

Performance of the Photovoltaic Module under Different Shading Patterns

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Abstract : Generation of the electrical energy based on photovoltaic (PV) technology has been increased over the world due to either the continuous reduction in the traditional energy sources in addition to the pollution problems related to their usage, or the clean nature and safe usage of the PV technology. Also, PV systems can generate clean electricity in the site of use without any transmission, which can be considered cost effective than other generation systems. The performance of the PV system is highly affected by the amount of solar radiation incident on it. Completely or partially shaded PV systems can affect its output. The PV system can be shaded by trees, buildings, dust, incorrect system configuration, or other obstacles. The present paper studies the effect of the partial shading on the performance of a thin film PV module under climatic conditions of Cairo, Egypt. This effect was measured and evaluated according to practical measurement of the characteristic curves such as current-voltage and power-voltage for two identical PV modules (with and without shading) placed at the same time on one mechanical structure for comparison. The measurements have been carried out for the following shading patterns; half cell (bottom, middle, and top of the PV module); complete cell; and two adjacent cells. The results showed that partially shading the PV module changes the shapes of the I-V and P-V curves and produces more than one maximum power point, that can disturb the traditional maximum power point trackers. Also, the output power from the module decreased according to the incomplete solar radiation reaching the PV module due to shadow patterns. The power loss due shading was 7%, 22%, and 41% for shading of half-cell, one cell, and two adjacent cells of the PV module, respectively.

Keywords : I-V measurements, PV module characteristics, PV module power loss, PV module shading

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