

PROJECT BRIEF

1. Identifiers:

Project Number:
Project Name: Benin: Decentralized Rural Energy Project
Duration: 5 years
Implementing Agency: World Bank
Executing Agency: Direction de l'Energie (DEN) of the Ministere de l'Energie, des Mines, et de l'Hydraulique (MEMH);
Requesting Country or Countries: Benin
Eligibility: Benin ratified the FCCC Convention on June 30, 1994
GEF Focal Area: Climate Change
GEF Programming Framework: OP#6 Promoting the adoption of renewable energy by removing barriers and reducing implementation costs.

2. Summary: The project will promote the adoption of renewable energy by privately-owned and operated solar photovoltaic equipment supply and service operations. Barrier removal activities will address: insufficient information about the real PV market; high risk for rural credit providers; limited technological know-how and institutional capacity; and inadequate regulations. Project components include: installation of at least 125 kW of PV electric system; establishment of private PV installation and service companies; development of codes of practice and standards; and strengthening the capacity of the Agence d'Electrification Rurale to monitor and regulate private sector activities in the rural energy sector. The project will also result in reduced CO2 emissions totaling 13,000 tons over 15 years.

3. Costs and Financing (Million US):

GEF:	-Project	US\$ 1.135 m
	- PDF:	-
	Subtotal GEF:	US\$ 1.135 m
Co-financing:	-IA:	US\$ 2.160 m
	-Other International:	US\$ 0.000 m
	-Government of Benin:	US\$ 0.403 m
	-Private	US\$ 2.047 m
	Subtotal Co-Financing:	US\$ 4.610 m
Total Project Cost:		US\$ 5.745 m

4. Associated Financing (Million US\$)

5. Operational Focal Point endorsement:

Name: Vincent Isidore Tchabi Title: Directeur de l'Environnement par l'Interim
Organization: Ministere de l'Environnement, de l'Habitat, et de l'Urbanisme Date: July 31, 1998

6. IA Contact:

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A: Project Development Objectives

1. Project development objective and key performance indicators (see Annex 2):

Project Development Objectives:

Provide rural households that have moderate-to-high cash incomes (US\$1,000 to US\$1,900 per annum) but little prospect of obtaining electricity service from the grid with affordable and reliable renewable electricity supply by establishing viable, technically-capable and privately-owned and operated solar photovoltaic (PV) equipment supply and service operations. To achieve this, the project aims to create an enabling environment conducive to investment in PV technology, promote private sector market penetration in rural areas, and create rural delivery mechanisms through a participatory process.

Project Global Environmental Objective:

Promotion of the adoption of renewable energy by removing barriers and reducing implementation costs. Project is expected to result in a reducing the cost of solar pv technology and service, strengthened institutional capacity and marketing infrastructure for commercialization of solar PV.

Selected Performance Indicators (See Annex 2 for key performance indicators)

- a) Installation of at least 125 kWp of PV electric system capacity serving at least 5,000 off-grid customers by 2005;
- b) Establishment of at least 2 financially-viable private PV installation and service companies by 2003;
- c) Issuance by the Agence d'Electrification Rurale (AER) of a photovoltaic Code of Practice for Benin including technical standards for solar photovoltaic systems, and standard renewable electricity services contracts by 2001.
- d) Improved capacity of the AER to monitor and eventually regulate private sector activities in the rural energy sector by mid-term;

B: Strategic Context

1.1. Sector-related Country Assistance Strategy (CAS) goal supported by the project (see Annex 2):

CAS document number: P-6308-BEN Date of latest CAS discussion: May 11, 1994.

The latest CAS, No P-6308-BEN, dated May 11, 1994 is being updated in order to take into account the latest political and economic changes. The project supports the main CAS objectives (i) to encourage and support the private sector supply response; and (ii) to ensure adequate provision of basic social services with the participation of beneficiaries. The project, by the creation of an autonomous AER with ultimately regulatory responsibilities, is also designed so as to support the new role of the state as a facilitator and a promoter of an appropriate environment for private activity. Promoting environmental sustainability is a central theme within Benin's national development strategy and established international cooperation agreements.

1.2.GEF Operational Strategy/Program Objective addressed by the project:

The project supports the GEF Operational Program Number 6; *Climate change: promoting the adoption of renewable energy by removing barriers and reducing implementation costs.*

The project will address the barriers to dissemination of solar photovoltaic technology because this technology remains the most promising renewable energy option for rural electrification in Benin. Since the 1980's, the Government of Benin has investigated the use of renewable energy - especially wind, biogas, mini-hydro and solar photovoltaic technology - to expand the electricity coverage in the country. The experience so far recorded with the first three renewable energy options was not successful because (i) wind resources were not sufficient, even in coastal areas, to allow for commercial development of wind power; (ii) villagers were strongly reluctant to collect animal dejecta for biogas production, despite the existence of a large livestock; (iii) rivers were seasonally running dry and as a result it was uneconomical to harness the identified hydro-sites. Experience with solar energy however is very promising owing to the country's solar resource endowment and the technical performance of the solar photovoltaic installations to date. The Government of Benin has thus decided to promote this technology among rural communities with financial participation of beneficiaries.

The adoption of the solar photovoltaic technology for electricity supply to a large number of rural households will mitigate the local emissions of greenhouse gases. GHG mitigation benefits from the systems installed under the project are expected to total at least 13,000 tons of CO₂ emissions over 15 years and actual reductions from replication of the project are expected to be substantially higher.

2. Main sector issues and Government strategy:

Benin had a population estimated at 5.5 million in 1995, of which 70 percent (or 385,000 households-equivalent) live in rural areas (population groups of more than 5,000 are designated as urban). In 1995, Benin had an overall electrification rate of about 12 percent for an annual electricity consumption of 289.6 GWh. The share of the *départments* of Atlantique (Cotonou) and Ouéme (Porto-Novo) was 85 percent of the total consumption. Given the low electrification rate, rural households usually purchase kerosene and disposable batteries to meet their lighting and small power needs. According to Government statistical data, kerosene represented the primary source of lighting for about 87 % of the population in 1994 and average household expenditures on commercial energy ranges between US\$2 and US\$12 per month.

While some of the rural households and communities (about 10 to 15% of the total) have the potential income to pay for grid-based electricity supply at prevailing tariffs, this service is neither available to them now, nor is it likely to be available to them in the medium term. In order to address their electricity needs, the Government has the options (i) to install a diesel power plant and build a mini grid (too expensive given the small and scattered loads); (ii) to develop, whenever feasible, renewable energy technologies. The Government has developed out its administrative budget six (6) pilot solar villages which represent 25 kWp of individual and communal PV installations. Based on the experience gained to date with these villages, the Government of Benin designed a strategy promoting solar photovoltaic technology "Contribution à l'amélioration de la qualité de vie en milieu rural par électrification solaire". Its main objective is to improve the rural populations' living conditions by providing each community with a standard comprehensive package of PV applications systems. Barriers to PV dissemination in rural areas that this project will address include:

- a) Market barriers: the rural market for PV systems is not clearly defined even though some investigations based on the pilot villages' development suggest a potential significant size. To

date, only distributors of kerosene lamps and small diesel generating units have been active in rural areas. The information shortfall, inter alia, about real cost/benefits of PV to the private consumer is one of the reasons quoted for the lack of interest. Moreover, surveys showed that rural credit providers do not finance PV installations because PV has no proven track record.

