

**TRANSFORMATION OF THE RURAL PV MARKET  
IN TANZANIA [URT/03/G31]**

**EVALUATION OF SUPPLY-CHAIN FINANCING  
PRACTICES**

**FINAL REPORT**

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## LIST OF ABBREVIATIONS

COD	Cash on Delivery
CWO	Cash With Order
CRDB	Cooperative & Rural Development Bank
GOT	Government of Tanzania
GNI	Gross National Income
FBO	Faith Based Organization
GEF	Global Environment Facilities
MFI	Microfinance Institutions
NBC	National Bank of Commerce
NMB	National Microfinance Bank
PRIDE	Promotion for Rural Initiatives and Development Enterprises
PV	Photovoltaic
PDF	Program Development Facility
REA	Rural Energy Agency
REF	Rural Energy Fund
REMP	Rural Electrification Master Plan
SACCOS	Savings & Credit Cooperative Society
TANESCO	Tanzania National Electric Supply Company
TRA	Tanzania Revenue Authority
URT	United Republic of Tanzania
USP	Unique Selling Proposition
UNDP	United Nation Development Program
Wp	Watt Peak

## **0.0 EXECUTIVE SUMMARY**

### **0.1 INTRODUCTION**

This report presents the findings of the evaluation of the financing options available for PV systems suppliers. Specifically the studies build upon financing options identified during the PDF (Nov 2001) and the result and recommendations of recently conducted study (May 2005) on PV consumer financing so as to identify and recommend the most suitable mechanism for financing PV suppliers and dealers. The field engagement carried out in Mwanza region in December 2005 was commissioned by the management of URT/03/G31, a UNDP/GEF funded project in Mwanza region. The project has four immediate objectives which together input into the ultimate project objective of “removing barriers with the aim of promoting the commercial utilization of photovoltaic (PV) to provide the basic electricity services to improve people’s livelihoods and reduce dependency on imported fossils fuels”. This five-year project is currently carried out in all seven districts of Mwanza region.

The supplier financing evaluation complement the consumer financing evaluation study and both respond to, and address the fourth immediate objective that seeks in “exploring, develop, and test and adopting viable financing options for dissemination of PV systems as the basis of spreading experience and lessons learned to promote replication throughout the other regions of Tanzania”. The study walk through the effectiveness and the level of utilization of financing options identified during the project design phase and build, link and harmonize the findings from the recently concluded study on consumer financing. As per terms of reference, the outputs generated from this work are the result of carrying out the following specific activities;

- Review of general financial regulations and the rules and terms of lending practices by different financing institutions in Mwanza region;
- Assessment of remarkable expansion and growth of the PV market currently noticed in Mwanza region;
- Explore the financing model recommended for consumer financing and assess how both types of financing can be interlinked; and

- Reviewing the experience of PV financing in other developing, especially the neighboring countries;

## **0.2 Methodology**

The methodology adopted included debriefing meetings with the project management team, review of documents and reports and interviews with financial institutions, PV suppliers, PV technicians, SACCOS, actual and potential individual buyers etc. The field visits to Mwanza region which is a pilot region touched base with the operations of suppliers/dealers, technical service providers, current users, etc. The primary study covered the city of Mwanza, Sengerema and Magu Districts. While Mwanza City and Magu involved physical visits, Sengerema was communicated through telephone including an interview with district based supplier who visited Mwanza on request.

## **0.3 Overview of PV Supply-Chain (Market)**

The PV supply chain in this context includes manufacturers, wholesalers/dealers, retailers, technical services provider/solar technician and consumers or end users. These actors operate independently but they all focus on the ultimate buyer. The PV supply chain in Mwanza comprises limited number of wholesalers/dealer that imports from outside the country i.e. USA, South Africa, German etc for eventual selling (on demand) to numerous retailers located in the city and three districts of Geita, Sengerema and Ukerewe. These retailers sells PV systems along with other items suggesting the possibility of internal re-switching of working capital to the next product line with higher financial reward or returns.

The financing of various supply actors is concurrently considered along with status of PV consumer market. This is true for any market economy where demand drives production and other market attributes including financing, engagement of the actors and delivery. Critical to Mwanza PV Market chain is the implication of “pyramid of mark-ups” on the price paid by the ultimate user which is already a barrier for widespread uptake. Second and of equal magnitude is market development stage which is now cruising along pre-commercial in some districts, and pioneering and emerging stages in other few areas. The overall market performance reflects the growing consumer demand including the increase in the number of retailers and technicians.

#### **0.4 Product Assessment**

There has been a significant product use enlargement by moving from limited domestic use to productive such as commercial charging of mobile phones, powering of TV for business show etc. The price reduction as a result of removal of taxes and duties (VAT) on PV system components has substantially increased the quantity demanded thus reflecting fairly high price elasticity on the product. The evaluation interview confirmed the three major shops operating at Mwanza City to have experienced the sales increase on average of three to five folds in the last six months of June –November 2005. While productive use (purpose) and price factors have been driving favorably towards increasing consumer demand, there are no clear indications of adequate engagement of other chain actors/suppliers in ensuring stable flow of product which is currently erratic. The purchase has mostly involved small PV systems ranging from 14Wp -50Wp have been financed from family sources as opposed to borrowing.

#### **0.5 Supply Development Trend**

Like many other products, the decision to allocate resource on PV systems among available options is driven by the current and potential market and the product/market life cycle. The PV supply growth in some areas/districts is crawling along the pre-commercial and pioneering markets. This is seen in the districts where there are no retail outlets though solar technicians are active in soliciting orders and doing some installations. The three districts of Sengerema, Geita and Ukerewe are sailing half way between pioneering and emerging markets. This is the conducive condition for financial investment as it provides longer learning curve, risks mitigation gateways and gradual experiential learning and consolidation. In general, the market development is now at the right footing for financing interventions.

#### **0.6 Evaluation of Potential Delivery/Financing Models**

The emergence, growth and sustenance of PV supply-chain often take different outlooks depending on the initial objective and motivation of the chain actor i.e. early adaptor or lagers. There are sharp opinion differences between suppliers who pioneer market even if there are no immediate indications or likelihood of making profit and the rest. This group believes in nurturing consumer demand right at the heart of end-users locations. The other group/suppliers emerge not because there is end-users effective demand but rather there is a financier who wants to install PV systems as means of power in carrying out a particular project i.e. where there is no grid electricity. The other extreme consist of

suppliers who crop up after noticing the initial signs of the potential growth of PV demand.

- **International Ordering-** This is the shorter chain that moves the equipment from the manufacturer directly to the customer without involving intermediaries such as dealers and wholesalers. The absence of local PV market players including experts to install the systems is the major push for the utilization of international ordering. This type of supply chain is very appropriate to non- commercial environment targeting mainly institutions that focuses on larger systems mainly financed by government and/or donors. The fact that Mwanza market is dominated by SHS makes this delivery method not very appropriate.
- **Donor Aid Initiated and One-off Market Test Ordering-** The actors in this type of supply/chain emerge in the wake of uncovering the existence of potential PV orders through government funding, donors or individual investor. The successful entry and creation of product image triggers follow on importation of small quantity of PV like what is now happening in Mwanza after project intervention. The mode has an advantage of raising curiosity and product awareness and from the standpoint of this study it had higher positive impact in areas where demonstration PV systems were installed i.e. health centres, schools etc.
- **Retail Cash Market-** The retail cash market delivery model is an indicator for developed consumer demand. The supply chain is characterized by relatively well developed distribution networks that reach out wider customer base. The chain attracts several actors along who adds small profit margin because of the price sensitivity on the part of ultimate buyers. Financing between the wholesale/dealer and retailer attract limited time credit but the retailer to consumer/end-user is *strictly cash*. The chain is engaged mainly with small home systems (SHS). The retail cash market is gradually building up in Mwanza PV market.
- **Wholesale Commercial Market-** This chain involves multinational companies with substantial financial muscles. The actors are commonly found in the international tendering system where the award of supply is the result of competitive bidding process with specific selection criteria. Most of these suppliers are vertically integrated from procurement, installation, and maintenance and servicing of parts. This type of supply

delivery model is weak agent for developing consumer market and is neither common in Mwanza nor in the rest of the country.

- **Hire Purchase Credit** - Hire Purchase (HP) delivery system is the mode that permits the purchaser to access the PV systems without hundred percent upfront payments or giving up personal valuable as collateral. On the part of the seller it minimizes the level of risk because of the right to repossess the product in case of default in paying the outstanding installment. The mode ensures supply of high quality products to induce continuity of installment repayment including possibility of re-selling incase of repossession. Technically, it is recommended to supply the whole system instead of components including installation to avoid mixing with weak quality parts and wrong installations. The study doesn't show to have been used in any stage of delivery chain in Mwanza.
- **Finance Credit Supply Chain.**-This is a member-clients driven chain. The cooperative organization identifies the PV needs of its respective members by inviting applications to assess the actual requirements. The SACCOS enters into an agreement with partner lending institution i.e. bank that pays the suppliers direct on agreement of delivering to SACCOS that eventually delivers to members as in-kind loan. Currently, the Magu Teachers SACCOS is making similar arrangement but it hasn't identified the right supplier who can source and deliver adequate sets of PV. This model is appropriate for supply –chain financing in Mwanza and the rest of Tanzania.

### **0.7 Financing Implication of Lending Terms and Conditions**

The lending terms and conditions vary slightly among different commercial windows thus creating limited flexibility in choosing one bank in favor of another. There are several shadow barriers that are more inhibitive than explicit lending terms and conditions. The pre-conceived negative attitude of potential economic failure should one goes for bank loans is considered the most critical barrier. The information gap between the PV suppliers and credit institutions is another key barrier. Most of the chain actors are now, unlike in the past, concern on attributes like the interest computation method, repayment patterns and grace period. In general people are now more aware on the impact of lending terms and conditions on cash flow than looking at them in isolation.

Financing of PV suppliers in the emerging market like the one currently performing in Mwanza will require a sizable amount of working capital. However, collateral will likely in the foreseeable future continue to be an obstacle towards utilization of financing facilities in the envisioned PV commercialization. The limitations on what qualifies as collateral including the requirement by the potential borrower to pay for the valuation costs sound inhibitive to many. Still many small and medium businesses find it difficult either by habit or because of the cost involved to keep business records and use of banks. This weakness denies most of the potential applicant the track record of past performance and records which are used by the bank officials to determine the applicant's liquidity levels, loan amount and grace period and repayment patterns.

