

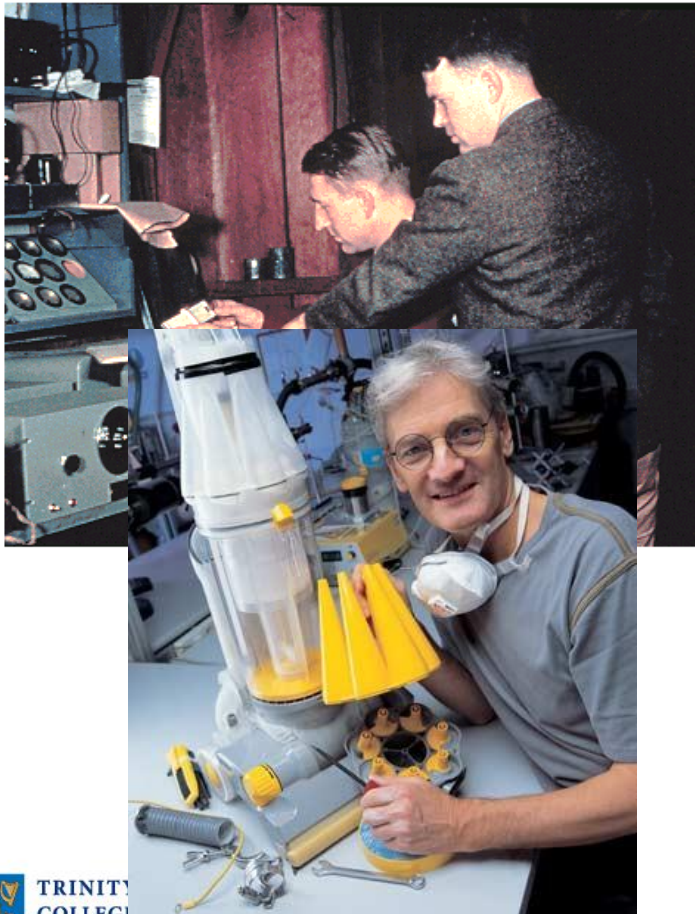
# The Eternal Candle Project

Trinity College Dublin

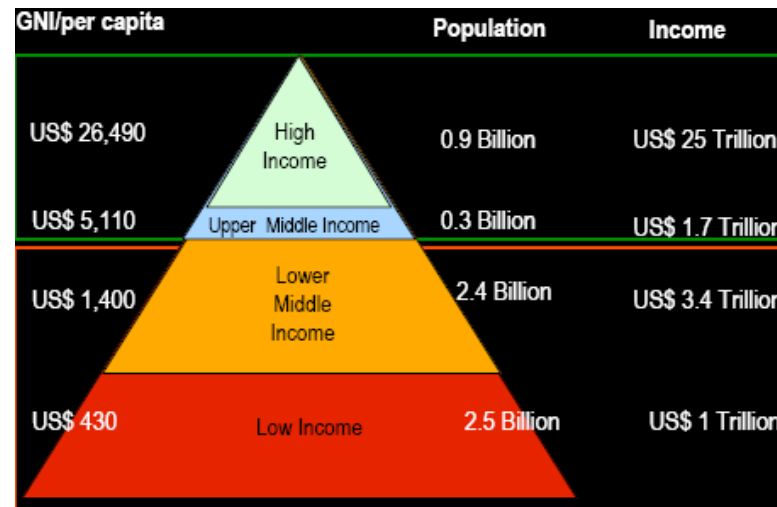
Dr. Tony Robinson  
Mr. Dragan Nikolic  
Mr. Wayne O'Connell

## What have these guys got in common

From Computer Desktop Encyclopedia  
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## The fortune at the Bottom Of Pyramid?

