



IP SUN  
SOLAR

DC, AC and clipping

# Agenda

What's DC and AC

When do we have clipping

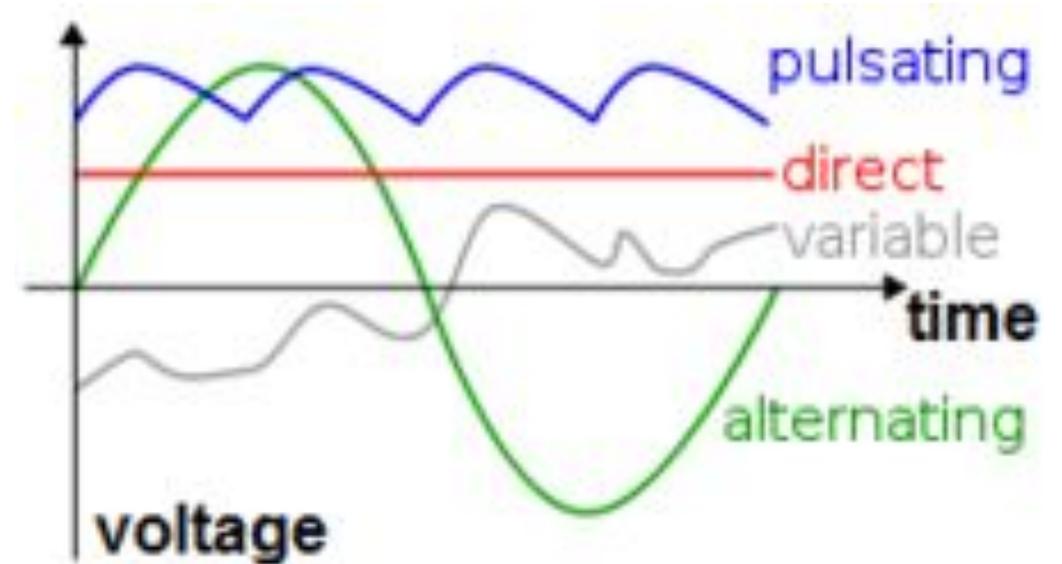
Why do we have clipping



# 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.

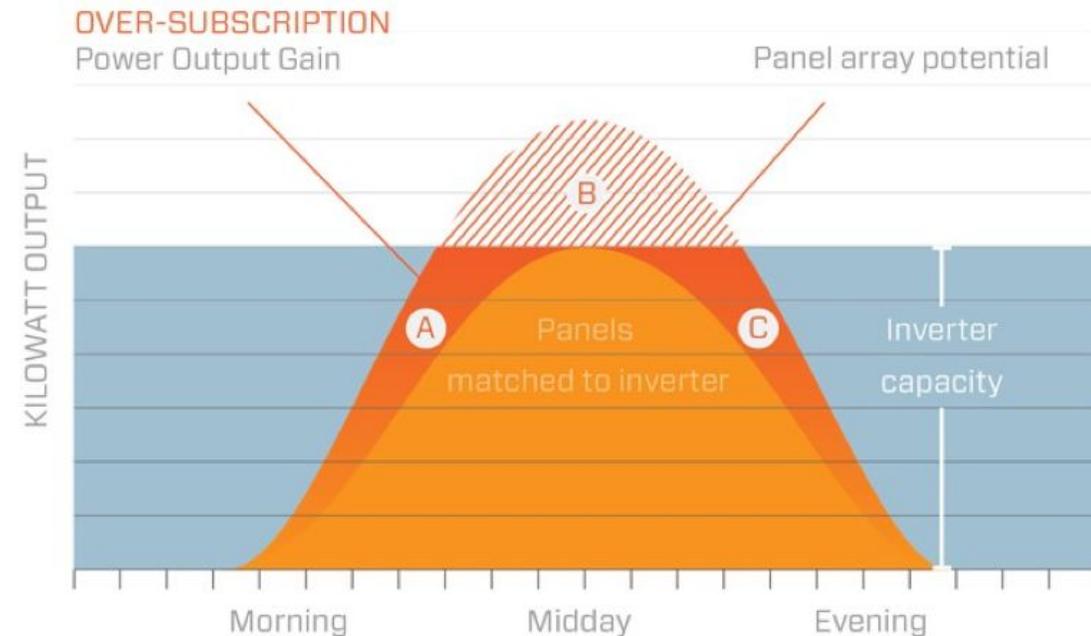
## Example:

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).