## **0.8 Practicability of Lending Terms & Conditions**

Continued influx and willingness by the small entrepreneurs to borrow from MFI to the tune of 30% pa (flat rate) on weekly repayments suggests the existence of other barriers other than interest rate which attract many complaints. The said MFIs' terms further require payment of compulsory upfront and continuous savings, fees and transactions costs i.e. transport to collection/repayment centres. It was revealed, depending on the risk level the bank can negotiate interest down to 8% pa yet some people find it difficult to approach a bank even for initial discussion and networking. The lesson learned from the impact of promotion and awareness campaigns on the availability of PV requires replication to financing. The fear and negative attitude expressed in the stakeholder's workshop has to be mitigated through creation of the right image on the benefits accrued to borrowing i.e. bank loans.

The habit of not keeping proper business records implies sustained inability to prepare authentic financial statements i.e. income statement, balance sheet and cash flow statement. Lack of these statements and records means no independent opinion on the fairness of the records and financial result of the company can be made by the auditor i.e. audit reports. The weakness of not keeping adequate records has been further reinforced by failure to utilize banks that could serve as an alternative source of assessing the authenticity of the records. The Business Development Service providers' shorter terms sacrifice because of small amount of fee to support them will likely be compensated by creation of the critical mass of clients in the future.

## **0.9 Evaluation of Financing Options Identified During the PDF –Block B (Nov 2001)**

Most of the suppliers have been found to continue using more of cash to finance the purchase of their supplies than any other options. The ability to match the increasing business volume has been the result of rationing the available capital by substituting other low rewarding items with PV systems. Lack of collateral remains a major disconnect factor between the lenders who are keenly looking for borrowers.

During the PDF, the NMB bank was singled out as the most appropriate rural financial vehicle but by that time (2001) it hadn't started lending to micro and small enterprises. Following restructuring including privatization the bank is now offering several loan products to SMEs. The discussion with bank management reflects an interest and willingness to promote PV market development through lending to small and medium level suppliers. The bank is also a participating bank under recently (2005) introduced SMEs credit guarantee scheme where the GOT through BOT guarantee 50% of the loan.

The Hire Purchase has to-date not yet effectively been utilized in stimulating PV businesses as earlier conceived. There is a substantial knowledge gap and both consumer and suppliers awareness on how the HP operates. The few who are aware find this form of financing more risky because of potential loss associated to the failure to dispose the repossessed asset. While the HP could conveniently suit wage earners it is relatively difficult to carry them in rural areas where PV systems are more marketable.

The limited amount of loan given by MFI has continued to be the limiting factor for suppliers to access financing. Still the TZS 5.0 million stands as maximum including group guarantee. The SACCOS policy of lending three times the amount of savings with no requirement of collateralization is such an important exit. However, this form of institution is still suffering from limited amount of lending capital. The ongoing CRDB-SACCOS downscaling strategic partnership offers a potential lending window for medium size PV suppliers.

### **0.10 Remarkable Expansions and Growth of PV Market**

The last six months ending November 2005 witnessed a remarkable expansion of PV systems sales. The three major retail outlets of Ms AOL Technology, Mona Electric and Zahra Electronics confirmed sales to have increased on average of three to five times. The one hour field visit and interview at Ms Mona and Zahra Shops which neighbors each other at the City centre witnessed an average of ten (10) PV enquiries of which two of them (20%) turned out to be actual purchase of PV panels while the other two (20%) bought PV parts. The unique feature which was noted during the interview with these buyers is the fact that they came as far as Shinyanga, Tabora and Kigoma regions.

The remarkable growth of PV consumer market is associated short and long term market and financing factors. The 15% to 25% price decrease as a result of VAT and duty removal has made the product more affordable especially small systems of 14Wp. The awareness and promotional campaigns through the use of TV, radio and demonstration in rural areas is relatively considered more instrumental. The widespread use of cell phones in rural areas has created demand for power to charge them. The expanded use of solar PV to power TV and skyrocketing of fuel to run generators has made many people to opt for solar energy which is cheap and safe for mobile phone handsets.

### **0.11 Market and Financing Implications for PV Growth**

The increase in demand for PV systems has been of little impact to chain actors because of inability to place a relatively big order. This is true because initiating an order without assurance of financing is wastage of resources and it amounts to tarnishing the personal and business image with suppliers. On the other side, soliciting credit from financial institution without solid plan on effective utilization may turn out to be an expensive undertaking. Placing an order and arrangement of funding can only be linked if the potential buyer/borrower can predict with higher level of certainty the likely demand for product. This condition is lacking due to infancy nature of the market.

The continued ordering in small lot denies the existing PV suppliers an opportunity to take advantages of ordering economic lot that is associated with handsome cash discounts and therefore low price to the final user. The increase in quantity purchased could as well reduce fixed overhead cost per unit. The increased market operation stimulates production on one hand while reducing lowering the price due to competition in the consumer market. This situation

will likely take course in the emerging PV market in Mwanza and neighboring regions of Shinyanga, Tabora and Kigoma.

#### **0.12 Linkage between Supply-Chain and Consumer Financing**

The PV users are part of supply chain that represents the lower and important end of the chain. The complementarities and sequential nature of the suppliers and consumer chain suggests that “End-User Credit and Dealer Credit/re-finance identified which has been adopted in consumer financing will directly drive and trigger upper levels actors i.e. suppliers. The bank guarantee scheme, commission agents, joint venture and partnerships between or among supply chain actors may lead to smooth flow of product yet adequate profit to the participating individuals or actors. This option has an advantage of achieving economies of operations because the order or consignment is not limited to number of intermediate buyers but capital and size of market demand.

There are evidences of the existence of the critical mass end users that are willing and capable of buying the PV provided the financing facilities are well matched to their cash flow cycles. The banks are well set for lending upon fulfillment of minimum lending criteria. Generally, lending constitute the banks core business and economic justification for their existence. These two scenarios challenge the suppliers to articulate their business attributes to ensure optimal win-win out of emerging PV market.

#### **0.13 Model Recommended for Supplier Financing and Possible Linkage with Consumer Financing.**

Tanzania PV market is cruising through pre-commercial and a mix of pioneering and emerging market development stages. Despite of the historical gradual growth of PV market there have been new developments and precedents that suggest potential emergence of growth in Mwanza region and the rest of areas which are not hooked to national electrify grid. These include increasing fuel costs for running generators, new national level (GOT) awareness and concerns on environmental degradation, grid electricity shading i.e. rationing etc. The study confirmed the lending institutions i.e. banks to be aware of opportunities equally to suppliers that are unsuccessfully seeking financing from them. This major disconnect is likely to continue because of policy barriers that requires collaterals against loans. There are no likely indicators that suggest quick fix/solution to collateral issues because of weak regulations on land laws, property rights, formalization etc. The following financing interventions/models are recommended;

- **Rural Energy Fund-** There is a need to establish an independent and autonomous trust fund that will be financed by different institutions including subsidies by donor organizations. The trust fund can be available for co-financing or guarantee of bank lending.
- **Hybrid of Cash and Credit-** The combination of cash and credit financing model is recommended on the premise that it reflects a certain level of commitment, eliminates the possibility of diverting the funds and permits the PV seller to receive money through a bank. This model can be repackaged with non-monetary conditionality like personal guarantee, use of banking facilities, use of legal mechanisms i.e. signing of loan liability before the advocates.
- **Finance Credit-** This is a member-client driven financing through which the cooperative organization identifies the PV needs of its respective members and arranges for bank financing. The loan for PV applications is assessed like any other cash loan with clearly agreed attributes like interest rate, duration, repayment pattern. The SACCO enters into an agreement with a partner lending institution i.e. bank that pays the suppliers directly on agreement of delivering to SACCO that eventually delivers to members as an in-kind loan. The cooperative and suppliers settle at ruling market price so as to permit the usual margin that could be obtained using own financing.

## 1.0 INTRODUCTION

### 1.1 Background

The transformation of the rural PV solar market in Tanzania (URT /03/G31) is a solar energy project jointly financed by UNDP and Global Environmental Facilities (GEF) under the execution of the Ministry of Energy. Its primary objective is to remove barriers with the aim of promoting the commercial utilization of PV to provide basic electricity services to improve people's livelihoods and reduce the dependency on imported fossil fuels. This five-year project is carried in all seven districts of Mwanza region.

The project objective hierarchies put the commercial utilization of PV in rural areas as one of the key outcomes. In working towards this objective, the project management has engaged several inputs in carrying out a number of activities that have so far generated tangible/verifiable outputs. Just along a start of year two out of projected five years of implementation the project has recorded a remarkable expansion and growth of PV utilization at rural household level. There are views this growth could be accelerated at a faster pace and reach out a greater part of Mwanza had financing couldn't be a barrier. As much as these view worth consideration they may not have linear and immediate answer. In recognition of market and private sector in which Tanzania is currently cruising, the project management has been deploying different strategies and approaches in ensuring the attainment of the project objectives. Together with on going and other similar studies that have in the past been carried out, the project has directly been involved in the following key initiatives;

- Pushing for cost reduction through the removal of taxes on different PV components which paid off during the 2005/6 GOT budget;
- Carrying out promotional campaign to invite and induce wide public on the benefits associated with the use of PV so as to contribute in development of customer market which essentially wasn't effective; and
- Open up dialogue with financial institutions with special emphasis and soliciting of supporting and doing business with the PV sector.

From the design and inception stage, the financing or capital inadequacy was sighted as a barrier towards commercial utilization of PV. This is why the project objective focuses on the removal of this barrier as a critical entry to wider reach out and the commercial level utilization. However, the financing and the intent

to remove the barrier is not a one off and stand alone problem but rather a process that has to adhere to some principles if they have to be remedied. The uniqueness of these principles is the dynamism and level of flexibility required as they are also being affected by fast changing private sector transition and winds of globalization which is too intense to emerging economies like Tanzania. This is instanced by changing hands or ownership of economic vehicles like banks and large manufacturing companies that also involves changes on the decision makers, operational policies etc.

