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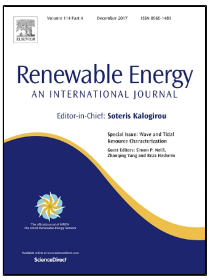

Thermoeconomic and Environmental Analysis of Solar Flat Plate and Evacuated Tube Collectors in Cold Climatic Conditions

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Abstract:

In the current study, a thermoeconomic analysis of two different solar hot water systems based on two types of flat plate collector (FPC) and evacuated tube collector (ETC) are studied under the cold climate conditions of Iran. The annual solar collector energy output and the collectors' output temperature are calculated using the TRNSYS16 software. As a result, it is found that the inlet temperature and weather conditions are the two major variables which effect on the collector performance. Finally, according to the thermal and economic analysis, the performance of ETC system is 41% better than the FPC systems, and the yearly useful energy gain of ETC is 30% more than that of FPC in cold climate. So, applying ETC in cold climate is recommended. Additionally, this simulation will be extendable and applicable for every zone with any climatic condition.

Keywords: Flat plate collector; evacuated tube collector; thermoeconomic analysis; economic assessment

Introduction