Scuola universitaria professionale della Svizzera italiana
Dipartimento ambiente costruzioni e design
Istituto sostenibilità applicata all'ambiente costruito

SUPSI

PVQUAL: a project on the quality of PV Systems in Switzerland

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Agenda

- General introduction
- Project presentation
- Examples from the practice
- Outlook & conclusion

What do we intend with quality?

QUALITY is the degree to which a set of quality features meet certain requirements!

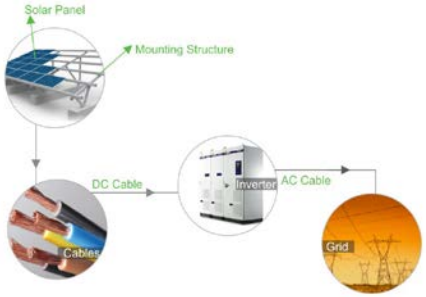
QUALITY can be understood differently in dependance of who is looking at it!

design conformity **value for money**
gurantees **good function** **durability**
reliability safety aestetics
after sales service

Why is quality so important for PV?

Increased

- safety requirements
- lifetime and yield expectations
- financial viability



PV Quality in the media

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Eidgenössisches Starkstrominspektorat ESTI

Ins

Häuf

Accurate, **clear** and **unbiased** information are needed to support the market!

Installateur geschenkt werden muss. Mit dem Aufzeigen der festgestellten Mängel soll ein Beitrag zur Verbesserung der Sicherheit solcher Anlagen geleistet werden.

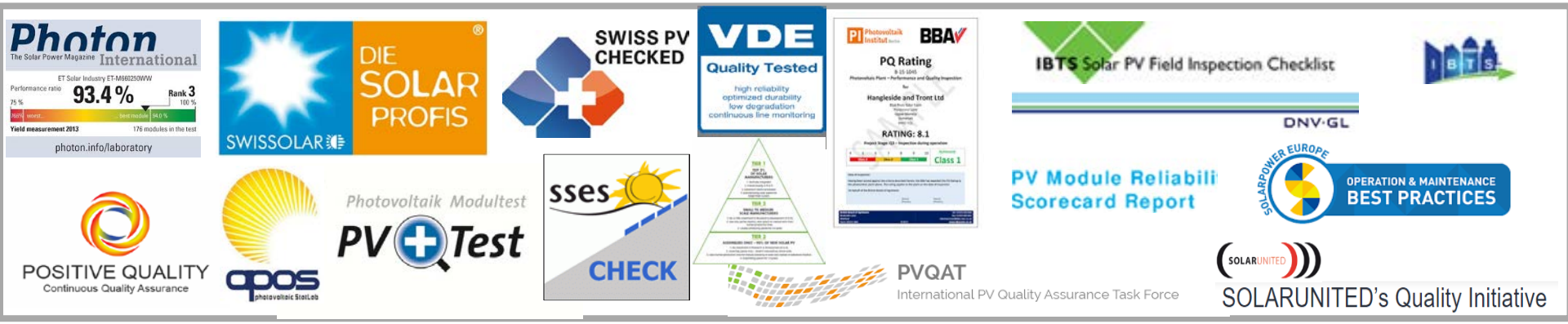
strom ist nur minim über dem
strom und deshalb von einer n
Überstromschutzeinrichtung k
detektieren. Der Verlegung die
tungen ist besondere Aufmerk
zu schenken. Neben der doppe

[1] From a global field-module survey including more than 70 global installations, (1,9 MM+ modules at 450+ MW) in NA, EU and AP.
[2] TUV Rheinland Intersolar 2015, Roundtable Solarpraxis

How is quality assurance perceived?

The experience teaches that **Quality assurance (QA)** is essential for the success of any PV project, **but…**

it is often perceived as complicated and expensive.



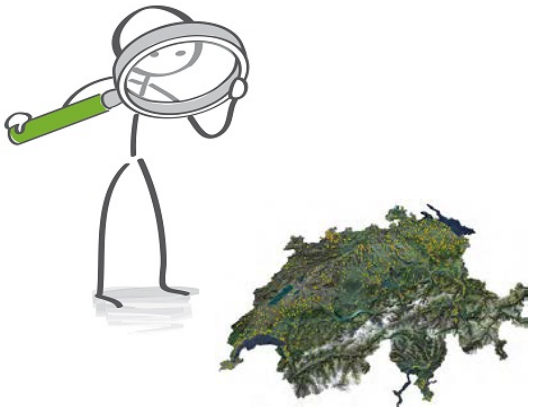
Need of a clear picture for non-experts!