The business environment in which the project is operating requires therefore the participating individuals and firms to be responsive to the ongoing changes and business dynamism. The barrier removal should now be considered in the context of mitigation and market penetrative techniques as the best options for widespread utilization and development of PV consumer market. This study seeks to evaluate the earlier (program development stage) suppliers financing options by comparing with the current market situation and gauge its potential implications on the attainment of the project objective. The evaluation study also assesses the effectiveness of lending terms and conditions. It further reviews the recently expansion and growth of PV; underpin its courses and financing implication for supply-chain development and the development of PV consumer market.

This study recognizes the sequential nature of supply-chain activities moves the product from the producer down to the retailer and consumer. This scenario suggests the financing of suppliers should also consider the needs of these different levels. While this is valid the reality on the ground is that the modern production and delivery is demand driven and therefore it's the consumer market that *dictates and regulates* all other processes including support services i.e. financing. The study on supplier financing has therefore been oriented and harmonized to what works first with consumer/ rural PV market i.e. consumer market and financing

## **1.2 Objectives of the Assignment**

The broad objective of the assignment was to review the evaluation of financing of PV systems suppliers undertaken during the program development (PDF stage) and the results of, and recommendations of the recently conducted study on evaluation of consumer financing in Mwanza region. The assignment focused more specifically on detailed examination of the following issues;

- Review of general financial regulations and the rules and terms of lending practices by different financing institutions in Mwanza region;
- Assessment of remarkable expansion and growth of the PV market currently noticed in Mwanza region;
- Exploration of the financing model recommended for consumer financing and assess how both types of financing can be interlinked; and
- Reviewing the experience of PV financing in other developing, especially the neighboring countries; and

### 1.3 Scope

This assignment was conceived and executed within the following;

- **Business and Private Sector Mindset** –Interview key supply-chain actors and financing institutions on potential for commercial utilization of Photovoltaic systems. These include large scale retailers, district based-retailers, banks, PV technicians, users etc. Interview seeks understanding and appreciation of their current and potential roles including ongoing private sector dynamics.
- **Product Availability & Usage**- Reviewing availability, price, quality and general awareness of the sources i.e. imports, product range, delivery channels and usage specifications. This coverage intended to assess the awareness on the middlemen mark-ups and its implications to the final/ultimate consumer price.
- **Policy/Program**- This refers to ongoing policy changes and related regulatory environment, parallel PV solar programs, government support intervention i.e. SME finance guarantee scheme etc. With specific focus on financial and energy the study gauges how policies and regulations have been contributing in nurturing or inhibit the growth of PV supply chain;
- **Financing and Delivery**- Revisited financing institutions and assessed how attractive or inhibitive lending terms and condition impact the wide spread of commercial PV systems;

- **Suppliers/ Chain Actors-** This coverage cruises key attributes like location, capital base, capacity to network and geographical coverage. It further review the percentage of PV business line in relation to other products to confirm the actual value driver of capital assignment and /or rationing i.e. costs, return, availability etc
- **Linkages/ Elasticity-** Walk around and through downward and upward streams linkages. Compare and gauge the effects of demand change for complementary product to the change in the quantity of PV demanded i.e. demand for mobile phone (charging), solar powered TV and skyrocket of fuel running generators.

#### **1.4 Methodologies**

The methodologies used in this study included review of documents, debriefing meetings with project management team, field visits to district SACCOS and interviews with large scale and small scale suppliers, solar technicians, bank managers and actual and potential buyers. Specifically the following were carried out;

- 1.4.1 Debriefing Meeting** – The consultant carried debriefing meetings with the Project Manager and the coordinator to get a mutual understanding of the terms of the assignment, processes and expected deliverables. The meeting also intended to agree on the role of project implementation team especially support staff;
- 1.4.2 Secondary Review-** This involved the review of Program Development Facility (PDF) Block B report on “Financial Evaluation/Assessment of PV Systems in the rural sector” (Nov 2001). The secondary review also involved walking through Banks and Financial Institution Act, 1991, National Energy Policies, lending terms and conditions for different commercial banks, consumer financing evaluation report etc; +the consumer financing study
- 1.4.3 Field Study** – The field visit was carried out to assess the awareness, attitude, flexibility to change and the capacity of different mainstream actors (suppliers), credit institutions, business development service (BDS) providers and consumers. ? This wide coverage was done on understanding that transformation of the PV solar market project is taking place during the wake of private sector consolidation in Tanzania rural. This is necessary because effective project implementation require timely

information not only to what is currently taking place but what will also happen in the future with potential implications..

**1.4.4 Stakeholders Workshop-** The stakeholder's workshop was held on 8<sup>th</sup> December 2005 to validate the observations, shares individual and cross cutting concerns and enrich a number of proposed strategies contained in this report. The workshop proceedings, including the list of participants constitutes annexure to this report.

## **2.0 Overview of PV Supply-Chain (Market)**

### **2.1 Background**

The PV supply chain in this context includes manufacturers, wholesalers, dealers, retailers, technical services provider/solar technician and consumers or end users. Each of the actors in this chain has a direct bearing not only to one another but importantly to the financing and price which is charged to the ultimate buyer. One among the critical issues out of this chain is the implication of “pyramid of mark-ups” on the price paid by the ultimate user which is already a barrier for widespread uptake. Given the moderately functioning matured market the final users could drive the whole key processes of production, distribution, pricing and delivering. However, the PV consumer market in Tanzania and Mwanza specifically, has not yet developed to the extent of driving the upper end of the supply chain.

The prerequisite for PV market (supply –chain) to operate as a system requires the existence and effective functioning of all key components which have to be compatible to/support one another. This is due to the fact that the regular system components which include solar panel(s), charge controller, batteries, inverter, bulbs and tubes are produced by different manufacturers in various parts of the world. Secondly, most of the suppliers/traders stocks one or few and in a very rare situations one can find the whole systems components under one roof. This study therefore, considers product attributes of the supply chain to include solar panel and other components but not necessarily the complete system as one package.

### **2.2 Overview of Supply-chain Actors**

#### **2.2.1 Producers/Manufactures:**

Tanzania does not produce many of PV systems components and thus relies mostly on importation. Even for imported stuffs, the make or brand, source and manufacturer’s location has considerable implications in-terms of customer’s preference, prices, overhead costs, and purchase and payment remittances procedures. This trickles down to the size of consignment ordered, number of dealers involved and delivery arrangements. The examination of various brands in a number of shelves which were visited in Mwanza and Dar shows that most of the solar panels, charge controllers and

inverters to have been imported from Germany, Italy, France, South Africa, China, Sweden, USA, India, Australia and Finland. Other key PV system components such as batteries are either manufactured locally or imported from Kenya and South Africa. There are no manufactures' or importers own retailing outlets in Mwanza or any of the district.

### **2.2.2 Wholesale/Dealership**

There is neither PV wholesaler nor dealers operating in Mwanza region. The limited number of wholesalers/importers like Umeme Jua Ltd and BP Solar Ltd are based and operates from Dar es Salaam. Although they are primarily retailers, the two large shops, Ms Mona Electrics and Ms Zahra Electronics in Mwanza City plays duo role by regular retailing and selling in relatively large quantities to the district based retailers that operate in Sengerema, Ukerewe and Geita. The attempt to link the financing with inadequate/limited stocking of PV systems components came up with the following responses and opinions;

- **Credit Absorption-**

Financing is an intermediate input of which the level of its utilization depends among other things, the market absorption or effective demand for a given product i.e. supply and demand. For instance, early before embarking to radio and TV promotion and dissemination the aggregate demand for PV in Mwanza was so scanty. Secondly, the frequency of purchases was so sporadic and unpredictable. Under these conditions it could be difficult for the rational investor or trader to estimate financing requirement that minimizes the costs of capital and the potential risk of stock costs i.e. pilferage, obsolescence. The last six months (June – November 2005) reflect a stable market growth that offers the bases for predicting future supply chain engagement including potential financial requirements.

- **Credible and Reliable Supply Deal**

The undersized and irregular ordering restrained not only benefits associated with economies of purchase i.e. quantity discounts and financing arrangements but sustain weak business relations with manufacturers or dealer importers. Most of manufactures or dealers have a minimum quantity that makes economic sense to handle. Before June 2005, the Mwanza market had not yet demonstrated track records of regular and increasing orders sufficient to justify credible supply

arrangements. This business relationship is necessary in placing effective orders well before remittance of money thus avoids stocks out and /or impairment of customer credibility. Even under cash with order (CWO) or cash on delivery (COD) purchase arrangements, the prior establishment of trust, business reliability and relationship are so critical.

### **2.2.3 Retail Windows/Outlets**

Mwanza region has eight PV's retail outlets of which five of them are situated within the city of Mwanza while each of remaining three is being located in Sengerema, Ukerewe and Geita districts respectively. These traders procure the PV supplies locally from dealers and large retailers as well as importing from regional countries i.e. Kenya & South Africa and sometime directly from international markets. Due to small size of the orders, some retailers finds economical to buy from the relatively large retailers in Mwanza i.e. Ms Mona and Zahra Electrical. The interview with five out of the eight traders confirmed the existence of strong relationship between the inadequate quantities of PV purchased or ordered by these shops and the weak financing or capital base.

### **2.2.4 Service Providers/ Solar Technician**

The market study puts the solar technician in Mwanza region at a pivotal position due to their role in stimulating the upper supply-chain levels and developing consumer market. This strong linkage has come through the project design that has trained a considerable number of solar technicians. The fast growing demand including wider outreach beyond Mwanza region i.e. Shinyanga, Kigoma and Tabora makes these technicians scarce already. Some of the solar technicians have been engaged by traders to serve as over the counter sellers cum technical advisors to the buyers and enquirers i.e. potential buyers. Others have opted to serve as merchant cum technicians thus pocketing both profit margins and technical fees. This is new chain-level development.

### **2.2.5 Consumers/End User**

This study conveniently segments the PV users/consumers into three categories that include solar home systems (SHS), institutional systems and utility companies. Each of the above is featured as follows;

- **Solar Home Systems (SHS)** –This segment constitutes household and small business consumer purchase systems for personal and business/income generating i.e. household lights, powering of TV, radio and cell phones. Most of them range between 14Wp-80Wp. The study interview of solar home systems (SHS) group registered concern related to lack information and knowledge, product range and usage differences and awareness to quality. The fact that project dwell more on solar home systems suggests the need for improved promotion and outreach strategies.
- **The institutional Systems** – This targets schools, clinics/dispensaries and they are often purchased/financed by donor or government.
- **Utility Companies** –The segment represent higher level consumer group that focuses big corporations like telecom and signaling companies/corporations which are mostly owned and financed by government<sup>1</sup>.

