



Global Environment Facility

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February 11, 2004

Dear Council Member,

UNDP, as the Implementing Agency for the project, *Tanzania: Transformation of the Rural Photovoltaics (PV) Market*, has submitted the attached proposed project document for CEO endorsement prior to final approval of the project document in accordance with UNDP procedures.

The Secretariat has reviewed the project document. It is consistent with the proposal approved by the Council in May 2003, and the proposed project remains consistent with the Instrument and GEF policies and procedures. The attached explanation prepared by UNDP satisfactorily details how Council's comments and those of the STAP have been addressed. I am, therefore, endorsing the project document.

We have today posted the proposed project document on the GEF website at www.gefweb.org. If you do not have access to the Web, you may request the local field office of the World Bank or UNDP to download the document for you. Alternatively, you may request a copy of the document from the Secretariat. If you make such a request, please confirm for us your current mailing address.

Sincerely,

for Leonard Good
Chief Executive Officer and Chairman

cc: Alternate, Implementing Agencies, STAP



14 January 2004

pen
Dear Mr. Good,

Subject: **CC/OP-6 "Tanzania: Transformation of the Rural Photovoltaic (PV) Market in Tanzania" - PIMS No. 1894**

I am pleased to attach herewith the above-mentioned project document, which includes UNDP/GEF response to the GEF Council's comments on Page 2. The brief was approved at the GEF Council Meeting in May 2003. Also attached is the co-financing letter from Mr. R.O.S. Mollel, Permanent Secretary, Ministry of Energy and Minerals, Vice President's Office, United Republic of Tanzania.

As per paragraph 29 and 30 of the GEF Project Cycle, we are submitting this project document for circulation to the members of the GEF Council and, subsequently, for your final endorsement.

Thank you in advance for expediting the review and endorsement of this project.

Yours sincerely,

Warm regards

A handwritten signature in black ink, appearing to read 'Frank Pinto', is written over the typed name.

Frank Pinto
Executive Coordinator

Mr. Leonard Good
Chief Executive Officer and Chairman
Global Environment Facility
Room G6005
1776 G Street
Washington D.C. 20433

Cc: Mr. Martin Krause, GEF Regional Coordinator
Mr. Ademola Salau, GEF Regional Manager

**GOVERNMENT OF THE UNITED REPUBLIC OF TANZANIA
UNITED NATIONS DEVELOPMENT PROGRAMME
Global Environment Facility (GEF)**

Project Document

PROJECT TITLE

**Transformation of the Rural
Photovoltaic (PV) Market in
Tanzania**

PROJECT NUMBER:

URT/03/GXX

PIMS Number: 1894

Council Comments to the Project Brief and Responses

2 Jun 2003

German comments to the Tanzania: Transformation of the Rural Photovoltaics (PV) Market

The list of barriers to the utilisation of PV to meet basic electricity needs of rural communities appears to be comprehensive, although one can argue about the prioritisation of the barriers. For example, the barrier “lack of established dealer network” is ranked as a secondary barrier. A project appraisal exercise recently conducted by GTZ found that the potential customers of PV systems in rural and peri-urban areas have difficulties to find outlets dealing in these systems in their vicinity, as the network of PV providers is virtually non-existent in these areas.

The Project Brief states “limited awareness of PV technology” as a major barrier. The mentioned GTZ appraisal mission found that a substantial number of rural people are actually aware of the potential and benefits of PV technology but, as already mentioned, do not have a PV dealer in their vicinity and, even if the desired product is locally available, do not have access to affordable finance. The Project Brief actually confirms that there is a “pent-up demand” for PV systems and recognizes that there is the potential “consumer’s willingness and capacity to pay” in the Mwanza region (which will also hold for other regions of Tanzania).

It is suggested to review the activities of Component 2 “Awareness Raising” as far as the PV end users are concerned as it may not be advisable to raise expectations before the access and affordability barriers are overcome.

Recommendation:

It is recommended to take the above comments into account during further project planning and implementation.

Ramon C. de Mesa

Program Coordinator

1. COMMENT

The list of barriers to the utilisation of PV to meet basic electricity needs of rural communities appears to be comprehensive, although one can argue about the prioritisation of the barriers. For example, the barrier “lack of established dealer network” is ranked as a secondary barrier. A project appraisal exercise recently conducted by GTZ found that the potential customers of PV systems in rural and peri-urban areas have difficulties to find outlets dealing in these systems in their vicinity, as the network of PV providers is virtually non-existent in these areas.

2. RESPONSE

We agree that the lack of established dealers network can also be a primary barrier in many areas. But in the Mwanza region (Mwanza is the second largest city in Tanzania) the PV market already a little developed, and there are some dealers and retailers present. Although they are not available in the rural areas, the fact that the centre of the region is relatively well equipped with outlets makes us analyse the lack of dealer network as a secondary barrier for Mwanza.

The project components will try to remove both primary and secondary barriers, and will work closely with private sector to boost the market development, and hence also the development of a dealers network.

Comment

The Project Brief states “limited awareness of PV technology” as a major barrier. The mentioned GTZ appraisal mission found that a substantial number of rural people are actually aware of the potential and benefits of PV technology but, as already mentioned, do not have a PV dealer in their vicinity and, even if the desired product is locally available, do not have access to affordable finance. The Project Brief actually confirms that there is a “pent-up demand” for PV systems and recognizes that there is the potential “consumer’s willingness and capacity to pay” in the Mwanza region (which will also hold for other regions of Tanzania).

It is suggested to review the activities of Component 2 “Awareness Raising” as far as the PV end users are concerned as it may not be advisable to raise expectations before the access and affordability barriers are overcome.

3. RESPONSE

The point raised is very key to the implementation of the programme, and it is agreed that awareness carried out on its own might even create false expectations and is not benefiting the increased use of PV. In the project the planned approach is to undertake awareness hand in hand with demonstration and marketing, and combined with sales and general stimulation of the private market. The awareness campaigns will be carried out in close collaboration with the dealers and technicians, and demonstrations will be done in partnership with private sector on a cost sharing basis, as described in Component 2. In terms of timing, component 2 will be carried out in parallel with component 3 - strengthening of private sector. The close coordination between the two components will ensure that the awareness campaigns are not carried out in vain. A detailed work plan will be elaborated when the project manager has taken up the post.

Swiss comments to the Tanzania: Transformation of the Rural Photovoltaics (PV) Market

General Commentaries

The project aims at reducing Tanzania's energy-related CO₂ emissions by introducing photovoltaics (PV) as a substitute for fossil fuel (kerosene and diesel) in rural areas remote from the electricity grid and improving people's livelihoods by improving their access and affordability of modern energy services. In addition, the project will reduce the growing number of rural poor, adults and children alike, who contract respiratory and eye problems due to prolonged exposure to kerosene smoke and soot (poor indoor air quality). The activities proposed in the project are designed to remove barriers to the wide-scale utilization of PV to meet the basic electricity needs of households, small businesses and of community users like health clinics and schools, initially in the Mwanza region, but eventually in the whole country.

Main Concerns

Tanzania has a very low rural electrification rate. The initiative for the market transformation and accelerated commercialisation of PV systems is a very positive development for the quality of life of the people benefiting from it.

However, the experience with PV dissemination show that the actual livelihood improvement potential on the economic level of power generated by PV is somewhat limited. PV based power alone cannot meet substantial energy need for productive use (e.g. irrigation pumps, flour mills, agro-processing, small machinery...) at reasonable cost. The development of willingness to pay and of the market on a sustainable basis can only occur if the affordability becomes better for lower income households. Added income generation activities are required if the PV market is to develop sustainably. Of course, this issue goes much beyond the scope of the project, but synergies between PV marketing and other added income generation activities should be explored.

One of the barriers to the sustainable development of the PV market is the lack of appropriate after-sale services. It is not clear how a dominantly cash sale market development will ensure a proper after-sales service development (when systems are on credit, after-sale service is automatically better ensured).

Conclusions and Recommendations

A frame work should be developed to ensure that PV companies benefiting from financing do set-up a proper after-sales system. Monitoring parameters should explicitly include after-sales services as a key issue. [Agreed]

Synergies or complementary initiatives should be sought to find substantial additional income generation activities that could help develop affordability. This could be in the form of clean multipurpose power generation systems (giving power for irrigation, processing of agricultural products, etc.), which would be shared on a commercial basis by remote located communities.

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RESPONSE TO SWITZERLAND'S COMMENTS

Comment 1 “However, the experience with PV dissemination show that the actual livelihood improvement potential on the economic level of power generated by PV is somewhat limited. PV based power alone cannot meet substantial energy need for productive use (e.g. irrigation pumps, flour mills, agro-processing, small machinery...) at reasonable cost. The development of willingness to pay and of the market on a sustainable basis can only occur if the affordability becomes better for lower income households. Added income generation activities are required if the PV market is to develop sustainably. Of course, this issue goes much beyond the scope of the project, but synergies between PV marketing and other added income generation activities should be explored.”

Recommendation 1

Synergies or complementary initiatives should be sought to find substantial additional income generation activities that could help develop affordability. This could be in the form of clean multipurpose power generation systems (giving power for irrigation, processing of agricultural products, etc.), which would be shared on a commercial basis by remote located communities.

4. RESPONSE 1

We fully agree with the Swiss comments that PV based power has limitations as source of energy for large scale productive use.

Mwanza region was selected as UNDP has several other ongoing activities in the Mwanza region, and the region was selected to effectively utilise potential synergies. The UNCDF support to Mwanza has focused on Local Government and increased local management of local resources, and will in the end benefit the development of the region. The UNDP/GEF small grants programme is supporting a number of community level projects in Mwanza region, supporting agriculture, energy etc. that are improving people's livelihoods. The project will strive to explore and maximize these benefits.

On productive use of PV, with the known limitations, the Project would test some of the possible productive uses through the component on Awareness – output 2.3 and Component on Financial Engineering, output 4.3.

5. COMMENT 2

One of the barriers to the sustainable development of the PV market is the lack of appropriate after-sale services. It is not clear how a dominantly cash sale market development will ensure a proper after-sales service development (when systems are on credit, after-sale service is automatically better ensured).

6. RECOMMENDATION 2

A framework should be developed to ensure that PV companies benefiting from financing do set-up a proper after-sales system. Monitoring parameters should explicitly include after-sales services as a key issue.

7. RESPONSE 2

The financing market is at very early stages in Tanzania, and the project will be testing and piloting various financing possibilities. After sales services are being included where PV systems are being financed for end users, as it is in the interest of all parties that the system is operational until the loan is repaid. The programme will look into the possibility of setting up after sales services also where the dealers are benefiting from finance, but the sales are still cash. As after sale service is seen as important for the long term sustainability and the success of the project, it has been added as an indicator in the programme result framework and will be incorporated into the monitoring of the project.

For cash sales, the current practice in private sector is to give a guarantee to the customer for ½ year or 1 year – where they can return any component of the system if there is any technical error. In addition, the dealers promote use of skilled technicians for the installation of the systems, to ensure they are set up properly and are functional from the start. If the end user in addition is properly exposed to basic operation and maintenance of systems and informed of what the system can do and what it cannot, the chances of failures of the system is not that high, and maintaining the battery is normally the largest challenge. The provision of a guarantee and of a technician for installation is normally the limit of what private sector can include in the cash sale, and also the customers are normally not interested in paying for an additional service.

GOVERNMENT OF THE UNITED REPUBLIC OF TANZANIA
UNITED NATIONS DEVELOPMENT PROGRAMME
Global Environment Facility (GEF)
Project Document

PROJECT NUMBER: URT/03/GXX
PIMS NUMBER : 1894
PROJECT TITLE Transformation of the Rural Photovoltaic (PV) Market in Tanzania
COUNTRY United Republic of Tanzania
DURATION Five years
EST. STARTING DATE December 2003
EST. END DATE December 2008

<u>Financing</u>	
UNDP / GEF	\$ 2,250,000
Cost-sharing	
UNDP Small Grant TRAC	\$240,000
Government (in kind)	\$ 147,600
Sida PV (new programme)	\$ 3,176,471
Dutch Govt/Umeme Jua	\$ 630,000
Others (UNESCO,Belgium)	<u>\$ 540,000</u>
Total Co-financing	4,734,071
Total	\$9,474,071

EXECUTING AGENCY National Execution (NEX), Ministry of Energy and Minerals
IMPLEMENTING AGENCY Ministry of Energy and Minerals, Renewable Energy Section

Summary:

The project aims at reducing Tanzania's energy-related CO₂ emissions by introducing photovoltaics (PV) as a substitute for fossil fuel (kerosene) utilized for lighting in the rural areas remote from the electricity grid and at slowing down the rate of additional diesel-based captive generation or grid extension schemes for providing basic electricity services to the unelectrified rural households, specifically in the Mwanza region. In addition, the project will substantially decrease the growing number of rural poor, adults and children alike, who contract respiratory and eye problems due to prolonged exposure to kerosene smoke and soot (poor indoor air quality). The activities proposed in the project are designed to remove barriers to the wide-scale utilization of PV to meet the basic electricity needs of individual households in terms of lighting, power for a radio-cassette/TV and of community users like health clinics and schools, initially in Mwanza region, but eventually in the whole country. The project will develop local capacity to identify technical and financing options and to formulate the regulatory, institutional, financial and marketing instruments necessary to demonstrate the technical, economic, and financial viability of using the private sector as a vehicle to deliver basic electricity services to rural households and community users.

On behalf of:

Signature

Date

Name / Title

**Government of
Tanzania**

Executing Agency

UNDP

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PREAMBLE

After approval of the project brief by the GEF Secretariat in May 2003, the project document has been developed. The UNDP Project Document has the standard cover page for signature, and includes:

- 1) Implementation modalities and organogramme;
- 2) Detailed M& E and reporting framework, the legal basis for this project document (standards text) and audit requirements;
- 3) Terms of Reference for the Main institutional structures and Individuals financed through the project;
- 4) An input budget in UNDP terminology; and
- 5) Initial workplan for 2004 and indicative workplan for the project period.

These operational modalities and the draft GEF project document were discussed and approved within the UNDP PAC (Project Advisory Committee) held in Dar es Salaam 7th October 2003. The PAC was chaired by the Assistant Resident Representative of UNDP, and was attended by stakeholders from Ministry of Energy and Minerals, Mwanza Regional Commissioner's Office (the Regional Commissioner attended in person), Sida, Tatedo, TASEA, University Consultancy Bureau, Tanzania Chamber of Commerce, Industry and Agriculture (TCCIA), Umeme Jua., Fredka International Ltd and UNDP. The project document takes into consideration recommendations of the PAC meeting.

LIST OF ACRONYMS AND ABBREVIATIONS

AfDB	African Development Bank
AFRREI	Africa Rural and Renewable Energy Initiative
BoS	Balance of System
COMESA	Common Market for Eastern and Southern Africa
CRDB Bank	Cooperative and Rural Development Bank Limited (the former CRDB was liquidated and CRDB Bank was formed--the long name is not used any more)
EAA	Energy Alternatives Africa
EAC	East African Community
GHG	Greenhouse Gas
GEF	Global Environment Facility
IPP	Independent Power Producer
MEM	Ministry of Energy and Minerals
NMB	National Microfinance Bank
PIU	Project Implementation Unit
PM	Project Manager
PMCT	Project Monitoring and Coordination Team
PPA	Power Purchase Agreement
PV	Photovoltaics
RAS	Regional Administrative Secretary
RC	Regional Commissioner
RES	Renewable Energy Section
SADC	Southern African Development Community
SEECO	Sustainable Energy and Environment Services Company
SHS	Solar Home System
Sida	Swedish International Development Cooperation Agency
SUDERETA	Sustainable Energy through Renewable Energy Tanzania
TANESCO	Tanzania Electric Supply Company Limited
TASEA	Tanzania Solar Energy Association
TRAC	Target for Resources Allocation from Core
UNDP	United Nations Development Programme
VETA	Vocational Education and Training Authority
WHO	World Health Organisation

Exchange rate: 1 US \$ = 1000 Tshs (Feb 2003) 1 USD = 9 SEK (Feb 2003)

8. BACKGROUND AND CONTEXT

1. For people and markets located at long distances from the electricity grid, the absence of reliable and affordable renewable energy technologies for electricity generation has meant that the only possibility for the provision of electricity services is through small diesel generators. Despite many initiatives aimed at developing and utilizing renewable energy technologies, small diesel generators remain the primary supplier of small quantities of electricity to remote regions located far from the grid. And when captive diesel generation is absent, the rural households rely on kerosene (and even wood; candles are hardly used for purposes of providing light) for lighting and dry cells/batteries to power their radio-cassettes/TV. In addition to the respiratory and eye problems associated with prolonged exposure to kerosene smoke and soot (poor indoor air quality), continued reliance on kerosene for lighting also results in the ever-increasing emission of greenhouse gases. Recent advances in the renewable energy field, especially in PV, have meant that some of these remote areas can now be provided with clean electricity services through renewable energy on a least-cost basis.

