Transformation of Rural Photovoltaic Market in Tanzania Project

(Project No. 00035062)

Terminal Evaluation Report

Final Report

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List of Acronyms and Abbreviations

APR	Annual Performance Report
BCU	Battery Charge Controller
BOS	Balance Of System
CRDB	Cooperative and Rural Development Bank
GEF	Global Environment Facility
GHG	Green House Gas
GoT	Government of Tanzania
IPP	Independent Power Producer
MEM	Ministry of Energy and Minerals
MOU	Memorandum Of Understanding
PIR	Project Implementation Report
PIU	Project Implementation Unit
PV	Photovoltaic
RAS	Regional Administrative Secretary
RE	Rural Electrification
REA	Rural Energy Agency
REB	Rural Energy Board
REF	Rural Energy Fund
RET	Renewable Energy Technologies
SHS	Solar Home System
SACCOS	Saving and Credit Cooperative Society
SIDA	Swedish International Development Agency
TANESCO	Tanzania Electric Supply Company
TASEA	Tanzania Solar Energy Association
TBS	Tanzania Bureau of Standards
UNDP	United Nations Development Program
VETA	Vocational Education and Training Authority
VRLA	Valve Regulated Lead Acid
VTC	Vocational Training Center
VPO	Vice President Office

Acknowledgement:

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Executive summary

The Transformation of Rural Photovoltaic Market in Tanzania is a UNDP/GEF/GoT funded project aiming at reducing Tanzania's energy related CO_2 emissions by introducing photovoltaic as substitute for fossil fuel (kerosene) utilized for lighting in rural areas. Geographically the project was targeting the Mwanza region with the aim to replicate the experience gained in Shinyanga, Kagera and Mara regions. The project has been operational since March 2004 with the first phase ended in December 2006 where a Mid-Term evaluation was conducted. The second phase was planned to overlap and intended for the replication of the Mwanza experience in Shinyanga, Kageera and Mara. The project has faced management change difficulties and the replication practically commenced a year later.

The project main objectives are:

- Refine the policy framework and institutional arrangements necessary for the widespread adoption of PV for off-grid rural electrification.
- Awareness raising among public, decision makers, consumers and end users on potential role that PV can play in rural electrification.
- Strengthen private sector capacity to provide quality services and develop PV packages that suit rural applications.
- Explore, develop and pilot financing modalities for PV systems.
- Disseminate experience and lessons learned to promote replication through other regions of the country

The purpose of this evaluation is to provide the project partners UNDP/GEF/GoT with an independent assessment of the project impact, achievement, sustainability and lessons learned.

Main Achievements:

1- The project has made remarkable achievements in the development of pro-PV policy framework. This is demonstrated by the removal of duties and VAT from PV modules and components, development of PV standards and code of practice, consideration of PV budgets in RAS development plans.

2- Conducted successful awareness programs targeting policy makers, PV suppliers and consumers.

3- Knowledge of PV in the project area has considerably increased due to awareness and wide scale technical training programs implemented by the project with currently over 200 technicians trained on PV systems. Further, technical training made available through VETAs in Mwanza, Shinyanga, Kagera and Mara as part of the VETA teaching programs.
4- The project has demonstrated the viability of PV dealer (supply-chain) financing to the banking system, as well as consumer financing.
5- The project has demonstrated the applicability of PV systems in supporting in delivering of social services such as health and education.
6- The project has demonstrated the applicability of PV for productive uses in promoting and improving rural income.

Areas of concern:

a- The replication, though started, but still at an early stage. Some Demonstration equipment not yet installed and other not yet delivered to the respective region.
b- The enforcement of the approved PV standards and code of practice is in need of more efforts in terms of informing the public about the existence of such standards and provision of PV test equipment for verification of imported items at ports.
c- Consumer (end-user) financing through SACCOS needs to be demonstrated in the replication area (at least one SACCOS per region to be included in this scheme).
d- There is a great concern on the quality of PV products in the market (especially small shops in the replication area importing substandard items from Kenya and Dubai) and also system designs (many dealers selling under sized systems). Especial awareness and technical support is needed.
e- PV for productive uses needs to be replicated on a wider scale.
f- The sustainability of PV systems for education and health services is an area of concern. Financial provisions for maintenance were mentioned by the regional authorities, but a more practical approach could be through the deployment of a bigger PV system (300Wp) and inclusion of Mobile Phone charging system at nominal fees to be used for the system maintenance (sustainability from within).

The main conclusions are:

1- The project has made remarkable achievements in the policy, awareness, training and private sector strengthening. That is indicated by:
   a. The removal of tax and VAT from PV modules and balance of system components.
   b. Development of standards and code of practice.
   c. Series of awareness meeting on PV system were implemented and information o PV was widely distributed.
   d. Over 200 technicians were trained on PV system sizing, installation and servicing,
   e. PV curriculum developed and integrated into VEAT system in the region.
   f. Over 15 PV dealers and shops emerged in the region selling, installing and servicing PV systems.
2- Although the project has demonstrated the viability of financing PV system for PV dealers and end-users, the sustainability of this experience remains an area of concern and in need of further support.
3- The replication of the project achievement is in progress but still an early stage to access its full functionality.

The recommendations are:

1- Further support, from the Government of Tanzania and UNDP is needed to sustain the achievement made on awareness PV systems design and quality of equipment, financing modalities (dealer and end-user) and the enforcement of PV standards and code of practice.
2- The role of REA will be very instrumental in sustaining awareness created on PV in the region.
3- Installation of demonstration PV systems, awareness raising and strengthening PV financing experience including more PV system for productive uses needs to be planned for and implemented before final project phasing out.

SECTION ONE

1- Introduction

Background of the project

1. The project and its development context

1.1- Development objective of the project:

The development objective of the project is Barrier Removal to promote the Utilization of PV to provide basic electricity services and improve people's livelihood by improving their access and affordability to modern energy services and reduce dependency on imported fossil fuel.

1.2- The project immediate objectives were:

1.2.1- Refine the policy framework and institutional arrangements necessary for the widespread adoption of PV for off-grid rural electrification.

1.2.2- Awareness raising among public, decision makers, consumers and end users on potential role that PV can play in rural electrification.

1.2.3- Strengthen private sector capacity to provide quality services and develop PV packages that suit rural applications.

1.2.4- Explore, develop and pilot financing modalities for PV systems.

1.2.5- Disseminate experience and lessons learned to promote replication through other regions of the country

2- Objectives of the terminal evaluation

As stated in the Terms of Reference, the purpose of this evaluation is to provide the project partners i.e. GEF, UNDP ad the Government of Tanzania with an independent assessment of the impacts and key achievements of the Transformation of Rural Photovoltaic Market in Tanzania Project as compared to the project document for the five years implementation of the

project. Assess the expected outcomes and their sustainability and suitability for policy related review inputs.

The evaluation results are envisaged to identify and discuss the lessons learned, through measurements of the changes in the set indicators, summarize the experiences gained and recommend for future policy dialogues

3- Scope of Evluation

Key issues addressed;

To achieve the above objectives the terminal evaluation is to address the following:

(i) Assess the impacts and key achievements of the project vis á vis its objectives and outcomes as per project design indicators

(ii) Assess the relevance achievements of the project objectives to the national development agenda and priorities, UNDP thematic areas and needs of beneficiaries

(iii) Review the appropriateness and clarity of roles and responsibilities of stakeholders and their level of satisfaction with the project achievements

(iv) Assess the achievements of the project in terms of timeliness, quality, quantity and cost effectiveness of the expected outcomes

(v) Assess the prospects of the sustainability of the project outcomes and benefits in the longer future

4- Methodology of Evaluation:

The terminal evaluation will be conducted in a participatory manner through a combination of processes including a review of the key project documentation, interview with project stakeholders and site visit. It will include visits to UNDP Country Office, Project Executing Offices of Government, PIU, REA as well as selected national partners and stakeholders, including interviews with key individuals both within the project in Mwanza, the government staff, NGOs, private sector (PV dealers), SACCOS and project beneficiaries mainly communities in various districts.

The following documents were provided to the evaluation team:

- Project Document
- Project implementation reports (APR/PIR's);
- Management Audit of Transformation of Rural PV Market in Tanzania.
- Solar PV Productive uses Evaluation Report.
- Annual technical reports and work plans of the various implementation task teams;
- Mid Term Evaluation report.
- Minutes of the project Steering Committee Meetings.

5- Structure of the evaluation process

The terminal evaluation relies on the information obtained from various sources involved in the project development, management and implementation. As to this, the evaluation process is structured to:

- Review document obtained from those sources (UNDP/PIU).
- Conduct consultation meetings and interviews with project stakeholders and get their views and obtain more information.
- Field visits for physical inspection of some installations and conduct discussions with end users.
- Compile the information revision results and personal observations.
- Compare project achievements to what was stipulated in the Project document on objective-by-objective basis.
- Draw conclusions and recommendations.
- It is to be noted that, the above evaluation structure was not implemented in a series concatenation but rather activities were tackled in parallel manner to meet the deadline requirement of the assignment. Having said this, this procedure has no effect in concluding the assignment as required by the Terms of Reference.

6- Main stakeholders:

The man project stakeholders are UNDP, the Ministry of Energy and Minerals (Renewable Energy Section), Private sector companies, Tanzania Solar Energy Society (TASEA), VETA, Financial Institutions (Banks), SIDA PV Project, Tanzania Bureau of Standards (TBS). Coordination between those parties has been achieved through the project Steering and Technical Committees. However, the financing institutions were under-represented.

7- Expected Results:

Each of the immediate objectives in section (4.2.1) to (4.2.5) comprises a number of activities that are expected to lead to certain results as follows:

7.1- **Immediate Objective 1**: ***Refine the policy framework and institutional arrangements necessary for the widespread adoption of PV for off-grid rural electrification.***

Expected results for this objective are:

7.1.1- Implementation framework for off-grid PV defined and in place.

7.1.2- Energy pricing policy in Government is adopted to support utilization of PV systems, to deliver appropriate products at the right place.

7.1.3- Standards for PV components and systems defined.

7.2- **Immediate Objective 2**: ***Awareness raising among public, decision makers, consumers and end users on potential role that PV can play in rural electrification.***

Expected results for this objective are:

7.2.1- Awareness program for decision makers developed and implemented.

7.2.1- End user awareness program addressing relevant PV applications and its limitation formulated and implemented.

7.2.3- Demonstration program showing the functionality and usefulness of limited PV installations at strategically important locations is implemented.

7.3- **Immediate Objective 3**: ***Strengthen private sector capacity to provide quality services and develop PV packages that suit rural applications.***

Expected results under this objective are:

7.3.1- Business development services strengthened.

7.3.2- Technical knowledge of PV strengthened

7.4- **Immediate Objective 4**: ***Explore, develop and pilot financing modalities for PV systems.***

Expected results under this objective are:

7.4.1- Most promising PV consumer financing model indentified, piloted and evaluated.

7.4.2- Most promising PV industry supply-chain financing identified, piloted and evaluated.

7.4.3- Provide limited grants to private sector proposed PV system for productive use.

7.5- **Immediate Objective 5**: ***Disseminate experience and lessons learned to promote replication through other regions of the country.***

Expected results under this immediate objective are:

7.5.1- Evaluation of impact of PV on rural livelihood in early adopting households and communities.

7.5.2- Support provided to learning and replication of the experience with the use of PV to generate electricity in off-grid rural communities.

SECTION TWO

8-Findings:

8.1- Achievement of Immediate Objectives, Outputs and Planned Activities:

8.1.1 Immediate Objective 1:

Refine the policy framework and institutional arrangements necessary for the widespread adoption of PV for off-grid rural electrification.

For this objective, the project has made remarkable success in removing duties and VAT from PV modules and components and the establishment of the Rural Energy Agency (REA) through the successful implementation of policy maker targeting awareness program. Other comments are as follows:

8.1.1.1 Output 1.1: Implementation of framework for off-grid PV defined and in Place.

- Awareness, training and tax exemption had led to the automatic presence of private sector led PV equipment importation, distribution, installation and after sale servicing network for household and institutional application in the Mwanza region. All PV players in the country are benefiting from this process as they supply equipment and service to PV dealers in the Mwanza region is linked to Dar Essalam based PV companies as well.
- The Rural Energy Agency (REA) established in 2005 by a Parliament Act as an autonomous body. REA is governed by a Rural Energy Board (REB), which is also entrusted to administer the Rural Energy Fund (REF) which is in the final stages of implementing a PV based Rural Electrification project with a total budget of US$5 million.
- The REA is providing support to project developers for Rural Electrification.
- The new regulation of the energy sector allows Independent Power Producers (IPPs) to enter into the Electricity Generation, Transmission and Distribution in the country.

