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Intelligent solar tracking for the utility-scale segment and its impact on plant performance

24 April 2025

4:00 pm – 5:00 pm | CEST, Berlin, Paris

10:00 am – 11:00 am | EDT, New York City

Matthew Lynas
Editor
pv magazine

Edgar Pedrego
Director of Technical Sales
PV Hardware

Noel Alvarez
Technical Presales Manager
PV Hardware

Hans Loewenheath
Product Manager, Xweather Protect
Vaisala

Welcome!

pv magazine webinars

Do you have any questions? ❓ 🙋

Send them in via the Q&A tab. 👉 We aim to answer as many as we can today!

You can also let us know of any tech problems there.

We are recording this webinar today. 📽️

We‘ll let you know by email where to find it and the slide deck, so you can re-watch it at your convenience. 👀 💡

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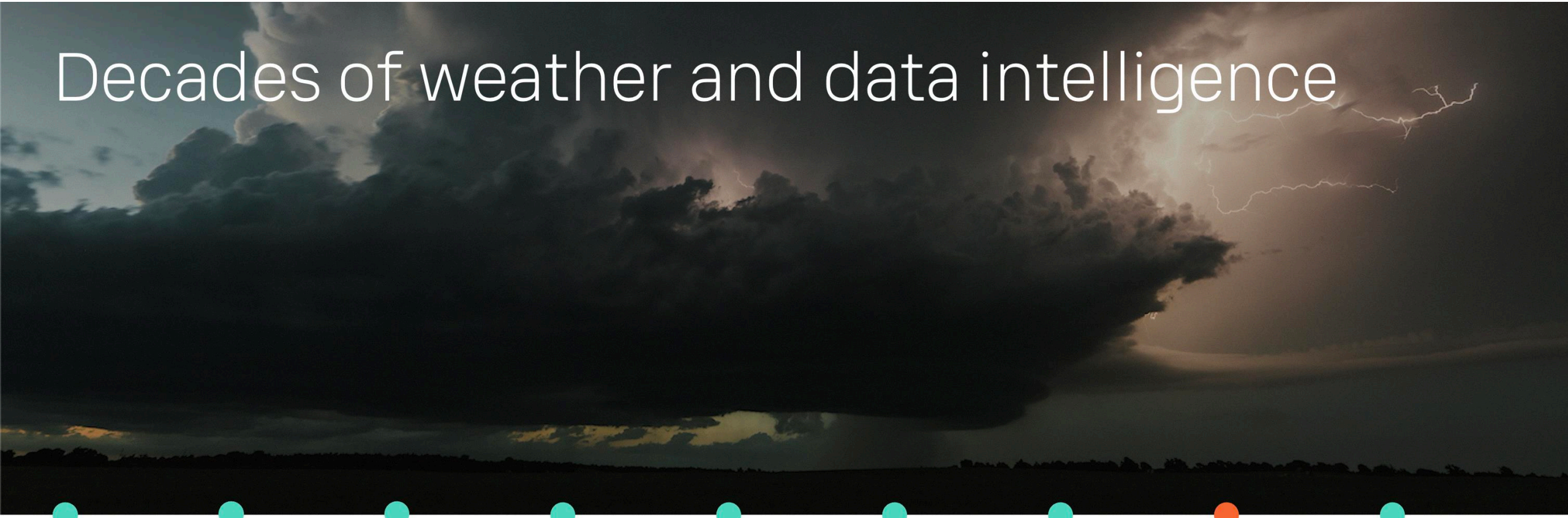
Decades of weather and data intelligence



1936
Vaisala sells radiosondes to its first customer, MIT

1983
National Lightning Detection Network begins operation

2009
Global, real-time lightning detection

2015
Thunderstorm Manager

2020
Lightning Threat Zone forecasting API

2021
Strike Damage Potential

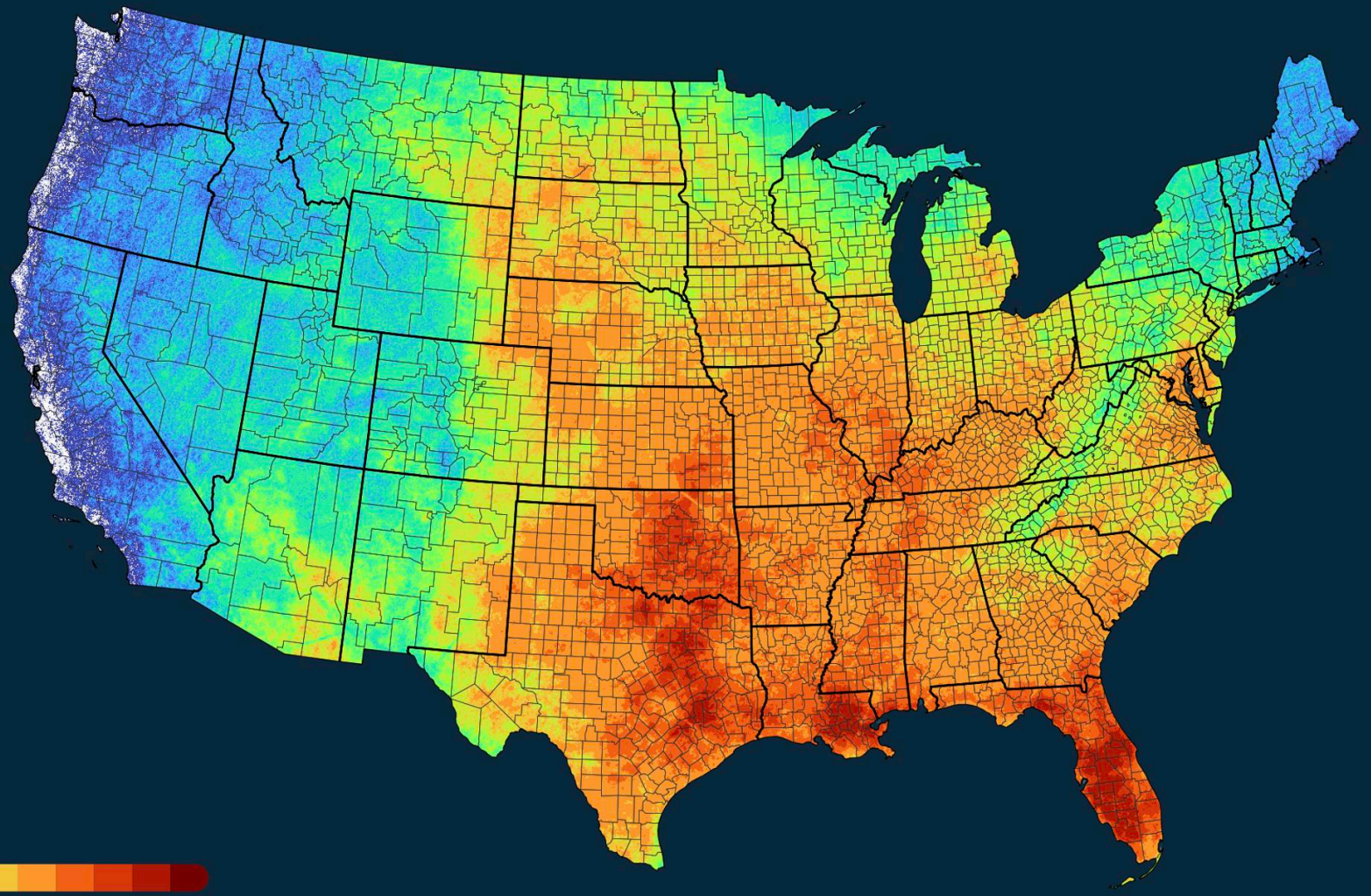
2022
Vaisala acquires AerisWeather

2022
Vaisala Xweather launch

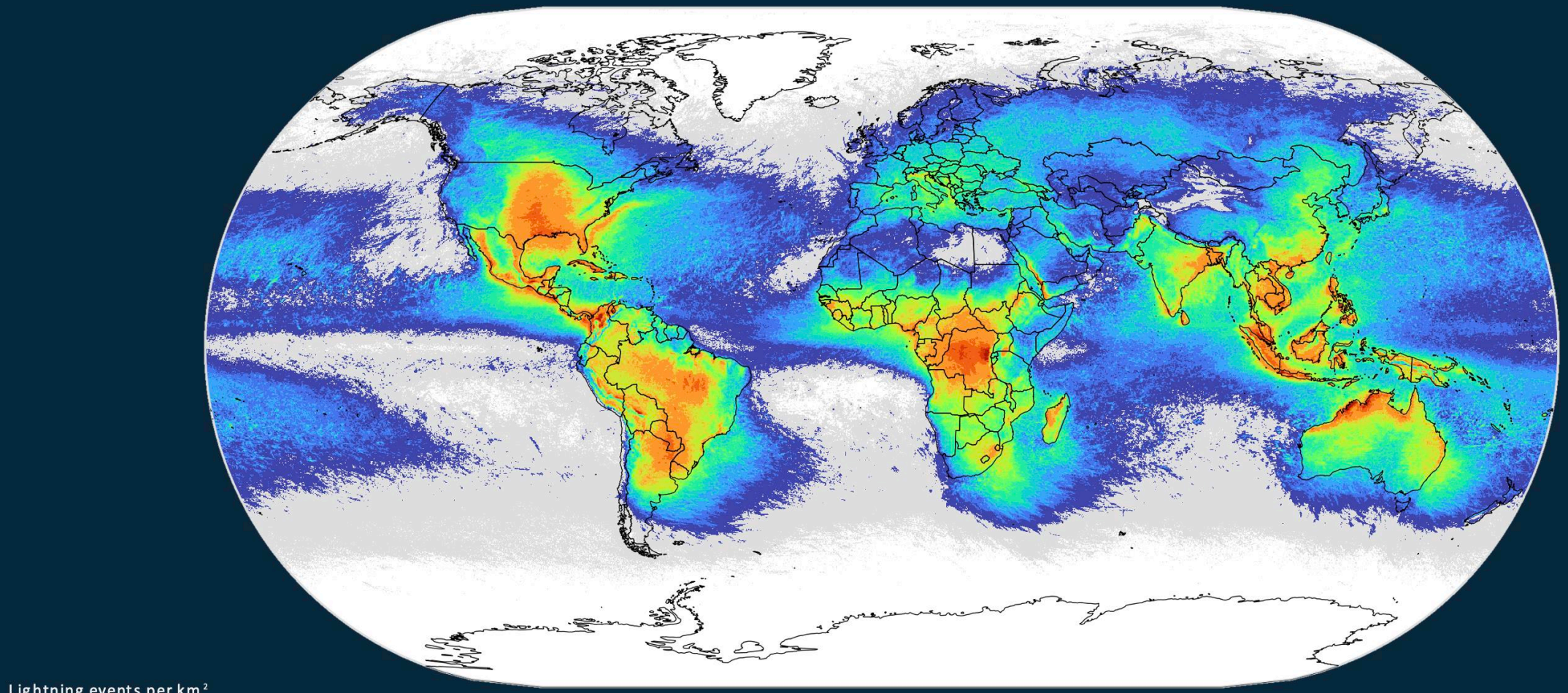
2024
Xweather Insight weather confidence platform

