

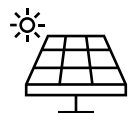
16-17 June 2026 Napa, USA

Maximizing PV Performance at the Component Selection and Build Stage: **Shield Module Technology**



John Dallapiazza
Director of Utility
Module Sales
Trina Solar (U.S.), Inc.

Trinasolar: Technology and Reliability Leadership



Founded in 1997, serving 180 countries for almost **30 years** of technology leadership



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

As of June 2025



Tier 1 Module Manufacturer
Per BNEF (Q1 2026)



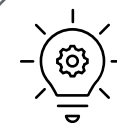
From 2010-2025, achieved **38 world records** for PV cell efficiency and module output



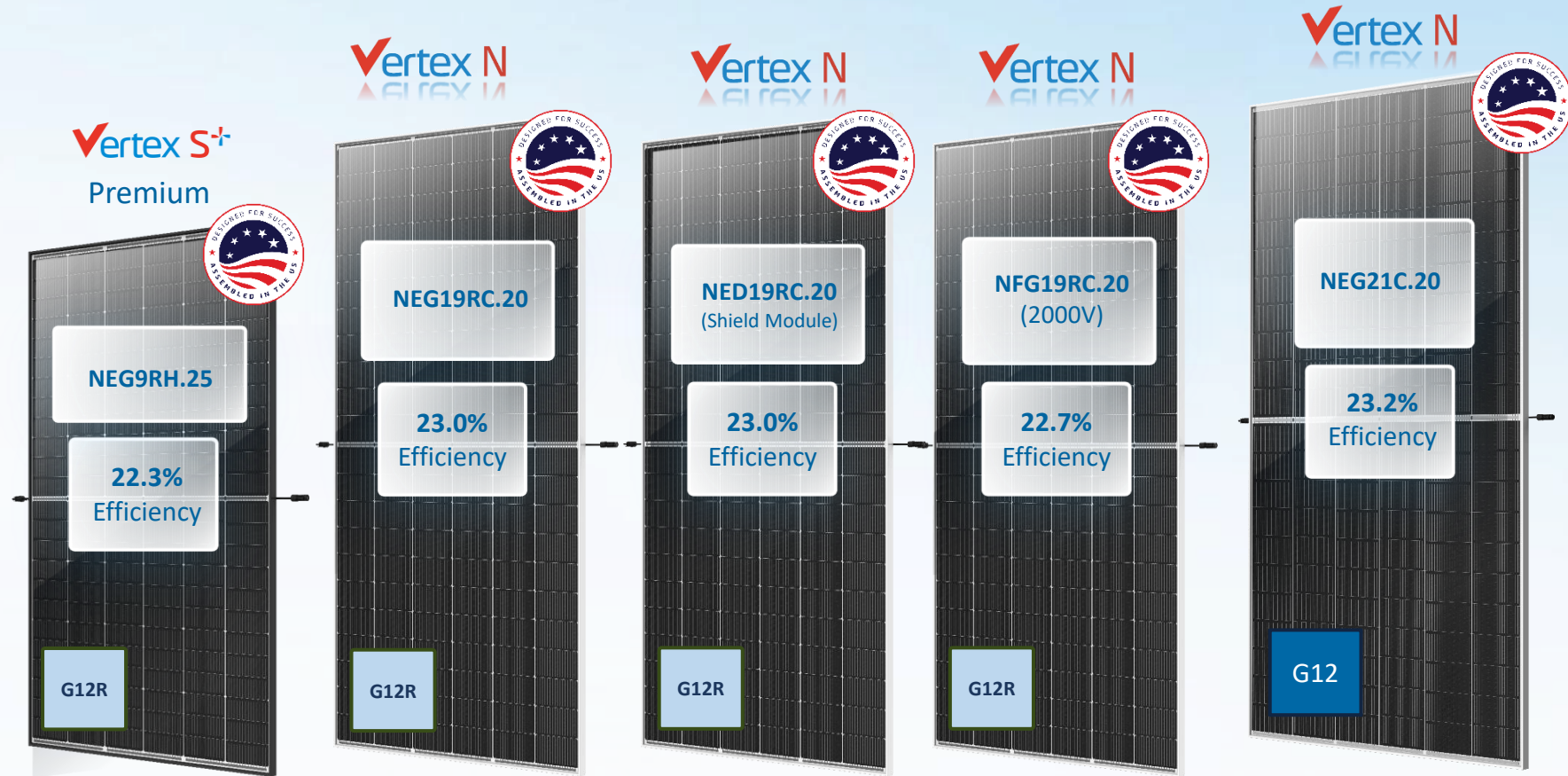
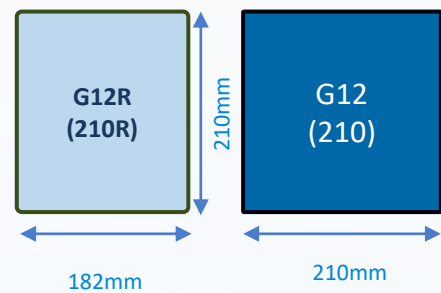
PVEL Top Performer for **12 consecutive years** and RETC Overall Highest Achiever **5 times**



