RURAL ENERGY ACCESS THROUGH OFF-GRID RENEWABLES

A PERSPECTIVE FROM TANZANIA

by

Eng. Bengiel Humphrey Msofe
Director for Technical Services
Rural Energy Agency (REA)
Contents of Presentation

1. Introduction
2. National Energy Policy and Reforms
3. Challenges of Improved Energy and Level of Access
4. Strategies to Increase Energy Access
5. Establishment of Rural Energy Agency and Fund (REA/REF)
6. Supported projects by REF
7. Standardized Power Purchase projects
8. Way forward
9. The End
1.0: Introduction

This picture shows how African continent looks like during the night!
Location of Tanzania
2.0: National Energy Policy & Reforms

“to ensure availability of reliable and affordable energy supplies and their use in a rational and sustainable manner in order to support national development goals. “

“to have a liberalised but regulated energy sector. The main thrust being increased private sector initiatives and investment for exploitation of energy resources in the country.”
Reforms in the Energy Sector

- Full liberalisation of Petroleum Sector (2000)
- Restructuring of the Power Sector (2001) Privatisation of Electricity Generation, Transmission, Distribution (Currently Ring fencing of operations is being carried out)
- Establishment of Energy and Water Utilities Regulatory Authority (EWURA) 2006
- Establishment of Rural Energy Agency 2005 (physical operation started October 2007 and Initial Recruitment April 2008)
3.0: Challenges to Improved Energy and Level of Access

- Increasing electricity supply and distribution particularly to rural communities. Recent figures show that Tanzania mainland has 12.1% of the population having electricity from the grid while the rural is about 2.5% electrified (Household budget survey 2007). Tanzania is estimated to have about 38 million people by end of 2007).

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2010</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projected Population</td>
<td>34.5 million</td>
<td>40 million</td>
<td>43 million</td>
</tr>
<tr>
<td>Rural portion</td>
<td>77%</td>
<td>60%</td>
<td>54%</td>
</tr>
<tr>
<td>Rural population</td>
<td>25,907,011</td>
<td>23,929,425</td>
<td>23,140,456</td>
</tr>
<tr>
<td>Av household size</td>
<td>4.9</td>
<td>4.9</td>
<td>4.9</td>
</tr>
<tr>
<td>Rural households</td>
<td>5,287,145</td>
<td>4,883,556</td>
<td>4,722,542</td>
</tr>
<tr>
<td>Access to electricity (Rural) HH</td>
<td>55,000</td>
<td>241,825</td>
<td>752,717</td>
</tr>
<tr>
<td>%</td>
<td>1%</td>
<td>5%</td>
<td>16%</td>
</tr>
</tbody>
</table>

Source: Strategic Targets for Rural Energy Agency and Fund
Access to Electricity in Tanzania
(As per Household Budget Survey of 2001)
National Grid network
Strategy to Increase Energy Access Hinges Upon

- Institutional arrangements
  - Market & private sector participation
  - Effective regulatory regime
  - Regional co-operation
  - Appropriate legislation

- Social and environmental sustainability
  - Balancing market forces with social obligations
  - Mitigating environmental impacts
  - Addressing gender issues

- Technical considerations
  - Appropriate technology (low cost)
  - Energy conservation and efficiency (demand side & supply side management.)
Major Objectives of Rural Energy Strategy

- Use modern energy and alternatives sources to promote economic development through productive end-uses such as agro-business, SMEs, and commercial ventures in and near rural areas.

- Increase access to modern energy services in key rural social service areas such as health, education, water, communication, etc.