### 2.3 Assessment of Product/Service Attributes

Sequential effects of chain action(s) implies no single attribute can be viewed in isolation without considering the effect on the other(s). Each and every action along the supply chain therefore reinforces and/or complements one another including on how the products are delivered to the next recipient. Appreciating relative market position of different actors (2.2 above) in the supply chain reveals the key gaps including financial intermediation. In addition, underscoring of what sells, the price dynamics, utilization, purpose and movements across and along actors (from whom to whom) provides necessary inputs in evaluating current and potential financing practices, options and constraints.

#### 2.3.1 Product (s) for Sale

The amorphous and mono or poly-crystalline are two regular PV panels brands which sells in almost all the shops in Mwanza. The intrinsic value on “What is in there for me” in deciding on what to buy and how much to pay was fairly difficult to capture from the buyers’ reaction. This is attributed among others, by low product knowledge in differentiating the quality and usage specifications. The price looks the major distinguishing feature between brands and across

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<sup>1</sup> This study covers to a great extent the first two segments and partly B where arm’s length transaction is involved i.e. institutions owned and run by the private sector.

different shops/sellers. The study shows the average price for 50Wp- amorphous solar panels to be selling at TZS 300,000 which is relatively low compared to similar capacity mono crystalline which sells at TZS 360,000. The usage lifetime between the two brands stands at 5 and 20 years respectively. There is a potential for unscrupulous dealers and/or solar technicians to abuse weak customer's knowledge on product which may end up being counterproductive for consumer market development and financing.

### **2.3.2 Price**

Due to some market imperfections the prices that have been charged by various suppliers in the chain does not precisely fit into the "cost plus margin" or "market price". Inadequate and irregular supply from manufacturing sources, limited number of suppliers/sellers and lack of customer information and weak distributions to rural retail outlets are some of factors that distort pricing mechanisms. The decision by some of the solar technician to import directly from Europe as underscored in the stakeholders workshop reflects existence of a comparative price discrepancies. This is a key step in market development and perfection though it may have some weaknesses. The benefits of directly ordering may however be eroded by higher overhead costs per unit given the limited quantity per order. This is the critical area for financing interventions.

### **2.3.3 Distribution from One Point to Another:**

There are appreciable barriers between retail outlets and actual/potential buyers or end-users. The single retail outlet for a bigger district like Sengerema or Geita requires someone to travel about 100Km for initial enquiry or purchase. The capacity of the existing retail outlet to extend the selling windows to division and ward levels is limited in manpower and logistic which further links to weak capital base. The upper-end distribution i.e. importer and large wholesale to retailer are detached by long physical distance (Dar-Mwanza) which implies substantial logistic costs, longer ordering time and overheads costs. The direct international ordering/purchase does exist but it is insignificant.

### **2.3.4 Purpose/Use of PV**

Most of the PV systems in Mwanza region are purchased as the next viable alternative energy source in areas/districts which are not hooked to the national grid electricity. The field interview shows the PV systems to have been used for personal and/or income generating i.e. domestic lights, powering radio and TV, charging of cell phone etc. Early product adapters had a very limited knowledge

on the multiple uses of PV system but there has been a fairly significant change after a widespread training which has been undertaken by the project team. The major shift in potential buyers attitude that has been associated to non-monetary benefits like security, working for extended hours, light for off school studying, TV watching for national programs, political campaigns etc. The upcoming Africa Cup of Nation (Cairo, Jan/Feb 2006) and world championship (German 2006) are some of key factors which are pushing for increased purchase.

## **2.4 Assessment of Supply Development (Growth Stages)**

One year after project kick start the Mwanza PV market (supply) has tremendously changed especially for solar home system (SHS) which constitute a significant segment of the market. The ongoing market trend reflect different picture unlike in the past where the PV were supplied mainly for government institutions, NGOs and faith based organizations through donor and/or government financing. This kind of supply used to cover one off purchase of PV systems for schools, dispensaries, religious organization etc. The supply to government corporations i.e. telecom and signals are historically limited and insignificant. The assessment of Mwanza supply-chain reflects the following market developmental features.

### **2.4.1 Pre -commercial**

The past purchase and use of PV by institutions i.e. dispensaries, schools and faith based organizations did serve in penetrating and creating the product image and technology to the general public especially rural areas of the district. However, there were no other initiatives to reach out other individual users. The consumer financing evaluation<sup>2</sup> found the two districts of Magu and Kwimba to have no PV retail outlets but there are few solar technicians that have been soliciting orders and concurrently serve in sourcing, installation and servicing of few systems in the area. The pre-commercial activities i.e. brochures distributions, leaflets, public demonstrations, publicity and promotional campaigns have to a greater extent been carried out by the project. The significant market outreach has been facilitated by the use of Radio Free Africa and Star TV through generic advertisement and promotion. This new developments have shortened the pre-commercial and quickly emerged to pioneering market.

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<sup>2</sup> URT/03/031, Evaluation of Consumer Financing study, June 2005

## 2.4.2 Pioneer and Emerging Markets

Part of Sengerema, Geita and Ukerewe have in the past (before June 2005) served a limited number of early PV systems adopters which had attracted single supplier i.e. pioneers in each of the district. The second half (July- December) of year 2005 has witnessed the critical mass of PV systems enquirers (potential buyers) and fairly increases in sales in all shops located at Mwanza City. These sales have been destined to all districts (with and without retail outlets) including other areas beyond Mwanza region e.g. Kahama in Shinyanga region, Nzega in Tabora and Kasulu in Kigoma. The interview with some of the buyers at Ms Mona Electrics, AOL Technology and Ms Zahra which are located at the heart of Mwanza City confirmed sales quantities to have increased three to five folds during the last six months. Detailed interview linked the purchase decision with the then ongoing general election i.e. use of TV for political campaigns and upcoming FIFA world Cup and Africa Cup of Nations in Cairo.

Actual Sales and Business Enquiries (Jan- June 2005) Vis-à-vis (July-Dec 2005)

Table # 1

<b>Supplier</b>	<b>Average # of Daily Enquiries</b>	<b>Actual Sales (As Compared to Jan-June 2005)</b>
Mona Electric Co.	25	4 Times
Zahra Electronic	20	5 Times
AOL Technology	15	3 Times

*Note: The products which currently dominate this market are solar home systems (SHS) with 14Wp to 50Wp.*

## 2.4.3 Full-Grown/Mature Markets

Full grown or mature markets which are traditionally featured by the critical mass of buyers, substantial number of suppliers with less monopoly and adequate market information are yet to take real shape not only in Mwanza but in-country in general. The technology infancy worldwide, limited use in areas connected to grid electricity and lack of consumer purchasing power i.e. upfront purchase cost are some of the key reason for weak market development and outreach. This doesn't ignore other factors which in some cases rates Tanzania unfavorably if paraded with other neighboring countries like Kenya and Zimbabwe. As much as supply-chain financing could be a strong as perceived, these other factors need to be considered along with;

- **Private Sector Growth & Status**

The private sector in Tanzania has in the last decade been sailing through different levels of transitions including re-defining, re-sizing and perfection. The real entrepreneurial and enterprise (SME sector) development is at infancy and gradually building up especially in the tertiary sector i.e. distribution of industrial consumables such as electrical items. Few of these which fit to be PV suppliers are fairly growing to match the market economy dynamics while others are finding difficult to sustain the competitive internationalization pressure. Legally and administratively, the policy and regulatory attributes are lagging behind the market pace and dynamics.

Like in many other regions in Tanzania the private sector in Mwanza especially medium enterprises is generally weak though growing. The foreign investors with comparative advantages in human and financial infrastructure have heavily invested in other sectors like mining, communications and banking but not in energy sector. Either, because of its sensitivity nature or time required to recoup the substantial amount of initial investment, the privatization of energy sector hasn't fully been sparked. The import trade sub-sector, especially the one whose major markets i.e. PV systems are in rural areas has not attracted adequate number of players/actors. The flow of capital, technology, experience, networks and linkages and inadequate utilization of IT (e-mails, internet use) are some of the deficiencies were pointed out by many participants in the stakeholders workshop.

- **Financial Market Vs Other Market Development**

The engagement of financing as an intermediation process depends on the volume of businesses, frequency of transaction, market development stage, the type of dealer or chain actor etc. This implies the quantity of PV systems handled, sizes and the number of actors in chain involved in the pre-commercial market is necessarily lower than emerging or fully matured markets. Lending as a commercial activity will likely grow concurrently to the growth in other markets holding other factors like policies, risk and return to shareholders. The creativity and innovation in engaging productive capacities and penetration to needy rural markets are key in stimulating the financial markets i.e. lending.

#### **2.4.4 Summary of Mwanza PV Market Attributes**

Table # 2

<b>Key Market Attribute</b>	<b>Assessment/Findings</b>
<b>Market Development Status</b>	Pre –commercial for Magu, Kwimba, Misungwi. Pioneer and Emerging stage for Geita, Ukerewe and Sengerema. Mwanza City serves as selling outlets because of connection to nation grid.
<b>Local PV Suppliers</b>	There are five in Mwanza Town and only one supplier/retailer at each of Ukerewe, Geita and Sengerema districts.
<b>Financing of Suppliers</b>	Limited Enterprise/personal savings. Bank Loans have not been utilized for PV systems.
<b>Product Sourcing – Country of Origin</b>	Germany, USA, Spain, France, Finland, South Africa, Kenya (Batteries), China, Japan
<b>Solar Technician- for installation, maintenance and service</b>	The project has trained a considerable number commensurate to the level of current market requirements. More technicians will be required to match the increasing demand for PV
<b>Market/Target Segment</b>	Mainly SHS (14Wp - 50Wwp) targeted for household end-users. Very limited and one off orders for institutional clients i.e. donor funded NGO, FBO, health centres etc
<b>Demand Trend</b>	Fast emerging. Potential for supplier's influx to meet the increasing demand.
<b>Distribution Networks</b>	No importer or dealer with selling outlets in Mwanza City. Equally, suppliers in Mwanza do not have distribution networks in the districts, division wards etc. Zahra Solar is now importing!
<b>PV Market Potential</b>	Local investors are now realizing the existence of potential PV markets. Some are willing and ready to import as Dar based outlets do not sustain supply requirements.
<b>PV selling as a core business</b>	Selling other products but gradually increasing the number of units i.e. Mona Electrical, AOL Technology and Zahra Solar in Mwanza

<b>Importer Cum Wholesaler/Retailer or Distinct Entities</b>	The importers in Dar are also wholesalers and retailer i.e. Umeme Jua, REX Investment, BP Solar, Chloride Exide
<b>Consumer Demand Status/development</b>	Not well developed but growing
<b>In-country Capacity</b>	The technology is relatively new. The Solar PV is neither included in the school curriculum, nor in the development plans of different government sectors.

