UNDP Project Document

Government of The Republic of Burkina Faso

United Nations Development Programme

Burkina Faso: Transformation of the Rural PV Market through the National Rural Water Service Delivery Program

Brief Description

The project aims at reducing Burkina Faso's energy-related CO_2 emissions by introducing photovoltaics (PV) as a substitute for fossil fuel (kerosene and fuel Oil for Diesel Gensets) utilized for diesel-based captive generation or grid extension schemes to provide basic water pumping services to the unelectrified rural communities in the centre-sud region. The activities proposed in the project are designed to remove barriers to the wide-scale utilization of PV to meet the basic water pumping needs of much of the rural Center Sud region for potable water use and low-head irrigation. In addition to the above productive end-uses, electricity needs of community and individual households in terms of lighting, power for a radio-cassette/TV, and of community users like health clinics, battery charging for cell phones, telecommunication/computing centres and schools are expected to accompany the private sector led deployments of solar PV pumping systems in theses unelectrified regions. With a specific focus on the government's national water pumping program, the project will develop local capacity to identify technical and financing options and to strengthen 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 the basic productive electricity services required for water pumping. The association of the PV system deployments on purely commercial/private sector terms with the government rural potable water program allows for a unique opportunity to tap a sizable PV market within Burkina and to ensure sustainability of the market building on the concrete economic activity represented by the sale of potable water.

PROJECT BRIEF

1. IDENTIFIERS:

PROJECT NUMBER	PIMS # 948
PROJECT NAME	**Burkina Faso: Transformation of the Rural PV Market Through the National Rural Water Service Delivery Program**
DURATION	04 years
IMPLEMENTING AGENCY	United Nations Development Programme
EXECUTING AGENCY	DGE (General Electricity Directorate), Ministry of Mines, Quarries and Energy
REQUESTING COUNTRY	Burkina Faso
ELIGIBILITY	Burkina Faso ratified the UNFCCC on 2 September 1993 (Entry into Force on 21 March 1994)
GEF FOCAL AREA/STRATEGIC PRIORITY	Climate Change/Sp-1 and Sp-4: Market transformation and Productive Uses of Renewable Energy
GEF PROGRAMMING FRAMEWORK	OP #6: Promoting the Adoption of Renewable Energy by Removing Barriers and Reducing Implementation Costs

3. COSTS AND FINANCING (MILLION US$):

GEF	Project:	US $ 1,700,000
	PDF B:	US $ 60,000
	Subtotal GEF	**US $ 1,760,000**
Co-financing (in US $)	Government	US$ 400,000
	UNDP TRAC	US$ 600,000
	AfDB	US$2,250,000
	Private sector	US$ 880,000
	Subtotal Co-Financing	US$**4,130,000**
	Total Project Cost	US$**5,890,000**

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Acronyms and Abbreviations

LIST OF ACRONYMS AND ABBREVIATIONS

AFD	Agence Française de Développement
PWSS	Potable Water Supply Systems
BoS	Balance of System
CBO	Community Based Organization
CEFOC	Centre de Formation Continue
CET	Collège d'Enseignement Technique
CFP	Centre de Formation Professionnel
DANIDA	Danish Cooperation Agency
DGE	Direction Générale de l'Energie
DERET	Direction des Energies Renouvelables et Energies Traditionnelles
EDF	Electrification Development Fund
EU	European Union
FDE	Fonds de Développement de l'Electrification
GHG	Greenhouse Gas
GEF	Global Environment Facility
IRSAT	Institut de Recherche en Sciences Appliquées et Technologie
LT	Lycée Technique
MEWR	Ministry of Environment and Water Resources
MFI	Micro-Finance Institution
MMQE	Ministry of Mines, Quarries and Energy
MP	Member of Parliament
NEP	National Electrification Plan
NGO	Non-Governmental Organisation
PV	Photovoltaics
PRS	Programme Régional Solaire
RESCO	Rural Energy Service Company
SHS	Solar Home System
SONABEL	Société Nationale d'Electricité du Burkina
TRAC	Target for Resources Allocation from Core
UNDP	United Nations Development Programme
VAT	Value Added Tax

Exchange rate: 1 US $ = 525 FCFA (May 2004)

PART I: Situation Analysis

Context and global significance

1. The World Health Organization and DHS (Demographic Health Survey) estimated in July 2004 that access to modern/potable drinking water sources in Burkina Faso by the rural populations had improved from 39% in 1990 to 42% in 2002 after more than a decade of government efforts. Considering that Burkina Faso is a Sahelian agricultural country with a significant share of its population still living in rural areas (an estimated 9 million out of 12 million), the above estimates helped put in perspective the merits and the limits of previous water supply programs together with the daunting challenges for all key actors involved (government, rural communities, NGOs, donor community and the private sector). A review of the above report together with the participatory PRSP (Poverty Reduction Strategy Paper) exercise placed further emphasis on the need to significantly improve performance in the delivery of rural water supply programs if the MDGs (Millennium Development Goals) for Burkina Faso are to be met.

2. Various factors account for the above poor potable rural water access rate including: **(i)** the government's initial focus on urban water supply programs; **(ii)** the initial strategic option taken in favor of surface water resource mobilization/management with expensive dam constructions to smooth out water needs for agricultural use/irrigation and urban household consumption in dry seasons; **(iii)** a relatively weak legal and institutional framework for the water and sanitation sectors which mean that tying rural water service delivery programs to the country's rural administrative decentralization program turned out to be overly costly owning to the stalled decentralization process that has only been re-energized in recent years; and **(iv)** the weak articulation between the government's national water and sanitation program with the scattered rural electrification projects. Given that lack of running power in the targeted rural communities appears to be a major barrier hampering the effective substitution for human energy in water collection, a systematic effort at building and strengthening synergies among both sectors at the policy and planning level could have, perhaps, been quite effective beyond the achievements of the EU funded PRS I (Programme Régional Solaire I) and PRS II projects.

3. In addition, despite steady improvements in the country's knowledge of its main hydrogeological characteristics, partly as a results of the Inter-African Committee Work on Water in the 1980 onwards, and partly as a result of the African Development Bank's Water Initiative, knowledge of the existing ground water resource endowment of the country for policy planning purposes remains limited and fragmented. For example, continuous or discontinuous aquifer layers were not sufficiently explored towards the elaboration of a credible rural water supply program taking into account key characteristics such as their potential, extension, renewal and discharge rates given the natural expansion of the country's rural communities. In contrast with a long standing belief in Sub-Saharan Africa, the exploitation of ground water for rural access purposes – in Burkina Faso -- is reported to be less constrained than the exploitation of surface water for the simple reason that ground water resources have been largely untapped and past government policies of the 70s through the late 90s have left an ever increasing share of rural populations in the blind spot of various national and/or donor funded water programs.

4. In Burkina, like in many Sub-Saharan African countries, the need for rational and integrated exploitation/management of water resources with respect to rural communities and the impacts of water collection activities on women labor time or economic productivity is emerging as a renewed government priority. The PRSP exercise, together with the recent efforts aimed at mainstreaming rural energy projects into broader rural development activities have brought to light the synergies missed and the opportunities for institutional capacity building, community-empowerment together with further private sector

participation in the delivery of basic rural services.

5. In 2002-2003, Burkina Faso started the preparation of a joint UNDP-GEF/WB-GEF capacity-building/renewable energy project component intended to help address the rural electricity access issues for productive end-uses in tandem with the broader sector reform efforts, which were launched several years earlier. The importance of the above GEF led efforts in the envisaged assistance to the government of Burkina Faso was agreed in view of the fact that the government was fully aware of the limits of its proposed Rural Water Access Program in Partnership with the African Development Bank without a concrete element of rural running electricity component. Moreover, the absence of reliable and affordable renewable energy technologies for electricity generation in years past has meant that the only possibility for the provision of electricity services in remote and sparse rural communities was through small diesel generators in a country where incomes are low. The poor performance of SONABEL (the Monopoly Power Utility) in a landlocked country, the notorious high electricity supply cost (which were compounded by the exceedingly costly fuel transit transport arrangements in the aftermath of the Ivorian Civil war) further heightened the need to expedite the conventional energy sector reforms under the leadership of the World Bank while at the same time keeping on track the Water sector partnership arrangements with the African Development Bank.

6. For the Burkina Faso government and viewed from the perspective of the National Drinking Water Supply and Sanitation (DWSS) program to be supported by the African Development Fund (AfDB's soft lending window) at the inception of the current GEF project, the immediate deliverable would be a comprehensive study to lay out the foundation for replicating successful projects and approaches in meeting rural drinking water and sanitation needs in a sustainable manner so as to improve the socio-economic and health conditions of the targeted rural populations. The AfDB would support: (i) a national inventory of water and sanitation structures; (ii) the master plan/blue-print for the National Drinking Water Supply and Sanitation Program to help Burkina meet the water and sanitation needs of the population, particularly the rural population in order to achieve a coverage rate of 66% in 2010 and 80% in 2015. It is expected that this initiative would also decrease medical expenses as a result of the reduction or even eradication of water-borne diseases by 2015. The African Development Bank's operation will promote water-related income-generating activities, particularly agricultural and pastoral activities, to reduce the poverty index from 50% to less than 20% by 2015 in rural areas.

7. On the World Bank side and building on its experience of over 20 years of involvement in the Burkina Faso conventional energy sector together with the compelling macroeconomic circumstances with the country's eligibility for IDA, it was urgent to finally set in motion an energy sector reform program that had been in the making since the mid-90s and which needed
tangible results. In November 2004, a grant co-financing US$63.58 million of IDA funds were approved under the World Bank's Specific Investment Loan Instrument and the Bank's debt vulnerability facility to kick start the reform program focusing on:

(i) Enhancing the policy and institutional environment for efficient sector development and operation by: **a)** helping the GoBF to implement its sector development strategy; **b)** supporting the Directorate o f Energy (Direction Générale de l'Energie -- DGE) in its role of policy formulation and monitoring;

(ii) Improving the availability and reliability of electricity supply in the area covered by the national power utility, SONABEL, by: **a)** extending the transmission network (construction o f a transmission line linking Bobo-Dioulasso and Ouagadougou); **b)** strengthening existing transmission lines in order to reduce outages (reinforcement of the transmission lines between Kompienga, Bagre, and Ouagadougou);

(iii) Providing an additional 14MW of critical and standby generation capacity; and

(iv) Promoting rational and efficient use of energy in public administration buildings through demand-side management initiatives, by: **a)** helping the DGE design an energy efficient program; **b)** implementing a first phase of this program at the level of public administration buildings.

The preparation and execution of the above activities in the modern energy sector for Burkina appear to have pre-empted the earlier WB intentions to deliver a dedicated renewable energy project/component which was approved for pipeline entry jointly with the current UNDP-GEF project. Nevertheless, with the progress made in the implementation of the above activities, the World Bank is reportedly planning a new **"Universal Energy Service Access Project"** in Burkina focusing on the rural electricity sector. This forthcoming project is the government and the Bank's response to a non-operational rural energy/electricity fund, an equally intriguing absence of any functional universal access structure and/or dedicated rural electricity/energy body. This has left the Directorate General for Electricity in charge of all policy and day-to-day operational issues with the blatant inefficiencies that typically characterize such policy vacuums. Though initially announced for late 2006, the Bank appears to have recently stepped up its processing of the above rural energy initiative and decided to prepare its forthcoming rural electricity project in Burkina in the months ahead with a focus on universal rural access mechanisms building on a national rural electrification strategy in the making. UNDP-GEF and the Bank team will continue to maintain close collaboration to maximize synergies and avoid duplications.

8. On the UNDP-GEF's side and after close to 2 years of PDF-B participatory involvement of government institutions, the bi-lateral donors in Ouagadougou and various renewable energy sector actors in Burkina, an opportune policy space to link RE (Renewable Energy) in a productive end-use context to a concrete priority national development project was finally emerging out the AfDB supported DWSS and the World Bank's sector reform project.

9. Rural electrification has been an important component of the national development agenda for Burkina Faso since it became independent on 5 August 1960. In February 1999, the then Ministry and Mines, with the support of DANIDA, published the National Electrification Plan (NEP) having one of its main objectives "to supply the burkinabè society with access to electricity services in a reliable, efficient and economic manner". However, the Electrification Development Fund (EDF) designed to be the vehicle for formulating, funding and implementing the National Electrification Plan, as per Law No. 60/98/AN of 17 December 1998, did not get created until January 2003 (Decree No. 2003-089/PRES/PM/MCE), with the result that implementation of the plan has fallen far behind schedule. The above sizable progress on the nation's ADF-DWSS program and the World Bank electricity sector reform project, the momentum generated during project preparation and the intense interaction with Burkinabe government Officials paved the way for UNDP-GEF's current project on strengthening the

Transformation of the Rural PV Market through the National Rural Water Service Delivery Program.

Threats, root causes and barriers analysis

10. Through implementation of the PDF B, the barriers to the utilisation of PV to meet the basic electricity needs of rural communities both for personal and productive uses can be classified into the following four broad headings, namely:

- Institutional

- Economic, commercial and market
- Technical and information
- Education and training

11. **Institutional barriers.**

- Lack of an effective infrastructure for delivering renewable energy-based energy services on a sustainable basis. The legal framework arising out of Law No. 60/98 of 17 December 1998 has not been formulated yet, with the result that neither the Electricity Regulatory Authority nor the Electrification Development Fund has been put in place.
- Fragmented institutional responsibilities and lack of integrated planning and implementation by various stakeholders including government, the research organisations, academic institutions, NGOs, community based organisations (CBOs) and the private sector with regard to the potential applications of PV (renewable energy). Strong community participation in the promotion of PV is essential; experience in other countries shows that its absence has led to PV components theft on a substantial scale.
- Law No. 04/98 and/or Law No. 041/98 in connection with the National Decentralization Framework and the organization of public and administrative Offices throughout Burkina Faso have yet to be fully operationalized with the adoption of all required decrees. Decree No. 98/98/365/PRES/PM/MEE sanctioned the adoption of a national water and Sanitation Plan. However, there has been little inter-ministerial coordination to ascertain that the best and/or least cost energy alternatives were being integrated in the solutions to meet the rural areas' basic water and sanitation needs.

12. **Financial, economic, commercial and market barriers.**

- Limited private sector capacity to supply, distribute, install and maintain PV systems. The situation is severe with maintenance since the PV suppliers and installers are all in major cities and not in rural areas where maintenance is required. In addition, ordinary retail shops do not sell PV components. Consequently, consumers need to travel long distances to get the required maintenance services or to purchase spare parts like lights. In some cases, this results in consumers losing interest in PV technology. This, then, becomes a disincentive to other potential consumers and constitutes one of the greatest barriers to the utilization of PV.
- Limited business skills: while there may be people with energy expertise, the appropriate business skills to start energy enterprises are often lacking.
- Inequality in fiscal treatment: while PV equipment purchased by SONABEL (a State Corporation) and DGE is imported duty free and VAT free; the same treatment does not apply to the private sector.
- Lack of viable financing options for renewable energy/PV companies and end-users, and the need for training of in-country financial institutions to provide credit for renewable energy enterprises and projects. This is a major barrier to the development of the market of PV industry in the country.
- As a result of the spread of the scattered rural populations, the private sector perceives the opportunities to deploy PV systems in the water pumping business as sub-optimal and/or below sustainable market threshold in the absence of a comprehensive water pumping program.

13. **Technical and information barriers.**

- Poor workmanship in the design, installation and maintenance, as well as inappropriate operation, of PV systems.
- Lack of access to necessary information in connection with PV system applications.
- Lack of public awareness of the potential applications of PV.
- Limited, outdated and fragmented data on ground water resources/continuous and discontinuous aquifer layers together with existing hydraulic structures in rural areas.

14. **Education and training barriers**.

- Lack of trained manpower at all levels and in particular at the rural consumer level.
- Insufficient qualified personnel for maintenance of PV systems.

To overcome these barriers, the present full project will establish a framework to transform the rural PV market in Burkina Faso, utilising the private sector as a vehicle for providing electricity services from PV for private and productive uses in the centre-sud region.

