The hidden risks of PV systems

Real Savings or just deferred CAPEX ?

Stäubli Renewable Energy

The safe choice in solar power connections

#SolarSafetyMatters

You can’t manage the unknown

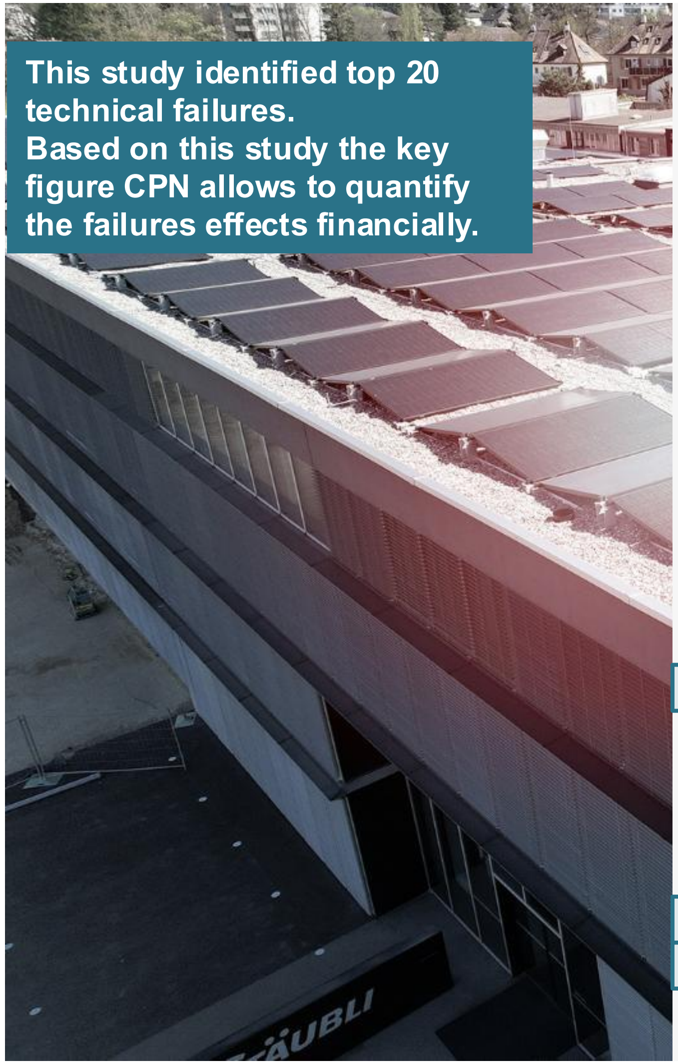
Lack of knowledge about eBOS components
(connectors/ cabling) ...

... and their relevance for the long-term success of a PV system.

