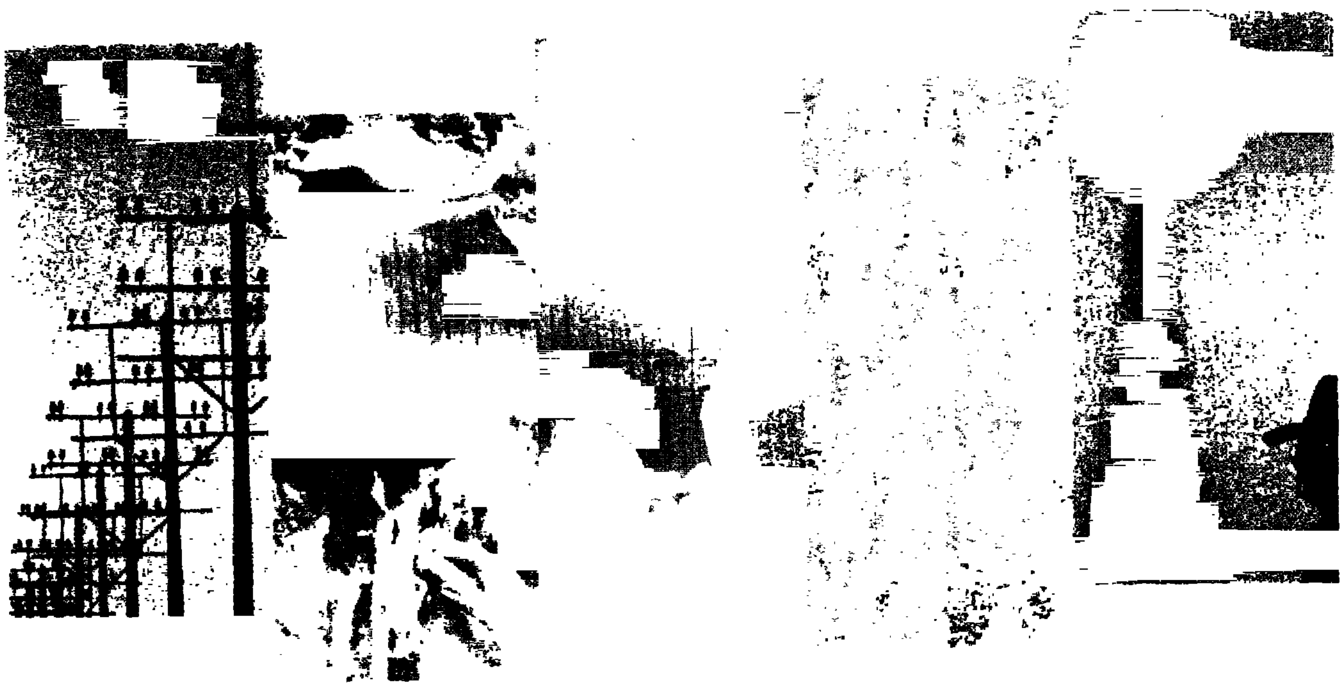
Best Practice Manual

Promoting Decentralized Electrification Investment

ESM248



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Management

Assistance

Programme

ESMAP

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JOINT UNDP / WORLD BANK

ENERGY SECTOR MANAGEMENT ASSISTANCE PROGRAMME (ESMAP)

PURPOSE

The Joint UNDP/World Bank Energy Sector Management Assistance Programme (ESMAP) is a special global technical assistance program run as part of the World Bank's Energy, Mining and Telecommunications Department. ESMAP provides advice to governments on sustainable energy development. Established with the support of UNDP and bilateral official donors in 1983, it focuses on the role of energy in the development process with the objective of contributing to poverty alleviation, improving living conditions and preserving the environment in developing countries and transition economies. ESMAP centers its interventions on three priority areas: sector reform and restructuring; access to modern energy for the poorest; and promotion of sustainable energy practices.

GOVERNANCE AND OPERATIONS

ESMAP is governed by a Consultative Group (ESMAP CG) composed of representatives of the UNDP and World Bank, other donors, and development experts from regions benefiting from ESMAP's assistance. The ESMAP CG is chaired by a World Bank Vice President, and advised by a Technical Advisory Group (TAG) of four independent energy experts that reviews the Programme's strategic agenda, its work plan, and its achievements. ESMAP relies on a cadre of engineers, energy planners, and economists from the World Bank to conduct its activities under the guidance of the Manager of ESMAP, responsible for administering the Programme.

FUNDING

ESMAP is a cooperative effort supported over the years by the World Bank, the UNDP and other United Nations agencies, the European Union, the Organization of American States (OAS), the Latin American Energy Organization (OLADE), and public and private donors from countries including Australia, Belgium, Canada, Denmark, Germany, Finland, France, Iceland, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Sweden, Switzerland, the United Kingdom, and the United States of America.

FURTHER INFORMATION

An up-to-date listing of completed ESMAP projects is appended to this report. For further information, a copy of the ESMAP Annual Report, or copies of project reports, contact:

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Best Practice Manual: Promoting Decentralized Electrification Investment

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(ESMAP)

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ESMAP Management"

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Illustrations

Acknowledgments

This report was prepared by Willem Floor, René Massé, and Dean Girdis of the World Bank.

Acronyms and Abbreviations

BP	business plan
DE	decentralized electrification
kWh	kilowatt-hour
LPG	liquefied petroleum gas
NGO	nongovernmental organization
RE	rural electrification
PV	photovoltaic
TA	technical assistance
TM	task manager

Executive Summary

1. This paper provides background information on decentralized electrification (DE) and serves as a guide for Task Managers (TMs) for implementing DE projects and initiatives in developing countries.* In doing so, it attempts to fulfill two objectives:

- Review methods of DE intervention
- Provide a step-by-step approach for TMs implementing a DE project.

2. Chapter 1 provides a brief overview and summary of rural electrification options.

3. Chapter 2 identifies implementation options for DE, focusing on either individual initiatives or collective/cooperative approaches.

4. Chapter 3 discussed the key factors necessary to create a conducive environment for the promotion of DE. This includes the legal, regulatory, and fiscal incentives, sustainable financing mechanisms, and necessary technical assistance to promote projects.

5. Chapter 4 defines the role of government and briefly discusses the functions of government agencies for the promotion of DE.

6. Chapter 5 provides a step-by-step guide for task managers implementing a DE project. Five project stages are presented. Each stage is divided into discrete steps task managers can carry out to explore a DE project's feasibility. These steps deal with the institutional and regulatory environment, market identification and assessment, technology and product options, delivery mechanisms, and financing.

7. The annexes present detailed background information and useful examples.

* This report was completed in July 1999 and reflects events only until that date.

1

Introduction

1.1 Access to electricity for everyone is a key objective of many international cooperative efforts.* Where people are distant from central sources of electricity, decentralized electrification (DE) becomes the focus of such efforts. Although many technical and organizational options are available for DE, it is the local populations, their respective ability to pay, and their access to distribution networks that will determine which solutions are most appropriate.

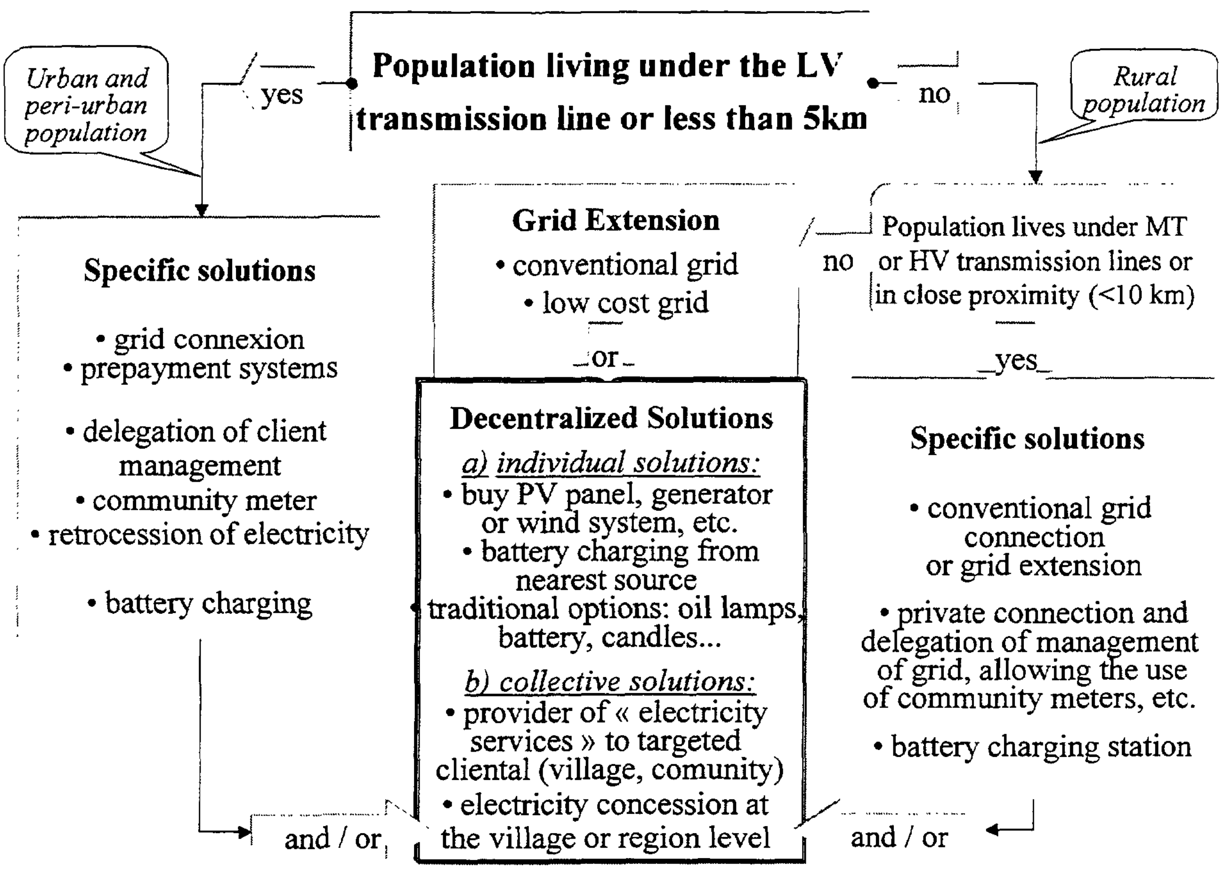
1.2 As shown in Figure 1, it is relatively simple to identify the best option for a DE intervention. Although this example is not exhaustive and serves only as a general guideline, it is a useful model for selecting the most appropriate intervention. Specific solutions will depend on the organizations involved as well as the energy choices, needs, and abilities of the local population: no solution will be applicable in all circumstances. (See Annex 1.1, "Factors Influencing the Introduction of Decentralized Electrification.")

1.3 The model presented in Figure 1 allows a task manager (TM) to identify the target group or population and determine the most appropriate intervention option. In principle, populations located close to an existing medium- or high-tension transmission line less than 10 kilometers long may make use of the specific solutions identified in Figure 1. For those groups where these options are not available or practical, or who are located further than 10 kilometers from such a transmission line, DE options are likely to be best.

1.4 There are several World Bank documents that highlight each of the options presented in Figure 1, including decentralized energy charging systems, installation of renewable energy systems (World Bank 1996), connection to medium-tension transmission lines (ESMAP 2000), and specific solutions for peri-urban areas (World Bank 1999b). Project-specific documents (based on country interventions) illustrate several solutions already implemented for commercial electricity services (World Bank 1998) and mini-grids (World Bank 1999a). Despite the Bank's activities, however, many innovative activities have yet to be implemented—in particular, activities in the peri-urban and rural areas near medium- and high-tension transmission lines.

* This report was completed in July 1999 and reflects events only until that date.

Figure 1. Rural Electrification Intervention Options



2

Identifying Implementation Options for DE

2.1 *Decentralized electrification* does not refer only to technological choices (grid or non-grid) or geographical location (urban or rural). This is a new, decentralized approach to both the production of electricity and the undertaking and management of electrification projects that may or may not be grid-connected.

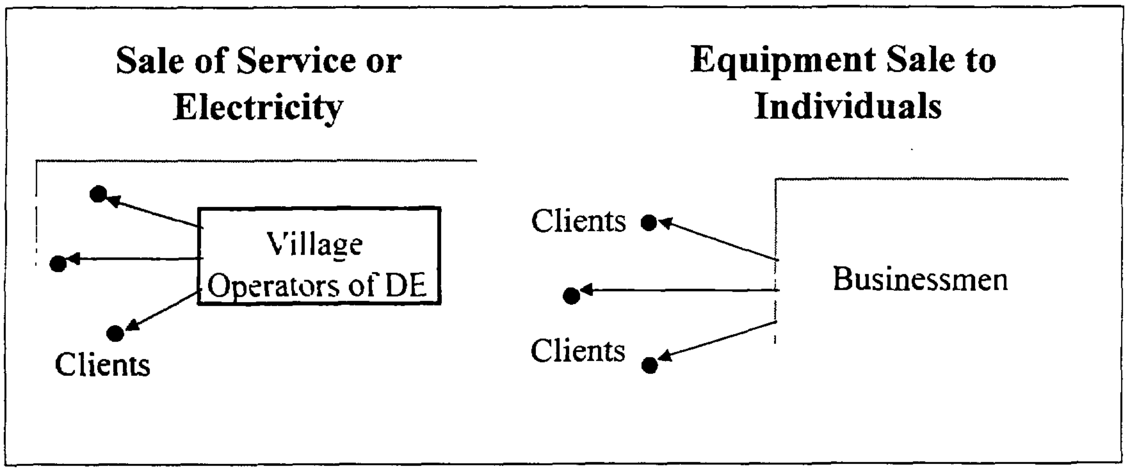
2.2 What characterizes the different decentralized electrification projects observed is that they are either individual initiatives or collective enterprises. *Individual initiatives* result either in the acquisition of energy equipment or rechargeable batteries. Although the method of payment varies (cash, credit, leasing) the final recipient always buys the equipment from a businessperson who installs it and takes the responsibility for maintenance and repairs throughout its lifetime.

2.3 *Collective enterprises* (i.e., companies or cooperatives) supply electricity or electric services at the village or regional level. The electricity supplier invests in and remains owner of the equipment. He or she periodically invoices the customer either on the basis of the cost of the power consumed or via a lump-sum payment calculated according to the estimated load of the provided service (e.g., the number of lamps or outlets). The customer (or family) does not have to take out debt, perform maintenance, or manage the equipment, though it will regularly pay a fixed fee in advance. The supplier calculates fixed prices that will (a) cover his fixed costs and credit, operating, and maintenance expenses and (b) recoup his invested capital. Because the financing mechanisms seek to promote investment, they thus address the service provider more than the final user.

2.4 These two dynamic DE methods are complementary (see Figure 2 and Annex 2.1, "Intervention Models"). Their combined effects on local markets are reinforced through developing the availability of spare parts and increasing knowledge to reduce costs to acceptable levels. In addition, they address customers characterized by their purchasing power and nature of their needs.

2.5 With the equipment-sale approach, maintenance and repairs are the responsibility of the user. In East Africa, several countries have been successful using this approach. In Kenya and Uganda, for example, families that traditionally used some form of battery have started to equip themselves with photovoltaic (PV) modules for easier charging. At the same time, commercial applications have begun to develop, albeit without particular support due to the demand for cost-competitive products. In these countries, PV modules are more popular than more-expensive PV systems because they better meet the demands of the local population.

Figure 2. Service Approach versus Equipment Sales



2.6 New DE approaches seek to support private providers of electric services rather than focus solely on equipment distribution. Given that DE technologies are relatively mature, it seems logical that public money should help the poor gain access to electricity services. In countries where the market for energy equipment is embryonic, the development of village DE will undoubtedly increase equipment sales.

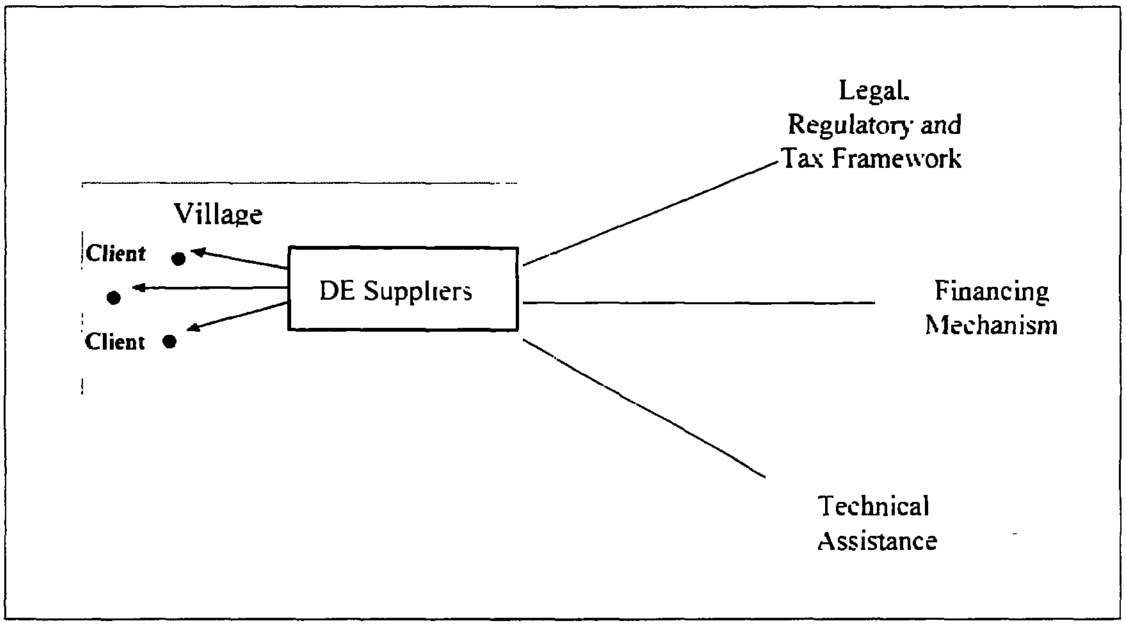
3

Creating a Environment Conducive to DE

3.1 The success of a DE program will depend on properly identifying the needs of the key actors. In this case, the key actor is the electric services provider, which will decide whether or not to engage in a commercial activity. To encourage an operator to sell electricity or electrical services to a population traditionally excluded from access to the grid, three elements must be in place (see Figure 3):

1. A legal, regulatory, and tax framework clearly adapted to DE
2. A sustainable financing mechanism
3. Technical assistance.

Figure 3. The Needs of Private DE Suppliers



Legal, Regulatory, and Fiscal Incentives for DE

3.2 Before engaging and investing in a new business activity such as DE, private suppliers need "rules of the game" that are clear, constant, and durable. However, because the regulations in force in the electric sector were conceived according to the needs and constraints of the electrical supply network, they do not offer a suitable framework for DE. Certain regulations are completely unsuitable, while others hinder the development of DE alternatives. Finally, certain significant aspects of DE cannot be regulated as they are for traditional grid-supplied electricity. The following key issues need to be addressed:

- *A flat kilowatt-hour tariff in an entire geographic area does not leave any possibility of promoting financially viable DE programs unless a permanent subsidy for operation is available—which is not an acceptable solution.* This is a common problem for many electric companies in rural centers, where they operate small power stations whose fuel costs higher than they can recoup by charging the legally allowed minimum sale price for electricity. Because the decentralized production of electricity is generally more expensive than grid production, it thus cannot be sold at the same price except with a subsidy.

- *Selling electricity per kilowatt-hour prevents the marketing of fixed-price "electricity services" that are specially adapted to small consumers.* On the basis of the logic of the grid, the company sells electricity delivered directly to the house. It is "logical" then to measure the consumption and to invoice in proportion to volume consumed, establishing a range of tariffs that take into account social considerations or economic promotion. As is already evident in cities, this system has led to problems: most families do not have the means to finance the cost of connection and metering, while the cost of servicing customers with low electricity consumption is uneconomic for the utility.

- *Legal restrictions on the provision of DE in developing countries not only hinder electric companies but also damage poorer families, which pay for expensive fraudulent connections.* By authorizing the provision of electricity by companies other than the state electric company, illegal connections can be reduced and strategies developed to better manage collections.

- *The legal imposition of inappropriate technical regulations, usually adapted for grid-based power, unfairly penalizes the development of small, village-based networks.* It is not justifiable to obligate the private DE operator to finance, with its own capital, an oversized system technically unsuited to the customers.

- *A good electricity law and accompanying decrees, although necessary, are not enough to guarantee the institutional capacity required to promote DE.* Granting of DE concessions must also take into consideration the development of appropriate DE models. The logic of profitability will inevitably lead most dealers not to distribute electricity to an entire population in a concession area, either urban or rural. It is therefore necessary to take into consideration the rights of the poor to have access to electricity.

- *It is important to legally define the precise field of application of DE.* Not only must governments deregulate the electric sector to meet the needs of DE; they must also liberalize the DE subsectors, which are governed by rules other that those in the conventional sector. The legal definition of the limits of these subsectors is essential to promote the advantages of DE and to legalize the initiatives of DE in concession areas.

- *The framework for DE must simultaneously stimulate investment by the private sector and aid the poorest populations.* In the absence of a clear framework, DE will be successful only on a small scale and will lack durable, long-term prospects. In the absence of such a framework, only some "profitable niches" will attract the private sector—niches that typically leave out the poorest people.
- *DE operators need a true legal status that is simple to manage and easy to negotiate with the administration.* Unfortunately, the concession granted to the DE provider is often the only statute envisaged by the electricity law.

3.3 By adjusting its tax policy in the following ways, national governments can support DE without reducing tax revenue:

- Reduction or temporary exemption of taxes on imported DE components such as photovoltaic modules, solar batteries, and regulators. Taxes currently imposed on imported photovoltaic equipment unnecessarily increase its cost and do not encourage market development. In some case, they can increase the cost of equipment by as much as 50 percent.
- Reduction or temporary exemption of value-added tax (VAT) on DE equipment.
- Reduction or temporary exemption of VAT on DE service, installation cost, monthly fees, and repair and maintenance of DE installations.
- Reduction or temporary exemption of the VAT on the interest expense payable by DE operators.

3.4 The duration of the proposed exemptions (in particular that of the income tax) should be at least equal to length of the projects considered. The exemptions granted to the contractors could be refundable in the event a project is terminated early.

A Sustainable Financing Mechanism

3.5 The success of DE in sub-Saharan Africa is still limited. This situation reflects the limited progress in the application of tariffs, which allow cost recovery and the opening of the sector to private capital. DE, photovoltaic, thermal, hydroelectric, and wind power still represent too high a capital investment with insufficient financial returns. As a result, electricity providers cannot and will not use their own capital or obtain credit to make such investments. Moreover, the absence of a demonstrated track record of successful DE projects and an increased perception of risks has diverted private capital to more traditional investments.

3.6 It is illusory to expect that increasing access to electricity for a significant part of the population traditionally excluded from grid-based electricity can be financed only by the private sector. Public electricity companies have not yet succeeded in rural electrification through a largely subsidized grid over the past few decades, and the introduction of more-expensive decentralized electrification technologies will not be feasible unless subsidies and local finance sources are available. European and U.S. history teaches us never to expect that a voluntary financing mechanism will arise to support rural electrification investments. Where there are customers willing and able to pay for electricity service, private operators will naturally focus on these markets at the exclusion of others. Long-term credit for investments with a subsidized interest rate may possibly help, but this has never been available in most developing countries.

3.7 If the objective is to increase access to electricity for disadvantaged populations in developing countries, then it is obvious that the supply of public services cannot be accomplished without a subsidy. It is largely accepted today that such a subsidy can cover part of the original equipment costs and support the emergence of markets for equipment and decentralized electric services. The chief concern, though, relates to the use of the subsidy, the methods of its assignment, and its impact on the operation of markets and competition. Several recent projects have demonstrated new ways to apply subsidies appropriately, such as the following:

- Support for access to DE but not financing consumption
- Creation of a market without distorting market rules
- Equitable use without creating or reinforcing a monopoly
- Neutrality in terms of technological choices
- Support for the installation of high-quality DE systems
- A focus on energy efficiency
- Support only for DE programs that would not be viable without the subsidy
- Reliance on available financial resources if subsidies are to be maintained.

Technical Assistance

Types of Missions

3.8 There are two types of technical assistance (TA) missions: short and permanent.

Short Missions

3.9 Short missions are typical for the development of DE mechanisms. They often require specialized knowledge for a limited length of time. Key features include:

- Legal and technical guidelines.
- Education of all DE actors in the new legal provisions and in the use of supporting techniques, such as targeted information campaigns and meetings with local communities and potential operators.
- Design of a procedures handbook for handling requests for DE financing. The handbook will include the description of a credit background (see the business plans in Annexes 5.5 and 5.6), a model contract for subscribers of electricity

services, a model of schedule of charges, a model for cooperatives, and procedures for tariff revision and control.

- Formation of national experts for the design of DE business plans and the provision of consulting services for DE.
- Training of electricity service providers in equipment management, invoicing of customers, and production of teaching documents.
- Technical training of installers.
- Evaluation of DE mechanisms.
- Initiation of the first DE schemes in order to immediately get feedback and begin work.

Permanent Missions

3.10 In the beginning of the project, TA services are provided by the implementing agency with assistance from local counterparts. As local experience is gained, some of these functions could be sub-contracted to people receiving benefits. Ultimately, the long-term objective is to train national actors to ensure project sustainability. Actions include:

- Selection of service providers on the basis of a business plan, technical studies, and an analysis of financial profitability of the installation. Throughout the project, this function is provided by the TA office; but it will have to be gradually entrusted to the credit organizations or independent agencies, and its financing will have to be envisaged in the project's financing plan.
- Evaluation of the financial profitability of a project and the decision on the amount of the subsidy to be granted to a provider (probably the responsibility of the rural electrification agency).
- Follow-up implementation of projects, including quality control and technical visits of the operator during the first years of operation to ensure proper use of funds and to provide any further assistance DE operators may require.
- Monitoring of operator service and addressing of user complaints. This will be allocated naturally to the agency (or ministry) regulating the sector or the institution to which activities are delegated before the end of the project. The TA office will ensure the continuation of electricity service in the event of egregious failure of the operator.

Methods of TA Intervention

3.11 Technical assistance will be entrusted on international invitation to tender with an engineering and design department able to coordinate all activities. The TA team will not have the ability to grow at the same rate as DE, but rather will create a local competence to develop electrification approaches. This suggests subcontracting for simple tasks and networking with contractual partners in the field regarding the status of implementation. From its base, the TA team will be able to ask for the opinion of specialists on particular files. A second network of international experts, intervening quickly and remotely (by exchanges of email), makes it possible to associate better international competence without weighing heavily on the budget. This intervention methodology prepares the transfer of responsibilities, which will have to take place throughout project. Thus, at the end of the permanent TA presence, essential activities for continuation of DE are ensured, technically and financially.

Autonomy

3.12 These complex missions can be carried out only if the office/agency of TA in charge of launching DE projects has financial autonomy and real independence with respect to the administration and the electric companies. This autonomy would extend to the management of a very detailed program of work, as well as to annual audits entrusted to an external expert. The audits will evaluate both the quality of accomplished work and the relevance of the mechanisms installed; they will also recommend ways to improve those mechanisms. The office of TA could, for example, be placed under the supervision of the government agency responsible for rural electrification.

