



IP SUN
SOLAR

DC, AC and clipping

Agenda

What's DC and AC

When do we have clipping

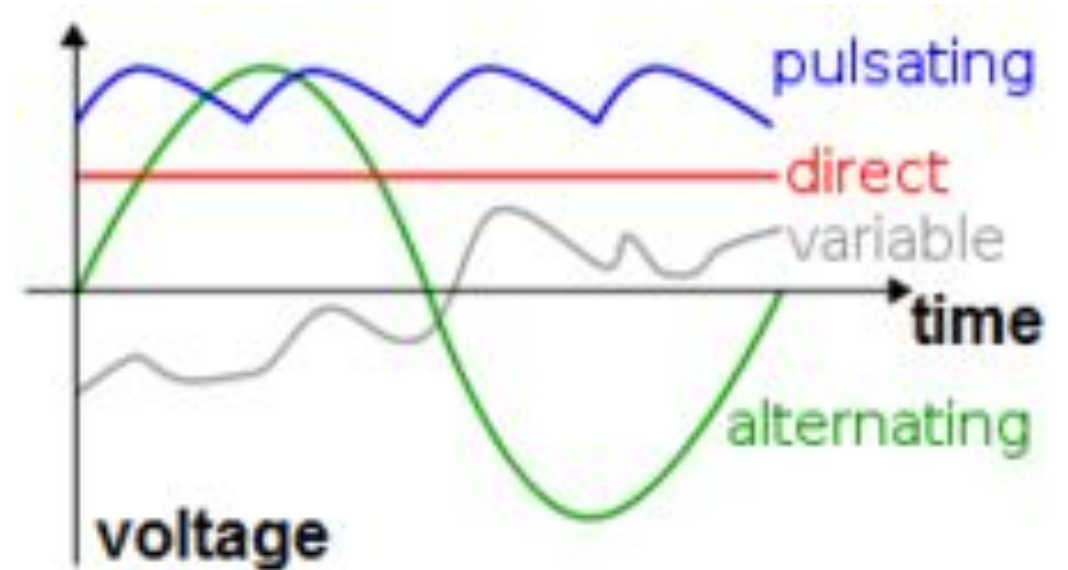
Why do we have clipping



What's DC and AC

DC: Direct Current. The PV transforms the energy of the sun into a Direct current.

AC: Alternating Current. The inverter transforms the DC current into AC current. The U.S. grid and the vast majority of buildings work on Alternating Current.



When do we have clipping

We have a clipping situation when the PV system works at its best conditions and when the DC from the solar panels produce more energy than the maximum inverter AC output.

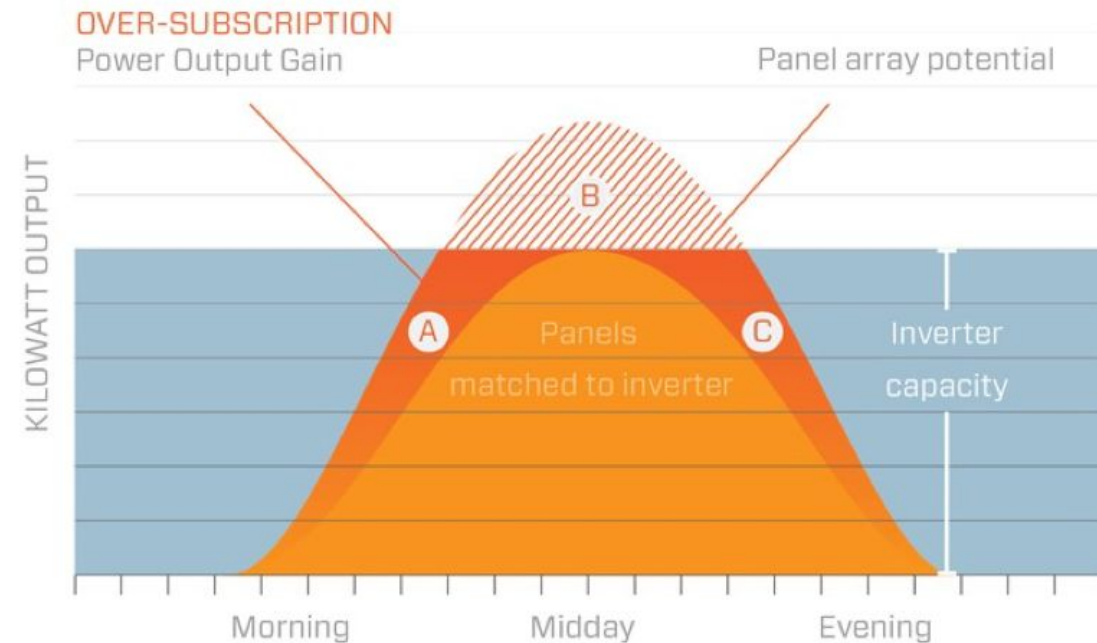
Example:

REC365 has a 365W power output

IQ7+ has a 290W power output

If the PV works at 100%, it will produce 365W but the inverter will convert maximum 290W and the rest is lost

Inverter Clipping and Advantages of Higher DC/AC Ratios



Why do we have clipping? (1/2)

Cost efficiency !!!

During the year, majority of the time, the PV doesn't work on 100% and even not at 70%

The goal of the solar system is to install the biggest PV power (kW) even if it doesn't work on 100%.

50% of a 10kW system = 5kW VS 50% of a 20kW system = 10kW

And select the most efficient inverter with a AC power equal to 70-80% of the PV power.

Example:

25.16kW DC project (25x LG370)

19.72kW AC project (25x IQ7+)

0% Shading

100% South direction

5° Tilt

	Month	Day	Hour	Energy Production [kWh]
1	Jan	1	1:00	0
2	Jan	1	2:00	0
3	Jan	1	3:00	0
4	Jan	1	4:00	0
5	Jan	1	5:00	0
6	Jan	1	6:00	0
7	Jan	1	7:00	0
8	Jan	1	8:00	0.1
9	Jan	1	9:00	0.89
10	Jan	1	10:00	1.85
11	Jan	1	11:00	2.6
12	Jan	1	12:00	3.04
13	Jan	1	13:00	3.1
14	Jan	1	14:00	2.82
15	Jan	1	15:00	2.19
16	Jan	1	16:00	1.29
17	Jan	1	17:00	0.29
18	Jan	1	18:00	0
19	Jan	1	19:00	0
20	Jan	1	20:00	0
21	Jan	1	21:00	0
22	Jan	1	22:00	0

	Month	Day	Hour	Energy Production [kWh]
3289	May	18	1:00	0
3290	May	18	2:00	0
3291	May	18	3:00	0
3292	May	18	4:00	0
3293	May	18	5:00	0
3294	May	18	6:00	0.31
3295	May	18	7:00	0.8
3296	May	18	8:00	1.61
3297	May	18	9:00	2.41
3298	May	18	10:00	3.06
3299	May	18	11:00	17.68
3300	May	18	12:00	19.46
3301	May	18	13:00	19.46
3302	May	18	14:00	17.8
3303	May	18	15:00	16.17
3304	May	18	16:00	12.93
3305	May	18	17:00	8.6
3306	May	18	18:00	4.01
3307	May	18	19:00	0.83
3308	May	18	20:00	0
3309	May	18	21:00	0
3310	May	18	22:00	0

	Month	Day	Hour	Energy Production [kWh]
5113	Aug	2	1:00	0
5114	Aug	2	2:00	0
5115	Aug	2	3:00	0
5116	Aug	2	4:00	0
5117	Aug	2	5:00	0
5118	Aug	2	6:00	0
5119	Aug	2	7:00	2.74
5120	Aug	2	8:00	6.35
5121	Aug	2	9:00	10.79
5122	Aug	2	10:00	14.6
5123	Aug	2	11:00	16.97
5124	Aug	2	12:00	18.6
5125	Aug	2	13:00	18.49
5126	Aug	2	14:00	17.81
5127	Aug	2	15:00	15.77
5128	Aug	2	16:00	12.68
5129	Aug	2	17:00	8.66
5130	Aug	2	18:00	4.35
5131	Aug	2	19:00	0.91
5132	Aug	2	20:00	0
5133	Aug	2	21:00	0
5134	Aug	2	22:00	0

Why do we have clipping? (2/2)

Cost efficiency !!!

We see in a few project a DC production higher than the AC maximum output. This high production appears just a few hours during the year. We could install a more powerful inverter but it is not recommended for the cost efficiency.

A higher AC power requests:

- A more expensive inverter
- A bigger wire size, breaker size, disconnect, more wires... This change has an impact on:
 - The price of the equipment
 - The labor of the installation

This difference of the price is not cost effective for the few hours during the year (= just during the midday when it is the best period of the year and when we have the best weather).