8.1.1.2 Output 1.2: Energy Pricing Policy in Government is adopted to support utilization of PV.

- The removal of duties and VAT from PV modules and components has exceeded the target set forth in project document. However, this has not reflected a considerable price change in the market due to increase in international price (especially PV modules due to grid connected market expansion in Europe and Japan) which is an external factor. Fortunately, and due to global economic crises, there is a sharp price decline in the world PV modules as large stocks targeting grid connected market couldn't be sold off.
- Locally the grid generated kWh price has experienced a considerable increase from TSH90 to TSH138 which creates more favorable conditions for the PV market to expand.
- The REA is considering a subsidy of US$2/Wp to 2.5US$/Wp for PV for household systems. This will be a breakthrough in PV for rural electrification if implemented and in the proper way.
- It was made clear to the evaluation team that, TANESCO is not considering rural electrification in its plans. For TANESCO Rural Electrification is the mandate of REA.

TANESCO is not considering PV in its electrification planning and with regards to renewable energy they only have a donor funded and implemented Wind Power project which is mini-grid for an isolated areas named Ukara in Ukerewe district.

8.1.1.3: Output 1.3: Standards for PV components defined.

- East African PV standard have been adopted for Tanzania. The standards has approved by the Tanzania Beurau of Standards (TBS) board and under implementation although are not yet Gazetted. TBS is lacking the necessary PV test equipment. Currently TBS is enforcing PV importers to have a Test Certificate for their imported PV products from a reputable international test institute. Further, TBS is running awareness programs for the existence of the local PV standards and the need to be considered by suppliers, installers and users.
- A code of practice for technicians is developed but not yet enforced. The enforcement of the code of practice is not simple as a lot of institutional and administrative arrangements are needed. The enforcement of the code of practice requires that all PV installation are done by certified PV installers and according to the best standards as correct wire size and wiring, using proper conduit system and avoiding wire taping. Practically this will require

huge administrative arrangement of employing and deploying installation certifiers on the ground specially if the installation is small PV system of 14Wp or so. On the other hand many good technicians will be left out of the growing PV industry while they are either not certified or they have to follow costly installation procedures to meet the stipulated standards. So, a great care should be taken in enforcing the code of practice as overdoing it will hinder the advancement of PV in the country.

- It is very important to involve the VETAs in the certification of the PV installers and rely on awareness for making the user to become informed and the consequences of relying on non-certified technicians. This can be smooth exist strategy to this issue.
- It is very crucial for the SIDA project to provide PV test equipment that will enable TBS to effectively implement the PV standards developed at the country customs entry points.

8.1.2 Immediate Objective 2:

Awareness raising among public, decision makers, consumers and end users on potential role that PV can play in rural electrification.

8.1.2.1: Output 2.1 Awareness program for decision makers developed and implemented.

- The project has successfully implemented a series of awareness meeting with federal, regional and district officials on PV application and their role in rural electrification and their added value in rural public service institutions.
- The project also, installed demonstration systems and organized site visits to those installation. This has played an important role with “seeing is believing” being the best awareness tool.
- The above efforts led the inclusion of PV in local government authority annual budgets to install more systems in health facilities and schools. Also financial provisions for maintenance of the already installed system were included.

8.1.2.2: Output 2.2: End user awareness program formulated and implemented.

- The project has developed and produced a very informative and comprehensive awareness package. Different set of printed materials (Pamphlets, calendars) were produced and widely used in conjunction with awareness meetings and solar days organized by the project

throughout the lake zone. . Special Radio and TV programs on PV application were conducted as part of the awareness package to the general public.

- The awareness material documentation is progressing and will be very useful for other on-going and future PV dissemination efforts. This is done under the title: ***Best Practices in Dissemination of Solar PV Technologies***. Solar day and Nane nane exhibition were organized and support by the project every year where PV dealers have always participated in the awareness campaigns, advertising for their PV products and services to potential customers.

8.1.2.3: Output 2.3: A Limited number of PV systems installed in visible locations.

- The project has installed more than 26 PV systems in schools and health facilities (dispensaries, clinics and schools) in the Mwanza region. The respective district has about 25% to 45% of the total installation costs.

- Additionally, demonstration supports were extended to other regions where the project were replicated , Shinyanga, Mara and Kagera.. However, PV modules for demonstration systems of Kagera region (for 15 systems) were still not delivered as financial provision for Balance of System Components (BOS) and installation cost were not yet in place. Installation of PV demonstration systems delivered to districts of Shinyanga not yet completed. The evaluation team has visited Bunambiyu health centre in Shinyanga district which was recommended by the project focal point as one of the demonstration sites in the district. But the team figured out that, eve PV equipment were not yet at site, also we came to now that equipment were not yet delivered to another health center in the area.

- PV demonstration systems were meant to provide limited number of lights in schools, Health Centers, Dispensaries or a Clinic and sustainability looks questionable as it is dependent on the availability of maintenance funds from the district budget, which might not respond to such requirement on time as required. It could have been more appropriate if sustainability made to come from within the systems. This could have been achieved by deploying a bigger PV system (300Wp AC system) where the facility can generate income by mobile phone charging at nominal fees and the accumulation dedicated to the maintenance requirement of the system.

- Already some systems experienced decaying batteries (system at Katunguro Health Center). It was observed that, batteries used were of the vented type requiring continuous maintenance of distilled water and hydrogen hazard. It is recommended that, VRLA sealed maintenance free solar batteries to be considered for rural applications.

8.1.3 Immediate Objective 3:

Strengthen private sector capacity to provide quality services and develop PV packages that suit rural applications

- One of the main successes of the project is indicated by the increased number of PV business and dealers in the regions of which currently there are 10 PV dealers and shops in Mwanza and more than 15 (Visited by the Evaluation team), and compared to 7 PV dealers as base line number PV dealers, it is clear that, there a considerable increase in PV dealers due to project activities. Among them only one large company can procure PV items from international manufacturers, and others depends on this company, Dar es Salam based PV suppliers, from Kenya and Dubai based PV suppliers.
- In other regions (Shinyanga, Kagera and Mara) there are smaller PV shops that purchase their PV stocks mostly from Kenya, Mwanza and Dar ss Salam. It was observed that, most shops were selling substandard (low quality items) and are price focused in their business. There are a number of freelance (and some employed by those shops) technicians who are active in PV systems installations and normally complaining from product quality.
- Most dealers (apart from one Mwanza based) in the area have no access to information on PV sources of quality products. Customers were not satisfied by the performance of the PV system models advertized by the dealers in their brochures and systems seemed to be under sized (This is clearly stated to the evaluation team by the Tupendane Farmers SACCOS - Gieta). Packages advertized by PV dealers are specifying system that can operate e.g light, TV and Light + TV, but none of them specify for how many hours a day.

- The project has left task of developing standard PV packages to the PV dealers who some time sell what the customer asks, although they are convinced that it is not going to function properly.
- In all installations visited (also all dealers stocks) only Vented Batteries were used. This represents a hazard to the user as Acid might spill-off and users are not aware of the hydrogen danger of those batteries. Additionally the requirement of addition of distilled water is another task which cannot be ensured by such users, leading to reduced life of the battery.
- Sealed VRLA batteries are normally recommended for rural application where proper maintenance cannot be ensured.

8.1.3.1 Output 3.1 Business Development Services Strengthened.

- The project has held four training workshop on technical, business planning and financial aspects of PV systems where almost all PV dealers in Mwanza have participated.
- PV dealers were always invited to awareness campaigns implemented by the project in the region where they had the chance to meet clients and advertise for the product and services.
- The project established supply chain financing with an agreement with CRDB where a number of PV dealers has benefited from this modality. However, the mechanism has been practiced for short lending period.

8.1.3.2 Output 3.2 Technical knowledge of PV technology and application strengthened.

- The project has trained over 200 technicians in the region on PV technology, system sizing, installation and maintenance.
- The project has trained 8 VETA instructors on PV technology, and mainstream PV technology in VETA Curriculum and also provided PV equipment for teaching purposes. The Curriculum was approved by the VETA board and included in the VETA teaching system.
- Currently VETA Mwanza has established a PV track as new specialization, while other VETA (Shinyanga, Kagera and Mara) has included PV as part of the Electrical Track.

- All VETA centers are planning for shot PV courses (1-3 month) targeting former VETA graduates and other electricians in the area active or intending to be active in the PV business.
- The VETA Shiyanga, Kagera and Mara have not received the Curriculum and instructors are relying on their notes of the training course. A follow-up is needed to make sure those VETA receive the original Curriculum (they can also be advised to download the document from the project website).
- Almost all PV dealers and shops in the area are employing a technician trained by the PV project or they have received technical training by the project themselves.
- The project has supported TASEA by hardware and also contracted TASEA to implement awareness campaigns. However, the current status of TASEA is that, TASEA is lacking staffing and activities are currently dependent individual voluntary availability of members. With the current situation of TASEA, it is not in the position to contribute to the sustainability of the project achievements unless financial resources made available whereby more and more support in terms of IT equipment is made available.
- -A solar PV book for secondary schools was prepared and distributed to impart such knowledge to young students.

8.1.4 Immediate Objective 4:

Explore, develop and pilot financing modalities for PV systems.

8.1.4.1 Output 4.1: The most promising model for consumer finance of PV identified, piloted and evaluated.

- The project made study on available financing options for consumer financing. The study highlighted a number of modalities and recommended two main options, namely:
    - Consumer credit as used by CRDB financing SACCOS (teachers, farmers and traders unions), then respective SACCOS lends its members and collects repayment and settlement with the bank.
- Dealer credit where the project provides a guarantee to a bank who lends PV dealer (PV dealer acts as an intermediary between the consumer and the bank) who lends PV systems for end users and collects repayments.

- The above efforts in consumer financing was meant to build trust between the PV end user and microfinance institution (directly or through PV dealers as intermediary). However response was not encouraging following this approach.

- As no bank or dealer was willing to accept either modality, no transaction has been made following those recommendations. However, at late stage the project has entered into direct SACCOS financing (project acting the role of the bank) at 0% interest rate. Two SACCOS benefited from the above exercise, namely Magu teacher SACCOS and Tupendane farmers SACCOS-Geita. The Magu SACCOS received TSH21 millions from the project and the agreement was to use the money for PV lending and return them back in 9 month time. The SACCOS utilized the money as per the agreement and returned the money to project on time but, as solar lending to the members was made on 1-3 years repayment, the SACCOS refunded the money from own resources.- The Tupendane SACCOS-Geita received TSH27 millions and used the money for lending PV systems to SACOS members (at IR=10% pa) and made it clear to the members that, PV lending is for 9 months and the lending is in terms of PV equipment and not cash receipts. Interestingly all members received PV systems (21 members + 1 PV System for SACCOS Office) repaid the lend amount on time including the SACCOS 10% interest. Then the money was returned to the project on time.

This short time test showed that, the risk is minimal in lending to SACCOS as they have a good internal management system and excellent means of collaterals as monthly salary, personal property and member granter. In fact the CRDB is lending SACCOS for various activities but was not interested in the project guarantee fund lending as the interest was fixed at 8% and normally the bank lends at IR=15% to 20% .

The Magu teachers SACCOS have extended lending for PV from its own resources and 9 more teachers benefiting from this scheme. The lesson learned from this short term test of end user financing is that, SACCOS represents a promising and successful end user financing channel and extending this model to more SACCOS can lead to wide spread of end user PV financing. It is to be noted that, the methodology of lending PV equipment to end users (as done by Geita farmer SACCOS) is more appropriate and ensures that PV lending is not used for other purposes. Lending government employed member SACCOS looks more secure. The recommended model is a mixture of both in the sense that, SACCOS get lending for PV system and lend its members PV equipment and not money which ensures that money is

used for PV and not other purposes. Further, it will be more secure from the bank view point to lend government employees as repayment is secured through salary.

8.1.4.2 Output 4.2: The most promising model for supplier or supply-chain financing in the PV business identified, piloted and evaluated.

The objective of the supply chain financing model was to develop trust between the Banks and the dealers, interest and awareness to the banks and financiers of the financial viability of PV systems and enable them to venture in the energy sector and in particular Solar PV industry.

