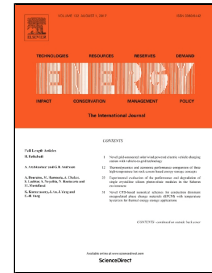


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A Hybrid Concentrated Solar Thermal Collector / Thermo-Electric Generation System

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1 **A Hybrid Concentrated Solar Thermal Collector / Thermo-Electric Generation**
 2 **System**

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11
12 **Abstract**

13 A bi-generation system combining direct absorption flat plate solar collector for medium
 14 temperatures air-heating applications integrated with a thermoelectric generator was
 15 modeled under optically concentrated solar radiation conditions. In order to improve the
 16 performance of the bi-generation system, the proposed system was simulated under the
 17 effect of evaporative cooling at the cold side of the thermoelectric modules in order to
 18 create a cooling effect that decreases the temperature of the cold junction, thus enhancing
 19 the electrical conversion efficiency of the thermoelectric modules. Rung-Kutta 4th order
 20 method is used to solve the ordinary differential, equation, while Newton-Raphson
 21 iterative technique is used to solve the nonlinear algebraic system of the model governing
 22 equations. The results have reflected a significant effect for the evaporative cooling on the
 23 system performance particularly at high values of optical concentration ratio. Furthermore,
 24 an augmentation of 19.13% in the total electrical power output was predicted at a
 25 concentration ratio of 20 suns. Simulation results had also shown that more stable electrical

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