From Project Health Assessments to Disaster Response: Field EL Imaging for PV Modules

When to Conduct Field EL Imaging

At PV Module Delivery Acceptance
Determine if PV modules were damaged during manufacturing and/or shipment.

At Site Acceptance/EPC Hand-off
Establish baseline project health for future warranty or insurance claims, and determine if installation damage occurred.

After Force Majeure Events
Quantify PV module damage to submit accurate, comprehensive claims for natural disasters such as:

- Hail
- High winds
- Fire
- Hurricanes

When System Underperformance Occurs
Guide repairs and maintenance by determining if PV modules are the root cause of underperformance.

During Due Diligence for Project Sales
Validate that PV modules are in good working order prior to project acquisition.

Who We Are

PV Evolution Labs (PVEL) is the leading independent lab of the downstream solar and energy storage market and a member of the Kiwa Group. PVEL's testing extends from the lab to operating assets through our field testing and EL imaging services. We have conducted field EL imaging for over 2.5 GW of solar assets.

Understanding Field EL

Field EL is an imaging technique for evaluating PV module health, diagnosing solar plant underperformance and assessing damage caused by force majeure events.

EL images reveal the full extent of damage to PV modules – even when the damage cannot be seen by eye and the anticipated energy loss is not yet realized. Issues detected include:

- Cell cracks
- Manufacturing defects
- Shipping and handling damage
- Mismatch
- Heat stress
- Potential-induced degradation (PID)
- Light- and elevated temperature-induced degradation (LETID)

EL Image Capture Technology

EL relies on the same principle as a light emitting diode (LED). Current is injected into a solar module, a radiative recombination of carriers causes light emission, and the EL image captures the emitted light. The amount of light that radiates from each region of the module is proportional to its voltage potential, so inactive regions appear dark on EL images.

PVEL's EL Imaging Best Practices for Insurance and Warranty Claims

EL images provide objective evidence of PV module health with a precise timestamp and geographic location. Following these best practices can help resolve disputes and expedite repairs, reducing system downtime:

1. Conduct EL imaging to document baseline PV module health before accepting PV module delivery and at EPC hand-off.
2. Establish EL image damage criteria in module supply agreements, EPC contracts and insurance policies. Contractually define damage thresholds and remedies, which may include replacements, spares, refunds and/or expanded warranties.
3. Conduct EL imaging to document damage for claims and submit claims that accord with specific policy and warranty terms.

Advantages of PVEL's Field EL System

PVEL's streamlined EL imaging and analysis process delivers fast, reliable and cost-effective results. Our approach has three key advantages:

1. Efficient, Flexible Scoping

Field EL images can be taken for 100% of the modules or on a reduced sample size targeting particular areas of the site in accordance with ISO 2859 sampling guidelines.

Testing can occur during regular daytime working hours. Crews typically work in teams of two to three for eight- or twelve-hour shifts depending on timelines.

2. On-Site Imaging

EL imaging is conducted on location at the project site. Delivery-acceptance testing takes place prior to installation as modules are removed from packaging. Post-installation EL imaging is conducted in-situ while modules remain installed.

3. Proprietary EL Image Processing and Analysis Techniques

PVEL collaborated with leading PV scientists to develop a unique methodology for EL image processing and analysis that uses artificial intelligence (AI) to produce accurate, data-driven damage assessments.

Thousands of images can be rapidly analyzed by leveraging PVEL's unique machine learning algorithms for identifying and categorizing modules according to project-specific criteria.

Contact PVEL's business development team to learn more: info@pvel.com

PVEL's Proprietary, AI-Driven Image Processing
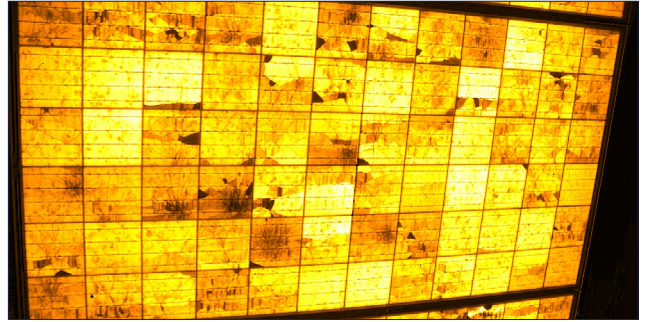
The unprocessed EL image above was taken by PVEL's field testing team at a hail-damaged project site.
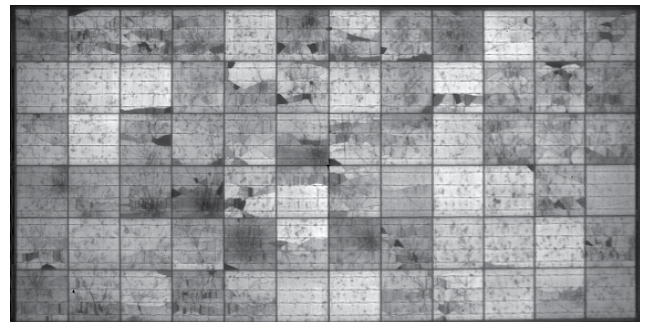
Through automated perspective-correction and color-enhancement, a new image is generated. Processing ensures images can be rapidly scanned and categorized using machine-learning algorithms.

member of group

kiwa