The study made by the project on Supply Chain Financing Practices has identified a number of modalities and the project followed the Fixed Deposit Receipt Plus (FDR) model. In this model a cash cover is used as collateral against PV loans provided to PV dealers. In fact the project was acting as the granter for the PV dealers.

The model was implanted in collaboration with the CRDB where it was agreed that the bank can extend loans amounting to 80% of the value of the fixed deposit at an interest rate of 8% (5% for the Fixed Deposit and 3% for the bank) pa. The advantage to bank is that all the risk is covered by the project and at the same time has access to the fixed deposit (in fact the Bank is not using its own resource).

The total fixed deposit was TSH60 millions and the bank has financed PV dealers in two phases. In the first phase five dealers received loans of TSH12 million or TSH15 millions both at 8% pa interest rate and repayment period of 6 months. In the second phase the interest rate kept fixed but the repayment period was extended to 9 months. In the second phase only three dealers participated (one new comer) as two dealers were deemed not qualifying as per the bank experience in the first phase and another dealer didn't participated as the loan size was too small for him (equivalent to two day transactions) in addition to the lending procedure which took long time.

The feedback from this experience was, from the dealer side the loan value was perceived as being very small and recommended a figure of TSH50 millions as being reasonable. Additionally, the lending period was too short and the loan processing time is too long. They

recommended period of 1-3 years and more flexibility in processing loans. From the bank side, the bank has to follow the lending procedures as stipulated by the Central Bank of Tanzania and has no authority to make any waivers and not interested in depleting the project fixed deposit by easing lending regulation.

The bank stopped lending since the end of the second phase and response to why stopped lending was: the Memorandum of Understanding (MOU) with the project has expired. This came out not true, but apparently the 8%pa interest rate seemed not favorable to the bank as he used to lend the same customers at interest rates exceeding 15% pa. Interestingly, the evaluation team came to know (from the bank and some PV dealers) that, the same bank has approached and negotiated to lend some PV dealers offering interest rate below the normal one. This strengthens our conclusion that, the bank was reluctant in FDR project lending system due to the low interest rate. Some PV dealers have received loans from E&Co which far exceeding the figures offered by the project lending system (one dealer got US$100,000 another received US$50,000). With the above experience and results, there are several lending opportunities which could be used by PV dealers to get finance, however new immerging PV shops, especially in the replication area, are in need of financing in the range of TSH12 millions to TSH15 millions but only if repayment period can be made more than one year.

8.1.4.3 Output 4.3 A limited number of productive uses of PV in the rural areas, proposed by the beneficiaries, tested and evaluated.

- Te project has identified ten categories of PV application for productive use in the lake zone and partially financed 19 PV systems for this purpose. The beneficiary contribution ranged between 25% and 45% and the experience was implemented through the Mwanza based PV dealers who were responsible for the identification of the prospective project, supply and installation of the system. The project contribution was paid once the system is supplied to the customer and installed. The dealer was responsible for the collection of the beneficiary contribution and provision of maintenance.
- The exercise showed that:

- Mobile Charging and Barber shops are most successful applications and able to pay back within six months.
- Application like Aquaculture, milk processing, poultry industry and electronic repair workshop business need more awareness to deploy PV systems.
- Application like power for guest house and secondary school hostels identified to being in need of high investment in terms of PV system size and currently should not be the project focus.

- The project has achieved success in demonstrating PV systems for productive use. Further the PV dealer's participation in identifying and implementing the projects was notable.
- The project needs to go further on this activity and identify more projects and disseminate information (investment and revenues) on those projects. The cost sharing financing modality will be of great influence in this respect (this could be decreased for smooth phasing out).

8.1.5 Immediate Objective 5:

Disseminate experience and lessons learned to promote replication through other regions of the country.

8.1.5.1 Output 5.1 The impact of the PV on rural livelihoods in early adopting households evaluated.

- The project defined PV user and suppliers surveys as means to evaluate the impact of PV on livelihood in early adopting households and communities.
- The project kept conducting surveys each 6 month and evaluating results
- In 2007/2008 surveys covered 521 household, 88 institutional systems and 16 PV dealers.
- For this output it is too early to come to concrete conclusions. However, it was evident that some PV application has created jobs, income and new business opportunities.
- The impact of PV on health and reduced reliance on kerosene is still at early stage to assess.

8.1.5.2 Output 5.2 The learning and replication of the experiences with the use of PV to generate electricity in off-grid rural communities supported.

- Preparation of publication on lessons learned in the Mwnaza initiative is in progress and not completed (***Titled: Best Practice in Dissemination of Solar PV Technologies***). This

document will be of great importance as it will highlight the success and challenges of the PV project in Mwanza and the Lake Zone and make it available and accessible to the PV communities in Tanzania and elsewhere.

- The project has organized site visits to the replication area together with PV dealers who actively participated in seminars organized by the project. This has lead to the extension of the Mwanza based dealers activities to the replication area. Although, this was done on a very limited scale, but it was notable step.

- Exchange of lessons learned with other projects was not noted.

9-Summary of Progress Towards Achieving Project Objectives:

Objective/Outputs	Indicators	Status	Rating/Comments
Global Objective: (i) To reduce Tanzania's energy related CO_2 emission by substituting PV for fossil fuel (kerosene) utilized to provide basic electricity services to rural homes and community users.	Consumption of kerosene reduced by 80% in households using PV systems	The project cumulative estimates of CO_2 reduction due to project activities is 2.2388 metric tons (APR 2008).	{S}/ There is a significant growth in PV market which is mainly in availing modern PV based lighting instead of kerosene which helps achieving the global objective of the project.
(ii) To improve people's livelihoods by improving their access to and affordability of modern energy services.	Incidence of kerosene-related respiratory and eye diseases reduced by 10% over 20yeras.	Too early to assess	N/A
Development Objective: To remove barriers with the aim of promoting the utilization of PV to provide basic electricity services to rural Mwanza region, thus reducing the region's (and country's) dependency on imported fossil fuel (kerosene).	Number of PV systems sold per annum in Mwanza reaches 1682 in 5 years of the project as compared to the baseline scenario of 631 systems for the same year.	8823 PV systems sold per annum and PV dealers (shops) extended their presence to the replication area (2 shops in Kagera, 3 in Mara and 4 in Shinyanga region)	{HS} Target already exceeded, however it is still early to state that, barriers are fully removed
Immediate Objective 1 : To refine policy framework and institutional arrangements necessary for the wide spread adoption of PV's	Import duties and tax on all PV equipment components reduced to a comparable level to Kenya	PV modules and components were exempted from all Duties and VAT.	{HS}/ Duties and VAT removed from PV systems.

for providing off-grid electricity services.			
Output 1.1: Implementation framework for off-grid PV defined and in Place.	PV features prominently in the rural energy master plan as an option for meeting energy needs in off-grid areas.	REA, REB and REF are established and PV based rural electrification in process (US$5 millions) and additionally REA is planning a PV subsidy of US$2 to US$2.5/Wp installed.	{S}/However dependent on the actual progress in those upcoming efforts.
Output 1.2: Energy pricing policy in government is adapted to support utilization of PV systems, to deliver appropriate products at the right price.	Retail prices of solar panels and other components of PV systems reduced by at least 25% by end of year 3 of project implementation.	Import duties and VAT removed from PV systems and components and eventually imports considerable increased. However, there is no retail price reduction indicated. This partially due to increase in international module prices influenced by grid-connected systems in Europe & Japan. With current situation in international market (post financial crises), the local PV market is expected to experience reduction.	{S}/ PV systems Price could have experienced increase if duties and VAT were not removed. Currently world PV market is experiencing a decline and this should be reflected in local retail PV prices (local market prices needs to be monitored to make sure concessions are in favor of end-user and not dealers)
Output 1.3: Standards for PV components and systems defined	Standards for PV components and systems in place	PV standard developed and approved by TBS board and in place. Arrangements with SIDA/MEM project in progress to support TBS with PV test equipment.	{HS}/TBS has already taken standards enforcement measures even before the PV test equipment (to be availed by the SIDA/MEM project)
Immediate objective 2: To increase awareness among the general public, and especially decision makers, consumers, and other end users on the	Public made aware of benefits and limitations of PV systems.		{HS}/Policy makers and public are very aware of PV role in rural electrification for the provision of basic energy needs.

potential role of PV in meeting basic energy needs.			
Output 2.1: Awareness program for decision makers developed and implemented.	Import duties and taxes on all PV equipment components reduced to comparable level to Kenya	Duties and VAT removed from PV modules and components.	{HS}/Target achieved.
Output 2.2: End-user awareness program formulated and implemented.	Number of customers enquiring information about PV systems in local dealer shops increased by 100% by year 4 of the project.	The number of customers enquiring information on PV systems has increased from 10 to 150 per day.	{HS}/Target achieved.
Output 2.3: Demonstration program implemented to show the functionality and usefulness of limited number of PV installations in strategically important locations and niches.	At least 50 on-site demonstrations of PV systems conducted over the lifetime of the project.	26 demonstration system installed in Mwanza, equipment for 24 PV demonstration system were delivered to Shinyanga and Mara regions (installations not yet completed)	{S}/However, installations need to be completed in Shinyanga and arrangement to deliver additional demonstration equipment (for 15 systems) to Kagera region needs to be completed
Immediate Objective 3: To strengthen and support the private sector working in the PV sector to provide better quality of service and to develop models for providing PV-based electricity services to rural areas.	Number of business dealing with PV equipment increased by 30% by the end of the project. Number of PV business qualifying for commercial supply-chain financing increased by 50% by end of the project.	10 PV dealers and shops in Mwanza. 6 PV dealers qualified for the supply-chain financing modality.	{HS}/Target exceeded, however financing need of emerging new dealers/shops in the replication area to be assessed and piloted.

	Level of end-user satisfaction with installation and after sale service increased by 50% by end of the project.		
Output 3.1: Business development services strengthened.	At least 60% of all PV dealers/companies participated in at least one capacity building activity offered by the project.	70% in Mwanza and 10 dealers from the replication area, according to project status 2008.	{HS}/A good collaboration was always maintained between the project and PV dealers/shops in Mwanza as well as those in the replication area.
Output 3.2: Technical knowledge of PV strengthened.	70% of all technical training courses offered to vendors, dealers and technicians are carried out successfully.	All technical training courses offered to dealers and technicians were successfully implemented. VETA instructors trained, Curriculum for VETA teaching developed and PV incorporated in VETA teaching system. VETAs plan to offer short term technical training.	{HS}/ PV dealers/shops employ at least one trained technician. Short term training courses can further sustain the technical knowledge (this will be attractive to PV dealers)
Output 3.3: Support to TASEA		The project has supported TASEA with hardware and sub-contracted TASEA to implement awareness activities and carry out studies (PV Standards) and TASEA was a member of the project technical committee	{S} But currently the Mwanza based TASEA office is in need of more support to be involved in the sustainability of the project achievements (lacking permanent staff and currently members are active on voluntary basis).

