Monitoring and Evaluation in Rural Electrification Projects:

A Demand-Oriented Approach

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Preface

The goal of this report is to develop a demand-oriented approach or methodology to monitor and evaluate rural electrification projects. The methodology is intended to assist rural electrification programs in measuring the socioeconomic impacts of their projects, with a focus on poverty and gender implications. The result of the project is a research strategy and two different but complimentary methodologies that can be useful in design, implementation, and postproject assessment. The ultimate goal of this initiative is to develop a sound methodological approach for improving the design and effectiveness of rural electrification projects.

The monitoring and evaluation methodology builds upon two existing and complimentary methodologies. They include a qualitative research methodology for participatory assessments developed by the World Bank Water and Sanitation Program in partnership with the International Water and Sanitation Centre, the Hague; and a more quantitative method for evaluating the benefits of rural electrification developed under the Energy Sector Management Assistance Program of the World Bank. For this initiative, the method for participatory assessments has been adapted for use in rural electrification projects, and the benefit assessment methodology has been revised to take into account gender considerations. The specific goal of this approach is to apply it in a future rural electrification project in Cambodia, as well as more generally in other projects financed by the World Bank and other international donors.

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Abbreviations and Acronyms

ASTAE	Asia Alternative Energy Program
EAP	Energy and Atmosphere Programme
EDC	Electricite du Cambodge (national utility, Cambodia)
EnPoGen	Energy, Poverty and Gender Initiative
ESMAP	Energy Sector Management Assistance Programme
FAO	Food and Agriculture Organization
GEF	Global Environment Facility
GENES	Gender and Sustainable Energy Network (Meso-America)
KW	kilowatt
Kwh	kilowatt-hour
Logframe	logical framework
M&E	monitoring and evaluation
M/F	male/female
MIME	Cambodian Ministry of Industry, Mines and Energy
MW	Megawatt
O&M	operation and maintenance
PV	Photovoltaic
REF	Rural Electrification Fund (Cambodia)
REPMEU	Rural Electrification Planning and Monitoring & Evaluation Unit (Cambodia)
RET	renewable energy technology
UNDP	United Nations Development Programme
UNIFEM	United Nations Development Fund for Women
UNOPS	U.N. Office of Project Services
Wp	watt-peak

Executive Summary

1. Most large-scale rural energy programs, whether promoting conventional or renewable energy, focus on providing development assistance through the supply of electricity services to stimulate economic productivity and enhance quality of life in rural areas. However, few of these programs start with an in-depth assessment of markets for these services, including the needs of the people they are meant to serve. In addition, they often fail to evaluate specific impacts resulting from these services. Most rural electricity monitoring and evaluation programs measure strictly quantifiable information, such as the number of new grid electricity connections or the number of renewable energy systems installed. They typically are not designed to measure socioeconomic impacts, often resulting in the masking of poverty- and gender-specific consumer choices and perceptions. This incomplete understanding of market forces hinders the development of initiatives that respond to the gamut of rural energy needs and have positive, equitable, and sustainable development impacts.

2. The purpose of this initiative is to develop a methodology for assessing end-user needs and the quantitative and qualitative socioeconomic impacts of rural electricity projects, with a focus on poverty and gender implications. The goal is to design a monitoring and evaluation methodology that is not an isolated data collection exercise, but rather an approach that is useful for project design and ongoing project implementation and post-project evaluation. To accomplish this task, the approach recommended in this report involves both qualitative participatory techniques and quantitative survey methods to yield a more comprehensive approach to program planning, implementation, and evaluation.

3. The approach advocated in this report has been developed with the specific goal of applying it in a future rural electrification project in Cambodia, as well as more generally in other projects financed by the World Bank and other international donors.

The Rationale for a Demand-Oriented Approach

4. Traditionally, the rural energy sector has been dominated by a supply-driven paradigm. Past projects supported by multilateral and bilateral funding agencies have typically focused on the extension of the electric grid or supply of devices for basic household energy needs. The majority of such projects were conceived without sufficient recognition of the needs and preferences of the consumers or end users. More recently, rural energy projects recognize that there is a link between energy and economic development, and they aim to provide electricity services to rural populations to assist in rural development. Unfortunately, many of these projects still neglect to take into consideration the specific needs of different end-user groups, which can dramatically improve project performance.

5. The needs and interests of the rural poor, and of women in particular, tend to be underrepresented in the context of rural energy projects. The needs of these groups vary according to their differing roles, customs, and lifestyles. The poor require energy to meet basic needs such as cooking, obtaining water, and other essential activities. The majority of the energy needs of the poor are met using "traditional" energy sources, especially biomass. In contrast, wealthier populations typically use greater amounts of electricity and other "modern" forms of energy to maintain higher standards of living. Many studies have shown that electricity technologies and appliances are expensive for poorer populations. Thus, in poorly targeted rural electrification programs, project benefits may flow mainly to the rural elite. However, access to electricity is also important for the poor and other marginalized groups, providing higher quality and safer lighting, less time- consuming motive power for productive uses, and lower cost and higher quality information and entertainment. One goal of the new approach to monitoring and evaluation advocated in this report is to assist energy planners and managers to better reach marginalized populations.

The Demand-Oriented Approach

6. The demand-oriented approach recommended in this report starts with the assumption that understanding gender and poverty issues are an important part the development and implementation of rural energy projects. Rural energy needs can be met using a variety of energy sources and technologies. However, projects that start with the assumption that a particular application is the only solution cannot possibly respond to the many pressing needs faced by rural populations. Thus, the recommended needs-assessment process provides broad information to help project designers and communities make informed decisions about the energy technologies and services that will be promoted through the project. This report does not, however, attempt to cover all forms of energy services. Rather, it is limited to the evaluation of the impact of rural electricity technologies and services on rural people. This approach is an initial step toward incorporating the socioeconomic development impacts of rural energy services as an important component of the project development process.

7. Two complimentary but quite different techniques are reviewed and recommend as appropriate for use in planning and evaluating the impacts of rural electrification projects: a participatory assessment and a socioeconomic impact survey. The approaches are based on methodologies that have been developed and applied in existing World Bank projects. These techniques incorporate qualitative methods to acquire in-depth insights from the consumers of energy services and more quantitative household surveys that can examine the patterns and use of energy services.

8. The methodology for participatory assessments is a comprehensive social assessment technique that links sustainability with energy demand and gender sensitivity. This involves the application of assessment methodologies at the community, institutional, and policy levels to evaluate the role of gender, poverty, energy demand, participation, and sustainable energy service delivery in rural electrification projects. This

approach links community-level outcomes and the responsiveness of the service delivery agencies to needs of those participating in the program.

9. The more quantitative socioeconomic survey methodology is a practical approach to understanding and quantifying the socioeconomic benefits of rural electrification interventions. The technique involves the measuring of prices and quantities of energy used by rural households and using this information to calculate the estimated value to the consumer of using various types of energy. It assesses some benefits that previously were considered "too hard to measure," including benefits on education, health, productivity, convenience, security, and entertainment.

