ASADI VI Conference

SOLAR ENERGY FOR POVERTY ALLEVIATION IN SUB-SAHARAN AFRICA

Theme- Improving access to Energy in Sub-Saharan Africa
Venue- The Lord Charles Hotels Somerset West, Cape Town, South Africa
Date- 7-10 November 2010

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CREET
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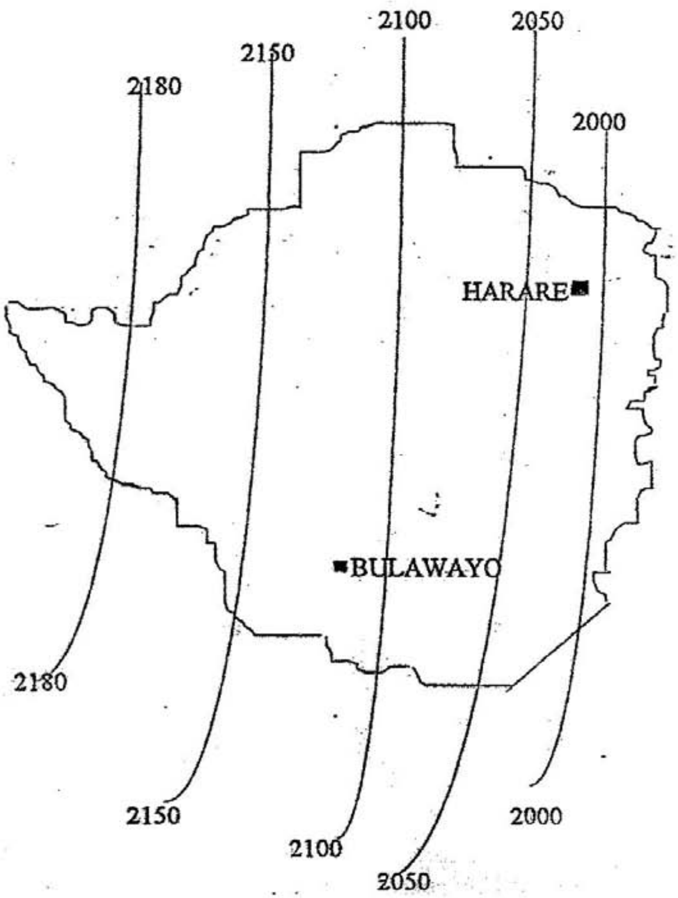
THE SOLAR ENERGY RESOURCE

- 1.1 Solar energy has three major developmental impacts on people’s well-being:
- general impact on living standards upgrading (poverty alleviation)
- efficiency (environmental, social impacts)
- simplicity (user friendly).
- Sound pollution—nil
- Noise pollution--nil
  - Solar energy, as partial radiation from the SUN can readily be appreciated from two standpoints:
- solar-thermal, consisting of collectors such as flat plates on roofs, parabolic dishes, power towers (heating and cooling), concentrating solar technology (CST), which uses a combination of tracking lenses and mirrors to drive turbine electricity. Solar thermal is 30% efficient to produce electricity from heat.
- Solar photovoltaic (SPV) converts sunlight into direct electricity using solar silicon cells (new materials and nanotechnology being researched into). SPV can power a simple hand-held calculator or a sizeable power station using several stacks of PV panels. PV technology has an average efficiency of 15% on sunlight to electricity conversion.
- An innovative energy resource is a combined SPV and CST power application.The Delta of Saloum Island site in Senegal has spectacular PV solar home systems and an allied solar power station.

SOLAR RESOURCES IN ZIMBABWE.

- One of the best solar regimes in the world, with annual insolation of over 2000 kWh/m^2 per year. There is a 15 % variation in insolation levels across the country, and a 25% variation between Summer and Winter.

