International PV Quality Assurance Task Force (PVQAT)
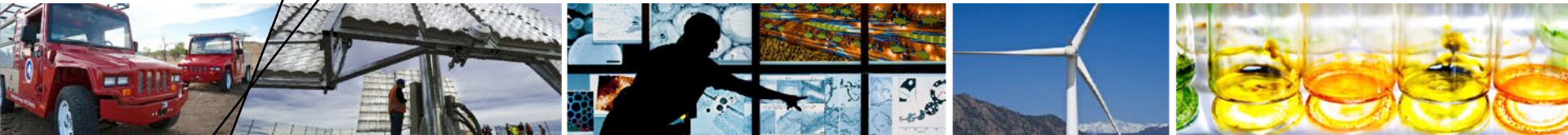

Sarah Kurtz (NREL)

Solar ABCs Workshop

Solar Power International

Anaheim, CA

Sept 17, 2015

Outline

- **History of PVQAT**
- **Goals of PVQAT**
  - Climate-specific module qualification
  - Consistency of manufacturing
  - System certification
- **Structure of PVQAT**
  - Twelve task groups working to support IEC
- **Recent activities and future directions**
  - IEC 62941 – Quality management of module manufacturing
  - Technical studies
  - Proposed Climate-specific test
  - Vision/support for IECRE

PVQAT (International PV Quality Assurance Task Force)

- **Formed in 2011, inspired by METI in Japan**
- **Informal organization encourages participation by all**
- **Emphasis on organizing and sharing research results toward how to test for different:**
  - Climates (Desert, Tropical, Temperate)
  - Mounting configurations (rack- and roof-mount)
- **www.PVQAT.org (English)**
- **www.PVQAT.com (Chinese)**

Three-prong effort addresses those questions

1. *Qualification of durability of design of products* **for chosen climate and mounting**
2. *Guide for audit of consistent manufacturing* **of products built to that design**
3. *Certification process for system verification* **to ensure adequacy of design, installation, and operation**
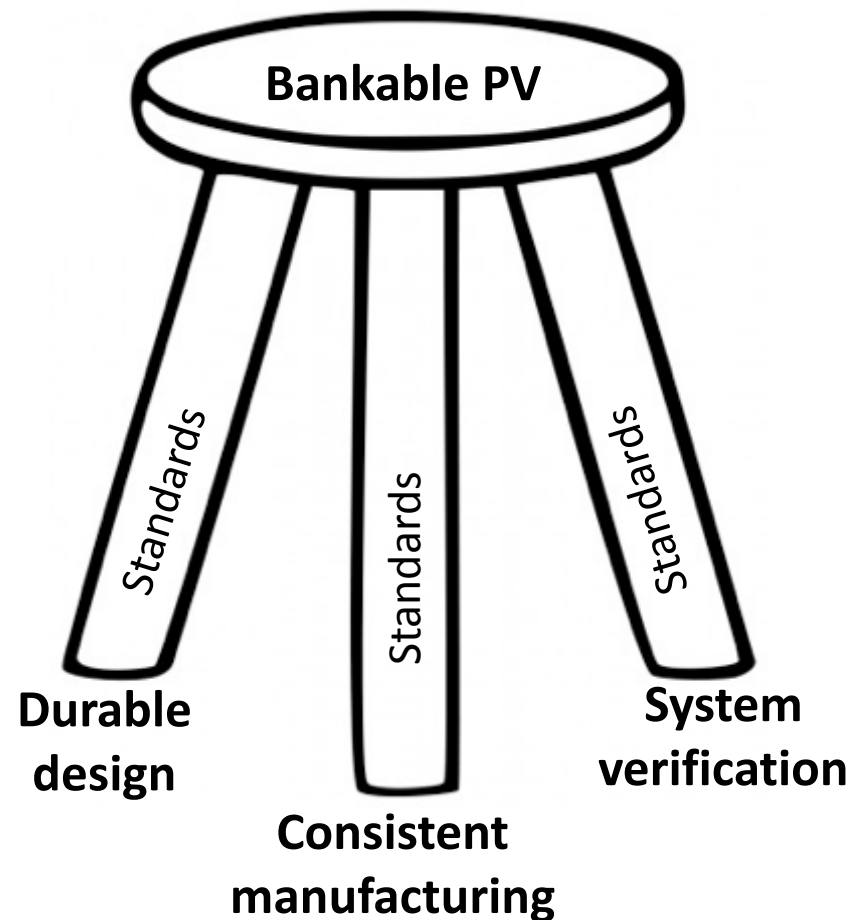
Bankable PV

