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 maximum power of the inverter[1] or the SW limited power set by the user, whichever is lower.

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

Oversizing SolarEdge inverters is allowed and will not harm the power optimizers or the inverters as long as some limits are met:

SolarEdge allows DC/AC oversizing of up to 125%[3].

Oversizing of up to 135% is allowed in geographical places with moderate climate. These are defined as locations where the average yearly high temperature is below 25°C. See below a detailed list of cold locations.

Maintaining this limit ensures the lifetime of the inverter and is needed for keeping the inverter covered by its warranty. However, the information in this document is not a recommendation of optimal oversizing. In many cases, you may design with lower sizing to ensure that the inverter does not clip power. SolarEdge recommends performing proper simulations before oversizing the inverter. You may refer to the SolarEdge Site Designer application to estimate the generated energy from the installation and the energy that may be lost due to clipping.

There is no minimum power sizing limit of the SolarEdge inverters as long as minimal string length is kept.

[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.

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.

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.

Oversizing by Location

135% oversizing is allowed in the following countries:

Austria	France (Not including Corsica and offshore territories)	Portugal
Belgium	Germany[1]	Romania
Bulgaria	Greece	Slovakia
Canada	Italy	Slovenia
Croatia	Latvia	Spain
Czech	Lithuania	Sweden
Denmark	Netherlands (Not including offshore territories)	Switzerland
Estonia	Poland	

In the USA or Australia, refer to the next section.

In all other countries maximum allowed oversizing is 125%.

Oversizing in USA and Australia

Since maximum allowed oversizing depends on local temperatures, refer to the following maps for the maximum allowed oversizing in USA and Australia.

In locations where irradiance levels are frequently above 1000 W/m2, and in locations with moderate climate, the maximum allowed oversizing is 125%.

Figure 1: USA map

[1] 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.

Figure 2: Australia map