

## PROJECT BRIEF

### 1. IDENTIFIERS:

<b>PIMS NUMBER :</b>	<b>1894</b>
<b>PROJECT NUMBER</b>	URT/03/G...
<b>PROJECT NAME</b>	<b>Transformation of the Rural Photovoltaic (PV) Market</b>
<b>DURATION</b>	Five years
<b>IMPLEMENTING AGENCY</b>	United Nations Development Programme
<b>EXECUTING AGENCY</b>	RES (Renewable Energy Section), Ministry of Energy and Minerals
<b>REQUESTING COUNTRY</b>	Tanzania
<b>ELIGIBILITY</b>	Tanzania ratified the UNFCCC on 17 April 1996 (Entry into Force on 16 July 1996)
<b>GEF FOCAL AREA</b>	Climate Change
<b>GEF PROGRAMMING FRAMEWORK</b>	OP #6: Adoption of Renewable Energy by Removing Barriers and Reducing Implementation Costs

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### 2. Summary:

The project aims at reducing Tanzania's energy-related CO<sub>2</sub> 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.

### 3. Costs and Financing

		<u>US Dollar</u>
<b>GEF</b>	Project:	2,250,000
	PDF B:	320,000
	Subtotal GEF	<b>2,570,000</b>
<b>Co-financing (Parallel)</b>	Government (in kind)	147,600
	Sida PV	3,176,471

	Dutch Govt/Umeme Jua	630,000
	UNDP TRAC	240,000
	Others	540,000
	Subtotal Co-Financing	4,734,071
<b>Total Project Financing</b>		<b>7,304,071</b>
Associated Financing	Sida institutional	2,352,941

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## LIST OF ACRONYMS AND ABBREVIATIONS

AfDB	African Development Bank
AFRREI	Africa Rural and Renewable Energy Initiative
BoS	Balance of System
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)
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
PPA	Power Purchase Agreement
PV	Photovoltaics
RAS	Regional Administrative Secretary
RDD	Regional District Director
SADC	Southern African Development Community
RES	Renewable Energy Section
SHS	Solar Home System
Sida	Swedish International Development Agency
TANESCO	Tanzania Electric Supply Company Limited
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 \$ = 980 Tshs (Dec. 2002)

1 USD = 9 SEK (Feb 2003)

## 1. 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,,:

<b>Barrier</b>	<b>Degree of Importance</b>
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 VCD 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.

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/97/G31: New approaches to reducing biodiversity loss at Cross Border Sites in East Africa (\$ 3,378,600); URT/00/G35: Jozani/Chwaka Bay National Park development (\$ 745,000); URT/00/G31: Mnazi Bay Marine Park (\$ 1.5 million); RAF/01/G41: Lake Tanganyika Management Planning Project (PDF-B \$ 599,000 ); URT/00/G41: Conservation of Forest Biodiversity Resources in the Eastern Arc Mountains of East Africa (PDF B --\$ 75,688); URT/97/G42: Conservation of coastal forests biodiversity in Tanzania (PDF A--\$ 22,969); URT/97/G43: Conservation of biodiversity of Great Rift Valley Lakes (\$ 28,150); GLO/99/G43: Nile River Basin Initiative (\$ 350,000); the Small Grants project URT/95/G32 aimed at enhancing the contribution of households and communities to conserve biodiversity, mitigate global climate change and protect international waters (\$ 400,000) and Conservation of the Selous-Niassa Game Reserve corridor through community based interventions (PDF A--\$ 13,000). All these initiatives are mainly directed towards conserving forest or marine biodiversity hotspots while simultaneously catering to the needs of local communities.

## 2. 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 electricity connection.

15. The Mwanza region has seven 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 (2000*)	Electrified HH (Feb. 2002)	Percentage connected
Magu	68,662	827	1.2%
Ukerewe	33,107	-	0.0%
Geita	110,702	-	0.0%
Sengerema	63,524	735	1.2%
Kwimba	47,782	424	0.9%
Missungwi	39,400	778	2.0%
Mwanza	59,043	22,193	37.6%
Total	420,029	24,957	5.9%

\*Results of the population census held in August 2002 are not yet available

16. Table 1 above shows that only 5,9% of the total households (each household consists of an average of 6.5 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. The future does not look any brighter: the projection is that in 2005 and 2010 there will be, respectively, 321,148 households (out of 458,782 households) and 382,177 (out of 545,967 households) located too far from the grid to benefit from it within 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.