DISTRIBUTION OF SOLAR RADIATION



MEAN ANNUAL SOLAR RADIATION

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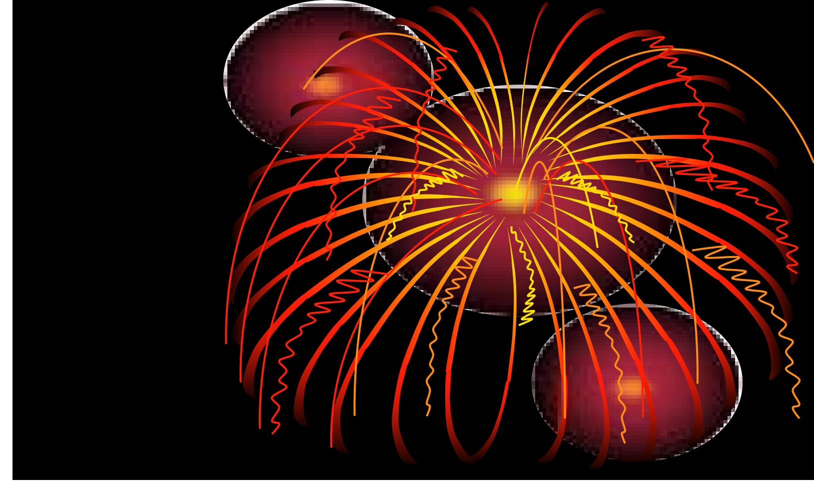
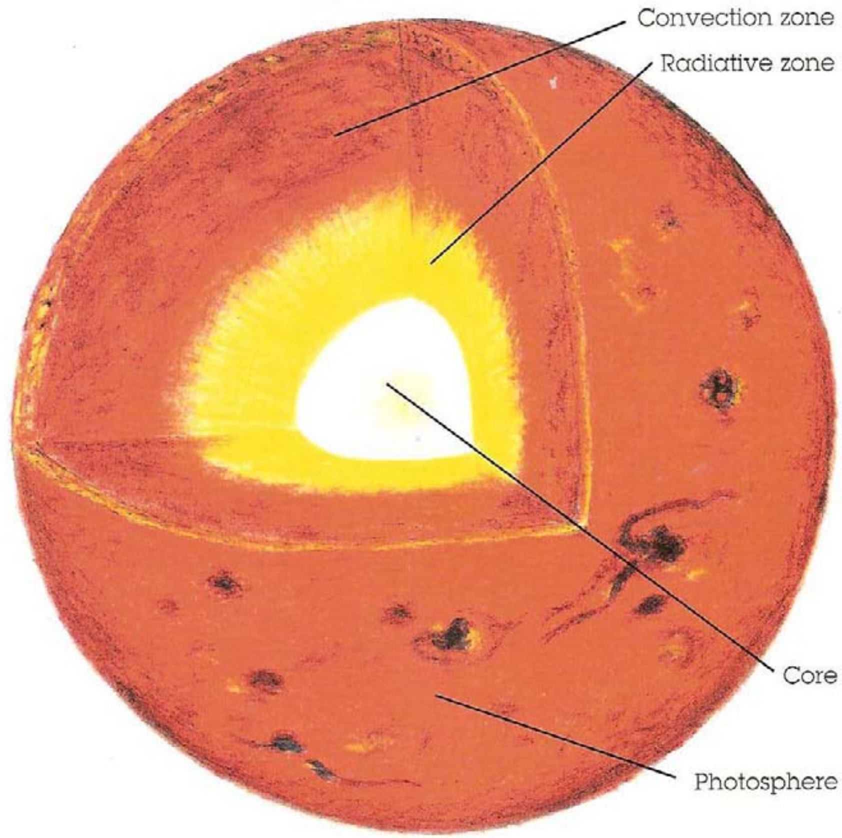
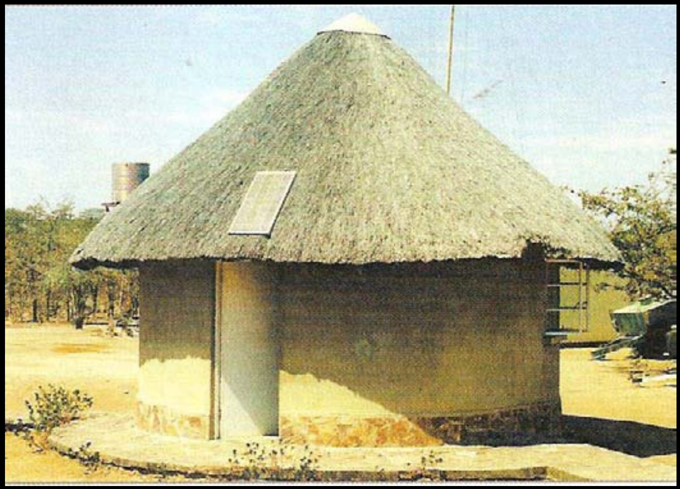




WHO ARE THE POOR IN SUB-SAHARAN AFRICA?

- 2.1 Poverty is a multi-dimensional phenomenon (usually measured by proxy):
- \- lack of money or of food
- \- illiteracy
- \- poor health
- \- lack of information
- \- lack of shelter, of no fixed abode, etc.
- Poverty perception involves **identification** (who is poor?), **cause** and **solutions.**

- **2.2** The poor in Sub-Saharan Africa are:
- **-** generally rural based
- \- generally semi-illiterate
- \- not familiar with electricity or modern technology



WHO ARE THE POOR IN SUB-SAHARAN AFRICA…continued?

- 2.3 Poverty forces the poor to live off the natural resources resulting in the degradation of the" village commons". Energy deprivation is a major cause of poverty.
- The factors are:
- high population growth rates and rural-urban migration
- fuel-wood scarcity
- low load factors for grid electricity
- inadequate support to explore renewables
- institutional/cultural barriers for renewables adoption
- lack of reliable energy database

- 2.4 To tackle poverty problems; intervention required at both policy and "people" levels.
- Poverty statistics in Zimbabwe (UNDP recent survey):
- 61% of Zimbabweans are poor
- 75% of the rural population are very poor
- 39% of the urban population are poor
- majority of rural population are women; hence involve women in energy planning

WHY SOLAR ENERGY?

