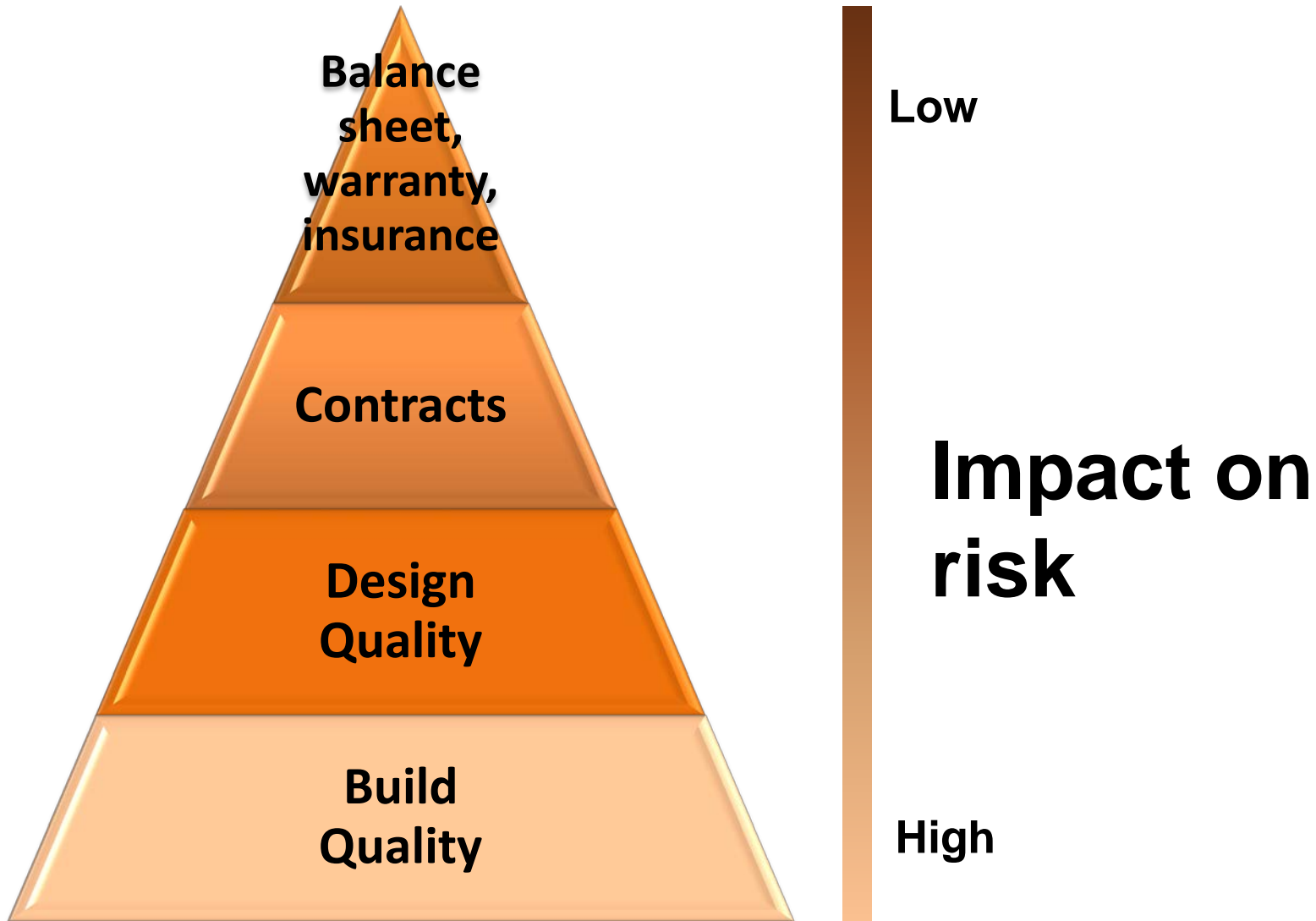




**... we help investors to buy the
right modules**

Peter Rusch, MD

Build quality has the greatest impact on reliability



What is design quality?

