



# Quality Assurance in PV Power Plant Projects in Asia

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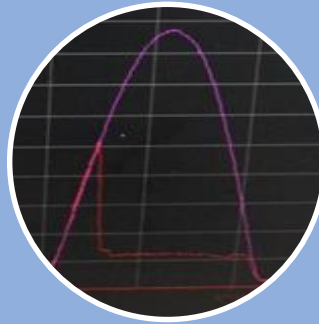
# Technical Risks



PV Modules



Installation



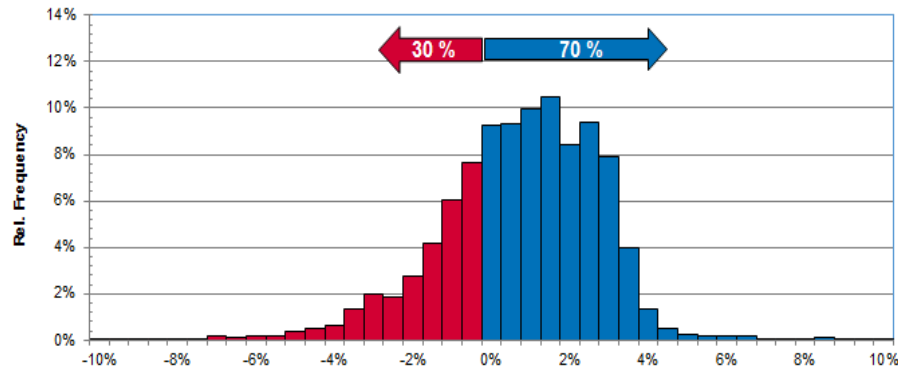
Performance



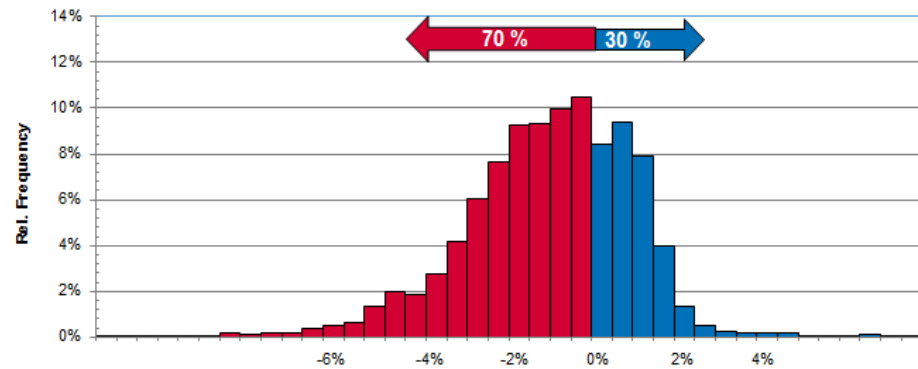
Safety



# PV Modules – Performance issue



**PMAX Deviation to Low Tolerance Limit [%]  
before LID**



**PMAX Deviation to Low Tolerance Limit [%]  
after LID**

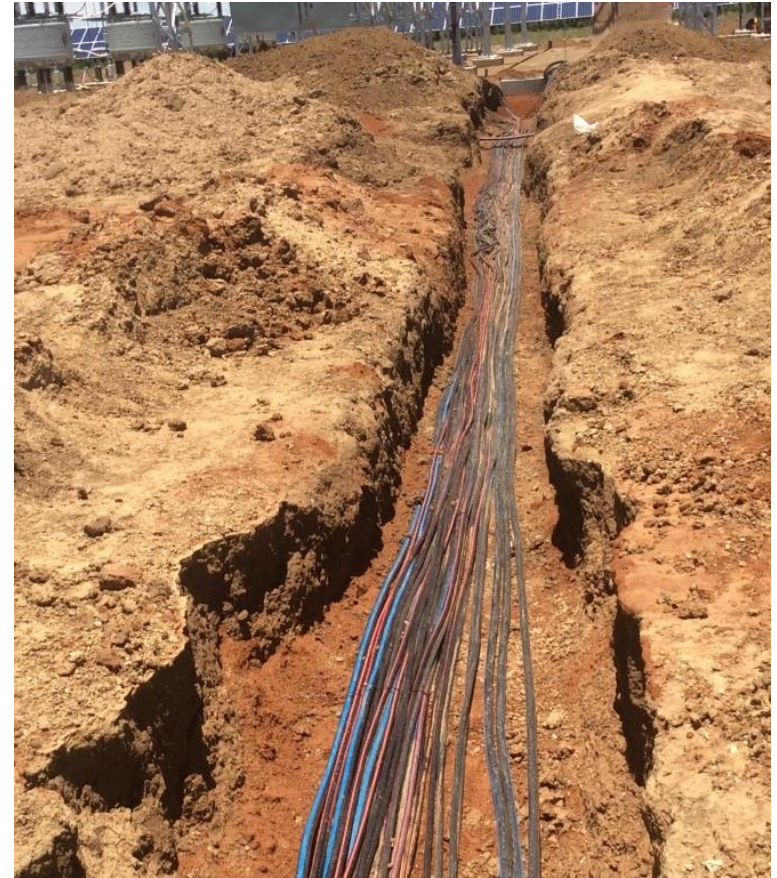
Unique SNs: 7179  
Unique module classes: 935  
Unique manufacturers: 190  
Test period: 2015-2016



“...We strongly recommend that module purchasers and banks do not use this list [TIER list] as a measure of quality, but instead consult a technical due diligence firm...”

