SHADOW SCAN FUNCTION

VER: 03, UPDATED ON DECEMBER 27TH , 2019

Why Shadow Scan Is Needed?

As known to all, MPPT or Maximum Power Point Tracker can ensure a solar inverter working at its maximum power by tracking DC voltage and current. This works once for all under normal conditions (without shadowing effect).
At the first startup of inverter, MPP tracker starts to work (as shown in Figure 1), scanning from the right side (Open-Circuit Voltage) to the left side (Minimum MPP tracking voltage) to find the first maximum power point.

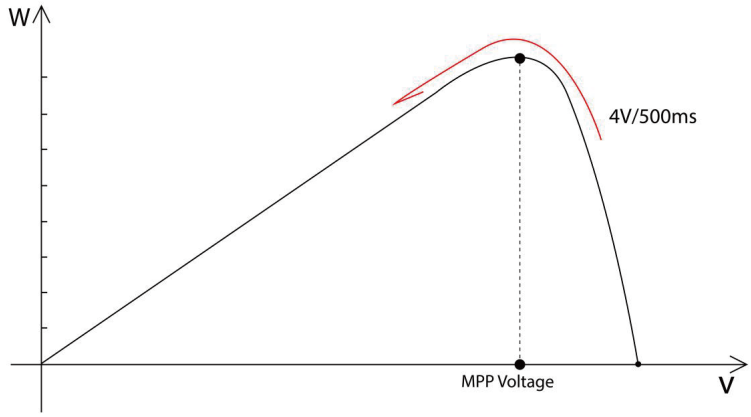

Figure 1. MPP Tracking Under Normal Condition

So what happens if there is shadowing imposed on solar panel strings? MIGHT NOT AT ITS MAX POWER! (Figure 2) because the tracker would stop at the first maximum power point it meets, which could cause power loss from the solar system.

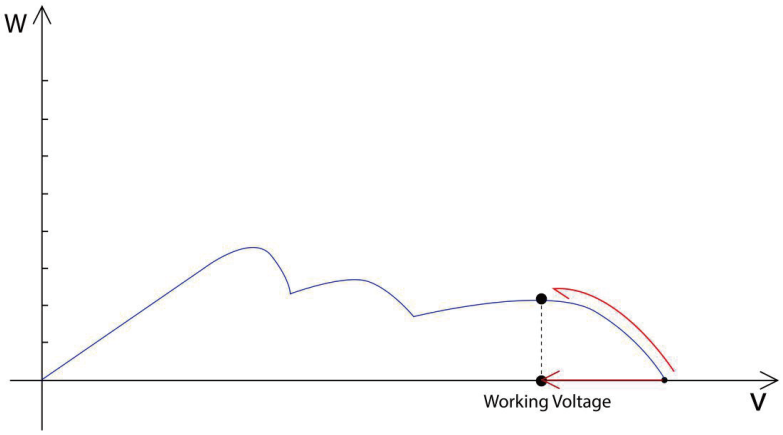

Figure 2. MPP Tracking Under Shaded Condition

That is why shadow scanning function or optimizer is adopted in solar system.

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What Is Shadow Scan?

When shadow scanning function is activated, MPP will be tracked regularly to help system locate the real maximum power point from multiple fake MPP points as shown in Figure 3.

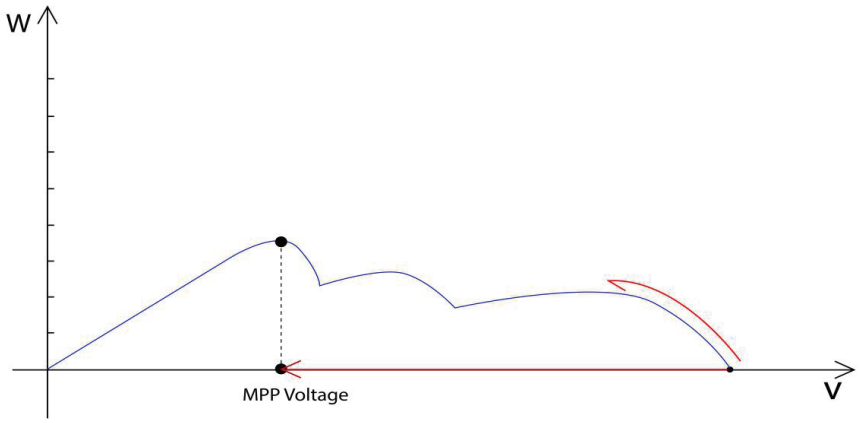

Figure 3. Shadow Scan Result Under Shaded Condition

How Does Shadow Scan Work?

