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# Spontaneous glass breakage on solar panels on the rise

The National Renewable Energy Laboratory noted an increase in spontaneous glass breakage in solar panels. The PV Module Index from the Renewable Energy Test Center investigates this and other glass-related trends in solar manufacturing.

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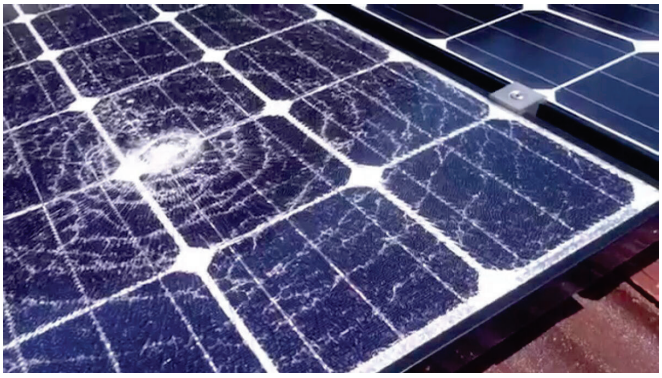

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From pv magazine USA

Glass is a unique material used for its chemical stability and visual transparency. It is commonly used in solar panels as a protective outer layer.

In its annual PV Module Index, the Renewable Energy Test Center (RETC) examined emerging issues in solar glass manufacturing and field performance. It found reports of a concerning rise in solar panel glass spontaneously breaking in the field, sometimes even before commissioning.

Teresa Barnes, Ph.D., manages the Photovoltaic Reliability and System Performance Group at the National Renewable Energy Laboratory (NREL). Barnes and her colleagues at NREL reported the issue.

"Spontaneous glass breakage is an example of a failure mode that we didn't use to see. When I first started working on solar module reliability seven or eight years ago, we mostly heard about glass breakage when there were sloppy operations and maintenance practices," said Barnes.

Now, this is no longer the case, and the NREL reliability team is regularly receiving reports of glass breakage in silicon modules unrelated to direct damage from maintenance or storm impacts. The team found that over time, the average quality of solar glass appears to be decreasing.

"It used to be the case that modules would pass the IEC 61215 static load test with a big safety factor," said Barnes. "Today, modules are either barely passing the base static load test or they are not passing with higher safety factors. Some new module designs are simply not passing the minimum static load test."

The NREL team has begun to hypothesize that glass damage in solar panels is undergoing a similar process to a car windshield in need of replacement. When a windshield takes impact damage, often it only shows up as a small star-shaped mark that seems insignificant. But when extreme weather conditions with very high or low temperatures cycle through, the severity of the damage is fully realized, and suddenly a large crack is visible across the whole surface.

"We think a similar dynamic could be a root cause of spontaneous solar glass breakage," said Barnes.

This rise in breakage is likely due to the trend of solar glass getting thinner over time, said NREL. Mike Pilliod from Central Tension, who spoke at NREL's 2024 PV Module Reliability Workshop said any manufacturer can temper glass that is 3 mm. But under 3 mm, glass tempering is a difficult process. He said that as glass gets thinner, it takes fewer defects to create strength-limiting flaws in the glass. These flaws are actively being studied by NREL to understand some of the potential pitfalls of using thin glass in solar manufacturing.

Barnes warned that it may be a combination of effects that are making glass breakage a larger threat than before. Modules are getting larger, frames are getting thinner, and mounting rails are getting closer together. All these factors lead to "large, floppy modules" that are putting more pressure on the glass surface, which is also getting thinner in many modules.

The NREL team said at this year's PV Module Reliability Workshop, manufacturers began speaking about introducing thicker frames and wider mounting positions.

"As people better understand how the module system interacts, they can work to optimize how loads are balanced out," said Barnes. "The pendulum in that balancing act may already be swinging back toward the integrity of the frame and the mounting rail."

While some module providers are focused on frames and mounting, others have introduced tempered glass modules that are marketed as hail-hardened and resilient to extreme weather.

RETC asked Barnes about the recent catastrophic losses in Texas, where hailstorms caused hundreds of millions of dollars in damage to operational solar assets.

GCube Insurance, an underwriter for renewable energy, said despite being only 1.4% of total number of insurance claims filed, about 54%of incurred costs of total solar losses can be attributed to hail. This is based on data collected by Gcube over the past five years. Average costs totaled $58 million per claim.

"Ten years ago, people would run you out of the meeting on a rail if you mentioned climate-specific module designs. The consensus was that this would simply be too expensive," said Barnes. "Now climate-specific modules and climate-specific testing are starting to look viable because we are seeing more of an emphasis on total system costs. It is entirely possible that we could see hail-hardened modules, especially in a market like the United States, where it could be worth paying more upfront for hail resilience."