16. FORUM SOLARPRAXIS
Workshop Financing and Insurance

How to Reach Sustainable and Competitive Quality Standards in Utility PV?

PRESENTED BY

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www.solarbankability.eu

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Introduction

The EU funded „Solar Bankability“ project pursues the objective to reduce technical risks associated with PV investments

TÜV Rheinland

TÜV Rheinland is one of the world’s leading independent provider of testing services for the solar industry since 30 years. This incudes site feasibility, tender development, energy yield prediction and assessment, product and vendor qualification, contract review, technical due diligence, risk assessment and financial sensitivity analysis.

ACCELIOS Solar

As owners engineer ACCELIOS is specia-lized in technical and commercial risk assessment in the PV industry. The service portfolio includes feasibility studies, due diligences, production audits, project audits and expert opinions for investors, financial institutions and insurance companies.

Consortium

- EURAC Research (Italy) WP 1&6
- TÜV Rheinland (Germany) WP 2
- 3E (Belgium) WP 3&6
- ACCELIOS Solar (Germany) WP 4
- SolarPowerEurope (Belgium) WP 5

Utility PV – Solar Bankability

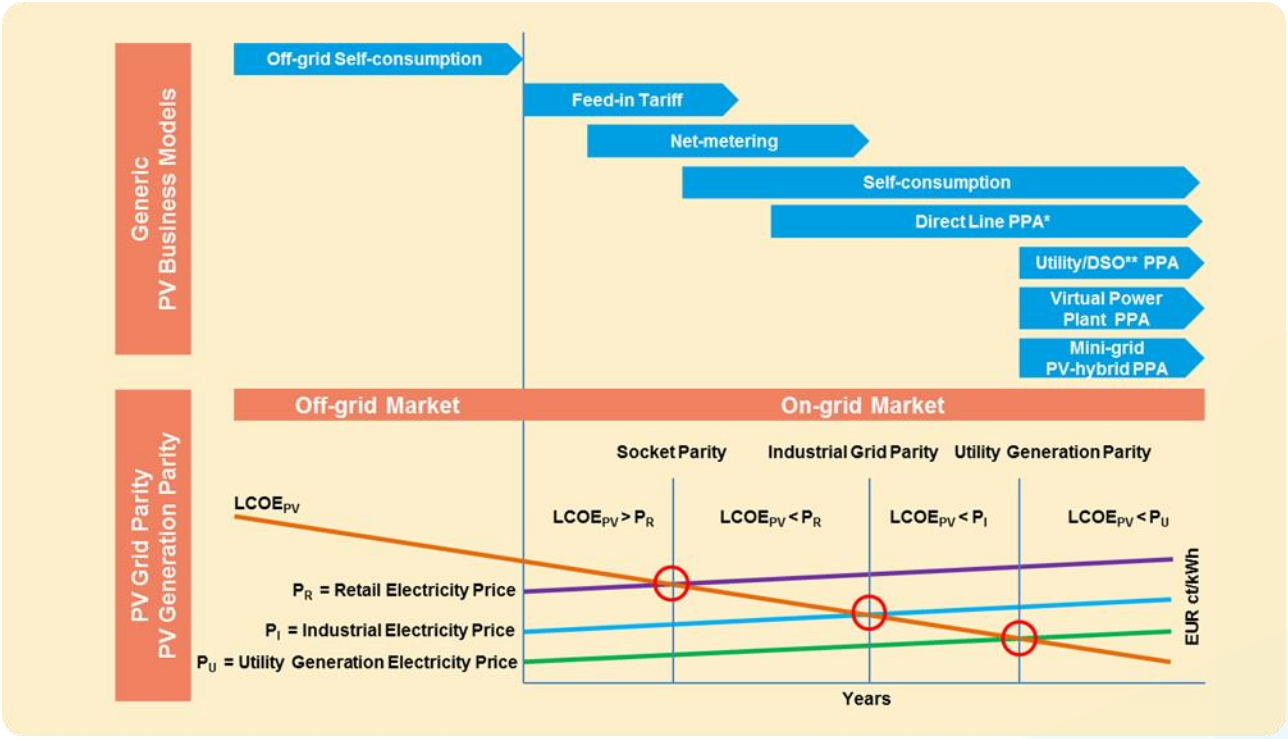
Formally the investment in a 2015 utility PV project seems as attractive as in 2010. However an in depth solar bankability analysis can reveal significant changes.

