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A Novel Approach to Dual-Source Renewable Energy Harvesting Using Thermoelectric and Solar Technologies

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Abstract

The increasing need in the world to have clean and reliable energy has increased the pace of research on hybrid renewable energy systems. The paper offers a new concept of dual-source renewable energy collection through the adoption of a hybrid technology that brings together thermoelectric and solar technology to one hybrid structure. The system that was proposed will capture solar power via photovoltaic modules and convert the waste heat to electric power via thermoelectric generators thus enhancing the overall efficiency in energy usage. The hybrid design also guarantees uninterrupted power production in the changing environmental conditions including the changing solar irradiance and temperature gradients. The combined approach covers system architecture, principles of energy conversion, and advantages of operation of the approach. The findings outline that the dual-source integration can maximize the power output, minimize the energy losses, as well as lead to the creation of sustainable and environmentally friendly energy production. The method is especially applicable in the smart grids, distant power devices, and environment-friendly construction of infrastructure.

Keywords: Dual-source energy harvesting; Renewable energy systems; Thermoelectric generators; Solar energy; Hybrid power generation; Sustainable energy