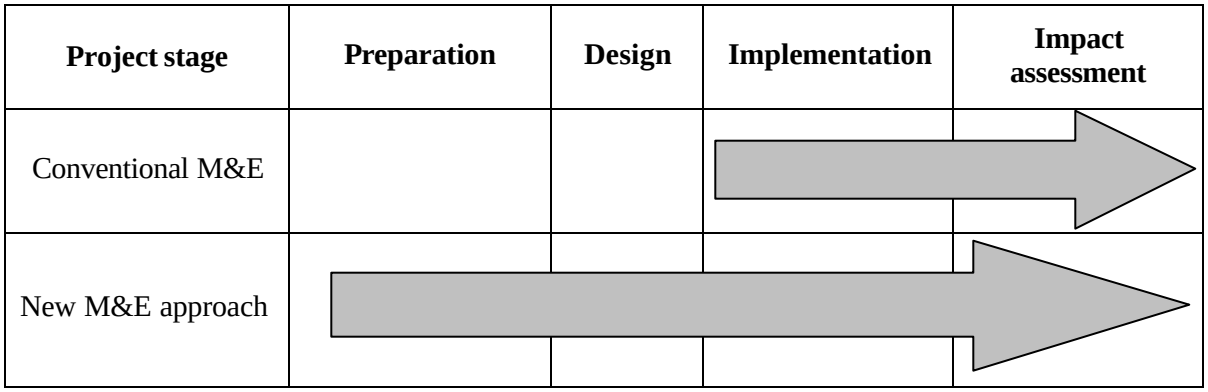
10. These methodologies contain complementary components that, if applied together, permit a comprehensive approach to planning and assessing poverty- and gender-related impacts of rural electricity projects. By applying the two methodologies in a complementary way, project managers can gain insight and make appropriate decisions based on the qualitative data necessary for understanding the needs and priorities of the target communities, and the quantitative data essential to systematically measure and analyze the benefits versus the costs of rural electricity interventions.

The Project Cycle and Monitoring and Evaluation

11. The conventional approach to monitoring and evaluation has been to develop a way to quantify different targets or project achievement goals following the project's initiation. Usually a monitoring unit is created within the implementing agency, which develops a series of techniques to measure project effectiveness. In the case of a rural electrification project, for example, the technique may be to monitor project effectiveness by measuring the number of connections or number of systems installed. In most cases, the monitoring and evaluation component traditionally begins only after the project has been approved and financed.

12. As illustrated in Figure E-1, rural electrification projects are generally divided into four stages: preparation, design, implementation, and postproject impact assessment. Under a conventional monitoring and evaluation approach, no activity takes place until the project reaches the implementation phase. Once implementation has begun, important changes that impact the objectives of the project are monitored, and at the end of the project, it is evaluated based on whether or not it achieved its targets. The new approach advocated by this report begins the monitoring and evaluation process at the preparation stage of the project, so that the input of the potential beneficiaries helps shape the design of the project. Priority needs are identified and insights are gained from the beneficiaries, and these are then incorporated into the project design and implementation.

Figure E-1: Conventional and Proposed Approaches to Monitoring and Evaluation



13. The application of the different methodologies will vary according to the project. However, it is recommended that a participatory assessment be conducted at the outset of the project. This can be done in some typical communities that will be served under the project or program. The results of the participatory approach can be used not only to inform the project's design, but also in designing and pilot testing the socioeconomic impact survey, which is implemented during the later stages of the project. Market surveys are also necessary early in the project cycle to assess the demand for the services offered by the project. Likewise, the participatory approach can be used to identify problems encountered later, during project implementation. Both the participatory and survey approaches can be applied at project completion to assess the impacts of the project and provide lessons for future projects. However, the ultimate decisions about how each methodology is applied in each stage will depend on the nature and objectives of the project.

14. The sustainability of improved rural energy systems and other rural infrastructure projects is positively associated with the degree to which all social groups and genders have access to and use the service. A project is not likely to be successful if it does not meet the needs of all population groups. The approach further assumes that success and sustainability are also positively influenced by institutional and policy environments where gender and poverty issues have been taken into consideration. Thus, there is a key set of variables to be measured in any given project. Among others, they include whether or not energy services can be sustained over an extended period of time, and whether they have an impact on other sectors such as education on health. In addition, it is important to measure the degree of policy support for gender and policy issues under the project, including the form of participation in the operation of the energy service.

Conducting the Participatory Assessment

15. The types of activities involved in the participatory approach include community mapping, stakeholder meetings, focus group discussions, and other

participatory techniques (Box E-1). The perceptions and priorities of the target communities are solicited through these participatory exercises. Open discussion within and among community members and the various interest groups increases the chance of obtaining credible and relevant information, allowing biased or incomplete answers to be checked by group dynamics. Participants identify problems and solutions and are more likely to own the outcomes. Tools such as social mapping and wealth classification allow villagers to assess and plan for equitable access to energy services. Self-scoring allows for instant feedback, which encourages transparency and joint action towards finding a solution. Community members also gain practical tools for monitoring infrastructure construction and service delivery.

Box E-1: Participatory Assessment Tools

1. Wealth classification
2. Community map
3. Focus group discussions
4. Transect walk with rating scales and system observation form
5. Pocket voting
6. Ladders
7. Stakeholder Meet
8. Policy-level assessment

16. Participatory assessments not only provide data for project managers and policy makers, but also are an established learning tool for various interest groups within communities and agencies. The approach builds capacity through joint investigation and analysis and community participation in planning and managing the project. In this cycle, the different groups in a community assess the situation, identify areas for change, and take collective action. The analysis can be repeated as needed later in the project to obtain over time trends. All participants, from community members to national policymakers, can obtain information generated by the user communities themselves, adding transparency to the entire process.

Conducting the Socioeconomic Impact Survey

17. Statistical approaches to the development of a monitoring and evaluation methodology for rural electrification projects often involve the use of surveys based on random samples of households or individuals. The typical approach taken for evaluating projects is to survey households in a project area with and without electricity. This establishes a baseline for the people living in the project area. A survey or part of the survey can be conducted at periodic intervals to track the progress of a rural electricity project over time. This report confines its description to the cross-sectional approach, which can be wholly or partially replicated in later years to yield time series data on the impact of the project.

18. The approach in this study is to conduct the cross-sectional comparisons that allow for examining the long-term benefits of rural electrification and the use of period samples to track the progress of a rural electricity project over time. Both approaches are valid and have their own strengths and weaknesses. In this section we will confine our description to the cross-sectional approach, which can be wholly or partially replicated in later years to yield times series data on the impact of the project. It should be cautioned that because of the nature of project cycles, time series data at the end of a project lasting five years may not capture all of the benefits that will result from the project. One weakness in many rural electrification project evaluation designs is that the time interval is too short to measure the "longer term" benefits of rural electrification. For instance, the long-term education of children takes between 10 and 12 years. An evaluation approach that measures only the impact of a project after one to three years would miss the impact of electricity on long-term education. Though longer-term time series data are desirable, often project managers lack the resources or interest at the end of the project to develop a longer-term effort to measure the benefits of the project.