# Construction – Burying of cables

- Using of adequate embedding material
- Consideration of minimum depths





# Installation – Erosion Issue





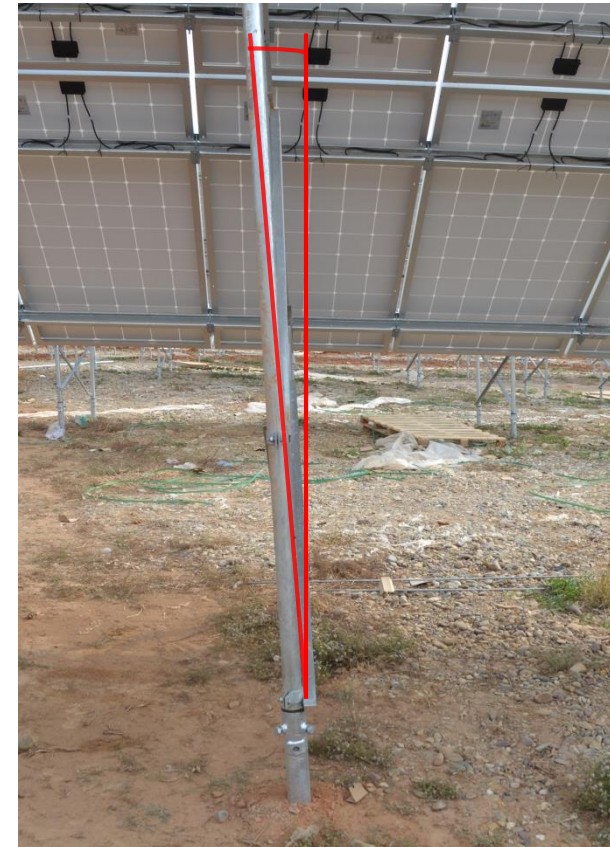
# Installation – Foundations/Mounting Structure

## Initial Design Screw:

- 1.9m long
- 0.3m above ground
- Thus: 1.6m in soil

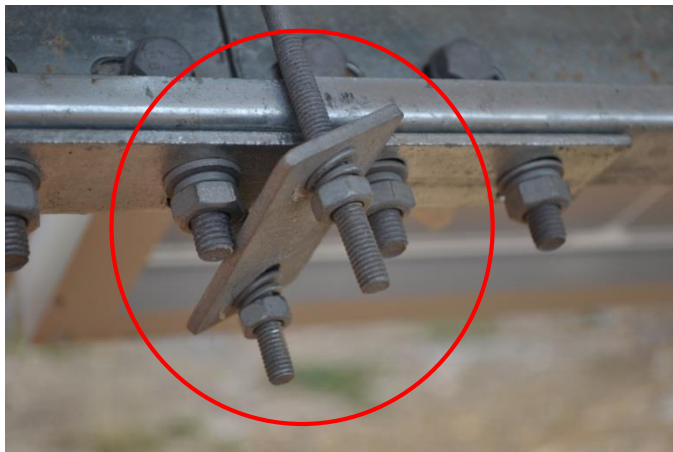
## As built:

- 1.85m long (updated design)
- 0.40m above ground
- Thus: 1.45m in soil
- Less 15 cm -> foundations/foundation design need to be checked in detail



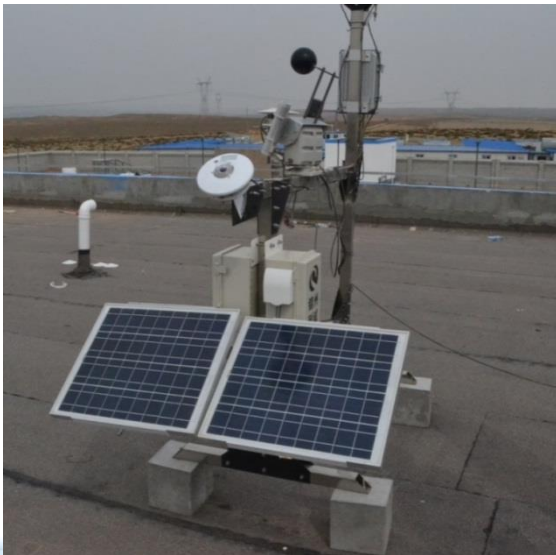
Poles with critical angle  $>5^\circ$  from vertical

# Installation Works





# Technical Risks – Yield Prediction and Performance



- How to predict the Performance Ratio (PR)?
- How to determine the “real” PR, especially in systems with multiple directions and tilts?
- How to implement incentive and penalty schemes in EPC and O&M Contracts?
- What is the “right” equipment for Performance Analysis? Who shall do the analysis?