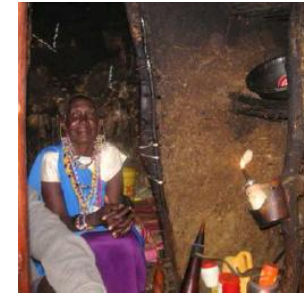


- **“The only way to alleviate poverty is to raise the real income of the poor”**
- **Whether one thinks of the poor as**
  - **Consumers (Prahalad, Bottom of Pyramid)**
  - **Producers (Karnani, Bottom of Pyramid, a mirage?)**

## Developing World Challenges

**1.6 billion people lack access to electricity**

- **Lighting**
  - 1 bn ? Kerosene lamps
  - Costs....
- **2.4 billion people use biomass fuels for cooking**
  - 500m Wood/Biomass fires
  - 1200 MT CO2 emissions per year
  - Costs .....
- **500m mobile phones where owners have no grid electricity**
  - \$2.8bn in unspent airtime.

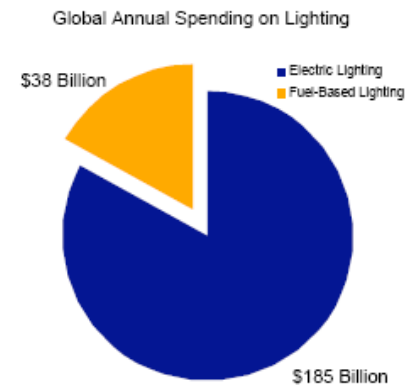
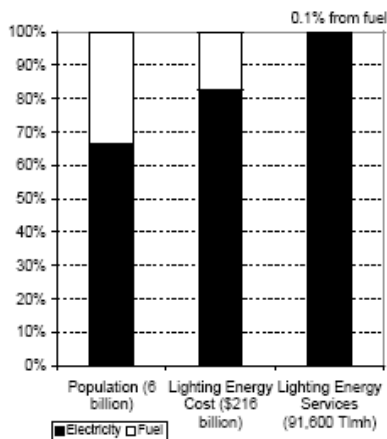


ReStor Energy will produce and consult in the deployment of technology to the BoP that reduce users existing energy costs to increase their economic strength

