Project Update on PV AFCI, PV Plastics, US Adoption of IEC 61730

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PV Arc Fault Interrupter (AFCI)

- The PV AFCI Working Group met in April of 2009.
- Draft Outline of Investigation for Photovoltaic (PV) DC Arc-Fault Circuit-Interrupters was issued on June 5, 2009 and this draft was posted on UL's Collaborative Standards Development System (CSDS).
- To date no comments to the draft have been posted.

Proposed Tests Include

- Series arcing tests pertaining to connector connection arcing
- Laminated module bus bar lap joint failures
- Loose terminal connections
- Point contact arcing
- Unwanted tripping tests
- Operation inhibition tests
- Note that optional wet track parallel arcing tests were also included for mfrs that choose to provide parallel protection, even thought described (proposals to 2011 NEC 690 for PV AFCI protection only requires series protection.

UL Testing of PV Arc Faults

- PV connectors
- PV inverters
- Laminated Lap Joints

R&D Tests

- Arc testing with pin and sleeve wire connections.
- Testing with and without various inverters.
  - Different inverter designs will react and interact differently with arcing faults due to MPPT functions.
- Working to define the pass/fail criteria to protect typical PV connector from fire hazards.
- UL is collaborating with SANDIA and other PV AFCI Ad Hoc members.

US Adoption of IEC 61730

As a result of several years of IEC 61730 applications experience, it is undergoing significant revisions to:

- Correct errors,
- Clarify and address ambiguities
- Address new technologies
- Address new materials and
- Address new mfg techniques

Revisions to IEC 61730

- As written today a UL 61730 evaluation will require retesting of most existing UL1703 Listed modules
- The upcoming IEC 61730 revisions will also result in retesting of the existing IEC certified modules

Therefore…

- To reduce unnecessary re-evaluation, file reviews and retesting on the US PV market, the UL61730 will be based upon the upcoming revised IEC 61730 once the IEC agrees upon the new requirements.

IEC / UL Plastics Revisions

- As we are participating in both the US and IEC standards panels, we are attempting to harmonize the new PV materials requirements.
  - Differentiate between cell encapsulants and j-box potting compounds.
  - Add requirements for cell encapsulants
  - Long Term aging of polymeric materials (RTI vs RTE)
  - Increased weatherometer testing of PV materials
  - Eliminate HB and V-2 materials from to prevent flaming droplets
  - Add requirements for polymeric materials used in frames or mounting systems.

Plastics Sub Groups

- Task groups for both encapsulants and backskins.
- Teleconferences combined for both Backskins and Encapsulants groups to identify common PV: operational parameters, risks, failure modes and mechanisms for PV
- Many new plastics experts

Plastics New Global PV Polymeric Materials Sub Groups Under WG2

- Now to include international polymeric materials experts outside of WG2 for the following two task groups:
  - Backsheets
  - Encapsulants
- Upcoming meeting in early 2010
- Work with NREL and international experts.

IEC 61730-1 Revision Work

- Clarify scope includes up to 1500V
- Add new section for definitions
- Change voltage and current limits for “low voltage” and “limited energy” modules.
- Dissimilar metal combinations guidance in annex
- Metal coating definitions
- Plastics revisions, lots and lots of plastics revisions

IEC 61730-1 Revision Work

- Amendment - out for ballot.
- Second Edition – under development

Electric Shock Limits Revised to Match Wet Limits

- The Voltage and Current limits are to be derived from IEC 60950 and IEC 61010 for wet location, accessible voltage limits and current limits for Inherently Limited Power Sources. These are similar to US NEC and UL requirements

Grounding

- Dissimilar metals
- Wire size and terminal based upon overcurrent protection.
- IEC ground symbol

Creepage and Clearance Tables

- Need to fix improper clearances that do not correlate to themselves or other standards
- Need to add creepages to address Internal J-box over surface electrical spacings

UL61730 Bottom Line

- This US national standards change will create a significant impact on the US PV industry. Therefore we want to make sure the base IEC standard is corrected and updated before we implement it in the USA.

Questions?

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