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The logo for GPOBA (The Global Partnership on Output-Based Aid) features the letters 'GPOBA' in a bold, sans-serif font. The 'G' is olive green, 'P' is light brown, 'O' is dark brown, 'B' is orange, and 'A' is dark brown. A thin horizontal line is positioned below the letters.

The Global Partnership on Output-Based Aid

GHANA

GPOBA COMMITMENT PAPER

Project name: Solar PV Systems to Increase Access to Electricity Services in Ghana (P105617)

The project's objective is to increase electricity access via solar photovoltaic systems to poor rural households in remote regions of Ghana where solar photovoltaic ("PV") systems are the least cost technology option and grid service will not arrive for ten years or more. The increased access to electricity will improve the quality of life, enhance educational services, and provide income-generating opportunities. This GPOBA project is part of the solar PV component of the Ghana Energy Development and Access Project (GEDAP), where an IDA credit provides consumer financing and a Global Environment Facility (GEF) grant provides technical assistance.

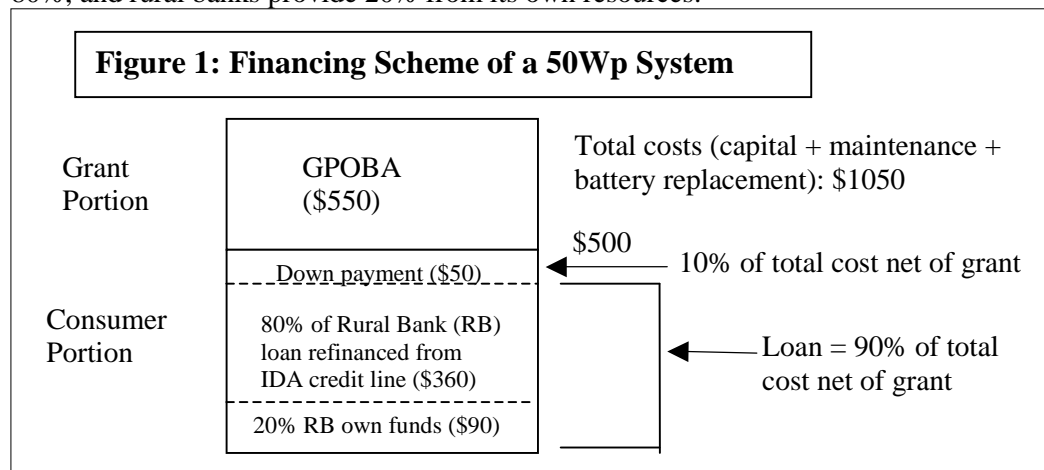
The project is pro-poor. First, it targets remote rural areas, where poverty rates are highest and the power grid will not arrive for ten years. In the target areas, 60% of the population earns less than US\$1/day, with most of the remaining population earning between \$1 and \$2 per day. Second, the project offers a wide range of PV products with a focus on promoting low-cost small-scale solar PV systems for the poor, but which even on the smaller end can still support several lights, a radio, and even a black-and-white TV for two hours. Third, the subsidies from GPOBA grants are structured in a progressive manner with higher subsidy percentages for smaller solar PV systems, which are targeted to the poorest. Specifically, the project sets a three-tier flat subsidy level for: (i) solar lanterns: 60% capital subsidy up to \$50; (ii) solar home systems (SHS) under 35 Wp: \$450, or about 60% of the total costs of supply, installation, maintenance, and battery replacement; and (iii) SHS above 35 Wp: \$550, or about 50% of the total costs of supply, installation, maintenance, and battery replacement.

The project uses the dealer credit sale model in which accredited dealers compete in an open market to sell and install the solar systems, and customers finance the purchase of solar systems through consumer credit provided by rural banks.¹ The project design has three innovative features to address the key barriers facing wide-spread dissemination of solar PV systems in Ghana: (i) a combination of GPOBA grant and IDA-financed consumer credit of up to three years through local rural banks to address the affordability barrier; (ii) service contracts that bundle supply, installation, maintenance, and battery replacement services to ensure project sustainability and loan repayment; and (iii) GEF-funded technical assistance to dealers for developing the market and setting up presence in deep rural areas.

The project aims to install 15,000 solar lanterns and SHSs, benefiting 90,000 people. This is three times the number of PV systems currently installed in Ghana. Using an international standard 50 Wp system as

¹ The dealer model is different from the medium-term contracts model used in the GPOBA-financed Bolivia SHS project. The dealer model is more suitable for Ghana's nascent market and sector with a low electrification rate and only three major existing solar dealers, because (i) the dealer model promotes competition within each target area and encourages new market entrants while the concession model gives exclusive right to the winner to develop the market in each target area; and (ii) the concession model has not proven to be very successful in Africa due to its complexity in implementation and regulation and a few number of bidders for such projects.

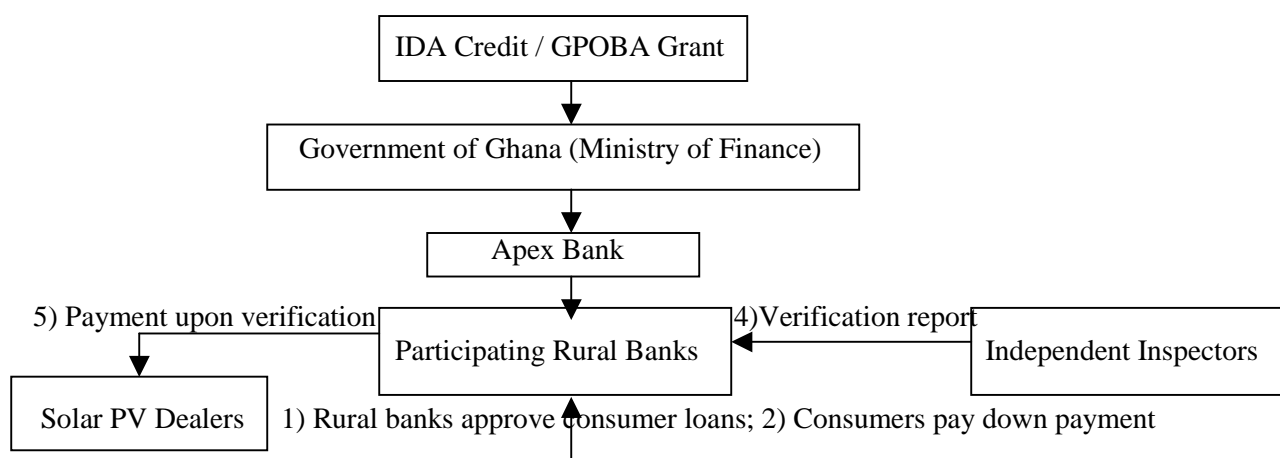
an example, the financing structure is demonstrated in Figure 1: (i) GPOBA contributes to 50% of the total costs of supply, installation, maintenance, and battery replacement; and (ii) the consumers pay for the other 50% – 10% as down-payment and 90% as loans. Of the consumer loans, the IDA Credit refinances 80%, and rural banks provide 20% from its own resources.



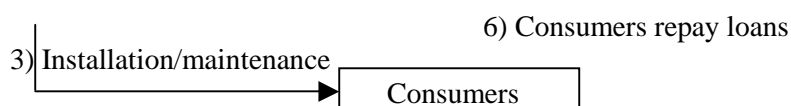
The GPOBA subsidy level was determined by the gap between the indicative costs of installation, maintenance, and battery replacement, and the estimated ability to pay of potential consumers. Currently, households in the targeted areas spend an average of \$6/month on kerosene and batteries. The monthly cost of a 35Wp SHS after GPOBA subsidies, for example, is a little more than \$8 per month – which is still affordable². But compared to existing alternatives, solar PV provides dramatically improve quality of lighting, increase convenience and safety, and provide better indoor air quality and more productive uses such as cell phone, shops, and street lighting. To date, demands for solar lanterns and SHS are strong; however, poor consumers can not afford them due to the high upfront costs. In addition, the economic analysis shows that the solar PV systems have a robust EIRR of 19%, as the marginal utility of the first few kWh of energy has high value to the consumers and the willingness to pay is very high.

Figure 2 shows the flow of funds. Apex Bank, the quasi “rural central bank” in Ghana, will be the implementing agency. The dealers bear pre-financing and performance risk, while the rural banks bear non-payment risk. GPOBA disbursement is output-based against well-defined milestones, as described in Table 1.

Figure 2: Flow of IDA/GPOBA Funds



² Experience in many developing countries has demonstrated that consumers can pay up to 5-10% of their monthly household income for electricity, and in many cases, people can pay more. \$8 per month is less than 5% of a household’s monthly income, estimated at \$1 per capita per day and a household of 6 people.

**Table 1: Indicative Costs and GPOBA Subsidies for Solar PV Products (US\$)**

Type of solar PV system	Supply and installation	Three-year maintenance	Battery replacement	Total Cost	GPOBA subsidy	Subsidy % of total cost
Solar lanterns	80	-	-	80	50	60%
SHS 35 Wp	550	130	70	750	450	60%
SHS 50 Wp	800	150	100	1050	550	50%

The project is sustainable, because from a technical point of view, the service contracts oblige the dealers to provide maintenance services for three years, and the Apex Bank will sign an agreement with dealers to continue maintenance services after three years. From a financial point of view, consumers can afford to purchase and maintain the systems given GPOBA subsidies and consumer credit. Over the long term, the project is expected to demonstrate a viable business model for dissemination of solar PV, so that the government would continue to provide subsidies from the Rural Electrification Fund. From a resource point of view, solar PV is renewable, and there is abundant sunlight. Finally, from a market point of view, once the affordability barrier is addressed, the solar market is expected to expand, and costs to come down.

The project's technology choices are consistent with and complementary to other initiatives such as the IFC Bottom of the Pyramid Lighting project and the Bank's Lighting Africa initiative. In particular, this GPOBA project supports the IFC/GEF initiative in Ghana by creating the actual market for LED, as both solar lanterns and SHS can use LED lighting. In addition, the consumer credit model under this project will help accelerate market development of LED products by addressing consumer affordability issues.

Project Data Sheet

Project name: Solar PV Systems for Rural Poor in Ghana

Scope: Delivering sustainable electricity service with solar home systems (SHS) and solar lanterns in rural Ghana

Total project costs: US\$12.65 million (GPOBA: \$4.75 million; IDA line of credit: \$3 million; GEF technical assistance: \$3.5 million; Participating rural banks consumer loans \$0.75 million; and User contributions: \$0.65 million)

Total GPOBA funding requested: \$ 4.75 million. The original application was for a GPOBA investment subsidy of \$6 million, but subsequent market survey for consumers' ability to pay in the targeted areas revealed that approximately \$4.1 million of GPOBA subsidy funding is required, as most of the poor customers can only afford to purchase solar lanterns and small SHSs, which require a lower amount of subsidy. Including costs for monitoring and verification and grant agreement supervision, the total new GPOBA funds requirement is \$4.75 million:

- (i) \$4,100,000 for investment subsidies
 - (ii) \$ 450,000 for monitoring, verification, auditing, impact evaluation, and transaction support
 - (iii) \$ 200,000 for Bank supervision over three years
- Total: \$4,750,000**

Funding leveraged from other sources:

- GPOBA will contribute approximately 50% of the SHS costs.
- Consumers will contribute the other 50% of the SHS costs: 10% as down payment and 90% as consumer loans from the rural banks. Of the consumer loans, 80% would be financed by the IDA Credit, and 20% by rural banks' own funds.
- For solar lanterns, GPOBA will cover 60% of the costs, while consumers will pay for the rest³.
- GEF funds will provide TA to the private sector dealers and micro-finance institutions.

GPOBA Funding Source: DFID (100%)

Outputs:

- Increased access to sustainable electricity services through solar PV systems for remote rural households. A total of 15,000 solar PV systems will be installed, including (a) 7,500 solar lanterns with an average of 5 Wp; (b) 4,500 SHS under 35 Wp; and (c) 3,000 SHS above 35 Wp.
- Provision of sustainable services by the solar dealers over three years including maintenance visits, warranty, and one battery replacement.

Expected beneficiaries: The project will directly benefit 15,000 poor households, or 90,000 beneficiaries.

Economic rationale: EIRR is 19%; FIRR (from the household perspective) is 8%

GPOBA subsidy "efficiency": \$45/person without TA and transaction costs (\$53 with TA etc)

Targeting: (i) *geographic*: focusing on the remote poor rural areas of the country where poverty rates are highest and the power grid will not arrive in 10 years. In targeted areas, 60% of population earn less than

³ For the remaining \$30, the project team has proposed rotating savings and credit associations, whereby a group of consumers (usually women) collectively put down \$30, and each consumer take turns to purchase the solar lanterns. This system is used locally and known as "susu".

US \$1/day, with most of the remaining population earning between US \$1/day and US \$2/day. GNI per capita in Ghana is \$450; (ii) *choice of system size*: promoting low-cost small-scale solar PV systems including solar lanterns for the poor; (iv) *pro-poor subsidy design*: a three-tier subsidy system for solar lanterns, SHS under 35 Wp, and SHS above 35 Wp, with a de facto progressive subsidy scheme of higher subsidy rates for smaller systems; (v) *consumer credit*: providing consumer credit up to three years for the poor to purchase SHS; and (vi) *low down payment*: 10% down payment is affordable yet ensures ownership.

Grant recipient: Government of Ghana (GoG). Apex Bank will be the implementing agency.

Financial Management: Same as the IDA-financed GEDAP project

Procurement: Procurement assessment was conducted for the ARP APEX Bank as it will be the implementing agency. The dealers will use established private sector or commercial practice procurement methods acceptable to the Bank, as the dealers will contribute their own resources to procure goods. Only dealers accredited by the Energy Commission can participate in this program.