19. One of the main strengths of quantitative surveys is that they provide valid information that can be generalized to a broader population. Surveys can provide important information on markets for energy services, the rate of adoption of electricity, the impressions and attitudes of people towards electricity, and the benefits of electricity compared to other types of energy. Such instruments are common in market research, but can also provide important information to project planners and implementers.

Box E-2: Possible Research Topics for Questionnaire

- Socioeconomic profile of actual and potential beneficiaries/customers
- Fuel and energy use prior to improved electricity services, including energy from all sources, such as candles, biomass, batteries, the electric grid, diesel generator sets, etc.
- Monthly expenditures on fuels and energy, by source
- Potential and actual willingness to pay for energy services, by application
- Energy use as it relates to substitutes for improved electricity services (kerosene, -candles, and others)
- Reasons for not connecting to the grid or purchasing improved energy devices
- Barriers to the adoption of improved electricity technologies/services
- Incentives to overcome barriers to adoption of improved electricity technologies/services
- Appliances in rural households, including those with and those without electricity
- Time use (males' and females') as it relates to existing energy use or appliances.

20. The survey is developed keeping in mind the priority needs identified by the communities during the participatory research. For rural electrification, several general categories of questions are important to address. These include questions designed to assess whether the market conditions are right for implementing or expanding projects or programs, questions on the socioeconomic impacts of rural electrification, and how the program will affect poverty and gender issues (Box E-2).

Conclusion and Recommendations

21. To summarize, the monitoring and evaluation approach advocated in this report uses both qualitative and quantitative techniques to improve the quality of rural electricity projects. The participatory method spans a variety of well-established qualitative methods including focus group discussions, pocket voting, and other participatory tools. Community members take an active role in project design, implementation, and evaluation, giving their preferences and opinions in all stages of the project. The survey approach is a more quantitative approach involving the use of questionnaires, random samples of populations, and formal interviews. In this case, project participants and, in many cases, non-participants are interviewed and their patterns of energy use and opinions about electricity and the project are measured and analyzed. Inherent in the framework proposed by this report is the evaluation of potential project design approaches and project impacts on all segments of the target population, including different genders and social groups.

22. Based on the findings of this report, a number of recommendations can be made. The first and most obvious is to place greater emphasis on monitoring and evaluation of socioeconomic development impacts in rural energy projects. The second is to apply monitoring and evaluation over the duration of a project rather than for just one point in time. Finally, a demand-oriented approach to monitoring and evaluation can provide a much-needed focus on rural consumers, who after all are the main beneficiaries of rural energy projects. As a result of all of these recommendations, changes can be made during the development and execution of project to make them more successful. The approach to monitoring and evaluation advocated in this report is an initial step in the development of tools to help rural energy project managers implement demand-oriented monitoring and evaluation.

1

Introduction

1.1 Most large-scale rural energy programs, whether promoting conventional or renewable energy, focus on providing development assistance through the supply of electricity services to stimulate economic productivity and enhance quality of life in rural areas. However, few of these programs start with an in-depth assessment of the local market conditions, including the needs of the people they are meant to serve. In addition, they often fail to evaluate specific impacts resulting from these services on the target populations. Most rural electricity monitoring and evaluation programs measure strictly quantifiable, technology-dependent variables, such as the number of electricity connections made or the number of systems installed. They typically are not designed to measure social development impacts, often resulting in the masking of poverty- and gender-specific consumer choices and perceptions. This incomplete understanding of market forces and program impacts on members of the target community hinders the development of initiatives that respond to rural needs and have positive, equitable, and sustainable socioeconomic development impacts.

1.2 This paper proposes a tool for assessing end-user needs and monitoring and evaluating the social development-related impacts of rural electricity projects, with a focus on poverty and gender implications. The goal is to design a method that is not an isolated data collection exercise, but rather an approach that is useful for project design and on-going project implementation and assessment and post project evaluation. This is accomplished through two complimentary and well-accepted research methodologies that include participatory assessments and surveys.

Rational for the Study

1.3 Traditionally, the rural energy sector has been dominated by a supply-driven paradigm. Past projects supported by multilateral and bilateral funding agencies have typically focused on the extension of the electric grid or supply of devices for basic household energy needs. The majority of such projects were conceived without recognition of the needs and preferences of the consumers or end users. More recently, rural energy projects recognize that there is a link between energy and socioeconomic development. As a consequence, recent project activities have typically focused on household lighting to improve quality of life in rural homes and the provision of electricity for income-generating purposes. Unfortunately, however, many of these

projects have neglected to take into consideration the specific needs of different groups within rural communities.

1.4 The needs and interests of the rural poor—and of women in particular—tend to be underrepresented in the context of rural energy projects. The needs of these groups vary according to their differing roles, customs, and lifestyles. The poor require energy to meet basic needs such as cooking, obtaining water, and other essential activities. The majority of the energy needs of the poor are met using "traditional" energy sources, especially biomass. In contrast, wealthier populations use greater amounts of electricity and other "modern" forms of energy to maintain higher standards of living. Many studies have shown that electricity technologies and appliances are prohibitively expensive for poorer populations (see, for example, World Bank Operation Evaluation Department, 1995, and World Bank, 2001). Thus, in poorly designed rural electrification programs, the benefits of the project may flow mainly to the rural elite. The majority of energy needs among the rural poor is likely to be supplied by biomass for many years to come, particularly for heating purposes, such as cooking and water heating. Still, the need for electricity for purposes such as lighting, the use of appliances, and income-generating activities can be very important for poor people who have little or no access to basic electricity services.

1.5 Women represent at least half of rural consumers, and often more than half of the rural poor, performing a wide range of work for which energy of one form or another is a critical input. Women are largely responsible for household activities that are highly dependent on the availability of clean and reliable sources of fuel, including collecting fuelwood for cooking, obtaining water for drinking and cleaning, preparing meals, taking care of children, and other activities essential for the family. These activities consume most of their time. In addition, women are often also responsible for a significant portion of income-generating activities in rural households.[1/] The income-generating activities of women tend to depend on high-quality sources of energy as well. Typical women's income-generating activities include food preparation, agricultural processing, animal and marine-life husbandry and the manufacture of products and crafts for sale. Although these activities are of great importance, women are often marginalized within both the household and the community. There is potential for improving women's productivity in these types of enterprises through improved energy services.

1.6 In certain cases, rural energy projects have attempted to incorporate poverty or gender considerations midway through the project implementation. While it may be better to incorporatethese considerations into the project at any point in a project cycle rather than not at allad-hoc approaches have, in some cases, created greater confusion and skepticism about how to apply these approaches successfully. To effectively integrate development-related energy technologies and services in rural areas, the needs of the rural poor and women must be taken into consideration from the early phases of project development.