- 3.1 Some advantages:
- - environment pollution; negligible
- - socio-economic benefits (education, entertainment, income generating pursuits)
- - modular, small-scale, user- friendly; no moving parts
- (keep it simple and stupid-KISS)
- - home lighting
- - energy supply diversity, distributed/decentralised energy resource
- - “chases away evil spirits”.

3.2 Solar energy, a viable resource:

- sustainable livelihoods
- environmental impact (least)
- cultural acceptance
- skills development/transfer of technology
- institutional/policy improvements

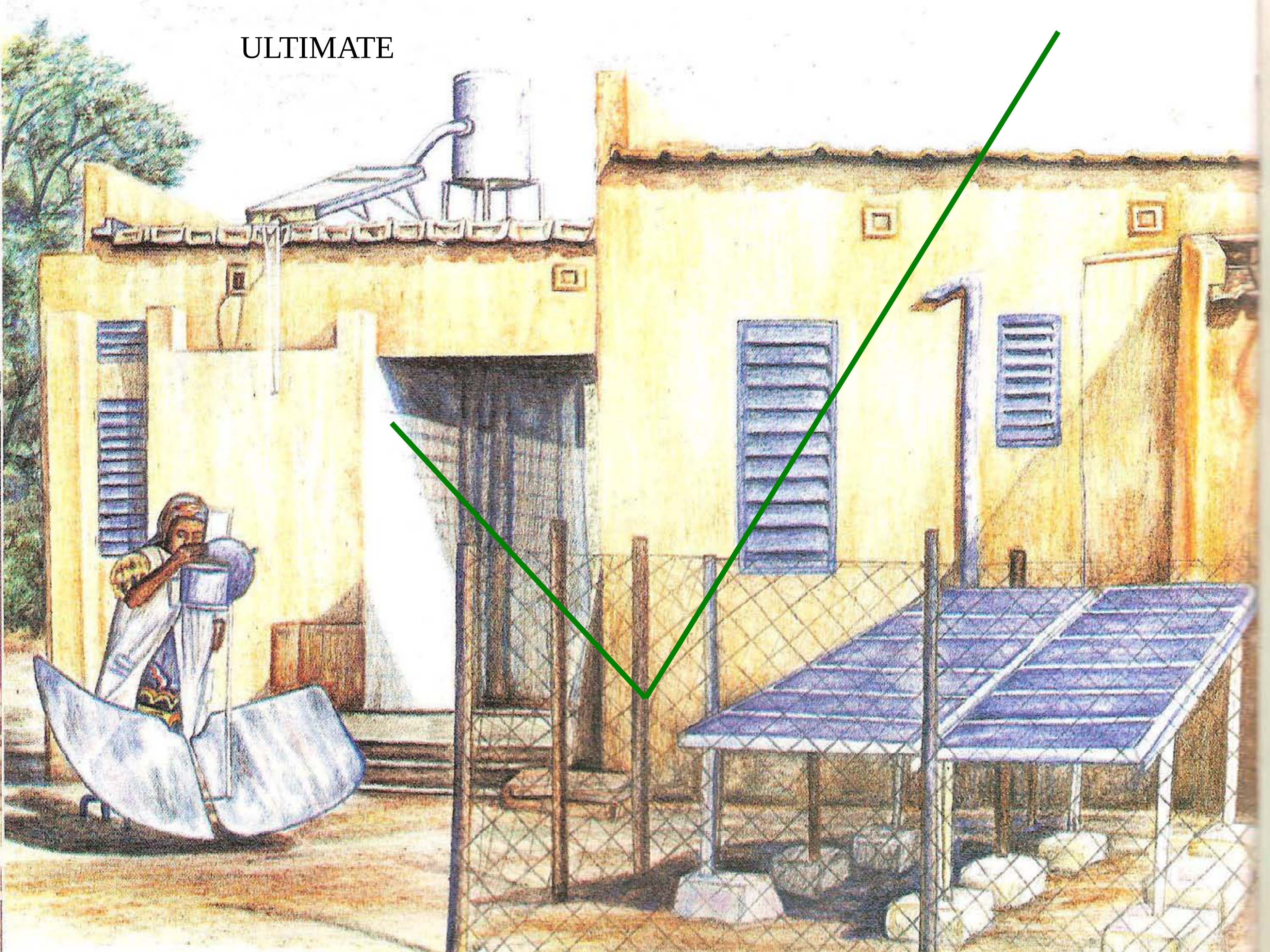
- 3.3 Solar energy is NOT being widely used for electricity generation due to initial high capital costs. However, popularity is gaining ground due to favourable market conditions and climate change considerations.

