National Electrical Code
Requirements For
Grounding PV Systems
A SOLARABCS Paper

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To Ground or Not to Ground
That was the Question

The NEC was first published in 1897. Thomas Edison was generating Direct Current electricity at that time. Grounding was debated from 1892 to 1913 and still is.

The 1913 NEC had several grounding requirements—mostly AC. The 2011 NEC has 31 pages on grounding plus Art 690 requirements.

Much of the Rest of the World (ROW) elected to not ground electrical systems. For the most part, the NEC requires that most electrical systems be grounded.

However, Art 690 allows both grounded and ungrounded PV systems.
Grounding?
Definitions Lead to Understanding

Circuit grounding >> The **grounded** conductor

Equipment grounding >> Equipment-**grounding** conductors (EGC)

ROW>> Protective Earth (PE)

**Grounding** electrode >> Connection to Earth

**Grounding**-electrode conductors (GEC) >> Grounding system to Electrode
Do We Have Problems?

Complex and in some cases unclear Code requirements

Unclear standards requirements

Inconsistent application of standards >> Differing hardware

Insufficient training of Installers

Insufficient experience/training of Inspectors

Murphy
The Paper

Definitions
Equipment-grounding requirements
System grounding requirements

Ground Fault Protection

AC PV Modules and Microinverters

Ungrounded Systems

The Connection to Mother Earth

NEC vs. NESC
Recent Progress in Grounding

May 2012 Release of ANSI/UL 1703

Significantly enhanced module grounding & mounting requirements
Common hardware no longer allowed unless provided
Must follow instructions provided with grounding devices
Must be grounded per instructions or listing not valid
Must be mounted per instructions or listing not valid
Instruction manual and tech notes must be reviewed by NRTL

Proposed for UL 1703 and UL 2703

Racks may not be used to mount or ground modules
unless tested with the specific module
GROUNDING

An important key to Public Safety for the next 50+ years