



Kiwa PVEL Breaks It Down

Understanding the Impacts of Cell Cracks & Glass Breakage

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12+

Years of
experience

700+

Bills of materials
tested in the lab

400+

Downstream
partners

Our mission is to support the worldwide solar and energy storage buyer community by generating data that accelerates adoption of solar technology.

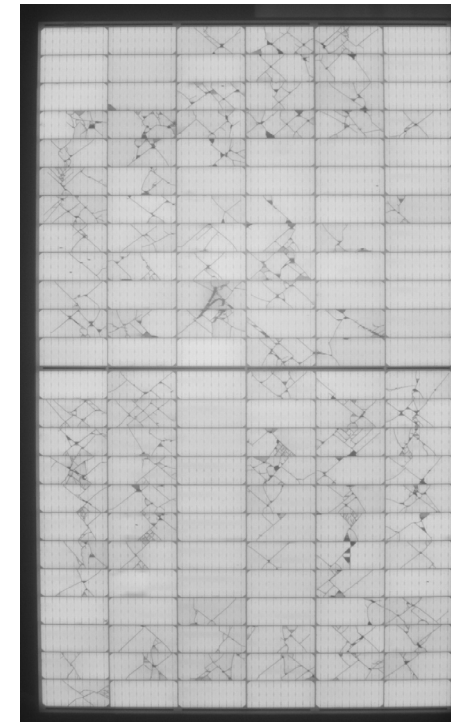
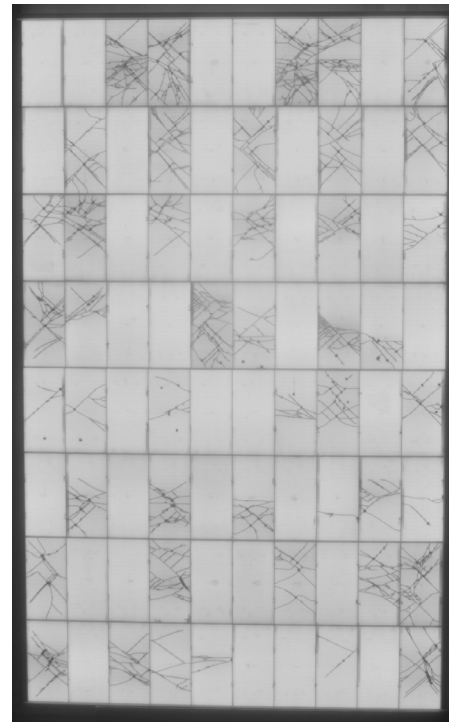
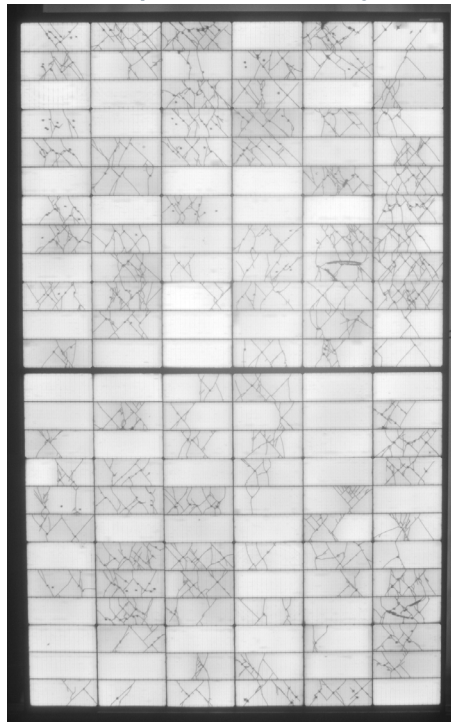
Services at a glance:

- Extended reliability and performance testing for PV modules
- Batch testing of PV modules
- Outdoor testing of PV modules, inverters and energy storage
- Data services for PV buyers and investors