Disbursement: GPOBA advances funds to GoG/Apex Bank, who then disburses to rural banks. The rural banks disburse funds to the dealers based on the following schedule: For SHS: 80% after installation; 5% against completion of maintenance services at the end of Year 1 and 2; and 10% final payment against one battery replacement and satisfactory maintenance services at the end of Year 3. For solar lanterns: 100% after sales with one-year warranty.

Environmental clearance: ISDS submitted and reports posted on Infoshop.

Government endorsement: Yes, letter of confirmation submitted to GPOBA.

TA to date received: \$155,000 (of which \$20k for supervision); about \$80k committed.

Responses to the Comments Raised by the Panel of Experts at Eligibility Stage

1. Dealer

Whether dealers can obtain working capital:

- To date, working capital has not been a major issue for solar dealers in Ghana, though the financing cost is high. As a matter of fact, the ability for dealers to find working capital is actually an indication that the dealers have sufficient capability to carry out the solar PV program.
- The dealers are concerned with the potential long delay of payment and resulting financing charges on working capital. The project will require rural banks to pay the installed costs to dealers within one month period after installation and verification. In addition, consumers pay 10% down payment prior to installation, and the rural banks can immediately disburse these down payments to dealers.
- The IDA/IFC MSME project is intended to provide working capital and guarantees for SMEs like solar dealers.

How to mitigate non-payment risk: The rural banks bear 100% non-payment risk. This will be dealt with in the following ways:

- As the risk is greater after the first year, the team is exploring the following options: (1) to set up a loan guarantee fund initially financed by GEF and then supported by a portion of interest reflows to cover partial default risk; and (2) in the case of theft or weather disaster, Apex bank is encouraged to purchase insurance, and pass the cost on to the interest rate of the loans.
- Training rural banks on screening and cash flow analysis to select clients for term loans;
- Requiring security and guarantees from clients following rural banks' normal requirements;
- Monitoring clients;
- Following rural banks' normal procedures to inform clients in arrears in the incidence of non-payment;
- Repossession of equipment in case of default. In Ghana, it is legal for the rural banks to repossess (or hire an agency that specializes in repossession) the equipment in case of default, as long as this is written in the loan agreements. However, the real problem is that the dealers are reluctant to commit to pay meaningful residual value to the rural banks for the repossessed systems because of the absence of a secondary market for these systems.
- As suggested by the Panel of Experts, the team considered an alternative business model of leasing, where the rural banks own the systems, and the ownership will be transferred to the consumers when the loan is fully repaid. However, the rural banks were not receptive to this model – feeling that the sector is not yet ready for this innovation in Ghana. Considering that most rural banks have a low capacity in Ghana, and this project aims to introduce new financing products for rural banks to provide longer-than-usual term financing for solar PV system, it was decided that it is better not to introduce the brand new concept of leasing at this stage.

2. Risk Exposure of Rural Banks: This was determined not to be a major issue. In 2006, the average net assets of rural banks were about \$2.5 million, with an annual advance (loan portfolio) of about \$1 million. If a typical rural bank makes 20 loans with an average outstanding balance of \$1,000 for SHS during a year, it would account for only 2% of its loans. We have set a ceiling of maximum of 5% of loan portfolio going to SHS. The rural banks have to maintain 5% of their capital as deposit at the Apex Bank, which can simply deduct the quarterly payment due from the rural banks' account in the case of default, therefore, there is negligible risk of non-repayment to the Apex Bank.

3. High Costs and Cost Benefit Analysis:

Why the costs are high: The costs of solar PV in Ghana are high by Asian standards, but similar to those in Africa and Latin America. It is also important to note that the cost of solar PV systems escalated by 20-30% over the past two years worldwide, due to a significant shortage of silicon that in turn was caused by

high demand in the OECD countries. Despite this, a cost benefit analysis of introducing the SHS to remote areas where the grid will not come in 10 years demonstrated that it has a robust EIRR of 19%. Based on recent data, the actual installed price of a 50 Watt-peak system is in the range \$ 800-900 in Honduras, \$ 850 in Peru, \$ 825 in Tanzania, and \$830 in the Philippines. Thus, the installed costs of \$800 in Ghana⁴ (Please see Table 1 in Executive Summary) are comparable to the actual costs in many other countries.

Cost benefit analysis: The first few units (kWhs) of energy consumed by households have very high value to them. This is borne out by the high unit cost of dry cell batteries, which even poor households use occasionally, and the cost of kerosene per unit of light (lumen) delivered. Correspondingly, the convenience of being able to get higher quality light on a reliable basis by simply turning on a switch provides high value even for the poor households. For these reasons, in Ghana, the estimated value of the benefits, measured in terms of **Willingness-to-Pay for electricity** including avoided costs of kerosene and battery plus consumer surplus, is as high as \$ 1.93/kWh, based on a recent consumer survey. As a result, **the EIRR of solar PV systems is estimated at 19%.**

4. Involvement of Government of Ghana: The Government has agreed that Apex Bank will be the implementing agency for this project, and the involvement of the government is minimal during project implementation. Apex Bank is implementing a number of Bank projects, where funds go through the government, and the established funding transfer mechanism has been smooth and not experienced serious delay.

5. Sustainability of the Project after Three Years: From a technical point of view, the Apex Bank and dealers will sign an agreement for the dealers to continue maintenance services after the three-year service contract. The IDA project agreement required the Apex Bank to manage a revolving fund on behalf of the government to support continued maintenance services and additional solar PV systems after the project completes. From a financial point of view, once this project demonstrates that solar PV is a viable option for electrification in remote rural areas and the dealer credit sales model is a viable business and financing model to implement solar PV programs, the Rural Electrification Fund is expected to continue to provide subsidies for solar PV, as currently the government is providing 100% capital subsidies to electric utilities for grid extension but no subsidy for solar PV.

6. Taxes/Import Duties and Dealer Competition:

Certification/license: The Energy Commission will certify, or hire contractors to certify: (1) all the installed systems comply with technical standards; and (2) all the dealers and installers meet minimum requirements. The project will provide these standards and criteria.

Tax/duties: Currently, solar PV systems are tax exempt, but batteries are not. This should not be an entry barrier for new players.

How to promote competition and prevent collusion of existing dealers:

- This project adopts a dealer credit sale model, in which the dealers can compete in the open market. The experience from Asia implementing similar business models demonstrates that as long as there are sufficient incentives in the form of subsidy provided to dealers, they tend to compete for the largest share of the market. In Indonesia, for example, where the dealer model was first demonstrated and there are frequent instances of collusion among vendors in other sectors, collusion of solar PV dealers has not been observed;
- GEF funding will be used to provide technical assistance for new market entrants through (1) sensitization of solar PV products and creating market awareness; (2) matching grants to the private

⁴ For comparison, the GPOBA-financed Bolivia SHS project estimates \$850 as installed costs (for a 50 Wp)

sector for business plans, feasibility studies, loan applications, setting up local solar dealerships, etc. to help new entrants to the market; and (3) training.

7. **Funding and Structure of Subsidy** The project will adopt three tiers of flat subsidy levels for: (1) solar lanterns: 60% capital subsidy up to \$50; (2) SHS under 35 Wp: a flat subsidy of \$450, equivalent to 60% of the estimated costs of supply, installation, maintenance, and battery replacement; and (3) SHS above 35 Wp: \$550, equivalent to 50% of the estimated costs of supply, installation, maintenance, and battery replacement. This is de facto pro-poor progressive subsidy scheme, in which smaller systems benefiting from higher subsidy levels. To further address affordability issues, consumers will pay 10% of down-payment for the SHS.

ABBREVIATIONS AND ACRONYMS

AGSI	Association of Ghana Solar Industry
CAS	Country Assistance Strategy
CFL	Compact Fluorescent Lamps
EIA	Environmental Impact Assessment
EMP	Environmental Management Plans
EPA	Environmental Protection Agency
FM	Financial Management
GDP	Gross Domestic Product
GEDAP	Ghana Energy Development and Access Project
GEF	Global Environment Facility
GHG	Greenhouse Gas Emissions
GoG	Government of Ghana
GPOBA	Global Partnership on Output-Based Aid
GPRS II	Ghana's Growth and Poverty Reduction Strategy for 2006-2009
IFC	International Finance Corporation
IFMIS	Integrated Financial Management Information System
IFR	Interim Financial Reports
LED	Light Emitting Diode
MDGs	Millennium Development Goals
MoE	Ministry of Energy
MoFEP	Ministry of Finance and Economic Planning
MSME	Micro, Small, and Medium Enterprises
NES	National Electrification Scheme
PFI	Participating Financial Institutions
PRSC	Poverty Reduction Strategy Credit
PV	Photovoltaic
REA	Rural Electrification Agency
REF	Rural Electrification Fund
SHEP	Self-Help Electrification Program
SHS	Solar Home Systems
SSA	Sub-Saharan Africa

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A. STRATEGIC CONTEXT AND RATIONALE

A.1 Country and Sector Context

1. The Government of Ghana (GoG) is committed to reducing poverty by increasing per capita income and decreasing income disparities between urban and rural areas. A recent Living Standard Survey has shown that Ghana's overall poverty level declined from 51.7 percent in 1991 to 28.5 percent in 2005. However, in rural areas where access to modern infrastructure services is lower, the poverty level is much higher than in urban areas, 39 percent and 11 percent respectively.⁵

2. Ghana, with a population of 22 million, has a GNI per capita of only US\$450 (2005). The Government's target is to reach a per capita income of at least US\$1,000 by 2015, which will require GDP growth at an average annual rate of 8 - 10 percent over the next eight years. Inadequate infrastructure is a major constraint to this high level of growth, and recent analysis shows that improved access to infrastructure such as energy would accelerate economic growth.

3. Ghana's electricity access rate has doubled from 28 percent in 1989 to about 54 percent now, under a National Electrification Scheme based mainly on extension of power from the grids. However, Ghana is currently suffering from a power shortage, which makes it difficult to serve additional rural customers. With outreach to more remote areas, the cost of rural electrification is increasing, and alternative models of off-grid options, particularly renewable energy, become more attractive.

4. Solar photovoltaic (PV) systems are usually the least-cost option to provide electricity services in remote and dispersed rural areas. It is an integral part of the Government's efforts to achieve its electrification goals. In addition, off-grid solar PV is playing an increasingly more important role in Ghana given the current power shortage.

5. However, wide dissemination of solar PV systems faces a few key challenges: (i) most rural consumers can not afford the up-front investment costs; (ii) financial services in rural areas are weak and do not provide term lending products; (iii) even if the rural banks provide consumer credit for solar PV products, the costs of servicing debt for the purchase of solar PV systems exceed consumers' ability to pay; (iv) solar PV dealers do not yet have a presence in deep rural areas; and (v) maintenance services are usually lacking, and consumers do not have money to replace the battery. As a result, sustainability has been a major issue.

6. Most rural customers in Ghana have a low ability to pay. Based on the consumer survey in Ghana, an average rural household currently pays about US\$5-6 per month for kerosene, dry cell battery, and candles in un-electrified areas. Because of the high upfront cost of most solar home systems (SHS), only a small percentage of rural households can purchase them on a cash basis. Therefore, market penetration of solar PV systems is very low in Ghana now, with less than 5,000 installed solar PV systems nationwide, even if the solar PV system is cost-effective.

A.2 Rationale for GPOBA Involvement

7. This GPOBA application is part of the IDA/GEF Ghana Energy Development and Access Project (GEDAP), which was approved by the Bank Board in July 2007. Under the Electricity Access Component, a solar PV sub-component will (1) on-lend the IDA Credit to participating rural banks, through ARB Apex Bank Ltd, to provide 80% long-term liquidity for financing consumer loans for SHS,

⁵ More than 60 percent of Ghana's population lives in rural areas

while the rural banks will contribute 20% of the loans; and (2) provide a GEF grant to build capacity of solar dealers, Apex Bank, and rural banks. However, even when long-term consumer credit up to three years is provided, the monthly payment for a typical SHS is still substantially higher than rural customers' ability to pay for kerosene and battery. Therefore, GPOBA funding is requested to provide a partial subsidy to bring down the costs of solar PV systems to match rural consumers' ability to pay.

8. In addition, this project is under the context of Ghana's rural electrification program. Ghana has already reached more than 50% electrification rate, and off-grid renewable such as solar PV can play an important role in reaching the rest of the population. The government and the GEDAP project (IDA funds) provide 100% capital subsidy for the electric utilities to extend the grid to rural areas. GPOBA support would provide a level playing field between grid extension by utilities and off-grid by private sector through partial subsidies to solar PV.

9. This project meets the eligibility criteria established by GPOBA and its Panel of Experts, as described below.

- a. **Targeting the poor:** The project design uses several pro-poor targeting methods: (1) *geographic*: the main project beneficiaries will be remote rural communities, who have the highest level of poverty in Ghana. In the rural areas being targeted under this project, 60% of population earn less than US \$1/day, with the remaining population earning between \$ 1 and \$2 per day. In addition, the average electrification rate in targeted areas is 15%, far below the national average of 24% in rural areas and 54% nationwide. (2) *Choice of system size*: Users can chose between several system sizes, from solar lanterns to smaller systems with lower costs that have been included to enhance the affordability of modern lighting services to the poorest; (3) *pro-poor subsidy design*: a *three-tier subsidy system* for solar lanterns, small SHS under 35 Wp, and large SHS with a *de facto* progressive subsidy scheme of higher subsidy rates for smaller systems; (4) *consumer credit*: providing long-term consumer credit up to three years for the poor to purchase SHS to further increase affordability; and (5) *lower down payment*: only 10% down payment is required for the poor consumers.
- b. **Risks borne by providers and financiers:** A commercial, market-oriented dealer credit sale model is used. The dealers bear pre-financing risks of importing equipment, stocking it in the targeted areas, and installation, and are obligated to take the performance risks. The participating rural banks bear 100% of the credit non-payment risks.
- c. **Private financing and user contribution leveraged:** The dealers will use their own funds to purchase the equipment upfront, marketing, and set up service centers. The participating rural banks will provide 20% of loan funds from their own resources, while refinancing 80% of loan amounts from the IDA Credit. The consumers will pay the cost of supply, installation, maintenance, and battery replacement, after subsidy is taken into consideration.
- d. **Sustainability:** As maintenance has been a major issue for sustainability in previous SHS projects worldwide, the proposed financing structure covers 3-year maintenance services and one battery replacement. After the project is complete, the Apex Bank and dealers will sign an agreement for the dealers to continue maintenance services. Over the long term, the project facilitates development of commercial markets both for SHS and solar lanterns. Subsidies are designed to cover the relatively high initial start-up costs for penetrating new, remote markets, with the expectation that experience and competition would drive prices down over time and reduce the need for subsidy. The demonstration effect of successful, well-maintained systems during the project period are expected to help enlarge the demand in the targeted areas to a sustainable, commercial level.

