Applications of Thermoelectric Devices for Power Generation

San Diego State University

San Diego State University Mechanical Engineering Department
In collaboration with Hi-Z Technology, Inc.

The Project

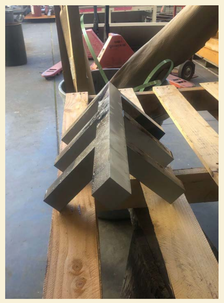
The goal of our project is to create a functioning thermoelectric generator that can charge an electronic device through the use of heat transfer from a wood-fueled fire to two Thermoelectric Modules (TEMSs) and the subsequent power generated to charge a 14.8 V, 50Wh battery.

Background

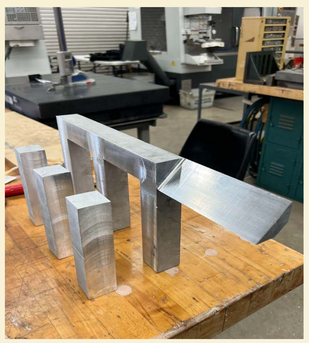
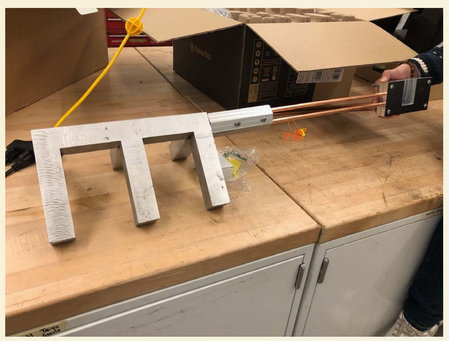
Thermoelectric generators are solid state devices used to convert heat and temperature gradients into a DC power source via the Seebeck Effect. By creating a temperature difference utilizing a heat exchanger system to transport heat from a fire while also isolating the cold side of the TEMs with a heatsink and fan, a stable power source can be produced to continuously charge a battery. After sufficient time the battery will reach a full charge and will be able to supply energy to a number of electrical devices. The product as a whole provides a renewable energy source utilizing only the energy produced by a campfire.

Manufacturing





Waterjet | Resulting Parts | Heat Trap Final Design

Faced/Cut Heat Trap Parts | Heat Exchanger Full Assembly

Team Hephaestus


Andres Cardenas

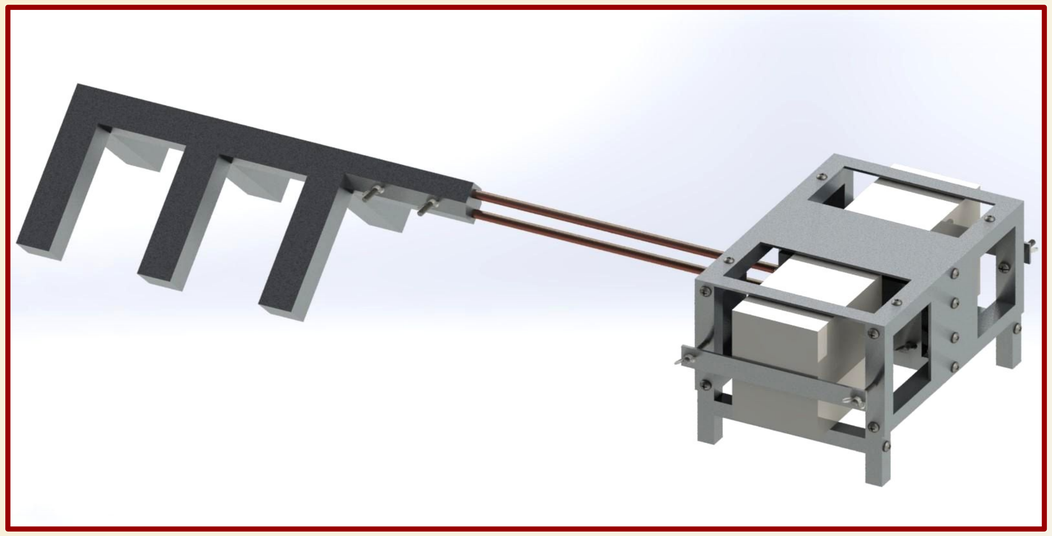

Dalaney Conte


Mathew Tivey


Bryce Horton

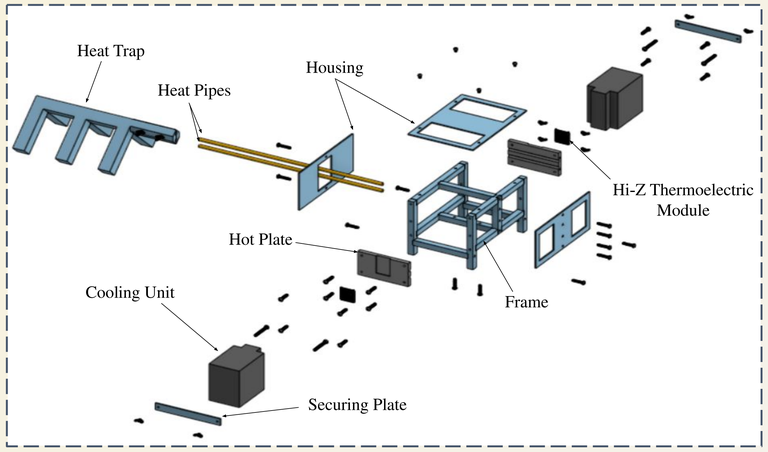

Caroline Yu

Rendered Final Assembly

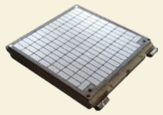


The Final Design is composed of the heat trap component and the main body of the system connected together by two copper heat pipes.

Exploded View



Key Components


10 W Thermoelectric Module
Converts temperature difference to usable electrical output.


Altex Dual Fan CPU Cooling Unit
Maintains low cool side temperature of thermoelectric modules.

Fxlion 14.8 V 50Wh Ultra-Compact Battery
Receives electrical output from thermoelectric modules to convert to usable energy for electrical device(s).


Aluminum Heat Trap
Captures large amounts of heat from campfire to transfer to dual heat pipes.


ATS Rounded Copper Heat Pipe
Highly conductive pipe using phase change to transfer heat gathered from the campfire to the hot side of thermoelectric modules.

Acknowledgments

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