### **3.0 Evaluation of Potential Delivery/Financing Models**

The emergence, growth and sustenance of PV supply-chain often take different outlooks depending on the initial objective and motivation of the chain actor i.e. early adaptor or lagers. There are sharp opinion differences between suppliers who pioneer market even if there are no immediate indications or likelihood of making profit and the rest. This group believes in nurturing consumer demand right at the heart of end-users locations. The other group/suppliers emerge not because there is end-users effective demand but rather there is a financier who wants to install PV systems as means of power in carrying out a particular project i.e. where there is no grid electricity. The other extreme consist of suppliers who crop up after noticing the initial signs of the potential growth of PV demand.

#### **3.1 International Ordering**

This is the shorter chain that moves the equipment from the manufacturer directly to the customer without involving intermediaries such as dealers, wholesalers, retailers, solar technicians etc. The absence of local PV market players including experts to install the systems is the major push for the utilization of international ordering. This type of supply chain is very appropriate to non- commercial environment targeting mainly institutions that are being funded by government or donor. The deployment of international ordering under commercial environment makes the financial efficiency resulted from elimination of intermediate mark-ups to be eroded by high costs of experts in installation and other follow on costs i.e. maintenance and services. The fact that Mwanza market is dominated by SHS makes this delivery method not very appropriate.

#### **3.2 Donor Aid Initiated and One-off Market Test Ordering**

The actors in this type of supply/chain emerge in the wake of uncovering the existence of potential PV orders through government funding, donors or individual investor. The successful entry and creation of product image triggers follow on importation of small quantity of PV not as a core business but as

additional product line in the retail outlet. The mode is a representative of pioneering and emerging stages of market development and more often it lacks rural distribution networks and adequate number of technicians to install the systems and provide after sales services. The model handles medium and large PV systems for institutional buyers and small ones 14Wp -50Wp for individual clients. The mode has an advantage of raising curiosity and product awareness and from the standpoint of this study it had a positive impact in areas where PV were installed i.e. health centres, schools, churches etc.

### **3.3 Retail Cash Market**

The retail cash market delivery model is an indicator for developed consumer demand. The supply chain is characterized by relatively well developed distribution networks that reach out wider customer base. The chain attracts several actors along who adds small profit margin because of the price sensitivity on the part of ultimate buyers. Financing between the wholesale/dealer and retailer attract limited time credit but the retailer to consumer/end-user is *strictly cash*. The chain is engaged mainly with small home systems (SHS) with limited large systems under special orders from institutional users. To expand the client base or niches the retailer finds necessary to sell on both cash and limited time/interval credit which further increases the quantity demanded. Trickle upwards to the sourcing of equipment, the increased demand result financing gap given the limited time and amount of credit offered by the importer/wholesaler or dealer to this retailer. The retail cash market is what currently dominates the PV delivery in Mwanza

### **3.4 Wholesale Commercial Market**

This chain involves multinational companies with substantial financial muscles. The actors are commonly found in the international tendering system where the award of supply is the result of competitive bidding process with specific selection criteria. Most of these suppliers are vertically integrated from procurement, installation, and maintenance and servicing of parts. In circumstances where there is no technical expertise in the end-users country, the supplier should fly in technical team to do so including training of back-up local capacity. This kind of market normally involves large single procurement targeted to national level operating companies or international investors. This type of supply delivery model is weak agent for developing consumer market.

### **3.5 Hire Purchase Credit**

Hire Purchase (HP) delivery system is the mode that permits the purchaser to access the PV systems without hundred percent upfront payments or giving up personal valuable as collateral. On the part of the seller it minimizes the level of risk because of the right to repossess the product in case of default in paying the outstanding installment. The buyer pays initial down payment of about 20-40% for follow on payment of agreed installment in the future. The mode ensures supply of high quality products to induce continuity of installment repayment including possibility of re-selling incase of repossession. The high interest i.e. 40-60% makes the product 2-3 times equivalent retail price and therefore very expensive. Technically, it is recommended to supply the whole system instead of components including installation to avoid mixing with weak quality parts and wrong installations.

### **3.6 Finance Credit Supply Chain.**

This is a member-clients driven chain. The cooperative organization identifies the PV needs of its respective members by inviting applications to assess the actual requirements. The loan for PV applications is assessed like any other cash loan with clearly agreed attributes like interest rate, duration, repayment pattern. The loan amount normally equal to the PV system purchase costs plus all transport and installation costs. The cooperative organization i.e. SACCOS purchase the PV on cash but issues them on credit for fixed monthly deductions out of their monthly salaries. Alternatively, the SACCOS enters into an agreement with partner lending institution i.e. bank that pays the suppliers direct on agreement of delivering to SACCOS that eventually delivers to members as in-kind loan. Currently, the Magu Teachers SACCOS is making similar arrangement but it hasn't identified the right supplier who can source and deliver adequate sets of PV.

## **4.0 Lending Rules & Terms Practiced by Different Financing Institutions in Mwanza Region**

### **4.1 General Overview**

The lending rules and terms which are offered and practiced by the financial institutions in Tanzania/Mwanza vary significantly depending on whether the institution is formal i.e. banks, semi formal or informal. The supply-chain financing study concentrated more on banks and partially on SACCOS as other segments i.e. semi and informal had a detailed coverage on the recently concluded study on consumer financing. It is worth appreciating also that semi formal and informal have limited lending capital and localized outreach i.e. village/ward and member-based which therefore doesn't well fit the suppliers financing requirements.

### **4.2 Lending Terms and Conditions**

For the purpose of this study, the bank terms and conditions are broadly categorized under the flexible and non-flexible bands. The non-flexible are the terms which are policy regulated and therefore strictly monitored by the Central Bank of Tanzania (BOT) with very limited room for flexibility i.e. Collateral requirements. The flexible ones encompass operational terms that are as well monitored by BOT but permit some range of comfort to the management. Most of these are attached to the liquidity, risk levels, reliability and trust, credit worthiness and status etc. The flexibility nature of these terms allows the banks to utilize them as unique selling proposition (USP) in negotiating and resizing competitive market position/share. The following are some of general lending terms which are considered to have direct financing implication;

#### **4.2.1 Interest Rate**

Over time, the lending rate in Tanzania has been edging down. Currently, the bank lending rate ranges between 12.5% to 21% pa on reducing balance method. The interview with senior bank managers in three commercial banks in Mwanza confirmed the flexibility of negotiating the rate down to 8% pa depending on the risk associated with the proposed borrowings. The interest is being used as a business catch particularly in bettering the competitor's offer. Due to this factor, the finally charged rate is not over the counter/publicly communicated but rather rests on the bargaining between the bank and the potential borrower. This would be a very good financing penetration window for suppliers given the growing PV market in the rural districts of Mwanza region.

#### **4.2.2 Nominal Vis-à-vis Effective Rate**

For most of the borrowers, the nominal interest rate is viewed as a stand alone factor and thus is not considered along with other attributes that determine the final real/effective rate. The filed study together with stakeholder's workshop confirmed among suppliers the very narrow knowledge on the impact of interest attributes i.e. computation method, repayment patterns, grace period etc. Most of the PV suppliers are sensitive to the nominal interest rate next to collateral requirement which seems to be a major barrier. The case on hand is the amount paid as application fee which constitute about 1%-1.5% yet not recognized as part of interest.

#### **4.2.3 Loan Products**

There are limited loan facilities/products that are responsive to different products with varied transactions cycle. Most of the banks have attempted to design sector specific products i.e. trade, agribusiness, but the energy sector is yet to be reached partly because of weak commercialization i.e. weak supply chain and infant consumer market. All three banks that were visited i.e. CRDB, NBC Ltd, NMB Banks were willing to extend business networks and positively design least cost products but still this is not demand driven. There is also an information gap and misconception between the banks and the level of operations/business in PV sub-sector. Some of PV suppliers who participated in the stakeholders workshop had strong disagreement with bank officials who as participated on the later' change from old systems before privatization.

#### **4.2.4 Loan Duration**

Most of the banks in Mwanza offer one to three years (12 -36 months) term loans depending on the nature of the transaction of which finance is being sought. The long duration normally attracts high interest rate but it lowers the size of repayment installments and thus makes the borrowed loan principal (working capital) relatively stable. The recently introduced SMEs guarantee scheme extends the duration to 60 months or five years. The scheme requires the participating financial institutions to adhere to all required screening only that the loan is 50% guaranteed by the Bank of Tanzania (BOT). The loan size ranges between TZS 50.0 million to TZS 200.0 million. This is another opportunity which the PV suppliers could utilize to carry out a wholesale level for a relatively shorter credit terms with district based selling outlets.

#### 4.2.5 Grace period

The grace period is loan specific and it varies across banks, sector and borrower's requirements. Most of the loans offered by different banks in Mwanza show the principal loan to have been given three to nine months before first installment. The appraisal criteria consider the incubation period, loan purpose and project liquidity patterns in deciding on appropriate grace period. Where the grace period for the repayment of principal installment is relatively long the banks requires servicing of interest immediately on monthly basis.

#### 4.2.6 Audited Financial Statement/ Report.

Loan application has to be supported by audit report/audited financial statements for the past three years preceding the year of request. The financial statements (income statement, cash flows and balance sheet) needs to show the applicant's business performance to provide the initial basis of comparing with the size of loan applied for. The audit reports which are legally prepared by independent certified public accountants provide third party confirmation on authenticity of the records/ information for the bank to rely in decision making.

