

A woman in a red shirt is cooking over a wood fire. She is holding a large metal pot over a fire pit. The scene is dimly lit, with the fire providing the main light source. The background is dark and blurry, suggesting an outdoor or semi-outdoor setting. The text is overlaid on the image in white.

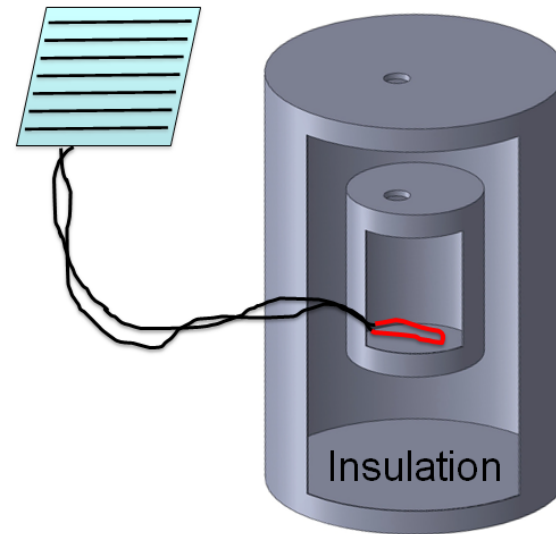
Solar Electric Cooking: Creating a Company in Ghana