Justification

3.13 International TA is justified for several reasons:

- Generally, because no knowledge is available locally, there is no reference point for approaches of the electricity sector
- TA missions require a certain "distance" from institutional authorities and distributors of electricity to effectively employ new practices in this subsector and especially to gain the confidence of new private operators of DE
- Mission activities are specific, evolutionary, and definitely distinct from those of government and its institutions or agencies. It is advisable not to transform the mission into a regular function.
- For a limited time during the DE project launching, international expertise will be required for targeted activities.

4

Defining the Role of Government

4.1 The government's first responsibility to any DE project is political. No electrification project has ever succeeded without the backing of strong political will. Throughout the world, national electricity sectors have been structured exclusively around electrical supply networks. Ministries share with the people they serve this network-based conception of electricity services; power company personnel are trained in the same schools and share a common outlook. This cultural homogeneity has created a strong resistance to the innovation DE projects will need to succeed.

4.2 To increase popular access to electricity, the current system must evolve. It is the role of the energy ministry (with government support) to facilitate this evolution in the following ways:

4. *Coordinate DE activities once government policy is established.* It is essential that all interventions, both international and national, fall within a same institutional and organizational scope and that they follow similar and compatible rules for a successful DE program. The energy ministry has the responsibility to lead government policy on these matters.

5. *Create conditions favorable to the private sector.* This includes electricity laws and accompanying decrees, reduction of taxes and customs duties on DE equipment, and support from the energy ministry to support reforms.

6. *Mobilize national and international financing.* This will require the engagement and the guarantee of the State. It is still the role of the Government to take care of the good use of the public funds intended for DE, through a mechanism of transparent and professionalized financing.

7. *Make sure DE project staff are technically competent.* The energy ministry needs to provide technical aid to DE projects to ensure that they are implemented with the highest standards.

8. *Gather information.* Multiple services, such as administration; customs, communities, health, and education needs, are required to gather and support its

introduction. It is the responsibility of the Agency (or energy ministry) of making sure that this information is gathered and properly applied.

9. *Provide independent regulation.* As the energy sector is liberalized, the introduction of multiple operators, statutes and a range of services (inter-connected networks and providers of electric, co-operative service users of electricity, etc), may cause conflicts requiring arbitration. Arbitrating such conflicts is generally the role of the ministry acting as "electricity regulator"—or, preferably, a regulatory agency independent from the ministry.

4.3 The energy ministry's regulatory role (via its regulator's office or agency) requires that the TA office be independent: the same institution cannot effectively both implement and judge a project. For example, the ministry (via its TA office) cannot first help project operators formulate their business plan, then switch roles (via its regulatory office) to evaluate the same plan. Whereas the TA office is on the ground with the DE operators, the regulator acts as a referee. It is the regulator that decides whether or not to allow subsidies for DE projects, notifies the commercial bank and the board (the board of directors for each project) of its decisions, and submits proposals for improving DE mechanisms.

5

Guide to Promoting Decentralized Activities

5.1 This section provides for task managers (TMs) a step-by-step guide to identifying, developing, and implementing decentralized electrification activities, either as a stand-alone project or as a component of a larger project. By using this guide TMs may determine whether a given decentralized electrification project is a logical option for meeting the energy needs of rural residents. To do so, TMs will likely need to complete each of the guide's five stages—although they may determine, prior to completing all the stages, that the project is not an appropriate investment.

5.2 Although TMs should address the five stages in sequential order, they may not need to address each respective step of the stages if sufficient information or knowledge is already available. By using this format, TMs will be able to begin to establish the framework and principal elements necessary to initiate decentralized electrification activities. These include identifying and assessing the following:

- Institutional and regulatory environment
- Markets and project concept
- Technology and product options
- Delivery mechanisms
- Financing options.

Stage 1. Define the Institutional and Regulatory Environment

5.3 The institutional and regulatory environment covers a wide range of issues that includes the role of government, the legal framework, market barriers, technical capacity, use of local institutions such as nongovernmental organizations (NGOs) and the financial sector, and the role of the private sector.

5.4 The TM's first priority is defining the role of government. Government must first demonstrate a commitment to decentralized power, ideally through direct support of DE initiatives, sector reform, and establishment of institutions and regulations to support such activities. Specific laws, regulations, or agencies may need to be established. If the government does not undertake the necessary initiatives, successful implementation of DE activities will be jeopardized and pursuit of a project should be reconsidered. Once these issues are fully addressed, then supporting elements dealing with technical issues and institutions can be covered.

Key Steps

1. Solicit and measure government support for DE from relevant institutions or agencies.

5.5 Governments must be committed to DE initiatives or those initiatives will likely fail. Following are several specific actions they can take that collectively would demonstrate a commitment to DE (see Box 1.1):

- A specific policy statement supporting DE
- Applicable law, amendment, or waiver supporting DE and making DE activities legal
- Annual budgetary allocation for DE investments and fiscal incentives to support investment
- Creation of supporting institutions, such as a rural energy entity.

5.6 In addition, agencies directly involved in providing energy services (such as the national utility, energy ministry, or other responsible agency) should agree to assist, either directly or indirectly, in the promotion of DE. If government support is lacking, the TM should solicit support from the respective agencies as a secondary option. Again, however, lack of support at this level is a major barrier to a successful project, and without such support no activity should be pursued.

2. Determine whether the electricity law allows the provision of DE by entities other than the national utility.

5.7 Often there may be a law (for example, a "General Electricity Law") stipulating that only a national or regional utility has the right to provide electricity services. If such a law exists, it should be amended (or a waiver granted) to give private operators the right to supply electricity to areas with no current or future planned access to the electricity grid (see Box 1.2). DE will have a better chance of succeeding and will likely have a higher rate of penetration if it is implemented by an entity (such as a private operator or an NGO) committed only to the supply of DE in a specific service area. Although only cursory experience supports this position, national utilities could still play a role in providing DE if they demonstrate a strong and supportive interest in pursuing DE activities.

(cont'd)

Box 1.1 Example of Government Support for DE

Ideally, the government will issue a statement or policy, possibly in conjunction with the proposed project or prior to its initiation, that clearly defines its level of commitment. This requirement should be fulfilled prior to the development of a full-scale project. Examples include the following:

Declaration of Energy Sector Policy in Madagascar, June 1999 (paragraph 29)

"Creation of a rural electrification program (RE). This program includes in particular the execution of an initial program of electrification (PROGELEC) including/understanding (i) the definition and the execution of program controls and general electrification with institutional solutions to ensure its sustainability, and (ii) the creation of a an autonomous Development Agency of Rural Electrification (DARE) which will have the following roles: (a) to promote the rural electrification carried out by private operators, (b) to supervise RE projects financed with its support, (c) to provide the technical aid and to establish technical standards of lower costs for RE, and (d) to ensure the follow-up and socio-economic and environmental evaluation. To ensure the financing of RE in a sustainable way, funds for decentralized rural electrification will be created, with funding from the State."

Mauritania: Water and Power Sectors Policy Letter, September 1998 (paragraph 66)

"Pertaining to the rural electricity subsector. This strategy will relate to the installation of tools to facilitate (i) an institution which will ensure the promotion, as well as the technical and financial support for rural electrification; (ii) establishment of cooperatives for rural electrification to represent the beneficiaries and deal with the management of investments and cost recovery; and (iii) the use of funds for rural electrification which will have as a goal the promotion of new investments; maintenance of installations; support from the State, financial backers and the beneficiaries; and support for the emergence of private companies for the manufacturing of equipment."

Senegal: Letter of the Sectoral Policy, January 1997 (paragraph 45)

"Electrification of rural and urban areas. The development of electricity in rural and peri-urban areas, through the grid or with decentralized electrification options, is often too expensive for most populations. Government plans to support these investments by granting subsidies within the framework of its social policy. The realization of this goal will rest on private firms operating in the target areas, according to procedures of adjudication. This task will require analysis and detailed proposals, in particular concerning the programming of investments and the source of financing. It is nevertheless hoped that the reorganization of the sector, as described below, will facilitate the development of rural energy activities."

Box 1.2 Ensuring the Legality of DE

Any law supporting DE should specifically allow and legalize the provision of DE services. Typically, the introduction of an amendment to the law—the ideal option—is a complicated process, but it should still be studied. Moreover, legality of DE is not the only question but it must also be backed by the creation of a level playing field supporting all potential DE operators equally without favoring a national or regional utility. Due to the nature of many national utilities and their long history of service provision in their countries, it may be difficult to create such a level playing field.

Recent World Bank initiatives in Laos have led to the creation of a DE project. Although the existing electricity law did not specifically outlaw DE, the rules specifically supporting its introduction were vague. The project helped establish the parameters for developing DE projects by defining the process for the granting of waivers to DE service providers. A government entity has now been established within the national utility to pursue DE service provision, although entrepreneurs are also encouraged to pursue a waiver to provide DE. Ideally, the granting of waivers will be relatively simple administrative procedure, although it may still be rather cumbersome for potential entrepreneurs in isolated areas.

3. Identify market barriers to DE.

5.8 The TM should identify any laws or regulations, policies, or tax/duty regimes that unfairly increase the cost of DE. Investment in DE may require making changes in tax, VAT, and duty regimes, particularly for imported products. Often, high import duties present a major barrier to reducing the delivered cost of DE, particularly for PV products. If duties, VAT, and taxes are high (greater than 20 percent), particularly compared to alternative energy sources, the TM should review the impact of duties on the cost of DE equipment. If capital costs increase greatly as a result, then the TM should investigate alternatives to reduce these taxes to more reasonable levels that will not significantly increase the cost of imported DE equipment and unnecessarily raise its cost as compared to alternative energy sources. (See Annex 5.1, "Tax and Import Regime for Solar Equipment in Senegal.")

5.9 The TM should identify subsidies for alternative rural energy options (such as kerosene). Use of subsidies to meet social, political, or development objectives may unfairly increase the cost of DE services, thereby discouraging their adoption. Under ideal circumstances, all energy options will be priced at their economic cost, free of heavy subsidies and import restrictions. There is, however, some justification for modest cross-subsidies between income groups for high-quality fuels such as liquefied petroleum gas (LPG) and electricity to encourage their use. In Thailand the success of rural electrification was based largely on cross-subsidies from urban to rural consumers and from large to small consumers.

4. Identify and assess technical capacity.

5.10 There must be sufficient technical capacity within the target country or region to design, install, and service systems on a sustainable basis (see Box 1.3). This capacity could be indicated by the existence of a technical school, technical consultants, or skilled technicians. Even with a good distribution system and appropriate financing, improper installation and lack of maintenance of DE equipment has led to many failed attempts to introduce sustainable DE service. For example, experience in many parts of Africa with PV systems and modules has not always been good because units have been improperly installed or maintained, leading to lower energy output or non-functioning units after less than one year of operation.

Box 1.3 Identifying Technical Capacity

There are several ways to identify available technical capacity in proposed project sites. Existing technical capacity may be available through existing product distributors, such as agricultural or electrical equipment suppliers. A trade school or adult education classes may provide training and/or a work-study program. Once the potential capacity is defined, a meeting should be held with the potential "installers" to determine their level of technical proficiency and interest, as well as how much additional training they will require to be able to service DE equipment.

5. Identify and assess local financial institutions.

5.11 Ideally, local financial institutions that could participate in DE financing should already be operating in the target areas, with a good knowledge of potential borrowers and a level of comfort with the degree of risk (see Box 1.4). Most of their experience may be related to agricultural and business lending rather than consumer lending. In addition, often the experience will be based on group lending or lending to cooperatives rather than lending to individuals—particularly rural residents, as they will likely have little or not borrowing history.

Box 1.4 Identifying Financial Institutions

Solar Finance Implementation in Kenya

The focus was to avoid traditional donor-driven approaches and instead concentrate on developing sustainable financing mechanisms for solar home systems (SHSs). On the basis of more than two years of field experience in Kenya, two different finance approaches were developed to address lighting and power needs of (a) rural households with regular cash income and (b) small businesses with the potential to increase productivity with PV electricity. For the finance system to work, the borrower must be sufficiently creditworthy to take on a small PV electricity system loan to be paid off in 18 to 24 months.

The approach adopted is based on the co-operation of a finance partner and a technical partner with communities that desire solar electric systems. The finance company makes loans available to qualifying households and small businesses that desire lighting and small power systems. The technical partner insures that all systems are well designed, installed, inspected and maintained. Loan agreements stipulate that the borrower follow technical guidelines set up by the technical partner to insure maximum system life (i.e., battery life). Rural-based service companies install and service the systems, while local artisans fabricate battery boxes and module mounts.

Two different types of finance institutions already active in rural areas are used. One is oriented towards giving business loans to small, well-organized rural groups or small businesses, with members guaranteeing each other and lower defaulting risks (i.e., peer pressure as collateral). The second type of finance group is an organized co-operative bank with experience loaning to individuals through rural-based savings and cooperative credit organizations (SACCOs), which provide loans to their members on the basis of income from cash crop earnings.

Identification and Formation of Loan Groups in Kenya

Efficient, organized, honest loan groups are the cornerstones of any rural finance program. A good solar finance program therefore needs *well-run loan groups*. The finance partner must organize the loan groups or fund recovery method. In this project, two types of rural loan groups were used:

1. Groups formed for the expressed purpose of getting solar loans. K-Rep guided the organization of the groups through its field offices.
2. Coop Bank Rural SACCOs—established tea societies that handle payment of rural tea farmers. They gave farmers loans based on their tea income. Because of the poor likelihood that the grid would be extended to their location, many of the households prioritize solar-powered lighting and TV systems.

Working with *existing* rural credit groups was, in this initiative's experience, the most effective way to develop SHS loan packages. Established credit groups have a history that the finance partner can review, and have screening methodologies that are more impersonal and objective than those of "informal" groups.

Keys for a Successful Loan Package

For the finance approach to work, loan recipients must be capable of taking on PV-electricity-system loans to be paid in 12–24 months. The loans should be provided using existing methodologies of finance institutions or loan groups. This manual outlines two finance approaches for PV systems which address lighting and power needs of:

1. Rural households with regular cash income
2. Small businesses with the potential to increase productivity with PV electricity.

One financing method involved a participatory, self-organized loan group guided by a successful micro-credit NGO whose approach has been shown to be successful in poverty alleviation on a wide scale. The other method used established SACCOs organized by a national cooperative bank. In both cases, the project approached the central finance group and allowed them to on-loan funds to the rural loan groups. As described below, both approaches have their relative merits and disadvantages.

5.12 The TM should initiate a dialogue with the respective financial institutions (local commercial banks and informal finance institutions) to assess their level of interest designing an approach. An activity review should be undertaken to determine the institutions' lending requirements and rates of interest in rural areas and their ability to participate in a DE program (see Stage 5 for a guide to analyzing local financial institutions). Finally, the TM should ensure that the interested local banks/financial institutions are established, committed, and active in targeted rural areas or at least willing to participate in the lending component of a new DE program.

6. Identify the agency responsible for DE and define its role.

5.13 The TM will need to either (a) identify the respective government agencies (or NGOs; see Step 7 below) that are responsible for rural energy or (b) initiate the establishment of such an agency or organization if does not exist. Ideally, the agency will have a degree of autonomy from the national utility and/or energy ministry so that it can independently act and promote DE activities without conflicting objectives. The willingness to have such an independent agency will in part establish government's commitment to the promotion of DE. This should include funding to support their operations, DE financing through government, a dedicated DE program, and commitment to monitoring and evaluation.

7. Identify local institutions or NGOs and define their roles.

5.14 Local institutions or NGOs can play a major role in providing DE, and every effort should be made to identify competent and experienced organizations in energy, community development, or rural finance (see Box 1.5). They can serve the needs of local communities by playing several distinct roles: identifying demand in rural areas during the project preparation phase, guaranteeing credit or cash sales for group lending, acting as an independent operator of a DE system, or monitoring the activities of DE operators and financiers.

5.15 Again, however, the local organization must be competent. Because many may lack the experience necessary to support DE activities, the TM must be careful to accurately assess their capacity in this regard. An established track record and history of success in the target area are good indicators of capacity. If such an institution does not exist, one may need to be created through the support of the project if the proposed activities are sufficiently large enough to support such an organization.

8. Identify private sector interest and commitment.

5.16 Potential investors or distributors may have been identified by the counterpart agency, through TM field knowledge and experience, or through a market study (see Box 1.6). If a counterpart agency has been identified or established, it may have identified and contacted private sector parties already and this stage may then be unnecessary.

5.17 Private sector participants (e.g., well established businesspeople) may be good candidates to provide DE-related services. Firstly, they will need to demonstrate an ability and willingness to (a) establish a distribution network, (b) provide some degree of financial commitment or investment, and (c) provide installation and technical service support. After they have been identified, the TM should meet with them individually and collectively to judge their degree of interest and willingness to participate in DE promotion. Once this has been done, an organizational forum should be established to acquaint potential participants with the DE program and availability of funds.

Box 1.5 Leveraging Local Institutions: The GECO Concept

In the Ivory Coast, a civil engineering company called Laboratoire du Bâtiment et des Travaux Publics developed and tested a process called GECO, which aims at providing a solution to the technical and financial difficulties encountered with the use of conventional methods of rural electrification. It is based, among other points, on three principle-points: limiting the costs of providing rural populations with energy, limiting power to what the population considers priority requirements, and the immediate distribution of power to all its potential consumers.

Energy options can include one (or many) autonomous thermic source(s) (oil- or, more usually, diesel-driven generator sets of small or medium power), coupled with low-power-consumption receivers, via a simplified network. The generator unit(s) produce for 3 or 4 hours a day and, on request, the electric power necessary for the houses' internal and outside lighting, for public lighting, and for the low-consumption equipment (television sets, cassette decks, fans). This represents an estimated power requirement per inhabitant of between 5 and 10 VA (volt-amperes). From this basic formula, the concept can be extended in terms of both operating times and equipment to be powered, depending on the social and economical realities of each village. It is then possible to contemplate limited uses of motive power.

The village community, grouped into consumer co-operatives, can ensure the technical and financial management of the installation collectively. The methods for doing so are defined in a schedule of conditions accepted by each user. This principle does not exclude the possibility of delegating management partly or totally to a private operator. A subscription fee is payable by each user to cover operating costs, the funds for the replacement of the consumable material, and repayment of any loans contracted for the investment. Its amount is calculated in proportion to the number of power points installed in each house, according to a sliding scale of charges.

Box 1.6 Identifying Private Sector Interest

In a typical example, a TM may be working with the local counterpart agency at the project-identification stage. At this time, they will likely begin to meet with private sector entrepreneurs and discuss their potential level of interest in a DE project. This would likely include their level of involvement, capabilities, and degree of commitment. Often one means of judging level of interest is to organize a group meeting and invite interested parties to discuss the details of DE and how they can play a role and generate additional revenue by entering into a new business activity.

5.18 Before proceeding to Stage 2, you should have:

- Established the government's level of commitment to DE
- Ensured that there are no legal barriers to service provision by independent operators
- Identified and reduced any taxes that may unfairly increase the cost of DE
- Assessed local technical capacity to ensure that it is sufficient
- Established working relationships with financial institutions
- Identified the agency responsible for DE
- Defined capabilities of interested local organizations and NGOs
- Identified interested private entrepreneurs.

Stage 2. Assess the Market and Identify the Project Concept

5.19 Before a DE project can be developed, the TM should thoroughly explore the rural energy market and its characteristics. This may include a detailed market assessment and identification of potential target segments, or it may be a relatively simple summary of key aspects of the market. If more information is required than is available, (particularly if a full-scale DE project is being contemplated), a formal rural energy survey could be completed to define such market characteristics as major consumers, energy consumption, expenditures on energy products, and the relative cost of energy.[1]

5.20 The market assessment should focus on identifying key buying characteristics of target customers to (a) market the most appropriate technology and product, (b) develop the delivery mechanism most appropriate to existing distribution channels, and (c) identify the most applicable financing structure on the basis of credit factors, the local banking system, and consumers' ability to pay.

5.21 After market conditions are sufficiently defined, an initial project concept can be developed.

Key Steps

1. Gather and review existing information and/or initiate market studies.

5.22 Existing rural energy surveys should be reviewed if available or, if a more detailed assessment is required, may need to be initiated to define market characteristics and profile potential consumers. Existing studies should be identified and reviewed by meeting with local sources of information or other multilateral or bilateral development agencies with experience in the area. Specific factors that need to be defined include rural energy consumption, energy expenditure by consumers, cost of energy, and willingness to pay for energy services. The depth of the market analysis depends on the scope of the activity being considered and on the TM's experience and knowledge of the country and rural energy sector.

5.23 For more information on data gathering see the following annexes:

- Annex 5.2, "Survey Questionnaire for Laos Off-Grid Electricity Planning Project"
- Annex 5.3, "Socioeconomic Survey Questionnaire for Villages in Guinea"
- Annex 5.4, "Willingness-to-Pay Questionnaire for Villages in Guinea"

2. Collate existing information and/or complete market analysis.

5.24 Existing information should be collated to build up a simple database of information on rural energy markets, consumer energy consumption and expenditure patterns, and existing activities by government entities and others. If basic information is not available, more research may be carried out. A more detailed marketing analysis would include a study of the basic factors that define the market for DE and how to take advantage of the opportunity. TMs with sufficient experience with rural energy may want to undertake the analysis directly

[1] This should be completed on the basis of the World Bank's *Household Energy Handbook* (Leach and Gowen 1987) and utilizing international and local consultants.

themselves or, if budget is available, they could utilize local or international consultants to complete such an analysis. Specific factors of a marketing analysis should include the following:

- Geographic boundary of the market for energy services (e.g., where the service will be provided).
- Economic and social factors that influence the market, such as the principal source of income and its seasonality for most households, and how this may influence ability to pay for energy services on a regular basis.
- The specific market niche, potential customers, and their buying characteristics, such as consumer density (whereas dense rural populations could be served with a mini-DE grid, more dispersed populations may need to be served with stand alone systems).
- Estimated existing electricity sales from grid-supplied sources in rural areas and demand for battery-charging services. These two factors will indicate potential future demand.

5.25 For entrepreneurs who may want to be either dealers or system operators, it is suggested that they undertake a similar process as outlined in this subsection. Specifically, they could complete a basic business plan, a manual for which is presented in Annex 5.5 ("How to Write a Business Plan for Rural Electricity Service") and Annex 5.6 (sample business plans and form).

3. Analyze competing products or services.

5.26 Competition for the provision of electricity service may either be *direct*, such as a substitute product or service (e.g., car batteries versus micro-grid lighting), or *indirect*, including other energy forms such as candles, kerosene lanterns, or flashlights. The TM will need to understand the roles that all alternative energy sources play in meeting the energy needs of rural consumers; this can provide insight on consumer needs and the most appropriate DE option. The advantages and disadvantages of each energy form should be compared, particularly their respective costs, reliability, and service attributes.

5.27 See Annex 5.7, "Energy Transition to More Efficient and Sustainable Fuels," and Annex 5.8, "Options for DE: Cost Effectiveness and the Choice of Alternatives," which summarizes energy sources used by rural communities and a transition process to more advanced energy forms.

4. Identify cost of service: expenditures on energy and disposable income.

5.28 Through information gathering and market analysis, the current expenditure of rural consumers on energy products and services should be identified. Typically, about 15 percent of disposable income for rural residents is used for all energy services and expenditure on energy products should be used a basis for determining the affordability of the proposed product/service and delivery channel. When estimating expenditure, it is important to include all forms of energy, particularly disposable batteries for radios or flashlights, candles and kerosene for lighting, car batteries and the cost of their re-charging, and other forms.

5.29 Expenditure on energy can be very high, often higher than electrification. In the Asunta Valley of Bolivia, for example, households spend as much as US$6 to $7 per month on candles for lighting, which typically give poor service (see Box 2.1).

5.30 Identifying the source and seasonality of income is also important. Many rural residents may be farmers without secure income. It is important to focus on rural areas or consumers with a relatively constant income stream, such as those cash-cropping or with some form of semi-permanent work, as they have a greater willingness and ability to pay for DE services.

Box 2.1 Paying High Prices for Poor Energy Services in Rural Bolivia

A 1990 household survey conducted in the Asunta Valley of Bolivia found that a surprising number of people were spending a significant portion of their cash income on candles for lighting. The survey, part of an ESMAP study to determine the feasibility of providing electricity to the Asunta Valley, found that 30 percent of households used candles, about 50 percent used kerosene, and 20 percent used LPG (see table).

Lighting Sources and Costs in the Asunta Valley, Bolivia

Fuel	*Energy share (%)*	*Family expenses (US$/mo.)*	*Price of light (US$/kilo-lumen hrs.)*	*Consumption of light (kilolumen hrs.)*
Candles	30	6.75	1.71	3.5
Kerosene	50	4.29	0.41	13.8
Electricity (estimate)*	—	(2.35)	(0.03)	(75.0)
LPG	20	1.94	0.02	96.7

* US¢6 per kilowatt-hour.

As the table indicates, expenses per household decrease with use of more efficient fuels, even though these households consume more light. For illustration, the table includes estimated costs of using electricity for minimal lighting at a rate of about US¢6 per kilowatt-hour. In practice, people in rural areas would pay either US¢6 per kilowatt-hour for grid electricity or US¢20–30 per kilowatt-hour from decentralized diesel generators. Most people do not use LPG because it is either unavailable or the up-front costs of equipment are too high. In addition, kerosene is often unavailable.

Source: ESMAP 1991.

5. Determine potential distribution methods.

5.31 Established distribution of existing consumer products or services can provide useful insight on successful distribution methods in rural areas. This may be particularly useful if individual energy systems, such as a PV module or battery charging, are to be marketed. For the provision of DE services, it may be useful to examine the current distribution methods used by the national utility for rural and peri-urban electrification and judge their relative success and key weaknesses to date.

5.32 Determination of the most appropriate distribution method will be based on a number of factors including experience with cash and credit sales of consumers, availability of entrepreneurs/distributors, existing distribution channels for comparable products or services, and the DE technology promoted. A favored distribution method should be selected on the basis of the categories presented in Section 4 in light of the current conditions of the market and choice of technology. (A detailed analysis of distribution will be completed in step 4).

5.33 Before proceeding to Stage 3, you should have:

- Assessed the rural energy market and have a good understanding of the key market drivers
- Analyzed the various energy options available to the target population of the proposed DE activities
- Established household income, current expenditure on energy services, and willingness of consumers to pay for the improved DE
- Identified possible distribution methods.

Stage 3. Select Technology and Product Options

5.34 The choice of the most appropriate technology or product should be based on its ability to meet the energy needs of the consumer as well as its applicability, reliability, and low cost. Choice of technology should also be based on the delivery mechanisms available in the targeted locale.

5.35 The choice of intervention type should be based on survey data and field visits by the task manager. If there is any doubt, a pilot study may need to be carried out. The following provides guidelines for the TM in identifying the most appropriate options.

