Oversizing of SolarEdge Inverters, Technical Note

PV inverters are designed so that generated output power will not exceed the maximum AC power. In many cases, oversizing the inverter, i.e. having more DC power than the inverter AC power, may increase power output in lower light conditions, thus allowing the installation of a smaller inverter for a given DC array, or alternately, installation of more DC power for a given inverter. However, too much oversizing of the inverter may have a negative impact on the total energy produced and on the inverter lifetime. This document provides considerations for oversizing inverters and presents the maximum allowed DC/AC oversizing of SolarEdge inverters.

Introduction

PV modules do not consistently perform at their nominal output rating. The module output power is affected by the weather, the sun's position during the day/different seasons, local site conditions and array orientation. In addition, module output power may decrease due to aging, soiling and shade.

For an inverter with maximum AC power output ($P_{AC,max}$) connected to a PV array with STC power ($P_{DC\ (STC)}$), the inverter is oversized if:

$$P_{DC\ (STC)} > P_{AC,max}$$

DC/AC oversizing is defined as the ratio between the array STC power and the inverter AC power:

$$DC/AC\ oversizing\,(\%) = \frac{P_{DC\ (STC)}}{P_{AC,max}} * 100\%$$

The maximum AC power output of the inverter ($P_{AC,max}$) is the rated/nominal power of the inverter[1].

DC/AC Oversizing Considerations

The main reason to oversize an inverter is to drive it to its full capacity more often. This will **maximize power output in low light conditions, thus allowing the installation of a smaller inverter for a given DC array (or alternately installation of more DC power for a given inverter).** Oversizing the inverter is typically not a requirement, however an experienced PV designer may choose to oversize the inverter in order to maximize the power production, due to the following:

- Actual PV module power vs. module nominal power
- Financial considerations

On the other hand, too much oversizing may negatively affect the inverter power production: Inverters **are designed to generate output power up to a maximum AC power that cannot be exceeded,** and they limit (clip) the power when the actual produced DC power is higher than what the inverter can output. This results in loss of energy.

Oversizing the inverter also causes the inverter to operate at high power for longer periods, thus affecting its lifetime. Operating at higher power also increases inverter heating and may heat its surroundings. Inverters will reduce their peak power generation in case of overheating[2].

Maximum Oversizing of SolarEdge Inverters

SolarEdge allows DC/AC oversizing of up to 155%[3][4][5] depending on the inverter model according to below specifications:

- For Single Phase Inverters up to (and including) SE6000, DC/AC oversizing of up to 135% is allowed.

---

[1] As specified in the inverter datasheet.

[2] Refer to the inverter installation manual, (Inverter Power De-rating appendix) for details on how the temperature affects the inverter power generation.

[3] In all limits, the rated STC power of the modules should be used regardless of module location, tilt, or orientation.

[4] When using SolarEdge's Designer, DC/AC oversizing is based on the maximum achieved DC power, given the site location and PV array tilt and azimuth. This allows a connection of more modules in a string than possible using the STC specifications.

[5] In Germany, utilities sometimes require to limit the AC power to 70% of the DC power according to EEG 2012. In these installations, oversizing of 155% is allowed.

- For Single Phase Inverters with HD-Wave Technology up to (and including) SE10000H, DC/AC oversizing of up to 155% is allowed.

- For Three phase inverters up to (and including) SE17K on the 400V grid DC/AC oversizing of up to 135% is allowed.

- For Three phase inverters SE25K, SE30K and SE33.3K on the 400V grid DC/AC oversizing of up to 150% is allowed.

- For Three Phase Inverters with synergy technology up to (and including) SE82.8K on the 400V grid or up to (and including) SE100K on the 480V grid DC/AC oversizing of up to 135% is allowed.

Minimum sizing of SolarEdge Inverters:

a. When using Single phase and Three phase inverters in combination with 1:1 power optimizer, the DC sizing should be with at least 60% DC/AC ratio.

b. When using SE15K Three phase inverters with 2:1 power optimizer, the minimum DC power should be 11kW (at least 73% DC/AC ratio).

Oversizing of power optimizers is not allowed: Module STC as listed in the module datasheet must not exceed the power optimizer rated input DC power. Modules with up to +5% tolerance are allowed.

Some countries and grid operators prohibit inverter oversizing or limit oversizing to a lower value than the maximum allowed by SolarEdge. In these cases, always follow the local regulations.