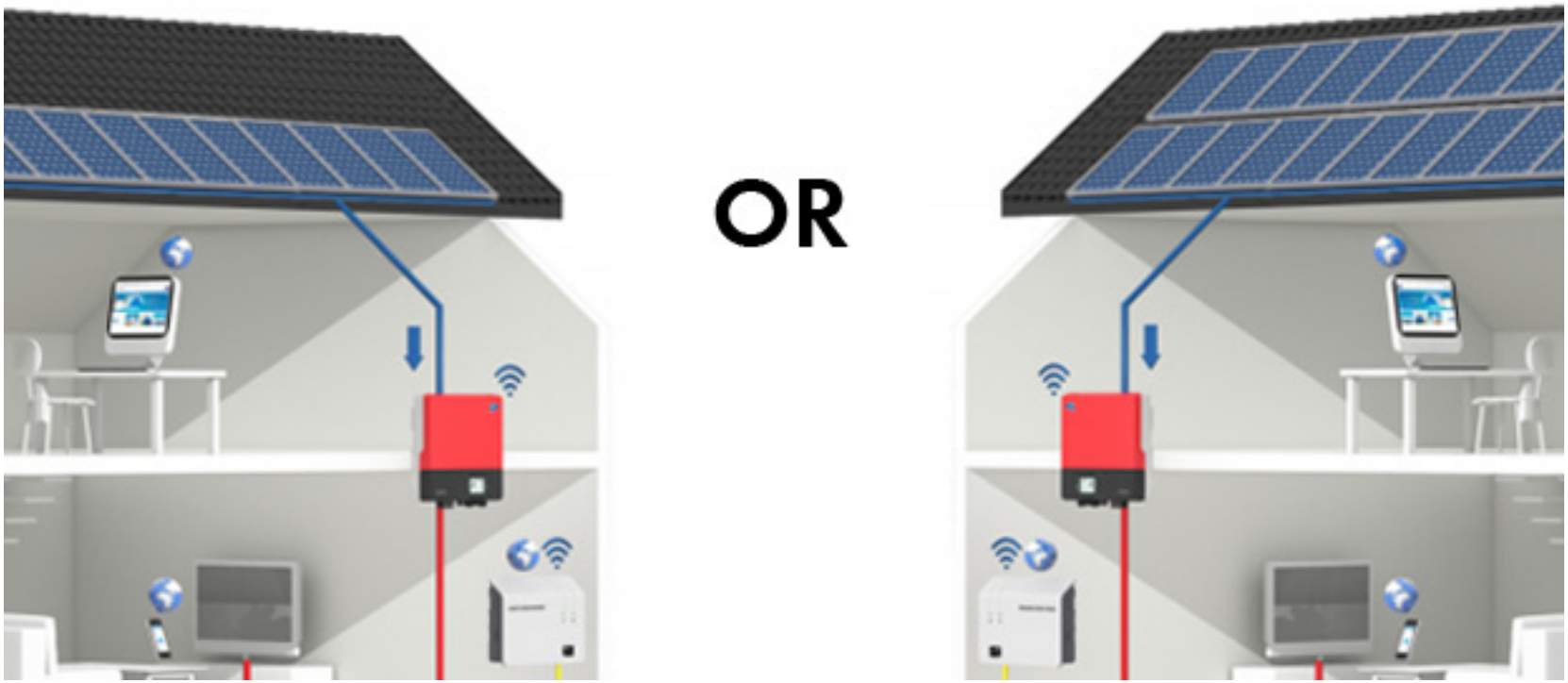
# 7 Reasons Why You Should Oversize Your PV Array