SOLAR ENERGY FOR POVERTY ALLEVIATION (addressing the MDGs)

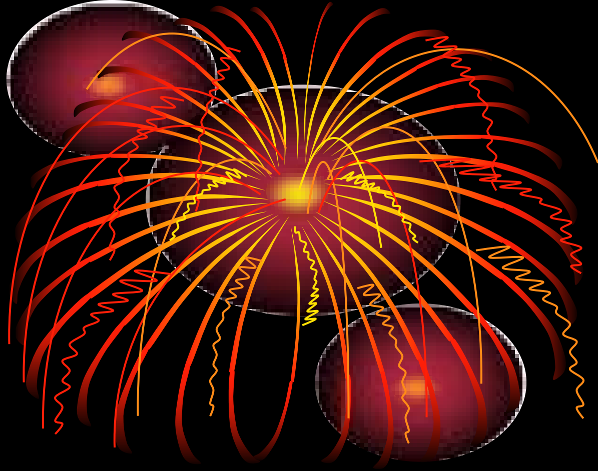
- 4.1- An estimated 1.5 billion people in the developing countries not connected to grid electricity
- - 80% of these living in Sub-Saharan Africa or South Asia (Lagros, G et al, UNDP-WHO-2009)
- - grid extension to the poor rural communities either impractical or too expensive

- 4.2 Energy for poverty alleviation entails:
- - equitable distribution
- - establishment of income generating projects to finance systems (energy dollars to stay in community)
- - low interest loans; viable finance /micro-credit scheme, leveraging funds, venture capital, revolving fund, payment in kind, rent
- - low cost systems (lanterns, DIY kits, etc)
- - relief from duties, taxes, levies

ULTIMATE



4.3 Solar for poverty alleviation subsumes:



- - people's capabilities and assets
- - self-sufficiency (raising own incomes)
- - self restraint(small ecological footprints)
- - recovery from economic stress.

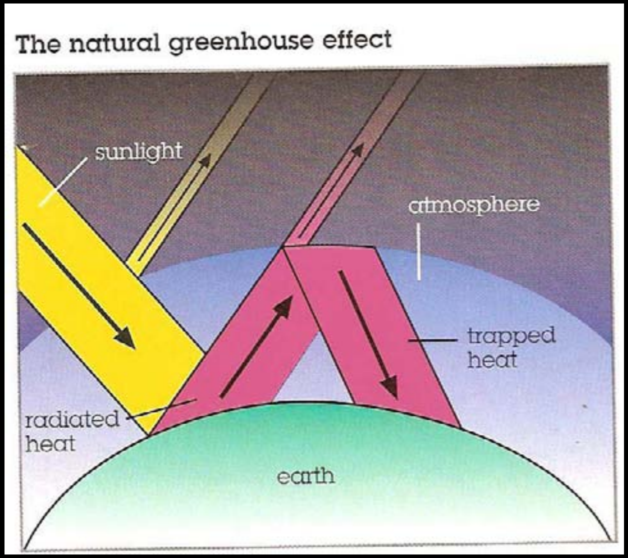
- 4.4 Solar a partial solution for provision of pro-poor, low carbon electricity in Sub-Saharan Africa; with regions receiving most solar energy:
- - yet these countries are least able to benefit due to lack of capacity to harness the solar energy.
- -advances in solar home systems installations being made:
- Kenya (300,000), South Africa (>200,000), rural Tanzania (6,000 installed by Zara Solar); Zimbabwe (10,000 installed under GEF project)

- 4.5 Growth in solar home systems installations greatly influenced by existence of micro-finance schemes or government/donor support (Bangladesh, India, China).

- 4.6 Solar lanterns are safer and cheaper lighting alternatives (NEST, India); Danish Riso company developed an efficient portable lamp using LEDs, PV cells and lithium batteries.

- 4.7 Poverty reduction solar applications include vaccine refrigerator, solar cookers, water disinfection unit, solar food/crop drier, solar radio/phone, solar water heating/pumping, pasteurisation plant, solar wifi (internet), battery charging stations.