Key Steps

1. Identify available technologies.

5.36 The TM should compare the technology consumers are now using with alternative DE technologies (identified in the earlier section) that can meet consumers' needs at an affordable price (see Box 3.1). Does the DE technology option provide more-versatile and higher-quality services than the currently used energy options at prices consumers will be willing to pay? A minimum service standard should be established at this point.

Box 3.1 Technologies, Applications and Their Cost

When identifying the respective DE options, the principal driver will be meeting consumer needs with the least-cost energy alternative. Ideally, technologies should not be promoted solely on the basis of meeting a policy objective, such as promoting renewable energy.

Technology	*Application/Advantages*	*Cost*
Car batteries or solar lamps	• Isolated location • Typically bought • May requiring recharging	• Low-to-medium capital outlay • High cost for power
PV panel	• Isolated location • Eliminates charging cost • Often bought but leasing also	• Capital expenditure required • Electricity is less expensive than battery
Solar home system (SHS)	• Isolated locations • Fulfils many needs	• Significant capital cost • Complete systems may be more

	• Sale or lease	expensive than components
Generators for distributed power and local mini-grid	• May use existing generator for such uses as grain milling • Requires dense population • Service provision only • Can provide electricity for productive activities	• Lowest cost option for DE, particularly if using existing resources • May require financing

2. Determine the principal form, use, and quantity of energy demand.

5.37 DE can be provided in two main forms: electricity and heat. DE projects targeting higher income groups are likely to focus on electricity and its provision for lighting, communication (television), and water pumping. However, heat also plays an important role in terms of total energy consumed and in meeting the cooking needs of rural populations. Although woodfuel, charcoal, kerosene, and LPG are used widely, their use for heat energy has not been considered for the purpose of this paper.

5.38 Identifying the expected use of DE is important because it will facilitate identification of the most appropriate energy form to meet the expected demand.

3. Determine the most appropriate DE technology.

5.39 This may include diesel, microhydro, solar, or a hybrid system, which combines several of these technologies. By reviewing the buying characteristics and needs of consumers, expected use of energy (Step 2) and available infrastructure, the TM will be able to determine which of the available technologies may be the most appropriate. This step must be completed together with the preceding steps of this section. (See Annex 5.8, "DE Technology Options.") Equipment standards may need to be established, though this is not specifically a necessity.

5.40 Whichever product is chosen, only technologies with a proven track record in the field should be considered. In particular, the technology, and ideally specific product proposed, should already have been used in the target country or area. Experience to date indicates that introduction of a technology or product that may have a good track record in a developed country may not be appropriate in a developing country with different climatic conditions, minimal access to technical service, and little maintenance. (See Annex 5.9, "Accounting for PV Market Growth in Rural Kenya.")

4. Select a product delivery option.

5.41 Completion of Step 3 depends on choosing an appropriate product delivery option. Options may include, but are not limited to mini/micro-grid systems, individual energy systems (solar home systems), or portable solar lamps (see Box 3.2). In principle, only a mini-grid system is technology-independent, with individual or home systems typically available only with PV technology.

Box 3.2 Delivery Options for DE

Mini/micro-grid: An existing generator already used in a rural community for such uses as grain milling could be adapted to meet lighting needs for rural residents in the off-peak hours of the milling operation, such as during the evening. This option has the advantage of using a relatively well-known existing technology with a low capital cost outlay and significant income earning potential. If this option is not appropriate, then a variety of technologies can be considered on the basis of local conditions, i.e., the availability of pico-hydro sites and capital and fuel costs.

SHS systems: In areas whose demand is too low for a grid-based system, or for a dispersed population, individual energy systems, typically solar, could be sold or leased to rural residents. Product distribution and technical support are key aspects of the successful introduction of this type of system.

Portable solar lamps: Applicable for consumers with low energy demand, insufficient income for a larger system, or who desire portability. Typically such systems would be sold on a cash basis due to the difficulty of securing the asset against theft.

5. Test the product and establish specifications

5.42 The TM can contract a local NGO, consulting firm, or government agency to test proposed products in the field if they are already available in the market and if there is some concern regarding their applicability in meeting energy needs. This function could also be completed by creating a pilot project to complete not only a test of the technology, but of the delivery mechanism as well. In most instances, it is unlikely that the product will need to be field-tested.

5.43 Product specifications will need to be established. In most cases, information may be compiled from other sources. Specifications will be particularly important for solar technology.

5.44 Before proceeding to Stage 4, you should have:

- Identified DE technologies available in the proposed project area
- Assessed energy demand
- Determined initially the most appropriate DE technology
- Identified a product delivery option.
- Tested the product and established specifications.

Stage 4. Select a Delivery Mechanism

5.45 There are two main types of delivery mechanisms:

- Cash and credit sales or leasing of products
- Provision of energy services.

5.46 In most instances, a dealer would be involved in the first option. Most dealers, however, may favor only cash sales as it limits their risk by eliminating the need to provide consumer credit. This option would be effective for portable PV lamps or possibly components. Credit sales, particularly of larger individual PV systems, will likely require access to affordable credit, possibly available from the dealer, the government, or another source. Given the often-limited experience of consumer credit in most rural areas, developing such a system will be challenging. Use of a revolving fund—where funds are lent to and guaranteed by a community group, which in turn lends, collects repayment, and then lends again—have been somewhat successful because they minimize risk.

5.47 Leasing may prove a more attractive alternative as it eliminates the need for a significant down payment for credit sales and reduces the risk assumed by the credit provider. Most private businesspeople or community organizations may only commit limited funds to buy and then lease DE equipment given the limited experience with such a scheme in rural areas.

5.48 The second option focuses on the creation of an energy service company (private entity, village cooperative or NGO) who would make it their business to supply energy services to rural consumers in a concession area for a fee. Consumers would be expected to provide some form of security, possibly a down payment, with failure to meet monthly payment obligations for energy services leading to termination of service. This option would focus on the idea of energy service provision, typically focusing on higher income consumers, and could involve a subsidy (through government if available). In some respects, there are many similarities with the leasing option, but instead of providing a specific product it is the service of energy that is provided.

5.49 As the following steps show, the choice of option depends on a number of factors.

Key Steps

1. Assess the availability of credit.

5.50 Two types of credit may be used for providing DE products or services: consumer and dealer credit. Experience with and availability of credit are necessary if the proposed project will make use of either form. Local banks, cooperatives, and consumers should all be well acquainted with credit. If credit use is not widespread it may be very difficult to initiate DE activities that rely on it. Credit sales of individual systems will likely be impossible in a market where consumers lack credit histories and where potential dealers may have difficulty in securing working capital credit. Under these circumstances, the project should probably focus on either cash sales or provision of energy services arrangement (through an energy services company, or ESCO). Lack of credit could be overcome with credit enhancement provided through a village organization/cooperative or with NGO support, but this requires considerable monitoring and prior experience is an advantage.

2. Review the distribution infrastructure.

5.51 Pre-existing dealers (of either energy or non-energy products) and sales channels (preferably of energy products) will simplify product sales. The lack of an adequate distribution channel may make this option obsolete or require establishment of an entirely new distribution system. Also, the availability of entrepreneurs willing to sell components and actively market the product is essential for successful cash or credit sales and for the leasing option.

5.52 To establish a service-provider model—a system operator providing DE services and electricity—reliability and timely service are perhaps the most important success factors.

3. Determine the affordability of DE.

5.53 Income and expenditure data should be reviewed to determine whether consumers can afford DE products or services (see Box 4.1). After identifying the initial cost of providing the service on the basis of product and technology, this should be compared to existing energy expenditures by delivery mechanism. The TM will then have an indication of the affordability of DE versus alternative forms of service. Consumers' ability to pay for energy services may be in several forms, either in direct cash payments or through credit schemes. Although ability and willingness to pay are often difficult to determine, a good indicator is the comparison of the cost of a DE product or service to current energy expenditures and disposable income.

Box 4.1 Determining Consumer's Ability to Pay for DE

Consumer's ability to pay for DE is often greatly underestimated due to a lack of understanding or knowledge of the local markets and consumer preferences. Rural residents often spend up to 10–15 percent of their monthly income on energy-related products and services such as disposable batteries, kerosene for lighting, or charging of car batteries. Monthly expenditures, though wide-ranging, are typically between $5 and $20 per household, well within the range of comparable services provided through DE. As a result, markets where consumers have a demonstrated willingness to pay are often ignored despite the potential to provide service to these markets.

4. Select a product and a delivery channel.

5.54 On the basis of the analysis of consumer disposable income, characteristics of DE demand, appropriate technologies, availability of interested and committed business people, and distribution channel status, the most appropriate (a) product or service and (b) distribution channel should be chosen. Often it may be necessary to select several different types of products or services given the conditions of the target market. And typically, the product or service will be tied to a specific delivery channel. (See Table 4.1.)

Table 4.1 Selecting a Delivery Channel

Technology	*Delivery Channel*
Automobile battery or solar lamps	• Cash sales via dealer
PV panel	• Cash or credit sales through dealers
Solar Home Systems (SHS)	• Credit sales with appropriate security through dealer • Leasing of systems from dealer • Electricity through service provider
Generators for Distributed Power	• Electricity through service providers • Requires dense population • Service provision only

5. Begin establishing a distribution system.

5.55 The TM should begin discussions with potential distributors and dealers to refine the framework for the distribution system, including need and scope of working capital credit, consumer credit (see Stage 5), product margins, advertising, distribution and inventory methods, and means for providing technical service. At conclusion of this step there should be a good understanding of the actual functioning of the distribution. Before proceeding to Stage 5 the TM should have:

- Identified the availability and type of consumer credit
- Reviewed alternate distribution system options
- Determined affordability of DE as compared to alternative energy options
- Chosen the most appropriate product and delivery options given the conditions of the market
- Initiated the establishment of a distribution channel.

Stage 5. Evaluate Financing Options

5.56 Review and assessment of the rural credit market is the first step in determining the financial sector's ability to meet DE financing needs. In some cases, an absence of sufficient financing entities or rural finance experience may make the introduction of certain DE options inappropriate. In other cases, the need for financing for certain types of DE services may not be essential. The choice of appropriate financing should be based on the factors described in the following steps.

Key Steps

1. Identify financing needs.

5.57 This will include the needs of both potential consumers and dealers. For dealers, working capital finance may be required to carry product inventory and provide some form of consumer credit. For dealers, DE will likely be perceived as a high-risk business. Insufficient capital by dealers may make it necessary to provide some form of financial assistance to them.

5.58 For consumers, financing may be required to cover "first costs" related to grid connection or the purchase of an individual energy system (see Box 5.1). Many rural and poor urban consumers who could otherwise afford to purchase modern fuels often cannot afford the high first costs of appliances and services. Rural people in particular are left with few choices and often pay high prices for low-quality energy services. Efforts need to be made to reduce these costs by making available the most appropriate DE technology, by not over-sizing the system, and through appropriate financing.

Box 5.1 Easing First-Cost Problems

Frequently, poor people pay more for useful units of energy used because they cannot afford the cash outlay needed to initiate service of a more efficient fuel. Connection to grid electricity is a pervasive problem across locations and fuel types, with first costs of connection ranging up to $1,000. A solar home system costs between $500 and $1,000 or higher, depending on the system's configuration, import tariffs, and margins (Foley 1995; Cabraal, Cosgrove-Davies, and Schaeffer 1996). Setting up a community grid can cost tens of thousands of dollars. Stoves and cylinders necessary to burn LPG also represent a significant investment for many poor people. One reason rural and poor urban people cannot afford the first costs of energy services is that products and service levels have often been developed mainly for use in developed countries and for higher-income groups. Sometimes high levels of service are justified, but in many cases programs suffer from adopting what amounts to a "gold-plated" approach.

High first costs are clearly a major reason for low connection rates in rural and poor urban areas. The design standards used in many developing countries do not cater to consumers with limited demand. For example, most rural and poor urban consumers use only a few lighting fittings and possibly a radio or small television, resulting in a power demand as low as .2 to about .5 kW. However, the minimum-service connection ratings of many utilities are on the order of 3.5 or 7.0 kW, resulting in an unwarranted increase in connection costs. Utilities sometimes attempt to justify the higher line gauges on the basis of minimum mechanical strength required for stringing. This can be resolved by using suitable messenger wires when necessary; the use of low-cost support poles can also reduce service connection costs. Many such low-cost options are resisted, however, on the basis that the utility will bear the responsibility for maintenance and replacement. But this responsibility can easily be transferred to consumers through community participation.

2. Evaluate (a) the rural banking system and (b) the availability and cost of credit.

5.59 Lack of experience with consumer credit or lack of rural credit may require the project to focus on cash sales or to provide some form of financing (ideally in conjunction with government funds). As a result the type and terms of financing will vary, (see Box 5.2). Detailed discussions will need to be held with the local banking sector to determine the most appropriate option.

5.60 The scope of current and proposed banking activities in rural areas will play an important role in defining the capabilities of the rural finance sector. This would include lending practices in the target areas proposed for DE, including type of activities, cost of consumer borrowing, transaction costs for servicing loans and the relative success of rural lending activities.

5.61 The type of financial institutions and their respective activities will impact how effective an option financing will be. In the absence of a strong rural banking system, consumer credit may be inappropriate, and group lending or provision of DE by a provider more appropriate. (See Table 5.1.)

Box 5.2 Cost of Rural Leading

Where commercial financing or leasing schemes are available, commercial loan terms often require a down payment of 25 to 30 percent. Interest rates on bank loans are often in the range of 18 to 25 percent, while dealer financing carries interest rates of over 30 percent (in local currency). The loan repayment periods for commercial loans are generally in the range of 2 to 5 years. High interest rates do not discourage borrowing. Rather, the willingness to borrow for a solar home system is influenced by the sizes of the down payment and the monthly payment relative to the perceived value of the services offered by the system and the ability to pay. Borrowing is also influenced by concern about long-term ability to pay. Borrowing is also influenced by concern about long-term ability to pay. This is particularly true among farmers and others with seasonal or uneven income streams.

Table 5.1 Local Sources of Finance

Sources	*Borrower*	*Availability and Cost*
Family or friends	Consumer maybe dealer	Very common, possibly limited resources
Money lenders or savings collector	Consumer or dealer	Common, credit can be expensive (>30% per year)
Supplier credit	Dealer	Rare and unlikely for an untested product or service

Informal savings institutions (local)	Consumer	Very common, limited capacity
NGOs	Consumer	Often targeted program with small loan amounts
Credit Union	Dealer or cooperative	Leverage local savings with little support
Local Banks	Only to established business or group	High transaction costs restricts loans to relatively large amounts

3. Mobilize the banking sector.

5.62 Identify local banks interested in participating in providing credit for DE services or products. Their lending terms and conditions will need to be defined by borrower type. Ideally, local banks will be interested in committing some of their own capital for lending purposes, though this is unlikely until the project has some track record of repayment (several years).

4. Identify local partners.

5.63 Local organizations can often act as a conduit for onlending of loans, reducing the transaction cost and simplifying the delivery of credit. Typically they would complete a credit review of the potential borrower, and may even act as a guarantor to the loan, thereby reducing default risk. Many agricultural cooperatives have experience lending to communities and individuals, and could be used to provide the financial framework to delivery DE services. However, only those with a proven track record of success should be targeted.

5. Identify financing options and programs.

5.64 The choice of financing option should be based on the needs of DE consumers given the constraints of the local credit markets. For consumer lending there are two options: (a) cooperative financing and (b) consumer credit. Cooperative financing—that is, group lending to a village organization—may be more appropriate than individual credit given the possibly of low credit worthiness of the target consumers. Consumer credit is relatively rare in rural areas, although has been introduced successfully where the borrower has a permanent and secure job, typically with a government agency. Under this scenario, direct deductions are made from the borrower's pay to cover debt and interest repayment obligations.

5.65 For DE service providers, or for dealers carrying an inventory of DE products for direct sale, working capital to finance capital equipment expenses may be required. Many dealers may lack sufficient capital or be unwilling to commit their own capital to a new technology or service without some track record of success. In most cases, dealers should have considerable experience and a good credit standing with a local bank.

5.66 DE companies can provide credit by including connection and service fees on consumers' bills, allowing them to spread costs over many years. A public electricity company in Bolivia, for example, doubled its customer base in a number of villages after offering to finance connection charges over a five-year period (see Box 5.3)

Box 5.3 Company Credit Financing in Bolivia

When people in the villages of Mizque and Aiquile in rural Bolivia were given the opportunity to purchase electricity service, the high connection costs prevented about 75 percent of households from accepting the offer.

The electricity companies then decided to finance the connection charges, allowing customers to pay back the costs in small monthly installments over a five-year period. In return, they received electricity service during evening hours. As a result of this financing scheme, the number of households who were able to purchase electricity service more than doubled.

In the village of Vacas, where 24-hour, grid-electricity service was extended without any credit scheme, the connection rate was about the same as in Aiquile and Mizque (see table).

Village	*System*	*Credit access?*	*% on credit*	*% households with electricity*	*Price ($/kWh)*
Aiquile	Diesel	Yes	51	55	.25
Mizque	Diesel	Yes	56	59	.30
Vacas	Grid	No	0	54	.06

Despite paying about five times more for service limited to only evening hours, over 50 percent of households in Aiquile and Mizque valued the benefits of electricity enough to pay for it when an affordable financing scheme became available.

5.67 Similarly, wholesalers or retailers of household photovoltaic (PV) systems can arrange for or provide credit to potential customers. NGOs and cooperatives can help finance the infrastructure to develop energy services, thus reducing the costs of administering such programs. Also, wholesalers and retailers should be able to obtain credit for stocking energy appliances.

5.68 In addition, it may be necessary to establish a formal financing mechanism to channel funds to consumers, energy providers or dealers. Such a fund will need to work with local financial institutions to meet the lending needs in a sustainable fashion. (See Annex 5.10, "Financing Mechanism for Rural Energy Operators in Cameroon.")

6. Determine financing terms.

5.69 By working with local banks and government representatives, the TM should establish the terms and conditions for lending to the various target borrowers on the basis of their ability to repay. It is important at this point to analyze the end cost of the delivered DE product or service to ensure that the end consumer will be able to afford it.

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Annex 1.1
Factors Influencing the Introduction of Decentralized Electrification

The following are among the numerous factors influencing the promotion of DE and its successful introduction to rural areas:

- Low per capita income in target areas;
- Low per capita energy expenditures;
- High consumer connection charges for grid supplied electricity;
- Wide variety of disparate markets with different needs;
- Lack of rural energy directive or agency within the power sector to support grid expansion or energy service provision;
- Low rural electrification penetration;
- Use of expensive fuels such as kerosene and batteries for lighting;
- Limited electrification options;
- Limited practical experience by consumers with renewable and decentralized power in rural areas;
- Legal and regulatory framework which forbids or restricts energy service provision; and
- Inappropriate taxes and custom regimes.

Experience teaches that there are several areas that will directly facilitate the development of decentralized electricity markets. These areas include technology, delivery mechanisms, costs and financing, and reform issues.

Technology Initiatives

The following key technology issues should be addressed as future DE projects are developed:

- **DE versus grid RE (rural electrification)**: Grid connection is an unlikely option for most rural residents due to the lack of overall investment in rural grid connected electrification, isolated and dispersed nature of consumers, and distance to existing power transmission and distribution lines. Alternatively, isolated systems, either individual or mini-grids, may be a more likely source of electricity in these areas. Moreover, the high connection costs and low per capita consumption of rural consumers is a major problem.

- **Traditional energy sources versus DE**: Candles and kerosene meet lighting needs in many poor rural households and diesel generators are favored by wealthier households and communities. Typically, these energy forms are expensive and do not provide as high quality lighting as alternatives currently available, such as solar lamps and systems. For an equivalent amount of monthly expenditures higher quality light could be made available, often in conjunction with a mechanism to finance the initial capital costs.

- **Technology independent:** A variety of technologies could be used to meet the DE needs of rural consumers. Selection of technology should be based upon (1) the most appropriate technological option with (2) the lowest marginal cost. Technology specific projects should evaluate other alternatives to ensure that the proposed option is the most appropriate and least expensive option.
- **Diesel power**: Diesel power is widely used both in cities, due to unreliable power, and in isolated rural settings. Although they are relatively expensive to operate, their economic efficiency could be increased by creating a hybrid system with solar panels, potentially serving as a mini-grid.
- **Micro-hydro**: This technology to date has been underutilized technology due to a lack of knowledge and technical expertise. Although its use is limited to highland areas, such as in Guinea, Cameroon, Togo, and Benin, further work and initiatives to promote its use. In particular, creating local technical expertise to evaluate the potential opportunities and to produce simple micro-hydro turbines from and with local materials is essential if a viable market is to be created.
- **PV systems versus components**: Market research often reveals that the typical PV systems may be too large for the vast majority of consumers, many who prefer smaller systems or individual PV panels (<20 watts). These alternatives are more affordable, allow consumers to built their own system, and better suit their needs.

Delivery Mechanism Initiatives

The following issues should be addressed as future projects are developed:

- **Raising DE awareness**: There is generally a low degree of consciousness regarding the benefits of electricity for rural residents and secondly, limited knowledge as to the potential uses of DE. These two issues need to be addressed if potential consumers are to become active and supportive participants in promoting renewable energy technologies to meet their energy needs.
- **Product sales versus leasing services**: Direct sale of products may be inappropriate and unsuccessful due to many factors including a high unit cost, lack of savings by consumers and limited access to credit. Marketing energy services through leasing of systems or through an energy service arrangement may be more appropriate than direct sales and may lower delivery costs to consumers.
- **Cash sales versus credit sales**: In developed countries, both retailers and consumers buy and sell on a cash basis, most having limited credit experience. In developing countries, use of credit may be quite complicated and may require mechanisms to administer and guarantee repayment. Use of community organizations, such as cooperatives, is one means of reducing lending complexity and cost through group lending arrangements.
- **Developing a distribution and service system**: A sales and service network is an essential element if DE services are to be made available to the potential consumers. Local businesspeople need to play a role, point-of-sale/service needs to be used, and an aggressive marketing campaign must be introduced to actively develop the market.

Once the product is installed, service technicians need to be available to provide any necessary technical assistance and repairs that may be necessary.

Financing Initiatives

Key issues relating to cost and financing include the following:

- **Dealer/distributor risk aversion and credit needs**: Many businesspeople are cautious when entering a new market. Their limited working capital and lack of market/product knowledge makes them increasingly cautious and risk adverse. Secondly, insufficient working capital reduces their ability to inventory, market, and finance DE products. By increasing access to working capital, businesspeople will be able to purchase products on credit and then either sell or lease products to consumers.
- **Consumer credit and payment schemes**: Meeting with local government, non-governmental, community agencies and banks are a necessary prerequisite to assess the optimal financing and repayment means. Group lending to a community organization is one way of reducing transaction costs and ensuring repayment. As well, using local community organizations, where the consumer is currently a member, is another way of screening candidates and guaranteeing repayment.
- **Aversion to consumer credit**: Lack of credit experience and an aversion to credit creates a need for alternative sales options such as lease arrangements or prepayment schemes. In many parts of the developing world consumer credit is a rare phenomenon frowned upon by or unavailable to rural residents. As a result, direct sales of large systems are more difficult, with component sales or leasing a more realistic option.

Reform Issues

Key reform issues that should be addressed include the following:

- **Establishing an electricity law and legalization of rural energy markets**: The government needs a law making provision of energy services legal, with specific reference to the provision of energy services by independent operators in rural areas without access to the grid.
- **Defining the role of government**: Governments have often taken an undefined role with little or no commitment by them to promote either rural electrification or renewable energy. As a result of initiatives in this project and increased consciousness, it appears government is making a greater commitment to promoting renewable energy initiatives. Attempting to promote DE with limited support are not likely to be entirely successful.
- **Elimination of tax and duty barriers**: Unfair import duties, VAT and taxes need to be eliminated to level the playing field with traditional energy options and support the introduction of renewable energy technologies.

Annex 2.1
Intervention Models

1. Direct Equipment Sales

Direct sale of equipment, either for cash or credit, has met with some success in developing countries. Typically this has involved photovoltaic systems and components, with the focus on systems although components are increasingly becoming popular as well. Most sales have been on a cash basis due to the lack of credit in rural areas and the perception and/or reality of a low credit standing amongst the target population. Consumer credit has been used to some extent though typically only for consumers with secure occupations (business or government) and income, thus leaving about 90 percent of the market without access to this option. Cash sales have therefore predominated, and will continue to do so in the future. It is likely that cash sales of PV components will continue to be a growth market as consumers choose to buy PV panels to charge car batteries, expanding their home system as they save sufficient money. Credit sales may expand in the future through credit schemes targeting group lending to community groups or cooperatives with a standing in the community and established credit.

Credit

An often-stated obstacle in distributing DE products to rural households is the lack of consumer financing. For many dealers (local businesspeople) in Africa, their working capital is typically too limited to provide credit to customers or to maintain significant stocks of products. In the case of DE, most dealers would further be unwilling to offer credit because of their risk adverse nature with new products that are untested in local markets.

This assumption—that consumer credit is the missing link for disseminating DE—may indicate a flaw in most of the current thinking in the delivery of DE systems and, as such, may reveal an even greater market opportunity than many suspect. Yet, debt finance may need to be injected at some juncture in the distribution system because large numbers of potential consumers are unable to afford cash purchases of DE. Credit funds could be made available to those who sell the products (retailers and distributors) and/or to those who buy the products (the customers).

Cash

Alternatively, cash sales may be a larger portion of total sales and the lack of credit not as a significant barrier to the development of a dynamic DE market as was once perceived.2 By providing a full product line of DE products to the consumers, (individual modules to full systems), market studies and practical experience indicates that many consumers will choose to purchase individual components with cash, as is currently done in Kenya. Under this scenario, working capital financing may be needed only to enable distributors and dealers to purchase a sufficient quantity of initial stock. Some consumer financing may be necessary but initially it appears that it will represent only a small portion of the market.

[2] In most parts of rural sub-Saharan Africa, consumer credit is a relatively unknown concept and not a favored method of purchase and in many countries the current system is unlikely to change in the near future.

Typical purchasing patterns by rural consumers for energy related services and products is the opposite from that found in most developed countries. Practical experience indicates that consumers will first purchase an appliance, (radio or TV), with a battery for power. Once a car battery is purchased consumers will often purchase a solar panel for charging the battery in lieu of paying for battery charging. Cash availability and income drive this purchasing pattern. Making credit available may not change existing patterns and, as such, may not indicate substantial market opportunities for large DE or PV systems. By contrast, PV components are of comparable price to consumer electronic equipment and are the logical "next step" on the consumer purchasing pyramid. Recent surveys indicate that this is common practice.

Equipment Leasing

Equipment leasing is a variant of the first option and has been used successfully in a number of countries, notably by the NGO Enersol in the Dominique Republic. Increased use of equipment leasing by dealers is an option worthy of further consideration. To date, its growth has been limited due to insufficient credit and working capital availability of dealers of DE equipment (again, principally PV systems) and to the perception of high-risk consumers. Leasing presents an alternative to the higher risk credit sales option as the dealer finances the system, instead of the consumer, who in turn receives a monthly lease payment from the consumer for the use of the system. In cases of default by the consumer, it is considerably less complicated retrieving the system. By making funds available to dealers, ideally through local banks, it would remove one of the major barriers to increasing the penetration of this option, lack of sufficient capital. Other factors of course need to be addressed as well.

