CALCULATION OF THE PHOTOVOLTAIC MODULE SERIES RESISTANCE

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Abstract

A theoretically based methodology to calculate the series resistance of a PV module after experimental meas-urements is suggested in this paper. For the methodology is considered the standard PV module one exponential equivalent circuit. In the paper is proposed to ignore the shunt resistance and take into account only the series resis-tance to obtain the PV module I-V characteristic. There is demonstrated that the total PV module I-V characteristic it is the sum of the p-n junction I-V characteristic (exponential form) and the serial resistance I-V characteristic (linear form). So, to get the series resistance characteristic we have to subtract ideal I-V characteristic from real one ob-tained after experimental measurements near to the normal conditions.

In the paper described a calculation algorithm for the series resistance. Experimental tests have shown that the maximum relative error between experimental and theoretical PV module I-V curves under different conditions is not exceeds 12%.

The suggested methodology may be used for the PV modules diagnosis during its exploitation on solar plants. Time to time, for example once a year, we have to measure I-V curve of the same PV module on a solar plant and then calculate the serial resistance value by the proposed algorithm. The analysis of the resulting trend will allow us to identify a decrease of the PV module efficiency or detect damages of this module.

Keywords: PV Module, I-V Characteristic, Equivalent Circuit, Series Resistance.