



CAL POLY

Insulated Solar Electric Cooker (ISEC): Solid Thermal Storage and Material Development

Eli Wortman and Nick Doing

Professor Pete Schwartz





ISEC

1. Healthy
2. Cheap
3. Local Manufacturing
4. Convenient to use



Outline

- ISEC Introduction
- Concrete Construction
- Solid Thermal Storage





ISEC

Insulated
Lid

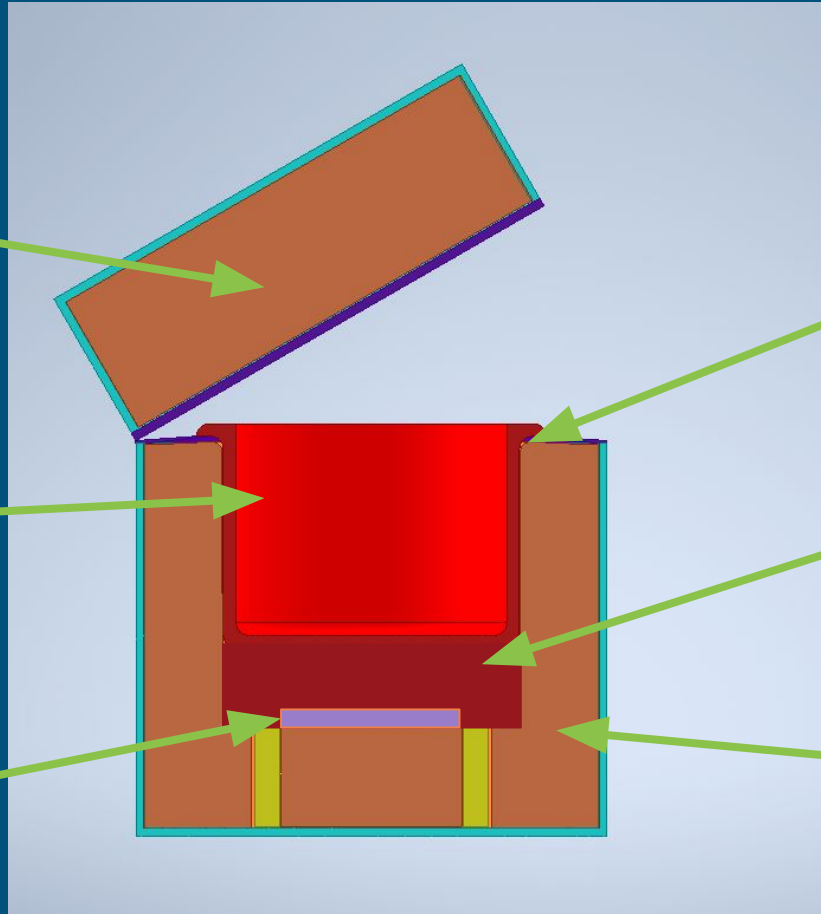
Nest

Solid Thermal
Storage (STS)