Private entrepreneurs/suppliers of PV systems and electrical equipment already exist in the capital city of Cotonou, but are unwilling to supply rural areas because of perceived high risks.

- b) Cost barriers: (i) PV systems have a higher initial investment cost than many conventional energy technologies; (ii) PV dealers buy in small quantities, so prices are even higher; (iii) import duties are high (on the average 33% of CIF Price). With respect to import duties, they apply to almost all electrical equipment and will be addressed by another project under preparation.
- c) Technological/capacity barriers: Lack of established rural private infrastructure for installation and servicing of PV systems as a consequence of the above two barriers. In fact, several private entrepreneurs are based in Cotonou but they have made limited sales to the rural areas due to the above-mentioned barriers. *One of the private entrepreneurs has been in business for about a decade and tried to train local technicians to provide after sales service in the pilot villages. However, the training was not completely satisfactory because of inadequate resources devoted to that activity.*

3. Sector issues to be addressed by the project and strategic choices:

The project would address existing barriers to PV technology penetration in Benin. *The activities that will be carried out have been identified as critical by the communities and the project implementation unit for the six pilot villages (underway with government funding).*

For the first barrier related to insufficient consumer information and confidence about the real PV market, a three-step removal strategy is defined: (a) at the onset of the project, information campaigns will be carried out throughout the targeted project areas to publicize the advantages of PV systems (better light quality, durability) over currently used devices, the types of systems that would be proposed with indicative fees; (b) until the PV market fully develops, customers will receive a ‘first cost grant’ to bring the fee in line with their current energy expenses. This ‘first cost grant’ would be disbursed over several years and include a contribution to the access fee (see below and Annex 1). As solar systems become established over time, consumer willingness to pay for the higher service should rise. At the same time costs should fall, so that the first cost grant can gradually be phased out. At the end of the project consumers will pay for the full cost of service.

To improve market information and the confidence of suppliers the following steps will be taken: (a) communities will demonstrate their interest to the Rural Electrification Agency (AER) by providing an indication of the number of households willing to pay for the services; (b) the AER will then produce a directory of villages with necessary information (demography, location, access, potential customers, solar resource). This directory will serve as a basis for the potential market; (c) in order to determine the solar resource availability, several state-of-the-art measurement stations will be installed at specific locations for data storage and monitoring; (d) detailed market surveys and other market development activities will be carried by the private operators (electricity service companies), once established.

The project would address the high up-front costs, i.e. lowering implementation costs by establishing PV based electricity service companies which will ultimately provide service at rates comparable to prevailing electricity tariffs. The procedure will be as follows: (a) a household and/or community that requires a certain level of service will have to pay an access fee to be eligible and make commitments to pay annual

service charges (which can be split into monthly installments) in order to benefit from the service. (In the initial years, GEF will contribute to the access fee and annual payments, see above and Annex 1); (b) the installation of the PV system will be contingent on due payment of the access fee. Any default to pay service charges will result ultimately in the removal of the system (service disconnection) which can be reinstalled elsewhere. (c) the access fee and service charges are set so as to cover the costs (initial and maintenance costs) of the systems over a long period.

The electricity service company approach has been selected because (i) by lowering the up-front costs, it offers the opportunity to have a large customer base which can enable the private sector to operate on a commercial basis, (ii) it is comparable to the type of service grid connected customers benefit from; (iii) it helps establish a local private infrastructure. GEF grant financing would be required to draft standard consumer contracts, to prepare tariffs studies.

The project will address the barriers relating to lack of rural private infrastructure for supply, installation and servicing of PV systems and lack of technical capacity to provide these services, through:

- (i) the installation and maintenance of PV systems will be performed by private operators selected on a competitive basis. The idea is to bid out the supply and installation of the PV systems and their maintenance (leasing of the market) in the project targeted zone, with the winner being the private operator asking for the lowest fee (the lease will be for 15 years and renewable up to 40 years). In order to ensure the quality and before buying the systems, the AER would perform several check-ups according to agreed quality control procedures. Local technicians will also be accredited according to specific procedures. In addition to these quality control procedures, the private operator will provide a manufacturer's guarantee for the systems supplied and performance bonds for the maintenance.
- (ii) the establishment of the AER as a regulatory agency vis-à-vis the private operators. The AER will issue the PV Code of Practice in Benin as well as technical standards. It will oversee the bidding process and prepare the lease (supply and service) contracts. It will manage the accreditation program of local technicians.

The GEF grant is required to finance market development activities, preparation of the PV code of Practice in Benin and technical standards, preparation of the local technicians accreditation program, and preparation and supervision of the bidding process. The GEF grant will not be used to pay import duties. The investment requirements for the project would be covered by the IDA credit, the private operators and customers.

C: Project Description Summary

1. Project components (see Annex 2):

<u>Component</u>	<u>Source</u>	<u>Category</u>	<u>Indicative Costs (US\$M)</u>	<u>Bank-financing (US\$M)</u>	<u>GEF-financing (US\$M)</u>
A. Installation & Operation of PV systems		Physical	4.222	1.53	
A.1 - Goods and Services	IDA		1.53		
A.2 - Goods and Services	Cust.		2.047		
A.3 - Market Development Activities and 1 st Cost Grant	GEF		0.645		0.645
B. Capacity building program		Inst. Capacity	1.212	0.32	

B.1 - Information/Training		Building			
B.1.1 - Training	IDA		0.064		
B.1.2 - Information/Training	GEF		0.245		0.245
B.2 - Technical Assistance					
B.2.1 - Technical Assistance	IDA		0.120		
B.2.1 - Technical Assistance	GEF		0.244		0.245
B.3 - Equipment	IDA		0.136		
B.4 - Operation	GVT		0.403		
C. Others (contingencies)			0.310	0.31	
Total			5.745	2.16	1.135

The capacity building program would comprise (i) provision for solar resource data improvement, promotion and dissemination of PV technology; (ii) TA for implementing, supervising, monitoring and evaluating the project; and (iii) Training program to strengthen the capability of regulatory capability of AER.

2. Key policy and institutional reforms to be sought:

The high import duties apply to almost all electrical equipment and are not specific to PV equipment. This issue is being addressed by the World Bank project, Benin-Energy VII under preparation (see D-2 for a full description of this project).

