

# 60-Cell Solar Modules & Off-Grid Applications

*The following is a discussion on the best practices of 60-Cell Photovoltaic modules in off-grid applications using batteries. SunWize recommends always using MPPT controllers when charging batteries using 60-cell Modules.*

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## CHARGING BATTERIES WITH 60-CELL SOLAR MODULES IN OFF-GRID APPLICATIONS

Traditional 36-Cell (nominal 12V) and 72-Cell (nominal 24V) solar modules work well in battery charging applications using traditional PWM charge controllers as long as the nominal voltage of the array and battery bank matches. For example, two 36-Cell modules wired in series (nominal 24V) will properly charge two 12V solar batteries wired in series (nominal 24V).

The actual solar module voltage is somewhat higher on 36-Cell (12V nominal) and 72-Cell modules (24V nominal) than the nominal voltage nameplate rating, for instance the max power voltage,  $V_{mp}$ , of a typical 320W “24V” solar module is actually 36.8V. The difference between the higher voltage solar module (36.8V) and battery bank (approximately 24V-28V) creates a voltage differential, allowing current to flow from the solar array to the battery bank, thus charging your battery banks with energy!

With the introduction and popularity of 60-Cell modules in many applications (both on-grid and off-grid), it's important to know there are critical differences between module types. Solar applications that utilize batteries need to be aware that 60-Cell solar modules do NOT have sufficiently high voltages to properly charge batteries using PWM charge controllers, which will result in damaged batteries and greatly reduced battery life.

SunWize strongly recommends that when using 60-Cell solar modules in battery applications to **ALWAYS** use MPPT charge controllers so that there is sufficient voltage to fully charge your batteries, which will help prevent premature battery failure.

Rather than go into this topic in great detail, we suggest reading Morningstar Corporation's white paper on this topic, which covers it thoroughly.

## Morningstar 60-Cell Module Reference White Paper

<http://support.morningstarcorp.com/wp-content/uploads/2014/07/tech-tip-60-cell-PV-module-sizing.pdf>

### **Online String Sizing Tools**

Another indispensable tool when sizing and designing solar arrays and charge controllers are online String Sizing tools. Many charge controller manufacturers have their own string designing tools on their websites. Morningstar Corporation has an excellent string sizing guide we recommend using.

Morningstar String Sizing Guide

<http://string-calculator.morningstarcorp.com/>