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



Trina Vertex TOPCon Module Portfolio



Up to
445W

Small format module
Residential Rooftop

Up to
620W

Medium-to-large format module
C&I Rooftop, Ground-Mount, and Utility

Up to
720W

Vertex N Shield Module: NED19RC.20

High Power Capacity

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

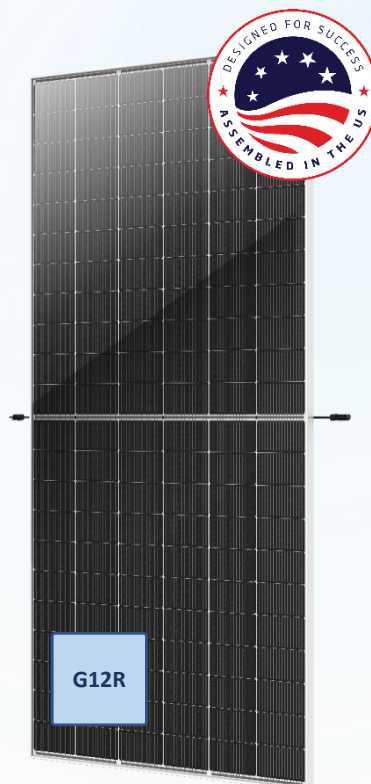
Superior Fire Protection

- 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°
- Withstands 75mm hail at 45°

Extreme Wind Capacity

- Static Load Capacity up to +7000Pa/-5000Pa
- Tracker Mount Capacity up to +3600/-3000Pa

Enhanced Reliability

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

Strong
Wind Protection

Severe
Hail Protection

Heavy
Snow Protection

Superior
Fire Protection

Vertex N

— TOPCon —

Shield

TSM-NED19RC.20
595-620W

Key Features

- Pass IEC 55mm diameter hail certificate at a speed of 33.9m/s
 Effectively reduce over 50% probability of losses caused by hail damage*
- Mechanical load with fixed mounting installation: +7000/-5000Pa
 Mechanical load with tracking installation: +3600/-3000Pa
- Pass IEC 61730-2 Class A+A fire rating certificate
 Pass EN13501-1 Class B certificate (FIGRA 19W/s)
 Pass UL61730 Type 30 fire resistance certificate
- Uneven snow load capacity up to 6600Pa

Performance Warranty



* Please refer to product warranty for details

Extreme Wind Capacity, Versatile Applications



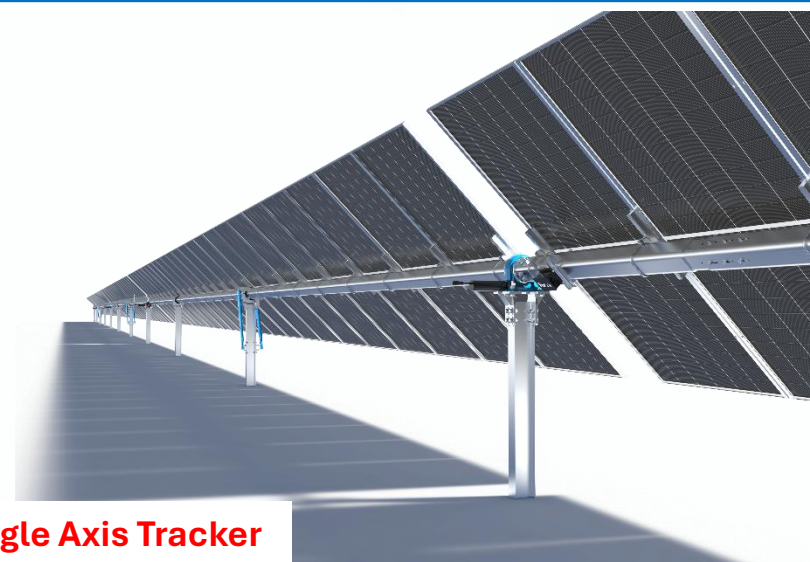
Fixed Tilt

High-Load Capacity:

+7000Pa/-5000Pa [5000Pa=202mph]



- Robust module paired with screw + clamp mount on 2-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.



