

TÜV Rheinland

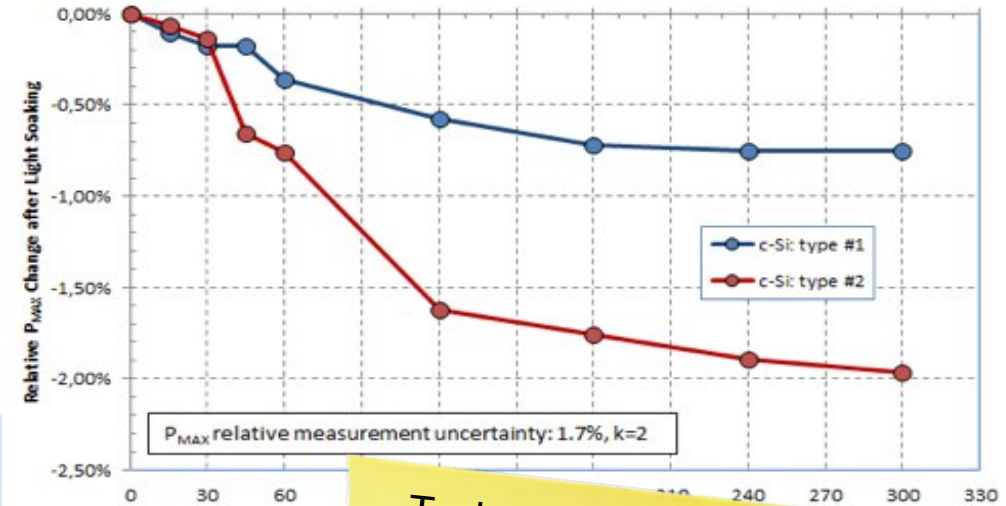
Excerpt from Quality Monitor 2017



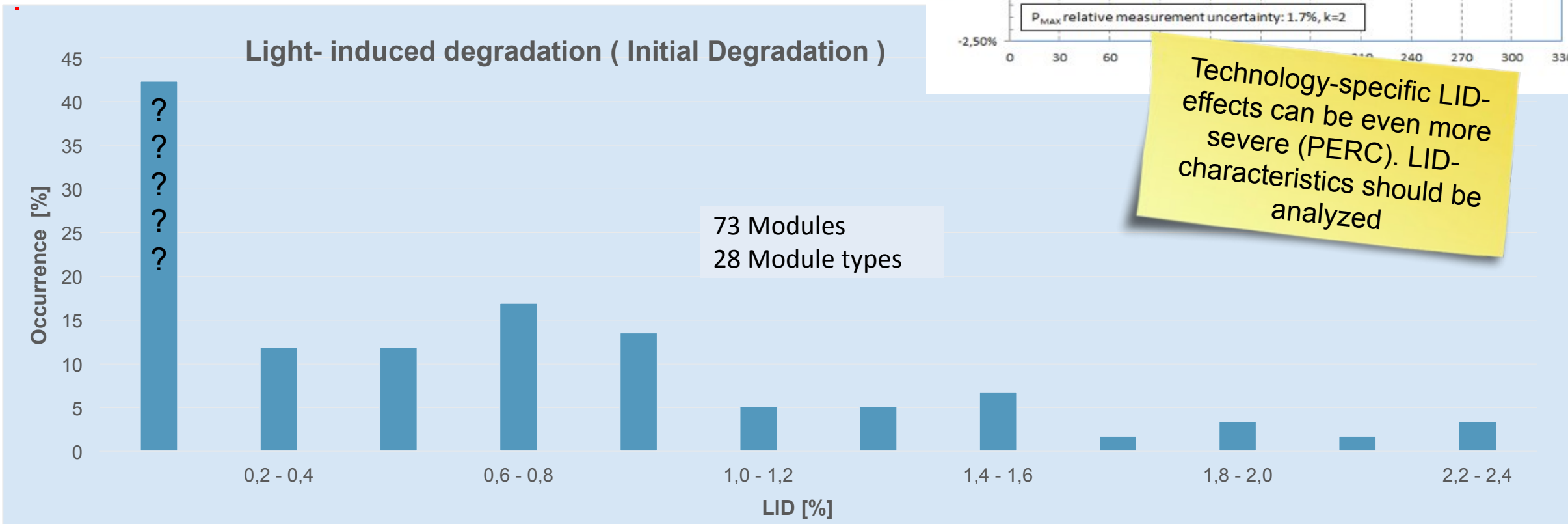
PV Module Performance

Underperformance and Influence of Light Induced Degradation

20 % (probably more) of the tested modules degrade more than 1 % with a respective loss in annual revenue.



Technology-specific LID-effects can be even more severe (PERC). LID-characteristics should be analyzed



Potential Induced Degradation

Quantification of the Economic Impact of Technical Risks

Description	Potential induced degradation is a performance loss in PV modules, caused by so called stray currents
Performance losses	8 % (failure rate 40 %, 20 % power loss of affected modules) 160 kWh/kWp/a (spec. yield 2,000 kWh/kWp) 700,000 \$US/a for 40 MWp plant (0.1 €/kWh)
Mitigation	Testing of the PV modules
Repair method	Installation of PV grounding kits
Cost to fix and repair	100,000 \$US 2,200 \$US per inverter x 40; incl. installation cost
Cost of mitigation measure	Testing of modules; 10,000 \$US for sample testing for PID resistivity 0.25 \$US/kWp



1.5 Mio \$US loss after 2 years incl. repair costs **versus**
10 k \$US mitigation costs