Comparison of two sample utility PV projects in Germany

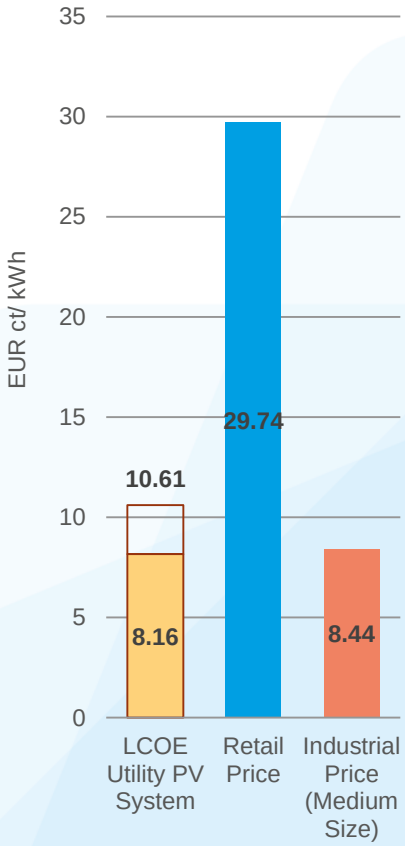
	2010	2015	Delta
Nominal capacity (MWp)	5,5	4,8	
Project duration (Years)	20	20	
Feed in tariff (€-Cent/kWh)	24,2	8,8	36%
Capital expenditure CAPEX (€/MWp)	2720	800	29%
Debt financing (%)	80	100	125%
Term (Years)	19	15	
Interest rate (%)	4,2	1,7	40%
Operational expenditure OPEX (€/MWp)	43640	5480	13%
Land lease (€/MWp)	4660	?	n.a.
Repair & maintenance (€/MWp)	5545	4270	77%
Insurance (€/MWp)	5450	165	3%
Plant management (€/MWp)	20545	625	3%
Dismanteling costs (€/MWp)	18900	0	0%
IRR on total investment (%)	5,6	5,7	not comparable

Utility PV – Reaching Financial Competitiveness

PV in Germany has reached socket parity. New business models are slowly emerging.