3. Benefits and target population:

The project seeks to create a customer base large enough to allow successful private sector operation and competition, through a leasing approach, which is in line with the general direction adopted in the power sector of Benin. At the end of the project, the private entrepreneurs that are now based in the capital city of Cotonou will expand their operations in rural areas by setting up local offices responsible for marketing, installation, and maintenance of the PV systems/components. The flexibility provided in the project will allow customers to upgrade their systems by reaching an agreement directly with the private operators. The private operators will be in position to respond to demand for solar lanterns and PV systems of different sizes, and to maintain a high quality after-sales service, given their already strong presence in the field as a result of the project. The accreditation program for PV technicians, which will be sponsored by AER will be instrumental in ensuring that the technicians responsible for installation and maintenance of the systems receive good practical training and work according to best practices. Given the demonstration effect produced by the project and the consumer awareness programs, rural populations will be in position to choose PV equipment whenever it is suitable for their needs. In this regard, the project will contribute to promote GEF objectives of OP#6 in Benin.

Expected benefits would include: (i) improved quality of life and health for targeted population through initial increased access to electricity for at least 5,000 rural households currently without electric power; (ii) increased private sector participation in the supply of energy services; (iii) development of an efficient entity for the monitoring and regulation of rural electrification sector operations and development; (iv) reduction of greenhouse gas emissions through the addition of at least 125 kWp of environmentally sustainable generating capacity; (v) the development of markets for solar photovoltaic systems in the private sector.

The project is targeting isolated rural households, businesses, and villages not yet connected to the grid. Beninese enterprises will benefit directly from the project through the partnership they would develop with PV manufacturers and by receiving the technical assistance and support required to successfully install and maintain decentralized photovoltaic systems.

4. Institutional and implementation arrangements:

Project implementation period: 2000 - 2005 (5 years)

Executing Agencies, Project Coordination and Oversight:

The recipient of the proposed GEF grant and Bank credit will be the Government of Benin (GOB). The Bank credit and the GEF grant will be transferred to the AER **under the same terms**. Institutional and implementation arrangements for the project are summarized below. They would be finalized during project appraisal.

Project Coordination:

The Ministère de l'Énergie, des Mines et de l'Hydraulique (MMEH) will be in charge of the general coordination and supervision of the implementation of the proposed Project through the AER. The AER will initially be a small unit composed of a project manager, technical advisor, an accountant and support staff, assisted by consultants as needed.

The AER will be responsible for: (i) project preparation; (ii) **project and private sector** promotion in targeted zones; (iii) establishment of guidelines and standards (PV technical standards, standard lease contract for private operators, standard service contract, PV Code of Practice); (iv) management of contracts tendered through international competitive bidding; (v) accounting and financial management of the project; and (vi) capacity building.

Project Implementation:

Surveys undertaken during project preparation determined the type and size of the systems in which the target population were strongly interested. Communities in project areas (designation of specific districts for the PV electrification components were selected on the basis of market potential and suitable insolation) which demonstrate expressions of interest by at least 25 to 30 households will self-select to AER (see section C-3). The AER will then produce a directory of villages which will serve as a basis for the potential market. The AER, with the assistance of consultants, will prepare the bidding documents containing all the information related to the potential market size and characteristics, the technical specifications and the contractual arrangements. The private operators will then be selected on a competitive basis according to IDA rules.

The winning bidder will receive specific allowances from the AER to perform detailed market studies in order to determine the real market. The private operator will install the systems according to agreed procedures once the households and/or communities pay the access fee. He will be responsible for service charges collection (which he could hand over to the local credit/savings institutions) and maintenance of the systems (see section C-3).

Accounting, Financial Reporting and Auditing Arrangements :

The AER will respectively maintain the statistical records related to, inter alia, market surveys, households serviced and collection rate by geographic distribution, costs (market price + installation fee) of components installed and of systems repaired, participatory rural appraisals, trade flows and prices of traditional fuels, dissemination rates of improved technologies.

The AER will maintain separate disbursements records and accounts with respect to each private operator and a project account. All records, documents and accounts are to be maintained in accordance with sound accounting practices for independent audits and for review by IDA missions.

The project accounts, including special accounts and all disbursements under SOEs, will be audited annually according to auditing standards by an independent auditor acceptable to IDA; and (ii) the annual audit report will be submitted to IDA within six months of the end of each fiscal year.

Monitoring and Evaluation Arrangements :

The choice of the leasing approach has three important benefits. It will: (1) facilitate system flexibility and ease of alteration if the systems are not optimal for the region; (2) ensure vendor accountability; (3) increase competition as margins are likely to be smaller and thus more local companies may compete. Therefore, to monitor progress towards the outcomes described above:

- Private operators will have to send to the AER monthly reports stating (i) the number of villages surveyed in order to justify the market development grant, (ii) the number of customers or systems installed and maintained in order to be paid either the system price or the maintenance fee.
- To supervise the maintenance process, the AER will (i) spot-check the installed systems and (ii) conduct regularly consumer surveys. The quality control procedures that will be implemented will also give the consumers a strong indication of the reliability of the systems installed and prevent complaints.
- Quarterly progress reports will be established on the basis of the project implementation plan that will be developed during project appraisal. Bank's supervision missions will take place twice a year and a project review will be held at mid-term. Government will transmit a completion report to IDA, within six months of credit closing.

The AER will monitor the capacity building component. This component would comprise inter alia training, monitoring and evaluation activities, and technical assistance. AER staff will be trained according to plan and procedures agreed upon during appraisal.

The innovative nature of the project and the inherent dispersion of project activities requires an intensive Bank supervision and a close monitoring of project performance.

A detailed full scale Monitoring and Evaluation Plan would be prepared under advanced preparation. Moreover, one should bear in mind that the ongoing sector reform would ultimately result in the setting up of a regulatory agency which would oversee private operators of distribution services. Once capacity is build in this regulatory agency, regulatory functions will be removed from the AER to this agency.

D: Project Rationale

1. Project alternatives considered and reasons for rejection:

Conventional techniques vs. PV technology. Detailed studies were carried-out for solar PV as compared to diesel generators, and the continued use of batteries and kerosene. Solar energy was shown to be the most attractive option in the medium term (once barriers are removed and the PV market picks up) when the installed cost of micro-diesel systems is greater than \$800/household. The solar PV option is even more favored when the average household consumption varies from 5 to 10 kWh/month which is currently the case for most of the isolated households.

Sale of systems vs. sale of services - While market development is an important element of a strategy for solar PV technology, experiences show that the market only reaches the relatively well-off who are able to pay the up-front purchase costs. In Benin, the rural market size was relatively small to allow the private sector to take over this business. As a result, the dissemination of PV systems in rural areas was perceived as a high commercial risk project. However, with the electricity service company approach and the incentives provided for the customers and the private sector, the customer base would be large enough to attract the private sector. Private operators have expressed a willingness and desire to penetrate new rural markets and build local capacity if transaction risks are lowered in the short term.

