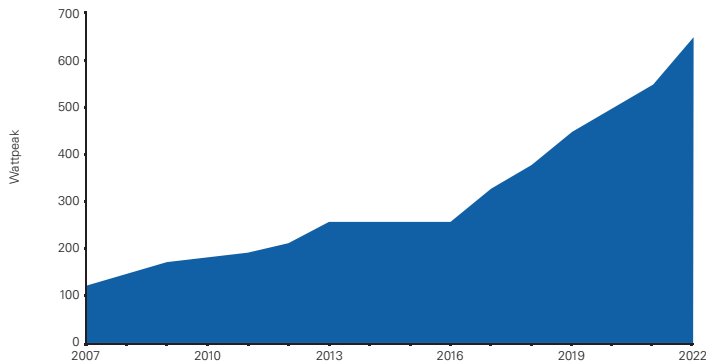


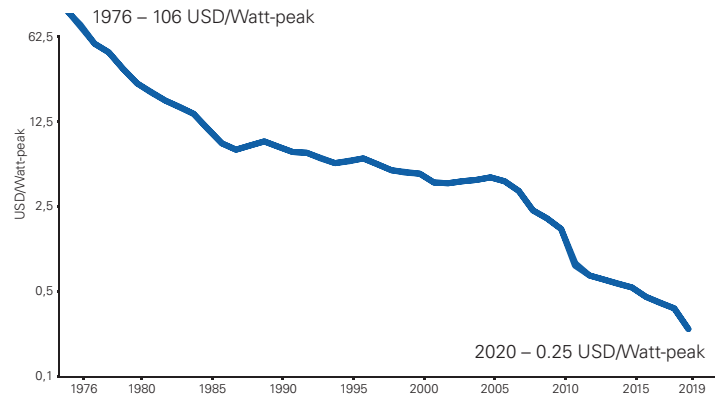
Safeguarding Solar PV Revenues



Bright solar PV future



Wafer/module size increases for more watt-peak



Dropping cost per wattpeak

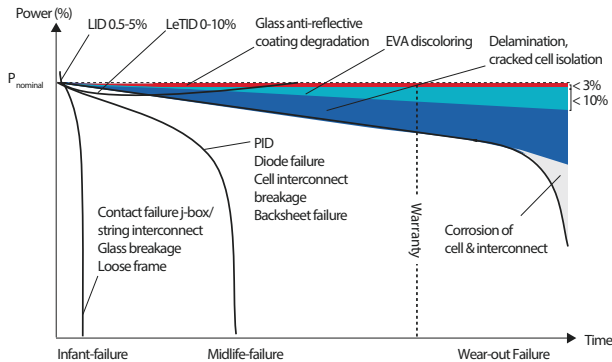
Safeguarding Solar PV Revenues



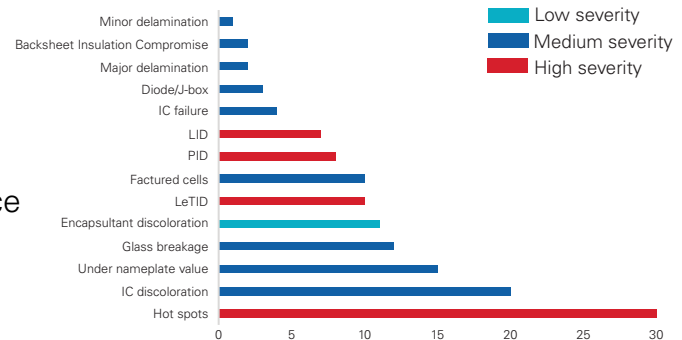
To profit you must mitigate technical risks

"Modules cause up to 5% of all system failure events"

Note: novel technologies may introduce new failure modes



Typical failure modes



Field failure frequency & severity over last 10 years

Theory → Practice

Failure rates and severity depend on bill of materials, type of technology, production quality, handling during shipment, condition of maintenance, installation quality, system age and site conditions

Safeguarding Solar PV Revenues



As it may result in extensive losses

No mitigation
measures may
lead up to
20% less yield = Up to
190K
EUR
LOSS*

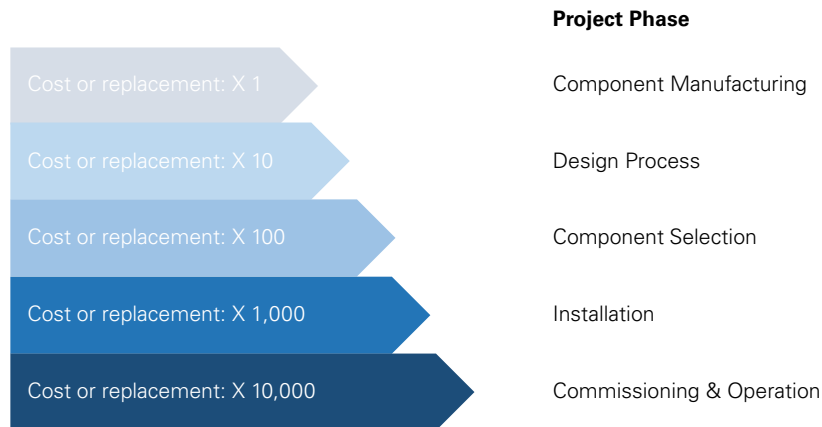
*based on 12 months with 20% less yield from a 10MW project with a PPA price of 0.10 EUR/kWh and a cap of 950kWh/kWp

***Debt Service Coverage Ratio should also account
for technical risks***

Safeguarding Solar PV Revenues



Case Study



"The cost of a lower quality project in which failures are potentially more frequent multiplies the cost of replacement by 10 through each step of the realization process"

Safeguarding Solar PV Revenues



Mitigate these risks by:



Pre-Shipment Inspections of Modules



Technology Validation



Accelerated Lifetime Testing



Factory Audits



Site Testing Components



PAC & FAC Instrumental Testing

Safeguarding Solar PV Revenues



Added value of mitigating risks

Up to
3.2
EUR/kWp/year
SAVED

Safeguarding Solar PV Revenues



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Sources:

Solar Bankability, Minimizing Technical Risks in Photovoltaic Projects, 2017
IEA PVPS, Review of Failures of Photovoltaics Modules, 2014
ITRPV, High Efficiency Solar Developments, 2020
MDPI, Impact of Energy Losses Due to Failures on Photovoltaic Plant Energy Balance, 2020
NREL, Technology and Climate Trends in PV Module Degradation, 2012
OSTI, Photovoltaic Failure & Degradation Modes, 2017
OdinSpire, 2020
UNSW, Hydrogenation of LID, 2018
Kiwa field experience and data analytics
PVEL data analytics & testing

Co-written with:



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