- e. **Innovation:** The proposed project combines IDA, GEF, and GPOBA support and could serve as a template for future projects. The proposed activity is innovative at several levels: (i) it introduces a dealer credit sale model to Ghana, which is proven to be an effective approach to disseminate solar PV systems in other countries; (ii) the proposed OBA design bundles supply, installation, and maintenance costs into one incentive package to ensure sustainable maintenance services; (iii) with IDA Credit providing consumer financing, this project targets the poor by providing financing solutions to address affordability issues, which is the No. 1 barrier to solar PV systems in Ghana; and (iv) this project can demonstrate a private sector approach to deliver off-grid services in Ghana, which is new. If the proposed model can be expanded beyond a pilot scheme and become a key mechanism for off-grid electrification in the Government's access expansion plan, it presents a unique opportunity to establish a precedent that could be replicated widely.

A.3 Higher Level Objectives to Which the Project Contributes

10. The higher level objective to which the project contributes is reducing poverty through combination of measures to increase economic growth and reduce inequalities in income. This objective is the core of the Government's GPRS. In support of this objective, the GPRS II emphasizes working toward the development of an energy sector that would ensure secure and reliable supply of high-quality energy services for all Ghanaian homes (urban and rural), businesses, industries and the transport sector. Government's objective is to increase electricity access from 54 percent to 75 percent by 2015 with the ultimate aim of universal access. The GEDAP project has plans of monitoring and evaluation of the impacts of electricity services on poverty alleviation. In this context, the GPOBA project will also undertake an impact evaluation (funded in part by GPOBA) to better understand the impact of solar PV on the poor households.

11. The project will help advance the Bank's *Country Assistance Strategy 2004 - 2007* (Report No. 27838-GH of February 20, 2004) for Ghana, which the Bank has aligned with the GPRS II. In particular, the CAS has cited deficiencies in the supply and quality of energy services as a major bottleneck to achieving Ghana's economic objectives and has targeted the sector for substantial reform. Furthermore, the CAS has included the project as key element in its lending program. By increasing access to electricity, the project will contribute to the provision of infrastructure that could lead to new business and thereby support the CAS objective of accelerating economic growth and employment. The project will contribute to breaking the constraint to growth so that growth can be sustained at or above 6 percent. Also the project will contribute to the achievement of the MDGs for human development (also part of the CAS) by reducing imbalances in access to electricity between urban and rural areas.

B. PROJECT DESCRIPTION

B.1. Project Development Objective and Key Indicators

12. The project's objective is to increase access to electricity services in remote rural areas of Ghana *via* solar photovoltaic systems. Increased access to electricity will improve the quality of household life, educational and health services provided, and also provide an opportunity for some income-generating activities.

13. The key output indicators of GPOBA support are:

1) Number of solar photovoltaic systems installed: A total of 15,000 solar PV systems will be installed, including (a) 7,500 solar lanterns with an average of 5 Wp; (b) 4,500 small SHS under 35 Wp; and (c) 3,000 large SHS above 35 Wp.

2) Provision of sustainable services by the solar dealers over three years including maintenance visits and battery replacement.

14. Current market demand in Ghana shows that (a) solar lanterns are popular for the majority of the poor households in the Northern region (see map in Annex 6) with dispersed populations and compound houses because it is mobile and affordable; (b) smaller SHS up to 35 Wp is also a popular product for the poor rural households supporting a few lights (a 35 Wp system can support a black-and-white TV for 2 hours); and (c) larger SHS above 50 Wp that can support income generation activities such as shops, restaurants, street lighting, etc. accounts for a smaller share of the market by peri-urban households and less poor rural households. Therefore, the project focuses on these three series of products.

B.2. Project Design and Components

B.2.1 Project Design

Project Design: IDA, GEF, GPOBA

15. To overcome the affordability issue and ensure sustainability of the systems, the project design has two innovative features: (1) it will support a dealer credit sale model, where dealers compete in an open market, and customers finance the purchase of the solar systems through affordable consumer credit or microfinance from participating rural banks⁶; and (2) the project will bundle supply, installation, maintenance, and battery replacement services into one service package to ensure project sustainability and loan repayment.

16. The project is part of the IDA/GEF Ghana Energy Development and Access Project (GEDAP), which includes a component for Electricity Access and Renewable Energy. The government provides 100% of capital subsidy for electric utilities to extend grids to rural areas, but grid extension alone cannot achieve Ghana's goals for access to energy by the year 2020. Therefore, the solar PV sub-component complements grid options to achieve access expansion. The solar PV sub-component is jointly funded by IDA, GEF, and GPOBA.

⁶ This model builds on successful experience from Bangladesh and Sri Lanka.

- 1) The IDA Credit will be on-lent to participating rural banks, through ARB Apex Bank Ltd, to provide the necessary long-term liquidity for financing consumer loans for SHS⁷. The IDA line of credit will provide 80% long-term liquidity to participating rural banks, through ARB Apex Bank, for consumer loans, and the rural banks will contribute 20% of the loans. The participating rural banks will bear the repayment risk. Repayment of the line-of-credit will be retained in a revolving fund to provide additional consumer credit to purchase Solar-PV systems, which will be managed by ARB Apex Bank on behalf of the government. This line-of-credit allows rural banks to provide loans with repayment terms of up to three years (as opposed to current short-term loans up to 6 months) to reduce consumers' monthly payment for a SHS.
- 2) The GEF Grant will provide (i) up to 50% in a matching grant to renewable energy project developers, who will pay for the other 50% of the costs, for business plans, market development, feasibility studies, loan application documentation, set-up of local Solar-PV dealership, etc.; (ii) technical assistance to the Association of Ghana Solar Industry (AGSI) to conduct Solar- PV promotion campaigns and training programs to local Solar-PV dealers; and (iii) capacity-building to ARB Apex Bank and participating Rural Banks.
- 3) The GPOBA grant is requested to finance output-based subsidies for the costs of supply, installation, three-year maintenance services, and one battery replacement of solar PV systems in remote rural areas, where the power grids will not reach over the next 10 years, consumers have ability to pay, and the rural banks have a track record of high repayment rates.

17. In sum, the project design addresses the key barriers facing wide spread dissemination of solar PV systems in Ghana:

- Most rural consumers cannot afford the high up-front capital costs. This is addressed by a combination of consumer credit from rural banks, and the GPOBA grant.
- Rural banks have only short-term liquidity and are not familiar with lending products for solar PV. This is addressed by a combination of IDA long-term credit refinancing and GEF-funded capacity building activities.
- Solar PV dealers do not yet have a presence in deep rural areas. This is addressed by GEF-funded technical assistance (TA), and potential market size, once the affordability barrier is addressed.
- Many solar systems breakdown after a year or two without warranty service. This is addressed by a combination of stringent technical standards for the solar systems sold under the project and a service contract under which the dealers are obliged to maintain the systems for three years.

Technology Selection

18. The project aims at providing sustainable access to electricity for remote/dispersed households. Solar Home Systems are the most cost-effective technology for Ghanaian rural dispersed households, due to their ability to provide independent service where extension of the grid system using centralized generation is not feasible. SHS typically include a PV module, a battery, a charge controller, wiring, efficient DC lights and outlets for other DC appliances. A standard SHS can operate several CFLs and/or LEDs, a small television, a radio or cassette player, cell phone and a dry cell charger. SHS can eliminate

⁷ The IDA credit will be on-lent from the Ministry of Finance to the participating rural banks through ARB Apex Bank at a variable interest rate of the 182-day Treasury bill rate plus 25 to 50 basis points. The Bank OP 8.30 requires that the rural banks will charge the SHS purchasers commercial interest rates (on a declining balance basis) to avoid market distortion.

or reduce the need for candles, kerosene, liquid propane gas, and/or battery charging, and provide increased convenience and safety, improved indoor air quality, and a drastically improved quality of light for reading (up to 200 times brighter than kerosene lamps).

19. The advantage of the solar home systems is that they can meet local demand in a flexible way, providing differentiated products adjusted to the local capacity to pay. The size of the offered systems under the proposed project would vary from solar lanterns for lighting only to large SHS for productive applications. All proposed project areas have been analyzed for alternative technologies and only those where SHS are least-cost solution were included in the proposed project.

B.2.2 Project Components

20. The project requests for a total of \$4.75 million from GPOBA, including (i) \$ 4.1 million investment subsidies; (ii) \$0.45 million client-executed transaction support; and (ii) \$0.2 million for Bank supervision. Please see table below:

Component	GPOBA contribution (US\$M)
Solar Lanterns	\$ 50 x 7,500 = \$0.4M
Small SHS under 35 Wp	\$450 x 4,500 = \$2.0 M
Large SHS above 50 Wp	\$550 x 3,000 = \$1.7M
Transaction support TA	\$0.45M
Bank supervision	\$0.2M
Total	\$4.75M

Subsidies for Solar PV Systems (US\$4.1 million)

21. The project will fund output-based subsidies to private dealers for the sale, installation, and after-sale service for solar home systems of different sizes for rural households. The dealers are obliged to (i) supply and install the systems; (ii) provide satisfactory maintenance service over three years including at least one visit a year to each user and timely repair service (within two weeks) after consumers' requests; and (iii) one battery replacement at year 2 or 3. The consumers are the ultimate beneficiaries of the subsidies, as the consumers only need to pay 40-50% of the total costs to purchase and maintain SHS after GPOBA subsidies.

22. The funding structure varies by the system size, as dealers offer a variety of products ranging from solar lanterns for poorer households to large SHS for productive and institutional uses. After consultations with solar dealers, the project sets a three-tier flat subsidy levels for three products: solar lanterns, small SHS of 35 Wp, and large SHS of 50 Wp. The dealers will sell solar PV systems in an open market, which will determine the price. The following table lists indicative costs for these three solar PV products, along with the proposed GPOBA subsidy. The costs include (i) initial capital and installation cost, (ii) operation and maintenance for three years, and (iii) replacement of a battery. While the cost of panels and batteries rises more or less proportionately to the size of the system (in Watt-peak), because the cost of installation and maintenance is relatively constant across different sized systems, the total cost is disproportionately high for smaller systems.

Type of solar PV system	Supply and installation (\$)	Three-year maintenance cost (\$)	Battery replacement cost (\$)	TOTAL (\$)	GPOBA subsidy (\$)	Subsidy % of total cost
Solar lanterns	80	-	-	80	50	60%
Small SHS 35 Wp	550	130	70	750	450	60%
Large SHS 50 Wp	800	150	100	1050	550	50%

23. The grant is structured to be pro-poor through a higher rate of subsidy on lanterns and smaller systems for the poorer customers and a lower subsidy on larger systems for better-off customers to operate home appliances or income-generating activities. For the solar lantern and the 35 Watt-peak system, the GPOBA subsidy is about 60% of the total cost, whereas for the larger 50 Watt-peak system, the subsidy is about 50% of total cost. To avoid consumers taking advantage of the subsidy scheme such as purchasing two small SHSs rather one large SHS to capture higher subsidies, each household will have a limit of one subsidized SHS and 3 subsidized solar lanterns per year. The subsidy amounts and structure will be reviewed periodically and adjusted if needed to ensure that they are achieving project objectives.

24. The subsidy levels are determined on the basis of the costs and consumers' ability to pay, with the assumption that the subsidy will make the products affordable to the target consumers (see Economic Analysis section below). Otherwise, there will not be a viable market for these systems. The affordability levels are based on the actual expenditures on kerosene and batteries of the target households. At the same time, it is also important to ensure that the dealers believe that they can run a profitable business, taking account of their costs. The project team has had extensive discussions with the potential dealers in Ghana in this regard. Finally, as a check, the proposed subsidies have been compared to the subsidies in similar projects in other countries.

25. It is important to note that the cost of solar PV systems escalated by 20-30% over the past two years worldwide, due to a big shortage of silicon that was caused by high demand in the OECD countries. In addition, the certified panels of less than 100 Wp are especially in short supply, as the main manufactures are busy producing large panels for the Western market. While the costs of solar PV in Ghana are high by Asian standards, they are comparable to the actual costs in African and Latin American countries, as shown from the comparison of SHS costs in other countries listed in the table below.

Country	Installed Cost of 50 Watt-peak system (\$)
Ghana	800 ⁸
Tanzania	825
Peru (55 Wp)	850
Honduras	800-900
Philippines	825-835
Bolivia	850

Note: Cost data based on data collected for preparation or implementation of World Bank projects.

⁸ Please note that this is installed costs of SHS (\$800) including capital costs of the system and installation costs (the first column in Table 1), while the total costs (\$1050) in this Paper include installed costs, 3-year maintenance costs, and one battery replacement costs.