Immediate Objective 4: To explore, develop and test viable financing options for selling PV systems.	50% of all PV dealers offer at least one financing option to end-users.	Two Mwanza based PV dealer are offering end-user finance (25% as per project report 2008)	{MS}/The increase in dealers offering end-user finance will be dependent on the market growth and possibility that small shop able to have access to long term financing.
Output 4.1: The most promising model for consumer finance of PV systems will be identified, piloted and evaluated.	At least 15% of all PV sales to end-users are done through the model piloted by the end of project.	Only two SACCOS availed end-user financing through project end-user model.	{MS}/ End-user financing has been demonstrated through two SACCOS which looked promising (though done within very short period of less than a year). There is a great need to replicate with other SACCOS (at least one per each regions of the replication area).
Output 4.2: The most promising model for supply-chain financing in the PV industry will be identified, piloted and evaluated.	At least 5 companies in the PV supply-chain have requested financing from the model piloted under this component by end of the project.	6 companies have benefited from the project adopted supply-chain financing model.	{S}/Big PV dealers are already getting finance from the normal banking system. However, a model suitable (small lending level and period exceeding one year) for small PV dealers/shops (especially in the replication area) is necessary to sustain the modality.
Output 4.3: To provide limited grant	At least 10 grants provided to	The project has provided grants to 19 PV systems for productive	{S}/ Two PV systems identified as highly

financing to small number of schemes proposed by the private sector to test various productive uses of PVs.	companies by the end of project. At least 1 PV product line of productive use commercialized by the end of the project.	use. The systems were identified as of high commercialization potential. (Mobile Phone Charging, barber shops and Video show)	commercially potential need to be replicated and other to be identified and supported (grant value could be reduced gradually for smooth existing)
Immediate Objective 5: To disseminate experience and lessons learned to promote replication throughout the other regions of the country.	Percentage of households in the region using PV reaches 2.1% as compared to baseline scenario of 1.2% in year 10 after project start.	Too early to evaluate	
Output 5.1: Evaluation of impact of PV on rural livelihoods in early adopting households and communities.	Baseline survey and annual data updates provided throughout the project lifetime.	Too early to judge in 5 years.	
Output 5.2: Support provided to learning and replication of experiences with PV.	70% of all PV dealers in other regions are briefed on lessons and experiences from Mwanza by the end of the project.	The project identified 11 dealers from the replication region. They have received technical, business development training and PV standards by the project	{S}/ The replication process needs to develop more and then evaluated.
Project Website www.solarmwanza.org	N/A	The project established a website(www.solarmwanza.org) which provides quite good information about the project, activities, achievements.	{HS}, However, the website not updated since end of 2006. This is very important.
Overall Rating	-Limited PV knowledge. -Limited PV market. -No conducive policy	-Barriers inhabiting PV market transformation in Tanzania removed. -Duties & VAT removed.	{HS}. Good achievements in Policy, awareness, training and private sector

	to PV. -Limited PV technical capacity in the region.	-Technical training. -Awareness among policy maker & public raised. -Dealer & End-user financing established. -Experience in Mwanza replicated in the region.	support. More efforts are need to sustain achievements with special emphasis on the financial engineering, Demonstration of PV for productive services and the replication process.

10-Impacts of the project:

The project has made tangible impact in PV business development in Mwanza and the Lake-Zone area. Considerable PV dealers/shops have emerged due to the project activities which have also contributed to new jobs creation in terms of PV business, installers and maintenance services.

PV systems are used to replace kerosene lighting which is contributing to less GHG emissions and better health (less respiratory diseases) in the long term.

Demonstration system has enabled the availability of health service during night time maternity health being the major beneficiary.

PV productive uses demonstrated a new window for income generation in rural areas.

11-Linkage of the project achievements to the national development agenda:

11.1- The project is relevant to the national development agenda especially in the energy sector. This clearly reflected in the National Energy Policy of Ministry of Energy and Minerals (MEM) and the Rural Energy Agency (REA) by the following statements:

11.1.2- In the household sector the policy stated that:

- Encourage efficient end-user technologies and good household practices.
- Encourage energy efficient buildings and wider application of alternative sources of energy for cooking, heating, cooling, lighting and other applications. (Page 21)

11.1.3- In the Renewable Energy Sector the policy stated that:

- Introduce appropriate rural energy development, financial, legal and administrative institutions.
- Establish norms, codes of practice, guidelines and standards for renewable energy technologies to facilitate the creation of an enabling environment for sustainable development of renewable energy sources.

11.1.4- In the Rural Energy Sector it is stated that:

- Promote application of alternative energy sources other fuelwood and charcoal, I order to reduce deforestation, indoor health hazards and time spent by rural women in search of firewood.

- Promote entrepreneurship and private initiative in the production and marketing of products and services for rural and renewable energy.

- Ensure continued electrification of rural economic centers and make electricity accessible and affordable to low income customers.

- Establish norms, codes of practice, standards and guidelines for cost effective rural energy supplies.

11.1.5- In Energy Information System Sector the Policy stated that:

- Establish and strengthen a proper information and communication system in the energy sector ad mobilize human resources to undertake sensitization, advocacy and dissemination o information to stakeholders.

11.1.6- In the Environment, Health and Safety, the policy stated that:

- Promote energy efficiency and conservation as a means towards cleaner production and pollution control measures.

- Promote development of alternative sources including renewable energies and woodfuel end-use efficient technologies to protect woodland.

11.2: The Rural Energy Agency (REA) is established as autonomous agency in 2005 with the responsibility to promote improved access to modern energy services in the rural areas of Mainland Tanzania and provide grants and subsidies to developers of rural energy projects.

11.3- The project achievements in the creation of awareness at different level on PV application, promoting the development and enforcement of PV standards and code of practice, demonstrating the functionality of PV system in health and education facilities, promoting PV market growth, financing PV dealers and end users and capacity building in PV technical and business all are I line with forth mentioned national policies and development agenda.

12- Linkage to UNDP/GEF Objectives:

The UNDP/GEF objective is climate change mitigation and poverty reduction. This is reflected in the global objective of the project as being:

- To reduce Tanzania's energy related CO_2 emission by substituting PV for fossil (kerosene) utilized to provide basic electricity services to rural homes and community users.
- To improve people's livelihood by improving their access and affordability of modern energy services.

The project latest estimates on total avoided CO_2 due to project as being 2.2388 metric tons which clearly adds to the global benefit from the project.

13- Stakeholder participation

The project has maintained good stakeholder participation throughout its lifetime through, Project Steering Committee (ST) and Project Technical Committee (TC). The Steering Committee represented the MEM, MoFA, VPO, UNDP, RAS Office, TASEA and the Private Sector. The last SC meeting was on 18 March 2009. Outcomes of this meeting were to prepare an exit strategy, invite REA for field visit to Mwanza and enable them see the project achievements and support needed to sustain those achievements. Further, a number of institutions were recommended to take part in the sustainability process (REA, VETA and TASEA). It was noted that, TASEA Mwanza, though being supported by the project, the current situation is that members are working on voluntary basis which renders the association in need f support to implement activities.

14- Linkage of the project and other interventions within the sector in Mwanza

In Mwanza and lake-zone, there are no parallel activities to link-up apart from TANESCO which is not considering neither rural electrification or PV in its plan. On the national level the SIDA/WB/MEM is a project of similar nature and both project have maintained a good understanding and coordination not to duplicate the same efforts in the same geographical area. Therefore, the SIDA/WB/MEM has excluded Mwanza and the Lake-Zone form their activities as this is covered by the PV project. Meanwhile, coordination is maintained at the two project management level but there is no indication of experience exchange between both projects, something which could have enhanced the performance of both projects.

15-Risks and Sustainability:

15.1 Risk Assessment:

There are five risks with different level were identified in the project document as being critical to the project. In particular:

15.1.1- Rural areas PV systems are introduced become target of Grid-Extension by TANESCO within a short period of time.

It clearly stated to the evaluation team by TANESCO that rural electrification is not in TANECO electrification plans and this mandate is shifted to REA. The focus of TANESCO is urban electrification and PV is not under consideration by TANESCO. So, this risk is no more there.

15.1.2- Risk of duties and VAT would not be removed from PV modules and balance of system components.

Duties and VAT already removed from PV modules and balance of system components. This risk is no more there.

15.1.3- Risk of customers not approaching lending institutions for loans to purchase PV systems.

The extension of loans to PV dealers through CRDB and project lending experience with SACCOS made this risk low. However, more is needed on the end user finance through the SACCOS and individuals for productive use before this risk is being fully mitigated.

15.1.4- Risk of non-appropriate battery disposal creating an environment threat.

This risk is largely mitigated by the market where PV dealers paying incentives to users to get back used batteries for recycling purpose. However, the incentive should pay for the transport cost plus a margin as users need to bring those batteries long distances.

15.1.5- Risk of Mwanza experience not to be replicated in other regions.

This risk is already dealt with by the project Immediate Objective 5 in the Lake Zone. This activity already started and the strong commitment of RASs by budgeting for maintenance funds and new PV systems in the Lake-Zone. This will certainly encourage other regions to replicate this experience. Additionally REA is currently in the process to implement a PV based rural electrification program, so replication is already ahead.

15.2- Sustainability Assessment:

Although the project has made tangible achievements in removing most barriers inhabiting the commercialization of PV systems in Tanzania, the sustainability of those achievements is still of great concern. There is a need for refinement in many areas. The primary areas of concern identified by the evaluation team are:

15.2.1- Replication activities to be completed.

The replication was delayed due to management change related problems (almost one year was lost) and still at early stage as demonstration equipment was either not yet handed over to the respective region or the handed over installation is not yet completed. This needs to be completed and coupled with awareness campaign on the technical issues of proper system design, equipment quality and approved installation technicians in the area.

15.2.2- Standards on equipment and code of practice to be enforced.

Already PV standards for Tanzania approved, but most dealers and end users are not aware of this development. Also, there are a lot of substandard PV components are entering the market, especially from Kenya and Dubai. The project needs to liaise with Tanzania Beurau of Standards (TBS) and the public (awareness) to enforce the approved standards.

For the enforcement of code of practice, the project needs to coordinate with the MEM and the VETA federal authority to approve mandating the VETA to certify PV installers and make the public aware of this development in the PV sector.

15.2.3- Awareness on system design, equipment quality and code of practice need to be enforced.

- Standard PV system designs advertized by PV dealers were not appropriate and not indicating the operating hours of the system. This has resulted in misconception and end-user dissatisfaction (Systems supplied to Gieta Farmers SACCOS). PV dealers needs to disseminate more accurate information on their packages in terms of type and origin of equipment they offer, system operating hours per day and warranty period during which they are responsible for rectification of any problems arising due to system performance (excluding misuse). The RESCO LTD sample information model is very useful (Annex(V)).

15.2.4- End user, small PV shops and PV productive use financing to be sustained.

From the pilot test made in financing end users through Magu teacher SACCOS and Geita farmers SACCOS seems encouraging. Both cases showed different implementation modes. In the first case funds were channeled to SACCOS who provided end user finance and collection of repayment (money could have been used for other purpose by the end user). In the latter case, the money channeled to the SACCOS who used it to lend the user the PV system he selects (money used strictly to PV and no other purpose).

The teacher SACCOS extended PV lending to other members from its own resources and the repayment was always secured by the member salary and collected from the treasury directly.

Both types of SACCOS look a good channel to spread financing to end users, but the trail does not likely to replicate automatically within other similar SACCOS unless more SACCOS are approached by the project and assisted to demonstrate PV systems. This could be sustained if at least one SACCOS in each replication region is assisted to implement this modality.

16-Lesson learned

16.1- The main lesson learned from this project is that, the entry point to the success made by this project is attributed to the strong government commitment which could be explained by the breakthrough made in the pro-PV policy and institutional frameworks.

16.2- There is a great demand for PV systems in the Mwanza region with growing number of PV dealers /shops and sales.

16.3- There is a potential for PV use for productive uses which needs to be explored further.

16.4- Though project has demonstrated to the financing sector that PV is a financially viable business, but, this activity remains a challenging issue which needs more efforts to sustain. Especially when comes to end-user financing.

16.5- The documentation of the project activities including document produced by the consultants hired by the project represents a great resources for the replication phase and future projects in the PV field at the national level.

16.6- The project has made an excellent use of the local knowledge by hiring local consultants as possible which had a notable contribution in the success made.

16.7- The strong and multi-level targeting awareness (policy maker, dealers, consumer and technicians) program implemented by the project has played a key role in the achievements made by the project.

16.8- There is a need to link-up the project with relevant governmental rural energy institutions, especially the Rural Energy Agency (REA), which is the potential body to take over most of the project activities on phasing out.

SECTION TREE

17- Conclusions and recommendations:

17.1-Conclusions:

The project has made remarkable achievements in removing most of the barriers inhabiting the commercialization of Photovoltaic systems in Mwanza region and the Lake Zone. In particular:

17.1.1- Policy & Institutional Frameworks:

a. There is strong government commitment towards achieving the goals set forth by the project. This is indicated by actions taken by the government in tax removal, establishment of a government body dedicated to Rural Electrification, active participation in the project Technical Committee (TC) and Steering Committee (SC). Further, the Government Regional Administrative Secretariats (RAS) have taken up the role of the Project Focal point in the replication phase by assigning a RAS employee to take the project focal point responsibility.

b. PV Modules and components are exempted from all duties and VAT.

c. The Rural Energy Agency (REA) established and functional. REA provides technical assistance for project developers and it is in the process of implementing a PV based Rural Electrification program.

d. East African PV Standards are adopted for Tanzania and approved by the TBS board (functional though not yet Gazetted).

e. Code of practice established.

17.1.2- Awareness:

17.1.2.1- A series of awareness meeting targeting regional and district officials on PV importance and its role in rural electrification were organized.