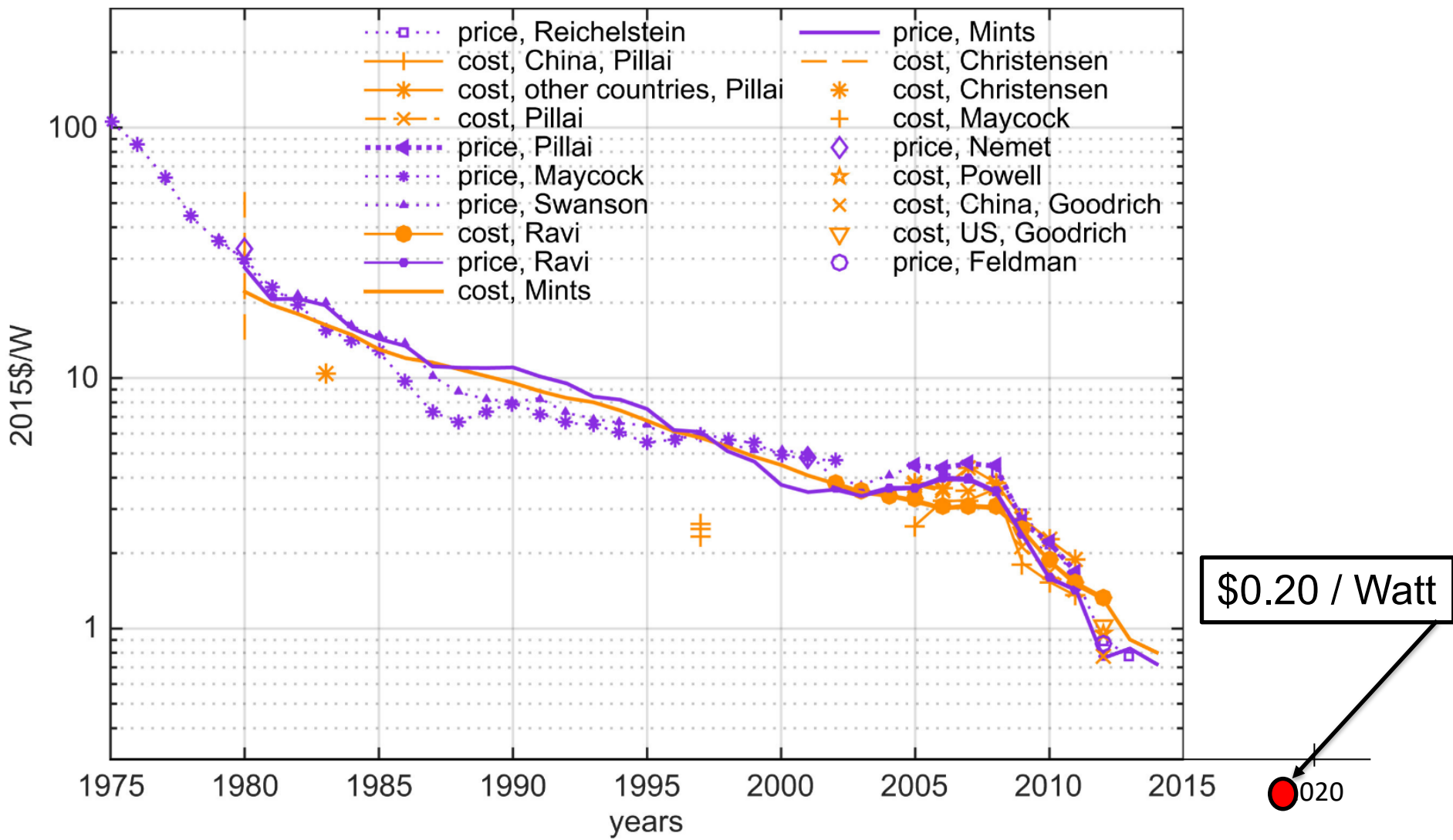
Grace Gius, *Cal Poly San Luis Obispo*



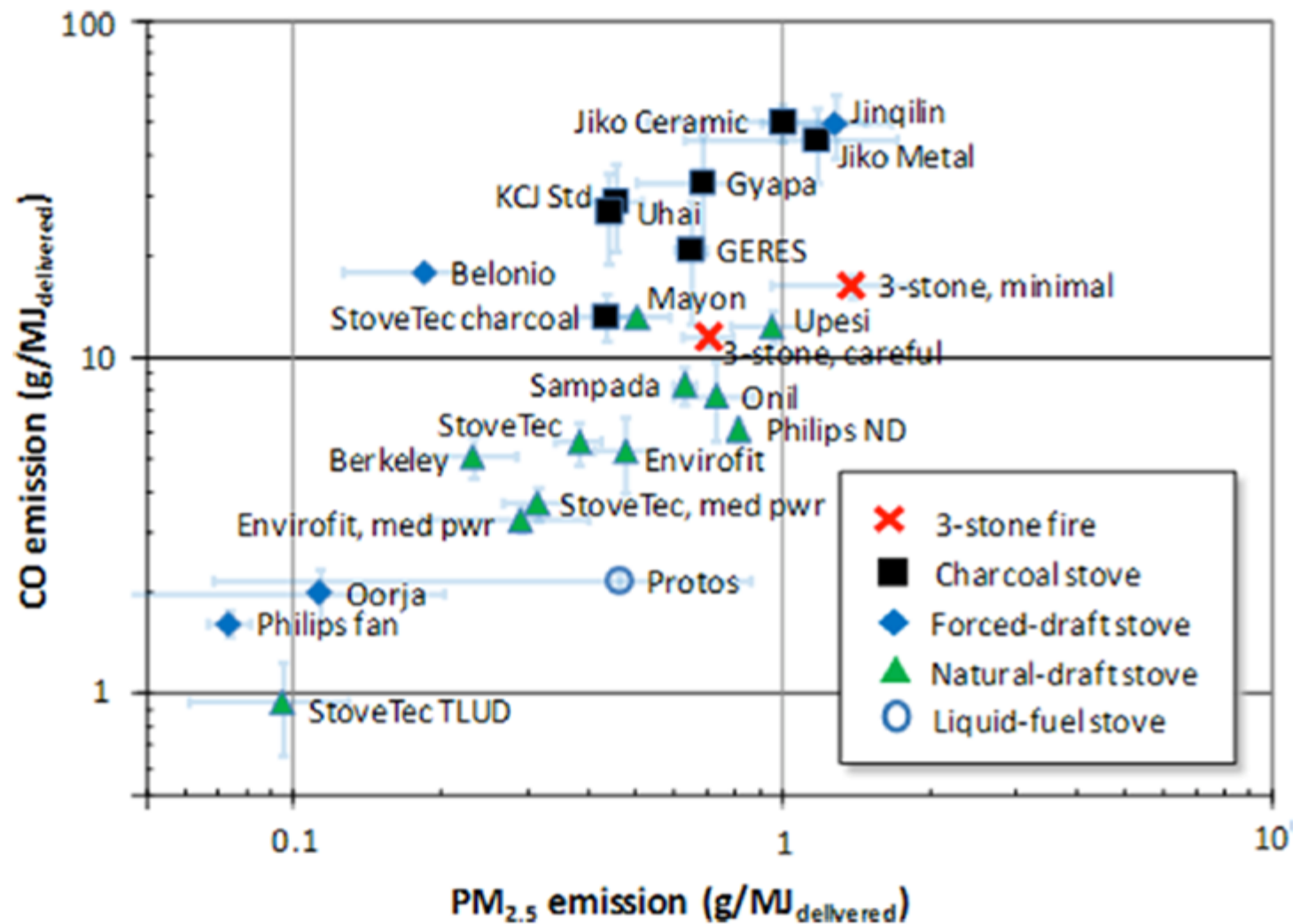
How did we get here? Where are we going?

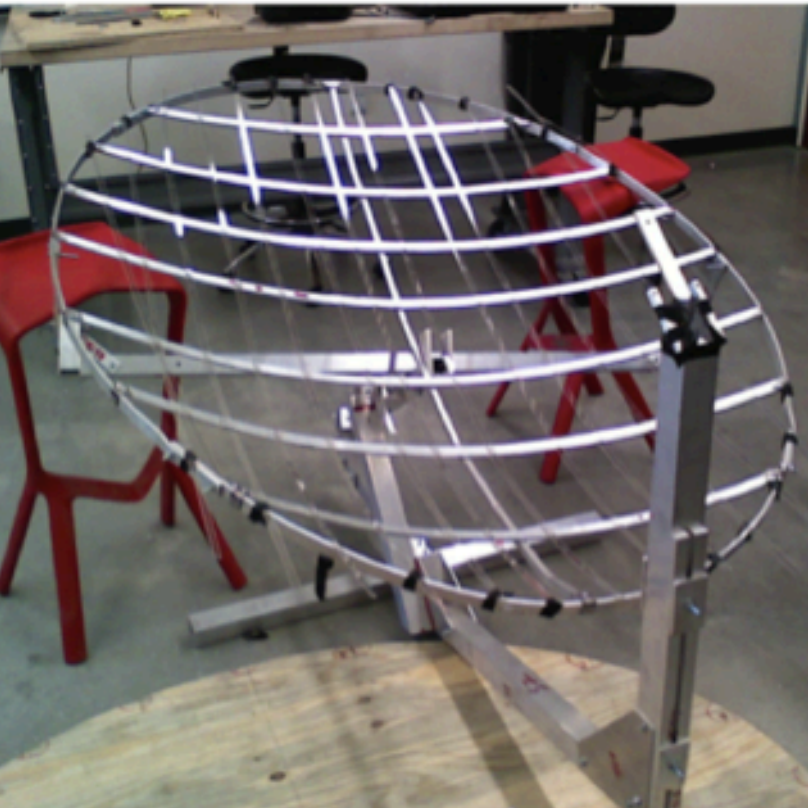
- Insulated Solar Electric Cooker
- 12 years of solar cooking development
- More than 100 students contributed
- Ghana Trip
- SolarElectricCook, and other collaborations





Kavлак et al. 2018, <https://doi.org/10.1016/j.enpol.2018.08.015>





2007-2015: Solar Concentrators



2015: First Prototype



Nickel-Chromium Wire and Concrete:

- Tailor Resistance
- Tailor Shape and Size



Four Students, one Month







Insulated Solar Electric Cooking – Tomorrow's healthy affordable stoves?