VAISALA Xweather

Precision lightning detection network



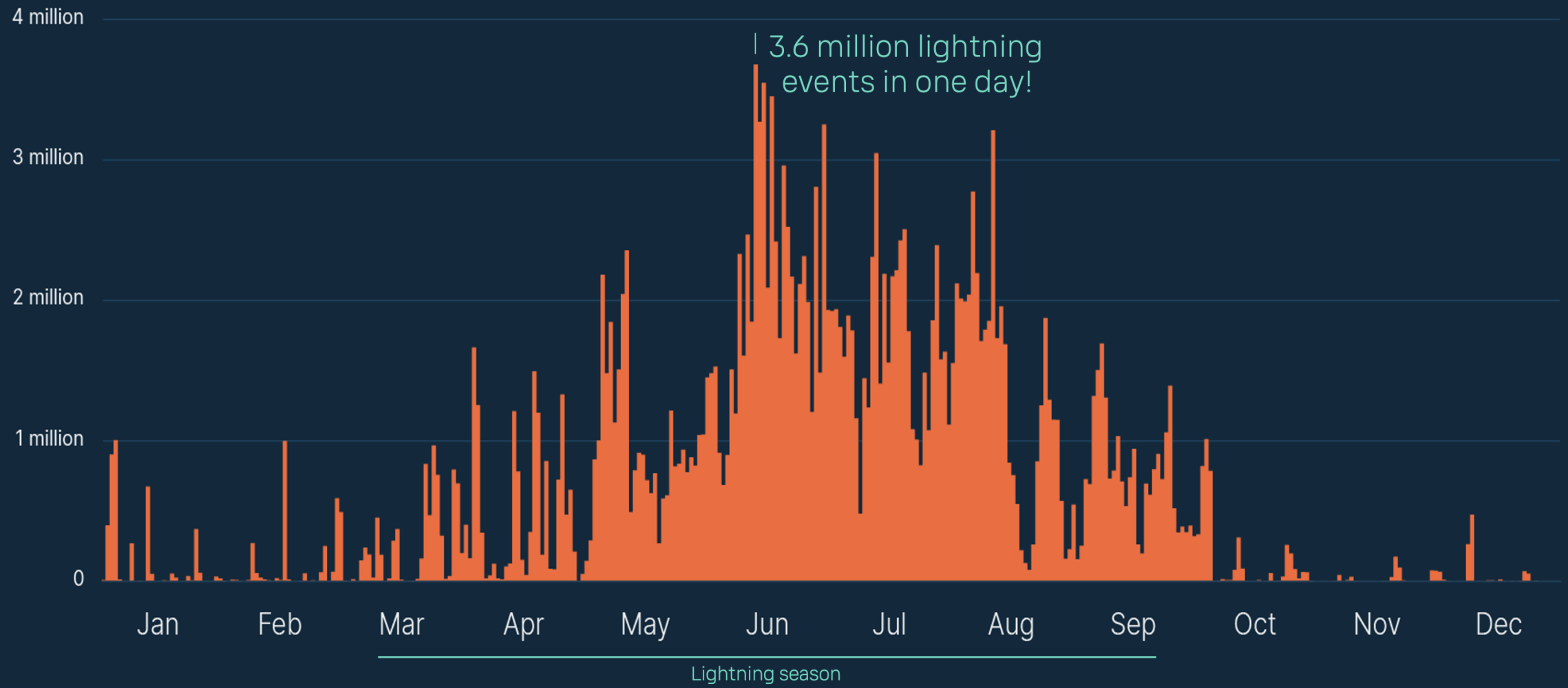
Long-range lightning detection network



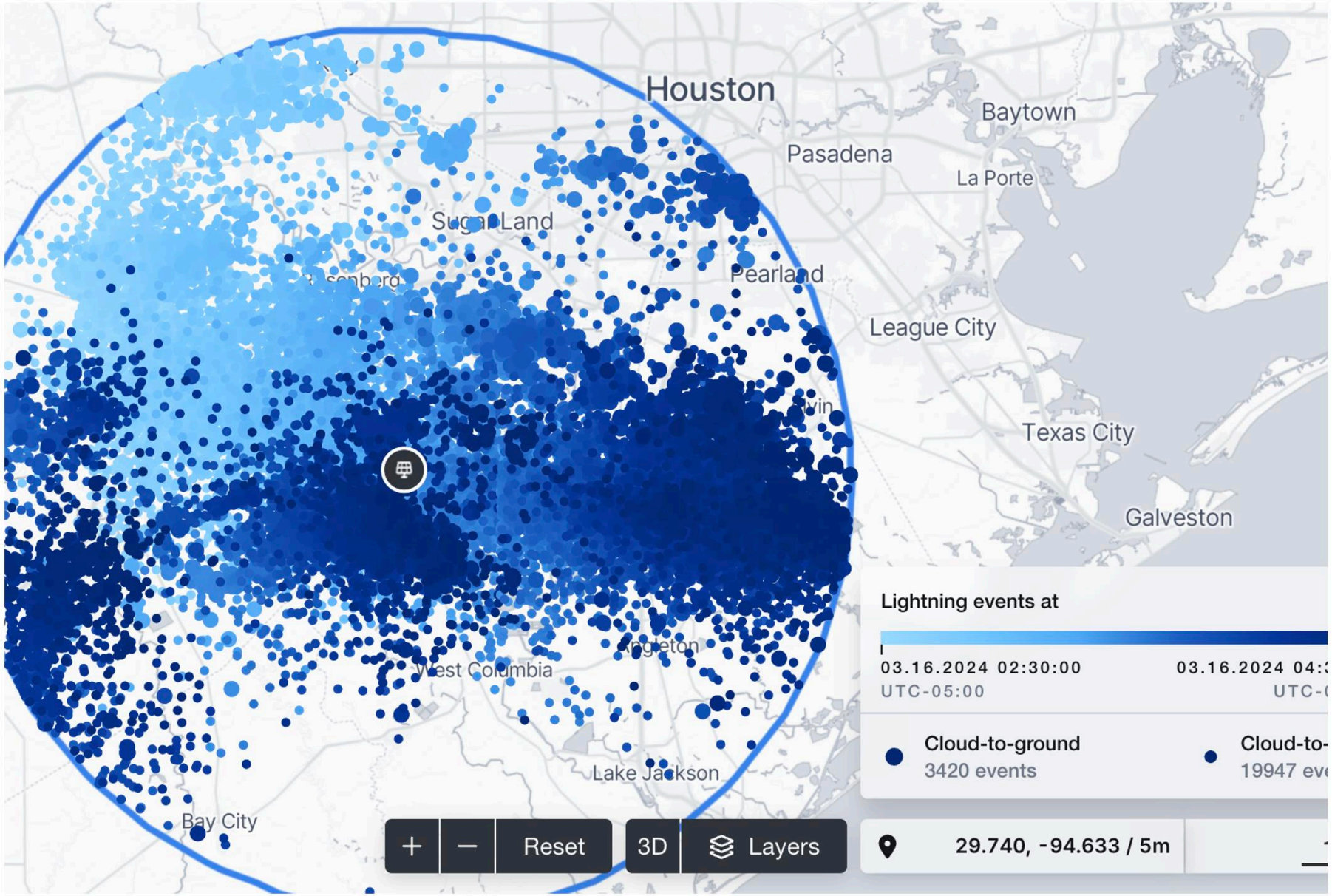
Lightning events per day in the United States in 2023

excluding Alaska and Hawaii

Hailstorms are strongly correlated with lightning



Lightning events on March 16, 2024



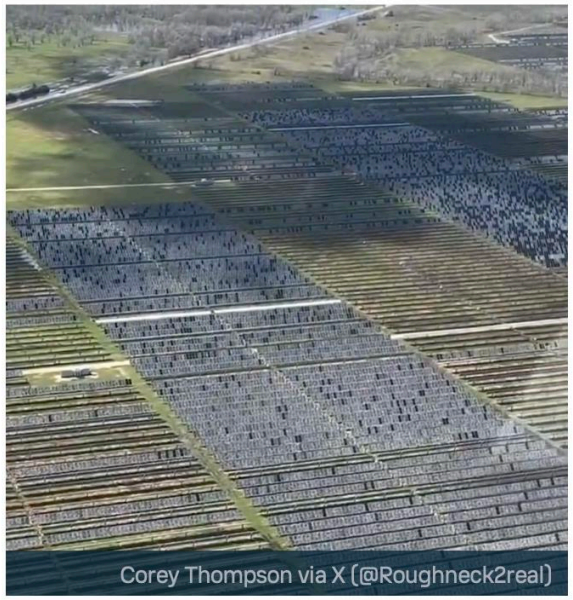
Over 23,000 lightning events detected near Fighting Jays during the 2-hour hailstorm

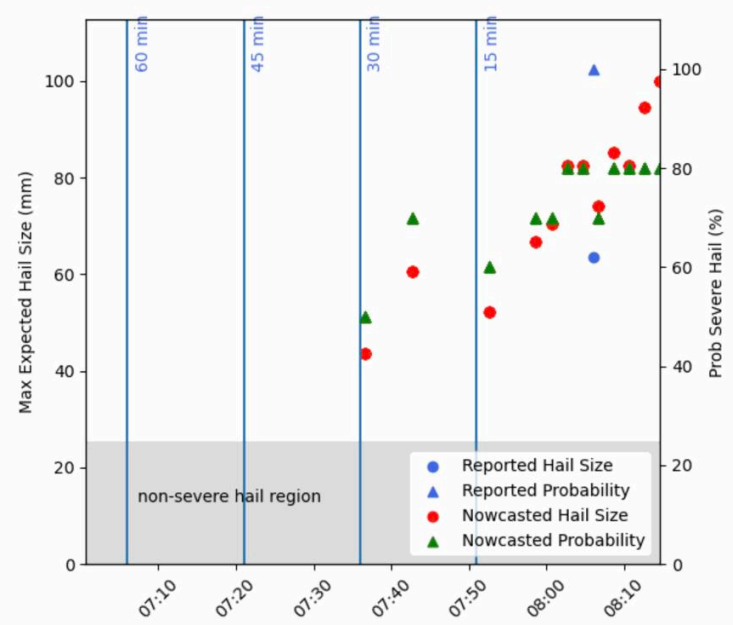
- 3,420 ground strokes
- 19,947 cloud pulses

FIGHTING JAYS CASE STUDY

Xweather hail forecast alert would have given 29 minutes lead time to stow

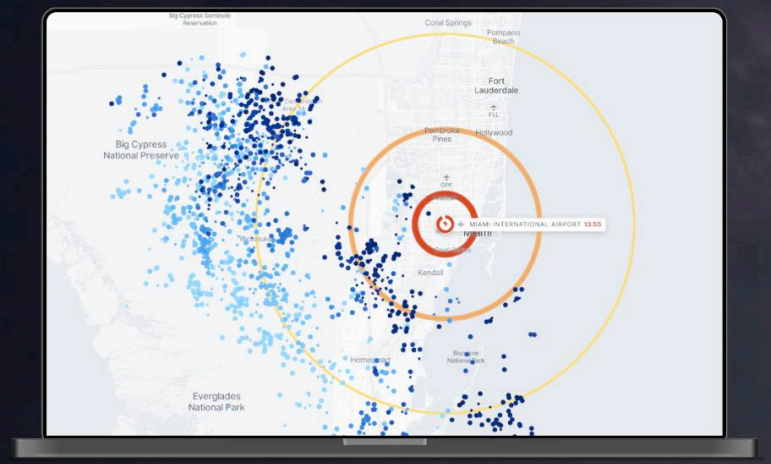
Event on March 16, 2024	Time	Lead time	Comments
First hail alert (reprocessed)	07:36Z	29 min	50% probability of severe hail at 07:36Z
Hail observation	08:06Z	n/a	Hail size estimated at 63.5 mm
Hail alert at observation (reprocessed)	08:06Z	0 min	80% probability of severe hail at 08:06Z



