

# ACEF2017

## Powering End Use Using Renewable Energy

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# Great Potential for Solar End Uses in Bangladesh but Barriers Remain

## ➤ Potential

- Millions of people in rural areas without electrical appliances
- Most households need very little energy (lighting, fan, TV, mobile phone, refrigeration)
- DC appliances
- Innovative/non-traditional uses (fishing/ferry boats, irrigation, etc.)
- Currently 4 million homes have solar PV rooftop systems

## ➤ Barriers

- Lack of information/education
- No feed-in tariff
- Bias against DC appliances
- Lack of commercial opportunity

# Innovations in End Use

1. Solar PV Powered Water Transportation System
2. Solar PV-Diesel Hybrid Mini Cold Storage
3. Solar E-Cooking Stove
4. Solar Nano Grid

## Pilot Projects

1. PV DC Peer-to-Peer Smart Village Grid
  - Won the “InterSolar Award 2016” in Munich, Germany in the category of “Outstanding Solar Projects”
2. Automatic Solar Irrigation System with Remote Monitoring & Control
  - Won the “Inter-University Innovative Project Competition”, Ministry of Power, Energy and Mineral Resources, Bangladesh

# Solar PV Powered Water Transportation System



Fig. 1: Fabricated ferry boat on Dhanmandi Lake, Dhaka, Bangladesh



Fig. 2: Fabricated ferry boat on Laukhati River, Patuakhali, Bangladesh

# Solar PV-Diesel Hybrid Mini Cold Storage for Rural Off-grid Areas of Bangladesh

## Highlights of the Refrigeration System

- Short-term storage 2-6 weeks
- Diesel back-up
- Extra insulation
- Small and low cost



Fig. 3: Fabricated Solar PV-based cold storage being tested at UIU Lab, Dhanmandi, Dhaka.

# Development of Solar E-Cooking Stove at UIU

## Initial design had several flaws

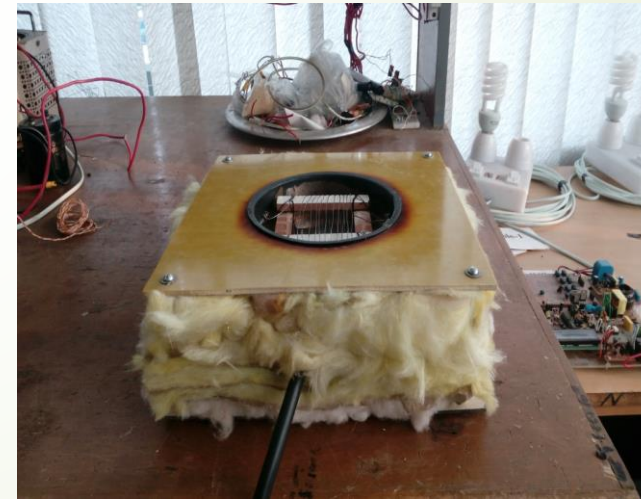
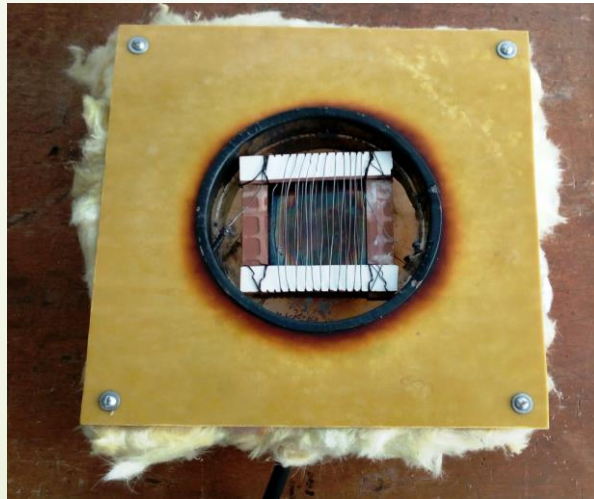
- The basic structure was fragile
- Heavier structure led to high self heat consumption
- Surface heat loss was higher than expected



# The Updated E-Stove Design

**New design had numerous advantages**

- ▶ Material was lightweight, insulated, and easily manufactured
- ▶ Cooking time cut in half
- ▶ Efficiency improved from 40% to 75%



# Solar Nano-Grids

- DC Nano-grid has technical advantages
- Economic and social benefits
- Can be implemented in a small community/village setting
- DC system avoids inverters, substantially lowering costs
- Incorporating disparate end-uses, such as irrigation with household needs optimizes the asset



# Solar Nano-Grids

An Appropriate Solution for meeting Community Energy Needs?



Fig. 4: A Pilot three kW<sub>p</sub> Solar PV system installed at Baroihati near Kapashia, Bangladesh.

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