17. The Mwanza region enjoys a very good solar regime (average of 5.5 kWh/m<sup>2</sup>/day). Therefore, introducing individual PV systems would make it possible, in the long term, for some 17% (as per the market survey undertaken by Umeme Jua) 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 CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> taking into the effect of the Mwanza project is almost 119,000 tonnes of CO<sub>2</sub> 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, a 1996 WHO report indicates that indoor air pollution is a leading cause of death and illness in developing countries; in fact, larger than tuberculosis, AIDS or malaria.

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:

- o 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.
- o 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 estimates 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. 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 RuralEnergy Agency and a Rural Energy Fund. The total support from Sida for these two projects adds up to app 5.5 mill USD. The Sida PV project is incremental and is considered as co-financing to the UNDP/GEF project, as the UNDP/GEF project can not 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 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 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.

### **3. OBJECTIVES, OUTPUTS AND ACTIVITIES**

27. The global objective of the proposed project is twofold: i) to reduce Tanzania's energy related CO<sub>2</sub> 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 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 and test viable financing options for disseminating PV systems.*
- *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 1996 World Health Organisation study referred to in Para. 19 above 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:

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

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

<b>Barrier</b>	<b>Component</b>
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 VCD 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
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
- 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 duty<sup>1</sup> and examine how other BoS components might also be exempted,

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<sup>1</sup> 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.

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 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 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 (eg. Kenya, South Africa, 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.

**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); and
- 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 with business to develop 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 project);

- To create awareness of PV systems, applications, and product lines (eg., lanterns; systems of < 20 to 50 W; systems over 50 W; larger systems; etc.) among existing businesses (eg., appliance stores, electronics shops, etc.) in the towns and villages of Mwanza Region;
- To support the functioning of the recently established TSEA 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; 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 and test 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 and elsewhere within 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 demonstration productive use applications 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;

- 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.* Introduction of 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 the Sida and Umeme Jua activities, to ensure that lessons learned are exchanged.

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

#### 4. 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, the national energy policy is not yet adopted and there is also the 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, pending the setting up of a Rural Energy Agency that will have as one of its very first responsibilities the formulation of a national rural electrification master plan, proper care will be exercised to ensure that the selection of the focus areas in the Mwanza region for PV are quite remote and will not be reached by grid extension for the next 15-20 years. The Presidential Parastatal Sector Reform Commission clearly sets the framework for unbundling and privatisation of the electricity sector by 2004 and promoting private capital investment. The Government will set up a Rural Energy Agency 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 level of risk deals with import duties and value added taxes on PV system components. This is mitigated by the fact that Government made a step in the right direction on 1 July 2001 by removing import duty on PV panels. 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 level of risk resides with the possibility that consumers will not approach the lending institution for loans to purchase PV systems. This risk will be minimal as consumers are already approaching PV dealers for loans to purchase systems, but, unfortunately, these dealers do not have sufficient cash flow to sell on credit. 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. This risk will be mitigated by the awareness campaign that will be mounted, as part of activities under the project, 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 level of risk deals with the replication of the Mwanza region experience to other regions of Tanzania, aimed at supplying PV-based electricity to rural consumers. The project cycle for the Mwanza region will provide “lessons learned” that will largely contribute towards mitigating this level of risk.

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. 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 interest (e.g. Umeme Jua Ltd.) to initiate activities in regions like Arusha and Kilimanjaro to create a network of PV dealers, sales agents and technicians and on the part of Sida Sweden to make loan funds available in several regions, including Mwanza, through the banking sector. Hence, a positive experience in the Mwanza region will go a long way towards generating private sector confidence to invest in the PV market.