Grid electrification costs. Grid electrification is not a cost-effective option for remote, low populated areas such as those considered. Experience in Benin suggests costs of line extension of about \$0.54-0.60 per kWh and kilometer for small communities (500 kWh monthly consumption). This would result in monthly bills in the order of \$90 for only 10 kilometers of distance for each household.

2. Major related projects financed by the Bank and/or other development agencies (completed, ongoing and planned):

Sector issue	Project	Latest Supervision (Form 590) Ratings (Bank-financed projects only)	
		Implementation Progress (IP)	Development Objective (DO)
<u>Bank-financed projects in Benin</u>			
Preparation of the Nangbeto project	Power Engineering and Tech. Ass. Project	S	S
Supply of indigenous hydro energy to meet demand	Nangbeto Hydro electric Project	S	S
Rehabilitation and extension of the distribution network in Cotonou, Porto Novo and Abomey-Bohicon	Power Rehabilitation & Extension Project	U	S
Preparation of the Adjarala Project	Power Engineering & Tech. Ass. Project	S	S

Increase private participation in power sector	Guinea Power II Project (Cr.2416-GUI, ongoing)	U	U
	Senegal Power Sector Adjustment Credit (in prep)		
	Indonesia Solar Home Systems Project (ongoing)	S	S
	India Renewable Resources development Project	S	S
	Argentina Decentralized Energy Project (in prepa.)		
	Cape Verde Energy, Water and Sanitation Project (in preparation)		
	Regional-Photovoltaic Market Transformation Initiative		
<u>Other development agencies</u> UNDP – GEF	Zimbabwe Photovoltaics for household and community use	N/A	N/A

IP/DO Ratings: HS (Highly Satisfactory), S (Satisfactory), U (Unsatisfactory), HU (Highly Unsatisfactory)

Benin Power VII (under preparation). The principal objective of the Bank financed Benin Power VII project, under preparation, is to promote economic growth by lowering the cost of electricity and making it accessible to a larger segment of the population. The specific objectives of the project are to: (i) ensure the least-cost supply of electricity, (ii) improve the reliability of electricity supply; (iii) promote regional cooperation and economic power interchange;(iv) increase access to electricity for urban, peri-urban and rural populations; (v) create the institutional framework for increasing economic and management efficiency and for attracting private investment to the power sector; and (vi) improve the institutional and technical capacity of the line Ministry. Components of the project are : (i) interconnection with Nigeria; (ii) interconnection Nord Togo - Nord Benin; (iii) extension of the distribution network; (iv) rural electrification in Benin (dealing with grid extension); and (v) an institutional component.

The institutional component deals with policy changes and aims to strengthen the institutional and legal framework in order to promote private sector participation in the power sector. The Government of Benin has recently shown its commitment to restore the financial integrity of the sector and to withdraw from the day-to-day management of the distribution utilities. Benin has also started the process of improving institutional arrangements in the power sector and encouraging private sector participation. The projects

preparation teams for Benin Power VII and the proposed Benin Decentralized Rural Energy project are the same. The findings of this team are automatically incorporated in respective project designs.

3. Lessons learned and reflected in proposed project design:

Solar home system projects must: (i) overcome the first cost barrier created by their initial high cost to gain an adequate potential market size; (ii) establish responsive and sustainable PV sales and distribution infrastructure; and (iii) provide quality products and services (WB Technical Paper No 324, Best Practices for Photovoltaic Household Electrification Programs, 1996). Through the electricity service company approach, the project will be instrumental in lowering the up-front cost barrier and establishing a responsive distribution infrastructure. Detailed technical standards for PV systems drafted and enforced by the AER will ensure the quality of the service provided to the consumers.

Solar home system projects should: (i) provide adequate consumer information, and (ii) ensure adequate management skills in local implementing organizations (World Bank Technical Paper 304, Photovoltaic Applications in Rural Areas of the Developing World, 1995). Due attention will be paid to consumer awareness campaigns which will include local awareness activities and community training.

Rigorous economic and financial analysis of rural electrification projects and an increased attention to cost recovery are key to successful project implementation. (OED Report #13291, Rural Electrification in Asia: A Review of Bank Experience, June 1994). Economic and financial analyses were carried out during the identification phase by consultants and the levels of tariff to be applied by the electricity service company were determined with respect to cost recovery. In addition, the households' eligibility criteria include, inter alia, the willingness and capacity to pay for the services provided.

4. Indications of borrower commitment and ownership:

The Government of Benin has demonstrated sustained commitment vis-à-vis the project. The Government of Benin has ratified the United Nations Framework Convention on Climate Change (06/30/94) and is seeking to promote the substitution of renewable energy sources for higher carbon-emitting conventional fuels (see Section B.2). Six solar villages were entirely financed out of the Government's budget. In addition, renewable energy pre-feasibility studies were also conducted in Benin for a wide scale dissemination of PV technology with IDA financing (Credit 2286-BEN).

Following the World Solar Summit of Hararé (September 1996), the President of Benin sent on June 20, 1997 an official letter requesting the support of the Bank for the implementation of the program "électrification rurale par le système solaire". This program aims to provide water and electricity to all the lakeside pile dwellings (*villages lacustres*) with solar PV technology. This project will take into consideration some of the requests of the Government.

5. Value added of Bank support in this project:

Continued Bank support of the Government's strategy in the energy sector would have a bearing on a number of dimensions, and in particular: (i) playing a catalytic role in the promotion of PV technology in rural areas; (ii) creating an adequate framework for private sector participation in the provision of electricity services in rural areas; (iii) assisting in the development of a local PV infrastructure; (iv) promoting poverty alleviation and administrative decentralization; (v) improving environmental quality through CO₂ emissions reduction; and (vi) mobilizing grant support and/or bilateral funding of renewable energy development in Benin.

GEF will provide financing to cover the incremental costs associated with the PV option (please refer to the attached IC appendix for justification). Without GEF financing to remove existing barriers, this market would not develop by itself.

E: Issues Requiring Special Attention

1. Economic

Summarize issues below (e.g., fiscal impact, pricing distortions)

To be defined (indicate how issues will be identified) None

There are three main economic issues: (i) the uncertainty about the actual size of the electricity market in rural areas, and the willingness and capacity to pay of the potential customers; (ii) the economy of scale (price reduction due to bulk supply) of PV components in Benin; (iii) the service fee that would be charged by the private operators for the installation and maintenance of the systems over an extended period of time.

The first issue will be addressed by carrying out in-depth field studies in the rural areas targeted by the project. Preliminary surveys were conducted at the identification phase but their results need to be consolidated in order to set the level of the access fee and service charges.

For the second issue, it is envisioned that detailed technical specifications will be drafted and an adequate packaging will then be made, with the assistance of a Bank procurement specialist, to allow for the economy of scale.