2. Rural electrification has been an important component of the national development agenda for Tanzania since independence in December 1961. However, the high costs of rural electrification programmes have been a formidable barrier over all these years, with the result that less than 10% of the total population of about 34.56 million has access to grid electricity services. The situation is worse in the Mwanza region, when compared to the national average: only 5.9% of the total population of 2.94 million in this region have access to grid electricity. Nationally, some 75% of the population live in rural areas, but only 1% of the rural population have access to electricity services. Therefore, the task that lies ahead is formidable.

3. There are little prospects that financial resources will become available and economic viability will encourage the national electric utility, TANESCO, to undertake electrification of even 20% of the rural households in the foreseeable future. In fact, the present process of restructuring that will lead to the privatisation of TANESCO in 2004 has slowed down expansion of the distribution system to serve the rural areas and a privatised TANESCO itself might slow it down further, as investment decisions will be made more on the basis of return on capital rather than on political considerations.

4. Over the last few years, Tanzania has made several policy changes in the energy sector. High on the Government's agenda is the restructuring and eventual privatisation of TANESCO, being undertaken by the Presidential Parastatal Sector Reform Commission; the setting up of a regulatory body, the Energy and Water Utilities Regulatory Authority, the revising of the Electricity Ordinance, these will lead to preparation of a bill for deregulation, licensing for Independent Power Producers, regulations for unbundling of the electricity sector into private generation, transmission and distribution utilities, etc. Also, as of 1 July 2001, the Government granted exemption on all import duty on PV panels, but the 20% value added tax (VAT) on these panels is maintained. The other components of a PV system have, however, not yet benefited from a similar measure of 10-20 % import duty exemption (the amount of import duty varies from component to component).

5. For its part, the Ministry of Energy and Minerals (MEM) has developed revised the National Energy Policy document, in consultation with various stakeholders including a special committee of the Parliament. This document has been reviewed and cleared by the Inter-Ministerial Technical Committee and was approved by Cabinet in February 2003. Several strategic objectives for the energy sector are defined in the policy document, viz. to

reduce the fossil fuel dependency for isolated grids and remote locations, to promote private participation in the energy sector, to introduce energy efficiency and conservation measures and to study the potential role of renewable energy, particularly in rural electrification initiatives. With regard to rural energy, the strategy for implementing the policy calls for the setting up of a Rural Energy Agency and a Rural Energy Fund.

6. MEM---through its Renewable Energy Section (RES)---launched a small project, under the World Solar Programme, to study the potential of PV to meet the basic electricity needs of remote communities. In this connection, with funding and technical support provided by UNESCO, RES installed a 2.5 kWp PV system at Mangaka, Masasi district in Mtwara region to supply PV electricity, to village amenities consisting of a secondary school, dispensary and a police post. The objectives were to investigate the conditions under which decentralised rural electrification through PV could be both technically feasible and economically viable. This study was completed in 2000 and recommended a thorough investigation of the barriers to PV utilisation for meeting the basic electricity needs of rural communities in the country.

7. In addition, with support from UNDP and UNIDO, MEM implemented a study entitled “A Framework for a National Programme to promote Renewable Energy Technologies and Energy Conservation in Tanzania” in 1998. The objectives of this study were to develop “a national programme on the application of renewable energy and energy conservation” and were intended to assist MEM in identifying the priority areas and to provide stimulus to discussion for all stakeholders to participate in the revision of energy policy in Tanzania. Again in 1998, Sida supported MEM in the implementation of a “Tanzania Rural Energy Study” with the objective of identifying “feasible projects that could improve the energy situation for people in rural Tanzania”.

8. Following the above initiatives, GEF approved a PDF B Project “URT/00/G43: Removing Barriers to the Transformation of the Rural PV Market in Tanzania” in February 2001. The main objective of this project, which led to the formulation of the present brief, is “to remove barriers to the growth of the rural market for photovoltaic (PV) equipment in Tanzania, thereby reducing the reliance on fossil fuels and reducing greenhouse gas emissions, while improving the quality of life of the rural population”. The project is designed to review the status of the rural market for PV, identify barriers to its sustained growth and formulate a full-scale programme to remove the identified barriers, thus providing a boost to the PV market, with the aim to meeting the electricity needs of rural communities located away from the grid. Initially, activities would focus on one region of the country, Mwanza. It was also expected that the results of the PDF B would provide useful data that would assist the Government in identifying the potential barriers to the development and utilisation of PV for electricity generation in the other regions of Tanzania. This preparatory phase was conducted with a view towards presenting a full-size project for GEF funding.

9. Through implementation of the PDF B, the barriers to the utilisation of PV to meet the basic electricity needs of rural communities in the Mwanza region were identified as indicated in the Table below:

Barrier	Degree of Importance
Limited awareness of, and experience with PV technology and 12 VDC appliances. Energy is a low priority area among users.	Major barrier
Inadequate business knowledge and capacity for distribution, aggressive marketing and sales of 12 VDC appliances and PV systems.	Major barrier
Limited technical knowledge of proper sizing, installation, operation and maintenance.	Major barrier
High cost of doing business	Major barrier
High cost of solar systems, initial capital investment and operation and maintenance.	Major barrier
Low purchasing power of the rural people	Major barrier
Lack of established dealer network	Secondary barrier
Lack of solar PV standards and poor /inappropriate installations.	Secondary barrier
Policy implementation	Secondary barrier
Difficult access to finance for suppliers (importers, dealers, etc.)	Secondary barrier
Difficult access to finance for end users	Secondary barrier

9. To overcome these barriers, the present full project will establish a project to transform the rural PV market in Tanzania, utilising the private sector as a vehicle for providing basic electricity services from PV in the Mwanza region. As part of the PDF-B, surveys were carried out to determine the size of the market for PV for both residential and community users. . This full project will seek to implement as large a share of PV-based rural electrification as is considered feasible. The activities proposed for implementation in the full project are in line with the recommendations of the September 2000 GEF Marrakech workshop “Making a difference in emerging PV Markets: Strategies to promote PV energy generation”, especially with regard to PV service businesses, financing, standardised quality products, creative partnerships, etc. The project has also been designed based on lessons from other GEF projects presented at the May 2003 GEF Pretoria Workshop “Financing Mechanisms & Business Models for PV Systems in Africa.

10. For the full project, the GEF will contribute towards the incremental costs in order both to encourage the adoption of PV technology for providing rural electricity services and to establish a replicable framework for future projects in the rural electrification sector. Thus, the proposed demonstration investment project is designed not only to demonstrate the sustainable use of PV in the Mwanza region, but also to provide a framework that can be pursued to further promote PV-based electricity generation in the other regions of Tanzania.

Prior and/or Ongoing Assistance

11. In addition to the GEF PDF B for the rural PV market that led to the formulation of this brief, UNEP implemented in 1997 a study on “Sources and Sinks of Greenhouse Gases in

Tanzania” with financial support from GEF and the International Development Research Centre of Canada. This study prepared an inventory of GHG emission by sources and removal by sinks in the various sectors of the economy.

12. Moreover, UNEP has recently secured GEF PDF-A funds to implement a regional study entitled “Building Sustainable Commercial Dissemination Networks for Household PV Systems in Eastern Africa” that will target Eritrea, Ethiopia, Kenya, Tanzania and Uganda. The objectives of the UNEP/GEF Regional Solar PV Program are to promote the Kenya business model in the region, and also to share experiences between players in the region. Kenya has the most active commercial PV market in the developing world. More than 20,000 PV SHS are bought each year in the country, and a bulk of the equipment is manufactured locally. There are over 500 shops which sell PV product and more than 1000 technicians that participate in the market. Consumers can obtain PV panels, batteries and 12 Volt DC appliances from hundreds of shops at competitive prices. In Tanzania, this project will be active in Iringa. The UNDP project will actively collaborate with the UNEP project.

13. In Tanzania, there are several other ongoing GEF-supported initiatives that may benefit from the results of this project, and which the project might learn from. They are mainly in biodiversity and international waters. Among these are: URT/00/G35: Development of Jozani/Chwaka Bay National Park development (\$ 745,000); URT/00/G31: Development of Mnazi Bay Marine Park (\$ 1.5 million); RAF/01/G41: Lake Tanganyika Management Planning Project (PDF-B \$ 599,000); URT/01/G32: Conservation of Forest Biodiversity Resources in the Eastern Arc Mountains of East Africa (Full project \$ 5,000,000); URT/97/G42: GLO/99/G43: Nile River Basin Initiative (\$ 350,000); the Small Grants Programme URT/98/G52 aimed at enhancing the contribution of households and communities to conserve biodiversity, mitigate global climate change and protect international waters (\$ 400,000) All these initiatives are mainly directed towards conserving forest or marine biodiversity hotspots while simultaneously catering to the needs of local communities, and some have energy components. The Small Grants Programme has supported a number of projects in Mwanza region, including demonstration of use of PV and solar energy.

9. RATIONALE AND OBJECTIVES

Rationale

14. TANESCO is contemplating the formulation of a rural electrification master plan for the whole country. This will, of course, include the Mwanza region, but TANESCO’s corporate priority is to electrify district headquarters and large towns over villages, even if these are close to the grid. The problem is compounded by the fact that most houses, even those located along the low voltage distribution grid, do not meet the construction standards for electric ity connection.

15. The Mwanza region has eight districts. The number of households in each district and the percentage of those connected to the grid are provided in Table 1 below:

Table 1: Household Distribution in Mwanza Region *in 2000

District		Number of HH (2002)	Electrified HH (Feb. 2002)	Percentage connected
Magu		70,065	827	1.2%
Ukerewe		40,729	-	0.0%
Geita		115,640	-	0.0%
Sengerema		76,632	735	1.0%
Kwimba		49,891	424	0.9%
Misungwi		39,956	778	1.9%
Mwanza City	Ilemela	53,349	22,193	21.7%
	Nyamagana	49,138		
Total		495,400	24,957	4.8%

*Based on 2002 housing and population census.

16. Table 1 above shows that only 4.8% of the total households (each household consists of an average of 5.9 persons) in the Mwanza region were connected to the grid in 2002. In 2000, as per the region's projections, there were 295,917 rural households (out of a total of 420,029) that were too far from the grid and could not realistically expect to have access to grid electricity services over the next 15-20 years. This will result in further exacerbating the situation, as it is not expected that grid-connected rural electrification will even keep pace with the projected population increase which according to 2002 population and housing census for Mwanza is at 3.2 per annum.

17. The Mwanza region enjoys a very good solar regime (average of 5.5 kWh/m²/day). Therefore, introducing individual PV systems would make it possible, in the long term, for some 17% (as per the market survey undertaken for Umeme Jua by TaTEDO and EEA) of the 295,917 households (2002 figures) and the few community users located far from the grid (see Table 2 below) to have their basic electricity needs met from the locally available solar resource. This will have the effect of eliminating the amount of 47 million litres of kerosene used for this purpose over the 20-year lifetime of the equipment. This will be leading to significant global benefits by reducing greenhouse gas emissions. Thus, it is expected that the introduction of PV systems for the provision of electricity services in Mwanza region will generate a reduction of app 29,000 tonnes of CO₂ over the 20-years.

18. As indicated in para. 2 above, national coverage of electricity is very low (10% of the total population) and 99 % of the rural population living in dispersed communities located away from the grid have no access to electricity services. Many of these rural communities may not be connected to the grid for the next 15-20 years because of the high investment that is required for grid expansion. Thus, removal of the identified barriers to PV-based electricity generation in the Mwanza region will have the net effect of more than a five time reduction of CO₂ when implementation of PV systems for basic electricity needs, based on the lessons learned in the Mwanza region, is completed in the other regions of Tanzania. The estimated national reduction of CO₂ taking into the effect of the Mwanza project is almost 119,000 tonnes of CO₂ over 20 years.

19. Removal of the identified barriers to PV will also provide the private sector with the necessary confidence to set up new businesses for the sale of PV systems. This will benefit rural consumers in Tanzania in that they will have access to environmentally clean electricity services without the long wait for the arrival of grid-connected electricity. The net result will have a four-fold effect: provide rural consumers with a better quality of life, create opportunities for income-generating activities based on the availability of electricity services, thus assisting in poverty eradication, generate the potential to substantially reduce the rural energy sector carbon emissions and eliminate a safety hazard (kerosene fires) while simultaneously provide better indoor air quality (decrease the number of smoke and soot-related health problems associated with prolonged exposure to kerosene fumes). On this last issue, WHO reports that Acute Lower Respiratory Infections (ALRI) remain the single most important cause of death globally in children under 5 years, and this is mainly caused by indoor air pollution.

20. In addition to bringing about local, national and global benefits, the project is consistent with Tanzania’s national development priorities. It will increase the use of renewable energy and decrease both the consumption of kerosene for lighting and that of diesel required to power the additional generating capacity in case of grid extension or captive electricity generation. The Government of Tanzania is currently engaged in a process that will lead to privatisation of the electricity sector and, hence, the project is in line with the objectives of MEM’s development priorities and privatisation programme.

21. The market assessment provides the following picture of the potential PV market and avoided kerosene consumption for lighting and refrigeration in rural Mwanza region:

Table 2: Potential PV Market and Avoided Kerosene Consumption in Rural Mwanza in 2002

Market Segment	Number of Potential PV Users in 20 years	Avoided Kerosene Consumption per User (litres/month)	Total Avoided Kerosene Consumption
Baseline	18,393	8	1.8 mill
Effect of project	61,679	8	5.9 mill

The market assessment further highlights the following two important considerations:

- The consumer market is primarily for individual solar home systems or individual community systems. Except in very few cases, the houses in rural Mwanza region are very dispersed, making it economically and financially not viable to supply them from PV-based mini-grids.
- The introduction of PV to provide electricity services in rural Mwanza region will create opportunities for new or additional income generating activities. Examples of these are the potential to set up solar battery charging businesses (e.g. Nyarugusu mining settlement and Bushishoro village, both in Geita district), to mount PV panels on mobile pushcart-operated “music” shops selling cassette tapes, with the electricity utilised for advertising and testing of tapes, to extend the business hours of neighbourhood shops, etc.

22. The different scenarios in the market surveys estimate that a variety of 10-30% of the rural households in the Mwanza region can afford electricity service from a PV system.

Using the base scenario of 17%, this amounts to approximately 50,000 PV systems. And assuming that the affordability rate remains constant at >30 % (the Government hopes that its aggressive poverty eradication policy will likely increase this rate), the total number of PV systems that would be “affordable” would increase with population growth. Thus, there is a huge potential market in the Mwanza region (and in the country as a whole) for properly sized and installed PV systems and the aggressive participation of the private sector is both required and necessary to provide the increasing number of households with basic electricity services.

23. In Mwanza, on the basis of consumers’ willingness and capacity to pay, as evidenced in the market study, it can be reasonably expected that the growth in sales from the project will start showing in the second and third year, with an exponential growth up to 50% at the peak. As per this scenario, it is expected that app. 4,600 PV systems would be installed in the Mwanza region during the five-year duration of the project, compared to the baseline estimation of 2,800 systems. The growth effect due to the project is expected to be continued in the first years following the project, and then eventually the market will be saturated and the growth is expected to decrease, and only follow population growth. In addition, the momentum for installing PV systems should pick up in the rest of the country after the 5 years of project implementation in Mwanza, by which time the breadth of coverage would have expanded to other regions of Tanzania as well, mainly due to the efforts of other partners active in the PV field. On the basis of the market survey, it is foreseen that the bulk of the requirements in the Mwanza region will be for individual solar home systems in the 10 - 50W range. There will also be markets for larger home or community systems as well, but the main bulk of the market is known to be on the smaller systems. 10-30 Wp lighting systems will be of interest to far more household in Tanzania than 50 Wp systems. Making available lanterns (and perhaps smaller systems for powering radios and cassettes) will help to reach the needs of lower income groups. The total cost of the project where an addition of 1600 PV systems for the provision of off-grid electricity services as per the scenario outlined in Para. 24 above and inclusive of the soft costs for the policy/institutional framework, capacity development, etc. are estimated at US \$ 2.25 million.