Institutional, sectoral and policy context

15. Rural electrification has been an important component of the national development agenda for Burkina Faso since it became independent on 5 August 1960. In February 1999, the then Ministry and Mines, with the support of DANIDA, published the National Electrification Plan (NEP) having one of its main objectives "to supply the burkinabè society with access to electricity services in a reliable, efficient and economic manner". However, the Electrification Development Fund (EDF) designed to be the vehicle for formulating, funding and implementing the National Electrification Plan, as per Law No. 60/98/AN of 17 December 1998, did not get created until January 2003 (Decree No. 2003-089/PRES/PM/MCE), with the result that implementation of the plan has fallen far behind schedule.

16. Moreover, the vast country coverage area, consisting of 13 regions, 45 provinces, 350 departments and 8,000 villages, coupled with the high associated costs in view of the very dispersed locations of the consumers to be served, make implementation of a rural grid-connected electrification programme a really difficult task. The results, consequently, speak loud and clear: at the present time, only 8 % of the total population of about 12 million actually benefit from electricity services; an additional 10 % has access to these services, but cannot afford to pay for a connection to the grid. The situation is worse in the rural areas, when compared to the national average; nationally, some 82% of the population live in rural areas, but only 3% of the rural population have access to electricity services. Therefore, the task that lies ahead is formidable.

17. There are little prospects that financial resources will become available and economic viability will encourage the national electric utility, SONABEL (a Government Corporation under the Ministry of Mines, Quarries and Energy---MMQE), to undertake electrification of even an additional 20% of the rural households in the foreseeable future, as the houses are spread out and, therefore, make a per customer grid-connection cost quite high. In fact, the present process of restructuring that will eventually lead to the privatisation of SONABEL has slowed down expansion of the distribution system to serve the rural areas and a privatised SONABEL 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.

18. Over the last few years, Burkina Faso has made several policy changes in the energy sector. Law No. 60/98/AN passed on 17 December 1998 defines several strategic objectives for the energy sector, 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.

19. With regard to rural energy, the law proposes to put in place a legal and institutional framework to allow the private sector to fully participate, through a concession modality, in the development and implementation of a programme to provide electricity services at least cost. It also makes provision, among others, to set up a Ministry of Energy (already set up as Ministry of Mines, Quarries and Energy) with responsibility to formulate an electrification policy and undertake strategic planning, and to set up an Electricity Regulatory Authority and an Electrification Development Fund. The Electrification Development Fund was set up, as indicated above, in January 2003 and since very little progress has been achieved in pushing the 1999 National Electrification Plan forward, the latter is being justifiably updated, again with DANIDA's support. Financial resources for this Fund should come from, among others, a levy on every kWh sold to consumers and from contributions from partners in development. With regard to the Electricity Regulatory Authority, it is yet to be established, although the law was passed over 5 years ago.

20. In addition, high on the Government's agenda is a Law passed in 2001 authorising the privatisation of public enterprises, including SONABEL and it has solicited the participation of donors/lenders to formulate an institutional, financial and technical framework that will enable producers, consumers and rural communities to participate in the promotion, development and utilisation of renewable energy in a sustainable way. To facilitate this, the Government allows SONABEL, as a Government Corporation, and MMQE to be exempted from paying import duties and VAT on PV panels and components that they import. However, the same cannot be said for the private sector: it is hit with a 56 % import duty and 18 % VAT on its PV components imports. This, unfortunately, constitutes a strong disincentive to the private sector interested in setting up business opportunities in the renewable energy field.

Relevant Electricity Sector Institutions and Organization

21. Rural electrification in Burkina Faso is shared between SONABEL and the Direction Générale de l'Energie (DGE) under MMQE. SONABEL mainly focuses on urban centres and any rural electrification that it undertakes is mainly through grid extension. When the population centres are too far to be served by grid extension and the small load does not justify building expensive transmission and distribution systems, DGE steps in to provide electricity services mainly through captive diesel generators. In doing so, DGE solicits the support of the Direction des Energies Renouvelables et Energies Traditionelles (DERET) in cases where it makes both financial and economic sense to utilize renewable energy technologies, mainly PV systems.

Relevant Water Sector Institutions and Organization

22. As of June 2002, the country's water management responsibility falls under the purview of the Ministry of Agriculture. The Directorate General for Potable Water Supply (DGAEP – Direction Générale de l'Approvisionnement en Eau Potable) is one of the six major Directorates in charge of the sector. DGAEP is responsible for design, planning and coordination/supervision of national potable water supply policy formulation in urban, semi-urban, rural and industrial areas together sewage management/waste water disposal activities. Other key players include the National Office for Dams construction (ONBI – Office National des Barrages et de l'Irrigation) together with the National Water Office (Office National de l'Eau). An important development was the decentralization of water management activities in the mid 80s with the establishment of 10 Regional Water Directorates across the country. The Regional Water Directorate covering the centre-Sud Region will be an important actor

in the planning and execution of the AfDB DWSS program and will partner with the Ministry of Energy in the implementation of the GEF funded activities.

Stakeholder analysis

23. The preparatory phase (PDF-B) was conducted with a view towards presenting a full-size project for GEF funding. Upon completion of PDF-B activities, the national project technical committee came to the conclusion that a project covering all the 13 geographical regions of the country would simply spread the project too thin, resulting in a loss of focus. Consequently, it recommended that activities would initially focus on one region of the country, viz. the centre-sud and the results achieved/lessons learned would be gradually applied to the other regions. The selection of the centre-sud region was made on the basis that the region has a fairly active private sector willing to enter the PV market, as evidenced by the PDF-B, and on the potential for developing synergies with other programmes aimed at poverty eradication in that region of the country. 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 Burkina Faso.

24. The centre-sud region consists of three provinces, viz. Bazèga, Nahouri and Zoundwéogo, comprising 18 "départements", 3 "communes urbaines" and 15 "communes rurales". The total population of this region is 435 956 inhabitants; of whom those living in the rural areas constitute 409,798 (94 %) spread over 452 villages. As per the results of the PDF-B, approx. 2,300 households are connected to SONABEL; therefore, the vast majority has no electricity service. None of the above unelectrified villages has water pumping systems running off electricity. The estimated potential for PV systems is 77,000 for individual households, 56 for health centres and 215 for educational establishments. To date, only 987 SHS have been installed but what has been really lacking is the application of PV systems for shaft machinery and concrete productive end-uses like water pumping. Agriculture is the main economic activity in the region, namely the farming of cotton and cereals. The above Burkinabè "cotton-belt" has consistently led national cotton production for the past 10 years. Two years ago, the national/state owned textile company sold out its assets and operations to a private operator in the region.

DATA ON TARGET BENEFICIARIES

Province	**Number of Departments**	**Number of villages**	**Estimated Population size**
BAZEGA	1. Doulougou	34	24 967
	2. Gaongo	6	18 609
	3. Ipelcé	11	12 145
	4. Kayao	13	29 857
	5. Kombissiri	52	41 613
	6. Saponé	20	23 102
	7. Toécé	38	32 698
NAHOURI	8. Guiaro	16	7 369
	9. Po	25	20 751
	10. Tiebelé	51	35 553
	11. Zecco	37	8 778
ZOUNWEOGO	12. Bere	19	21 418
	13. Bindé	27	29 714
	14. Gogo	19	27 098
	15. Gomboussougou	29	36 023
	16. Guiba	19	26 180
	17. Manga	12	11 162
	18. Noberé	24	28 919
Total	**18**	**452**	**435 956**

Source : February 2002 Census data for Burkina.

Baseline analysis

25. Through implementation of the PDF B, the barriers to the utilization of PV to help meet the basic potable needs of the rural populations communities both for personal and productive uses can be classified into the following four broad headings, namely:

- **Institutional**

  - Lack of an effective infrastructure for delivering renewable energy-based energy services on a sustainable basis.

  - Fragmented institutional responsibilities and lack of integrated planning and implementation by various stakeholders including government, the research organizations, academic institutions, NGOs, community based organizations (CBOs) and the private sector with regard to the potential applications of PV (renewable energy) in productive end use sectors.

  - Delivery of the AfDB DWSS program without the RE (Renewable Energy Elements) and without the significant private sector participation.

- **Economic, commercial and market**

  - Limited private sector capacity to supply, distribute, install and maintain PV systems.

  - Limited business skills: while there may be people with energy expertise, the appropriate business skills to start energy enterprises are often lacking.

  - Inequality in fiscal treatment: while PV equipment purchased by SONABEL (a State Corporation) and DGE is imported duty free and VAT free; the same treatment does not apply to the private sector.

  - Lack of viable financing options for renewable energy/PV companies and end-users, and the need for training of in-country financial institutions to provide credit for renewable energy enterprises and projects. This is a major barrier to the development of the market of PV industry in the country.

- **Technical and information**

  - Poor workmanship in the design, installation and maintenance, as well as inappropriate operation, of PV systems.

  - Lack of access to necessary information.

  - Lack of public awareness of the potential applications of PV.

- **Education and training**

  - Lack of trained manpower at all levels and in particular at the rural consumer level.

  - Insufficient qualified personnel for maintenance of PV systems.

26. The successful removal of the barriers cannot be realized through national initiatives alone. The GEF project is expected to play a pivotal role in removing the barriers to wider adoption of PV-based rural electrification, thus leading to the availability of electricity for needed service delivery to meet the urgent community needs in rural water pumping for household and community use.

PART II : Strategy

Project Rationale and Policy Conformity

27. MMQE is presently updating the 1998 National Electrification Plan to give a fresh impetus to rural electrification covering the whole country. This will, of course, include the centre-sud region, but SONABEL's corporate priority is to electrify regional/provincial 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 grid electricity connection.

28. Almost 90% of energy consumption in the rural areas is sourced from indigenous biomass fuels consisting of shrubs, firewood, crop residues and cow-dung. Kerosene is mainly used for lighting while small diesel sets are used for water pumping and electricity generation, when consumers can afford them. Many rural people have to walk/travel long distances to get fuels such as kerosene and diesel, often at very high prices. The declining number of trees in rural areas has resulted in rural people having to walk several kilometres a day to collect firewood. Other fuels such as liquefied petroleum gas (LPG) play a relatively minor role in rural areas. Finally, very few households in the rural areas use solar photovoltaic (PV) systems.

29. The population of Burkina Faso is 12 million inhabitants, of whom 82 % live in rural areas. With an average of 6 persons per household, this leads to approximately 1.6 million households residing in rural areas. At present only about 8% of households in Burkina Faso have access to electricity, with most of them being located in urban areas. It is estimated that only 3% of rural households have access to reliable electricity. The Government's objective is to increase the electrification targets from this current 8% to at least 35% by 2020.

30. As indicated above, there is a potential for over 77,000 PV systems in the rural areas of centre-sud. The national potential market is about 1,100,000 customers and it will not be possible to meet this market without the intervention of the GEF project. The Government's Poverty Reduction Strategy Paper (PRSP) has identified community priority needs as employment creation, infrastructure development, food security and rural development. Availability of reliable and affordable energy supply is a prerequisite for these needs to be satisfied and post importantly, access to potable water. Based on target beneficiary regions data presented in paragraph 24, a minimum of 220 Solar pumping systems under the rather conservative assumption of 2,000 inhabitants for 1 solar water pump, will have to be deployed.

31. In addition to the compelling needs for potable water for household consumption, electricity is also required for other income generating activities namely water pumping for small agriculture, sewing and local shops to extend operating hours beyond the daylight period. Good quality lighting is required at homes, for study purposes, for schools, under the policy of universal primary education and "leisure" centres (village halls). In terms of Health, a reliable source of energy for vaccine and medicine refrigeration is needed. Communication is poor in most of the rural areas and one of the greatest barriers for communication networks to cover these areas has been reported to be the absence of electricity. Given the AfDB DWSS initiative and the inventory/survey of all hydraulic structures together with the compilation and diffusion of reliable data on the ground water/aquifer resources of the country's rural areas, it is clear that the removal of a major informational and technical barrier on water pumping activities in the rural areas with the expected outputs of the AfDB supported DWSS initiative, is a strong incentive for the private sector to venture its own capital if there is a clear framework within which the remaining barriers will be addressed.

32. PV systems were first installed in Burkina Faso some twenty years ago under grant financing for demonstration purposes. Despite several initiatives in the development and promotion of PV, it is still not widely used in the country due to a number of barriers. Limited efforts to address the barriers have been implemented in the country. Some positive progress has been achieved in addressing the issue of lack of awareness of PV, poor workmanship in the installation and lack of qualified personnel for maintenance of PV systems. Progress also includes the design and implementation of dissemination strategies, the preparation of a code of practice for solar home systems (SHS), utilisation of PV for water pumping, rural dispensaries, schools, etc. Despite this progress, the barriers as identified in para. 13 above are still very much present. The issues related to private sector participation and high initial investment costs for PV continue to be the greatest barriers in the promotion and utilisation of these systems and, consequently, they are of high priority.

33. The successful removal of the barriers cannot be achieved through national initiatives alone. The GEF project is expected to play a pivotal role in removing the barriers to wider adoption of PV-based water pumping systems, thus leading to the availability of electricity for needed service delivery to meet the urgent community water needs in the rural areas of the country.

34. Burkina Faso enjoys an excellent solar regime with an average radiation of 5.5 kWh/m2/day. The exploitation of such a valuable resource through PV technology would make it possible to meet the basic electricity needs of the rural population and thus improving their quality of life and providing opportunities for income generating activities. PV will mainly replace diesel fuel oil and kerosene currently used for diesel generator set operation and lighting purposes, dry cell batteries for entertainment purposes. Local benefits are a reduction in the exposure to smoke and soot from kerosene and reduced expenditure on dry cell batteries.

35. Thus, it is expected that the introduction of PV systems for the provision of electricity services in the centre-sud region will generate a reduction of 24,000 tons of CO2 over 20 years. In reference to paragraph 30 above and assuming that 220 solar pumping systems[1] are deployed as a result of this project **with an effective private sector penetration rate of 5% in 3rd year of implementation (increasing to 10% in 4th year of project implementation)**, this yields 22 solar pumping systems fully supported by the private sector by the 4th year of project implementation. Using Pump type P4 for convenience of estimation (as described in the financial modeling attached; i.e. 1,500 Watt peak), an additional investment cost of US$880,000[2] is expected from the private sector during project implementation.

36. As indicated earlier, national coverage of electricity is very low (8% of the total population) and 97 % 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 centre-sud region will have the net spin-off effect[3] of an additional reduction of 16,000 tons of CO2 when implementation of PV systems for basic

[1] It is sensible to assume 2000 village inhabitants for 1 Pumping system.

[2] This is because the P4 type of pumps with all associated investments would roughly cost US$44,000 at 1,500 Watt peak.

[3] Basically introducing PV systems would make it possible, in the long term, for some 8% (as per the market survey undertaken by the PDF-B) of the slightly over 77,000 potential individual customers to have their basic electricity needs met from the locally available solar resource during the 4-year project period. This will have the effect of eliminating the amount of over 1 million litres of kerosene (equivalent to 9,000 tons of CO2) used for this purpose over the 20-year lifetime of the PV equipment. In addition, the replacement of one planned diesel generator of 100 kW[3] with PV will reduce the GHG emissions by 15,000 tons of CO2.

electricity needs, based on the lessons learned in the pilot region, is implemented in parallel in the other regions of Burkina Faso. Consequently, the estimated national reduction of CO2 taking into consideration the spin-off effect of the centre-sud project is almost 40,000 tons of CO2 over 20 years.

37. Removal of the identified barriers to the use of renewable energy technologies will also provide the private sector with the necessary incentive to improve and expand their services. This will benefit customers in the whole country, not only in the rural areas or the target areas of the project.