17.1.2.2- Information on PV packages and benefits were prepared and largely distributed among the public.

17.1.2.3- Leaflets, news letter were widely used as effective awareness tool. This is in addition to TV/Radio programs.

17.1.2.4- Demonstration PV systems were installed at health and education facilities in Mwanza and the replication area.

17.1.2.5- PV is budgeted for in District annual budgets for the provision and maintenance of PV systems for existing schools and health facilities and further PV to be considered as part of any new schools and health service units.

17.1.3- Private Sector Strengthening:

17.1.3.1- There are 10 active PV dealers and PV shops in Mwanza, 2 in Kagera, 3 in Mara and 4 in Shinyanga region. All are actively selling and installing different sizes of PV system.

17.1.3.2- More than 200 technicians were trained on PV system sizing, installation and servicing in the region.

17.1.3.3- A PV Curriculum for VTC was developed and incorporated into the VTC education program at VETA Mwanza, VETA Kagera, VETA Mara and VETA Shinyanga. All VETAs have already received PV equipment for teaching and instructors received training provided by the project.

17.1.3.4- VETA has already developed plans for short courses (1 to 3 month) targeting former graduate technicians and business dealers.

17.1.3.5- The project provided training on business planning and financial aspect of PV systems to PV dealers.

17.1.4- Financial Engineering:

17.1.4.1- Supply chain financing through CRDB started in 2007 and stopped end of 2008. However the experience has demonstrated the viability of financing PV dealers to the bank.

17.1.4.2- Funds allocated were TSH60 millions and especially small dealers has benefited from this scheme but currently not functional. The bank was not willing to go further (no reasons were given but the 8% pa Interest Rate applied appeared to be not favorable to the bank). Currently the same bank approached some of those dealers to lend them from own resources and it happened.

17.1.4.3- End user (consumer) financing didn't function through the bank and finally the project decided to lend some SACCOS directly with a total amount of TSH44 millions. Initial results were encouraging (41 SHS were financed and installed through this arrangement). This pilot needs to be extended to the replication area.

17.1.5- Replication of the Mwanza Experience in Shinyaga, Kagera and Mara Regions:

17.1.5.1- The replication process started in Shinyanga, followed by Mara and very lately in Kagera region. The role of the Project Focal Point was always handled by a government employee from the respective Regional Administration Secretariat.

17.1.5.2- PV demonstration equipment not received in Kagera region.

17.1.5.3- PV demonstration equipment received in Shanyanga region since 2007 installation are not yet completed.

17.1.5.4- VETA Mwanza is teaching PV as new specialization (separate track).

17.1.5.5- VETAs in Shinyanga, Kagera and Mara started implementing PV education as part of the electrical track as of 2009 intake, except for Shiyanga which planned to start by next year.

17.1.5.6- Awareness still at early stages in Kagera, Mara and Shinyang regions, but very high in Mwanza.

17.1.5.7- Project achievement documentation is in progress (Titled: Best Practices in the Dissemination of PV Solar Technologies).

17.2- Recommendations:

17.2.1- General:

a. The awareness created by the project needs to be strengthened and it is still early to be sustainable. Especially when comes to proper system design and quality of equipment. More need to be done in replication regions.

b. There is no financing modality currently in place (supply chain or end user). There is serious need to establish at least end user financing mechanism. The current PV market is much dependent on the wealthy category who affords to pay in cash upfront and the low income (majority) is not included. This will lead to early market saturation and eventually will die-out.

c. TBS/PIU/MEM needs to follow with SIDA/WB project to ensure the procurement and delivery of PV test equipment to TBS.

d. Extending the SIDA/MEM project activities to the Mwanza and Lake Zone is recommended to sustain awareness and end –user financing.

17.2.2- For the Project Implementation Unit (PIU)

17.2.2.1- Prepare a new Log Frame (**One Year Exit Strategy**) for critical activities to be implemented to sustain and replicate the achievements made concentrating on:

17.2.2.2- Complete installation of demonstration systems in the replication area.

17.2.2.3- Prepare and implement a PV quality, proper system design and code of practice focused awareness program in Mwanza and the replication area.

17.2.2.4- Identify and support more PV productive uses.

17.2.2.5- Demonstrate end-user financing through SACCOS in the replication area.

17.2.2.6- Design a grass root approach awareness program in support of institutional PV systems for educational and health facilities.

17.2.3- For the Government of Tanzania:

17.2.3.1- The project needs to strongly engage the REA in the exit strategy. REA is the government potential body to take over the leading role of scaling up and sustaining the awareness and end-user financing (through SACCOS) activities through TASEA Mwanza and other appropriate regional bodies that has the experience and involved in the project activities there.

17.2.3.2- Take the necessary and immediate measures to enforce the approved PV standards through consumer awareness and inspection and control at ports and entry borders, especially the Tanzania-Kenya boarder custom points (This is very urgent as most substandard items were reported to come from Kenya based suppliers).

17.2.3.3- Implement the code of practice to ensure good systems functionality. VETA is the potential body to take over the leading role in the certification of PV installers and informing the public through awareness campaigns and the media.

17.2.4- For UNDP:

17.2.4.1- Work out an arrangement with the Government of Tanzania whereby the project hanging activities could be completed (especially the financing and replication issues) in a one year time (plans with financial implications to be prepared by the PIU as recommended earlier).

17.2.4.2- Carry out a budget revision for the remaining project financial resources and mobilize more if needed.

SECTION FOUR

Annex (I)

TOR FOR TERMINAL EVALUATION

TRANSFORMATION OF RURAL PHOTOVOLTAIC (PV) MARKET PROJECT IN TANZANIA (Project No. 00035062)

1. BACKGROUNG

The project aimed at reducing Tanzania's energy-related CO_2 emissions by introducing photovoltaic (PV) as a substitute for fossil fuel (kerosene) utilized for lighting in rural areas remote from the electricity grid and at slowing down the rate of additional diesel-based captive generation schemes for providing basic electricity services to the unelectrified rural households, specifically in Mwanza, Shinyanga, Kagera and Mara. In addition, the project had to substantially decrease the growing number of rural poor, adults and children alike, who contract respiratory and eye problems due to prolonged exposure to kerosene smoke and soot (poor indoor air quality). The activities proposed in the project had been designed to remove a number of barriers to wide-scale utilization of PV to meet the basic electricity needs of individual households in terms of lighting, power for a radio-cassette/TV, productive use activities, and of community users like health clinics and schools, initially in the Lake Zone regions, but eventually in the whole country. The project aimed at developing local capacity to identify technical and financing options and to formulate the regulatory, institutional, financial and marketing instruments necessary to demonstrate the technical, economic, and financial viability of using the private sector as a vehicle to deliver basic electricity services to rural households and community users.

The project document was signed in November 2003 and the implementation started in March 2004 with the Project Implementation Unit put in place in April 2004. It is a five year project. It was implemented by UNDP and executed by the Government of Tanzania through the Ministry of Energy and Minerals (MEM). The project total budget is US$ 2.25 million

funded by the Global Environment Facility (GEF) with the Government of Tanzania providing an equivalent of US$147,000 in kind.

For the first two and a half years the project activities focused on overcoming the most major barriers of policy, awareness, technical and financial nature for market penetration of PV technology in Mwanza Region, whereby mid-term evaluation was conducted and the experience gained and lessons learned were then replicated in other regions of Shinyanga, Kagera and Mara. The project activities were structured to ensure that the technical and financial capabilities of PV business are strengthened, public awareness on the potential PV applications and limitations are raised and the appropriate policies, required expanding these markets on a demand driven. Different financial models were piloted to establish suitable financing mechanisms to support the affordability and accessibility of PV end users, especially the rural households and the capacity of the private sectors in the PV supply-chain to avail the necessary equipment.

1.1 Project objectives

The development objective of the project was to remove barriers with the aim of promoting the commercial utilization of PV to provide basic electricity services to improve people's livelihoods improve their access and affordability to modern energy and reduce the dependency on imported fossil fuels (kerosene). At the global level, the project aimed at reducing Tanzania's energy related CO_2 emission by substituting PV for fossil fuel to provide basic electricity to rural homes and community users.

The Project's immediate objectives encompass:

(i) To refine the policy frame work and the institutional arrangements necessary for the widespread adoption of PV's for providing off-grid electricity services;

(ii) To increase awareness among the general public, especially decision makers, Consumers and other end users on the potential role of PV in meeting the basic energy needs of rural communities located away from the electricity grid;

(iii) To strengthen and support the private sector working in the PV sector to provide better quality of services and to develop models for providing PV based electricity services to the rural areas

(iv) To explore, develop, test and adopt viable financing options for disseminating PV systems; and

(v) To disseminate experience and lessons learned to promote replication throughout the other regions of the country.

The assessment of the project impacts and achievements during the implementation period and the extraction of lessons learned both in terms of financial and technical approaches, require a proper evaluation of the project achievements and to measure the improvements or changes in the designed indicators, as a result of the project intervention, compared to the base line parameters. A set of indicators were identified during the project development phase and is documented in the logical framework. These were revised and updated in the baseline study conducted towards the end of 2004.

The project is seeking the services of two qualified experts (an international and a local one) to conduct the above evaluation. The consultants will assess the project achievements and impacts, in consultation with the main stakeholders. The consultants will work very close with the Project Implementation Unit (PIU) in Mwanza, MEM, UNDP Country Office and UNDP/GEF Technical Regional office in Pretoria. All required support and documents will be provided as necessary to the consultants.

2. OBJECTIVES OF THE EVALUATION

The main objective of this evaluation is to provide the project partners i.e. GEF, UNDP & GoT with an independent assessment of the impacts and key achievements of the project as compared to the project document for the five years implementation of the project. Assess the expected outcomes and their sustainability and suitability for policy related review inputs. The evaluation results are envisaged to identify and discuss the lessons learned, through measurements of the changes in the set indicators, summarize the experiences gained and technically, and recommend for future policy dialogues.

3. TASK AND SCOPE OF THE EVALUATION

3.1 Scope

The scope of the evaluation will cover the success in removing the barriers, raising the public awareness on potential applications of PV technology, strengthening the technical and financial capabilities, appropriateness of policies, potential replication of the achievements, the impacts and sustainability of outcomes.

3.2 Tasks

To achieve the above objectives the terminal evaluation is to address the following:

(vi) Assess the impacts and key achievements of the project vis á vis its objectives and outcomes as per project design indicators

(vii) Assess the relevance achievements of the project objectives to the national development agenda and priorities, UNDP thematic areas and needs of beneficiaries

(viii) Review the appropriateness and clarity of roles and responsibilities of stakeholders and their level of satisfaction with the project achievements

(ix) Assess the achievements of the project in terms of timeliness, quality, quantity and cost effectiveness of the expected outcomes

(x) Assess the prospects of the sustainability of the project outcomes and benefits in the longer future

4. METHODOLOGY

The terminal evaluation will be conducted in a participatory manner through a combination of processes including a review of the key project documentation, interview with project stakeholders and site visit as deemed necessary. It will include visits to UNDP Country Office, Project Executing Offices of Government, PIU, REA as well as selected national partners and stakeholders, including interviews with key individuals both within the project in Mwanza, the government staff, NGOs, private sector (PV suppliers) SACCOS and project beneficiaries mainly communities in various districts. The following documents are recommended to be reviewed by the team:

- Project Document

- Project implementation reports (APR/PIR's);
- Annual technical reports and work plans of the various implementation task teams;
- Mid Term Evaluation report, and
- Minutes of the project Steering Committee Meetings.

5. EXPECTED OUTPUTS

The consultants shall provide the project partners and the PIU with a comprehensive draft report with the following:

(i) Impacts and key project achievements identified and documented according to the project indicators

(ii) Project achievements and sustainability in relation to the project design

(iii) Relevance of the project achievements and the national policy development agenda

(iv) Efficiency and effectiveness of the project in terms of financial and planed activities

(v) Project shortcomings and lesson learned and policy review for rural energy development in Tanzania.

6. EXECUTION ARRANGEMENTS

The two consultants should work together as a team towards producing the evaluation report. The national consultant will be responsible for providing any necessary background information, attending meetings when necessary and preparation of the relevant parts of the report. Nevertheless, the international consultant will be responsible for the timely required outputs and submission of the deliverables.