[1/] Or solely responsible for income-generating activities, in the case of "female-headed" households.

1.7 Understanding the different impacts of energy programs and projects on different social classes and genders enables planners to increase the equity with which energy programs benefit rural populations. Electricity may be a key element in enabling marginalized groups to meet some of their "strategic" needs. In other words, this might not simply improve the quality of their lives by reducing the drudgery of daily tasks, but might enable them to take on new, and often emancipating roles and activities.

1.8 Increasing program responsiveness to the specific needs of all customers—including different social classes and genders—is also good business. Services that respond to the needs of broad social groups generally are more successful than projects that unintentionally service only a small group of the rural population. This has been demonstrated in other sectors, including water and sanitation, health, agriculture, and education. For instance, Bamberger (2001) summarizes several World Bank studies demonstrating that women's participation in project design and management improves World Bank project outcomes and sustainability. Further, Murphy (1997) reports that World Bank projects that included gender-related considerations had a higher proportion of satisfactory ratings than projects that did not (see also Dutta, 1997; Dutta et al, 1997; Gautam, 1997; Jha, 1992; Ramana, 1993; Roy, 1997; and Van Nes and Lam, 1997). Thus, not only is it important to understand the differences in the impacts of energy projects on women and the poor, but this type of understanding has been shown to improve project performance as well.

1.9 If designed and implemented carefully, energy products based on appropriate sources, equitable access and end-user participation can play an integral role in helping to alleviate poverty and improve gender equity. This means starting not with the question, "How can renewable energy be applied in rural settings?" but rather beginning with a series of questions addressed to various members of rural communities, such as, "What are your needs? Can renewable energy be applied to best meet these needs? If so, how?" Developing a project that is able to recognize poverty- and gender-related implications and maximize project benefits for the target communities requires that poverty and gender approaches be incorporated into the very fabric of the project cycle.

The Demand-Oriented Approach

1.10 There is increasing acceptance in the energy sector of the importance and relevance of poverty and gender issues in energy programs and projects. Evidence can be found in the growing interest among some multilateral donor agencies in supporting gender- and energy-related development needs,[2/] and the recent development of international gender and energy networks, such as the ENERGIA International Network on Gender and Sustainable Energy and the Meso-American Gender in Sustainable Energy (GENES) Network. Yet there remains much uncertainty about how to apply poverty and gender sensitive approaches in the energy context.

1.11 The approach recommended in this report applies gender and poverty perspectives starting with an initial needs assessment and continuing through project development, implementation, and evaluation. Rural energy uses and needs can be met using a variety of energy sources and technologies.[3/] However, rural energy projects that start with the assumption that a particular technological application is the only solution cannot possibly respond to the many pressing needs faced by rural populations. Thus, the recommended needs-assessment process provides broad information to help project designers and communities make informed decisions about the energy technologies and services that will be promoted through the project.

1.12 This report does not, however, attempt to cover all forms of energy services that could respond to the variety of energy needs that rural populations face. Rather, it limits its focus to rural electricity, which can be applied to meet some of these rural energy needs. This reflects a recognition that monitoring and evaluation systems are most relevant and effective when they are tailored to the specific types of technologies and services being targeted by the project (see, for example, Cecelski et al, 2001, and ARECOP, 2001). The use of participatory and survey approaches to assess the influence of economic, environmental, social, and cultural factors on a project will enable participants and planners to determine the most appropriate energy services to be promoted under the project, whether based on conventional or renewable energy resources.

2/ For example, ASTAE's partnership with the Netherlands government to create the EnPoGen program. The World Bank/UNDP Energy Sector Management Programme (ESMAP) has also supported a number of activities relevant to energy, poverty, and gender. Additionally, in 1999, the United Nations Development Programme/Energy and Atmosphere Programme (UNDP/EAP) launched a global project entitled, "Energy and Women: Generating Opportunities for Development," which supports research and projects to explore energy, poverty, and gender linkages. The United Nations Development Fund for Women (UNIFEM) and the Food and Agriculture Organization (FAO) have also supported a number of gender-focused, energy-related projects, mostly those having to do with women's cooking and food processing needs, and more efficient cookstoves for improved indoor air quality.

3/ Rural energy uses and needs can be met using a variety of energy sources—including firewood, charcoal, animal dung and other biomass; biogas; coal briquettes; kerosene, diesel and other oils; fossil and renewably fueled electric grids and minigrids; solar photovoltaic panels; wind generators; hydroelectric systems and so on—and using a variety of technologies—such as cookstoves; lamps and lightbulbs, transport vehicles; mechanized crop processing mills and other machinery; electric soldering irons, drills, sewing machines, and other equipment; refrigerators; televisions, radios, telephones and other communications technologies, and so on.

1.13 The approach advocated in this report blends two different types of techniques—a participatory assessment and a socioeconomic impact survey. These techniques incorporate qualitative methods to acquire in-depth insights from the consumers of energy services and more quantitative household surveys that can examine the patterns of use of energy services. The approaches are complementary to one another, and are based on methodologies that have been developed and applied in existing World Bank projects. The participatory approach builds upon the methodology for participatory asessments developed by the IRC International Water and Sanitation Centre and the World Bank's Water and Sanitation Program (Dayal et al, 2000). The energy survey method builds upon the rural electrification benefit assessment survey method developed as part of a study on rural electrification in the Philippines (World Bank, 2002).

1.14 The methodology for participatory assessment a social assessment technique that links project sustainability with demand-oriented and gender sensitive approaches. The method incorporates both qualitative and quantitative information for designing, monitoring, and evaluating rural development projects. It uses participatory methods to enable people at the household, community, institutional, and policy levels to have a voice in the development and implementation of projects. The benefit assessment survey methodology is used to estimate the socioeconomic benefits of rural electrification and other energy interventions. The technique involves the measuring of prices and quantities of energy used by rural households and using this information to calculate the estimated value to the consumer of using various types of energy. It assesses some benefits that previously were considered "too hard to measure," including benefits on education, health, productivity, convenience, security, and entertainment.

1.15 For the purposes of this initiative, these methodologies have been revised and refined. While the participatory approach easily addresses the issues of poverty, gender, and the needs of rural households, it was adapted for use in rural electrification projects made applicable to stand-alone electric systems, in addition to community-managed ones. At the same time, while the benefit assessment survey methodology was developed for use in rural electrification projects, and is able to measure social impacts in monetary terms useful to Bank energy projects, it was revised to take gender considerations more fully into account. The two methodologies applied together are stronger than either one of them applied separately. By applying the two methodologies in a complementary way, policymakers and project managers can access both the "softer," qualitative data they need to understand the needs and priorities of the target communities, and the quantitative types of data necessary to systematically measure and analyze the benefits and costs of rural electricity interventions.

2

Evaluation Methods and the Project Cycle

2.1 Recognition of the need to integrate qualitative and quantitative approaches in monitoring and evaluation programs is growing (see, for example, Baker, 2000; Rubio et al, 2000; and Bamberger, 2001). This chapter highlights the strengths of participatory and survey approaches in order to demonstrate how monitoring and evaluation can benefit from using the two together in a complementary way, and how these approaches fit into the typical project cycle.

