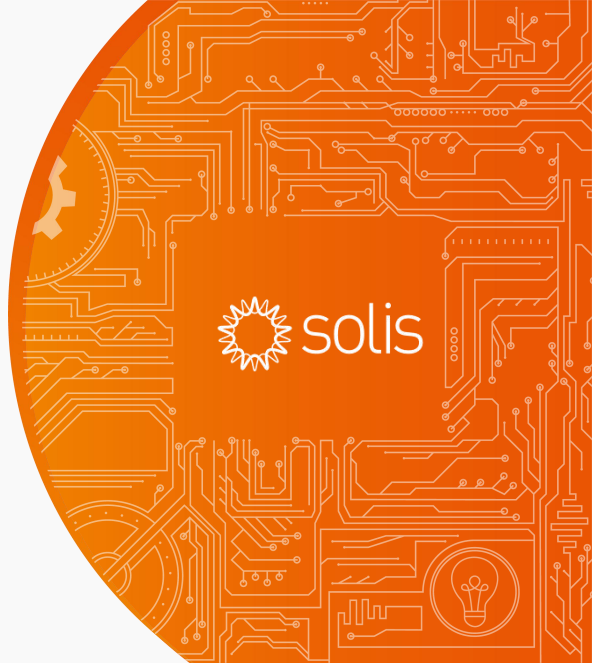


# Inverter Starts up Late? Find Possible Causes and Troubleshoot Problem



## Background

The amount of power generated by a solar power system is positively correlated with the grid-connected working time of the system. Under the same conditions, the earlier the inverter starts up and connects to the grid, the higher the power generation. For example, in the same summer, one inverter can usually start up and be connected to the grid at around 05:00, but another inverter may start later, or even 2~3 hours slower than the other. What could cause this? How can it be resolved?

In this Solis seminar we will share with you the reasons for the later start of inverters and some related solutions.

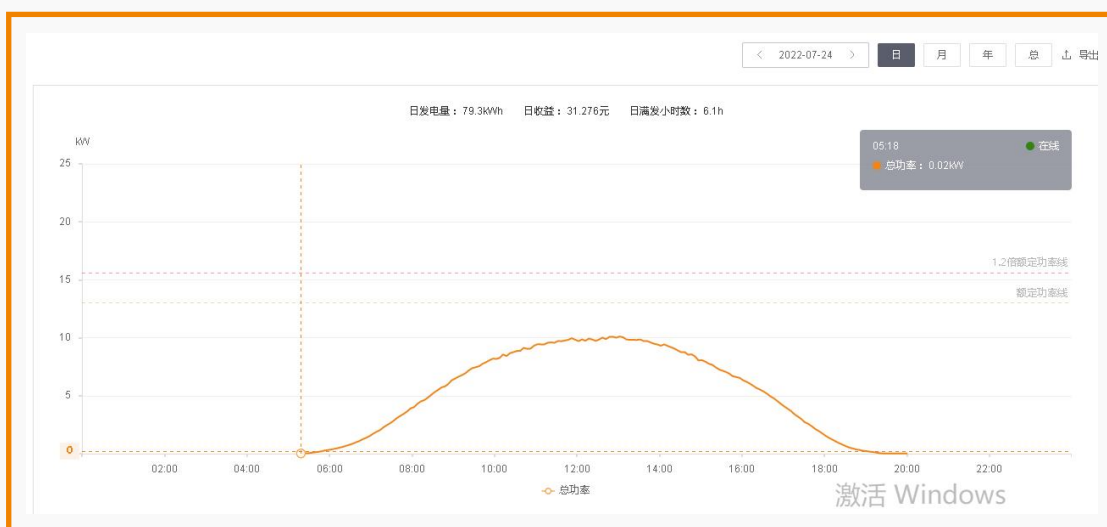


Figure 1 : Normally inverter , start early and shut down late

## Cause

### 1. Inverter start-up voltage thresholds are different

Different inverters have different start up voltages. For example, the startup voltage of low-power inverters is generally 60V~90V, and the startup voltage of medium-power inverters is generally 120V~180V. High-power inverters it is above 190V; this also leads to different inverters starting to work at different times.