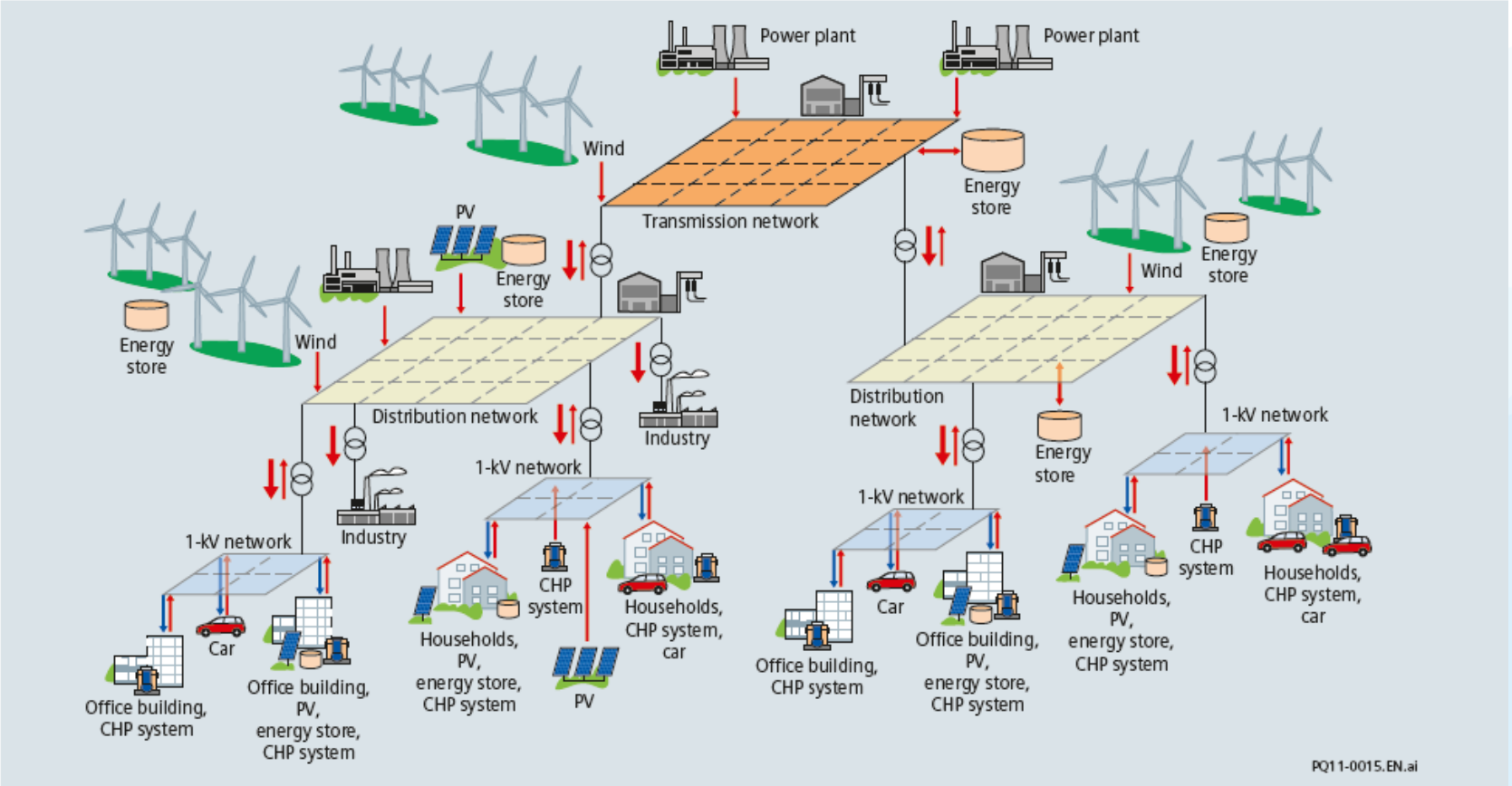


* PPA = Power purchase agreement
** DSO = Distribution system operator



Utility PV – Reaching Grid Competitiveness

Market integration of PV with the existing grid and utility infrastructure gets a must.



Source: Siemens AG – Energy Management and Energy Automation Products

Utility PV – Reaching Quality Competitiveness

The PV industry is highly dynamic and innovative. Not all risks are fully visible yet. Quality standards have to be further developed and verified.

Challenges for Investors

Product quality is often compromized due to the current market situation (high competition, low financial resources, personnel fluctuation, change of suppliers, lack of quality assurance knowledge).

Quality of planning and installation reduced due to sub- and sub-subcontractors, high competition, lack of knowledge and experience, tight commissioning due date, weak quality assurance during construction and installation.

Project assumptions & feasibility are imprecise:

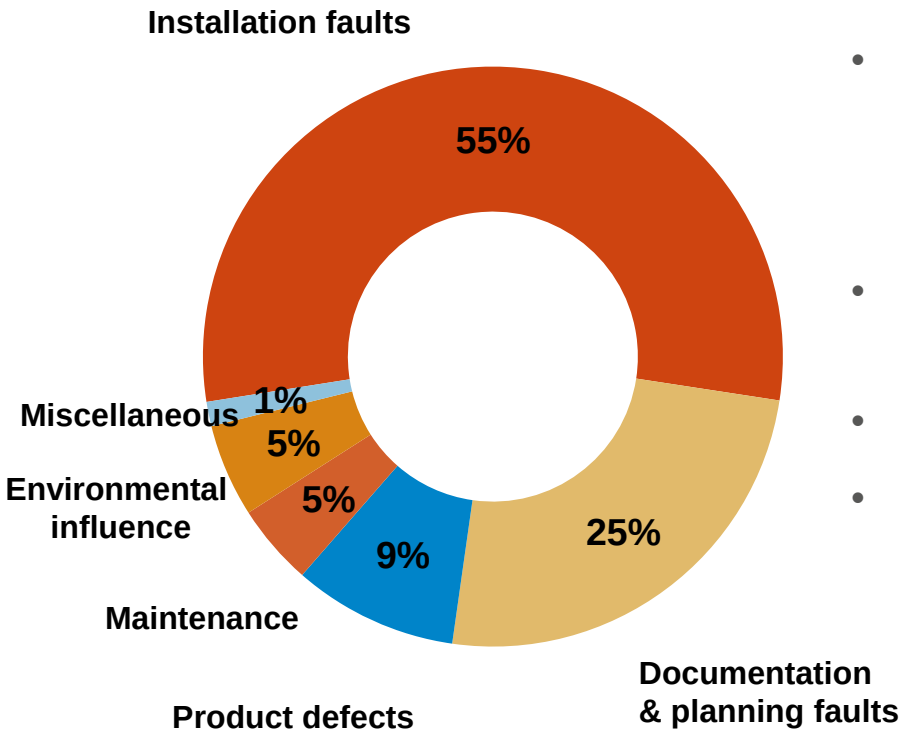
Annual irradiation tends to be higher than 10-year-mean and thus real annual yield is higher than prediction. Uncertainty and unreliability in irradiance measurements leads to unrealistically high PR values.

Bankability of involved parties often not given:

Unstable market situation, choice of manufacturers is not the only criteria for bankability, guaranties and warranties are often questionable.

Utility PV – Technical Failures in PV Power Plants

TÜV Rheinland has inspected more than 12 GWp of PV plants. A large number of issues and serious defects have been identified.