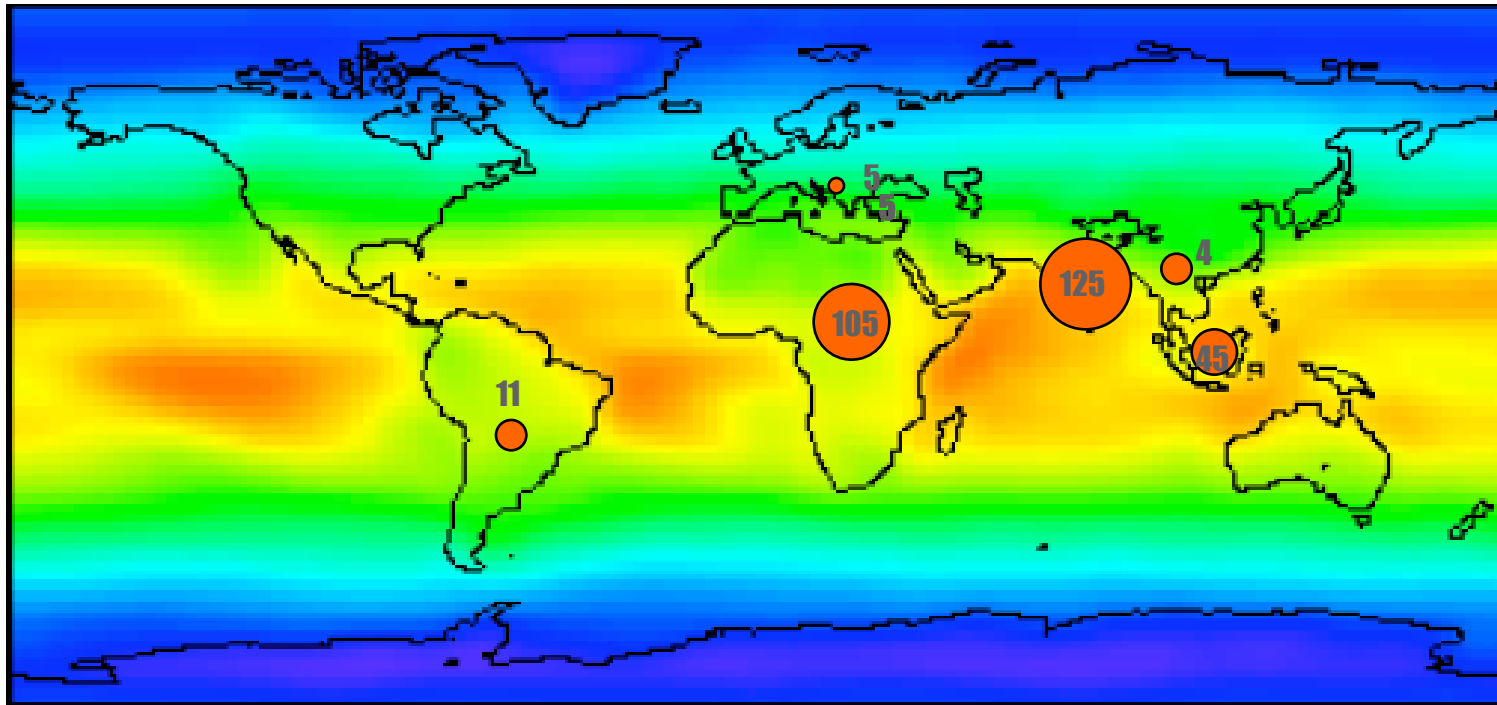
## Team

- **Dr Tony Robinson**
  - Principle Investigator
  - Lecturer in Thermodynamics in TCD
- **Mr. Dragan Nikolic**
  - Diploma in Chemical Engineering
  - PhD - University of Western Macedonia, 2010
- **Mr. Wayne O'Connell**
  - MSc Optics
  - Commercialization Specialist
- **Chloe Kinsella**
  - TCD Graduate - M.Sc. Student
  - ESBi International – The Carbon Economy