Single Axis Tracker

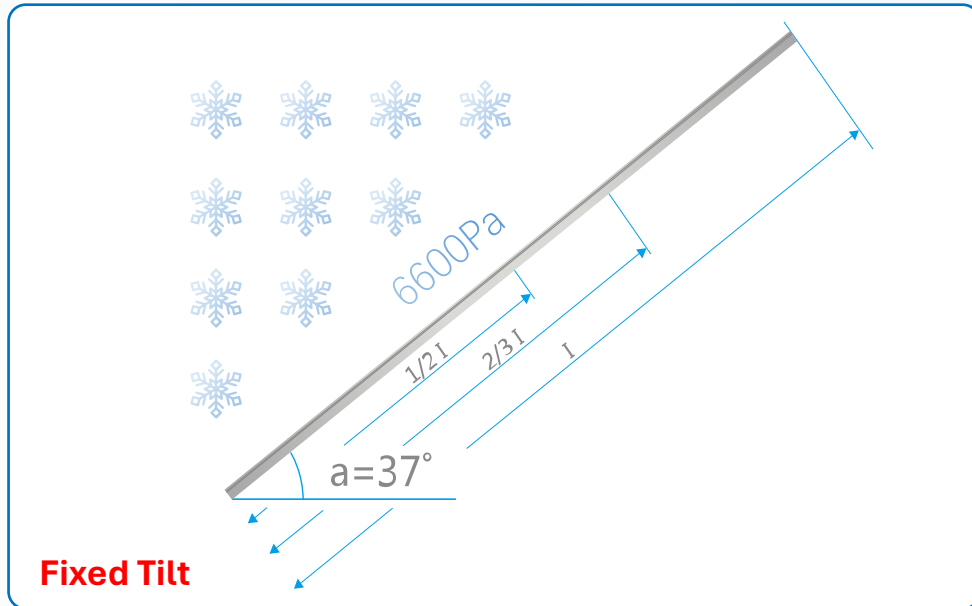
Enhanced Tracker-Mounted Strength:

+3600Pa/-3000Pa | +2700Pa/-2700Pa

[3000Pa=156mph] [2700Pa=148mph]

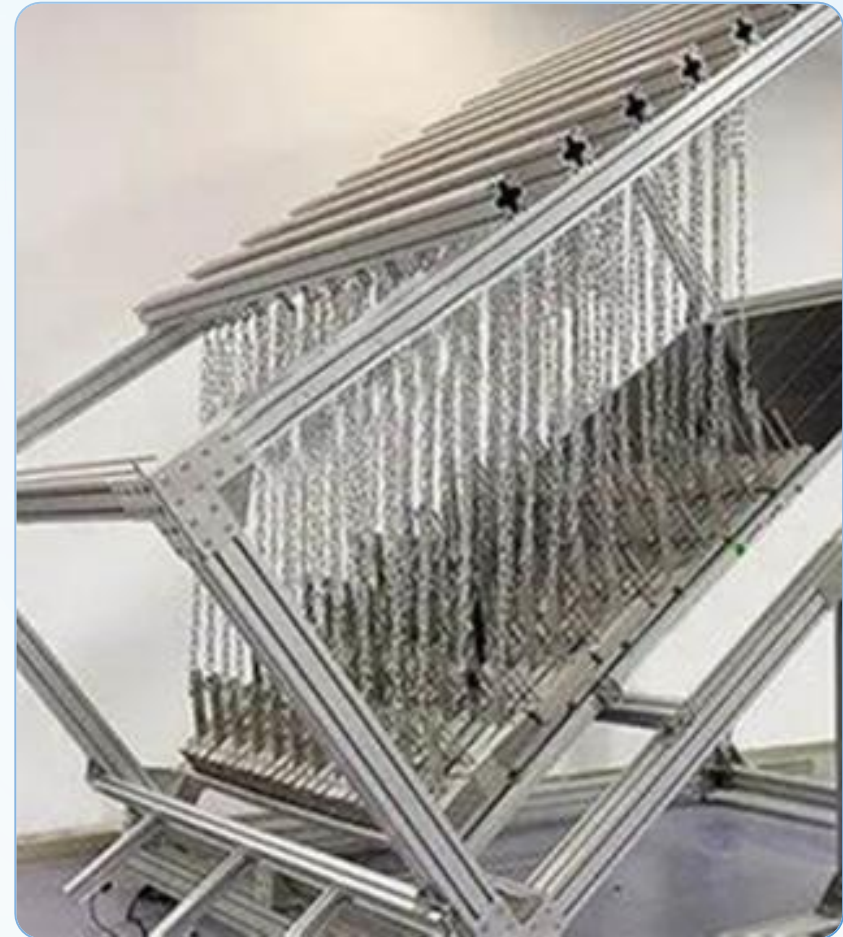
- Achieved on 790mm and 400mm spaced mounting holes respectively.
- Enhanced strength can support a higher factor of safety or allow shorter purlins, helping reduce tracker cost.

