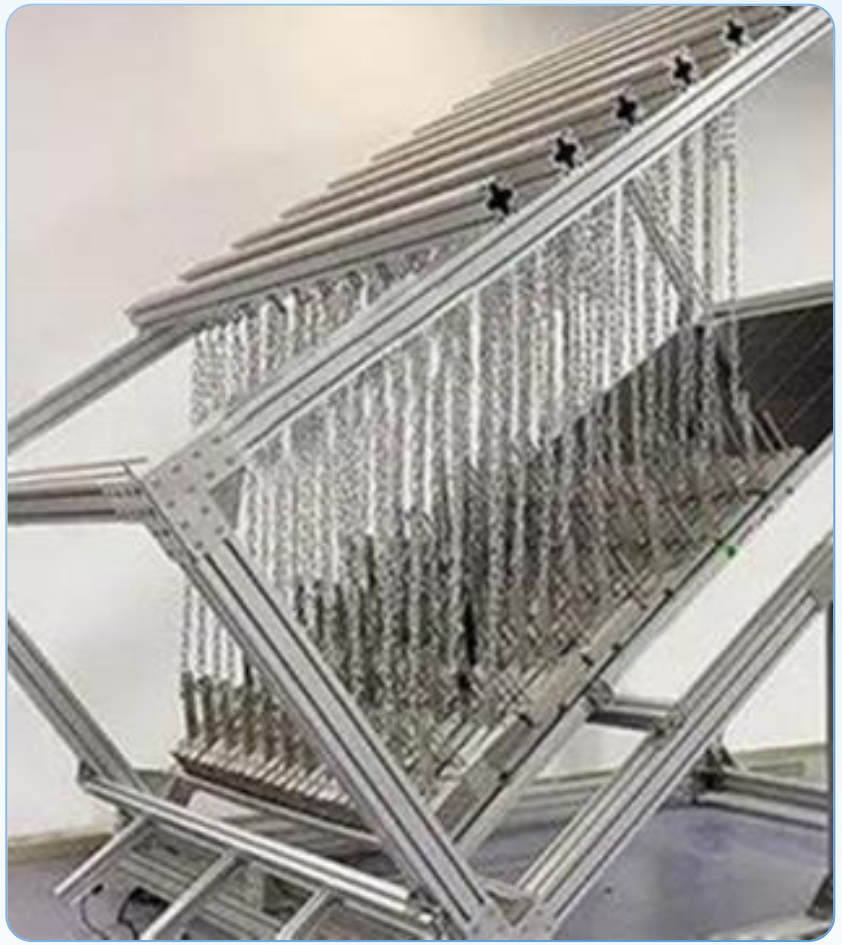
Heavy Snow Load Capacity for Real-World Applications



Fixed-Tilt Solution Withstands 7.2 ft. of Uneven Snow Load

- IEC 62938: 2020 standard simulates realistic snow accumulation of a tilted module with uneven distribution.
- Critical snow load limit for NED19RC.20 reaches a maximum of 6600Pa.
- This is equivalent to 7.2 ft. of snow.