# Technical Risks – Safety

## Wrong Design

- Wrong assumptions
- Not enough conservative assumptions
- Extreme weather conditions not considered
- Wrong calculation

## Wrong Execution

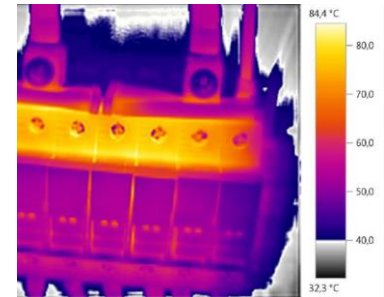
- Execution does not follow design
- Different material used



Source : 北极星太阳能光伏网

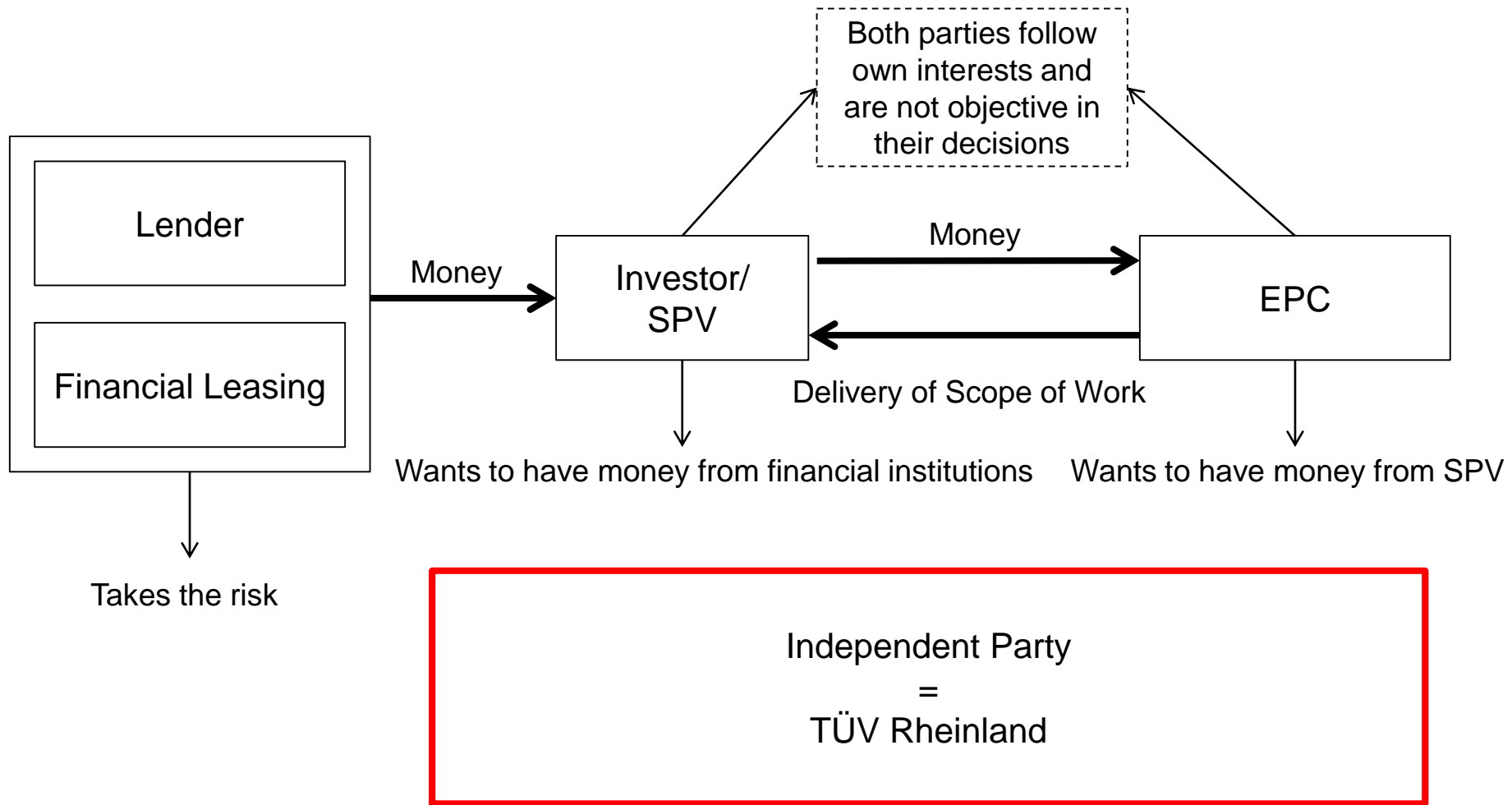
## Consequences

- Destruction of PV system
- Destruction/damage of building
- Threat of life
- Loss of permits





# Quality Assurance Mechanism



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**Thank you!**

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