Key questions of PVQUAL project

How can obstacles be mitigated and QA assurance applied in a more efficient way in the Swiss context?

- **What** do we know about **quality**?
- **How** can we improve **quality**?
- **Where** are located the risks for a low **quality**?
- **When** do we have to check for **quality**?
- **Who** is responsible for **quality**?

PVQUAL investigation



Project Consortium

University of Applied Sciences and Arts of Southern Switzerland

SUPSI

PVLab (accredi… 5)

G. Friesen … dinator)
M. Cac… PV systems quality team)

TESTING & MONITORING

SWISSOLAR

Swiss Business fed… Solar energy

C. Moll (Head … ic unit)
P. Toggweil… pert, Basler & Hofmann AG)
T. Hoste… technical PV co…mission)

RECOMMENDATIONS & TRAINING

electro suisse

Swiss association for el… gy and information technolo…

J. Rellstab (Head … ertification)
P. Arnold (He… velopment and sales/marketing)

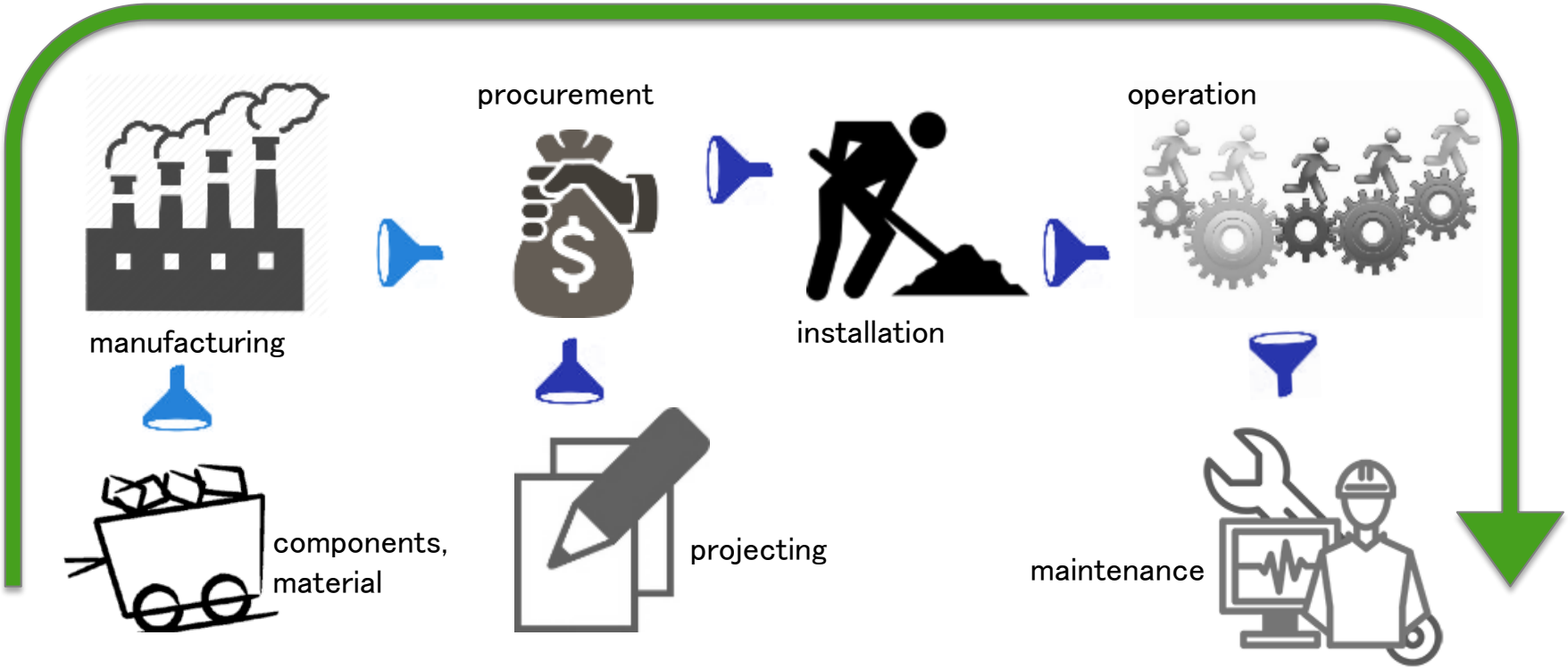
CERTIFICATION & INSPECTORAT

Funded by:

energieschweiz
Unser Engagement: unsere Zukunft.