The third issue is critical to the success of the project. Depending on how the private operator is going to charge the service he provides (either by system or by village) and the commercial risk he would like to take, the operation can be profitable to all parties (AER, customers and private operators). The simulation of a model lease company (including a substantial commercial margin) will be performed in order to determine the **minimum service fee** that could attract private operators. The lease contract **will be given to the bidder proposing the lowest fee above the minimum fee.**

Economic evaluation methodology:

Cost benefit Cost effectiveness Other [Incremental cost analysis performed]

The economic costs of the PV option were compared with mini-diesel systems to confirm that PV systems were the appropriate choice of technology in the medium term for serving electricity needs in isolated rural areas which are below 10 kWh/month/households. However, the PV systems are more expensive than the currently used lighting and electricity systems (kerosene lanterns and disposable batteries) and the incremental costs have to be financed in order to lower the market barriers identified to date.

2. Financial

Summarize issues below (e.g., cost recovery, tariff policies, financial controls and accountability)

To be defined (indicate how issues will be identified) None

The electricity service company approach will require careful monitoring of delivery conduits (PV systems installation and maintenance, fees collection), particularly to ensure repayment objectives are met.

3. Technical

Summarize issues below (e.g., appropriate technology, costing)

To be defined (indicate how issues will be identified) None

The long-term sustainability of this PV program will depend on well-designed products (including proper assembly and installation procedures) that meet consumer expectations and capacity to pay. To achieve this, (i) the solar resource will be evaluated with state-of-the-art devices for the proper design of the systems; (ii) the AER will issue and enforce the PV Code of Practice.

To ensure good technical performance of private operators, the AER will (i) spot-check the installed systems and (ii) conduct regular consumer surveys. These actions will be conducted with a technical assistance.

4. Institutional

Summarize issues below (e.g., project management, M&E capacity, administrative regulations)

To be defined (indicate how issues will be identified) None

Training and information programs are programmed in the following areas: (a) accreditation for PV technicians (see Table 6 of Annex 1); (b) Multi-media consumer awareness programs (see Table 6 of Annex 1); and (c) project team training in project management and utility regulations. The main idea is to train the project team how to assess the performance of private operators and in enforcement relating to the PV Code of Practice and the agreements of the lease contract signed by the private operators. Additional training needs and information dissemination mechanisms will be explored during project preparation as part of the information campaigns and training component.

The AER needs to be established and its regulatory functions developed and strengthened. While the electricity service company model proposed in this project is an attractive concept, its long-term viability requires business management skills and technical capabilities that need to be developed in rural areas. The capacity building component of this project will address these issues.

5. Social

Summarize issues below (e.g., significant social risks, ability to target low income and other vulnerable groups)

To be defined (indicate how issues will be identified) None

This project is targeting rural populations without access to electricity in specific geographic areas, and the eligibility criteria will be enforced in order to ensure that these rural populations are the ones really served. During the pre-feasibility study, the consultant noted that the Government's choice of communities that would benefit from its program was strongly based on political criteria. In order to avoid that situation, we will emphasize during appraisal that only qualifying communities and households (that have the capacity to pay the access fee and the service charges) will be considered during implementation. In addition, consumer awareness programs will be carried out systematically so as to publicize the project and its procedures.

6. Environmental

a. Environmental issues:

Summarize issues below (distinguish between major issues and less important ones)

To be defined (indicate how issues will be identified) None

Major:

Other:

b. Environmental category: A B C

b. Other key stakeholders:

Name and describe groups, how involved, and what they have influenced.

Not applicable (describe why participatory approach not applicable with these groups)

Cross-fertilization would be carried out in part through the Bank thematic groups activities. The Bank's Thematic Leader for Renewable and Rural Energy, will be consulted for the organization of the "small meeting, potentially in conjunction with Village Power '98, for project participants from not only the Benin Decentralized Rural Energy Projects, but also other similar efforts elsewhere (e.g. the Togo Decentralized Rural Energy project, the PV projects in Mexico, Indonesia, and Zimbabwe, and with PVMTI participants). Some project funds would also be allocated to address the STAP Reviewer suggestions of a study tour as provided in the comments: a fact-finding trip to East Africa, or a reciprocal visit by members of the PV industry there (Kenital, Kenya Solar, Total Solar, etc.) could be a cost effective and important investment. Additional mechanisms for sharing and dissemination of data will also be explored during project preparation as part of the technical assistance components.

8. Checklist of Bank Policies

a. This project involves (check applicable items):

- | | |
|--|--|
| <input type="checkbox"/> Indigenous peoples (<u>OD 4.20</u>) | <input type="checkbox"/> Riparian water rights
(<u>OP 7.50</u>) (<u>BP 7.50</u>) (<u>GP 7.50</u>) |
| <input type="checkbox"/> Cultural property (<u>OPN 11.03</u>) | <input type="checkbox"/> Financial management (<u>OP 10.02</u>) (<u>BP 10.02</u>) |
| <input type="checkbox"/> Environmental impacts
(<u>OP 4.01</u>) (<u>BP 4.01</u>) (<u>GP 4.01</u>) | <input type="checkbox"/> Financing of recurrent costs (<u>OMS 1.21</u>) |
| <input type="checkbox"/> Natural habitats
(<u>OP 4.01</u>) (<u>BP 4.01</u>) (<u>GP 4.01</u>) | <input type="checkbox"/> Local cost sharing
(<u>OP 6.30</u>) (<u>BP 6.30</u>) (<u>GP 6.30</u>) |
| <input type="checkbox"/> Gender issues (<u>OP 4.20</u>) | <input type="checkbox"/> Cost-sharing above country three-year average
(<u>GP 6.30</u>) (<u>OP 6.30</u>) (<u>BP 6.30</u>) |
| <input type="checkbox"/> Involuntary resettlement (<u>OD 4.30</u>) | <input type="checkbox"/> Retroactive financing above normal limit
(<u>OP 12.10</u>) (<u>GP 12.10</u>) |
| <input checked="" type="checkbox"/> NGO involvement (<u>GP 14.70</u>) | <input type="checkbox"/> Disputed territory
(<u>OP 7.60</u>) (<u>BP 7.60</u>) (<u>GP 7.60</u>) |
| | <input type="checkbox"/> Other (provide necessary details) |

b. Describe issue(s) involved, not already discussed above:

F: Sustainability and Risks

1. Sustainability:

The market studies carried out during project preparation showed that current energy expenditures in the target zones range from US\$5 to US\$12 per month. The tariff that are set for the 20 and 50 Wp are in the same range and because of the first cost grant that will be given, the transition from the current sources of lighting to the PV systems is expected to be smooth. Once the reputation of PV were established, the customer willingness-to-pay would likely increase.