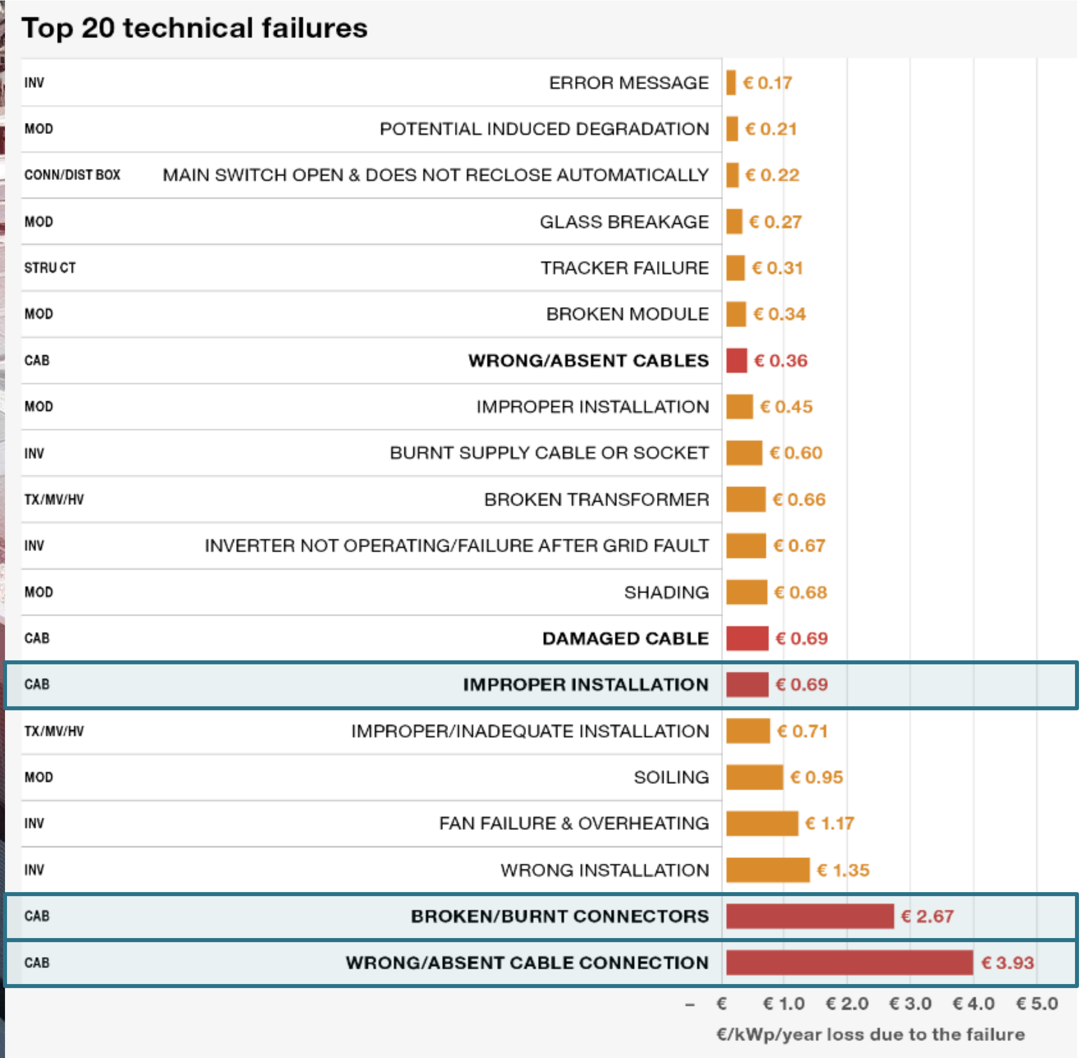
Resulting in eBOS component failures

HIGHERCOSTS and LOSSES

Failures in PV systems



This study identified top 20 technical failures. Based on this study the key figure CPN allows to quantify the failures effects financially.



Solar Bankability project by European Commission's

Horizon 2020

Common practice for professional risk assessment to reduce risks for investments in PV projects

Cable & connector with huge financial impact

Euro/ kWh/ year loss → due to the failure

Risk mitigation measures with objective to minimize LCOE

by optimizing the balance between CAPEX & OPEX

Making use of the CPN*

* CPN (cost priority number) = cost-based failure mode and effects analysis (FMEA)

The consequences of connector (eBOS) failure

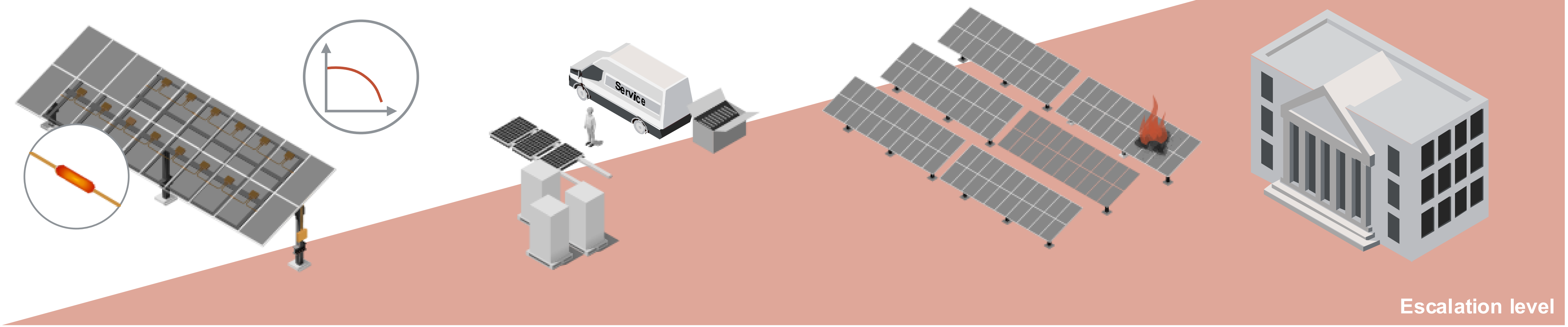
Level 01
Increasing contact resistance & hotspots