Heavy Snow Load Capacity for Real-World Applications



Fixed-Tilt can withstand 7.2 feet 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 . **[$6600\text{Pa} = 232\text{mph}$]**
- This is equivalent to 7.2 ft. of snow.



Above-Average Fire Resistance

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

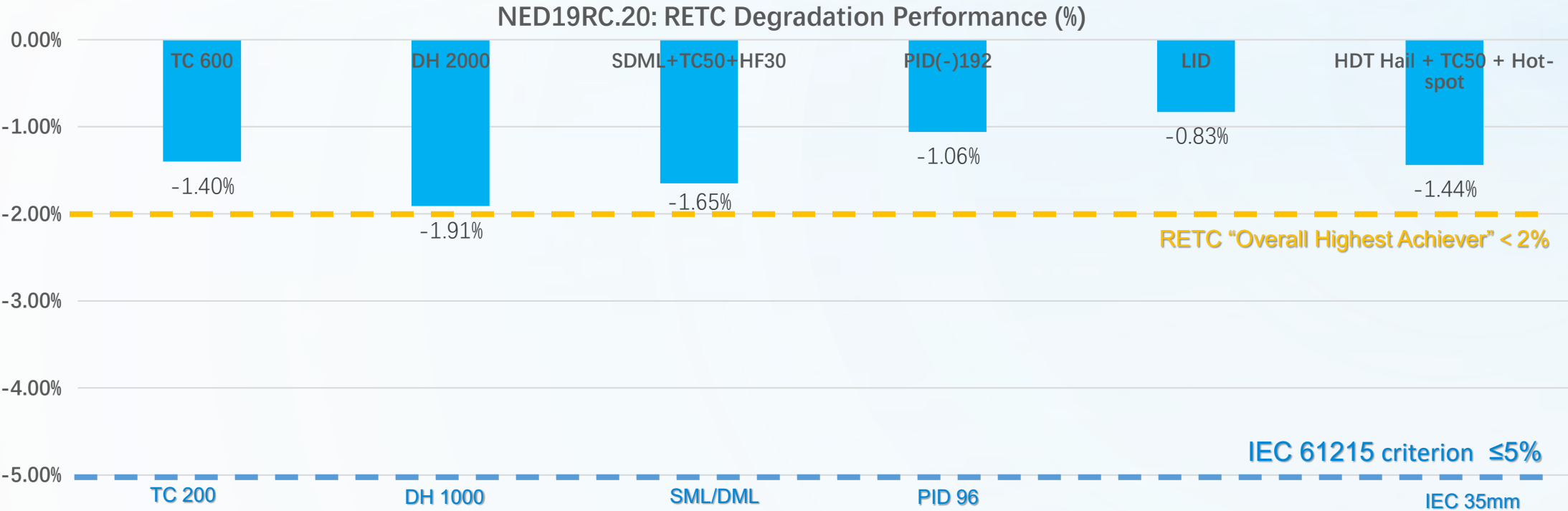
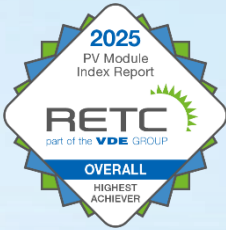
- UL 61730 grants a Fire Type rating ranging from 1 to 49
- Categorized via module construction and further subdivided by fire performance
- Combined performance with racking as defined by UL 2703 offers “Class” rating of A, B, or C
- International Building Code (IBC) dictates rooftop solar assemblies 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