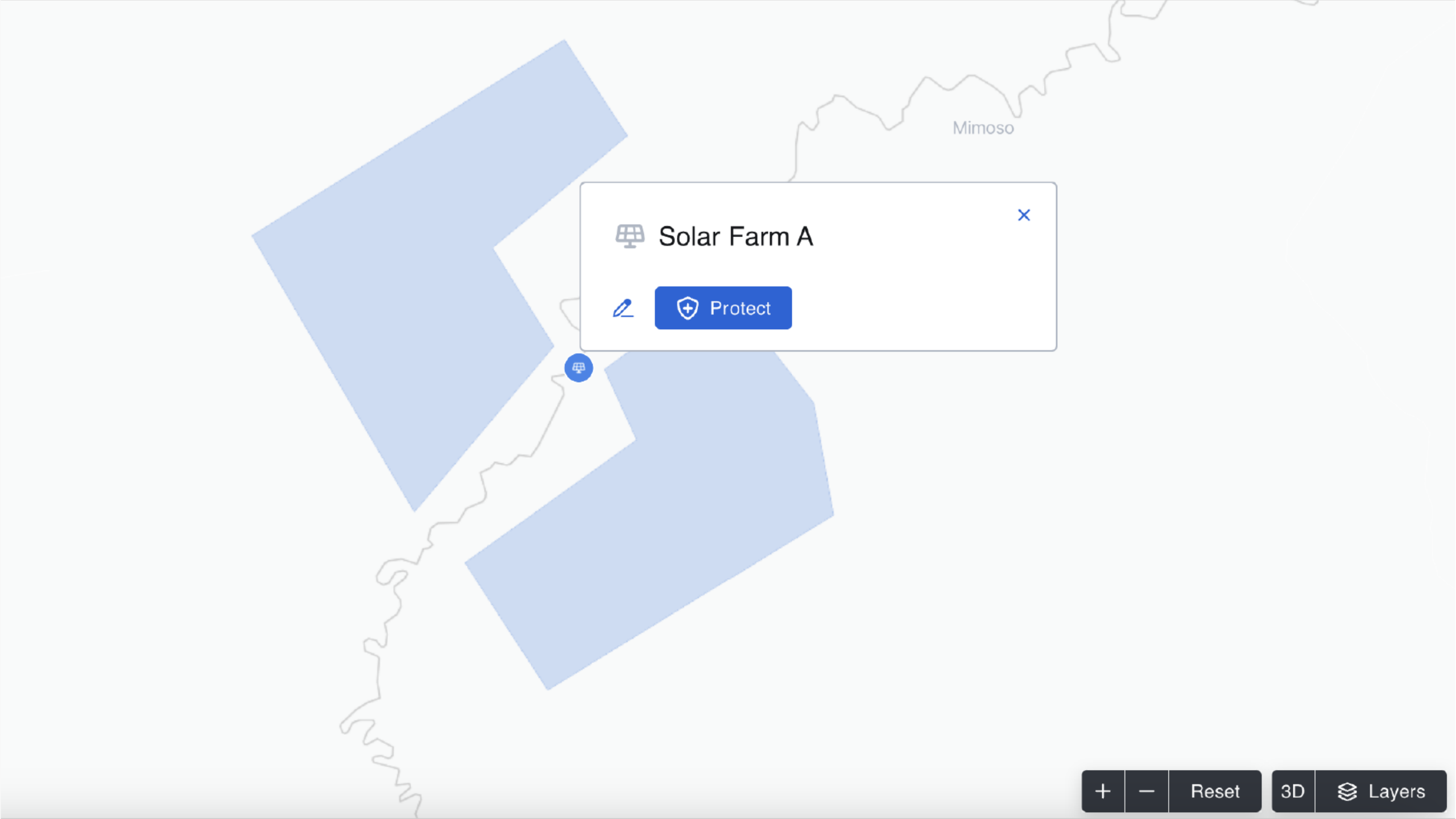


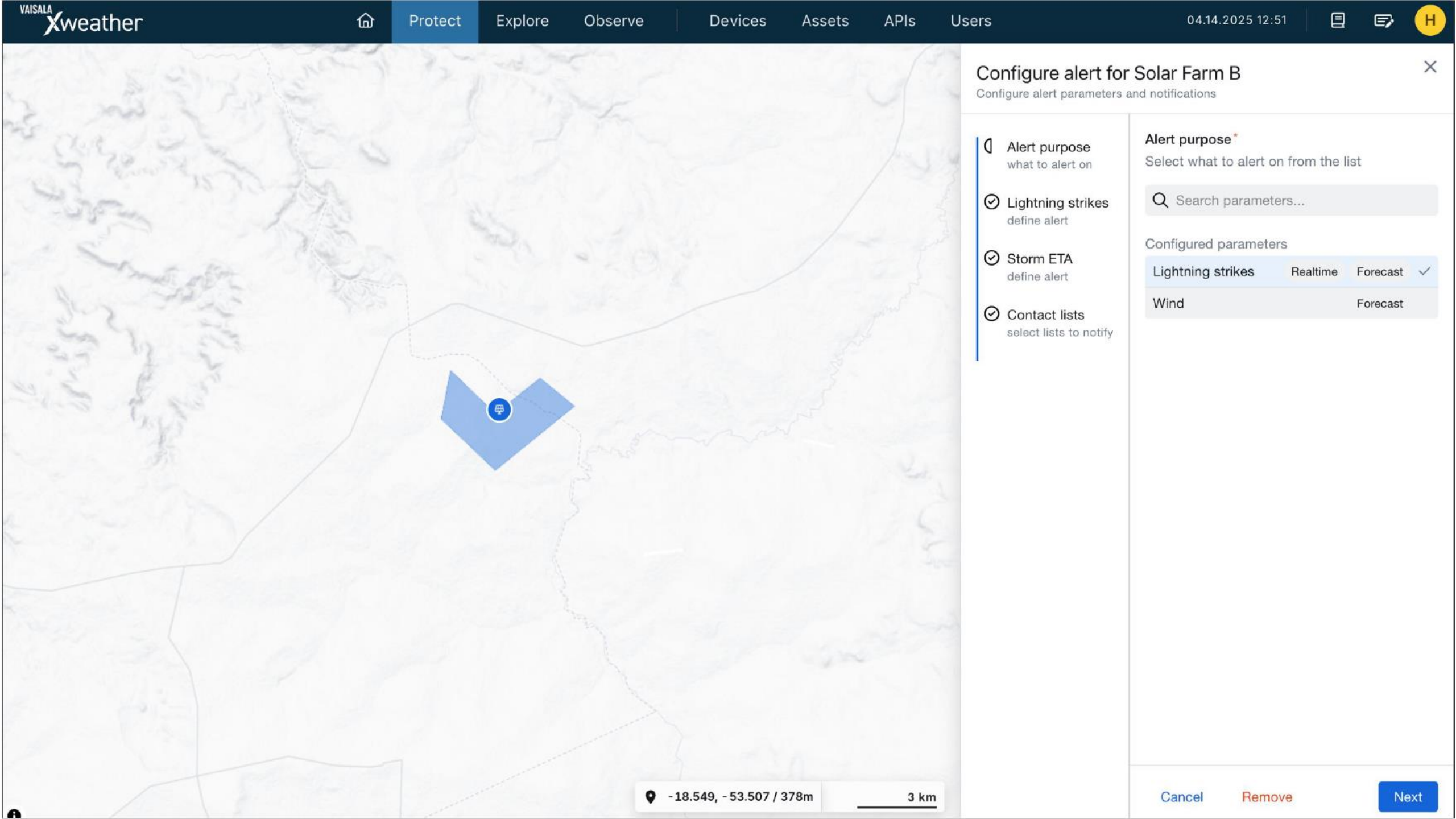
Xweather Protect

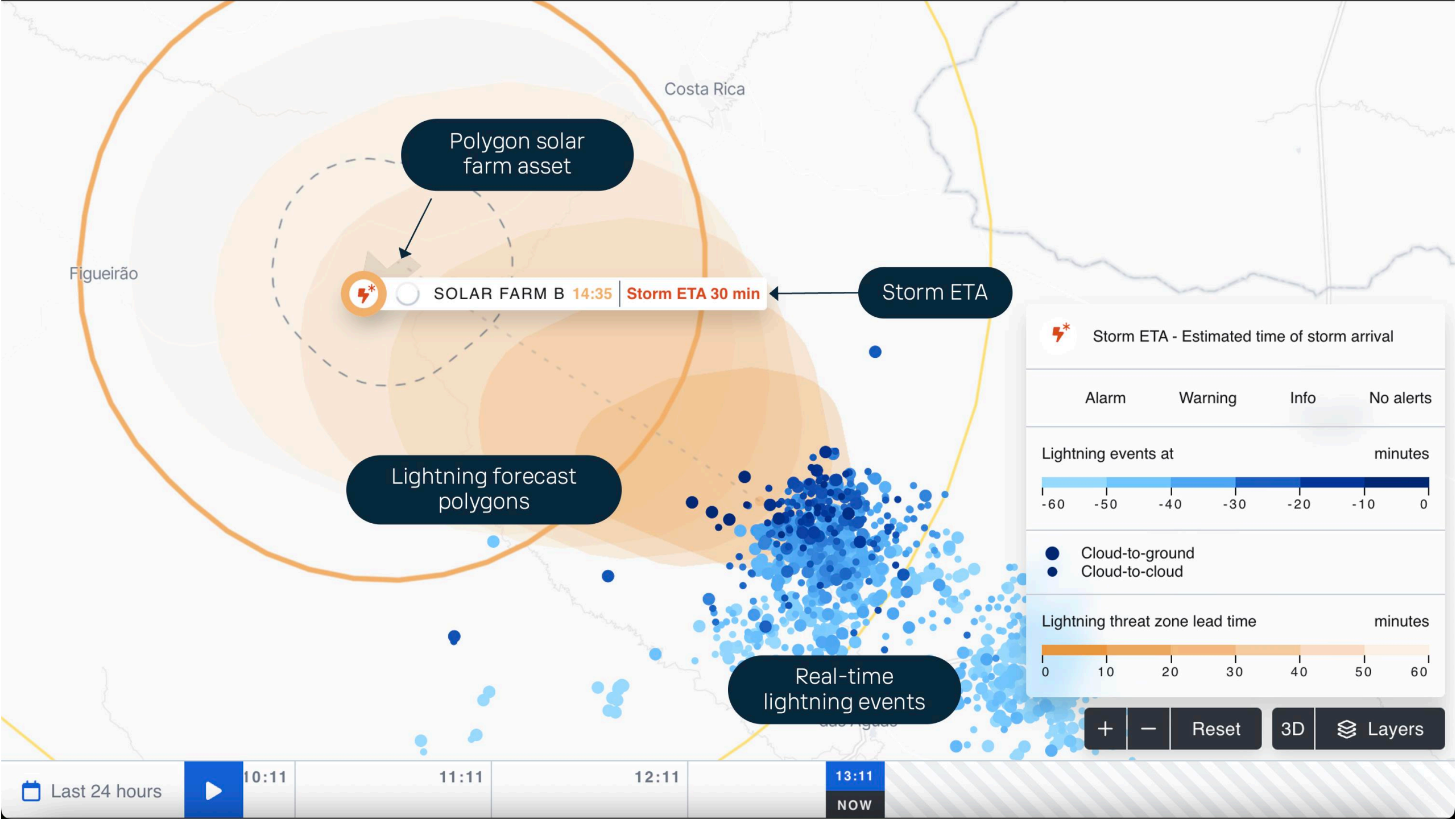
Manage severe weather risks with real-time monitoring and alerts for any location.



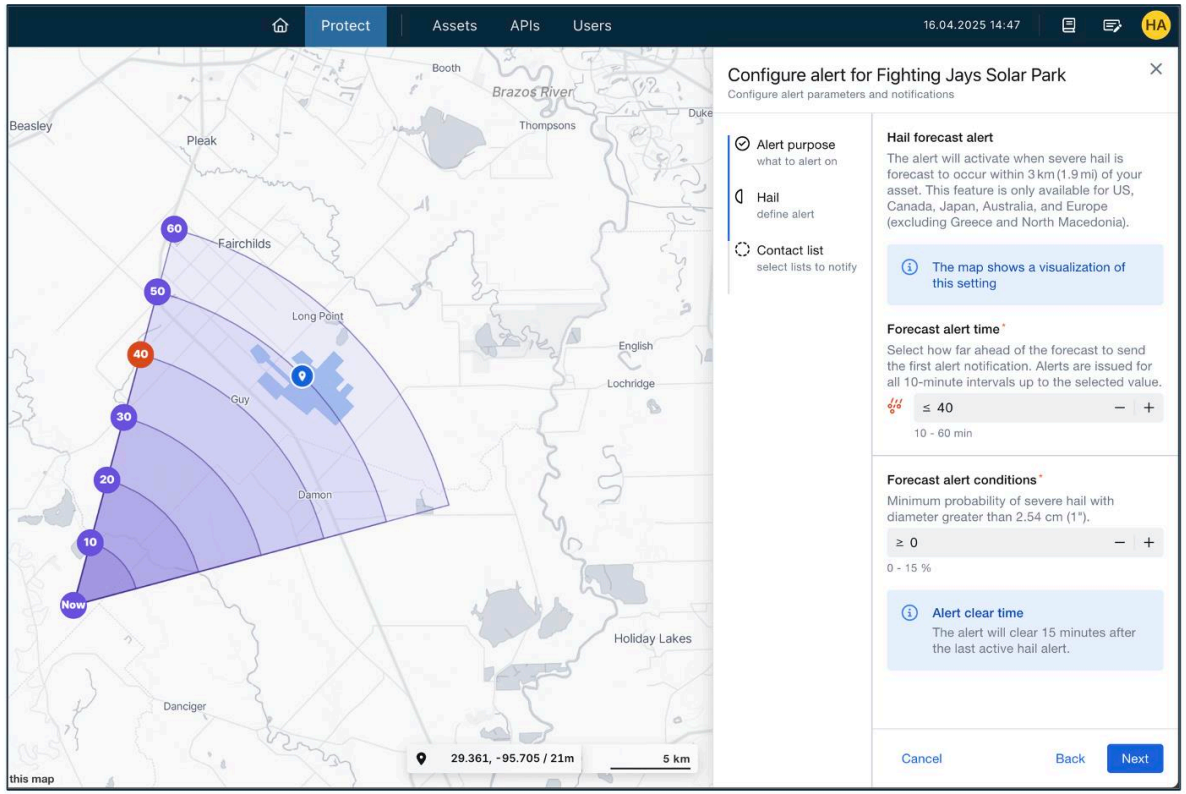
Hail alerts coming soon

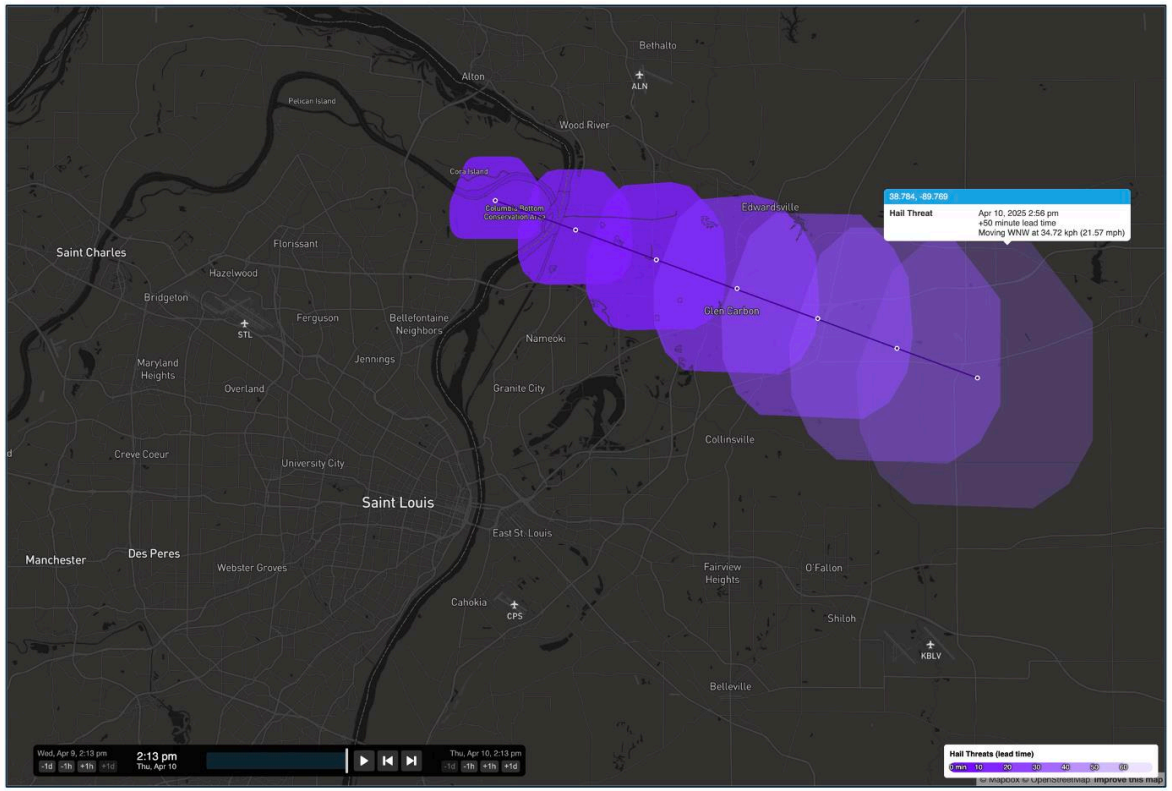

Mimoso
Solar Farm A
Protect
Reset
3D
Layers


VAISALA Xweather
Protect
Explore
Observe
Devices
Assets
APIs
Users
04.14.2025 12:51
H
Configure alert for Solar Farm B
Configure alert parameters and notifications
Alert purpose
what to alert on
Lightning strikes
define alert
Storm ETA
define alert
Contact lists
select lists to notify
Alert purpose *
Select what to alert on from the list
Search parameters...
Configured parameters
Lightning strikes
Realtime
Forecast
Wind
Forecast
-18.549, -53.507 / 378m
3 km
Cancel
Remove
Next