The consultants will be contracted by UNDP country office in consultation with MEM and GEF. The PIU shall arrange for the consultant all necessary site visits and meetings in the project site according to the TOR. UNDP country office in coordination with the PIU shall arrange logistics for the mission including hotel reservation and transportation during the mission. The mission will maintain close liaison with UNDP CO, The Renewable Energy Section of MEM as well as the PIU.

7. TIME FRAME

The evaluation will be carried out through a period of 22 working days for the international consultant, which includes a 15 days mission to Tanzania and, 17 working days for the national consultant. The assignment will commence early May 2009.

7.1 Preparatory stage-inception: 3 days

- Preliminary desk study review of relevant documentation provided by the PIU and UNDP-Dar es Salaam.
- Circulation of information among main stakeholders to determine the key issues to be addressed during the mission
- Submission of inception report. The inception report will outline the work plan and the key issues to be addressed during the mission.

7.2 Field Mission: 12 days

- Briefing for the evaluators
- Interviews and meetings with the key stakeholders
- Validation of preliminary findings of the mission with UNDP and GOT. This will be in form of presentation and discussion forum.

7.3 Preparation of Final Evaluation Report: 7 days

- Submission of first draft report and circulation for comments and feedback from key stakeholders: two weeks after the field mission
- Preparation of final evaluation report: two weeks after the receipt of the feedbacks from the key stakeholders

8. DELIVERABLES

- Submit 5 hard copies of draft report after two weeks
- Submit 5 hard copies and 1 soft copy of the final report.

8.1 Presentation of the findings

The initial conclusions and recommendations will be presented to the Project management team, in DSM or Mwanza and UNDP/GEF for their comments. Once these are integrated, a final draft will be presented to MEM/UNDP.

8.2 Report sample outline

Evaluation Report – Sample outline

a. Also include list of acronyms

b. Table of Content of the Report.

c. Executive summary

- Brief description of project;
- Context and purpose of the assignment;
- Main conclusions, recommendations and lessons learned;

d. Introduction

- Purpose of the assignment;
- Key issues addressed;
- Methodology of undertaking the assignment;
- Structure of the evaluation process.

e. The project(s) and its development context

- Immediate and development objectives of the project;
- Main stakeholders;
- Results expected.

f. Findings and Conclusions

Project Implementation

- Impacts of the project
- Linkage of the project achievements to the national development agenda
- Stakeholder participation
- Linkage of the project and other interventions within the sector in Mwanza
- Sustainability of the intervention

g. Lesson learned

h. Conclusions and recommendations

9. REQUIREMENTS OF THE EVALUATION TEAM

Two consultants are proposed to conduct the evaluation exercise: an international and a national consultant. The International Consultant, who will also serve as the team leader, shall be an energy specialist having a post graduate qualifications preferably in energy related technical field with at least 15 years of relevant experience preferably with renewable energy technologies (RET) development, integration in the general energy balance and the technical, socio-economic and environmental issues of their applications, preferably in the developing countries. Extensive experience in the fields of project formulation, execution, Monitoring and Evaluation is required. Previous involvement and understanding of UNDP's procedures is an advantage. The consultant should have strong writing skills coupled with relevant experience in results-based monitoring and evaluation techniques.

The National Consultant shall have experience and conversant with nation policy development. Experience in renewable energy technologies is an added advantage. Must have postgraduate qualifications preferably in Engineering, Environment Sciences, Agriculture, Economics, development studies or development related studies with experience in upstream-downstream policies. At least 7 years of relevant technical experience in Monitoring and Evaluation of development programmes/projects. The consultant should be well acquainted with the general energy situation in Tanzania, in particular electrical energy demand/supply issues, and well informed on the energy and overall economic development strategies and programmes, particularly for rural development. Previous involvement or knowledge of the institutional and organizational setup of the energy sector is an advantage & some international experience in project formulation, execution and evaluation UNDP/GEF is an asset. The consultant should be fluent in English and possess strong technical writing skills.

10. REPORT ANNEXES

- TORs
- Itinerary
- List of persons interviewed
- List of documents reviewed
- Questionnaire used and summary of results if any.

Annex (II)

Itinerary

Date and Place	Time	Institution	Contact person (s)	Position	Phone & email
25/06/2009 Dar es Salaam	08:30 -10:00	UNDP Country Office	Getrude Lyatuu	Team leader energy section	
			Savinus Kessy/ Bariki Kaale	Project desk officer (s)	0754 286273/ 0715 950450
	10:00 – 11:00	Ministry of Energy and Minerals (MEM)	Paul Kiwele & Jacob Mayalla	Acting. Assistant commissioner for RE	0784 380680
	11:00 – 12:00	Sida-MEM PV Solar Project	Jeff Felten	Project manager	0787 349842
	12:00- 13:00	Rural Energy Agency (REA)	Lutengano Mwakahesya/ Justina Uiso	Director General/ Projects Manager	0784 291801/ 0754 282217
	14:00 – 15:00	Tanzania Bureau of Standards (TBS)	Dunstan Kalugira	Head electrical – PV Standards	0784 700255
	15:00- 16:00	Tanzania Solar Energy Association (TASEA)	Eng. Hamis Mikate	Chairperson Technical Committee and Acting Executive Secretary	0784 694413/ 0754 694413
26/06/09 Dar es salaam	08:30 -13:00	Evaluation team travel and other logistics at UNDP country office			
	13:00 – 17:00	Travel to airport and back to town because no flight			
27/06/09 Mwanza	06:00 – 08:00	Travel to Mwanza	Evaluation team		

	08:30 -11:00	Project Implementation Unit (PIU)	Isidory Fitwangile		0784 876543
	11:00- 12:00	Zara Solar – supplier	Eng. Mohamed Parpia		
	12:00 – 12.30	**MONA Electrcal and Electronics**	**Mr.Nizar Parpia**		
	12:30 – 13:00	Mukesh Vunja Bei Shop	**Ms.Hawa Jumaa**		
	13:00 – 13:30	**Elisha Solar & Electronics, Sales Shop**	**Ms.Salima Saeedi,**		
	13:30- 14:00	**Justine Electronic/ Sales Shop**	**Ms.Sleevia Roman,**		
28/06/2009		Documentation			
29/06/2009	09:00 – 10:00	Regional Administrative Secretary (RAS)	Acting Regional Administrative Secretary / Mwanza Focal Point	Ms. Getrude Kulindwa / Mr. Kyamba	
	10:00- 11:00	CRDB Bank	Loan officer	Mamertus Lueno/ Mr Albert Michael	
	11:00 – 12:00	VETA	Acting Centre Manager/ Solar PV trainer	Joseph Mwanda	0754/078 7 445060
	13:00 – 14:00	Magu Teachers SACCOS	Executive Secretary	Xavery Ngombilenga	
	14:00 – 15:00	Site visit to solar PV beneficiaries of Magu teachers SACCOS	Faida		
30/06/09 Mwanza	08:30 -03:30	Travel to Kagera focal point	Evaluation team		
		Meeting Kagera Focal point	Assistant Admin Secretary – Economist.	Mr. Fikira R. Kissimba	

		VETA - Kagera	Principal	Said A. Kirari	
		VETA - Mara	Principal and solar trainer	Balthazar Kimaryo/ Imanuel Nyarusanda	
		Bwanga Electrical shop	Adolf		
		Kagera Electrical Shop & General supplies	Vishani Mahendra		
01/07/2009 Mwanza	06:00 -08:00	Travel back to Mwanza			
	08:00 – 12:00	Mara Focal point	Principal Community development officer	Samson Mkama	
	12:00 – 12:30	Visit solar dealer	Tibesigwa Electrical Shop	Dickson Samson	0787 172591
	12:30 – 13:00	Visit solar dealer	Mujuni Electrical Shop	Mujuni Mujuni	0784 635387
	13:30 – 16:00	Travel back to Mwanza			
	16:00 – 16:45	Visit solar dealer in Mwanza	Sunshine Solar Limited	Denis Azaria Nyambita	
	16:45 – 17:30	TASEA - Mwanza	TASEA Chairman Mwanza branch	Mohamed Parpia	
02/07/2009 Shinyanga & Mwanza	08:30 -11:30	Shinyanga Focal point	Regional Engineer	Deusdedit Mushuga	
	11:30 – 12:30	VETA - Shinyanga	Principal	Teobald Isaka	
	12:30 – 13:30	Visit solar dealer	Onesmo Electrical shop	Mr. Onesmo	
		Visit solar dealer	Tesha electrical bacborne	Peter Tesha	
	13:30 – 14:30	Visit Bunambiyu health centre	Incharge Bunambiyu Health centre	Mr. Kabaka	
	16:00 – 17:00	TANESCO	Member of Project Technical Committee	Eng. William Masome	
03/07/2009 Geita & Sengerema	11:00 – 11:45	Visit a health centre	Katunguru Health Centre	Mr. Mutabilwa	
	14:00 – 15:00	Tupendane Farmers SACCOS Lwamgasa	Chairman/ Treasurer	Maganga Msakoli/ Mwalimu Hassan	

	16:00 – 16:35	Visit solar dealer in Sengerema	Intra professional East Africa Limited	Medard Kachubo	
04/07/2009 Geita	09: 00 – 13:00	Meeting and debriefing PIU on findings and draft conclusions and recommendations		PIU	
05/07/2009 Lwamgasa SACCOS		Back to Dar Essalam			
06/07/2009	08:30- 11:00	Meeting with VPO office Environment department	Senior Environment Officer	Fred Manyika	
		Documentation of findings			
07/07/2009		Documentation of findings			
08/07/2009	11:00 – 13:00	Debriefing at UNDP CO	UNDP/MEM/Consultants		
09/07 – 16/07/09		Reporting and submission	Consultants		

Annex (III)

List of Persons Interviewed and Summery of Responses

Date: 25.06.2009

1- Mr.Jacob Myala and Paul Kiwele

- Acting/Assistant Commissioner for Renewable Energy (MEM).
- The Energy sector structure in the Ministry (Petrol, Electricity, Renewable Energy and Environment & Development).
- The Energy Policy act developed in 1992, revised in 2003 allowed for IPPS to enter into the electricity sector (power generation, transmission and distribution) which formerly monopolized by TANESCO.
- Also the Act resulted in the establishment of the Rural Energy Agency (REA)- which is an autonomous body but providing advisory service to the MEM.
- Access to Electricity in Tanzania is 12% (Urban) and <2% (Rural)
- In his view awareness about PV is not yet sufficient and there still concern about the quality of imported PV equipment.

2- Mr. Jeff Felten: Senior Consultant (Sida & WB PV Project).

- The WB project is composed of 5 sub-projects all working to link the local beneficiaries to the international PV suppliers. The project provides system specifications, preparation of procurement documents and capacity building assistances. The 5 sub-project are targeting:
    - Farmers union
    - Coffee union
    - Tea union
    - Gold Mining union (PV for HH and social infrastructure)
    - Vodcom (Cell phone chargers and PV/Diesel Hybrid systems)

- The Sida project is working on the national level (Excluding Mwanza Project area). It is complementary to the Mwanza (UNDP/GEF) project.
- The Sida project concentrates on PV traders networking, Training on business development, marketing assistance and technical training.
- The Sida project has no hardware component.
- PV venders are sourcing equipment from Japan, US, China/India and Europe.
- There is a great need for PV User training (Users abusing battery and blaming the technology).
- Over 80% of batteries used in Tanzania are Chloride-Exide Brand.
- Most PV system use charge controllers and technicians are aware of the charge controller importance.

- A national PV Standards exists and the Mwanza PV project has played the key role in the development of the PV standards in Tanzania.
- Low quality PV equipment observed in Mwanza are not directly imported to Tanzania but are coming via Kenya due to Mwanza proximity to Kenya.
- The SIDA project planned to provide technical training to TRA (Tanzania Revenue Authority) personnel on PV (TRA is responsible for enforcement of Standards at Ports) and also SIDA project will provide PV test equipment to TBS.
- Tanzania annual PV market is estimated at 350kWp with HH dominating the applications.
- PV Pumping is very limited due to high cost of the system and it is donor driven as donors support health, education and water.
- SIDA consultant opinion on the Mwanza project is: The project was very successful, trained many technicians, made PV awareness in Mwanza very high and boosted PV business in the area (ZARA Solar and REX Investment are good examples).