2. System Operator: Dispersed Area Concession Model

The system operator model is based on an exclusive area monopoly for the right to provide electric services to homes and public sector entities. Companies, either local or foreign, will have the option of bidding for the right to provide specified levels of service to a region or sub-region. The level of service and delivery mechanism may vary and include: purely cash sales or leasing arrangements. This option differs from the market approach, as winner of a contract will have exclusive rights to provide services. The TM should provide a support package with partial financing for the initial investment with the winning company selected on the basis of the least subsidy requested. Other companies may still enter the market though would do so at a competitive disadvantage. This method is seen as attractive for markets that present entry barriers.

Technology choice is left to the company and may include PV wind, micro-hydro, diesel, or hybrid systems. The concession period will be divided into operation periods, rebid after each period, with extension of existing contracts based upon fulfillment of contract conditions. Users, those receiving service, would pay a connection fee plus tariff set by the government. The companies operating the concession would receive a subsidy per user.

In the utility model the rural consumer gets the same advantage as the urban consumer, viz. a monthly cost-based tariff based on a financing package with a 30 years discount range. In the dealer model, this option is not yet offered. However, the consumers' problem is not the ability to pay, but cash flow. What can we offer to overcome this?

The system operator model may present the most potential in some respects and it has been the least utilized due to a number of factors. A system operator could be a businessperson or local organization that would receive the right to provide energy service to a specified rural area, such as a village. A key advantage of this option is that it can be of lower cost than other alternatives as it can often utilize existing technology, such as already operating energy systems such as engines used for the milling of grain. The system operator would operator the energy system, such as the generator, and install power lines to households who would pay a connection and monthly service fees to the operator. A major limiting factor to the promotion of this option is a common restriction/regulation that restricts electricity service provision in rural areas to only the national utility, requiring passage of new laws or elimination of such restrictions by government.

Annex 5.1
Tax and Import Regime for Solar Equipment in Senegal

Le régime fiscal et douanier des matériels solaires au Sénégal

Le régime fiscal et douanier des matériels solaires est défini conformément à la note n.0706/DGD/DERD/BE.1 du 4 mai 1993, se référant au Conseil Interministériel du 8 juillet 1992 et à la lettre n° 02 224-MEFP-CTAN du 11 mars 1993. Les produits qui suivent bénéficient de la fiscalité suivante (sans être exonérés du timbre douanier de 5%) : exonération du Droit de Douane (DD), suspension du Droit Fiscal (DF), exonération de la Taxe sur la Valeur Ajoutée (TVA).

Filière photovoltaïque

a) Kit d'éclairage solaire à usage fixe : le "kit" d'éclairage solaire est composé des éléments ci-après vendus dans le même emballage :

- un ou plusieurs modules solaires photovoltaïques d'une puissance totale maximale de 60 Wc qui délivrent un courant continu,
- une structure de fixation du ou des modules,
- un régulateur électronique à courant continu 12-24 V de 10 A maximum,
- une à quatre réglettes fluorescentes à courant continu avec une puissance maximale de 18 W, à l'exclusion
- des lampes à incandescence,
- un jeu de câbles électriques avec une longueur maximale de 10 m,
- un jeu de fixation de câbles, du régulateur et des réglettes fluorescentes.

NB : importé séparément, chaque élément doit être déclaré à sa position propre.

b) Lampe portable solaire: elle est composée d'une lampe et d'un module de 15 Wc maximum importés ensemble. La batterie de 15 W est incorporée dans le lampe. L'éclairage est produit par un tube fluorescent, à l'exclusion des lampes à incandescence.

NB : importé séparément, chaque élément doit être déclaré à sa position propre.

c) **Kit de pompage photovoltaïque :** il est composé des éléments suivants vendus dans un même emballage :

- un ou plusieurs modules photovoltaïques qui délivrent un courant continu,
- une structure de fixation des modules,
- une armoire de commande,
- un onduleur de pompage,
- un jeu de câbles électriques d'une longueur maximale de 5 m,
- un jeu de fixation de câbles.

NB : En aucun cas, une batterie ou des tuyaux de refoulement ne peuvent faire partie intégrante du système, ils doivent être déclarés à leur position propre. De même, chacun des éléments précités importé séparément doit être déclaré à sa position propre.

d) Modules solaires photovoltaïques : il s'agit d'éléments fixes produisant un courant électrique continu par transformation du rayonnement solaire, à l'exclusion de tout élément en mouvement.

Filière thermique

- Chauffe-eau solaire : le chauffe-eau solaire est composé d'un ballon et de panneaux solaires. Les panneaux solaires peuvent être importés séparément (exemple chauffe-eau pour piscine). Le chauffe-eau solaire ne doit pas comporter de résistance électrique.

Annex 5.2
Survey Questionnaire for Laos Off-Grid Electricity Planning Project

Household ID No.: [ ][ ][ ][ ]

Non-Electrified and Electrified Household Survey Form

Rural Household Energy Survey
LAO PDR
Non-Grid Rural Electrification Planning Project

Date of interview: ______________

Time Start: ______________

Time End ______________

Interviewer's Name: ______________

Supervisor's Name: ______________

1.2 House Number:	______________	Q1.2	[ ]
1.3 Village (Ban):	______________	Q1.3	[ ]
1.4 District (Muang):	______________	Q1.4	[ ]
1.5 Province (Kwaeng)	______________	Q1.5	[ ]

Coding: [-7] = Do not apply [-8] = No answer [-9] = Missing value

Section 2: Socio-Economic Information

			Variable Name	
	Name of respondent:			
2.1a	Sex of the respondent Code: [1] = Male [2] = Female	______	**Q2.1a**	
2.1b	Age of respondent:	______	**Q2.1b**	

		Variable Name
2.1c	Educational level of respondent: [0] = Never attended school [1] = Primary school [2] = Middle school [3] = High school [4] = College education [5] = University education [6] = Post-graduate education	Q2.1c
2.2	Respondent's relationship to head of household [1] = Head of the household [2] = Head of household's wife or husband [3] = Daughter [4] = Son [5] = Daughter-in-law [6] = Son-in-law [7] = Other, specify	Q2.2
2.3	How many persons usually eat or sleep in the household ? (Fill in according to age)	
2.3a	Less than 6 years	Q2.3a
2.3b	7-17 years	Q2.3b
2.3c	18-60 years	Q2.3c
2.3d	61 years and over	Q2.3d
2.3e	Total	Q2.3e
2.4	What is the highest educational level of immediate adult family member of the household ? (regardless of where he/she lives) [0] = Never attended school [1] = Primary school (1-7 years) [2] = Middle school (S1 to S4) [3] = High school (S5 to S6) [4] = College education [5] = University education [6] = Post-graduate education	Q2.4
2.5	How many persons in your household earn income? (include all types of income earned)	Q2.5

Section 3: Housing Unit

			Variable Name	
3.1	Main type of dwelling unit [1] = Wood construction [2] = Brick construction (bricks)/concrete block [3] = Brick and wood construction [4] = Bamboo construction wall [5] = Other specify............	________	**Q3.1**	
3.2	Main roofing materials of the dwelling unit [1] = Metal sheet roof [2] = Bamboo/straw fiber/leaves [3] = Bake brick [4] = Other specify	________	**Q3.2**	
3.3	Is any part of your house used for business activity or commercial purposes or home industry, i.e., business owned and operated by you or a member of your household? [1] = Yes; [0] = No, If "No," go to Q3.5	________	**Q3.3**	
3.4	If part of your house is used for business activity, please indicate type [1] = Hair salon or barber shop [2] = Food and beverage shop (i.e., restaurant) [3] = Grocery and beverage shop [4] = Beverage shop [5] = Retail store [6] = Making handicraft or handicraft shop [7] = Tailor/Dress maker [8] = Repair/tool shop (e.g., agricultural tool) [9] = Rice mill [10] = Small saw mill/furniture factory [11] = Other, specify	________	**Q3.4**	
3.5	Does your household own or rent this house? [1] = Own; [0] = Rent	________	**Q3.5**	

Section 4: Sources of Energy for Lighting

What is your usual sources of energy for lighting in the household?
Code: Yes = [1]; No = [0]

		Yes	No	Variable Name	
4.1	Electricity from the grid			**Q4.1**	
4.2	Kerosene.			**Q4.2**	
4.3	Diesel			**Q4.3**	
4.4	Car battery			**Q4.4**	
4.5	Electricity from privately/community owned generator			**Q4.5**	
4.6	Dry cell battery			**Q4.6**	
4.7	Candles			**Q4.7**	
4.8	Torch			**Q4.8**	
4.9	Electricity from the household own solar PV panel			**Q4.9**	
4.10	Other specify			**Q4.10**	

Sources of Energy for Cooking and Boiling & Heating of Water and Frequency of Usage

How often does your household use the following fuels for cooking?
Code: [0] = Do not use
[1] = Use some of the time
[2] = Use most of the time
[3] = Always

			Variable Name	
4.11	Charcoal		**Q4.11**	
4.12	Firewood		**Q4.12**	
4.13	Twigs or small tree branches		**Q4.13**	
4.14	Scrap wood		**Q4.14**	
4.15	Agricultural residue including straw & stalk		**Q4.15**	
4.16	Electricity		**Q4.16**	
4.17	Sawdust		**Q4.17**	
4.18	LPG		**Q4.18**	

No.	Section 5: Electricity	Yes	No	Variable Name	
5.0	Does your household use electricity generated from electric generator is connected to the grid? Code: [0] = Do not use [1] = Use electricity		______	Q5.0	
5.1	What is the source of your household electricity connection? Code: Yes = [1]; No = [0]	Yes	No		
5.1	Electricité du Laos (EDL's central grid)	______	______	Q5.1	
5.2	Neighbor/relative who connected from Electricité du Laos (EDL)	______	______	Q5.2	
5.3	Provincial electricity services (local grid)	______	______	Q5.3	
5.4	Neighbor/relative who connect to Provincial electricity services	______	______	Q5.4	
5.5	Neighbor who has generator	______	______	Q5.5	
5.6	Private entrepreneur who has generator	______	______	Q5.6	
5.7	Owned electric generator home	______	______	Q5.7	
5.8	Cooperative	______	______	Q5.8	
5.9	Other, specify	______	______	Q5.9	
5.10	How many years has your household had electricity? ________ Years.			Q5.10	
5.11	Is the electricity used by *your* household only? [1] = Only my household; (If [1] go to Q4.3) [2] = We share with other household(s)		______	Q5.11	
5.11a	If share electricity with other household, please indicate the total number of households including your households who are sharing electricity with yours? ________ households.		______	Q5.11a	

			Variable Name	
5.12	Who do you pay electricity services to: [1] = EDL [2] = Neighbor/relative who pays to EDL [3] = Provincial Electricity services [4] = Neighbor/relative who pays to Provincial electricity services [5] = Neighbor who has generator [6] = Private entrepreneur who has generator [7] = Does not pay [8] = Cooperative [9] = Other, specify	________	Q5.12	
5.13	On the average, how much does your household pay for electricity for each billing period? ________ Kips	________	Q5.13	
5.14	How many days do each bill cover? ________days	________	Q5.14	
5.15	How does your household pay your monthly electricity bill? [1] = Pay by kWh used [2] = Pay by number of light bulbs/tubes & appliance [3] = Fixed monthly cost (If answer [2] or [3] go to Q5.17a)	________	Q5.15	
5.16	If pay by kWh used, how much does your household pay per kWh ________ Kips/kWh	________	Q5.16	
5.17	If pay by number of light bulbs/tubes & appliances or fixed monthly cost:			
5.17a	How many light bulbs and tubes do you have? ________ Bulbs/tubes	________	Q5.17a	
5.17b	What is the average wattage of all light bulbs/tubes? ________ Watts		Q5.17	
5.18	Does your household use electricity to cook rice? [1] = Yes; [2] = No		Q5.18	
5.19	Does your household use electricity to boil water? [1] = Yes; [2] = No		Q5.19	
5.20	Does your household use electricity for radio/tape? [1] = Yes; [2] = No		Q5.20	
5.21	Does your household use electricity for TV? [1] = Yes; [2] = No		Q5.21	
5.22	How many hours during the daytime do you have electricity services? ______ Hours during the day		Q5.22	
5.23	How many hours during the evening & nighttime do you have electricity services? ______ hours during the evening and night time		Q5.23	

				Variable Name	
5.24	Do you have to use any of the following sources of energy to supplement electricity for lighting ? Code: [1] = Yes; [0] = No	**YES**	**NO**		
5.24a	Candle	______	______	**Q5.24a**	
5.24b	Kerosene/diesel lamp	______	______	**Q5.24b**	
5.24c	Pressurized lamp	______	______	**Q5.24c**	
5.24d	Car Battery	______	______	**Q5.24d**	
5.25	On the average, how much does your household have to spend per month to supplement electric light?	______	**Kip**	**Q5.25**	

Ask the respondent to show you most recent electric bills (at least 2 consecutive bills for each meter will be needed). Then copy information from the bills in the questionnaire form.

Electricity Bills

_____/_____/_____ Billing date: (Enter date/mo/yr) | ______________ Meter Number | ______________ Billing Number

Last meter reading	Current meter reading	Total kWh	Total Costs	____/____/___(dd/mo/yr) date current meter reading

_____/_____/_____ Billing date: (Enter date/mo/yr) | ______________ Meter Number

Last meter reading	Current meter reading	Total kWh	Total Costs	____/____/___(dd/mo/yr) date current meter reading

____/____/____ Billing date: (Enter date/mo/yr)

________________ Meter Number

Last meter reading	Current meter reading	Total kWh	Total Costs	___/___/___(dd/mo/yr) date current meter reading

____/____/____ Billing date: (Enter date/mo/yr)

Meter Number

Last meter reading	Current meter reading	Total kWh	Total Costs	___/___/___(dd/mo/yr) date current meter reading

Interviewer must calculate number of days, kWh and kips from the bills and fill in the following sections after the interview, prior to submit this form to the field supervisor.

Calculation of electric bills for kWh consumed and expenditure

Meter number:	________	No. of days bill cover:	________	days	**Q5.26a**	
		kWh consumed	________	kWh	**Q5.26b**	
		Amount due/owed:	________	Kips	**Q5.26c**	
Meter number:	________	No. of days bill cover:	________	days	**Q5.27a**	
		kWh consumed	________	kWh	**Q5.27b**	
		Amount due/owed:	________	Kips	**Q5.27c**	
Meter number:	________	No. of days bill cover:	________	days	**Q5.28a**	
		kWh consumed	________	kWh	**Q5.28b**	
		Amount due/owed:	________	Kips	**Q5.28c**	
Meter number:	________	No. of days bill cover:	________	days	**Q5.29a**	
		kWh consumed	________	kWh	**Q5.29b**	
		Amount due/owed:	________	Kips	**Q5.29c**	

Section 5.1: Electric Appliances Ownership

	How many of the following appliances does your household have? (Enter "0" for do not have)	**Number Have**	**Variable Name**	
5.30	Rice Cooker	______	**Q5.30**	
5.31	Electric hot plate and/or Stove	______	**Q5.31**	
5.32	Electric kettle	______	**Q5.32**	
5.33	Electric power drill/saw	______	**Q5.33**	
5.34	Electric motor	______	**Q5.34**	
5.35	Fan	______	**Q5.35**	
5.36	Ironing	______	**Q5.36**	
5.37	Refrigerator	______	**Q5.37**	
5.38	Color Television	______	**Q5.38**	
5.39	Washing machine	______	**Q5.39**	
5.40	Black and White Television	______	**Q5.40**	
5.41	Radio/tape cassette	______	**Q5.41**	
5.42	Large stereo system	______	**Q5.42**	
5.43	VCR	______	**Q5.43**	

Section 5.1: Electric Appliance Ownership (Cont.)

			Variable Name	
5.43	Electric Pump (water)	________	Q5.44	
5.44	Electric sewing machine	________	Q5.45	

Section 6: Use Electricity for Business and/or Productive Purposes

			Variabl e Name	
6.1	Does your household use electricity to conduct your business or productive purposes? [1] = Yes; [0] = No (If answer [0] go to Q7.1 Do you use electricity for lighting or anything else in your home business/industry/agricultural activity? If Yes, for which of the following purposes do you use electric energy sources in your home business/industry/ agricultural activity?	________	Q6.1	
6.3	Lighting **to protect your home business/industry** from burglary or alike OR to **protect your livestock and/or crops**. [1] = Yes; [0] = No; if "NO" go to Q6.5	________	Q6.3	
6.4	If yes, generally how many hrs/evening do you keep light on to protect your home business or industry or livestock or crops? _____ hrs/evening	________	Q6.4	
6.5	Area lighting **to conduct business** (i.e., lighting to keep store/shop open in the evening, or do handicraft, or etc.). [1] = Yes; [0] = No; if "NO" go to Q6.7	________	Q6.5	
6.6	Generally, how many hours/evening do you have area lighting on to conduct business. (i.e., keep store/shop open, or do handicraft, or etc.) ________hours/evening	________	Q6.6	
6.7	Lighting to **do more work** in the evening Code: [1] = Yes; [0] = No;	________	Q6.7	
6.8	Lighting to **repair equipment/tools** used for production. Code: [1] = Yes; [0] = No	________	Q6.8	

Uses Electricity for Productive Purposes (Cont.)

			Variable name	
6.9	**To power tool/motor/machine/pump/refrigerator** Code: [1] = Yes; [0] = No	________	Q6.9	
6.10	**Radio/tape** for music to entertain customers in the business premises. [1] = Yes; [0] = No	________	Q6.10	
6.11	**TV/Video** to entertain customers [1] = Yes; [0] = No		Q6.11	
6.12	Any other use [1] = Yes, specify.................... [0] = No	________	Q6.12	

Lighting

Can you please tell me how many light bulbs are used each day in your household, as well as the capacity of each and the number of hours used?

Incandescent light bulb

Capacity (watts)	Number of bulbs	Total hours each bulb is used during a 24-hour period	Number of bulbs	Total hours
5			B5W	B5H
10			B10W	B10H
25			B25W	B25H
40			B40W	B40H
60			B60W	B60H
75			B75W	B75H
100			B100W	B100H

First, for each capacity listed in Column 1, the interviewer enters in Column 2 the number of bulbs the household has for each.
Second, the interviewer enters in Column 3 the total number of hours each bulb is used during a 24-hour period, using the addition sign between entries (e.g., 3 + 4 + 2).
Third, add the numbers from Column 3 and records the total number of hours in Column 5, and copy the number of bulbs from column 2 into column 4.

Lighting (cont.)

Could you tell me how many lamps are used daily in your household for lighting, as well as their capacity and number of hours used per day?

Fluorescent Tube

Capacity (watts)	Number of tubes	Total hours each lamp is used during a 24-hour period	Number of tubes	Total hours
			F10W	**F10H**
10				
			F18W	**F18H**
18				
			F20W	**F20H**
20				
			F36W	**F36H**
36				
			F40W	**F40H**
40				

First, the interviewer enters in Column 2 the number of lamps the household has for each capacity.
Second, the interviewer enters in Column 3 the total number of hours each lamp is used in a 24-hour period, using the addition sign between entries (e.g., 3 + 4 + 2).
Third, adds the entries from Column 3 and records them in Column 5, then and copy the number of bulbs from column 2 into column 4.

Section 7: Kerosene

				Variable Name	
7.1	During the past 12 months how often did your household use kerosene for lighting? [0] = No, did not use; If "NO" go to Q8.1 [1] = Used sometimes [2] = Used most of the time [3] = Always	________		**Q7.1**	
7.2	During the month that your household uses kerosene, what percentage is dedicated for the following purposes? (e.g., enter 5%, 10%, 15%, 20%, 25%, 30%, ...85%, 90%, 95%, 100%				
7.2a	Lighting	________	%	**Q7.2a**	
7.2b	Refrigerator	________	%	**Q7.2b**	
7.2c	Fire starter	________	%	**Q7.2c**	
7.2d	Other, specify	________	%	**Q7.2d**	
	Total	100	%	Total	100%
7.3	On the average, how much does your household spend on kerosene per month? ________Kips	________		**Q7.3**	
7.4	In general, how many liters of kerosene and price per does your household usually purchase?				
	(Q7.4a) Number of liters usually by each time E.g., Small Pepsi bottle (0.25 liter) Beer bottle (0.65 liter) Whisky bottle (0.75 liter) Fish sauce bottle (0.65 liter) Big Pepsi Bottle) (1.00 liter)	________		**Q7.4a**	
	(Q7.4b) Price per liter (in Kip)			**Q7.4b**	
7.5	Generally, how many days does the kerosene from your usual purchase last? _______ days	________		**Q7.5**	
7.6	When your household uses kerosene, how many liters are usually used in a month?	________		**Q7.6**	

Section 8: Diesel

				Variable Name	
8.1	During the past 12 months did your household use any diesel for lighting? [0] = No, did not use; If "NO" go to Q8.7 [1] = Used sometimes [2] = Used most of the time [3] = Always	________		**Q8.1**	
8.2	During the month that your household uses diesel, what percentage are dedicated for each of the following purposes? (E.g., enter 5%, 10%, 15%, 20%, 25%, 30%, ...85%, 90%, 95%,.100%)				
8.2a	Lighting	________	%	**Q8.2a**	
8.2b	Rice milling	________	%	**Q8.2b**	
8.2c	Electric generator	________		**Q8.2c**	
8.2d	Agricultural activities/Three wheeler transport)	________		**Q8.2d**	
8.2e	Fire starter	________		**Q8.2e**	
8.2f	Other specify	________	%	**Q8.2f**	
	Total	100	%	Total	100%

			Variable Name	
8.3	On the average, how much does your household spend on diesel per month? (Kip)	________	**Q8.3**	
8.4	In general, how many liters of diesel, and price per liter does your household usually purchase?			
	(8.4a)Number of liters usually buy each time E.g., Small Pepsi bottle (0.25 liter) Beer bottle (0.65 liter) Whisky bottle (0.75 liter) Fish sauce bottle (0.65 liter) Big Pepsi Bottle) (1.00 liter)	________	**Q8.4a**	
	(8.4b) Price per liter		**Q8.4b**	
8.5	Generally, how many <u>days</u> does the diesel from your <u>usual purchase</u> last? _______ days	________	**Q8.5**	
8.6	When your household uses diesel, how many liters if diesel are usually used in a month?	________	**Q8.6**	

Uses of kerosene &/or diesel for household activity

Now I would like to ask you some questions about evening activities that require diesel lamp.
Do any household members use diesel lamp in the evening for the following purposes?

			Variable Name
8.7	**Reading/writing/studying** (i.e., read newspaper, bible, novel, write letter, do homework for school, prepare for examination, and etc.). [1] = Yes; [0] = No; If "NO" go to Q8.9	________	Q8.7
8.8	Generally, how many <u>hours per evening</u> do household members usually use diesel lamp for reading/writing/studying? _____ hours/evening	________	Q8.8
8.9	**Area lighting** [1] = Yes; [0] = No; If "NO" go to Q8.11	________	Q8.9
8.10	Generally, how many <u>hours per evening</u> does your household usually use diesel lamp for area lighting? _____hours per evening	________	Q8.10
8.11	**Security** [1] = Yes; [0] = No; If "NO" go to Q8.13	________	Q8.11
8.12	Generally, how many <u>hours per evening</u> does your household usually use diesel lamp for security purpose? _____hours per evening	________	Q8.12
8.13	**Social activities** such as, meeting [1] = Yes; [0] = No; If "NO" go to Q9.1	________	Q8.13
8.14	Generally, how many <u>hours per</u> **<u>WEEK</u>** do household members usually use diesel lamp for these social activities? ______hours per **<u>WEEK</u>**	________	Q8.14

Section 9: Electricity from Car Battery

No.	Question	Answer	Variable Name	
9.1	During the past 12 months did your household use car battery to supply electricity? [1] = Yes; [0] = No, if "NO" go to Q9.16	________	**Q9.1**	
9.2	During the past 30 days did your household use car battery to supply electricity? [0] = No, did not use [1] = Used as supplementary source of electricity [2] = Used as the main source of electricity If "USED AS THE SUPPLEMENTARY [1] OR MAIN SOURCE [2]" go to Q9.4a	________	**Q9.2**	
9.3	Please give me reasons, why your household has not used your car battery during the past 30 days? [1] = Out of order [2] = Being serviced [3] = Recharge is too costly [4] = No transportation [5] = Other specify, ... Does your household use car battery for the following end-uses? [1] = Yes; [0] = No	________	**Q9.3**	
9.4a	Television	________	**Q9.4a**	
9.4b	Lighting	________	**Q9.4b**	
9.4c	Radio & cassette tape player	________	**Q9.4c**	
9.5	How many batteries does your household have? ________ Battery(ies)	________	**Q9.5**	
9.6a	What is the Voltage of your **First** car battery ________ Volts.	________	**Q9.6a**	
9.6b	What is the Amps hours of your **First** car battery ____________ Amp-hrs	________	**Q9.6b**	
9.7a	How much does the first car battery cost? (kips	________	**Q9.7a**	
9.7b	What is the Voltage of your **Second** car battery ________ Volts.	________	**Q9.7b**	
9.8a	What is the Amps hours of your **Second** car battery ____________ Amp-hrs	________	**Q9.8a**	
9.8b	How much did your household pay for your **Second** battery? __________ Kip	________	**Q9.8b**	
9.9	On the average how much do you spend on recharging battery each month? ________ Kip	________	**Q9.9**	
9.10	How much does each recharge cost? _______ Kip	________	**Q9.10**	

Section 9: Electricity from Car Battery (Cont.)

		Variable Name
9.11	How many months did your previous battery last? (Enter "0" if you did not own any battery before)	Q9.11
9.12a	How long does the battery give you services before the next recharge? _______ days	Q9.12
9.13	What is the distance from your home to the recharge station? _______ kilometers	Q9.13
9.14	Which mode of transport does your household use to the recharge station? [1] = Bicycle [2] = Motorcycle [3] = Bus/truck/car [4] = Cart [5] = Other, specify	Q9.14
9.15	What is the average cost of transport to and from the recharge station? __ Kip. (Cost/round trip)	Q9.15
	Electricity Connected from Neighbor or Private generators	
9.16	What is the source of your household electricity services? [0] = Do not have electricity from any sources [1] = Connected from neighbor [2] = Own generator [3] = Own mini micro hydro generator [4] = Electric generator owned by community or neighbor [5] = Own car battery Amount of electricity service your household receive in a month?	Q9.16
9.17	Number of light bulbs___________	Q9.17
9.18	What is the average capacity of the light bulb _______ watts	Q9.18
9.19a	Do you also use electricity for: Radio/tape cassette? [0] = No; [1] = Yes	Q9.19
9.19b	Do you also use electricity for: Television? [0] = No; [1] = Yes	Q9.20
9.20	Milling rice or other productive purposes [0] = No; [1] = Yes	
9.21a	Based on the amount of money you pay, how many hours of services you receive in a day? _____ Hrs/day	Q9.21a

Variable Name	
Q9.21b	
Q9.22	

9.21b In general, how many days in a month does your household have electric services? ______ days/mo

9.22 On the average how do you spend in a month for such electricity services? _____Kips/month
(don't have to pay enter "0"; if have your own generator enter total fuel and maintenance costs)

Uses of car battery & electricity from neighbor & private generator for household activity

Now I would like to ask you some questions about evening activities that require car battery to supply electric energy for lighting. Do any household member use car battery or electricity connect from neighbor to supply electric energy in the evening for the following purposes?