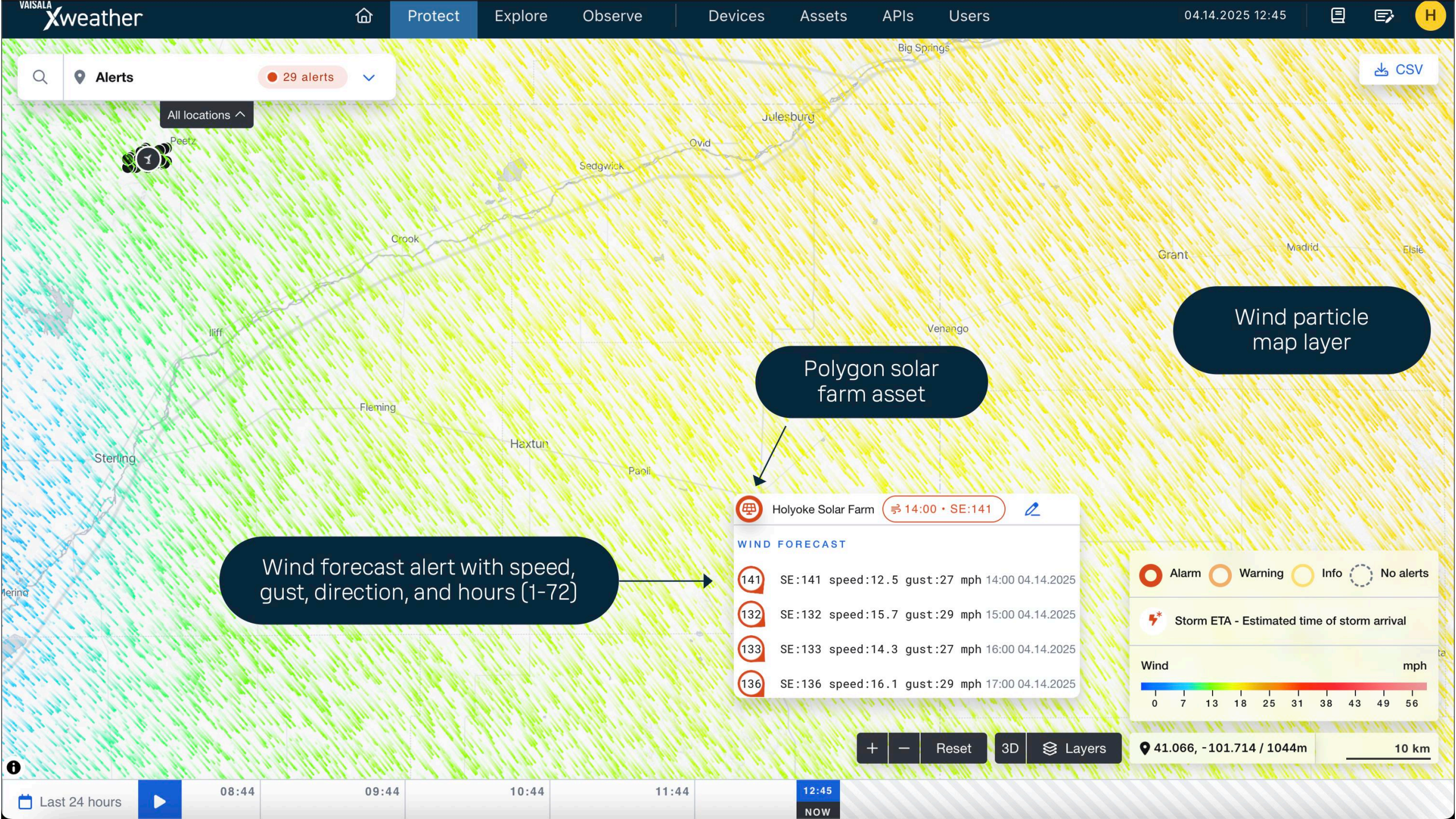

Costa Rica
Figueirão
Polygon solar farm asset
SOLAR FARM B 14:35
Storm ETA 30 min
Storm ETA
Lightning forecast polygons
Real-time lightning events
Storm ETA - Estimated time of storm arrival
Alarm
Warning
Info
No alerts
Lightning events at
minutes
-60 -50 -40 -30 -20 -10 0
Cloud-to-ground
Cloud-to-cloud
Lightning threat zone lead time
minutes
0 10 20 30 40 50 60
Reset
3D
Layers
Last 24 hours
10:11
11:11
12:11
13:11
NOW

Xweather Protect hail alerts enables users to configure maximum lead time and minimum probability of severe hail (> 1 in / 2.54 cm) thresholds



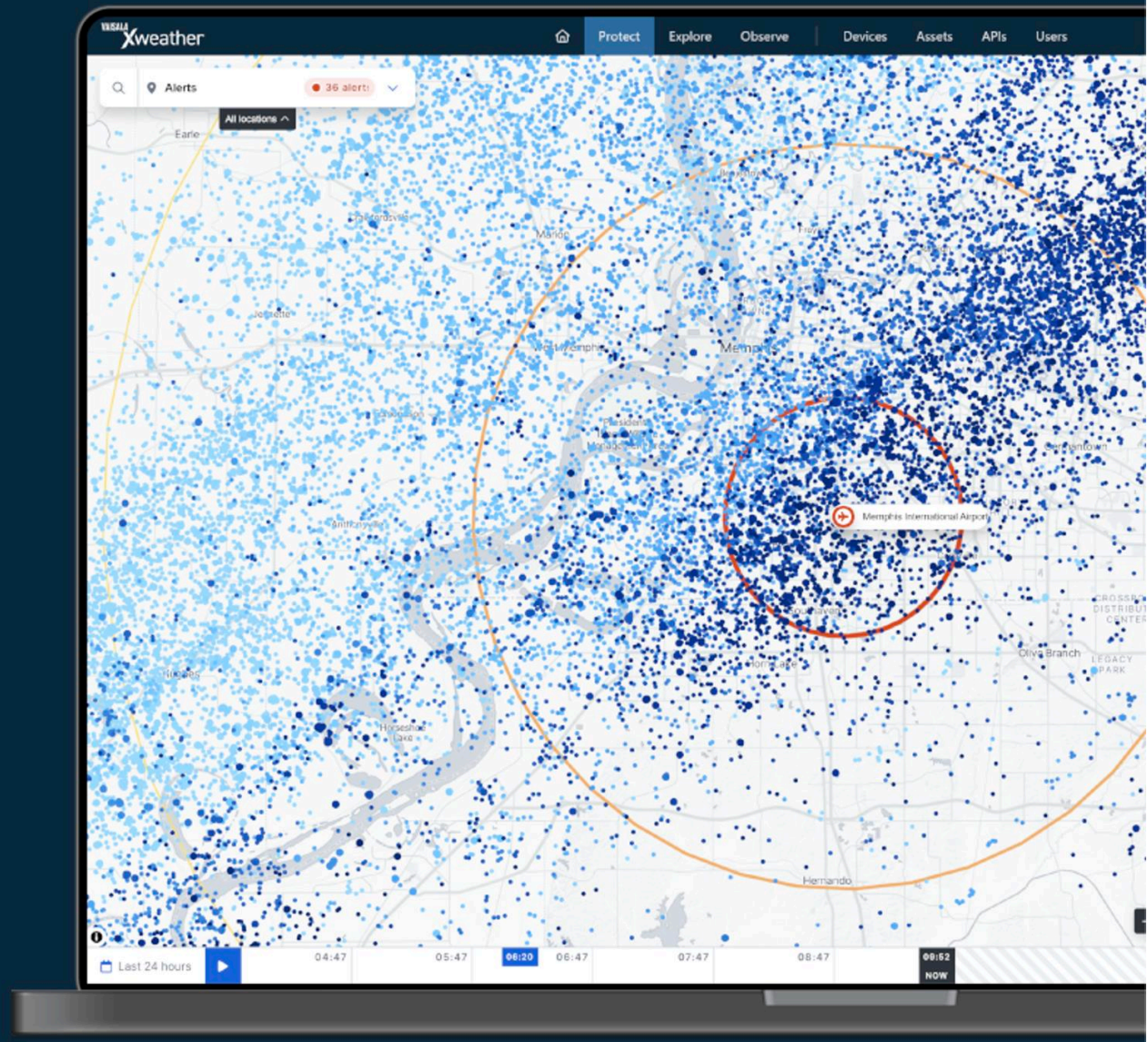


Available for locations in US, Europe, Canada, Japan, and Australia


VAISALA Xweather
Protect
Explore
Observe
Devices
Assets
APIs
Users
04.14.2025 12:45
H
Alerts
29 alerts
All locations
CSV
Big Springs
Julesburg
Ovid
Sedgwick
Peetz
Crook
Grant
Madrid
Elsie
Venango
Fleming
Haxtun
Sterling
Paoli
Wind particle map layer
Polygon solar farm asset
Holyoke Solar Farm
14:00 • SE:141
WIND FORECAST
141 SE:141 speed:12.5 gust:27 mph 14:00 04.14.2025
132 SE:132 speed:15.7 gust:29 mph 15:00 04.14.2025
133 SE:133 speed:14.3 gust:27 mph 16:00 04.14.2025
136 SE:136 speed:16.1 gust:29 mph 17:00 04.14.2025
Wind forecast alert with speed, gust, direction, and hours (1-72)
Alarm
Warning
Info
No alerts
Storm ETA - Estimated time of storm arrival
Wind
mph
0 7 13 18 25 31 38 43 49 56
Reset
3D
Layers
41.066, -101.714 / 1044m
10 km
Last 24 hours
08:44
09:44
10:44
11:44
12:45
NOW

Get started with a free trial

xweather.com/pvhardware



Xweather Protect

Severe weather alerting:

- Hail
- Wind & gusts
- Lightning
- Storm ETA

Weather forecast (NWP)

Machine learning

Sensor-enhanced wind gust forecast

Stow triggered when wind exceeds threshold

Stow when observed wind > 11 m/s

Correct + 8	Misses 23
False alarms 4	Correct – 16,564

Stowed when needed	Did not stow when needed
Stowed when not needed	Did not stow unnecessarily

Values are the number of 10-minute events over a 3-month evaluation period.

Gust observation trigger increases protection

Stow when observed wind > 11 m/s

Correct +	Misses
8	23
False alarms	**Correct –**
4 40 minutes	16,564

Stow when observed gust > 11 m/s

Correct +	Misses
30	1 Much better
False alarms	**Correct –**
1,000 ~7 days	15,568

We want the best of both worlds:

- The small number of misses of the more sensitive trigger
- With the lower false alarm rate of the less sensitive one

VAISALA Xweather

Values are the number of 10-minute events over a 3-month evaluation period.

Reduce false alarms with Vaisala Xweather sensor-enhanced gust forecast

Xweather brings predictive intelligence to gust forecasting.

Over 3-months, our system provided the same protection as a more sensitive reactive system but **reduced unnecessary stow time from 7 days to 1 day**.

Stow when observed gust > 11 m/s

Correct +	Misses
30	1
False alarms	Correct –
1,000 ~7 days	15,568

Vaisala Xweather gust forecast system

Correct +	Misses
30	1
False alarms	Correct –
132 ~1 day	16,436

Values are the number of 10-minute events over a 3-month evaluation period.

VAISALA Xweather

Who we are

We are manufacturers

PVH is a leading manufacturer and provider of advanced racking solutions for the global utility-scale solar PV market. Specializing in solar trackers and fixed-tilt systems, **we engineer our products to ensure the lowest installation costs** while delivering exceptional customer support throughout every project phase. As the top supplier of solar trackers across Europe, the Middle East, Africa, and Australia, we've delivered over 29 GW to PV plants worldwide. Our factories in Europe, USA and the Middle East enable us to serve more than 500 PV plants globally, including 180 projects exceeding 50 MW each.

