Sustainable Thermal Energy Partnerships (STEPs)

Business Models in Lesotho

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By

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CONTENTS

ACRONYMS AND UNITS

AfDB	African Development Bank
DfID	Department for International Development, United Kingdom
GEF	Global Environmental Facility
GNI	Gross National Income
GoJ	Government of Japan
GoL	Government of Lesotho
HDI	Human Development Index
LEA	Lesotho Electricity Authority
LEC	Lesotho Electricity Company
LREBRE	Lesotho Renewable Energy Based Rural Electrification Project
NGO	Non-Governmental Organisation
O&M	Operation and Maintenance
PAYG	Pay-As-You-Go
PJ	Peta-Joules
REF	Rural Electrification Fund
REU	Rural Electrification Unit
SE4All	Sustainable Energy for All
SEA	Sustainable Energy Associates
SHS	Solar Home Systems
STEPs	Sustainable Thermal Energy Partnerships
UNDP	United Nations Development Programme

1.0 BACKGROUND

The Kingdom of Lesotho is located in Southern Africa occupying 30,355 square kilo meters, with 74% of the country being covered by mountains and foothills. 83% of the households in Lesotho are in rural areas and 70% households derive all or part of their livelihoods from agriculture[1]. Despite the Gross National Income (GNI) per capita of 1,220 $ in 2011, more than 56% of the population lives below the poverty line[2]. The Human Development Index (HDI) value of Lesotho is 0.450 positioning the country at 160 out of 187 countries[3].

The total primary energy supply for Lesotho is 37.2 PJ and the country's energy mix is dominated by traditional biomass with a share of 66%. Modern forms of energy such as petro-products, coal, electricity and gas constitute the remaining 34%[4]. The country also imports large quantities of kerosene, diesel, firewood and charcoal which are used for household energy needs. It is estimated that 74% of the population in Lesotho do not have access to electricity. The investments in rural energy have been largely driven by the public sector and international organisations. While there have been some purchases of rural energy systems and devices by private households[5], the investments are relatively small. So the rural energy development and the related business models in Lesotho have been driven largely by the government and development assistance.

This report by Sustainable Energy Associates (SEA) under the Sustainable Thermal Energy Partnerships (STEPs) project funded by a grant from the Department for International Development (DfID) examines the prevailing business models for energy access in Lesotho. The objective of this review of the experience in Lesotho is intended to serve as the baseline for planning and designing pilot interventions of the STEPs model in Lesotho.

2.0 BUSINESS MODELS

The energy access efforts in Lesotho have been driven by government, development agencies as well as private sector and NGOs. The major business models that have been employed in Lesotho for providing rural energy access have been:

- **Grid Extension**: In this business model, the national energy utility Lesotho Electricity Company (LEC) electrifies villages through the electricity network expansion and extends the distribution grid into households that do not have electricity access;

- **Mini-grid Projects**: In this business model the Rural Electrification Unit (REU) of the Government of Lesotho (GoL) finances and establishes mini-grids for village electrification;

- **Cross-border Electrification**: In this pilot business model the REU has established a mechanism for cross-border electrification from the South African grid network;

- **Development Aid Model**; this model has been used by development agencies in Lesotho to implement rural energy projects. Some examples of such initiatives have

[1] Ministry of Natural Resources, Lesotho Meteorological Services, 2004, Adaptation to Climate Change Technology Needs in Lesotho : Energy and Land Use Change and Forestry
[2] http://data.worldbank.org accessed January 2013
[3] United Nations Development Programme (UNDP), International Human Development Indicators: Lesotho, hdr.undp.org, accessed October 2012.
[4] Sustainable Energy for All (2012): Rapid Assessment and gap analysis for Lesotho.
[5] Particularly, portable solar lanterns, SWHS and SHS

been the initiatives by African Development Bank (AfDB) and Government of Japan (GoJ);

- **LREBRE Model**, this model has been implemented for Solar Home Systems (SHS) based rural electrification in selected rural areas of Lesotho, by the United Nations Development Programme (UNDP) and Global Environment Facility (GEF) under the project Lesotho Renewable Energy Based Rural Electrification (LREBRE).