24. UNDP GEF activities will focus on the Mwanza region, mainly from the point of view of having a focused development support, and to establish a pilot for further replication. Mwanza is chosen, as its rural population is higher than other regions in Tanzania, and is also a fast growing region economically. Mwanza as an urban centre is the second largest city in Tanzania. Also Mwanza city can provide most services to the rural areas in the development of the PV market. Mwanza was also chosen on the basis of UNDP’s own regional focus and on the potential for developing synergies with other programmes aimed at poverty eradication in that region of the country. The components focusing on awareness, business development and financing will concentrate on Mwanza, but will be carried out in close collaboration with the Sida project, which will have national coverage. Also, the components related to policy and institutional issues as well as the learning and replication will benefit not only the Mwanza region, but also the whole country.

25. The Swedish International Development Co-operation Agency (Sida) has decided to finance market-driven support to enhance the development of the rural PV market in Tanzania. This approach is not directly aiming at poverty reduction, but rather at promoting the use of the PV technology, which by the development of the commercial market for PV application will reduce the cost structure in the business, and in the longer term, improve affordability, thereby encompassing consumer segments having less purchasing power. It is a five-year project with a budget of 27 M SEK (approximately 3.2 mill USD). The emphasis is on supporting the private sector and stimulating demand. The project shall support the

implementation of activities within the following broad areas: 1). Business development support to existing and potential PV companies, 2) Development of the Solar Network, 3) Policy and Institutional Development, and 4) Stimulation of End-user Market. The project is based on a few principles such as: The market should preferably initiate the activities in order to avoid predefinition of “problem” and “solution” by the project. Project activities should be minimised to supervision and monitoring whereas activities supporting the market should be subcontracted as much as possible to existing organisations and companies. Sida is also supporting the capacity development in the Ministry of Energy and Minerals and the development of the institutional framework, which according to the new energy policy will put in place a Rural Energy Agency and a Rural Energy Fund. The total support from Sida for these two projects adds up to approximately US\$ 5.5 million. The Sida PV project is incremental and is considered as co-financing to the UNDP/GEF project, as the UNDP/GEF project cannot succeed fully without the Sida project. The Sida institutional project is part of the baseline, and is considered as associated financing, but is also key to the sustainability of the UNDP/GEF project.

26. In addition, a local private company, Umeme Jua (*Kiswahili* words for Electricity from the Sun), has been set up in Dar es Salaam to “put in place the main components for an effective commercial market infrastructure for solar home systems in Tanzania”. The shareholders of Umeme Jua are Ameco Environmental Services and Free Energy Europe BV of The Netherlands, and Fredka International and SEECO, a subsidiary company of TaTEDO of Tanzania, and the initiative is partly supported by the Dutch embassy. Umeme Jua is investing approximately US\$ 630,000 for setting up a dealer network for sales of PV solar home systems in 6 regions, including Arusha, Kilimanjaro and Mwanza. Again, the Umeme Jua initiative is in line, albeit on a smaller scale, with the objectives of the GEF project. In discussions with Umeme Jua, it is understood that while its activities in the Mwanza region will be implemented in parallel, they would be undertaken, as in the case of Sida in close collaboration with the UNDP GEF project.

10. OBJECTIVES, OUTPUTS AND ACTIVITIES

27. The global objective of the proposed project is twofold: i) to reduce Tanzania’s energy related CO₂ emission by substituting PV for fossil fuel (kerosene) utilised to provide basic electricity services to rural homes and community users and ii) To improve people’s livelihoods by improving their access and affordability of modern energy services. These would be achieved by project activities designed to remove barriers to the wide-scale utilisation of PV for providing electricity services, initially in rural Mwanza region, and nation-wide at a later stage. The project will develop the regulatory, institutional, financial and market instruments necessary to demonstrate the technical, economic, and financial viability of using the private sector to participate in the process of sustainable development in the Mwanza region, through the delivery of basic electricity services from PV to the rural areas. It will also remove the barriers to the wide-scale replication of this modality in other regions of Tanzania, thereby enhancing the dissemination of such a model in the neighbouring SADC countries and elsewhere.

28. The development objective of the project is *to remove barriers with the aim of promoting the utilisation of PV to provide basic electricity services to improve people’s livelihoods and reduce the dependency on imported fossil fuel*. The project aims at overcoming the most important/major barriers. Setting up of a commercial dissemination system is important in order to create the demand. The project shall commence by targeting the market segment comprising of higher income earners. The Project’s immediate objectives encompass:

- *to refine the policy framework and the institutional arrangements necessary for the widespread adoption of PV's for providing off-grid electricity services;*
- *to increase awareness among the general public, especially decision makers, consumers, and other end-users on the potential role of PV in meeting the basic energy needs of rural communities located away from the electricity grid;*
- *to strengthen and support the private sector working in the PV sector to provide better quality of service and to develop models for providing PV-based electricity services to the rural areas;*
- *to explore, develop, test and adopt viable financing options for disseminating PV systems; and*
- *to disseminate experience and lessons learned to promote replication throughout the other regions of the country.*

29. This Project will enable the Mwanza region to benefit from a clean, modern and, at the same time, reliable source of energy for basic electricity services. A secondary objective is to decrease the number of respiratory and eye problems that affect the rural population as a result of prolonged exposure to kerosene smoke and soot. The same World Health Organisation study indicates that indoor air pollution annually causes some 2 million deaths world-wide and represents 5% of the global burden of disease. The project also aims at supporting the Government's objective of introducing renewable energy technologies based on PV (and other renewables) for electricity generation to supply remote areas, thus reducing the country's reliance on imported fuel.

30. The project consists of the following five components:

- Component 1: Policy support & institutional strengthening;
- Component 2: Awareness raising;
- Component 3: Private sector strengthening;
- Component 4: Financial engineering; and
- Component 5: Learning and replication.

The components are related to the barriers identified, in the following manner:

Barrier	Component
Limited awareness of, and experience with PV technology and 12 VDC appliances. Energy is a low priority area among users.	Component 2
Inadequate business knowledge and capacity for distribution, aggressive marketing and sales of 12 VDC appliances and PV systems.	Component 3
Limited technical knowledge of proper sizing, installation, operation and maintenance.	Component 3
High cost of doing business	Component 3, 4
High cost of solar systems, initial capital investment and operation and maintenance.	Component 1, 3, 4

Low purchasing power of the rural people	Component 2, 3
Lack of established dealer network	Component 3
Lack of solar PV standards and poor /inappropriate installations.	Component 1
Policy implementation	Component 1
Difficult access to finance for suppliers (importers, dealers, etc.)	Component 4
Difficult access to finance for end users	Component 4

The components are interdependent and are all part of transforming the rural PV market in Tanzania, hence all have to be addressed to remove the barriers. The sequencing of the activities planned to be undertaken as follows:

Component	Year 1	Year 2	Year 3	Year 4	Year 5
1: Policy/institutional	■	■			
2: Awareness	■	■	■	■	
3: Private sector		■	■	■	■
4: Financing		■	■	■	■
5: Disseminate experiences		■	■	■	■

Each of the five components is composed of an immediate objective, specific output(s) and a number of activities. By achieving the five immediate objectives, the project will contribute towards the achievement of the global and development objectives.

COMPONENT 1 POLICY SUPPORT & INSTITUTIONAL STRENGTHENING: The immediate objective is *to refine the policy framework and the institutional arrangements necessary for the widespread adoption of PV's for providing off-grid electricity services*. As outlined in “The National Energy Policy” document recently approved by Cabinet, the Government attaches high priority to providing basic energy services to the country’s off-grid rural communities. The implementation of the new energy policy will be supported through this project. In particular, this project will help the Government ensure consistency between the adopted policy and other rural energy support activities; examine the role of VAT and import duties on the price of PV components, and establish standards and codes for the assembling, utilisation and financing of PV systems in Tanzania. As Tanzanian prices for PV systems are estimated to be between 20 and 40% higher than the prices of equivalent systems in Kenya. In order to help reduce the price of PV systems in Tanzania, this component will also look at the East African Community or COMESA tax and customs systems, as prices could be readily reduced if systems could be brought into Tanzania from Kenya without being taxed twice.

The estimated cost of this component is US\$ 200,000.

The three outputs of this component will be:

Output 1.1: Implementation framework for off-grid PV defined and in place.

Activities:

- To assist the Government in implementing the new National Energy Policy by:
 - Providing to the development of the institutional framework for implementing the Energy Policy, within which PV will have a niche;
 - Assisting the Government in formulating an implementation plan/strategy for off-grid PV systems; and
 - Assisting the Government to design incentive packages for off grid electrification.
- To assist the Government in finalising a Rural Energy Master Plan (supported by AfDB; Sida; and others) that is consistent with the needs of a nascent PV market.

Output 1.2: Energy pricing policy in Government is adapted to support utilisation of PV systems, to deliver appropriate products at the right price.

Activities:

- To review the recently introduced regulation exempting PV panels from the payment of import duty¹ and examine how other BoS components might also be exempted, consistent with international best practice and experience in the East African Community or COMESA tax and customs systems;
- Based on the above review, to formulate proposals for the removing/decrease of tax/duties on all PV system components and initiate discussions with the Ministry of Finance; and
- Study how all energy services are priced, taxed or subsidised in order to ensure consistency between policies to support conventional fuels and those relating to PV and other renewable energy systems.

Output 1.3: Standards for PV components and systems defined.

Activities:

- To develop a project set of preliminary standards, codes and minimal warranty procedures that will be promoted throughout the project, based upon international experience (including PV gap);
- To develop a code of practice for technicians to follow to correctly size, install and maintain PV systems; and
- To facilitate the formulation and adoption of national standards for PV components and systems, in joint collaboration with the Tanzania Bureau of Standards and a consortium of participating PV companies.

COMPONENT 2 AWARENESS RAISING: The immediate objective is *to increase awareness among the general public, especially decision makers, consumers, and other end-users on the potential role of PV in meeting the basic energy needs of rural communities*

¹ Import duties have been lowered to 10, 15 and 20% from 40% for all items, import duty on solar modules is zero. Compounded tax/duty on PV systems is < 25% of the total price. This implies that tax/duty is significant but not major cost item.

located away from the grid. Knowledge and awareness are important links in the process to successfully introduce PV for off-grid rural electrification. Market growth has been limited by the extremely narrow band of familiarity with PV systems found among the population at large, and the potential market stakeholders in particular in Tanzania.

The budget for this component is estimated at \$ 500,000.

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

Activity:

- To develop targeted awareness and information packages about PV systems and their potential to offer development benefits (to be implemented in close consultation with the Sida project);
- To organise field trips for key decision makers (e.g. MPs, key ministry representatives, NGOs, dealers etc.) to witness the demonstration of PV systems in villages, as well as their local deployment and acceptance.
- To organise a study tour for a limited set of key decision makers (MP's, key ministry representatives, NGO's, dealers, etc.) to countries with blossoming PV markets (e.g. Kenya, South Africa, India, Chile, Sri Lanka, etc.)

Output 2.2: End user awareness programme formulated and implemented to address the usefulness and availability of 12VDC appliances (such as radios, lamps etc); that PV systems can power 12 VDC appliances; the technical limitations of PV systems; and the inherent worth and value in PV systems and 12 VDC appliances. This component will be done in close cooperation with private sector.

Activities:

- To prepare and disseminate information and awareness packages of printed materials to raise awareness of the benefits of PV systems and technology;
- To prepare and disseminate an outreach programme utilising multi-media to raise awareness of the benefits of PV systems;
- To prepare educational material on PV systems to be disseminated through schools in the targeted regions;
- To organise general awareness campaigns (e.g. free PV-powered video shows on market occasions, etc.) including the active involvement and support of local PV dealers.

Output 2.3: Demonstration program implemented to show the functionality and usefulness of a limited number of PV installations in strategically important locations and niches.

Activities:

- To install PV demonstration systems at selected schools, market places and health centres that will serve as an awareness vehicle to sensitise the younger generation and their parents about the value and utility of PV installations. The costs of this activity will be shared between the project, the user and the supplier;
- To identify and make widely available information about a range of PV system packages that service different perceived market needs (in conjunction with 3.2 below); to organised site visits of key decision makers and the press to the pilot demonstration sites.

COMPONENT 3 PRIVATE SECTOR STRENGTHENING: The immediate objective of this component is *to strengthen and support the private sector working in the PV sector to provide better quality of service and to develop models for providing PV-based electricity services to the rural areas.* The studies undertaken as part of the PDF for this project have estimated that the bulk of between 2000 and 3000 PV systems (estimated at up to 40 kWp) presently installed in the Mwanza region have been supplied through the efforts of the private sector, with some grant funding from aid agencies. Despite this early reliance upon grant funding, the bulk of the market for PV's in Tanzania will have to be built around cash sales, with private companies not only engaging in the sales of PV systems, but also assisting in their repair and maintenance. While the theoretical potential exists for the private sector to engage in lease-hire or "ESCO" arrangements, the continued growth of the market will depend upon cash-sales. This component is designed to assist and strengthen the private sector to take advantage of the opportunities in the Tanzanian market, beginning with the Mwanza region.

The budget for this component is estimated at \$ 600,000.

Output 3.1 : Business Development Services strengthened.

Activities:

- To provide business planning and development services through one-on-one meetings, training courses and on the job training with emphasis on development of business plans, , marketing plans, and promotional opportunities, making reference, as appropriate, to the resources and opportunities available for support through other efforts (including the Sida PV project);
- To create awareness of PV systems, applications, and product lines (e.g., lanterns; systems of < 14 to 50 W; systems over 50 W; larger systems; etc.) among existing businesses (e.g., appliance stores, electronics shops, etc.) in the towns and villages of Mwanza Region;
- To support the functioning of the recently established TASEA and other similar organisations to facilitate networking among technicians, dealers and suppliers in order to strengthen opportunities for collaboration, partnering, and co-operation;
- To assist local PV wholesalers and importers to develop stronger linkages with international companies;
- To provide training in potential for local manufacturing and assembly, making available the regional studies, market data that indicate the potential.
- To study and discuss alternative service delivery modes (such as ESCO's, "utility delivery", "hire purchase" or "fee for service" modes) and the roles of various potential stakeholders in the provision of electricity service;
- To make available, reassess; refine; and update the PV market data for the key product lines in order to support further business development; and
- To carry out training on PV business "best" practice, including service warranties and maintenance contracting.

Outcome 3.2 Technical knowledge of PV strengthened. These activities will be carried out in close collaboration with ongoing training activities (such as TATEDO; VETA; SUDERETA- ELCT etc.) in order to improve and expand upon their effectiveness, and reach.

Activities:

- To develop a variety of courses (short/long) for various target groups on financing for small-scale renewable energy systems; the correct sizing, installation, and repair and maintenance of PV systems; and other relevant topics tailored to the needs of the following groups:
 - NGOs, micro-finance institutions (MFI's); banking staff, and others;
 - Technicians and sales people;
 - Engineers; and
 - Vendors.
- To work with VETA and other training institutions to develop an appropriate curriculum for the training of PV technicians, including training in standards, international best practice, and codes of practice/ethics.

COMPONENT 4 FINANCIAL ENGINEERING: The immediate objective of this component *is to explore, develop, test and adopt viable financing options for disseminating PV systems*. The lack of financing—either to consumers or vendors—is not considered to be a first order barrier to the incipient growth of the PV market in Tanzania. More important to the growth of the market are the limitations on system quality, public awareness, and business support. As a result, this component is designed to test and evaluate two financing schemes on a limited basis as well as to stimulate and support a small number of innovative "productive use" ventures proposed by the private sector participants in the Mwanza region.

The value of this component is estimated at \$600,000.

