PID RECOVERY SOLUTION

VER: 02, UPDATED ON NOVEMBER 22ND, 2019

What Is PID?

Potential Induced Degradation (PID) is an undesirable phenomenon that occurs when the module's voltage potential and leakage current drive ion mobility within the module between the semiconductor material and other elements of the module (such as glass, mount and frame), as shown in Figure 1, thus causing the module's power output capacity to degrade.

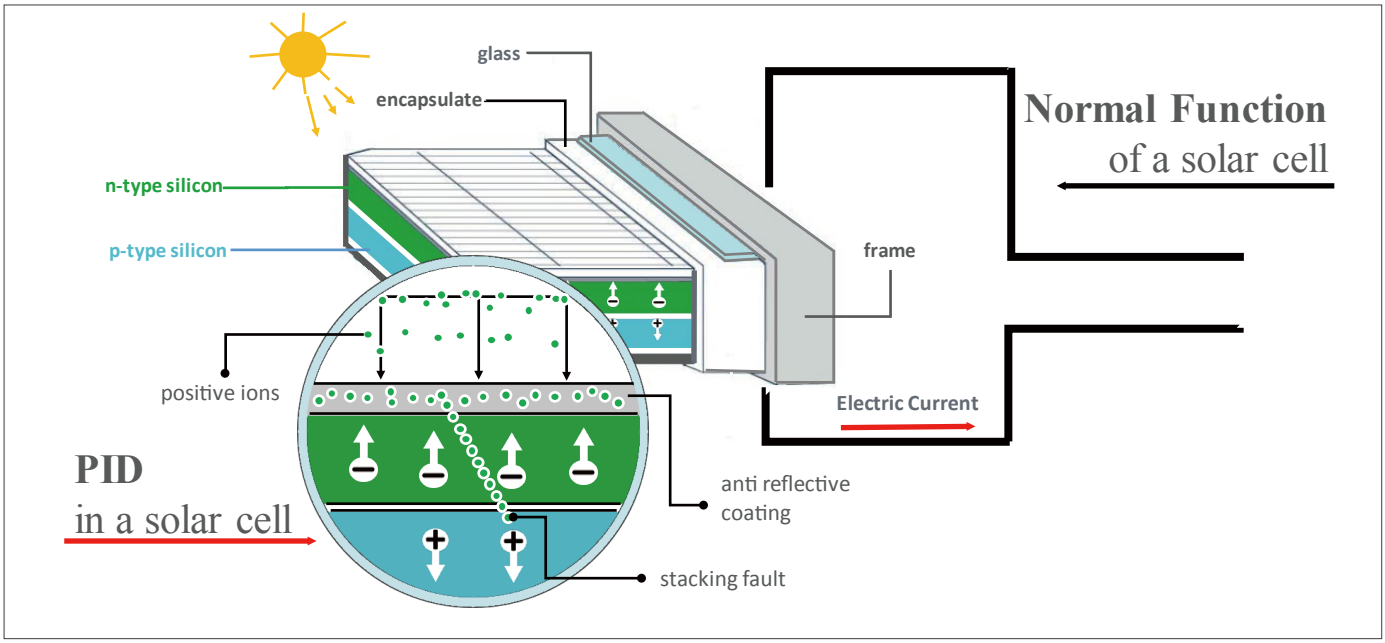

Figure 1

There is no definite answer to what causes PID effect. However, many researches and tests show that the ion mobility accelerates with humidity, temperature and voltage potential. At system level, PID is most often associated with a negative voltage potential, which depends on both the system grounding topology and the module's position in the array.