26. In addition, Ghana is a relatively high-cost market for the following reasons:

- *Small market size:* Currently, there are only 5,000 solar PV systems installed in Ghana.
- *Low population density* in remote rural areas, particularly in the Northern region;
- *Lack of distribution channels* outside the major cities;
- *High cost of transport* to the north (and poor roads affecting delivery around the north to the target areas that are by definition off the main grid and roads); rising fuel prices have exacerbated the already high costs of installation and servicing in remote areas;
- *High cost of financing:* stocking of the equipment will have to be pre-financed by the companies at interest rates around 22.5-25%;
- *Exchange rate:* Ghana is generally a relatively high-cost country, and inflow of aid and remittances has prevented the Ghanaian Cedi from depreciating over the last couple years, despite inflation rates higher than the rest of the world; dollar depreciation has further tended to raise prices in dollar terms;

27. The prices in Ghana are influenced by international and local trends. If the worldwide solar PV panel supply catches up, international Solar PV prices may come down. The local costs can be expected to come down over time as:

- The market in the targeted areas becomes established, both in terms of volume and experience in the costs of installation and maintenance;
- Competition among different dealers increases;
- New products and technologies (e.g., LED) come into the market.

28. At present, however, the costs of SHS are considered to be generally beyond the reach of potential users in the relatively remote, poor areas being targeted. Under the project, the solar PV systems would be financed as follows: (i) GPOBA grants; (ii) 10% down payment by client; and (iii) loan up to 3 years. Refinancing to the participating financial institutions (PFIs) will be at the prevailing Prime Rate (plus possible small mark-up by the Apex Bank), to avoid distortion in wholesale finance markets. No restrictions will be placed on retail rates charged by the PFIs. Please see the following table for the financing break-down of different solar products:

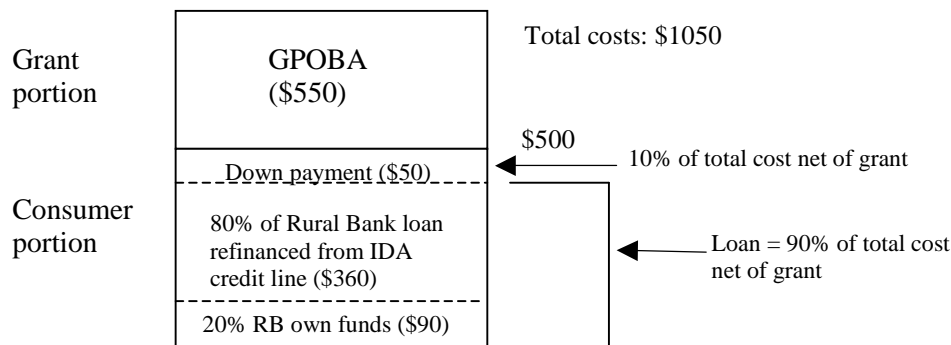
Solar Products	GPOBA Grant	Consumer Down Payment	Consumer Loans (excluding interest rate)	Total Cost
Solar Lanterns	50	30	0	100
Small SHS 35 Wp	450	30	270	750
Large SHS 50 Wp	550	50	450	1050

29. The following chart demonstrates financing sources using a 50 Wp system as an example⁹:

- Total system cost including installation, maintenance, and battery replacement: \$1050
- Grant = 50% or \$550
- Consumer makes down payment of 10% of remaining cost (\$500): \$50

⁹ A 50 Wp system is used to illustrate the financing structure because (i) a 50 Wp system is an international standard, so it is easy to compare with costs in other countries; and (ii) given that the total cost of a 50 Wp system is approximately \$1000 (a round number), it is easy to illustrate the financing structure and disbursement schedule.

- Consumer borrows the rest from a Rural Bank
 - IDA Credit refinances 80% of the loan to rural banks
 - Rural banks provide 20% of the loan from its own resources.



Transaction Support TA (US\$ 450,000)

30. *Output Monitoring and Verification (M&V) (US\$250,000)*: This component will finance the monitoring and verification of outputs and auditing over a three-year period. The M&V is crucial for disbursement of output-based aid. The participating rural banks would need to outsource the M&V functions to accredited independent inspectors. M&V is costly due to high logistics costs of remote areas with dispersed population. In addition, the project will also conduct external audits.

31. *Recipient-executed Technical Assistance for Transaction Support, Coordination and Supervision (US\$150,000)*: While the majority of the technical assistance will be covered by GEF under GEDAP, a further US\$150k is earmarked here for activities directly related to the coordination and implementation of GPOBA grant, particularly for Apex Bank and participating rural banks. These funds would finance the minimum needed staff for the GPOBA project implementation.

32. It is worth noting that the provision of technical assistance is consistent with emerging practices for off-grid electrification, which indicate that successful off-grid electrification projects require substantial accompanying technical assistance resources, both for the transaction and supervision, given that (i) these are nascent markets, (ii) governments typically lack experience and capacity to oversee these new transactions, (iii) private sector providers tend to be small-scale and require substantial capacity building to be able to scale-up their interventions, (iv) financial institutions lack experience with these new markets and financing products. Experience shows that the investment in TA and capacity building can be offset by a reduction in subsidy requirements.

33. *Outcome Monitoring and Evaluation (M&E) (US\$50,000)*: This component will finance monitoring and evaluation of the impacts of solar PV on poverty alleviation. The project team is working with DEC on impact evaluation of electricity in general under the GEDAP project. This funding will allow the team to expand this work to specifically target at solar PV, and better understand the impact of GPOBA intervention on the poor households.

Project Supervision by the Bank: US\$200,000

34. Project supervision covers the work of the task team leader, the technical specialists, and the fiduciary and safeguards staff for the supervision of GPOBA subsidies. This figure does not include the US\$20k in project supervision budget already awarded by GPOBA for TA and preparation of the

commitment package. As mentioned earlier, experience demonstrates that off-grid electrification, particularly introduction of new business models and involvement of SMEs, requires extensive and close supervision. The solar PV component is only one of many project components under the IDA GEDAP project, and the Bank supervision budget is quite limited. However, the team expects synergies and economies while working on the IDA-funded project.

B.2.3 Payment Steps, Risks, and Disbursement Schedule:

Funds Flow, Payment Steps, and Risks

(1) Selection of Regions:

- The selection process should be market-driven. If there is consumer demand for solar PV and credit from rural banks, it should be considered;
- OBA grant will only go to regions where the grid will not arrive in ten years based on rural electrification plan. MOE will provide a list of these areas in the whole country;
- SHS is the least-cost option to provide electricity services;
- There should be presence of rural banks;
- The IDA line of credit can also go to branches of the participating rural banks located in peri-urban areas, but no OBA grant will be available. No more than 50% of the IDA line of credit should go to these non-OBA areas.

(2) Selection Criteria for Rural and Community Banks (RCBs): The ARB Apex Bank will screen RCBs with the following eligibility criteria on the basis of their financial soundness, experience with new products (such as microfinance), and management capability. □

- Compliance with liquidity reserve required by the Bank of Ghana where applicable;
- Adequate provisions for bad and doubtful accounts satisfactory to the Bank of Ghana;
- Portfolio at Risk of not more than 20% at each participating branch or agency;
- Operational self-sufficiency¹⁰ should be above 100%;
- Audited annual financial statement of accounts for its most recent two years;
- Have adequate technical financial and administrative capacity to manage on lending loans;
- Have operating policies, procedures, organization and staff necessary to evaluate and supervise micro loans;
- Agree to adopt specific terms and conditions of the Bank-financed Community-Based Rural Development Project (CBRDP) and to sign participation agreement;
- Agree to furnish all relevant information and documents requested by RICU or its agents in connection with the loans made under the project;
- Must be willing to contribute at least 20% of the loan amount from own financial resources; and
- Solar PV portfolio should not exceed 5% of participating rural banks' total loan portfolio.

(3) Dealer accreditation: The Energy Commission will accredit dealers based on the following criteria, to determine their eligibility to participate in this program.

- have operations that include sales of PV systems or other products in the rural areas;
- have annual, audited accounts that include its PV systems sales;

¹⁰ Operational self-sufficiency = (Total Operating Income (TOI)/Total Operating Cost (TOC)). TOI = Income and fees from loans plus income from other finance related services+ income from investments; TOC = Interest and fee expenses + loan loss provision expense + administrative expenses, personnel + other administrative expenses.

- be financially viable;
- prepare a business plan acceptable to the Bank that demonstrates that:
 - ⌚ the PV systems sold would meet the Project's technical specifications;
 - ⌚ the company's operations would be commercially viable;
 - ⌚ the company has made arrangements to increase its sales either by expanding its service network or by increasing marketing efforts in existing market areas;
 - ⌚ the company would abide by adequate consumer protection plans, including a returns policy, warranties, and adequate after-sales service networks; and
 - ⌚ the company has a system to provide data required for project monitoring by Apex Bank and rural banks.
- agree to abide by competitive code of norms for dealing with customers, employees, and other companies, including:
 - ⌚ providing customers with complete and correct information about products, services and prices;
 - ⌚ competing openly, not engaging in actions that might prevent competitors from entering or operating in particular market areas.

(4) Marketing: Dealers (in collaboration with RCBs) undertake marketing in the targeted districts and communities. Dealers compete in an open market, and bear the market risks.

(5) Consumer Application:

- Consumers make choice of supplier and solar PV products.
- Consumers negotiate price with dealers that include (i) equipment + installation cost; (ii) operating & maintenance costs for 3 years; and (iii) battery replacement cost.
- Preferably, the customers are existing rural banks' clients. Make application to RCB (for grant + loan). If not already a RCB client, open an account.

(6) Grant & Loan Approval:

- RCB verifies that client comes from targeted community; calculates grant and loan amounts on the system selected;
- RCB does loan appraisal of client, makes loan decision (Calculates loan and down payment amounts, after allowing for grant; Informs client that loan would be approved, subject to making deposit; Calculates disbursement schedule).

(7) Down Payment: Consumers deposits 10% down payment with the rural bank who passes it on to the dealer.

(8) Obtaining Funds:

- RCB informs dealer (e.g., monthly) about pipeline of loans for which down payment has been made and funding from Apex Bank is being sought;
- RCB forwards approved application(s) and disbursement schedule(s) to Apex Bank (e.g., monthly);
- Apex Bank approves, informs RCB;
- Apex Bank advances the first tranche (for equipment + installation costs) of grant and credit to RCB.

(9) Installation and Verification:

- RCB informs local dealer that funds are in hand, and authorizes installation;
- Supplier/dealer undertake installation; inform RCB and Inspection Agent when completed; Dealers bear pre-financing risks prior to receiving payment.
- Inspection Agents (certified by Energy Commission, and contracted by Apex Bank) conducts inspection to (i) ensure the dealers are certified and imported equipment meets international standards by the Energy Commission; (ii) the installers are certified by the training program; and (iii) verify that

the system is properly installed, functioning, and provides verification report to RCB through random sampling.

(10) Payment to Dealers: RCB disburses the grant plus the relevant loan amount to dealers, equivalent to the installed equipment cost, within one month of installation. The participating rural banks bear 100% non-payment risks, while the dealers are obliged to provide maintenance services and one battery replacement during three-year repayment period.

(11) Consumer Repayment and Default: Consumers make regular repayments on loan according to schedule agreed with RCB. In the case of default, Apex bank will deduct the loss from rural banks' deposit at Apex bank. RCB may undertake procedures to repossess the solar panels and battery, and the suppliers may repurchase panels and battery at pre-agreed price. Alternatively, rural banks can apply for compensation from the partial risk guarantee fund, to be established initially with GEF funds, and later with partial interest rate payment. In the case of theft or weather disaster, Apex Bank should purchase insurance, and pass the costs on to the interest rate.

(12) Maintenance Visits and Payment:

- Over the three-year warranty period, dealers will (i) make 1 regular maintenance visit per year to all solar PV systems to undertake a list of required actions; and (ii) provide in-time breakdown repair services -- respond to a recorded enquiry or complaint within 5 working days and restore the systems to full functional capability within 10 working days in case of breakdown.
- RCB makes payment to dealers annually against satisfactory maintenance services and battery replacement, upon client-signed verification form and invoice.

Disbursement Schedule:

35. GPOBA advances funds to GoG/Apex Bank, who then disburses to rural banks. The rural banks disburse funds to the dealers. Before second tranche of funding to be released from IDA and GPOBA, the following documents are required (Apex Bank and rural banks should have these documentation on file, and prepare a summary report before second tranche can be released):

- Verification report from the inspection agents
- Invoice from dealers
- Receipt of rural bank payments

36. Given the funds flow steps outlined above, the table below for disbursement schedule with an indicative example of a 50 Wp system.

Output Milestone	GPOBA disbursement (and percentage)	Consumer Down Payment	Consumer Loans	Dealers Receive (and percentage)
After installation and verification	440 (80%)	50	310	800 (75%)
After year 1 maintenance services	30 (5%)		20	50 (5%)
After year 2 maintenance service	30 (5%)		20	50 (5%)
After Year 3 of maintenance service and battery replacement	50 (10%)		100	150 (15%)
Total	550 (100%)	50	450	1050 (100%)

Note: It is preferred to disburse 100% of GPOBA grant after installation to reduce financing charges on consumer. For example, for a 35 Wp system, if GPOBA disburses 80% of the grant after installation, the monthly payment would be \$8. If GPOBA disburses 100% of the grant after installation, the monthly payment will be reduced to \$6. Under this scenario, the dealer will receive the same total payment after installation and verification as shown in the table above, the difference is that a larger portion will come from GPOBA. The Project Team seeks the Panel's views on this.

B.3. Economic and financial analysis

B.3.1 Economic Analysis (See Annex 1 for details)

37. The basis for the calculation of benefits is the estimated income compensated demand curve for a cross-section of new users of electricity. The demand curve consists of a value for the substitution effect of using electricity plus the value of the incremental demand likely to result from consumer access to lower cost electricity, due to the use of new technologies that the project will introduce. The economic analysis takes into account survey data showing that solar-electrified households in rural areas continue to use kerosene lighting although at about half the level of non-electrified households¹¹.

38. The resulting income compensated demand curve indicates a Willingness to Pay (WTP) for solar lighting equivalent to US\$1.93/kWh. This high value applies only to the first few units of electricity consumed by households and reflects the significant improvements in the quality of life brought about by modern lighting and the linkage to the outside world brought about by watching TV.