Rationale and Incentives for Private-Sector Participation in the DWSS and PV-based Service Delivery

38. With 75% custom and value added taxes on PV-systems in Burkina Faso, the economics suggest that the past experiences of significant government and donor subsidies could be avoided if a proper fiscal policy was implemented to avoid the distortions that often result from tax collection. The fact that a number of successful PV-Systems have been implemented in Burkina under the above fiscal regime while requiring sizable subsidies simply mean that removal of the tax burden would increase the chances of commercial viability towards the elicitation of a self-standing/sustaining PV market in the specific water pumping sector. **The case for this is further strengthened by the government's national water program targeting the rural areas and anticipating significant economies of scale and scope at the national level as the productive end-uses of PV through water pumping and the incomes generated help fuel additional income generating activities.**

Lessons Learned from Past Initiatives

39. Previous rural water programs within the Ministry of Environment and Water Resources have shown that the national institutions tend to favor the use of the French SDAGE (Schémas Directeurs d'Aménagement et de Gestion des Eaux, or **Strategic Plans for the Development and Management of Water**). Per a recent EU report, SDAGE has reportedly been a planning tool suited for French Water companies with financial and regulatory management of regional water policy within a large area, in a country that is heavily regulated and well irrigated, an in which concerns about pollution predominate. One of the critical findings from the Burkina South West Water Resource Development Program backed by the European Development Fund (FED) that was implemented in the mid 90s through early 2000 is that the approach of the SDAGE is of limited use in a country in which water regulation is still vague and ineffective, with the primary issue being the development of water resources 9since pollution is still very localized) and in which structured consultation and the negotiation of rights have still yet to be learned.

40. DANIDA, EU and, recently, AFD have been/are the Government's principal partners in the electrification of secondary and rural centres, mainly through captive diesel generation and, in some cases, through extension of the distribution grid. In addition, several donors have dealt with a pre-electrification approach to meet community needs. This is the case, for example, of the Programme Régional Solaire (PRS) funded by the EU and under which 80 PV pumps and 287 community PV systems were installed. A second phase of this programme is envisaged for the installation of 100 additional PV pumps. Moreover, the recently-completed (December 2003) AIJ/RPTES project implemented by the World Bank and managed by the Direction des Energies Renouvelables et Energies Traditionelles (DERET) of the Ministry of Mines, Quarries and Energy included a component that dealt with promoting PV for rural community use. An evaluation of this activity has demonstrated better educational results at schools having PV lighting, improved services at health centres, etc.

41. Another recently-completed project implemented by DGE and funded by Spanish Cooperation dealt with a PV programme to electrify public buildings (prefectures, dispensaries) and provide street lighting to 146 "chefs lieux" in the various provinces. Finally, a project funded by AFD and implemented by the Ministry of Agriculture in the province of Ganzourgou (east of Ouagadougou) includes, in addition to captive diesel generation, commercial dissemination of 740 PV kits sold under a 3-year credit scheme managed by the Caisses Populaires.

42. As part of the PDF-B, surveys were carried out to determine the size of the market for PV for residential, community and productive uses. This full project seeks to implement as large a share of PV-based rural electrification as is considered feasible in ways that bring to bear lessons learned from past GEF experiences and focusing on private sector led delivery mechanisms with the highest chances of success. 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, standardized quality products, creative partnerships, etc. and takes into account the lessons learned by UNDP-GEF, as discussed in its May 2004 publication entitled "Solar Photovoltaics in Africa: Experiences with Financing and Delivery Models".

43. 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 for water pumping and to establish a replicable framework for future projects in the rural electrification sector. Thus, the proposed full project is designed not only to demonstrate the sustainable use of PV for productive end-uses in the centre-sud region, but also to provide a framework that can be pursued to further replicate PV-based electricity generation for rural water pumping through the AfDB DWSS program in the other regions of Burkina Faso. Removal of the identified barriers to the use of PV-systems will essentially provide the private sector with the necessary incentive to improve and expand their services. This will benefit customers in the whole country, not only in the rural areas or the target areas of the project.

44. Specific lessons to draw from GEF Projects: Various past GEF projects could provide some guidance on the design and implementation of the proposed activities. The Tanzania "Transformation of the Rural PV market deals mainly with SHS, provisions of subsidies and hardly any income generating activities which is at the heart of the current Burkina Faso project. Nevertheless, the support of joint efforts between the private sector and the PV sectors to develop models for providing PV services to rural areas and improve the quality of service bears some resemblance with the expected engagement of the Burkinabè private sector. While grants are provided to innovative business ideas for productive end-uses in the Tanzania case, this project sets out to demonstrate that once a sizable locale niche market has been identified for productive end uses and barriers clearly identified and removed, the private sector can have enough commercial incentives to venture its time and own resources with the initial support of GEF.

45. Another interesting experience to learn from is the Uganda PV Pilot Project for Rural Electrification. Because this project has effectively established a functioning financing mechanism for vendors and users of PV systems, built technical capacity in the public and private sector and deployed PV systems through competitive bidding, it provides some credence to the merits of private sector implication and the need to depart from old outright public sector financing and subsidies to PV systems. In the above Ugandian case, total value of private investments in the tune of some US$2,600,000 suggests that the African private sector which is interested in the PV business can – indeed – venture its own resources under the right set of initial conditions with concrete market incentives. This Burkina Faso project conservatively estimates that approximately US$880,000 in private resources will be mobilized because of the expected lag between the front loaded barrier removal/technical assistance

activities and the actual investments after the AfDB inventories are complete. In both projects, however, it appears that sensitization and awareness campaigns will determine to a certain extent the level of mobilization of both private and public actors. As suggested by the above Ugandian experience, the seasonality of incomes of the rural customer means that flexible repayment terms with lower rates and longer maturities can elicit the market further. Given that these issues are or will be captured by the sale of water and collection of fees between the private PV-based water pumping system operator and the rural customer, much efforts should – perhaps – be directed at re-aligning the private operators liquidity/cash flow constraints with the water fees collection arrangements. Perhaps, this will ensure that the private operator has a full control of its revenue cycle. As the government of Burkina Faso is committing significant resources in its water sector investment program, it clearly appears that design and future enforcement of PV-based water pumping systems should be closely coordinated between the Ministry of Energy and the Ministry of Agricuture and Water resources.

46. UNEP MSP project entitled "Building Sustainable Commercial Dissemination Networks for Household PV Systems in Eastern Africa" is also a good illustration of the search for economies of scale and scope on a regional basis while ensuring close private sector involvement in the PV-sector policy dialogue with Financial Institutions (FIs), NGOs and the industry at large. The project started only 2 months ago and the launching of the inception workshop was reportedly a great success. The rationale that motivates this project which is to build linkages between consumers, institutions and local and international PV companies is essentially to create a conducive business environment for 5 countries of the region including Kenya. Burkina Faso expects a similar momentum and policy impetus from the association with the AfDB DWSS program which will act as a conduit for broader international FIs involvement with the added value of being focused on potable water pumping in rural areas nationwide. The business case is clear and local benefits toward achieving the MDGs well accepted.

47. Although not without merit, the Ghana PV experience completed in 1999-2003 on the pros and cons of establishing rural ESCOs to manage the PV service delivery business does not appear to be critically informative for the proposed Burkina project because of the productive end-use focus with a clear market niche supported by an overall Burkina government program backed by the African Development Bank. Therefore, taken together, all of the above prior GEF experiences purport to support the innovative character of the Burkina Project and do help put in focus the need to maintain the emphasis on the intended productive end-uses away from past experiences of SHS for household and community social uses. This is indeed an important challenge as the rural communities would always try to shift emphasis on short-term social conveniences of lighting, TV and household uses but to the extent that this project principally supports local PV actors and firms in upgrading their own market and operational capacities, attend social uses (however compelling they may appear) can realistically be expected to be dealt with on a self-liquidating basis without direct project intervention for social uses as such. The spin-off effects, cannot go unnoticed and are fully accounted for in the incremental cost analysis.

Project Goal, Objective, Outcomes and Outputs/activities

Overview

47. The global objective of the proposed project is **to reduce Burkina Faso's energy related CO2 emission by substituting PV for fossil fuel (kerosene and diesel) utilized to provide electricity services for water pumping together with other attendant basic productive energy services to the targeted agricultural communities.** These would be achieved by project activities designed to remove barriers to the wide-scale utilisation of PV for providing electricity services, initially in the centre-sud 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 centre-sud region, through the delivery of electricity services from PV-based water pumping systems to the rural areas. It will also remove the barriers to the wide-scale replication of this scheme in other regions of Burkina Faso, thereby enhancing the dissemination of such a model in the neighboring West African countries and elsewhere.

48. The development objective of the project is to improve people's livelihoods and reduce dependency on imported fossil fuel through the utilization of PV to provide potable drinking water in the rural communities. The project will address the institutional, financial and market instruments necessary to demonstrate the viability of using the private sector to participate in the process of poverty reduction in the rural areas through the provision of potable water from a clean, modern, and at the same time, reliable source of energy.

49. The project consists of the following five components:

- Component 1: To support the development of the policy/institutional framework for the widespread utilisation of PV for providing off-grid electricity services;
- Component 2: To increase awareness among the various stakeholders on the potential role of PV in meeting the basic electricity needs of rural communities located away from the grid;
- Component 3: To assist the private sector in providing better quality of service and in developing models for providing PV-based electricity services to the rural areas;
- Component 4: To develop viable financing mechanisms for PV
- Component 5: To disseminate experiences and lessons learned to promote replication throughout the other regions of the country.
- Component 6: To execute an AfDB funded update and expansion of the national inventory of hydraulic structures together with the assessment of ground water resources/continuous or discontinuous aquifer layers in rural areas and prepare a DWSS program.

50. The components are related to the barriers identified, in the following manner (Table 1):

Barrier	**Component**
Inadequate business knowledge and capacity for distribution, aggressive marketing and sales of PV systems and DC appliances.	Component 3
Limited technical knowledge for proper sizing, installation, operation and maintenance.	Component 3, 6
High cost of doing business.	Components 3, 4
High cost of solar systems with associated initial capital.	Component 1
Lack of awareness and low purchasing power of the rural people.	Component 2, 3
Lack of access to information on PV technology and the services it can provide.	Component 5
Lack of established dealer network.	Component 3
Difficult access to finance for PV technology due to the high-perceived risks.	Component 4
Very limited experience of local lending institutions with loans for PV systems.	Component 4
Limited private sector business skills/experience with project finance investments for PV.	Component 4
Inadequate PV standards and poor /inappropriate installations.	Component 1, 6

51. The above 6 components are interrelated and they all need to be addressed to remove the identified barriers. In particular, the availability of critical technical information on availability and sizing of ground water resources in the targeted rural areas will remove uncertainty and reduce perceived private sector risks in participating in an emerging solar water pumping market, first in the Centre Sud region and extending throughout Burkina in the years to come. The following schedule for implementing activities related to the project components is envisaged (Table 2):

Component	Year 1		Year 2		Year 3		Year 4	
1: Policy/institutional								
2: Awareness								
3: Private sector								
4: Financing								
5: Learning and Replication								
6: National Inventory of Hydraulic Structures/DWSS								

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

53. **COMPONENT 1** -- POLICY & INSITITUTIONAL: The immediate objective is to refine the policy framework and the institutional arrangements necessary for the widespread adoption of for providing off-grid PV-based water pumping services. As outlined in the 1999 National Electrification Plan (NEP) presently being updated by DGE, the Government attaches high priority to providing basic energy services to the country's off-grid rural communities. The implementation of this plan will be supported through this project. In particular, this project will assist the Government to determine the off-grid niche for PV and define the framework for its implementation focusing on the outcomes of the AfDB DWSS socioeconomic surveys in the Centre SUD region; review the role of VAT and import duties on the price of PV components imported by the private sector, and establish standards and codes for the assembly and installation of PV systems. This component will lay the foundation to address these issues and the critical coordination arrangements between the Energy Ministry and the Water Ministry; its cost is estimated at $ 400,000. Funding in the amount of $ 200,000 is requested from GEF. The outputs will be:

54. **Output 1.1**: Implementation framework for off-grid PV developed and in place.

Activities: To assist the Government in implementing the National Electrification Plan by:

- Providing support to the development of the institutional framework for implementing NEP, which is consistent with the needs of the PV market and within which PV will have a niche.
- Assisting the Government in formulating an implementation plan/strategy for off-grid PV systems;
- Assist with the consolidation of the AfDB DWSS socioeconomic surveys with an eye to identifying the most suitable PV-based water pumping opportunities in the rural areas;

55. **Output 1.2**: Energy pricing policy adapted to support utilization of PV systems to deliver appropriate products at the right price.

Activities:

- To review international/regional best practice and experience regarding import duty and VAT reduction/exemption on PV modules and BoS components.
- Based on the above review, to formulate proposals for decreasing/removing of tax/duties on all PV system components with a view to making them consistent for both Government and private sector-funded projects, and initiate discussions with the Ministry of Finance.
- To study how all energy services in the country are priced, taxed or subsidized in order to ensure consistency between policies to support conventional fuels and those relating to PV systems.

56. **Output 1.3:** Standards for PV components and systems definition with emphasis on dedicated PV-based water pumping systems

Activities:

- To develop a 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 IRSAT and a consortium of participating PV companies.

57. **COMPONENT 2** -- AWARENESS RAISING: The immediate objective is to increase awareness among the various stakeholders on the potential role of PV in meeting the basic electricity needs of rural communities located away from the grid. It encompasses all levels of the PV supply chain, from Government decision-makers, be they central, regional or local, financing institutions, private sector, rural consumers and the general public. Awareness is an important link in the process to successfully introduce PV for off-grid rural electrification. The budget for this component is estimated at $ 350,000, of which $ 200,000 is requested from GEF.

58. **Output 2.1:** Awareness programme 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 organise a study tour for a limited group of key decision makers (MP's, key ministry representatives, NGO's, dealers, etc.) to countries that have successfully implemented PV off-grid rural electrification programmes. eg. Kenya, Republic of South Africa, Sri Lanka, etc.
- To organise in-country field trips for key decision makers (MP's, key ministry representatives, NGO's, dealers, etc.) from key ministries to acquaint them with demonstration PV installations in villages and to witness their acceptance or otherwise by the communities.

59. **Output 2.2:** Consumer/end-user awareness programme formulated and implemented.

Activities:

- To prepare and disseminate information and awareness packages of printed material and through multi-media to raise awareness of the benefits of PV systems and technology.
- To prepare educational material on PV systems to be disseminated through schools in the targeted region and throughout the country;

- To organize general awareness campaigns (e.g. free PV-powered video shows on market occasions, roving van with PV installation, etc.) including the active involvement and support of local PV dealers.
- To install PV demonstration systems at selected schools, market places and health centres that can serve as an awareness vehicle to sensitize the younger generation (the next adult generation) who would, in turn, sensitize their parents/elders and attract the attention of rural people visiting health centres for medical services, etc.

60. **COMPONENT 3** -- PRIVATE SECTOR SUPPORT + PRIVATE SECTOR LED **SOLAR PV-SYSTEM INVESTMENT/TANKS ETC…EQUIPMENT/HARDWARE**: The immediate objective of this component is to strengthen and support the private sector active in PV to provide better quality of service and to develop models for providing PV-based electricity services to the rural areas. The studies undertaken under the PDF-B have estimated that the bulk of the approximately 500 kWp of PV presently installed in Burkina Faso was supplied through the efforts of the public sector, with substantial grant funding from aid agencies. Despite this early reliance on grant funding, the bulk of the market for PV in Burkina Faso will have to be built around cash sales, with the private sector not only engaging in the sale of PV systems, but also participating in appropriate sizing, correct installation and trouble-free maintenance and repair. Hence, the technical capability of the private sector needs to be strengthened, to ensure that the business community is able to efficiently respond to the concerns of consumers. Also, to date, the private commercial sector in the centre-sud region has focused on what it does best: the sale of goods, and, in this particular case, the sale of PV systems, albeit a very small number. However, there is the potential to create an incentive for the private sector to venture into the field of rural energy service delivery through "RESCO" (lease-hire) arrangements, in addition to just the sale of equipment and possible operation of water pumping services. The budget for this component is estimated at $ 1,880,000. GEF is requested to contribute $ 500,000 towards this component. The targeted Private actors will contribute US$880,000 towards hard investments, and government and UNDP US$200,000 and US$300,000 respectively.