#### 4.2.7 Collateral and Valuation Report

The three banks visited (CRDB, NBC and NMB Ltd) lends to individuals (personal loans) individual/SME (micro and small loans), SACCOs (group loans) and large organizations (corporate loans). Each of the segments has discrete conditions and terms depending on the risk level attached to the loan applied for. The proposed loan has to be collateralized by a valuable property with a market value ranging from 125% to 165% of the value of loan applied for. The value of collateral has to be determined and certified by the registered professional valuer through a formal valuation report.

**Table # 3: Sample of Terms and Conditions- CRDB Bank**

<b>Individual/SMEs</b>	<b>Employee &amp; Community based SACCOs</b>
Land Properties	Need to be legally registered and being in operations for more than six months. The bank uses Municipal valuers for propertied pledge against loan valued between TZS 1.0 to 20.0 million. For the amount above TZS 20.0 million the bank i.e. CRDB relies on its appointed

	approved valuer. The cost of valuation has to be paid by applicant,
Guarantee from other bank customers. The guarantor should not withdrawal his/her account below the amount of loan. In other ways the loan amount should be 80% of the minimum balance of the guarantor;	Open and maintain an account with the bank. Eligibility is considered after six months of successful banking operations
Value of Security should be 125%-165% of the loan amount;	Interest Rate- If secured by cash the work place/employee' SACCOS may negotiate between 6 to 9% pa. The community based SACCOS negotiate between 12% to 19%
For the vehicle to be accepted it should be aged less than five years and fully covered by comprehensive insurance	For less than TZS 20.0 million -No audited Financial statement required. The loan amount above TZS 20.0 million requires three years audited financial statements and the management account of the current year.

### 4.3 Other Lending Window Available for SMEs

Several banks have loan products that suits short and medium terms loans durations. This excludes the recently introduced SMEs special package of TZS 50.0 million to TZS 200.0 million under BOT guarantee. NMB offers micro loans with a size ranging between TZS 1.0 million to TZS 5.0 million and SMEs loans with sizes ranging between TZS 5.0 million to TZS 30.0 million. Micro loans are collateralized by personal effects/domestic durables, houses in surveyed and un-surveyed areas. Micro loans would provide a very good entry for small PV district retailers as they assist in building track record and basic borrowing relationship with bank before they graduate for larger loans. The NMB products respond effectively to the requirements of different segments of PV suppliers.

**Table # 4: Terms & Conditions –NMB Ltd**

<b>Lending Attributes</b>	<b>Individual Micro Loans</b>	<b>SME/Business Loan</b>
<b>Loan Size</b>	TZS 50,000- 5.0Million	TZS 5.0- 30.0 Million
<b>Interest</b>	20% pa or 2% per month diminishing	20% pa or 2% per month diminishing
<b>Duration</b>	Mostly-One year	1-3 years
<b>Repayment- Principal &amp;</b>	Principal and interest are	Interest has to be paid right

<b>Interest</b>	paid in a single installment	at start but the principal depends on the agreement
<b>Guarantee (BOT for SME guarantee scheme)</b>	Personal Account/ chattels	Up to 50% of the loan is guaranteed by the GOT through BOT
<b>Collateral</b>	Personal belongings i.e. domestic durables, houses (even in un-surveyed areas)	Chattels, vehicles, houses, trust, investigation on character assessment,
<b>Default</b>	Family recovers	Sell of collaterals
<b>Other Conditions</b>	Peer group references, residential area, business location, licenses etc	Audited Financial Statements; Valuation Report (from authorized valuer; Bank has to register them in the name of the bank;

#### **4.4 Practicality of Lending Terms & Conditions (Real Situation on the Ground)**

Rationally, the lending terms and conditions are aimed at communicating the buyer of the product and services offered including inducing their quality in favor of competitor's products or/and services. It is expected under normal market conditions the lenders would utilize available means to reach out wider public and potential buyers. The potential borrowers are also expected to reciprocate by enquiries so as to get more detailed information for rational decision making. However, the stakeholder's workshop (part of this study) which involved different actors in PV supply chain and senior managers from leading commercial banks in Mwanza revealed a number underlying challenges that first have to be addressed. These other challenges are discussed together with the practicality of the terms herein below;

##### **4.4.1 Attitude and Information Gap**

There is significant divergence of clients' perceptions and attitudes toward bank's product and services. This was apparent during the field visits and it also re-surfaced during the stakeholders' workshop. The public seems to lag behind the sprit of the private sectors and overall changes that have been taking place in the financial sector. Either way, perhaps the banks haven't done enough in

promoting what they offers or the potential clients haven't been responsive to the banks initiatives. This scenario reflects serious information gap and trust to the extent that some of the PV suppliers who participated in a stakeholder's workshop expressed scaring concerns on the potential of been ruined financially should one opt for bank loans. The attitude which seems to be pre-conceived and historical is such a big snag that needs to be cleansed by positive promotional and persuasive campaigns.

#### **4.4.2 Inadequate Advisory Support Services**

Rationally, the choice of appropriate source of financing requires some basic quantitative and qualitative criteria though experienced based decision might as well lead to the correct decision. This study revealed, holding the criterion of collateral constant, over 70% of the borrowing decisions are driven by the nominal/face value interest rate. On the same perception, the interest rate is also used in deciding on the best offer among the different banks. In reality however, the real rate/cost (effective rate) paid by the borrowers is significantly influenced by other loan attributes like application fees, interest computation method, grace period, frequency of repayment, loan duration etc. Lack of adequate support services can be explained by continued influx of individual and SMEs borrowers to MFIs which charges up to flat rate of 30% pa on a weekly repayment but finds difficult to approach a commercial bank that charges 18% to 21% pa (declining method) on a monthly repayment.

#### **4.4.3 Location and Outreach**

Mwanza region is the second largest after Dar es Salaam City in hosting commercial banks. These banks are located at the heart of Mwanza City because of among other reasons, the weak development of auxiliary services and physical infrastructure in rural areas. Even the National Microfinance Bank (NMB Ltd) which is the only one with rural networks is located at the district headquarters. Practically it is difficult for a potential applicant to travel about 70 km to the district headquarter to initiate a borrowing process that may costs about five to ten similar expensive trips. The location issue may partly be justified by the demand but the image reflected by their current outreach strategies sounds more of exclusion of rural based enterprises. The banks have to lend themselves to the public/potential borrowers in terms of locations and outreach.

#### **4.4.4 Loan Cycle, Grace Period and Loan Duration**

PV suppliers are expected or could serve as a hub in driving downward and upward flows of products and services to manufactures and end-users. This implies lending to all or any of this institution/individual must fit into the transaction cycles of the partners involved in production and consumption. Presently, banks have not adequately been responsive by designing financial facilities that matches the manufactures terms and conditions as well as consumer markets financing. For instance, the consumer financing study suggested the use of dealer-credit as most of them cannot afford to pay cash upfront. It is rational to appreciate that inflows from the ultimate borrowers constitute the supplier's outflows in servicing the bank loans which was previously used to pay the manufacturers or dealers. The attributes attached to the current loan products are inflexible to match the trading partner's business needs.

#### **4.4.5 Audited Financial Statements**

The audit report including audited financial statements and the management letter are the outputs of effective internal control that encompasses proper record keeping. The study confirms the serious weakness among the SMEs in keeping proper records probably because of higher costs of engaging a trained book keeper or accountant. It was further noted, the suppliers are also been scared by the high fees charged by audit firms or certified auditors. This requires a tradeoff because the monetary values of economic activities which are reflected by these statements offer the basis for assessing the loan applied while the auditor's opinion independently reports the authenticity of the information. The report further reflects the capacity of the organization to continue performing as a going concern thus serving as a key input in the loan assessment.

#### **4.4.6 Exposure to Tax Liability**

There are perceived fear and concerns among the SME that proper record keeping might expose them to the heavy tax liability by the revenue authority. The banks therefore finds difficult to establish the track records of the applicant' past performance as the basis of forecasting potential cash flows which is key input in deciding on the amount of loan, duration, repayment pattern etc. Lack of, inadequate or incomplete records deny many business enterprises to prepare different reports for internal and external use .i.e. audit report. The availability of BDS providers specialized in supporting the medium enterprises will elevate their capacity to afford the reporting requirements and thus easy the screening processes yet remain compliant on tax liability status.

#### **4.4.7 Habit to Use Banks –**

The interview with some of suppliers and sample of SMEs and individuals shows very few of them to have been utilizing the banks in remitting payments, settling institutional overhead liabilities etc. There are many reasons put forward to justify the situation however, the historical perception on delays in cheque clearances among banks, low awareness of the modern bank services and weak marketing i.e. promotion on the part of the banks. More often, lenders put higher reliance and trust on applicant's financial records if they are transacted through banks. The amount and number of transactions that have in the past been channeled through the banks including the repayments patterns serves in assessing the credit status. The problem of third party confirmation of applicant's tracks records (other than own records) will continue to be the snag in financial intermediation unless necessary interventions are initiated to promote the use of banks.

**4.4.8 Collateral Valuation Report-** There are several barriers that surround the collateral valuation processes which make the lending process cumbersome and time consuming. At a lower end, owning a valuable asset or property that qualifies to serve as collateral is fundamentally a barrier especially in rural areas where the development of real estates is quite poor. Even after identifying the property it requires professional expertise in ascertaining its value. These valuers are required to be certified and registered for that purpose by the bank but the evaluation fees has to be paid by the loan applicant/ potential borrower. These barriers are more severe in rural areas especially because of high logistic cost of taking the valuer to the remote places where facilities are inadequate.

## **5.0 The Linkages: Consumer Vis-à-vis Supply-Chain Financing**

From PV supply-chain context, the consumer stage/level constitutes the lower physical end which serves as a final recipient/output side of production and delivery from other actors in the series. In Tanzania the PV chain comprises very few dealers and/or wholesalers and numerous retailers that stock quite a limited number of small and medium size SHS. The PV Producers/ manufactures are situated outside the country specifically South Africa, Europe and USA as local production doesn't exist. This condition adds another level of linkage requirements including financing.

