2.4. The control of PV array output.

2.4.1. Circuit diagrams.

2.4.2. Inverters and controllers.

2.4.3. Edge of cloud effect.

[EC]. What is the “edge-of-cloud effect” and how can it cause solar array issues?

Clouds are classified by height: high clouds at 5 – 12 km, such as cirrus, cirrostratus and cirrocumulus, mid clouds at 2 – 7 km, of type altostratus, altocumulus and nimbostratus and low clouds at up to 2 km, such as cumulus, stratus and cumulonimbus.

“As the cloud begins to cover the sun or when the sun is emerging from behind a cloud, there is a sudden burst of energy that produces more power than normal. This is caused by light refraction. Refraction can concentrate the sunlight while the edge of the shadow passes by. The result is a boost in module voltage output. On a day with bright blue skies and fair weather cumulus clouds, the effect is quite noticeable.

So how can you account for this increase in output? Common practice is to add 20% to 25% to the amperage rating of the solar controller. But many controllers today are the MPPT type. They track the arrays Maximum Power Point on its IV curve. As the edge of clouds start causing over-irradiance. The MPP voltage starts to rise, so too, does the current. The MPPT controller then adjusts the voltage up to correct for this effect.

Take for example a Sunny Boy 5000 Watt grid-tie inverter. The lower the voltage of the array the better the efficiency. Of course the design of an array depends on the solar panels but you should never design around the highest voltage under standard conditions. In this case 480 VDC. Me, I would design around 350VDC to 400VDC under normal operating conditions. This would allow for the MPP to move around where it wants to”.