

Up to 5.13% Yield Gain on Grass Ground/ Outdoor Performance Study on PERC and TOPCon by SGS in Ningxia

Background:

PV module's outdoor performance is strongly influenced by various environmental parameters such as temperature, humidity, low irradiance, angular losses, and spectral effects. The performance of PV modules in real-world conditions may differ from laboratory test results, and the STC values quoted by manufacturers for their PV modules do not necessarily match those observed under outdoor exposure. As TOPCon (tunnel oxide passivated contacts) cell technology has been transferred from manufacturing to actual projects and the deployment increased sharply since this year, it is more crucial to investigate the technologies in outdoor performance.



Figure 1. The project picture

Introduction:

This comparison study conducted by SGS (Societe Generale de Surveillance S.A.) aims to present an objective third-party experimental study on the outdoor yield performance of the TOPCon bifacial PV module compared to PERC bifacial PV modules in Yinchuan, Ningxia. Field test is located in Ningxia (38°35'N ~ 106°1'E), northwest of China, which as a temperate continental climate. During the September, the average temperature remains 20 ° C and the average daily global irradiance is at 5.85kWh/m².

Experiment Set Up:

In total, 20 pieces of bifacial modules of two different technologies were selected from Jinkosolar, as shown in Table. 1.

Module type	P-type Bifacial JKM540M-72HL4-BDVP	N-type Bifacial JKM560N-72HL4-BDV
Power	540W	560W
Module Efficiency	20.90%	21.68%
Module dimension(mm)	2278×1134	2278×1134
No. of modules/string	10 pieces	10 pieces
Ground	Grass ground (Albedo 10%)	
Mounting system	2P Tracker	
Inverter	SG20RT-20	
Data collection frequency	once a minute	
Data collection method	DC meter	
Generation gain per watt (kWh/kWp)	baseline	+3.93%

Table 1. The specification of PV modules

Each bifacial module contains 144 pieces of the half-cut cells (182" wafer size). These modules in two comparison groups were installed vertically on two 2P trackers with module height of 1.5m above the grass ground (Albedo 10%). The inverter applied is model SG20RT-20 with efficiency of 98.6%. The outdoor energy generation was measured by DC meters in a 1-min interval. The energy yield performance of TOPCon and PERC bifacial PV were revealed and systematically compared during September 01~September 30, 2022, Test result is shown as below in Figure 1.

Conclusion:

The experimental results have proven that the energy yield performance of TOPCon bifacial modules is **3.93%** higher in average than that of the PERC modules, and the highest gain up to **5.13%** occurred on September 29 which featured strong irradiance and hot temperature.



Figure 1. The yield for each type of studied modules