

**PUBLIC- PRIVATE SOLAR ENERGY SERVICE DELIVERY IN RURAL AREAS
IN BOTSWANA**

PRESENTED BY

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1.0 INTRODUCTION

Botswana is endowed with large reserves of coal and high level of solar insolation. The major sources of energy supplied are fuelwood and coal which have been most predominant. About 70% of the country's electricity requirements are imported. Although solar energy is becoming increasingly popular, especially in the field of water heating and lighting its contribution to the primary energy supply is still less than 1 %.

The Long Term Vision for Botswana (Vision 2016) recognises the potential role that solar energy can play in meeting the energy requirements of rural communities not served by the national grid. The vision recommends that Botswana should be developed into a centre of excellence for solar energy technology and has identified electrification of rural schools as one of the key areas of potential applications.

The Government of Botswana, in consonance with Vision 2016 also recognises the huge potential of this resource and as a result has put in place policies and strategies to promote the use of solar energy. Specific policy objectives on solar during National Development Plan 9 are:

- i) To promote increased use of photovoltaic/solar electrification in an orderly manner with adequate coordination, institutional support, financing and technical standards
- ii) To take advantage of regional and international developments in research and development
- iii) Promote the use of solar energy for both power generation and water heating where economically feasible.

2.0 INSTITUTIONAL FRAMEWORK

The Ministry of Minerals, Energy and Water Resources (MMEWR), through the Energy Affairs Division (EAD), is responsible for formulation, direction and coordination of the national energy policy including rural electrification. The following ministries and parastatals share energy portfolio responsibility with MMEWR:

- Ministry of Works and Transport is responsible for off-grid power supply and installation and maintenance of solar energy equipment in government institutions in rural and urban areas through its Department of Electrical and Mechanical Services (DEMS).
- Rural Industries Innovation Centre (RIIC) is responsible for developing, testing and dissemination of renewable energy technologies.
- Botswana Technology Centre (BOTECH) undertakes research and development and information dissemination on solar energy.
- The Botswana Power Corporation (BPC), a parastatal under MMEWA is responsible for electricity generation and supply and it is the implementing agent of the Rural Electrification Programme on behalf of the government.

3.0 SOLAR ENERGY INITIATIVES IN BOTSWANA

In its endeavour to promote the use of solar energy, the government has taken a number of initiatives such as;

3.1 *Manyana Pilot Project*

In 1992, the Energy Affairs Division implemented a pilot project under the management of RIIC at Manyana (50 km South West of Gaborone) whose aim was to assess the technical and economic performance of different renewable energy technologies under a village environment. The installations included:-

- (a) 42 residential photovoltaic lighting systems with DC sockets to power small transistor radios.
- (b) 1 photovoltaic AC lighting system for the clinic
- (c) 1 photovoltaic vaccine refrigerator for the clinic
- (d) 6 solar water heaters
- (e) 7 photovoltaic streetlights

After two years of monitoring and implementation an evaluation was conducted whose findings revealed that the technologies were socially accepted, there has been an increase in economic activities as well as improvement in the medical care capabilities.

3.2 *National photovoltaic Rural Electrification Programme (NPVREP)*

Following the successful implementation of the Manyana Pilot project, in 1997 the government initiated a programme on PV electrification and was to run for a period of 4 years subject to its performance. The programme was implemented by Rural Industries Innovation Centre (RIIC), a parastatal based in Kanye. The programme offered credit to individuals who wished to purchase home lighting systems. The programme was fully funded by government for the provision of loans and administrative costs.

Table 1. Funding for the National PV Rural Electrification Programme

Year	1997/98	1998/99	1999/2000	2000/2001
US\$ (mill)	0.264	0.12	0.68	0.2

Source: Project Reports, 1997- 2001

At its inception the programme was supposed to provide about 200 systems per year, however only 300 were instituted over a period of

4 years. Most of the installations in the range of 100 –150 Wp power are for domestic use i.e. lighting and power small household appliances like TVs, VCRs and radios. The larger systems (150 Wp) are not many and are used mostly for business e.g. shops and poultry. Loans ranged from US\$ 800 to US\$ 4000 depending on the ability to pay. Potential clients had to prove that they have a source of income, which is sufficient to service the loan.

3.3 Photovoltaic Rural Electrification Master Plan

Although the NPVREP was expected to install about 200 systems per year, only 300 were installed over a period of 4 years. The reasons for low uptake of the systems included lack of clear strategies to achieve the preset target, poor record management and the project having to cover too many areas with limited resources.

As a result, the government with the assistance of Japan International Cooperation Agency (JICA) undertook a study to formulate a master plan for promotion of rural electrification in Botswana by using photovoltaic electrification over the ten-year period starting in 2003. Within the study a pilot project was undertaken in 3 rural villages with solar home systems and battery charging station at one of the villages to validate the Master Plan. The fee-for-service delivery model was employed.

4.0 THE ROLE OF THE PRIVATE SECTOR IN ENERGY DELIVERY SERVICE

There are four types of PV operators in Botswana namely designers, manufacturers, distributors/installers and maintenance providers. In all the initiatives the government has undertaken the private sector has been engaged in consultancy services, supplying and installation of solar systems. And such the private sector suppliers in Botswana supply mostly to the national government and the local councils.

