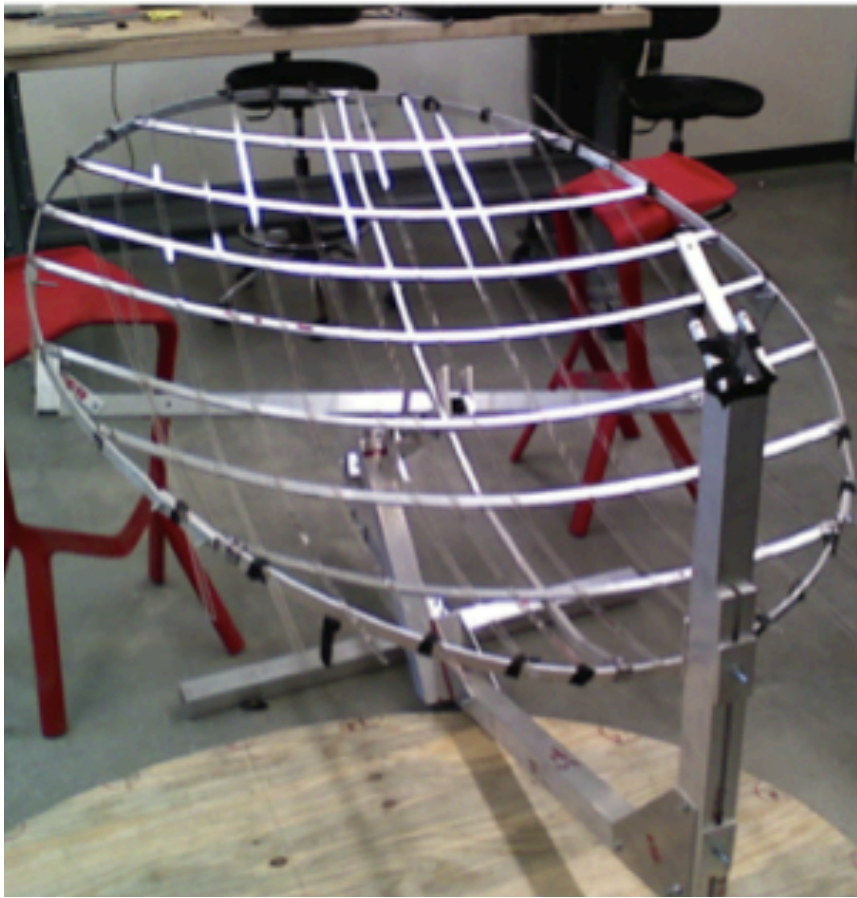


# Insulated Solar-Electric Cooking: Tomorrow's Healthy Affordable Stoves?



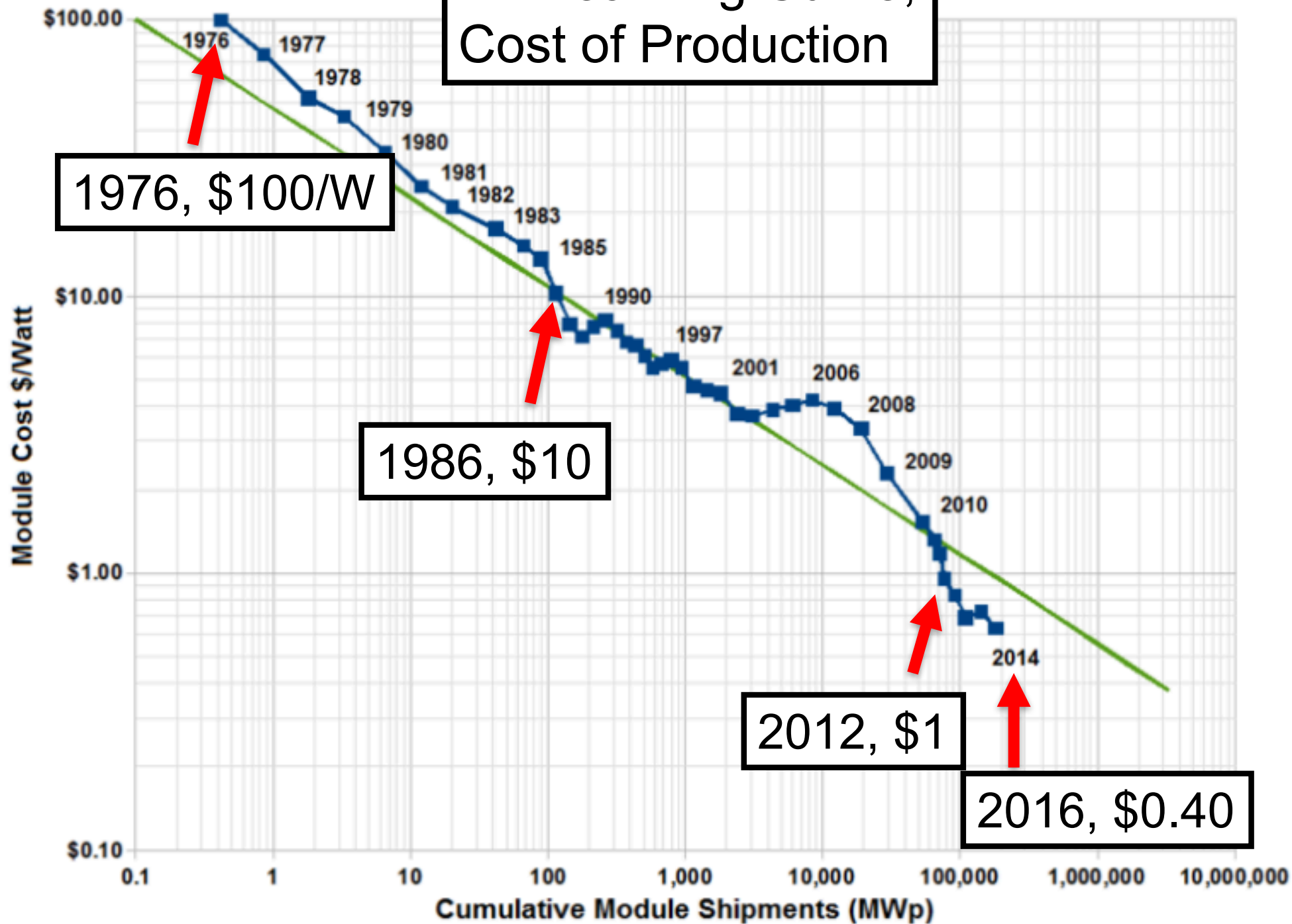


# Scheffler Reflectors, ~5 years





# PV Learning Curve, Cost of Production



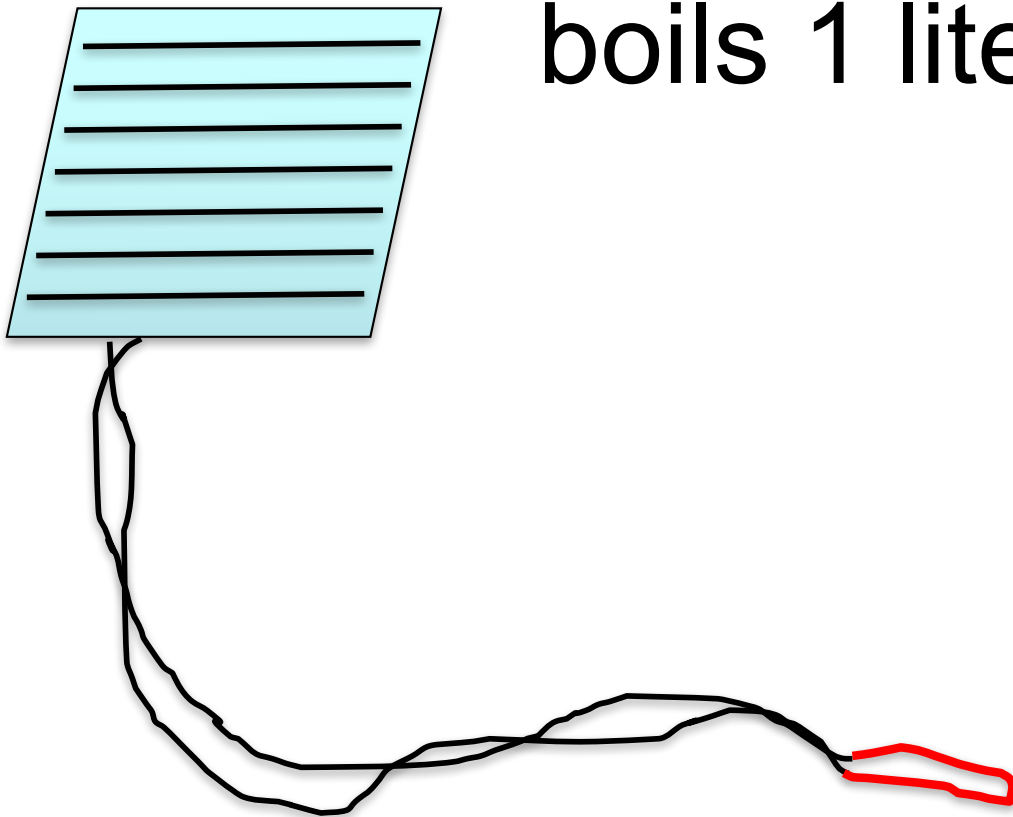


# Solar Panel, Heater, No Electronics

1000 W:

\$750 (PV) + \$2 (heater)