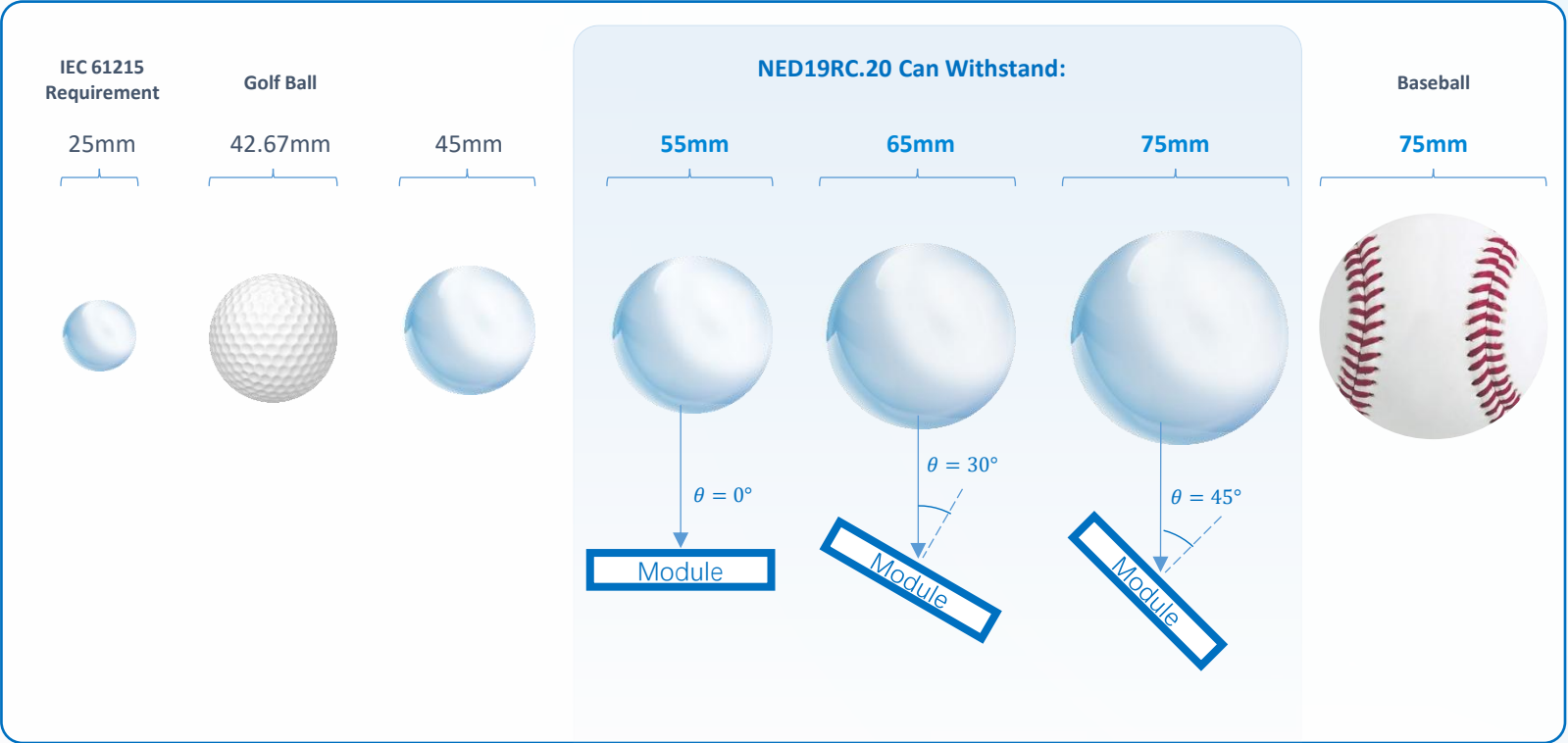


TC=Thermal Cycling, DH=Damp Heat, SDML=Static & Dynamic Mechanical Loading
HF=Humidity Freeze, PID=Potential Induced Degradation
LID=Light Induced Degradation, HDT=55mm Hail Durability Testing

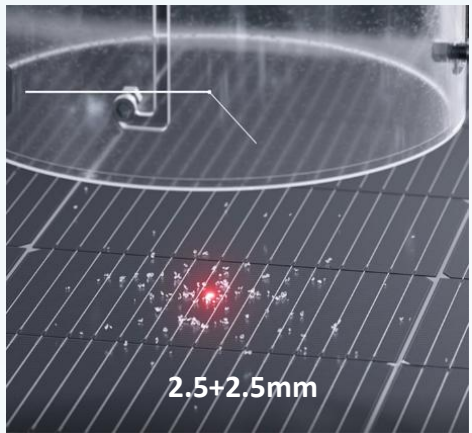
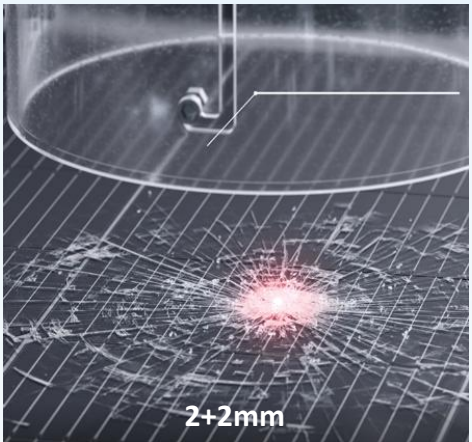
NED19RC.20 performance significantly exceeds IEC 61215 degradation requirements

