Latest amendment of IEC 61730 and its impact on backsheets quality assurance
Incidents of Field Failures of Backsheets are Increasing
Not only one type of backsheets, not only one type of failure

Cracked backsheets with electric breakdown in isolation.

Powder effect of back-sheet ("chingk") leads to loss of UV protection.

Delamination and detachment of backsheet; interlayer and total delamination possible.

Bill of material not sufficient to withstand the climatic stress. Early wear out.

Insufficient process control leading to delamination.

Cost saving strategies of the last 6 years lead to material thickness minimization and introduction of backsheets designed to meet minimum requirements, rather than being made to last.
Failure analysis and material identification

Typical questions in case of a failure

- Is the material the one defined in the contractually agreed and certified bill of materials?
- How does the failure propagate?
- Will unaffected modules be affected in the future?
- Who is to blame?

→ Material analysis
→ Failure propagation testing
→ Keep spare modules for relative analytics

FTIR-spectrogram of module vs. original backsheet sample
How did the standard development community answer to the failure rates?

Updating IEC 61730 was a lengthy process started in 2009…
## Changes to Safety Standard IEC 61730-1 / -2

### Definition of layers and their thickness | additional more severe UV test sequence

<table>
<thead>
<tr>
<th>Single layer</th>
<th>Multi layer</th>
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<tbody>
<tr>
<td><strong>a) Single layer</strong></td>
<td><strong>b1) Double layer</strong></td>
</tr>
<tr>
<td><img src="image1.png" alt="Single layer" /></td>
<td><img src="image2.png" alt="Double layer" /></td>
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</table>

- **Thickness (e.g. > 150 µm for 1000 V)**
- **A**
- **B**
- **25 µm**
- **125 µm**

### Tests sequence:

- **Damp heat test (200 h)**
  - MST 53

- **UV test (60 kWh/m²)**
  - MST 54

- **Humidity freeze test (10 cycles)**
  - MST 52

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  - MST 54

- **Humidity freeze test (10 cycles)**
  - MST 52

- **Cut susceptibility test**
  - MST 12

- **Insulation thickness test**
  - MST 04

*Source: IEC 61730-1 Figure 4*
Experience with new IEC 61730-1 / -2 so far

- Minimum thickness requirement has eliminated some designs from the market.
- In our lab in Germany > 30% of the modules tested to the new standard show some form of “chalking”.
- No clear tendency for particular material combinations or backsheet designs.
- “Chalking” is not defined as a failure in the IEC pass criteria, as it is a new phenomenon.

- Testing of affected modules from the field acc. to the new sequence shows test sequence is adequate to propagate effects.
- New amendment may require material prequalification.
Thank you for your attention!