See more details at kiwa.com/pvel

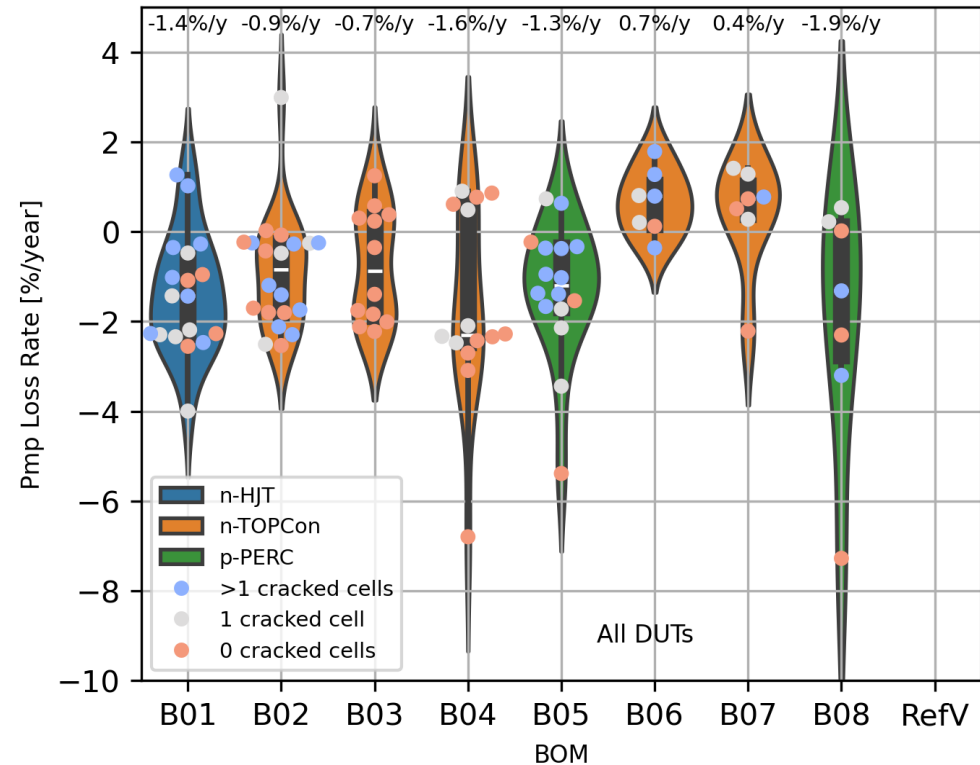
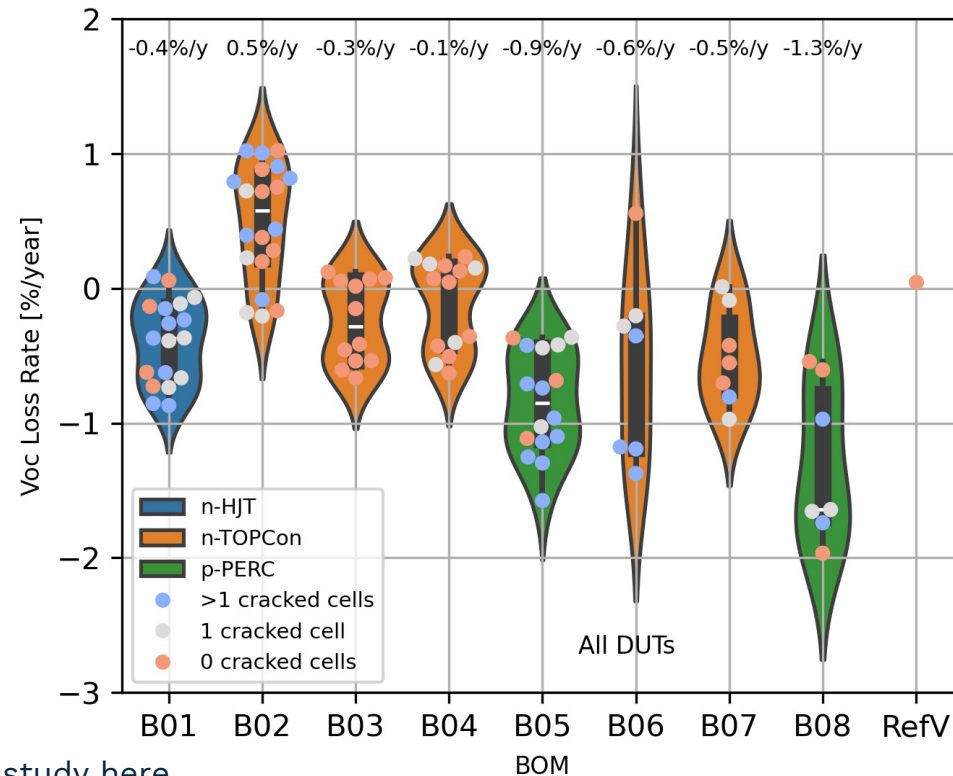
Cell Cracks – Outdoor Study