Level 02
Connector failures

Level 03
Detection & replacement

Level 04
Fire

Level 05
Liability



Result 01
Performance losses & safety risk

Result 02
Downtimes, higher losses & service cost

Result 03
Highs service & replacement costs

Result 04
Damage of other components/system

Result 05
High costs for legal disputes

Operation

CASE STUDY N.1

Contact resistance and cross-connection

Cross Connection and melted connectors

Visualization of a 100 MW system

CASE STUDY

- 3.112 panels affected so far
- Inspection: 3 months after project commissioning

Damages to components and modules

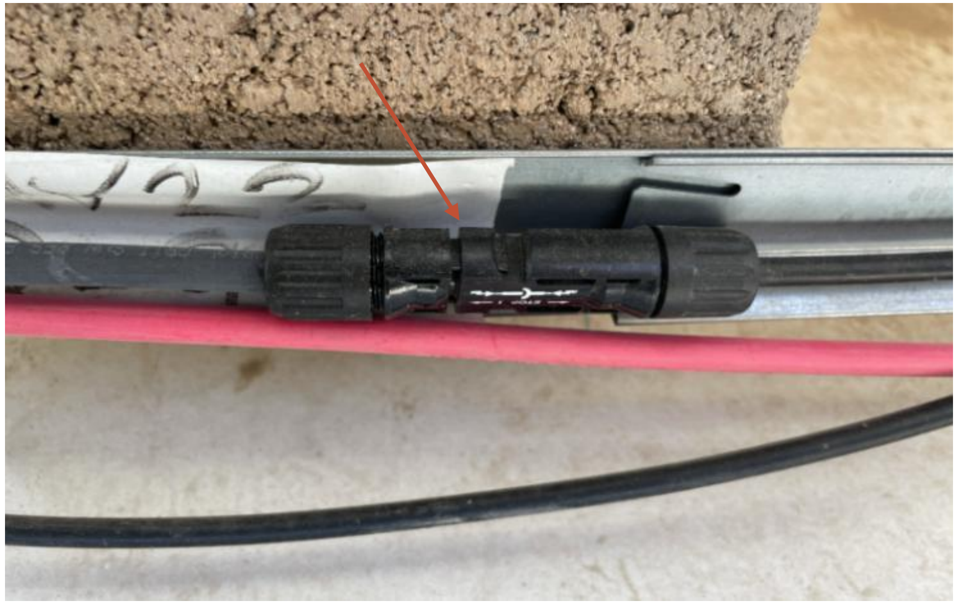
Mechanical damage, but electrically conducting with high temperature due to contact resistance

String failure due to completely broken connection mechanically and electrically

Months of operation	Percentage of defect	Number of failures
3	0,8%	3’112
9	3,1%	12’116

CASE STUDY N.2

Thermal event and connector assembly



Connector assembly

CASE STUDY

Site location: Rooftop, USA

Size: >3 MW

Failure pattern

- Thermal event on asset within the first 3Y of production
- System downtime of multiple months

Solution

- Training and knowledge transfer
- Installation oversight
- QA/QC reports and documentation

Consequences

- Performance loss (downtimes)
- Repair cost: system refurbishment

Financial impact

>100K EUR per month for electricity

Set the course for safe returns

By having the **right PV knowledge** and paying **attention to the eBOS selection and installation**,