### **5.1 The Linkage- Economic Justification**

The selling of PV to the willing and capable (purchasing power) ultimate users is what constitute a complete production-consumption circuit. However, the growing, repeat orders (recurrence) and profitable selling is what sustains dealers or suppliers businesses. This scenario is conditional to the existence of the critical mass of end-users with financial capacity to purchase either on cash or credit. This later condition is currently floating in Mwanza region thus seeking the effective reciprocal on the supply side. The continuous supplies to these end users are again conditional to payment (flow) of value of purchase/products for refinancing/replenish new stocks. Following this mutual business relationship, the consumers serve as a conduit of achieving suppliers objectives and vice versa.

### **5.2 The Model Opted For Consumer Financing**

The recently concluded/conducted study on consumer financing identified "credit" and "cash" to be the most feasible models that accelerate commercial utilization of PV in Mwanza and later in other regions during the rollout phase. Other options which were evaluated included (i) Donation and subsidy and (ii) Fee for Services model. The selected credit model is subdivided into "*Dealer Credit/re-finance*" and "*End-User Credit*". This financing facility emerged as more realistic and feasible option as it primarily provide solutions to the limitations accrued to upfront cash requirement. It also counters not only Mwanza region specific challenges but it essentially builds a base for the development of consumer market which is key for a wider commercial uptake of the product. The models reflect the following key operational features or attributes;

### **5.2.1 Dealer/Supplier Initiated Credit**

This type of financing is initiated/driven by the dealer/supplier or end –user. The *dealer credit* involves an arrangement by which the dealer/supplier accesses the credit from a banker that pays for hardware purchase costs directly in a single payment with immediate transfer of ownership. This facility requires the PV client to pay directly to the dealer who eventually pays directly to the credit institutions. The sale to the end-user is often attached to different terms and conditions aimed in minimizing the default risk i.e. using the PV as collateral.

### **5.2.2 End-User Initiated Credit**

Under this approach, the *client arranges* a specific sum and time credit facility with a bank or any other financial institution. Upon agreement the credit institution pays directly to the dealer to warrant the release of PV hardware to the end-user. The end users remits/pays agreed installments to the credit institutions on monthly basis or specified time duration. The repayment pattern is normally dependent of end-user's income cycle. In most cases the title to hardware is transferred to the buyer by the time of paying last installments.

## **6.0 Evaluation of Financing Options Identified During the PDF – Program Development Facility-Block B (Nov 2001)**

### **6.1 Background**

The design of the project (2001) and inception few years later were carried on understanding that there were minimum financing options that could develop over time. This is necessary step for effective commercial transformation. Below is the status and market performance of various options and conditions identified during the PDF stage;

### **6.2 Various Options Identified and other Market Conditions**

6.2.1 **Cash** –The larger percentage of PV chain financing has been carried out through cash systems. This has been possible through mobilization of funds from private sources, hard savings, close family borrowing and internal re-assignment of capital from other business lines. This later process involves substitution of one product line to another on the basis of what generate higher returns for a given time period.

6.2.2 **Credit**- PV suppliers find challenged by bank requirements especially the need for collateral. However, there has been a slight increase in utilization of credit in financing PV businesses. The interview with lending institutions and traders in a separate occasions reflects a serious disconnect that suggest the existence of information gap. Banks are claiming to have credit packages which are lacking borrowers while on the other extreme the suppliers are complaining on unfavorable lending terms. Other actors/suppliers link it with lack of strong consumer market with parameters that are attractive enough to justify credit application.

6.2.3 **Hire Purchase** – The assessment of hire purchase as a form of financing shows different chain actors to have a very limited knowledge about it. The inadequate information on how it works is lacking on both suppliers and consumers. The few suppliers with knowledge about HP find it more risky because of potential loss associated to the failure to dispose the

repossessed asset. No clear sign for future utilization of HP in stimulating PV supply market.

- 6.2.4 **MFI** –The major barrier in utilization of MFIs is the group lending methodology which requires forming a group of five individuals that guarantee each other. This is difficult for a medium size SMEs that are trading in PV. The largest amount of loan offered by MFI to SMEs/individual borrower is TZS 5.0 million which is sufficient to buy an average of ten (10) smaller size (14 Wp) PV or relatively lesser quantity incase of higher size. Even for this loan size it is only few MFIs such as PRIDE or FINCA that are financial capable to serve a reasonable number of clients.
- 6.2.5 **Commercial Wholesale to SACCOS-** Of recent this form of financing has become very popular for agriculture cooperatives and other income generating community based institutions. However, the conditions that holds members together i.e. cohesions in agriculture settings are difficult to be found on PV users. The discussion with CRDB Bank confirmed their willingness to innovatively replicate this model from agriculture to other sectors i.e. PV financing. By the time of this evaluation the Magu Teacher’s SACCOS had indicated an interest in utilizing this form of financing to buy PV for their interested members. This method is considered more appropriate for work based SACCOS
- 6.2.6 **VAT and Duty on PV-** VAT and duty removal in 2005/2006 GOT financial year has lowered the price by about 15% to 25% of the previous price. This form of indirect financing has contributed significantly in the emerging consumer market.
- 6.2.7 **NMB Lending -** During the PDF, the NMB bank was singled out as the most appropriate rural financial vehicle but by that time (2001) it hadn’t started lending to micro and small enterprises. Following bank restructuring including privatization the NMB Ltd is now offering several loan products to individuals and SMEs. Currently the bank offers SMEs loans that range between TZS 5.0 to TZS 30.0 million. The bank is also a participating financial institution (PFI) under recently (2005) introduced SMEs credit guarantee scheme.
- 6.2.8 **Capacity of Rural Institutions-** The initial evaluation indicated that institutions that operate in the division, ward and village levels such as

ulughuyo and SACCOS lack finance, human and MIS resources. The evaluation reflects some significant development in-terms of capital mobilization in form of equity subscription and savings deposits. The human resource capacity is gradually improving though sounds inadequate. The weak development in MIS is being associated lack of electricity and inability to purchase and install necessary working equipment i.e. computers, faxes, internet facilities etc.

Table # 5 : Solar PV systems financing Modalities or Delivery Modes

<b>Financing Modality/Delivery Mode</b>	<b>PDF Field Result &amp; Recommendations (2001)</b>	<b>Assumptions on the Effectiveness (2001)</b>	<b>Evaluation Remarks –Project Implementations (2004/5)</b>
<b>Direct Cash Sales</b>	Majority of rural households have low income levels. Few of these could afford to purchase on cash. Loans financing more preferred	Feasible where the communities and households have economic activities which can generates enough funds for both subsistence and some savings	Assumptions are still valid. A greater percentage of purchases have been settled on cash raised from personal sources/disposable income.
<b>Suppliers Credit</b>	None of the supplier was ready and willing to offer credit to rural household because of default precedent. Poor infrastructure, loan monitoring and follow-ups are prohibitively expensive.	The arrangement requires the buyer to have a reliable way generating income for repaying the loans at an agreed time intervals. The seller must have a very good knowledge and be closely linked to the buyer	The assumptions are still valid. However, rural suppliers (district based) accept a mix of cash (varied proportions) and short intervals credit installments.
<b>Cash Deposits (“Kubandika”)</b>	Suppliers and Customers	Actual and potential	Suppliers and customers

<b>Buyer pays down payments and subsequent installments to the supplier (up to 100%) delivery of PV</b>	confirmed to have worked well. Promised to continue using this option i.e. cash deposits	customers must have assured income i.e. employees	confirmed to have contributed to the increased sales volume. The study confirmed to have widely been used in purchase of other items like TV in Mwanza and Dar.
<b>Cash Credit [Used in Kenya, Sri Lanka in financing the PV]</b>	Most institutions indicated their willingness to offer cash credit than any other financing modalities	Financing institutions must be willing to offer loans to such market segment i.e. rural areas.	About six SACCOS in Magu and Kwimba districts indicated a willingness to use CRDB-SACCOS downscaling alliances to finance the PV purchase. ELCT-micro-lending/MFI have in small scale piloted loans for PV in Sengerema district
<b>Fee For Service/User Fee Charges i.e. TANESCO, Generator users in rural areas of Mwanza</b>	Most of the suppliers did not indicate interest to install solar PV for charging user fee ("rental")- Risk of loosing or defecting the equipment by the user, high incidence of solar PV theft,	Existence of Rural Electrification Master Plan/ Investors with substantial capital for equipment and networking/monitoring	Still no single supplier/investor has opted for this delivery mode.  The ongoing Rural Electrification Master Plan (REMP) and enactment of National Energy Policy will likely accelerate Fee for Service Model.
<b>Hire Purchase [Experience of</b>	Users were willing and able to pay upfront a percentage	Existence of Hire Purchase Companies/Facilit	The experience of TUNAKOPESHA Ltd shows to

<p><b>SIDO &amp; Tunakopesha]</b></p>	<p>of the value of the product and final payments. Sellers were reluctant due to default precedence by SIDO clients. The Hire Purchase Act 1969 limits the borrowers liability to the realizable value of the property (repossessed ) sold</p>	<p>ies and legal and logistic machineries to execute</p>	<p>limitedly worked for salary/wage earners in the government sector.</p> <p>Tenure instability makes difficult for the private employer to guarantee.</p> <p>Long initial processing time and high interest rate are inhibitive</p> <p>The Hire Purchase Act 1969 specifically on lenders liability on repossessed is still inhibitive on the part of suppliers.</p>
<p><b>Leasing [Operating – renting the equipment to the user on payment of rental &amp; Capital Lease- Buyer pays rents for eventual ownership of the equipment upon expiry of the contract period.</b></p>	<p>No supplier was willing to offer solar PV on leaseholds</p>	<p>Existence of the number of leasing companies, stable and reliable income flow on the part of lessee.</p>	<p>No individual or institution has given a trial on this delivery mode.</p> <p>The concept by itself sounds new to many of the interviewee</p>
<p><b>Guarantees-</b></p>	<p>SACCOS in Ukerewe, ELCT-MFI unit, CARITAS indicated interest to guarantee their members.</p>	<p>Guarantor has to be individual or institutions being credit worthy or good financial standing</p>	<p>Lending institutions are willing to lend to SACCOS as they have a mechanism of collecting directly</p>