Above-Average Fire Resistance

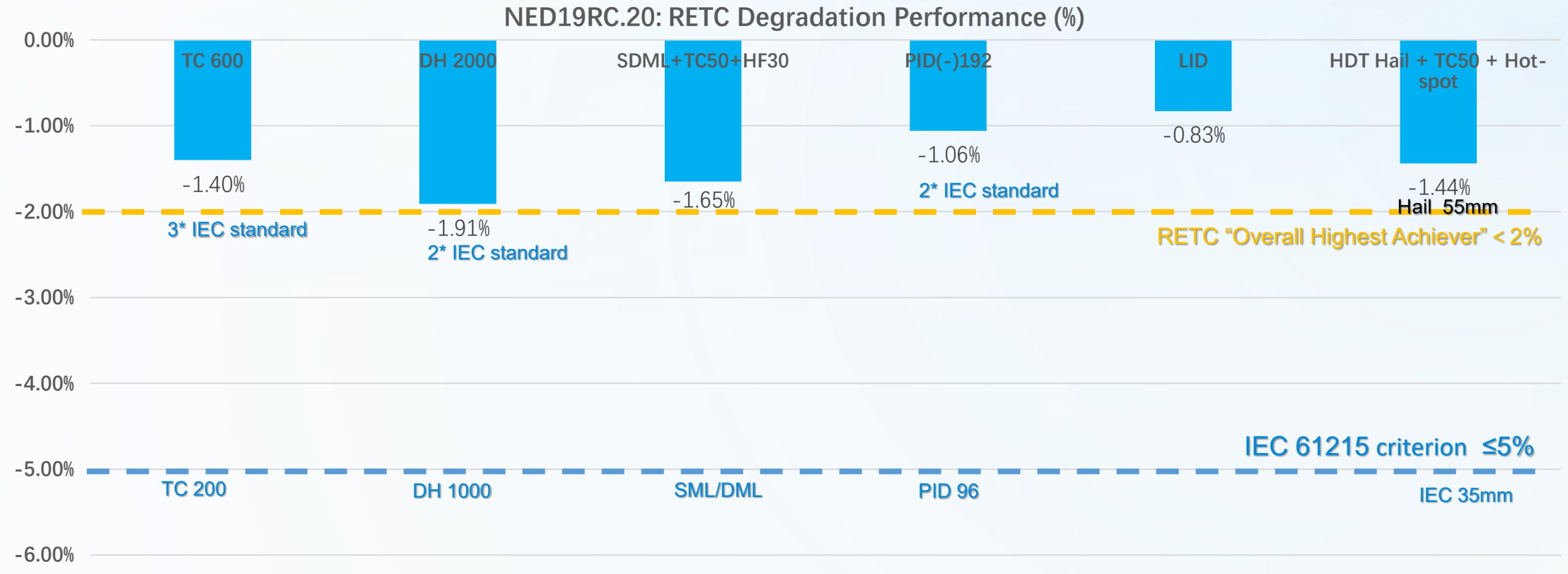
Fire Type 30 (Class A+A) Surpasses Standard Fire Performance

- UL 61730 grants a Fire Type rating ranging from 1 to 49
- Categorized via module construction and further subdivided by fire performance
- Combined performance with racking as defined by UL 2703 offers “Class” rating of A, B, or C
- International Building Code (IBC) dictates rooftop solar assemblies meet various Fire Classes via UL 2703 rating
- Most typical modules pass “Class A” Spread of Flame testing, limiting flame spread to 6 ft. in 10 min.
- **Fire Type 30 includes the challenging “A brand” burning brand test, surpassing performance of typical fire types.**

UL 61730 Fire Type	Spread of Flame Performance	Burning Brand Performance
1	6 feet (Class A)	C Brand
2	6 feet (Class A)	C Brand
29	6 feet (Class A)	C Brand
30	6 feet (Class A)	A Brand

Type 30 Fire Tests

Superior Reliability: RETC Overall Highest Achiever



NED19RC.20 performance significantly exceeds IEC 61215 degradation requirements despite enhanced test criteria per RETC test series.