## Lighting Up the World ..... *One LED at a time*

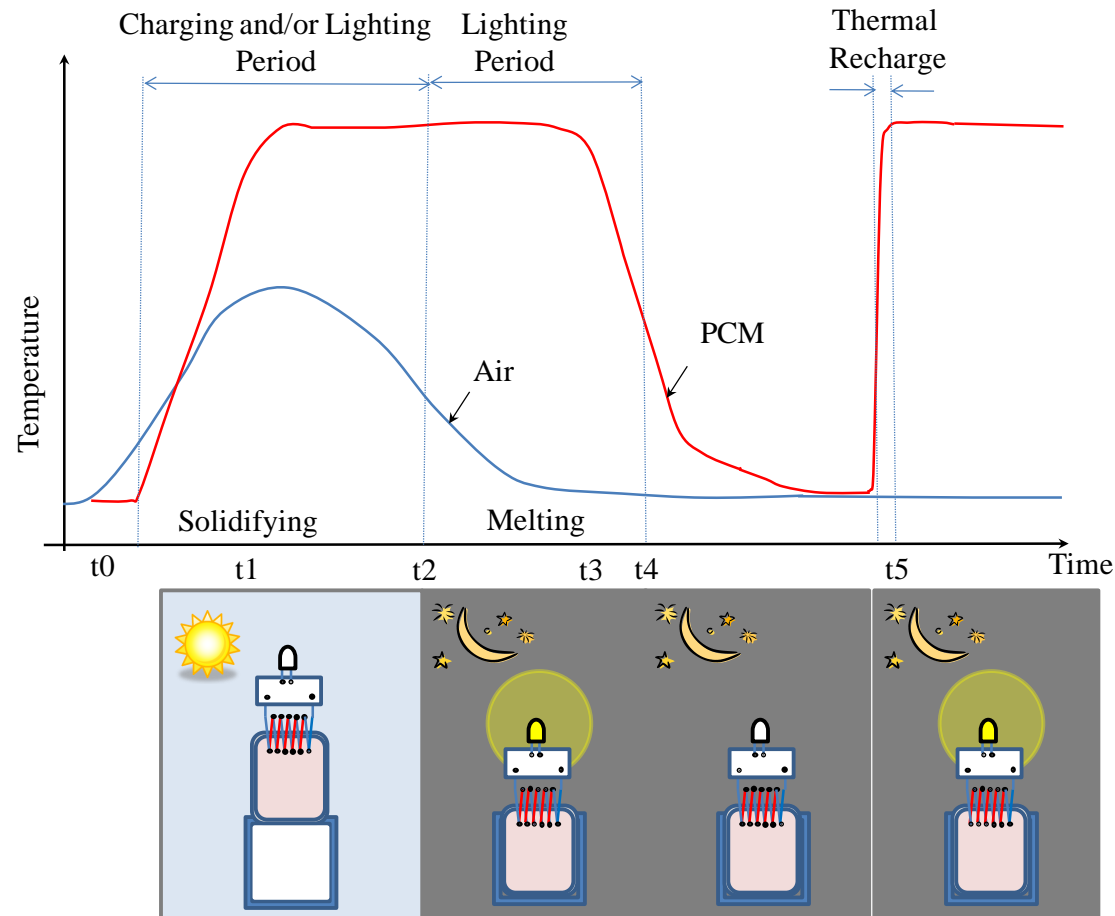


## Average Insolation Intensity

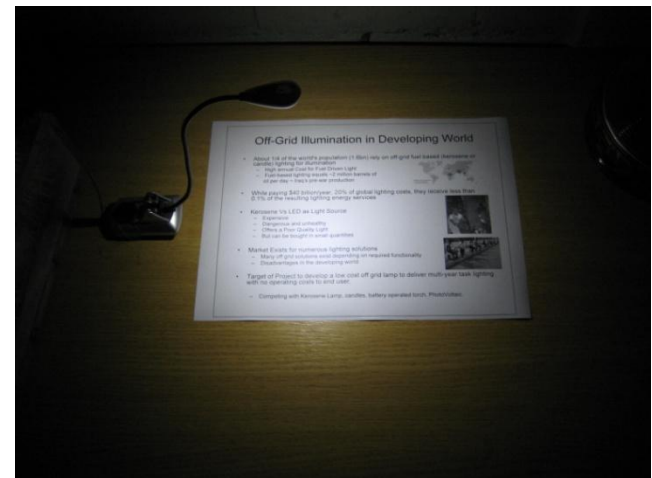
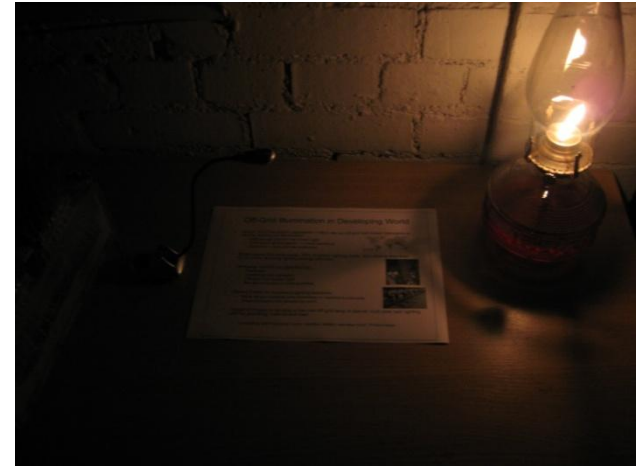


