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A thermal model for N series connected Glass/cell/polymer sheet and Glass/cell/glass crystalline silicon photovoltaic modules with hot solar cells connected in series and its thermal losses in real outdoor condition

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Abstract

The importance of reliability and degradation of photovoltaic (PV) systems as a renewable energy resource is well recognized. In the present study, a thermal model has been developed to estimate the temperature, efficiency and thermal losses for N series connected Glass/cell/polymer sheet and Glass/cell/glass PV modules with hot solar cells in terms of climate and design parameters. The numerical computation has been performed for larger number of days as June (summer) and December (winter) following the temperature of hot solar cells at the National Institute of Solar Energy, Gurugram, India. In the case of string 1 (3 hot solar cells) of Glass/cell/polymer sheet has higher short circuit current than the Glass/cell/glass PV modules string 2 (7 hot solar cells). Similarly, leakage current of Glass/cell/polymer sheet PV module with 7 hot solar cells is marginally higher in comparison to Glass/cell/polymer sheet PV module with 3 hot solar cells. Further, 1% electrical
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