1.7% Yield Gain of TOPCon Over BC in Rooftop Installation

Abstract:

The harvested energy of TOPCon and BC modules has not yet been proved in the field test before. This project aims to present an experimental study on the energy yield performance of the TOPCon PV modules compared to BC modules in the rooftop installation scenario in Laizhou, located near the north east coast of China. The experimental results have proven that the energy yield gain of the TOPCon modules is 1.7% higher compared to BC modules.

Introduction:

To investigate both technologies in outdoor performance, especially in the humid rooftop field environment, an experimental study on the energy yield performance of TOPCon PV modules in comparison to BC modules was carried out in Laizhou, Shandong Province, China.

15 pieces of Jinkosolar' s TOPCon modules rated 585Watt and 15 pieces of BC modules also rated 585Watt were installed in a residential rooftop with a tilt angle of 20° in Laizhou, 2 kilometer away from Bohai Sea. By this installation, an optimum for the use of front side power generation was reached as shown in Figure 1.

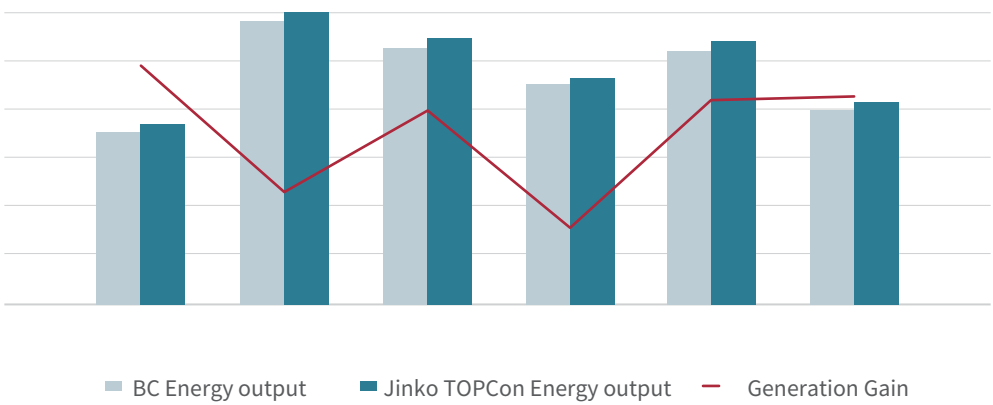
Figure 1: Project Picture

The outdoor energy generation was measured by DC meters in a 1-min interval. The data of each panel including DC voltage, current, power, module temperature, irradiation of front side, wind speed, orientation, ambient temperature, relative humidity, atmosphere pressure were collected for each day since June 01, 2024. After one month operation, TOPCon module compared to BC module, showed initially a yield gain of 1.7%.

Results and Analysis:

Since in back contact (BC) solar cell, all the electrical contacts are located at the rear side (back side) of the device, which results in stress concentration, back side deformation or bending and local temperature rise. This deformation temperature resulted from stress concentration at the rear side will negatively affect the performance of BC cells. The phenomenon is observed more obvious in days of higher temperature in Laizhou, where the temperature could be 38-39 Celsius degrees and the module temperature could reach up to 55 Celsius degrees at noon.

This stress-induced damage tends to occur and propagate. Furthermore, there is a high possibility of back surface bending or even broken during transport and load/unload handling and initial stage of installation. Moreover, the high humidity high salt spray coastal environment will deteriorate its reliability.

Conclusion

As the new mainstream cell technologies in solar industry, this paper proposes an experimental study on TOPCon PV modules' energy yield compared to BC in rooftop scenario which is supposed as the ideal application for BC technology. It realizes that the TOPCon module has **1.7%** higher energy yield performance compared to BC modules, the majority of the contribution from its low-temperature, better stability and robust reliability.