A recent research paper, published by the Bank, demonstrated that leasing is the best way to develop small and medium enterprises because it provides a good allocation of risks among different stakeholders. In the case of the Decentralized Rural Energy Projects, the simulation of a generic model lease carried out as part of preparation showed:

for private operators, a modified internal rate of return of 27.8 % over a 5-year period and a 12.1% over a 15-year period. The discounted surplus/profit was about FCFA 50 million per year over a 5-year period and FCFA 500,000 per year over a 15 year period. These results were based on very conservative assumptions (for example, systematic replacement of a battery after 3 years, local bank interest rate equal to 13%, salary range high above the average national range) and could be improved depending on the business skills of the private operator.

for the AER, the annual operating profit after the project was above FCFA 200 million. This result could also be improved as the competition between private operators is likely to bring their prices down.

In order to ensure technical performance, the technical specifications of the PV systems will be drafted by technical assistance with due respect to local conditions (availability of solar resource, availability of spare parts, etc.) and the components will be purchased through an ICB process. The components will then be tested thoroughly, according to procedures also drafted by technical assistance, and marked with a quality label before being installed in the field. The selected private operators for the installation and maintenance of the systems would receive additional training, if necessary, on the PV Code of Practice before taking their assignments. They will provide the AER with appropriate manufacturer warranty and performance bonds. To supervise the maintenance process, the AER will (i) spot-check the installed systems and (ii) conduct regularly consumer surveys. The quality control procedures that will be implemented will give the consumers a strong indication of the reliability of the systems installed and prevent complaints.

In order to ensure financial performance, selection households or communities will be according to their willingness to pay which will be demonstrated by the payment of an access fee (representing mainly the costs of batteries and bulbs) and a service charge (which can be broken into monthly or quarterly installments). This approach has the significant benefit of tying payment to continuation of service. Moreover , by phasing out the GEF subsidy, the service charges would be equal to the economic costs by the end of the project, thereby ensuring cost-recovery. Some cost reductions are also expected to be achieved over the course of the project through the procurement method and the standardization of components and installation processes. In addition, the forecast continued decline in international prices for photovoltaic modules would also contribute to cost reductions over the long term. Decreasing prices and increasing demand for household PV systems would result in a large customer base and sustainable markets with expansion potential for private operators.

2. *Critical Risks (reflecting assumptions in the fourth column of Annex 2):*

<u>Risk</u>	<u>Risk Rating</u>	<u>Risk Minimization Measure</u>
Renewable Energy Component		
Annex 1, cell "from Outputs to Objective"		
<ul style="list-style-type: none"> Continued consumer's ability to pay for the services that meet their expectations 	N	Targeted zones are the richest in Benin and their income sources are not solely agriculture-based. In addition, detailed market studies and willingness to pay before selection of consumers.
<ul style="list-style-type: none"> AER perform regulatory functions 	M	AER staff training programs and technical assistance would minimize this risk.
<ul style="list-style-type: none"> Technical performance of PV systems installed 	N	The quality controls for installation and maintenance of the systems (certification procedures for systems and installers) would minimize this risk. (see section F)
Annex 1, cell "from Components to Outputs"		
<ul style="list-style-type: none"> Unsatisfactory institutional arrangement and 	M	AER staff will be competitively selected and

managerial capability of AER		TA regularly provided for implementation, monitoring and evaluation of the project. Agreement on structure/staffing and budget before Board Presentation.
• Private sector interest and ability to undertake assignment	M	Strong incentives for private sector and adequate information provided during the bidding process.
• Government interference in selection of communities and implementation of cost recovery policy	N	During appraisal, agreement will be reached on this issue with the Government.
• Targeted training plans are designed and strictly implemented	N	TA will carry out this activity under close Bank supervision.
Overall Risk Rating	M	

Risk Rating - H (High Risk), S (Substantial Risk), M (Modest Risk), N (Negligible or Low Risk)

3. Possible Controversial Aspects (Project Alert System):

Risk	Type of Risk	Risk Rating	Risk Minimization Measure
Insufficient local responsiveness/initiative for project appraisal process (delaying Board presentation)	M	S	Strengthen local team in charge of appraisal process.

Type of Risk – S (Social), E (Ecological), P (Pollution), G (Governance), M (Management capacity), O (Other)
Risk Rating - H (High Risk), S (Substantial Risk), M (Modest Risk), N (Negligible or Low Risk)

G: Project Preparation and Processing

1. Has a project preparation plan been agreed with the borrower:

[] Yes, date submitted: MM/DD/YY [x] No, date expected: MM/DD/YY

This project has been prepared with UN trust funds and Bank-financed pre-investment credit. It has also benefited from studies sponsored by World Solar Commission. As this project is being prepared in parallel with The World Bank financed Energy Project, it will benefit from these preparatory activities. For example, the regulation and institutional framework that will be set under the larger energy project will benefit the preparation of this rural energy project.

2. Advice/consultation outside country department:

[x] Within the Bank: IENPD [x] Other development agencies:

STAP Review: (see Annex 3)

3. Composition of Task Team

4. Quality Assurance Arrangements

5. *Management Decisions:*

<u>Issue</u>	<u>Action/Decision</u>	<u>Responsibility</u>

Total Preparation Budget: (US\$000) Bank Budget: (US\$000) Trust Fund: (US\$000)
 Cost to Date: (US\$000)

GO NO GO Further Review [Expected Date]

[signature]

Task Team Leader/Task Manager: Said R. Mikhail

[signature]

Sector Manager/Director: Mark Tomlinson

[signature]

Country Manager/Director: Ted Ahlers

Annex 1
Benin: Decentralized Rural Energy Project
Incremental Cost and Global Environmental Benefits of The
Renewable Energy Component
(5 years)

Broad Development Goals

1. Benin's basic goals and policies for the development of the energy sector highlight the importance to reduce the country's heavy reliance on energy imports and promote the economic expansion of energy supplies to rural communities through the development of the country's indigenous resources, especially renewable energy for decentralized use. This strategy is expected to, inter alia, improve the provision of basic services and foster rural development.

Baseline

2. Given the low electrification rate of Benin, many rural households usually purchase kerosene and disposable batteries to meet their lighting and small power needs. Communities or villages rely on kerosene and diesel units to meet their lighting and power needs whenever possible. According to Government statistical data, kerosene represented the primary source of lighting for about 87 % of the population in 1994 and average household expenditures on commercial energy ranges between US\$2 and US\$12 per month. While some of these households (about 10 to 15% of the 385,000 households) and communities have the potential income to pay for grid-based electricity supply at prevailing tariffs, this service is neither available to them now nor is it likely to be available to them in the medium term. At the same time, the market penetration of renewable is hampered by a series of barriers as outlined in section B.2. Thus, the baseline course of action is that these households/communities will continue to rely on fossil fuel for their electricity needs, initially with current mix but slow conversion to diesel.

Global Environmental Objective

3. The project supports the GEF climate change Operational Program #6 aimed at promoting the adoption of renewable energy by removing barriers and reducing implementation costs.

4. The baseline course of action will lead to emissions of greenhouse gases (CO₂). Thus the global environmental objective of this decentralized rural energy project is the mitigation of GHG emissions from the use of kerosene for households and community lighting. Total GHG emissions are expected to be reduced by 13,000 tons of CO₂ over the lifetime of the project. This mitigation is the rationale for the GEF grant.