61. **Output 3.1**: Business Development Services strengthened and deployment of PV-based Pumping systems

Activities:

- To provide business planning (cash flow projections, income statement and balance sheet analysis) and development services through one-on-one meetings with the private sector to develop business and marketing plans, promotional material, etc.
- To create awareness of PV systems, applications and product lines (e.g. lanterns, systems of < 20 to 50 W, systems over 50 W, larger systems for productive uses) among existing businesses (appliance stores, electronics shops) in the towns and villages of the centre-sud region;
- To support and facilitate networking among suppliers, dealers, technicians and installers in order to strengthen opportunities for collaboration and partnerships;
- To assess the potential for and advise on opportunities, on the basis of market data, for local manufacture and assembly of PV system components;
- To study and discuss alternative service delivery modes (e.g. RESCO, utility delivery or fee for service modes) and the roles of various potential stakeholders in the provision of electricity services;
- To undertake training on PV business "best practices", including service warranties and maintenance contracting;
- To assist local PV importers, wholesalers and dealers to develop linkages with international companies.
- Procurement and installation of PV-based water pumping systems.

62. **Outcome 3.2** Technical knowledge of PV components and systems strengthened. These activities will be implemented by existing training institutions (e.g. IRSAT, Lycée Technique, CFP, etc.).

Activities:

- To develop a variety of courses (short/medium) for various target groups on financing for small-scale PV systems; the correct sizing, installation, maintenance and repair of PV systems; and other relevant topics tailored to the needs of the following groups:
    - NGOs, micro-finance institutions (MFIs), bank staff and others;
    - Technicians and sales people;
    - Engineers; and
    - Shop-keepers/Vendors
- To work with IRSAT, Lycée Technique and other training institutions to develop an appropriate curriculum for the training of PV technicians, including training in standards, international best practices and codes of practice/ethics.

63. **COMPONENT 4** – FINANCING MECHANISMS: The immediate objective of this component is to develop and assist with the implementation of appropriate financing mechanisms for the large-scale utilisation of PV systems in rural areas. This will be undertaken, within the context of the Electrification Development Fund (EDF), by piloting a number of viable financing options, including consumer finance, hire purchases, RESCOs, etc, in close partnership with financing agents present in the field. The cost of this component is estimated at $ 600,000 and GEF is requested to contribute $ 600,000.

64. **Output 4.1** Financing scheme for consumers/end-users designed and implemented.

Activities:

- To evaluate the experience of consumer financing for PV systems, both within Burkina Faso and the West Africa region, and make recommendations for the most promising system for piloting in the centre-sud region. The options to be considered will include micro-financing through banks, Caisses Populaires and other micro-finance institutions; salary withholding to salaried residents of rural areas (e.g. school teachers, policemen, etc.); vendor-financed schemes; and other approaches to financing the purchase of PV systems;
- To establish and operate a alternative pilot schemes to test the recommended approach to consumer finance together with supplier/vendor financing schemes with a view to minimizing transaction costs;
- To evaluate progress achieved in the pilot activity in order to determine its suitability for promoting further growth of the PV market and its potential level of penetration in the rural areas.

65. **Output 4.2** Financing scheme for supplier/vendor of PV systems designed and implemented.

Activities:

- To evaluate the experience of supplier/vendor financing for PV systems, both within Burkina Faso and the West Africa region, and make recommendations for the most promising system for piloting in the centre-sud region. The options to be considered will include manufacturer financing, bulk purchase agreements, conventional credit from lending institutions, use of guarantees and contingent finance, etc.
- To study financing of supply chain that aims at developing financing mechanisms for potential manufacturers and assemblers;

- To establish and operate a limited pilot scheme to test the recommended approach to consumer finance;
- To evaluate progress achieved in the pilot activity in order to determine its suitability for promoting further growth of the PV market and its potential level of penetration in the rural areas.
- Establish a project development fund ($100,000), and its accompanying operational procedures, to support potential manufacturers and assemblers in developing their business plans for PV.

63. **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. This activity will monitor lessons learned to develop understanding on the conditions that need to be in place for large-scale dissemination in 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. The cost of this component is estimated at $ 250,000 and GEF is requested to provide $ 150,000.

The outputs from this component will be:

64. **Output 5.1:** Report on evaluation of the impact of PV systems on rural livelihoods.

Activities:

- To closely monitor implementation activities in the target region;
- To develop/adapt existing methodology to measure impact of installed PV systems on livelihoods and standards of living of the targeted rural communities.
- To apply the methodology to a carefully selected sample of consumers and villages in the centre-sud region;
- To summarise the impact of PV systems on consumers' livelihoods and standards of living.

65. **Output 5.2:** Support provided to the learning and replication of experience with PV to supply electricity services to off-grid rural communities.

Activities:

- To prepare publications on the lessons learned and results of the PV initiative in the centre-sud region for distribution throughout Burkina Faso and neighbouring countries;
- To organize site visits to the centre-sud region for other donors/investors and private sector entrepreneurs interested in implementing a similar initiative nationally in other regions or internationally;
- To engage with other projects in the country, region and world to exchange lessons, experiences, and solutions encountered to perceived challenges in the PV field;
- To present the results achieved in the centre-sud region through presentations at national and international seminars/workshops.

66. **COMPONENT 6** – UPDATE AND EXPANSION OF NATIONAL INVENTORY OF HYDRAULIC STRUCTURES/DWSS ACTIVITIES: The immediate objective is to provide the country with a reliable inventory of water and sanitation structures focusing on rural areas for the preparation of the National DWSS Program. The AfDB will support the cost of this component for US$2,250,000. The inventory will be prepared for the entire country. All the eight thousand villages in the 13 regions of the country will be visited and an inventory of their hydraulic structures will be prepared. This will include bore holes, modern wells, traditional wells, emergency water supply structures and water points, sanitation structures, dams and reservoirs. Technical data on the current operating status (need for

running power/PV-system based water pumping equipment deployment or lack thereof) together will all necessary socio-economic information directly related to water uses will also be identified. Hydraulic and hydrogeological data collected from all drainage basins will be centralized and processed towards the publication of a national hydrologic and hydrogeological year book. The data generated by the field surveys will be computerized as work progresses in each region, before verification and compilation at the central level.

67. **Output 6.1:** National Inventory of Rural Hydraulic resources.

Activities:

- Select a DWSS component Manager/PMU from within the Ministry of Environment and Hydraulic resources.
- Establish a multi-disciplinary team of scientists providing expertise in the field of geology, hydro-geology, hydrology, soils, pedology etc…
- Collect, archive and analyse the physical and socioeconomic data, using the the scientific tools provided by rural/ground water-management models.
- Explore and discover new available resources;
- Develop an action plan for the protection of natural resources.
- Develop an electronic classification/filing system focusing on: a) basic data; b)surface water resources; c)ground water aquifer classification and mapping; d) agricultural waste management; e) water management and grazing; f) urban, semi-urban and rural water management; g) village water management; h) industrial water management; i) problems and conflicts; j) basic program initiatives and private initiatives; k) environmental impact and drainage; l) remote sensing; m) summary and recommendations;
- Survey all targeted villages in the UNDP-GEF project area;
- Specific studies relating to geology, hydro-geology, hydrology, pedology and ecology, designed to provide more detailed information about particular sites.
- Analyse the methods and scientific tools used in the areas of geology, hydro-geology, soils and ecology, considering how improvements might be made in these areas;
- Implement water-resource management models using Hydrom, Pluviom, Hydram, Modilac and other programs as appropriate.

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

Technical Specifications, System Costs and Ownership Structure of the Proposed Basic PV-Systems for Rural Water Pumping Applications

68. The structure of the proposed PV-System for Water pumping is presented in Table 1 below. 4 basic types of PV-systems are considered depending upon the required Watt peak suited for 4 alternative water pumps that match the observed sizes of various rural communities in the region: P3 for water volumes in the range of 10 to 30 cubic meters daily; P4 for 20 to 50 cubic meters daily; P5 for 20 to 90 cubic meters daily; and, P6 for 40 to 100 cubic meters daily.

69. The initial investment includes water pumping equipment in addition to the solar PV-System. The other investments are assumed to represent approximately 30% of initial investment costs and the beneficiary contribution is assumed to be 10% of the total investment cost. A staged maintenance cost schedule has also been assumed: 1% of investment costs during year 0 to 5; 2% during year 5 to 10. At year 10 a major refurbishment is assumed (35% of initial investment cost) and during year 11 through

20, a constant annual O&M expense in the tune of 3% of the initial investment is assumed. Depending on the size of the selected villages, various individual/Solar Home systems, solar community systems for schools, health centers and youth/community centers may be deployed at a rate that the private system owner would negotiate with the beneficiary rural communities. The prime function of the intended PV-Systems being the for water pumping systems (potable drinking water/DWSS) and water pumping for cultivation in oases 1 500 Watt Peak sizes would be sensibly appropriate for most villages surveyed and shallow ground water resources (1-30 m).

70. Usually, sizing of the solar pumps takes into account the volume required (m3/day), the total manometric head (m3) and the daily average solar irradiation to calculate the solar power required (Wp). In this case, the sizing has been simplified since the study leads to three standard systems chosen to fit local demand in the oasis assuming a daily irradiation of 6 kWh/m2/day.

71. Each pumping station will include the following parts:

- Immersed water pump
- Open-air storage tank (30-50 m^3) locally made in concrete at the floor level are acceptable for this project although they present a large area for evaporation. If the tank is closed, PV modules can be fixed on top of them.
- Protective devices against theft will include modules and electronics branding, elevation of PV modules (on top of water tank), anti-theft devices (breakable bolds), and welded frames.
- Hybrid pumping systems will also be considered to overcome the frequent problem of non availability of water due to a lack of solar radiation or an unusual need for more water. Diesel genset will not be provided but a switching box should be included to allow the operator to use or rent a spare genset.
- Another concern is the high evaporation rate due to open air irrigation channels and tanks; water saving actions like cheap flexible tubes from the tank to the plot of land, and "drip or micro irrigation" systems should be promoted and included in the project.
- Special attention should also be given to the water quality as the immersed pumps are much more vulnerable than the surface pumps. Additional well casing or housing with gravel will retain sand.

72. A detailed study will be carried out by each private operator in each selected location to accurately size the solar pump as a function of the borehole characteristics: (i) hydraulic characteristics of the borehole/well; (ii) seasonal variations in water level, (iii) measurement of several water source parameters, (iv) assessment of water availability, drawdown or drop in water level after pumping, (v) daily water needs, (vi) monthly irradiation, min./max. temperatures, etc.

73. Ownership of the wells and bore holes will remain in the public domain and shall be vested in the rural community-based/village associations/rural municipalities and other appropriate decentralized administrative structures irrespective of the arrangements for management and operation of the Solar PV-based water pumping system. This will be quite obvious in areas where the private sector has not been selected or has expressed little interest in supplying the intended PV-based water pumping services. Ultimately, the private PV dealer/firm that wins the management and operation rights (say through competitive bidding) and who is prepared to invest in the public end- use asset, will be conceded the management right for the 20 years of its PV-System. All detailed contractual arrangements and ownership issues in connection with the exact delineation of rights and responsibilities among all players will be spelled out in the MOU and collaboration matrix between the Minister of Energy and the Minister of Water resources. This MOU and its accompanying collaboration matrix is a pre-requisite to GEF grant effectiveness and disbursement. It will be annexed to the Project document towards GEF Council endorsement.

(I) Table 1: Structure of the PV-Systems for Rural Water Pumping in Burkina

Pump Type	rate: m^3/day	Watt peak	Investment: water pumping equipment (FCFA)	Investment: water tanks, water distribution costs (30% of initial investment costs) (FCFA)	TOTAL	Contribution of beneficiaries (10% of total investment)
P3	10 to 30	800	9 000 000	2 700 000	11 700 000	1 170 000
P4	20 to 50	1 500	15 000 000	4 500 000	19 500 000	1 950 000
P5	20 to 90	2 500	25 000 000	7 500 000	32 500 000	3 250 000
P6	40 to 100	3 600	36 000 000	10 800 000	46 800 000	4 680 000
Pump Type	**Rate: m^3/day**	**Watt peak**	**Initial Investment (1)**	**Other Investments (2)**	**Beneficiary Contribution (3)**	**Net Investment**
P3	10 to 30	800	$18,000	$5,400	$2,340	$21,060
P4	20 to 50	1 500	$30,000	$9,000	$3,900	$35,100
P5	20 to 90	2 500	$50,000	$15,000	$6,500	$58,500
P6	40 to 100	3 600	$72,000	$21,600	$9,360	$84,240

Notes

1. The initial investment includes water pumping equipment
2. The other investments include water tanks, water distribution costs (30% of initial investment costs)
3. The beneficiary contribution represents 10% of the total investment

Assumption

There are 360 days per calendar year

Type of pump	rate: m^3/day	Average Rate	Potential annual resources: **$0.4/$m^3$**, for the sale of 60% of produced water	Daily Cash Flow/m3	Yearly Cash Flow
P3	10 to 30	20	$876 - $2,628	$ 4.80	$ 1,728
P4	20 to 50	35	$1,752 - $4,380	$ 8.40	$ 3,024
P5	20 to 90	55	$1,752 - $7,884	$ 13.20	$ 4,752
P6	40 to 100	70	$3,504 - $8,760	$ 16.80	$ 6,048

Project Indicators, Risks and Assumptions

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

74. The first level of risks relates to the policy level: the National Electrification Plan (NEP) formulated in 1999 (and presently being updated, May 2004) has accumulated considerable delay in full-fledged implementation due to the absence of the Electrification Development Fund (EDF) which has been designed to serve as a vehicle for formulating, funding and implementing a rural electrification master plan. While the EDF was finally set up in January 2003, it is hardly operational, with the result that no national rural electrification master plan, through both conventional and renewable energy, is in place yet for the whole country. SONABEL, on the other hand, is presently getting geared towards restructuring prior to its privatisation in the near future and has been unable to focus on the preparation of its own rural electrification plan within the context of the EDF master plan. Thus, there is the risk that a rural area where PV systems are introduced becomes the target of grid extension or captive diesel generation within a short period of time. This is mitigated by the fact that, pending the formulation of a national rural electrification master plan by EDF, proper care will be exercised by DGE to ensure that the selection of the focus areas in the centre-sud region for PV are quite remote and will not be reached by grid extension for the next 15-20 years.

75. The second level of risk deals with import duties and value added taxes on PV systems and components procured from overseas by the private sector, while SONABEL and DGE enjoy duty-free and tax-free status. This risk is considered to be 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 finalization and implementation, with a view to having PV systems sold in the local market free of all import duties and taxes.

76. The third level of risk is associated with the possibility that consumers will not approach the lending institutions for loans to purchase PV systems. This risk is considered quite small 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. 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 Burkina Faso 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).

77. The fourth and last level of risk deals with the replication of the centre-sud region experience to other regions of Burkina Faso. 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 centre-sud region and the lessons learned, 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 to initiate activities in regions like Kadiogo, Kouritenga and Ganzourgou to create a network of PV dealers, sales agents and technicians to work with the finance sector. Hence, a positive experience in the centre-sud region will go a long way towards generating private sector confidence to invest in the PV market.

Expected global, national and local benefits

78.Global benefits are the avoided CO2 as a result of the operation of the water pumps with solar PV-systems rather than diesel generators and also the collateral use of renewable electricity for the basic household and community uses. At the national level, water borne diseases will diminish, infant mortality rates will decrease and women welfare will improve significantly. Locally, the quality of life of the beneficiary villages will improve significantly, a local commercial economy will be driven and new employment opportunities will arise as a result of the involvement of the private sector.

Country Ownership : Country Eligibility and Country Drivenness

79. Burkina Faso ratified the UNFCCC on 2 September 1993 (Entry into Force on 21 March 1994). Several initiatives aimed at providing electricity services to rural areas have been implemented since the 1980s by SONABEL and the Direction Générale de l'Energie with the support of the Agence Française de Développement (AFD), World Bank, DANIDA, Spanish Cooperation, European Union (EU), etc. Despite this, as stated above, still only 3 % of the total rural population of 82 % benefit from electricity services.

80. In order to address the issue of access to electricity services by the rural population, UNDP GEF approved, at the request of the Government, a PDF-B Project "BKF/01/G41: Réforme et Développement du Secteur de l'Energie" in March 2003. The main objective of this project, which led to the formulation of the present brief, is "to assist the Government in improving efficiency in the energy sector and to increase opportunities for rural areas to access modern sources of energy". The project is designed to promote the participation of the private sector and to empower local organisations to efficiently provide energy services, especially within the context of a favourable framework to promote energy conservation and utilization of renewable energy, mainly PV and biomass. During the course of the PDF-B implementation, the national technical committee set up to monitor the project made the decision 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, both for improving the quality of life and for productive uses, of rural communities located away from the grid.