9.23 **Reading/writing/studying** (i.e., read newspaper, bible, novel, write letter, do homework for school, prepare for examination, etc.) __________
[1] = Yes; [0] = No; If "NO" go to Q9.25

9.24 Generally, how many hours per evening do household members usually use either sources of electricity for lights to read/write/study? _______ hours/evening __________

9.25 **Area lighting**
[1] = Yes; [0] = No; If "NO" go to Q9.27 __________

9.26 Generally, how many hours per evening does your household usually use the above sources to supply electric energy for area lighting? ______hrs/evening __________

9.27 **Security**
[1] = Yes; [0] = No; If "NO" go to Q9.29 __________

9.28 Generally, how many hours per evening does your household usually use electric lights for security purposes? _____hrs/evening __________

9.29 **Social activities** such as, meeting
[1] = Yes; [0] = No; If "NO" go to Q9.31 __________

9.30 Generally, how many hours per **WEEK** do household members usually use electric lights for these social activities? _______hours/**WEEK** __________

9.31 **Entertainment** such as TV, radio, tape, stereo
[1] = Yes; [0] = No

9.32 Television _______ Hours/day

Variable Name	
Q9.23	
Q9.24	
Q9.25	
Q9.26	
Q9.27	
Q9.28	
Q9.29	
Q9.30	
Q9.31	
Q9.32	

Section 10: Dry Cell Battery

		Yes	No	Variable Name	
10.1	During the past 12 months did your household use dry cell battery? [1] = Yes; [0] = No, if "NO" go to Q11.1		________	Q10.1	
	Which of the following purposes does your household use dry cell batteries for: Code: [1] = Yes; [0] = No				
10.2	Flashlight	________	________	Q10.2	
10.3	Lantern	________	________	Q10.3	
10.4	Combine flash light and lantern	________	________	Q10.4	
10.5	Radio and/or tape cassette	________	________	Q10.5	
10.6	Other, specify	________	________	Q10.6	

			Variable Name	
10.7	On the average, how much does your household spend on dry cell batteries per month? ______ Ush	________	Q10.7	
10.8a	On the average how much does your household spend on dry cell battery for **each purchase?** ________Ush/purchase		Q10.8a	
10.8b	Generally, for how long do the batteries from each of those purchase last? _________ days	________	Q10.8b	

Section 11: Candle

No.	Question	Answer	Variable Name	
11.1	During the past 12 months how often did your household use candle for lighting? [0] = Do not use candle for lighting If "NOT USE CANDLE"' go to Q12.1 [1] = Used sometimes [2] = Used candle most of the time [3] = Always	________	**Q11.1**	
11.2	On the average, how much does your household spend on candle each month? ______Ush/month	________	**Q11.2**	
11.3a	On the average, how much does you household spend on candle for each purchase? _______ Ush.	________	**11.3a**	
11.3b	Generally, for how long do the candles from each purchase last? ________days	________	**Q11.3b**	
	Uses of candle light for household activity Now I would like to ask you some questions about evening activities that require candle light Do any household member use candle light in the evening for the following purposes.			
11.4	**Reading/writing/studying** (i.e., read newspaper, bible, novel, write letter, do homework for school, prepare for examination) [1] = Yes; [0] = No; If "NO" go to Q11.6	________	**Q11.4**	
11.5	Generally, how many hrs per evening do household members usually use candle light for reading or writing or studying	________	**Q11.5**	
11.6	**Area lighting** [1] = Yes; [0] = No; If "NO" go to Q11.18	________	**Q11.6**	
11.7	Generally, how many hours per evening does your household usually use candle for area lighting? ______hours per evening	________	**Q11.7**	

		Variable Name	
11.8	**Social activities** such as, meeting [1] = Yes; [0] = No; If "NO" go to Q11.10	**Q11.8**	
11.9	Generally, how many hours per **WEEK** do household members usually use candle for lighting for social activities? ____hours/**WEEK**	**Q10.9**	
	Torch		
11.10	During the past 12 months how often did your household use torch for lighting? [0] = Do not use torch for lighting If "NOT USE TORCH'" go to Q12.1 [1] = Used sometimes [2] = Used candle most of the time [3] = Always	**Q11.10**	
11.11	On the average, how much does your household spend on torch each month? ______Ush/month	**Q11.11**	
11.12	**Area lighting** [1] = Yes; [0] = No; If "NO" go to Q11.10	**Q11.12**	
11.13	Generally, how many hours per evening does your household usually use torch for area lighting? ______hours per evening	**Q11.13**	

Section 12: Non-Electric Lighting Equipment

		Variable Name	
12.1	How does your household use non-electric lighting equipment? [0] = Does not use; If "Does not use" go to Q13.1 [1] = Supplementary to electric sources [2] = Main source of lighting	**Q12.1**	
12.2a	How many **kerosene/diesel wick lamps** does your household have? ________ lamps (Enter "0" for none, if "NONE" go to Q12.3a)	**Q12.2a**	
12.2b	How often does your household use **kerosene/diesel wick lamp**? [0] = Never; [1] = Some of the time; [2] = Most of the time; [3] = Always	**Q12.2b**	

			Variable Name
12.3a	How many **pressurized kerosene lamps** does your household have? ________ lamps (Enter "0" for none, if "NONE" go to Q12.4a)	________	**Q12.3a**
12.3b	How often does your household use **Pressurized kerosene lamp**? [0] = Never; [1] = Some of the time; [2] = Most of the time; [3] = Always	________	**Q12.3b**
12.4a	How many **hurricane lanterns** does your household have? ________ lamps (Enter "0" for none, if "NONE" go to Q12.5a)	________	**Q12.4a**
12.4b	How often does your household use **hurricane lantern** ? [0] = Never; [1] = Some of the time; [2] = Most of the times [3] = Always	________	**Q12.4b**
12.5a	How many other non-electric lighting equipment does your household have? Please specify and enter the number owned	________	**Q12.5a**
12.5b	How often does your household use **other non-electric lighting equipment**? [0] = Never; [1] = Rarely; [2] = Sometime; [3] = Always	________	**Q12.5b**

Section 13: Uses of energy for productive purposes

Do you use any of the following fuels or energy sources for lighting or anything else in your home business/industry/agricultural activity?
[1] = Yes; [0] = No; If "NO" to all 5 questions (Q3.1, Q13.2, Q13.3, Q13.4, Q13.5 go to Q14.1)

		Yes	No	Variable Name
13.1	Kerosene	________	________	**Q13.1**
13.2	Diesel	________	________	**Q13.2**
13.3	Car battery	________	________	**Q13.3**
13.4	Electricity from private or community owned generator	________	________	**Q13.4**
13.5	Electricity from the grid (including local & central grid)	________	________	**Q13.5**

No.	Section 13: Uses of energy for productive purposes (cont.)		Variable Name	
	If Yes to any of the above 4 questions, for which of the following purposes do you use the above fuels or energy sources in your home business/industry/ agricultural activity?			
13.6	Lighting **to protect your home business/industry** from burglary or alike OR to **protect your livestock and/or crops**. [1] = Yes; [0] = No; if "NO" go to Q13.8	______	**Q13.6**	
13.7	If yes, generally how many hrs/evening do you keep light on to protect your home business or industry or livestock or crops? _____ hrs/evening	______	**Q13.7**	
13.8a	Area lighting **to conduct business** (i.e., lighting to keep store/shop open in the evening, or do handicraft, or etc.). [1] = Yes; [0] = No; if "NO" go to Q13.10	______	**Q13.8**	
13.9	Generally, how many hours/evening do you have area lighting on to conduct business. (i.e., keep store/shop open, or do handicraft, or etc.) _______hours/evening	______	**Q13.9**	
13.10	Lighting to **do more work** in the evening Code: [1] = Yes; [0] = No;	______	**Q13.10**	
13.11	Lighting to **repair equipment/tools** used for production. Code: [1] = Yes; [0] = No	______	**Q13.11**	
13.12	**To power tool or motor or machine or pump or refrigerator** Code: [1] = Yes; [0] = No	______	**Q13.12**	
13.13	**Radio/tape** for music to entertain customers in the business premises. [1] = Yes; [0] = No	______	**Q13.13**	
13.14	**TV/Video** to entertain customers [1] = Yes; [0] = No	______	**Q12.14**	
13.15	Rice milling or grind coffee [1] = Yes; [0] = No	______	**Q13.15**	

Section 14: Cash Income

Variable Name	
Q14.1	

14.1 What was your household's **total non-agricultural** cash income over the past 12 months
Include all cash income such as, cash income from sales of livestock/fowl (including their products)/fish, worker wages, bonuses, pension, veteran benefits, remittances from relatives, rent income, interest, and others income ________

Section 14.1: Agricultural activities and income from agriculture

Please tell me about all of the crops that generate income for your household during the past 12 months. (Do not enter losses or crops grown for your own household consumption.)

Type of Crops	Total gross income from sales of crops	Total production expenses	Net income from sales of crops
	Q14.11	Q14.12	Q14.13
	Q14.21	Q14.22	Q14.23
	Q14.31	Q14.32	Q14.33
	Q14.41	Q14.42	Q14.43
	Q14.51	Q14.52	Q14.53

Note: Total expenses must include the expenses incurred, such as land rental fees, fertilizer, and workers' wages. The number of crops in the questionnaire must reflect the variety of crops grown in the survey area.

Section 15: Non-Agricultural Expenditures

			Variable Name	
15.1	What was your household's total non-agricultural expenditure last year? (include all expenditure such as, food, foodstuff, medicine, schooling, and any others) Food and foodstuff (i.e., meat, sugar, and etc.)	________	Q15.1	

Section 16: Agricultural land

Please describe your land that was under cultivation last year (in Hectares).

			Variable Name	
16.1	Total Land owned (Enter "0" for do not own land)	________	Q16.1	
16.2	Total land under cultivation (Even if not owned, enter number of Hectares under cultivation)	________	Q16.2	
16.3	Cultivated portions of land that were irrigated	________	Q16.3	
16.4	Slash & burn (Even if not owned, enter number of Hectares under cultivation)	________	Q16.4	

Section 17: Livestock Holdings

			Variabl e Name	
17.1a	How many **goats and sheep** does your household have? (enter "0" for do not have)	________	Q17.1a	
17.2a	How many **pigs** does your household have? (enter "0" for do not have)	________	Q17.2a	
17.3a	How many **Cattle** does your household have? (enter "0" for do not have)	________	Q17.3a	
17.4a	How many **domestic fowls** does your household have? (enter "0" for do not have)	________	Q17.4a	
17.5a	How many other livestock/fowls does your household have? Please, specify............... (enter "0" for do not have)	________	Q17.5a	

Variable Name	

Section 18: Electrical appliance acquisition

Code: [1] = Cooker [2] = Black & White Television [3] = Refrigerator [4] = Fan
[5] = Color Television [6] = Washing Machine [7] = Radio [8] = iron
[9] = Hot Plate [10] = Stereo [11] = Milling machine
[12] = Electric machinery and/or tools for productive purposes
[13] = Other specify,...............

Use the coding above for the following questions

Q18.1 **First Appliance Would Like to Acquire**
If electricity were to become available to your household use, in addition to lighting which of the above electric appliance would you like to acquire for your family/business as the **First Appliance**? ________ **Q18.1**

Q18.2 **Second Appliance Would Like to Acquire**
If electricity were to become available to your household use, in addition to lighting which of the above electric appliance would you like to acquire for your family/business as the **Second Appliance**? ________ **Q18.2**

Q18.3 **Third Appliance Would Like to Acquire**
If electricity were to become available to your household use, in addition to lighting which of the above electric appliance would you like to acquire for your family/business as the **Third Appliance**? ________ **Q18.3**

Section: 19 Household Attitude Towards Electricity

Variable Name	

The following statements I am about to read to you concern energy use and other issues. Please tell me if you agree or disagree with these statements and how strong your feelings are.

Use the following coding for answer:
[1] = strongly agree; [2] = agree; [3] = no opinion
[4] = disagree; [5] = strongly disagree

19.1 It is true that electricity is the most convenient source of energy. ________ **Q19.1**

Use the following coding for the answer.
[1] = strongly agree; [2] = agree; [3] = no opinion
[4] = disagree; [5] = strongly disagree

			Variable Name	
19.2	Electricity is very expensive fuel.	________	**Q19.2**	
19.3	Electricity will improve my family's way of living.	________	**Q19.3**	
19.4	Electricity is a very reliable source of energy for the family	________	**Q19.4**	
19.5	Electricity is a clean source of energy for my family	________	**Q19.5**	
19.6	Electricity can supply more lighting for my family	________	**Q19.6**	
19.7	Electricity is cheaper than other fuels	________	**Q19.7**	
19.8	Electricity is energy for the rich family	________	**Q19.8**	
19.9	Electricity is dangerous	________	**Q19.9**	
19.10	Electricity is the way of the future.	________	**Q19.10**	
19.11	Electricity must be used sparingly.	________	**Q19.11**	
19.12	Electricity is convenient to use.	________	**Q19.12**	
19.13	Electricity is a luxury.	________	**Q19.13**	
19.14	Electricity is affordable	________	**Q19.14**	
19.15	Electricity improves security at night	________	**Q19.15**	

			Variable Name	
19.16	Electricity is the key to have productive business	______	Q19.16	
19.17	Electricity allows me to do more work in my business	______	Q19.17	
19.18	Car battery is the best way to provide light for me and my family	______	Q19.18	
19.19	Car battery is the best source of energy for my household entertainment equipment. (i.e., radio & TV)	______	Q19.19	
19.20	My family is very happy with the source of energy that we are using for lighting	______	Q19.20	

Section 20: Household desires to use electricity

			Variable Name	
20.1	Would your household like to have access to electricity, or would you prefer to continue using your present energy sources? (exclude energy for cooking) [1] = Electricity (If answer "ELECTRICITY" go to Q20.3 [0] = Prefer present energy sources	______	Q20.1	
20.2	Please give me reasons why you prefer present energy sources? [1] = Can't afford to pay for the costs associated with connection and usage of electricity [2] = Can't afford to buy electrical equipment [3] = See no applications [4] = Satisfied with present energy sources [5] = Other, specify	______	Q20.2	
20.3	Which of the following services you would like to have first, second and third? (enter the rank number (1, 2, or 3) you like to have first, second and third)	Rank		
20.3a	Clean water	______	Q20.3a	
20.3b	Electricity	______	Q20.3b	
20.3c	Irrigation		Q20.3c	
20.3d	Road	______	Q20.3d	

Annex 5.3
Socioeconomic Survey Questionnaire for Village in Guinea

Questionnaire d'enquêtes socio-économiques
dans les villages en Guinée,
SNAPE[3]/ESMAP 1997

1. Préfecture... **2. Sous-préfecture**......................................
3. District... **4. Village**...
5. Accès, 51. Difficile ☐ 52. A aménager ☐ 53. Facile ☐
6. Population................. 7. Nombre de familles.......... 8. Nombre de maisons.........
9. Type d'habitat,
91. Village rue ☐ 92. Très dispersé ☐ 93. Concentré ☐
10. Type d'activité économique dominant dans le village,
101. Agriculture ☐ 102. Commerce ☐ 103. Autre ☐
11. Statut de la personne interviewée...

12. Type d'habitat dominant :

121. En terre ☐ 125. Toiture en tôle ☐
122. En dur ☐ 126. Toiture en chaume ☐
123. En bois ☐ 127. Toit Conique ☐
124. En semi-dur ☐ 128. Autre préciser...............................

14. Existe-t-il des Opérateurs Villageois ? 141. Oui ☐ 142. Non ☐
1411. Si oui Nombre.................

15. Types d'activités,
151. Commerce 1511. Oui ☐ 1512. Non ☐
152. PME 1521. Oui ☐ 1522. Non ☐
153. Autre, préciser...

[3] *Service national d'amenagement des points d'eau.*

16. Existe t il des associations dans le village ?

161. ONG 1611. Oui ☐ 1612. Non ☐
16111. Si oui, dans quel secteur d'activités ?....................................

162. Coopérative 1621. Oui ☐ 1622. Non ☐
16211. Si oui, dans quel secteur d'activités ?.......................................

163. Autre forme d'association, préciser..
1631. Si oui, dans quel secteur d'activités ?..

17. Sont t-elles intéressées par un programme d'électrification de leur village ?

171. Oui ☐ 172. Non ☐

1711. accepteraient-elles de s'engager dans un programme d'électrification de leur village ? Comment?

17111. Apport à l'investissement ☐

17112. Gestion ☐ 17113. Autre..................

18. Existe-t-il une agence de banque ou d'épargne-crédit ?

181. Dans le village ? 1811. Oui ☐ 1812. Non ☐

18111. Si oui, de quel type ? 181111. Crédit Rural ☐

181112. Crédit Mutuel ☐ 181113. Autre ☐, lequel ?.................

182. Dans un village voisin ? 1821. Oui ☐ 1822. Non ☐

18211. Si oui, de quel type ? 181111. Crédit Rural ☐

181112. Crédit Mutuel ☐ 81113. Autre ☐, lequel ?...................

19. Existe t il un marché ? 191. Oui ☐ 192. Non ☐

1911. Si oui, est-il ? 19111. Hebdomadaire ☐

19112. Autre fréquence ☐, laquelle ?...........

20. Coûts de transport du village aux villes ou villages les plus proches ?

201-
202-
203-

21. Existe-t-il des techniciens locaux ou des électriciens ?

211. Oui ☐ 212. Non ☐ 2111. Si oui, nombre.................

22. Existe-t-il d'autres branches d'activités artisanales ?

221. Oui ☐ 222. Non ☐
Si oui, lesquelles?
2211-
2212-
2213-

23. Existe-t-il ?

231. Une Ecole 2311. Oui ☐ 2312. Non ☐
2314 Si oui, est elle éclairée ? 23141. Oui ☐ 23142. Non ☐
2315. Type d'éclairage.................................
232. Une église 2321 Oui ☐ 2322 Non ☐
2323. Si oui, est elle éclairée ? 23231. Oui ☐ 23232. Non ☐
2324. Type d'éclairage............................
233. Une mosquée 2331. Oui ☐ 2332. Non ☐
2333. Si oui, est elle éclairée ? 23331. Oui ☐ 23332. Non ☐
2334. Type d'éclairage............................

24. Existe-t-il des groupes électrogènes dans le village ?

241. Oui ☐ 242. Non ☐
2411. Si oui, quel est leur nombre...

242. Profil économique des utilisateurs, Citez...
2421. Eclairage bâtiment ☐
2422. Vidéo club ☐
2423.Telivision + éclairage ☐
2424. Industrie ☐
2425. Chaudronnerie ☐
2426. Autre..................... ☐

Usage	Durée d'utilisation en heures/ jour	Durée d'utilisation Nombre de jour /mois	Remarques
Eclairage Bâtiment			
Vidéo club			
Télé + éclairage			
Industrie			
Chaudronnerie			
Autre			

25. Problèmes rencontrés par les utilisateurs: décrivez les un par un

251.
252.
253.

26. Est-ce que le village est menacé par la foudre?

261. Oui ☐ 262. Non ☐
2611. Si oui, période de menace...

PLAN DU VILLAGE

Tracez les routes d'accès et les routes intérieures du village, estimez la distance des villages voisins, localiser les infrastructures (école, mosquée, église, bureau, agence bancaire, etc.)

Annexe 5.4
Willingness-to-Pay Questionnaire for Villages in Guinea

Questionnaire d'enquêtes sur les consommations
et sur la capacité de payer un service électrique
des familles rurales vivant
hors réseaux électriques en Guinée
(questionnaire SNAPE – ESMAP 1997)

1. Village.. **2.** District...

3. Nom du consommateur.......................... **4.** Prénoms....................................

5. Nombre de personnes vivant sous le même toit..

6. Nombre de maison sous la responsabilité de la personne interviewée................

7. Nombre de pièces dans chacune des maisons...

8. Nombre de pièces éclairées chaque soir...

9. Fonction/statut de la personne enquêtée...

10. Quelle est l'activité principale de la personne interviewée?
111. Agriculture ☐ 112. Artisanat ☐ 113. Elevage ☐
114. Commerce ☐ 115. Fonctionnaire ☐
116. Autre, préciser..

12. LOCAL A ELECTRIFIER , TYPE DE CONSTRUCTION

121. Habitation ☐ 125. En terre ☐ 129. Toiture en tôle ☐
122. Centre de santé ☐ 126. En dur ☐ 1210. Toiture chaume ☐
123. Ecole ☐ 127. En bois ☐ 1211. Toit Conique ☐
124. Lieu de culte ☐ 128. En semi-dur ☐
1212. Autre toiture préciser

13. ECLAIRAGE EXISTANT

	131. Bougies	132. Lampe à pétrole	133. Lampe à pression	134. Lampe à gaz	135. Lampe Tempête	136. Feu de bois	137. Autre …………
Quantités							
Prix Unitaire							
Coûts Mensuels							
Total dépenses							

Dépenses mensuelles estimées du consommateur……………………….FG

14. EQUIPEMENTS ELECTRIQUES EXISTANTS

	141. Lampe torche	142. Radio	143. Televis.	144. Lampe electriq.	145. Lampe solaire	146. Autre …………..	147. Autre ………….
Quantité							
Prix unitaire							
Puissance totale							
Tension utilisée							
Coûts mensuels							

148. Le Consommateur a-t-il un groupe électrogène 1481. Oui ☐ 1482. Non ☐
- 14811. Si oui, de quelle marque ? ………………………………………………………
- 14812. Puissance……………KVA 14813. Carburant utilisé……………………
- 14814. Prix d'achat du carburant ………………FG par litre
- 14815. Dépenses mensuelles en carburant/Autre………………………FG.
- 14816. Nombre d'heures d'utilisation par jour en moyenne……………
- 14817. Nombre de jours d'utilisation par mois en moyenne………………
- 14818. Type d'utilisation ? 148181 Eclairage ☐ 148182 Autre ☐, préciser……………
- 14819. Prix d'achat du groupe électrogène……………………FG.

15. Etes vous intéressé par un service électrique?
- 151. Oui ☐ 152. Non ☐
- 1511. A combien pensez-vous pouvoir participer à l'investissement ?……………FG.
- 1512. Combien pourriez-vous payer chaque mois pour un service électrique?…….FG

16. PARTIE A REMPLIR PAR L'ENQUETEUR

Lorsque vous avez terminé l'entretien, que vous êtes seul, prenez le temps de faire les calculs et de rapporter vos impressions subjectives en remplissant le cadre ci-dessous

161. Votre estimation de la capacité maximale de règlement d'un abonnement.....................FG

162. Votre estimation de la capacité maximale de paiement mensuel d'un service électrique..............................FG/mois

163. Calcul des dépenses mensuelles consacrées à l'éclairage et à l'audio visuel.........FG/mois

164. Evaluation des revenus mensuels de la famille.................. FG/mois

165. Sources de revenus...

166. Fréquence des revenus ? 1661. Semaine ☐ 1662. Mois ☐

167. Réaction du consommateur..

Fiche établie par....................................., le................ Signature

17. DUREE DE FONCTIONNEMENT ET QUANTITES DE POINTS LUMINEUX

Pièces éclairées la nuit	171. Bougies		172. Lampe à Pét. à mèches		173. Lampe à Pét. à pression		174. Lampe à gaz		175. Lampe tempête		176. Autres, préciser	
	1711. Nb	1712. durée h/j	1721. nb	1722. durée h/j	1731. nb	1732. durée h/j	1741. nb	1742 . durée h/j	1751. nb	1752. durée h/j	1761. nb	1762. durée h/j
Cour extérieure												
Salon												
Chambre 1												
Chambre 2												
Chambre 3												
Chambre 4												
Chambre 5												
Chambre 6												
Autre, préciser												
Autre, préciser												
Autre, préciser												
Cuisine												
Toilettes												
TOTAL												

Prix d'une pile au village (du modèle usuel)..........FG/pile. Décrivez le type de pile........................
Prix d'une bougie..................FG
Prix d'un litre de pétrole ou de Gasoil au village...............FG/litre. Et en ville............F/litre
Prix d'une tube de gaz......................FG/tube volume du tube.....................
Calcul des montants de dépense mensuelle d'éclairage : par pièce..............................FG/mois
total maison.......................FG/mois
Nombre total d'heures d'éclairage en moyenne chaque jour.......................heures/jour
Utilisation exceptionnelle.................... fréquence.............. surplus de consommation...............................
Prix d'une batterie..............................
Prix d'une lampe torche d'un modèle usuel..............

Annex 5.5
How to Write a Business Plan for Rural Electricity Service

This guide describes how to prepare a business plan (BP) for rural electricity service. Originally used for a project in Laos, it is for use by a rural development worker or consultant with some business training or experience to assist either an individual or a community group in (1) writing a business plan, (2) presenting the business plan for financing to a bank or government agency, and (3) assisting in the implementation of the business plan.

The document describes how the consultant should work with the entrepreneur and what they should discuss with the entrepreneurs, be they individuals or cooperatives. Many of the concepts and terms may be new to many rural residents, so it is important that the consultant take time to explain the ideas and concepts presented. If the entrepreneurs fail to understand the principles and approach of writing a business plan, it is unlikely that they will be able to prepare a successful one. Simplifying many of the concepts by referencing examples within their communities is one approach that may be helpful in explaining the concepts and ideas to them.

Why Write a Business Plan?

After coming up with a business idea, writing a business plan will help to better define and assess the opportunity for the entrepreneur (businessperson or community group/ organization). After it is complete, either a strong, well-planned approach to develop the business will result or the idea will be discarded as being unfeasible. A BP will help the entrepreneur to

- define the product which they will sell,
- determine how they will sell it and at what price,
- estimate how much it will cost to make,
- identify competing products, and
- identify the potential customers.
-

·A BP can be used for any type of product or service, the general methodology is the same. In the rural energy sector, BP can be used to determine how to generate and sell electricity to potential customers. In this example, the entrepreneur produces electricity, similar to the farmer. In each case, they must determine how to make the good and sell it profitably.

In Laos, electricity can be produced and sold in several ways to rural consumers. A decentralized micro-grid system can be developed to sell electricity to a group of consumers living closely together, say in a small village or town. Each consumer would be connected to the micro-grid and pay a monthly fee for electricity. Another alternative could be a solar battery charging business, charging batteries for individuals/families for a service fee. Lastly, a farmer could use an agricultural engine used during the day to generate electricity at night. A BP should be completed for each of these options to define if the business can be successful for each specific location noted.

The following presents how to prepare a simple business plan by anyone, adapted specifically for those who want to provide electricity for themselves and for sale to others in rural areas. A sample outline is presented in Box 1. Accompanying the general approach outline below are two example business plans: ***Micro-grid Electricity*** sold by a community group and ***Battery Electricity*** sold by a private business.