32+

GW supplied worldwide

500+

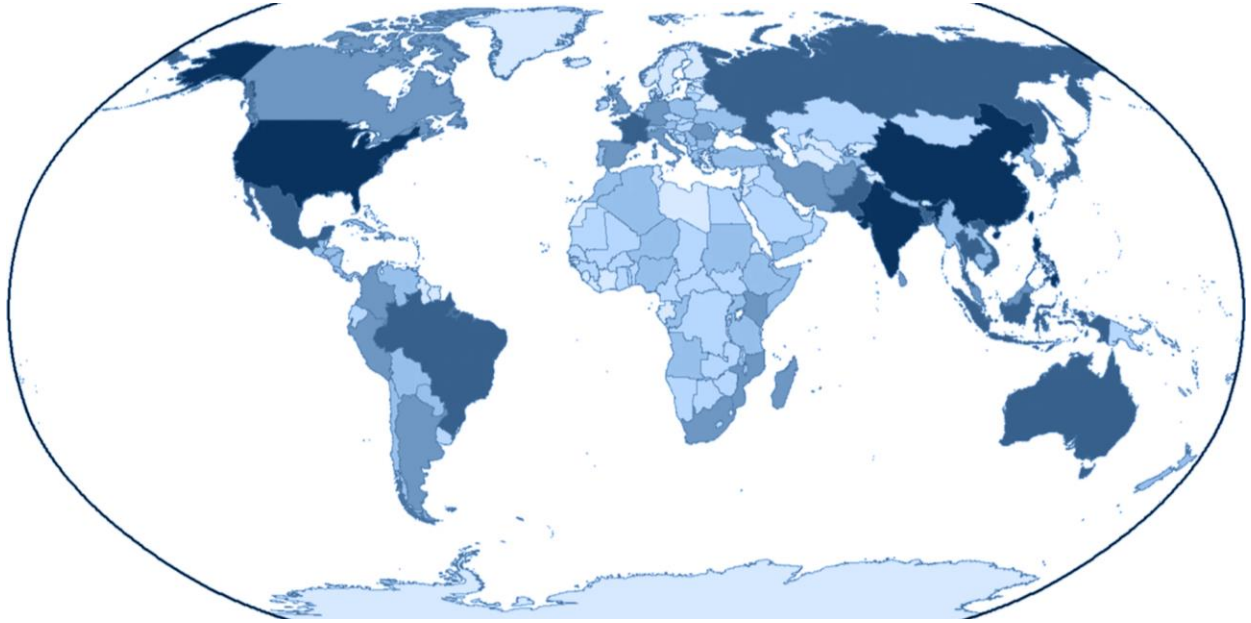
PV plants supplied in 5 continents

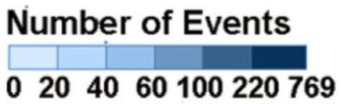
180+

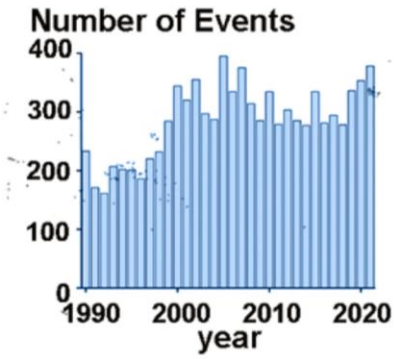
PV plants above 50 MW

The Urgency of Climate Resilience in Solar Projects

- Solar PV Plants face growing risks from Extreme weather events despite robust designs
- Increased frequency, severity, and duration of weather events impact the global PV industry.
- The photovoltaic sector is evolving rapidly with larger modules and thinner frames and glass.
- Advanced protection strategies are essential to safeguard solar energy production from these challenges







Your projects will be at risk in these following situations

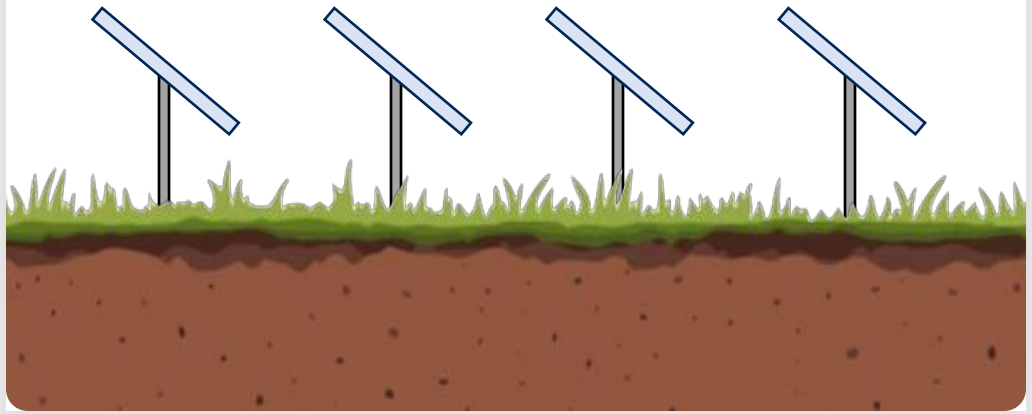
- Wind events when power plants are under construction
- Wind Direction changes during weather events
- Rapid increase on wind speed

Protection

Market Standard

LIMITED SAFETY

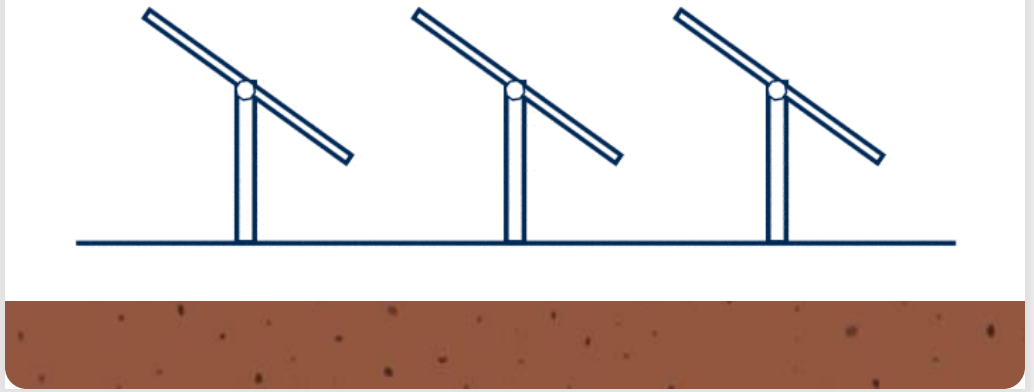
- Directional stowing
- Intermediate unsafe position



PVH TotalStow™ Solution

SUPERIOR WIND PROTECTION

- Non directional stowing
- Safest position from the start



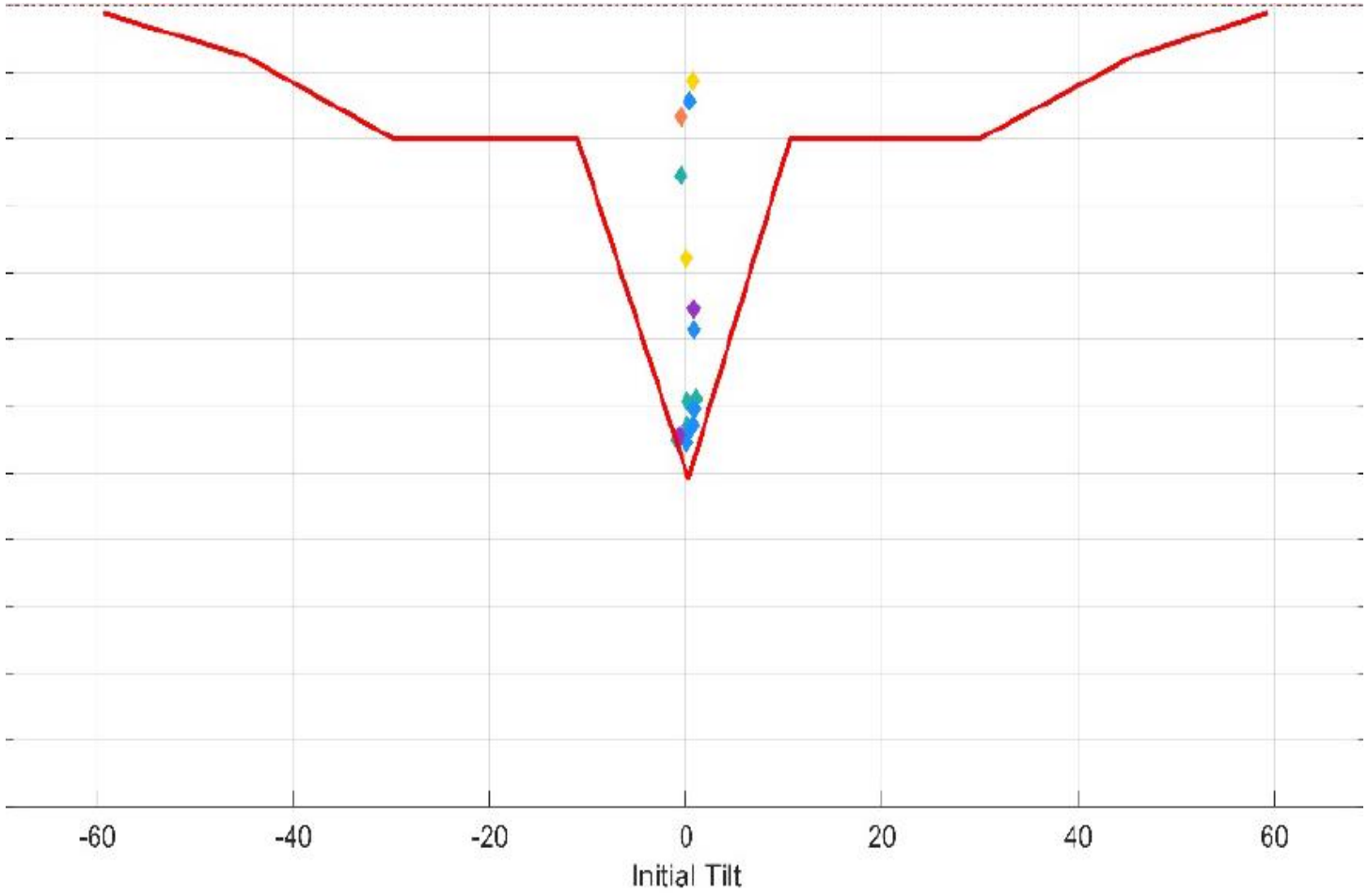
Speed to Stow: A Critical Factor

Rapid Stowing Enhances Durability
Faster stowing minimizes exposure to instabilities, protecting the trackers' structure and components.

Reduced Risk at Higher tilts
Significant risk reduction as tracker tilts beyond 30º stabilizing the structure before instabilities come in.

TotalStow™ Advantage
Ensures optimal protection by quickly reaching the safest angle in any direction, enhancing resilience during a weather event.

LORA communications
Ensures all trackers receives alarm without latencies, prioritizing alarms over other messages.