Output 4.1 The most promising model for consumer finance of PV systems will be identified, piloted, and evaluated. This output will draw heavily upon the experience in Kenya, Uganda and elsewhere within and outside the region with consumer credit schemes for financing PV systems.

Activities:

- To evaluate the experience of consumer financing for PV systems within the region (and elsewhere in the world, where possible) and to make a recommendation about the most promising system to be piloted in Mwanza region. The options to be evaluated will include micro-financing through banks, credit unions, and micro-finance institutions; salary with-holding to salaried residents of rural areas (such as school teachers, policemen and civil servants); vendor-finance schemes, and other approaches to financing the purchase of PV systems.
- To establish and operate a limited pilot system to test the recommended approach to consumer finance; and
- To evaluate the progress made in the pilot activity in order to evaluate its suitability for promoting further growth of the PV market and its reach into rural areas.

Output 4.2 The most promising model for supplier or supply-chain financing in the PV industry will be identified, piloted, and evaluated. To continue the work initiated under the PDF B to study the various opportunities for sustainable financing PV systems in Tanzania, on both the supply and demand sides.

Activities:

- To build upon the evaluation of financing options available for consumer financing of PV systems undertaken during the PDF to identify the most promising avenues within the region and elsewhere in the world, if possible) and to make a recommendation about the most promising system to be piloted in the PV industry in the Mwanza region. The options to be evaluated will include, but not be limited to, micro-financing, bulk-purchase agreements; conventional banking; manufacturer financing; the use of guarantees and contingent finance; and so forth. One goal will be to see how such financing can be linked to the mainstream financial sector to make it sustainable and replicable over a larger scale;
- Study Financing of supply chain that aims at developing financing mechanisms for potential manufacturers/assemblers;
- To establish and operate a limited pilot system to test the recommended approach to supply-chain finance; and
- To evaluate the progress made in the pilot activity in order to evaluate its suitability for promoting further growth of the PV market and its reach into rural areas.

Output 4.3 To provide limited grant financing to a small number of schemes proposed by the private sector to test various productive uses of PV's in rural areas.

Activities:

- To develop, in consultation with all local stakeholders, especially private sector entities, a competition process to select several schemes to demonstrate productive use of PV systems in Mwanza region. This competition is designed to bring forth the creativity of the private sector as well as "kick-start"-ing the local industry while maximising leverage of GEF resources; and
- To support a small number of the "best" projects judged to most effectively meet the goals of the competition.

COMPONENT 5: LEARNING AND REPLICATION: The immediate objective is *to disseminate experience and lessons learned to promote replication throughout the other regions of the country.* The experiences from introducing PV to provide basic electricity services to rural communities will be made available for similar efforts in the other regions of the country and in other SADC countries. Also the project will work closely with stakeholders such as Sida, Umeme Jua, TASEA, SUDERETA, BP and TaTEDO to ensure that lessons learned are exchanged between these initiatives.

The cost of this component to the GEF is estimated at US\$ 350,000. The outputs from this component will be:

Output 5.1 Evaluation of Impact of PV on rural livelihoods in early adopting households and communities.

Activities:

- Define methodology targeting households adopting PV systems to evaluate and measure the impact of those systems on livelihoods and standards of living;

- Apply methodology to a limited, but carefully selected sample of households and villages in Mwanza region; and
- Summarise the impacts of PV systems on households based upon project experiences.

Output 5.2: Support provided to learning and replication of the experiences with the use of PV to generate electricity in off-grid rural communities.

Activities:

- Prepare publications on the lessons learned and results of the PV initiative in Mwanza for distribution to other sites in Tanzania;
- Organise site visits to the Mwanza region for other donors/investors and private sector entrepreneurs interested in implementing a similar initiative nationally in other regions or internationally;
- Engage with other projects in the country, region and world to exchange lessons, experiences, and solutions encountered to perceived challenges in the PV field; and
- Present the results achieved in Mwanza region through presentations at national and international seminars/workshops.

The GEF Budget for the entire program is provided in Table 3 below. The detailed incremental cost analysis is provided in Annex A and discussed in Section 6.

Table 3 Project Budget

Component Description	Estimated Budget (US\$)
Component 1: Policy Support	200,000
Component 2: Awareness Raising	500,000
Component 3: Private Sector Support	600,000
Component 4: Financial Engineering	600,000
Component 5: Learning and replication	350,000
Total	2,250,000

11. RISKS AND SUSTAINABILITY

31. The project presents several levels of risks. Market-driven projects are always linked with high risks in particular in short and medium term, but should, if properly designed, attain sustainability in the long term perspective.

32. The first level of risks relates to the policy level. There is absence of a rural electrification master plan for the whole country. TANESCO is undergoing restructuring prior to its privatisation in 2004 and has been unable to focus on the preparation of a rural electrification master plan. Thus, there is the risk that a rural area where PV systems are introduced becomes the target of grid extension within a short period of time. This is mitigated by the fact that the Government will set up a Rural Energy Agency, according to the new energy policy, that will have responsibility for, among others, rural electrification. One of the very first tasks of the Rural Energy Agency will be to formulate a long-term rural electrification master plan and, in this regard, the support of the African Development Bank has been secured. Thus, there will be clear demarcation of those areas that will not be connected to the grid for the next 15-20 years and these will be the focus for PV. In the interim, the target

areas for PV will be carefully chosen to be away from potential grid extension. And in any case, the Government's priority for grid extension over the next few years is to cover the 14 district headquarters that are not yet electrified.

33. The second risk is associated with import duty and value added tax (VAT) on PV system components. Until 30 June 2001, an import duty of 20 to 30% was imposed on PV system components (panel, battery control unit, battery and lights), the rate varying from component to component. In addition, a 20% VAT is imposed on all solar items. Thus, these taxes increased the cost of a complete system by over 40%. However, as of 1 July 2001, PV panels are exempted from import duty, but the 20% VAT is maintained. Both import duty and VAT, albeit at a reduced 10 to 20% level, are still imposed on all other PV system components. This risk is considered small to moderate. The project has been developed in close consultation with various key Government Ministries and is supported at the highest political level. Laws are in place to facilitate private sector participation in the provision of public services, including electricity services. In addition, the Government has adopted a policy to reduce fossil fuel dependency for electricity generation and use renewable energy as a substitute, where feasible. Therefore, this issue will be closely followed during project finalisation and implementation, with a view to having PV systems sold in the local market free of all import duties and taxes.

34. The third risk factor is associated with the possibility that consumers will not approach the lending institution(s) for loans to purchase PV systems and it is considered quite small. While the present level of awareness on the services that PV systems can provide to off-grid consumers is not high, rural consumers do every now and then approach the few PV dealers in Dar es Salaam and Mwanza cities for credit sales. Unfortunately, because of poor cash flow, these dealers cannot make credit sales. The piloting of various financing systems will mitigate this risk for consumers, as well as the awareness campaign that will be mounted. In addition to explain the potential services that PV can provide to off-grid rural consumers, the awareness campaign will also provide consumers with information that they can have access to loans for that purpose from lending institution(s). In addition, the PV dealers themselves will direct potential consumers in need of loans for the purchase of systems to the appropriate lending institution(s).

35. The fourth risk factor is related to the disposal of used batteries. These batteries might create an environmental threat when disposed if they are not dealt with properly. This is already being mitigated by the market. The iron plates in the used batteries are valuable, and many dealers pay a small amount to users for used batteries, and they sell the iron to be recycled. Also, the project will seek to establish a disposal system for used batteries, where people can dispose of their used batteries against a small fee, and avoid the environmental hazard of used batteries.

36. The last risk factor identified is related to the replication of the Mwanza region experience in other regions of Tanzania. This risk is also considered quite small, and will be mitigated by the fifth component of the project. After the successful demonstration of the private sector driven delivery modality for the provision of basic electricity services to rural communities in the Mwanza region, it is expected that the private sector in the other regions will find the modality interesting and worth replicating. Already, there is private sector (e.g. Umeme Jua Ltd.) activities in regions like Arusha and Kilimanjaro where a network of PV dealers, sales agents and technicians is being set up. The Sida activities throughout the country will also generate an opportunity to spread the lessons. Hence, a positive experience in the Mwanza region will go a long way towards generating private sector confidence to invest in the PV market.

12. STAKEHOLDER PARTICIPATION AND IMPLEMENTATION ARRANGEMENTS

37. The development of the PDF-B project brief has been undertaken in a participatory way, consulting the major stakeholders throughout the process. A wide range of groups and organisations are stakeholders in this process, from the supply chain - the end users, dealers, importers and international suppliers. Then various Government institutions are involved in their capacity as policy makers and setting up an enabling environment for PV growth. Also NGOs, consultants and training institutions have a stake in the sector, as well as development partners supporting MEM's activities with related projects in Tanzania and related projects in the region.

38. Three stakeholder workshops were held in Dar es Salaam and in Mwanza City in September 2001 and Morogoro, December 2001. Additional meetings with key partners have been undertaken one-on-one. The discussions with stakeholders brought out the following important considerations: there is huge potential for PV in rural Mwanza region (and Tanzania) to provide off-grid consumers with basic electricity services. The local population are supportive of activities that can accelerate their access to these services in order to enable them to enjoy a better quality of life. They recognise the fact that privatisation of the electricity sector may increase their wait for grid electricity and see PV as a really viable alternative. They also fully understand the Government's plans to privatise the services sector. Hence, they are willing to work with the private sector and lending institution(s) to make this happen.

39. Potential consumers and end users of PV products were consulted as part of the TATEDO/Fredka Market Study in Mwanza region in 2000 - 2001. Also community members were part of the workshops organised in the region in September 2001. In addition, there have been close consultations with the RAS Office in Mwanza responsible for regional administration, development and planning issues and districts representatives. The relevant Government institutions in Tanzania dealing with energy and climate change issues and with international collaboration were consulted during the implementation of the PDF B, and support the follow-up Project Brief. The main Government partner is the Ministry of Energy and Minerals (MEM) responsible for policy formulation and defining strategic objectives in the Energy (and Minerals) Sector. MEM's Renewable Energy Section (RES) is in charge of the national renewable energy (and energy efficiency) programmes and projects, and the assistant commissioner for Renewable Energy is the main contact point for the project.

40. Additional government institutions that have a role are The Vice Presidents Office, the National Focal Point for GEF matters and main authority for environmental policy, strategy, regulations, inspection, management and education. Then the Ministry of Finance - Responsible for overseeing and coordinating financial matters at national and international levels have a role. The most key NGOs and network organisations in PV in Tanzania are the Tanzania Solar Energy Association (TASEA) – An association of practitioners active in the promotion and utilisation of solar energy technologies. TaTEDO and SUDERETA are key NGOs in renewable energies, delivering training, consultancies and awareness. For training the Vocational Education and Training Authority (VETA) is a key institution, responsible for vocational/technical training of craftsmen, technicians, etc. at the post-primary/mid-secondary school level.

41. Financing institutions of relevance to PV is a number of Banks/Micro-Finance Institutions, as they are potential providers of loans to the rural sector (e.g. CRDB, Tanzania

Postal Bank and NMB). Then the representatives of the Private Sector have a key role in the implementation of the programme, as they will be involved throughout the market chain, in the manufacturing, importing, wholesale, dealers, sale and after-sales service of PV systems. Other relevant stakeholders are the Tanzania Bureau of Standards (TBS) – Responsible for formulating standards for goods and services in the country will have a role in the formulation of standards. Then the Tanzania Electric Supply Company Ltd. (TANESCO) – National Electricity Utility owns, operates and maintains the electrical system. It is a government-owned company that is in the process of being restructured prior to privatisation.

13. IMPLEMENTATION ARRANGEMENTS

42. The programme will be executed by the Government, under the UNDP National Execution (NEX) modality. Experience has shown that NEX modality provides the best opportunity for project support to conform Government Priorities and ensure national ownership. The Ministry of Energy and Minerals will serve as overall Executing Agency for this Programme and has the responsibility for providing oversight and technical co-ordination of the Programme. For operational purposes the Assistant Commissioner for Renewable Energy will be the lead counterpart, and the project will be executed under the Renewable Energy Section in the Ministry.

43. For smooth implementation of the programme, a Project Implementation Unit (PIU) will be set up. The PIU will be consisting of a Project Manager (international), a Project Coordinator (Tanzanian), a Project Administrative Assistant and a Project Driver. The Project Implementation Unit will be based in Mwanza. The Project Manager will be responsible for day-to day operations and co-ordination, contact with the main stakeholders and will act as liaison/facilitator among the various local stakeholders and donors/investors. The Project Coordinator will be assisting the Project Manager in his duties in the day to day management of the project. The Project Manager will build the capacity of the Project Coordinator so that he/she can be equipped to take over the management of the project after some years, while the post of the PM is phased out. The Project Coordinator, the Secretary and the Driver will all report to the PM. The PM will report on the progress of the project to the Project Coordination Unit in MEM, submitting financial reports on a quarterly basis with the requests for quarterly advance, and preparing annual reports, as per UNDP regulations.

44. The Project Manager shall also have the overall responsibility for procuring individual project component implementers through sub contracts. This task comprises the formulation of Terms of Reference for the required services, preparation of complete tender documents including contract conditions, preparation of short lists, advertising and issuance of tender documents to prospective bidders, tender evaluation and contract negotiations. These tasks should be done in close collaboration with MEM, and government rules and regulations for procurement shall apply. UNDP may assist the Government in some of these services, such as identifying consultants, developing ToR etc. If UNDP's assistance is requested for procurement, UNDP procedures shall apply. The Project Manager (PM) will develop overall annual work plans indicating the activities that will be supported by UNDP/GEF through the programme. This should be co-ordinated with the work plan prepared for the Sida supported programme, to enhance synergies. The PM will prepare quarterly reports and budget requests against the annual work plan to submit to UNDP for advancement of funds.

45. A pool of technical experts will be set up to assist the Project Implementation Unit, and the Project Manager on technical issues throughout the implementation of the project. The technical experts will be drawn from all over the world and will be experienced in PV solar.

They will mainly provide running advisory services to the PM via the Internet on request, but may also come on mission, participate in strategic meetings and give inputs where necessary, on consultancy basis.

46. Two MEM staff will form a Project Monitoring and Coordination Team (PMCT), the PMCT would be the main liaison from the ministry's side, and each of PMCT Staff will allocate approximately 25% of their time to follow up the project activities, do regular monitoring and evaluation during implementation. The same officers will also be coordinating the Sida project and other projects in renewable energy. To ensure continuity beyond the project life, it is foreseen that these positions will be transferred to the new Rural Energy Agency (REA) when in place. The REA, which is likely to be funded from fossil fuel taxes and surcharges on electricity consumption, would be the most appropriate institutional home for continuing the task of PV market stimulation.

47. In addition, a Project Steering Committee, consisting of representatives of the Office of the Vice President (Department of Environment), Ministry of Finance, RAS Office in Mwanza, TASEA, Sida and UNDP, chaired by MEM, will provide overall guidance to project execution. The Steering Committee should be a joint steering committee for both the UNDP/GEF project and the Sida project to ensure co-ordination. Other donors active in the renewable energy sector and private sector representatives may be invited to participate in the meetings of the Steering Committee on an ad-hoc basis.

48. The private sector will play a key role in the implementation of this project, and are seen as the 'driver' of the project. This observation is well supported by components 2, 3, 4 and 5 of the Project. To ensure active participation from the private sector, the project will issue short-term consultancies to employ existing private sector participants to carry out awareness training, demonstration projects, work on financing packages etc. Based in Mwanza region, the Project Implementation Unit will maintain very close contact with the business community, and seek to set up a network of importers and assemblers, vendors, dealers, agents and technicians, as well as participants from financing institutions and potential consumer from communities. The PIU will organise regular meetings with the network to secure their concurrence and support to the activities proposed for implementation.

49. Public participation is vital in the whole process of providing electricity services to remote rural areas. It is important that the Mwanza region residents as well as the whole of Tanzania be briefed on the complete modality of working with the private sector and lending institution(s) and their support secured. Based in Mwanza region, the PIU will maintain very close contact with the rural consumers in the local communities. The PIU will also organise regular meetings with the local inhabitants to secure their concurrence and support to the activities proposed for implementation and to explain to them the benefits that they would derive from such activities.