- Over-riding Objective

- Universal access to modern energy services to the rural population of mainland Tanzania.
5.0: Establishment of Rural Energy Agency

Rural Energy Agency/Rural Energy Fund

Established under the Rural Energy Act No. 8 of 2005 and operation started in October, 2007 with the following major tasks:

- Promotes, coordinates and facilitates private sector initiatives and entrepreneurship in rural energy supply.
- Ensures continued electrification of rural commercial centres and households
- Promotes accessibility and affordability to low income groups
- Promotes increased availability of power (both grid & non-grid)
- Quality Control: Standards, norms, guidelines
- Continued research, development and application of appropriate rural energy solutions
**REA/REF – Governance Arrangements**

**Board reports to both Ministers**

- **Minister of MoF**
- **Minister of MEM**

**Rural Energy Board**

- REB governs REF
- REB appoints Trust Agent to manage REF payments

- Trust Agent

**Staff of Rural Energy Agency**

- Works with project developers

**Project Developers & Partners**

**Stakeholders**

- Minister appoints Board from stakeholder reps
- REA is secretariat to REB

**Minister of MEM**

**REA is secretariat to REB**
Functions of the REA

- Promotion, dissemination and capacity building in rural energy services provision
  - Facilitating improved rural energy development primarily through identifying socially and economically viable rural energy projects;

- Providing finance through the REF
  - Primarily as co-financing of those projects identified by the REA
  - REF is the grant and “smart subsidy” arm of the REA

- Monitoring and evaluating progress
  - Learning from experience
  - Activities to improve chances for future success and improved impacts
Competencies of REA

**REA Activities**
- REA solicits, reviews and assists preparation of rural energy investment proposal
- REA prepares annual plans and recommends projects for support
- REA monitors and evaluates on-going rural energy projects

**REA’s necessary competencies include**
- Stakeholder analysis
- Technical aspects of energy projects
- Project structuring
- Project financing
- Management & marketing
Project Cycle

1. **Project identification**
   - Technical assistance

2. **Promotion & mobilisation**

3. **Project preparation**
   - Technical assistance

4. **Application to REF**

5. **Rejection**

6. **Accept proposal**

7. **Preparation & negotiation of contracts & licence**

8. **Implementation supervision**

9. **Disbursement of funds**

10. **Project monitoring & evaluation**

11. **Reporting and feedback to strategy**

12. **Revision of proposal**

13. **Project appraisal**

14. **Monitoring & evaluation**

15. **Project preparation**

16. **Promotion & mobilisation**
Rural Energy Agency as Facilitator

INVESTORS & FINANCIAL ASSISTANCE

PROJECT CHAMPIONS & COLLABORATORS

RURAL ENERGY AGENCY/FUND

TECHNICAL EXPERTISE & TRAINING

VIABLE RURAL ENERGY INVESTMENTS, PROJECTS AND VENTURES
REF Finance Flows

- Multi-laterals, GEF, etc.
- Co-financing from other sources
- Revenue from Taxation & Levies

Rural Energy Agency and Fund

Project Financing

- Fund Operation
- TA & Capacity Building

Direct Risk Investment

NGO "Soft Investment"

Rural Electrification Projects

Project Champions

Consumer

Banking Intermediaries

Micro-Finance Institutions
Sources of Funding

Main sources of funding are:

- Annual Budgetary allocation
- Contribution from international financial organizations
- Levies of up to 5% on electricity sales from national grid
- Levies of up to 5% on the specific isolated systems including systems for private consumption
- Fees in respect of programmes, publications, seminars and consultancy services
6.0: Supported Projects by REF

REA has so far supported various projects through REF as follows:

- **2007/08**: Ten projects worth US$ 9m= 
- **2008/09**: Projects worth US$ 18m.
  - Rural grid extension to the rural 
  - Some energy efficiency 
- Appraisal of other renewable energies and efficiency projects
Progress on funded projects in 2007/08
TEDAP Sustainable Solar Market Project (SSMP) in Rukwa region

- WB-GEF supported
- Overall objective: Sustainable provision of energy services in remote areas for community services and households.
- The project include supply, install and maintain the system for six years.
- Scale-up planned other regions including Kigoma, Tabora, Ruvuma, Shinyanga and Kagera.
Sustainable Solar Market Project

This project will be developed in remote rural areas, with a large share of dispersed population, outside TANESCO’s main grid and other isolated grids where it is least economic cost option.

