

Enhancing the Efficiency of Solar Steam Turbine by Adding a Thermoelectrical Generator for Renewable Clean Energy Generation

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Solar energy conversion systems are crucial in life due to our dependency on electricity. They are green and renewable energy sources, thus, allows people to design multiple systems involving the use of solar energy. One of these designed systems is the solar steam turbine, however, it faces a drawback of wasting heat so that not all solar power is utilized. In this work, a thermoelectric generator (TEG) is added to a solar steam turbine system with the objective of increasing the utilization of solar power. A solar concentrator trough, where the heat from the sun is concentrated, was first redirected to a TEG that was attached to a semi-circular tube containing water. The TEG generated electrical power from the temperature difference across the two sides of the TEG while water was steamed under concentrated solar power. The generated steam was connected to a turbine to generate electricity after that. A simulation study using COMSOL Multiphysics software was used to optimize the dependent variables for which the power generation will be maximized. The simulation results have indicated promising preliminary outputs where the electricity generation is maximized. The best performing design resulted in 72W extra energy using only 16 TEG units. This project proposes a potential enhancing scheme for a simple, low cost, effective system in order to supply the global energy demands.