Superb Hail Impact Resistance, Verified by Third-Party Testing

Resistance to hailstones up to 75mm diameter



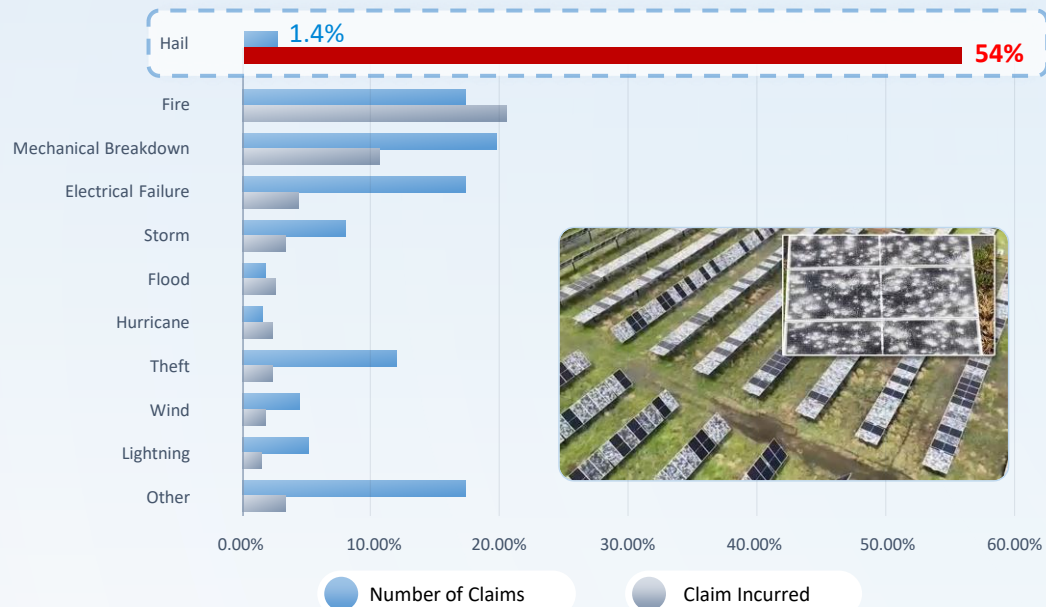
Direct Impact from 55mm Hailstone



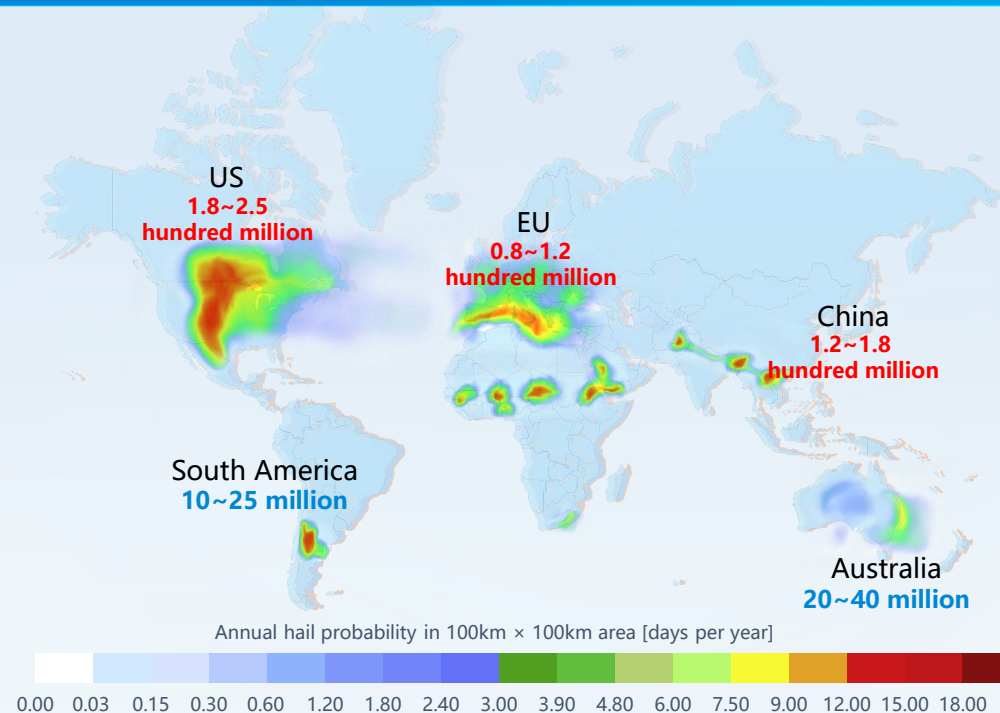
Disproportionate Financial Effects of Hail Damage

