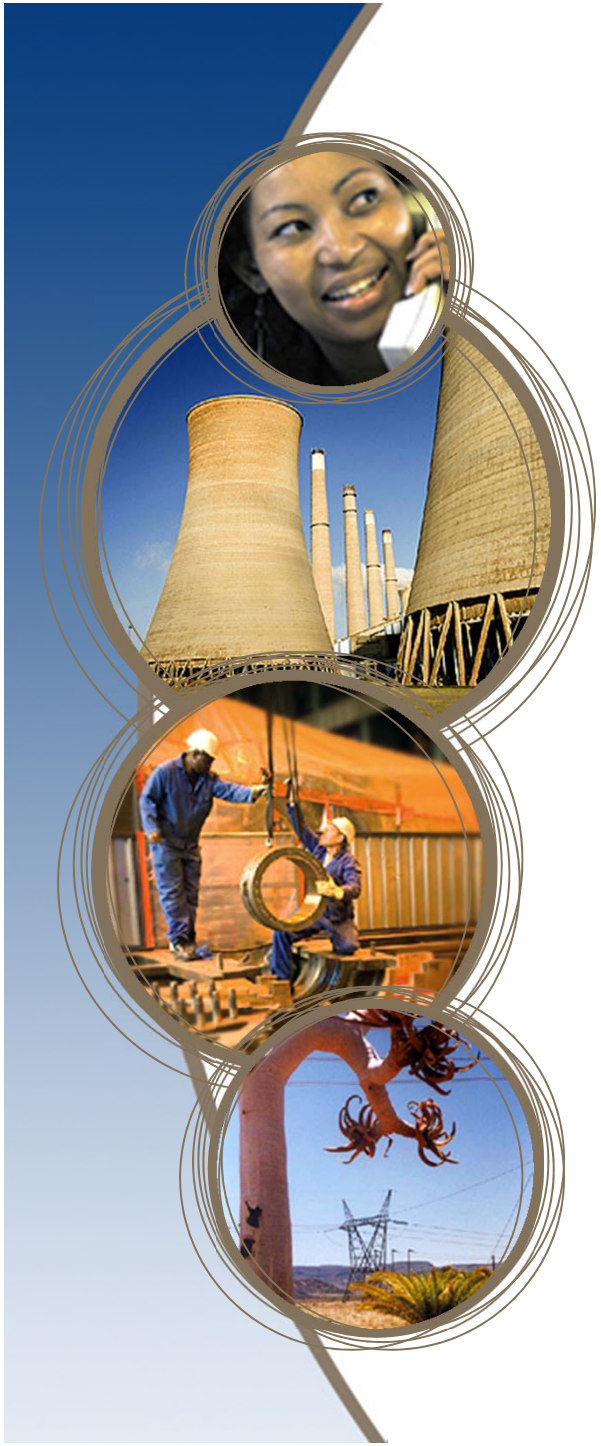


Rural Electrification & Clean Energy Development

A Wires Utility View

Dr Hendri Geldenhuys

Corporate Specialist

Technology Division

Electrification in South African: Key Factors

A means of delivering value to voters of the Utility Owner

- **Speed of roll out**
- **Initial cost of roll**
- **Operating and Maintenance and sustainability of network and customer service**
- **Cost of energy on the network**
- **Energy losses**

Electricity Utilities are very good at :

- **Electricity Utilities' business focussed on highly business- efficient mega electricity production (called power stations)**
- **It interconnect these mega factories with a network of power lines and transmits the energy around the service area**
- **It distributes electricity effectively down to large and small consumers by means of standardised technologies and approaches (in the black model T Fords fashion.)**

Rural Electrification

Speed of rollout

At the peak of the Eskom program

(All Grid connected)

> 1 000 new connections per day

Options for Rural Electrification

- **Grid based**
- **Mini-Grids (Mini Power Stations)**
- **Off Grid PV**
- **Other carriers- LPGas, wood etc.**

