Outdoor energy yield comparison of n-type versus p-type in Ningbo

In order to understand and prove the harvested energy of advanced n-type bifacial modules in the field, an experimental study was conducted on the energy yield performance of the TOPCon bifacial PV module compared to PERC bifacial PV modules in Ningbo (121 ° 30' E, 29 ° 31' N) eastern of China. The yield for baseline and compared groups, provided by the monitoring portal were analyzed. The in field experiment result (started from 2022.7.2-2022.7.7) have proven that the energy yield performance of n-type Topcon bifacial modules is **5.32%** higher than that of the PERC modules with tracker and white-painted ground(below refer to Group I), and is **3.31%** higher with fixed axis with a tilt angle of 16 ° and cement ground (below refer to Group II).

In Group I, 18 pieces of bifacial modules of Jinkosolar n-type (JKM560N-72HL4-BDV) and 18 pieces p-type module (JKM540M-72HL4-BDVP) were installed in two arrays on tracking system with paint white ground. The SUN2000-60KTL-M0 simulator measured the front and rear sides' electrical characteristics. The outdoor energy generation was measured by DC meters in a 1-min interval (Figure 1).

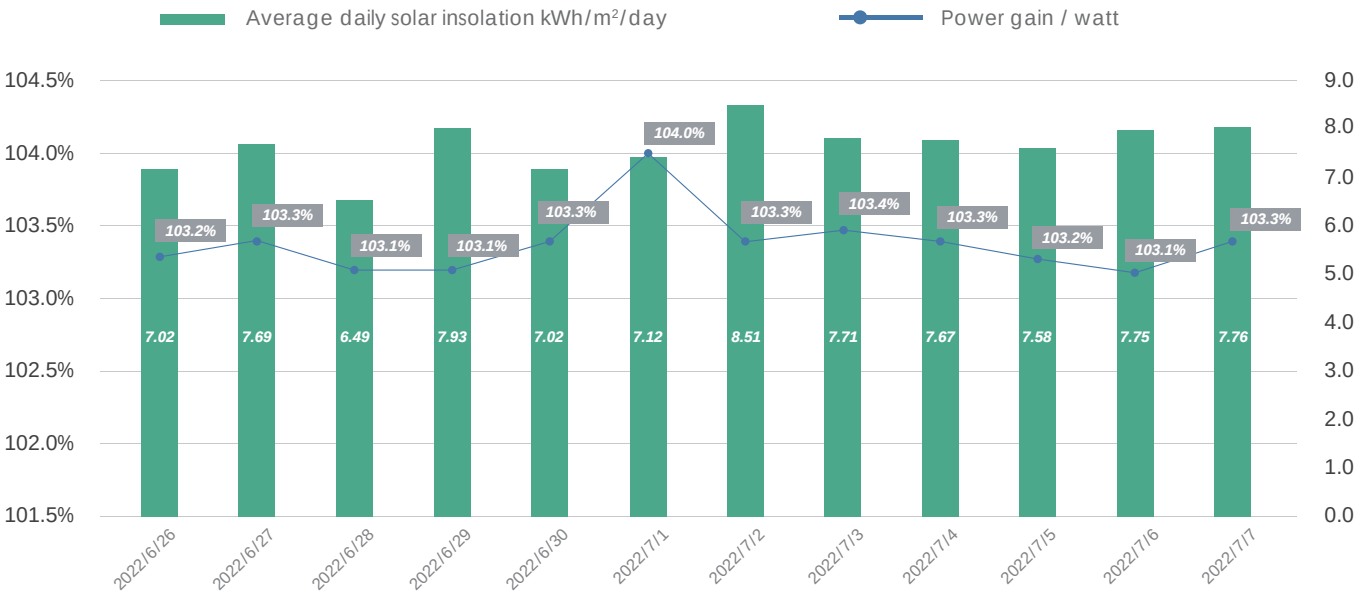

Figure 1: Fixed mounting system & Cement floor

Pictures of the Fixed mounting system & Cement floor

In Group II, 18 pieces of bifacial modules of Jinkosolar n-type (JKM560N-72HL4-BDV) and 18 pieces p-type module (JKM540M-72HL4-BDVP) were installed in two arrays on a fixed axis with a tilt angle of 16 ° . The SUN2000-110KTL-M0 simulator measured the front and rear sides' electrical characteristics. The outdoor energy generation was measured by DC meters in a 1-min interval (Figure 2).

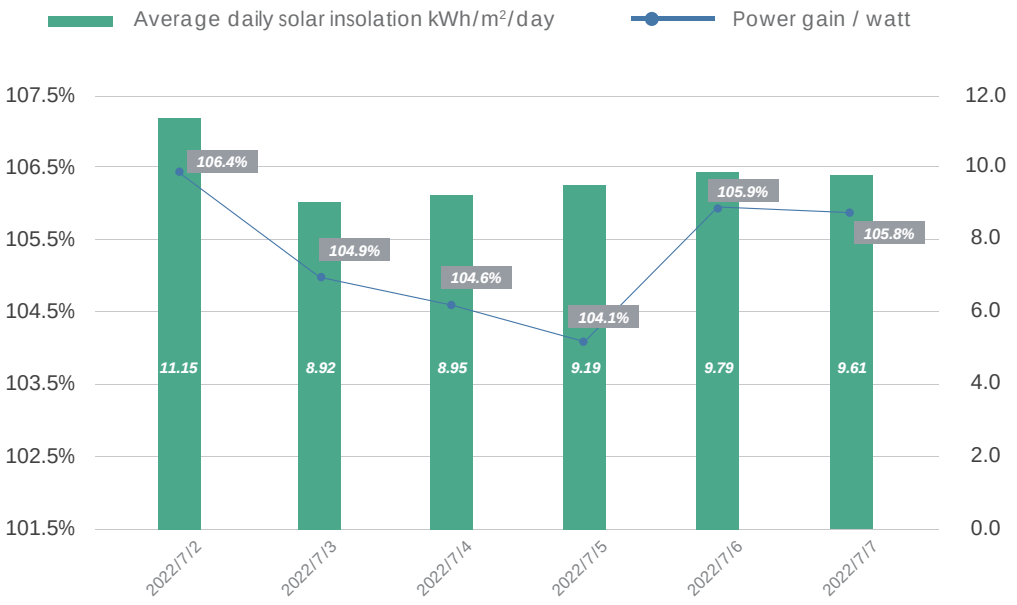

Figure 2: Tracking system & White painted floor

Pictures of the Tracking system & White painted floor

PV module' s outdoor performance is 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, especially for the bifacial modules, which are highly sensitive to the surrounding environment. Ningbo (121 ° 30' E, 29 ° 31' N) is the one of easternmost cities of China, and the average temperature remains above 15 ° C throughout the year. This experiment undergoing is crucial to investigate both technologies in outdoor performance.

Conclusion

It realizes that the n-type Topcon bifacial module has the higher yield gain in kWh/kW in the real world condition, varying from **3.31**% to **5.32%** compare to PERC modules, the majority of the contribution from its high bifaciality and low-temperature.