Sensor based solutions

SNOW

FLOOD

HAIL

WIND

Sensor based Solutions WIND

METEOCARE

SENSOR BASED SOLUTIONS, ULTRASONIC DEVICES

Reactive approach

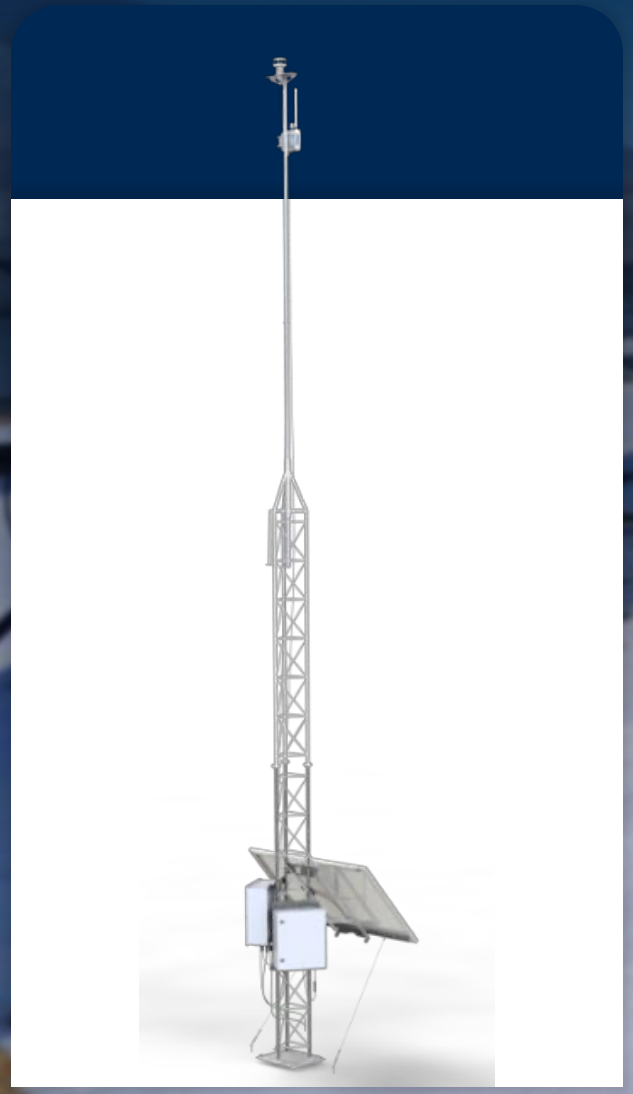
PREDICTIVE SOLUTION

Predictive approach

WINDSENSE

Sensor based Solutions SNOW

METEOCARE

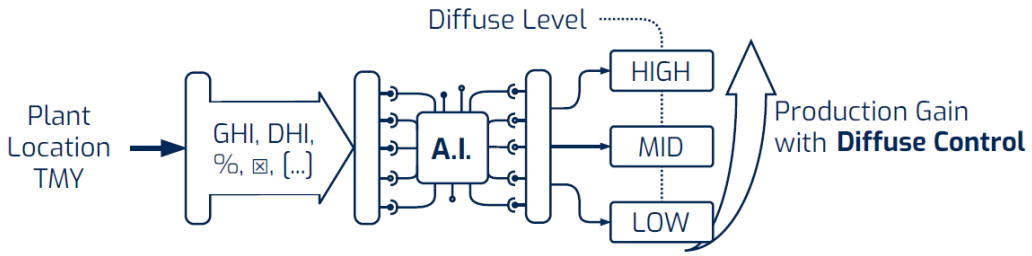


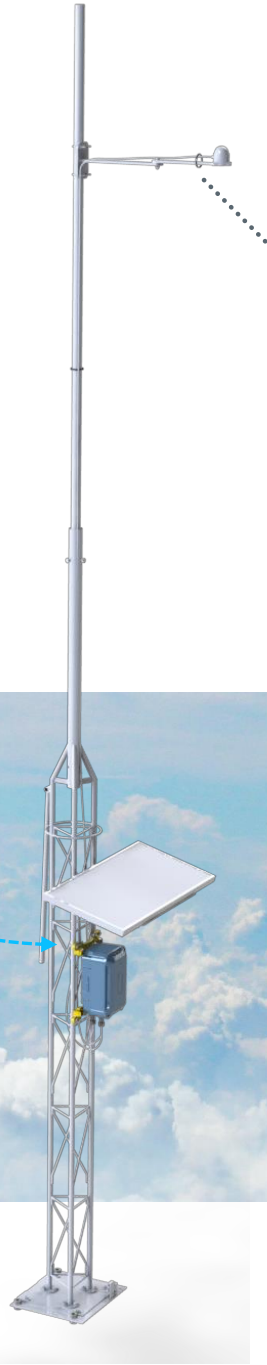
Sensor based Solutions FLOOD

METEOCARE

Sensor based Solutions Diffuse

DIFFUSECONTROL

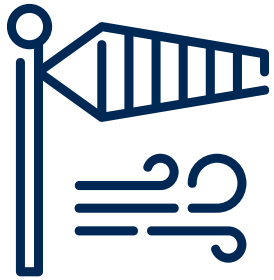




Perfect match!

TotalStow™ + LoRa

Reduced risk during **construction**



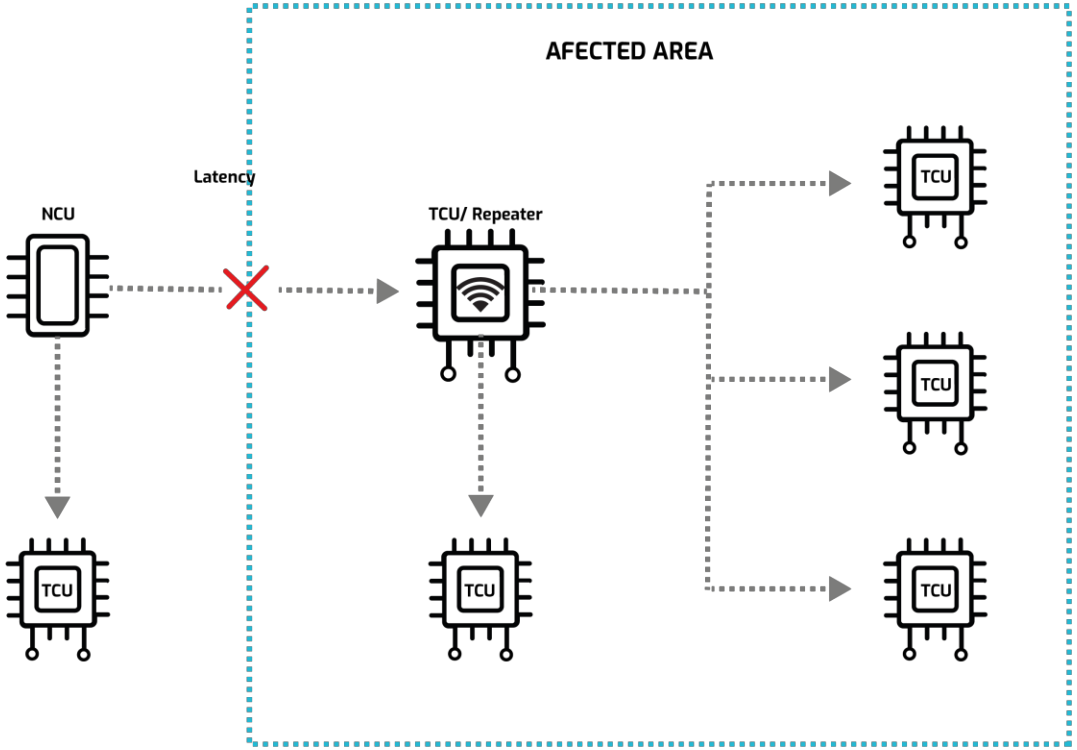
Enhance protection during **rapid changes in wind direction**