Standards

Standards

Standards

Durable design

Consistent manufacturing

System verification

PVQAT (International PV Quality Assurance Task Force)

# PVQAT Task Groups – All supporting IEC

1. PV QA Guideline for Manufacturing Consistency

2. Thermal and mechanical fatigue including vibration

3. Humidity, temperature, and voltage

4. Diodes, shading and reverse bias

5. UV, temperature and humidity

6. QA Rating Communication

7. Snow and Wind Loading

8. Thin-film Testing

9. CPV Testing

10. Connectors

11. PV Systems

12. Soiling and Dust

PV-Specific ISO 9001
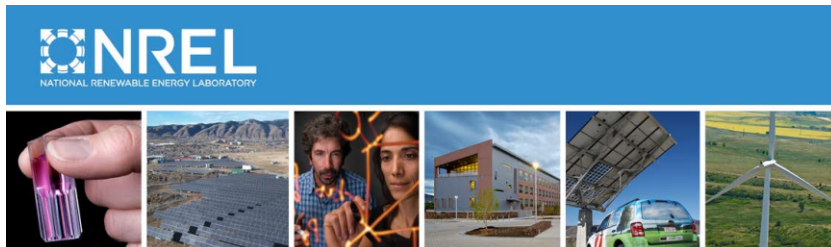
Updated Proposal for a Guide for Quality Management Systems for PV Manufacturing: Supplemental Requirements to ISO 9001-2008

Govind Ramu,[1] Masaaki Yamamichi,[2] Wei Zhou,[3] Alex Mikonowicz,[4] Sumanth Lokanath,[5] Yoshihito Eguchi,[6] Paul Norum,[7] and Sarah Kurtz[8]

[1] *SunPower*
[2] *National Institute of Advanced Industrial Science and Technology (AIST)*
[3] *Trina Solar*
[4] *Powermark*
[5] *First Solar*
[6] *Mitsui Chemical*
[7] *Amonix*
[8] *National Renewable Energy Laboratory*

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC

This report is available at no cost from the National Renewable Energy Laboratory (NREL) at www.nrel.gov/publications.