Losses of PV Assets Caused by Different Factors

2018-2023 Claims and Amounts for PV Asset Insurance Due to Different Disasters



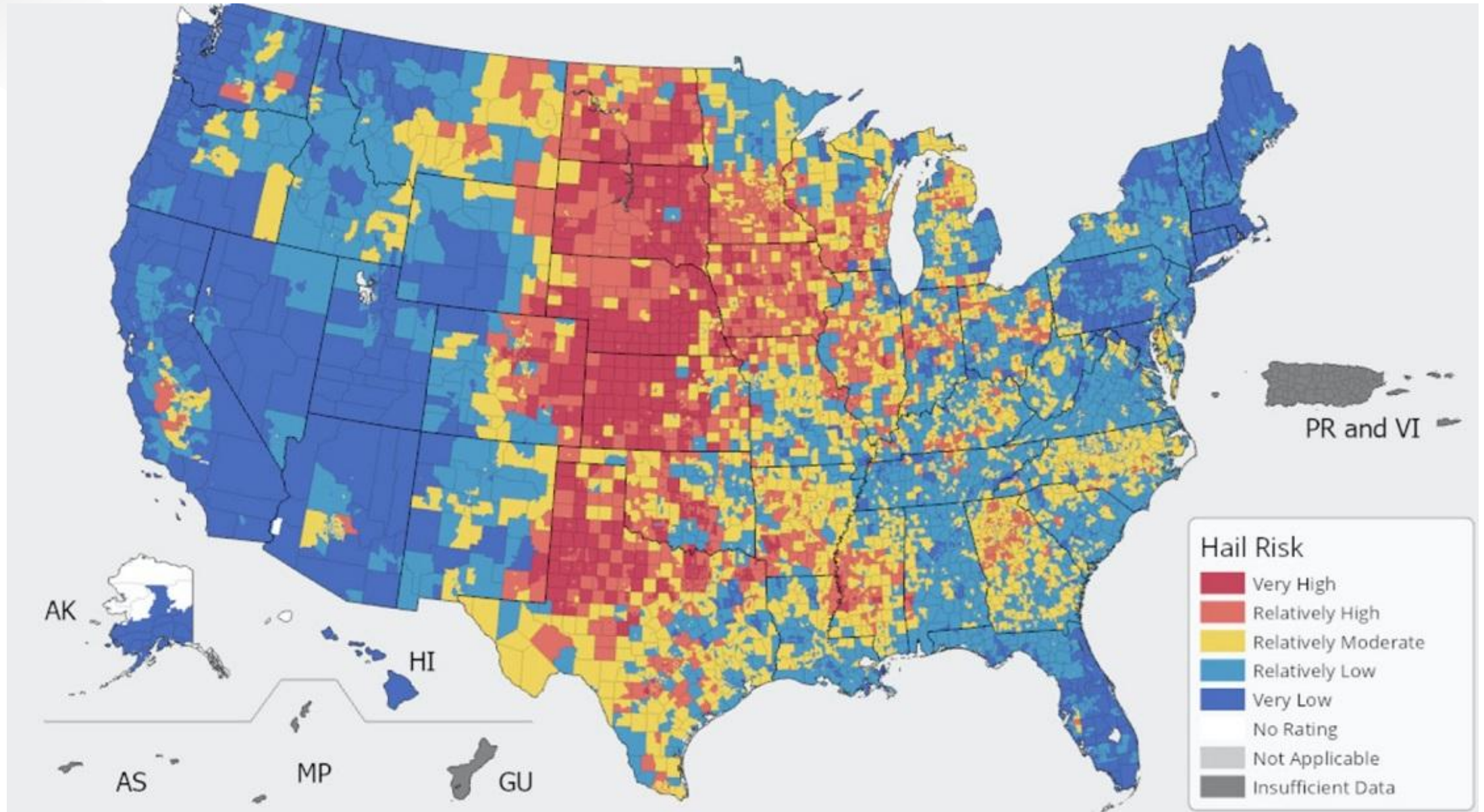
Distribution of hail in various regions and the average annual loss amount (USD)



Extreme Destructiveness: The damage is proportional to the square of the severe hailstone velocity and its diameter.

Sudden and Short Duration: Severe Hailstorms can occur abruptly, lasting only a few to several minutes.

Hail Map of the United States



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.

$$TOC_H = \Sigma \{ (\underbrace{Ac}_{\text{Replacement Cost}} + \underbrace{Dc}_{\text{Downtime Cost}}) \times \underbrace{Px(k)}_{\text{Probability of hail weather occurring}} \times \underbrace{P_{GK}}_{\text{Probability of module being damaged due to extreme weather}} \}$$

Replacement Cost
Determined by
system design and
project cost

Downtime Cost
Related to the project's
expected revenue and
electricity selling price

Probability of module
being damaged due
to extreme weather

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	$x \geq 95$
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%