- In 2023, Kiwa PVEL received a US Department of Energy grant to study the performance of modules with and without cell cracks.
- Modules are automatically individually IV curve traced throughout the day.
- A variety of modern modules (8 unique BOMs) were admitted to the study; mostly TOPCon, with some PERC and HJT. Examples of very cracked modules:



Cell Cracks – Results So Far

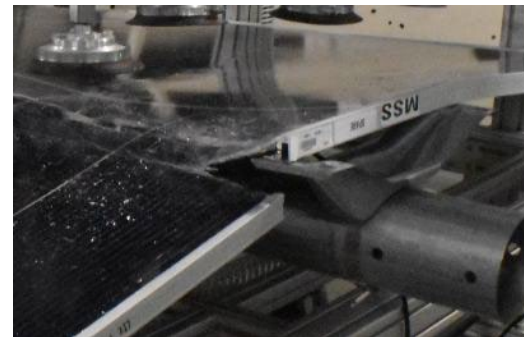
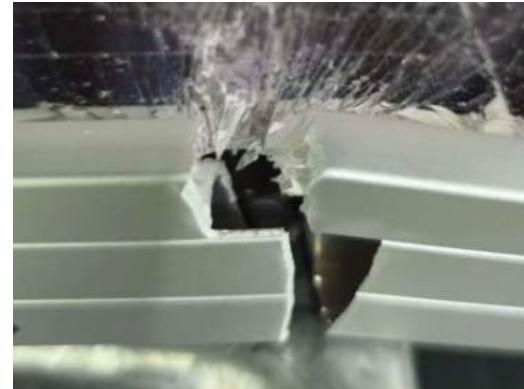
- Voc and Pmp loss rates are similar for modules with and without cracked cells.
- Voc loss rate for TOPCon and PERC BOMs is less than 0.5%/yr thus far.
- However, **many modules exceed 2% power degradation in first year (even control samples).**



More on this study [here](#)

Broken Modules – No Shortage of Examples

- As will be reported in the 2025 PV Module Reliability Scorecard (www.scorecard.pvel.com):
 - **20% of BOMs** undergoing the PQP's Mechanical Stress Sequence experience broken glass or frames.
 - **40% of manufacturers** experienced at least one failure during MSS testing