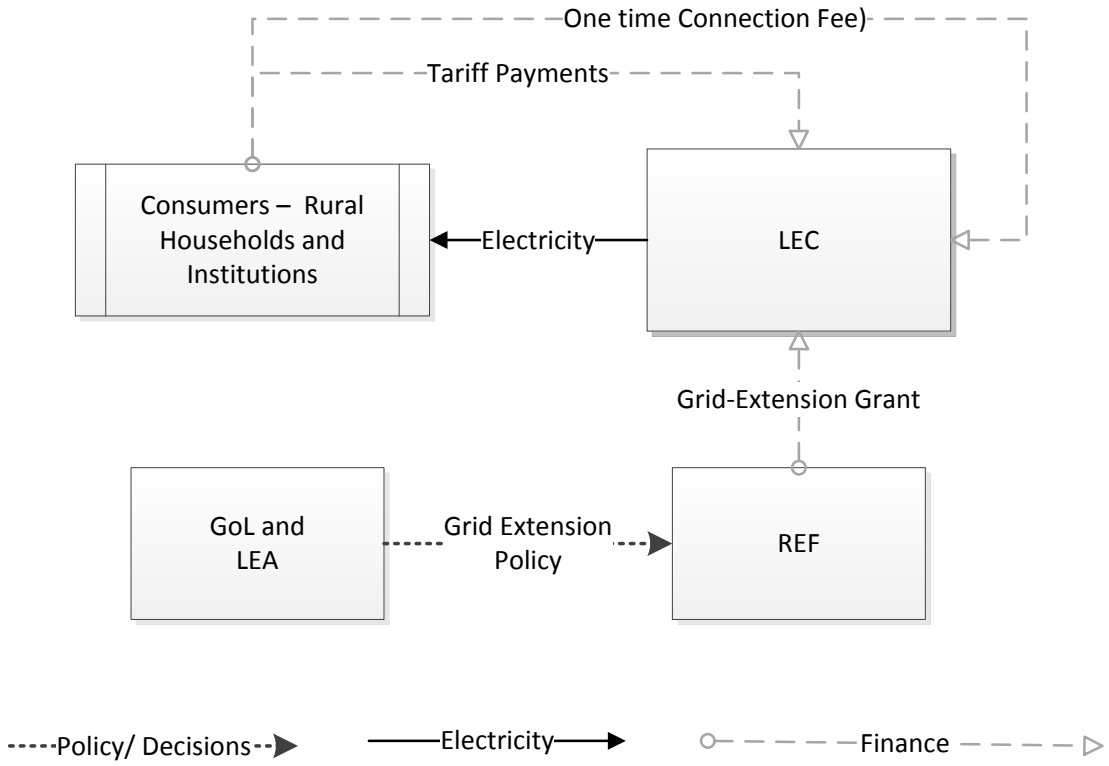
- **Private Sector Business Model**, the private sector has also been offering cash and credit driven electrification efforts for on smaller systems and devices.

- **Mobile Telephony Model**, this is an innovative a fee-for-service rural electrification business model being offered by one of the telecom service providers in Lesotho.

All the seven business models are explained in subsequent pages.

3.0 GRID EXTENSION

Fig 1: Grid Extension Business Model in Lesotho



(Source: SEA)

The grid extension model is implemented by the LEC based on the financial support and guidance from the GoL. A cess is collected as part of the electricity tariffs by the energy regulator – Lesotho Electricity Authority (LEA) which is pooled into the Rural Electrification Fund (REF). The GoL reviews the cess collections annually and decides on the utilisation of funds to electrify new villages based on cost estimates prepared by LEC. The REF essentially subsidises the cost of the grid network extension by LEC. The household consumers in the electrified village then pay a connection fee. The connection fee can also be paid in instalments making the financial costs