Superb Hail Impact Resistance, Verified by Third-Party Testing

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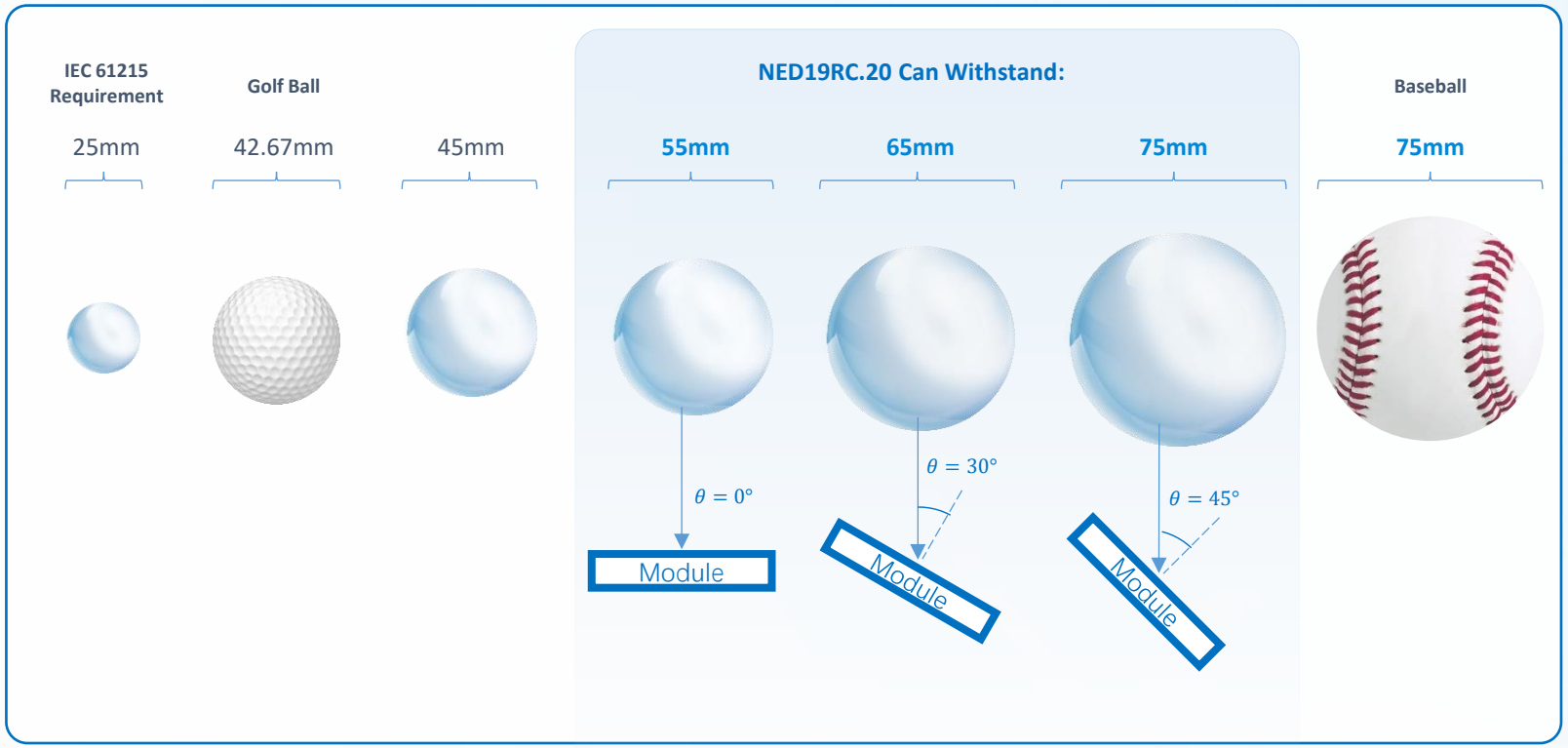
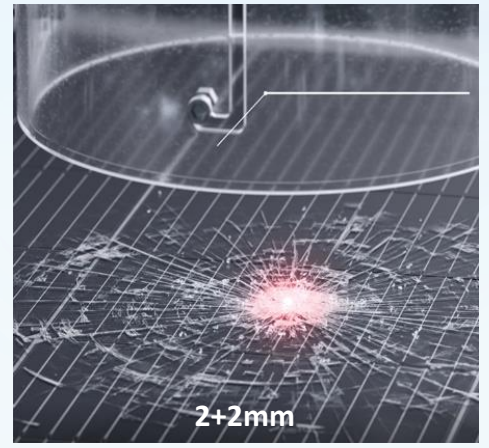
Resistance to hailstones up to 75mm diameter

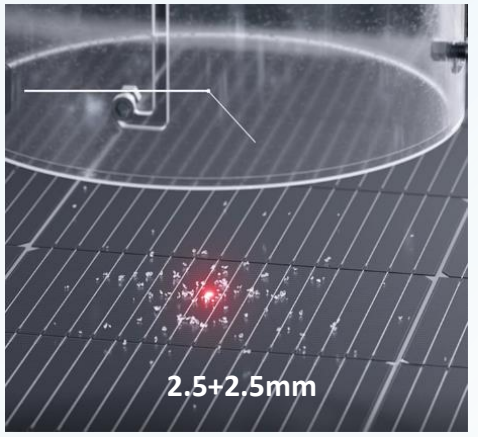
RETC

TÜVRheinland® Precisely Right.