From Scott Partlin on December 15, 2015 in Category Technology with 6 Comments

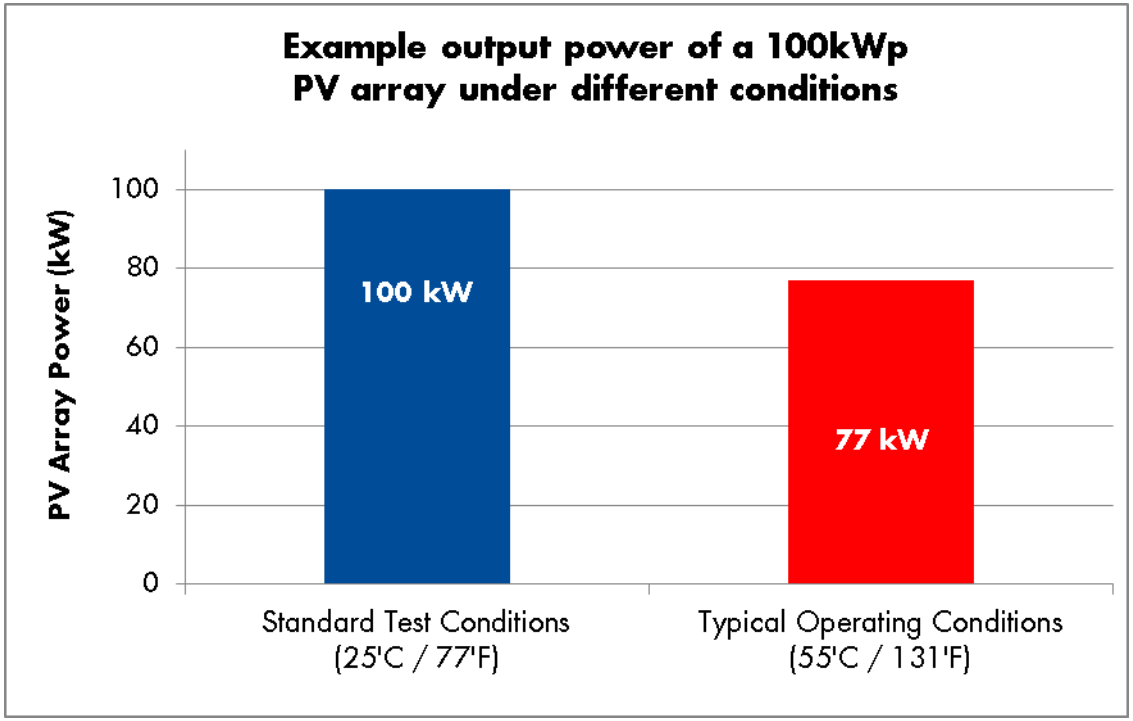



**Oversizing a PV array, also referred to as undersizing a PV inverter, involves installing a PV array with a rated DC power (measured @ Standard Test Conditions) which is larger than an inverter's rated AC output power (i.e. DC @ STC > AC). It can be a valuable tool for system designers seeking to deliver a maximum amount of energy at a lowest possible specific cost. Reasons for oversizing PV arrays and important factors to consider are summarised below.**

## 1. Make better use of the inverter's AC output

PV modules have ratings which define how they will operate. Their power, current and voltage ratings are all defined at Standard Test Conditions (STC). STC are defined as operating at:

- 25º Celsius
- Air Mass 1.5
- Insolation 1000W/m2

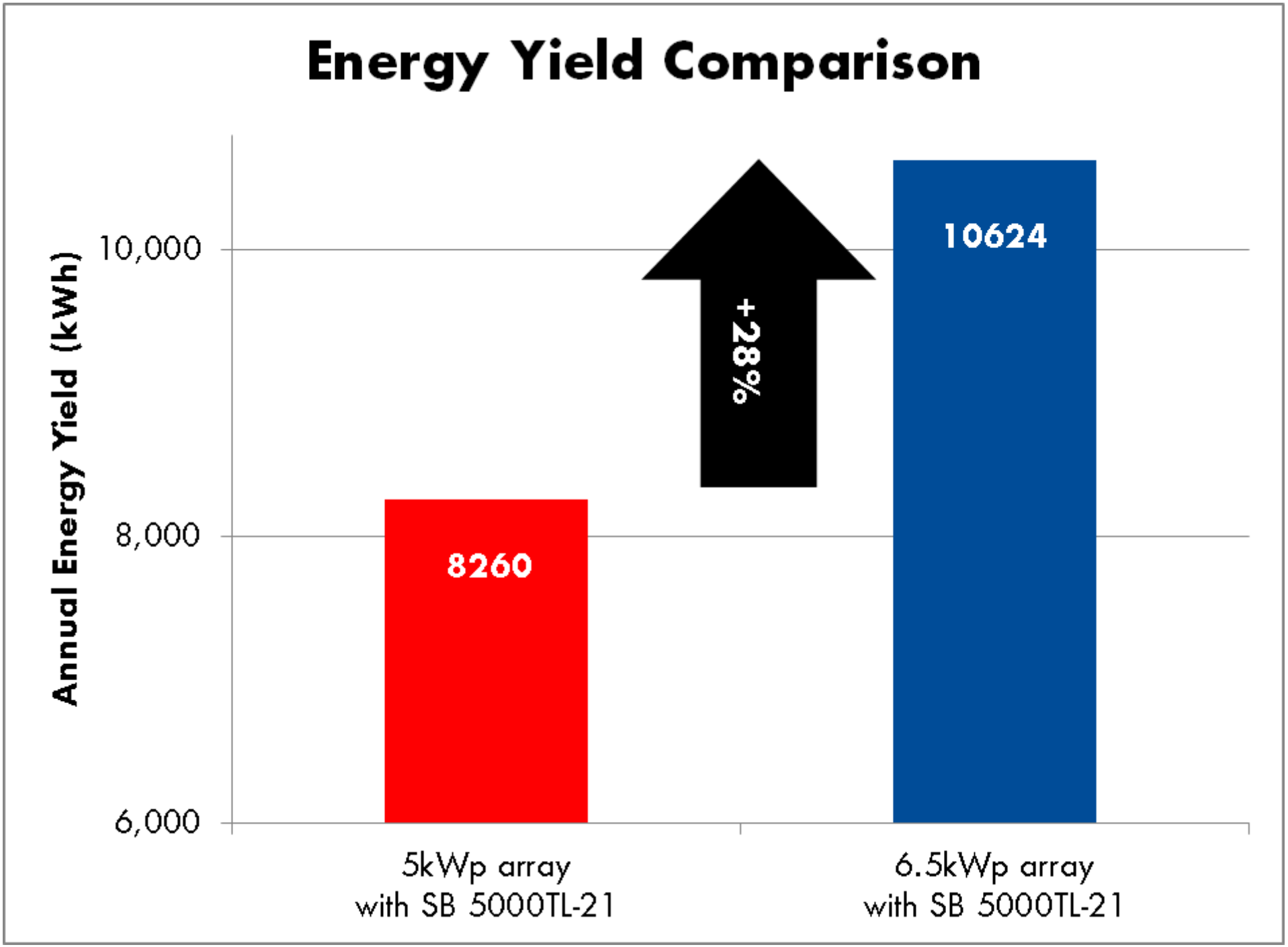



However it is obvious that a PV module would very rarely be subjected to these conditions under real world operating scenarios. Operating conditions can vary throughout the day and temperature can greatly impact the output power of a PV array. As the temperature of a PV array increases, its voltage and power will

decrease. Typically at solar noon (maximum solar irradiation), a PV array will have its STC output power de-rated by between 20-25%, due to the array operating above25ºC. That would mean that at solar noon on a clear sunny day a 100kWp PV array would probably be generating approximately 77kW. That's 23% of the array's rated power not being delivered!
If a PV array will never deliver its rated power, sizing an inverter to match that array's typical peak power can make better use of the inverter's AC output capacity.

## 2. Lower the specific cost of energy delivered

By oversizing a PV array, a lower cost of delivered energy can be realised (lower $ or €/kWh). Oversizing a PV array will increase the cost of PV modules and array racking for a system. However, since this can be achieved without necessarily increasing either the quantity of rating of other balance of system components, the increased energy production is achieved with a lower $ or €/kW installed cost. This in turn yields in a lower specific cost of energy delivered by the system. An example comparison made using Sunny Design shows that by oversizing a PV array with a 5kW inverter, the annual energy yield of a system can be increased by over 28% for only a ~10% increase in the total cost of installation.


Energy Yield Comparison
Annual Energy Yield (kWh)
10,000
8,000
6,000
8260
10624
+28%
5kWp array
with SB 5000TL-21
6.5kWp array
with SB 5000TL-21