39. Comparing this with the actual cost of the system (including supply, installation, maintenance, battery replacement at three-year intervals, and controller replacement every 10 years) results in an EIRR of 19 percent for household solar installations.

¹¹ Obeng, G. Kwame, Survey Of Electricity and Kerosene Consumption In Rural Communities, Ghana, Nkrumah University Of Science And Technology, Kumasi, Ghana, October 2006.

B.3.2 Financial Analysis

40. The financial analysis was based on the financial return to the customers to compare FIRR with and without subsidies to answer the question whether the subsidy is really necessary, as the ultimate beneficiaries of the subsidies are consumers. The total cost includes solar PV capital, installation, maintenance, battery replacement every 3 years, and controller replacement every 10 years. The benefit is measured by annual savings in kerosene and battery costs. If no subsidy is provided, the FIRR is estimated at -4%, and the net incremental NPV of the solar system over a 20-year period between the total costs and benefits is US\$550 per household. In addition, worldwide experience demonstrated that the high upfront cost of solar PV systems is a far greater barrier than high monthly payment. Therefore, GPOBA subsidy is necessary to facilitate and accelerate widespread uptake of the solar PV systems, particularly for the poor households. With the GPOBA subsidy, the FIRR is estimated at 8% from the perspective of the consumer. This is consistent with FIRR calculations conducted on similar projects where the analysis was conducted from the point of view of the consumer, for example, Nepal Biogas.

B.4. Lessons Learned and Reflected in Project Design

41. This project has reviewed and incorporated lessons from past Solar-PV projects in Ghana and elsewhere. The fee-for-service model to deliver solar home systems (SHS) in Ghana under the UNDP/GEF was not financially sustainable for the service providers, because the monthly charges (US\$2) were too low to cover the operating and maintenance costs of the systems. The project's design has taken into account lessons learned from a successful program for rural electrification in Sri Lanka, which used IDA re-financing to provide long-term financing and credit to renewable energy projects. The project's design also has incorporated lessons learned from the China Renewable Energy Development Program, where small-scale SHS systems are the dominant solar products for the "dealer sales/consumer credit model," given the low ability to pay in rural areas. The project design reflects the innovation of maintenance contracts introduced by a solar PV project in Bolivia. A recent DANIDA supported solar project has shown that rural banks should participate in the program design from the very beginning. The project has incorporated this lesson by involving the rural banks at the preparation stage.

42. The project team has been working closely with the IFC team through meetings and joint missions to coordinate this solar PV project with their "Lighting the Bottom of the Pyramid" project, which is funded by the GEF and aims to accelerate the development of markets for Light Emitting Diode (LED)-based lighting technology in Sub-Saharan Africa (initially in Ghana and Kenya). The proposed Ghana GPOBA project is consistent with and complementary to the IFC initiative. LED lighting is designed to be used for solar lanterns, which are a major part of the proposed GPOBA project. Thus, the GPOBA project, in effect, helps create the actual market in which the LED solar lanterns will be sold. Further, LED lights can also be used in small and large solar home systems. In addition, the consumer credit sale model under this project will help accelerate the market of LED products by addressing consumer affordability issues.

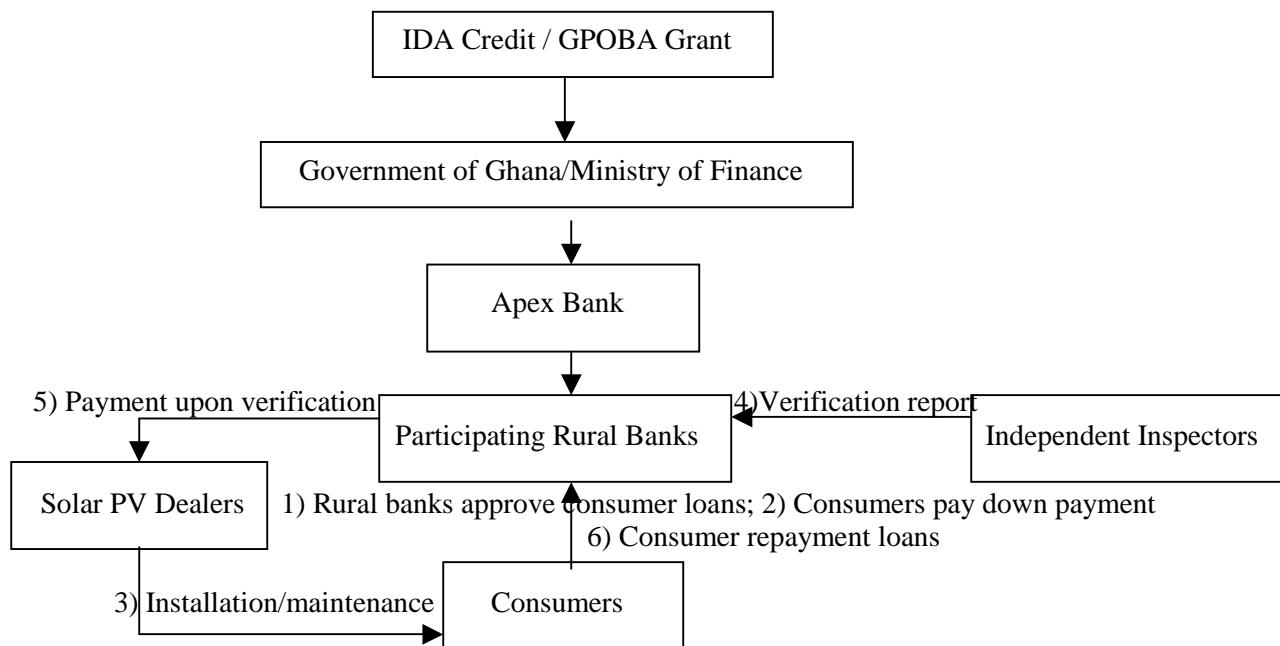
C IMPLEMENTATION

C.1. Institutional and Implementation Arrangements

43. This project will be implemented by the Apex Bank, including management of the IDA line-of-credit and the GPOBA grant on behalf of the Government. The Apex Bank is a quasi Central Bank for the network of 115 rural and community banks (RCBs), which was set up by the IDA "Rural Financial Services Project" in Ghana. Each of these rural banks is independent, and some have their own branches in remote rural areas. The rural banks specialize in micro credit evaluation, delivery and recovery.

44. To incorporate the Solar-PV business within its organization, the ARB Apex Bank has designated staff from its Credit, Microfinance, Training, M & E, and Finance/Accounting departments to manage this project. The ARB Apex Bank will also hire, with GEF funds, a full-time project coordinator to supervise all the project activities. The Apex Bank will hire independent inspection agents, approved by the Energy Commission, to verify that the equipment meet technical standards and installations are properly completed. The inspection agents will be funded through GPOBA funds. For procurement activities, the ARB Apex Bank will use the Procurement Specialist already engaged under the Rural Financial Services project. The ARB Apex Bank will report quarterly on implementation to the MoE’s Project Coordinator.

45. The Figure below shows the flow of funds for the installation and financing of Solar-PV systems, with detailed discussions in Section 2.3. The participating rural banks will process loan requests from clients based on invoices from dealers, and pass on those approved for financing to the Apex Bank. Upon approval from the Apex Bank and the Project, and release of the grant and refinancing funds, the PFI will pay the dealer an agreed portion of the total solar PV cost upon verification of installation. The remainder will be held back for subsequent payment to the dealer upon verification that maintenance visits have been made on an annual basis and the battery replaced (at the end of 3 years, if not required before). After project completion, the ARB Apex Bank will retain the repayments to the IDA line-of-credit in a revolving fund to provide additional consumer credit (and grants if needed) to purchase Solar systems.



C.2. Monitoring and Evaluation of Outcomes/Results

46. The monitoring of the project’s results indicators and the overall evaluation of the project’s impact will be undertaken as part of the GEDAP project, and will be the responsibility of the Apex Bank. Apex Bank will be responsible for preparing quarterly progress reports on procurement, financial management, and implementation of environmental and social management measures, and the achievement of the project’s monitoring indicators. Apex Bank also will prepare the annual work plans and budgets. The Apex Bank will commission an independent survey twice a year, once a sufficient number of systems have been installed to draw a reasonably sized ransom sample. Please see Annex 5 for more detailed information.

C.3. Sustainability

47. The project is sustainable, because (i) from technical point of view, the service contracts oblige the dealers to provide maintenance services for three years, and the Apex Bank will sign an agreement with dealers to continue maintenance services after three years; (2) from financial point of view, consumers own the systems and can afford to purchase and maintain the systems given GPOBA subsidies and consumer credit. After the project is complete, it is expected that the government would continue to provide subsidies from the Rural Electrification Fund, as currently the government provides 100% capital subsidy for grid extension but no subsidy to solar PV; and (iii) from resource point of view, solar PV is renewable energy in a country with abundant sunlight.

48. Over the long-term, it is expected that provision of a grant during the project lifetime to promote solar PV in the targeted areas will result in a sufficient market for solar PV systems that the costs of provision will come down, the loan product will become more widely accepted by clients and less costly to manage, and there will be continuing demand for the solar PV loan product on a commercial basis.

49. The ARB Apex Bank and many of its member banks have expressed interest in developing this loan product. Furthermore, it is hoped that experience with this term lending product will enable RCBs to extend term lending to businesses and other investments in their areas. The IDA project agreement required the Apex Bank to manage a revolving fund on behalf of the government to support continued maintenance services and additional solar PV systems after the project completes.

C.4. Critical Risks

Risk	Risk Mitigation Measure(s)	Rating
Low level of demand	<ul style="list-style-type: none"> • <i>Sensitization:</i> The project will support sensitizing the public on the benefits and availability of solar energy, to help create adequate commercial demand. • <i>Loans and Subsidies:</i> Term financing and microfinance products are being developed to make SHS and lanterns more affordable in terms of monthly payments. Subsidies will help offset the additional cost of maintenance contracts (in addition to interest costs) required for such loans. • <i>Options of products:</i> The project will encourage different segments of the market in targeted areas to help ensure an adequate minimum level of demand. The focus in the remote villages eligible for subsidies will be on lanterns and small SHS. Urban and peri-urban customers can access to consumer financing but not subsidies. 	M
Default risk of non-payment on consumer loans	<ul style="list-style-type: none"> • <i>Client selection:</i> Requiring a down payment helps to screen out less committed customers. Since participating financial institutions bear the risk, they will be able to apply their normal selection and risk mitigation measures. • <i>System maintenance:</i> Experience shows that breakdown (or theft) of the SHS greatly increases the risk of default. This risk is mitigated by requiring a maintenance contract as part of the loan agreement, so that the supplier will provide maintenance and repair to keep systems operating. • <i>Repossession:</i> In case of default, the rural banks can repossess the solar PV systems, and re-sell to dealers at residue values; • <i>Guarantee Fund:</i> The project is considering to set up a partial 	M

	<p>guarantee fund initially funded by GEF and later by part of the interest rate payment, to pay for default.</p> <ul style="list-style-type: none"> • <i>Insurance:</i> The Apex Bank is encouraged to negotiate an insurance contract to cover theft and storm damage, with the cost to be added to the loan charges. 	
Long-term Sustainability	<ul style="list-style-type: none"> • <i>Demonstration effect:</i> By subsidizing the introduction and maintenance of good-quality SHS, the project expects to raise demand sufficiently to support continued commercial operation. • <i>Cost reduction:</i> By allowing and encouraging competition, along with the establishment and training of local dealerships, it is expected that costs will come down over the project period as scale and experience increase. • <i>Financing:</i> The financial products are designed to be commercially viable with a view to encouraging banks to continue financing SHS beyond the GPOBA project end. Repayments of the line of credit under the project will continue to be managed by the Apex Bank as a revolving fund to continue refinancing term loans for SHS (given the likely continued lack of term funds in the Ghanaian financial system). 	M
Not enough competitions among dealers and potential collusion of dealers	<ul style="list-style-type: none"> • <i>Business model encourages competition:</i> This project adopts a dealer credit sale model, in which the dealers can compete in the open market. The experience from Asia implementing similar business models demonstrated that as long as sufficient subsidy is provided to dealers, they tend to compete for the largest share of the market; • <i>TA for new entrants:</i> GEF funding will be used for (1) sensitization of solar PV products and creating market awareness; (2) providing matching grants to the private sector for business plans, feasibility studies, loan applications, setting up local solar dealerships, etc. to help new entrants to the market; and (3) providing training for new entrants 	M
Overall risk rating		M

C.5. Conditions for the GPOBA Grant

Disbursement Conditions

Apex Bank has: (a) designated staff, with qualifications and terms of reference acceptable to the Association, dedicated to implement its Respective Part of the Project; and (b) adopted the Solar-PV Financing Operation Manual for both GPOBA Grant and IDA Credit, in form and substance satisfactory to the Association and GPOBA.

Dated Covenants:

Solar-PV Line-of-Credit. The Government shall cause the Apex Bank to deposit all repayments of the principal amounts of Solar-PV Loans extended through the revolving line of credit facility established under the Project, for the purpose of providing additional consumer credits and/or grants for Solar-PV systems in accordance with the provisions of the Solar-PV Financing Manual.

Implementation and Reporting Milestones

- (a) Apex Bank will prepare quarterly progress and Interim unaudited Financial Reports (IFRs).
- (b) Apex Bank will participate in a mid-term review of the project in mid-2009.
- (c) Apex Bank will prepare an annual project work plans and budgets for their respective components and submit them to the MoE by September 30 of each year. MoE will aggregate the work plans and budgets and submit them to the co-financiers by October 30 of each year.

Annex 1. Economic and Financial Analysis

1. Economic Analysis (Cost-Benefit)

1. The economic analysis is based on (i) the cost data presented in the main text, and (ii) estimates of economic benefits, which draw upon a survey conducted in rural Ghana in 2006 for GEDAP. The economic benefits are based on estimates of the Willingness-to-Pay (WTP), which consists of avoided expenditures plus consumers' surplus.