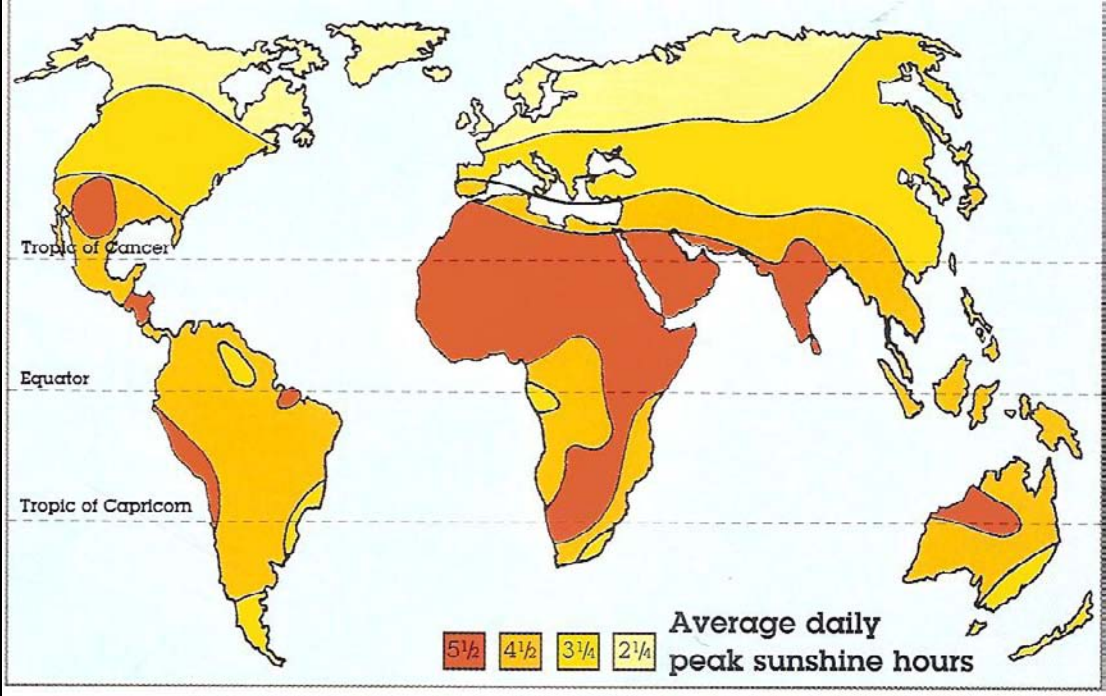
MANAGING SOLAR ENERGY DISSEMINATION



- 5.1- establish decentralised Rural Energy Centres (RECS) for installers, maintenance technicians, application processors/assessors
- - solar income generating centres become Renewable Enterprise Zones (REZs), which can become pillars of rural trading (urbanisation of rural poverty);
- - These twin concepts ensure sustainability for the solar energy roll out scheme
- - they facilitate public awareness programmes
- - they facilitate assessment of consumer needs
- - they evaluate barriers to solar energy system acquisition
- -they ensure end-user involvement in planning (inputs) and deployment of energy
- resources.

- 5.2 Who are the consumers of the solar energy systems?
- - home owners, especially rural households
- - small-scale farmers
- - rural business centres
- - Urban-based poor households
- - rural based institutions(schools, clinics, cooperatives, etc)

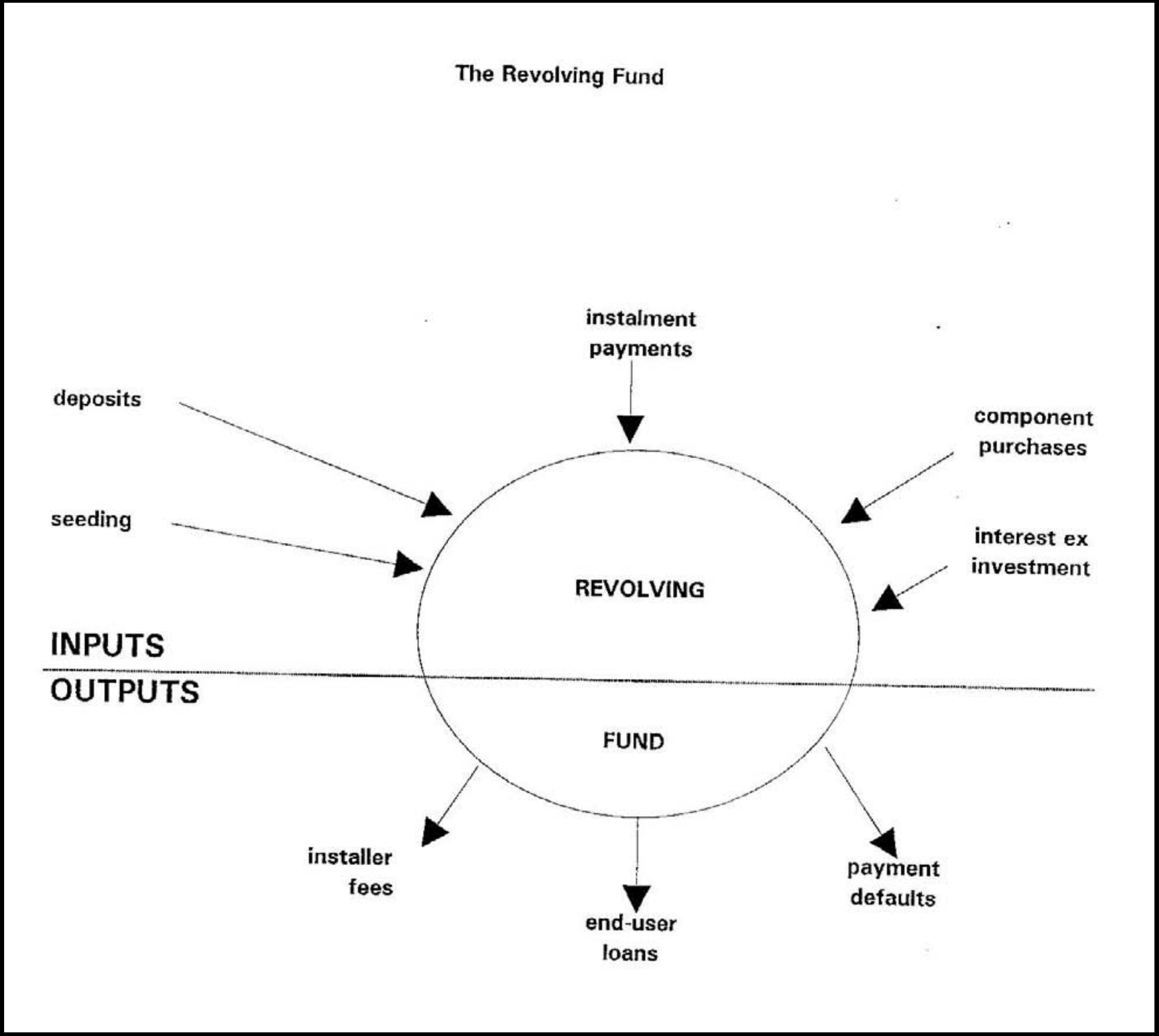
Diversify delivery modes:



- - national utility
- - private sector
- - NGOs/group initiatives
- - District Councils
- - Cooperatives
- - Donor Agencies

- 5.4 Solar Energy Programme Administration
- - acquisition of equipment
- - access to credit/finance
- - database development
- - training of installers/technicians
- - public awareness (media, leaflets, tv/radio)
- - establishment of system specifications and standards
- - monitoring and after-sales service

5.5 Establish a Revolving Fund (RF)

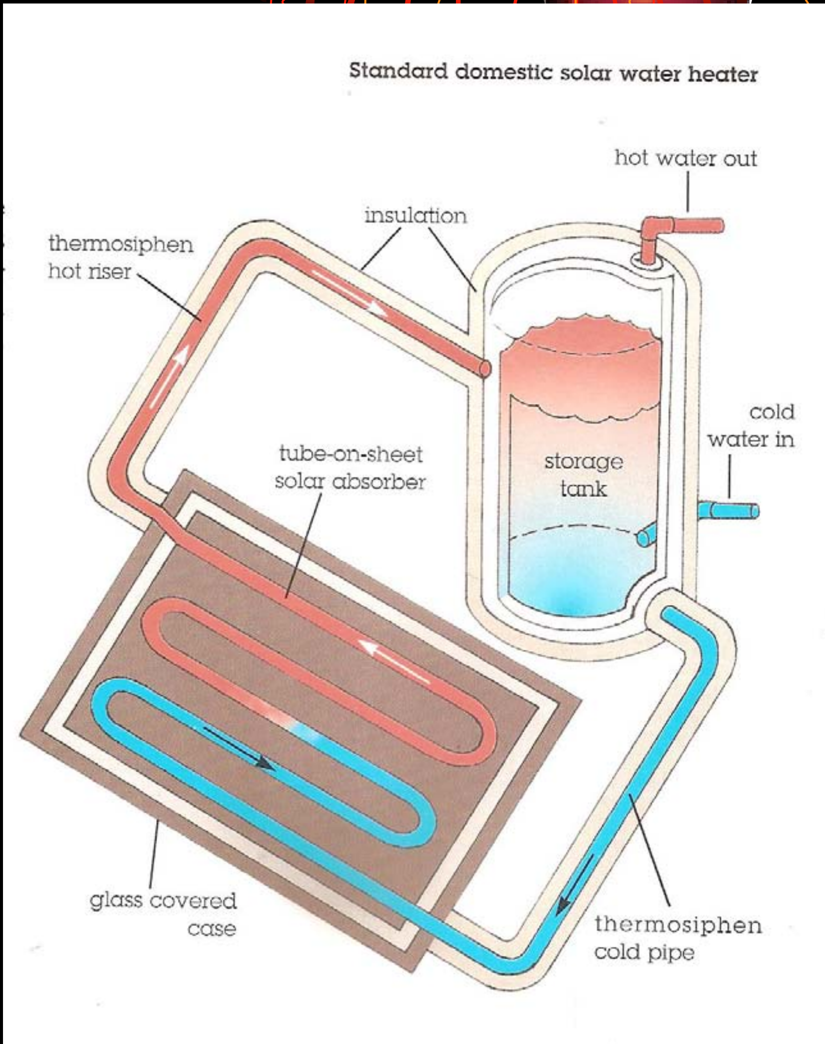


Revolving Fund

- 5.6 In the Zimbabwe GEF Project an efficient RF was established in conjunction with the Agricultural Finance Corporation (AFC) by the Project Management Unit (PMU).