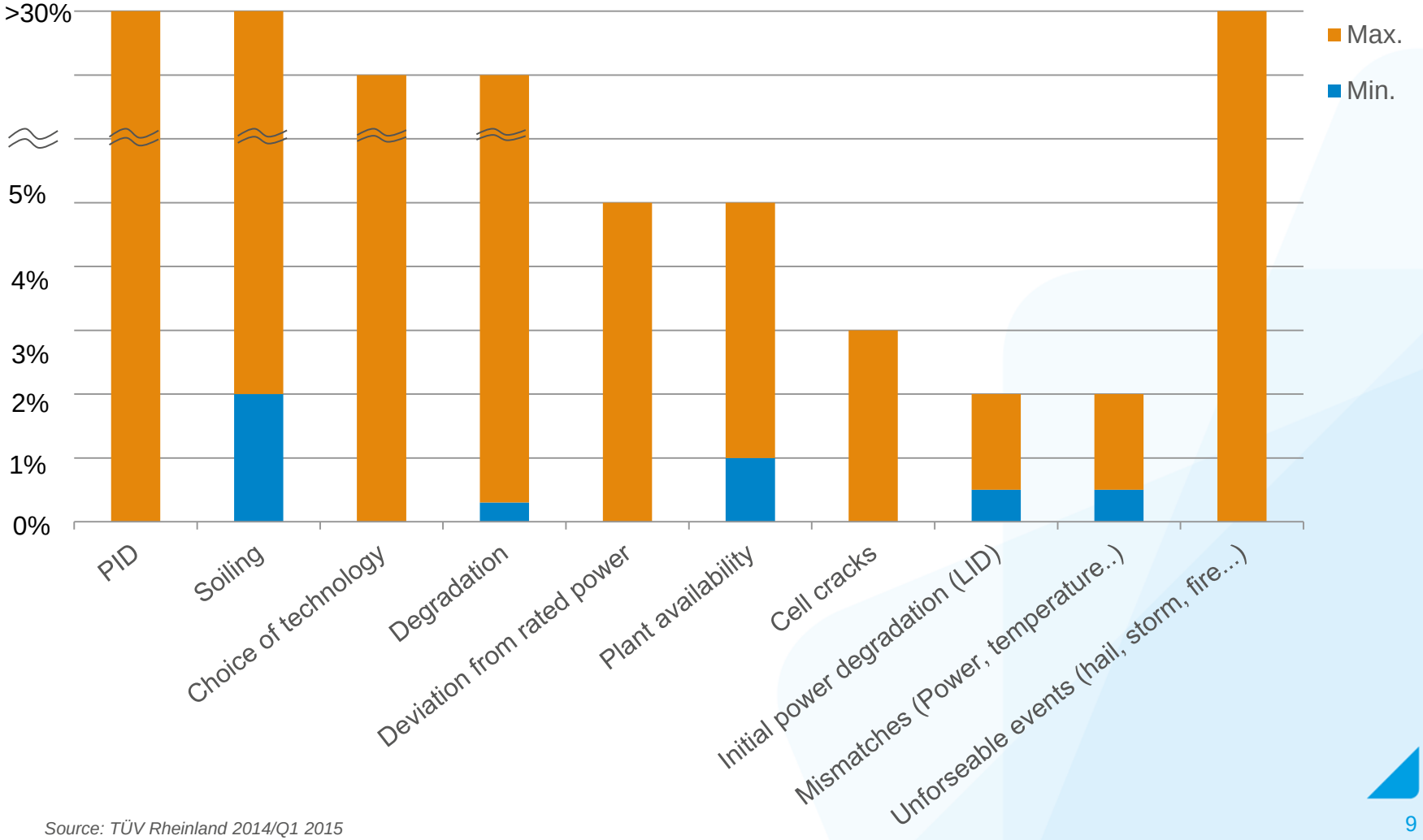
Main findings:

- 30 % of PV power plants show particularly serious (incl. safety issues) and serious defects or large number of issues
- > 50 % of the failures are caused by installation faults!
- Systematic quality assurance is required.
- Plant inspections and maintenance are a must for every bankable PV project.