- The SSMPs aims at:
  - (i) providing sustainable electricity service with photovoltaic (PV) systems to rural public institutions (mainly schools, health centers and their staff homes) and police posts;
  - (ii) facilitating provision of sustainable and affordable electricity service with PV systems to individual households, rural businesses and private schools and clinics through a market-based approach;
Prospective Solar PV Project for Schools and Health Facilities

- Planned for implementation in FIVE districts of regions without grid electricity;
- Targets installation of centralized and decentralized solar PV systems for secondary schools, health facilities, and close by households;
- Aims at improving educational and health facilities in above rural areas;
- A total of 173 rural facilities (78 secondary schools, 67 dispensaries, 26 health centers, and 7 Hospitals) will be covered;
- Total cost estimated at US$ 18m/=, including a training package for technicians and maintenance contracts to sustain the project.
Proposed Lighting Tanzania Competition

- As part of Lighting Africa programme, Tanzania is proposing to have a competition on Lighting Tanzania

- Objective: Promote the use of renewable energies in the rural areas especially the use of solar LED lanterns in social institutions including schools, health centres, homes etc.

- The ultimate goal is get rid of wick and kerosine lamps.

- REA has received guidelines from WB on the preparation of the competition.
Prospective Main/Mini grid Projects in the Pipeline

Seventeen off-grid projects are being pursued with various developers;

- 13 Small Hydro Power Projects
- 2 Biomass Cogeneration Projects
- 2 Biomass Gasification Projects

- These projects are at various stages of implementation;
- Total expected capacity to be generated is 46.2 MW;
- Total new connections expected is 8,400;
- Total expected cost for all the 17 projects is US$ 118.9m/=, REA will contribute subsidy at US$ 500 per connection.
## Priority Projects - Private Sector and NGOs Owned

<table>
<thead>
<tr>
<th>REA NO</th>
<th>Name (1)</th>
<th>Champion</th>
<th>Total Installed Capacity (MW) (2)</th>
<th>New Connections (3)</th>
<th>Estimated Energy Production (MWh/a)</th>
<th>Total Project Cost (MUSD)</th>
<th>SPPA - Main Grid (MW)</th>
<th>SPPA - Minigrid (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>Mbinga Mtambazi SHP (Ruvuma)</td>
<td>Andoya Hydro Electric Company Ltd</td>
<td>1.2</td>
<td>600</td>
<td>4,147,000</td>
<td>4.3</td>
<td>-</td>
<td>1.2</td>
</tr>
<tr>
<td>002</td>
<td>Mawenge SHP-MG (Iringa)</td>
<td>Njombe Roman Catholic Church</td>
<td>0.3</td>
<td>300</td>
<td>1,037,000</td>
<td>0.9</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>003</td>
<td>Njombe SHP (Iringa)</td>
<td>Njombe Roman Catholic Church</td>
<td>4.6</td>
<td>1,500</td>
<td>34,56</td>
<td>11.6</td>
<td>10.00</td>
<td></td>
</tr>
<tr>
<td>004</td>
<td>Mufindi SHP (Iringa)</td>
<td>Mufindi Tea Company/IDF</td>
<td>3.0</td>
<td>1,000</td>
<td>19,44</td>
<td>8.7</td>
<td>3.00</td>
<td></td>
</tr>
<tr>
<td>005</td>
<td>TPC Biomass Co-gen (Arusha)</td>
<td>TPCL</td>
<td>18.0</td>
<td>1,200</td>
<td>64,8</td>
<td>36.0</td>
<td>10.00</td>
<td></td>
</tr>
<tr>
<td>006</td>
<td>Mafia Island Biomass Gasification (Coast)</td>
<td>Stanley &amp; Sons</td>
<td>0.4</td>
<td>1,500</td>
<td>1,382,000</td>
<td>2.6</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>007</td>
<td>Kitonga SHP (Iringa)</td>
<td>Kitonga Electric Co</td>
<td>NA</td>
<td>500</td>
<td>34.56</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>008</td>
<td>Mbinga-Lupilo SHP (Ruvuma)</td>
<td>Agnes Chipole (Sisters’ Mission)</td>
<td>NA</td>
<td>1,200</td>
<td>1,659,000</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>009</td>
<td>Kilombero SHP Mngeta (Morogoro)</td>
<td>Rufiji Basin Development Authority</td>
<td>0.4</td>
<td>300</td>
<td>2,592,000</td>
<td>0.3</td>
<td>0.40</td>
<td></td>
</tr>
<tr>
<td>010</td>
<td>Mwoga SHP (Kigoma)</td>
<td>Kasulu District Council</td>
<td>0.3</td>
<td>NA</td>
<td>1,037,000</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>012</td>
<td>Nakatuta SHP (Ruvuma)</td>
<td>TBA</td>
<td>9.2</td>
<td>NA</td>
<td>31,795,000</td>
<td>31.0</td>
<td>-</td>
<td>9.2</td>
</tr>
<tr>
<td>013</td>
<td>Mzovwe SHP (Rukwa)</td>
<td>TBA</td>
<td>3.0</td>
<td>-</td>
<td>13.0</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>014</td>
<td>Sunda falls SHP (Ruvuma)</td>
<td>TBA</td>
<td>3.0</td>
<td>-</td>
<td>10,368,000</td>
<td>11.0</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>015</td>
<td>Pininyi SHP (Arusha)</td>
<td>TBA</td>
<td>2.8</td>
<td>-</td>
<td>9,677,000</td>
<td>11.0</td>
<td>-</td>
<td>2.8</td>
</tr>
<tr>
<td>016</td>
<td>Lugarawa SHP-MG (Iringa)</td>
<td>Njombe Roman Catholic Church</td>
<td>1.0</td>
<td>500</td>
<td>498,000</td>
<td>0.5</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>017</td>
<td>Mavanga SHP-MG (Iringa)</td>
<td>Njombe Roman Catholic Church</td>
<td>1.5</td>
<td>200</td>
<td>553,000</td>
<td>1.7</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td></td>
<td>47.2</td>
<td>7,900</td>
<td>59,561</td>
<td>127.4</td>
<td>23.4</td>
<td>15.4</td>
</tr>
</tbody>
</table>