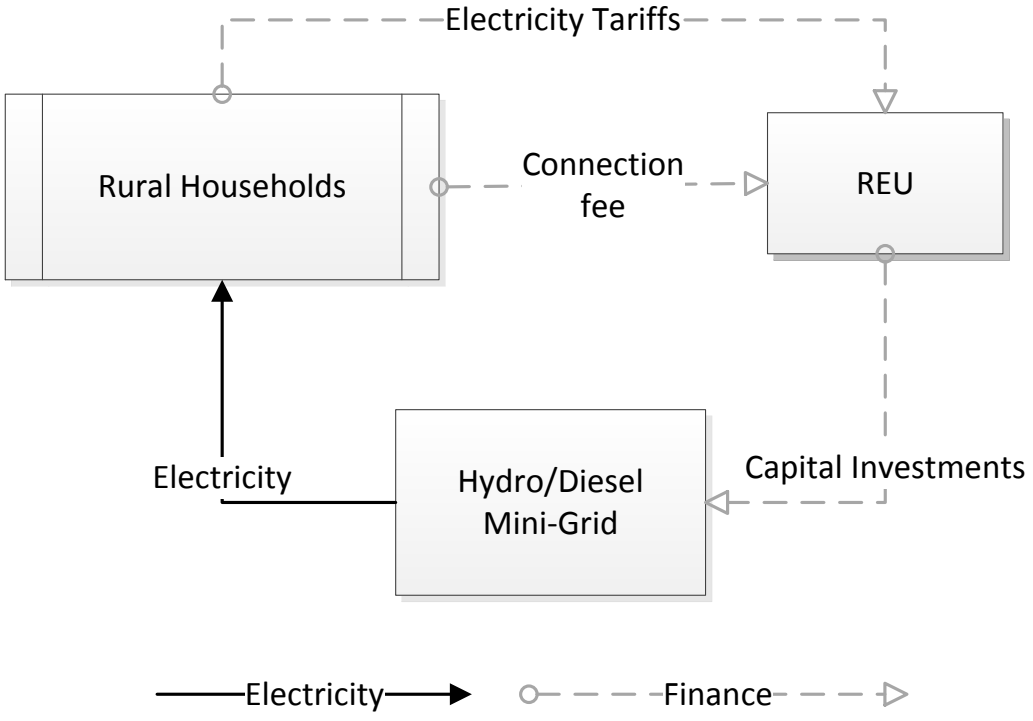
of electricity access staggered and easier to manage. The electrified households then pay the LEA regulated tariff for electricity.

It is also possible for villages and individual households that are not yet electrified by LEC to be electrified by paying the cost of the electricity grid extension. However many villages are unable to raise resources on their own to pay for these costs of grid extension. The GoL has carried out two pilot projects in Qholoqhoe where REU has financed the costs of two LEC grid extensions of 5.5 km and 8 km each to rural villages. Due to the mountainous nature of the country, longer distances between settlements, complex terrain and low population density in remote settlements, the costs of rural electrification tends to be very high. This has resulted in the REF resources being inadequate in meeting the rural electrification needs of the country. The business model for grid-extension is shown in fig 1 above.

4.0 MINI GRIDS

The REU has also implemented two mini-grids – a 250 kW diesel powered mini grid at Sekake and another 180 kW micro-hydro powered mini-grid at Semonkong. The investments in these generation assets and grid infrastructure were made by REU. The REU also operates, services the consumers and maintains the mini-grid based utilities. The electricity tariffs that are levied on the rural village consumers are regulated by the LEA. The diesel mini-grid has turned out to be unviable at the LEA regulated electricity tariffs and currently REU is considering linking the mini-grid to national grid by extending the LEC electricity network. The business model for the mini-grid projects in Lesotho is illustrated in fig 2 below.

Fig 2: Mini-Grid Business Model in Lesotho



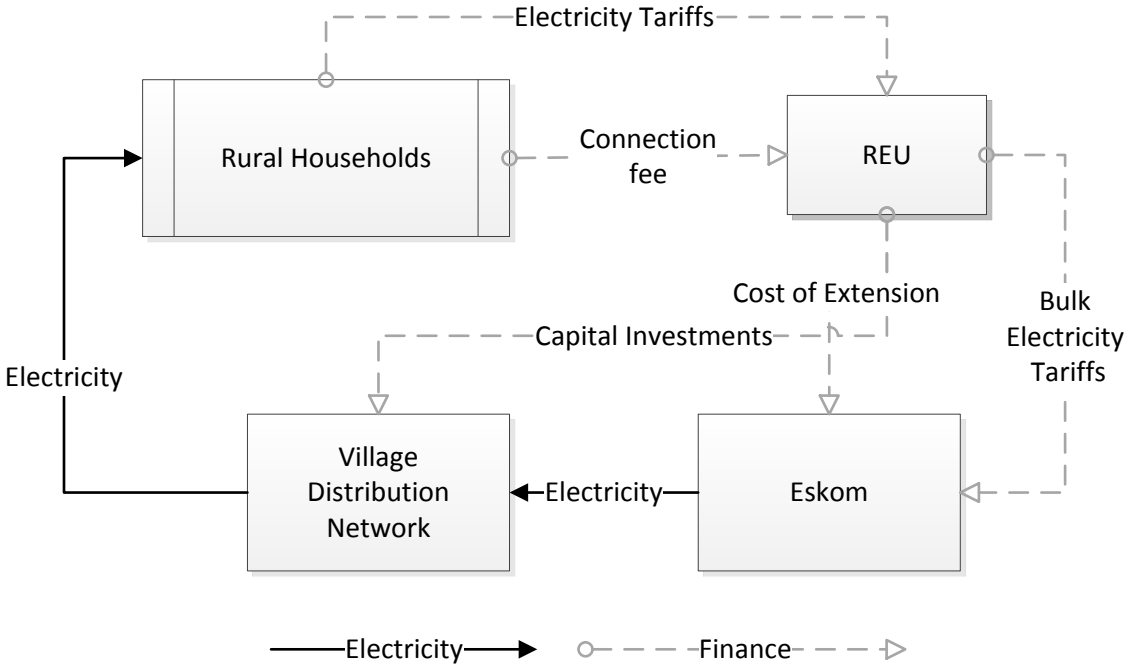
(Source: SEA)