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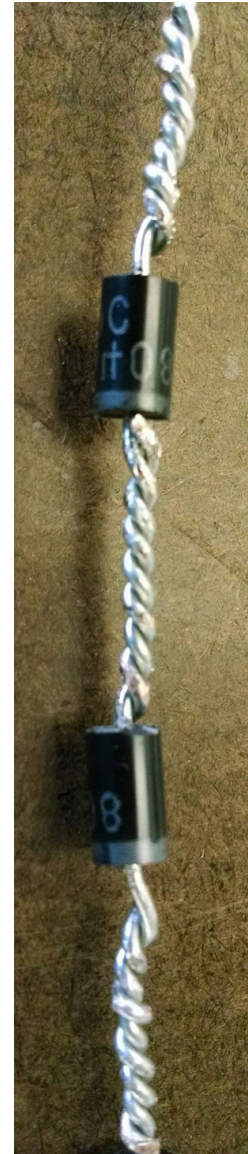
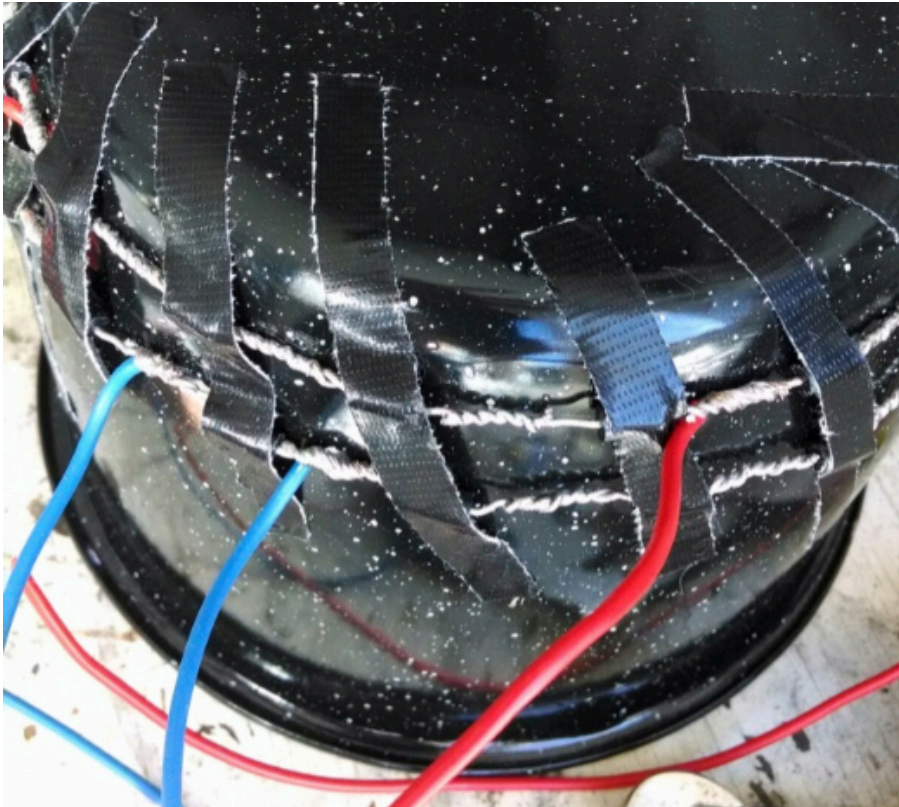
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Abstract

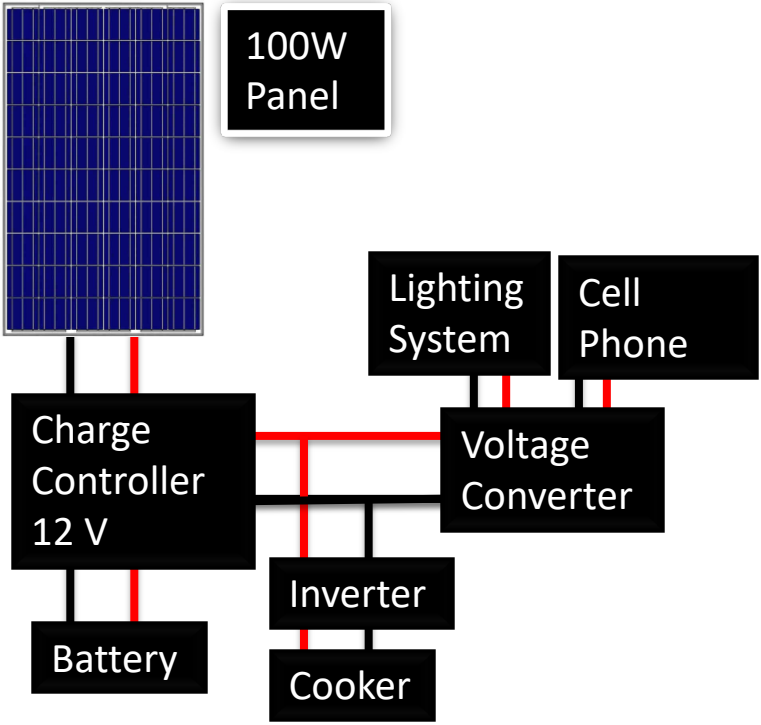
We present a cooking technology consisting of a solar panel directly connected to an electric heater inside of a well-insulated chamber. Assuming continued decrease in solar panel prices, we anticipate that in a few decades

Present day: Diodes!