50. The PIU will be based in the Regional Commissioner's Offices in Mwanza, and the RC's office will play a part in the implementation. The RC will provide political support to the implementation of the project, and will be regulating and monitoring the private sector activities in the area. The RC's office will assist in identifying areas where the assistance is most needed for demonstration of PV, based on local knowledge.

51. The Sida-PV project is part of the increment and the GEF project cannot succeed without the Sida project. Both have been designed to offer complementary efforts and are seen by the government, Sida and UNDP/GEF as one initiative with the same objective and almost similar approach, but with distinct geographical focus. A high degree of coordination is envisaged (for example through the joint steering committee). Key components (awareness

and private sector) of the GEF project are mirrored in the Sida project. GEF will focus on the Mwanza region and Sida will cover the rest of the country. Example of coordination includes: Awareness and outreach material and activities will be developed jointly with the Sida project to send a coherent message across the country and to reduce costs (for design and production of posters, radio messages and the like). Also for the private sector component GEF and Sida will develop a programme to strengthen PV dealers and other companies in the supply chain. Those companies who operate mainly in Mwanza will benefit from the GEF project, those who operate elsewhere from the Sida project. Capacity building courses (for example in accounting, bookkeeping, marketing etc) will be developed jointly between the GEF and the Sida project.

Organogramme, Implementation Modalities

Diagram 1: Overall coordination in Ministry of Energy and Minerals

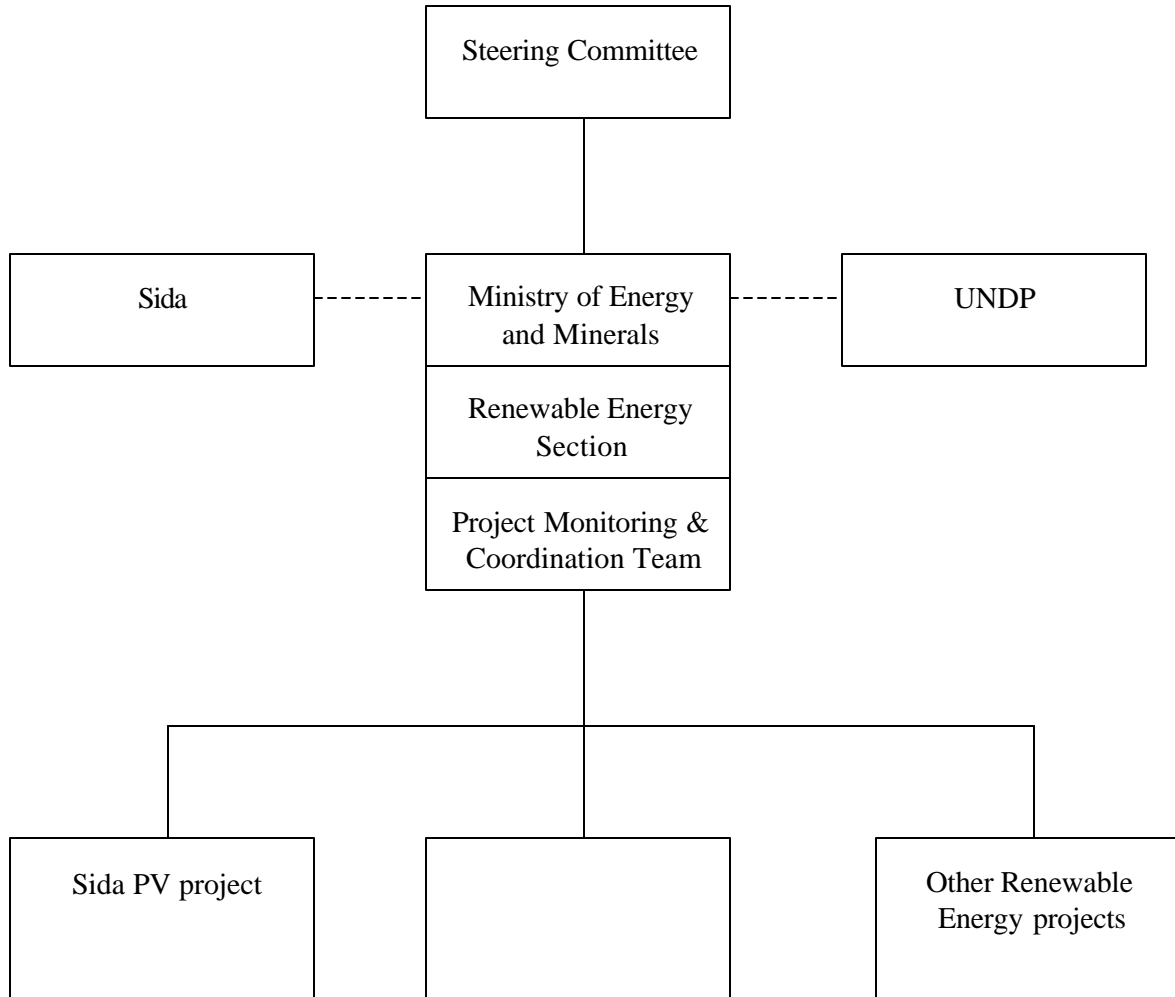
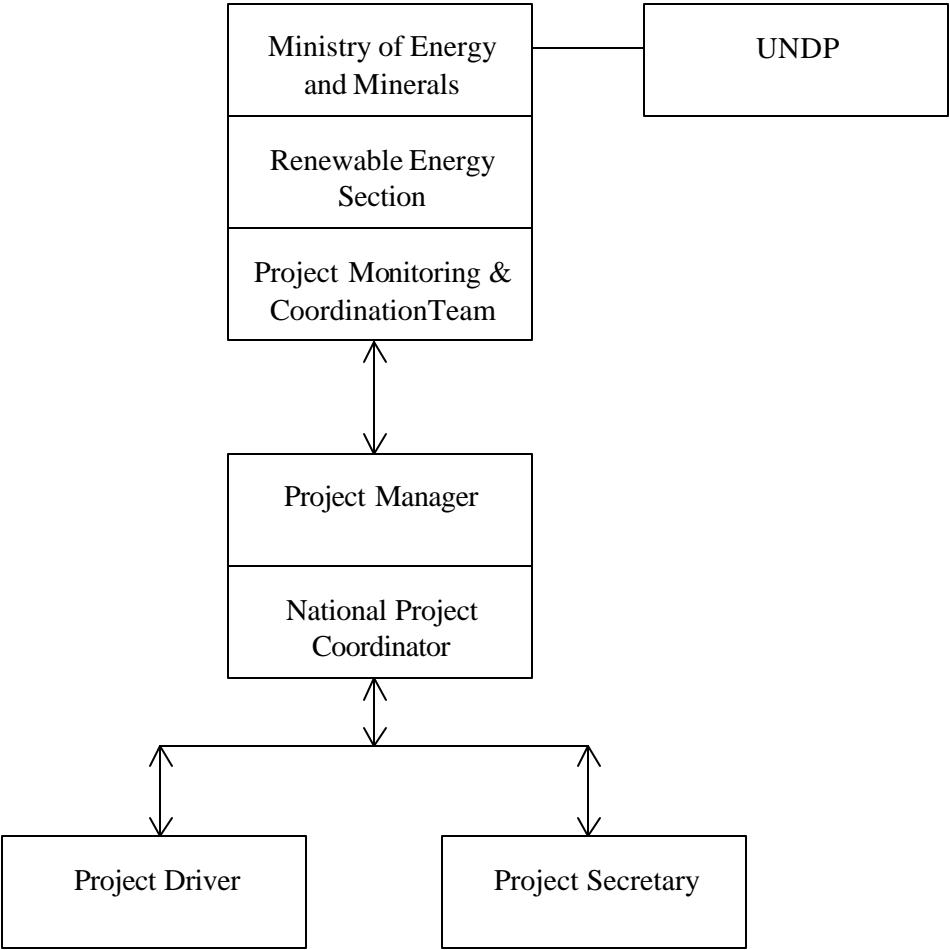


Diagram 2: Reporting Lines between Project Implementation Unit, MEM and UNDP



INCREMENTAL COSTS AND PROJECT FINANCING

52. This project is designed to remove barriers to the introduction of PV systems to meet the basic energy needs of rural communities in the Mwanza region. It will adopt a market transformation approach to the PV market in Mwanza, and is consistent with the terms of GEF Operational Program 6. To the extent that it helps stimulate greater sales of PV's to households and institutions, it will also help reduce both the incidence of respiratory and eye problems attributable to kerosene soot and the risk of hut fires. The proposed project activities are not likely to take place in the absence of UNDP and GEF support, making the project activities largely incremental.

53. A detailed assessment of incremental costs is presented in Annex A. According to market survey information obtained during the PDF B, upper and middle income households use between 8 and 12 litres of kerosene per month, costing \$4 and \$6. Battery expenses may run to an additional \$2 to \$4 per month, raising the monthly expenditure on lighting to between \$6 and \$10 monthly. Because the costs of a small PV system are still relatively high in Tanzania (\$200-300 for a small, 14Wp system), there are likely to be incremental costs associated with the purchase of PV systems. However, the market surveys show that the market for PV system may be 17% of the rural, unelectrified households in Mwanza (nearly 50,000 households, depending upon the assumptions used). The purchase and use of a PV system in rural Tanzania may be considered to be an attractive investment for the upper and many of the middle-income rural households. However, at the moment, much of the pent-up demand for modern lighting and electricity in rural Mwanza is not being met due to the undeveloped or immature state of the PV market. The purpose of this project is to stimulate the growth of the PV market in Tanzania, especially the Mwanza area, so that costs will reduce as the numbers of installed systems increases, thereby leading to a greater satisfaction of this pent-up demand. However, no incremental cost subsidy per system or per Wp is being requested in this project.

54. According to information obtained during the PDF stage of the project, the PV dealers in Mwanza are currently selling approximately 500 PV systems annually, most of which are smaller systems of less than 20 Wp (typically 14Wp systems using amorphous cells). At present, there are estimated to be 2000 systems of all types in place in Mwanza. (Many of these are donor or mission-funded.) These numbers would put the capacity of PV installed in Mwanza each year at less than 10 kWp for a total of about 40kWp. Although no historical data exist, it might be safe to assume that the number of PV sales in Mwanza is increasing yearly by as much as 6% (3% attributable to population growth and the rest to economic growth). These assumptions have been used to estimate the baseline growth in the number of PV systems.

55. Through the proposed activities, the project seeks to transform the market for PV's in Mwanza, thereby increasing the number of systems sold by as much as 50% per year in the peak years of the project. This would mean that within five years of project implementation, the PV market in Mwanza would be expected to be selling over 1500 systems per year or approximately 20kWp per year. There will also be expected to be more large systems (>50Wp) sold and in-use as well as more lanterns sold and in-use.

56. Because this project is not requesting a subsidy per W of PV installed, the incremental costs associated with this project are considered to be the costs of the activities designed to remove the primary barriers to PV electrification and stimulate the PV market in the Mwanza region. It will focus primarily on stimulating cash sales, experimenting various credit mechanisms, which might be used in future projects to expand the market further.

57. Over twenty years, the expected growth in PV deployment in Mwanza region attributable to the project is expected to reduce kerosene consumption by 47 m litres (47,000 m3), equivalent to approximately 28,000 tonnes of CO₂. To the extent that the success of the Mwanza region project can be replicated in the un-electrified areas of other regions of Tanzania, this figure can increase more than five times to a conservative estimate of 119,000 tonnes of CO₂.

58. In terms of the electricity service to be provided to rural Mwanza region, consumers will be made aware of the limitations on the electrical loads that PV can supply. Also, in conjunction with the introduction of PV systems, the use of energy-efficient compact fluorescent lamps and other DC appliances (e.g., low-wattage radio-cassette recorders/TV sets, etc.) will be promoted and consumers will be trained in the appropriate use of electricity. In addition, all batteries used for energy storage will be recycled.

Table 4: Overall Financing--- US 7,304 mill

Project Activity/ Component	GEF	Others	Total
Policy	200,000	427,877	627,877
Awareness	500,000	840,830	1,340,830
Private Sector	600,000	2,685,363	3,285,363
Financing	600,000	780,000	1,380,000
Learning and Replication	350,000	-	350,000
Contingency/PDF-B	320,000		320,000
Total	2,570,000	4,734,071	7,304,071

14. MONITORING, EVALUATION AND DISSEMINATION

Monitoring

59. The project will be monitored and evaluated according to standard UNDP rules for nationally executed projects. For each of the five components, a monitoring plan will be prepared during project inception. As part project inception, the Logical Framework Matrix will be revised, specifically the detailed indicators will be revisited and adapted, including measures to track the major external project risks. These indicators will draw upon all sources of information, including those of other donors active in the energy field in Tanzania. Appropriate and specific performance benchmarks will be established prior to project implementation to effectively monitor project progress and to make crucial management decisions. An annual reporting cycle will be established for this project that will provide progress reports to be shared by all participants in the project.

60. Following UNDP's change to results based management the country office has developed a new format for work plans. The format emphasises achievements (benchmarks and milestones) as well as cost per output/result. This format will allow for a critical assessment of program performance as it shows, at a glance, what activities are to take place, when, the

cost for each activity, the responsible agent for implementation, progress at the end of every quarter, and to facilitate the preparation of the work plans for the subsequent quarters.

61. In addition to normal Government monitoring, UNDP will have the monitoring and reporting to GEF as an obligation for the program. In this connection, additional M&E missions will be undertaken by UNDP when this is judged to be required. This will be done in collaboration with the executing agency as well as with the implementing partners.

Tripartite reviews

The tripartite review is the highest policy-level meeting of the parties directly involved in the implementation of the project. The project will be subject to Tripartite Review (TPR) at least once every twelve months by representatives of the government, the executing agency and UNDP. The first such meeting will be held within the first twelve months of the start of full implementation. The Project Manager will prepare an Annual Project Report (APR) to be ready two weeks prior to the TPR meeting. The Project Manager presents the APR to the TPR, highlighting policy issues and recommendations for the decision of the TPR participants.

Terminal Tripartite Review

The terminal tripartite review is held in the last month of project operations. The PIU is responsible for preparing the Terminal Project Report. It shall be prepared in draft sufficiently in advance to allow review and technical clearance by the executing agency at least two months prior to the terminal tripartite review. The Terminal Report will serve as the basis for discussion in the TTR. The TTR considers the implementation of the project as a whole, paying particular attention to whether the project has achieved its immediate objective and contributed to the broader development objective, and decides whether any actions are still necessary.

Project Implementation Review (PIR)

The PIR is a major tool for monitoring the GEF portfolio and extracting lessons. The PIR has become an essential management and monitoring tool for project managers and offers the main vehicle for extracting lessons from ongoing projects. The PIR is mandatory for all GEF projects that have been under implementation for at least one year at the time that the exercise is conducted. A project becomes legal and implementation activities can begin when all parties have signed the project document, The PIR is sent to the UNDP country office, usually around the beginning of June, It is the responsibility of the PM to complete the PIR questionnaire, together with the Country Office and MEM, and for the MEM to forward the PIR to UNDP-GEF headquarters.

Evaluation

An independent mid term evaluation will be undertaken towards the middle of the project period. The Mid-Term Evaluation will focus on effectiveness, efficiency and timeliness of the project implementation; will highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation and management. Findings of this evaluation will be incorporated as recommendations for enhanced implementation during the final half of the project's term. The organisation, terms of reference and timing of the mid term evaluation will be decided after consultation between the parties to the project document.

A terminal evaluation will be carried out toward the end of the programme. A terminal evaluation will assist programme stakeholders to draw lessons learned for use in improving the quality of future development interventions with similar activities. The evaluation could be done in collaboration with the other development partners to the programme. Such a multi-stakeholder and partner evaluation is new, but could be a useful learning experience for all parties, where 360 degree approach could be taken to evaluate all parties input to the programme. These evaluations could be undertaken in partnership with Sida, as this would create synergies and more efficient evaluation.

15. LEGAL CONTEXT

This programme document shall be the instrument referred to as such in Article 1 of the Standard Basic Assistance Agreement between the Government of the United Republic of Tanzania and United Nations Development Programme, signed by the parties concerned on 30 May 1978.