3- **Dr. Lutengano Director General: Rural Energy Agency (REA):**

- REA is an autonomous body established by a parliament act.
- REA promotes and facilitates rural electrification through subsidies to project developers (this is done through its Trust Fund).
- So far, project development subsidies were provided to projects in Min-Grids, Micro-hydro, Wind and PV Solar.
- REA is currently piloting a PV solar project for institutional systems (Schools, and Health facilities) with a budget of US$2mil at the national level. So far, demand study is completed, standard PV system designs for schools and health centers were identified and the PV contractor(s) will be responsible for the provision of equipment and services for 5 years.
- Another project under consideration is the Solar Cluster Project targeting coffee and tea cooperatives for lending end users (different from the SIDA approach).
- A third project in the REA pipeline is for lending for household with subsidies of US$2 to US$2.5/Wp. This is also for 5 years contract for the equipment supply and service.

4- Eng. Dunstan Kalugira, Head Electrical Engineering Standards (Tanzania Bureau of Standards –TBS):

- Tanzania has 16 PV standards covering all PV system components.
- For enforcement of the PV standards, TBS has no test facility but currently actively doing PV importer awareness on the availability of local PV standards and the need to consider it. Also, issues wants to importers that, PV equipment should come with a test certificate from accredited test laboratories and should conform to the local Tanzania PV standards requirement.

- The Mwanza PV project has funded the whole process establishing the Tanzania local PV standards. Also, the project has funded 10 technical committees on the PV standards in Mwanza and Dar Essalam.
- The Tanzania PV standards are approved by the TBS board and in place since 2006 (although not yet Gazetted).
- There is exists standards for PV code of practice but its enforcement is left for the project implementers and contractors.
- Due to work done locally in establishing PV Standards, the TBS is participating in the IEC-TC-82 internationally.

5- Eng. Hamisi Mikate, Chairman of the Technical Committee (Tanzania Solar Energy Association –TASEA):

- TASEA is mandated to promoting Renewable Energy Applications in Tanzania through (information are distributed in English and local Kiswahili languages):
    - Networking of Renewable Energy stakeholders.
    - Public Awareness and Advocacy.
    - Technical Training.
    - Publication.
- TASEA funds its activities through membership fees, Organizing RE workshops, Sub-contracts for RE projects, Government contribution in terms of projects and Donations.
- TASEA is involved in PV Quality improvement through informing the public about substandard PV products in the market.
- TASEA also receives volunteers from many countries who are interested in doing RE related research in Tanzania.
- Currently the preparation of the Tanzania RE Directory in its final stage.
- The proposal for custom and VAT exemption for PV to the Tanzanian government was funded by the PV Project and prepared by TASEA.

6- Eng. Hamisi Mikate, Managing Director/Ensol Tanzania Limited:

- Ensol supplied PV equipment to the Mwnza PV project.
- Ensol used to get enquiries for the Mwana/Lake Zone from Dar ESssalam based individuals/institutions. Now Ensol receives more enquiries for PV systems from customers from Mwanza and Lake Zone directly. This is as a result of the increased awareness on PV and PV Chain created by the project.

Date: 27.07.2009

Eng. Isdory Fitwangile, Project Manager: Transformation of Rural PV Market in Tanzania.
(Provided Complete over view of the project status and project reports).

7- Mr. Mohamedrafik: Managing Director ZARA SOLAR – MWANZA

- Started PV business in 2000 in his brother shop and activities were very minimal.
- Established ZARA Solar in 2005 when the real PV market kicked off as result of the Mwanza PV Project awareness and training program.
- ZARA Solar benefited from the PV Project supply chain financing scheme when he received a loan of US$12000 through the CRDB which he paid back in 6 month period. He didn't tried the project lending scheme again as the level of funding was too low for the scale of PV business he was running. Now he is running his business from loans he gets from the normal banking system and he is maintaining big stocks of PV modules and components.
- ZARA Solar is keeping good quality of PV equipment and always sourcing from internationally recognized PV manufacturers.
- ZARA Solar is now the biggest PV dealer in Mwanza (he also established a branch in Dar-Essalam) and sells equipment and also carries out installations. The company has well trained technicians (by the PV project) an also relies on freelancers in some districts.
- ZARA Customers are 80% individuals and 20% institution and all pay the full cost and he is not providing credit.
- Some competitors of ZARA used to sell sub-standard (low quality) PV products, but awareness made by the PV project enabled people to differentiate between products and quality.
- According to ZARA Solar, PV market in Mwanza is now sustainable and is not expected to be affected by the project phase-out.
- Most sales are systems and the small sizes 14 to 50Wp are fast moving.
- A great contribution made by the PV project in removing the customs and VAT from PV modules and components.

8- Mr.Nizar Parpia, Director: MONA Electrcal and Electronics-Mwanza

- Sourcing PV equipment from Dar Essalam based PV suppliers.
- Financing his business from equity capital and keeping limited PV stocks.
- Customers are mainly individual and small systems (14Wp-30Wp) for lighting.
- He is selling items and also doing installations when requested. His technicians trained in VETA (by the PV Project).
- The PV project awareness campaign has facilitated the kick-off of the PV market in Mwanza

9- Ms.Sleevia Roman, Justine Electronic/Sales Shop (Mwanza):

- Established in 2008. Selling and Installing PV systems. The shop benefited from the project training and awareness programs.
- Sourcing small system components (<20Wp) from Nairobi based PV dealers.
- Most customers are individual.

10- Ms.Hawa Jumaa, Mukesh Vunja/ Sales Shop (Mwanza).

- Established in 2007 and only selling PV components.
- Sourcing PV equipment from Nairobi and Dubai based dealers.
- The shop established as result of PV demand created in the area (Project awareness)

11- Ms.Salima Saeedi, Elisha Solar & Electronics, Sales Shop (Mwanza):

- Established in 2008 and sells/installs only PV products.
- Sourcing PV equipment from Nairobi based PV dealers.
- Customers are individuals (lighting, mobile charging and power for TV/Video).
- Awareness needs to be continued.

Date: 29.06.2009

12- Ms.Gertrude M. Kulindaw: Assit Admin Secretary –Social Sector Support Service – (Mwanza)

- The administration is convinced with the positive role of PV in improving the functionality and availability of social services.
- The administration support the idea of allocating fund for PV systems maintenance and installation of new ones in education and health services, but

the request for such fund should come as part of the individual district budget. Further, demonstration systems installed by the project appeared small to meet the institution demand and future installation should consider bigger systems.

- The project contributed to convincing the regional administration and the public of the role and importance of PV to the rural communities.

13- Mr. Mamertus G. Luena: SME Account Manager (CRDB Mwanza Branch):

- The project has deposited TSH60millions for supply chain lending with the sealing for an individual loan not exceeding TSH15 millions at an Interest rate of 80% (annual) and the total lending seal not exceeding 80% of the Fixed Deposit at all time.
- The bank has lend PV dealers and reached the sealing of the 80% and throughout the period he experienced a delayed re-payment by one dealer, but finally the bank got the money after taking legal steps against that dealer.
- Challenges were:
    - Short lending period (6 month extended to 9 months).
    - Loan sealing was too small for a number of PV dealers who then preferred to go for normal lending practice.
- Way forward:
    - Increase guarantee amount.
    - Finance wholesalers rather than small shops (economy of scale).
    - Consider longer re-payment period.
- End user financing was not included in the Bank-Project MOU which already expired.

14- Mr.Albert Michael: Micro-finance relationship Manger (CRDB Mwanza Branch).

- CRDB has micro-finance sister companies that assist low income people.
- Individual financing is possible but the bank has to be sure that the client meets the lending requirement.
- The Interest Rate is negotiable depending on source of income of the client.
- For lending SACCOS (Saving and Credit Cooperative Society) there is a lending seal which is calculated according to their savings and it will be illegal to finance SACCOS above that sealing.

15- Mr.Joseph H. Mwanda Acting Manager VETA Mwanza.

- The PV project has provided training for VETA instructors, PV equipment for PV experiments and developed a PV Curricula for teaching in VETA (English/Kiswahili).

- PV education in VETA Mwanza started in 2006 with 15 students, then 13 students in 2007, 9 students in 2008 and 15 students in 2009.

- The training composes of Theoretical and Practical sessions as well as field visits to PV installations and the student spend one year studying only PV systems.

- Currently VETA Mwanza is preparing for one month short PV courses for technicians who already have background on electricity and field experience.

16- Mr. Xavier: Secretary of Magu Teachers SACCOS-Magu.

- The Magu SACCOS is established in 1993 and currently have 850 members who are mostly teacher and some civil servants.

- The PV project has provided TSH21 millions (without interest) which was used to finance PV systems for 19 members. The SACCOS provides repayment period of from 1 to 3 years, but the PV project lending was provided for 10 months , so the SACCOS has re-paid the loan to the project (before receiving all the re-payment) from its own resources by the end of the lending period.

- The SACCOS financing condition to the member is that, individual total re-payment should not exceed 50% of his net salary.

- Currently the SACCOS have financed PV systems for 9 members from own resources.

- Requested PV systems are (1) Lighting, (2) Mobile Charging and (3) TV/Video

- The SACCOS is not facing any repayment problems because payments are collected directly by the treasury from the individual salaries (contractually).

- Currently the SACCOS is implementing projects in the volume of TSH1.2 billion (this two loans TSH200 million and TSH1billion received from RCDB on 12% interest rate). The monthly collection rate is TSH51 million and the monthly re-payment on both loans is TSH43 millions (The SACCOS charge is 2%).

17- Mr. Xavier (Magu SACCOS above - as a PV system end user)

- He owns 280Wp system used for operating TV/Video for income generation.

- The system cost was TSH5 million (2005).

- He is operating the system 7 hours/day and receives between 30 and 40 customer a day and the fee is TSH200/person.

Date 30.06.2009

18- Mr. F.R. Kissimba: Assit Admin Secretary-Economic Development (Kagera/Bukoba)

- Kagera is part of the Uganda-Tanzania interconnect power grid and enjoying good electricity supply at towns and some villages. But grid extension is becoming prohibitive with increased electricity tariffs.

- The concept of PV for rural electrification is clear to the administration and the awareness made by the project has played an important role in making decision makers and individuals aware of the advantage and limitation of PV systems.

- The replication of the PV project in Kagera is very slow and demonstration system not yet installed for budgetary reasons concerning the Regional Administration in availing its contribution. But now the contribution is ready.

- The regional administration policy now, the annual budget will include a PV component for system maintenance. PV will be integrated into all new construction (School & health facilities) budget.

- Also NGOs active in the health and education sector in the region will be advised to consider PV within their activities.

- The Regional Administration has already requested the appointment of an Energy Advisor in Kagera in order to enable the Kagera Region prepare PV project proposals to the REA.

- There is a need for the PV project continuation and the involvement of the local SACCOS as key important pre-conditions for the PV market to kick-off in the region.

19- Mr.Saidi A. Kirrari: VTC Principal (VETA Kagera)

- The VTC has received PV equipment for teaching, PV Syllabus and 2 of its instructors have been trained by the PV project.

- PV is integrated into the Electrical track of the VTC and the first intake commenced 2009. The group is composed of 20 students (level 1 – Basic) and 12 students (Level 2) and the student spent 2 years in the VTC to graduate.

20- Mr. Balthazar M. Kimaro: Mara-VTC Manager and Mr.Emmanual: Instructor Mara-VTC.

- 2 instructors have been trained by the PV project.

- The VTC received teaching syllabus and PV equipment very recently.

- PV is considered as part of the Electrical track and the first batch will start in July 2009.

- The VTC is planning for short courses (3 month) in PV and already received request from technicians working in the area (Former VTC graduates).

21- Mr.Marendra Vishani: Owner Kagera Electricals & General Supplies (Bukoba)

- Started selling PV components since 2005 and deals with MONA Electricals of Mwanza.
- He prefers to design, supply and install PV systems for his clients as he is concerned about the quality of the products and installation services available in the area.
- He has received training from the project.

22- BWANG PV SHOP (Bukoba)

- Selling PV items and sourcing from Mwanza and Kenya.

Date: 1.07.2009

23- Mr.Samsong Johana: Principal Community Dept Officer (Also Project Focal Point) – Musoma (Mara Region)

- The PV Project helped reducing dependence on Kerosene for lighting by making people aware of the PV alternative.
- The project activities started in Mara in 2007 by awareness workshop followed by training of 32 technicians.
- The region received three demonstration PV systems and the regional administration has financed the installation and currently implementing PV systems for school lighting and health centers (3 systems per council with a total of 5 councils in the region).
- Some school systems are sponsored by school fund and system are supplied and installed by Mwanza based PV supplier.
- PV is budgeted into the annual district council begets to cover a number of lighting systems for schools and health facilities.
- There are three local PV shops selling PV components.
- Some vandalism cases were reported.
- Awareness and technical training should continue to sustain the efforts made so far.