SWISS PHOTONICS

QS Levels und Gates



Product standards and requirements: IEC 61215, 61730, VKF pr.25, etc.

System standards und safety requirements: IEC 62446, VSE, works regulations, ESTI

General quality assurance and best practice: ISO 9001, etc.

Examples of well-implemented QA processes

Standards and technical specifications for photovoltaic

Swissolar, SUPSI and Electrosuisse supports the national committee CES-TK 82 ‘photovoltaic energy systems’ in the definition of rules for good and reliable PV components and systems.

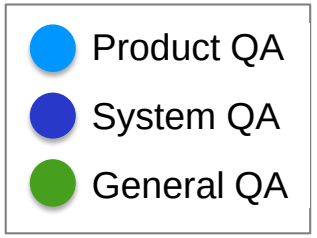
Control of electrical installation

Basic and effective controls are performed trough the SiNa (mandatory proof of conformity to the safety requirements).

Professional training

Swissolar keeps the Solarprofi register.

Some needs for improvement



- Quality of system documentation.
- Strengthen technical competences of system planners and installers.
- Effective/simple performance indicators.
- New or better exploitation of diagnostic tools for the identification/prevention of failures.
- Broader collaboration to standardization groups.
- Increase feedback from the field (lessons learned and statistical data).
- Clear and comprehensive rules.

Key questions of PVQUAL project

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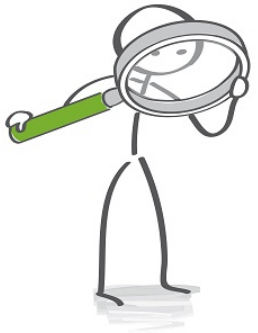
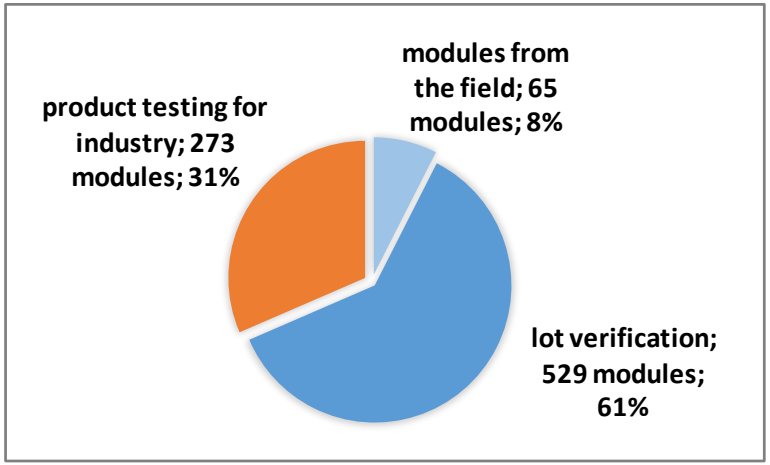
➡ PVQUAL investigation