The host country-executing agency shall, for the purpose of the Standard Basic Assistance Agreement, refer to the Government co-operating agency described in that Agreement. As support to the executing agency, the UNDP country office will provide support services for some of the activities of the project as identified and agreed upon by all parties, especially in the following areas:

- a) Identification and recruitment of the recruited personnel/experts to undertake specific activities under the project;
- b) Identification and facilitation of training services
- c) Procurement of goods and services

The country Office will charge 5% of the total project budget for the provision of all the identified and agreed upon services

The following types of revisions may be made to this Programme Document with the signature of UNDP Resident Representative only, provided he/she is assured that the other signatories of the programme document have no objection to the proposed changes:

- a) Revisions in, or in addition to, any of the annexes of the programme document
- b) Revision which do not involve significant changes in the immediate outcomes, outputs or activities of the programme, but are caused by the re-arrangement of inputs already agreed upon or by cost increases due to inflation; and
- c) Mandatory annual revisions, which re-phase the delivery of agreed programme inputs, or reflect increased expenditure or other costs due to inflation or take into account agency expenditure flexibility.

16. ANNEXES

Annex A – UNDP Input Budget

Annex B - Incremental Costs

Annex C - Project Planning Matrix

Annex D - STAP Review

Annex D1 - Response to STAP Review

Annex E – TOR for Project Manager, Project Officer and Technical Experts

List of References

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Annex A: Input Budget

United Nations Development Programme								
URT/03/Gxx TRANSFORMATION OF THE PHOTOVOLTAIC MARKET IN TANZANIA								
Administrative budget - Draft 6 Nov 2003								
BL	Act	Description	Total	2004	2005	2006	2007	2008
10		PERSONNEL						
11		International Staff						
11.01		International Project Manager	383,500	122,000	107,000	107,000	47,500	
11.02		Technical Pool of Experts	40,000	10,000	10,000	10,000	10,000	
11.99		Subtotal	423,500					
13		National Support Staff						
13.01		Secretary	64,800	14,400	14,400	14,400	14,400	7,200
13.02		Driver	32,400	7,200	7,200	7,200	7,200	3,600
13.99		Subtotal	97,200					
15		Monitoring and Evaluation						
15.01		Local travel by PMU	27,900	8,300	4,900	4,900	4,900	4,900
15.02		Evaluation	50,000		18,000			32,000
15.03	2.3.3	Local travel for demonstration	40,000	-	20,000	20,000	-	
15.04	2.1.3	International travel for PV study tour (ticket and DSA)	20,000	10,000			10,000	

15.05	5.2.2-4	Travel for lesson learning and replication	110,000				70,000	40,000
15.99		Subtotal	247,900					
17		National Staff						
17.01		National Project Coordinator	81,000	18,000	18,000	18,000	18,000	9,000
17.02	1.1-1.3	Policy advisors and consultants	60,000	50,000	10,000			
17.03	3.1-3.3	Business development advisors and consultants	150,000	20,000	35,000	40,000	30,000	25,000
17.04	4.1-4.3	Financing advisors and consultants	60,000	40,000	-	-	20,000	-
17.05	5.1-5.3	Lessons learned consultants	60,000	-	-	-	60,000	-
17.99		Subtotal	411,000					
19		Component Total	1,179,600					
21		SUB-CONTRACTS						
21.01	2.1-2.3	Awareness - subcontracts	155,000	55,000	50,000	40,000	10,000	-
21.02	3.1-3.3	Business development	250,000	50,000	75,000	70,000	40,000	15,000
21.03	2 Vehicles (1 Pick-up, 1 Station wagon)	Financing subcontracts	340,000	40,000	130,000	130,000	40,000	-
21.04	5.00	Lessons Learned subcontract	40,000				30,000	10,000
21.99		Subtotal	785,000					

29		Component Total	785,000					
30		TRAINING						
31	1.1-1.3	Policy workshops and meetings	60,000	20,000	35,000	5,000	-	-
39		Component Total	60,000					
45		EQUIPMENT						EE
45		<u>Non expandable equipment</u>						
45.01		4 computers -2 desktop, 2 laptops	7,000	7,000				
45.02		2 UPS + software	2,500	2,500				
45.03		1 printer	500	500				
45.04		1 copier	7,000	7,000				
45.05		1 digital camera	1,000	1,000				
45.06		1 scanner	1,000	1,000				
45.07		1 fax	2,500	2,500				
45.08		4 telephones	1,000	1,000				
45.09		2 Vehicles (1 Pick-up, 1 Station wagon)	45,000	45,000				
45.10		Operation of office, tel, internet, cleaning, security	8,500	2,000	2,000	2,000	2,000	500
45.11		Operations & Maintenance vehicle & equipment, fuel etc	13,000	3,000	3,000	3,000	3,000	1,000
45.12	2.3.1	Local procurement of PV modules	105,000	45,000	35,000	25,000		
49		Component Total	194,000					

50		MISCELLANEOUS						
52.01		Reporting	10,000	2,000	2,000	2,000	2,000	2,000
53.01		Sundries (tel, copying, bankcharges)	21,400	5,000	5,000	5,000	5,000	1,400
		Miscellaneous						
59		Component Total	31,400					
99		TOTAL	2,250,000					

Annex B: Incremental Cost Analysis

Project Activity	Baseline	Alternative	Increment
Component 1: Support the formulation of the policy/implementation framework for the widespread utilisation of PV for providing off-grid electricity services.	<p>SIDA supports Gov't in creating a Rural Energy Agency. The role for PV in this endeavour remains unclear.</p> <p>Import duties on PV panels were recently eliminated, but the 20% VAT on these panels was maintained. In addition, both import duty and VAT are maintained on other system components.</p> <p>No standards exist for PV components and systems. Cost: US \$ 2,352,941 (SIDA-Rural Energy) Total: US\$ 2,352,941 (SIDA-RE)</p>	<p>Regulations will be formulated to assist Government in reducing import duties on all PV system components.</p> <p>Proposals will be formulated to decrease and, eventually, eliminate VAT on PV system components.</p> <p>Assistance will be provided to the Tanzania Bureau of Standards to develop standards for PV components and systems. Cost: US\$ 200,000 (GEF) US\$ 2,352,941(SIDA-RE) <u>US\$ 280,277 (SIDA-PV)</u> Total: US\$ 2,833,218</p>	<p>Institutional, legal and regulatory basis for vibrant PV/renewable energy market with private participation is created.</p> <p>Import duties and VAT on all PV system components are removed.</p> <p>Standards for PV components and systems are defined.</p> <p>Incremental cost:US\$ 200,000 (GEF) <u>US\$ 280,277 (SIDA-PV)</u> Total US\$ 480,277</p>
Component 2: Increase awareness of stakeholders on role of PV for meeting the basic electricity needs of off-grid rural communities.	<p>Decision-makers not fully sensitised with regard to the role that PV/renewable energy can play in rural electrification.</p> <p>Consumers are not fully aware of the potential of utilising PV, as an alternative to kerosene, to obtain safe and efficient lighting/electricity services in off-grid situations.</p> <p>Cost: US\$ 0</p>	<p>Formulate an outreach programme utilizing multi-media; organise general awareness campaigns; and limited demonstration PV systems at critical sites with different applications.</p> <p>Formulate and implement capacity development programme to train users to safely and properly handle PV systems and appliances they power.</p> <p>Cost: US\$ 500,000 (GEF) <u>US\$ 840,830 (SIDA-PV)</u> Total: US\$ 1340,830</p>	<p>Increased awareness among the public at large, decision-makers, and consumers of the benefits of PV as an energy source.</p> <p>Increased awareness among users on the safe operation of PV systems and appliances they power.</p> <p>Incremental cost: US\$ 1,340,830</p>
Component 3: Assist private	<p>Local vendors/technicians do not properly size, install, maintain and repair PV systems.</p>	<p>Develop an appropriate curriculum and train vendors/technicians to properly size, install, maintain and repair PV systems.</p>	<p>Pool of local vendors/technicians available to assist consumers in properly sizing, installing, maintaining and repairing PV</p>

sector to provide better quality of service and to develop models for providing PV-based electricity services to the rural areas.	<p>Local distributors and vendors have limited business skills which may be preventing expansion of market.</p> <p>One or two vendors may become large operations, but market growth remains limited.</p> <p>Cost: US\$ 630,000 (Dutch--Umeme Jua)</p>	<p>maintain and repair PV systems. Assist the private sector to develop real business skills; prepare business plans; and access loans for expanding the market.</p> <p>Cost: US\$ 630,000 (Dutch--Umeme Jua) US\$ 600,000 (GEF) <u>US\$ 2,055,363 (SIDA-PV)</u></p> <p>Total: US\$ 3,285,363</p>	<p>installing, maintaining and repairing PV systems.</p> <p>Private sector better prepared to formulate business plans to access loans for PV in order to expand market.</p> <p>Incremental Cost US\$ 600,000 (GEF) <u>US\$2,055,363 (SIDA-PV)</u></p> <p>Total US\$2,655,363</p>
Component 4: Financial Engineering	<p>- Despite some interest, very little actual lending for or investment in PV market occurs. As the market expands, the lack of financing to PV consumers and industry will become a bigger bottleneck to the expansion of the market.</p> <p>- Limited funds are available for financing PV consumers and companies. Limited experience with PV for productive uses.</p> <p>Cost: US\$ 240,000 (UNDP-SGP) <u>US\$ 540,000 (missions and others)</u></p> <p>Total : US\$ 780,000</p>	<p>Design, pilot, and evaluate financing systems for consumer finance and supply-chain finance.</p> <p>Establishment of small-scale productive uses testing competition to elicit creativity, replication and leverage from private sector.</p> <p>Cost: US\$ 240,000 (UNDP-SGP) US\$ 540,000 (missions, others)</p> <p><u>US\$ 600,000 (GEF)</u></p> <p>Total: US\$1,380,000</p>	<p>Valuable experiences trying finance for PV's is obtained.</p> <p>Some experience with innovative ideas is obtained.</p> <p>Incremental cost: US\$ 600,000</p>
Component 5: Disseminate experience and lessons learned to promote replication throughout the other regions of the country.	<p>No dissemination in the baseline scenario.</p> <p>Limited ability to learn from projects both within and outside country.</p> <p>Cost: \$147,600 (Gov't of Tz--likely spent on other related tasks)</p>	<p>Initiate a national programme to replicate the use of PV to generate electricity to supply off-grid consumers</p> <p>Experience documented and dissemination program initiated.</p> <p>Program initiated to document impacts of PV adoption on rural livelihoods.</p> <p>Cost: US\$ 350,000 (GEF) <u>US\$ 146,700 (Govt of Tz)</u></p> <p>Total: US\$ 497,600</p>	<p>Dissemination programme in place.</p> <p>Lessons learned.</p> <p>Improved understanding of impact of PV on rural livelihoods and poverty alleviation.</p> <p>Incremental cost: US\$ 350,000</p>
Total Costs	<p>Total: US\$ 3,910,541</p>	<p>Total: US\$ 2,250,000 (GEF) <u>US\$ 7,087,011 (Other)</u></p>	<p>Total: US\$ 5,426,470</p>

		Total: US\$ 9,337,011	
Global Environmental Benefits	<p>About 9,000 tonnes CO2 emissions avoided over 20 years in Mwanza due to PV adoption</p> <p>About 82,000 tonnes CO2 emission avoided nationally over 20 years due to PV adoption.</p>	<p>In Mwanza, 29,000 t CO2 avoided through PV adoption in rural Mwanza.</p> <p>Nationally, 142,000 t CO2 avoided through PV adoption.</p>	<p>In Mwanza, emissions are reduced by 20,000 t CO2 over 20 years.</p> <p>Nationwide, approximately 60 thousand additional tonnes of CO2 emissions reduced in 20 years.</p>
Domestic Benefits	<p>PV market continues slow growth. In Mwanza, 18,000 PV systems (3.3% penetration) expected to be deployed over 20 years. Nationally, 162,000 PV systems expected to be deployed (2.2%).</p> <p>Most rural households continue using kerosene for lighting, being exposed to smoke and soot.</p>	<p>Over 20 years, in Mwanza, 61,000 households adopt PV systems (11% of rural Mwanza).</p> <p>Nationally, 269,000 PV systems (3.6%) adopted.</p> <p>Significant reduction in Mwanza and nationally in exposure to kerosene smoke and soot.</p>	<p>In Mwanza, 43,000 additional PV systems adopted saving 47 m litres of kerosene.</p> <p>Nationwide, 137,000 additional PV systems adopted saving 141 m liters of kerosene.</p> <p>Significant reduction in exposure to indoor air pollution from kerosene.</p>

ANNEX C – PROJECT PLANNING MATRIX

STRATEGY	INDICATORS	MEANS OF VERIFICATION	CRITICAL ASSUMPTIONS
Global objective: (i) To reduce Tanzania’s energy related CO ₂ emission by substituting PV for fossil fuel (kerosene) utilised to provide basic electricity services to rural homes and community users and ii) To improve people’s livelihoods by improving their access to and affordability of modern energy services	Consumption of kerosene reduced by 80% in households using PV systems	End-user survey	
	Incidence of kerosene-related respiratory and eye diseases reduced by 10% over 20 years	Medical statistics and reports	
Development Objective: To remove barriers with the aim of promoting the utilisation of PV to provide basic electricity services to the rural Mwanza region, thus reducing the region’s (and country’s) dependency on imported fossil fuel (kerosene)	Number of PV systems sold per annum in Mwanza reaches 1,682 in year 5 of the project as compared to the baseline scenario of 631 systems for the same year	Chamber of commerce Dealer survey	Kerosene prices will not drop significantly
Immediate Objective 1: To refine the policy framework and the institutional arrangements necessary for the widespread adoption of PV's for providing off-grid electricity services	Import duties and taxes on all PV equipment components reduced to a comparable level to Kenya	Publication of tax & import exemption rules	Government takes steps to implement the new energy policy
Output 1.1: Implementation framework for off-grid PV defined and in place	PV features prominently in the rural energy master plan as an option for meeting energy needs in off-grid areas	Rural energy master plan.	
Output 1.2: Energy pricing policy in government is adapted to support utilisation of PV systems, to deliver	Retail prices of solar panels and other components of PV systems reduced by at least 25% by end of year 3 of project	Studies on products and prices in retail shops in Mwanza	Government amenable to decreasing/removing

appropriate products at the right price	implementation		import duty and VAT
Output 1.3: Standards for PV components and systems defined	Standards for PV components and systems in place	Issuance of Standard Booklets from TBS	
Immediate Objective 2: To increase awareness among the general public, and especially decision makers, consumers, and other end-users on the potential role of PV in meeting basic energy needs			End-users are willing to adopt new technology and are susceptible to change
Output 2.1: Awareness program for decision-makers developed and implemented	Import duties and taxes on all PV equipment components reduced to a comparable level to Kenya	Publication of tax & import exemption rules	Decision-makers willing to base decisions on knowledge acquired
Output 2.2: End-user awareness programme formulated and implemented	Number of costumers enquiring information about PV systems in local dealer shops increased by 100% by year 4 of the project	Dealer survey	Consumers willing to accept new technologies
Output 2.3: Demonstration program implemented to show the functionality and usefulness of a limited number of PV installations in strategically important locations and niches	At least 50 on-site demonstrations of PV systems conducted over the lifetime of the project	Project files	
Immediate Objective 3: To strengthen and support the private sector working in the PV sector to provide better quality of service and to develop models for providing PV-based electricity services to the rural areas	Number of businesses dealing with PV equipment increased by 30% by the end of the project Number of PV businesses qualifying for commercial supply-chain financing increased by 50% by the end of the project. Level of end-user satisfaction with installation and after sales service increased by 50% by the end of the project	Dealer survey Dealer survey End-user survey	Market actors are willing to cooperate Busineses are eager to expand
Output 3.1: Business Development	At least 60% of all PV dealers/ companies	Project files	Private sector's

Services strengthened	participated in at least one capacity building activity offered by the project		commitment to follow code of practice
Output 3.2: Technical knowledge of PV strengthened	70% of all technical training courses offered to vendors, dealers, technicians, etc. are carried out successfully	Project files	
Immediate Objective 4: To explore, develop and test viable financing options for selling PV systems	50% of all PV dealers offer at least one financing option to end-users	Data from PV dealers	Full participation of lending institution(s) essential
Output 4.1: The most promising model for consumer finance of PV systems will be identified, piloted, and evaluated	At least 15% of all PV sales to end-users are done through the model piloted by the end of the project	Data from PV dealers	
Output 4.2: The most promising model for supplier or supply-chain financing in the PV industry will be identified, piloted, and evaluated	At least 5 companies in the PV supply chain have requested financing from the model piloted under this component by the end of the project	Project files	
Output 4.3: To provide limited grant financing to a small number of schemes proposed by the private sector to test various productive uses of PVs	At least 10 grants provided to companies by the end of the project At least 1 PV product line for productive use commercialised by the end of the project	Project files Dealer survey	
Immediate Objective 5: To disseminate experience and lessons learned to promote replication throughout the other regions of the country	Percentage of households in other regions using PV reaches 2.1% as compared to baseline scenario of 1.2% in year 10 after project start	Statistics from Chamber of Commerce	Market forces in other regions are willing to cooperate
Output 5.1: Evaluation of Impact of PV on rural livelihoods in early adopting households and communities	Baseline survey and annual data updates provided throughout the project lifetime	Evaluation report	
Output 5.2: Support provided to learning and replication of experiences with PV	70% of all PV dealers in other regions are briefed on lessons and experiences from Mwanza by the end of the project	Dealer survey	

Annex D

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March 11, 2003

From: Daniel M. Kammen

STAP Review

Transformation of the Rural Photovoltaics (PV) Market in Tanzania (URT/03/G)

Summary:

With only 10 kWp of solar systems sold in Mwanza to date, the market is clearly at a very early stage. This project seeks to take an integrated perspective on the local market – extending from import duties, to local entrepreneurial groups, to education of end-users – to build market stability and support extended growth. If successful in developing the market, the GEF project team estimates that 17% of the local market could be served by PV systems. The aim of this project is market transformation.