81. The activities proposed in the project are designed to remove barriers to the wide-scale utilization of PV to meet the basic potable water supply needs of individual rural households/communities, low-head irrigation and various social applications in terms of lighting, power for a radio-cassette/TV, for productive applications like pumping of water for potable use, and of community users like health clinics, battery charging for cell phones, telecommunication/computing centres and schools. The project will develop local capacity to identify technical and financing options and to strengthen 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 productive/community users. The project is therefore in line with GEF Operational Program #6: Promoting the Adoption of Renewable Energy by Removing Barriers and Reducing Implementation Costs. It fits in the following GEF strategic priority SP-4 Productive Uses of RE/EE.

82. The preparatory phase (PDF-B) was conducted with a view towards presenting a full-size project for GEF funding. Upon completion of PDF-B activities, the national project technical committee came to the conclusion that a project covering all the 13 geographical regions of the country would simply spread the project too thin, resulting in a loss of focus. Consequently, it recommended that activities would initially focus on one region of the country, viz. the centre-sud and the results achieved/lessons learned would be gradually applied to the other regions. The selection of the centre-sud region was made on the basis that the region has a fairly active private sector willing to enter the PV market, as evidenced by the PDF-B, and on the potential for developing synergies with other programmes aimed at poverty eradication in that region of the country. Project design followed the

barrier-removal approach and is based on incremental reasoning, defining a baseline scenario against which an alternative GEF scenario is developed.

Sustainability

83. Given that the project principally targets private operators to boost the rural PV market in Burkina, the critical sustainability question is under what conditions can a private operator expect an interesting rate of return if any. Under the cost and O&M schedule described earlier, the private operator would only be able to yield a sufficient enough return if all custom and duty taxes are removed. This is illustrated in the table below.

Rate of Return	P3	P4	P5	P6
ERR (Tax Exemption)	27%	29%	27%	23%
IRR (No tax exemption)	-2%	2%	-2%	-1%

84. Based on the above and to ensure project sustainability, GEF grant effectiveness for this private sector led PV-System Water Pumping Program will be contingent upon the government agreeing to remove all custom and duty taxes on PV equipments. After project approval, written evidence consent by the Burkina Government will be required before project submission for Council endorsement.

Replicability

85. The replicability issue has been partly addressed by the AfDB US$2.25 million study to launched the National Drinking Water and Sanitation Programme throughout the country. The above work along with the demonstrated success of this project will allow all key government Officers, more private actors to see for themselves how Solar PV-Systems can be used to address final priority or urgent developmental challenges. As there is an interesting rate of return on an activity that serves many converging community purposes, it is expected that the private sector will essentially drive project replication in other regions of Burkina. By providing US$400,000 in treasury funds, and US$2.25 million in ADF-AfDB resource, the Government of Burkina Faso expects the success in the Centre-Sud Region to spread to other parts of the country.

86. As one of the key output of the AfDB/DWSS component is to develop a multi-year/multi-donor rural water sector investment program with concrete funding commitments from all international players, the local and international PV-players in Burkina would realize the strategic position they could take now. This is because with the national coverage of the program there is clearly a new market dynamics with sizable economies of scale and scope, new funding opportunities at stake and the active private sector in the Centre SUD region will consider this as a safeguard for successful replication of project schemes elsewhere in Burkina and – perhaps – beyond in other countries given that the AfDB DWSS has selected an initial set of 5 Sahelian countries to work in.

PART III : Management and Implementation Arrangements

Implementation Arrangements

86. The programme will be executed by the Government, under the UNDP National Execution (NEX) modality with a few selected activities where the Dakar UNDP-GEF Regional Coordination has a comparative advantage in supervision and technical assistance. Experience has shown that NEX provides the best opportunity for project support to conform to government priorities and ensure national ownership. The General Electricity Directorate (DGE) of the Ministry of Mines, Quarries and Energy (MMQE) will be the Government Implementing Agency. For this purpose, MMQE will set up

a Project Management Unit (PMU) consisting of a National Project Manager, a Project Assistant and a Project Driver. To ensure continuity beyond the project life, it is desirable that they both come from within the ranks of MMQE. The Project Manager will be responsible for day-to day operations and will act as liaison/facilitator among the various local stakeholders and donors/investors. The Project Management Unit will be based in Uer in the centre-sud region.

87. 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 inputs through sub-contracts. This task comprises the formulation of Terms of Reference (ToR) 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. MMQE 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. The PMU will develop an overall annual work plan indicating the activities that will be supported by UNDP/GEF through the programme. The PMU will also prepare quarterly reports and budget requests against the annual work plan to submit to UNDP for advancement of funds.

88. In addition, a Project Steering Committee, consisting of representatives of the Ministry of Environment and Water Resources, Ministry of Finance, Regional Authorities in the centre-sud region, Micro-Finance Institutions/Banks, IRSAT, a representative of an NGO and UNDP, chaired by MMQE, will provide overall guidance to project execution. MEWR will monitor and supervise the project as the GEF national focal point. 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.

89. The private sector will have a key role in the implementation of this project, and is 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 short consultancies to employ existing private sector participants to carry out awareness training, demonstration projects, work on financing packages etc. Based in the centre-sud 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.

90. Public participation is vital in the whole process of providing electricity services to remote rural areas. It is important that the centre-sud region residents as well as the whole of Burkina Faso be briefed on the complete modality of working with the private sector and lending institution(s) and their support secured. Based in centre-sud 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.

PART IV : Monitoring and Evaluation Plan, Incremental Cost and Budget

91. 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 of project inception, the Project Planning Matrix may be revised, specifically the detailed indicators will be revisited and adapted as necessary, 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 Burkina Faso. 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 that will provide progress reports to be shared among all participants in the project.

92. Following UNDP's emphasis on results-based management, the country office has developed a new format for work plans. This format emphasises achievements (benchmarks and milestones) as well as cost per output/result. This format will allow for a critical assessment of programme performance as it shows, at a glance, what activities are to be implemented and when, the cost for each activity, the responsible agent for implementation, progress at the end of every quarter, and will facilitate the preparation of the work plans for the subsequent quarters.

93. In addition to normal Government monitoring, UNDP will have the monitoring and reporting obligation for the project. 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 made 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

94. Annual review meetings involving key stakeholders will be held to review the status of implementation of the project. The purpose of the review meetings is to assess the progress achieved and to make decisions on recommendations to improve the design and implementation of the project in order to achieve the expected outputs. The annual review is to be based on the annual Project Implementation Report (PIR).

Evaluation

95. An evaluation will be carried out towards the end of the project. This terminal evaluation will assist project 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 project evaluation, so it should be needs based. The evaluation could be done in collaboration with the other development partners to the project. Such a multi-stakeholder and partner evaluation could be a useful learning experience for all parties, where the 360-degree approach could be used to evaluate all parties' inputs to the programme.

Incremental Costs

96. This project is designed to remove barriers to the introduction of PV to meet the basic electricity service for water pumping needs of rural communities in the centre-sud region. It will adopt a market transformation approach to the PV market in centre-sud and is consistent with the stated objectives of GEF Operational Programme 6, with focus on provision of electricity services for productive uses. As it is unlikely that these project activities would take place in the absence of UNDP and GEF support, the project can largely be considered to be incremental.

97. A detailed assessment of incremental costs is presented in Annex A – Incremental Cost Matrix. According to the available information on the current energy consumption, a household uses approximately 3 litres of kerosene per month for lighting purposes, costing approximately FCFA 1,000 (US $ 2/ month). In addition, a household in rural areas spends approximately CFA 800 on dry cell batteries to power radios and flashlights. In the case of Hi-Fi or TV appliances, a monthly battery charging rate of about FCFA 1,000 has to be paid by the household.

98. The replacement of diesel generation amounting to 100 kW to pump water in all 22 villages will reduce the GHG emissions by 15,000 tons of CO2. The project activities[4] as such will eliminate nearly 24,000 tonnes of CO2 over a 20 years' time horizon.

99. Spin-offs of the direct project activities, as sales of PV systems in the other regions of the country pick up during project implementation are expected to contribute an additional 16,000 tones of CO2 emissions reduction. Therefore, the total CO2 emission reductions that can be directly attributed to the project are 40,000 tons of CO2 over the 20 year lifetime of the equipment. As a result of the AfDB supported DWSS program and the success of the proposed GEF solar water pumping program, another 10 major departments can be expected to implement similar water pumping programs in partnership with the Private sector. This results in a cost of
US$ 5/ton of CO2 ($ 2,000,000/ 40,000 * 10 tons CO2).

100. As the project is not requesting a subsidy per W of PV capacity installed, the incremental costs associated with this project are considered to be the costs of the activities designed to remove the primary barriers to the intended use of Solar PV-Systems for the **National Rural Water Service Delivery Program** and stimulate the PV market initially in the centre-sud region and subsequently throughout the whole country. As the AfDB supported Drinking Water Supply and Sanitation (DWSS) program covers the whole country and would have,most likely, taken place without the proposed GEF supported activities, only specific PV-market transformation and productive end uses towards the intended water pumping and community-based applications will be considered incremental. The proposed technical assistance activities will focus on stimulating cash sales and will experiment with various credit mechanisms, which might be used in future projects to expand the market further building upon the findings of the AfDB DWSS which covers the entire country.

The detailed incremental cost analysis is provided in Annex A.

The overall financing of the project is summarized in Table 3 below.

[4]For an estimated 6,000 Community-based/solar home PV systems in the centre-sud region, the estimated CO2 emissions reduction as a result of substituting kerosene-based lighting with electrical lighting amounts to 9,000 tonnes over a 20 year period. This is based on an average of nearly 3 litres paraffin savings per month per customer. CO2 reduction per litre of paraffin has been taken as 3.2 kg. (Source: IPCC draft Guidelines for National Greenhouse Gas Inventories, Volume 3 UN Energy Statistics Yearbook 1992).

Table 3: Project Financing --- US $5,830 million

Project Activity/ Component	GEF	UNDP-Burkina	Government	AfDB	Private Sector	Total
Policy/Institutional Support	200,000	100,000	100,000			400,000
Awareness Raising	200,000	150,000				350,000
Private Sector Support + Private sector led **Solar PV-system Investment/Tanks etc…equipment/hardware**	500,000[5]	300,000	200,000		**880,000**	1,880,000
Financing Mechanisms	600,000					600,000
Update and Expansion of the National Inventory of Hydraulic structures and Elaboration of **DWSS for 2015**				2,250,000		2,250,000
Learning and Replication	150,000		100,000			250,000
Monitoring and Evaluation	50,000	50,000				100,000
PDF-B	60,000					60,000
Total	**1,760,000**	**600,000**	**400,000**	**2,250,000**	**880,000**	**5,890,000**

[5] Will apply only to TA activities not PV system hardware equipment.

PART V: Legal Context and Pre-requisites

101. This Project Document shall be the instrument referred to as such in Article I of the Standard Basic Assistance Agreement between the Government of Burkina Faso and the United Nations Development Programme, signed by the parties. The host country implementing agency shall, for the purpose of the Standard Basic Assistance Agreement, refer to the government co-operating agency described in that Agreement.

Pre-requisites:

103. All GEF grant disbursements will be contingent upon the evidence to UNDP-GEF/UNDP-Ouagadougou of the following:

a) AfDB co-financing approval for the DWSS component

b) Submission of signed MOU between the Ministry of Energy and the Ministry of Water Resources with a satisfactory matrix of collaboration in respect of the project activities in the Center-Sud/South region;

c) Designation of all Project Steering Committee Members and appointment of national project Coordinator/PMU within the Ministry of Energy.

PART VI: Stakeholder Involvement Plan

104. The development of this project brief was undertaken in a participatory way, consulting the major stakeholders throughout the exercise. A wide range of groups and organizations 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 in 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 MMQE's activities with related projects in Burkina Faso and in the region.

105. The discussions with stakeholders brought out the following important considerations: there is huge potential for PV in rural centre-sud region (and Burkina Faso as a whole) to provide off-grid consumers with basic productive electricity services. The local population is supportive of activities that can accelerate access to these services in order to enable it to enjoy a better quality of life and participate in productive uses of electricity. It recognises the fact that privatisation of the electricity sector may increase its wait for grid electricity and sees PV as a really viable alternative. It also fully understands the Government's plans to privatise the services sector. Hence, it is willing to work with the private sector and lending institution(s) to make this happen.

106. The relevant Government institutions in Burkina Faso 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 Mines, Quarries and Energy (MMQE). It is responsible for policy formulation and defining strategic objectives in the Energy Sector. The Ministry's Directorate General for Energy (DGE) has overall supervision of the Electrification Development Fund which manages the rural electrification programme.

107. In addition, there is the Ministry of Environment and Water Resources, 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 has a role. Also, there are several key NGOs (GERED, ATESTA) operating in the rural energy/rural development sector as well as vocational/technical training institutions like CEFOC, CET, CFP, LT and IRSAT involved in the training of craftsmen, technicians, etc. at the post-primary/mid-secondary school level.

108. 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. 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 manufacture, import, wholesale, dealerships, sale and after-sales service of PV systems. Another relevant stakeholder is IRSAT – responsible for formulating standards for individual PV system components as well as complete installations.

ANNEX A: Incremental Cost Annex

Project Activity	Baseline	Alternative	Increment
Component 1: Policy framework and Institutional arrangements ---to refine the policy framework and institutional arrangements necessary for the widespread adoption of PV for providing off-grid PV-based water pumping services.	PV-based rural electrification will not be an integrated activity in the National Electrification Plan. Minimum standards for PV components and systems are in place and enforced. Cost: US$ 100,000 (Gov)	Assistance to the integration of renewable energy-based rural electrification in the activities of the NEP. Assistance provided to IRSAT to develop standards for PV components and systems. Cost: US$ 200,000 (GEF) US$ 200,000 (UNDP))	Institutional, legal and regulatory framework for vibrant PV market with private sector participation is created. Import duties and VAT removed on all PV components imported by the private sector. Standards for PV components and systems are defined. Incremental Cost: US$ 300,000
Component 2: Awareness raising --- to increase awareness among the various stakeholders on the potential role of PV in meeting the basic electricity needs of rural communities located away from the grid.	Decision makers are not fully sensitized with regard to the role that PV can play in rural electrification. Consumers are not fully aware of the potential of utilising PV as an alternative for kerosene, dry cell batteries and diesel to obtain safe, efficient and reliable lighting /electricity services in the rural areas. Cost: US$ 0	Formulate an outreach programme utilizing multi-media, organise general awareness campaigns and limited demonstration PV systems at critical sites with different applications. Formulate and implement a capacity development programme to train users to safely and properly handle PV systems and appliances they power. Cost: US$ 200,000 (GEF) US$ 150,000 (UNDP)	Increased awareness among the public at large, decision makers and consumers of the benefits of PV to meet their basic electricity needs. Increased awareness among users on the safe operation of PV systems and appliances they power. Incremental Cost: US$ 350,000
Component 3: Private sector support + **Private sector led Solar PV-system Investment/Water Tanks/rural distribution etc…equipment/ hardware** --- to strengthen and support the private sector active in PV to provide better quality of **service and to develop models for providing PV-**	Local vendors/technicians do not properly size, install, maintain and repair PV systems. Local distributors and vendors have limited business skills which prevent market expansion. At the scale of the country and based on various scattered donor led activities, the GOVERNMENT would cofinance along with UNDP-	Develop an appropriate curriculum and train vendors/technicians to properly size, install, maintain and repair PV systems. Assist the private sector in developing business skills, prepare business plans and access loans to expand the market. Private sector procurement and deployment of some 22 PV-based water pumping	Local companies are able to deliver higher quality products and services. Private sector companies have better business skills and thus able to expand their operations. Incremental Cost: US$ 400,000

based water pumping services to the rural areas on a learning by doing-basis.	Ouagadougou various incentives and training programs. Cost: US$ 300,000 (UNDP) US$880,000 (government)	equipments to ensure 10% penetration rate by year 4 of project implementation. Cost: US$ 500,000 (GEF) US$ 200,000 (Govt.) US$880,000 (private sector)	
Component 4: Financial mechanisms --- to develop and assist with the implementation of appropriate financing mechanisms for the large-scale utilisation of PV systems in rural areas.	Despite some interest and previous initiatives, very little actual lending for investments in the PV market occurs. As the market slowly expands, the lack of financing to PV customers and industry will become a major bottleneck to its expansion. Limited funds available for financing consumers and companies. Limited experience with PV for productive uses. Cost: US$ 0	Design, test and evaluate viable financing options / mechanisms for consumer and supply-chain finance. Cost: US$ 600,000 (GEF)	Valuable experience on setting up appropriate financing schemes for PV is obtained. Incremental Cost: US$ 600,000
Component 5: Learning and replication --- to disseminate experience and lessons learned to promote replication throughout the other regions of the country.	No structured learning and dissemination of activities in the baseline scenario. Limited ability to learn from projects both within and outside the country. Cost: US$ 0	Document and disseminate lessons learned. Initiate a national programme to replicate use of PV to generate electricity to supply off-grid consumers. Evaluate the impact of the project interventions on rural livelihoods. Cost: US$ 150,000 (GEF) US$ 100,000 (Gov)	Lessons learned documented and a dissemination programme is in place. Improved understanding of the impact of PV on rural livelihoods. Incremental Cost: US$ 250,000
Component 6: Update and expansion of the National Inventories of Hydraulic resources in Burkina/ DWSS program preparation	The government pursues the DWSS program without any element of renewable /Solar-PV use for rural water supply	The decentralized Regional Directorates collaborate with the Ministry of Energy to execute the DWSS and strengthen private	Strengthened coordination between DWSS and the Ministry of Energy through.

