

Comment on Proposal 4-302 (Log #3157 NEC-P04)

690.35 (C) Ground-Fault Protection for Ungrounded Photovoltaic Power Systems

Comment submitted by: Mark J. Albers, SunPower Corporation, on behalf of the PV Industry Forum 690.35 Task Group **

Text from proposal 4-302 with proposed modification:

(C) Ground-Fault Protection. All photovoltaic source and output circuits shall be provided with a ground-fault protection device or system that complies with (1) through (4):

~~(1) Determine the pv input circuit has isolation prior to export of current~~

(1) Detects ground fault(s) in the PV array DC current carrying conductors and components

(2) Indicates that a ground fault has occurred

(3) Automatically disconnects all conductors or causes the inverter or charge controller connected to the faulted circuit to automatically cease supplying power to output circuits.

(4) Be listed for providing PV ground fault protection.

Legend: Black text is currently accepted language for the 2014 NEC. The red text is changes proposed in this comment.

Substantiation:

Inadequate ground fault protection has caused several fires in PV systems over the last half decade. Clearly ground fault protection (GFP) capabilities need to be improved in new PV systems. As result, we applaud and support the Code Making Panel in addressing this important issue. However, the newly proposed 2014 language does raise very serious concerns. It requires the use of insulation resistance measurements in all systems at some unknown frequency. The statement of "... prior to the export of current" is not enforceable because it is unclear how frequently this test would have to be performed. It could be interpreted to be: 1) before the system is turned on for the first time; 2) every night; or 3) every time the inverter starts up. Furthermore, the new language could be interpreted to mean that the system needs to test for a ground fault only at this undefined time, leaving the system free to operate with a ground fault in between tests.

Additionally, insulation resistance measurements are not universally effective and will not be the best GFP for all PV system designs. Moreover, as new technologies come to market, GFP methods superior to insulation resistance measurements may emerge. We want the 2014 NEC to address the inadequacies of present GFP once and for all and not legislate the use of a specific solution. Additionally, we propose to add a requirement that the GFP be listed for protection PV systems. This will allow the inspector to rely upon the listing to verify the functionality of this extremely important protection system, which will improve the enforceability of the GFP requirements. For these reasons, we request that you adapt 690.35(C) to read as modified above. This will stimulate UL 1741 to be updated to reflect the needs for improved GFP in PV systems and to ensure that the new functional requirements are met without requiring a specific implementation/solution.

** A SEIA/PV Industry Forum meeting was held at UL in Northbrook on August 27, 2012. A 690.35 task group was formed to develop this comment/proposal by consensus. The task group includes representatives from:

- BEW Engineering (Greg Ball)
- First Solar (Robert Rynar)
- REFUSol Incorporated (Tilak Gopalarathnam)
- SunPower Corporation (Mark Albers)
- UL (Tim Zgonena)