Shadow scanning function is in periodical operation. The operation process is illustrated as following steps.

STEP 1. Ready for scanning (Figure 4)

When shadow scan function is activated, MPP tracker will track back to the original voltage point to get ready for scanning the whole voltage range.

Speed: 15V/500ms

Starting Point: Present Working Voltage

Back-tracking Point: PV String Open-Circuit Voltage or Maximum MPPT Range, or PV power＜50W

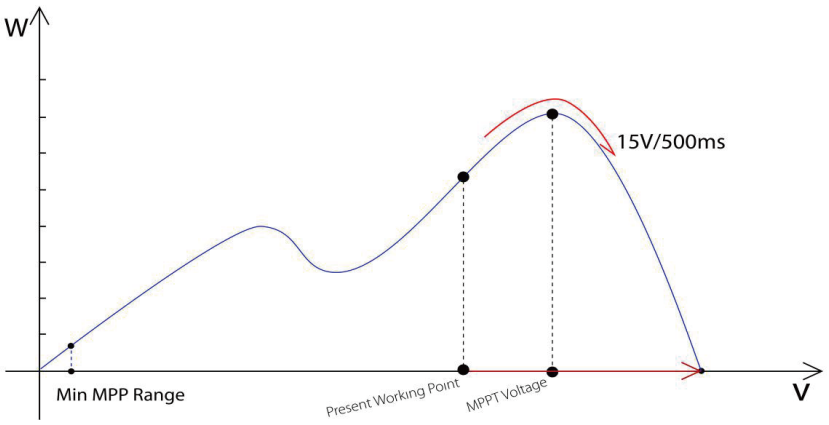

Figure 4. Ready for Scanning

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STEP 2. Scan Whole Voltage Range (Figure 5)

By scanning the whole voltage range, the real maximum power pint can be detected. .

Speed: 4V/500ms

Starting Point: Ready Point - PV String Open-Circuit Voltage or High MPPT Range, or PV power＜50W

Back-tracking Point: Low MPPT Range

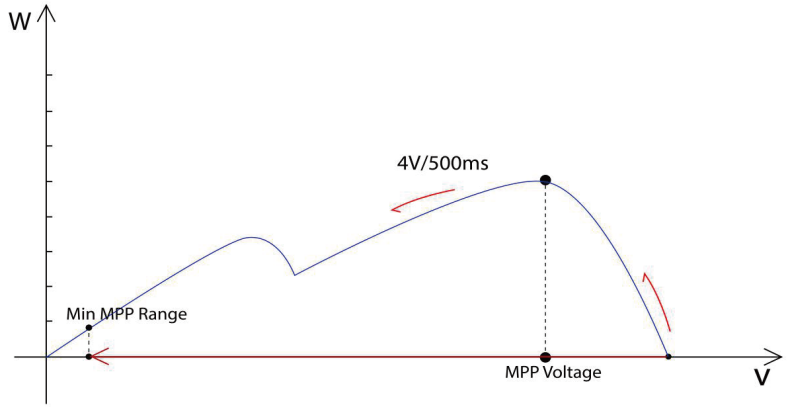

Figure 5. Scan Whole Voltage Range

STEP 3. Track Back to The MPP Voltage (Figure 6)

As the tracker has found out the real maximum power point, it will track back to the point to make sure the inverter works at the maximum power of PV strings.

Speed: 15V/500ms

Starting Point: Low MPPT Range

Back-tracking Point: MPP Voltage / Maximum Power Point

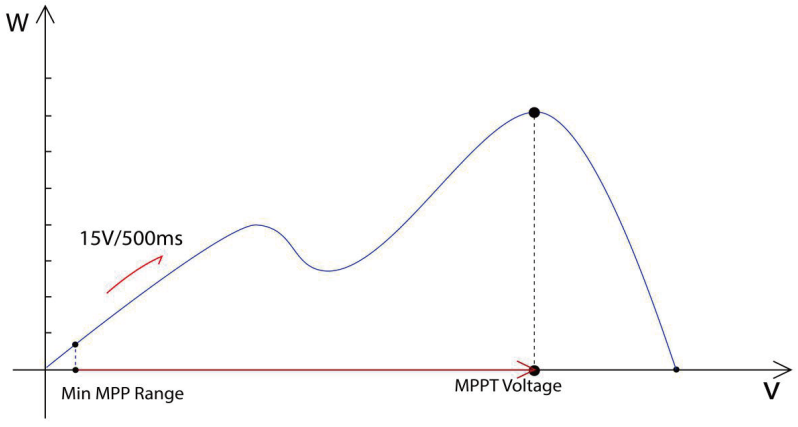

Figure 6. Track Back to the MPP Voltage

Note

In scanning process the scanned MPPT may not stay on the maximum power point. The real power would change during the scanning process.