WTP Estimation

2. The WTP for newly connected customers was derived by estimating the demand curve for a cross-section of new users and uses. In order to eliminate the income-effects of price changes, an income-compensated demand curve was estimated. The shape of the curve was assumed to be of the form

$$Q = A + H*Y + B*\ln P = A' + B*\ln P$$

where A, H and B are constants, and are derived from observed behavior of households with and without access to electricity supply, and from the observed income elasticity of demand.

3. The estimation of the demand curve was based on a survey carried out in rural Ghana during the summer of 2006¹². The survey covered the energy consumption patterns and expenditures of households in small rural communities including those that had and did not have access to electricity supply. The survey indicated that the main differences in energy consumption between electrified and non-electrified households – and hence the most likely substitution effects – were the use of dry cell batteries (mainly for listening to radios) and the use of kerosene lamps for lighting in non-electrified households.

4. The survey found that the average non-electrified household had 1.9 kerosene lamps which were used for an average of 11.7 hours per day¹³. Assuming an output equivalent to a 4.5 watt bulb, this would be equivalent to a monthly lighting consumption equivalent to 3.1 kWh. These households consumed on average 2.8 liters of kerosene per month at an average cost of US\$1.39 per liter or the equivalent of US\$1.30 per kWh of lighting equivalent.

5. Using the sample, the demand curve for lighting was derived to be as follows:

$$Q = -.084 + .024*Y - 8.8*\ln(P)$$

6. Drawing together the willingness-to-pay for substitutes (dry-cell batteries, kerosene lamps) and induced consumption (incremental lighting, other consumptive uses) gives a weighted average willingness-to-pay on the part of electrified households of US\$0.53 per kWh [(US\$1.31*1 + US\$0.64 * 37 + US\$0.041 * 10)/48].

¹² George Yaw Obeng, "Survey of Electricity and Kerosene Consumption In Rural Communities", Ghana", Kwame Nkrumah University of Science And Technology, Kumasi, Ghana, October 2006.

¹³ Interestingly, the use of kerosene lamps throughout the night was quite common, with the average household burning lamps for over 9 hours per night. This would suggest that safety might be almost as important as lighting in terms of the perceived utility of the lamps.

7. The analysis of the economic and financial viability of the Solar- PV pilot followed a methodology similar to that described above. In the case of solar-electrified homes, however, survey results indicated that solar was used as only a partial substitute for kerosene lighting. Solar-electrified homes continued to use kerosene lamps but at only about half the level of non-electrified households. The willingness-to-pay analysis therefore considered the value of the substitution effect only with respect to the differential in kerosene use between the two types of households. The income compensated demand curve indicated a willingness-to- pay for solar lighting equivalent to US\$1.93/kWh.

Economic Analysis

8. The economic analysis is based on a 50Watt-peak system, which is a standard size, and corresponds closely to the level of service for which the WTP has been estimated above.

9. The assumptions are:

- Initial installed capital cost of \$ 800
- Maintenance costs of \$ 50/year for first three years, and then \$ 8/year (1% of capital cost)
- Battery replacement every three years at \$ 100
- Controller replacement every ten years at \$ 50
- WTP at \$ 1.93/kWh – lighting only. Global environmental and TV benefits excluded from calculation
- kWh per month at 8.1

Solar PV Systems for Rural Poor in Ghana							
Economic Cost-Benefit Analysis (in constant 2007 US Dollars)							
For a 50 Watt-peak System							
	Costs				Benefits	Total Net Benefits	
Year	Capital	Replacement	Maintenance	Total	Lighting costs + consumer surplus		
1	800	0	50	850	188	-662	
2	0	0	50	50	188	138	
3	0	100	50	150	188	38	
4	0	0	8	8	188	180	
5	0	0	8	8	188	180	
6	0	100	8	108	188	80	
7	0	0	8	8	188	180	
8	0	0	8	8	188	180	
9	0	100	8	108	188	80	
10	0	50	8	58	188	130	
11	0	0	8	8	188	180	
12	0	100	8	108	188	80	
13	0	0	8	8	188	180	
14	0	0	8	8	188	180	
15	0	100	8	108	188	80	
16	0	0	8	8	188	180	
17	0	0	8	8	188	180	
18	0	100	8	108	188	80	
19	0	0	8	8	188	180	
20	0	50	8	58	188	130	
EIRR	<i>Lighting only - global environmental benefits excluded</i>						19.1%

2. Financial Analysis

10. The financial analysis was based on the financial return to the customers to compare FIRR with and without subsidies to answer the question whether the subsidy is really necessary, as the ultimate beneficiaries of the subsidies are consumers. The total cost includes solar PV capital, installation, maintenance, battery replacement every 3 years, and controller replacement every 10 years. The benefit is measured by annual savings in kerosene and battery costs. If no subsidy is provided, the FIRR is estimated at -4%, and the net incremental NPV of the solar system over a 20-year period between the total costs and benefits is US\$550 per household. In addition, worldwide experience demonstrated that the high upfront cost of solar PV systems is a far greater barrier than high monthly payment. Therefore, GPOBA subsidy is necessary to facilitate and accelerate widespread uptake of the solar PV systems, particularly for the poor households. With GPOBA subsidy, the FIRR is estimated at 8%.

11. The assumptions are:

- Initial installed capital cost of \$ 800
- Maintenance costs of \$ 50/year for first three years, and then \$ 8/year (1% of capital cost)
- Battery replacement every three years at \$ 100
- Controller replacement every ten years at \$ 50
- Avoided cost for kerosene and battery: \$6.4/month, based on a recent consumer survey.

Annex 2: Financial Management and Disbursement

A. Executive Summary

1. The GPOBA project will be implemented by the ARB Apex Bank. In accordance with the Financial Management Practices Manual issued by the Financial Management Board on November 3, 2005, Bank staff carried out a Financial Management (FM) assessment of the ARB Apex Bank. The objective of the assessment was to determine whether the FM arrangements at ARB Apex Bank were adequate to ensure that the entities: (a) will use the funds only for the intended purposes in an efficient and economical way; (b) will prepare timely, accurate and reliable periodic financial reports; and (c) safeguard the assets they acquire under the project.

2. The assessments were undertaken by a World Bank Financial Management team, and included interviews with key staff responsible for financial management at ARB Apex Bank, as well as the completion of standard Bank FM Assessment Questionnaires. The assessment also draws on earlier work carried out under various projects in Ghana.

ARB Apex Bank

3. ARB Apex Bank, the “Central Bank” for the Rural Banks in Ghana, was assessed on account of the role it is required to play in supervising and coordinating the Solar-PV Systems. The Finance and Accounts Department will have responsibility for managing the proceeds of the Grant under the project. The department is headed by a qualified accountant, who is assisted by three other part-qualified accountants. The ARB Apex bank has a comprehensive accounting procedures manual which covers: (i) budgeting; (ii) accounting; (iii) audit; (iv) accounting for grants; and (v) reporting. The most recent audits conducted by independent auditors indicated unqualified/clean audit opinions.

4. The assessment concluded that the FM arrangements at ARB Apex Bank meet the minimum requirements for FM for Bank financed projects, with overall risk rated low to moderate.

B. Country Issues

5. The Government of Ghana has implemented several reforms in response to the findings of the Country Financial Accountability Assessment (CFAA) for Ghana, carried out in 2001 and updated in June 2004. Some of the key actions taken include the enactment of:

1. Financial Administration Act 2003, in response to the identified weakness of the fragmented legal structures that governed public financial management.
2. Internal Audit Agency Act 2003, to set up modern internal audit in all government departments.
3. Public Procurement Act, to improve the efficiency of public procurement systems and practices.

6. The enactment of these laws is intended to remove weaknesses in the regulatory frameworks for procurement, financial administration and internal audit. It is recognized that the process of implementation of these regulations and procedures will take time, involve continuous capacity building and demand greater accountability. Risks still remain in the areas of:

- ③ Enforcement of the enacted laws.
- ③ Effectiveness of independent oversight.

7. The summary risk analysis is based on the assessment of the financial management units of ARB Apex Bank.

C. Risk Assessment and Mitigation

Table: Risk Assessment and Mitigation

Risk	Rating	Risk Mitigation/Remarks	Condition of Negotiation or Effectiveness (Y/N)
Inherent Risks:			
Country			
(a) Delay in the implementation of New Financial Administration Act (FAA).	S	Government has introduced a new comprehensive legal framework for public financial management -- the Financial Administration Act (FAA) with related regulations for implementation. There is need for close monitoring to ensure effective implementation of this Act.	N
(b) Non-compliance with statutory regulations and non-enforcement of penalties.	H	Government needs to institute measures that would ensure the systematic review, update and enforcement of penalties for non-compliance.	N
(c) Government agencies may not fully comply with new Internal Audit Agency Act, in the establishment of internal audit units within their offices.	S	Government has passed legislation, Internal Audit Agency Act (IAAA), for all Government Ministries, Departments and Agencies (MDAs) to establish internal audit function within their offices. Assistance will be provided to strengthen the Internal audit of MDAs to meet the Act's requirements and for the benefit of the project.	N
Overall Inherent Risk	S		

Risk	Rating	Risk Mitigation/Remarks	Condition of Negotiation or Effectiveness (Y/N)
Control Risks			
Staffing			
ARB Apex Bank			
Finance and Accounting staff may not have any knowledge of Bank disbursement procedures.	M	Qualified staff are already in place. Staff will be provided training in Bank's FM and disbursement procedures. Staff will be encouraged to participate in Bank's periodic FM and disbursement workshops.	N
Funds Flow			
ARB Apex Bank			
Delays in preparation and submission of Withdrawal Applications.	M	Key operating staff will be given training in completion of appropriate forms for withdrawal of funds. Continuous training in Bank's FM and disbursement procedures and processes.	N
Undocumented Accounting Policies and Procedures.	L	ARB Apex Bank documents its accounting policies and procedures in an Accounting Procedures Manual.	N
External Audit			
Project audit reports submitted late.	M	TOR for audit will be ready within three months of project effectiveness; auditors will be appointed in another three months.	Dated covenant -- TOR for audit of project will be ready

		Apex Bank will institute mechanisms where their respective audit programs for the relevant year will be agreed with their respective auditors prior to year end and monitored to ensure compliance. Auditors' contracts will be for one year and renewable contingent on timely completion and submission of audited reports and satisfactory performance. Use of the entities' existing auditors may be considered.	within three months of effectiveness for review by the Bank. Appointment of auditors to be finalized within six months after project effectiveness.
Reporting and Monitoring			
(a) Delays in the submission of agreed Interim Financial Management and other relevant reports.	L	Support will be provided to the participating institutions to improve overall FM. ARB Apex Bank will be encouraged to institute good records management practices to facilitate production of timely and relevant reports. ARB Apex Bank prepares periodic management reports every month. The IFR formats for the project components will be agreed.	Formats of IFRs agreed at negotiations.
Information Systems			
Delays in providing requisite information to management and to the staff of the Bank.	L	ARB Apex Bank uses the GLOBUS software for all its accounting and treasury transactions. The same software is used to produce the periodic and year-end Financial Statements.	N
Overall Control Risk			
ARB Apex Bank	L / M		

Ratings: H - High, S - Substantial, M - Modest, L – Low

D. Strengths

8. **ARB Apex Bank:** The Accounts Unit is headed by a qualified Accountant assisted by three part-qualified Accounting Officers. The Accounting Policies and Procedures are documented in Accounting, Inspection and Audit manuals, which guide staff in the performance of their day-to-day functions. Accounting and Treasury transactions are captured and managed with the GLOBUS software. The same software is used to produce periodic and annual Financial Statements.

E. Implementing Entities

9. **ARB Apex Bank:** The Finance and Accounting Unit will directly manage Bank funds for the first time and will have to be provided assistance/guidance until it is comfortable with the processes and procedures.

F. Project Financial Management

10. Financial Management of the project will be undertaken by the credit unit of ARB Apex Bank. It will maintain streamlined systems with appropriate and sufficient internal controls to manage project transactions and reporting obligations.

11. The policies, rules and procedures specified to implement project and institutional objectives will be documented in the Financial Management section of the Project Implementation Manuals to be prepared by the implementing agencies. The Financial Management Manuals already exist, and cover at least the following aspects.

- (a) Budgeting and forecasting procedures.
- (b) Records specification and support documentation.
- (c) Major transaction cycles and authorization procedures.
- (d) Chart of accounts and account coding structure.
- (e) Financial reporting processes.
- (f) Fund disbursement and replenishment procedures.
- (g) Flow of funds to participating agencies and payment to service providers.

12. ARB Apex Bank will prepare un-audited quarterly interim financial reports as the basis for project financial monitoring and control.

G. Budgeting

13. Financial Management activities for each year will commence with the determination of project activities to be carried out and eligible expenditures to be financed during the year (i.e., the annual work plan and budget). The ARB Apex Bank will establish their individual program/activities, budgets and work plans, in accordance with their normal budgeting and approval procedures. The Boards of Directors for ARB Apex Bank would approve the expenditure estimates for the project components under their management.

H. Accounting

14. The Apex Bank will be responsible for maintaining the accounting books and records of transactions for the activities they implement. They will maintain records adequate to support project accounts as well as to track commitments and safeguard assets. Where appropriate, the Chart of Accounts of an implementing entity will be customized to facilitate the preparation of relevant quarterly and annual financial statements, highlighting the following information.

- ③ Total project expenditures by activity for the quarter and accumulated to that point in the life of the project.
- ③ Total project expenditure by expenditure category.
- ③ Total financial contribution from each donor/co-financier.
- ③ Total financial contribution by GoG or the respective entity.
- ③ Schedule of assets (acquired under the project) by location etc.

15. Quarterly and annual financial statements will be prepared in accordance with International Accounting Standards (IASs). All accounting and control procedures will be in accordance with the documented manuals of procedures, as regularly updated.