Practical Options

The practical options are:

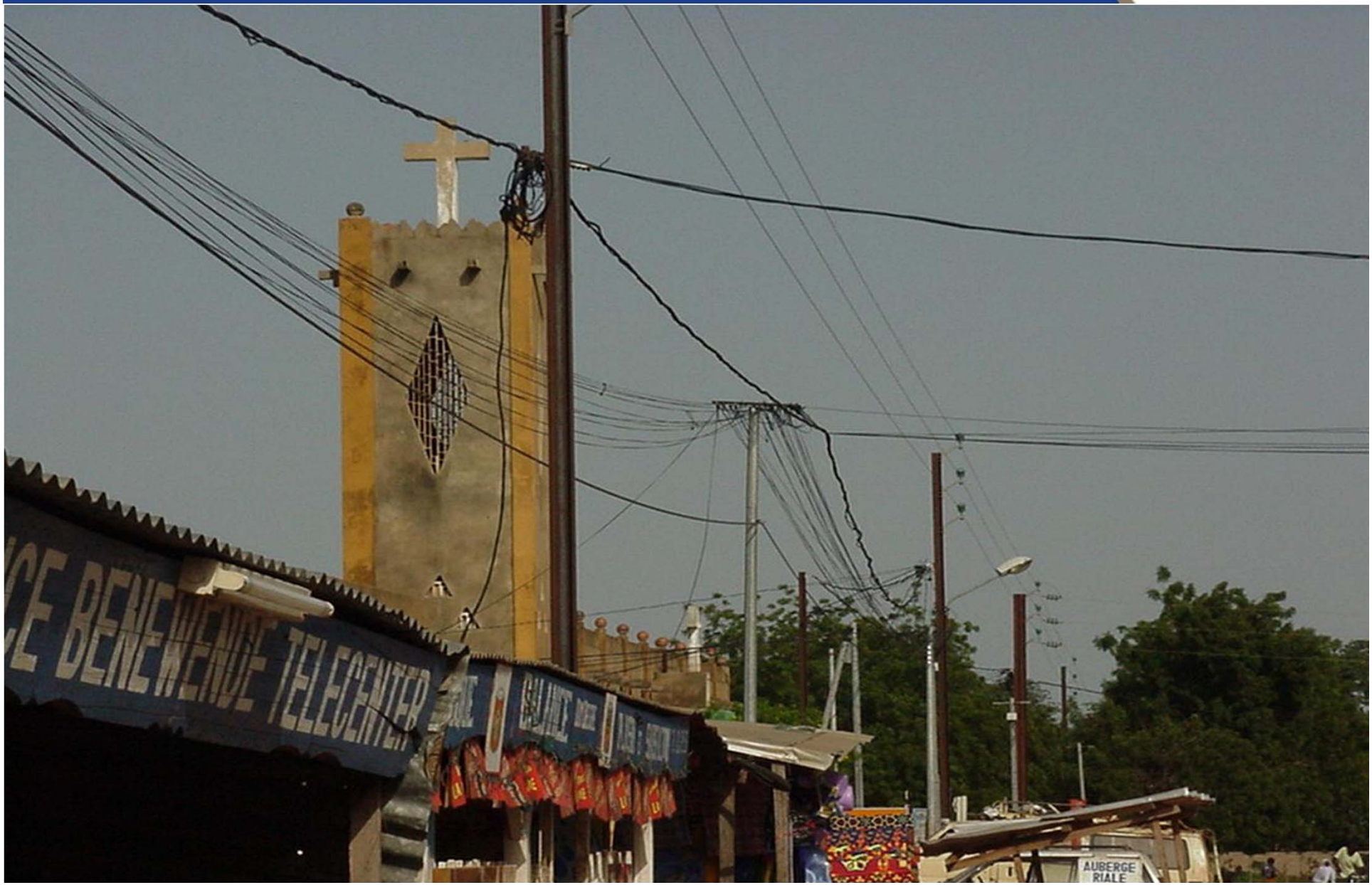
1) Grid based …… as clean as the grid

2) PV- Battery storage…….. Some clean benefits (?)