Box 1: Sample Outline: Typical Business Plan for a Rural Energy Company

1. Business Description
2. Market Analysis and Electricity Demand
3. Marketing Plan
4. Technical Design, Equipment Procurement and Construction Plan
5. Operating Plan
6. Organization Plan
7. Financial Analysis
8. Summary and Conclusion

Preparation

It is very important to have completed some necessary steps prior to writing the business plan. Failure to do so will not produce a good business plan and will only require additional and supplementary work during the preparation of the business plan. Key steps that must be undertaken include:

- Defining the business: What is the goal of the business? What will it sell? Where will it be located? Who are the customers?
- Assessing the market for energy products: What are people using now?
- Assessing potential customers: Would they use your product?
- Developing a marketing approach: How would you sell your product?
- Defining the production process: How will you generate electricity or distribute your product?
- Operating the business: Who will run the business? How will the product be produced?
- Identifying the Owners: Who are they?
- Assessing the financial structure: How will the business make money? Do you understand that it must be profitable?
-

Any potential entrepreneurs who have not thought about these questions should not proceed. They probably will not have detailed answers to any of these questions but they should have thought about them and they should be able to give an answer indicating that they have completed some basic work and/or thought on the subject. Lastly, it is important that the entrepreneur, either individual or cooperative, understand this last point—the need to run the business profitability. If they do not understand or accept this then they should not establish the business.

There are three principal phases of a business plan: (1) writing the business plan, (2) getting financing, and (3) implementing the business plan.

Phase 1: Writing the Business Plan

The business comprises the following components:

10. Business description
11. Market analysis and electricity demand assessment
12. Marketing plan
13. Technical design, equipment procurement and construction plan
14. Operating plan
15. Organization plan
16. Financial analysis
17. Summary and conclusion.

1. Business Description

The BP should introduce the business concept and the entrepreneur, giving a realistic impression of the business, its objectives and merits. The business description will define the basic type of business and its purpose. The entrepreneur should be able to briefly answer the following questions before they can proceed to the next phase, preparing operating plans. Questions to answer include:

- What is the exact business of the venture?
- What product or service does it sell?
- Where is the market for this product or service?
- What is the target market or specific customer group?
- How will the business be operated?
- Who will manage/run the business?
- How will it be financed? Or, what are the potential sources of finance?
- Why will it succeed?
-

By focusing on these questions, the entrepreneur will firstly be able to determine their understanding of the business and the factors that lead to its success or cause its failure. Secondly, the business description will meet the expectations of the reader/financier. Typically, the business description would be drafted before the other phases, but updated after the entire BP is complete.

How to prepare a business description

1. *Identify the location of the business.* This will include contact information such as name of business, name of contact person, and address.
2. *Define the history of the entrepreneur.* Prior business experience should be briefly outlined and for community groups their activities as well. Does the entrepreneur have any energy experience and if so what is it?
3. *Identify the mission statement or goal of the business.* Why is the business going to be established? Is it to make money or to provide a service?
4. *Define the history of the market for electricity/energy services and identify the target market geographically and demographically.*
5. *Describe the operations of the business.* This will include what product/service will be sold, how it will be sold, how it will be produced or procured;
6. *Develop profiles of managers.* This should include past experience managing projects and people
7. *Develop a financial summary.* This will describe key points of the financial plan

2. Market Analysis and Electricity Demand

The entrepreneur will need to complete an analysis of the market for electricity, which should clearly identify the opportunity and potential sales. The term market refers to the geographic boundaries of where the firm will operate and its *target market* the group of potential customers, their characteristics and needs, that they will market energy services directly to.

There are two steps that need to be undertaken to fully assess the market. First, an analysis of competing products or services needs to be completed, and secondly, a marketing plan needs to be developed. Competition can come in either two forms. Direct competition refers to substitute products or services, such as car batteries versus micro-grid lighting, and indirect competition, including other energy forms such as candles, kerosene lanterns, or flashlights.

A marketing analysis includes a study of the basic factors that define the market for the firm's product or service and how the firm will take advantage of the opportunity. Specific factors of a marketing analysis include

- the geographic boundary of the market for energy services
- economic, competitive, and social factors that influence the market;
- specific market niche, the potential customers, and their buying characteristics, such as consumer density;
- estimated electricity or battery charging demand and potential sales; and
- competing energy products or services.

How to Prepare a Market Analysis and Sales Forecast

A market survey of the target market will need to be completed, taking into account the following:

1. *Define the firm's market location.* This refers to geographic boundaries. Will electricity be sold only in the village? Is there potential to expand its sales at a later date (either in the village, adjacent villages, or to others)? Will batteries be leased to customers outside the immediate surroundings, e.g. village?
2. *Understand customer buying forces.* This includes determining consumers income level, current expenditures on energy services/products, seasonality and/or variability of income, customer occupation - farmer or government worker, and ability to pay for new energy services. What do they use energy for? What service or use will your product have?
3. *Identify the target market.* Within the larger market of the village or community there is a specific customer group that will be the focus of marketing efforts. The entrepreneur must match their abilities and skills to meet these potential customers needs. The target market will be the customers most likely to purchase the product. The entrepreneur should develop a customer profile that will define their key characteristics such as where they live, their occupation, income, family size, social class, and buying habits. For example in other countries, for many micro-grids and grid connected power customers are government employees with stable incomes who can afford the initial connection fee or capital investment. Farmers may be very interested in the service as well though poorer farmers may not have enough income to buy the product and would therefore not be a target market for the firm.
4. *Identify competing product.* The success of the business will be strongly influenced by the level of competition it will confront. Competing electrical/energy services need to be evaluated including direct competition of grid based power and car batteries for lighting and indirect competition from dry cell batteries, kerosene, and candles. Competing energy products should be evaluated based on: quality, price, customer service, credit availability, accessibility, and reliability.
5. *Estimate electricity demand and sales.* The ultimate aim of market research is to determine the potential sales, and by doing so the business can judge the feasibility of the business and prepare other parts of the business plan. The business will need to identify the potential sales of electricity or batteries based on their target market including: (1) number of customers, (2) estimated electricity demand, either kWh consumption monthly or battery charges monthly, and (3) demand profile; low demand or only evening demand. The electricity demand forecast can be based on several factors: existing energy consumption (quantity), existing energy expenditures, and ability to pay for energy services. A survey should be completed by the business owner or community group to determine this information. Sales forecast can then be based on existing energy use patterns, taking into account potentially higher energy consumption for better lighting service provided by micro-grids.

3. Marketing Plan

Planning involves deciding what must be done, how it will be done, when it needs to be done, and who will do it. A marketing plan will establish basic plans, policies, and procedures to delivery electricity in the right form to the customer at the right time and price. A marketing plan will

- describe how the business's target customer will be motivated to purchase energy services,
- identify the method of selling the energy service, and
- convince lenders as to the commercial success of the business.

How to Prepare a Marketing Plan

1. *Identify marketing goals.* They should be concise and serve as the basis for providing incentives to management and as means of measuring the business's success. Ex. the electricity cooperative will have 20 customers by the end of the first year or the business will lease 15 batteries in the first four months.
2. *Describe the marketing strategy.* The strategy is the business's plan for reaching the targeted consumers and for presenting the product/service to them. There are several components:

   - First, product positioning must be identified. Will electricity be sold/presented as a basic service, to replace other energy forms, or will it be sold as a luxury good? Depending upon the target market either option may work though it is likely that it will serve as a new and improved basic service to the consumer.

   - Second, price will need to be established with consideration for the product cost, consumer ability to pay, and profit margin. The price must be greater than the cost if the business is going to succeed.

   - Third, how the product will be distributed must be identified. For micro-grids this will be with electrical lines to homes but for the businesspeople selling batteries they will need to determine how to delivery the product to the customer.

   - Last, how the product will be promoted should be defined and may include: promotion in public places such as a weekly market, visit to homes or advertising with signs and when they will collect payment at this time?
3. *Prepare a marketing budget.* The budget should include all the costs for promoting the product, such as printing expenses and sign rentals. Monitoring and evaluation of the marketing effort can be measured either by total sales or the cost of making the sale.

4. Technical Design: Equipment Procurement and Construction Plan

Selecting the right equipment and installing it correctly is very important. For a micro-grid, if too large a generator is chosen then the cost of capital and electricity will be high. For a battery charging stations, using too many solar panels to charge batteries will raise capital costs and the cost for charging a battery. In each case, the result may be fewer customers, lower profit and a lower probability of the business succeeding. Once the equipment is purchased it must be installed and serviced correctly. If it is not, then the quality of electricity service may be low or may not work at all.

The business needs to choose equipment that meets its needs with access to the right technical capacity to make it work properly.

How to Prepare a Procurement and Construction Plan

1. *Select generation source.* The source of generation will depend upon the availability of natural resources and technical capabilities. For a micro-grid hydropower may be an option depending upon site availability. If no sites are available then diesel may be the only option. As well, even if a hydro site is available the business must have the skills or assistance to develop the site. For a solar battery charging station, the site will need to have good isolation and be free of shade.
2. *Define the equipment needed.* After electricity demand has been estimated and market research completed then the business can determine what type of equipment it will need. For a micro-grid, estimated demand will assist them in choosing the right size generator (see technical standards). A battery charging station will as well estimate the potential demand and choose the right size battery and solar panels necessary to charge the batteries.
3. *Estimate construction costs.* The business will need to estimate the cost of building the place of operation, production site, costs of installing the equipment, and for micro-grids determine the costs for installing distribution lines.
4. *Determine vendors' list.* The business will need to select what vendors they will purchase goods and choose the criteria for evaluating the products: such as cost and service support.
5. *Assess the building contractor.* Are they well qualified to complete the installation of the equipment? Have they done this work before? Will they provide a guarantee and servicing for the equipment?

5. Operating Plan

The operating plan describes the production process or how the electricity or energy service will be produced and sold. The inputs included are the energy source, such as diesel, labor to manage its production, sales skills, and the final output.

How to Prepare an Operating Plan

1. *Defining operating procedures.* The day-to-day operations of the business must be defined. This includes: how will the product/service be produced or procured, such as maintenance and operation of generator and solar panels? How will the electricity be sold? Will the batteries be leased? How will the production process be managed?
2. *Describe the operating facilities.* How much and what type of space is required to sell the product? Where will the product be produced or sold from? What resources are needed to produce the product?
3. *Describe how the product will be purchased.* Where will the generator or solar panels be bought: from a supplier in the capital or abroad? Will it be paid for with credit? How often will it be purchased?
4. *Describe how electricity will be sold.* Pricing of electricity must include variable and fixed charges. There are likely differences between the cost of electricity service and batteries and they must be priced differently if necessary.
5. *Describe the service/product delivery.* How will the bill collection system work? What are the hours of operation and how will the system load be managed? Describe the system operation and maintenance?

6. *Establish an inventory control system.* Where will the goods be stored? When will the business know to buy new products, such as batteries? How will the products be protected against theft. What are the storage facilities for the business and what is the protection against the resale of electricity by consumers?
7. *Establish a quality control system.* It is important to ensure that electricity service is reliable and that solar panels are of high quality. The business will need to create a system to monitor the service provided to households by surveying them on a periodic basis. Basic customer service expectations and product standards will need to be established.

6. Organization Plan

The organization plan discusses the management of people, physical assets, and financial aspects of the business and will lay the groundwork on how to manage the business successfully. It will include the form of ownership, organization structure, organization of staffing, and functions and responsibilities of staff.

How to Prepare an Organizational Plan

1. *Identify the form of ownership.* Will the community own the business, will only customers be shareholders, or will a private person or group own it? The advantages of the type of ownership selected should be described.
2. *Define the management philosophy.* What are the values, beliefs and goals of the organization? What are the principles that will govern the business? Is it here to only make money or to provide a service or both? A business may have a very different approach than a community organization would have. For both businesses, it is critical that the management philosophy recognizes the need to be profitable as this is the underlying principle of any business, even a community/cooperative based business-providing services to the community.
3. *Create an organizational structure.* This defines what the roles and responsibilities are for the business operator and employees including the owner of the business, members of the cooperatives.
4. *Personnel and compensation.* Key personnel need to be identified with required qualifications and compensation defined, if any. Who will be the manager and what is their experience?

7. Financial Analysis and Plan

The financial plan will establish if the business is profitable and what the financing requirements are. Key questions that it will answer include:

- What amount of financing is needed to start the business?
- When will the financing be needed and in what form?
- Who will provide it?

How to Complete the Financial Analysis

1. *Determine the business cash flow.* This requires estimating the potential revenue based on the electricity demand forecast and the price of the electricity, or number of battery charges. Costs must then be estimated including capital costs to purchase equipment, operating costs for managing the business, operation and maintenance expenses, and fuel costs. After both revenue and costs have been identified, a cash flow over a five-year period should be created to demonstrate if the business will make money or loss money over a period of operations.
2. *Define the capital structure and financial conditions.* The use of either a loan to fund the micro-grid or leases for solar PV systems/batteries should be described. Disbursement schedule of the financing and repayment schedule should be described.
3. *Determine the financing of capital costs for consumers.* Based upon quantity of electricity sold and the consumers' ability to pay for electricity, financing costs should be estimated and how they will impact the customer determined.
4. *Financial controls.* A mechanism will need to be established to monitor the inflows of payments, repayment of debt, and the profitability, or return, of the business.

8. Summary and Conclusion

The business plan should be summarized, with key points of key section presented. It is important that the overall concept is highlighted and why the business will be successful described in detail with supporting facts from the main text of the BP presented.

Phase 2: Getting Financing

Once the business plan has been completed the entrepreneurs must present the plan for financing. When doing so, the key personnel involved in the plan's preparation and future management of the business should present the plan to the financing group. The representatives of the business must demonstrate their knowledge and commitment to the business if they expect to receive financing.

Phase 3: Implementing the Business Plan

Once financing is secured, the BP can be implemented—although first the market and product should be reviewed to determine if the business plan needs to be adjusted to any conditions that may have changed. Major changes should not be necessary if the BP was properly prepared. Once any necessary changes have been made, the implementation process may begin. The consultant should work with the entrepreneurs in initiating the process, with periodic visits every other month to assess their progress and provide any additional assistance that may be needed.

Annex 5.6
Business Plan: Bam Nadee Micro-grid

1. Business Description

The proposed business, *Bam Nadee Micro-Grid (BNM),* will generate and sell electricity to a group of families in the village of He Hai in Vientiane Province. BNM will form a cooperative to provide electricity to families in the village.

BNM is a community-sponsored project, organized and managed by the residents of the village. Prior to this venture, the members of this project successfully established a rice cooperative, selling the produce at a 50 percent profit for several consecutive years. We propose to use some of this profit to buy the generator, borrowing the remainder. We believe that our positive experience with this business taught us good business skills that we can use in this new business.

The goal of the business is to provide a service to its members. BNM expects to make some money from the sale of electricity but we propose to invest the money into the business for maintenance and as a cash reserve.

The village of Bam Nadee has about 150 families though BNM does not expect to initially sell electricity to all the families. We have estimated that about 30 families will join the BNM, paying an initial fee of $20 and the additional monthly fee of $6. Most of these families earn a good income as farmers, skilled artisans, and government workers. Poorer families appear unwilling to join at this time. The monthly fee charged is about the same amount a village family now spends on energy services.

The business will be operated by a committee of cooperative members who will be responsible for managing the daily operations of the business and in collecting the monthly fees. A generator will be bought and installed in a community hut. BNM will hire a contractor to install the equipment, including the poles, wires, and wiring into each home.

There will be two keep managers for the cooperative. Mr. Kham was manager of the rice farm and a village leader. He has experience managing people, basic accounting skills, works hard, and is honest. Ms Phiuphon is the local bar manager and has strong experience in working with and motivating people.

BNM expects to obtain financing from EdL, with assistance from local NGOs in filing the necessary paperwork. After repaying the loan for the generator and operating expenses, we expect to make about $95 per month by the ninth month.

BNM believes that the business will succeed for the following reasons:

- A good market has been identified.
- Additional members will join once the business in operating successfully.
- Many village families currently spend as much as $8/month on energy services, mainly for lighting.
- Members of the co-operative are very committed to making the business succeed.

2. Market Analysis and Electricity Demand

Business location
BNM will operate only in the village of Bam Nadee. After the business is operating, BNM expects that it will expand within the village as families recognize the benefits of electricity and demand service. Once the village market is fully met, BNM could expand to the neighboring village, a distance of two hundred meters, by constructing a distribution line or by installing an additional generator. BNM has not evaluated this option.

Customer
The income level of villagers surveyed is about $45 per month, with a current expenditures on energy services/products of about $5/month. BNM expects its customers will be in the higher range of these figures. Most household income is seasonal as the economy is agriculture based. Government workers will use the service as well and do not have seasonal income. Based on our survey, most consumers have the ability to pay for electricity service.

Target market
Within the village BNM has identified a specific target customer to focus its marketing efforts. These customers would most likely be able to purchase the product based on a customer profile. Key characteristics include: living in the center of the village, non-farm based occupation, income above $60 a month, six family members, higher social class, current users of car batteries for energy, and ownership of electrical appliances, such as a stereo and TV.

Competition
Competing energy services is primarily car batteries charged at the neighboring village. He Hai is too far from grid-based power to be connected within the next 10 years. Indirect competition from other energy sources includes dry cell batteries used for radios and stereos, and kerosene used for evening lighting. It is expected that electric lighting and power will replace most of these fuels because: 1) quality is higher, 2) price of electricity and current energy sources is equivalent, 3) credit will be made available and 4) reliability is higher.

Electricity demand
Based on BNM's survey of 50 families, we expect that thirty families will purchase an estimated 1 kilowatt-hour of electricity daily. The electricity demand forecast was based: 1) existing energy consumed with car batteries, disposable batteries and kerosene, and 2) current income level of target families of $60 month. Electricity sales would represent only 15 percent of total income. The cooperative members completed the survey.

3. Marketing Plan

Marketing goals

The marketing goals for BNM include:

- 30 paying customers connected by the end of third month of business,
- 20 additional customers connected by the end of the first year, and
- high quality electricity service between 7 PM and 10 PM seven nights a week.

Marketing strategy

The strategy for reaching the targeted consumers is based upon replacing other forms of energy. BNM expects that the improved quality electricity provided to the consumer will convince them to join BNM to obtain access to the service. Based upon capital, marketing and maintenance costs we expect to charge $6/month, sufficient to cover loan repayment costs and generate a small profit. Electricity will be distributed through a micro-grid with electrical lines directly to homes and businesses. Product promotion will include displays in the weekly village market, community meetings, and visits to respective consumers at their homes. Advertising will be used but meetings and visits are expected to play the most important role in attracting customers.

Marketing budget

The estimated marketing budget is $50 and includes all promotion costs, including printing expenses and display material.

4. Technical Design: Equipment Procurement and Construction Plan

Generation source and equipment

The micro-grid will use a 75 horsepower diesel generator to generate power. It is expected that this type of generator will be sufficient to generate power for an additional 40 families within the village. Total demand for initial 30 customers, based on a consumption of 1 kilowatt-hour each, is about 30 kilowatt-hours. The generator to be purchased can produce 60 kilowatt-hours, with sufficient capacity for expansion.

Construction costs

The following table summarizes construction costs:

Construction Costs

	Capital	Labor
Building and Site	$500	coop members
Generator	$1500	n/a
Installation of Equipment	$500	n/a
Distribution Lines/Other Equipment	$2000	coop members
Other	$200	n/a
TOTAL	*$4700*	-

Vendors' list
The generator and equipment will be purchased in the regional capital based upon quotes from a variety of suppliers. The vendor will provide a warranty and service for the generator free of charge for the first year, thereafter a service fee is required.

5. Operating Plan

Operating procedures
The generator operator will run the generator from 7 PM to 10 PM daily. A cooperative member will be trained and hired by the cooperative to run and maintain the generator. Each consumer will receive electricity during this period of time for a fixed monthly fee. Maximum demand will be limited to 1 kilowatt-hour/day, sufficient to power five lights, radio and TV.

Operating facilities
The generator will be located in the village in a secure building that will be built by BNM. Diesel fuel will be stored in the same building as the generator.

Product purchasing
The generator will be bought from Lak Diesels (located in the regional capital) with credit obtained from the financing source. Diesel fuel will be purchased weekly from the village market.

Electricity sales
Electricity will not be sold per kilowatt-hour, and instead a fixed fee will be charged per month for unlimited consumption up to an estimated 1 kilowatt-hour daily. Consumption above this amount will be restricted by a circuit cutoff switch. Total monthly sales is estimated to be about 30 kilowatt-hours.

Service delivery
BNM will collect payments on the first day of the month. In case of non-payment, power will not be cut off until the third month of non-payment. All fees collected will be deposited in the local bank account and used to pay bills. Hours of operation are from 7 PM to 10 PM. Maintenance will be performed on a weekly basis.

Quality control system
The quality of electricity service will be maintained by periodic surveys of households to assess their level of satisfaction with the service. Basic customer service expectations have been established through our market survey, with consumers expecting reliable power on a daily basis.

6. Organization Plan

Form of ownership
The business be owned by cooperative members, each of whom will contribute to the equity by depositing $20 per family. Additional members who will join must give the same amount to be members. Only customers will be shareholders. The advantage of this system is that it will encourage complete commitment to BNM.

Management philosophy
The goals of BNM is provide electricity to cooperative members and earn sufficient profit to maintain service and reinvest in the business.

Organizational structure
The managers will be responsible for operating the business with members of the cooperatives participating in semi annual meetings to discuss its operation and other issues of importance.

Personnel and compensation
Key managers with responsibility for managing and running the cooperative are Mr. Kham and Ms Phiuphon. Each will receive a monthly salary of $5.

- Mr. Kham was manager of the rice cooperative and is a village leader who organized the village to establish the cooperative. He has experience managing people, basic accounting skills, works hard, and is honest. With his leadership we expect to be equally successful with this new business.
- Ms Phiuphon runs a local bar. Her experience is wide and shows that she can do anything asked of her quite well. She is now managing the cash collection of the bar and is directing employees.

7. Financial Analysis and Plan

Business cash flow
Revenue for the first year, based on the electricity demand forecast, is $2,280 with a positive cash balance of $1,290 at the end of the year. Net profit for the year is a loss of $60, but we expect to make $1,140 in year 2.

Capital costs include the purchase of a generator, construction of a building, other equipment and installation for $4,000. Operating costs are $540 for the first year.

Our annual cash flow table (see attached) demonstrates that the business will make $95 monthly by the ninth month.

Capital structure and financial conditions
A loan of $5,000 is necessary for the purchase of the generator and for installation of equipment. BNM expects to begin repayment after the third month of operation and continue until the entire loan is repaid.

Financing of capital costs for consumers
Each family is expected to invest equity into BNM from their savings. No credit will be provided for them to join the cooperative initially though after one year BNM may consider providing some type of credit financing.

Financial controls

The managers of BNM will monitor the inflows of payments, record them in a ledger, deposit them in the bank, repay debt on a monthly basis, and assess the profits on a yearly basis. This is presented in the attached cash flow. Income statements are presented below for Year 1 and 2.

Income Statement, Year 1

	US$
Monthly fees collected	2280
Operating costs	540
Net profit	*1740*
Loan repayment	1800
Net profit/loss	***-60***

Income Statement, Year 2

	US$
Monthly fees collected	3600
Operating costs	660
Net profit	*2940*
Loan repayment	1800
Net profit/loss	***1140***

8. Summary and Conclusion

BNM believes the business will be successful because we have completed good field research, discussed the business and service issues with cooperative members, identified a good market for electricity and are committed to the business and its success.

Bam Nadee Micro-grid: Cash-Flow Projection for Year 1 (US$)

	Month												
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**
REVENUE													
Capital	600								400				1000
Loan	5000												5000
Monthly fees			180	180	180	180	180	180	300	300	300	300	2280
Total Cash	*5600*	*0*	*180*	*180*	*180*	*180*	*180*	*180*	*300*	*300*	*300*	*300*	*8280*
COSTS													
Capital Costs													
Generator		1500											1500
Building	500												500
Equipment		2000											2000
Installation Cost		500											500
Other			150										150
Operating Costs													
Marketing	20	20	10										50
Fuel Cost			20	20	20	20	20	20	30	30	30	30	240
Managers' Salaries			10	10	10	10	10	10	10	10	10	10	100
Operator Salary			5	5	5	5	5	5	5	5	5	5	50
Maintenance Cost			10	10	10	10	10	10	10	10	10	10	100
Total Costs	*520*	*4020*	*205*	*45*	*45*	*45*	*45*	*45*	*55*	*55*	*55*	*55*	*5190*
Cash Flow (Profit/Loss)	***5080***	***-4020***	***-25***	***135***	***135***	***135***	***135***	***135***	***255***	***255***	***255***	***255***	***3090***
Loan repayment (less)	150	150	150	150	150	150	150	150	150	150	150	150	**1800**
Net Cash Flow (Profit/Loss)	***4930***	***-4170***	***-175***	***-15***	***-15***	***-15***	***-15***	***-15***	***495***	***95***	***95***	***95***	***1290***
Cash Balance	4930	760	585	570	555	540	525	510	1005	1100	1195	1290	1290

Annex 5.6 (cont'd)
Business Plan: Laotian Battery Charging

1. Business Description

The proposed business, *Laotian Battery Charging (LBC)*, will charge batteries with a solar hybrid diesel system and lease them to families in the village of Laksoa in Vientiane Province. LBC will be owned by Mr. Phonphan and his sons, businesspeople in the village and owners of a shop charging batteries with a small generator.

Mr. Phonphan has been a successful shop owner, with twenty years of experience in the community. LBC will buy the generating system distributor in the capital, investing 10 percent equity and borrowing the remainder. We believe that our experience with the current shop taught us good business skills that we can use in this new business.

The goal of the business is to make money by leasing batteries to consumers in the village and surrounding community. Profits will be used to expand the business by buying more batteries to lease to more consumers, perform maintenance on existing equipment, and as a cash reserve.

The village and surrounding communities of Laksoa has about 300 families. LBC does not expect that all households will be interested in leasing a battery but have estimated that about 50 batteries will be leased after three months. Each customer will pay an initial security fee of $5 and additional monthly fee of $4. Most of these families earn a good income as farmers, skilled artisans, and government workers. Some poorer families appear unwilling to join at this time but probably some will join when they understand the benefits. The monthly fee charged is less than the amount a village family now spends on energy services.

The business will be operated by Mr. Phonphan his two sons who will be responsible for managing the daily operations of the business and in collecting the monthly fees. The battery charging system will be installed in a hut located next to my existing business. LBC will hire a contractor to install the equipment.

LBC expects to obtain financing from the local bank, with assistance from local NGOs in filing the necessary paperwork. After paying the monthly repayment fee is paid each month LBC expects to make $100 per month by the ninth month of operations.

LBC believes that the business will succeed for the following reasons:

- There is large market.
- Many village families currently spend as much as $7/month on energy services, mainly for lighting.
- The owner is very committed to making the business succeed.

2. Market Analysis and Electricity Demand

Business location
LBC will operate in the village of Laksoa. After the business is operating, LBC expects that it will expand and lease batteries outside the village as families recognize the benefits of batteries. Once the village market is fully met, LBC could expand its services to as many as five neighboring villages.