## The Eternal Candle

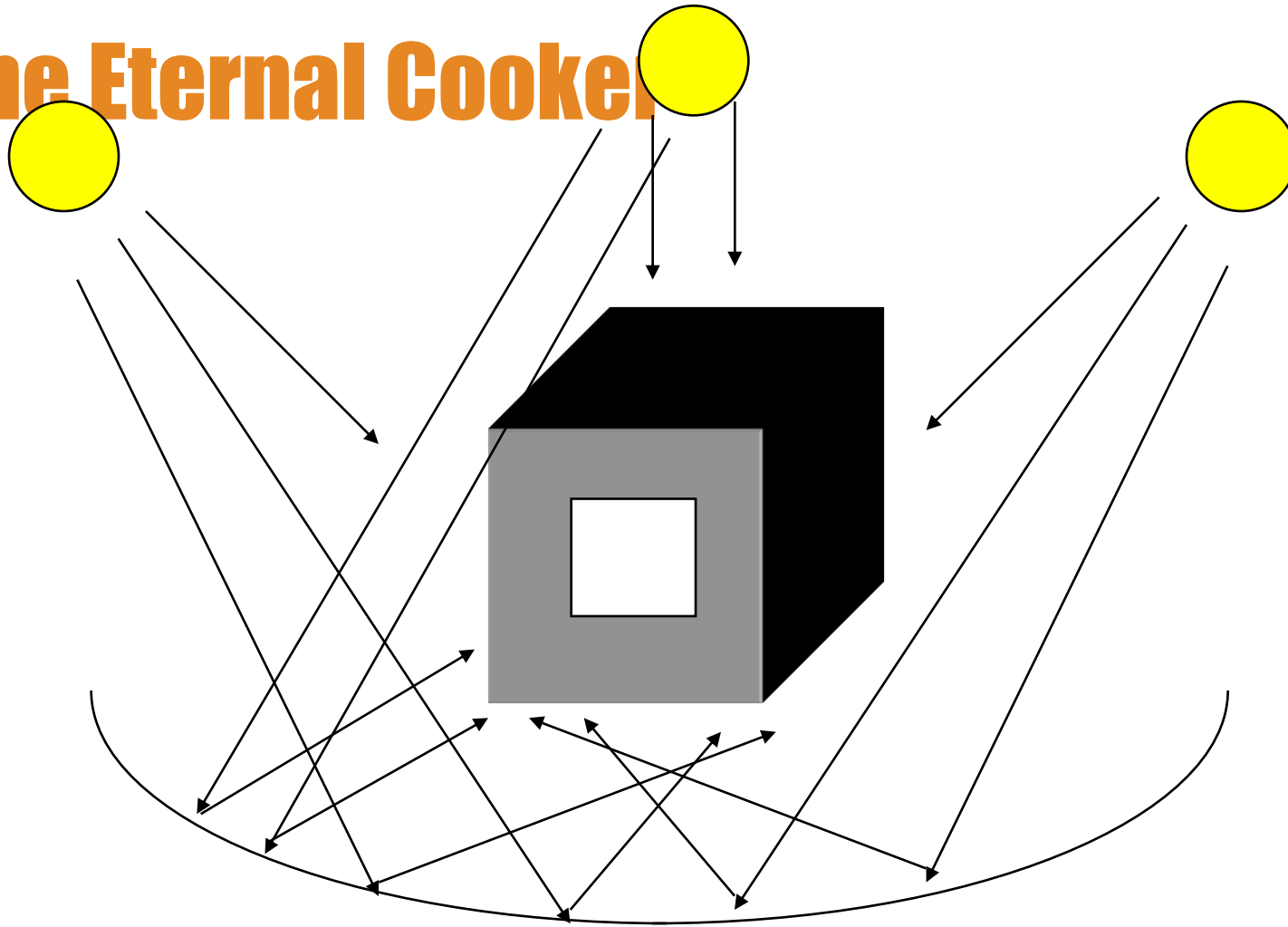
- Phase Change Material as Energy Storage
- Thermal energy is absorbed and stored during the day in Phase Change Material
- Thermal – Electrical conversion, boosted to power LED
  - Seeback effect
  - Eliminates need for chemical battery
  - No consumables in design
    - Zero operating cost goal
  - Potential for low cost design manufacture (\$12, landed price )