Technical Report
NREL/TP-5J00-63742
March 2015

Contract No. DE-AC36-08GO28308
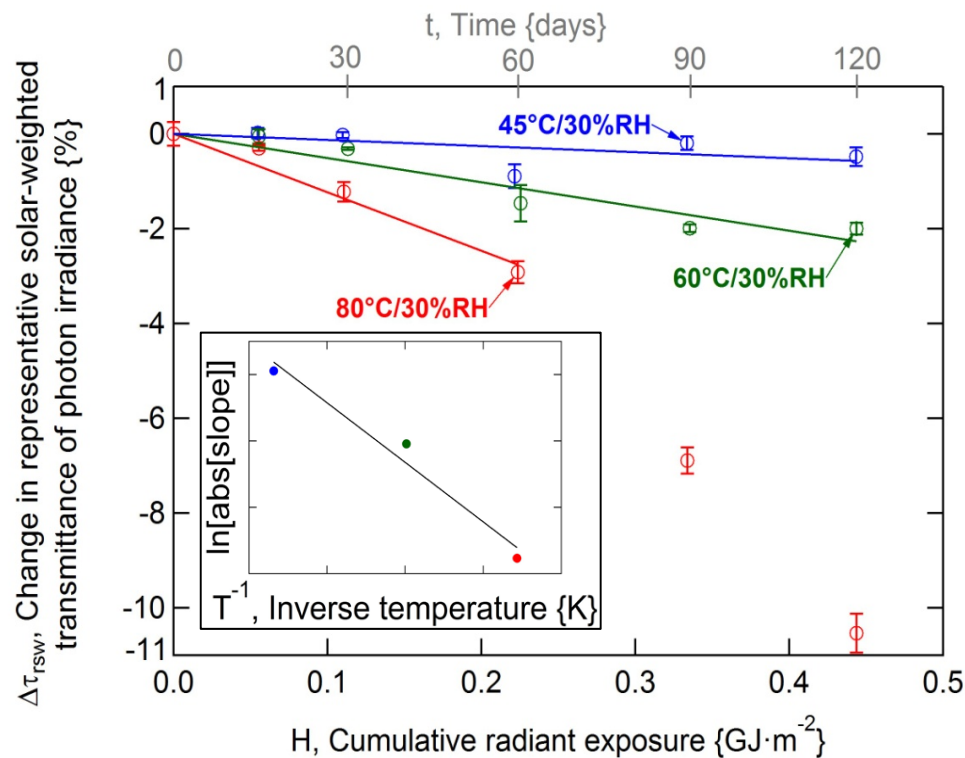
- Goal is to take ISO 9001 a level deeper by adding PV-specific requirements

- Guide for PV Quality Management System http://www.nrel.gov/docs/fy15osti/63742.pdf

- Builds on Japanese standard*

- Expect publication in early 2016 – next need to launch

*JIS Q8901-2012 Terrestrial photovoltaic (PV) modules-Requirement for reliability assurance system (design, production, and product warranty)

Recent progress – quantitative studies

- **PVQAT study quantifies temperature dependence of UV-induced discoloration**

Miller, et al, PVSC 2015

Proposed climate-specific test – details under discussion

Initial inspection and baseline testing

Test leg #1
5 modules

5 modules

Control
1 modules

Materials Test

IEC 61215 Thermal cycle

IEC 61215 UV/DML/TC/HF

Control

Longer UV for discoloration (not mechanical properties that require full module)

Additional thermal cycles
 - include bypass diodes
 - hang weight from j-box

Longer UV;
Repeat DML/TC/HF
Then DH

Final inspection and baseline testing

System Verification – IECRE

IEC has formed IECRE for Renewable Energy System verification

PV Standards for testing all aspects of PV Systems:

- Component quality (IEC 61215, IEC 61730, IEC 62891, IEC 62109, IEC 62093, IEC 61439, IEC 60947, IEC 60269, new?)
- System:
    - Design (IEC TS 62548, IEC 60364-7-712, IEC 61634-9-1, IEC 62738)
    - Installation (IEC 62548, IEC 60364-7-712)
    - Commissioning (IEC 62446)
    - Operation (First draft completed)
- Training of personnel

Plan to be able to issue first certificates in 2016

IECRE value - vision

- **Reliable components**
  - Type testing
  - Quality management (IEC 62941)
- **System installation**
  - Quality management of installation
- **Consistent metrics for system performance**
  - Define annual prediction based on stated annual irradiation
  - Measure annual electricity produced and availability
  - Report performance index and availability along with measured

Saudi Arabia has adopted tests for hot climates

- **Start with IEC Qualification tests**
- **Add "Qualification Plus" test**
- **Increase temperatures for some tests**

- **India, Mexico, Kuwait, Qatar, United Arab Emirates, and others are seeking to work together to define an international standard for hot climates**
- **PVQAT and IEC will facilitate and implement**

Conclusion

PVQAT is on path to comprehensive technical standards
1. Durable design
2. Consistent manufacturing
3. System verification

Available in 2016

Proposals are being developed:
1. Climate-specific test protocol
2. PV-specific QMS
3. Oversight of QMS for installation
4. Consistent performance metrics

www.pvqat.org

sarah.kurtz@nrel.gov

Thank you to dozens of volunteers!

Bankable PV

Standards Standards Standards

Durable design   Consistent manufacturing   System verification