Customer
The income level of villagers surveyed is about $48 per month, with current expenditures on energy services/products of about $6/month. LBC expects its customers will be in the middle range of this figure. Most household income is seasonal as the economy is agriculture based. Government workers will probably be more likely to lease batteries as do not have seasonal income. Based on our survey, most consumers have the ability to pay for battery leasing.

Target market.
Within the community LBC has identified a specific target customer to focus its marketing efforts. These customers would most likely be able to purchase the product based on the following customer profile: non-farm based occupation, income of about $45 a month, six family members, diverse social class, current users of car batteries and disposable batteries for energy and lighting, and ownership of a stereo.

Competition
Competing energy services is primarily car batteries charged at the trading town, ten kilometers from the village. Laksoa is too far from grid-based power to be connected within the next 10 years. Indirect competition from other energy sources includes dry cell batteries used for radios and stereos, and kerosene used for evening lighting. It is expected that solar charged batteries will displace currently used car batteries because: 1) higher quality batteries will be used, 2) price of the charging is lower than the price charged in the neighboring town, 3) reliability is higher, and 4) batteries will be guaranteed.

Electricity demand
LBC's survey demonstrated that 50 families will lease batteries on a monthly basis. The battery demand forecast was based: 1) existing energy consumed with car batteries, disposable batteries and kerosene, and 2) current income level of target families of $45 month. Battery sales would represent only 10 percent of total income. My sons completed the survey of families in the community.

3. Marketing Plan

Marketing goals
The marketing goals for LBC are as follows:

- 50 paying customers leasing batteries by the end of third month of business
- 20 additional customers by the end of the first year
- A profitable business after one year of operations.

Marketing strategy
The strategy for reaching the targeted consumers is based upon replacing other currently used energy sources. LBC expects that the improved quality electricity provided by the better batteries will convince consumers to lease batteries from LBC. Based upon capital, marketing and maintenance costs we expect to charge $4/month, sufficient to cover loan repayment costs and generate a good profit. Batteries will be leased from the entrepreneur's existing business location where customers would bring their batteries to be charged. Batteries will be promoted with displays in the weekly village market, community meetings, and visits to respective consumer's homes.

Marketing budget
The estimated marketing budget is $50 and includes all promotion costs, including printing expenses and display material.

4. Technical Design: Equipment Procurement and Construction Plan

Charging source and equipment
The solar hybrid charging station includes 4 X 100 solar panels and a small backup 20 Hp diesel generator to charge batteries. It is expected that this system will be able to generate enough power to charge 10 batteries every day. By rotating the charges, this system could charge a maximum of 70 batteries weekly.

Construction costs
The following table summarizes equipment and construction costs:

Construction Costs

	Capital
Building and Site	$250
Generator	$500
Solar equipment	$4000
Installation of Equipment	$250
Other equipment	$500
TOTAL	*$5500*

Vendors' list
The solar panels, generator and other equipment will be purchased in the capital through an approved dealer. The vendor will provide a warranty and service free of charge for the first five years, thereafter a service fee will be paid.

5. Operating Plan

Operating procedures
The charging system will operate during daylight hours. My two sons will be trained to run and complete basic maintenance to the system. Each customer will receive one charge per week for the fixed monthly fee. Additional charges will cost $1 per charge.

Operating facilities
The charging system will be located next to my shop in the village and batteries and other equipment will be stored in my locked storehouse. Diesel fuel will stored in the same building as the batteries.

Product purchasing
The batteries and solar panels will be bought from ACME Solar Panels located in the capital with the entrepreneur's equity and credit obtained from the financing source. Diesel fuel will be purchased weekly from the village market.

Service delivery
LBC will collect monthly payments on the first charge of the month. In case of non-payment, batteries will be taken back after one month of non-payment. All fees collected will be deposited in the local bank account and used to pay back the bank loan and other expenses.

Quality control system
Battery quality will be monitored when batteries are returned for charging. If customers are overusing batteries, they will be charged an additional fee. If a battery is bad then a new battery will be given to the customer. Quality will be judged through periodic surveys of households to assess their level of satisfaction with the service. Basic customer service expectations have been established through our market survey, with consumers expecting reliable batteries and charging.

6. Organization Plan

Form of ownership
The business be owned by Mr. Phonphan and his two sons and will contribute $600 in equity.

Management philosophy
The goals of LBC is to earn a good profit through battery charging and to create a sustainable business.

Organizational structure
Mr. Phonphan will be the manager of the business and will be directly responsible for the operations of the business. His sons will be in charge of battery charging and marketing.

Personnel and compensation
Mr. Phonphan has considerable experience in managing and running a business with over twenty years of experience. His two sons have been working with him for five years and have both

studied business at the regional capital. Compensation will be through ownership of the business: Mr. Phonphan will have 50 percent and his sons will each have 25 percent.

7. Financial Analysis and Plan

Business cash flow

The first year revenue based on the electricity demand forecast is $2,320 with a positive cash balance of $1,620 at the end of the year. Net profit for the year is a loss of $170 but we expect to make $1,210 in year 2.

Capital costs include the purchase of a generator, construction of a building, other equipment and installation for $6,000. Operating costs are $350 for the first year.

Our annual cash flow table (see attached) demonstrates that the business will make $100 monthly by the ninth month.

Capital structure and financial conditions

A loan of $6,000 is necessary for the purchase of the solar panels, generator, other equipment and for installation of equipment. LBC expects to begin repayment immediately and continue until the entire loan is repaid. The owners will invest $600 of their savings.

Financial controls

The managers of LBC will monitor the inflows of payments, record them in a ledger, deposit them in the bank, repay debt on a monthly basis, and assess the profits on a yearly basis. This is presented in the attached cash flow. Income statements are presented below for Year 1 and 2.

Income Statement, Year 1

	US$
Monthly fees collected	2320
Operating costs	350
Net profit	*1970*
Loan repayment	1800
Net profit/loss	***170***

Income Statement, Year 2

	US$
Monthly fees collected	3360
Operating costs	350
Net profit	*3010*
Loan repayment	1800
Net profit/loss	***1210***

8. Summary and Conclusion

LBC believes the business will be successful because we have completed good field research, discussed the business and service issues with cooperative members, and identified a good market for electricity, and because we are committed to the business and its success.

Laotian Battery Charging: Cash-Flow Projection for Year 1 (US$)

	Month												
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**
REVENUE													
Capital	600												600
Loan	6000												6000
Battery Deposit			250						100				350
Monthly fees			200	200	200	200	200	200	280	280	280	280	2320
Total Cash	*6600*	*0*	*450*	*200*	*200*	*200*	*200*	*200*	*380*	*280*	*280*	*280*	*9270*
COSTS													
Capital Costs													
Generator		500											500
Building	250												250
Solar Panels		4000											4000
Installation Cost		250											250
Other		500											500
Operating Costs													
Marketing	20	20	10										50
Fuel Cost			10	10	10	10	10	10	10	10	10	10	100
Miscellaneous			10	10	10	10	10	10	10	10	10	10	100
Maintenance Cost			10	10	10	10	10	10	10	10	10	10	100
Total Costs	*270*	*5270*	*40*	*30*	*30*	*30*	*30*	*30*	*30*	*30*	*30*	*30*	*5850*
Cash Flow (Profit/Loss)	***6330***	***-910***	***410***	***170***	***170***	***170***	***170***	***170***	***350***	***250***	***250***	***250***	***3420***
Loan repayment (less)	150	150	150	150	150	150	150	150	150	150	150	150	1800
Net Cash Flow (Profit/Loss)	***6180***	***760***	***260***	***20***	***20***	***20***	***20***	***20***	***200***	***100***	***100***	***100***	***1620***
Cash Balance	6180	760	1020	1040	1060	1080	1100	1120	1320	1420	1520	1620	1620

Annex 5.6 (cont'd)
Business Plan Form

1. Business Description

The proposed business will:

The owner(s):

The goal:

The market:

The business will be operated by:

Financing will come from:

We believe that the business will succeed for the following reasons:

-
-
-
-

2. Market Analysis and Electricity Demand

Business location

Customer

Target market

Competition

Electricity demand

3. Marketing Plan

Marketing goals

The marketing goals are as follows:

-
-
-
-

Marketing strategy

Marketing budget

4. Technical Design: Equipment Procurement and Construction Plan

Charging source and equipment

Construction costs

Construction Costs

	Capital	Labor
Building and Site		
TOTAL		

Vendors' list

5. Operating Plan

Operating procedures

Operating facilities

Product purchasing

Service delivery

Quality control system

6. Organization Plan

Form of ownership

Management philosophy

Organizational structure

Personnel and compensation

7. Financial Analysis and Plan

Business cash flow

Capital structure and financial conditions

Financial controls

Income Statement, Year 1

	US$
Monthly fees collected	
Operating costs	
Net profit	
Loan repayment	
Net profit/loss	

Income Statement, Year 2

	US$
Monthly fees collected	
Operating costs	
Net profit	
Loan repayment	
Net profit/loss	

8. Summary and Conclusion

____
____
____
____
____

Cash-Flow Projection for Year 1 (US$)

	Month												
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**
REVENUE													
Capital													
Loan													
Monthly fees													
Total Cash													
COSTS													
Capital Costs													
Generator													
Building													
Installation Cost													
Other Equipment													
Operating Costs													
Marketing													
Fuel Cost													
Miscellaneous													
Maintenance Cost													
Total Costs													
Cash Flow (Profit/Loss)													
Loan repayment (less)													
Net Cash Flow (Profit/Loss)													
Cash Balance													

Annex 5.7
Energy Transition to More-Efficient and Sustainable Fuels

Energy transition involves a movement away from biomass fuels used in traditional and inefficient ways, toward fossil fuels, renewable energies, and biofuels used more efficiently and sustainably. In rural areas of developing countries, the general movement is from biofuels, human, and animal power to more efficient uses of biofuels combined with modern forms of energy (see Table 1.1).

Table 5.7.1 Rural Energy Use Patterns in Developing Countries, by End Uses

	Income stage		
End use	*Low*	*Medium*	*High*
Household			
Cooking	Wood, residues, and dung	Wood, residues, dung, kerosene, and biogas	Wood, kerosene, biogas, LPG, and coal
Lighting	Candles and kerosene (sometimes none)	Candles, kerosene, and gasoline	Kerosene, electricity, and gasoline
Space heating	Wood, residues, and dung (often none)	Wood, residues, and dung	Wood, residues, dung, and coal
Other appliances	None	Electricity and storage cells	Electricity and storage cells
Agriculture			
Tilling	Hand	Animal	Animal, gasoline, diesel (tillers and tractors)
Irrigation	Hand	Animal	Diesel and electricity
Postharvest processing	Hand	Animal	Diesel and electricity
Industry			
Milling and mechanical	Hand	Hand and animal	Hand, animal, diesel, and electricity
Process heat	Wood and residues	Coal, charcoal, wood, and residues	Coal, charcoal, wood, kerosene, and residues

The major household end uses in rural areas are cooking, lighting, space heating, and appliances. For cooking, wood is the preferred fuel; when wood becomes scarce, people generally must turn to agricultural residues or dung. In more prosperous regions, people sometimes cook with kerosene or coal. Biogas is sometimes used in warm climates where there are significant numbers of livestock and other energy sources are lacking. For lighting, those with little or no access to electricity use either candles or kerosene. Wealthier households will choose electricity, if available, because of the significantly greater light produced and added convenience.

Annex 5.8
Options for Rural Electrification: Cost-Effectiveness and the Choice of Alternatives

Electrification programs have centered almost exclusively on grid electrification. While this is cost-effective for high-density loads, planners have often overlooked the alternatives. The costs of electrification can be reduced by working with lower service standards, but other options are available.

Costs of Grid Supplies

The costs of extending distribution to unelectrified areas can range from 12 US cents per kilowatt-hour for high-density rural areas to as much as 55 US cents per kilowatt-hour for a relatively isolated village (World Bank, *Rural Energy and Development Policy Paper*, 1997). The incremental costs of expanding grid supplies usually have the following components: (a) the capital and fuel costs of generation; (b) the capital costs of reinforcing the transmission and sub-transmission networks; (c) the extension of medium-voltage transmission networks; and (d) the establishment of a low-voltage distribution network and household connections. Such costs vary from country to country and among regions in a single country, and the costs of meeting peak demands are considerably higher, but the table illustrates how costs vary in a typical situation. Grid supplies are usually a cheaper option in areas with high load densities and high load growth near the grid.

Reducing Initial Investment Costs by Using Appropriate Design Standards

The high initial costs are a major barrier to service extension, but can be reduced appreciably by using design standards suitable for areas with lower demand (once demand rises, standards can be increased). The demands of most rural consumers range from 0.2 kilowatts (kW) to 0.5 kW; however, the minimum service connection ratings in developing-country utilities are typically 3 to 7 kW, which raises costs. For the same reason, the costs of installation and wiring provided by the utility are high. Simplifying wiring codes and using load limiters (circuit breakers) for lower levels of consumption can reduce costs significantly. In addition, using cheaper poles and involving local people in works and maintenance will also reduce service costs. When service is being provided to millions of people, the aggregate of such economies is considerable.

Micro-Grids Supplied by Diesel Generators

Decentralized, isolated distribution systems have been common for several decades in remote population centers, and in most developing countries predate the establishment of grids. For example, such systems were serving numerous villages and towns in northern Ghana before the grid extensions in the 1980s. Box 4.2 on Bolivia provides another example. The costs of such systems typically range from US$0.20 to $US0.60 per kWh.

Maintenance and high fuel costs have been long-standing problems with diesel generators. The systems are often in remote locations, and the difficulties of purchasing imported spare parts and fuel have often made them unreliable.

Electricity Supplies from Renewable Energy Sources

The cost estimates typical of small diesel plants ranges show why energy from solar, wind, and micro-hydro schemes has become attractive in regions where the solar insolation, wind regime, or hydro resources are suitable. A report by the former Office of Technology Assessment of the U.S. Congress (OTA 1992) found that the all-inclusive unit costs of electricity were as low as $US 0.12 per kilowatt-hour for micro-hydro, depending on the site, US045 per kilowatt-hour for PVs, and $US 0.25 per kilowatt-hour for small wind sets (the costs of the latter two technologies have declined significantly since). Electricity for local distribution can also be generated from such fuels as biogas or biomass, depending on local availability of resources).

Micro-hydropower can be one of the cheapest options for providing electricity to rural areas that are too far away from the grid to be connected to it, and can sometimes also supply the grid. This is certainly true where local capacity to manufacture turbines exists, as in China and India. In India, a program to finance micro-hydro, systems privately will both serve local demand and feed into the central grid system.

Another aspect of micro-hydro is the care needed when selecting a site, given the possible variation in stream flows during the year and from river to river. Costs vary significantly, depending on the site and the terrain. In Nepal, for example, some 25 percent of total costs for a micro-hydro project can be for transportation of equipment and materials alone, but are much lower in less mountainous regions. However, if all elements of the project cycle adopted a low-cost approach, even in Nepal the costs of extending the grid to small consumers could be as low as US$150 per consumer. One important aspect of such approaches is the participation of the local community, which reduces costs, enhances consumer satisfaction, and helps to provide a financially viable investment.

The development of micro-grids, whatever their primary source of energy, requires a significant level of community consensus and support regarding such factors as billing, service, and organization. Local participation is a key ingredient in the design of such isolated systems, in their implementation, and in their day-to-day operation. This is self-evident in the case of small local systems that are the result of local self-help or private initiative. However, even isolated systems put in place by a national program are more efficient if they enlist the cooperation of local consumers. Central grid systems also benefit from local participation in rural distribution. In Bangladesh, for example, locally managed rural electric cooperatives are responsible for distributing power that they purchase from the grid or generate locally. Their record of billing, collection, losses, and maintenance is significantly better than that of the main power utility in charge of urban distribution.

Developments in new renewable energy technologies have greatly expanded the options for supplying electricity in rural areas (see chapter 5 for a more complete discussion). Consider developments in solar PV technologies, for example. Barely twenty years ago, at the time of writing the Bank's previous policy paper on rural electrification, costs were several hundred thousand dollars per kilowatt, conversion efficiencies were low, and the only applications were in aerospace and in specialized switching circuits. Today PV systems are providing electricity economically to rural areas of developing, countries for domestic lighting and appliances, vaccine refrigeration for health clinics, village water pumps, telephones, irrigation pumping, street lighting, and schools. In areas far from the grid or where delivering conventional fuels is difficult, renewables are often the least-cost options. Significant markets for PVs are thriving in rural areas of developing countries-in Kenya, for example

Cost-efficient use of renewable energy technologies in rural areas can be encouraged by educating people about the possibilities and by providing training in how to install and maintain the technologies. Electricity distribution companies also need to be encouraged to consider the costs and benefits of the solar alternative to grid supplies to meet small loads and provide supplementary power on the longer distribution networks.

Annex 5.9
Accounting for PV Market Growth in Rural Kenya

In rural Kenya in 1993, grid electrification reached 17,000 households but was significantly subsidized, including a tax waiver on imported products used in electricity distribution. By contrast, PV systems reached about 20,000 households, but their imported components were subject to a 30-percent duty, significantly raising the cost of the households systems (see Box 1).

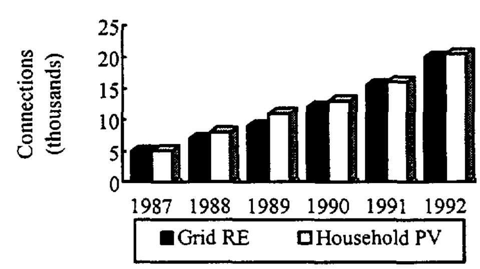
In the past, private investments in rural areas have centered mainly on retailing energy and energy products. However, under favorable conditions, private funding of such energy-related activities as generation and microgrids should be increased. Greater diversity of producers, marketers, and retailers investing in rural areas can and should be encouraged through appropriate deregulation and pricing policies. Such encouragement must occur in response to the demand for energy services in rural areas rather than in response to artificial targets. Special incentives should be used sparingly.

Box 5.9.1. PV Market Growth in Kenya

By 1994 about 20,000 households in rural Kenya had purchased PV systems for electric lighting, despite the absence of any government program and in the face of import taxes of 30 percent or higher on PV equipment. By contrast, the country's rural electrification program, which is highly subsidized, had reached only 17,000 households. Although donor organizations have been involved in much of the PV growth, the private sector has accounted for about two-thirds of the total installed capacity.

The cost of PV-supplied electricity for low levels of lighting in rural areas is now competitive with grid electricity (see figure below).

Comparing Grid and PV Use



Rural-based electricians are linking with urban business people and solar electric suppliers based primarily in Nairobi. Currently, eight or so companies supply the PV market and compete through agents in rural areas to market, install, and maintain PV systems.

Such substantial growth in PV use illustrates the high value people in remote locations place on electric lighting. They view PVs as an attractive alternative to waiting indefinitely for the grid system, which may never reach them.

Source: ESMAP (1994a).

Annex 5.10
Financing Mechanism for Rural Energy Operators in Cameroon: Report Summary

Purpose of the Study

The purpose of the study is to define “a sustainable financial mechanism”that will meet the financing needs of private operators providing decentralized electrification (DE) in Cameroon.*

Progress and Objective of the Mission

The mission took place, for the most part, in Douala, where the consultant carried out his work from two main angles:

- A thorough familiarization with all the different aspects of the DE project, and in particular the economic forecasts drawn up by the project
- Working sessions with the Management of the Banque Internationale pour l’Épargne et le Crédit (BICEC). These enabled the consultant to validate a general intervention plan together with the bank. This has been set down in writing in a memorandum annexed to this report.

Principles of the Financial Mechanism

Following are the selected principles for the DE financial mechanism:

1. Avoid resorting to a specialized financing fund. International experience has proved that this system, which is difficult to sustain, does not work.
2. Resort to a national banking system and choose a single commercial bank, if possible the most well placed (the BICEC), when the Project begins. This is for the sake of efficiency and also due to the experimental nature of the Project. Other banks may be consulted later as operations progress.
3. Take the constraints of the commercial bank into account:
   - Available assets
   - Protecting operations
   - Profitability of loans allocated.
4. Leave the decision to allocate loans to the bank, which will do so on the basis of its criteria of financial analysis and sufficient securities.

* This summary is based on a 1998 report by Messrs. François Lecuyer and René Massé of the World Bank titled “Détermination d’un mécanisme de financement durable du secteur de l’éléctricité décentralisée au cameroun.”

5. Provide the bank with financial resources at a reduced cost to limit the borrowers' output rate.
6. Define a subsidy policy and avoid loans at preferential rates because of the perverse effects on credit demand.
7. Check that the proposal is economically and socio-culturally well adapted to the local Cameroonian context. Consequently, involve users by creating "common-initiative groups" (CIGs).
8. Provide for a sufficiently incentive profitability of investments made by private operators.
9. Make credit operations secure upstream (credit decision and allocation) and downstream (monitoring operations).
10. Look for agreements between the bank and micro-finance institutions in the aim of strengthening the security of operations.

Description of the Financial Mechanism

The financial mechanism that has been selected is as follows:

- *Financing resources.* To take the liquidity problems faced by the BICEC and the entire Cameroonian banking system into account, the World Bank will provide the Cameroonian government with a credit limit that will then be retroceded to the BICEC according to procedures in force at the World Bank. Below are the characteristics of the retroceded funds:
  - Two funds will be provisioned: a credit fund and a subsidy fund
  - The BICEC remunerates stable funds at the current official savings rate (5%).
- *Operations financing plan:* operations are financed from three types of resources that will enable them to reach economic equilibrium. The financing plan of the total cost of the investment is as follows:
  - 30% through internal financing apportioned as follows:
    - 10%: capital provided by users
    - 20%: capital provided by the professional operator.

    In the event of insufficient initial capital, prior investment will be required.
  - 35% of the equipment subsidy to be paid back over 5 years without interest after the 8^{th} year, in the aim of replenishing subsidy funds. This subsidy is deposited in the BICEC's books and managed by the bank according to the Project instructions.
  - 35% credit apportioned as follows:
    - 25% on IDA credit fund resources, monthly payments, 7 years at the IDA resource rate increased by 5% (i.e. 11% excluding turnover tax)

- 10% on the BICEC's own resources, monthly repayments, over 5 years at the prime rate (i.e. approximately 11% excluding turnover tax).

In all, 60% (35% subsidies, 25 credit) of financing resources are being provided by the World Bank, 30% by the beneficiaries and 10% by the BICEC.

- *Amount of financing:* FCFA 400 000 per user, ranging from FCFA 20 to 50 million depending on operations.
- *The operators:* two types of potential DE operators emerge from the analysis:
  - Private professional entrepreneurs who are interested in investing in this new sector; they take the investment risks and own the equipment used. They provide all the electricity and related services (servicing, repairs, maintenance, etc.). They are represented in the rural area by the CIG of users who act as intermediaries and guarantors.
  - The CIGs of DE users who invest in all the equipment. With the consent and backing of the project, they choose a professional service provider or a village agent who is paid to run the equipment.
- *Making operations secure:* because of the lasting nature of the financing mechanism, it is necessary to ensure that the operation is secure. This objective will be pursued both upstream and downstream in the following ways:
  - With support of the DE project's technical bureau and the service providers it has chosen, it will be possible to select operators, train them, monitor their performance both on the technical and management levels. This support is provided together with the bank, especially in matters relating to follow-up after the project has been launched.
  - Special attention is paid to the initial running of operations: choice of equipment and suppliers, orders, imports and delivery, transportation and starting-up on-site. The technical bureau or an appointed service provider shall present the bank with a technical certificate to confirm that all these operations are running smoothly.
  - Guarantees are in keeping with the bank's usual practice while taking the context of intervention in a rural zone into consideration. They are guarantees relating to the investment and guarantees relating to the applicant (collateral, securities, collateral securities of the CIG, insurance delegation, etc.). An interest-bearing savings account at the current savings rate of 5%, blocked over a fixed period, is opened in the operator's name. This account is intended for the renewal of equipment and replenished with money taken from operating revenue. It is pledged to the bank over a fixed period of time.
  - These agreements were made with micro-financing institutions (MFI) with which the BICEC already deals (Projet Pilote de Crédit Rural Décentralisé, or PPCRD), or with considerable national influence (Cameroon Cooperative Credit Union League, or CAMCULL). The MFIs established in the villages harness payments from the users and direct the money to the bank (opening users' accounts, monthly direct debit systems and payments and drafts to beneficiaries' accounts). The regulation and

control of the MFIs by the Commission Bancaire de l'Afrique Centrale (COBAC) facilitate these agreements.

- Agreements and procedure briefs regulate relations between the different actors: World Bank, Cameroonian Government, BICEC, Project and Technical Bureau (Bureau Technique du Projet, or BED), operators, village users within the CIG, MFI, other service providers, etc.

Project Implementation

The roles of the different parties are as follows:

- The Cameroonian government must:
  - Define, adopt and enforce the law on electricity. This law must take the needs of the DE sector into account
  - Define and decide on the reduction of customs duties and taxes on DE operations
  - Define the role of the Regulatory Authority (Ministry of Energy) concerning the approval and supervision of DE operators (possible creation of a National Agency).
- The DE Project must:
  - Finalize the overall project
  - Define the different agreements and procedures.
- The BICEC must:
  - Contact MFIs such as the PPCRD to define a structure that will make operations secure
  - Define those procedures that concern it (management of funds, processing of files concerning the Project).

