The Thermoelectric Generator Using Hot Sand to Store and Generate Electricity

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In modern times, our planet has plunged into a crisis of energy, one where "clean" energy systems rely on Lithium-Ion Batteries, or LIBs, to store electricity. Due to the Lithium, Cobalt, and other rare metals in these batteries, LIBs are extremely expensive, limited in supply, and dangerous. These issues (along with ties to child labor and pollution) make Lithium-Ion batteries unsuited to store large quantities of energy. This leads to curtailment, brownouts, and blackouts in "clean" energy grids that rely on LIBs. My solution to the energy crisis is the Thermoelectric Generator Using Hot Sand to Store and Generate Electricity. This project uses sand's low heat transfer ratio to store energy in the form of heat for long periods of time. After that, thermocouples use the Seebeck Effect to convert the thermal difference between hot sand and a colder, outside temperature into electricity. In the past, I have proven that this concept can not only store and generate electricity, but do it in a way that both lasts longer and is cheaper than using Lithium-Ion Batteries. New developments of this project include the improvement of the thermocouples, sand, heating system, and insulation used in this project. By using a nitinol-and-copper-based thermocouple, I have been able to achieve a power output of 5.901 watts from a 255-degree Fahrenheit temperature difference. Additionally, at less than $.50 per piece and only taking up a one mm^2 area, I can implement hundreds more of these thermocouples into my design while still being a cost-effective and smaller alternative to the thermocouples that I have used in the past. A new gravity-fed heating system has decreased the heating time of the sand used in this project by over 5 hours on end, and more depending on the conditions.

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