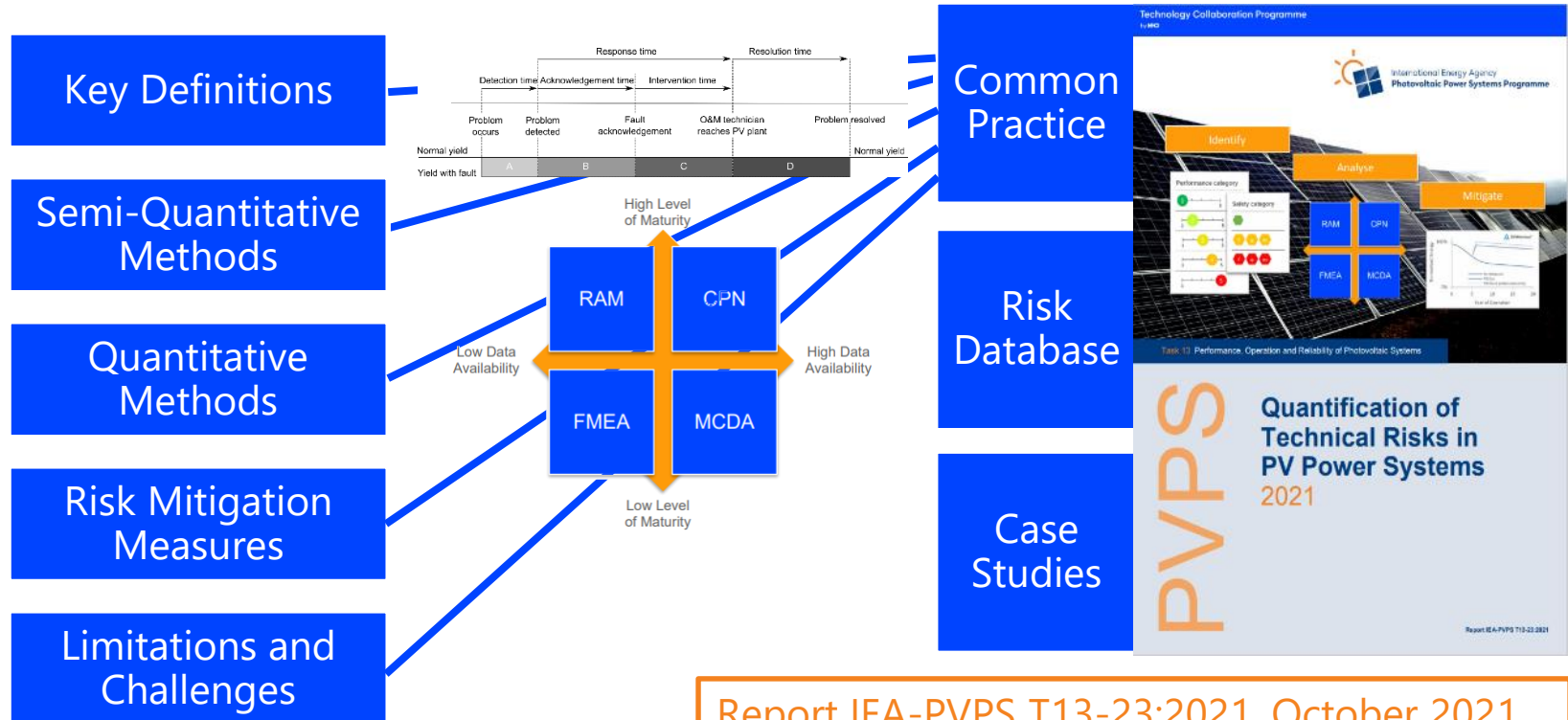


# Quantification of Technical Risks in PV Power Systems



Review methods to compare and assess common practice

PVPS



Report IEA-PVPS T13-23:2021, October 2021

# Quantification of Technical Risks in PV Power Systems



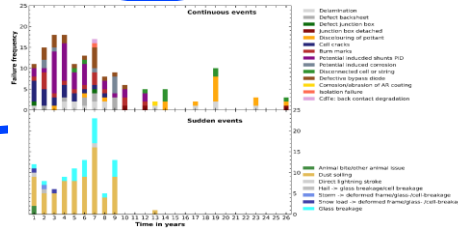
Create and maintain a risk database with standardised nomenclature and ratings

