Application Note - SolarEdge String Sizing, North America

Revision History

- Version 1.1 , February 2018:
    - Added Design rules for new inverter models: SE30KUS, SE43.2KUS, SE66.6KUS, SE100KUS
    - Added design rules for power optimizer models: P405, P505
    - Added note about meeting rapid shutdown requirements
- Version 1.0, June 2017 - Initial release

Introduction

There are two primary criteria for string sizing in a SolarEdge system. Maximum (STC) power per string, and minimum and maximum string lengths. This document explains how these values are determined and provides the string sizing rules for the different inverter and optimizer combinations. For additional system design information refer to the inverter and optimizer datasheets.

Sizing rules typically depend on the type of inverters and optimizers used:

- Inverters: single phase or three phase
- Optimizers: general or commercial

Commercial optimizers can be used only with three phase inverters, while general optimizers can be used with both single and three phase inverters.

General optimizers typically have one PV module per optimizer, and commercial optimizers typically have two modules. However these are not fixed requirements and as long as the cumulative power and voltage/current of the modules meets the optimizer specifications as detailed in the datasheet, connecting additional modules per optimizer is permitted (for example connecting 2x120W modules in series to a single P300 general optimizer). Refer to the Connecting Multiple Modules to Power Optimizers application note for details.

NOTE

In the context of this document, string length refers to the number of optimizers and modules in the string. When designing the installation make sure to maintain the maximum **physical** string length as well: The total cable length of the string (excluding power optimizers' conductors) should not exceed 1000ft./300m from DC+ to DC- of the inverter (2,300ft./700m when using the SE14.4KUS, SE30KUS,SE33.3KUS, SE43.2KUS, SE66.6KUS and SE100KUS inverters).

Maximum String Power

Maximum string power is simply the "Inverter Nominal DC Input Voltage" multiplied by the "Optimizer Maximum Output Current". These values can be found on the inverter and optimizer datasheets respectively. Table 1 details the values of available products.

Inverter Model	AC Grid Voltage [V]	Inverter Nominal DC Input Voltage [V]	Optimizer Max Output Current [A]	Maximum String Power [Wp]
Single phase inverters SE3000A-US – SE11400A-US	240	350	15	5,250
Single phase HD-Wave Inverters SE3000H-US – SE6000H-US	240	380	15	5,700
Single phase HD-Wave Inverter SE7600H-US	240	400	15	6000
SE9KUS, SE14.4KUS, SE43.2KUS	120/208	400	15	6000 (or 6500 in some cases[1])
			18 (P800)	7200

SE10KUS, SE20KUS, SE33.3KUS, SE66.6KUS, SE100KUS	277/480	850	15	12750 (or 15000 in some cases[2])
			18 (P800)	15300

Table 1: Maximum string power

[1] For SE14.4KUS/SE43.2KUS, when used with P600/P700/P730, it is allowed to install up to 6500W per string when 3 strings are (3 strings per unit for SE43.2KUS) connected to the inverter and when the maximum power difference between the strings is up to 1000W.

[2] For SE33.3KUS/SE66.6KUS/SE100KUS, when used with P600/P700/P730, it is allowed to install up to 15000W per string when 3 strings are connected to the inverter (3 strings per unit for SE66.6KUS/SE100KUS), and when the maximum power difference between the strings is up to 2000W.

Minimum and Maximum String Length

The minimum number of optimizers per string depends on the "Maximum Output Voltage" of the optimizer and on the "Nominal DC Input Voltage" of the inverter: the optimizers connected in series in the string must be able to achieve the inverter's nominal voltage. There is a buffer added to ensure the operability of the string also in some shading or fault conditions.

The maximum number of optimizers per string was established to ensure proper communications between the optimizers and inverter.

NOTE

When connecting multiple modules to commercial optimizers, in case of an odd number of modules per string it is allowed to connect one optimizer with one module, as long the minimum number of modules per string is maintained as well.

		General optimizers	Commercial optimizers
Single phase inverters	Minimum	8 (6 with P405/P505)	N/A
	Maximum	25	N/A
SE9KUS, SE14.4KUS, SE43.2KUS	Minimum	10 (8 with P405/P505)	8 optimizers, 16 modules
	Maximum	25	30 optimizers
SE10KUS, SE20KUS, SE33.3KUS, SE66.6KUS, SE100KUS	Minimum	18 (14 with P405/P505)	13 optimizers, 26 modules
	Maximum	50[1]	30 optimizers

Table 2: Minimum and maximum string length

[1] A string with more than 30 optimizers does not meet NEC rapid shutdown requirements; safety voltage will be above the 30V requirement.

NOTE

For SE43.2KUS/SE66.6KUS/SE100KUS, the DC bus of each unit is separate and not shared for all units. Therefore in addition to following the inverter design rules, each unit should follow the unit design rules as detailed in Technical Specifications.