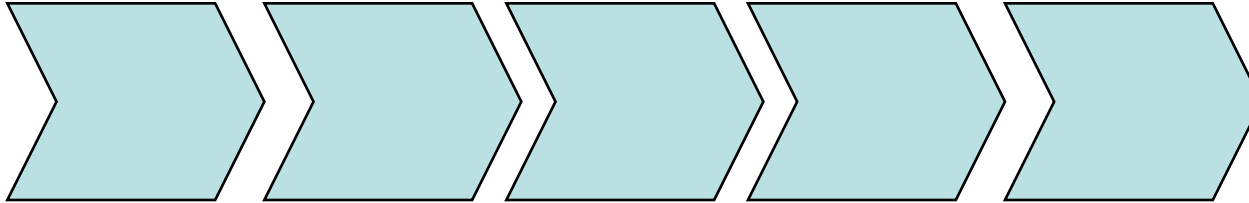
## The Eternal Candle



## The Eternal Cooker

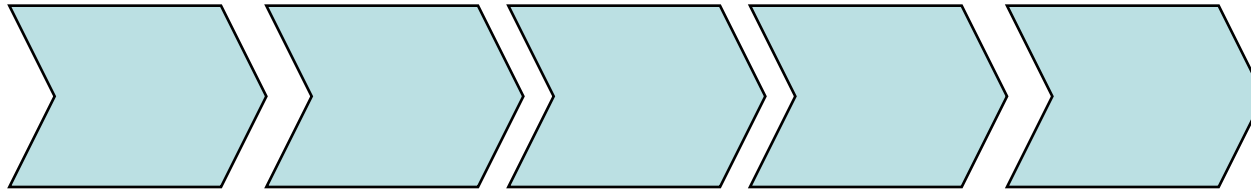


## Proposed Business Model (1)



- i. Integrated Technology Solutions  
Manufactured/Assembled in local or international environment.
- ii. Devices are Sold to Carbon Credit Organization which attaches either Voluntary or Organized Credits which are sold internationally.
- iii. MicroFinance Organization offers loan certified against either end user individual or against amortized value of carbon credit. ???.
- iv. End user purchases the device (including service contract) at effective subsidized price and pays back loan.

## Proposed Business Model (2)



- i. Integrated Technology Solution (Solar Cooker/Light /Heat)  
Manufactured/Assembled in local or international environment.
- ii. 1-2 year period (requiring external funding), (NGO/Gov) where data is obtained on usage in field and Certification by appropriate body.
- iii. Devices are Sold directly in volume to NGO / Gov Org for distribution on large scale in target area providing relief from
  - i. Monotonous collection of materials
  - ii. Deforestation
  - iii. Carbon emissionBUT NOT CARBON OFFSET..
- iv. End user is certified in use of the

## “Eternal Candle” Field Trial

**March 2010 Malawi – Kamphuka Trial**

**Cara Malawi, Hestian Innovation, ReStor Energy**

**Tony Robinson, Wayne O’Connell, Dragon Nikolic, Conor Fox (Hestian), Christina Lynam (Cara Malawi)**

- **Characterization of baseline needs**
  - **Intra-household and community decision-making**
- **Evaluation of actual carbon savings**
  - **Lighting**
  - **Solar Cooking**
- **Quality and performance**
- **Synergisms with cell-phone charging**
- **Feedback on Business model**

## Milestones

- **Working Lab Prototype**
- **Optimized Prototype and Final Casing**
- **Analysis of preferred environment for field evaluation and selection of partner for field trials**
  - **Manufacture of samples for field trials**
  - **Field Trial – Malawi (March 2010)**
  - **Identification Evaluation and Initial contacts with Manufacturing / Distribution partners**
  
- **Technology Extension**
  - **Non Fossil Fuel Source for Night Cooking**
  - **Water Purification**

## Questions

- **For further information contact**
  - **Wayne O'Connell**
  - **Dr Tony Robinson**