Strengths of Participatory Approaches

2.2 Three main strengths are unique to participatory approaches. They can help identify priority needs and capacities as identified by the end users or communities themselves. They can also provide softer kinds of information of importance to the project and project design, such as end-user perceptions, preferences, and opinions about the project. Finally, they can assist in organizing the communities to express their views of how to better implement the project, so that it is better able to meet their needs.

2.3 Recent research suggests that community participation throughout the project cycle improves project quality. For example, an evaluation of 121 rural water projects offers strong evidence that increasing stakeholder participation improves project outcomes (Isham et al, 1995). When implementing agencies actively included beneficiaries, they had a 62 percent rate of positive economic returns. When they did not, the success rate was 10 percent. A study of water projects in 88 communities also found that a "higher level of participation in establishing community-managed rural water supply services is significantly associated with better-sustained service" (Dayal et al. 2000).

2.4 Participatory approaches can not only provide data for project managers and policymakers, but also can facilitate exchange of information and enhance cooperation of both interest groups within communities and between implementing agencies and the communities themselves. Using participatory approaches, different groups in a community assess the situation, identify areas for change, and take collective action. They can then repeat the analysis as needed to plan further. All involved in the project, from community members to national policymakers, can obtain information generated by the communities themselves, adding transparency to the entire process.

2.5 Using the results of participatory exercises, community members can monitor progress periodically and compare their service with that of other communities in the area. Indicators can be used to highlight potential inequalities with regard to women or poor households. For instance, the "Stakeholder Meet"[4/] brings the perceptions of different income groups and genders into discussions had during the institutional- and policy-level assessments. Open discussion in focus groups increases the chance of obtaining credible and relevant information, allowing biased or incomplete answers to be checked by group dynamics. Participatory approaches also can bring to light the fact that different social groups may need or want different kinds of energy services. User choice can guide key investment decisions, thereby encouraging services that conform to what people need and want, and can confirm whether or not certain groups are willing to pay for the service.

2.6 Participatory approaches offer both the poor and better-off methods with which to influence the process of service establishment and participate in the management of the service (Gross et al, 2000). This approach also builds capacity through joint investigation and analysis, and community participation in planning and managing the project. Participants identify problems and solutions and are more likely to own the outcomes. Tools such as social mapping and wealth classification allow villagers to assess and plan for equitable access to energy services. Self-scoring allows for instant feedback, which encourages transparency and joint action toward finding a solution. Community members also gain practical tools for monitoring infrastructure construction and service delivery.

2.7 In preliminary field tests of participatory assessments in rural Cambodia,[5/] a strong demand and willingness to pay for improved electricity services was found. However, in the three villages participating in the field tests, most of the household expenditures were for food and health care. Thus, project planners must consider whether the proposed new electricity services will be affordable and will meet priority needs. The preliminary field tests also showed that most villagers were unfamiliar with participatory tools such as social mapping. However, they quickly joined in and were quite impressed by the activities that told them more about the situation in their own communities. This example shows the participatory approach not only provides information for project managers, but also is able to produce information and feedback for the community.

[4/] The Methodology for Participatory Assessments has named a particular type of stakeholder meeting the "Stakeholder Meet" to differentiate it from other types of meetings.

[5/] Conducted in October 2001 by Ms. Rekha Dayal and Ms. Moho Chaturvedi of The Mallika Consultants, seven local professionals from the Green Group led by Mr. Chea Sarin, and Mr. H. Seiha from Cambodian Ministry of Industry, Mines and Energy.

2.8 Weaknesses of participatory approaches include that they can be time consuming, and that to function effectively they require well-trained, experienced, sensitive staff. Because participatory approaches generate detailed qualitative data specific to the particular communities being studied, the data generated often cannot be generalized to a broader area. Experience has shown that participatory methodologies can be manipulated and used in a purely extractive manner, while one of the primary objectives of such methodologies is to foster on-going interactive communication between project staff and the target population.

Strengths of Survey Approaches

2.9 The main strength of quantitative surveys is that they provide valid information that can be generalized to a broader population with similar characteristics. Surveys can provide important information on markets for energy services, the rate of adoption of electricity, the impressions and attitudes of people towards electricity, and the benefits of electricity compared to other types of energy. Such instruments are common in market research and can also provide important information to project planners and implementers.

2.10 Quantitative surveys have been used widely in World Bank activities, and they can be especially useful today in the context of strategies for poverty reduction. Most World Bank poverty reduction strategies involve the use of either "Living Standards Surveys" or "Existing Income and Expenditure Surveys," which provide information on the poorest households. Many household energy surveys are conducted under World Bank energy programs, both in urban and rural areas. The goals of these household energy surveys typically are to assess changing patterns of energy demand, identify possibilities for inter-fuel substitution, and understand the impact of energy policies on the poor.

2.11 A household energy survey is usually initiated when a policymaker or institution confronts energy issues or problems for which existing information is insufficient. Once it is felt that more information is required for project planning or implementation, a survey plan is developed to gather this information. Typically, the survey will gather baseline energy consumption data, including general information on the level and patterns of national or regional energy demand. The survey also evaluates the impact of a policy or technical intervention on energy issues. Finally, quantitative surveys are used to conduct market research and assess the overall level of demand for energy and willingness to pay for new energy services. For example, one objective of the survey may be to evaluate the effects of energy price increases on low-income households, with data collected on household energy consumption, and the ability of low-income households to pay for energy services. However, because of the time and expense involved in developing and conducting surveys, most surveys have multiple objectives.

2.12 Quantitative surveys have a usual set of activities associated with them. Typical energy surveys use the household as the research unit, but this is by no means essential or necessary. Surveys can use individuals within households as the basic unit for data collection. This is essential if gender disaggregated data is to be collected. Energy surveys usually consist of a questionnaire that collects information on income, socioeconomic status, energy consumption, expenditures, appliance ownership, and other aspects of energy demand. Methods to collect data can include personal interviews, collection of secondary information, and the use of community level information. These surveys typically involve random selections of households and communities for interviews, but it is important that the sample is representative of the entire community and includes both male and female representatives of the various different social groups identified. A wide variety of information useful for rural energy projects can be collected through the use of surveys.

2.13 Weaknesses of survey approaches include that they require very good planning and organization to obtain satisfactory results, are fairly expensive to implement, and require specialized staff competent in survey design and analysis. The surveys themselves are not difficult to implement, but both the planning and the analysis take longer than many project managers expect.

