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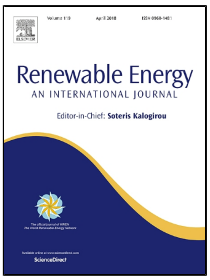

Experimental study on a stove-powered thermoelectric generator (STEG) with self starting fan cooling

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Abstract:

In order to obtain electricity in off-grid areas and in emergency conditions (earthquake, hurricane, tidal wave, military field, etc.), a prototype of stove-powered thermoelectric generator (STEG) without battery embedded was built and tested. A novel type of heat collector, i.e. two copper heat conducting flat plates installed oppositely, was designed to integrate a relative large number of thermoelectric (TE) modules (eight TE modules in the present work). The heat collector works with optimized heat sinks and cooling fans to maintain large temperature difference and low cold end temperature, and to insure the self startup of the STEG. Hard charcoal was used to test the performance of the STEG, including the startup performance, power load feature, response dynamics when adding a load and thermoelectric efficiency. Results showed that the STEG can be self startup. The measured maximum electricity power is 12.9 W, and the thermoelectric efficiency lies between 2.4% and 2.8% when the temperature difference ranges from 119 °C to 147 °C. The response time is short enough (several seconds) to stable the outputs, and the cold end temperature is low enough, i.e. less than 65 °C to install normal cooling fans.

Keywords: Thermoelectric generator, power load feature, response dynamics, thermoelectric efficiency