**Notes:**
1. SHP: Small Hydro Power Project; MG: Mini-Grid
2. Existing and new installed capacity; Capacity for grid-connected as well as mini-grids
3. Figures according to latest documentation on file
4. REA/TEDAP contribution: US$500 per connection
Wind and solar energies for the rural areas
7.0: Standardized power Purchase Agreement and tariff

- Objectives
  - minimize negotiations between prospective developer of small power projects and utility;
  - expedite the process of project formulation, financing and contracting;
  - increase access rates in areas not covered by the TANESCO grid in a sustainable manner, leveraging private resources for rural electrification;
  - types of projects to be developed under SPP:
    - (i) small renewable power generation projects with export capacity less than 10MW selling power to TANESCO grid;
    - (ii) Minigrids to serve community
Principles of Small Power Producers

- Makes an application and gets a letter of intent (support) to develop a power plant;

- The power plant will use a renewable resource or waste heat;

- Signs a Small Power Purchase Agreement (SPPA);

- Builds a Small Power Plant (SPP);

- Gets paid at the Small Power Purchase Tariffs (SPPTs) which has been established for Tanzania;

- Continues to own and operate it for a long period; (15 yrs)
Capacity Building Component

One of the main functions of REA

REA has carried out the following capacity building trainings for project developers:

- Charcoal briquetting and compact biogas;
- Two trainings on Small hydropower development;
- Solar and Wind technologies; and
- Business plan to project developers trained on the above technologies.
8.0: Wayforward

- **Government commitment**
  - There must be major commitment from Government on funding projects
  - Drivers must be clear (economic, social, etc.)

- **Stakeholders participation**
  - Broad agreement must be obtained & built upon
  - For decentralised off-grid RE, important to mobilise broad spectrum of stakeholders

- **Cross-sectoral links**
  - Development of key cross-sectoral links & co-financing,
  - ‘Piggy-backing’ onto other initiatives

- **Work with partners**
  - “Champions” that can conceptualize, plan, implement and manage rural energy projects
For More information please contact:
Director General
Rural Energy Agency (REA)
114 Malik Road, Upanga
P. O. Box 7990
Dar Es Salaam, Tanzania
Tel: +255 22 2134006
Fax: +255 22 2134007
e-mail: info@rea.go.tz
Website: www.rea.go.tz
I THANK YOU ALL FOR YOUR ATTENTION