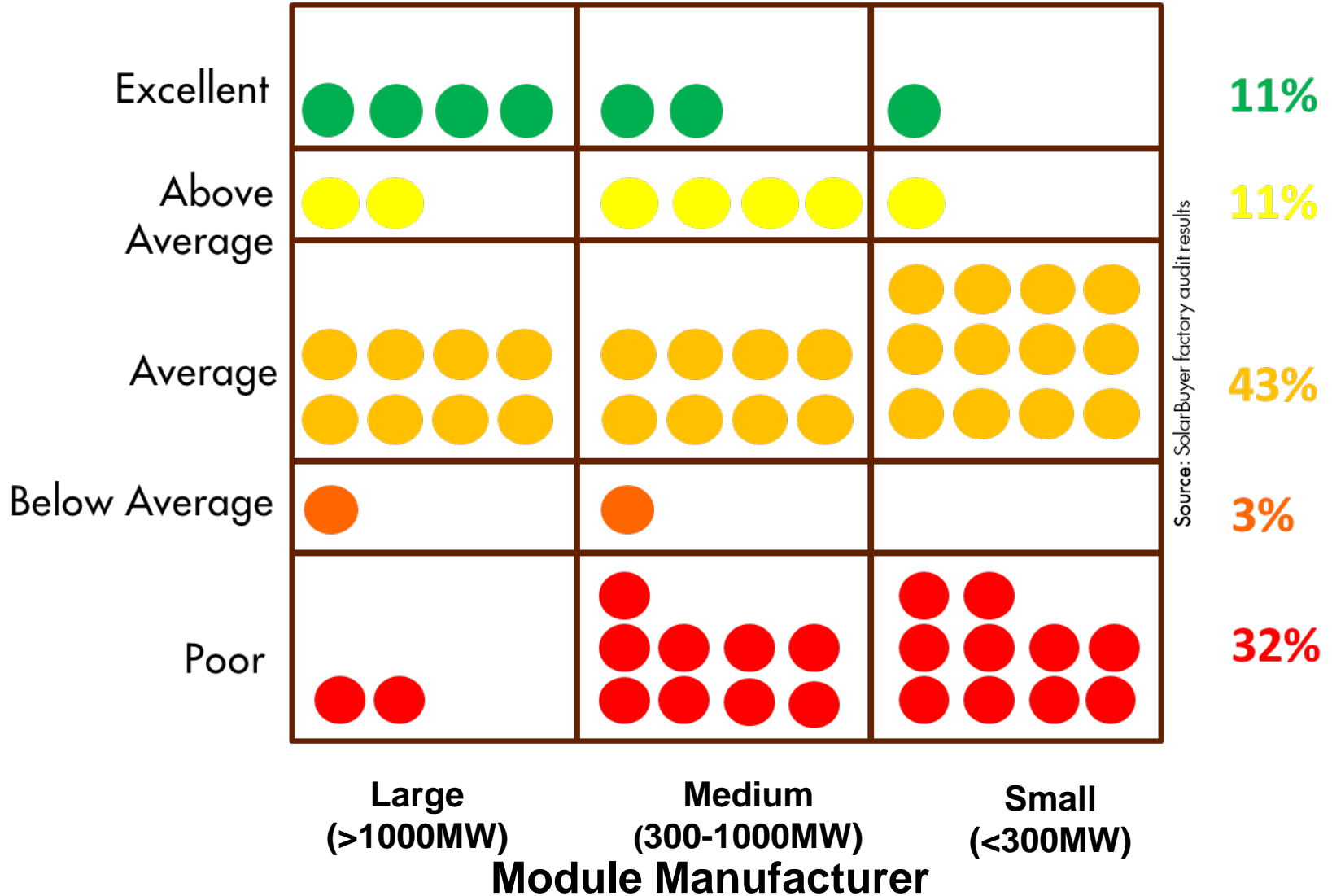
- **The design quality of a module is primarily driven by the types and combination of materials used to build the module ('Bill of Materials or BOM')**
- **The industry has never questioned the importance of design quality and its contribution to the reliability and safety of PV modules**
- **International standards governed by IEC and UL represent a minimum threshold but not good to predict reliability**
- **Increasing push to develop long term reliability and performance tests and standards**

What is manufacturing quality?

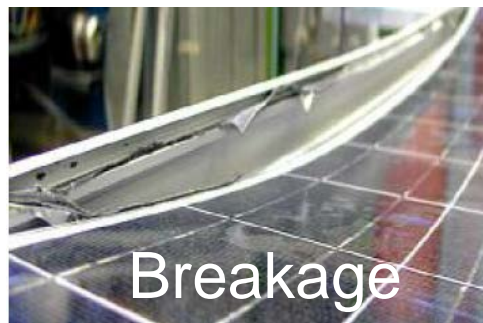
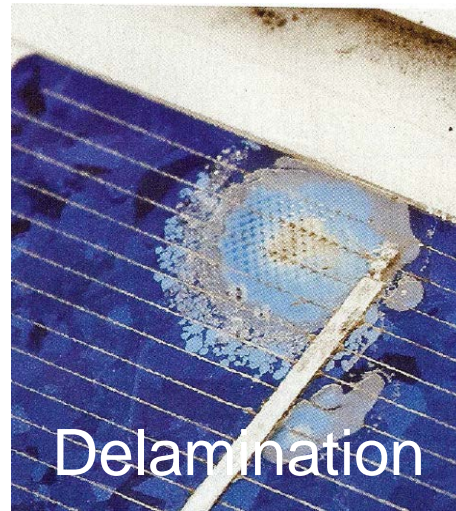
- **How well thousands of modules are built on a daily basis**
- **Can vary from factory to factory and within factories**
- **Not easily verifiable in a finished module**
- **It looks closely at materials, quality controls during production**
- **It covers the chain from raw material supply to a finished module**
- **Can have a direct impact on module performance and reliability**
- **and therefore affect the investors expectations of a good \$\$\$ return!**

