PV Rapid Shutdown Summary

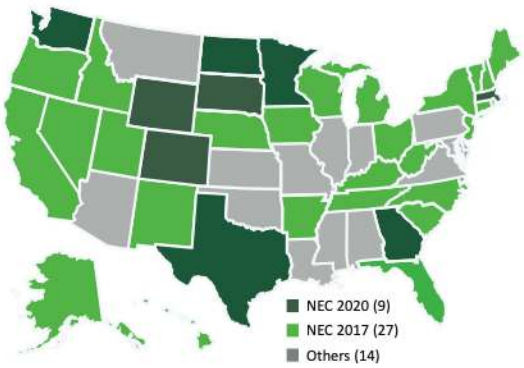
For the US National Electrical Code

Module level rapid shutdown required across US

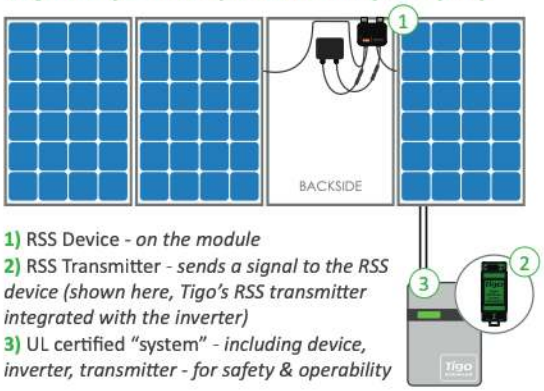
A PVRSS (Photovoltaic Rapid Shutdown System) provides a means for firefighters and first responders to stop or reduce the voltage from the PV array, so they can stay as safe as possible from electrical hazards while still doing their jobs efficiently.

Rapid shutdown is a requirement as part of the U.S. National Electric Code® (NEC®). The majority of US states (36 and growing, shown in green on the right) have adopted NEC 2017 or NEC 2020, which **require new rooftop PV systems to have module level shutdown capability.**

Tigo's TS4-A-O, TS4-A-S, TS4-A-F, and TS4-A-2F products all meet rapid shutdown compliance when paired with a UL PVRSS certified inverter



Major components rapid shutdown system (RSS)



1) RSS Device - *on the module*
2) RSS Transmitter - *sends a signal to the RSS device (shown here, Tigo's RSS transmitter integrated with the inverter)*
3) UL certified "system" - *including device, inverter, transmitter - for safety & operability*

Major functional requirements

The PV array boundary is defined as 1ft (305mm) from the array in all directions. Within 30 seconds of rapid shutdown initiation, controlled conductors must be limited to:

- Not more than 30 volts outside the array boundary
- Not more than 80 volts inside the array boundary

How it works: a transmitter sends a keep alive signal to a rapid shutdown device that is connected to each PV module. When the transmitter loses power, the keep alive signal stops. This initiates module level rapid shutdown. The key components required to meet these requirements are shown in the graphic on the left.

Key certification requirements

NEC 690.12 requires rapid shutdown equipment (PVRSE) and systems (PVRSS) be UL Listed (NRTL) for the purposes of rapid shutdown.

- PVRSE – Equipment intended to be used in a PVRSS to initiate, disconnect, isolate or attenuate the controlled conductors of a PV system
- PVRSS – System consisting of PVRSE intended to initiate, in addition to disconnect, isolate or attenuate the controlled conductors of a PV system

The PVRSS system level rapid shutdown certification requires the inverter manufacturer as well as the rapid shutdown device manufacturer, to submit for compliance, compatibility, and testing that the two devices work together as a system to safely and effectively provide rapid shutdown compliance in accordance with the guidelines designated by NEC.

> *"When multiple pieces of PV rapid shutdown equipment are used in an overall system configuration, to be Certified (Listed) it is required that the combination be evaluated and tested."* - UL

For further reading:

NEC 2017 and NEC 2020
UL Whitepaper on Rapid Shutdown
UL Q&A regarding Rapid Shutdown
Current state adoption levels for NEC

Tigo®

Tigo is the leader in module level shutdown technology and has been delivering reliable module level power electronics (MLPE) in the PV industry since 2007. Contact us for more information.

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