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THERMODYNAMIC EFFICIENCY OF SOLAR PHOTOVOLTAIC MODULES

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Abstract

Solar photovoltaic (PV) system performance parametrically depends on climatic, operating and design parameters, and in view of thermodynamics it can be evaluated in terms of energy and exergy efficiencies. In this paper, thermodynamics efficiencies of two different solar PV modules technology i.e. wafer based crystalline silicon and thin-film are evaluated. As a subject, polycrystalline silicon (ASE-100) and amorphous silicon (DS-40), as components of 10 kWp grid-connected PV array system at Szent István University are used under Gödöllő - Hungary climatic conditions. Based on theoretical evaluation, it is found that average energy and exergy efficiencies during a year were 47.66% and 11.82% for ASE-100, and 43.20% and 4.30 for DS-40. Meanwhile, based on experiments in one day, it is found that an average exergy efficieny during effective sun hours were 12% and 4%, for ASE-100 and DS-40, respectively. Besides a comparison purpose, further outcome of this research is trying to find a possibility to increase the performances both solar PV modules, in PV array system at Szent István University.

Key words: amorphous silicon, energy, exergy, performance, polycrystalline silicon

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