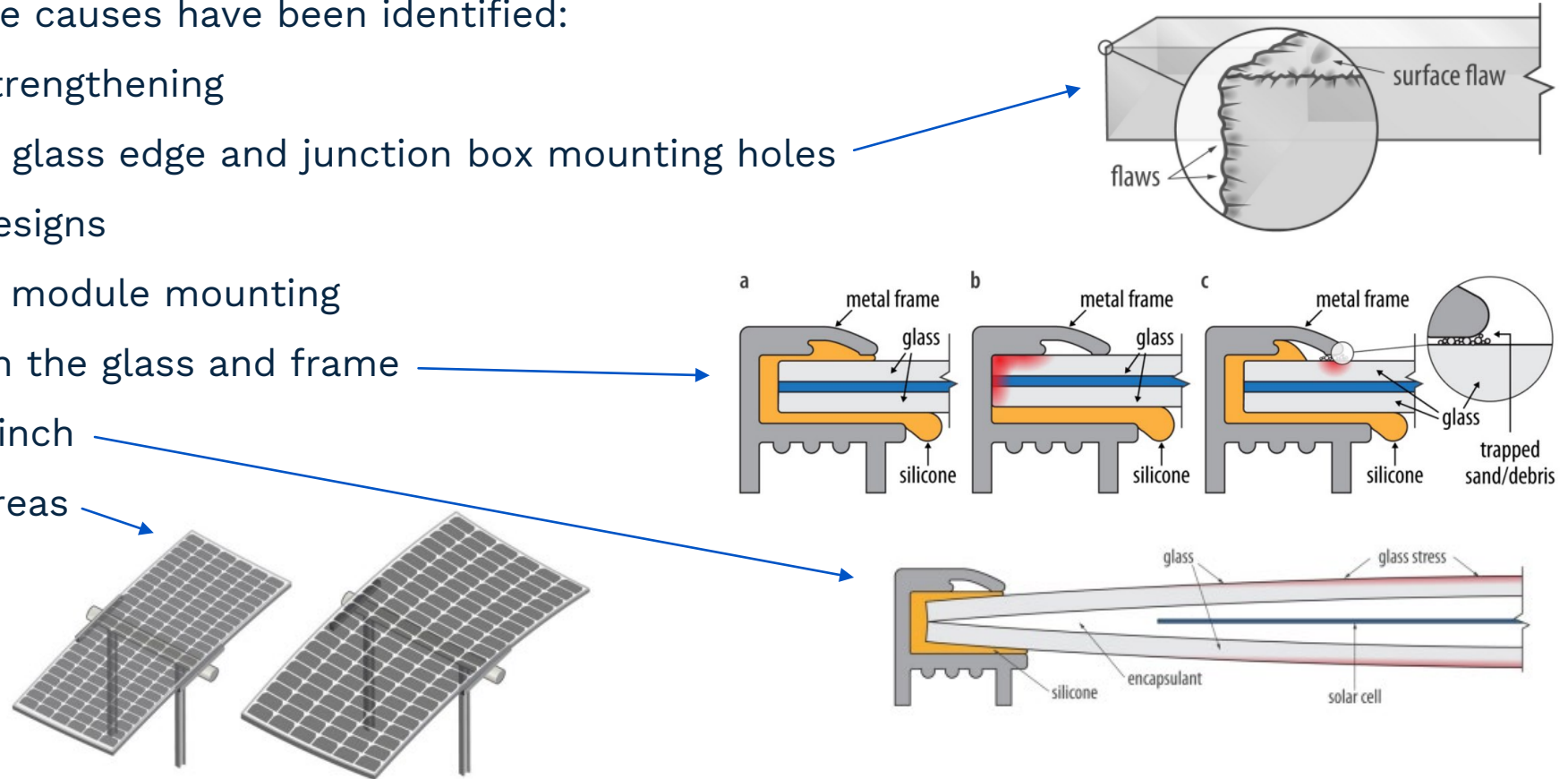


Broken Modules – Possible Causes

■ Kiwa’s analysis of broken modules from the lab and field supports NREL’s recent work¹ on this topic.

■ A range of possible causes have been identified:

- reduced glass strengthening
- flaws within the glass edge and junction box mounting holes
- weaker frame designs
- more aggressive module mounting
- contact between the glass and frame
- laminate edge pinch
- larger module areas



¹ <https://www.nrel.gov/docs/fy25osti/91695.pdf>



Thanks for your attention

Visit us at booth A3.216 and head to www.scorecard.pvel.com on June 4, 2025

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