

Faculty of Mathematics, Computing and Technology
Department of Engineering & Innovation

Lighting up Africa
– and not one house at a time!

Research Project

Chris Moller, October 2015

Chris.moller@open.ac.uk, T.01954 253900

Two approaches:



Photo: Azuri Technologies

- In **rural areas**, make standalone minigrids more affordable

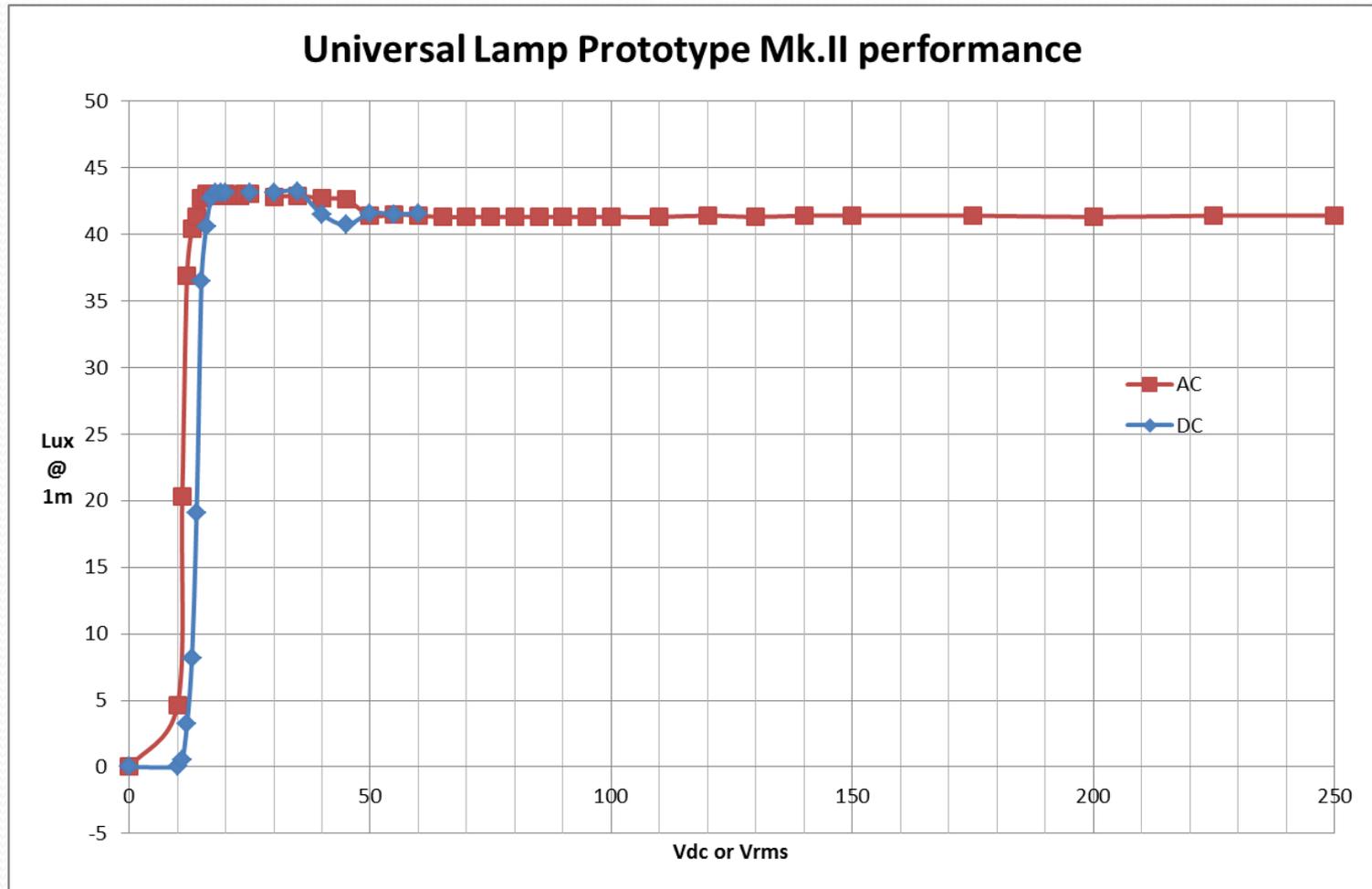
- In **urban areas**, solve the blight of electricity rationing
 - Rationing is very widespread in Africa, where generating capacity lags far behind demand



The Central Idea

- When electricity is plentiful, provide the full 220-240Volts
- When electricity is short, don't black out everyone completely – provide a very low voltage (say 20VAC)
 - Electricity consumption will be reduced by 99%
 - Of course, large motorised appliances won't work at 20VAC, but they won't be damaged, either
 - **The lights will stay on!** It is possible to make LED lamps that give out the same amount of light, regardless of whether they have 20V or 240V to run from

Prototype LED Lamp



Rural implementation

- A solar-powered minigrid with a 4amp feed to each of 10 houses will provide:
 - 1kW per household during the day, at 240VAC
 - 80W per household at night, at 20VAC
- Without this scheme, it would need 120kWh of batteries – costing £10K every 5 years
- With this scheme, this reduces to 9.6kWh, ie £800 every 5yrs

Urban implementation

- Most substation transformers have a 20VAC tapping, so implementation by the electricity company is straightforward
- They reduce their electricity demand by 99%
- Anyone who has bought universal LED lamps will continue to enjoy lighting during power cuts
- No technical skill is required from the consumer – beyond changing a lightbulb
- Self-financing, as we expect users will pay a premium for light bulbs that stay on during power cuts

Timescales



Photo: PeaceOnline.com

Protests against electricity rationing on the streets of Accra, Ghana, February 2015

- It will take years to build more power stations
- The need is more urgent than that

- If we had quantities of universal lamps, this scheme could be implemented tomorrow

Next steps

- Team up with someone who can sell the idea to the decision-makers
- Go to China to buy some lamps – they may do the production design.
 - There is a price war on LED lamps
 - This provides a manufacturer with an opportunity to add value, instead of lowering price
- Raise funding for in-country urban and rural pilots
 - First - Single homes implemented using two car batteries (and no inverter)
 - Second - Solar village minigrids with reduced batteries
 - Third - Low-voltage grids in cities during power rationing