GEF Alternative

5. The GEF alternative to the baseline scenario is the provision of electricity service to at least 5,000 households over a five-year period through an ESCO delivery mechanism in the Zone Extrême Nord Benin, Zone Cotonnière du Nord Benin, and Zone des Pêcheries. These zones have been selected based upon the availability of solar radiation, population density in rural areas, disposable income and opportunities for

private sector operation. The GEF alternative will also include capacity building and PV markets development activities which would contribute to the removal of barriers to the adoption of PV systems.

6. Apart from the provision of electricity, additional benefits accrue to the households/communities from increased convenience and safety, improved indoor air quality and a higher quality of light (more consistent illumination, better color rendering). However, since data is insufficient to calculate these benefits, there are not included in the analyses.

Costs

7. Surveys undertaken during project preparation determined the type and size of the systems in which the target population were strongly interested: 20 and 50 Wp SHS were preferred because of the possibility of having at least 2 to 4 lighting points and/or a radio and television.

8. At present, PV is cheaper than other high quality solution like diesel units. However, PV is more expensive than the baseline solutions until market reaches a good size. Also a demonstration project of higher quality light is needed to increase consumer willingness to pay. Based on survey data and secondary information about prices, the incremental cost of PV systems for households, as compared to baseline solutions, reveals a 15-year life cycle cost of US\$ 112.86 for solar lanterns, a cost of US\$134.89 for the 20 Wp systems and a cost of US\$199.49 for the 50 Wp systems, depending on the level of service (using a 12% discount rate, as it is for the World Bank project under preparation).

System	Lifetime Cost (\$)	Lifetime Cost of Baseline (\$)	Increment (\$)	Tons of CO2 avoided
Lantern	218.66	105.75	112.91	1.37
20 Wp	497.31	362.41	134.89	2.99
50 Wp	999.75	800.26	199.49	3.49

Table 1: Incremental Cost for Households over the 15-year equipment lifetime

9. In order to smooth the transition from baseline options to GEF alternative, households and communities will receive a first cost grant based upon the level of service required. The grant will be phased out gradually and completely by the end of the project. At that time, households would pay the economic cost for service delivery. As the private operator will sell solar lanterns on a credit basis (over a 2-year period) and provide electricity service to households requesting 20 and 50 Wp systems, the first cost grant would be phased out according to the plan below:

System	Access fee (\$)	Annual Service Charges (\$)					
		1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year
Lantern		63.64	63.64	63.64	63.64	63.64	
20 Wp	18.18	36.36	36.36	18.18	18.18	9.09	0
50 Wp	36.36	54.55	54.55	27.27	27.27	9.09	0

Table 2: Phasing out of the First Cost Grant over the project life

10. For a customer requesting 20 Wp service in the 3rd year, he will receive a first cost grant of \$18.18 for the access fee, \$18.18 for the service charges the first year, \$18.18 for the 2nd year and \$9.09 for the third year (5th year of the project). The total first cost grant that he would have received at the end of the project will be \$63.64. At the end of the project, the equivalent grant received by private customers would be:

Equivalent Grant to Customers of (\$)						
System	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year
Lantern*	63.64	63.64	63.64	63.64	63.64	0
20 Wp	136.36	100.00	63.64	45.45	27.27	0
50 Wp	209.09	154.54	100.00	72.72	45.45	0

*: First cost grant for the lantern remains constant and is below incremental cost because the lantern is sold to the customer on a credit basis over 2 years.

Table 3: Equivalent GEF First Cost Grant for Households

11. In order to promote community equipment, a first cost grant will also be given to communities that will be selected. The size of the grant will be equivalent to half the access fee that would be requested.

Equivalent Grant to Customers (Communities) of (\$)						
System	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year
Street Lighting (per Unit)	90.91	90.91	90.91	90.91	90.91	0
Entertainment Center	227.27	227.27	227.27	227.27	227.27	0

Table 4: Equivalent GEF First Cost Grant for Communities

12. In addition to the first cost grant, incremental costs arise from: (i) market development activities; (ii) information campaigns and training, (iii) consultancy services (technical studies & studies).

PROJECT INCREMENTAL COSTS CALCULATION SUMMARY

	Baseline	GEF Alternative	Increment
Domestic Benefit	Lighting and small power needs	Lighting and small power needs	-
Global Benefit	Some 13,000 tons of CO2 emissions	PV market breakthrough + No CO2 emissions	PV market breakthrough + Abatement of 13,000 tons of CO2 emissions
COSTS (US\$)			
(1) Lifetime Cost of Equipment	3,577,087	4,121,423	544,336
(2) Market Development Activities	0	101,111	101,111
(3) Information Campaigns and Training	63,637	308,846	245,209
(4) Consultant Services	120,000	364,200	244,200
(5) Operation and Equipment of AER	539,091	539,091	0
(6) Contingencies	310,000	310,000	0

TOTAL PROJECT COST	4,609,815	5,744,671	1,134,856
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Assumptions: 15 year projections, 5 year project duration, 12% discount rate

Table 5: Project Incremental Costs Calculation

The requested GEF grant is rounded up to US\$ 1,135,000. Table 6 presents a breakdown of the GEF grant per year.

Annex II
Project Design Summary
(2000 - 2005)

Benin : Decentralized Rural Energy Project

Narrative Summary	Key Performance Indicators	Monitoring and Evaluation	Critical Assumptions
<p>Sector-related CAS Goal:</p> <p>1. Encourage and support the private sector response and ensure adequate provision of basic social services</p> <p>2. Promote renewable energy technology and mitigate CO2 emissions</p>	<p>1.1 Increased share of customers serviced by private operators in the power sector.</p> <p>1.2 Increased number of private operators providing electricity services in Benin.</p> <p>2.1 Increased share of photovoltaic technology in electricity generation (PV market share)</p> <p>2.2 Avoided CO2 emissions (target: >13 kt CO2 avoided)</p>	<p>Banks reports</p> <p>Ministry of Energy Reports</p>	<p>(Goal to Bank Mission)</p> <ul style="list-style-type: none"> • Uniform approach of donors • Macroeconomic stability continues
<p>Project Develop Objective:</p> <p>1. Provide rural households that have moderate-to-high cash incomes but little prospect of obtaining electricity service from the grid with affordable and reliable renewable electricity supply by establishing viable, technically-capable and privately-owned and operated solar photovoltaic (PV) equipment supply and service operations.</p> <p>2. GEF: Remove barriers and lower implementation costs of solar PV:</p> <ul style="list-style-type: none"> - lack of market information by suppliers - high up-front cost - installation/service network - implementation costs 	<p>1.1 By 2005, electricity service to > 5,000 households</p> <p>2.1 Number of SHS installed</p> <p>2.2 Size of access fee</p> <p>2.3 Consumer satisfaction > 80%</p> <p>2.4 Installation & maint. per Wp</p>	<ul style="list-style-type: none"> • Quarterly progress reports of AER • Mid-term review • Annual reports of lease companies • Implementation Completion Report. • Field surveys. 	<p>(Objective to Goal)</p> <ul style="list-style-type: none"> • Continued Government commitment to private sector participation • Sustained growth of the PV rural markets. • Private sector interest sustained • AER perform regulatory functions