PV Failure Fact Sheets (PVFS)

PV Failure Degradation Sheets

PV Cost Data

Component	Module	3-2	Photomicrographs
Defect	<b>Degradation of encapsulate</b>		
Appearance	Any local separation of the layers between the front glass and the solar cells and the backsheet visible as bubbles or air gaps, white areas, or any other continuous or spotted. The position and size of the discolouration bubble depends on the angle and/or angle of the failure.		
Origin	The adhesion between the glass, encapsulating adhesive layer, and back sheet can be compromised for many reasons. Typically, it is caused by the manufacturing process (e.g. poor curing of EVA, too fast temperature change, contamination, improper storage of the glass, incompatibility of EVA with backing sheet, or environmental factors like thermal stresses, wet/dry mechanical stresses, UV). Degradation is generally followed by moisture ingress and corrosion. It is classified into four types and more subtle and/or more continuous.		
Impact	Degradation or bubble do not automatically cause a safety issue, but it can result in reduced insulation of the component and increased safety risk when there is a continuous path between electric circuit and the grid due to possible water ingress. Defects in the module will decrease performance due to an increase in non-radiation PV loss (light losses, shading and/or some cases also the electrical energy will be made, depending on location and direction with the solar path) and result in initial reduction and subsequent decrease in output. This can be the sign of current leakage. If the current is significant, it will trigger the bypass diode and cause further power loss.		
Detection	Visual inspection, Infrared thermography, Ultraviolet fluorescence, performance, resistance, wet leakage		
Action	Modules with a safety or safety issue should be replaced. In case of individual and/or failing parameters which indicate a technology that should be replaced, regular inspections should be done to monitor the progress of the failure until the module is replaced.		



Common Practice

Risk Database

Case Studies

Technology Collaboration Programme  
IEA PVPS

International Energy Agency  
Photovoltaic Power Systems Programme

Identify Analyse Mitigate

Performance category  
Safety category

RAM CPN  
FMEA MCDA

Task 13: Performance, Operation and Reliability of Photovoltaic Systems

**PVPS**

**Quantification of Technical Risks in PV Power Systems 2021**

Report IEA-PVPS T13-23:2021

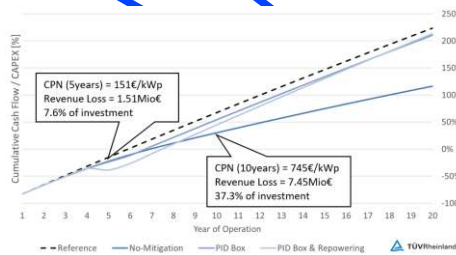
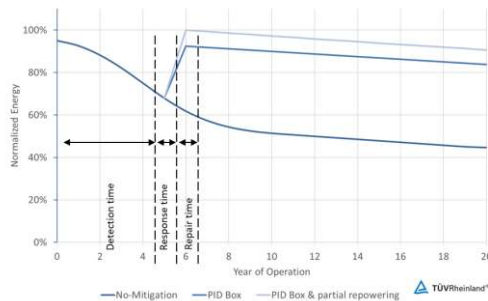
# Quantification of Technical Risks in PV Power Systems



Assess the economic impact of risks and the effectiveness of mitigation measures

Risk Analysis

Cost-Benefit Analysis



Common Practice

Risk Database

Case Studies

Technology Collaboration Programme  
IEA-IEC

International Energy Agency  
Photovoltaic Power Systems Programme

Identify Analyse Mitigate

Performance category  
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**PVPS** Quantification of Technical Risks in PV Power Systems 2021

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