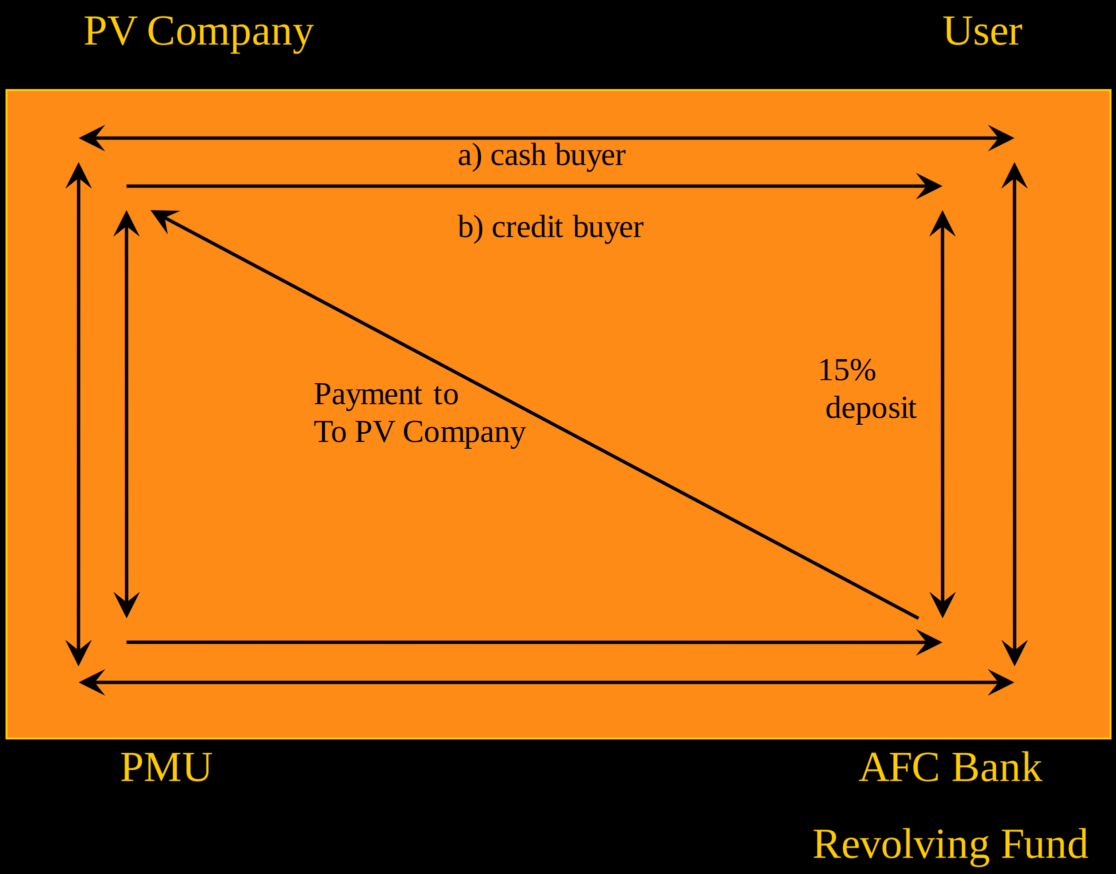
- \- End-users paid 15% down deposit for an installation, with 15% interest per annum (for 3 years), made up of:

- Insurance……………………………..1.5%
- Contribution to RF……………………3.5%
- Stabilisation Fund…………………….3.0%
- (to cover defaulters)
- Administration Fee (AFC)…………….7.0%.
- ---------
- 15.0%



5.7 The GEF Project Solar PV Project System Acquisition

5.7



5.8 Stabilisation of the RF

- To avoid erosion of the RF (through inflation, finance mismanagement, etc), there is need to ensure that:
- Inputs(I) > Outputs(O), for at least three successive months
- Defaults of consumer payments are minimised (through a strict screening regime of loan applications)
- An increasing number of system installers is realised
- Group end-user participation is encouraged (schools, clinics, churches, donor/support).

- 5.9 Financing
- - self financing by the poor via microfinance,etc.
- - private solar companies may link/ connect customers with finance houses as “down-payment guarantees”
- - government subsidies and incentives (levy) for the poor to access solar electricity
- - donor aid
- - payment in kind (food for work, barter, etc.)
- - “resource sharing” whereby government supplies hardware, and end-user supplies labour and overheads
- - carbon emissions trading (Kyoto)

6.0 Observations

- - rural based dwellers maintained their loan repayments satisfactorily
- - salaried urban based workers were predominant loan applicants for rural based
- relatives
- - farmers generally paid after harvests
- - home ownership of solar systems greatly valued
- -Project Management appreciated as main value addition, the space created for linking solar energy, MDGs and poverty reduction themes.

- VI. SUSTAINABILITY OF THE SOLAR ENERGY RESOURCE
- 6.1 In managing solar energy dissemination we distinguish between five phases (not mutually exclusive):

	DESIGN	
	INSTALLATION	
<u>Acceptance</u> variables	OPERATION	<u>Feedback</u> variables
	DISTRIBUTION	
	END-USE	

6.2 Promote solar energy programme to manufacture components:

- - batteries
- - lights
- - charge controllers
- - solar pv panels lamination
- - solar water heaters, crop driers
- - mounting structures

- 6.3 Salient highlights:
- - gender mainstreaming (role of women)
- - integration of parallel forces
- - collaboration with government, donors, private sector, NGOs
- - training and capacity building
- - monitoring, evaluation and assessment