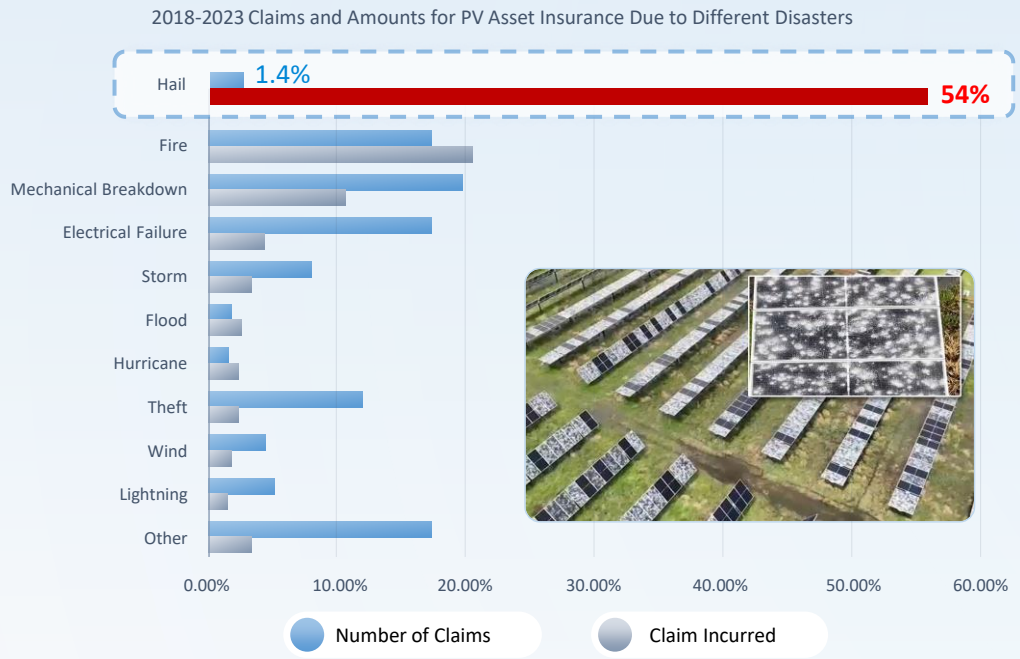
Direct Impact from 55mm Hailstone





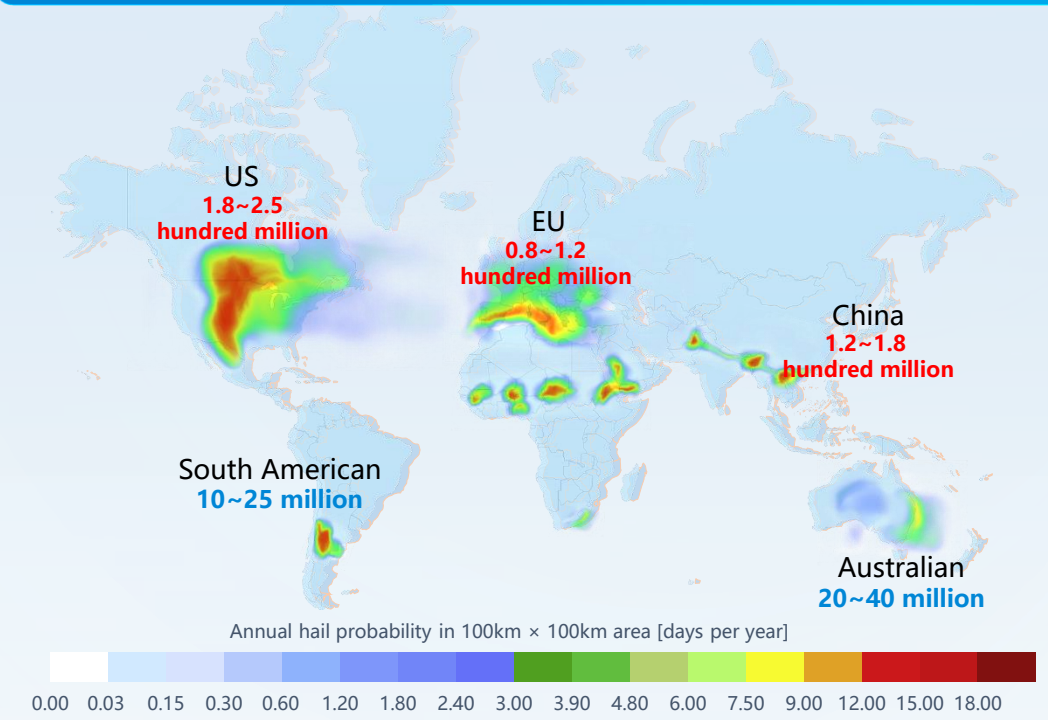
Disproportionate Financial Effects of Hail Damage