## 3. Reduce inverter costs

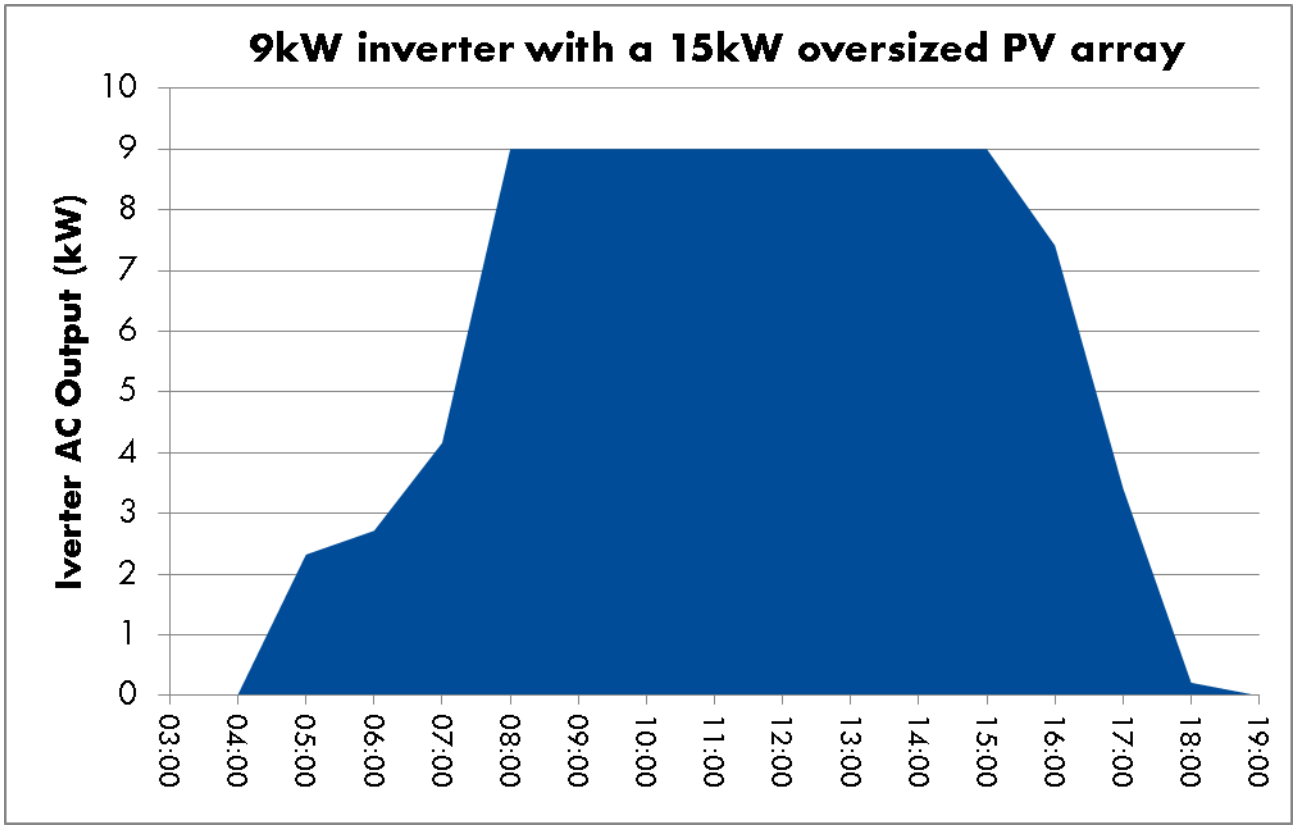
By oversizing a PV array, the DC energy output of that array can better match the rated AC power of an inverter. This means that an inverter with a lower AC rating (hence lower cost) can be used. Consequently, this can decrease the relative cost of inverters compared to the total system cost.

## 4. Achieve favourable energy output when installing inverters in limited space

Inverters sometimes need to be installed in specific locations, either due to constraints from the owner or local electrical regulations. This may mean it would not be possible to install as many inverters at a site as would be desired for a perfectly sized system. However by oversizing PV arrays, it may be possible to achieve almost the same annual energy output with fewer installed inverters. For example, using Sunny Design, a 100kWp PV array with three STP25000TL-30 inverters (i.e. 75kW of inverters) would only produce ~2% less annual energy compared to the same PV array with four STP25000TL-30 inverters (i.e. 100kW of inverters). This means that there is only a ~2% lower energy output for 25% fewer inverters.

## 5. Maximise the value of daytime energy to the system owner

For a business which operates during normal business hours, the value of daytime energy from their PV system might be different depending on individual circumstances. The PV output may be used to avoid peak-capacity grid charges or to offset constant loads which may be operating on the site. In such cases, oversizing a PV array could provide a business with greater certainty in their energy costs, especially given the low price of PV modules in today's market. By oversizing a PV array, the inverter can reach its rated AC capacity earlier in the day, and continue operating at that point until late in the afternoon as shown in the following graph.




## 6. Better match the inverter to the PV array, in the event an inverter needs to be replaced

Sometimes if an inverter which is no longer within its warranty fails, it is not always possible to replace it with the same model inverter. In such cases an inverter of a different AC output power may need to be purchased and installed. By installing an inverter with a lower AC output power, the existing PV array could be better matched to the inverter's capacity and the replacement cost to the system owner minimised.