The Project Cycle and Monitoring Evaluation

2.14 The rural electrification project cycle has several different stages, and the assessment and evaluation techniques applicable to each stage are usually different. For instance, in the earliest stages of a project, it is likely that more informal input is necessary from the potential participants. This is because understanding the needs of those who potentially will be affected by the project is very important, and the methods of project implementation have not yet been fully defined. At the early stages, it is difficult to specify the exact type of information needed to evaluate the success or failure of the project. At this stage, the energy problems faced by the various classes of potential beneficiaries are not fully known, and a market assessment of service needs will be necessary for project preparation. Participatory techniques, which allow selected households, and different members within households, to identify and discuss their energy problems with the researcher under the direction of a group facilitator, can reveal priority needs and the underlying causes of consumption behavior.

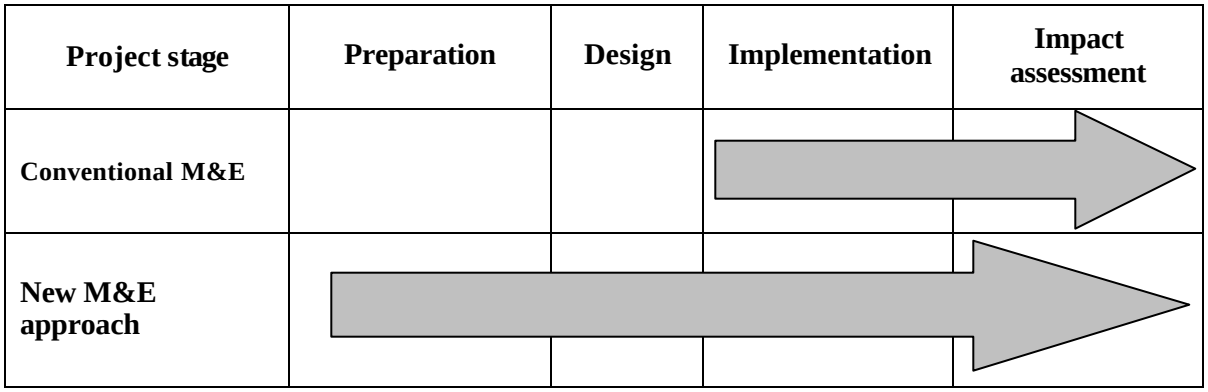
2.15 In subsequent stages, quantitative information is generally necessary to allow for more standardized types of analysis and comparisons. Such information can be obtained through a survey. The specific topics to be addressed in the survey can be developed from the earlier participatory research. These quantitative approaches can be utilized in many parts of the project cycle, but require the use of different evaluation techniques that provide different kinds of data. Thus, the two approaches fulfill different needs at the different stages of the project cycle.

2.16 The conventional approach to monitoring and evaluation has been to develop a way to quantify different targets or project achievement goals following initiation of the project. Usually a monitoring unit is created within the implementing agency, which develops a series of techniques to measure project effectiveness. In the case of a rural electrification project, for example, the technique may be to monitor project effectiveness by measuring the number of connections or number of systems installed. In most cases, the monitoring and evaluation component traditionally only begins after the project has been approved and financed.

2.17 Rural electrification projects are generally divided into four stages: preparation, design, implementation, and postproject impact assessment, as illustrated in Figure 2-1. Under a conventional monitoring and evaluation approach, there is no activity until the project reaches the implementation phase. Once the project has begun implementation, important changes that impact the goals of the project are monitored and at the end of the project, it is evaluated based on whether or not it achieved its targets.

2.18 The new approach advocated by this report begins the monitoring and evaluation process at the preparation stage of the project, so that the input of the potential beneficiaries is taken into consideration in the project's initial phases. Priority needs are identified and insights are gained from the end users; these are then incorporated into the project design.

Figure 2-1: Conventional and Proposed Approaches to Monitoring and Evaluation



2.19 Different levels of research are required at each project stage. The sample approach illustrated in Table 2-1 is only one possible application of the different approaches at the various stages of the project, and the ultimate decisions on how each methodology will be applied in each stage will depend on the nature and objectives of the project.

Table 2-1: New Approach to Monitoring and Evaluation in the Project Cycle

M&E component	Preparation	Design	Implementation	Postproject impact assessment
Participatory assessment	Development of the assessment design based on the issues and needs of the project	Extensive participatory assessment to shape project design	Less intensive follow-up assessments, including revisits of team to communities in project areas	Analysis and documentation of project impacts
Socioeconomic impact survey	Development of the survey design based on the issues and needs of the project	Market survey to assess market demand for energy service to be provided by project	Execution of baseline surveys and planning of any follow-up surveys based on need of postproject evaluation	Postproject survey and analysis and documentation of project impacts

Project Preparation

2.20 During project preparation, participatory research can begin to identify the issues that need to be clarified for the design of the project. For instance, participatory research can help identify social groups within the community and the target beneficiaries. It may be of interest to examine community members' priority energy needs, and how these needs vary by region or by income class. Participatory research also may help in understanding the conditions that will affect who participates in the project and who benefits. Participatory research can also help to identify all of the stakeholder groups that will influence the success of the project and to enlist their support in project design and implementation. It can further identify household, community, and institutional roles and processes that will influence project outcomes, and help guide the design of any survey research being planned. The point of completing this preparatory work is to strengthen the foundation of the project so that it addresses the real needs of the individuals and communities it intends to benefit. Thus, during the preparation phase, initial participatory research is conducted to identify key issues and groups and to help in planning for subsequent participatory work. This will be complemented by visits to the field to strengthen the approach.

2.21 During the preparation stage, the type and coverage of the survey needs to be assessed. For instance, there may be no useful preexisting information on energy use or the market for various energy services. A market survey could be planned to assess these needs. During this stage, the main issues to be quantitatively evaluated under the project should be identified, and planning should begin on how to address these needs.

2.22 At this stage of the project, the "logical framework" (logframe) will begin to be developed. Key steps in the logframe approach include: identifying and analyzing all key stakeholders, enlisting participation from the stakeholders to identify and prioritize problems, analyzing the problems, defining project objectives, and defining the most appropriate strategies to achieve the selected objectives. Part of the logical

framework is the monitoring of the results of the project, and both the participatory and the survey approach can be integrated into the logical framework to provide the required information.

Project Design

2.23 At the beginning of the design stage, both the participatory and survey approaches collect information similar to, but more detailed than, that gathered in the preparation stage. This will guide project design. Participatory assessments should be conducted at the community, institutional, and policy levels to gather detailed information about the needs, concerns, and priorities of the project's various stakeholders. This information can be used to refine project design issues and to inform the development of the surveys. Surveys at this stage can be utilized to assess the market conditions of the project areas, detailing the income levels, levels of desired service, and other important information necessary for project planning. Specifically, quantitative surveys are used to get an in-depth understanding of existing market conditions and identify key factors among the target population that will impact the project's success, such as willingness and ability to pay for new technologies/services.

Implementation

2.24 Surveys are conducted during the implementation stage to generate baseline data necessary for understanding preproject conditions of the population. This information can be utilized to plan the project as well, and can be done as part of the market survey conducted in the design phase. These surveys can provide the measurable information needed by project implementers and stakeholders to make regular improvements to services throughout the project's life cycle, while providing the baseline for later evaluations of the impact of the project.