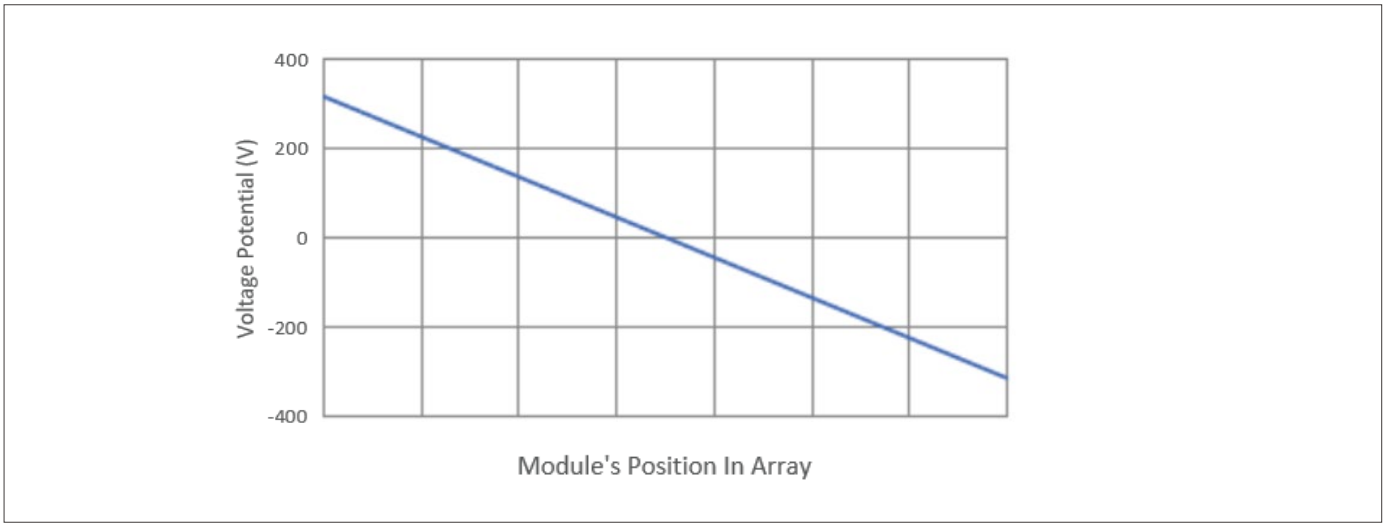

Figure 2

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Common Practice Against PID Effect

There are three ways to prevent, mitigate or repair PID effect.

> Direct grounding by DC negative polarity. The grounding changes the voltage potential to the earth and thus prevents the occurrence of PID. However, there are special requirements on the electrical devices, such as transformer-isolated inverter, in the system and the system must be provided with high insulation protection and other protective measures.

> Virtual grounding. It refers to changing the voltage potential of AC neutral wire to the earth. Due to the connection on circuit schematic between AC neutral wire and DC negative polarity, the voltage potential to the earth by the negative or positive polarity of DC side is changed correspondingly. However, this solution can be adopted only to certain grid type without mandatory requirement on neutral connection. The existing PID effect can be not reversed but it can only prevent further degradation.

> Imposing reverse voltage. Through additional device, reverse voltage is imposed to the DC side of inverter at night (when no output) to redirect the lost ions back to glass plate. This solution can not only prevent but also repair PID in the system. However, it would be laborious or expensive to add such external device at a proper point in the system.

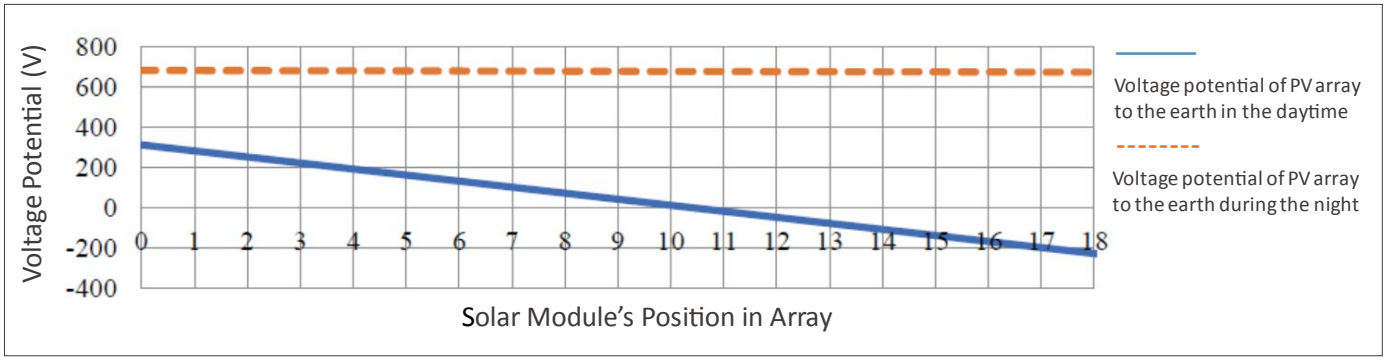

Figure 3

What Is GoodWe Solution?