The customer base for REU has tended to be dominated by households and only a limited amount of economic activities and public service opportunities were serviced by the mini grids.

5.0 CROSS-BORDER ELECTRIFICATION

As Lesotho is surrounded by South Africa, there are border villages in Lesotho which are closer to the South African National grid operated by Eskom than to the Lesotho national grid operated by LEC. Therefore in these un-electrified villages, extension of the Eskom electricity grid was more cost effective than extension of the LEC electricity grid. For the village of Dilli-Dilli close to the south African border, REU reached an agreement with Eskom following inter-governmental discussions and agreements. REU financed the extension of Eskom grid to the village and financed the village low-voltage distribution network. REU buys electricity at bulk-rates from Eskom and manages the distribution, metering, billing and tariff collection in the village. Consumers in the village pay LEA regulated electricity tariffs to REU. The business model for the cross-border rural electrification in Dilli-Dilli is portrayed in fig 3.

Fig 3: Cross-Border Electrification Business Model in Lesotho



(Source: SEA)

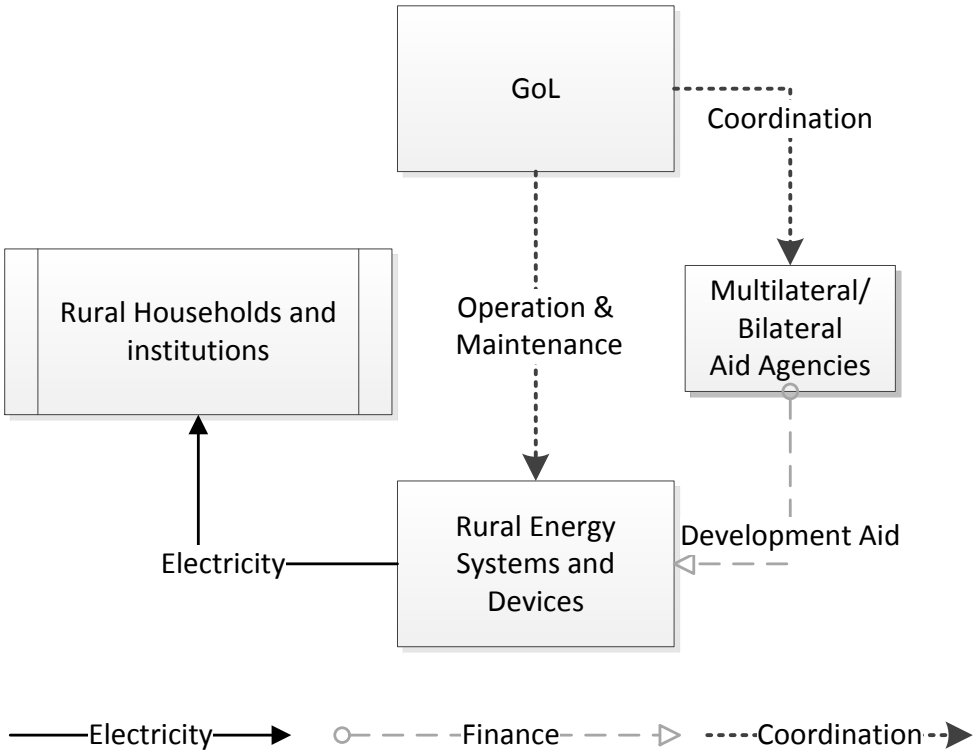
This model was seen to be the most viable of the rural electrification models by REU, primarily due to the margin between the electricity tariffs in Lesotho and the bulk purchase tariffs of Eskom. However the applicability of this model is limited to a few villages in Lesotho that border South Africa.