24- Mr. Dickson Samson: Owner, Tibesi Gua Electrical PV Shop, Musoma (Mara Region).

- Since 2006 selling components and rarely systems.

- There is a great concern over equipment quality and available components are imported from Kenya (people purchase cheep items) and of low quality.

25- Mr.Mujuni: Owner : Munjuni Electrical PV Shop, Musoma (Mara Region).

- Since 2005 selling PV components (sub-standard) and sourcing from Kenya, Mwanza and DarEssalam.
- The high cost of PV makes it not affordable to many potential users.
- Originally the shop was for electrical items but entered into PV as new business opportunity appeared as result of the PV project.

26- Mr.Denis Azaria Nyambita, Owner: Sunshine Solar and Electricals (Mwanza)

- Established in 2004, have a PV trained technician and benefited from the PV project awareness efforts in PV market development.
- Sells and installs systems and components and sourcing from Dar Essalam, Mwanza(ZARA) and Kenya (Free Energy and Premier modules).
- He benefited from the project supply chain finance twice (TSH15 million each) in 2007 and 2008 (think the lending period was too short). In 2009 he wanted to go for the same finance but CRDB denied him the chance saying the MOU with the project is expired. But interestingly, he has been approached by the same bank to finance him from the bank resources.
- He has dealer in Kagera and Shinyanga.
- No report of defects yet

27- Mr.MohamedRafik: Chairman TASEA Mwanz-Mwanza.

- There is a great job done by the PV project. To sustain it awareness among dealers (quality products), Training dealers (to know what to sell and advice customer instead of selling him what he asks for) needs to be continued.
- TASEA Mwanza has collaborated with the PV project from day one and can handle the awareness requirement as long as it has been financially supported or contracted to do that. This is highly recommended.

Date 2.07.2009:

28- Mr.Mshuga Deus: Civil Eng-Shinyanga Regional Secretariat – (Project Focal Point Shinyanga)

- Stareted n 2007 by awareness campaign targeting district officers.
- The project provided PV modules for 17 demonstration sites and the remaining BOS and installation cost was contributed by the Regional Authorities.

- The 17 units were installed at dispensaries as the health sector was the responsive to contribute towards the request for participation is overcoming the installation cost.
- There are 40 technicians who are trained by the PV project and also 5 dealers active in the provision of PV equipment.
- PV is budgeted for in the new annual budget to install PV systems in health facilities and schools.
- The RAS has a technician trained on PV and assists in the preparation of bill of qualities and costing for any PV system budgeted for by the respective district.
- Awareness on maintenance requirement of PV system is needed as people think PV is a system to install and forget.

29- Mr.Theobala Tifus Isaca, Director VTC Shinyanga & Mr.Willson PV Instructor VTC Shinyanga

- The institute has gone a complete renovation period and activities were hanging but will commence this month.
- Two VTC instructors are trained by the PV project, PV equipment for education received and the instructors have their training manual (Curriculum not received yet).
- The VTC is planning a one month PV course this month (already received many requests). The continuation of this practice will depend on the real response and number of participants.
- PV will be included in the VTC training program as part of the electrical track (2 year study) and the first intake will be next year.
- The idea of selecting the VTCs as technician certification bodies is highly accepted.

30- Onesmo Electrical Shop – Shinyanga

- Selling PV items since 2008 and sourcing from Kenya mostly substandard PV product with focus on low price products.
- Has a trained technician and sells are quite low.

31- Peter Tesha Backbone Electrical Shop – Shinyanga

- Selling PV substandard items since 2006.
- Sourcing from Mwanza and Dar Essalam in small quantities.
- Have an installation technician

32- Eng. William Masome: Panning Eng. TANESCO Mwanza (Member PV Project TC).

- Rural Electrification is the responsibility of REA and TANESCO is not planning to be involved.
- Grid extension to small towns and villages is not under consideration by TANESCO.
- The Electricity Power sector in regulated with EWURA (Energy & Water Utility Regulatory Authorities under the Ministry of Water) responsibility.
- There are IPPs generating electricity and selling to TANESCO as still the Power Transmission and Distribution is monopolized by TANESCO. IPP selling price to TANESCO is determined by EWURA.
- PV is very important to electrify remote towns and villages as they are out of TANESCO scope and not foreseeable for TANESCO to extend grids to those communities.
- TANESCO have a wind power min-grid in an island (This is donor funded and implemented).

Date: 3.07.2009

33- Mr.Muttabilwa –Medical Officer in Charge – Health Center (Katungura-Mwanza)

- Two Demonstration PV Systems were installed at the Health Center (64WP and 2x64Wp) in 2006 and the district contributed by the installation cost.
- Both are using vented batteries and for lighting purposes only.
- Code of practice looks good but currently the units are suffering aging batteries.
- The center has a third PV system received and installed by the Catholic Relief Services. This is an AC system powering computer. The system comprises of 4 PV modules (2 similar in size and type but the other two look different in size and shape. Also the array direction is not exactly facing the north.
- Repair funds are available through community health contribution and accumulation of patient entry fees.

34- Mr. Magang Masakoli (Chairman) and Mr.Malimo Hassan (Treasury): Tubendane Farmers SACCOS (Geita-Mwanza).

- Established in 1999 and registered in 2001 with 35 members and currently the number exceeded 200 members.
- Started by TSH35000 and currently owns TSH27 millions.
- Resources from member entry fees, Shares and Savings. They have a loan committee and a loan follow-up committee.
- Resources are used for lending for: Agriculture, Commercial activities (shops), live stocking and Gold Mining (most resources are circulated within the members in lending and very little at the bank). So far they are not able to get bank loans.
- Received TSH27.7 million loan from the PV project with the following conditions:
    - Interest free
    - Lending PV equipment to members and not cash money
    - Lending period of 9 month
- The project money was used to lend PV equipment to 21 members and a system or the SACCOS office computer (for 9 month period as per agreement with the project). The SACCOS was getting 10% Interest (annual).
- The SACCOS internal lending terms are: Provide Personal property as collateral and a Granter (should be a member of the SACCOS).
- They re-paid the total amount in 9 months as agreed.
- Most systems were 64Wp for light and TV but almost all are disappointed with the performance as they can use TV for very short period (< one hour).
- The system sizes were selected from company brochures they received from dealers who attended the project awareness campaign in the area.
- Some systems are one module 64Wp and others 4x15Wp, the latter being less efficient.

35- Mr.Medard Kachubo, Owner of Intera Professional East Africa Ltd (Sengrema Mwanza)

- Trained by the PV project and established the company in 2004.
- Selling and installing PV modules, BCU, Inverters, lamps and batteries. Sourcing from Dar Essalam, Mwanza and Nairobi.
- Fast moving are small and medium PV systems (14Wp-70Wp).

- Got two loans from the PV project finance modality, first TSH12 millions and then TSH10 millions with IR=8%. The fist loan he repaid in 6 month (market was good), the second he has experienced delay due to delayed collection the company was waiting for, but the bank could not give him the chance and took steps against the company but finally he was able to settle his obligation.
- Problems with the project lending were small amount and very short repayment period. It could have been reasonable if the period made 3 to 4 years. In such case he can go to up to TSH50 million.
- Currently received a US$50,000 from E+Co for 4 years at an IR=8% on quarterly repayment condition.
- There is a great concern on product quality
- Average sales: 14Wp (6units per week), and 50-100Wp (1 to 2 units per week).

Annex (IV)

List of Document Reviewed

1- GoT/UNDP/GEF: Transformation of Rural Photovoltaic Market in Tanzania, Project Document March 2004
2- D. I Banks, K Steel & O Kibazohi: Mid-Term Evaluation Report, March 2007.
3- Got/UNDP Report on Baseline Data Survey for PV Solar Project in Mwanza Region, Feb.2005.
4- Imanuel W. Muro, Evaluation of Supply-Chain Practices, Center for Sustainable Development Indicatives (CSDI), June 2006.
5- Management Audit of Transformation of Rural Photovoltaic Market in Tanzania, Financial Consultants & Services (FCS), Jan. 2008.
6- UNDP/GEF APR/PIR 2007 – Climate Change, June 2007.
7- UNDP/GEF APR/PIR 2008 – Climate Change, July 2008.
8- Annual Performance Report for 2007. Dec.2007.
9- Annual Performance Report for 2008. March.2008.
10- Mzumbe Musa, Solar PV Supply Chain Evaluation Report, June 2008.
11- Mzumbe Musa, Solar PV Productive Uses Evaluation Report, July 2008.
12- The National Energy Policy, MEM 2003.
13- Rural Energy Act 2005.

Annex (V)
Sample of PV Dealer Information Sheet

RESCO (T) LTD
Nkrumah Street, Plot No. 430/158 Next to Continental Hotel
P.O BOX 1517, DAR ES SALAAM

Mobile: + 255 754 982004, 754 492260
Tel/Fax: +255 22 2127578
Email: info@resco-tz.com Web: www.resco-tz.com

DECCN TANZANIA LIMITED
For Affordable and Reliable Energy Solutions

4.02.2009

SOLAR SYSTEM FOR TWO LIGHTS

S/N	ITEM	AMOUNT(TSH)
1	14 Wp Amorphous Panel	90,000
2	5 A charge Controller	50,000
3	26 Ah Battery	57,000
4	2 X 6W FL (Sundaya)	30,000
5	Accessories	114,950
	Net Price	**341,950**
	INSTALLATION	40,000
	GRAND TOTAL	**381,950**
The system will power two lights for 3 hours each per day		

SOLAR SYSTEM FOR FIVE LIGHTS + RADIO

S/N	ITEM	AMOUNT(TSH)
1	40 Wp Crystalline panel	380,000
2	5A charge Controller	50,000
3	100 Ah Solar Battery	180,000
4	5 X 6W FL (Sundaya)	75,000
5	Accessories	318,925
	Net Price	**1,003,925**
	INSTALLATION	100,000
	GRAND TOTAL	**1,103,925**
The system will power FIVE lights for three hours each per day and a radio		

SOLAR SYSTEM FOR FOUR LIGHTS + RADIO

S/N	ITEM	AMOUNT(TSH)
1	2x14Wp Amorphous Panel	180,000
2	5 A charge Controller	50,000
3	50 Ah Solar Battery	110,000
4	4X 6W FL (Sundya)	60,000
5	Accessories	221,875
	Net Price	**621,875**
	INSTALLATION	60,000
	GRAND TOTAL	**681,875**
The system will power FOUR lights and a radio for 3 hours each per day.		

SOLAR SYSTEM FOR SIX/SEVEN LIGHTS + RADIO

S/N	ITEM	AMOUNT(TSH)
1	55 Wp Crystalline Panel	550,000
2	10A charge Controller	80,000
3	100 Ah Solar Battery	180,000
4	3 X 6W FL (Sundaya)	45,000
5	4x7W/12V FL (Phocos)	60,000
6	Accessories	423,375
	Net Price	**1,338,375**
	INSTALLATION	130,000
	GRAND TOTAL	**1,468,375**
The system will power SIX to SEVEN lights for three hours each per day and a radio .		

SOLAR SYSTEM FOR FIVE LIGHTS + RADIO

S/N	ITEM	AMOUNT(TSH)
1	3x14Wp Amorphous Panel	270,000
2	5 A charge Controller	50,000
3	75 Ah Solar Battery	144,000
4	5 X 6W FL(Sundaya)	75,000
5	Accessories	221,875
	Net Price	**760,875**
	INSTALLATION	75,000
	GRAND TOTAL	**835,875**
The system can power FIVE lights and a radio for 3 hours each per day		

SOLAR SYSTEM FOR EIGHT LIGHTS + RADIO

S/N	ITEM	AMOUNT(TSH)
1	65 Wp Crystalline Panel	634,000
2	10A Charge Controller	80,000
3	2X75 Ah Solar Battery	288,000
4	4 X6W CFL (Sundaya)	60,000
5	4X12V/7W FL (Phocos)	60,000
6	Accessories	479,825
	Net Price	**1,601,825**
	INSTALLATION	160,000
	GRAND TOTAL	**1,761,825**
The system will power EIGHT lights for three hours each per day and a radio		