

# Maintaining Traditional Cooking With Stored Solar Thermal Energy

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## STORED SOLAR COOKING PERFORMANCE

### Purpose

The purpose of this research is to determine the performance of a stored solar thermal cookstove and begin identifying measures for successful adoption. The stored solar cookstove contains 5 kg of thermal storage material. Placed at the focal point of a parabolic concentrator, the cookstove is fully heated when the thermal storage material reaches an internal temperature of 340 C. The cookstove has been used successfully for cooking at temperatures upwards of 300C.



Cookstove setup in the Navajo Nation, Arizona

### Cookstove Performance Results

The current vessel charges in less than two hours and reaches of 300-500 C, mimicking the temperature of fire. Because the cookstove stores the sun's energy for up to 6 hours, the user can cook when, day or night, and where, indoors or out, they desire.

On a single charge, the cookstove can be used to easily prepare full meals for 4-6 people. The cookstove can be used for up to two hours of active cooking, in which the first 30 minutes is best suited for high heat tasks such as boiling water or searing meat. A variety of meals have been prepared averaging 1.5 kg of cooked food per meal with a range of total caloric content of 900-2900 calories, depending on the nutritional value of the food.

Cookstove performance has also been measured using a modified water boil test.



Cooking potatoes on the cookstove

## STORED SOLAR COOKING ADOPTION

### Familiarity is Key

Stored solar thermal energy allows for a variety of cooking methods, respecting local cooking cultures.

The cookstove has been used to cook food in a variety of methods:

- Grill (steak, sausages, burgers, vegetables, pizza)
- Stir-fry (pad see ew, noodles, shrimp)
- Pan Fry (chicken, fish, tofu, potatoes, roti, Navajo fry bread, tortillas)
- Boil (rice, lentils, pasta, beans, corn, mashed potatoes)
- Simmer (stews, soup, sauces, risotto)
- Slow cook (4 pounds of chicken)



Training in the Navajo Nation, Arizona

### Stored Solar Cooking in the Field

Field testing is currently being conducted in:

- Navajo Nation, Arizona, USA (6 units)
- Les Cayes, Haiti (6 units)
- Rajasthan, India (1 unit)
- Champaign-Urbana, Illinois, USA (one-time tests)
- Potential future test sites include Namibia and Cambodia

### Deployment Method for Research

- Institutional Review Board approval
- 1 hour individual training
- Individual pre-survey
- Charging log, cooking log, and temperature data collection
- Individual post-survey

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