GoodWe adopts the last solution to PID effect by imposing a reverse voltage to the DC negative polarity of inverter to the earth. The device, PID recovery board as shown in figure 4, is deployed and integrated in the AC side of inverter. It draws energy from the grid (input range 310 ~ 528V; 45~ 65HZ) and provides high DC voltage of 800V (＜5mA) to the DC negative polarity. In this way, the voltage potential between PV- and the earth is reversed and the lost ions are driven back to the solar cell. The PID effect is repaired and solar module's performance restored to certain extent.

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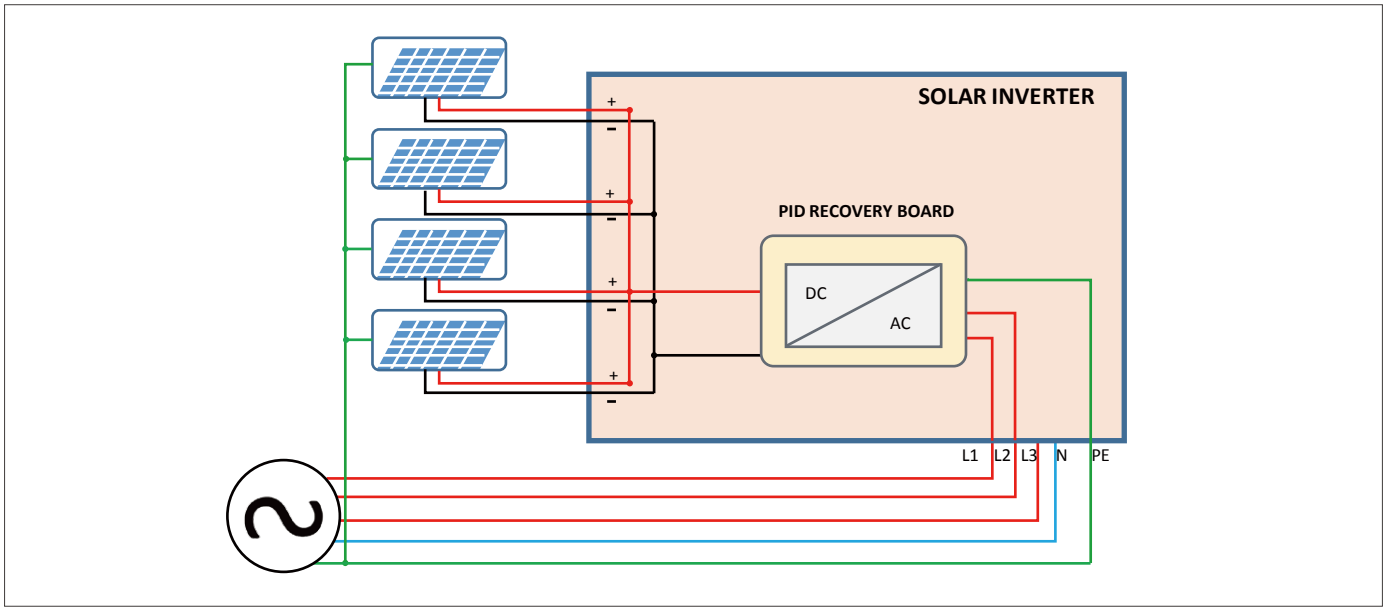

Figure 4

NOTE

**PID recovery function is optional and this function comes with GoodWe recovery board built in the inverter without extra wiring or connection required.*

How Does PID Recovery Work?

PID recovery board is a smart module built inside the inverter. It is able to detect PV input voltage. With a threshold value preset, the PID recovery board would start up or stand by based on PV input voltage. When the input voltage is below the threshold, the PID recovery board enters into operation mode to provide high DC voltage (＜5mA) to increase the PV- to the earth to a positive potential thus reversing the polarization effect. And it switches automatically to standby mode when the DC input voltage is higher than the threshold. To put it simply, at night PID recovery function wakes up and stands by during the day.

As there is high voltage on DC side when PID recovery board is in operation, it is also integrated smart insulation monitoring and DC overvoltage protection functions for safety concern.

In conclusion, generation loss due to PID effect is a common phenomenon when a solar system is already in operation for two or more years. With PID recovery function integrated in the inverter, performance of solar modules in solar system can be effectively recovered and further degradation prevented.

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