Protecting from **higher wind ramp rates**

LORA Communications

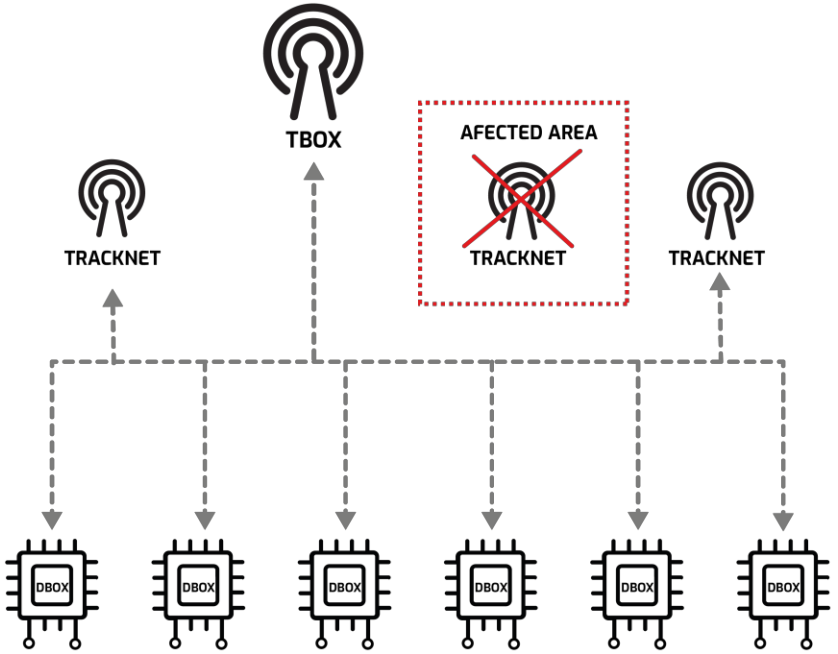
ZigBee

LATENCY EXISTES
FAIL AFFECTS PRODUCTION



LoRa

NO LATENCY
FAILSAFE



Message path

Auxiliary Services

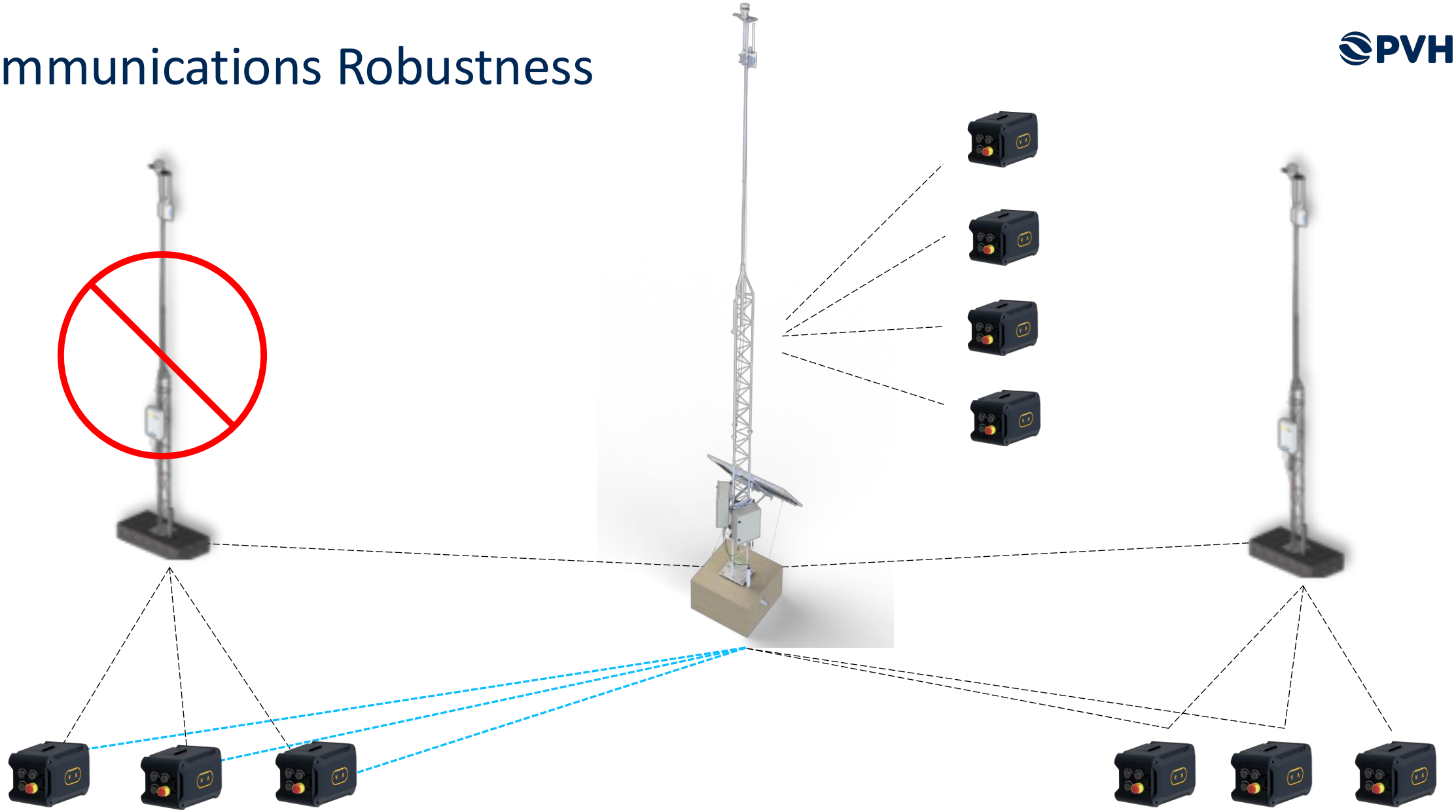
Auxiliary Services

Message path

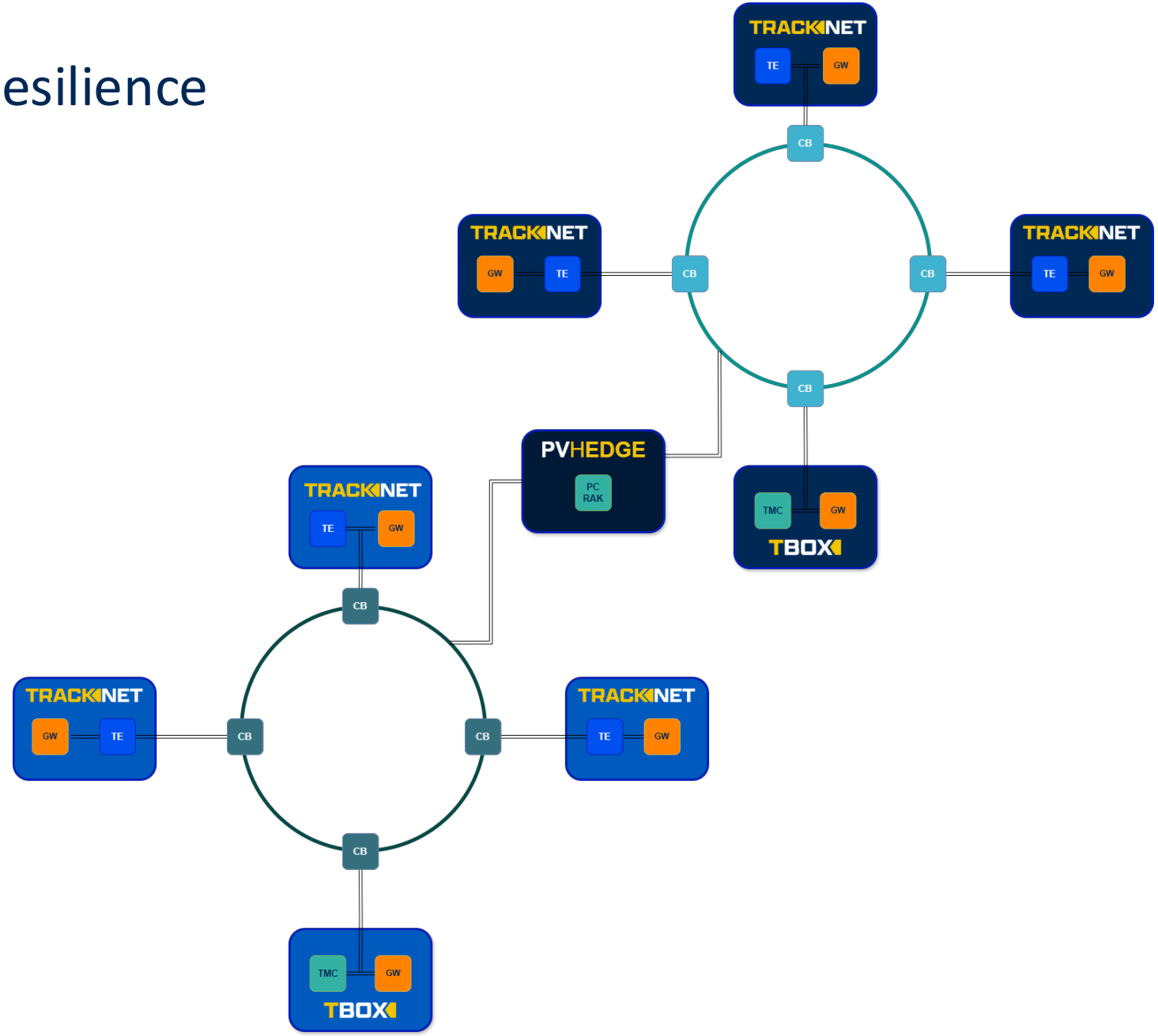
Auxiliary Services

Auxiliary Services

Communications Robustness

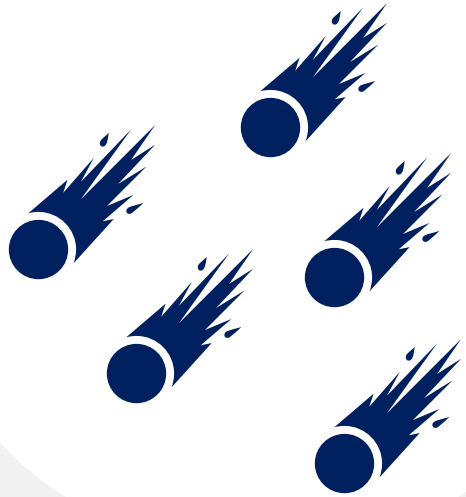


Deeptrack Resilience



Prediction Based Protections

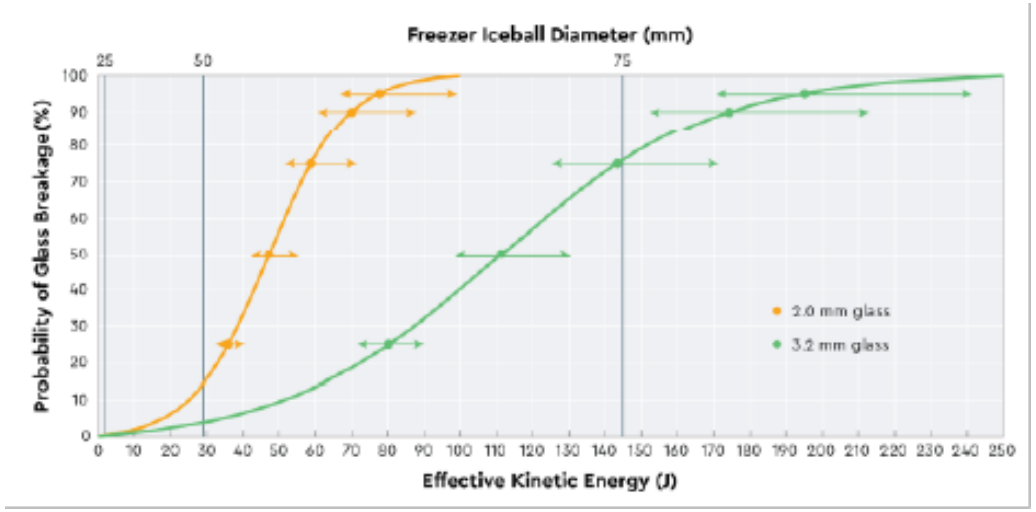
WINDSENSE



HAILPREDICTION

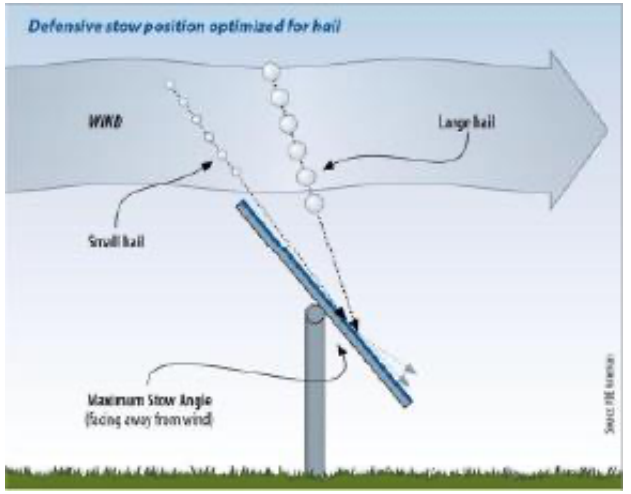
Hail Defense Strategy

- Using Higher stow position [75º] to minimize impact
- Thickness of glass has an impact on the resilience
- Advanced weather monitoring to help with being in better positions when hail arrives



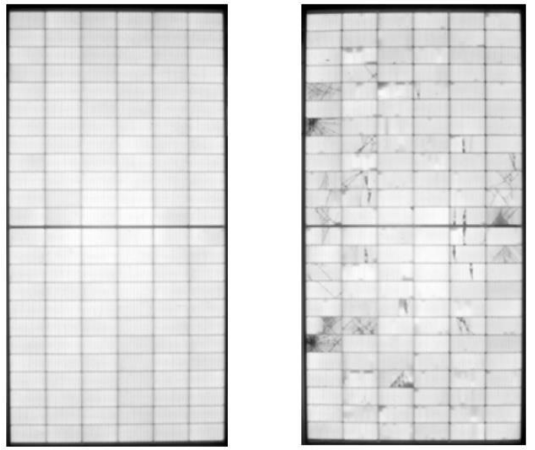
Comparative freezer iceball resiliency curves for common c-Si PV module packages

(Source: RETC)

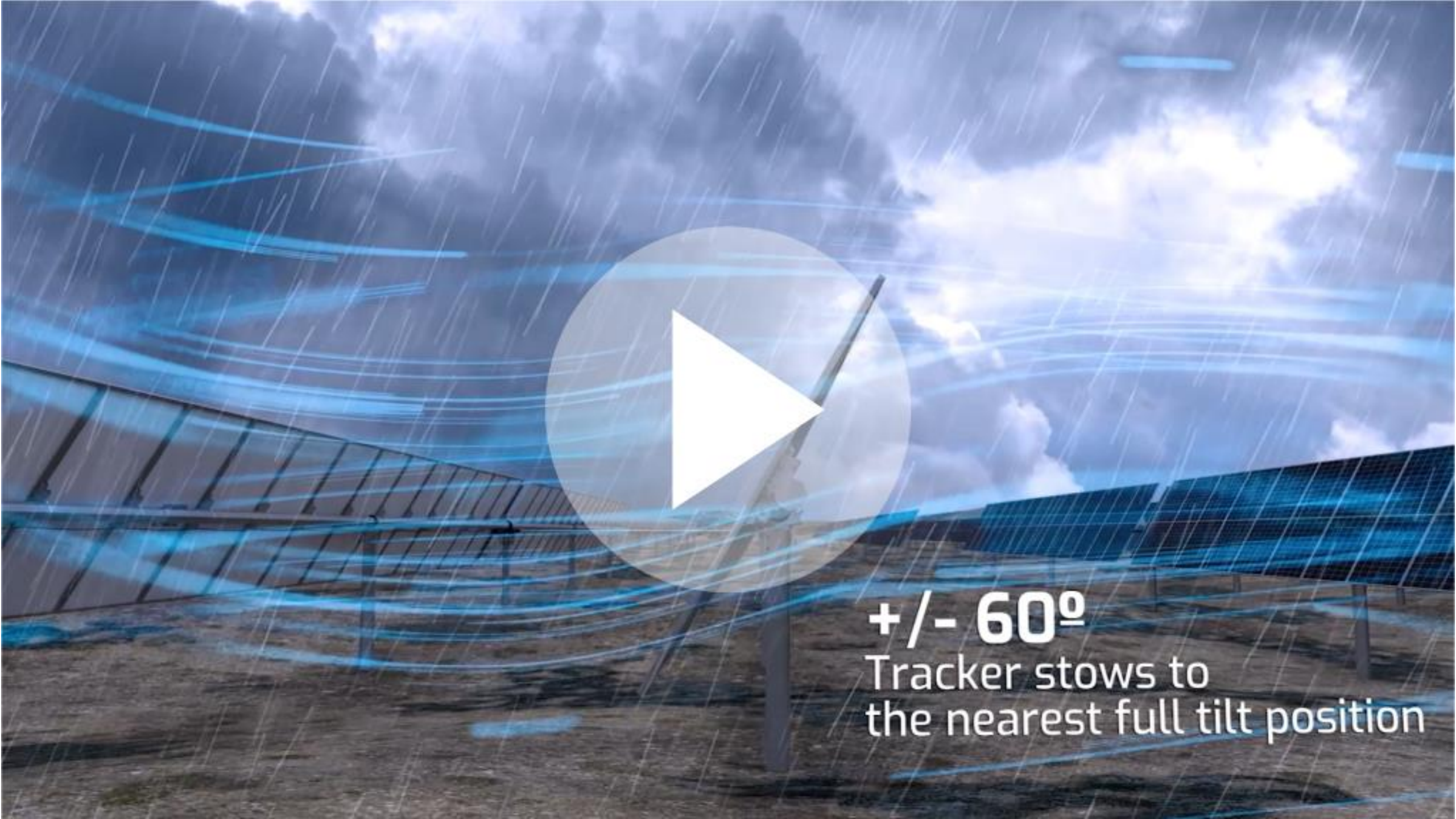


PV modules stowed away from the wind at a maximum tilt angle

(Source: VDE Americas)



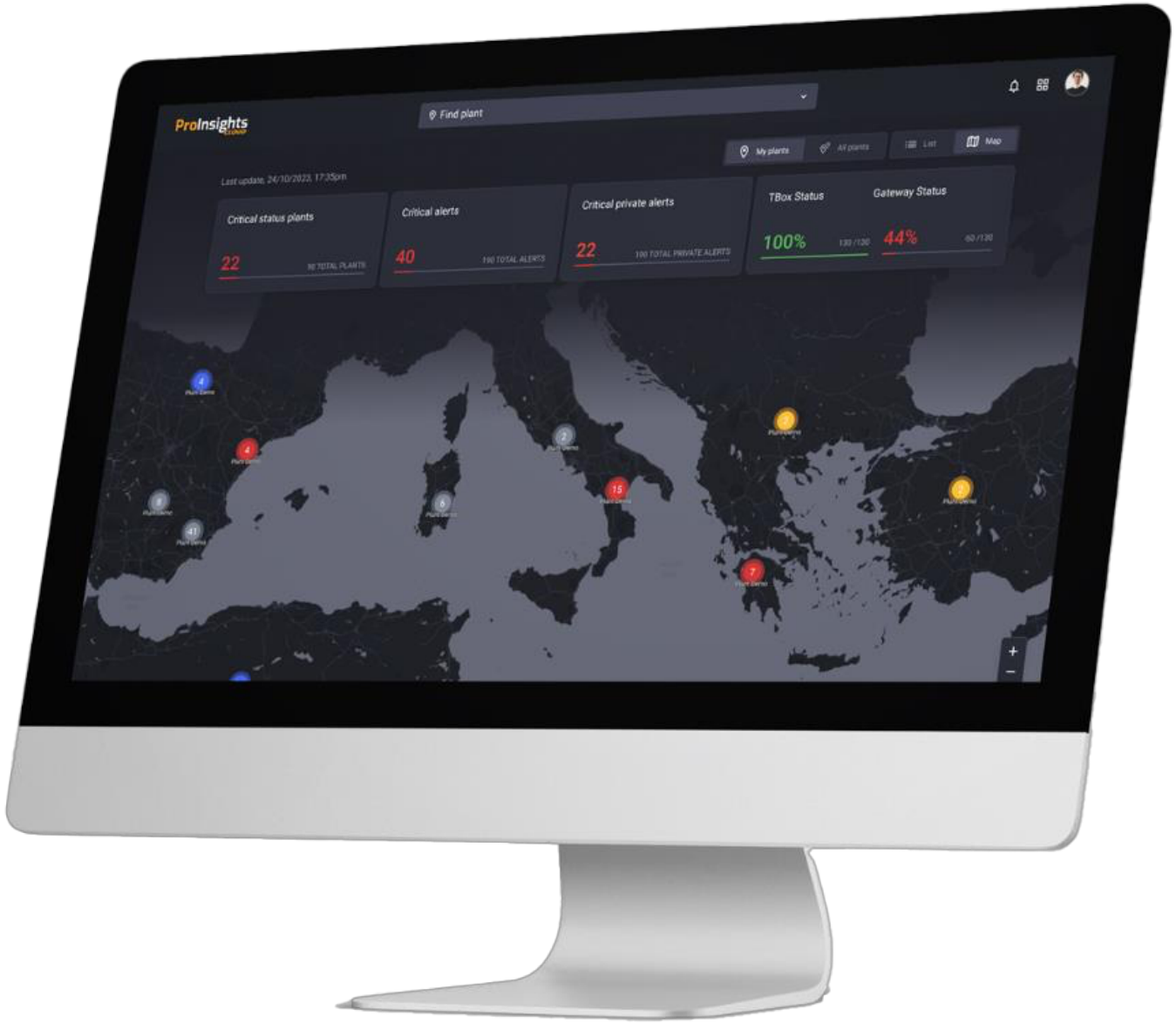
Effects of 50mm hail strinkes on Dual glass(left) and Glass/backsheet (right)