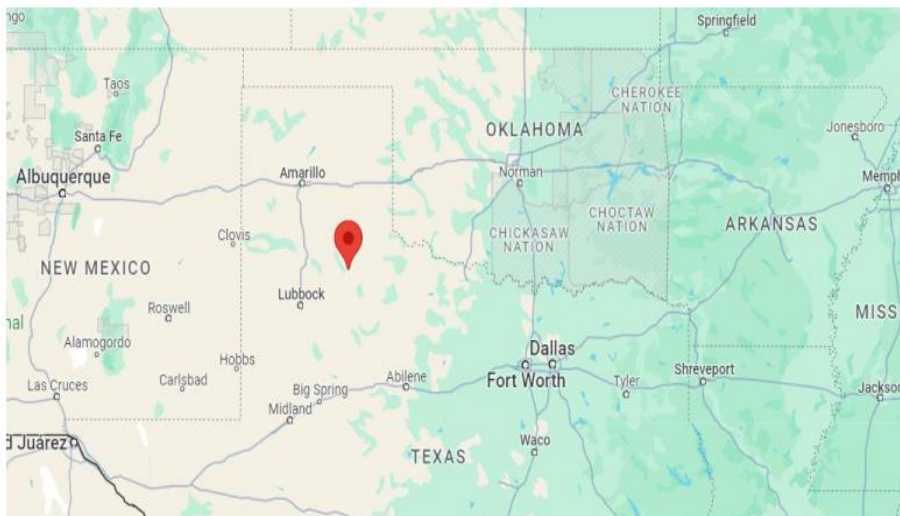
Source: RETC article and data published in kWh analytics' Solar Risk Assessment 2023.
Shield module P_{GK} data is cited from the evaluation of RETC.

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

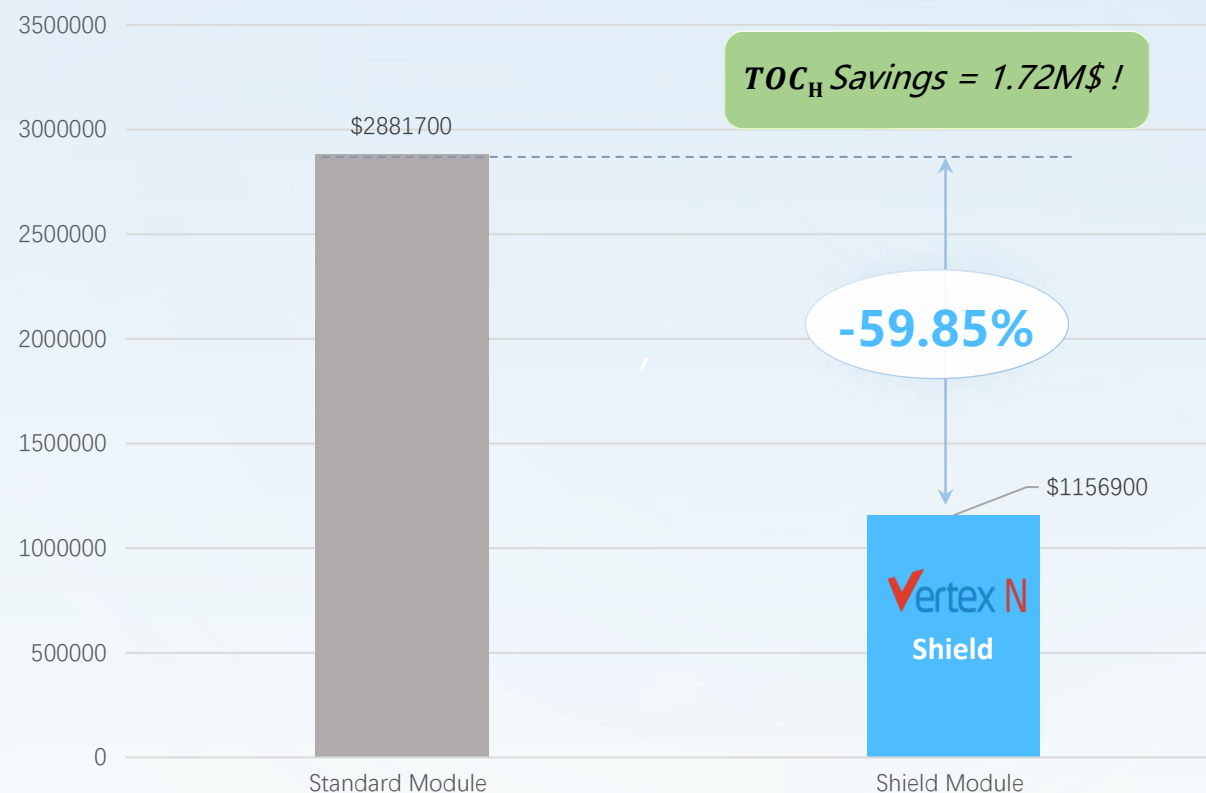
Case Study: ~60% TOC_H Reduction vs. Standard Module

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	Standard Module (2+2mm dual-glass)
Comparison module 2	Shield Module (2.5+2.5mm 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° tilt or 55mm at 0°.
- In “frequent hail zone” case study, system losses were reduced by ~60%, or \$1.72M vs. standard modules.



Hail rated modules turn
lemons into lemonade



Trina solar

Thank you!