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Scanning Frequency

For inverters deployed with different number of MPPT, the overall frequency is one hour. More details are presented in below table.

MPPT Number	Frequency Between MPPTs	Overall Frequency	Inverter Model
1 MPPT	1 hour	1 hour	XS
2 MPPTs	0.5 hour	1 hour	SDT
3 MPPTs	20 min	1 hour	SMT/MS
4 MPPTs	15 mins	1 hour	MT G2

Note

1. For inverters with multiple MPPTs, MPPTs do not scan at the same time but one by one.
2. Shadow scan function is off as default setting on each inverter. Please do commissioning on the local display (as shown in Figure 7) or contact GoodWe if this function needs to be activated.

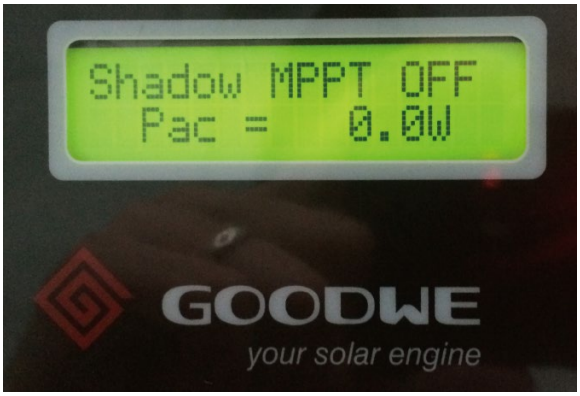

Figure 7. Activate Shadow Scan Function On Inverter

Power Loss Caused by Shadow Scanning

The power generation loss after each cycle of shadow scanning is about 8Wh.

Strict tests were conducted to get this value as illustrated below.

STEP 1. Preparation

Test object: GoodWe single-phase inverter with 2 MPPTs

Test conditions: DC input: Vmppt=300V, Pmppt=4300W; AC Output: Vac=220V, Frequency=50Hz (grid connection)

Test period: 142min

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STEP 2. Procedure

a. Turn on Shadow Scan function on inverter and conduct twice of the scan (around 35 seconds for each scan) for a certain period of time and record the total amount of power generation;

b. Turn off Shadow Scan function and record the total amount of power generation for a same length of time;

c. The figures below show the AC output curve comparison during the shadow scan.

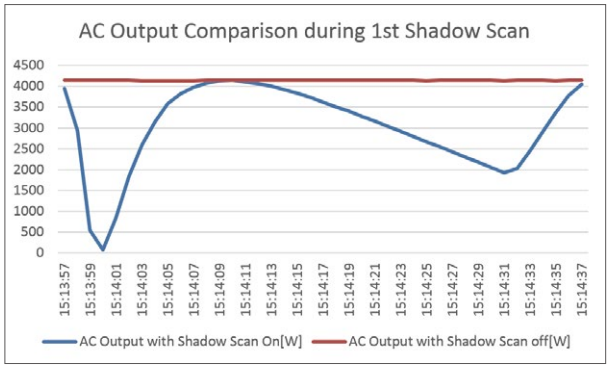

Figure 8

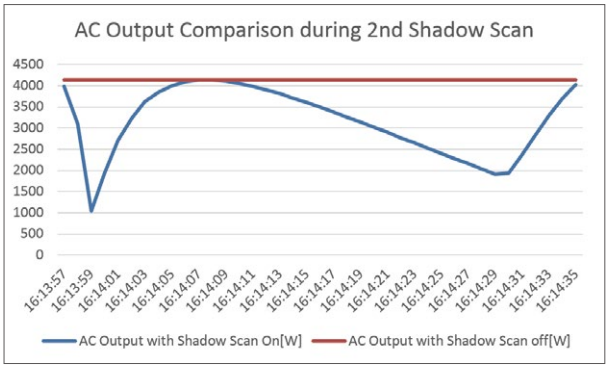

Figure 9

STEP 3. Result

The total amount of power generation of step 1 is 9785.57 Wh, and the amount of step 2 is 9802.30 Wh.

So the average power generation loss of each cycle of shadow scan is

$$\frac{9802.3-9785.570}{2} = 8.365\text{Wh}$$

Note

At present, GoodWe XS, MS, SDT (GW20KN-DT), MT and MT G2 series are equipped with the latest Shadow Scan function and this function will be available for SDT G2 with firmware V06.

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