+/- 60º
Tracker stows to
the nearest full tilt position

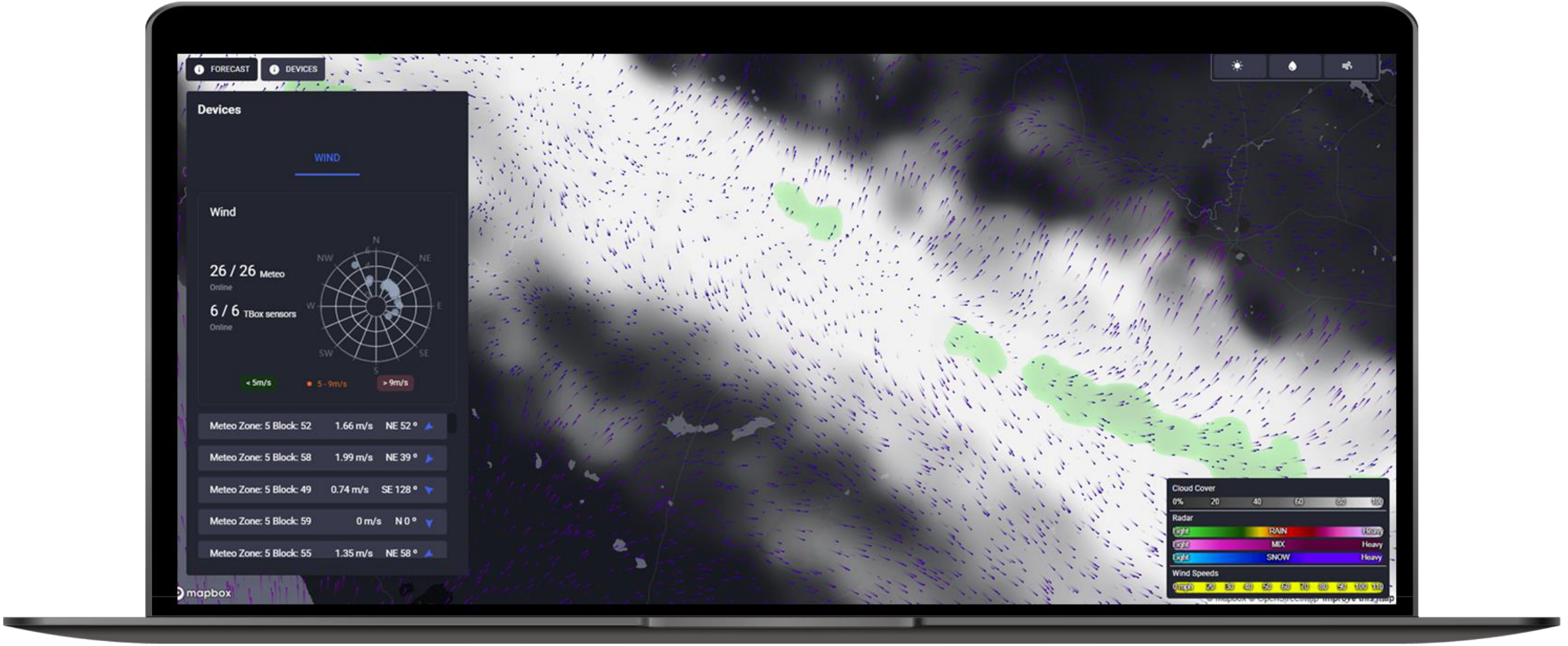
Monitoring & Increasing Performance

ProInsights CLOUD

- Multiplataform.
- Personal Access Management.
- All your Site at a glance.
- Forecasting.
- Monitoring only.
- Remote - Global.

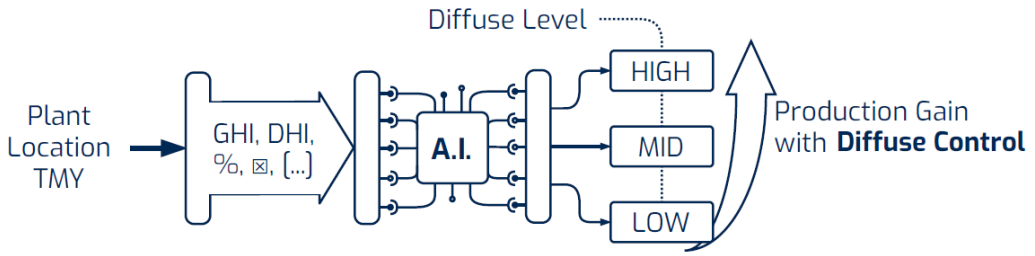


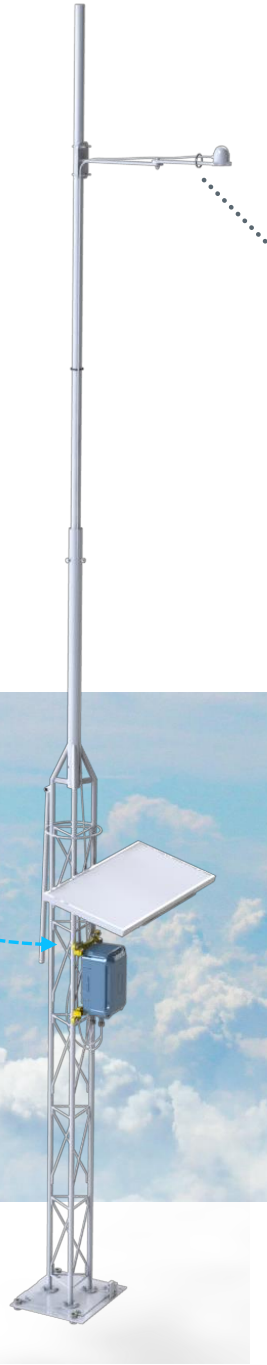
Predictive systems Wind & Hail



DIFFUSE OPTIMIZATION

DIFFUSECONTROL



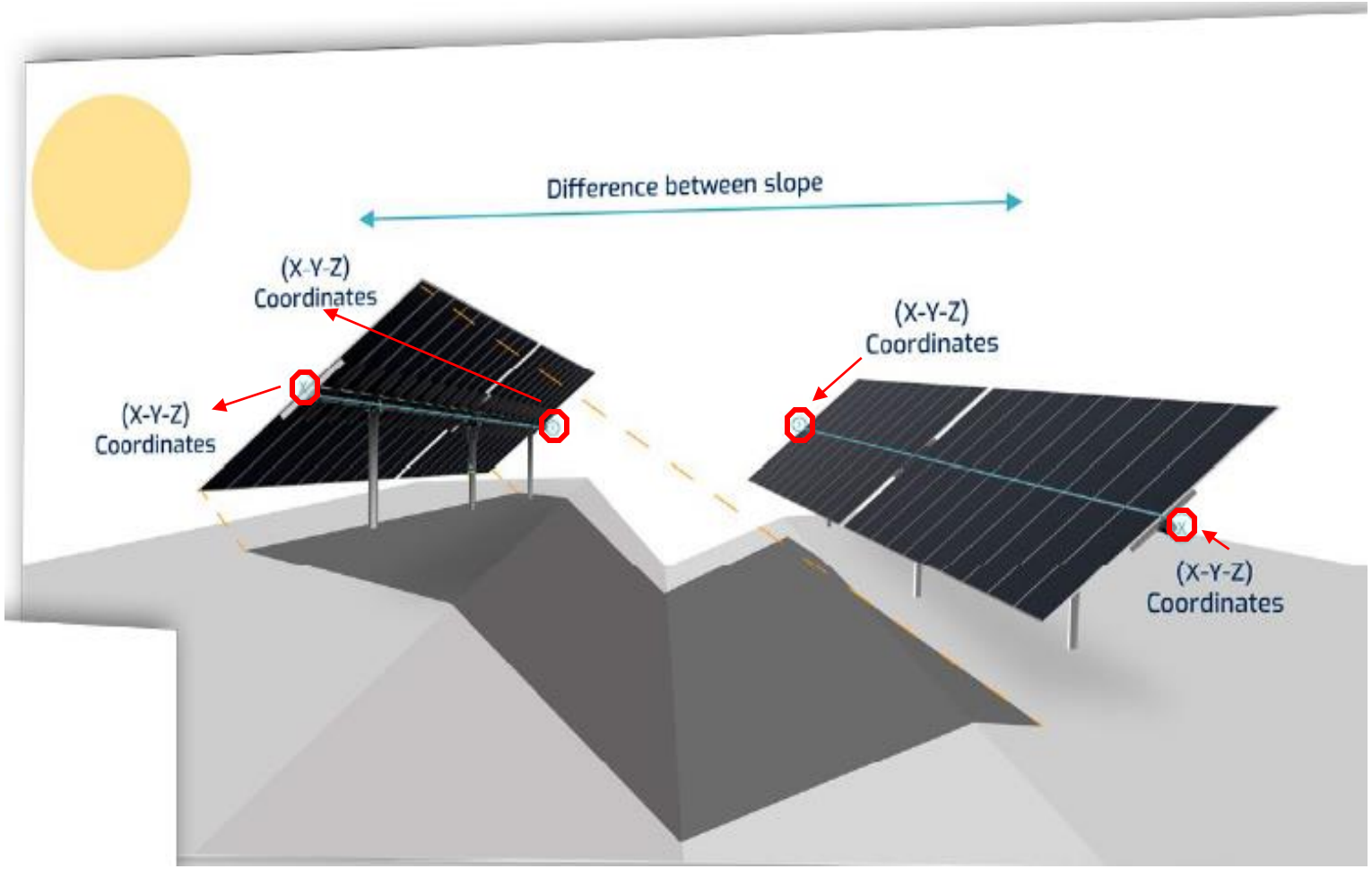


SHADOWS AVOIDING – 3D Backtracking

DNV Study

Increase yields up to 6%.

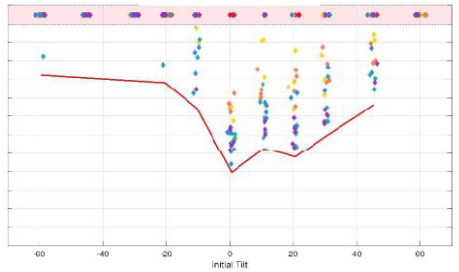
Exact geometry-based backtracking



Tracker Protection Strategies

CONSTRUCTION SAFEGUARDS
Wind protection during construction and rapid commissioning help mitigate risks in early stages.

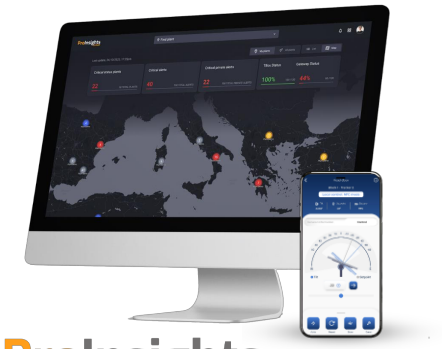
LoRaWAN®



COMMUNICATION ROBUSTNESS
LoRa will ensure the alarms and signals get delivered to the trackers

RISK REDUCTION
Implementing advanced protection mechanisms significantly reduces the likelihood of weather-related issues.

WEATHER MONITORING
Advanced forecasting and monitoring systems provide crucial early warnings for potential hazards.



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TRACKNET SMARTMOTION DIFFUSECONTROL WINDSENSE

Looking to the Future:
Resilient Solar Energy

Conclusions

- Increased frequency, severity, and duration of weather events impact the global PV industry.
- Forecast and overview of assets is key to improve resilience and output.
- Importance of Stow strategies, coordinating more than “just” wind, to respond to the most severe weather events.
- Reducing Action time to apply Stow & forecast help reducing impact on Generation.

THANK YOU FOR YOUR ATTENTION

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10:00 am – 11:00 am | EDT, New York City

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Thank you for joining today!