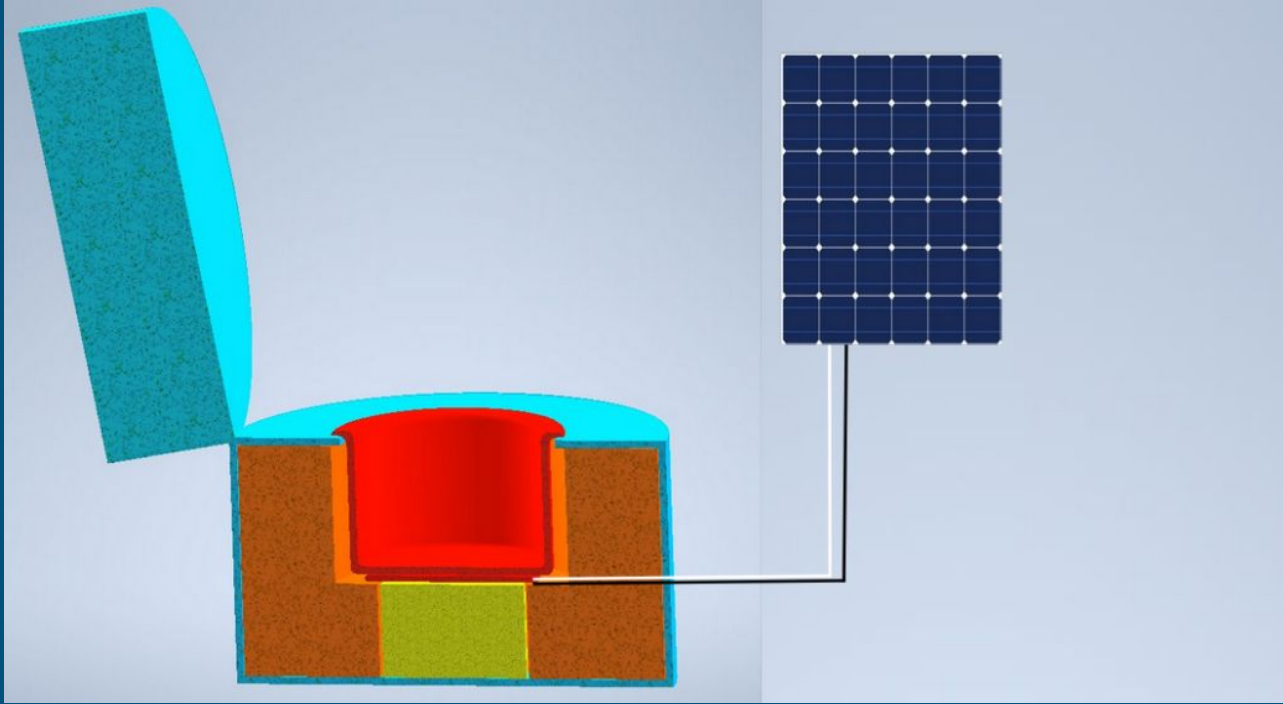
Insulated Outer Shell

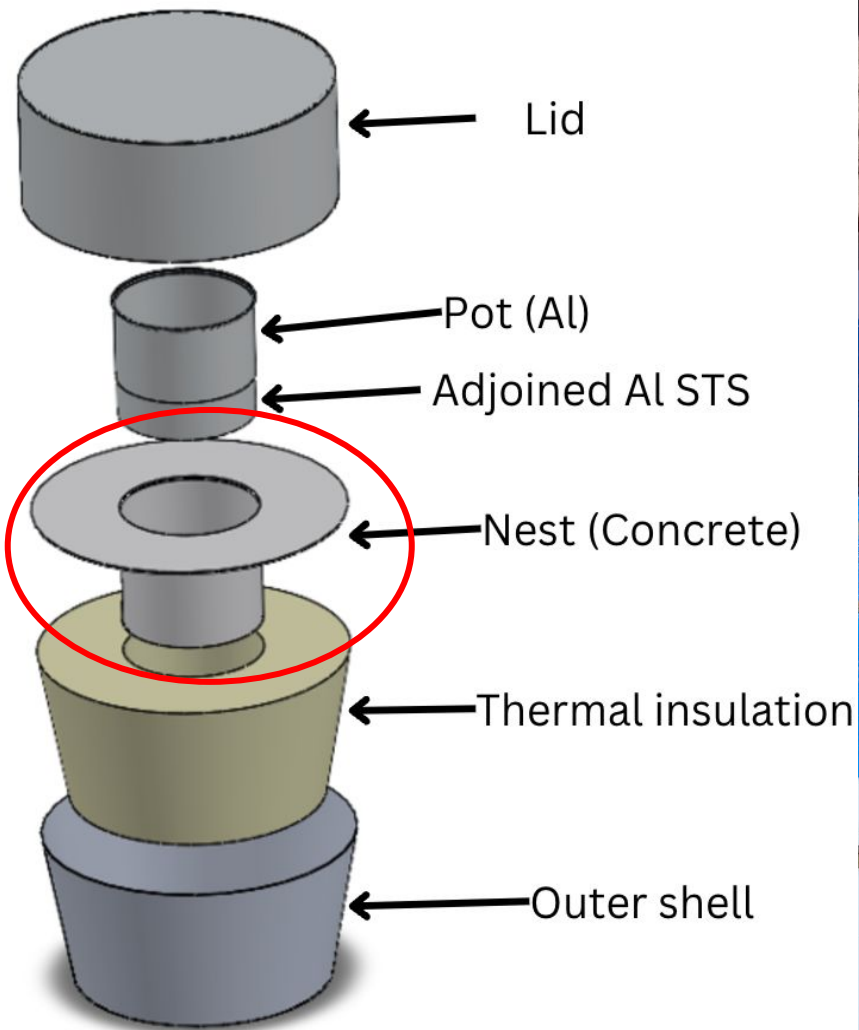
Cooking Pot

Resistive Heater



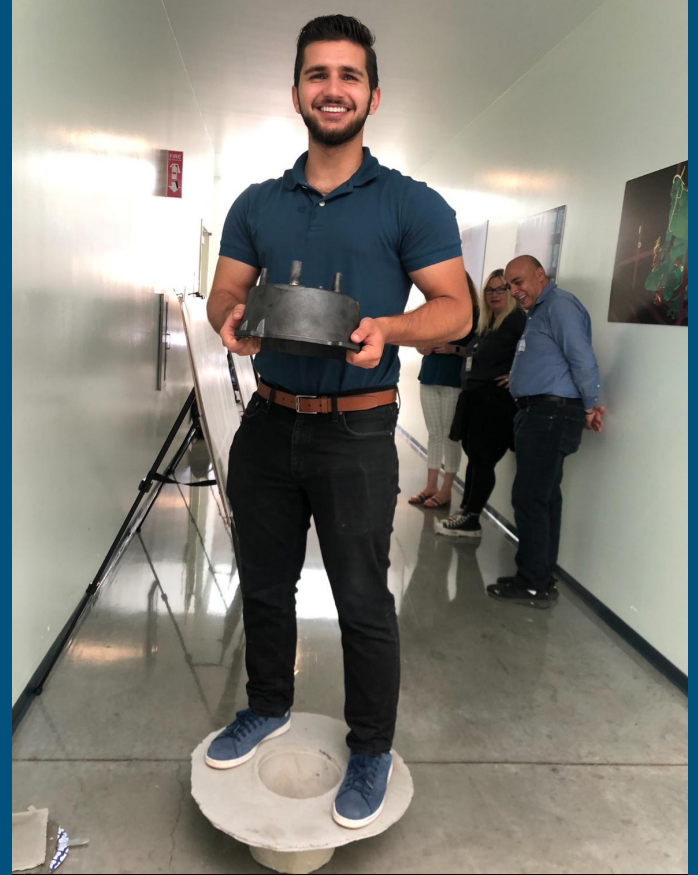
Solar Electric







Concrete Construction



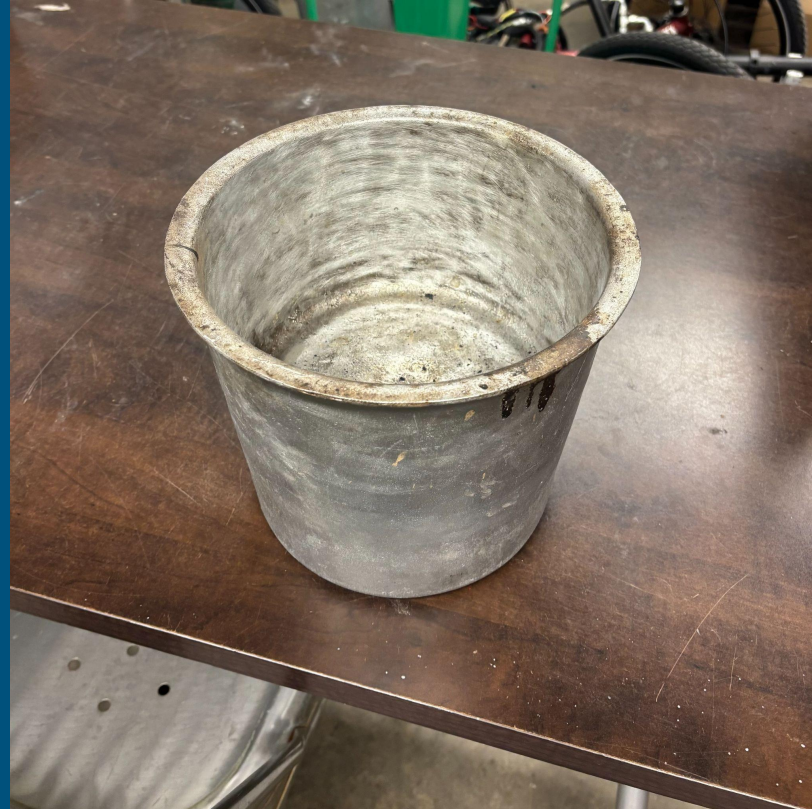
Material Comparison



Material	Stainless Steel Nest	Concrete Nest
Materials Used	- Stainless Steel (0.2 in. thick) - Custom-cast aluminum pot - Fasteners + insulative paste	- ~6.5 kg of concrete - 2.7 sq. ft. of 1/2 in. mesh
Price Breakdown (per unit)	- Stainless steel: \$20.10 (\$4.50 in India) - Custom aluminum pot: Difficult to produce - Fasteners + paste: ~\$4 Total: >\$24.10 per unit	- Concrete: ~\$1.02 - Rebar: ~\$7 Total: \$8.02 per unit

STS Material Selection

	Iron	Aluminum
Specific Heat J/g ° C	0.442	0.90
Thermal Conductivity W/m K	94	205.0