boils 1 liter: 6 minutes





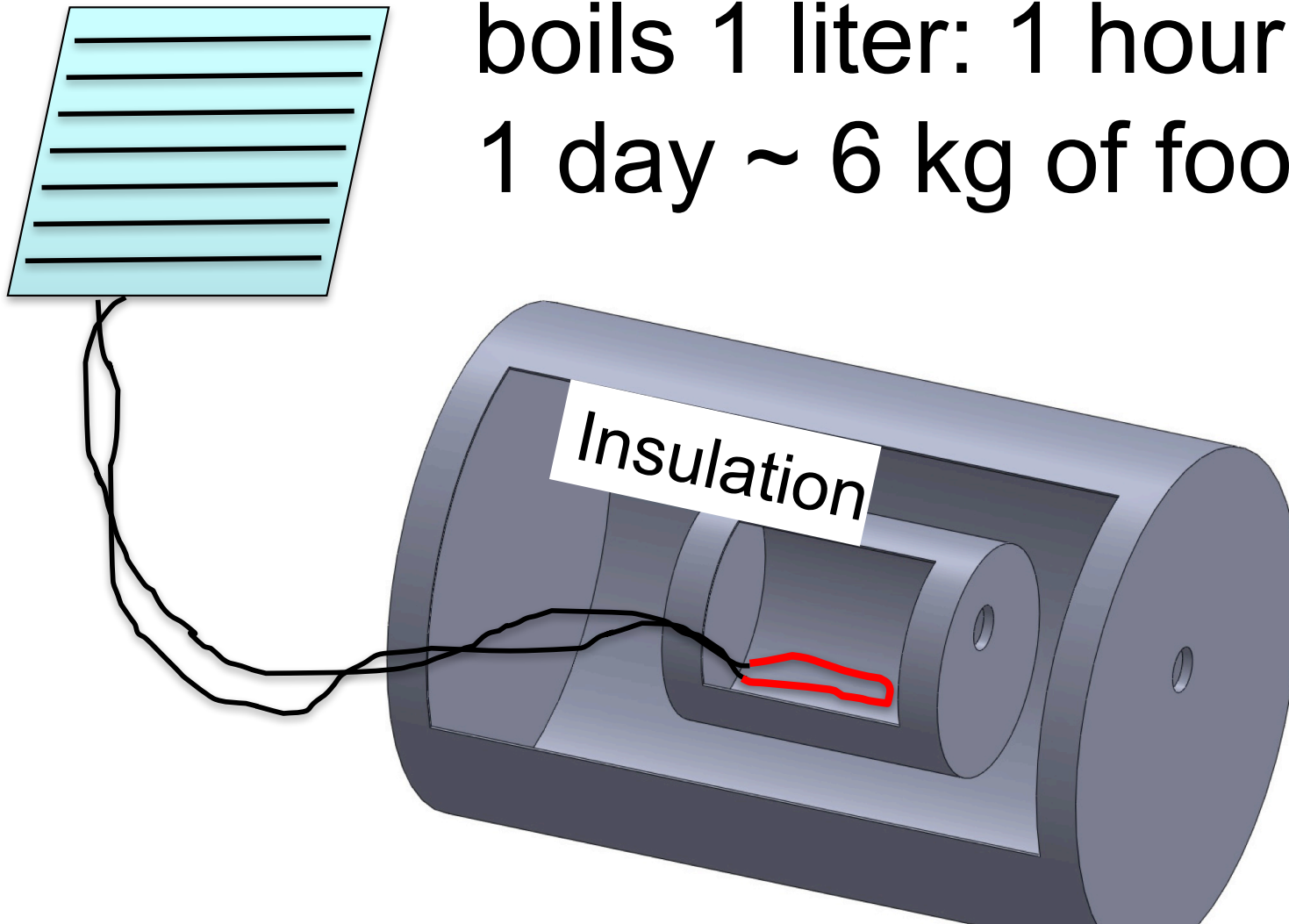
# Solar Panel, Heater, No Electronics

100 W:

\$75 (PV) + \$2 (heater)