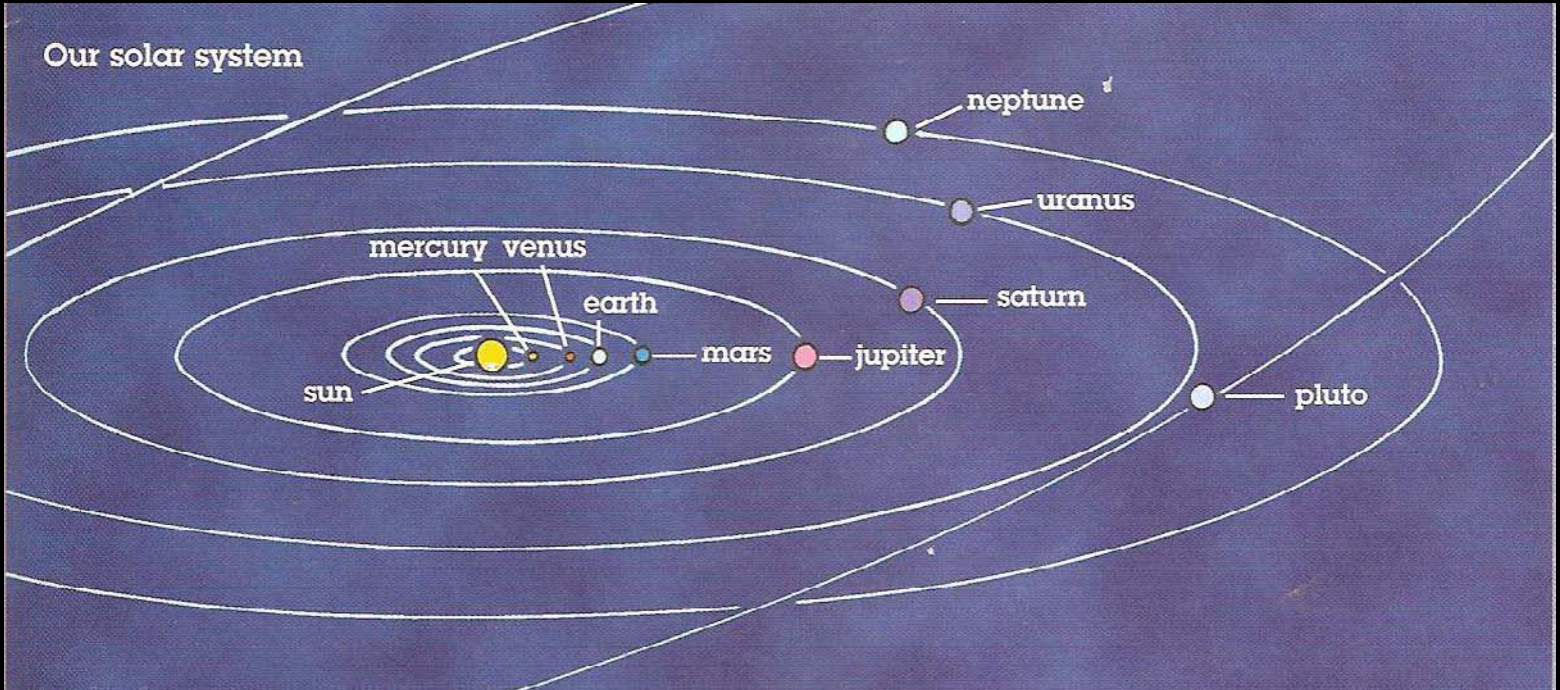
6.4 Decentralised solar energy for poverty alleviation

Conditions	Activity
Political commitment	Energy efficiency, resource mobilzation
Allocation of budget	Finance Scheme, public awareness
Technology transfer	Local manufacture of components
End-user involvement	Demand analysis, demonstrations

6.5 Handle and manage the constraints:

- 6.5 Handle and manage the constraints:
- - relatively high initial capital costs
- - low PV energy conversion rate
- - bad weather-induced power fluctuations
- - after-sales service and maintenance
- - thefts , loss or damage of panels

- 6.6 Solar panel prices generally decline with time;
- But battery prices remain static (40% of system cost)
- systems to remain relatively expensive for the poor



6.7 Success Factors
(experienced in the Zimbabwe GEF Solar Project)

- - existence of favourable government policy and a market-driven economy
- - industrial infrastructure for manufacture of solar components
- - functional database for installed systems, defaults, component thefts, etc.
- - engage a wider funding base
- - enlist innovative finance/micro-credit (revolving fund) schemes
- - entice urban-based workers to finance systems for rural-based folks
- - enlist end-user involvement from planning stages to implementation
- - promote positive synergy among stakeholders
- - ensure dependable after-sales service/maintenance (a notorious shortcoming of energy providers)
- - enlist wide publicity campaign using various media
- - promote formation of a vibrant single-umbrella solar energy industries
- association
- - promote solar education and appreciation in schools and colleges
- - publish a solar newsletter or annual report
- - facilitate decentralisation of installers, manufacturers and end-users
- - intensify training of installers, manufacturers and consumers
- - uphold quality standards and specifications on installed systems
- - energy poverty reduction to be geared towards a more general concept of integrated management of rural areas, targeting the process more than action.

6.8 Solar Energy Scenario
(when fossils power crashes)

- **technology portal** (R&D, SPV/CST interface, solar hydrogen, fuel cells, solar cum ICT , nanotechnology)
- **Project Noah**
- **Social development portal** (health, education, Housing, living standards , jobs)

Power in the desert

THANK YOU

CREET

CENTRE FOR RENEWABLE ENERGY AND ENVIRONMENTAL TECHNOLOGY

"Greening Zimbabwe"