- Voltage relatively constant
- Couples power from PV panel better
- Acts as crude, inexpensive voltage regulator

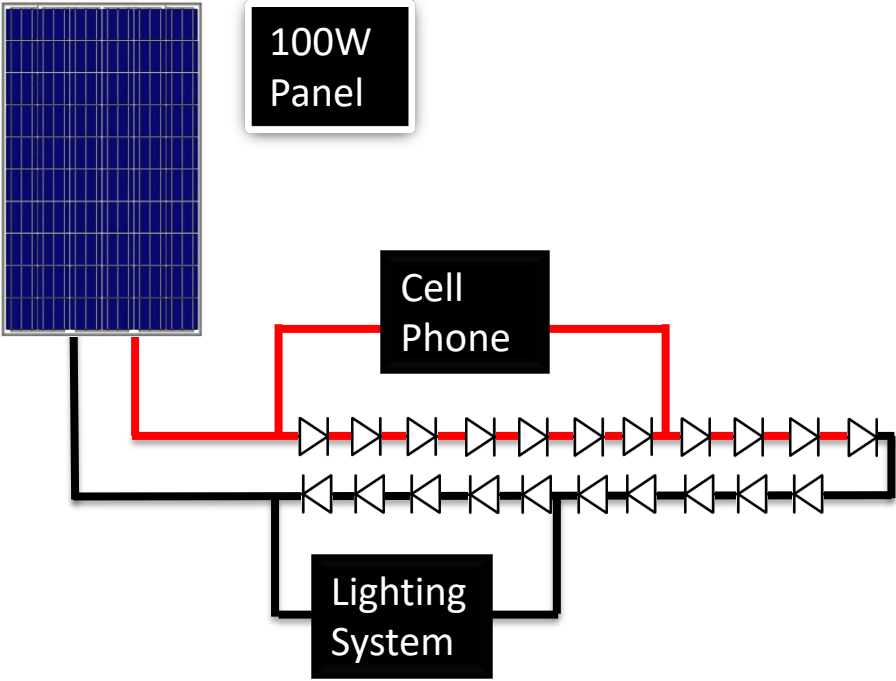


Charge Controller / Battery

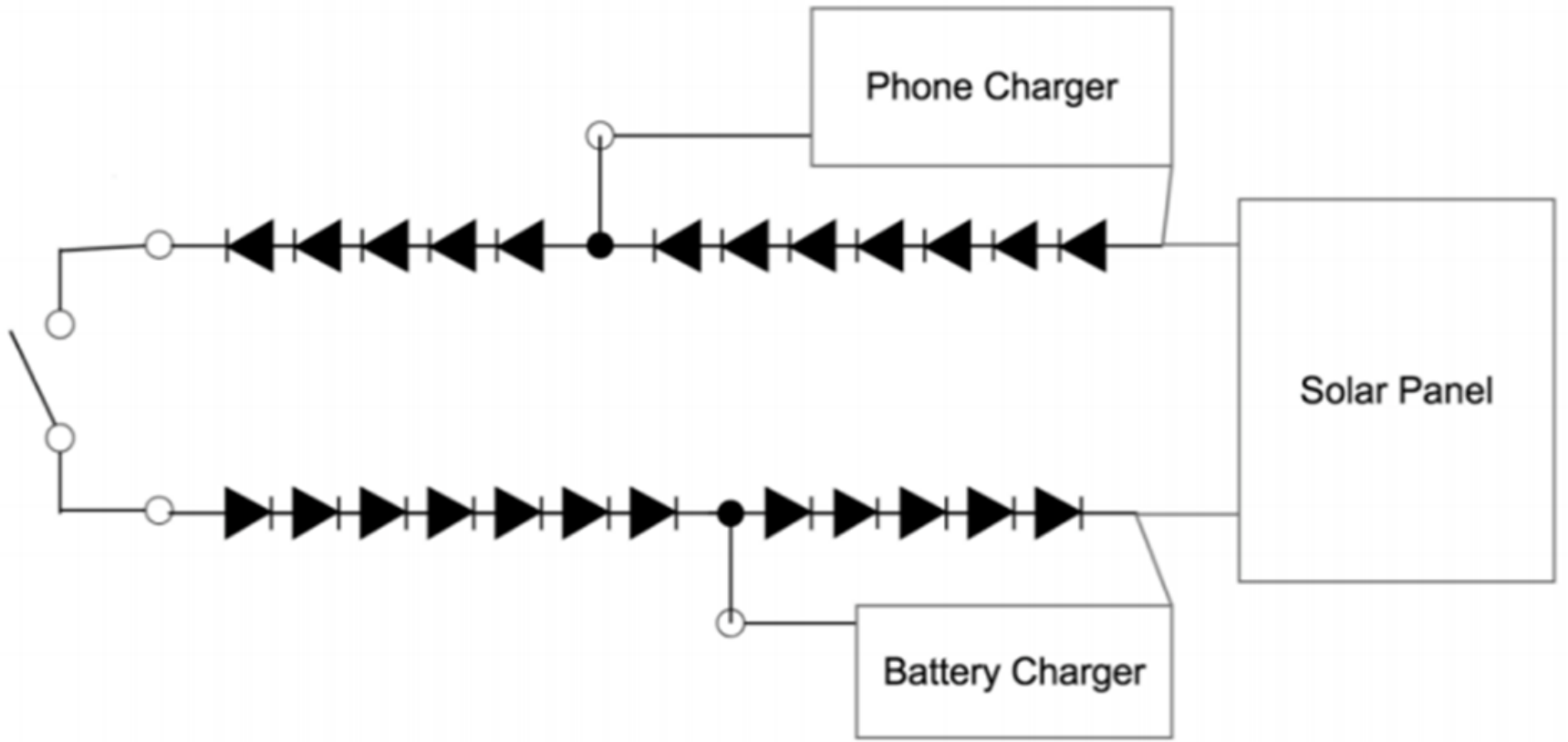


\$150 + Solar Panel

Diodes / Direct DC Solar

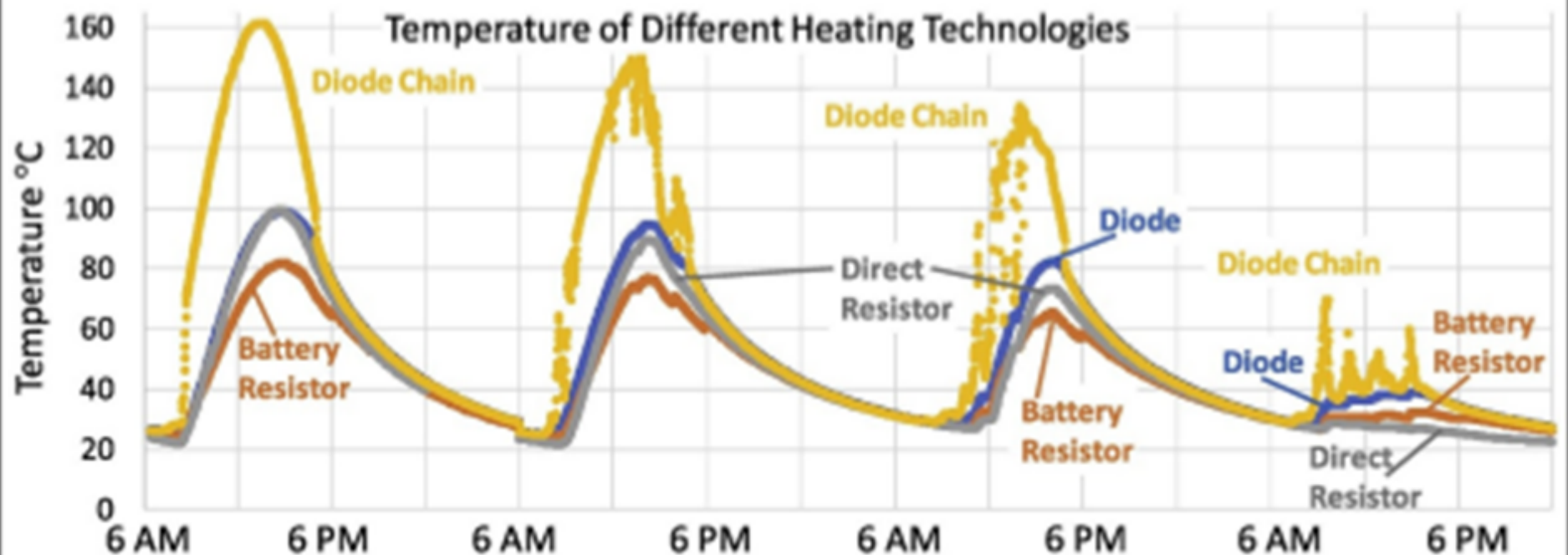


\$10 + Solar Panel





Temperature of Different Heating Technologies

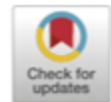




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Hot diodes!: Dirt cheap cooking and electricity for the global poor?

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DDS

ISEC

Insulated Solar Electric Cooking

ABSTRACT

Direct DC Solar (DDS) electricity can inexpensively cook food and charge appliances. Insulating the cooking chamber allows the food to cook with a lower-power (less expensive) solar panel over a longer cooking time. We explain how using a chain of diodes instead of a resistive heater extracts more energy from a solar panel over a variety of solar intensities and also acts as a rough, inexpensive voltage regulator to charge batteries and power appliances. We show how a diode heater produces more heat from a solar panel than either a DDS resistive heater or a PWM/battery-connected resistive heater, averaged over a wide variety of solar intensities. The resulting cost of electricity is already cost competitive with biomass cooking in many areas. Benefits include inexpensive access to electricity as well as reductions in indoor air pollution, deforestation, and cost/burden of providing cooking fuel. With continued decrease in the price of solar panels, DDS will become ever more effective for bringing electricity and electrical cooking to the global poor.