<p>Outputs:</p> <p>1. Installation and operation of PV systems</p> <p>2. Improved environment for private sector provision of electricity services</p> <p>3. Training to enhance public sector capability</p> <p>4. Consumer awareness programs</p>	<p>1.1. Installation of at least 125 kWp of PV systems by 2005</p> <p>1.2 Establishment of 2 private operators in targeted areas by mid-term</p> <p>2.1 By 2001, issuance of standard contracts (for lessor and consumer); PV technical standards and certification procedures, Code of Practice.</p> <p>3.1 By 2002, 2 local staff of AER trained on regulatory issues & enforcement of certification procedures</p> <p>4.1 By 2001, 03 consumer awareness campaigns organized in targeted zones.</p> <p>4.2 By 2002, 09 consumer awareness campaigns and project promotion campaigns organized.</p>	<ul style="list-style-type: none"> • Procurement and disbursement records • Bank supervision reports • Quarterly progress reports of AER • Lease companies annual reports • Consumer surveys • Project mid-term review • Training records of AER • Consultants reports • Quarterly progress reports of AER • Consumer surveys • Records on events of the project promotion program 	<p>(Outputs to Objective)</p> <ul style="list-style-type: none"> • Continued consumer's ability to pay for the services that meet their expectations • AER perform regulatory functions • Technical performance of PV systems installed
<p>Project Components/Sub-components:</p> <p>1. Procurement, installation and operation of PV systems</p>	<p>Disbursement of IDA and GEF funds according to schedule</p>	<ul style="list-style-type: none"> • Procurement and disbursement records • Bank supervision reports • Quarterly progress reports of AER • Lease companies annual reports • Project mid-term review 	<p>(Components to Outputs)</p> <ul style="list-style-type: none"> • Unsatisfactory institutional arrangement and managerial capability of AER • Private sector interest and ability to undertake assignment • Government interference in selection of

2. Capacity Building Program		<ul style="list-style-type: none">• Training records of AER• Consultants reports	communities and implementation of cost recovery policy <ul style="list-style-type: none">• Targeted training plans are designed and strictly implemented.
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ANNEX III
TECHNICAL REVIEW
BENIN
DECENTRALIZED RURAL ENERGY PROJECT

Response to STAP Reviewer Comments:

The World Bank-GEF Project Concept Document is an upstream presentation of a project under preparation and also limited in length and detail. As such, a number of the STAP reviewer comments relate to elements of the project which exist or will be further developed during advanced project preparation and detailed in final project documentation. Specifically: administrative, coordination and communication details will be provided in a project implementation plan and an annex which summarizes social analysis and agreed participatory approach as it relates to the GEF policy on public involvement.

The following responses relate directly to STAP Reviewer comments – and have been largely incorporated into the revised project text.

Community and NGO participation. Participation and role of communities and NGOs will be further detailed during planned project preparation activities. A workshop is planned in the course of this FY to gather national stakeholders/PV entrepreneurs in order to collect their inputs about design and implementation aspects. Findings will be incorporated into a participatory approach document which will detail procedures relating to transparency and inclusion of communities and NGOs. Project design is strongly participatory in that participation of communities is based on self selection preceded by extensive information and awareness campaigns.

Training and information dissemination. Cross-fertilization would be carried out in part through the Bank thematic groups activities. The Bank's Thematic Leader for Renewable and Rural Energy, will be consulted for the organization of the "small meeting, potentially in conjunction with Village Power '98, for project participants from not only the Benin Decentralized Rural Energy Project, but also other similar efforts elsewhere (e.g. the Togo Decentralized Rural Energy Project, the PV projects in Mexico, Indonesia, and Zimbabwe, and with PVMTI participants)." Some project funds would also be allocated to address the suggestion of a study tour as provided in the comments: "...a fact-finding trip to East Africa, or a reciprocal visit by members of the PV industry there (Kenital, Kenya Solar, Total Solar, etc.) could be a cost effective and important investment." Additional mechanisms for sharing and dissemination of data will also be explored during project preparation as part of the technical assistance components.

Training and information programs are programmed in the following areas: (a) accreditation for PV technicians (see Table 6 of Annex 1); (b) Multi-media consumer awareness programs (see Table 6 of Annex 1); and (c) project team training in project management and utility regulations. The main idea is to train the project team how to assess the performance of private operators and in enforcement relating to the PV Code of Practice and the agreements of the lease contract signed by the private

operators. Additional training needs and information dissemination mechanisms will be explored during project preparation as part of the information campaigns and training component.

Option to lease. The project proposal is consistent with the STAP Reviewer's emphasis on the importance of option to lease systems.

Lanterns vs. solar home systems. Surveys undertaken during project preparation determined the type and size of the systems in which the target markets were strongly interested: 20 and 50 Wp SHS were preferred because of the possibility to have at least 2 to 4 lighting points and/or a radio and television. However, it was agreed that there was a potential market for lanterns in the poorer section of the target zone. To deal with this situation, the project will be designed so as to assist private operator to have a 20 and 50 Wp customer base large enough to allow him to carry lanterns. In this manner, private operators can develop the lanterns market on their own and provide the servicing without any additional support.

Quantification of health benefits. An economic analysis, which will look at as many parameters as possible, will be carried out as part of the advanced project preparation

Grid electrification costs. Grid electrification is not a cost-effective option for remote, low populated areas such as those considered. Experience in Benin suggests costs of line extension of about \$0.54-0.60 per kWh and kilometer for small communities (500 kWh monthly consumption). This would result in monthly bills in the order of \$90 for only 10 kilometers of distance for each household.

Other projects. The GEF projects, Zimbabwe Photovoltaics for Households and Community Use (UNDP-GEF) and the Regional Photovoltaic Market Transformation Initiative (World Bank-GEF) were reviewed as part of project preparation and have been noted.

Selection of targeted districts. Designation of specific districts for the PV electrification components were selected on the basis of market potential and suitable insolation.

Similarity between Benin and Togo systems. Available biomass and kerosene systems are roughly identical for Benin and Togo.

Comparing costs. The PV component is being submitted for consideration under OP#6, the objective of which is the promotion of renewable energy technology. As such, comparison with costs of sequestering CO₂ or management of bioenergy plantations is not necessary.

Traditional energy component. The traditional energy component has been withdrawn from consideration.

Please note that the Annex 4(a) to which the STAP reviewer refers is now labeled Annex I (a). Annex 4 (b) is not relevant to the current proposal.