Thermoelectric Generation

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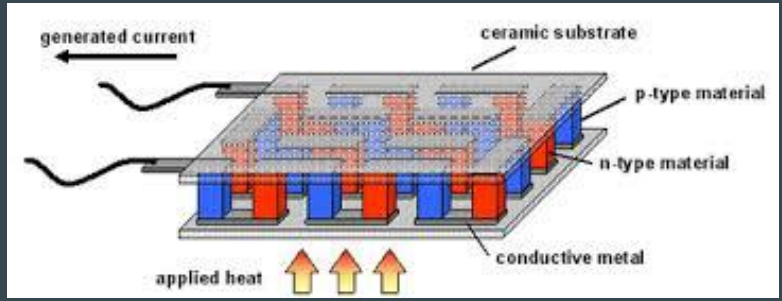
The Idea

Thermoelectric Generation (TEG)

A TEG is a device with no moving parts that converts heat energy directly to electrical energy.



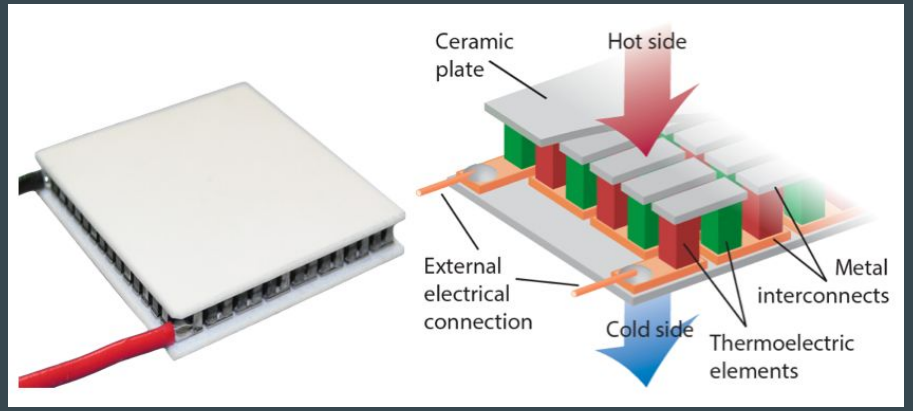
To create the electrical energy there must be a temperature difference across the device.

Since there are no moving parts and little maintenance required, thermoelectric generators are primarily used for unmanned sites that are off-grid. However, the market for thermoelectric generation is growing rapidly. The current market for thermoelectric generators is $320 million and with an expected growth of $720 million by 2021.

The First Idea - Elementary

At UCSD, thermodynamics is under taught to students in engineering. Electrical engineers do not have any courses regarding thermodynamics and mechanical engineers only have one.

The idea is to build a device that incorporates basic concepts of thermodynamics by having students build a simple thermoelectric generator that can charge a phone.



The Second Idea - Complex

Design a TEG device that has the ability to harvest excess heat as an energy source in both residential and commercial applications. For example:

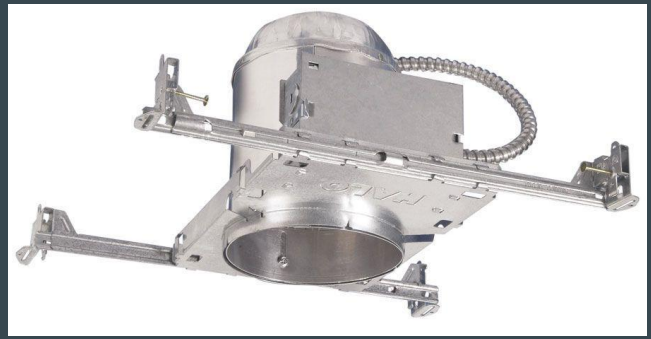
1. Recessed Lighting
2. Photovoltaic Cells

The Second Idea - Recessed Lighting

There has been a low adoption rate of energy efficient light bulbs like LED and CFL's.

90% of the energy used to light an incandescent light bulb is released as heat.

The idea is to harvest this excess heat and convert it into usable energy by using a thermoelectric generator.