## 7. Make the most of East-West PV arrays

Often, PV arrays are installed to maximise energy output and so are tilted towards the equator (south facing

in the northern hemisphere, north facing in the southern hemisphere). Sometimes however the array plane available for installing PV modules with these ideal orientation conditions may not be as great as other less ideal array planes. In cases where the area available for east and west facing orientations is greater, a PV array might be split into some east facing strings and some west facing strings. Since an east and west PV array will peak in output power at different times of the day, it is possible to greatly oversize a PV array (e.g. install a DC input power equal to the inverter AC output power for EACH of the east and west PV arrays). Using an inverter's sizing capability in such a way can deliver greater overall energy output, and a more levelled AC output each day.

**FACTORS TO CONSIDER WHEN OVERSIZING**

There are two important factors which must be considered when designing for and installing oversized PV arrays:

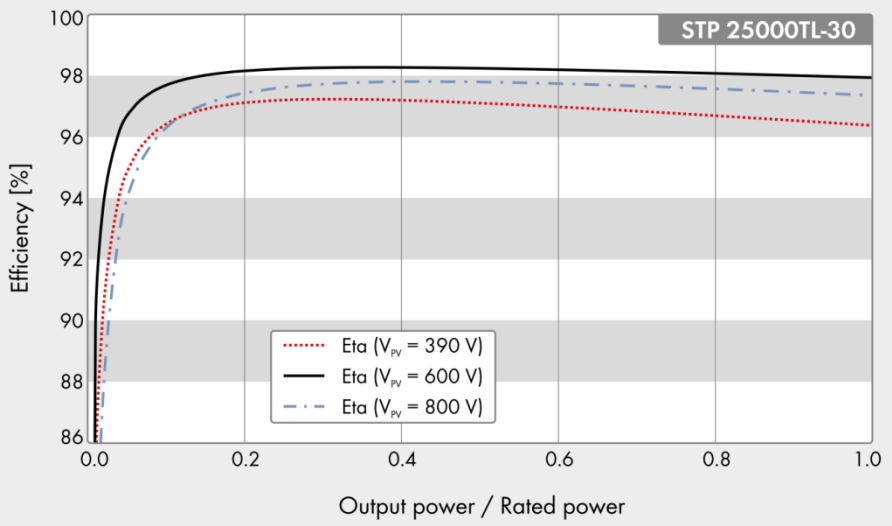
1. Inverter input conditions

The most important input characteristic which should NEVER be exceeded for any SMA inverter is the input voltage limit. Inverters and their constituent components are designed and rated for certain input voltage levels. If an input voltage were to exceed this rating, it will almost certainly result in the inverter's immediate failure. When oversizing a PV array, it is important to never exceed an inverter's maximum input voltage. Consideration should also be given to the maximum power point tracker's operating voltage range, to make sure that the PV array will not go outside that range. When a PV array voltage is outside an MPPT voltage range, the inverter is not able to maximise the performance of the system. To most easily design an oversized PV array, Sunny Design is the simplest tool since it can provide warnings if a design will exceed an inverter's critical input parameters.

2. Inverter Operating Efficiency and Heat Generation

Broadly speaking, the efficiency loss from an inverter is realised as heat generation. An inverter has a different operating efficiency at different output powers. The example curve below shows that for an STP25000TL-30, at certain input voltage levels, operation is between 0.5-1.0% less efficient at full rated

output power compared to 60% or 80% rated output power. This could result in more than double the heat generation at 100% AC output power compared to 60% or 80% AC output power. And when oversizing a PV array an inverter will be more often operate at or close to its rated AC output power, heat generation from the inverter may create an issue for the installation location especially if inverters are installed in a plant room or similar where air flow and heat dissipation might be limited.




## Summary

There can be many different reasons to install an oversized PV array. Given PV array's rarely operate at their rated peak power, oversizing a PV array can make better use of an inverter's rated AC output and deliver a lower cost/watt system resulting in a lower specific cost of energy delivered ($ or €/kWh). When oversizing PV arrays it is important that an inverter's critical input limits are never exceeded. Sunny Design is the perfect tool to use when attempting to design a PV system with an oversized PV array. It is important to always comply with local electrical regulations and to use appropriately qualified system designers and installers.

- See more at: http://en.sma-sunny.com/2015/12/15/7-reasons-why-you-should-oversize-your-pv-array-2/#sthash.glM17Rpm.dpuf