	Catholic church was reluctant because of non-repayment precedent i.e. perception of the church as charity organization		from source (directly from salary) Non-salaries SACCOS requires having a minimum of 33% savings (of required loan size) plus a group guarantee i.e. peer pressure.
<b>Subsidies – Used to lower the price thus making it affordable</b>	No commitment from any donor or government The study recommended as necessary especially for rural households	There should be a need for Solar PV system  Households ability to meet the cost sharing component of the subsidy;  Household potentials of generating incomes from the use of solar PV systems.  Should target economically engaged household groups (fishing, mining etc)	The removal by the GOT of VAT and import duty on PV and related accessories has lowered the purchase price by 15% -25% of the initial retail costs.
<b>Grants</b>	The recipient should aware of the purpose otherwise it may lead to market distortion	Where grant is necessary it should be based on cost sharing mechanism.	No grant has been offered. Many donor organizations are discouraging grant financing because of its impact in market distortion. However,

			it is an effective instrument for market penetration and raising of awareness (Initial stage e.g. PV for productive uses.
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## **7.0 Expansion and Growth of the PV Market Currently Noticed in Mwanza Region**

### **7.1 Background**

There has been a remarkable expansion and development of the PV consumer market both in Mwanza City and individual districts of Mwanza region. The said development have been noted on the quantity of PV systems sold by different retail outlets, number of business/product enquiries lodged at the retail selling counters and geographical spread of customers. The increase in number and engagement of PV technicians in both soliciting orders and providing technical support and advices (for potential buyers) serves as additional indicators for the expansion of PV market in Mwanza. The growth of PV market has a number of downward and upward streams linkages across sectors. However, this study is confined to financing implications.

### **7.2 Factors Associated with Remarkable Expansion & Growth**

The interview with the actual and potential buyers, suppliers and technicians and the project management team on the possible reasons for the recently expansion of PV demand gathered a number of varied, yet useful responses. One unique message accrued from the responses is the diversion of initial focus of consumer financing as a major barrier. Although it is relatively difficult to establish the specific magnitude of each factor, the findings partly confirm the observations on consumer financing study that there exist other factors, other than financing that are equally substantial. These are utility based product attributes that answers the question on “what is in there for me” before considering on how much one is willing to pay for. From the field market study and interview the following emerged as fundamental factors behind the market growth/expansion;

**7.2.1 VAT & Duty Removal**-The decision by the Government of Tanzania (GOT) to remove VAT and import duties on PV and its accessories has reduced the final consumer price for about 15% to 25% of the former price. The price reduction has acted as inducement and partly confirms the

initial observation of substantial upfront purchase cost as a barrier for commercial utilization of PV.

**7.2.2 Promotional Campaigns-** The solar technology is relatively new to most of the people and PV systems are not regular traded items. This is the first level barrier which inhibits people's access to the products in terms of physical attributes (creation of image) and utility or usage. About 40% of the actual and potential (enquirers) buyers who were interviewed while shopping at two major retail shops confirmed to have heard of the product availability through Radio Free Africa and Star TV. The product demonstration at public areas and involvement (training) of secondary school teachers in the dissemination of PV technology has also contributed to the noticeable growth. The duo role of solar technician where now they are serving as middlemen cum service provider has reached many clients in the remote areas.

**7.2.3 Increased Use of Solar Powered TV-** The Mwanza based Star TV station which has been established in the past few years has substantially revolutionized information networking and market development in many sectors. The TV station has triggered the TV demand in both urban and rural areas. Lack of grid electricity to power these equipments necessitate search of alternative source of power. As a result, there has been a tremendous increase in the use of solar powered TV in the rural districts of Mwanza regions. The interview with several buyers at Mwanza city revealed that some of them came as far as Shinyanga, Tabora and Kigoma regions. The attraction has been accelerated by the use of TV for political campaigns especially in 2005 general election, upcoming world cup soccer competition and African Cup of Nation.

**7.2.4 Widespread Use of Cell- phone in Rural Areas-** The increased competition in the communication industry has pushed most of the cellular phone companies to the remote areas where there' no landline networks. The expanded use of cell phone has triggered the demand for solar power in re-charging the handset. The average cost of charging in Sengerema and Magu districts ranges between TZS 300- TZS 500/- per handset.

**7.2.5 Skyrocketing of Fuel and Maintenance Cost-** The persistent increase of fuel costs for the last two years have made the cost of diesel generated

power to be substantially high. The former users of this services which is common in the rural districts of Mwanza and neighboring regions are finding more difficult to afford the costs thus forcing them to look for the next cheap alternative. The diesel generators are becoming more unpopular because of the high costs of running and maintenance. There are also claim on the destructions of handset.

### **7.3 Financing Implication for PV Expansion and Growth**

The actual or potential growth of PV market in Mwanza has direct and indirect financing implications that varies across different actors in the chain i.e. producers, retailers etc. As earlier noted the PV panels and other related accessories are all imports. Unlike local transactions, the importation requires a minimum knowledge on sourcing the product, enquiry, ordering, shipping and payment remittance which is a major financing implication. Others include;

**7.3.1 Reliable Networks with Producers-** The last six months (ending November 2005) business trends offers a gradual increase in the quantity purchased for all three big shops in Mwanza City. The district based shops in Sengerema, Ukerewe and Geita depict the similar demand outlook. This is a key feature in the supply chain development and it's envisioned financing. The increasing market demand provides the minimum base of negotiating short and medium terms sizable orders with producers or dealers which eventually ensure stable availability of product.

**7.3.2 Economies in Ordering-** With the exception of batteries which are sometimes sourced regionally i.e. Kenya, the PV and its accessories are mostly imported from USA, Europe and South Africa etc. Under regular market conditions, the increase in quantity demanded will likely trigger the suppliers order size upwards which eventually edges down the overhead cost per unit. The cost effects will likely increase the profit margin and afford the suppliers to effectively cover such important items like interest on loans.

**7.3.2 Influx of Potential Suppliers-** The increasing market for PV is gradually inducing actual supplier to consider increasing the business volume thus creating demand for credit facilities. The higher frequency of purchase

provides the basis of projecting the future demand which essentially in input in negotiating potential supply deal with the producers/manufactures. The information is also very useful in assessing the loan size, appropriate grace period, duration, repayment pattern etc.

## 8.0 Model Recommended for Supplier Financing and Possible Linkage with Consumer Levels.

### 8.1 Background

As earlier noted, the Tanzania PV market is gradually cruising through pre-commercial and a mix of pioneering and emerging stages. This level of development is therefore not robust enough to stimulate market for support services including financial intermediation i.e. lending. The evidence from consumer financing evaluation study shows the existence of a substantial need by ultimate demand. This theoretical principles of modern production i.e. demand driven reflect an information gap with actual situation on the ground. What is important at this stage is the appreciation of economic transition in which Tanzania is operating and the need to create market through promotion and awareness before conclusion of “lack of market demand”

Despite of the current infancy status of PV market there are new developments and precedents that suggest potential emergence of growth in Mwanza region and the rest of areas which are not hooked to national electrify grid. These new developments offer new business opportunities which will requires intervention from financial institutions. What therefore called for are innovative approaches of designing appropriate products responsive to the need of different chain actors. The new developments that likely to change the PV market and financing landscape include;

- **Increasing Fuel Costs-** As confirmed in a PV market study the use of fuel generators are in a wide use in various districts of Mwanza region. The continued increase in fuel prices is now making this facility uneconomical and inaccessible to many people who used to depend on it.
- **New Orientation on Environment Degradation-** There has been a concern on the future impact of continued environment degradation as reflected by the government decision to ban charcoal business. Given the limited supply of grid electricity and increased fuel price it implies therefore the PV solar energy will likely emerge as the potential option.
- **Downscaling for Lending Institutions-** Of recent there has been a wave by lending institutions to downscale its operations to small and medium

enterprises (SMEs). This new turn is attributed to competition on few corporate borrowers and perception change that small enterprises are creditworthy and bankable.

- **Shading of Grid Electricity** i.e. rationing- The expansion in industrialization and service sector as a result of growing private sector suggest more utilization of available hydro power in urban areas and less in rural areas. This skewed allocation is compounded by low installation and tariff collection costs in urban areas as compared to rural where users are situated far from one another with very limited use i.e. two or three bulbs and a radio. The electricity rationing has also been the reason for increased purchase of PV systems in urban areas as a back up facility for office lights and running of computers.

## **8.2 Recommended Financing Models**

- 8.2.1 Government Guarantee** – The study confirmed the lending institutions i.e. banks to be aware of opportunities equally to the desire by suppliers that are unsuccessfully seeking financing from them. This major disconnect is likely to continue because of policy barriers that collaterals against loans. There are no likely indicators that suggest quick fix/solution to collateral issues because of weak regulations on land laws, property rights, formalization etc. This problem may be solved through guarantee scheme that can be financed by government, development or/and donor organizations
- 8.2.2 Rural Energy Fund-** There is a need to establish an independent and autonomous trust fund that will be financed by different institutions including subsidies by donor organizations. The trust fund can available for co-financing or guarantee of bank lending.
- 8.2.3 Hybrid of Cash and Credit-** The combination of cash and credit financing model is recommended on premise that it reflect a certain level of commitment, eliminate possibility of diverting the funds finance and permit the PV seller to receive money through bank. This model can be repackaged with non-monetary conditionality like personal guarantee, use of banking facilities, use of legal machineries i.e. signing of loan liability before the advocates.

#### **8.2.4 Finance Credit.**

This is a member-clients driven financing through which the cooperative organization identifies the PV needs of its respective members and arrange for bank financing. The loan for PV applications is assessed like any other cash loan with clearly agreed attributes like interest rate, duration, repayment pattern. The SACCOS enters into an agreement with partner lending institution i.e. bank that pays the suppliers direct on agreement of delivering to SACCOS that eventually delivers to members as in-kind loan. The cooperative and suppliers settles at ruling market price so as to permit the usual margin that could be obtained using own financing.

#### **8.3 Linkages between Consumer and Supplier Financing**

The PV users are part of supply chain that represents the lower and important end of the chain. From the demand driven standpoint it is this stage that drives and triggers the development in upper ends of manufactures, wholesalers, dealers, retailers and other support services including financing. The dealer credit and end-user credit financing models which have been adapted at consumer levels has given a minimum amount of trust for other lending institutions to come in.