The project is recommended for approval. There are several issues to address, however. First, it is recommended that the scope of the project be increased to include support for local manufacturing of solar cells. Second, the plan to support several large firms with investments totaling \$400,000 may provide too large amounts of funding per package to genuinely assist the indigenous solar companies. Without careful management, funding at this level will provide too strong an incentive for foreign companies to enter and most likely dominate the emerging market. Clear safeguards against this need to be developed.

Major Comments:

Executive Summary, page 4, and Incremental Cost Annex A (page 7ff): The incremental cost discussion does not provide a cost/tC. This is a particularly problematic calculation, to be sure, due to the uncertain offsets of kerosene (see, e.g. Duke, Jacobson, and Kammen, 2002). Nevertheless, it is an important figure of merit. By one measure, the reduction is expected to be: $\$9,557,012 / (19,585 \text{ tCO}_2 / (12 \text{ gC} / 44 \text{ gCO}_2)) = \$1,7931 / \text{tC}$, or, if the figure of an added 113,139 tonnes of CO₂ from the replication effect is included, the cost becomes: $[\$9,557,012] / [(19,585 \text{ tCO}_2 + 113,139 \text{ tCO}_2) (12 \text{ gC} / 44 \text{ gCO}_2)] = \$264 / \text{tC}$. Note, of course, that these are undiscounted figures, that are based on 20-year greenhouse gas reductions. Since the financial outlays are primarily up-front, at the outset of the project, and in any case during the project itself, the nominal value of the project funds are used for the calculation.

These values are, of course, very high compared to other carbon offset projects, but: (1) an argument can be made that the total project cost is not appropriate, and that the GEF-only component (e.g. \$2.25 million, as tallied on page 6, for which an argument can be made that the total incremental cost/tC is $[\$2,250,000] / [(19,585 \text{ tCO}_2 + 113,139 \text{ tCO}_2) (12 \text{ gC} / 44 \text{ gCO}_2)] = 16.9 \$/\text{tC}$), or some other fraction of the total should be used. Either way, these figures – as determined by the project team to be the most appropriate measure, should be included in the analysis.

The point of stressing the cost/tC metric is not to call into the question the value of solar photovoltaics programs – indeed this reviewer believes that compelling evidence exists as to the merits of PV efforts (see, e.g. Duke and Kammen, 1999; Kammen, 1999; Jacobson, Duke and Kammen, 2000). The reason why this calculation is important is to highlight

the benefits of choices of energy *services* versus *technologies*. Solar PV will frequently look – at least initially – to be an expensive option, and in some cases the support for a combination of solar PV and some mechanical energy delivery mechanisms, such as wind-water pumping or biomass energy delivery, may be key parts of building a locally useful energy market. In each market case, the key aspect is to evaluate the incremental cost benefits of direct market support versus the long-term benefits of building the market.

Executive Summary, page 5 “Replicability” and PCD, page 6 – 7, 12ff

Many of the criteria listed in ‘replicability’; are ones that have been addressed in the Kenyan market – not always successfully – through a series of informal sector reforms. These include (1) testing without formal component certification; (2) training of *informal* sector solar technicians and sales people; (3) and support of local solar entrepreneurs through bulk equipment purchases. The reasons for these steps (discussed in detail in Duke, Jacobson, and Kammen, 2002) are:

- (1) testing of components *with* certification can be valuable, but can also lead to market advantages for foreign PV firms over local enterprises, biasing the market to be even more import oriented than need-be;
- (2) with many PV markets dominated by informal sector sales and service groups and individuals, in many cases the key entrepreneurial sector to support is not that of ‘full time’ solar professionals as we might envision in an industrialized nation, but a far more informal group that sells solar systems as *part* of a wider array of products. The needs of this group are very different from that of a full-time, fully professional work force;
- (3) with the informal nature of much of the emerging African PV industry, capital to maintain an inventory is often a critical resources. Bulk purchases of PV materials (not only panels, but locally manufactured batteries, charge controllers, etc ...) that are then made available to registered solar vendors, can dramatically reduce their inventory worries, their need to try and maintain an inventory, and their worries of being over-charged by importers.

Solar Cell Manufacturing:

It is important for the project team to consider the potential to include solar cell *manufacturing* in the project plan. This will, to be sure, expand the dimensions of the project. The solar home system market in Kenya has been studied for some time (Duke, Jacobson, and Kammen, 2002), as has been the expansion to neighboring Uganda, Tanzania, the former Somalia, and Ethiopia. We have concluded that one of the key impediments to sustained lower prices for PV systems in East Africa is the absence of any local solar cell fabrication. Currently the PV panels constitute 55 – 60% of the cost of the systems. A small amount of PV production in the region, locally controlled, would exert a strong downward price pressure on the industry, which is at present primarily an import-driven one from Europe.

An added feature of this plan is that it would dramatically improve the opportunities, at low cost, for meaningful training in the industry for the emerging Tanzanian – and indeed the regional – solar cell business sector. A second advantage of this plan is that by placing a cell manufacturing facility in the region, but not in Kenya, it will help to expand the base of the industry to a regional one, and one so dominated by the influence of the Kenyan market.

My research group has examined this idea at some length and concluded that a small, roughly 0.5 MW/year production facility would be cost effective, would provide an important source of local PV cells, and would send a strong signal to the international PV manufacturing community that the GEF will support the entire PV sector.. Further, thin-film PV production can be accomplished with inexpensive reel-to-reel technology that requires no clean room.

The estimated cost for such a fabrication facility is only \$1.4 – 2.2 million, and would not be that large an added cost to a market transformation project.

The major benefit of this facility – beyond the opportunity for genuine training and expertise in PV systems – is the strong downwards price pressure that such a regional facility would put on the solar import sector that charges the East African market a high premium for panels.

EXECUTIVE SUMMARY, PAGES 9 – 12: ANNEX B – PROJECT PLANNING MATRIX (AND PCD, PAGE 5 – 6, PAGES 14FF)

MANY OF THE ITEMS (SUCH AS OFFERING FINANCING OPTIONS AND ACHIEVING THE SAME PRODUCE QUALITY STANDARDS AS IN KENYA) MAKE SENSE IN GENERAL. THE PLAN(S) FOR HOW TO ACHIEVE THESE GOALS, HOWEVER, IS NOT CLEARLY INDICATED. IT IS NOT NECESSARY THAT EACH BE DETAILED AT THIS STAGE, BUT IN A NUMBER OF CASES THE PLAN SHOULD SPECIFICALLY SUPPORT THE DEVELOPMENT OF LOCAL ENTREPRENEURS AND TO SHIELD THEM FROM ENTRY OF FOREIGN SOLAR SYSTEM SELLERS. IT IS IN THESE AREAS IN PARTICULAR WHERE SPECIFICS ARE NEEDED AT THIS STAGE.

PCD, Page 7:

A stated project goal is to: “Select, prepare and make investments in 5-10 PV companies with \$400,000 of Solar Development Foundation finance.” The plan to support several large firms with investments totaling \$400,000 may provide too large amounts of funding per package to genuinely assist the indigenous solar companies. Without careful management, funding at this level will provide too strong an incentive for foreign companies to enter and most likely dominate the emerging market. Clear safeguards against this need to be developed to avoid some of the pitfalls of the PVMTI program in Kenya.

PCD, page 7ff:

The plan to link the regional PV markets is important, and if managed well could be one of the major vehicles to strengthen and sustain the East African PV and broader renewable energy industry.

PCD, page 18 (**Output 4.3**)

This project component – drawing on local innovative capacity to design income-generating applications is particularly important. If anything, this activity should be expanded.

PCD, pages 18 – 22: The project risks are each real, but appear to be well considered. The problems of PV dealers is discussed, and is arguably the major risk in developing this project. A series of round-table meetings to evolve the project based on input from these fledgling entrepreneurs would make a great deal of sense. It is these industry workshops that were employed in Kenya to great effect to inform and work with the industry to informally introduce technology standards that weeded out poor quality PV modules.

Minor Comments

Executive Summary, page 6

Has there been an evaluation of the effectiveness of the *Umeme Jua* program? The information in Table 2 in the PCD, for example, provides only a glimpse of the market.

Executive Summary, page 3

(a) The term “Country Drivenness” does not make sense.

PCD, page 9. The prospect of PV mini-grids under private management would seem to be unlikely. The experience with the Urambo and Tabora (diesel-fired) mini-grids can be used as a model, with the added cost of PV factored into the analysis.

References (All available at <http://socrates.berkeley.edu/~rael/publications.html>):

Duke, R. D., Jacobson, A., and Kammen D. M. (2002), "Product Quality in the Kenyan Solar Home Systems Market," in press, *Energy Policy*.

Duke, R. D. and Kammen, D. M. (2000) “PV Market Transformation: The virtuous circle between experience and demand and the strategic advantage of targeting thin-film photovoltaics”, workshop proceedings of the *IEA Workshop “Experience Curves*

for Policy Making: The Case of Energy Technologies, Stuttgart, 10-11 May, 1999 (IEA Volume), 77 – 100.

Duke, R. D., and Kammen, D. M. (1999) “The economics of energy market transformation initiatives”, *The Energy Journal*, **20 (4)**, 15 – 64.

Jacobson, A., Duke, R.D., and Kammen, D.M., (2000) “Amorphous Silicon PV Panels: Are They a Good Value for the Money?”, *Solarnet*, **2 (2)**, 7 – 14.

Kammen, D. M. (1999) “Bringing power to the people: Promoting appropriate energy technologies in the developing world”, *Environment*, **41 (5)**, 10 – 15, 34 - 41.

ANNEX D1
Response to STAP Review

“Transformation of the rural PV market in Tanzania”

The STAP review is quoted as normal text, the response is in italics

Executive Summary, page 4, and Incremental Cost Annex A (page 7ff):

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Response to inclusion of cost/tC

Using the amount of the GEF Contribution to the project US\$2.57m gives a unit abatement cost of \$22.7 per ton of carbon. This number has been included in the title page of the executive summary.

Executive Summary, page 5 “Replicability” and PCD, page 6– 7, 12ff

Many of the criteria listed in ‘replicability’; are ones that have been addressed in the Kenyan market – not always successfully – through a series of informal sector reforms. These include (1) testing without formal component certification; (2) training of *informal* sector solar technicians and sales people; (3) and support of local solar entrepreneurs through bulk equipment purchases. The reasons for these steps (discussed in detail in Duke, Jacobson, and Kammen, 2002) are:

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- (6) with the informal nature of much of the emerging African PV industry, capital to maintain an inventory is often a critical resources. Bulk purchases of PV materials (not only panels, but locally manufactured batteries, charge controllers, etc ...) that are then made available to registered solar vendors, can dramatically reduce their inventory worries, their need to try and maintain an inventory, and their worries of being over-charged by importers.

Response to comment on replicability

We appreciate the info on the Kenyan experiences and we have and will be using this is the design and implementation of this project. The project brief was reviewed by a Kenyan consultant, in order to take the Kenyan experience onboard. The project is based on the principle of open access to all stakeholders in the PV supply chain, whether informal or not. The project recognizes that it is important to avoid market distortion, and keep the market open for informal businesses, and not apply stringent selection criteria of who can participate. The project is designed according to these principles. The project will try to work with existing business which already sell electronics, radios, TV and other 12VDC appliances etc as potential PV dealers, and does not seek to set up pure PV retailers only.

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Jacobson, and Kammen, 2002), as has been the expansion to neighboring Uganda, Tanzania, the former Somalia, and Ethiopia. We have concluded that one of the key impediments to sustained lower prices for PV systems in East Africa is the absence of any local solar cell fabrication. Currently the PV panels constitute 55 – 60% of the cost of the systems. A small amount of PV production in the region, locally controlled, would exert a strong downward price pressure on the industry, which is at present primarily an import-driven one from Europe.

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The major benefit of this facility – beyond the opportunity for genuine training and expertise in PV systems – is the strong downwards price pressure that such a regional facility would put on the solar import sector that charges the East African market a high premium for panels.

Response re manufacturing

The projects aims at creating an enabling environment for transformation of the PV market, but will not directly invest in manufacturing or sales of systems. The The project will assist in the reduction of prices by i) removal/reduction of taxes/vat and ii) promote increased sales and bulk imports. In addition the will provide business development and study financing options for PV supply. These activities will assist in creating an enabling environment for investments in the private sector, not only in dealing and selling of systems but also for local manufacture and assembly. It is not the place of this project nor UNDP to establish such a factory using GEF resources. Such investments are better made by private sector entities themselves, not by UNDP. However, some changes have been made to support potential assemblers through the project.

Based on the STAP comments the following changes are done:

A specific activity added under Output 3.1 Business Development: to provide training in potential for local manufacturing and assembly, making available the regional studies, market data etc that show potential.

A specific activity added under Output 4.2 Financing of supply chain that aims at developing financing mechanisms for potential manufacturers/assemblers, and not only importers, wholesalers and dealers/retailers.

EXECUTIVE SUMMARY, PAGES 9 – 12: ANNEX B – PROJECT PLANNING MATRIX (AND PCD, PAGE 5 – 6, PAGES 14FF)

MANY OF THE ITEMS (SUCH AS OFFERING FINANCING OPTIONS AND ACHIEVING THE SAME PRODUCE QUALITY STANDARDS AS IN KENYA) MAKE SENSE IN GENERAL. THE PLAN(S) FOR HOW TO ACHIEVE THESE GOALS, HOWEVER, IS NOT CLEARLY INDICATED. IT IS NOT NECESSARY THAT EACH BE DETAILED AT THIS STAGE, BUT IN A NUMBER OF CASES THE PLAN SHOULD SPECIFICALLY SUPPORT THE DEVELOPMENT OF LOCAL ENTREPRENEURS AND TO SHIELD THEM FROM ENTRY OF FOREIGN SOLAR SYSTEM SELLERS. IT IS IN THESE AREAS IN PARTICULAR WHERE SPECIFICS ARE NEEDED AT THIS STAGE.

Response to support local entrepreneurs, shield from foreign sellers

This project is aiming at creating an enabling environment for all actors in the supply chain. No specific groups are favoured nor shielded. Many of the capacity building activities undertaken under the project are targeted towards all levels of the supply chain, but especially towards local PV dealers and companies. If international companies see a potential role for direct intervention in local retail in rural areas, they are free to do so in accordance with Tanzania’s national guidelines and regulations on direct foreign investment. Such investments are not considered to be necessarily negative, as they may help reduce prices, increase sales and benefit the end users, reducing CO2 emissions in the process.