Source: TÜV Rheinland 2014/Q1 2015

Utility PV – Examples of Loss of Revenue Factors

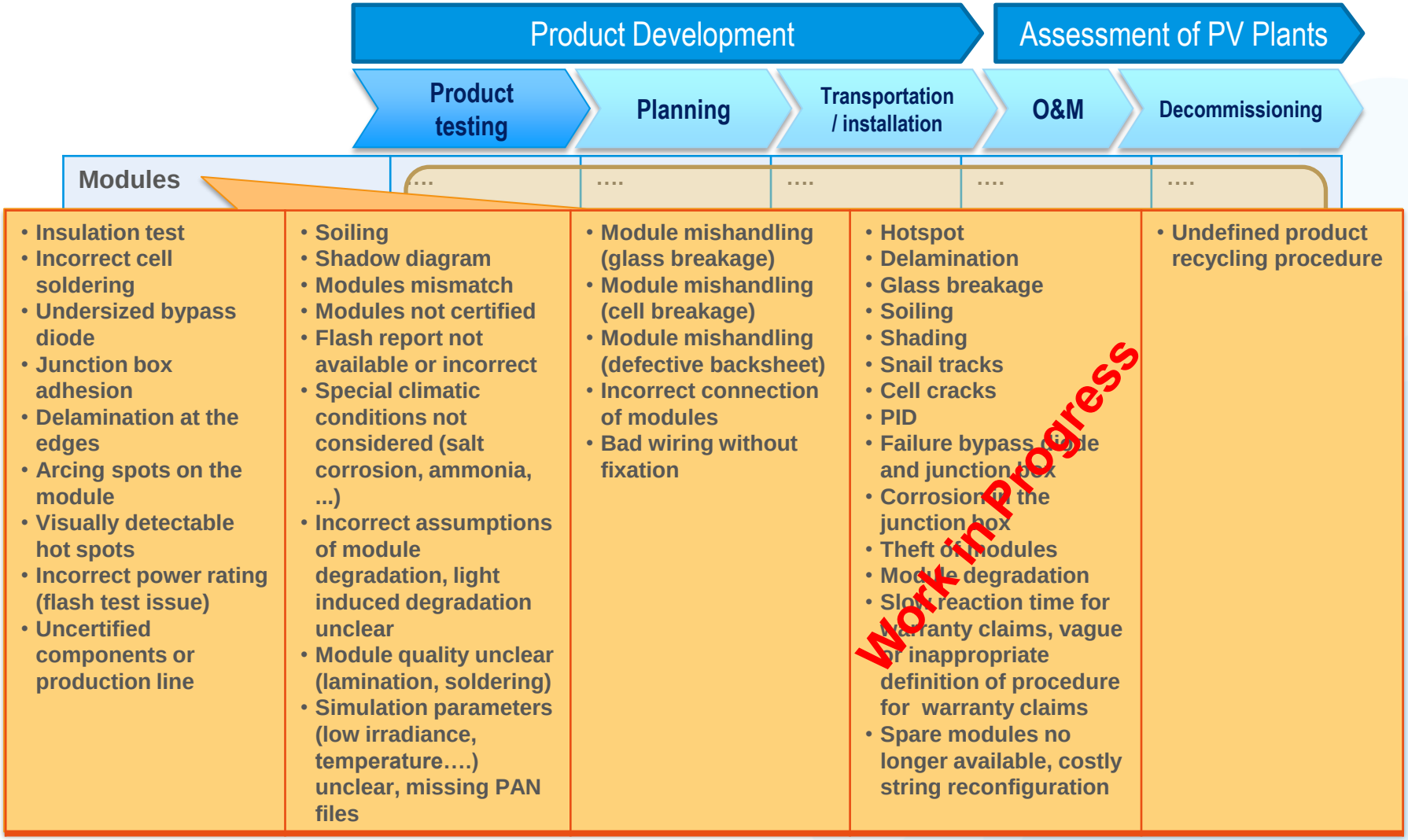
Financial revenues are negatively impacted by several loss factors, which show a large variance under field conditions