2.25 Using participatory assessments in the implementation stage helps to understand how different social groups and genders perceive and are affected by the project. It also encourages transparency and helps community members assume responsibility for improved energy services. Participatory methods in this stage also help to understand how institutional processes and policies are influencing the burdens and benefits for females, males, rich, and poor. In addition, participatory approaches can be used to check consistency and obtain a deeper understanding of quantitative monitoring data, and to help explain unanticipated consequences.

Postproject Impact Assessment

2.26 During postproject impact assessment, surveys are conducted with households or individuals who have participated in the project, and with others who have not yet participated, to assess and quantify the social and economic impacts of the project. Surveys can be extremely useful in the evaluation of both the successes and failures of the project. This can feed postproject completion reports, which all Bank projects are required to produce. Participatory assessments should also be conducted at this stage to obtain a deeper understanding of these quantitative results, and probe into the qualitative impacts of the project on peoples' lives.

Usefulness of Demand-Oriented Monitoring and Evaluation

2.27 The proposed approach can have significant benefits for project design and planning on several different levels. It can provide information useful to community members as well as service providers, project planners and implementers, and policymakers. The approach is designed to provide information useful to each of these stakeholders—who can benefit from the richness of both the quantitative and qualitative data is collected using these techniques—and to be useful in improving the quality of the project, both in design and implementation.

Communities

2.28 Women and men in the target communities can use the approach to assess various dimensions of the sustainability of their services, such as physical functioning, financial adequacy, management effectiveness, sustained access and use, and environmental impacts (Box 2-1). Participatory tools are used with self-scoring matrixes to enable community members to assess their situation collectively, stimulate an analysis of causes, and identify possible actions to enhance sustainability, safe and optimum use, and equity. They can choose to monitor progress periodically and/or compare their service with those of other communities in the area, and understand in what ways others are doing better or worse. The methodology also highlights specific inequalities with regard to women or poor households.

Box 2-1: Creative Problem Solving by One Community Following Participatory Exercise

During participatory exercises conducted in one community, community members identified numerous problems with leaking and breaking water and sanitation pipelines. They revealed that when pipelines were being constructed, they were often buried just below the ground's surface, instead of at the proper depth. The researcher worked with community members to develop a plan to allow the community members to verify that pipelines were being constructed properly. They drew a line on a yardstick to mark the proper depth at which the pipes should be buried, and every time a pipeline was constructed, community members showed up with the yardstick to ensure that the lines were buried properly.

Rural Energy Suppliers and Service Providers

2.29 Energy entrepreneurs and businesses can use the information gathered from this approach to better understand the market for their products and services, to gauge customer satisfaction, to identify problems and potential solutions, to improve customer relations, and to promote overall improvements in their businesses. Information gathered from the participatory assessments is provided directly to the suppliers and providers through the Stakeholder Meet and focus group discussions.

Project Staff and Managers

2.30 Project staff and managers can use the outcomes of the participatory assessments and surveys for day-to-day monitoring and objective and transparent communication with users and entrepreneurs at the community level. Information from the participatory assessments is recorded on a series of scoring matrices, which translate qualitative data into a quantitative form, so that project staff and managers can improve project planning and implementation, track progress, and make comparisons between among communities.

Sector Policy Formulators

2.31 The techniques provides a framework to link sustainability outcomes at the community level to institutional factors in energy agencies and to policies at the national level. For instance, under the participatory approach a process is set in place that facilitates a joint assessment of existing policy support for sustainability in light of those results. This builds high-level consensus about the kinds of policy support available or needed to foster sustainability through the mainstreaming of gender-sensitive, poverty-targeted, and demand-responsive approaches. It thus sets the agendas for policy improvement. The survey approach on the other hand provides policymakers with quantitative data on how the project is reaching its goals, and the impact that it is having for the intended populations.

Project Designers and Donors

2.32 Designing for sustainability can be made tangible and verifiable through the use of the indicators summarized in the next chapter. New project designers can draw on this monitoring and evaluation approach to identify strategic project interventions needed at the community, institutional, and policy levels and to enhance the achievement of sustainability and equity.

3

Project Development and Sustainability Indicators

3.1 The demand-oriented monitoring and evaluation approach advocated in this report is dependent on obtaining information for a key set of variables relevant for rural energy projects, with a particular emphasis on rural electrification. A key set of indicators is used to measure these variables. Of course, the final choice of variables and indicators will depend on the local context and the objectives and priorities of the project. Some projects may choose to supplement this list of indicators with other relevant ones. The choice of indicators will also depend on the technologies and service delivery mechanisms present in the communities being studied, as different methods of delivering energy services might involve households, entrepreneurs, communities, or a combination of these. Thus the information required varies according to the type of community and project that is being evaluated.

3.2 As an example of the varying requirements, we can take the cases of a solar home system and a community-owned microhydro system. A solar home system is usually owned and operated by a household. In this situation indicators for assessing the ability of the household to operate its system will be important. On the other hand, a community might own a microhydro station that distributes electricity to the community through a small grid. In this case, indicators should cover the community's ability to manage the system and the ability of the provider to maintain the system and associated services. In many communities, different types of management systems will exist.

3.3 Thus, for many projects, it is not practical or even necessary to measure the entire set of indicators presented in this chapter. Representative stakeholders should select the subset of indicators used for ongoing monitoring during project preparation. At the project level, staff must analyze monitoring data to make midcourse corrections during periodic work plan reviews. At the community level, interested parties can monitor results more frequently to adjust project activities as appropriate.

The Key Variables and Indicators

3.4 The purpose of the variables and indicators is to highlight the key social development issues that impact rural electricity project effectiveness and sustainability. All of these indicators are collectible and measurable. However, due to budget or time constraints, it may not be possible to measure all of these indicators. This list of

indicators can be scaled down to accommodate project priorities, local capacity levels, and local budgets. In such a case, the final set of indicators used must reflect the unique circumstances of each project and the priorities of interested persons.

3.5 The important issues involved in assessing the effectiveness of a project are fairly straightforward. They include an evaluation of the sustainability of the project, whether the project is accessible by most social groups including women and the poor, and whether it has an impact on other sectors such as education or village water supply (see Table 3-1).

Description of Variables and Indicators

3.6 The importance of the variables for evaluating the project progress is that they measure key aspects governing the success or failure of most projects. In general, they deal with the sustainability of the project, the impact of the project for different social groups, the degree to which national policy goals are achieved under the project. In this section, these seven key project indicators are examined in detail.

Effective Project Sustainability

3.7 Sustainability is a key component in any improved energy project. The extent to which the service is sustained depends on a number of factors, including system quality, effective functioning of the technical system, financial viability of the service provider, and effective management of the project.

3.8 System quality is to a great extent dependent on whether an energy system has been appropriately configured and is properly sized for expected loads and daily use. The quality of the components used is also important, including whether respected brands with manufacturer guarantees have been used. The quality of installation is also critical, and can be measured by whether the system is properly sited, whether it uses proper wire sizing and connections, and finally whether it is safe and accessible for maintenance.