## **5. 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 Market Study in Mwanza region /REF XX/ in 2000 - 2001. Also community members were part of the workshops organised in the region in September 2001. In addition, there has been close consultations with the RAS/RDD 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) . They are 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 who 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 Fredka 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 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.

### **Implementation arrangements**

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

43. For the implementation of the programme, an independent Project Management Unit (PMU) will be set up. The PMU will be consisting of an international Project Manager, a

national Programme Officer, a Project Assistant and a Project Driver. The Project Management 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 Manager shall also have the overall responsibility for procuring project 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. MEM shall be the contracting partner. Government rules and regulations for procurement shall apply. MEM shall approve all tender documents and tender evaluations before contracts are signed. UNDP can 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 PMU will develop an overall annual workplan indicating the activities that will be supported by UNDP/GEF through the programme. This should be co-ordinated with the workplan prepared for the Sida supported programme. The PMU will also prepare quarterly reports and budget requests against the annual workplan to submit to UNDP for advancement of funds.

44. Two MEM staff will be the main liaison officers from the ministries side, and each of them will allocate approximately 25% of their time of follow up the project, do regular monitoring and evaluation during implementation. The same officers will also be co-ordinating 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 when REA is in place. The Agency, 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.

45. In addition, a Project Steering Committee, consisting of representatives of the Office of the Vice President (Department of Environment), Ministry of Finance, RAS/RDD Office in Mwanza, TASEA, Sida and UNDP, chaired by MEM, will provide overall guidance to project execution. The Steering Committees 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.

46. The private sector will have a key role in the implementation of this project, and are seen as the 'driver' of the project. In components 2, 3, 4 and 5, the private sector has a key role to play. To ensure active participation from the private sector, the project will issue shorter 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 Management 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 PMU will organise regular meetings with the network to secure their concurrence and support to the activities proposed for implementation.

47. 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 Project Manager will maintain very close contact with the rural consumers in the local communities. The Project Manager will 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.

48. The Sida-PV project is part of the increment and the GEF project cannot succeed without the Sida project. Both have been designed as complementary efforts and are seen by the government, Sida and UNDP/GEF as one initiative with the same objective and 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 are: 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.

## **6. INCREMENTAL COSTS AND PROJECT FINANCING**

49. 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 would not take place in the absence of UNDP and GEF support, making the project activities largely incremental.

50. 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.

51. 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.

52. 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.

53. 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.

54. 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 m<sup>3</sup>), equivalent to approximately 28,000 tonnes of CO<sub>2</sub>. 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 CO<sub>2</sub>.

55. 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 (eg., 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**

<b>Project Activity/ Component</b>	<b>GEF</b>	<b>Others</b>	<b>Total</b>
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/PDFB	320,000		320,000
<b>Total</b>	<b>2,570,000</b>	<b>4,734,071</b>	7,304,071

## **7. MONITORING, EVALUATION AND DISSEMINATION**

### Monitoring

56. 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.

57. 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.

58. In addition to normal Government monitoring, UNDP will have the monitoring and reporting obligation for the program. In this connection, additional M&E missions will be undertaken by UNDP when this is judged to be required, as for example when there is a need for an intermediate assessment of progress or impact before a decision is taken as to the continuation of any given activity. This will be done in collaboration with the executing agency as well as with the implementing partners.

### Annual reviews

59. Annual review meetings involving key stakeholders will be held to review the status of implementation of the programme and PED's strategic plan. The purpose of the review meetings is to assess the progress made and to take decisions on recommendations to improve

the design and implementation of the programme in order to achieve the expected outputs. The annual review is to be based on the Annual Programme Report.

### Evaluation

An 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. UNDP regulations have no formal requirements of an end-of programme evaluation, so it should be needs based. 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.

## **8. 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.

## **9. ANNEXES**

Annex A - Incremental Costs (See separate file 1)

Annex B - Project Planning Matrix (See separate file 1 )

Annex C - STAP Review (See separate file 1)

Annex C1 - Response to STAP Review (See separate file 1)

Annex D - Endorsement Letter (See separate file 2)

Annex E - Cofinancing Letter (See separate file 2)