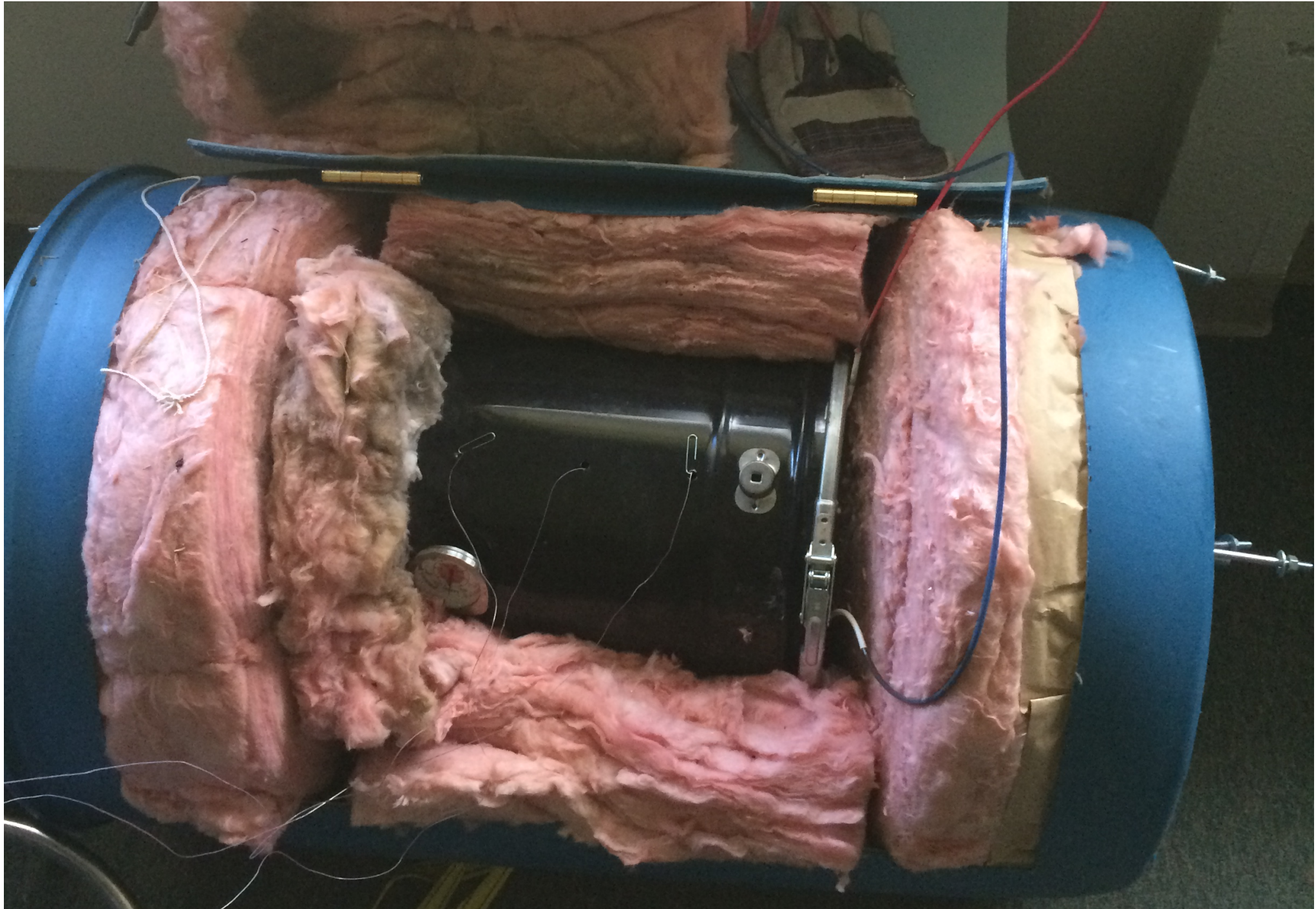
boils 1 liter: 1 hour

1 day ~ 6 kg of food





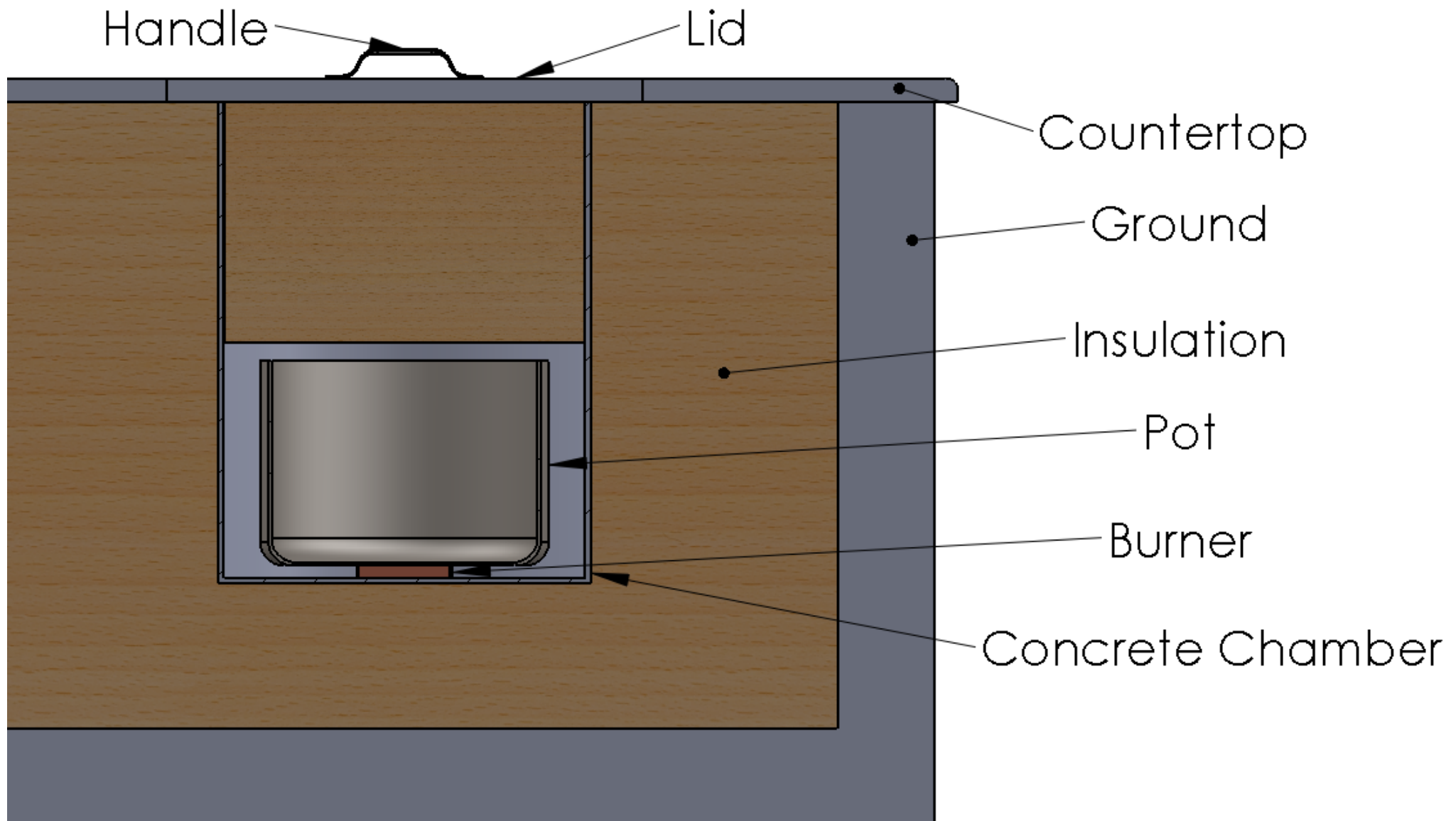