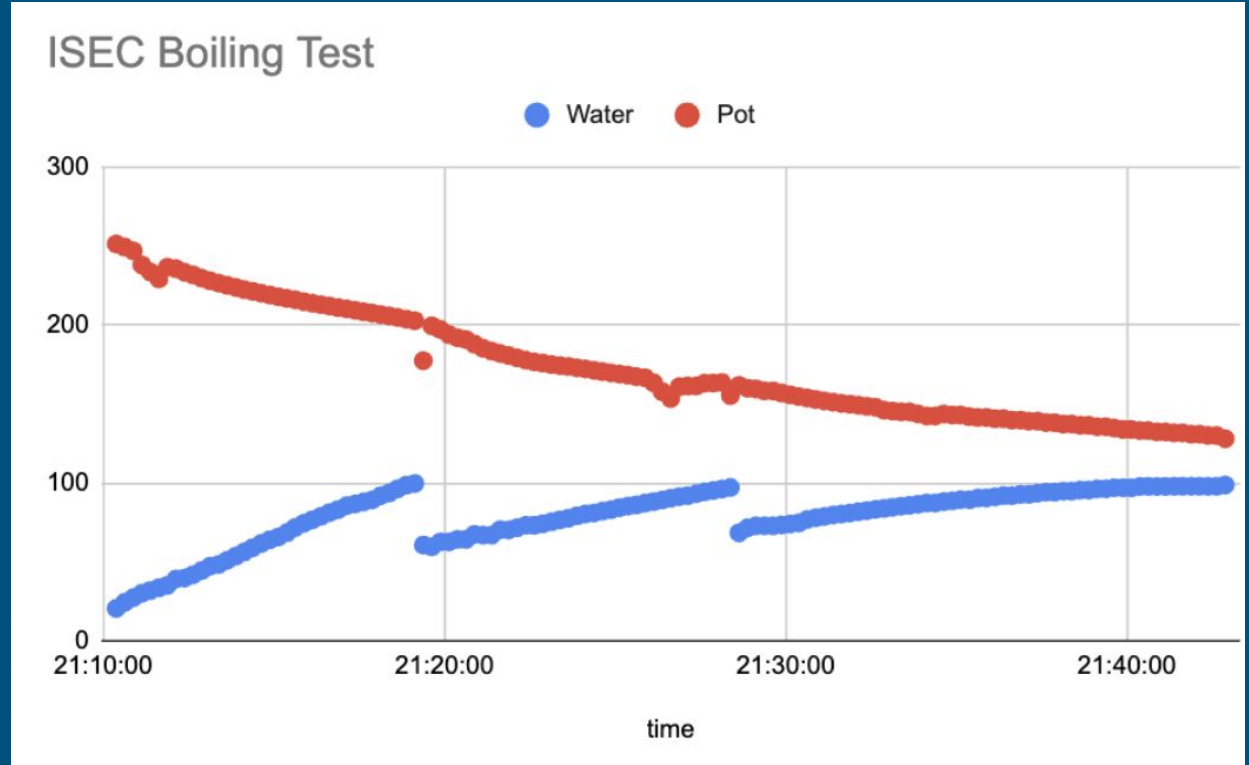
Recent Testing

Results:

1st Liter: 9 min, 609 W

2nd Liter: 9 min, 576 W

3rd Liter: 14 min 30 s, 367.9 W



In Use



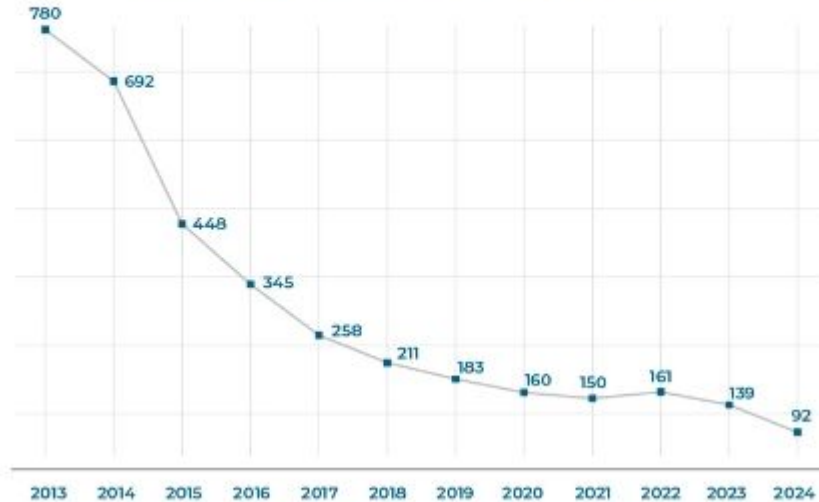
Final Result



End of Solid Thermal Storage



Lithium-Ion Battery Price, In \$ per kWh



Key Takeaways

- Concrete is a strong alternative option for the ISEC nest, due to cost and material + production accessibility
- Solid Thermal Storage is an effective way to store energy to be used to “sear” foods and slow cooking options



Questions?