6.0 DEVELOPMENT AID

Both multi-lateral and bilateral development aid programmes have also supported energy access effots in Lesotho. These aid supported electrification programmes target a specific village or location identified in consultation with the GoL. The aid programmes then finance the cost of rural electrification hardware which is installed in the target areas. Multi-lateral programme are generally implemented through local equipment suppliers and service contractors. However in some bilateral programmes, the supply and commissioning of the equipment are by suppliers and contractors from the donor country. The responsibility of Operation and Maintenance (O&M) of the systems is then passed on to the responsible government department. The same

modus operandi was also employed by aid agencies to electrify rural schools, hospitals and water supply systems. The business model for the development aid supported rural energy programmes is shown in Fig 4.

Fig 4: Development Aid Supported Electrification Business Model



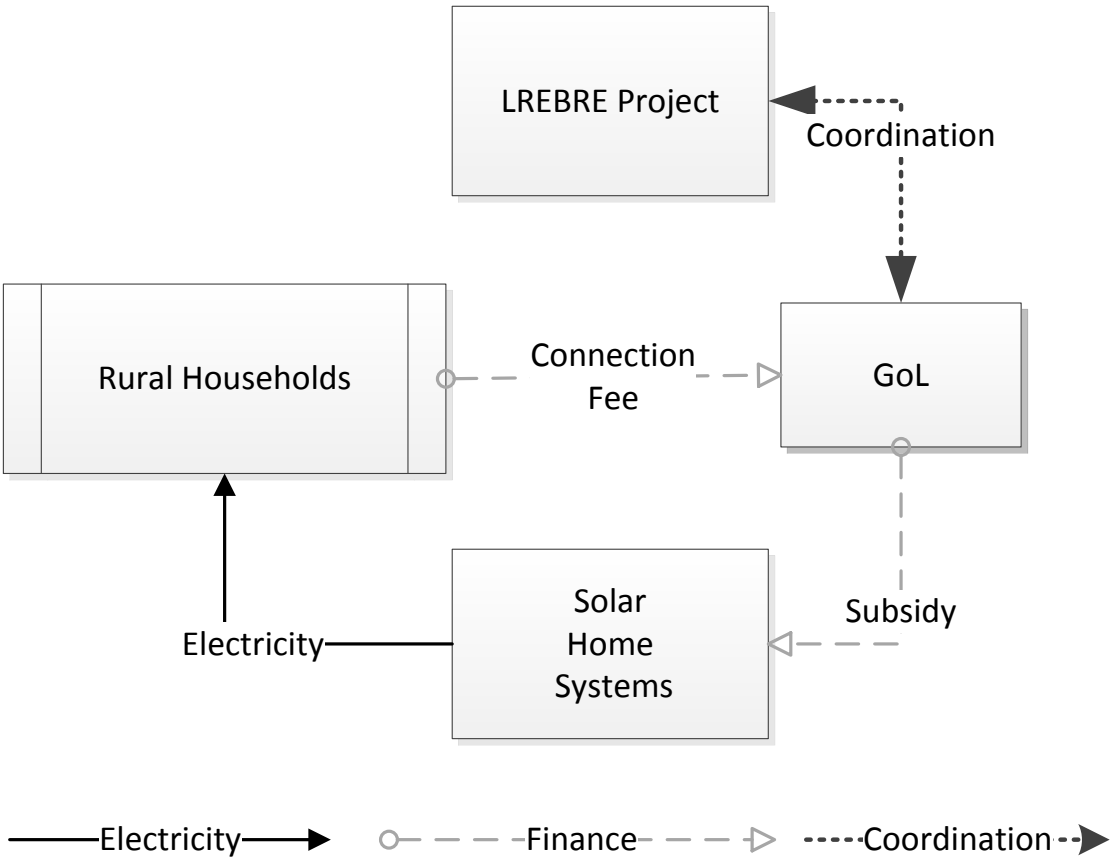
(Source: SEA)

Many of the development aid programmes face challenges in terms of long-term sustenance as the O&M arrangements are not very effective and the systems do not always survive beyond the major repair or component replacement stages. This is particularly true for bilateral programmes with tied procurement and supply.