nationwide.	Cost: US$ 2.25 million.	sector participation in the delivery of potable drinking water at negligible/marginal incremental cost Cost: US$2.25 million	Incremental cost: 0 (as the recurrent charges/operational budgets of the Decentralized or Ouagadougou based Water Ministry and Energy Ministry relevant services will most likely remain the same under this component.
Component: Monitoring and Evaluation	No monitoring of the impact on CO_2 emissions reductions and the impact on the quality of life of the rural population of Burkina Faso will occur. Cost: US$ 0	To design a baseline, indicators and means of verification of the impacts on CO_2 emissions reduction, the PV market development and income generating activities. Cost: US$ 50,000 (GEF) US$ 50,000 (UNDP)	Impacts of the proposed interventions have been measured, analyzed and serve as a management tool for the project management team. Incremental Cost: US$ 100,000
Global Environmental Benefits	In the baseline scenario, the approximately 10 million people living in the rural areas and not having access to electricity services will continue to rely on kerosene, open wood fires and diesel for their lighting/electricity needs. Accordingly, GHG emissions in Burkina Faso's energy sector will continue to rise.	Within 5 years, decision making for new investment will integrate the benefits of PV. For electrification of the approximately 10 million people not having electricity services, PV will be chosen whenever economic analysis shows a lower global cost for this option. PV for grid-connected electricity generation will also develop as general knowledge and experience is gained.	A total of 24,000 tons of CO_2 will be avoided over the equipment lifetime only in the centre-sud region. The spill over effect in other regions of Burkina Faso will result in an additional 16,000 tons of CO_2 being avoided. For an estimated **total incremental cost in the tune of US$2,000,000**.
Domestic Environmental Benefits	There will be slow and very limited development and utilisation of PV in Burkina Faso.	Within 5 years, Burkina Faso will have built partnership with the private sector and lending institutions to implement PV - based rural electrification nationwide, thereby reducing GHG emissions.	Trained personnel in PV development and utilisation. Developed partnership to implement PV rural electrification. The net effect will be a reduction in GHG emissions.

ANNEX B: Logframe Matrix

Strategy	Indicators	Means of Verification	Critical Assumptions
Global objective: to reduce Burkina Faso's energy related CO2 emission by substituting PV for fossil fuel (kerosene and diesel) utilized **to provide electricity services for water pumping** together with other attendant basic productive energy services to the targeted agricultural communities.	Widespread adoption of PV. Consumption of Fuel Oil, kerosene and diesel for electricity generation reduced by 90 % in the target rural communities, households and businesses and the resulting 40,000 tons of GHG emission reductions. Small-scale PV-based water pumping activities increased by 10% compared to the baseline.	Energy supply survey. National GHG inventories and reports to UNFCCC. Dealer survey.	A policy/institutional/regulatory framework that is fully supportive of the project objectives.
Development Objective: to improve people's livelihoods and reduce dependency on imported fossil fuel through the utilization of PV to provide potable drinking water in the rural communities.	Number of PV-based water pumping systems deployed on private sector terms. Number of additional villages having PV-based potable water services reaches 22 in Year 4 of project in 4th year of Project in the Centre Sud region as compared to the baseline scenario.	Dealer survey. AfDB DWSS socioeconomic survey of rural areas in the Centre SUD region Report on implementation status of National Electrification Programme (NEP).	Fuel Oil, Kerosene and diesel prices will not significantly get reduced. NEP will get implemented as per plan.
Immediate Objective 1: To refine the policy framework and institutional arrangements necessary for the widespread adoption of PV for providing off-grid electricity services.	Policy/Institutional framework in place.	Publication of revised National Electrification Plan.	DGE's willingness to incorporate PV as an option for off-grid rural electrification.

Output 1.1: Implementation framework for off-grid PV developed and in place.	PV features prominently in NEP as an option for off-grid rural electrification.	National Electrification Plan.	
Output 1.2: Energy pricing policy adapted to support utilization of PV systems to deliver appropriate products at the right price.	Retail prices of PV panels and components reduced at least by 25 % by the end of Year 3 of project implementation.	Report on products and prices in the centre-sud region.	Government amenable to reducing/eliminating import duty and VAT on systems and components imported by the private sector.
Output 1.3: Standards for PV components and systems defined.	Standards for PV components and systems in place. Suppliers of PV committed to code of practice.	Standards Booklet published. List of companies that adhere to code of practice.	Industry is willing to cooperate to finalise the standards. Private sector willing to improve quality of services by adhering to code of practice.
Immediate Objective 2: To increase awareness among the various stakeholders on the potential role of PV in meeting the basic electricity needs of rural communities located away from the grid.	Doubling of the number of people using PV technology, as compared to the baseline scenario.	Dealer survey.	Consumers/end-user will to adopt new technology for receiving electricity services.
Output 2.1: Awareness programme for decision-makers developed and implemented.	At least 25 key decision makers having visited the target region and been exposed to project activities.	Reports on these visits.	Willingness of key decision makers to undertake multi-day trips to the rural areas.
Output 2.2: Consumer/end-user awareness programme formulated and implemented.	At least 500 potential consumers/end-users having attended meetings in the rural areas. At least 50 on-site demonstrations of PV-based water pumping systems conducted over the lifetime of the project.	Reports of awareness activities undertaken for consumers/end-users. Project files.	Consumers willing to accept new technologies.
Immediate Objective 3: To strengthen and support the	Number of businesses dealing with PV equipment increased	Dealer survey.	Market actors are willing to

private sector active in PV to provide better quality of service and to develop models for providing PV-based water pumping services to the rural areas.	by 30 % by the end of the project. Level of end-user satisfaction with PV installation and after sales service increased by 50 % by the end of the project.	End-user survey.	cooperate and businesses are eager to expand their PV activity.
Output 3.1: Business Development Services strengthened.	At least 50 % of all PV dealers/companies participated in at least one capacity development activity offered by the project. 5% private sector penetration in year 3 of implementation; and, 10% in year 4 of implementation.	Project files.	Private sector's willingness to invest time and financial resources in capacity development and actual service delivery.
Output 3.2: Technical knowledge of PV strengthened.	Several technical training courses offered to vendors, dealers, technicians, with a participant completion rate of 75 %.	Project files.	Private sector's willingness to invest time in capacity development.
Immediate Objective 4: To develop and assist with the implementation of appropriate financing mechanisms for the large-scale utilisation of PV systems in rural areas.	50 % of all major PV dealers offer at least one financing option to rural consumers.	Data from PV dealers.	Full participation of financial institution(s) essential.
Output 4.1: Financing scheme for consumers/end-users designed and implemented.	At least 25 % of all PV sales to consumers by project completion are through the model piloted.	Data from PV dealers.	
Output 4.2: Financing scheme for supplier/vendor of PV systems designed and implemented.	At least five companies in the PV supply chain have, by project completion, requested financing through the model piloted. Project development fund for	Project files.	

	business plan preparation by suppliers/vendors established.		
Immediate Objective 5: To disseminate experience and lessons learned to promote replication throughout the other regions of the country.	Number of additional PV systems installed in subsequent years.	Annual reports.	Full commitment of private sector.
Output 5.1: Report on evaluation of the impact of PV systems on rural livelihoods.	Baseline survey and annual data updates provided throughout the project duration.	Project files/Evaluation report.	Willingness of rural consumers to provide necessary socio-economic information to assess impact.
Output 5.2: Support provided to the learning and replication of experience with PV.	Project experience shared both nationally and in neighbouring countries.	Project files.	Stakeholders willing to learn from experience.
Immediate Objective 6: Update and expansion of the National Inventories of Hydraulic resources in Burkina/ DWSS program preparation nationwide.	95% of Hydrological structures surveyed	Inventory reports and thematic studies.	Cooperation from all decentralized administrative structures from the line Ministries involved.
Output 6.1.: National Inventory of Rural Hydraulic resources.	Baseline review/survey of existing aquifer information and socioeconomic data on the beneficiary villages.	Annual activity reports for the Ministry of Water Resources and the Ministry of Energy.	Sustained willingness of both ministries to collaborate.

ANNEX C-A: RESPONSE TO STAP REVIEW

The STAP Review is quoted in normal font style, the response in italics.

Major Comments:

1. In general I think this is a worthwhile project that merits GEF funding. I especially like the idea of starting PV market development and promotion in one region of the country and then expanding to other regions based on the lessons learned, if the pilot project is successful.

Response: *Agreed.*

2. In the background discussion, it is stated that to date 987 SHS have been installed in the centre-sud region. I think there should be further discussion of and/or research on these systems—how many are resulting from donor-based programs and how many from sales in the marketplace, who provided the systems, how many are still operating, are users satisfied with them, etc. This information should be collected if it is not already known, and should be used to help guide project implementation.

Response:

The point is pertinent and the Burkina authorities have agreed to put the lessons learned to further good use by preparing a 10-year Renewable Energy Strategic Framework with support from FAO. At least, lessons learned from the following 6 major initiatives are currently being reviewed by the government appointed task team:

- *Regional Solar Program, Phase I (1992-1997) focusing on solar water pumping applications.*
- *Electrification of 150 rural Districts (public lighting, schools and heath centers, public buildings, cooling applications for health centers and community-based/managed playgrounds with Spanish grant funding (1999-2002);*
- *Promotion of PV kits applications in the Gnanzourgou region with funding from AFD (Agence Francaise de Développement);*
- *Rural Energy Project in the Kourritenga region by NGO FONDEM;*
- *World Bank funded AIJ/RPTES – activities implemented Jointly under the Bank's former Regional Program for the traditional energy sector; together with*
- *Various PV promotion programs for social applications with the Ministries of Education and health.*

Based on the work being carried out, the government expects a fully completed draft by June 2005. It is also clear to the government that the question of sustainable financing the PV sector

is the most critical issue rather than the technology given the level of local ownership and mastery of technical/trouble shooting and maintenance issues. The revised project brief indicates that government adoption of the above strategy consolidating past experiences and lessons learned will be a conditionality/pre-requisite to the disbursement of the current GEF grant. As for the ownership/leadership of the above programs, 70% of the above activities are donor funded/led. The execution was based on NCB (National Competitive Bidding) following national rules of procedure for the procurement of consulting services and installation of PV systems. 15 local enterprises participated in the tender/bidding process and it is fair to suggest that 4 national/privately owned enterprises/firms have emerged out of the above experience which establishes both the need to further elicit the private market and consolidate the experiences gained thus far. The private Burkinabe firms have successfully teamed up with Western firms such as Kyocera, Siemens, BP Solar, Photowatt, etc.. and there is a strong sense that the customers are satisfied. An important factor that appears to continue to hamper further progress is the lack of sustainable financing and an overall enabling environment that allows autonomous replication and consolidation of past-scattered successes.

Analysis of the above experiences suggest that donors subsidized the acquisition/investment cost of PV systems by close to 50%-70% and helped established various decentralized micro-finance structures. The financial data relevant to the Ganzourou PV project is attached in annex to this Executive Summary for illustration purposes. Further data is also available upon request from the above-mentioned government task-force in charge of taking stock of the key lessons to be drawn from previous projects. In particular, it should be noted that import duties accounted for close to 56.16% and VAT (value added taxes) 18% of the total PV system cost. O&M (operations and maintenance) costs represent 8% of PV system acquisition cost.

3. On p. 8, a list of prior or ongoing PV assistance projects is given. One is commercial dissemination of 740 PV kits under a 3-year credit scheme. How is this project going? Is it successful—is there demand for the PV kits given the financing terms? Is the equipment of reasonable quality and functioning well? What lessons does this effort provide that can help inform this project?

Response:

The answer to the above question is included in the response to the previous one. The financial table provided in connection with the Ganzourou project indicates that the financial delivery mechanisms being tested through previous interventions have performed rather remarkably. Satisfaction of the customer base was already highlighted. As indicated earlier, the government is taking a pro-active attitude in investigating all lessons learned within the context of a broader national PV promotion strategy formulation based on concrete in-country field experiences. The essential merit of the government's approach being supported by FAO is that it pulls together all major actors, raises mainstreaming of PV/SHS issues at the level of a national priority and is expected to result in a coherent national strategy with the required consensus to facilitate implementation. Nevertheless, the proposed GEF project in Burkina at this time adds significant value because of the predominant government implication in previous projects, the specific private sector barriers that have been identified and the need to emphasize RE/PV-SHS mainstreaming when larger conventional power sector reforms are at stake to avoid leaving RE

and decentralized rural universal electricity access issues in the blind spot of the policy makers.

4. The barriers listed on pp. 7-8 of the project brief are formidable. It will take a concerted effort to overcome or remove many if not all of these barriers, in order for the project to be a success. This is recognized in the project brief, p. 11 and pp. 16-17.

Response: *Agreed.*

5. Regarding Component 1, I think the Government of Burkina Faso should commit to substantially reducing if not eliminating the import duty and VAT on PV modules and system components imported by the private sector, before or in conjunction with this project getting approved and implemented. It is much more likely that the project will be a success, including being sustainable and replicable, if this is done.

Response: *As indicated in the project brief, the government has effectively removed import taxes on the previous donor funded projects with heavy public sector involvement, namely with SONABEL. The recommendation of the STAP Reviewer to eliminate import duties and VAT on PV modules is pertinent if these can be achieved as a pre-requisite to GEF grant disbursement not before approval. Because import duties accounted for close to 56.16% and VAT (value added taxes) for 18% of the total PV system cost in previous schemes, it is clear that action on fiscal policy in connection to PV modules will be indispensable to demonstrate that the government is serious about promoting and mainstreaming rural PV applications. The Burkina Faso government task force in charge of reviewing past PV projects believes that this will be achieved in the context of the current UNDP-GEF operation because the emphasis is clearly on barrier removal so the private sector intervention in the sector can be sustain on a self-liquidating basis.*

Learning from the previous interventions, it appears that the Burkina-Faso Government already made the commitment to remove and/or substantially reduce import levies and value added taxes on PV systems given that it has signed the UMEOA (West Africa Monetary and Economic Union including Benin, Burkina –Faso, Cote-d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal and Togo) regional treaty in respect of removal of import duties and VAT on renewable energy equipment. The government task force believes that much of the problem is that the above treaty has never been enforced and custom Officials in Burkina have displayed poor awareness and sensitivity to the recent regional trends intended to support UMEOA's TEC (Tarif Exterieur Commun—Regional common tariff/import regime). In its 2003 Annual report, the UMEOA acknowledges that implementation of fiscal policy convergence provisions – despite a few emerging reforms with good promises -- has been a disappointment for various reasons outside the scope of this response. Therefore, tying GEF grant disbursement to actual implementation and enforcement of the government's commitment after UNDP-GEF approval by Council would be a step in the right direction as suggested in the revised project brief.

