Application Note - Compatibility of Bi-facial Modules with SolarEdge Power Optimizers

Version History

- Version 1.5 (Jan 2022) – Added new part numbers for S-Series Commercial Power Optimizers
- Version 1.4 (Sep 2021) – Added new part numbers for S-Series Residential Power Optimizers
- Version 1.3 (Sep 2020) – Added new part numbers
- Version 1.2 (Jan 2020) – Updated policy guidelines
- Version 1.1 (Jan 2019) – Added clarification about temperature co-efficiencies
- Version 1.0 (Nov 2018) – Initial release

NOTE

This document is valid for:

- Power Optimizers which have a part number that matches the format - Sxxx-xxxxxx or Sxxxx-xxxxxx
- Power Optimizers with the following "4" prefix in its part number - Pxxx-**4**xxxxxx
- Power Optimizers with part numbers P401-5XXXXXX and MXXXX-1XXXXXXX
- Power Optimizers manufactured starting from working week 42 of 2019, as indicated in the power optimizer's serial number. Example: S/N SJ**5019**A-xxxxxxxx (working week 50 in 2019)

Background

Bi-facial PV modules produce solar power from both sides of the panel by exposing both front side and backside of the solar cells. The added energy due to the rear side is usually referred as the "back side power gain". The actual gain of the PV bi-facial module depends on many parameters, including the type of installation and the reflection factor of the ground/roof.

This document describes the method of selecting the right power optimizer to be used with bi-facial modules.

Bi-facial modules and Power Optimizers

Selecting the correct power optimizer depends on the electrical characteristics of a given module. When designing a solar system with bi-facial modules, it is challenging to estimate the added gain from the backside of the modules, especially due to the non-uniformity nature of the irradiance from the backside of the module.

The added backside gain is highly influenced by various conditions such as geographic location, temperature, tilt of the modules, surface behind the modules and so forth.

In order to provide design flexibility and support a wide range of modules, SolarEdge power optimizers include a unique feature, which is capable of handling the wide range of current/power expected by a bi-facial module even in extreme cases such as those mentioned above.

Power Optimizer Selection Guidelines

When using bi-facial modules, SolarEdge allows selecting power optimizers that support the maximum power, current and voltage of the modules, taking into account the front side electrical values (@ 0% back side gain) as stated in the modules datasheet (in addition to accounting for the location's temperature using the module temperature co-efficiencies).

NOTE

The power optimizer product warranty will be voided in case that the selected module power, voltage or current at 0% backside gain is above the specifications of the selected power optimizers.

System Design

When designing a system (manually, using the SolarEdge Designer tool, or third party design tools), module STC power, as stated in the module datasheet, should be used without taking into account the potential bi-facial backside power gain.

Example:

- Bi-facial module specifications:
  - Module power @ STC (0% backside gain): 400W
  - Module power @ STC (with 30% bifacial gain): 520W
  - Module open circuit voltage @STC: 49.7
  - Module short circuit current @STC: 10.22A
  - Module Isc @ location max temperature: 0.03 [%/°C]
  - Module Voc @ location min temperature: -0.27 [%/°C]
- Selected power optimizer (for series connection of 2 modules):
  - Power optimizer Part Number: P850-4xxxxxx
  - Example: Serial Number SJ5019A-xxxxxxxx (working week 50 in 2019)
  - Max power = 850W (greater than 2 x 400W = 800W)
  - Max input voltage = 125Vdc (greater than 2 x 49.7Vdc = 99.4Vdc)
  - Max Isc = 12.5Adc (greater than 10.22Adc)
- Selected inverter:
  - AC power: 25kW
- Design considerations:
  - Maximum string power: 15,750W (for 230/400V grid)
  - Inverter maximum DC power @ STC (135% oversizing): 33,750W
  - Max. number of modules in a string: 15,750W/400W = 39 (20 power optimizers)
  - Max. number of modules connected to the inverter: 33,750W/400W = 84 (42 power optimizers)