Alternative energy sources remains the providers of intensive energy consumption

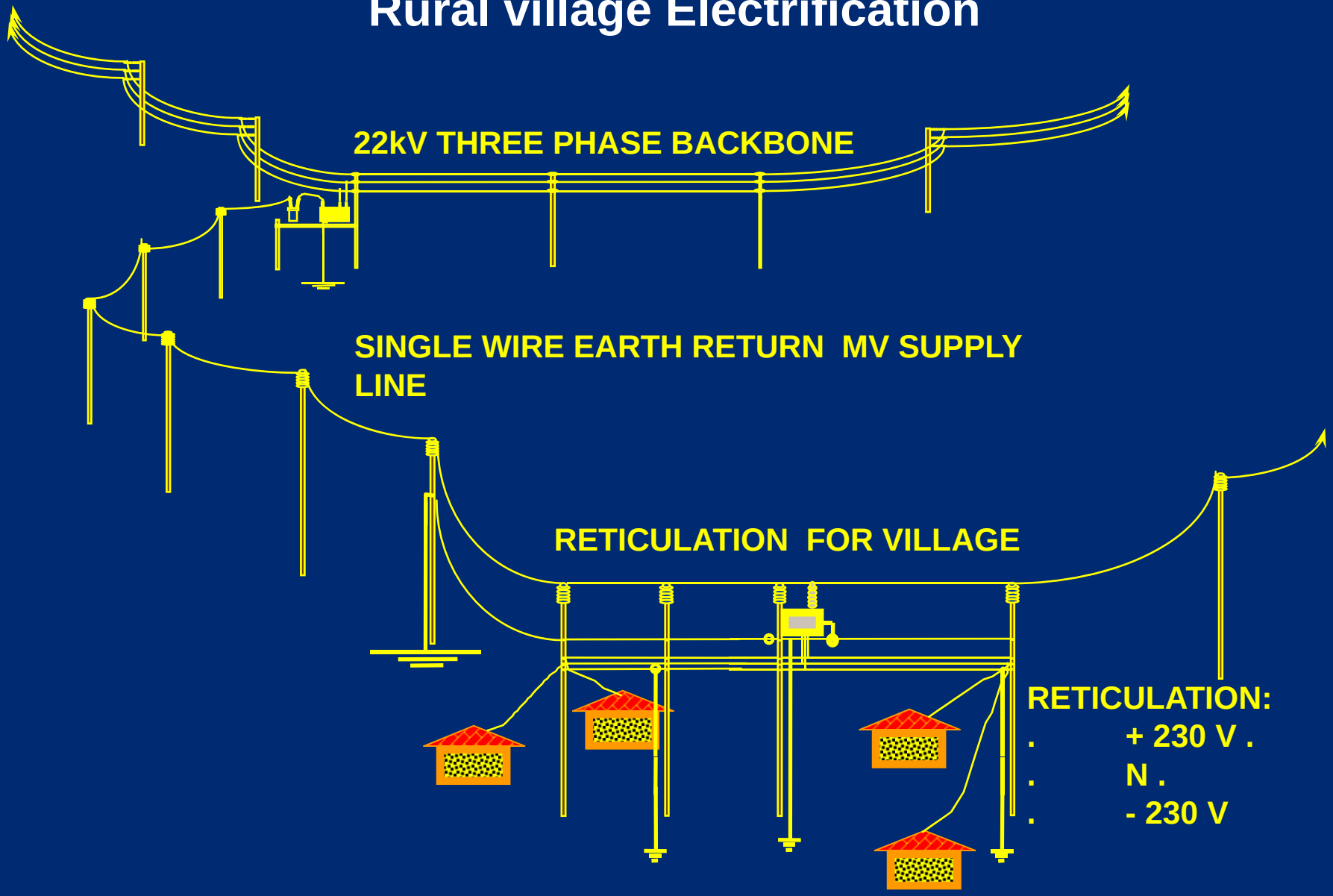
Mini Power Station in Burkina Faso

Mini Grid in Burkina Faso

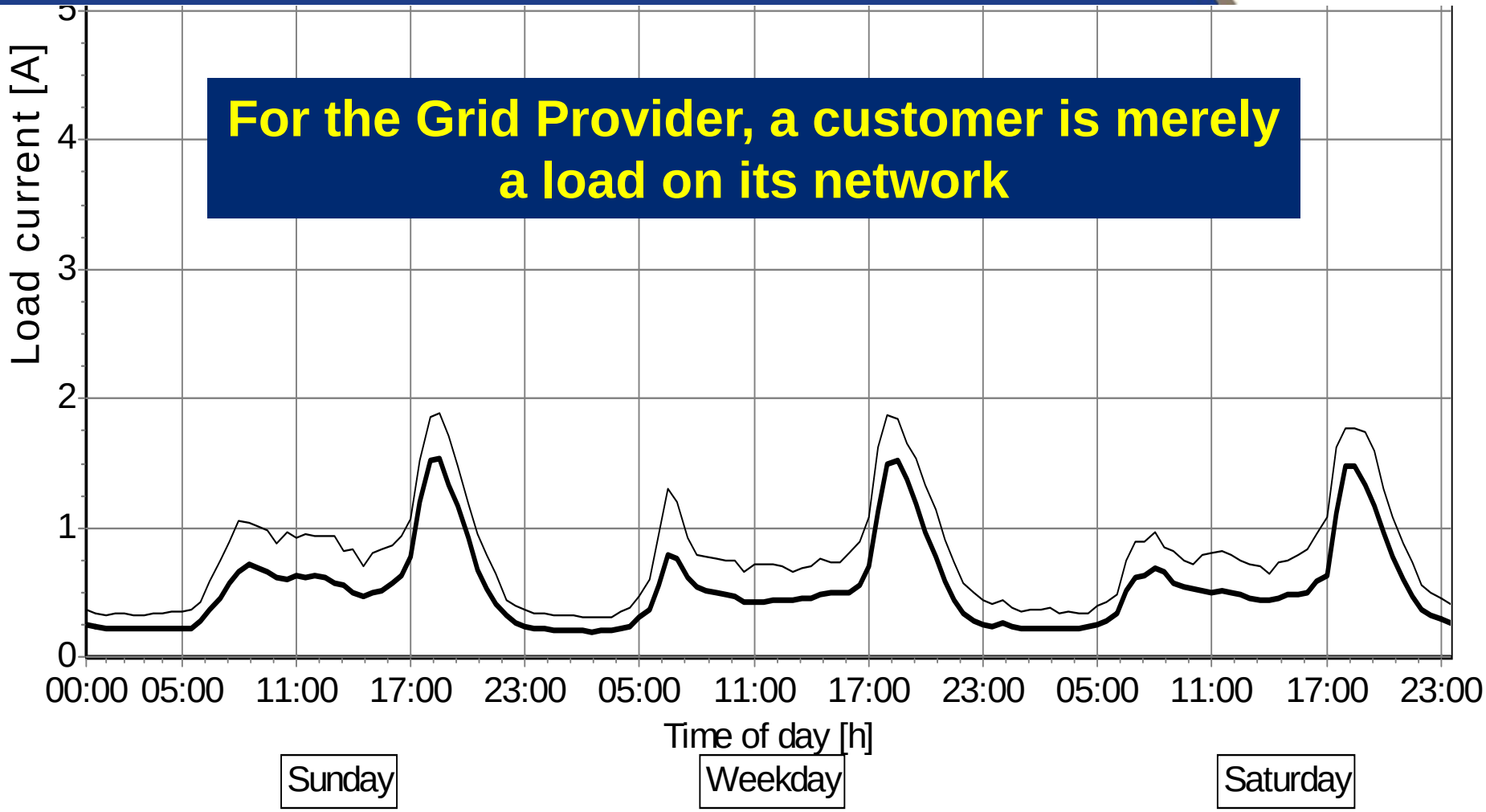


Grid Electrification South Africa

Rural village Electrification



Load curve of a typical House Hold



Grid Electricity: Nothing beats its simplicity

- **There is a huge gap between grid supplied rural electrification and alternative options at the moment.**

  (Any customer will tell you about it.)

- **This is one of the real big challenge for PV Battery systems**

- **For PV-Battery Systems the detail beyond the point of supply become part of what needs to be supplied and what requires attention by the service provider**

Use by house hold

Use	Alternative sources
Space heating	Biomass
	Coal
	Gas heating
	Paraffin heating
Cooking	Biomass
	Coal
	LPGas stoves
	Paraffin stoves
	Solar stoves?
Refrigeration	Paraffin fridges, Reciprocating engine-generators

Use by house hold

Lighting	Gas lamps
	Paraffin lamps
	Candles
	Photo Voltaic battery system
	Torch & batteries
Electronic power supplies	Batteries
E.g. Computers, radios, cell phone chargers etc.	Resiprocating engine-generators
Rotational drives	Reciprocating engines


PV Panel, battery and CFL light

