

Case Study: Arc Prevented

New Jersey, USA

Location: New Jersey, USA
 System Size: 50kW
 Modules: (360) 175-mono
 Inverter: (1) 50kW

The Challenge

On the morning of 11 Feb 2013 as snow was melting off the array, the optimizer on module H5 detected three consecutive over-voltage events. This signature is indicative of a broken trace in a solar module. Without module-level electronics broken traces can go undetected and can create fire hazards in the form of arcing if reverse current conditions are presents.

Reverse Current Leads to Arcing:

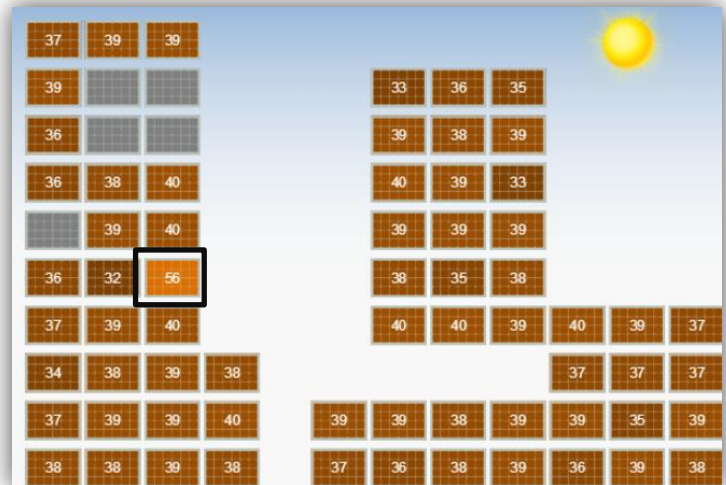
Under normal operating conditions, a broken trace behaves similarly to a broken bypass diode. However, when there is a harsh mismatch between strings (as in heavy shade or melting snow) the voltage runs in reverse through the weaker string. This is especially problematic when the inverter is not yet pulling current because the high voltage conducts through the cells and traces. If a trace is broken in this scenario it will lead to a high voltage low current arc inside the module.

The Solution

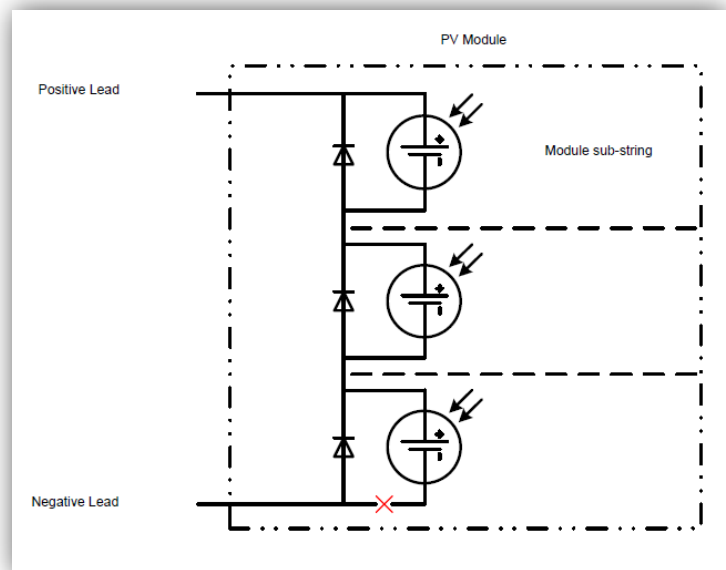
Tigo Energy’s optimizer system detects safety hazards and implements a specific response for each type of event. In this instance, the MMU responded to repeated over-voltage events. Tigo Energy’s Management Unit (MMU) attempts to restart after one or two high-voltage events to confirm sustained high-voltage. After a third event, the MMU disables the system as part of the embedded safety features. Once the MMU disables the system, the system owner, installer and Tigo Support team are alerted to the problem. The system can then be diagnosed and must be manually turned back on once the safety hazard has been addressed. On this array, the MMU utilized this exact protocol to ensure the system was safe.

The Results—Arc Prevention

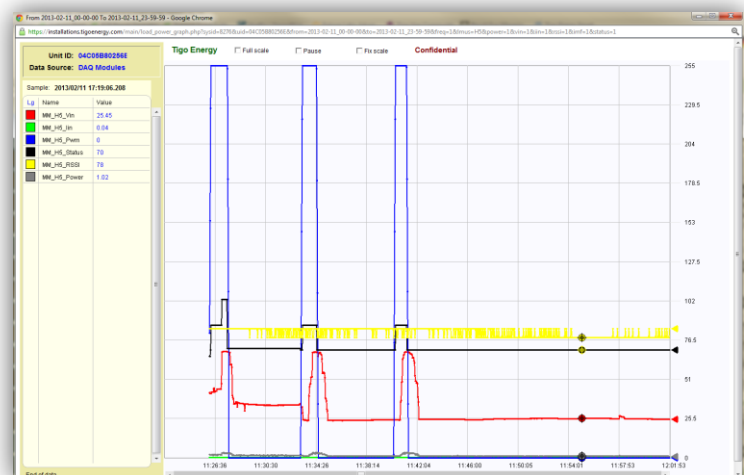
Using Tigo Energy’s module-level monitoring and alert system, a potentially dangerous situation was detected and diagnosed. The MMU effectively detected the signature of a broken trace and shut down the system. The Tigo Energy system prevented arcing and a potential fire.



Over voltage event on Tigo Energy summary screen
 Gray modules are covered in snow



Electrical Behavior of a broken trace



Over voltage event 11 FEB—11:27-11:45