Recent audits of 65 PV si-c module manufacturers highlight the ongoing build quality 'spread'

Manufacturing Quality



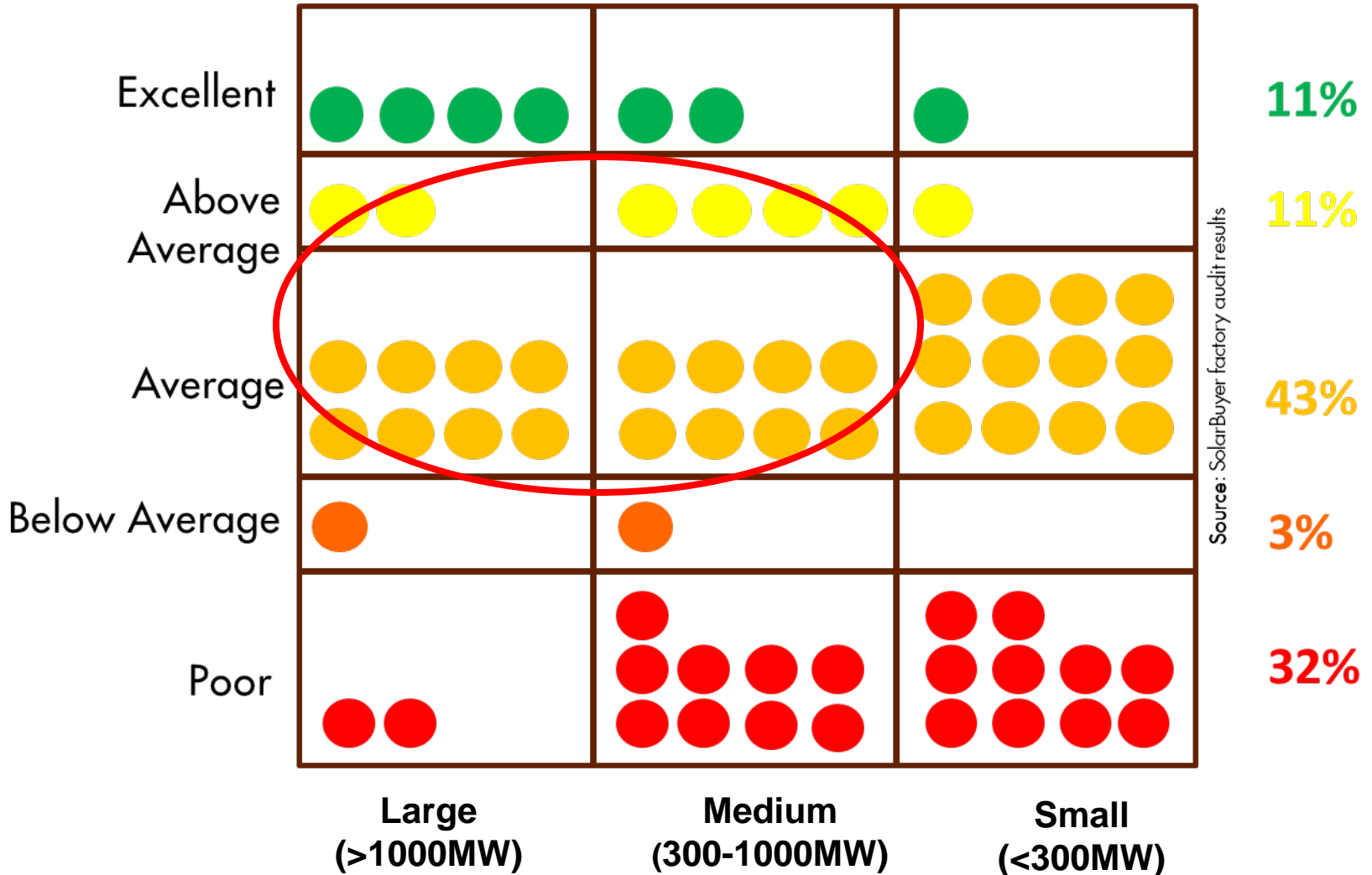
Poor quality can cause field failures, Industry needs more transparency