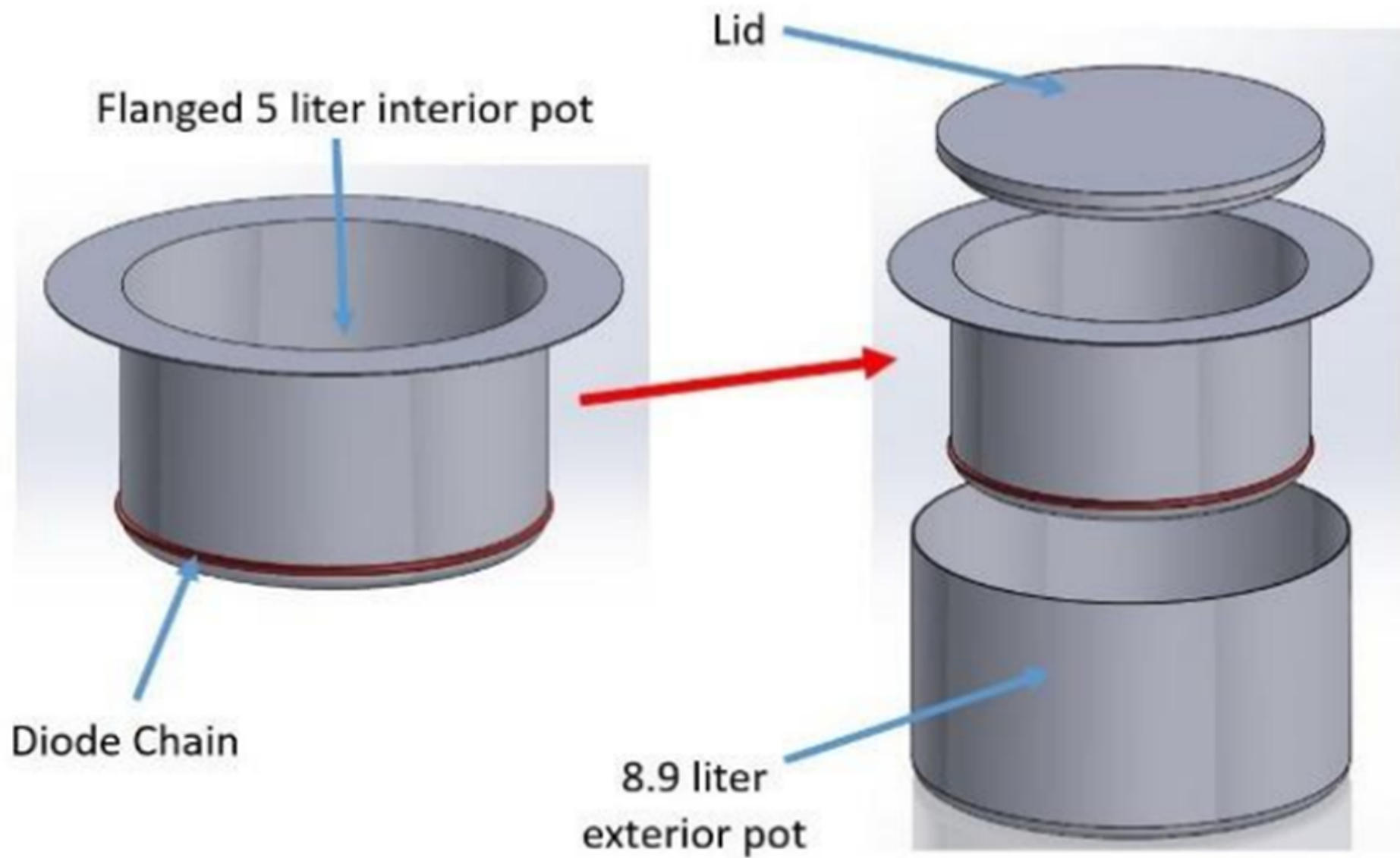
Motivation for Improvements

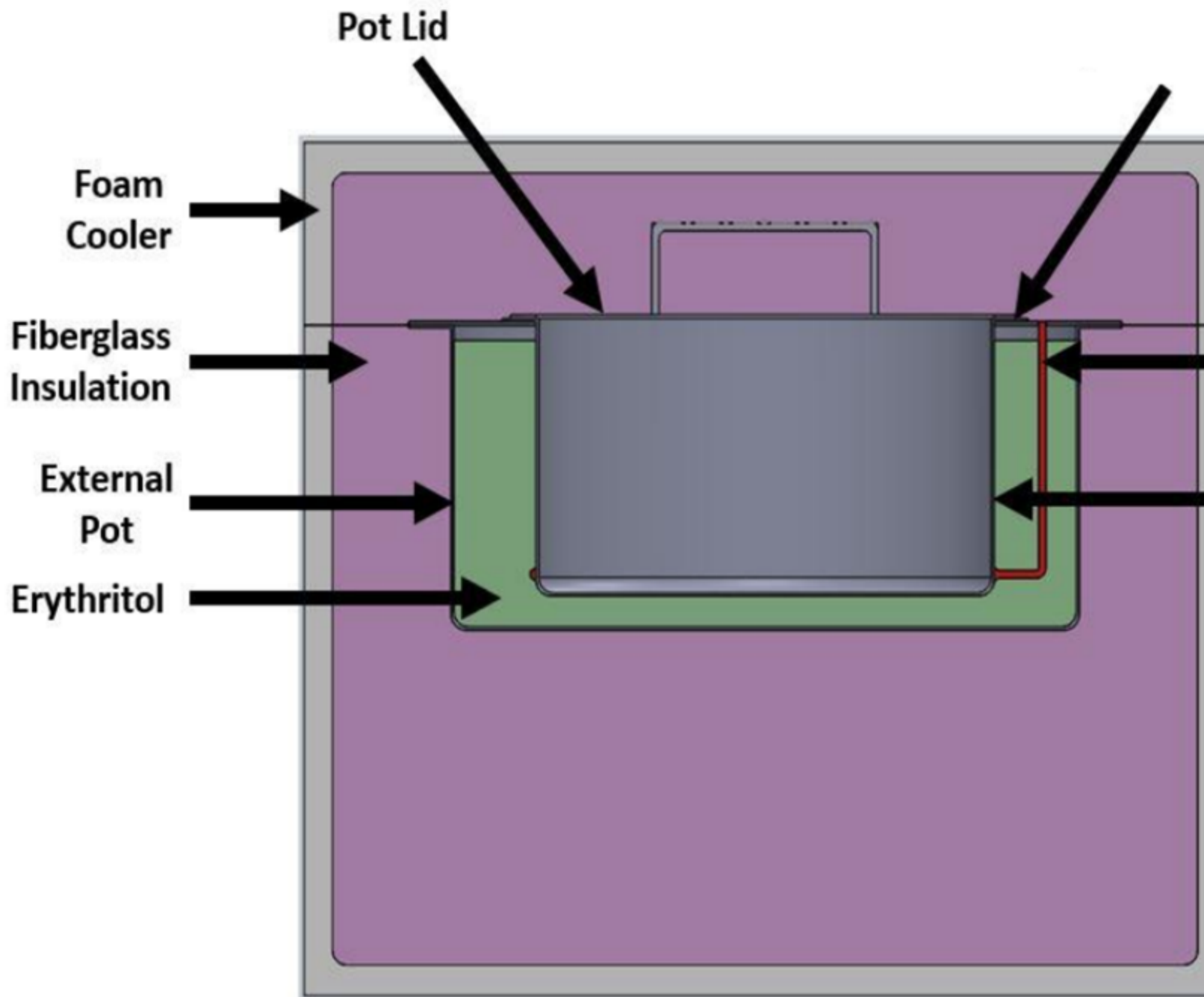
Wires hanging from pot:

- Pot inside a pot

More power desired; cooking after dark

- Phase change thermal storage









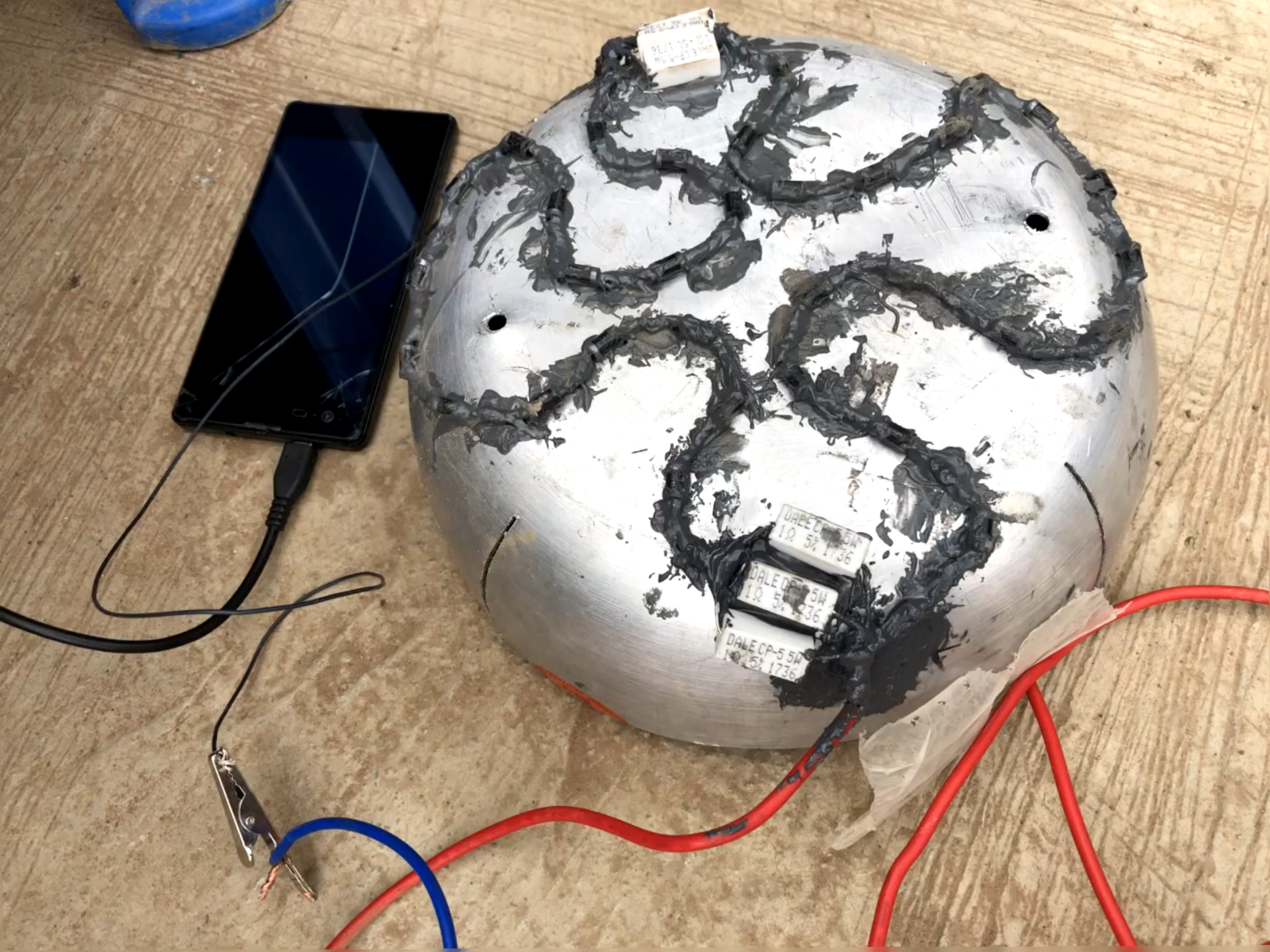
Agbokpa, Ghana











DALECP-5W
NO. 52 1736

DALECP-5W
NO. 52 1736

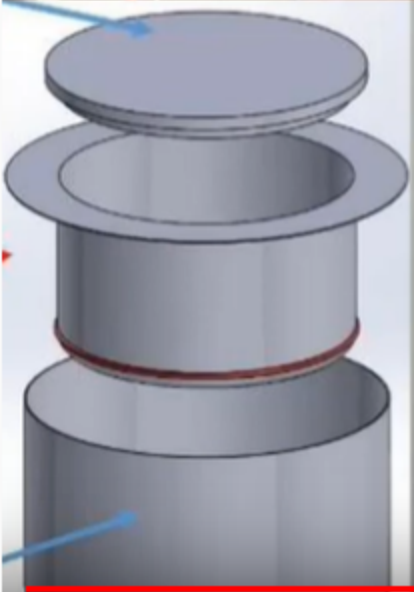
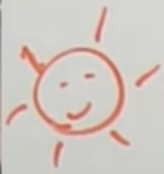
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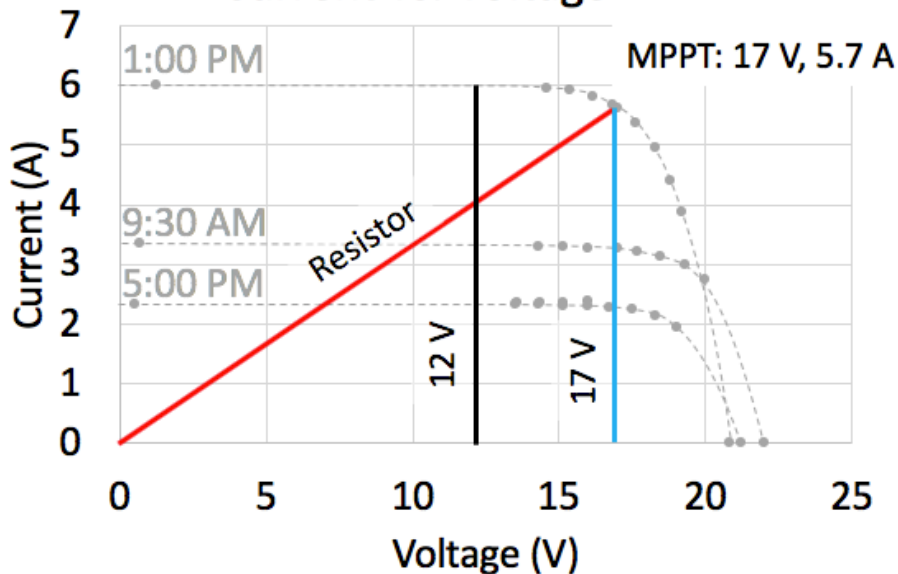