Eskom-Shell JV - SA Non Grid Electrification Program

- SA Non Grid program
- 50W panels ,100 AH 12V Battery, wire harness and CFLights.
- Several concessionaires including ESJV
- Service for fee business model
- Capital cost subsidised by electrification program
- Operating cost could draw on Free Basic Electricity program
- 6 000 initial roll out
- Transferred to management after 5 years
- Growth of overall program was not significant

PV-Battery vs Grid- Politics

Political Fairness and impact:

Electrification in SA is a politically driven (vs commercial)

Voters ask: " We have waited for 20 years to be electrified (last in the queue), do you really expect us to accept 2nd rated power? (poorest quality)"

Pilot projects runs into political pressure regularly

Market driven environment should not have the same pressure

Better PV

Improvements that will make PV

Battery systems more competitive

The Battery !!!!!! (150W system)

PV-Battery System 40 Year NPV	US $	
150W Solar module	$	225
290 Ah Battery	$	**275**
Control, wiring and fittings	$	475
Installation cost	$	125
Maintenance	$	**788**
Battery and system replacement	$	**1,088**
Total cost NPV	$	2,975

PV Panel Price Greatly reduced

http://www.metalprices.com/p/SiliconFreeChart?weight=KG&size=M&theme=1012

Character of PV Rural Electrification

- **Battery maintenance**
- **Battery life**
- **Reliability**
- **Hi Tech equipment compared to Grid appliances**
- **Market availability of appliances for low voltage DC power**
- **Customers have low levels of exposure to technology generally**

Efficiency opportunities- Super Bright LEDs

- **Because of the need for energy storage- efficiency has a major impact on the cost of such a system**
- **Currently CFL's are used for lighting it consume 50% of the system energy**
- **A 50% improvement in efficiency of lighting can make a significant contribution**

Deep Cycle Battery Technology:

- **Lead Acid probably remains for time to come (?)**

- **Sealed lead acid batteries could solve some of the maintenance issues any experience ??**

Closure

- **Utilities are traditionally good at grid electrification**
- **PV-Battery systems are economically competitive when dwelling density are very low**
- **Non grid electrification solutions are politically challenged (in SA)**
- **Energy efficiency of appliances and batteries are key areas where improvement would make huge contributions**
- **Business models require attention**
- **Support to trade and industry is required ensure that DC suitable “appliances” are readily available**
- **Behaviour change to adopt new**