6. In developing the implementation strategy as part of Component 1, I suggest giving particular emphasis to identifying applications where PV systems can support income-generating activities. There is likely to be greater demand and more willingness to pay for (and pay back financing of) PV systems in these applications.

Response: *Agreed. This was an oversight in the initial Project brief which has now been corrected in output 1.3 to reflect: Standards for PV components and system definitions with emphasis on productive uses (e.g. Solar Water Pumping applications). During the PDF-B phase for this proposal, the government task force looked at the system requirements for water pumping requirements in the targeted zone, ranging from 10 to 30 cubic meters per day to 40 to 100 cubic meters per day. A preliminary cash flow analysis was carried out and PV systems at 800 Wp(Watt Peak), 1,500 Wp, 2,500 Wp, up to 3,600 Wp were considered with a detailed investment cost structure to match alternative end-use applications. The English translation and summary of the relevant original French documents are attached to illustrate how the field data from past experiences in the mid-90s with the initial Regional Solar Program to the more recent experience funded by the Spanish cooperation has been used to guide the systems sizing and revenue estimations based on the sales price of water. The background work in support of this GEF strategic priority 4 applications builds on past field experiences and systems investment costs derived from existing operations.*

7. Component 2, awareness raising, is a fine thing to do. But there have been hundreds of PV systems already installed in BF through donor programs, and this has not led to a viable supply infrastructure or market for off-grid PV systems in the country. So I caution that not too much emphasis be placed on additional awareness raising until the other major barriers to PV system market development are adequately addressed, specifically until Components 3 and 4 are well underway.

Response: *The point is well taken. Proper sequencing of sensitization activities will be key to success. As this is intended strengthen private sector participation in ways that are both sustainable and replicable, awareness raising activities should be closely coordinated with components 3 and 4 and also with component 1 so the deeper fiscal policy decisions could also be shaped as a by-product of country's own awareness.*

8. Component 3 is a critical component of the project in my view. It might be helpful to define some goals regarding the number of businesses marketing and servicing PV systems in the region at different benchmarks in the project (end of first year, end of second year, etc.). Likewise, I suggest defining some goals in terms of PV systems sold and installed over time. Finally, I think there should be some goals concerning system support and servicing, perhaps along the lines of X% of the PV systems installed during the course of the project are still operating at the end of the project. And I hope this percentage is close to 100%!

Response:

The first activity under Component 3 in this project brief is now clearly spelled out to be provision of business planning (cash flow projections, income statement and balance sheet analysis, evaluation of alternative business/delivery models) and development services through one-on-one meetings with the private sector to develop business and marketing plans, promotional material, etc. Because the project is intended to be a catalyst – not a substitute – for the work that would be expected from each private operator the generic definition of targets may have limited use given that a detailed comprehensive work is envisaged with the

participating private sector taking into account specific local circumstances. In this regards, the overall targets suggested by the project log-frame is acceptable.

9. Component 4 is another critical component of the project in my view. It might make sense to test more than one pilot consumer financing scheme in order to come up with one that works, or one that works best. Regarding supplier/vendor financing, I would add to the list of options the idea of modest low-interest loans to help small businesses (potential equipment vendors) get established with some working capital. Also, I suggest trying to figure out ways to minimize transaction costs as different financing options are developed and evaluated.

Response: *Suggestions have been incorporated as needed in the revised Brief.*

10. I was looking for an economic analysis of the cost effectiveness of PV systems in BF but didn't see it in the project brief. This is a significant shortcoming in my view, and should be remedied. How much does a simple PV lantern that substitutes for a kerosene lamp cost in BF (with and without the PV import duties)? It will save a household about $2 per month in kerosene according to the project brief. Will market-based financing for the PV option bring the monthly cost down to close to that of the kerosene lamp? If not, should subsidies be considered and included as part of the project at least to "jump start" the commercial market for PV lanterns and other types of PV systems? What about economic analysis from the utility system perspective of financing PV systems (perhaps with a subsidy) as an alternative to grid extension or diesel generators? I think all of these questions should be addressed as part of the project brief, in order to provide a clearer indication that there will be a demand for PV systems, and to determine if subsidies are needed or not.

Response: *The above has now been, in part, effectively remedied based on the cost tables attached, which were prepared during the PDF-B exercise. The comparison of the private sector based financing of PV systems as proposed in the Project brief to kerosene lamp alternatives has some merits but the thrust of the proposal is again to focus on the overall PV-business environment and barrier removal activities from a private sector perspective, not to establish a blue-print for the private sector. As explained elsewhere, the government task force is investigating these detailed economic/financial issues with support from FAO to justify its overall strategy for the forthcoming 10 years. As a completed sector report is expected by June 2005, and as the GEF Council endorsement will be contingent upon government adoption of the recommendations expected, the incorporation of past cost/financial data in the design of this project as reflected in all of the above answers appears sufficient. Likewise, the Project brief has provided significant background information on the transitional nature of the sector and the Public Electric Utility under the World Bank reform project with over US$64 million of IDA grant funds. SONABEL (the Utility as we know it today) is bound to be dismantled and/or privatized with news rules of the game in the making under World Bank leadership. Though feasible, it may therefore not be realistic to prejudge the outcome of the sector restructuring exercise with alternative case scenarios of local/multi-district Utility modus operandi to estimate the presumed level of subsidies that may – or may not – be required. The World Bank has announced a FY06 (Fiscal year 2006) renewable energy project precisely to build addition safeguards in the current efforts once the entire sector restructuring has been set on a more permanent trajectory. Perhaps, this clearly appears to be an example where specific PV*

investment decisions and possible financial returns will be shaped by broader national electricity sector policy and restructuring efforts without diminishing the merits and value added on an economic basis, looking at the ripple/multiplier effects on the aggregate economy. The sustainability section of the project brief addresses the issue.

11. The implementation arrangements and the evaluation plan seem reasonable.

Response: *Agreed.*

12. I question the calculation of avoided CO2 emissions. I think either a solar PV lantern or system displaces a kerosene lamp, or displaces electricity from a diesel generator, but not both at the same time. So I think the avoided CO2 emissions should be recalculated assuming a portion (presumably the majority) of the PV systems displaces kerosene lamps and the remainder displaces electricity from a diesel generator.

Response: *We disagree with the above suggestion. The reviewer has previously underscored the need to highlight the productive use focus of the proposal and baseline data from past experiences have been attached to our answers to indicate that the government is prepared to implement an effective rural PV market transformation project to jump-start private sector participation with the required level of financial comfort. In setting out to do so, it has also been clarified and documented that in Burkina, PV systems have been operated where captive diesel generation were the standard in past years in way that support the claim for simultaneous displacement of kerosene and captive diesel generation. These PV systems have also supplied lighting power and other social-end uses in tandem with running power for shaft machinery and motor drive. The answer is that households and rural communities in the region would use electricity service as a derived good irrespective of the primary energy used to produce the service. Hence, our calculations are founded on realistic assumptions in low-income environments like Burkina.*

ANNEX C-1

PROJET GANZOURGOU « SOLAR KITS »

Base data

	Standard Kit	TV Kit	Standard Kit	TV Kit
Number of kits	443	295		
Cost of kits	395 932	469 858		
Down payment of costumer	53 965	66 758	14%	14%
Subsidy per kit	180 072	202 828	45%	43%
Cash payment or loan	161 895	200 273	41%	43%
Monthly installment (10%, 3 per year)	5224	6 462		

Warranty amount :

Coverage of warranty amount			15%
Total credit amount	71 719 485	59 080 388	130 799 873
Initial deposit required by costumer	53 965	66 758	14%

Withdrawal / cancellation after 1 Year

Initial amount of loan	161 895	200 273
Repaid capital	46 497	57 520
Remaining dues	115 398	142 753
Salvage value	120 080	120 080
Extra assets/Capital investments not covered	0	22 673

Withdrawal / cancellation after 2 Years
:

Initial amount of loan	161 895	200 273
Repaid capital	97 644	120 791
Remaining dues	64 251	79 482
Salvage value	90 060	90 060
Extra assets/Capital investments not covered	0	0

- Please note that import duties in the tune of 56.16% on the price of solar systems is very high. Additionally the VAT has been estimated to be 18%

- Moreover, the cost of the current watt peak (including accessories) for solar energy is estimated at 9 600 FCFA

- Annual cost of O&M is estimated at 8% of the initial investment cost required.

ANNEX C-2

PV Systems Cost for productive end uses:

Type of pump	**rate: m^3/day**	**Watt peak**	**Investment: water pumping equipment (FCFA)**	**Investment: water tanks, water distribution costs (30% of initial investment costs) (FCFA)**	**TOTAL**	**Contribution of beneficiaries (10% of total investment)**
P3	10 à 30	800	9 000 000	2 700 000	11 700 000	1 170 000
P4	20 à 50	1 500	15 000 000	4 500 000	19 500 000	1 950 000
P5	20 à 90	2 500	25 000 000	7 500 000	32 500 000	3 250 000
P6	40 à 100	3 600	36 000 000	10 800 000	46 800 000	4 680 000

Income

Generated for each type of syetm.

Type of pump	**rate: m^3/day**	**Potential annual resources: 200 F CFA/m^3, for the sale of 60% of produced water**
P3	10 à 30	438 000 à 1 314 000
P4	20 à 50	876 000 à 2 190 000
P5	20 à 90	876 000 à 3 942 000
P6	40 à 100	1 752 000 à 4 380 000

Overall Cost estimates per end-use based on previous Experiences.

Description	**Cost in FCFA (taxes not included)**
Lighting system for a three classroom school	2 205 000
Lighting and medicine refrigeration system for a health center	4 960 000
Lighting and refrigeration system for recreation center	6 935 000
Lighting and medicine refrigeration system for a local maternity	4 960 000
Office lighting systems	1 854 800
Public lighting systems (8 households)	12 160 000

N.B:costs do not include taxes.
System Components

Cost Structure in 1999

Lighting system	**Cost in FCFA (taxes not included)**
Community or personal	One 120 Wp panel, 1 support panel, six 20W waterproof fluorescent lamp support ,3 switches, one 200 Ah five days autonomous battery, one 15 A standardized regulator
Recreation center	1 community system, 1 radio video kit, one 50W color TV, one 40 W VHS, one 20W cassette player, one 150/300W UPS, 1 standardizedregulator, one 360 Ah five day autonomous battery, two 120 Wp panels, 2 panel supports, 1 refrigerator kit, one 100 liters 60 W refrigerator, two 120 Wp panels, 2 panel supports, one 420 Ah battery.
Health center	1 community system, one 20W waterproof fluorescent lamp support, 4 switches, 1 refrigerator kit, one 100 liters 60 W refrigerator, one 420 Ah five days autonomous battery, two 120 Wp panels, 2 panel supports
Public	8 lamp posts

Article	Cost in FCFA (taxes not incl.)
Four 75 Wp Panels, A monocristallin	214 200
Panel support structure 4 to 5 m high	38 850
Lamp post 4 to 5 m high	238 000
420 Ah 12V Stationary battery (without maintenance) 164 Ah 12V Stationary battery (without maintenance)	603 000 201 000

15 A output charge regulator	99 160
Fluorescent lamp with waterproof base 12V – 20W 12V – 24W for lamp posts	 26 130 207 700
UPS 12 VDC, 220 VAC – 300W	301 500
Refrigerator, 12 VDC – 140 liters 60 W maximum, adjustment temperature –5° à 10°c	479 000
21 in color TV, 50 W maximum	227 130
40W VHS or DVD player,	160 000
FM/AM/SW radio cassette player 20 W maximum	261 300

Financial Modeling/Cash-Flow Analysis and Sensitivity Runs

(IV) - IMPACT OF TAXES EXEMPTION

This scenario assumes that there are no beneficiary contribution

Pump Type	Rate: m^3/day	Watt peak	Initial Investment (1)	Other Investments (2)	Total Investment less taxes	Beneficiary Contribution (3)	Net Investment
P3	10 à 30	800	$18,000	$5,400	$5,850	$0	$5,850
P4	20 à 50	1 500	$30,000	$9,000	$9,750	$0	$9,750
P5	20 à 90	2 500	$50,000	$15,000	$16,250	$0	$16,250
P6	40 à 100	3 600	$72,000	$21,600	$23,400	$0	$23,400

Notes

1. The initial investment includes water pumping equipement
2. The other investments include water tanks, water distribution costs (30% of initial investment costs)
3. The beneficiary contribution represents 0% of the total investment

Assumption: There are 360 days per calendar year

Type of pump	rate: m^3/day	Average Rate	Potential annual resources: $0.4/$m^3$, for the sale of 60% of produced water	Daily Cash Flow/m3	Yearly Cash Flow
P3	10 à 30	20	$876 - $2,628	$ 4.80	$ 1,728
P4	20 à 50	35	$1,752 - $4,380	$ 8.40	$ 3,024
P5	20 à 90	55	$1,752 - $7,884	$ 13.20	$ 4,752
P6	40 à 100	70	$3,504 - $8,760	$ 16.80	$ 6,048

Total Maintenance Costs

Statistics

20 Years Lifetime

Year 0 - Year 4 **1%**

Year 5 - Year 9 **2%**

Year 10 **35%**

Year 11-Year 20 **3%**

(IV) - IMPACT OF TAXES EXEMPTION

This scenario assumes that there are no beneficiary contribution

Pump Type	Rate: m³/day	Watt peak	Initial Investment (1)	Other Investments (2)	Total Investment less taxes	Beneficiary Contribution (3)	Net Investment
P3	10 à 30	800	$18,000	$5,400	$5,850	$0	$5,850
P4	20 à 50	1 500	$30,000	$9,000	$9,750	$0	$9,750
P5	20 à 90	2 500	$50,000	$15,000	$16,250	$0	$16,250
P6	40 à 100	3 600	$72,000	$21,600	$23,400	$0	$23,400

Notes

1. The initial investment includes water pumping equipement
2. The other investments include water tanks, water distribution costs (30% of initial investment costs)
3. The beneficiary contribution represents 0% of the total investment

Assumption: There are 360 days per calendar year

Type of pump	rate: m³/day	Average Rate	Potential annual resources: $0.4/m³, for the sale of 60% of produced water	Daily Cash Flow/m3	Yearly Cash Flow
P3	10 à 30	20	$876 - $2,628	$ 4.80	$ 1,728
P4	20 à 50	35	$1,752 - $4,380	$ 8.40	$ 3,024
P5	20 à 90	55	$1,752 - $7,884	$ 13.20	$ 4,752
P6	40 à 100	70	$3,504 - $8,760	$ 16.80	$ 6,048

Total Maintenance Costs

Statistics

20 Years Lifetime

Year 0 - Year 4 **1%**

Year 5 - Year 9 **2%**

Year 10 **35%**

Year 11-Year 20 **3%**

Total Costs - Outflow	P3	P4	P5	P6
Year 2005	-$5,850	-$9,750	-$16,250	-$23,400
Year 2006	-$59	-$98	-$163	-$234
Year 2007	-$59	-$98	-$163	-$234
Year 2008	-$59	-$98	-$163	-$234
Year 2009	-$59	-$98	-$325	-$468
Year 2010	-$117	-$195	-$325	-$468
Year 2011	-$117	-$195	-$325	-$468
Year 2012	-$117	-$195	-$325	-$468
Year 2013	-$117	-$195	-$325	-$468
Year 2014	-$117	-$195	-$325	-$468
Year 2015	-$2,048	-$3,413	-$5,688	-$8,190
Year 2016	-$176	-$293	-$488	-$702
Year 2017	-$176	-$293	-$488	-$702
Year 2018	-$176	-$293	-$488	-$702
Year 2019	-$176	-$293	-$488	-$702
Year 2020	-$176	-$293	-$488	-$702
Year 2021	-$176	-$293	-$488	-$702
Year 2022	-$176	-$293	-$488	-$702
Year 2023	-$176	-$293	-$488	-$702
Year 2024	-$176	-$293	-$488	-$702
Year 2025	-$176	-$293	-$488	-$702

Total Inflow	P3	P4	P5	P6
Year 2005	$0	$0	$0	$0
Year 2006-2025	$1,728	$3,024	$4,752	$6,048

