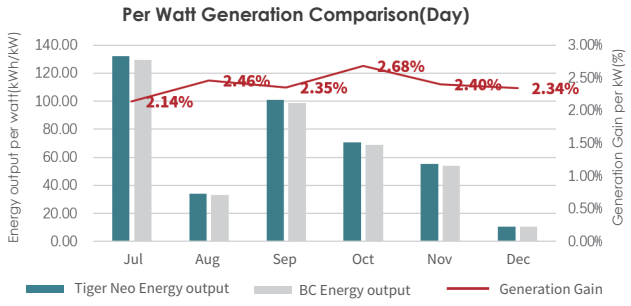
Maximum 15.86% Power Gain During Low-Light Periods: Empirical Verification of Industrial and Commercial Rooftop PV Systems in Sichuan

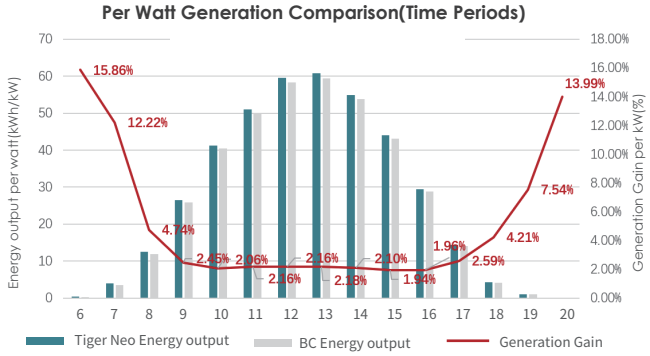
In scenarios with insufficient illumination such as rainy, foggy, morning, and evening periods, the power generation efficiency of PV modules generally declines sharply. Low-light performance serves as a core indicator for measuring a module's adaptability to complex lighting environments. For regions with limited sunshine hours and poor lighting conditions, the low-light power generation capability of modules directly determines the pay-back period of PV projects. This empirical study was conducted in central Sichuan, with a monitoring period from July 9 to December 7, 2025. The region features limited annual effective irradiation hours, a high proportion of cloudy and rainy weather, and prolonged low-light environments, providing a real-world application scenario for the all-weather performance testing of modules. Data collection was uninterrupted throughout the period, ensuring the accuracy and representativeness of the empirical results.

Key Conclusions:

1.Significant Advantage in Total Power Generation: During the empirical period (July 9 - December 7, 2025), the total power generation per-watt of JinkoSolar Tiger Series modules reached **404.21Wh**, achieving a stable power generation gain of **2.35%** compared to the **394.91Wh** of N-type BC modules, demonstrating outstanding cumulative power generation performance.



2.Outstanding Gain in Low-Light Scenarios: The periods of 6-8 AM and 18-20 PM represent the lowest light intensity intervals in central Sichuan, where JinkoSolar Tiger Neo modules exhibited significant advantages. Specifically, the average gain reached **10.94%** during 6-8 AM and **7.88%** during6-8PM, with performance advantages in low-light environments far exceeding the full-period average level.



3.Distinct "Early Start and Late Shutdown" Characteristics: At 6 AM, the power generation per-watt of JinkoSolar Tiger Neo modules achieved a gain of **15.86%** compared to N-type BC modules, entering the effective power generation state earlier; at 8 PM, the gain reached **13.99%**, effectively extending the daily power generation duration.

Project Background:

This empirical test was located in central Sichuan, with a monitoring period from July 9 to December 7, 2025, and the core observation period was 6 AM to 8 PM daily. The region is characterized by limited annual effective irradiation hours, a high proportion of cloudy and rainy weather, and prolonged low-light environments, providing a real-world application scenario for all-weather performance testing of modules. Uninterrupted data collection ensured the accuracy and representativeness of the empirical results.

Project Design:

This empirical study adopted a parallel comparison test scheme, strictly controlling variables to ensure data validity. The test samples included 15 JinkoSolar Tiger Neo 635W bifacial modules and 15 N-type BC 640W bifacial modules. Both types of modules were installed in parallel facing south at a 5 ° tilt angle without shading interference. Meanwhile, they were connected to the same data monitoring system and identical string inverters, with full-period data collection frequency and a core observation period of 6 AM to 8 PM daily. Core monitoring indicators included hourly power generation per-watt (Wh/W), period/monthly/total power generation (Wh), and relative power generation gain (%), while synchronously recording the impact of light intensity changes on module performance to ensure data traceability and verifiability.

Conclusion:

Based on the empirical data, the core competitiveness of Tiger Neo modules lies in two key dimensions: "efficiency improvement in low-light environments" and "extension of effective power generation duration", which are highly compatible with the lighting characteristics of Sichuan region, such as high proportion of cloudy and rainy weather and prolonged low-light periods. In terms of total power generation, the 2.35% increase stems from the high gain performance during the low-light periods of 6-8 AM and 18-20 PM, directly filling the power generation trough of conventional modules. For regions with a high proportion of annual low-light periods, the actual revenue improvement is much higher than the total power generation growth rate. From a temporal perspective, the "early start and late shutdown" characteristics of Tiger Neo modules further amplify their advantages: faster power ramp-up speed in the morning enables early capture of weak light energy in the dawn, while slower attenuation speed in the evening extends the evening power generation time, resulting in significant revenue improvement. From the perspective of technical adaptability, Tiger Neo modules exhibit better efficiency stability in low-light environments, which is closely related to their optimized shunt resistance (Rsh) design. In low-light conditions, they have smaller leakage current losses and higher current collection efficiency, thus achieving all-weather performance of "not falling behind in strong light and leading in weak light".

In summary, the empirical performance of Tiger Neo modules in Sichuan fully demonstrates that they are the preferred solution for PV projects in regions with high low-light proportions and complex lighting conditions.