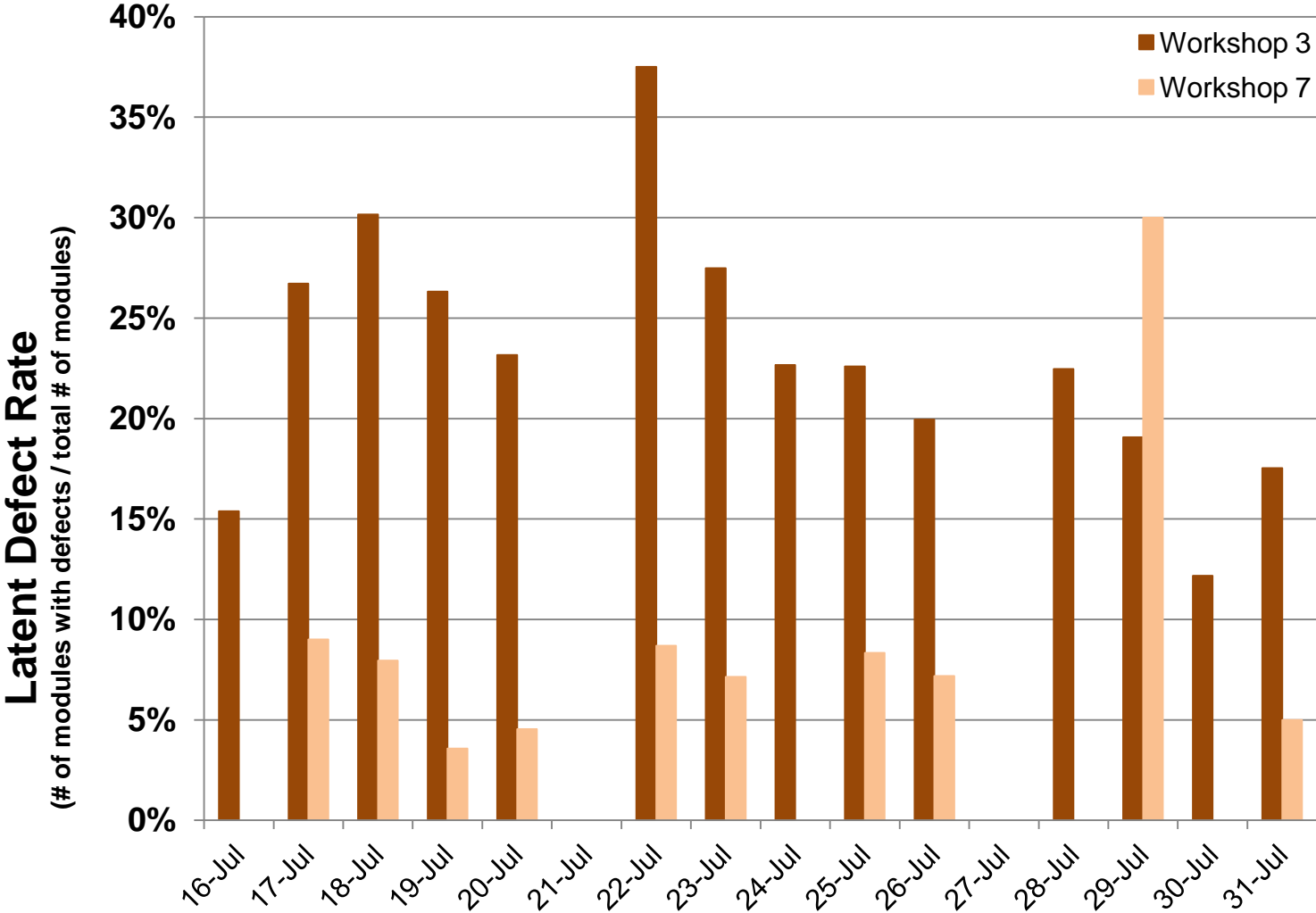
Sources: TÜV Rheinland, Photon, SolarBuyer

Red circled companies provide best economic value in terms of ROI for investors

Manufacturing Quality



Pre-shipment defect rates validate concerns



Source: SolarBuyer pre-shipment inspection results / July 2013 / 5 MW inspected



Manufacturing quality and reliability can be managed



Independent due diligence to identify potential risk



Smart contracting to manage risk



Third party quality assurance during production to remove risk

Risk Mitigation by SolarBuyer

- International consultancy company
- We are hired by banks, investors, developers, EPCs
- We help investors understand and manage project risk
- Offers three basic services to mitigate the risk for PV panels and inverters
 1. Technical due diligence
 2. Procurement assistance
 3. Quality assurance services



Peter Rusch, MD

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