Total Cash Flow	P3	P4	P5	P6
Year 2005	-$5,850	-$9,750	-$16,250	-$23,400
Year 2006	$1,670	$2,927	$4,590	$5,814
Year 2007	$1,670	$2,927	$4,590	$5,814
Year 2008	$1,670	$2,927	$4,590	$5,814
Year 2009	$1,670	$2,927	$4,427	$5,580
Year 2010	$1,611	$2,829	$4,427	$5,580
Year 2011	$1,611	$2,829	$4,427	$5,580
Year 2012	$1,611	$2,829	$4,427	$5,580
Year 2013	$1,611	$2,829	$4,427	$5,580
Year 2014	$1,611	$2,829	$4,427	$5,580
Year 2015	-$320	-$389	-$936	-$2,142
Year 2016	$1,553	$2,732	$4,265	$5,346
Year 2017	$1,553	$2,732	$4,265	$5,346
Year 2018	$1,553	$2,732	$4,265	$5,346
Year 2019	$1,553	$2,732	$4,265	$5,346

Year 2020	$1,553	$2,732	$4,265	$5,346
Year 2021	$1,553	$2,732	$4,265	$5,346
Year 2022	$1,553	$2,732	$4,265	$5,346
Year 2023	$1,553	$2,732	$4,265	$5,346
Year 2024	$1,553	$2,732	$4,265	$5,346
Year 2025	$1,553	$2,732	$4,265	$5,346
Rate of Return				
ERR (Tax Exemption)	**27%**	**29%**	**27%**	**23%**
IRR (No tax exemption)	**-2%**	**2%**	**-2%**	**-1%**

Assumptions: Custom taxes (57%) and value added taxes (18%)

(II) Sensitivity Analysis - Increase of Sale price by 5%

Pump Type	Rate: m^3/day	Watt peak	Net Investment - 5% increase
P3	10 à 30	800	$22,113
P4	20 à 50	1 500	$36,855
P5	20 à 90	2 500	$61,425
P6	40 à 100	3 600	$88,452

Notes

1. The initial investment includes water pumping equipement
2. The other investments include water tanks, water distribution costs (30% of initial investment costs)
3. The beneficiary contribution represents 10% of the total investment

Assumption

There are 360 days per calendar year

Type of pump	rate: m^3/day	Average Rate	Potential annual resources: $0.4/$m^3$, for the sale of 60% of produced water	Daily Cash Flow/m3	Yearly Cash Flow
P3	10 à 30	20	$876 - $2,628	$ 4.80	$ 1,728
P4	20 à 50	35	$1,752 - $4,380	$ 8.40	$ 3,024
P5	20 à 90	55	$1,752 - $7,884	$ 13.20	$ 4,752
P6	40 à 100	70	$3,504 - $8,760	$ 16.80	$ 6,048

Statistics

20 Years Lifetime

Year 0 - Year 5 **1%**

Year 5 - Year 10	**2%**
Year 10	**35%**
Year 11-Year 20	**3%**

Total Costs

Total Costs - Outflow	P3	P4	P5	P6
Year 2005	($22,113)	($36,855)	($61,425)	($88,452)
Year 2006	($221)	($369)	($614)	($885)
Year 2007	($221)	($369)	($614)	($885)
Year 2008	($221)	($369)	($614)	($885)
Year 2009	($221)	($369)	($1,229)	($1,769)
Year 2010	($442)	($737)	($1,229)	($1,769)
Year 2011	($442)	($737)	($1,229)	($1,769)
Year 2012	($442)	($737)	($1,229)	($1,769)
Year 2013	($442)	($737)	($1,229)	($1,769)
Year 2014	($442)	($737)	($1,229)	($1,769)
Year 2015	($7,740)	($12,899)	($21,499)	($30,958)
Year 2016	($663)	($1,106)	($1,843)	($2,654)
Year 2017	($663)	($1,106)	($1,843)	($2,654)
Year 2018	($663)	($1,106)	($1,843)	($2,654)
Year 2019	($663)	($1,106)	($1,843)	($2,654)
Year 2020	($663)	($1,106)	($1,843)	($2,654)
Year 2021	($663)	($1,106)	($1,843)	($2,654)
Year 2022	($663)	($1,106)	($1,843)	($2,654)
Year 2023	($663)	($1,106)	($1,843)	($2,654)
Year 2024	($663)	($1,106)	($1,843)	($2,654)
Year 2025	($663)	($1,106)	($1,843)	($2,654)

Total Inflow	P3	P4	P5	P6
Year 2005	$0	$0	$0	$0
Year 2006-2025	$1,728	$3,024	$4,752	$6,048

Total Cash Flow	P3	P4	P5	P6
Year 2005	($22,113)	($36,855)	($61,425)	($88,452)
Year 2006	$1,507	$2,655	$4,138	$5,163
Year 2007	$1,507	$2,655	$4,138	$5,163
Year 2008	$1,507	$2,655	$4,138	$5,163
Year 2009	$1,507	$2,655	$3,524	$4,279
Year 2010	$1,286	$2,287	$3,524	$4,279
Year 2011	$1,286	$2,287	$3,524	$4,279
Year 2012	$1,286	$2,287	$3,524	$4,279

Year 2013	$1,286	$2,287	$3,524	$4,279
Year 2014	$1,286	$2,287	$3,524	$4,279
Year 2015	($6,012)	($9,875)	($16,747)	($24,910)
Year 2016	$1,065	$1,918	$2,909	$3,394
Year 2017	$1,065	$1,918	$2,909	$3,394
Year 2018	$1,065	$1,918	$2,909	$3,394
Year 2019	$1,065	$1,918	$2,909	$3,394
Year 2020	$1,065	$1,918	$2,909	$3,394
Year 2021	$1,065	$1,918	$2,909	$3,394
Year 2022	$1,065	$1,918	$2,909	$3,394
Year 2023	$1,065	$1,918	$2,909	$3,394
Year 2024	$1,065	$1,918	$2,909	$3,394
Year 2025	$1,065	$1,918	$2,909	$3,394

Internal Rate of Return				
IRR	**-2%**	**-2%**	**-3%**	**-5%**

(III) Sensititvity Analysis - Adjustment of Sales Price using different inflation rates

Current Inflation rate = 3.01%
Jan'04 -
Dec'04 2.75%
Yearly projected Increase 1.50%
Half increase 0.0075
One Fourth increase 0.00375

Pump Type	Rate: m^3/day	Watt peak	Initial Investment (1)	Other Investments (2)	Beneficiary Contribution (3)	Net Investment
P3	10 à 30	800	$18,000	$5,400	$2,340	$21,060
P4	20 à 50	1 500	$30,000	$9,000	$3,900	$35,100
P5	20 à 90	2 500	$50,000	$15,000	$6,500	$58,500
P6	40 à 100	3 600	$72,000	$21,600	$9,360	$84,240

Notes

1. The initial investment includes water pumping equipement
2. The other investments include water tanks, water distribution costs (30% of initial investment costs)
3. The beneficiary contribution represents 10% of the total investment

Assumption

There are 360 days per calendar year

Type of pump	rate: m^3/day	Average Rate	Potential annual resources: \$0.4015/m^3, for the sale of 60% of produced water	Daily Cash Flow/m3	Yearly Cash Flow
P3	10 à 30	20	\$876 - \$2,628	\$ 4.82	\$ 1,734
P4	20 à 50	35	\$1,752 - \$4,380	\$ 8.43	\$ 3,035
P5	20 à 90	55	\$1,752 - \$7,884	\$ 13.25	\$ 4,770
P6	40 à 100	70	\$3,504 - \$8,760	\$ 16.86	\$ 6,071

Total Maintenance Costs

Statistics

20 Years Lifetime

Year 0 - Year 5	**1%**
Year 5 - Year 10	**2%**
Year 10	**35%**
Year 11-Year 20	**3%**

Total Costs

Total Costs - Outflow	P3	P4	P5	P6
Year 2005	(\$21,060)	(\$35,100)	(\$58,500)	(\$84,240)
Year 2006	(\$211)	(\$351)	(\$585)	(\$842)
Year 2007	(\$211)	(\$351)	(\$585)	(\$842)
Year 2008	(\$211)	(\$351)	(\$585)	(\$842)
Year 2009	(\$211)	(\$351)	(\$1,170)	(\$1,685)
Year 2010	(\$421)	(\$702)	(\$1,300)	(\$1,872)
Year 2011	(\$421)	(\$702)	(\$1,300)	(\$1,872)
Year 2012	(\$421)	(\$702)	(\$1,300)	(\$1,872)
Year 2013	(\$421)	(\$702)	(\$1,300)	(\$1,872)

Year 2014	($421)	($702)	($1,300)	($1,872)
Year 2015	($7,371)	($12,285)	($20,475)	($29,484)
Year 2016	($632)	($117)	($1,755)	($281)
Year 2017	($632)	($117)	($1,755)	($281)
Year 2018	($632)	($117)	($1,755)	($281)
Year 2019	($632)	($117)	($1,755)	($281)
Year 2020	($632)	($117)	($1,755)	($281)
Year 2021	($632)	($117)	($1,755)	($281)
Year 2022	($632)	($117)	($1,755)	($281)
Year 2023	($632)	($117)	($1,755)	($281)
Year 2024	($632)	($117)	($1,755)	($281)
Year 2025	($632)	($117)	($1,755)	($281)

Total Inflow	**P3**	**P4**	**P5**	**P6**
Year 2005	$0	$0	$0	$0
Year 2006-2025	$1,734	$3,035	$4,770	$6,071

Total Cash Flow	**P3**	**P4**	**P5**	**P6**
Year 2005	($21,060)	($35,100)	($58,500)	($84,240)
Year 2006	$1,524	$2,684	$4,185	$5,228
Year 2007	$1,524	$2,684	$4,185	$5,228
Year 2008	$1,524	$2,684	$4,185	$5,228
Year 2009	$1,524	$2,684	$3,600	$4,386
Year 2010	$1,313	$2,333	$3,470	$4,199
Year 2011	$1,313	$2,333	$3,470	$4,199
Year 2012	$1,313	$2,333	$3,470	$4,199
Year 2013	$1,313	$2,333	$3,470	$4,199
Year 2014	$1,313	$2,333	$3,470	$4,199
Year 2015	($5,637)	($9,250)	($15,705)	($23,413)
Year 2016	$1,103	$2,918	$3,015	$5,790
Year 2017	$1,103	$2,918	$3,015	$5,790
Year 2018	$1,103	$2,918	$3,015	$5,790
Year 2019	$1,103	$2,918	$3,015	$5,790
Year 2020	$1,103	$2,918	$3,015	$5,790
Year 2021	$1,103	$2,918	$3,015	$5,790
Year 2022	$1,103	$2,918	$3,015	$5,790
Year 2023	$1,103	$2,918	$3,015	$5,790
Year 2024	$1,103	$2,918	$3,015	$5,790
Year 2025	$1,103	$2,918	$3,015	$5,790

Internal Rate of Return				
IRR	**-2%**	**2%**	**-2%**	**-1%**

Programme des Nations Unies pour le développement

Burkina Faso

003/LD - ORG/130/2 BKF

le 22 février 2005

Objet : Engagements financiers pour les projets « Energie » et le PDF-B du projet régional hydromicro-barrages.

Cher Monsieur,

J'ai l'avantage de vous informer que dans le cadre du cofinancement du projet « Energie » dont le PDF-B a été exécuté par notre Bureau, je marque mon engagement au nom de notre Bureau, pour apporter un montant de 600 000 $ au coût total du projet.

En outre, nous nous engageons pour apporter un montant de 100 000 $ au PDF-B du projet régional hydromicro-barrages pour lequel le Burkina Faso a voulu être associé.

Je vous en souhaite bonne réception et, vous remercie de votre collaboration et de votre appui.

Anna S. Coulibaly
Représentant Résident a.i.

Monsieur Frank Pinto
Coordonnateur Exécutif
du PNUD-FEM
1, place des Nations Unies
New York, NY 10017 – **USA**

CC : M. Mathieu-C. Koumoin, Coordonnateur Régional pour l'Energie et les Changements Climatiques, Afrique de l'Ouest et Centrale

Immeuble des Nations Unies, Koulouba (secteur 4) 01 BP 575 Ouagadougou 01 – Burkina Faso
Téléphone : (226) 50.30.67.62/63/64 – Fax : (226) 50.31.04.70 – Email : registry.bf@undp.org

MINISTERE DES FINANCES
ET DU BUDGET

SECRETARIAT GENERAL

DIRECTION GENERALE DU BUDGET

DIRECTION DU BUDGET ET DES COMPTES
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11 AVR. 2005

N° 2005- 743 /MFB/SG/DGB/DBC/BI
/PAK/LETTRES/MDCFB-MINISTRES

Le Ministre des Finances et du Budget

A

Monsieur le Ministre des Mines des Carrières et de l'Energie

- OUAGADOUGOU -

Objet : **Contrepartie nationale au projet PNUD-FEM d'appui à la réforme du secteur de l'énergie.**

Réf : **L N° 05-073/MCE/SG/UER du 16 février 2005.**

Dans le cadre du processus de préparation du projet PNUD-FEM d'appui à la réforme du secteur de l'énergie, vous avez sollicité de la part de l'Etat burkinabé une formulation d'intention de prise en charge d'un montant de Deux Cent Millions (200.000.000) Francs CFA par lettre ci-dessus référencée.

Par la présente, j'ai l'honneur de vous informer que je marque mon accord pour ladite requête.

MINISTERE DES FINANCES ET DU BUDGET
Le Ministre

Jean - Baptiste M. P. COMPAORE/.
Officier de l'Ordre National

MINISTERE DES FINANCES
ET DU BUDGET

SECRETARIAT GENERAL

DIRECTION GENERALE DU BUDGET

DIRECTION DU BUDGET ET DES COMPTES

BURKINA FASO
UNITE - PROGRES - JUSTICE

N°2005 - 0875 /MFB/SG/DGB/DBC/BI
/PAK/NOTE/DGB NOTE1.DOC

OUAGADOUGOU, le 07 AVR 2005

NOTE

A

l'attention de Monsieur le Ministre des Finances et du Budget

- OUAGADOUGOU -

Objet : **Contrepartie nationale au projet PNUD-FEM d'appui à la réforme du secteur de l'énergie.**

Réf : **L N° 05-073/MCE/SG/UER du 16 février 2005.**
Note N° 2005-0459/MFB/SG/DGB/DBC/BI du 14 mars 2005.

Par lettre ci-dessus référencée, votre collègue des Mines, des Carrières et de l'Energie a fait une requête relative au financement du Projet PNUD-FEM d'un montant de Deux Cent Millions (200.000.000) Francs CFA.

Suite à la note sus-citée, vous avez marqué votre accord pour une éventuelle prise en charge sur la ligne contrepartie aux nouveaux projets.

Toutefois, le projet n'ayant pas encore ouvert de compte, les responsables sollicitent d'abord un engagement de l'Etat Burkinabé par une formulation d'intention de prise en charge de ce besoin afin de permettre la poursuite du processus de préparation.

Aussi, ai-je l'honneur de vous soumettre pour approbation et signature, un projet de lettre adréssée à votre collègue à cet effet.

LE DIRECTEUR GENERAL DU BUDGET

MINISTERE DES FINANCES ET DU BUDGET * BURKINA FASO * Directeur Général du Budget

Moumounou GNANKAMBARY

Country: _____

UNDAF Outcome(s)/Indicator(s):
_____
(Link to UNDAF outcome., If no UNDAF, leave blank)

Expected Outcome(s)/Indicator (s):
_____
(CP outcomes linked t the SRF/MYFF goal and service line)
_____

Expected Output(s)/Indicator(s):
_____
(CP outcomes linked t the SRF/MYFF goal and service line)
_____

Implementing partner: _____
(designated institution/Executing agency)

Other Partners: _____

_____

Programme Period:_____
Programme Component:_____
Project Title:_____
Project ID: _____
Project Duration: _____
Management Arrangement: _____

Total budget: _____
Allocated resources: _____
- Government _____
- Regular _____
- Other:
  - Donor _____
  - Donor _____
  - Donor _____
- In kind contributions _____

Agreed by (Government): _____
Agreed by (Implementing partner/Executing agency):_____
Agreed by (UNDP):_____