Losses of PV Assets Caused by Different Factors



*Source: GCube Insurance

Distribution of hail in various regions and the average annual loss amount (USD)



Hail Loss Modeling Methodology

For PV projects, hail damage mainly affects the replacement cost (including module and installation costs) and the downtime cost (losses during downtime caused by extreme weather, as well as module/system maintenance or replacement costs). TOC_H can model the complete loss costs of PV projects caused by hail disasters.

$$TOC_H = \Sigma\{(Ac + Dc) \times Px(k) \times P_{GK}\}$$

- Ac: Replacement Cost — Determined by system design and project cost
- Dc: Downtime Cost — Related to the project's expected revenue and electricity selling price
- P_{GK}: Probability of module being damaged due to extreme weather
- $Px(k)$: Probability of hail weather occurring (over system lifecycle)

$$Px(k) = \frac{e^{-(\lambda t)}(\lambda t)^k}{k!}$$

λ： The average rate of event occurrence.
t： The holding period of photovoltaic assets, assuming 22 years (can vary according to project).
k： Actual number of events occurring within the time interval *t*.

The probability of hail occurrence varies with respect to climate:

Probability of hail weather occurring $Px(k)$						
Hail Size (mm)	19~35	35~50	50~65	65~80	80~95	x ≥ 95
Mild Climate Zone	0.38%	1.15%	0.06%	0%	0%	0%
Occasional Hail Zone	3.06%	28.24%	13.51%	0.51%	0.02%	0.08%
Frequent Hail Zone	1.84%	30.63%	19.40%	1.08%	0.01%	0.04%

Source: VDE Hail Observation Frequency by Hail Size and Site Location

The results of module hail impact tests are as follows. The test standards refer to IEC61215: 2021.

Probability of module being damaged due to extreme weather P_{GK}			
Hail Size(mm)	Energy (J)	Standard Module P_{GK} (2.0+2.0mm)	Shield Module P_{GK} (2.5+2.5mm)
45	14.29	4%	2%
55	31.74	18%	5%
65	61.70	80%	15%

Source: RETC article and data published in kWh analytics' Solar Risk Assessment 2023.
Shield module P_{GK} data is cited from the evaluation of RETC.

Reduction of Module Damage Probability (P_{GK}) offers dramatic reduction of loss (TOC_H)!