Source: TÜV Rheinland 2014/Q1 2015

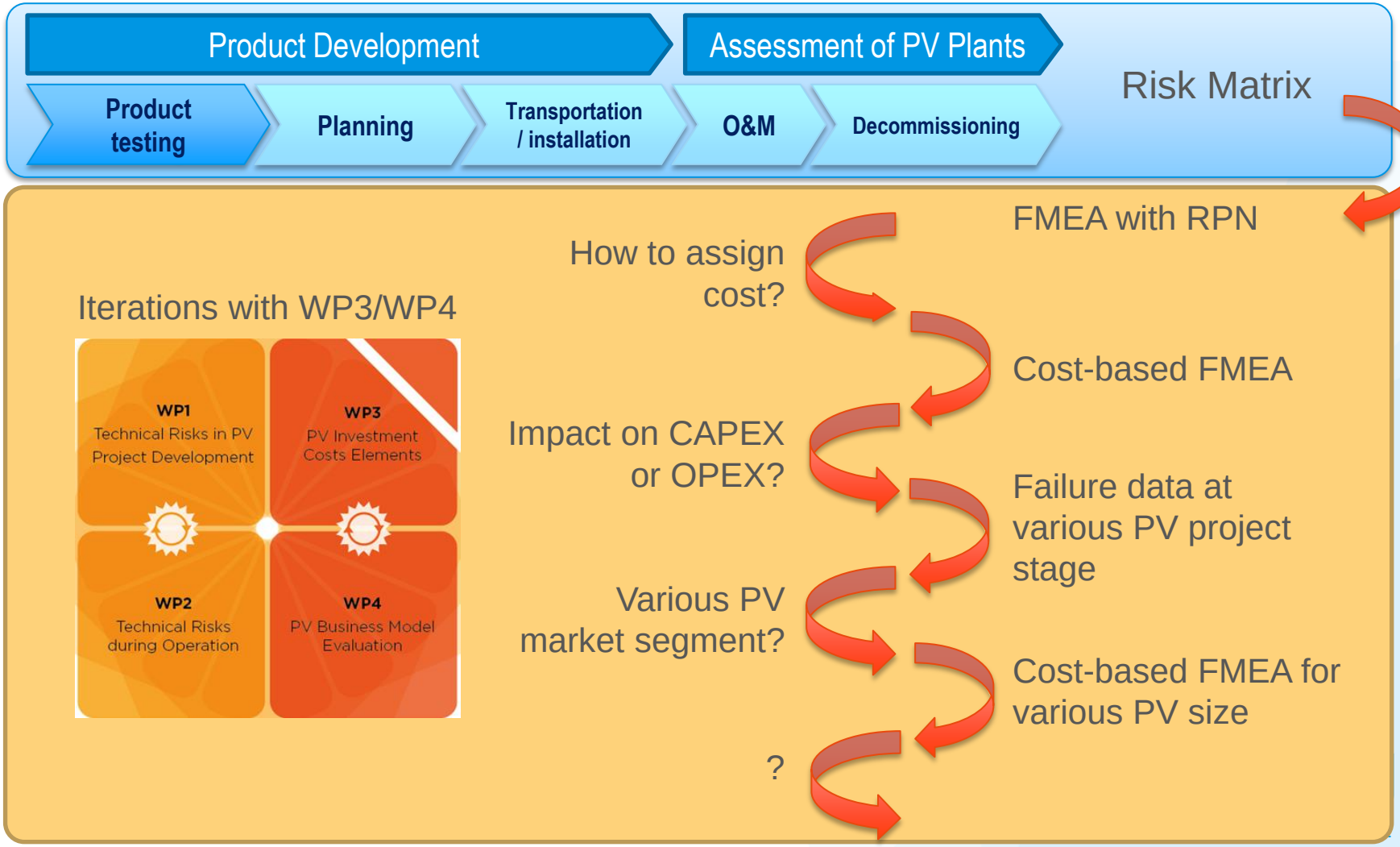
Solar Bankability Project

In the Solar Bankability project a systematic risk matrix is being established



Solar Bankability Project

Risk and cost priority numbers will be developed and realistic risk scenarios will be analyzed with a dedicated financial modelling tool.



Conclusions

- Quality assurance and risk management are the key issues for all stakeholders!
  - Manufacturer: Ensure high product quality to prevent later claims
  - Test labs: Project related product testing and full characterization of product
  - Installer: Quality assurance of installation, installer education and qualification
  - O&M contractors: PR guarantees by monitoring, cleaning, maintenance, repairing
  - Independent entities: Supervision by feasibility study, energy yield prediction, due diligence, on-site inspection,

- The EU Solar Bankability project aims at
  - a risk ranking system and risk mitigation mechanisms that should allow PV projects to become bankable
  - establishing a common practice for professional risk assessment which will serve to reduce the technical risks associated with investments on PV projects.
  - increasing trust of investors and financers into the financial viability of sustainable energy investments.

- The quality improvements must be demanded by
  - financial sector: lenders, institutional investors, asset managers banks, insurers
  - owners and operators: real-estate owners, social housing societies, independent power producers

1st Public Workshop
Enhancement of PV Investment Attractiveness

Technical Risk Quantification, Financial Risk Modelling and Risk Mitigation Measures