7.0 LREBRE MODEL

The LREBRE programme provides SHS to households in selected villages that are not electrified. The part cost of the SHS is financed by the GoL and the suppliers of systems are identified through competitive procurement. The households electrified by the programme pay the equivalent of the connection fee that they would otherwise pay to obtain an LEC electricity connection. The reminder of the cost of SHS is subsidised by the GoL. The UNDP/GEF funds provide support for management, oversight and implementation of the programme. The households retain ownership of the system and one year of after sales service and maintenance is provided by the local supplier who supplies the system. The business model employed by the UNDP/GEF LREBRE project is illustrated below in fig. 5.

Fig 5: LREBRE Business Model



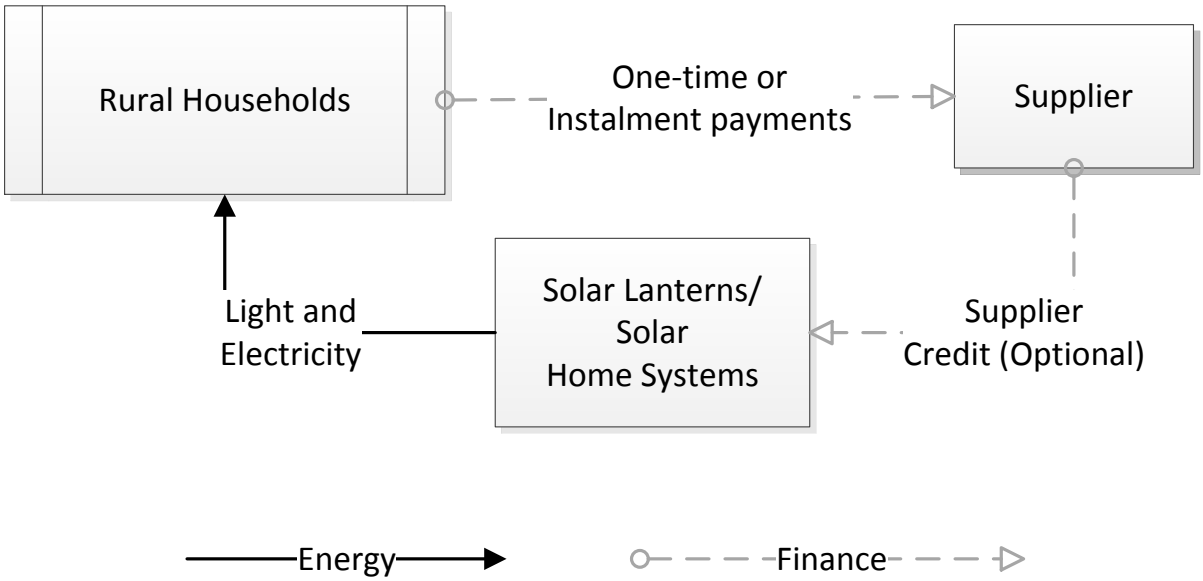
(Source: SEA)

8.0 PRIVATE SECTOR MODEL

Private sector suppliers in Lesotho and some of the local NGOs have also been involved in the direct sales of rural electrification and lighting systems. Most of the systems sold are portable solar lighting systems or solar lanterns and SHS. Some of the shops in Lesotho use a 'lay-by[6]' system whereby the purchaser pays for the systems in instalments and a system is 'reserved' for the purchaser by the shop. Once the cost of the system is fully paid up, the system can betaken possession of and owned by the purchaser. Some of the suppliers have also introduced a supplier credit finance system whereby the user pays 50% of the cost of SHS on installation and pays the remaining 50% in monthly instalments over 6 months. The private sector business model is shown in fig 6.

[6] This arrangement is commonly practiced in purchases of household appliances and furniture by shops in Lesotho.