# Prototype #1: Barbeque



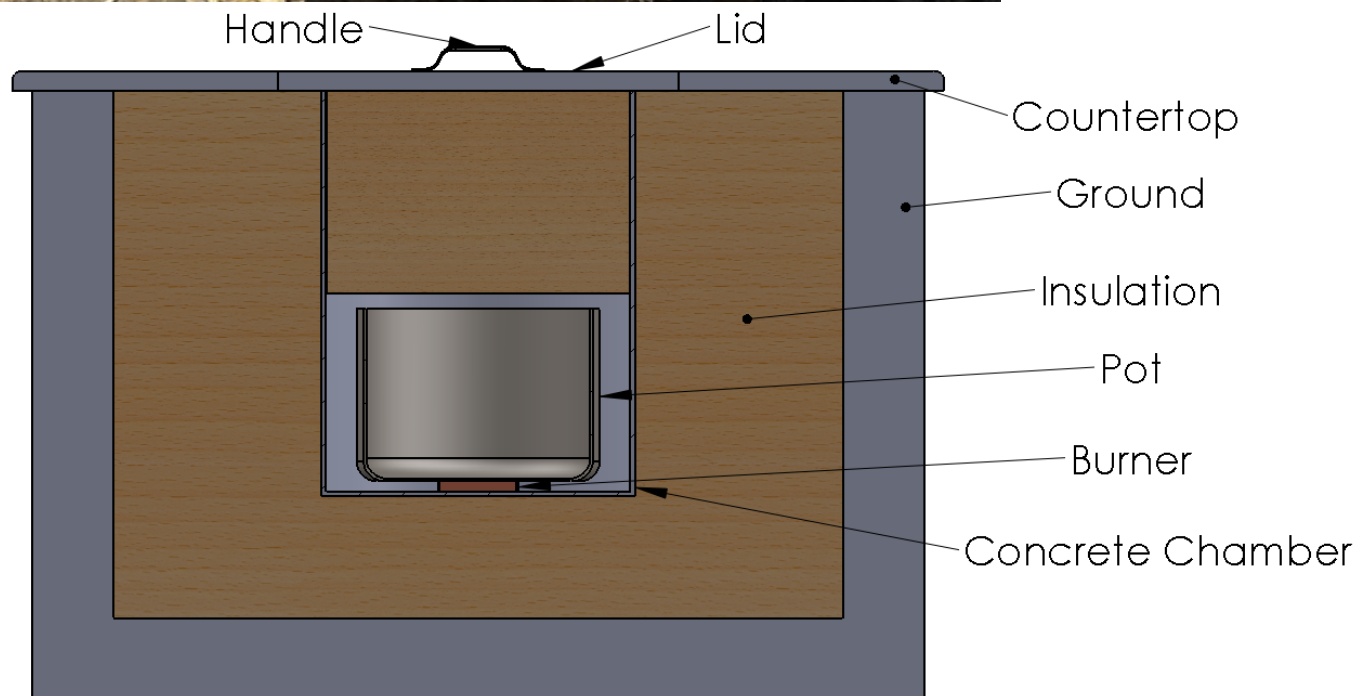


# Prototype #2: Boil and Simmer

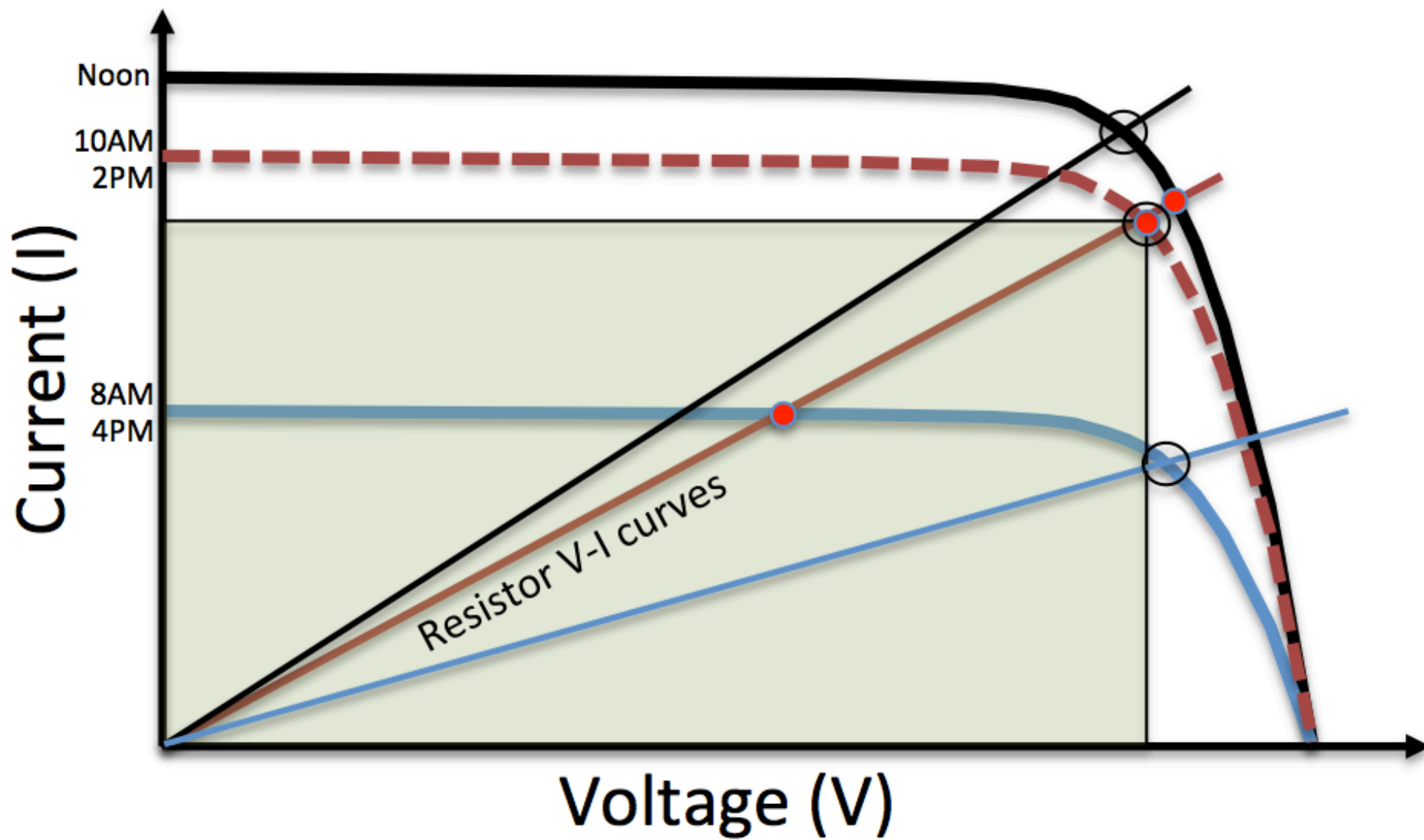
Hybridization is easy: just heat on a fire first.



# Earth Housing, Straw Insulation









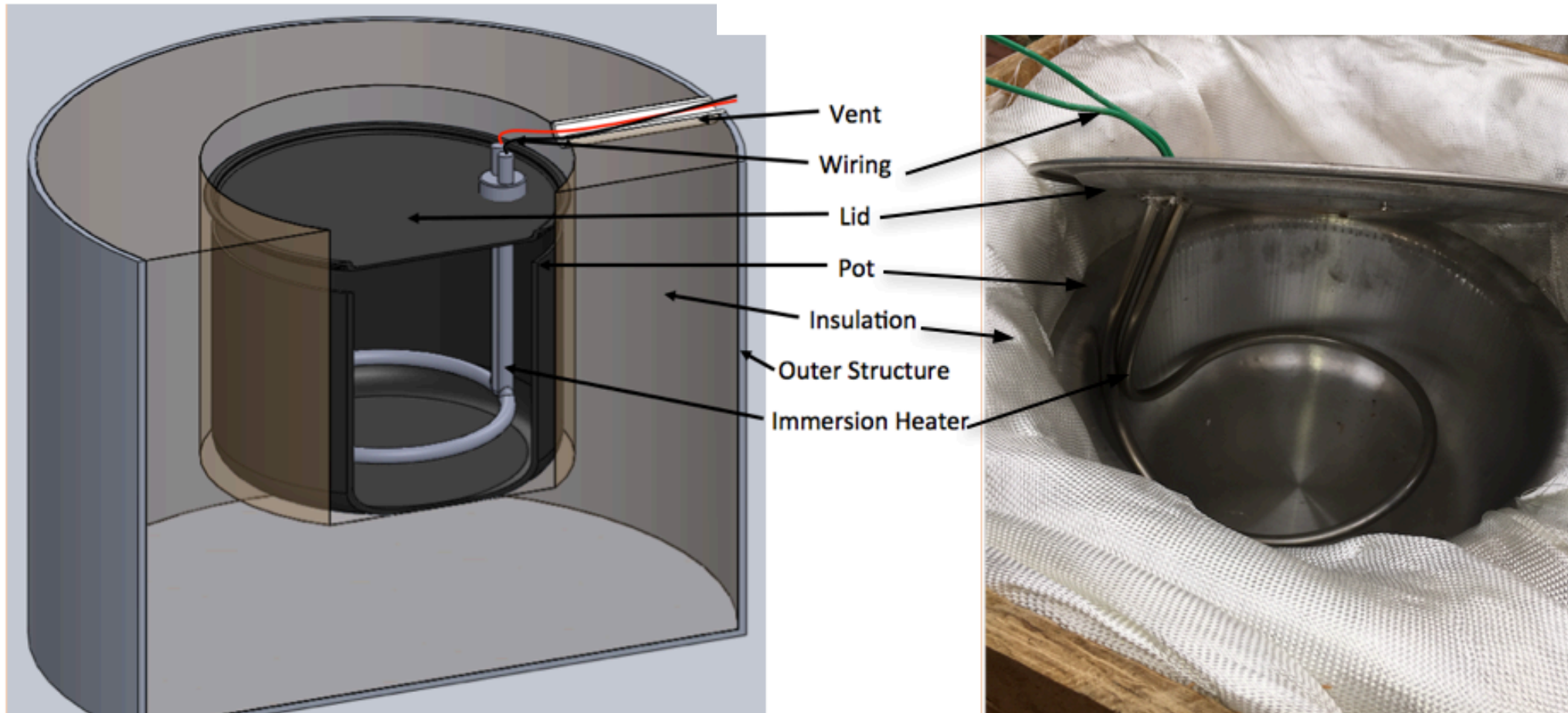
## Nickel-Chromium Wire and Concrete:

- Tailor Resistance
- Tailor Shape and Size

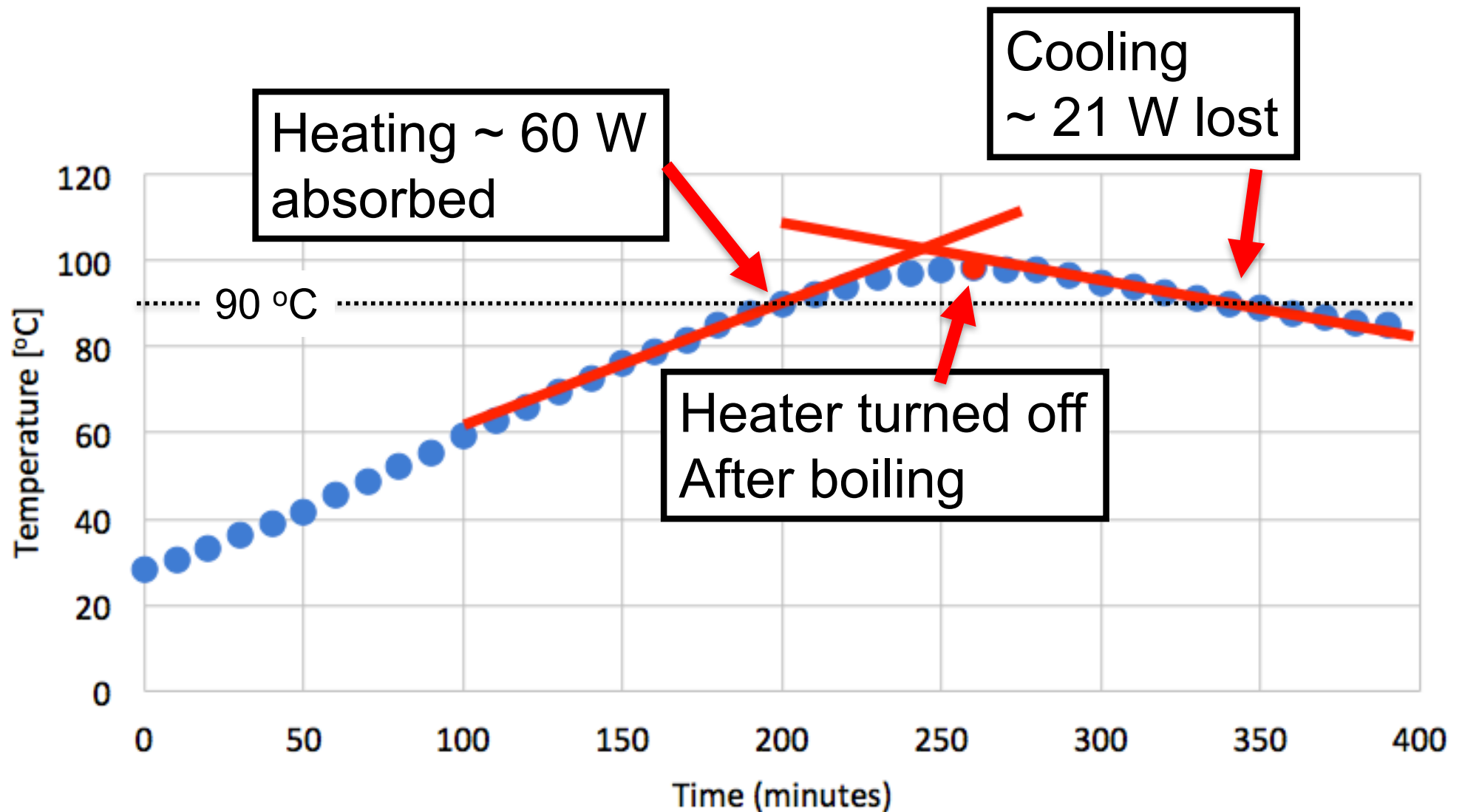


## Prototype #3: With Immersion Heater:

- Stainless steel, NiCr wire, MgO insulation: \$2
- No shell between heater and insulation
- Insulation stays below boiling point



2.7 kg of stew  
4 hours to boil with 80 Watts





Heating Efficiency at 81W, 90°C:

$$\zeta = \frac{P_{absorbed}}{P_{in}} = \frac{60 \text{ W}}{81 \text{ W}} = 74\%$$

Increases with:

- Increased power
- Improved insulation
- Decreased pot size (surface area)













