7.18% Low-Light Yield Gain of TOPCon: Chengdu Distributed

The low-light performance of solar panels refers to their operational efficiency and power output under insufficient lighting conditions. In such scenarios, solar panels face challenges including reduced current generation, decreased conversion efficiency, voltage fluctuations, and their response to different spectral wavelengths of light. Superior low-light performance means that even under less-than-ideal lighting conditions, solar panels can effectively generate power, enhancing the overall energy output, which is vital for areas with short daylight hours or suboptimal lighting conditions.

Project Picture

To investigate and examine solar panels' ability to generate electricity under low light conditions, a comparison test was conducted on a rooftop project in Chengdu, southwest of China, which is famous for its cloudy foggy days with annual irradiance hours less than 1000 hours a year. By analysing the latest technologies' low-light performance in the real world to help determine the most suitable type of solar panel for low-light environments. The field-test data were independently verified by the authoritative third-party testing body TÜV Rheinland.

The sample groups selected are 15 pieces of Jinkosolar N-type TOPCon dual panel of 635Wp and 15 pieces N-type BC dual panel of 640Wp. These two groups are installed parallel, mounted on the rooftop with an angle of 5° south. All the panels are connected to the same model string type inverter to avoid BOS variance impact on the result.

Type of sample	JKM635N-66HL4M-BDV	N-type BC Module
Power	635 W	640 W
Specification	2382 x 1134 x 30mm	
Quantities	15 pcs	15 pcs
Voc(V)	49.68	49.52
Isc(A)	16.26	16.38
Vmp(V)	41.16	40.78

Sample component parameters

Result:

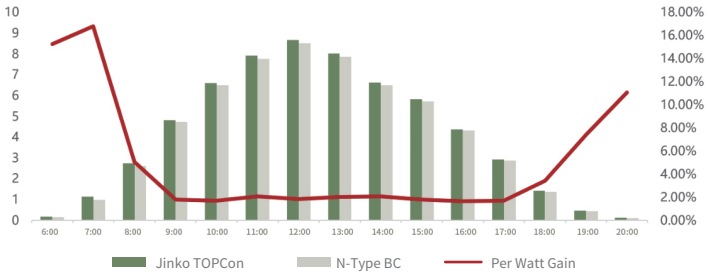

Chart 1: N-Type TOPCon vs. N-Type BC Module Output Gain in Different Day Time

The data was collected and recorded from 6:00 to 20:00, July 09 to July 20, during which period 90% were cloudy and rainy with daily irradiance ≤400W/m². **The result has revealed that TOPCon generated 74.114 kWh/kW while N-type BC generated a total of 72.398 kWh/kW, representing a 2.37% yield gain of TOPCon versus N-type BC. In a day, the peak gap occurred in the early morning hours of 6:00-8:00 and 18:00-20:00 in late afternoon; the relative gain reached as high as 7.18%.** (see chart 1). In 12 days, 90% were gloomy weather, the peak gain of TOPCon over N-type BC occurred in July 11 and July 18 two rainy days, (see chart 2).

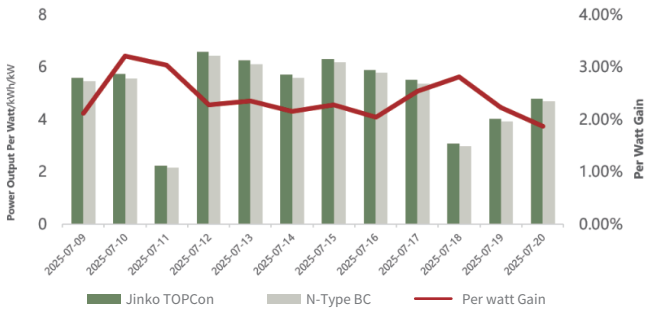

Chart 2: N-Type TOPCon vs. N-Type BC Module Power Output Gain in Different Days

As a result, they begin generating electricity earlier in the morning and continue operating longer into the evening, thus extending the overall energy generation time. Compared to n-type BC solar panels, **TOPCon panels show a power generation gain of 2.0%-7.18% over n-type BC, marking a significant improvement in efficiency and energy harnessing capability.**

Conclusion:

In regions with inadequate daylight, like cloudy or foggy days or high-latitude areas in Northern Europe, South West of China, Japan, Korea, the focus on the efficient power generation capability of solar panels within limited sunlight hours highlights the importance of their low-light performance. TOPCon's performance advantage in low irradiance scenarios is proven to work better, mainly due to the shunt resistance and FF advantages of n-type TOPCon. The relative efficiency change of n-TOPCon cells is higher than that of n-type BC cells, and the weak light performance of n-TOPCon cells is better than that of n-BC cells.