Fig 6: Private Sales Business Model

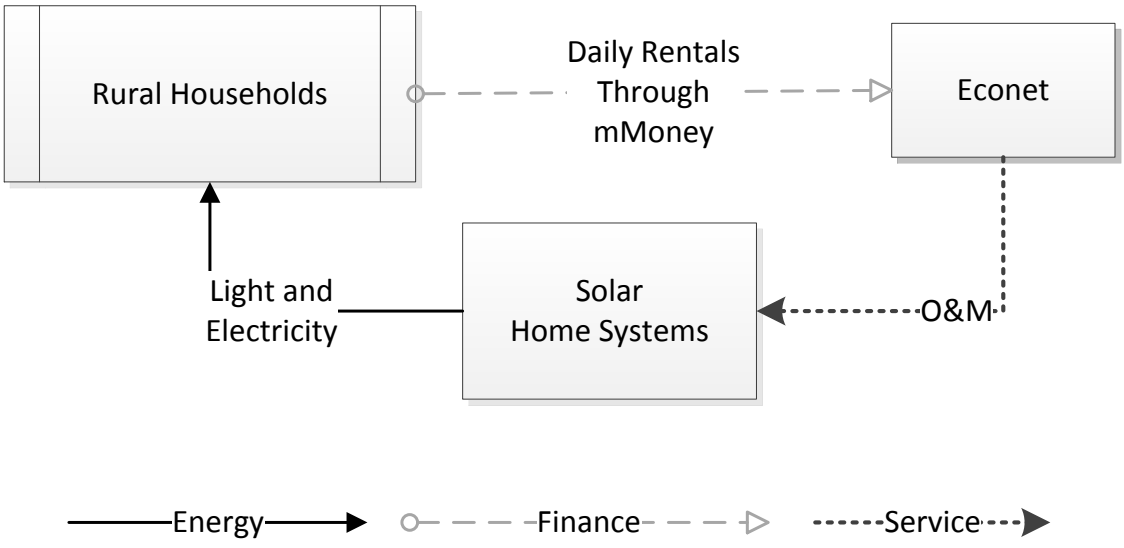


(Source: SEA)

The private purchases driven energy access market in Lesotho is quite small compared to the demand. The cost of ownership of SHS and solar lanterns is still beyond the reach of rural households even with the help of supplier credit and lay-by arrangements.

9.0 MOBILE TELEPHONY MODEL

Fig 7: Mobile Telephony Business Model



One of the mobile and fixed telephony operators in Lesotho – Econet Telecom has launched a rural electrification arrangement for households in Lesotho. According to the arrangement, the systems will be installed at the customer premises by Econet telecom and the customer will pay a daily rent for use of the system. The customer needs to have a pre-paid mobile phone connection with Econet and the daily rental value will be deducted from the credit balance of

the customer or from the mobile money account of the customer. The systems continue to remain the property of Econet and are maintained and serviced by Econet. The business model for the Econet mobile telephony model is shown in Fig. 7.

The mobile telephony model has been successfully implemented in Southern Africa by Econet and various Pay-As-You-Go(PAYG) models have also been implemented in Eastern Africa by entities like M-Kopa, Angaza, Fenix etc. This business model rolled out by Econet holds the potential to make significant contributions to electrifying rural areas of Lesotho. The impact and coverage of this model can be scaled up significantly through a partnership with government and development aid agencies.

10.0 CONCLUSIONS

Based on a review of the seven energy access business models in Lesotho the following conclusions can be made:

- The O&M arrangements have been taken care in the models where LEC, REU or Econet provides the energy service. In other models the O&M and continued service provision is not addressed and raises questions about sustainability.

- The business models generally focus only on lighting and electricity. None of the business models address thermal energy needs relating to space heating, cooking and hot water in rural areas. These continue to be met through traditional energy sources such as firewood, shrubs, dung cakes etc.

- The rural electrification business models does not seem to recoup the initial investment costs on infrastructure and only seem to be able to recover the O&M and repair costs.

- The REF finances and the private purchases together does not seem to be able to make significant contributions to the rural energy challenge in Lesotho. More international support and business model innovation is scale up the efforts and reach universal energy access.

- The finance and banking sector does not seem to have much involvement in the rural energy business in Lesotho. Similarly the role of local private sector has been quite limited and only covers supply of equipment in rural energy programmes.

- The system rental model being implemented by Econet holds the promise of offering a viable business model that is sustainable. This model needs to be leveraged through partnerships with government and development aid agencies to create impacts at scale.

- A business model that addresses both electrical and thermal energy needs and which is based on a fee-for-service or similar mode with clear O&M and repair arrangements as well as replacement arrangements is likely to be a viable business proposition. This is an area which needs to be explored further by development research.

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