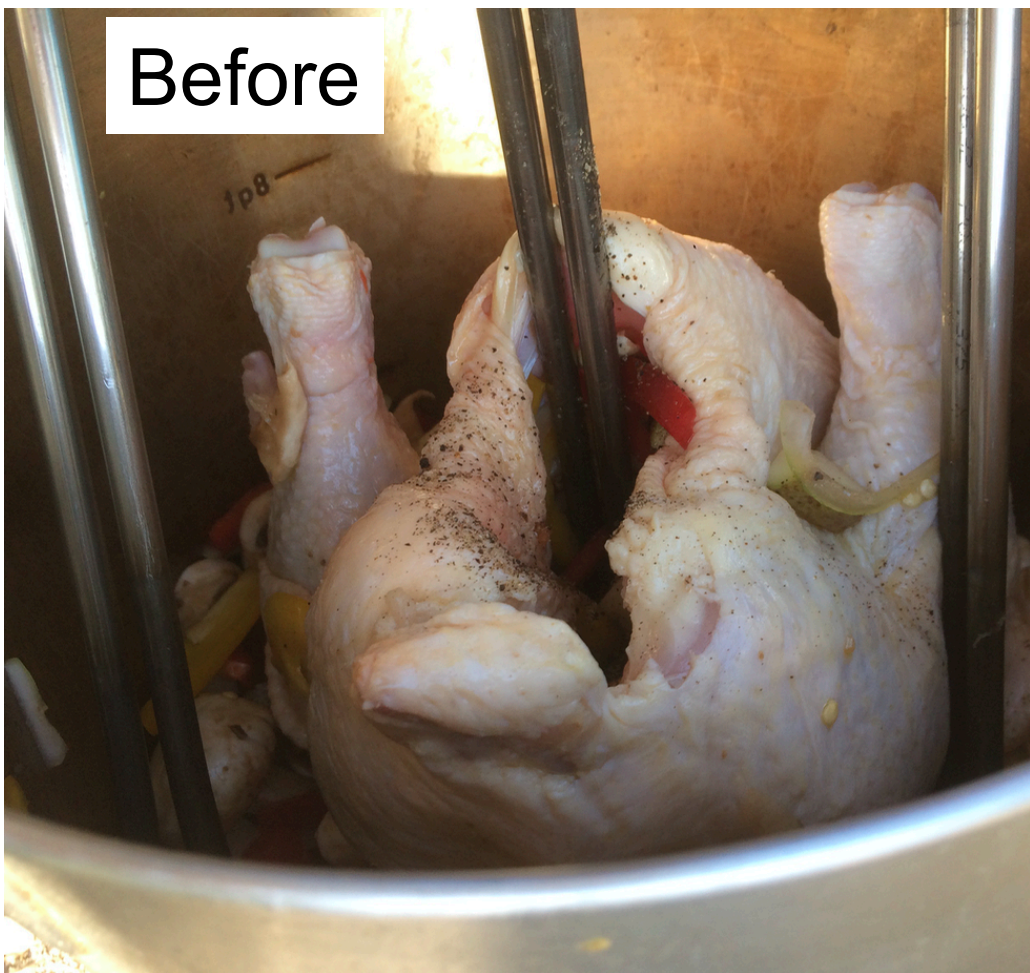








Before



After Cooking





# Aid Africa, Uganda: July, 2016





# Four Students, one Month





# Collaborative Design with Users











Development Engineering, January, 2017

“Insulated Solar Electric Cooking –  
Tomorrow’s Healthy Affordable Stoves?”

Pete Schwartz, *Cal Poly Physics*

Peter Keller, *Aid Africa, Uganda*





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Tyler Watkins, Pablo Arroyo, Ryan Perry,  
Ryan Wang, Omar Arriaga, Madison Fleming,  
Chris O’Day, Ian Stone, John Sekerak,  
Devin Mast, Nick Hayes

10 Student Authors

Yes, they use the two stoves...

...but sold the solar panels after 2 months?





Cooked all kinds of food,  
but increasingly for bath water

- For \$100?
- Displace biomass cooking?
- Carbon market funding?