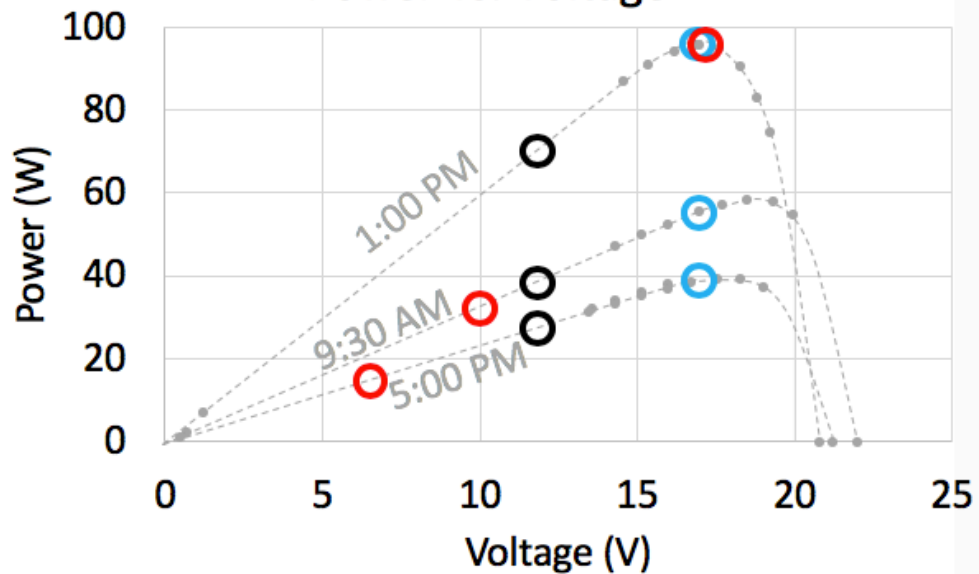
Where are we now?

- How to source parts / materials to Ghana?
- Martin just arrived in Chicago
- New director in Ghana
- Producing ISEC in Ghana!
- Student Research supports development

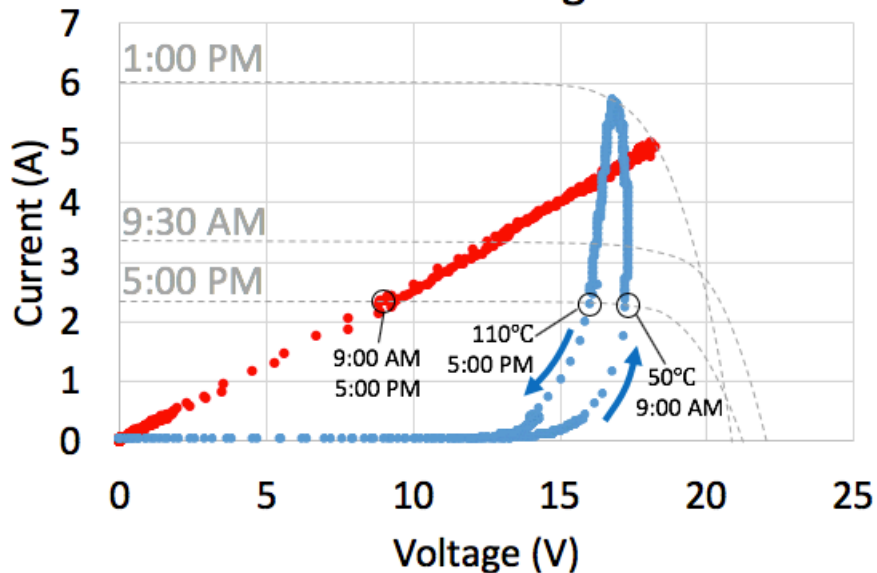
Current vs. Voltage



Power vs. Voltage



Current vs. Voltage



Power vs. Voltage