16. Accounting staff of the implementing entities will be afforded the opportunity to learn more about financial management and disbursement procedures for Bank financed projects whenever such training is scheduled, usually with partner institutions.

I. Flow of Funds

17. ARB Apex Bank will establish a Designated Account with a Commercial Bank under terms and conditions acceptable to the Bank. They will maintain the Designated Account in US dollars to receive disbursements from IDA Credit and GPOBA Grant accounts opened by the Bank on behalf of the borrower. An initial advance will be disbursed into each Designated Accounts on request and subject to compliance with conditions that are specified in the Financing Agreements and additional instructions that are provided in the respective Disbursement Letters.

18. Implementing entities will execute their respective budgets as approved in respect of the project activities and make payments for approved and authorized transactions to contractors, suppliers and service providers.

19. The accounting teams of the implementing entities will be responsible for making monthly replenishment requests to the World Bank in accordance with the Bank's disbursement guidelines and policies.

J. Financial Reporting and Monitoring

20. Each implementing entity will prepare quarterly un-audited Interim Financial Reports (IFR), highlighting actual performance against target, in the areas of finance, procurement (including complaints from bidders), and project progress. The financial management system in place at ARB Apex Bank is capable of producing these reports. The report formats have been discussed. The reports include.

Quarterly Interim Financial Report

21. The quarterly Interim Financial Report consists of a statement of cash receipts by source and expenditures by main expenditure classifications/categories for the period and cumulatively to the reporting date; cash balances of the project; and supporting schedules comparing actual and budgeted expenditures. The quarterly report will also give details of expenditure by component/activity within component.

Quarterly Physical Progress Report

22. The quarterly Physical Progress Report would include narrative information on outputs, output indicators and would link financial information with physical progress and report on issues that require attention.

Quarterly Procurement Management Report

23. The report would compare procurement performance against the procurement plan as updated. The report should also provide information on complaints by bidders, unsatisfactory performance by contractors and any contractual disputes if any.

24. Each implementing entity will prepare and submit these reports in respect of the component/sub-component it manages. The reports will be submitted to the Bank within 45 days after the end of each quarter.

K. Disbursement Arrangements and Methods

25. The proceeds of the GPOBA would be disbursed over a 3-year period. A period of four (4) months after closing date is allowed to make disbursements for goods and services received by the closing date(s).

Disbursement Methods

Designated Account

26. As indicated under 'Flow of Funds' above, ARB Apex Bank will each maintain a Designated Account (DA), with a Commercial Bank acceptable to IDA, to receive proceeds of the Credit. The Designated Accounts will be maintained in US dollars. Disbursement will initially be transaction based, with the possibility of converting to report-based disbursement allowed, subject to satisfactory IFR reporting and reliable expenditure forecasting.

27. The initial deposit into the DA and how to access it, will be specified in the Disbursement Letter. The financial resources made available through the Designated Accounts will be used to finance agreed project activities only.

Use of Statement of Expenditures (SOEs)

28. Disbursements for all expenditures would be against full documentation, except for items of expenditures under contracts below: (i) US\$100,000 equivalent each for consulting firms; (ii) US\$50,000 for individual consultants; (iii) US\$250,000 equivalent for goods; (iv) training; and (v) incremental operating costs for which disbursements would be based on statement of expenditures (SOEs). Supporting documentation for SOEs would be retained by the accounting units of ARB Apex Bank for review by IDA missions and external auditors when required.

Direct Payments

29. The Bank may make payments direct to a third party (i.e. Consultants, Contractors and Suppliers) at the request of the borrower in a prescribed format to the Bank for eligible expenditures incurred under the project.

Special Commitments

30. The Bank may make payments to a third party for eligible expenditures under a Special Commitment entered into, in writing, at the borrower's request and on terms and conditions agreed between the Bank and the borrower.

L. Auditing Arrangements

31. Independent and qualified auditors acceptable to the Bank would carry out the annual financial audit of all project expenditures. The appointment of the auditors must be finalized within six months of effectiveness of the project. As it is the responsibility of the Auditor General of Ghana to audit government entities, selection of the independent auditors will be done in collaboration with the Auditor General. Existing auditors of the implementing entities can be considered for the audit of the project expenditures, provided that the TORs of their existing assignments meet the Bank's requirements, or can be modified as appropriate. One audit report covering the activities financed by the project will suffice for each implementing entity.

32. The audit shall be carried out in accordance with international standards of auditing and the auditor's reports and opinions, including the Management Letter and the annual Financial Statements must be submitted to the Bank within six months of the close of fiscal year audited.

M. Financial Covenants

34. (i) Quarterly progress reports including procurement, physical and financial progress will be prepared and sent to the Bank no later than 45 days from the end of each quarter.
- (ii) Annual audit reports will be prepared and submitted to the Bank by June 30 of each year.

N. Dated Covenants

35. Finalization of auditors to be made within six months of effectiveness.

O. Supervision Plan

51. During the first year of the project implementation, intensive World Bank supervision will be required, particularly for ARB Apex Bank, in order to ensure that the project financial management arrangements are operating effectively given that this would be their first Bank-financed project. The first supervision mission after effectiveness will take the form of a Financial Management Specialist visiting the ARB Apex Bank to review systems and procedures so as to ascertain that the systems' integrity have been maintained. Subsequently there will be a minimum of two supervision missions per year for ARB Apex Bank.

P. Conclusions

52. The proposed FM arrangements for the project to be managed by the ARB Apex Bank meet the minimum requirements for financial management under OP/BP 10.02.

Annex 3: Procurement Arrangements

A. General

1. Procurement legal and institutional framework in Ghana has improved substantially since the Bank carried out Country Procurement Assessment Review (CPAR) in 2003¹⁴. The Parliament of Ghana approved the Public Procurement Bill on December 18, 2003 and the President signed it into a Public Procurement Act on December 31, 2003. The Parliamentary Accounts Committee (PAC) invited public input in March 2003 and received comments from a broad cross-section of stakeholders, including the Bank. The Bill was widely discussed in the media, in roundtable conferences, and in meetings with the PAC. The final version of the Public Procurement Act has been assessed as a good UNICTRAL-based procurement law.

2. The Act includes most of the features of good public procurement practice, i.e., (i) effective and wide advertising of upcoming procurement opportunities; (ii) public opening of bids; (iii) pre-disclosure of all relevant information including transparent and clear bid evaluation and contract award procedures; (iv) clear responsibilities and accountabilities for decision making with segregation of executive and oversight responsibilities; and (v) an enforceable right of review for bidders when public entities breach the rules. The Public Procurement Act (PPA) is comprehensive and covers all procurement in the public sector.

3. The PPA created the Public Procurement Board (PPB), an autonomous regulator empowered to set rules and oversee public procurement practices by all public sector bodies. In turn, the PPB has issued standard bidding documents and set rules for open, competitive procurement across government, developed a website to enable posting of bid notices and contract awards and other procurement documents. At the same time, challenges remain in several areas such as dissemination of regulations, training of government staff and the private sector, establishment of procurement plans tied into the budgeting process, and audits of main spending entities. Progress is being monitored under the PRSC for Ghana.

4. *Procurement Guidelines*: Procurement for the project would be carried out in accordance with the World Bank's "Guidelines: Procurement under "IBRD Loans and IDA Credits" dated May 2004 (revised in October 2006); "Guidelines: Selection and Employment of Consultants by World Bank Borrowers" dated May 2004 (revised October 2006); and the provisions stipulated in the Legal Agreement. The various items under different expenditure categories are described in general below. For each contract to be financed by the Credit, the different procurement methods or consultant selection methods, the need for pre-qualification, estimated costs, prior review requirements, and time frame are agreed between the Borrower and the Bank and are outlined in the Procurement Plan.

5. *Standard Bidding Documents and Manuals*: The Bank's Standard Bidding Documents (SBDs) will be used for all tenders for procurement of goods and works under International Competitive Bidding (ICB). Domestic preference would be used under ICB in accordance with Clause 2.55 and Appendix 2 of the Bank's Guidelines.

¹⁴ The main findings of the CPAR included: (i) lack of a comprehensive legal framework; (ii) use of merit point system for evaluating bids for works contracts; (iii) use of "bracketing" for evaluating bids for works contracts; (iv) excessive use of single source; (v) repetitive use of same firms under selective tendering procedures; (vi) lack of procurement planning; (vii) poor record keeping; (viii) weak oversight of procurement; (ix) poor contract management; (x) poor stores management; (xi) weak procurement capacity; and (xii) weak budget commitment control leading to contract payment arrears.

6. In recognition of the quality of the legal framework, procedures in the Ghana Public Procurement Act (PPA) would be used for National Competitive Bidding (NCB) procurement¹⁵. The standard documents for the procurement of goods can be used provided that: (a) the standard documents are used for NCB without pre-qualification only as they do not incorporate clear provisions on the pre-qualification of bidders; (b) margin of preference is not applicable; (c) bidders are given a minimum of 30 days to submit bids from the date of availability of the bidding documents; (d) foreign bidders are not excluded from participating in the bidding process; and (e) where required by the set thresholds and procurement methods, concurrent No-Objections are sought from the Bank after internal clearances have been obtained in response to the PPA. In the case of consulting services, the Bank's Standard Request for Proposals (SRFP) and standard time-based and lump-sum contracts will be used for all assignments involving international competition. The procurement procedures and SBDs to be used for each procurement method, as well as model contracts for goods to be procured, will be highlighted in the Project Implementation Manual (PIM).

7. **Procurement of non-consulting services:** Procurement of non-consulting services will follow procurement procedures similar to those stipulated for the procurement of goods, depending on their nature. The applicable methods shall include NCB and Shopping.

8. The procurement procedures and SBDs to be used for each procurement method, as well as model contracts for works and goods procured, are presented in the Project Implementation Manual.

9. **Selection of Consultants:** The preferred method of selection for consultant services would be the *Quality and Cost Based Selection (QCBS)* method. Consulting assignments costing less than US\$200,000 may be procured by using *Selection Based on Consultants Qualifications (CQS)*.

10. Services for tasks that meet the requirements of paragraphs 3.8 through 3.11 of the Consultants' Guidelines may be awarded using the *Single Source Selection* method. Services for which a team of Consultants are not required and meet all the requirements set forth in paragraph 5.01 of the Consultants Guidelines would be procured under contracts awarded to individual consultants in accordance with the provisions of paragraph 5.1 through 5.3 of the Consultants Guidelines. Short lists of consultants for services estimated to cost less than US\$200,000 equivalent per contract may be composed entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Consultants Guidelines.

11. Consultancy services estimated to cost above US\$100,000 per contract for firms and single source selection of consultants (firms) for assignments estimated to cost above US\$50,000 will be subject to prior review by the Bank.

12. Short lists composed entirely of national consultants: Short lists of consultants for services estimated to cost less than US\$200,000 equivalent per contract may be composed entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines.

13. **Capacity Building and Training Programs** are geared towards building capacity and improving management and staff skills. Overall strategy focuses on conducting training, and support for training activities through seminars, workshops, and training in the region and abroad based on individual needs as well as group requirements. All training and workshops will be carried out on the basis of programs which shall have been approved by the Bank on an annual basis, and which shall, *inter alia*, identify: (a) the training and workshops envisaged; (b) the personnel to be trained; (c) the institutions which will conduct the training; and (d) the duration of the proposed training. The detailed annual training program

¹⁵ Foreign bidders will not be disqualified from bidding under NCB procedures.

should outline categories of training, number of trainees, duration of training, staff months, timing, and estimated cost of the training.

14. **Others -- Grants.** Approval arrangements for selecting and funding proposals, including procurement, will be carried out in accordance with procedures detailed in the Operational Manuals. The types of activities eligible for financing under the sub-projects are described in the Operational Manuals.

15. **Operating Costs:** For the ARB Apex bank, expenditures made for operational costs such as fuel, office stationery, vehicle maintenance, travel costs and per diems, among others, excluding staff salaries will follow Ghana Government practices in line with the Public Procurement Law or, whenever these Laws do not apply, commercial practices commonly used for the same.

B. Assessment of ARB Apex Bank Capacity to Implement Procurement

16. An assessment of the capacity of the ARB Apex Bank, (incorporated under the Companies Code, 1963 (Act 179) as a public company limited by shares) to implement procurement actions for the project was carried out in May 2007 by Anthony Mensa-Bonsu, Procurement Specialist. The assessment reviewed the organizational structure for implementing the project and the possible interaction between the project's staff responsible for procurement and the Ministry's relevant central unit for administration and finance.

17. The assessment concluded that ARB Apex Bank did not have any direct working links with the Ministry of Energy and its units for administration and finance. It was also not in compliance with the procurement law, since it did not have established entity and review committees as required by the law. Neither did it have an established procurement unit or experienced staff who can fully conduct procurement using the Bank's Guidelines. Its experience with World Bank procurement strategies derive from the limited involvement of two staff members in procurement activities under the Rural Financial Services Project for which ARB Apex Bank was a beneficiary. As a Bank, however, it has support and control systems. It also has adequate internal technical and administrative controls and anti-corruption measures, and satisfactory appeal mechanisms for bidders, when using its own procedures. However, none of its staff has attended any procurement training course. The assessment, therefore, shows a "High risk" for ARB Apex Bank for conducting procurement actions.

Action Plan

18. The key risks for procurement are: (i) non-compliance with the Procurement Law; (ii) limited exposure to World Bank procurement strategies; (iii) lack of established procurement presence in the Bank; and (iv) minimal staff involvement in procurement.

19. The proposed Action Plan to address the above deficiencies include: (i) preparation of a Project Implementation Manual (PIM), which describes their organizational structure for implementing the project, including a section on procurement which describes the organizational arrangement for the management of procurement, detailed terms of references for the staff, the functional relationships and interaction between the project's staff responsible for procurement and the relevant units for administration and finance, and clear instructions and guidance for the management of procurement records; (ii) a project launch workshop will be held for key staff of the implementing agencies, including the tender committees. The workshop will include sessions on Bank procurement policy as well as the Public Procurement Act. The focus will be to orient key staff on the principles of good public procurement planning and practice and to discuss the procurement arrangements under the project; and (iii) setting of standard processing times.