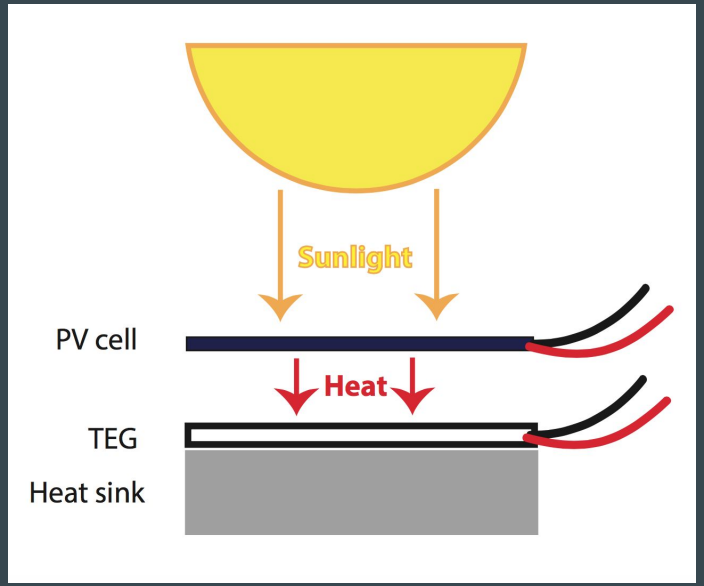


The Second Idea - Photovoltaic cells

As photovoltaic cells heat up in the sunlight they lose 10%-25% efficiency.

Instead of allowing the heat to decrease the efficiency of the photovoltaic cells, we can harvest this excess heat.

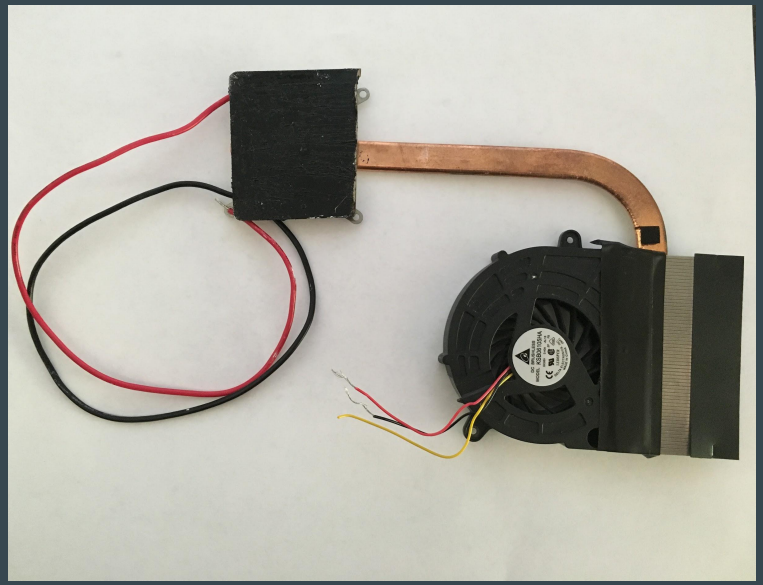
Not only increase the efficiency of the photovoltaic cell but by using a TEG we could transform the heat into a usable form of energy that can be put back into the grid.

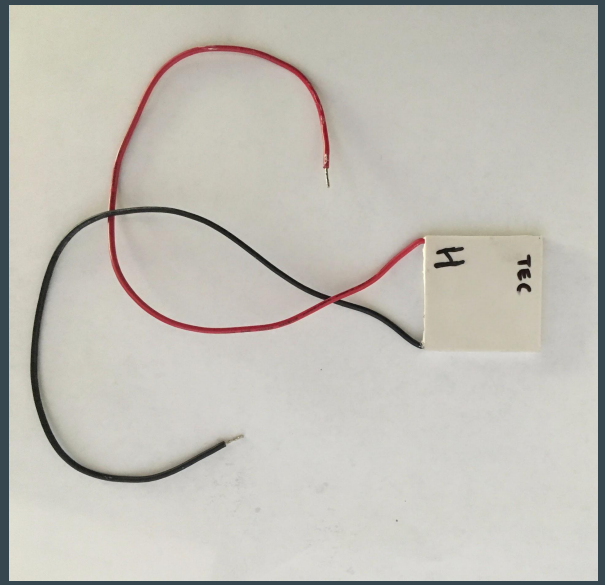


What do we need?

- TEGs
- Heat Sinks
- CPU Fans
- Voltage Regulator
- Thermal Glue
- Heat Source
- Outputs Vary. Examples Include: LEDS, Motors, Displays, Chargers

First Prototype [TEC]





Second Prototype [TEG]

Cost Estimates

TEG ~ $2.40

Heat Sink ~ $5.00 - $10.00

Voltage Regulator (Already Built) ~ $7.80

Thermal glue ~ $1.00-$2.00

Misc. Parts i.e. Stands, Screws, Candle...etc ~ $15.00

Total Cost ~$30.00 - $40.00