Institutions such as the Botswana Telecommunications Corporation (BTC) and Botswana Railways (BR) have installed significant numbers and capacity of PV. BTC relies on solar energy to power telecommunication equipment in areas where there is no grid power. This equipment includes repeater stations, which provide essential link with remote areas. Botswana Railways relies on solar panels to power signalling and communication equipment for the safe management of rail traffic in areas without grid power.

District Councils install PV to provide electricity to clinics in areas not serviced by the grid. The Department of Library Services has also installed PV in village reading rooms as part of their literacy programme.

Despite these efforts, the uptake in the use of solar energy in rural areas still remains low.

5.0 BARRIERS ASSOCIATED WITH UPTAKE OF SOLAR ENERGY

A number of barriers associated with the slow uptake of electricity have been identified as but not limited to: theft, technical and financial.

Theft

Theft of PV panels and equipment constitute a serious barrier to the use of solar energy. In the case of the credit or hire purchase model, theft of PV panels and equipment from rural households discourages potential users from adopting the technology. For large installations not only does theft discourages the institutions from using solar energy but also distorts the private sector market for PV panels because stolen re-enter the market.

Technical

Technology becomes a barrier to its own adoption when it is too expensive and complex. The limitation of solar system in application has led to most people not wanting to use it. Also the issue of poor quality system or workmanship normally leads to continuous breakdown of the systems.

Financial

In general, the level and mode of payments offered by delivery agents do not tally the income levels and the structures of the potential rural customers. The payments required are often either too high or too inflexible resulting in a very small uptake and extremely slow market growth.

6.0 CONCLUSIONS

Financing alone will not lead to a successful and sustainable rural electrification (PV or grid) programme but other issues that need to be addressed are institutional, technical and capacity related.

PV technology has its limitations and will not be able meet or solve most of the power requirements of rural communities. It is therefore important that all potential users are well informed of its limitations and where possible offered packages with alternatives such as diesel engines to meet their requirements.

In developing countries like Botswana, the provision of subsidy in rural electrification is a social obligation by the government to enhance rural development. Hence there is need for the government and the private sector to work together overcoming the barriers to the use of solar energy such the introduction of subsidies and exemption of PV equipment from custom duties in order to lower the capital cost.

Public-Private Solar Energy Service Delivery In Rural Areas In Botswana

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Order Of Presentation

- Introduction
- Institutional Framework
- Solar Energy Initiatives in Botswana by the Government
- The role of the Private Sector in Solar Energy Delivery Service
- Barriers associated with uptake of solar energy
- Conclusion

Introduction

- Botswana is endowed with large reserves of coal and high level of solar insolation.
- Major sources of energy :- fuel wood and coal.
- Solar energy contribution less than 1 %.
- Vision 2016 recommends development into a centre of excellence for solar energy technology.

Introduction (cont'd)

- Specific Policy Objectives on Solar
 - ◆ To promote increased use of solar energy in an orderly manner.
 - ◆ To take advantage of regional and international developments in research and development.
 - ◆ Promote the use of solar energy for both power generation and water heating where economically feasible.

Institutional Framework

- MMEWR (EAD) share energy responsibilities with other ministries and parastatals
 - ◆ Ministry of Works and Transport – off grid electrification.
 - ◆ Rural Industries Innovation Centre – developing , testing and dissemination of renewable energy technologies.
 - ◆ Botswana Technology Centre – research , development and information dissemination on solar energy .
 - ◆ BPC – electricity generation , supply and distribution and PV electrification

Solar Energy Initiatives

- Manyana Pilot Project (1992)
 - ◆ Aim was to assess the technical and economic performance of different energy technologies
 - ★ 42 residential PV lighting systems
 - ★ 1 PV AC lighting system for clinic
 - ★ 1 PV vaccine refrigerator for the clinic
 - ★ 6 Solar water heaters
 - ★ 7 PV streetlights
 - ◆ Monitored for 2 years

National PV Rural Electrification Programme

- After the success of Manyana Pilot Project , in 1997 gov't initiated PV electrification which ran for 4 years.
- Offered credit to individuals who wished to purchase home lighting systems.
- Estimate of about 200 systems per year
- But only managed to install 300 systems over 4 years.
- Installation ranged from 100-150 Wp.
- Programme is being wound up.

PV Rural Electrification Master Plan

- NPVREP failed because of amongst other things;
 - ◆ No clear strategies to achieve target.
 - ◆ Poor record management
 - ◆ Covering many areas with limited resources
- The gov't with assistance of JICA undertook a study to formulate a master plan for promotion of PV rural electrification .

- Within the study a pilot was also undertaken
 - ◆ 3 rural villages with solar home systems and battery charging station to validate the Mater Plan.
 - ◆ Fee-for –Service delivery model was employed.

Role of Private Sector

- There are 4 types of Solar/PV operators
 - ◆ Designers
 - ◆ Distributors/installers
 - ◆ Maintenance providers
 - ◆ Manufacturers
- The private sector also provides the service to other organisation like BTC, BR, the Police etc.
- All in all the private participation is still low

Barriers – Uptake of solar energy

- Despite the concerted efforts by gov't the use of solar in rural areas still remains low.
- Reasons or barriers are cited as
 - ◆ Technical
 - ◆ Financial
 - ◆ Perception
 - ◆ Theft

Conclusion

- Generally, public-private partnership is still at its infancy
- Need to forge a working relationship to overcome some of the barrier
- Solar / PV technology has its limitation hence people have to be informed.
- There is need for increase subsidy in relation to solar energy services.
- Exemption of PV equipment from custom duties.



Thank You