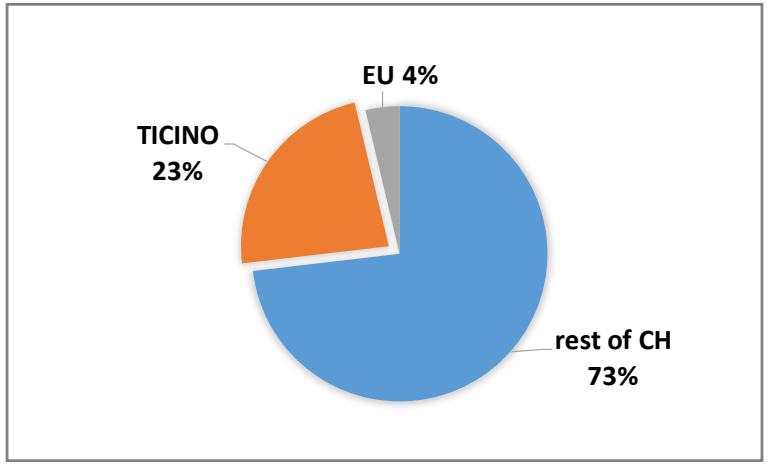
Experience from the laboratory

Overview of module testing at SUPSI 2015/2016 (*services only / no research)*

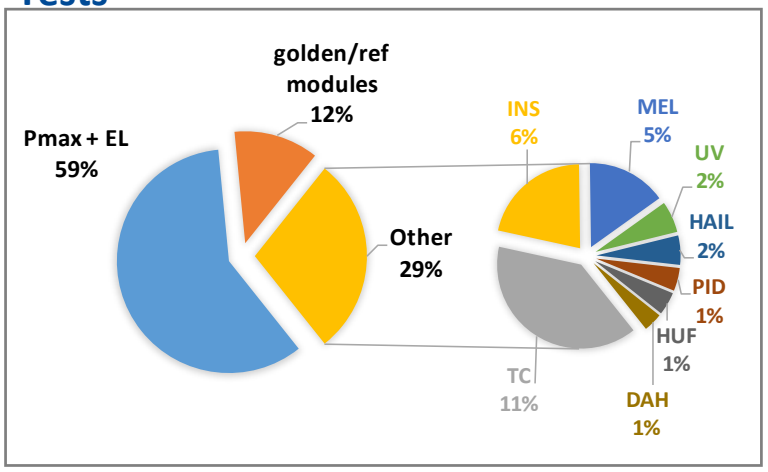
Motivation



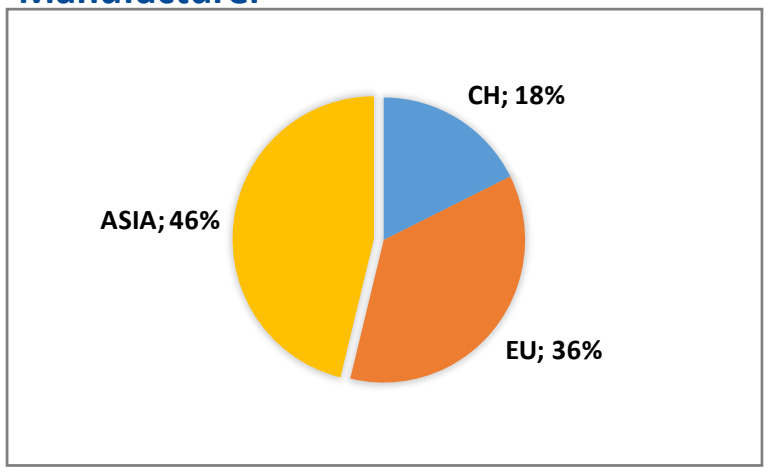
Customer



Tests

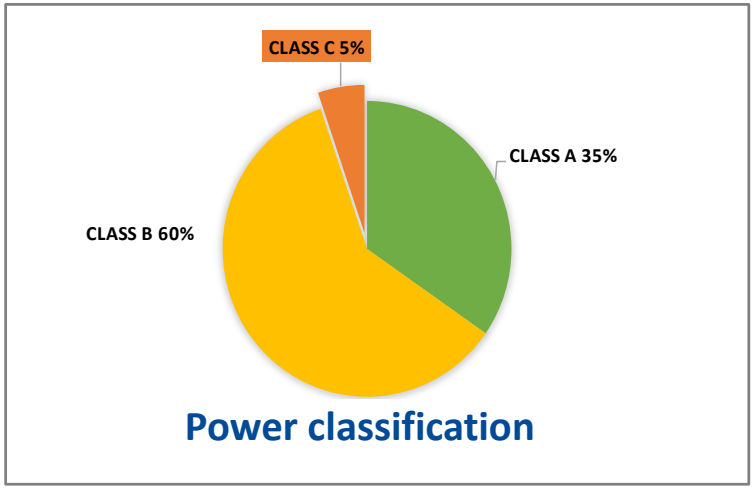


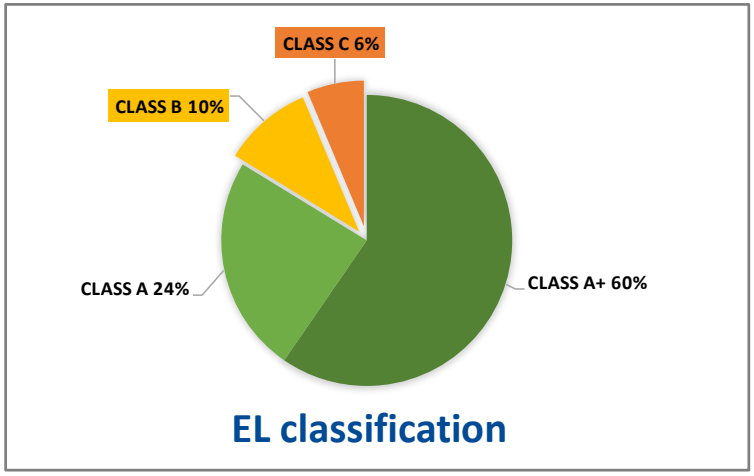
Manufacturer



Experience from the laboratory

Module classification of new modules at SUPSI 2015/2016





Do I get what I expect?

Are defects present which could increase the risk of failures or higher degradation rates?

Failure origin identified in:

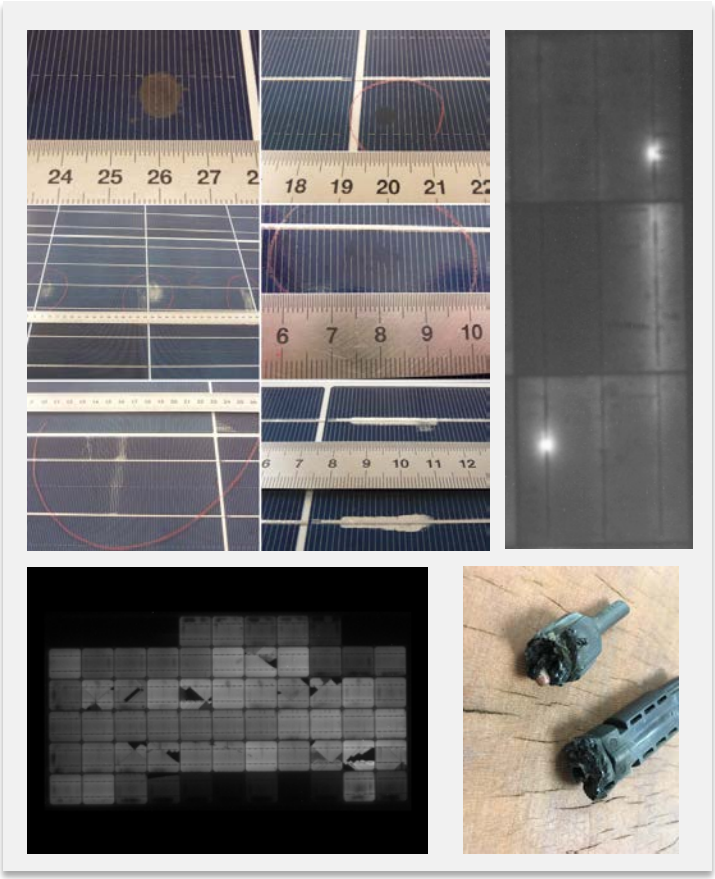
production, transport, mounting and exposure to extreme stress conditions

Experience from the laboratory

Module failures at SUPSI 2015/2016

Observed problems:

- Not-conform power declarations
- LID in PERC modules
- Cell inter-connection problems
- Fire damages (arc faults)
- Potential induced degradation
- Micro cracks/snail tracks
- Module connector issues
- Weakness of mounting
- Hail damages
- ….



Project approach

ONGOING ACTIVITY!

- **Interviews** on quality and QA of Swiss PV stakeholders.

  group 1: EPC's, operators, owners, manufacturers, wholesalers, investors, insurances, …

  group 2: independent QA providers (privat companies + associations e.g SSES, VESE, ESTI, VSEK, …)

- **Analysis** of technical gaps and mitigation measures.