21. The ARB Apex Bank, the “Central Bank” for the Rural Banks in Ghana, will supervise and coordinate the provision of finance to prospective consumers under the Solar-PV Systems sub-component. This responsibility does not call for a dedicated professional procurement presence in ARB Apex Bank. In fact, with the exception of motor-bikes, office stationery and equipment, hiring an Inspection Agency for monitoring the use of the funds, etc., no major procurement activities are expected. For this reason, it was agreed that ARB Apex Bank will continue to rely on the support of the Bank of Ghana Procurement Officer, as obtained under the just-ended Rural Financial Services Project.

C. Frequency of Procurement Supervision

22. In addition to the prior review to be carried out by the Bank Country Office in Ghana, the capacity assessment of the Implementing Agencies has recommended a project launch workshop and a minimum of two supervision missions annually to visit the field to carry out post review of at least 20% of all contracts below the prior review threshold.

Annex 4: Safeguard Policy Issues

1. Ghana is one of the countries being considered for piloting the use of country environmental systems, specifically in the proposed Ghana Energy Development and Access Project (GEDAP). GEDAP will be governed by the new operational policy¹⁶ (OP 4.00) on “Piloting the Use of Borrower Systems to Address Environmental and Social Safeguard Issues in Bank-Supported Projects.” In accordance with OP 4.00, staff from the World Bank, in collaboration with local staff, carried out an equivalence analysis and acceptability assessment of applicable Ghanaian environmental systems, in the latter half of 2005 and early 2006. The work was done in partnership with the African Development Bank (AfDB) in order to facilitate use of country systems in Ghana by both banks and to progress toward harmonizing their respective safeguards requirements.
2. The equivalence analysis, which was based on a review of legislation, regulations, guidelines and procedures, concluded that Ghanaian systems for environmental assessment (EA) and physical cultural resources (PCR) are in most respects equivalent to the World Bank’s and AfDB’s policies and procedures.
3. The project is unlikely to have any adverse impact on the environment; rather, the substitution of solar energy for fossil fuels is expected to have a positive global environment impact, due to reduced CO₂ emissions.
4. As in solar energy projects in other countries, the main potential adverse impact comes the replacement of batteries. Ghana already has in place a functional, though not perfect, market-based informal system of recycling batteries, and this system is expected to continue to function in the future. Under this system, waste collectors collect the batteries and sell them to people who disassemble and use the materials to the extent possible. To the extent that EPA is trying to improve recycling systems for automobile batteries, GEDAP would work with them to make sure that the solar dealers who take back used batteries will dispose of them through the best practice local system available.

¹⁶ OP/BP 4.00 can be viewed at this website:
<http://wbln0018.worldbank.org/Institutional/Manuals/OpManual.nsf/tocall/E49CED1645FB433885256FCD00776B19?OpenDocument>.

Annex 5: Results Framework and Monitoring Mechanism

The overall responsibility for monitoring and verification lies with the Ministry of Energy and the Apex bank.

A. Key Performance Indicators

The project will monitor the following indicators, which will be used to assess overall performance of the project.

1) Number of solar photovoltaic systems installed:

Type	Project Target
a) Lanterns	7,500
b) Small systems (under 35 Wp)	4,500
c) Large systems (over 35 Wp)	3,000
TOTAL	15,000

2) **Provision of sustainable services by the solar dealers over three years including maintenance visits and battery replacement.** Data related to this indicator will be collected during supervision missions and also on an ongoing basis by the Apex Bank. Data will be collected on the following sub-indicators:

- a) Number of unscheduled service visits requested
- b) Average time taken to respond to unscheduled visit request and performance required maintenance
- c) Scheduled visits undertaken
- d) Battery replacement done as per schedule
- e) Average level of satisfaction with functioning of solar system, and main problems

B. Additional Tracking Indicators

The following indicators will be used to track the operation of the project:

- a) Cost of solar systems
- b) Average time taken to make GPOBA payment
- c) GPOBA subsidy per beneficiary
- d) Default rate on loans
- e) Number of solar dealers

The information above plus additional information will be provided by the implementing agency on a semi-annual basis in the form of a Project Progress Report. Information will be provided in the format specified below, tables 1 through 4.

Table 1: Output table

Year		2009		2010		2011	
		June	Dec	June	Dec	June	Dec
Outputs delivered (pls. add a line for each output)	Solar lanterns Planned						
	Solar lanterns actual						
Subsidy per output (pls. add a line for each output)	SHS < 50 Wp planned						
	actual						
Disbursements request	SHS > 50 Wp planned						
	actual						

Table 2: Static data (to be provided at the beginning of the project and updated when necessary)

Outputs	Definition of outputs	Solar lanterns, SHS 20Wp, SHS 30 Wp, etc.
	Disbursement milestones	1) X% at downpayment 2) Y% after installation and verification 3) Z % after year 1, etc.
Access	Number of people per hh in project area	6
Targeting	Targeting	a) Geographic (poor, rural areas with 60% at less than \$1 income per capita per day, 30% between \$1 and \$2); b) self-selection with most outputs small PV poorer households likely to use; c) progressive subsidy – larger percentage for smaller units
	Average household expenditure on alternative service provision	\$6 for minimal kerosene and batteries
Aid efficiency	Maximum allowable subsidy	\$50 for solar lanterns; \$450 for SHS 35Wp; \$550 for SHS 50Wp
	Actual unit subsidy (by type of output)	
	Cost reduction	Reduction in cost increase in outputs
	Cost of project development (TA)	
Pr ovi	Description of service provider	Local private dealers
	Type of contract/ certification	Dealer sales model, with three year service contracts
De v.	Development impacts recorded by the project	Reduction in time spent or distance traveled for procuring service; health benefits; others, as recorded by the project.

Table 3: Indicator tracking table

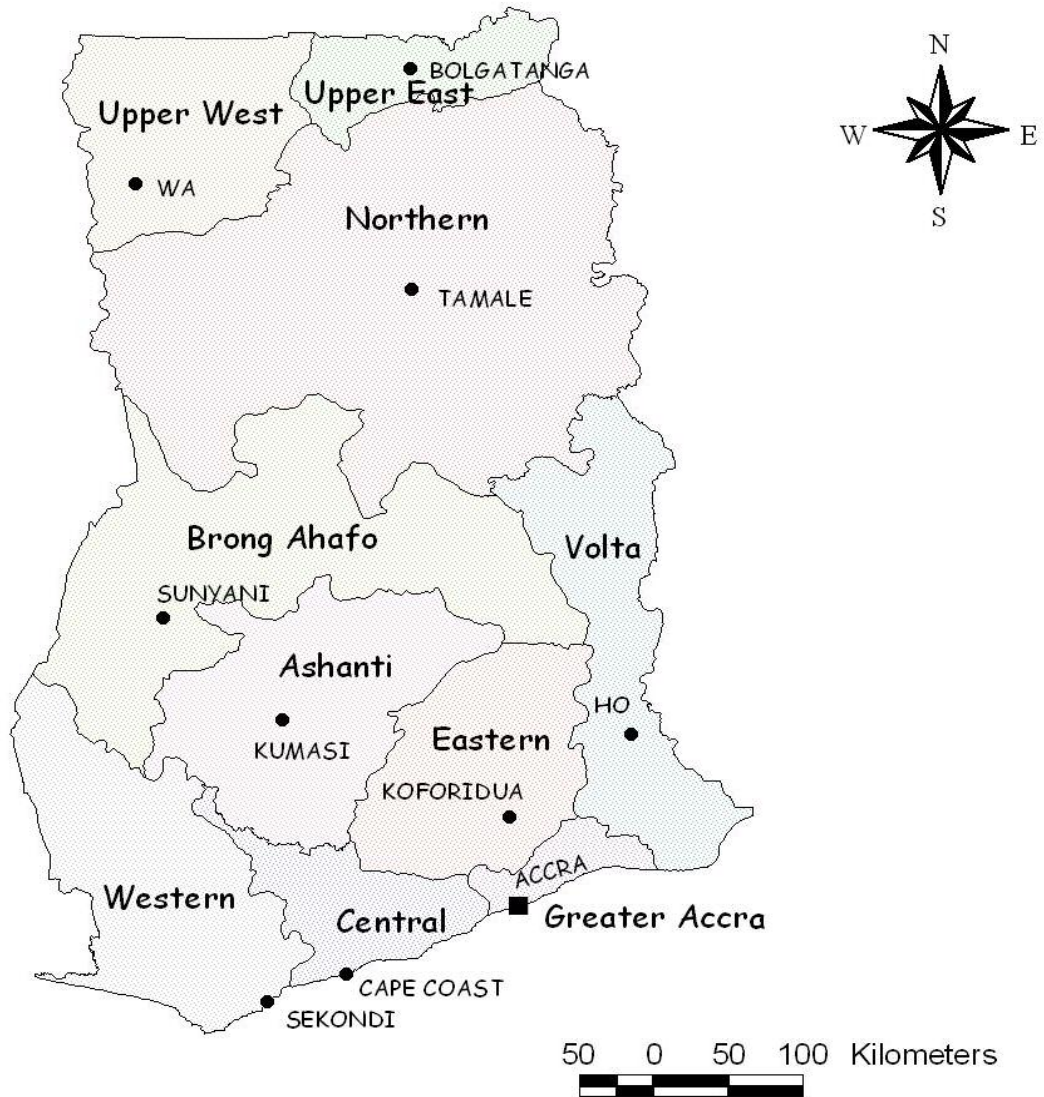
Year		Unit	Base- line	20..		20..		20...	
				P1	P2, ...	P1	P2, ...	P1	P2, ...
Outputs delivered (pls. add line for each output)	planned	#							
	actual								
Number of hhs/people benefiting	planned	#							
	actual								
Service quality indicators		Unit							
Average household income of beneficiary households		Specify currency							
Consumer debt default		%							
Number of service providers participating in the project		#							
Percentage of population in target area with access to service in question		%							

Table 4: Project funding sources (per period)

Year		Unit	Unit cost	Total
GPOBA subsidy	planned	Specify currency		
	actual			
User contribution	planned	Specify currency		
	actual			
Private financing	planned	Specify currency		
	actual			
Funding from other sources (pls. specify)	planned	Specify currency		
	actual			
Total	planned	Specify currency		
	actual			

Annex 6: Target Areas

1. **Map of Ghana:** The project targets at the following regions: Northern, Upper East, Upper West, Brong Ahafo, and Volta Regions.



2. Target Districts:

Based on the criteria below, the preliminary targeted regions and districts are selected and shown in the following table:

- Grid will not arrive in ten years, based on rural electrification plan;
- Current electrification rate below 20%, and not on the list of the Self-Help Electrification Program or other grid expansion plans;
- SHS is the least-cost option to provide electricity services;
- There should be presence of rural banks; and
- Areas with high poverty indicators.

Region/Districts	Total Population	Rural Population	Electrification Rate (%)	Percentage of the Rural Population under \$1/day
NORTHERN				74.0
West Gonja	139,329	119,195	14.6	58.4
West Mamprusi	115,025	96,413	17.2	82.2
East Mamprusi	174,863	143,195	19.1	88.8
UPPER EAST				75.2
Builsa	75,375	75,375	7.0	57.5
Kassena-Nankana	149,491	125,689	13.0	62.6
Bongo	77,885	77,885	7.0	70.6
UPPER WEST				83.9
Sissala	85,442	76,584	18.0	85.0
Lawra	87,525	75,484	14.6	89.8
VOLTA				51.9
Krachi (island community)	159,925	130,142	19.8	46.7
BRONG AHAFO				50.4
Sene	82,166	75,107	16.5	44.6
Total	1,321,526	1,145,659 (or 170,994 rural households)		

Annex 7: Project Preparation and Supervision

A. Institutions responsible for preparation of the project:

ARB Apex Bank.

Primary contacts: Duke Osam-Doudu, Deputy Managing Director

B. GPOBA/World Bank Team:

Name	Title	Unit
Xiaodong Wang	Task Team Leader	AFTEG
Elizabeth Wang	Senior Financial Officer	IEF
William Steel	Rural Finance/Consultant	AFTEG
Patience Mensah	Senior Agriculture Economist (rural finance)	AFTS4
Subodh Mathur	Economist/Consultant	AFTEG
Fred Akuffo	Solar Energy Specialist/Consultant	AFTEG
Peggy Wilson	Economist/Consultant	AFTEG
Manush Hristov	Senior Counsel	LEGAF
Thomas Walton	Environmental Specialist	AFTSD
Jonathan Nyamukapa	Senior Financial Management Specialist	AFTFM
Samuel Bruce-Smith	Financial Management Specialist	AFTFM
Amadou Tidiane Toure	Lead Procurement Specialist	AFTPC
Ferdinand Tsri Apronti	Procurement Specialist	AFTPC
Anthony Mensa-Bonsu	Procurement Specialist	AFTPC
Helena Kofi	Procurement Analyst	AFTEG
Yogita Mumssen	Infrastructure Economist	GPOBA
Lars Johannes	Operations Analyst	GPOBA
Lily Wong Chun Sen	Program Assistant	AFTEG

Advisory team:

Name	Title	Role	Unit
Patricia Veevers-Carter	Program Manager	Peer Review/ Advisory	GPOBA
Irving Kucynski	Panel of Experts	Advisory	GPOBA
Alejandro Jadresic	Panel of Experts	Advisory	GPOBA

C. Project Preparation Costs

Technical assistance of \$ 155,000 has been awarded by GPOBA, part of which was used to engage a number of independent consultants. In addition, at least \$150,000 of World Bank and GEF funds have been spent on project preparation of the solar PV component to date.