Location: Cologne, Germany

Dates: May 2016

To be announced at:

www.solarbankability.eu

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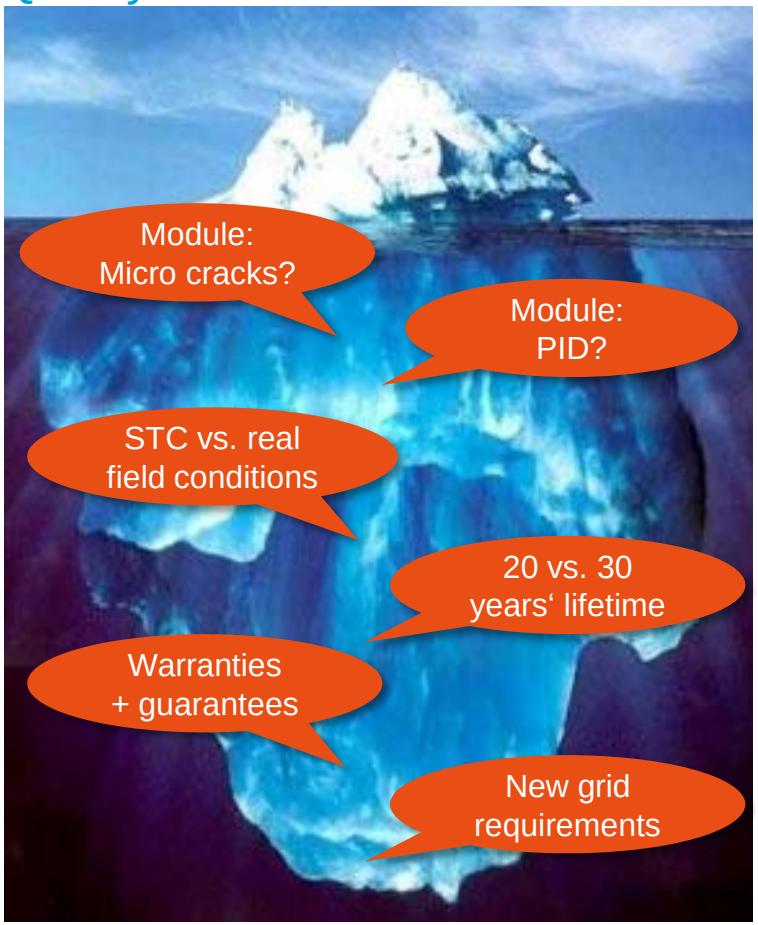
Utility PV – Reaching Competitiveness in Quality Assurance

The PV industry is highly dynamic and innovative. Not all risks are fully visible yet. Quality standards have to be further developed and verified.



- Do existing standards and guidelines cover the right measurement criteria?
- Which practical relevance do these criteria have?
- Do we have the right tools for precise estimates of PV system production?
- Do all testing institutions possess the required competence and neutrality to provide independent and reliable test results?
- How reliable are the warranties and guaranties of component manufacturers?
- How do cost pressure and consolitation affect quality standards in PV industry and project development?

PV Scale-up

PV electricity has left its niche and is becoming a center pillar of Germany‘s national power supply. The capacity of utility PV systems exceeds 10 GWp.

	PV Market Climate Estimate June 2015e	Average Global Horizontal Irradiation (kWh/m² a) [5]	Cumulative Installed PV Capacity (GWp) [1]	NREAP Target 2020 (GWp) [6]	PV Share of Net Electricity Production (%) [7]	Residential Electricity Retail Price (EUR ct/kWh) [8]	LCOE Indicator Utility Scale PV (EUR ct/kWh) [9], [10]
Germany	Cloudy	936	38.24	51.75	6.3	29.74	8.16-10.61
Italy	Cloudy	1326	18.31	8.00	8.7	23.39	6.71-8.16
France	Sunny	1100	5.63	4.86	1.1	17.51	6.71-10.61
Spain	Rainy	1600	5.39	8.37	4.9	23.67	6.71-9.00
United Kingdom	Cloudy	970	5.23	2.86	6.1	20.14	10.61-12.00
Romania	Rainy	1200	1.22	0.26	2.7	12.47	8.16-10.61
Netherlands	Sunny	950	1.07	0.77	0.1	17.32	10.20-10.61