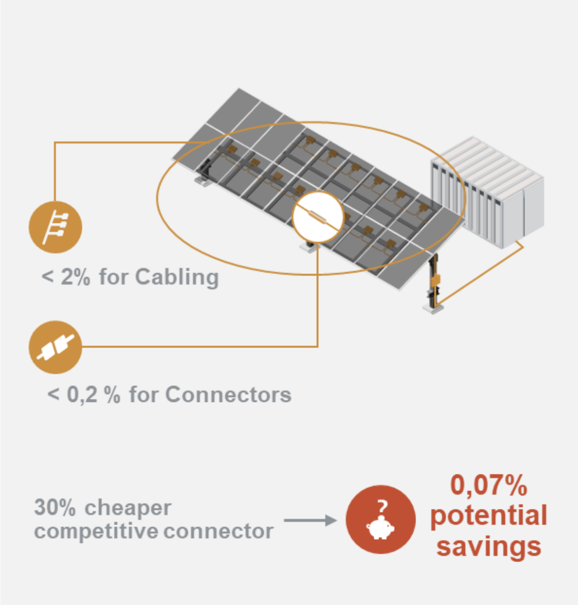
you set the course for:

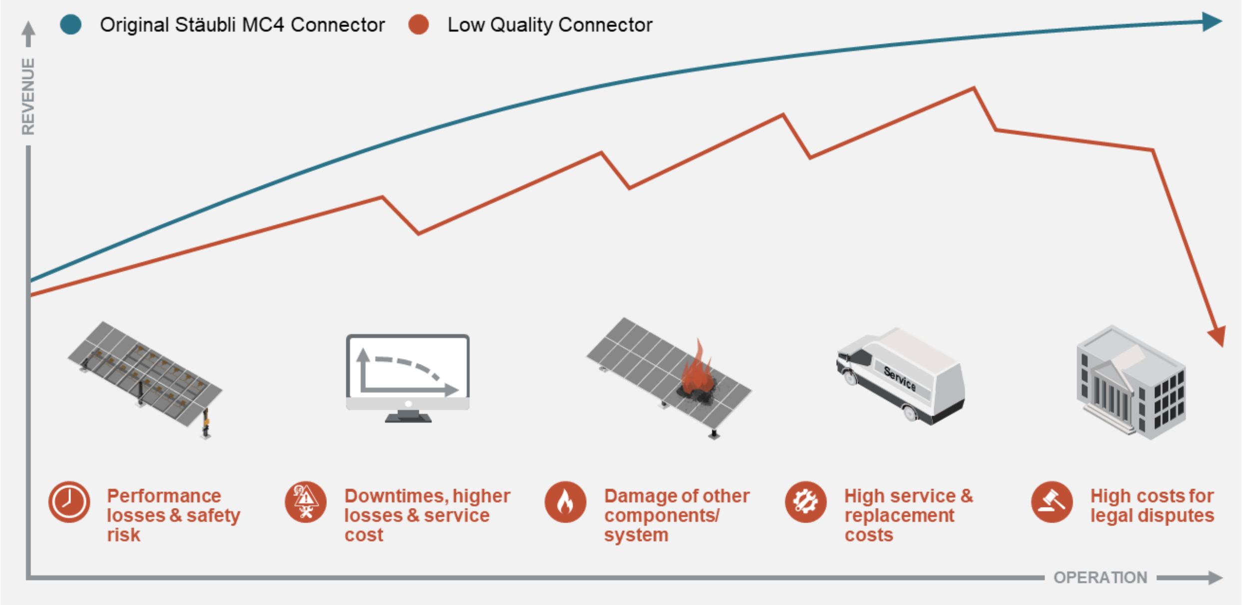
Conception | Construction | Operation

CAPEX + OPEX

Energy Yield

- ✓Safe planning
- ✓Safe product selection
- ✓Safe design
- ✓Safe installation
- ✓Safe operation
- ✓Safe returns





✓Safety for your PV Asset

FAST MOVING TECHNOLOGY

Stäubli Electrical Connectors

Thank you for your attention!

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