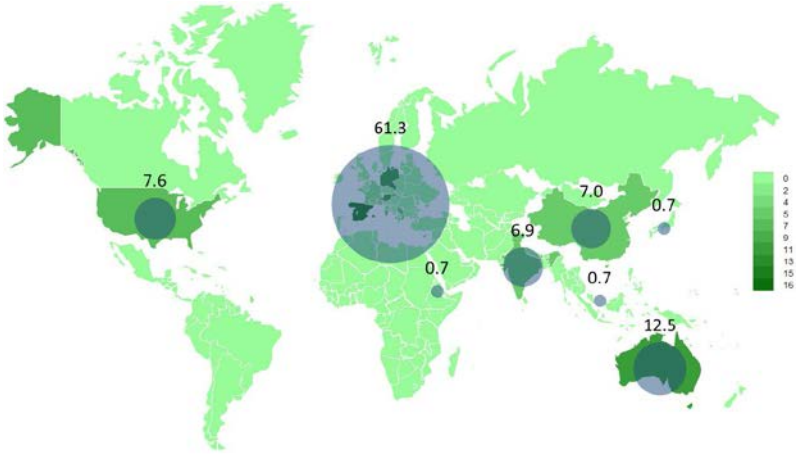
  Step1: set-up of a table with technical gaps

  Step2: ranking according criticality and occurrence

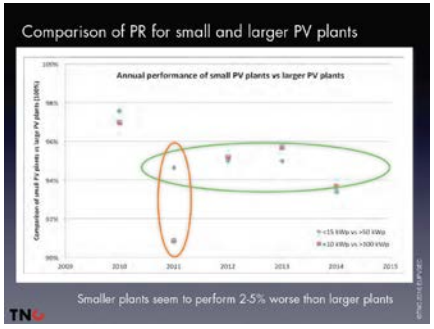
Priorities for CH and gaps in existing mitigation measures for both small and large systems.

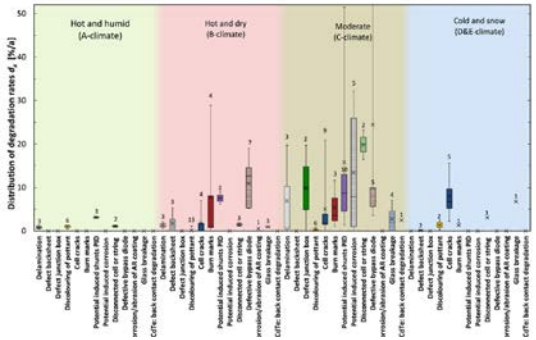
International comparison

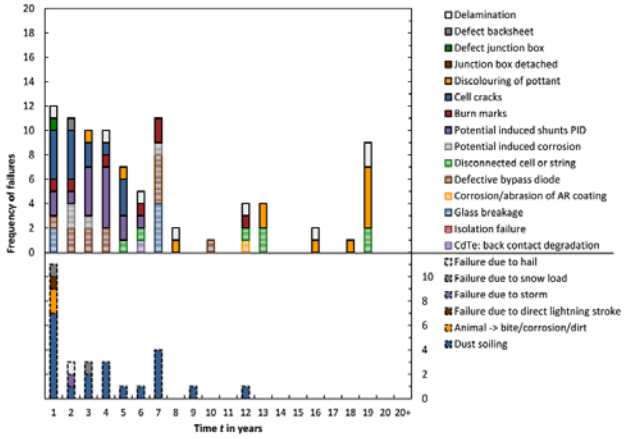
Support Photovoltaic Power Systems Programme
PVPS Task 13 'PV system performance and reliability'
and the **COST action PEARL PV**



- Performance data base
- Failure mode analysis survey
- Failure statistics







Ongoing activities and next events

Interviews of manufacturers, EPC‘s and system operators and collection of data.
anyone interested is invited to participate!

Brainstorming (6 hot-topics)
1 Dez. 2017 - Hotel Four Points/Zürich
limited to 36 participants

Final workshop (QA in Switzerland)
January/February 2018 - SUPSI/Lugano
Invited speakers form the field

Expected results

PVQUAL is a pre-study which aims:

- to give a clear picture of different quality aspects.
- to trigger new projects/initiatives to support or improve QA in Switzerland.
- to set the basis for a closer collaboration between QA providers (from test laboratories to associations).
- to facilitate the collection of input data for international expert platforms.

Let's work together to boost PV quality and support market growth!

Thank you for your attention!