Joint UNDP/World Bank
ENERGY SECTOR MANAGEMENT ASSISTANCE PROGRAMME (ESMAP)

LIST OF REPORTS ON COMPLETED ACTIVITIES

Region/Country	*Activity/Report Title*	*Date*	*Number*
	SUB-SAHARAN AFRICA (AFR)		
Africa Regional	Anglophone Africa Household Energy Workshop (English)	07/88	085/88
	Regional Power Seminar on Reducing Electric Power System Losses in Africa (English)	08/88	087/88
	Institutional Evaluation of EGL (English)	02/89	098/89
	Biomass Mapping Regional Workshops (English)	05/89	--
	Francophone Household Energy Workshop (French)	08/89	--
	Interafrican Electrical Engineering College: Proposals for Short- and Long-Term Development (English)	03/90	112/90
	Biomass Assessment and Mapping (English)	03/90	--
	Symposium on Power Sector Reform and Efficiency Improvement in Sub-Saharan Africa (English)	06/96	182/96
	Commercialization of Marginal Gas Fields (English)	12/97	201/97
	Commercilizing Natural Gas: Lessons from the Seminar in Nairobi for Sub-Saharan Africa and Beyond	01/00	225/00
	Africa Gas Initiative – Main Report: Volume I	02/01	240/01
	First World Bank Workshop on the Petroleum Products Sector in Sub-Saharan Africa	09/01	245/01
Angola	Energy Assessment (English and Portuguese)	05/89	4708-ANG
	Power Rehabilitation and Technical Assistance (English)	10/91	142/91
	Africa Gas Initiative – Angola: Volume II	02/01	240/01
Benin	Energy Assessment (English and French)	06/85	5222-BEN
Botswana	Energy Assessment (English)	09/84	4998-BT
	Pump Electrification Prefeasibility Study (English)	01/86	047/86
	Review of Electricity Service Connection Policy (English)	07/87	071/87
	Tuli Block Farms Electrification Study (English)	07/87	072/87
	Household Energy Issues Study (English)	02/88	--
	Urban Household Energy Strategy Study (English)	05/91	132/91
Burkina Faso	Energy Assessment (English and French)	01/86	5730-BUR
	Technical Assistance Program (English)	03/86	052/86
	Urban Household Energy Strategy Study (English and French)	06/91	134/91
Burundi	Energy Assessment (English)	06/82	3778-BU
	Petroleum Supply Management (English)	01/84	012/84
	Status Report (English and French)	02/84	011/84
	Presentation of Energy Projects for the Fourth Five-Year Plan (1983-1987) (English and French)	05/85	036/85
	Improved Charcoal Cookstove Strategy (English and French)	09/85	042/85
	Peat Utilization Project (English)	11/85	046/85
	Energy Assessment (English and French)	01/92	9215-BU
Cameroon	Africa Gas Initiative – Cameroon: Volume III	02/01	240/01
Cape Verde	Energy Assessment (English and Portuguese)	08/84	5073-CV
	Household Energy Strategy Study (English)	02/90	110/90
Central African Republic	Energy Assessement (French)	08/92	9898-CAR
Chad	Elements of Strategy for Urban Household Energy The Case of N'djamena (French)	12/93	160/94

Region/Country	*Activity/Report Title*	*Date*	*Number*
Comoros	Energy Assessment (English and French)	01/88	7104-COM
	In Search of Better Ways to Develop Solar Markets: The Case of Comoros	05/00	230/00
Congo	Energy Assessment (English)	01/88	6420-COB
	Power Development Plan (English and French)	03/90	106/90
	Africa Gas Initiative – Congo: Volume IV	02/01	240/01
Côte d'Ivoire	Energy Assessment (English and French)	04/85	5250-IVC
	Improved Biomass Utilization (English and French)	04/87	069/87
	Power System Efficiency Study (English)	12/87	--
	Power Sector Efficiency Study (French)	02/92	140/91
	Project of Energy Efficiency in Buildings (English)	09/95	175/95
	Africa Gas Initiative – Côte d'Ivoire: Volume V	02/01	240/01
Ethiopia	Energy Assessment (English)	07/84	4741-ET
	Power System Efficiency Study (English)	10/85	045/85
	Agricultural Residue Briquetting Pilot Project (English)	12/86	062/86
	Bagasse Study (English)	12/86	063/86
	Cooking Efficiency Project (English)	12/87	--
	Energy Assessment (English)	02/96	179/96
Gabon	Energy Assessment (English)	07/88	6915-GA
	Africa Gas Initiative – Gabon: Volume VI	02/01	240/01
The Gambia	Energy Assessment (English)	11/83	4743-GM
	Solar Water Heating Retrofit Project (English)	02/85	030/85
	Solar Photovoltaic Applications (English)	03/85	032/85
	Petroleum Supply Management Assistance (English)	04/85	035/85
Ghana	Energy Assessment (English)	11/86	6234-GH
	Energy Rationalization in the Industrial Sector (English)	06/88	084/88
	Sawmill Residues Utilization Study (English)	11/88	074/87
	Industrial Energy Efficiency (English)	11/92	148/92
Guinea	Energy Assessment (English)	11/86	6137-GUI
	Household Energy Strategy (English and French)	01/94	163/94
Guinea-Bissau	Energy Assessment (English and Portuguese)	08/84	5083-GUB
	Recommended Technical Assistance Projects (English & Portuguese)	04/85	033/85
	Management Options for the Electric Power and Water Supply Subsectors (English)	02/90	100/90
	Power and Water Institutional Restructuring (French)	04/91	118/91
Kenya	Energy Assessment (English)	05/82	3800-KE
	Power System Efficiency Study (English)	03/84	014/84
	Status Report (English)	05/84	016/84
	Coal Conversion Action Plan (English)	02/87	--
	Solar Water Heating Study (English)	02/87	066/87
	Peri-Urban Woodfuel Development (English)	10/87	076/87
	Power Master Plan (English)	11/87	--
	Power Loss Reduction Study (English)	09/96	186/96
	Implementation Manual: Financing Mechanisms for Solar Electric Equipment	07/00	231/00
Lesotho	Energy Assessment (English)	01/84	4676-LSO
Liberia	Energy Assessment (English)	12/84	5279-LBR
	Recommended Technical Assistance Projects (English)	06/85	038/85
	Power System Efficiency Study (English)	12/87	081/87
Madagascar	Energy Assessment (English)	01/87	5700-MAG
	Power System Efficiency Study (English and French)	12/87	075/87

Region/Country	*Activity/Report Title*	*Date*	*Number*
Madagascar	Environmental Impact of Woodfuels (French)	10/95	176/95
Malawi	Energy Assessment (English)	08/82	3903-MAL
	Technical Assistance to Improve the Efficiency of Fuelwood Use in the Tobacco Industry (English)	11/83	009/83
	Status Report (English)	01/84	013/84
Mali	Energy Assessment (English and French)	11/91	8423-MLI
	Household Energy Strategy (English and French)	03/92	147/92
Islamic Republic of Mauritania	Energy Assessment (English and French)	04/85	5224-MAU
	Household Energy Strategy Study (English and French)	07/90	123/90
Mauritius	Energy Assessment (English)	12/81	3510-MAS
	Status Report (English)	10/83	008/83
	Power System Efficiency Audit (English)	05/87	070/87
	Bagasse Power Potential (English)	10/87	077/87
	Energy Sector Review (English)	12/94	3643-MAS
Mozambique	Energy Assessment (English)	01/87	6128-MOZ
	Household Electricity Utilization Study (English)	03/90	113/90
	Electricity Tariffs Study (English)	06/96	181/96
	Sample Survey of Low Voltage Electricity Customers	06/97	195/97
Namibia	Energy Assessment (English)	03/93	11320-NAM
Niger	Energy Assessment (French)	05/84	4642-NIR
	Status Report (English and French)	02/86	051/86
	Improved Stoves Project (English and French)	12/87	080/87
	Household Energy Conservation and Substitution (English and French)	01/88	082/88
Nigeria	Energy Assessment (English)	08/83	4440-UNI
	Energy Assessment (English)	07/93	11672-UNI
Rwanda	Energy Assessment (English)	06/82	3779-RW
	Status Report (English and French)	05/84	017/84
	Improved Charcoal Cookstove Strategy (English and French)	08/86	059/86
	Improved Charcoal Production Techniques (English and French)	02/87	065/87
	Energy Assessment (English and French)	07/91	8017-RW
	Commercialization of Improved Charcoal Stoves and Carbonization Techniques Mid-Term Progress Report (English and French)	12/91	141/91
SADC	SADC Regional Power Interconnection Study, Vols. I-IV (English)	12/93	--
SADCC	SADCC Regional Sector: Regional Capacity-Building Program for Energy Surveys and Policy Analysis (English)	11/91	--
Sao Tome and Principe	Energy Assessment (English)	10/85	5803-STP
Senegal	Energy Assessment (English)	07/83	4182-SE
	Status Report (English and French)	10/84	025/84
	Industrial Energy Conservation Study (English)	05/85	037/85
	Preparatory Assistance for Donor Meeting (English and French)	04/86	056/86
	Urban Household Energy Strategy (English)	02/89	096/89
	Industrial Energy Conservation Program (English)	05/94	165/94
Seychelles	Energy Assessment (English)	01/84	4693-SEY
	Electric Power System Efficiency Study (English)	08/84	021/84
Sierra Leone	Energy Assessment (English)	10/87	6597-SL
Somalia	Energy Assessment (English)	12/85	5796-SO
Republic of South Africa	Options for the Structure and Regulation of Natural Gas Industry (English)	05/95	172/95

Region/Country	*Activity/Report Title*	*Date*	*Number*
Sudan	Management Assistance to the Ministry of Energy and Mining	05/83	003/83
	Energy Assessment (English)	07/83	4511-SU
	Power System Efficiency Study (English)	06/84	018/84
	Status Report (English)	11/84	026/84
	Wood Energy/Forestry Feasibility (English)	07/87	073/87
Swaziland	Energy Assessment (English)	02/87	6262-SW
	Household Energy Strategy Study	10/97	198/97
Tanzania	Energy Assessment (English)	11/84	4969-TA
	Peri-Urban Woodfuels Feasibility Study (English)	08/88	086/88
	Tobacco Curing Efficiency Study (English)	05/89	102/89
	Remote Sensing and Mapping of Woodlands (English)	06/90	--
	Industrial Energy Efficiency Technical Assistance (English)	08/90	122/90
	Power Loss Reduction Volume 1: Transmission and Distribution SystemTechnical Loss Reduction and Network Development (English)	06/98	204A/98
	Power Loss Reduction Volume 2: Reduction of Non-Technical Losses (English)	06/98	204B/98
Togo	Energy Assessment (English)	06/85	5221-TO
	Wood Recovery in the Nangbeto Lake (English and French)	04/86	055/86
	Power Efficiency Improvement (English and French)	12/87	078/87
Uganda	Energy Assessment (English)	07/83	4453-UG
	Status Report (English)	08/84	020/84
	Institutional Review of the Energy Sector (English)	01/85	029/85
	Energy Efficiency in Tobacco Curing Industry (English)	02/86	049/86
	Fuelwood/Forestry Feasibility Study (English)	03/86	053/86
	Power System Efficiency Study (English)	12/88	092/88
	Energy Efficiency Improvement in the Brick and Tile Industry (English)	02/89	097/89
	Tobacco Curing Pilot Project (English)	03/89	UNDP Terminal Report
	Energy Assessment (English)	12/96	193/96
	Rural Electrification Strategy Study	09/99	221/99
Zaire	Energy Assessment (English)	05/86	5837-ZR
Zambia	Energy Assessment (English)	01/83	4110-ZA
	Status Report (English)	08/85	039/85
	Energy Sector Institutional Review (English)	11/86	060/86
	Power Subsector Efficiency Study (English)	02/89	093/88
	Energy Strategy Study (English)	02/89	094/88
	Urban Household Energy Strategy Study (English)	08/90	121/90
Zimbabwe	Energy Assessment (English)	06/82	3765-ZIM
	Power System Efficiency Study (English)	06/83	005/83
	Status Report (English)	08/84	019/84
	Power Sector Management Assistance Project (English)	04/85	034/85
	Power Sector Management Institution Building (English)	09/89	--
	Petroleum Management Assistance (English)	12/89	109/89
	Charcoal Utilization Prefeasibility Study (English)	06/90	119/90
	Integrated Energy Strategy Evaluation (English)	01/92	8768-ZIM
	Energy Efficiency Technical Assistance Project: Strategic Framework for a National Energy Efficiency Improvement Program (English)	04/94	--
	Capacity Building for the National Energy Efficiency Improvement Programme (NEEIP) (English)	12/94	--

Region/Country	*Activity/Report Title*	*Date*	*Number*
Zimbabwe	Rural Electrification Study	03/00	228/00

EAST ASIA AND PACIFIC (EAP)

Region/Country	*Activity/Report Title*	*Date*	*Number*
Asia Regional	Pacific Household and Rural Energy Seminar (English)	11/90	--
China	County-Level Rural Energy Assessments (English)	05/89	101/89
	Fuelwood Forestry Preinvestment Study (English)	12/89	105/89
	Strategic Options for Power Sector Reform in China (English)	07/93	156/93
	Energy Efficiency and Pollution Control in Township and Village Enterprises (TVE) Industry (English)	11/94	168/94
	Energy for Rural Development in China: An Assessment Based on a Joint Chinese/ESMAP Study in Six Counties (English)	06/96	183/96
	Improving the Technical Efficiency of Decentralized Power Companies	09/99	222/999
Fiji	Energy Assessment (English)	06/83	4462-FIJ
Indonesia	Energy Assessment (English)	11/81	3543-IND
	Status Report (English)	09/84	022/84
	Power Generation Efficiency Study (English)	02/86	050/86
	Energy Efficiency in the Brick, Tile and Lime Industries (English)	04/87	067/87
	Diesel Generating Plant Efficiency Study (English)	12/88	095/88
	Urban Household Energy Strategy Study (English)	02/90	107/90
	Biomass Gasifier Preinvestment Study Vols. I & II (English)	12/90	124/90
	Prospects for Biomass Power Generation with Emphasis on Palm Oil, Sugar, Rubberwood and Plywood Residues (English)	11/94	167/94
Lao PDR	Urban Electricity Demand Assessment Study (English)	03/93	154/93
	Institutional Development for Off-Grid Electrification	06/99	215/99
Malaysia	Sabah Power System Efficiency Study (English)	03/87	068/87
	Gas Utilization Study (English)	09/91	9645-MA
Mongolia	Energy Efficiency in the Electricity and District Heating Sectors	10/01	247/01
Myanmar	Energy Assessment (English)	06/85	5416-BA
Papua New Guinea	Energy Assessment (English)	06/82	3882-PNG
	Status Report (English)	07/83	006/83
	Energy Strategy Paper (English)	--	--
	Institutional Review in the Energy Sector (English)	10/84	023/84
	Power Tariff Study (English)	10/84	024/84
Philippines	Commercial Potential for Power Production from Agricultural Residues (English)	12/93	157/93
	Energy Conservation Study (English)	08/94	--
	Strengthening the Non-Conventional and Rural Energy Development Program in the Philippines: A Policy Framework and Action Plan	08/01	243/01
Solomon Islands	Energy Assessment (English)	06/83	4404-SOL
	Energy Assessment (English)	01/92	979-SOL
South Pacific	Petroleum Transport in the South Pacific (English)	05/86	--
Thailand	Energy Assessment (English)	09/85	5793-TH
	Rural Energy Issues and Options (English)	09/85	044/85
	Accelerated Dissemination of Improved Stoves and Charcoal Kilns (English)	09/87	079/87

Region/Country	Activity/Report Title	Date	Number
Thailand	Northeast Region Village Forestry and Woodfuels Preinvestment Study (English)	02/88	083/88
	Impact of Lower Oil Prices (English)	08/88	--
	Coal Development and Utilization Study (English)	10/89	--
Tonga	Energy Assessment (English)	06/85	5498-TON
Vanuatu	Energy Assessment (English)	06/85	5577-VA
Vietnam	Rural and Household Energy-Issues and Options (English)	01/94	161/94
	Power Sector Reform and Restructuring in Vietnam: Final Report to the Steering Committee (English and Vietnamese)	09/95	174/95
	Household Energy Technical Assistance: Improved Coal Briquetting and Commercialized Dissemination of Higher Efficiency Biomass and Coal Stoves (English)	01/96	178/96
	Petroleum Fiscal Issues and Policies for Fluctuating Oil Prices In Vietnam	02/01	236/01
Western Samoa	Energy Assessment (English)	06/85	5497-WSO
	SOUTH ASIA (SAS)		
Bangladesh	Energy Assessment (English)	10/82	3873-BD
	Priority Investment Program (English)	05/83	002/83
	Status Report (English)	04/84	015/84
	Power System Efficiency Study (English)	02/85	031/85
	Small Scale Uses of Gas Prefeasibility Study (English)	12/88	--
India	Opportunities for Commercialization of Nonconventional Energy Systems (English)	11/88	091/88
	Maharashtra Bagasse Energy Efficiency Project (English)	07/90	120/90
	Mini-Hydro Development on Irrigation Dams and Canal Drops Vols. I, II and III (English)	07/91	139/91
	WindFarm Pre-Investment Study (English)	12/92	150/92
	Power Sector Reform Seminar (English)	04/94	166/94
	Environmental Issues in the Power Sector (English)	06/98	205/98
	Environmental Issues in the Power Sector: Manual for Environmental Decision Making (English)	06/99	213/99
	Household Energy Strategies for Urban India: The Case of Hyderabad	06/99	214/99
	Greenhouse Gas Mitigation In the Power Sector: Case Studies From India	02/01	237/01
Nepal	Energy Assessment (English)	08/83	4474-NEP
	Status Report (English)	01/85	028/84
	Energy Efficiency & Fuel Substitution in Industries (English)	06/93	158/93
Pakistan	Household Energy Assessment (English)	05/88	--
	Assessment of Photovoltaic Programs, Applications, and Markets (English)	10/89	103/89
	National Household Energy Survey and Strategy Formulation Study: Project Terminal Report (English)	03/94	--
	Managing the Energy Transition (English)	10/94	--
	Lighting Efficiency Improvement Program Phase 1: Commercial Buildings Five Year Plan (English)	10/94	--
	Clean Fuels	246/01	10/01
Sri Lanka	Energy Assessment (English)	05/82	3792-CE
	Power System Loss Reduction Study (English)	07/83	007/83
	Status Report (English)	01/84	010/84

Region/Country	Activity/Report Title	Date	Number
Sri Lanka	Industrial Energy Conservation Study (English)	03/86	054/86

EUROPE AND CENTRAL ASIA (ECA)

Region/Country	Activity/Report Title	Date	Number
Bulgaria	Natural Gas Policies and Issues (English)	10/96	188/96
Central Asia and The Caucasus	Cleaner Transport Fuels in Central Asia and the Caucasus	08/01	242/01
Central and Eastern Europe	Power Sector Reform in Selected Countries	07/97	196/97
	Increasing the Efficiency of Heating Systems in Central and Eastern Europe and the Former Soviet Union (English and Russian)	08/00	234/00
	The Future of Natural Gas in Eastern Europe (English)	08/92	149/92
Kazakhstan	Natural Gas Investment Study, Volumes 1, 2 & 3	12/97	199/97
Kazakhstan & Kyrgyzstan	Opportunities for Renewable Energy Development	11/97	16855-KAZ
Poland	Energy Sector Restructuring Program Vols. I-V (English)	01/93	153/93
	Natural Gas Upstream Policy (English and Polish)	08/98	206/98
	Energy Sector Restructuring Program: Establishing the Energy Regulation Authority	10/98	208/98
Portugal	Energy Assessment (English)	04/84	4824-PO
Romania	Natural Gas Development Strategy (English)	12/96	192/96
Slovenia	Workshop on Private Participation in the Power Sector (English)	02/99	211/99
Turkey	Energy Assessment (English)	03/83	3877-TU
	Energy and the Environment: Issues and Options Paper	04/00	229/00

MIDDLE EAST AND NORTH AFRICA (MNA)

Region/Country	Activity/Report Title	Date	Number
Arab Republic of Egypt	Energy Assessment (English)	10/96	189/96
	Energy Assessment (English and French)	03/84	4157-MOR
	Status Report (English and French)	01/86	048/86
Morocco	Energy Sector Institutional Development Study (English and French)	07/95	173/95
	Natural Gas Pricing Study (French)	10/98	209/98
	Gas Development Plan Phase II (French)	02/99	210/99
Syria	Energy Assessment (English)	05/86	5822-SYR
	Electric Power Efficiency Study (English)	09/88	089/88
	Energy Efficiency Improvement in the Cement Sector (English)	04/89	099/89
	Energy Efficiency Improvement in the Fertilizer Sector (English)	06/90	115/90
Tunisia	Fuel Substitution (English and French)	03/90	--
	Power Efficiency Study (English and French)	02/92	136/91
	Energy Management Strategy in the Residential and Tertiary Sectors (English)	04/92	146/92
	Renewable Energy Strategy Study, Volume I (French)	11/96	190A/96
	Renewable Energy Strategy Study, Volume II (French)	11/96	190B/96
Yemen	Energy Assessment (English)	12/84	4892-YAR
	Energy Investment Priorities (English)	02/87	6376-YAR
	Household Energy Strategy Study Phase I (English)	03/91	126/91

Region/Country	*Activity/Report Title*	*Date*	*Number*
	LATIN AMERICA AND THE CARIBBEAN (LAC)		
LAC Regional	Regional Seminar on Electric Power System Loss Reduction in the Caribbean (English)	07/89	--
	Elimination of Lead in Gasoline in Latin America and the Caribbean (English and Spanish)	04/97	194/97
	Elimination of Lead in Gasoline in Latin America and the Caribbean - Status Report (English and Spanish)	12/97	200/97
	Harmonization of Fuels Specifications in Latin America and the Caribbean (English and Spanish)	06/98	203/98
Bolivia	Energy Assessment (English)	04/83	4213-BO
	National Energy Plan (English)	12/87	--
	La Paz Private Power Technical Assistance (English)	11/90	111/90
	Prefeasibility Evaluation Rural Electrification and Demand Assessment (English and Spanish)	04/91	129/91
	National Energy Plan (Spanish)	08/91	131/91
	Private Power Generation and Transmission (English)	01/92	137/91
	Natural Gas Distribution: Economics and Regulation (English)	03/92	125/92
	Natural Gas Sector Policies and Issues (English and Spanish)	12/93	164/93
	Household Rural Energy Strategy (English and Spanish)	01/94	162/94
	Preparation of Capitalization of the Hydrocarbon Sector	12/96	191/96
	Introducing Competition into the Electricity Supply Industry in Developing Countries: Lessons from Bolivia	08/00	233/00
	Final Report on Operational Activities Rural Energy and Energy Efficiency	08/00	235/00
	Oil Industry Training for Indigenous People: The Bolivian Experience (English and Spanish)	09/01	244/01
Brazil	Energy Efficiency & Conservation: Strategic Partnership for Energy Efficiency in Brazil (English)	01/95	170/95
	Hydro and Thermal Power Sector Study	09/97	197/97
	Rural Electrification with Renewable Energy Systems in the Northeast: A Preinvestment Study	07/00	232/00
Chile	Energy Sector Review (English)	08/88	7129-CH
Colombia	Energy Strategy Paper (English)	12/86	--
	Power Sector Restructuring (English)	11/94	169/94
	Energy Efficiency Report for the Commercial and Public Sector (English)	06/96	184/96
Costa Rica	Energy Assessment (English and Spanish)	01/84	4655-CR
	Recommended Technical Assistance Projects (English)	11/84	027/84
	Forest Residues Utilization Study (English and Spanish)	02/90	108/90
Dominican Republic	Energy Assessment (English)	05/91	8234-DO
Ecuador	Energy Assessment (Spanish)	12/85	5865-EC
	Energy Strategy Phase I (Spanish)	07/88	--
	Energy Strategy (English)	04/91	--
	Private Minihydropower Development Study (English)	11/92	--
	Energy Pricing Subsidies and Interfuel Substitution (English)	08/94	11798-EC
	Energy Pricing, Poverty and Social Mitigation (English)	08/94	12831-EC
Guatemala	Issues and Options in the Energy Sector (English)	09/93	12160-GU
Haiti	Energy Assessment (English and French)	06/82	3672-HA
	Status Report (English and French)	08/85	041/85
	Household Energy Strategy (English and French)	12/91	143/91

Region/Country	*Activity/Report Title*	*Date*	*Number*
Honduras	Energy Assessment (English)	08/87	6476-HO
	Petroleum Supply Management (English)	03/91	128/91
Jamaica	Energy Assessment (English)	04/85	5466-JM
	Petroleum Procurement, Refining, and Distribution Study (English)	11/86	061/86
	Energy Efficiency Building Code Phase I (English)	03/88	--
	Energy Efficiency Standards and Labels Phase I (English)	03/88	--
	Management Information System Phase I (English)	03/88	--
	Charcoal Production Project (English)	09/88	090/88
	FIDCO Sawmill Residues Utilization Study (English)	09/88	088/88
	Energy Sector Strategy and Investment Planning Study (English)	07/92	135/92
Mexico	Improved Charcoal Production Within Forest Management for the State of Veracruz (English and Spanish)	08/91	138/91
	Energy Efficiency Management Technical Assistance to the Comision Nacional para el Ahorro de Energia (CONAE) (English)	04/96	180/96
	Energy Environment Review	05/01	241/01
Panama	Power System Efficiency Study (English)	06/83	004/83
Paraguay	Energy Assessment (English)	10/84	5145-PA
	Recommended Technical Assistance Projects (English)	09/85	--
	Status Report (English and Spanish)	09/85	043/85
Peru	Energy Assessment (English)	01/84	4677-PE
	Status Report (English)	08/85	040/85
	Proposal for a Stove Dissemination Program in the Sierra (English and Spanish)	02/87	064/87
	Energy Strategy (English and Spanish)	12/90	--
	Study of Energy Taxation and Liberalization of the Hydrocarbons Sector (English and Spanish)	120/93	159/93
	Reform and Privatization in the Hydrocarbon Sector (English and Spanish)	07/99	216/99
	Rural Electrification	02/01	238/01
Saint Lucia	Energy Assessment (English)	09/84	5111-SLU
St. Vincent and the Grenadines	Energy Assessment (English)	09/84	5103-STV
Sub Andean	Environmental and Social Regulation of Oil and Gas Operations in Sensitive Areas of the Sub-Andean Basin (English and Spanish)	07/99	217/99
Trinidad and Tobago	Energy Assessment (English)	12/85	5930-TR

GLOBAL

	Energy End Use Efficiency: Research and Strategy (English)	11/89	--
	Women and Energy--A Resource Guide The International Network: Policies and Experience (English)	04/90	--
	Guidelines for Utility Customer Management and Metering (English and Spanish)	07/91	--
	Assessment of Personal Computer Models for Energy Planning in Developing Countries (English)	10/91	--
	Long-Term Gas Contracts Principles and Applications (English)	02/93	152/93
	Comparative Behavior of Firms Under Public and Private Ownership (English)	05/93	155/93

Region/Country	*Activity/Report Title*	*Date*	*Number*
Global	Development of Regional Electric Power Networks (English)	10/94	--
	Roundtable on Energy Efficiency (English)	02/95	171/95
	Assessing Pollution Abatement Policies with a Case Study of Ankara (English)	11/95	177/95
	A Synopsis of the Third Annual Roundtable on Independent Power Projects: Rhetoric and Reality (English)	08/96	187/96
	Rural Energy and Development Roundtable (English)	05/98	202/98
	A Synopsis of the Second Roundtable on Energy Efficiency: Institutional and Financial Delivery Mechanisms (English)	09/98	207/98
	The Effect of a Shadow Price on Carbon Emission in the Energy Portfolio of the World Bank: A Carbon Backcasting Exercise (English)	02/99	212/99
	Increasing the Efficiency of Gas Distribution Phase 1: Case Studies and Thematic Data Sheets	07/99	218/99
	Global Energy Sector Reform in Developing Countries: A Scorecard	07/99	219/99
	Global Lighting Services for the Poor Phase II: Text Marketing of Small "Solar" Batteries for Rural Electrification Purposes	08/99	220/99
	A Review of the Renewable Energy Activities of the UNDP/ World Bank Energy Sector Management Assistance Programme 1993 to 1998	11/99	223/99
	Energy, Transportation and Environment: Policy Options for Environmental Improvement	12/99	224/99
	Privatization, Competition and Regulation in the British Electricity Industry, With Implications for Developing Countries	02/00	226/00
	Reducing the Cost of Grid Extension for Rural Electrification	02/00	227/00
	Undeveloped Oil and Gas Fields in the Industrializing World	02/01	239/01
	Best Practice Manual: Promoting Decentralized Electrification Investment	10/01	248/01

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