SE-GR1P0.7K-M		SE-GR1P1K-M		SE-GR1P1.5K-M		SE-GR1P2K-M		SE-GR1P2.5K-M		SE-GR1P3K-M		SE-GR1P3.6K-M	
<b>Input DC</b>		Recommended max. PV power: 1.1 kW		Max. input voltage: 600 V		Rated voltage: 200 V		Start-up voltage: 60 V					
SS-GR3P3K	SS-GR3P4K	SS-GR3P5K	SS-GR3P6K	SS-GR3P8K	SS-GR3P9K	SS-GR3P10K	SS-GR3P12K	SS-GR3P13K	SS-GR3P15K				
<b>Input DC</b>		Recommended max. PV power: 12 kW		Max. input voltage: 1100 V		Rated voltage: 600 V		Start-up voltage: 180 V					

Figure 2: Starting voltages of different inverters

### 2. A Possible PV String Problem

#### ① Too few PV modules connected in series

If the number of modules connected in series is too few, the voltage generated by the string will be low due to the lack of irradiance early in the morning. This won't reach the starting voltage of the inverter, resulting in a later start up. This situation generally occurs in spring, winter or on rainy days.

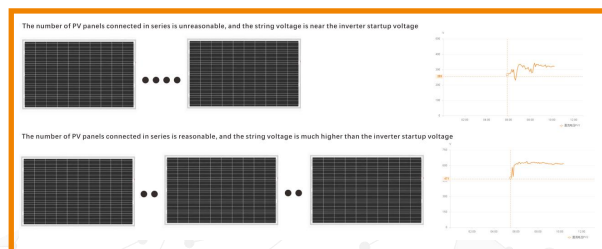


Figure 3: Debris blocks the inverter air ducts and fans, causing inverter failure

## Solution:

During the design process, ensure enough panels are configured in series to ensure the inverter and system work efficiency.

#### ② PV module shading, dirt or damage

Solar modules are affected by shading, or when surrounding vegetation blocks the modules or the modules are dirty/ damaged. This will all result in a low string voltage, which will cause the inverter to start late.

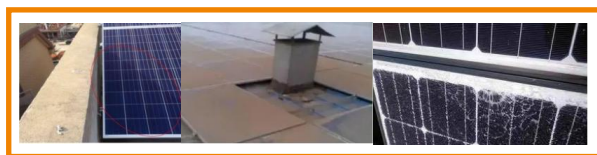


Figure 4: PV panel occlusion and damage

### 3. System Error

The third key factor is system faults, such as insulation resistance, grid overvoltage / under-voltage and current leakage, etc., Most common being low insulation resistance and grid overvoltage problems.

#### ① Insulation Resistance

Insulation resistance is mainly that the insulation resistance of the DC side is detected to be too low before the inverter is connected to the grid. The inverter will disconnect from the grid, enter the protection mode, and send and display an error message. Such problems are likely to occur in the morning with heavy humidity and moisture in the air increases. This results in a lower impedance, causing the inverter to enter the protection mode and grid connection delay.



Figure 5: The PV system has a low impedance problem

### Solution:

Refer to Solis Seminar Episode 15: PV Isolation Protection

### ② Grid Overvoltage

Shortly after dawn, the local power grid can experience transient fluctuations and overvoltage, causing the inverter to shut down for protection. When the grid voltage returns to a normal value, the current alarm is cleared and the inverter is reconnected to the grid. If it is always higher than the upper limit of grid reconnection voltage, the inverter will display: grid detection or grid overvoltage. Overvoltage of the power grid in the morning will cause the inverter to be frequently disconnected and connected to the grid, delaying the connection time and causing the illusion of the inverter "starting late".

### Solution:

Refer to Solis Seminar [Episode 25] : Solution for "OV-G-V0X" alarm.

## Conclusion

The working time of a solar power system is positively related to its power generation. A system that starts earlier and stops later will produce more power so if your solar system starts late, troubleshoot and solve problems according to the solutions above, so that your system generation is maximized and maintained. At design stage, ensure enough panels are connected to a single string to provide enough voltage for the system to start up