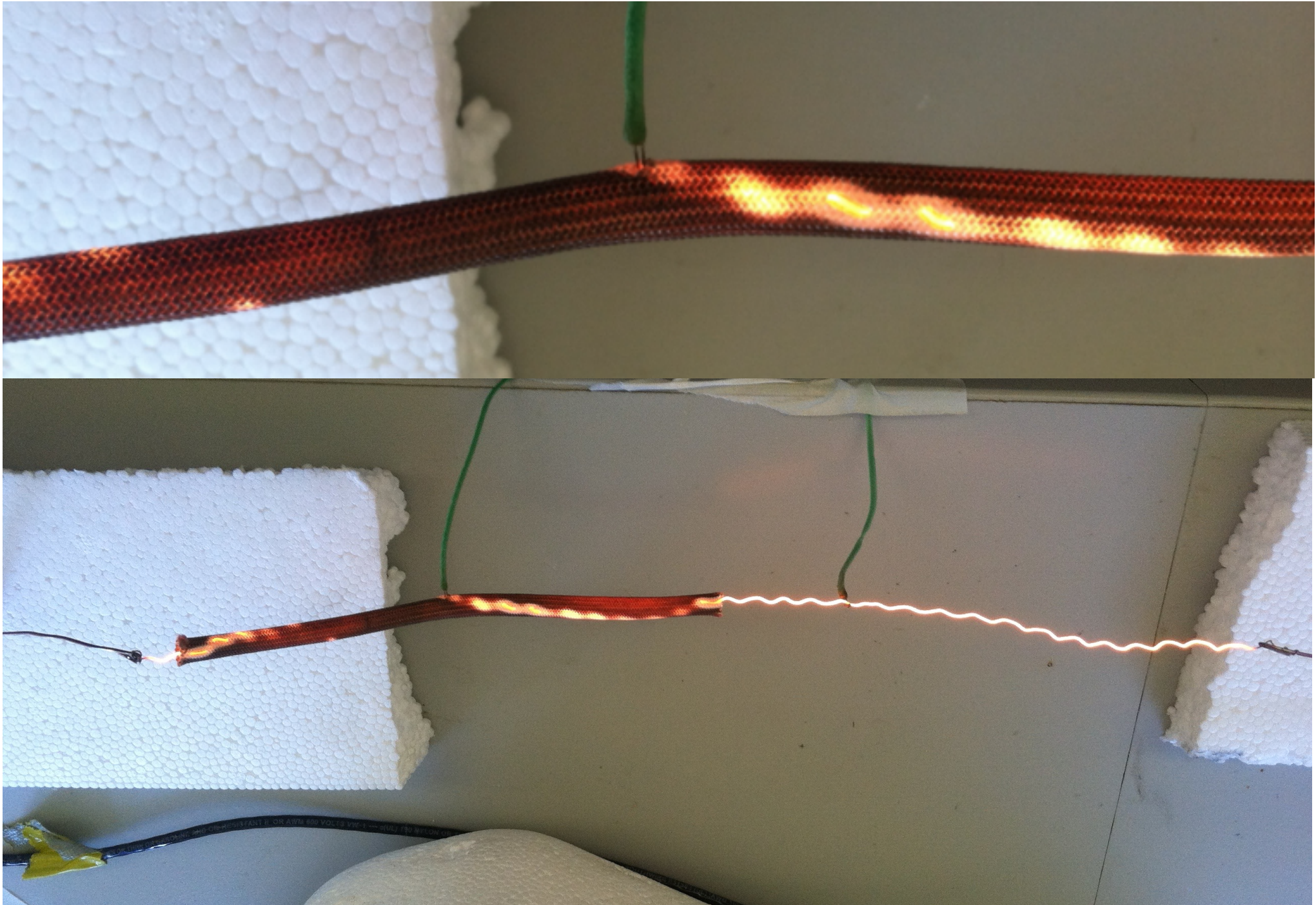


## Next Steps

- Develop Immersion heater manufacturing
- Provide Hot Domestic Water
- Provide Solar Lighting and Cell Phone Charging
- Build Collaboration: Villages and Beacon of Hope

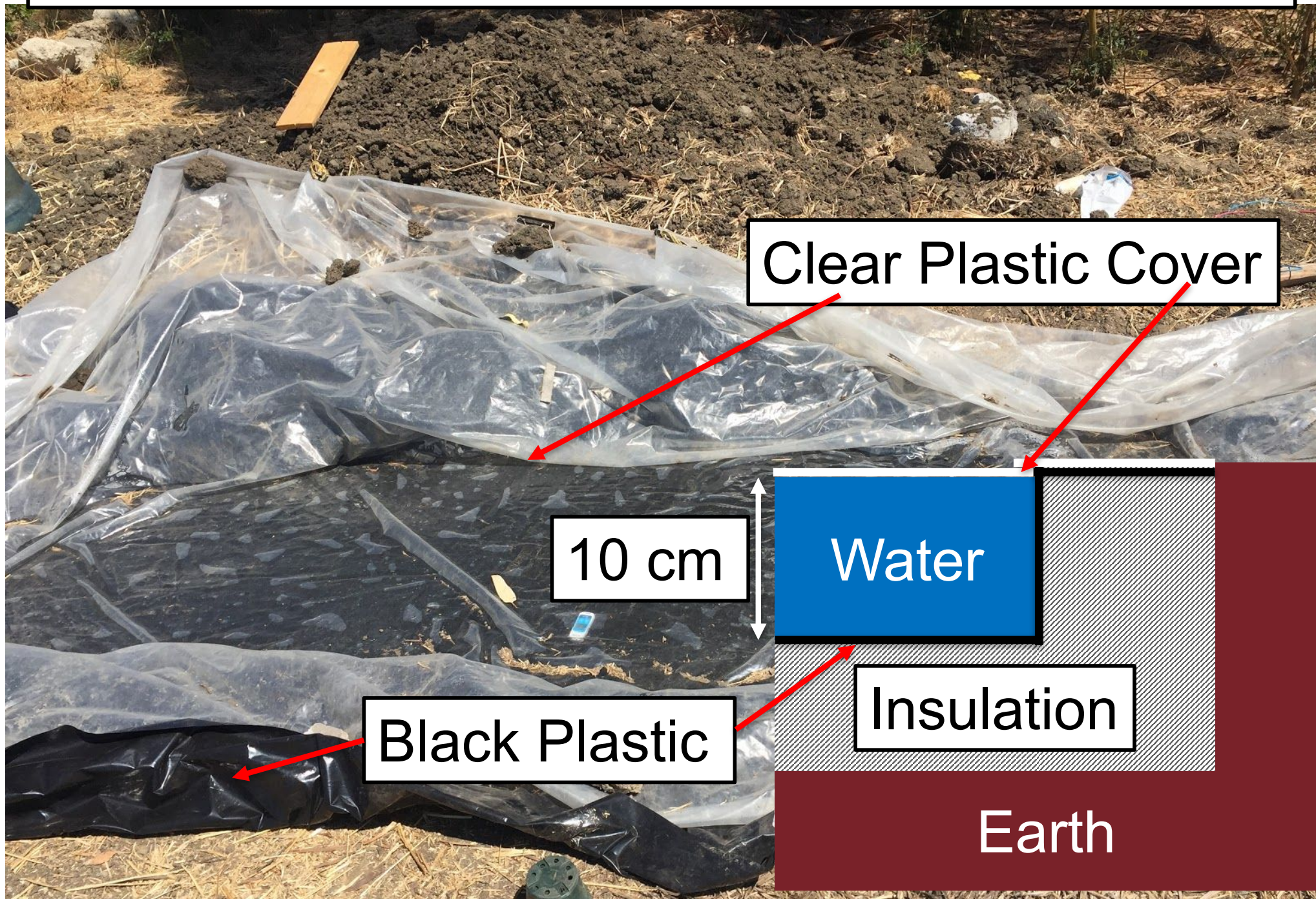


# Develop Immersion heater manufacturing





# Covered Solar Ponds Heat Water to 60° C









## **Aid Africa nonprofit**

- 13 years experience
- cooking technology, fruit trees, and clean water
- Certified with UN CO<sub>2</sub> Market



## **Beacon of Hope**

- 700 of “Uganda’s most vulnerable youth”
- Cooking Technology Club





# Insulated Solar-Electric Cooking: Tomorrow's Healthy Affordable Stoves?

Any Ideas?  
Want to try it?  
Work with us?

Thanks!

