Summary of the San Francisco Forum

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Aims

To create a QA rating system to differentiate the relative durability of module designs

1) Compare module designs
2) Provide a basis for manufacturers' warranties
3) Provide investors with confidence in their investments
4) Provide data for setting insurance rates

To create a guideline for factory inspections of the QA system used during manufacturing.

Hosted by

NREL
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SEMI PV Group

International PV Module Quality Assurance Forum

International PV Module QA Forum was held on July 15-16, 2011, at the Moscone Center in San Francisco, CA, USA.

Agenda

Session **I**. Defining the Need
Session **II**. Existing Standards
Session **III**. Regional and Application-Specific Requirements
Session **IV**. Proposed New Tests
Session **V**. Proposals for Manufacturing QA Guideline and QA Rating Methodology
Including breakout discussions
Session **VI**. Prioritization of Failure/Degradation Mechanisms
Including breakout discussions

The detailed agenda and presentations made over the two days are available on the forum websites in English and Japanese;
http://www.nrel.gov/ce/ipvmqa_forum/
http://unit.aist.go.jp/rcpvt/ci/update/2011/qaforum_index.html

Manufacturing process QA

- A manufacturing QA guideline for defining factory controls and guiding inspections will be developed to become a part of the certification process.
- A PV QA Task Group is being formed to:
  - *Work with IEC to define factory inspections and retest guidelines that would become part of the IEC 61215 certification process*
  - *Work with SEMI and other standards organizations to develop standards for material, component and equipment qualification and in-line testing*

QA Rating Methodology

The breakout discussions of Session V identified a list of important stresses and added any missing stresses to those already in the table.

Stress	Rating system	Environmental definition
Voltage	Numeric value for maximum system voltage	System voltage
Temperature	Class Hottest, Hot, Warm, Cool	Use Arrhenius behavior and create maps for rack and roof mounting
Thermal cycling	Class A, B	Thermal cycling comes from changes in irradiance and weather
Humidity	Class Humid, Dry	Average humidity; make map
Snow	Numeric rating for kg of static load	Snow load from local building code
Salt spray	Numeric severity rating	Distance from ocean
Hail	Numeric ratin ball	lls experienced locally
UV	Class A, B	tes high-altitude or high- site
Wind	Numeric rating for maximum wind gust	Maximum wind speed seen during gusts
Transportation	Rough/Smooth	Paved/unpaved roads, train, etc.
Farmland	Pass/Fail	Ammonia in agricultural area

To be developed at the Breakout discussion

Session **VI**. Prioritization of Failure/Degradation Mechanisms

The breakout discussions of Session VI concentrated on a priority list of known failure and degradation mechanisms.

It will not be possible to test for every failure mechanism; as such the breakout discussions of session VI prioritized the failure and degradation mechanisms that are most important in determining a module's service life.

The PV QA Task Force was formed at the conclusion of the Forum and consists of five Task Groups;

Task Group 1: PV QA Guideline for Manufacturing Consistency (leader Ivan Sinicco)

Task Group 2: PV QA Testing for Thermal and mechanical fatigue including vibration (leader Chris Flueckiger)

Task Group 3: PV QA Testing for Humidity, temperature, and voltage (leaders John Wohlgemuth and Neelkanth Dhere)

Task Group 4: PV QA Testing for Diodes, shading and reverse bias (leaders Vivek Gade and Paul Robusto)

Task Group 5: PV QA Testing for UV, temperature and humidity (leader Michael Köhl)

Want to Volunteer!

To volunteer for **Task Group 1**, individuals may contact the leader directly or request access to the website at

http://pvqataskforcemanufacturingqa.pbworks.com/

To volunteer for **Task Groups 2-5**, individuals may contact the leaders directly or request access to the website at

http://pvqataskforceqarating.pbworks.com/

Roadmap-Goals and Milestones

- Goals: to create a single set of QA standards and guidelines.
  - A QA rating system
  - A manufacturing QA guideline
- Milestones (interim):
  - QA standards and guidelines for Si PV Modules
    - Task Group proposal (s) to IEC TC82 WG2 — Spring 2012
    - Task Group proposal (s) to IEC TC82 WG2 — Fall, 2012
    - Testing under the international QA standard begins — Spring 2012.

- Meetings:
  - #1 International QA Forum @ San Francisco, USA — Jul.15-16, 2011
  - Introductory EU meeting @ Hamburg, Germany — Sep.8, 2011
  - APEC meeting @ San Francisco, USA — Sep. 15-16, 2011
  - APEC meeting @ Taipei, Taiwan — Oct. 12-13, 2011
  - #2 International QA Forum @ Tokyo, Japan — Dec. 7, 2011
  - #3 International QA Forum @ Europe — Spring, 2012

Executive Summary

- PV Module QA is one of the most critical challenges for healthy growth of the industry; Improved PV QA reduces risks for PV system users and investors.
- A single international approach is needed to find effective solutions. International PV Module QA Forum, managed jointly by NREL, AIST, and EU DG-JRC, to define the need and create an action plan.
- International development of a QA rating system and a guideline for a QA system for the manufacture of crystalline Si PV modules are of highest priority.
- The PV QA Task Force (currently with 5 Task Groups) is being formed to tackle these tasks and will work with IEC, SEMI and other standards organizations

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- Further work will be required to extend this approach to thin-film and CPV testing and to quantify the meaning of the test results.