We agree on the comment that the plan and activities as described in the PPM and the pro doc, need to be more detailed further. This will be planned to take place in the inception phase.

PCD, Page 7:

A stated project goal is to: “Select, prepare and make investments in 5-10 PV companies with \$400,000 of Solar Development Foundation finance.” The plan to support several large firms with investments totaling \$400,000 may provide too large amounts of funding per package to genuinely assist the indigenous solar companies. Without careful management, funding at this level will provide too strong an incentive for foreign companies to enter and most likely dominate the emerging market. Clear safeguards

against this need to be developed to avoid some of the pitfalls of the PVMTI program in Kenya.

Response on investments for companies:

Investment of 400 000 to several large companies is the objective of the UNEP regional programme, not this project. In the UNDP-GEF PV project the aim is to set up a small grant fund (Output 4.3) for innovative ideas where PV will be used in productive uses (300 000 USD in total for app. 20 000 USD grants to 15-20 companies). This is not expected to attract international investors and distort the market.

In the project document the text on UNEP objectives has been revised in order to avoid further confusion for readers of the document.

The previous text under UNEP was the following:

12 Moreover, UNEP has recently secured GEF PDF-A funds to implement a regional study entitled “Building Sustainable Commercial Dissemination Networks for Household PV Systems in Eastern Africa” that will target Eritrea, Ethiopia, Kenya, Tanzania and Uganda. The objectives of the UNEP/GEF Regional Solar PV Program are to promote the Kenya business model in the region, and also to share experiences between players in the region. . Kenya has the most active commercial PV market in the developing world. More than 20,000 PV SHS are bought each year in the country, and a bulk of the equipment is manufactured locally. There are over 500 shops which sell PV product and more than 1000 technicians that participate in the market. Consumers can obtain PV panels, batteries and 12 volt dc appliances from hundreds of shops at competitive prices.

From the UNEP proposal, designated objectives are to:

- *“to stimulate increased rural sales of PV by increasing consumer awareness and by sharing experiences between commercial markets and projects in region.*

Other objectives are to:

- *Select, prepare and make investments in 5-10 PV companies with \$400,000 of Solar Development Foundation finance*
- *Build linkages between East African country PV sector stakeholders, including companies, dealers, NGOs, rural energy projects and international companies.*
- *Increase involvement of international PV companies in the region by building awareness of potential markets, linking them with local players*
- *In each country, assist to develop market linkages between the major commercial centre (Addis, Asmara, Dar, and Kampala) and a selected rural district. In each district, to increase awareness of PV among consumers, suppliers, sales agents and technicians.*
- *To develop local capacity to sell, install and service PV systems”*

In Tanzania, this project will be active in Iringa. However, the UNDP project will actively collaborate with the project.

The revised section looks like this

12 Moreover, UNEP has recently secured GEF PDF-A funds to implement a regional study entitled “Building Sustainable Commercial Dissemination Networks for Household PV Systems in Eastern Africa” that will target Eritrea, Ethiopia, Kenya, Tanzania and Uganda. The objectives of the UNEP/GEF Regional Solar PV Program are to promote the Kenya business model in the region, and also to share experiences between players in the region. . Kenya has the most active commercial PV market in the developing world. More than 20,000 PV SHS are bought each year in the country, and a bulk of the equipment is manufactured locally. There are over 500 shops which sell PV product and more than 1000 technicians that participate in the market. Consumers can obtain PV panels, batteries and 12 volt dc appliances from hundreds of shops at competitive prices.

PCD, page 7ff:

The plan to link the regional PV markets is important, and if managed well could be one of the major vehicles to strengthen and sustain the East African PV and broader renewable energy industry.

Response to regional component

This is also an objective of the UNEP regional programme, not this programme, so the comment does not apply. This section is now revised as shown above

PCD, page 18 (Output 4.3)

This project component – drawing on local innovative capacity to design income-generating applications is particularly important. If anything, this activity should be expanded.

Response to productive uses

The advise is taken, and under Component 4 the output on innovative grants for productive uses has been upscale to 300,000, and the other two outputs are reduced to 150 000 each, so the total component remains 600 000. This allows to issu 20 000 USD grants to 20 p proponents over 3 years, instead of 8 -10 only.

PCD, pages 18 – 22: The project risks are each real, but appear to be well considered. The problems of PV dealers is discussed, and is arguably the major risk in developing this project. A series of round-table meetings to evolve the project based on input from

these fledgling entrepreneurs would make a great deal of sense. It is these industry workshops that were employed in Kenya to great effect to inform and work with the industry to informally introduce technology standards that weeded out poor quality PV modules.

Response to risks

The project seeks to strengthen the network of supply chain players to strengthen coordination, working with standards etc in component 3.

MINOR COMMENTS

Executive Summary, page 6 Umeme Jua

Has there been an evaluation of the effectiveness of the *Umeme Jua* program? The information in Table 2 in the PCD, for example, provides only a glimpse of the market.

Response to Umeme Jua

No evaluation of yet, but so far the consortium seem to have positive results.

Executive Summary, page 3

(b) The term “Country Drivenness” does not make sense.

Response

It is part of the GEF template for the executive summary, but it was misspelled, should be drivenness - explains what the governments role has been

PCD, page 9. The prospect of PV mini-grids under private management would seem to be unlikely. The experience with the Urambo and Tabora (diesel-fired) mini-grids can be used as a model, with the added cost of PV factored into the analysis.

Response on mini grids

The comment is taken, and the project will not support the development of mini grids directly. The project is adopting a careful approach to fee-for service, and will explore under the financing component potential financing mechanisms for such service delivery, and pilot the recommended ones.

Annex E

TERMS OF REFERENCE FOR THE PROJECT MANAGER

Job Description

Title:	Project Manager
Reports to:	PS of the Ministry of Energy and Minerals
Duration:	4 years (subject to yearly review)
Duty Station:	Mwanza, Tanzania
Remuneration:	Commensurate with qualifications, skills and experience

Duties and Responsibilities

The Project Manager shall be responsible for the overall coordination of both technical and administrative aspects of the Project on Transformation of the Rural Photovoltaic Market. He/she shall liaise directly with designated officials of the Executing Agency (the Ministry of Energy and Minerals), UNDP Country Office, the Renewable Energy Section), existing and potential additional project donors and others as deemed appropriate and necessary by the Project Steering Committee (PSC) or by the Project Manager him/her self. The budget and associated work plan will provide guidance on the day-to-day implementation of the approved Project Document and on the integration of the various donor funded parallel initiatives. The Project Manager shall be responsible for delivery of all substantive, managerial and financial reports from and on behalf of the Project. He/she will provide overall supervision for all the PIU staff.

The Project Manager shall facilitate the implementation of the following specific Project Components and activities:

1 Policy Support & Institutional Strengthening:

Work with MEM to refine the policy framework and the institutional arrangements necessary for the widespread adoption of PV's for providing off-grid electricity services. This will include:

1.1. The development of an Implementation framework for off-grid PV through:

- Assisting the Government in implementing the new National Energy Policy by:
 - Providing to the development of the institutional framework for implementing the Energy Policy, within which PV will have a niche.
 - Assisting the Government in formulating an implementation plan/strategy for off-grid PV systems

- Assisting the Government in finalising a Rural Energy Master Plan (supported by AfDB; SIDA; and others) that is consistent with the needs of a nascent PV market.

1.2 The adaptation of the Energy pricing policy in Government to support utilisation of PV systems, to deliver appropriate products at the right price, through:

- Reviewing the recently introduced regulation exempting PV panels from the payment of import duty and examine how other BoS components might also be exempted,
- Based on the above review, to formulate proposals for the removing/decrease of tax/duties on all PV system components and initiate discussions with the Ministry of Finance; and
- Study how all energy services are priced, taxed or subsidised in order to ensure consistency between policies to support conventional fuels and those relating to PV systems.

1.3 Development of standards for PV components and systems through:

- Developing a project set of preliminary standards, codes and minimal warranty procedures that will be promoted throughout the project, based upon international experience (including PV gap);
- Developing a code of practice for technicians to follow to correctly size, install and maintain PV systems; and
- Facilitating the formulation and adoption of national standards for PV components and systems, in joint collaboration with the Tanzania Bureau of Standards and a consortium of participating PV companies.

2 Awareness raising:

Work to increase awareness among the general public, especially decision makers, consumers, and other end-users on the potential role of PV in meeting the basic energy needs of rural communities located away from the grid. This will include:

2.1: Awareness program for decision-makers developed and implemented through:

- Developing targeted awareness and information packages about PV systems and their potential to offer development benefits (to be implemented in close consultation with the SIDA project);
- Organising field trips for key decision makers (e.g. MPs, key ministry representatives, NGOs, dealers etc.) to witness the demonstration of PV systems in villages, as well as their local deployment and acceptance ;

- Organising a study tour for a limited set of key decision makers (MP's, key ministry representatives, NGO's, dealers, etc.) to countries with blossoming PV markets (e.g. Kenya, South Africa, Sri Lanka, etc.);

2.2: End user awareness programme formulated and implemented:

- Facilitating preparation of an outreach programme utilizing multi-media (radio, plays, print and video)
- Organizing general awareness campaigns (e.g. roving van with PV installation, free PV-powered video shows, etc.) among all stakeholders. (PV dealers should participate actively in this.)
- Facilitating installation of PV demonstration systems at selected schools and health centres that will serve as an awareness vehicle to sensitise the younger generation (the next adult generation) who would, in turn, sensitise their parents/elders and attracting the attention of rural people visiting health centres for medical services. Costs should be shared to ensure sustainability.
- Facilitating availability of appropriate products to affordable prices - develop different packages that service different needs.

PRIVATE SECTOR STRENGTHENING

This component will assist the private sector to provide better quality of service and to develop models for providing PV-based electricity services to the rural areas. This will cover the following:

3.1: Business Development Services strengthened through:

- Facilitating business planning and development services - one-on-one meetings with business to develop business plans, marketing plans, promotion etc. This will help in accessing loans for implementing the “utility delivery” or “fee for service” mode or for setting up mini-grids for the provision of electricity service.
- Creating awareness with businesses at town and city levels;
- Facilitating presentation and reassessment of the PV market study data with business, to understand and agree with the market data;
- Carrying out training on PV business practice;
- Facilitating a workshop for technicians, dealers and suppliers - for players to meet;
- Developing finance assistance packages for retailer companies and small players. For example, through MFIs the Project might guarantee loans from suppliers to retailers for up to a given amount, e.g. \$ 5,000 to enable the small dealers to have the capacity to run PV business

- Assisting local PV dealers to develop linkage with international companies.

3.2 Technical knowledge of PV strengthened through:

- Developing a variety of courses (short/long) for various target groups
- Working with VETA and other training institutions to develop an appropriate curriculum for the training of PV technicians.
- Facilitating development of a code of practice for technicians to follow to correctly size, install and maintain/repair PV systems. (Linked to development of project standards)
- Facilitating provision of technical training to private sector staff on the correct sizing, installation and trouble-free repair of PV systems.
- Organizing training courses to develop a pool of PV technicians to correctly size, install and service PV systems.
- Facilitating development of appropriate sized PV packages for various user categories, e.g. lanterns, battery and telephone charging centres, etc.

FINANCIAL ENGINEERING:

The component will develop a viable financing mechanism for PV. This will be done by piloting a number of viable financing ideas, including consumer finance, hire purchases, ESCOs etc

LEARNING AND REPLICATION

This Project component will aim at disseminating experience and lessons learned to promote replication throughout the other regions of the country.

Subcontractors will be contracted to undertake specific project tasks according to the final project schedule. Subcontractors may be individuals and/or organisations, whichever is appropriate for a given task.

QUALIFICATIONS

The candidate should have:

- A minimum of Masters degree or similar degree in a relevant fields such as renewable energy, marketing, business development, etc
- Work experience in the field of renewable energy, preferably PV solar and experience on marketing/business development of the commercial sector

- Knowledge of energy policy issues
- Work experience from East Africa and preferably from Tanzania
- Experience from project management
- Good communication skills, written as well as oral. Knowledge of Kiswahili would be added advantage
- Ability to work in a cross-cultural team, work with local private sector, manage consultants, work with stakeholders.

Aspiring candidates must also have a combination of the following requirements:

- Work experience with renewable energy technologies, in particular solar energy systems;
- At least 10 years experience in the renewable energy field at the household, small-scale commercial/industry and institutional level in public or private sector;
- At least five years work experience at senior management level with demonstrable project level management skills and ability to coordinate activities involving a large contingent of professional consultants drawn around the country and/or internationally;
- Working knowledge of the Tanzanian energy sector;
- Experience in donor supported international cooperation project;
- Demonstrable skills in Information Technology, including use of Word Processing, Power Point, spread sheets, email and internet;
- Fluent communication skills (oral & written) in English.

Terms and conditions

The project manager will be hired on a full time basis for the duration of the project, which is 4 years, and is expected to start mid October 2003.

The project manager will be based in Mwanza, but is expected to work 1-2 months a year in Dar es Salaam.

TERMS OF REFERENCE FOR THE NATIONAL PROJECT OFFICER

Job Description

Title:	Project Officer
Reports to:	Project Manager
Duration:	4 years (subject to yearly review)
Duty Station:	Mwanza, Tanzania
Remuneration:	Commensurate with qualifications, skills and experience

Duties and Responsibilities

The Project Officer shall assist the Project Manager in the coordination of both technical and administrative aspects of the Project on Transformation of the Rural Photovoltaic Market. The Project Officer shall assist in the implementation of the following specific Project Components and activities:

1. Policy Support & Institutional Strengthening;
2. Awareness raising;
3. Private Sector Strengthening;
4. Financial Engineering; and
5. Learning and Replication.

Qualifications

The candidate should have:

- A minimum of Bachelor degree or similar degree in a relevant fields such as renewable energy, marketing, business development, etc
- Work experience in the field of renewable energy, preferably PV solar and experience on marketing/business development of the commercial sector
- Experience from project management
- Good communication skills, written as well as oral. Knowledge of English and Kiswahili
- Ability to work in a cross-cultural team, work with local private sector, manage consultants, work with stakeholders.

Aspiring candidates must also have a combination of the following requirements:

- Work experience with renewable energy technologies, in particular solar energy systems;
- At least 5 years experience in the renewable energy field at the household, small-scale commercial/industry and institutional level in public or private sector;
- At least five years work experience with project level management skills and ability to coordinate activities involving a large contingent of professional consultants drawn around the country and/or internationally;
- Working knowledge of the Tanzanian energy sector;
- Experience in donor supported international cooperation project;
- Demonstrable skills in Information Technology, including use of Word Processing, Power Point, spread sheets, email and internet;
- Fluent communication skills (oral & written) in English.

Terms and conditions

The Project Officer will be hired on a full time basis for the duration of the project, which is 4 years, and is expected to start January 2004. The project officer will be based in Mwanza, with the rest of the project team.

TERMS OF REFERENCE FOR THE POOL OF TECHNICAL EXPERTS

The pool of experts will be consisting of 4 different experts in the field of PV solar, renewable energy, marketing, private sector strengthening. The positions will be on a consultancy basis on an hour-by-hour basis. The experts will act as support to the Project Implementation Unit, and the Project Manager in particular.

Qualifications

The experts should complement each other in qualifications and have:

- A minimum of Masters degree or similar degree in a relevant field such as renewable energy, marketing, business development, etc
- Expertise and minimum 15 years of work experience in the field of renewable energy, preferably PV solar or experience with marketing/business development of the commercial sector
- Be well respected and acknowledged as experts in their field.

Terms and conditions

The Technical Experts will be appointed for the duration of the project, and the positions will be advertised on competitive basis. The experts will then be used on a hour by hour basis based on request. The experts will be based where their normal business is, and will provide support service and advice via email and internet based upon request by the Project Manager. The experts may also be required to travel to the country on strategic meetings and milestones in the project when found necessary. The experts will be remunerated on UNDP consultancy rates, the level will be based on their experience and expertise. The no of days of input will be decided for each separate case, and the time put in will be agreed in advance with the Project Management.