Case Study: ~60% TOC_H Reduction vs. Standard Module

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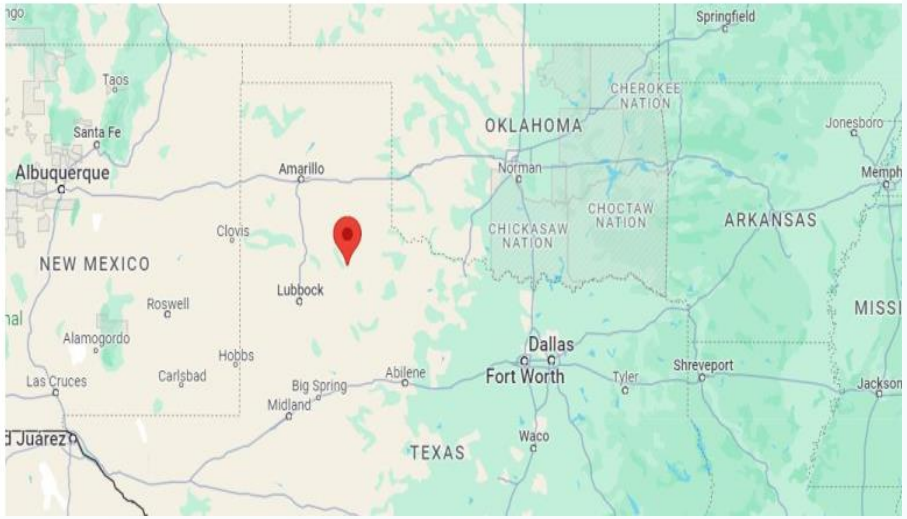
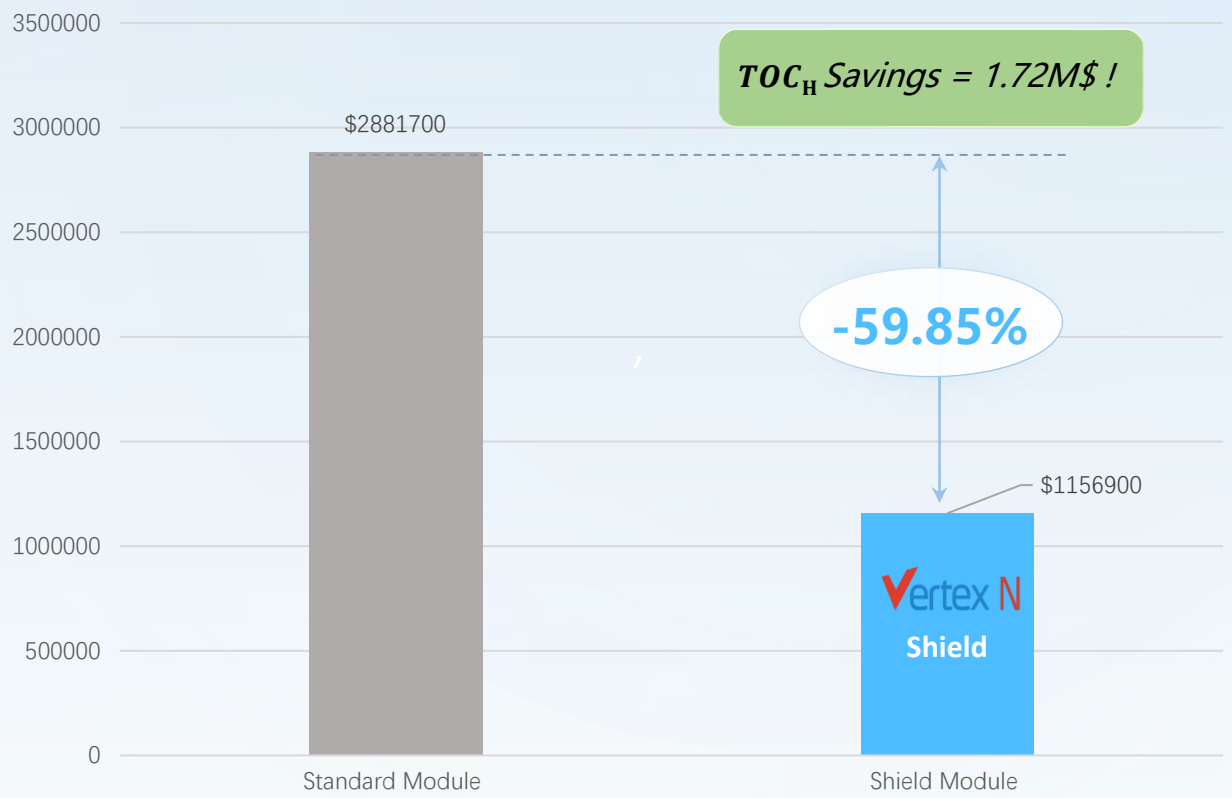
Project Case Introduction

Project Name	Trina Texas Extreme Solar
Project Location	Motley County, Texas Coordinates （34.10，-100.90）
Project Volume	100MW
Hail Climate	Frequent Hail Zone
Comparison module 1	Shield Module （2.5+2.5mm dual-glass）
Comparison module 2	Standard Module （2+2mm dual-glass）



30° Fixed Tilt Installation: TOC_H($) of Standard vs. Shield Module



Source: VDE report

Summary

- NED19RC.20 – the Vertex N Shield module – offers excellent resistance to hail, fire, wind, and snow.
- Extreme mechanical strength can meet severe loading requirements while reducing system cost.
- Uneven snow load capacity of 6600Pa shows durability in real-world loading applications.
- Type 30 (Class A+A) fire rating exceeds fire performance status quo.
- Achieved RETC's Overall Highest Achiever performance with <2% degradation.
- Super-strong hail resistance of up to 75mm at 45^0 tilt or 55mm at 0^0.
- In "frequent hail zone" case study, system losses were reduced by ~60%, or $1.72M vs. standard modules.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Thank you!