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Outdoor current-voltage testing of bifacial photovoltaic modules to determine bifaciality coefficients and gain

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Bifacial photovoltaic (bPV) modules utilise light incident on both front and rear surfaces. This leads to enhanced power generation characterised by the bifaciality coefficients, which is the ratio of electrical characteristics between front and rear surfaces. The amount of light reflected from the surface underneath a tilted module is a major contributing factor to the rear irradiance-driven bifaciality power gain. In this work the performance of a sample of bPV modules was investigated and a methodology refined for the outdoor baseline testing of bPV modules. A monofacial PV (mPV) modules as a reference in the determination of the bifacial gain of the bPV modules under different albedo conditions, viz. white, black, grass and concrete surfaces. The bifaciality coefficients of short-circuit current, open-circuit voltage and maximum power are measured according to the testing standard IEC TS 60904-1-2 (2019-01). The calculated values for the coefficients are 73% for maximum power and 75% for short-circuit current. The bifaciality coefficients depend on the structure and type of solar cell used in the bPV module, and for Passivated Emitter Rear Contact (PERC) modules like ones used in this study, the expected bifaciality range is 70 – 80 %. The bifaciality power gain from different reflecting surfaces was for the black cloth (+5%), concrete (+7%), grass (+10%) and white cloth (+15%). These results are as expected and indicate the performance advantages of Bifacial modules depend on the ground surface reflectance.

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No

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