3.9 The system must also function in an effective way. This means that there must be an appropriate level of service operation that is both reliable and predictable. These sub-indicators can be measured by whether the system provides consistently good power quality, whether the system provides the expected amount of electricity, whether there is ever a lack of service due to system malfunction, and the degree to which users can predict service hours, respectively.

3.10 Another key facet of most systems is that the financial viability of the service provider is critical in ensuring sustainability of the service. Financial viability can be measured by the degree to which the service provider's or user's income covers all installation and operation and maintenance costs, provides for system expansion, and allows replacement of major parts of the system. It can be further ascertained by the degree to which payment records are properly kept, whether all user households pay their share on time, and the presence and nature of subsidies.

Table 3-1: Key Indicators for Monitoring and Evaluation

Variables	Indicators
Effectively sustained (M/F, R/P)	System quality: Quality of design, components and installation.
	Effective functioning: Quality of service operation, expected load being met, reliability and predictability of service.
	Financial viability of service provider: Coverage of installation/connection and operation and maintenance (O&M) costs, universality and timeliness of payments, presence and nature of subsidies.
	Effective management: Level of user awareness of fees/tariffs and expected O&M costs, end user awareness of system use and capabilities/limits, end-user capacity to troubleshoot problems, level of service, quality and timeliness of repairs, presence of complaints redressal mechanism, budgeting and accounting for service, metering, billing, and type and proportion of user contribution at time of service establishment.
Equitable access and use (M/F, R/P)	Access: Choices in services, appliances, and equipment offered, choice in location of fixtures, and proportion of population using the service.
	Affordability: Installation and connection costs, fee/tariff structure, O&M costs, costs of appliances, including replacement parts, and existence and understanding of user financing options.
	Service use: Knowledge and practice of efficient, safe and environmentally sound use services, knowledge and practice of recycling and disposal practices, and nature of use.
	Demand-responsive service: User voice in planning end-use priorities, technology and service options, tariff structure and O&M, and user satisfaction.
Degree of change in cross-sctoral social development indicators (M/F, R/P)	Education: Ability to attend school, time spent on education, quality of education and presence of teachers. Health care and safety: Access to and quality of health care, access to medicines, presence of doctor(s)/health worker(s), and safety in and outside the home. Domestic productivity: Ability to conduct and efficiency of household (nonincome generating) responsibilities. Income-generating activities: Ability to conduct income-generating activities, productivity/efficiency and profitability. "Strategic" needs: Ability to undertake new/desired activities, participation in household decisionmaking and voice in community decisions. Access to information and communications: Access to news and information on income-generating activities, health and safety and family planning, and access to communication with distant family members. Convenience/comfort: Leisure time and time spent sleeping, socializing, watching TV/listening to radio/reading for enjoyment.
Division of costs and benefits (M/F, R/P)	Share of cost or contribution both between and within households, and division of decisionmaking.
Participation in service establishment and operation (M/F, R/P)	Degree of control in installation and construction schedules and quality, capability of relevant local energy committee, coordination between local energy committee and service provider(s), level of skill created and practiced through end-user training, and perceived transparency in accounts.
Institutional support for gender- and poverty-sensitive demand-responsive participation	Service objectives, implementing strategies and project performance criteria reflect gender- and poverty-specific elements, gender- and class-disaggregated planning and monitoring systems in operation, poverty and gender expertise reflected in the type of agencies involved, field teams and team approach, extent and nature of staff training available for gender and poverty approaches, and capacity building, managerial support and staff performance incentives for using poverty- and gender-aware approaches.
Policy support for gender and poverty-sensitive demand-responsive participation	National relevant sector policy present with sustainability and equity as explicit goals.

3.11 Effective management is a complex but critical issue that can be determined by some key factors having to do with end-user awareness, level of service, budgeting and accounting for service, metering, and the nature of user contributions to

service establishment. Quality and timeliness of repairs is measured by whether repairs are timely, effective and allow for system expansion. Budgeting and accounting for service is measured by whether effective budgeting and fee/tariff collection systems are in place and based on the financial requirements of the service. Fair and effective metering is measured by whether tariffs charged reflect equitable charging based on consistent meter readings, and whether or not problems with illegal connections are experienced.

3.12 Other issues that may effect management include end-user awareness of fees and tariffs and expected operation and maintenance costs. The awareness of proper system use and capabilities also is important. Level of service can be measured by the existence of provider guarantees and service contracts. Finally, the type and proportion of user contribution at the time of service establishment can be measured by whether cash and in-kind contributions are adjusted to reflect different capacities to pay.

Equitable Access and Use

3.13 In the past some projects have not taken into consideration equitable access to electricity services. As a consequence, in some countries extremely high numbers of households still have no access to electricity. Access is determined by the proportion and nature of the population using the service, and the degree to which full choices are available for all community groups involving the types of service, appliances, equipment, and location of fixtures.

3.14 Affordability is determined by the affordability of connection or installation costs, price for the service, the costs of appliances, and the degree to which financing options are available and accessible. The use of a system is related to affordability, but also can be measured according to whether systems are being used for income-generating purposes.

3.15 Demand-responsive service can be measured by whether consumers have a voice in the types of applications targeted, including different technology options, along with the levels of service offered. Obviously such service depends on the willingness of the local service management enterprise or organization to take into consideration views of consumers. The general idea is to investigate whether the needs or voice of the consumer has been taken into consideration in terms of the services offered to them.

Degree of Change in Cross-sectoral Social Development Indicators

3.16 For development-focused energy projects, the ultimate goal is to improve the lives of the target population through improved energy services and technologies. This can be determined by examining the degree of change in a number of social development indicators. Education can be assessed based on children's and adults' ability to attend school, time spent on education in the home, the quality of the education, and the presence of teachers in the school or community. Health care is measured according to community members' access to health care and the quality of the health care provided. Safety is measured based on the degree of safety both inside and outside the home.

3.17 Domestic productivity is another critical indicator. This is determined by whether household members have time or are better able to conduct all of their household responsibilities. For income generation, information should be collected on the degree to which the consumer is able to conduct productive activities within the household. "Strategic" needs, or the ability of female and male community members to take up new activities and challenges, should also be assessed. These include activities that may be considered emancipating, rather than those which simply lighten the usual work that individuals undertake.

3.18 The degree of change in access to information can be evaluated by measuring access to news and information. Such information may be important for improving income-generating activities, enhancing the health and safety for adults and children, and promoting family planning. Communications is evaluated based on access to communication with distant family members. Finally, convenience and comfort can be evaluated according to time spent on leisure activities, sleeping each night, and socializing with neighbors. Also, electricity can have an impact on the time watching TV, listening to the radio or reading for enjoyment.

Division of Costs and Benefits

3.19 The division of costs and benefits is a key variable in determining whether an energy project has impacted the target population in an equitable manner. This is determined by the nature of cost sharing between different types of households. On this issue, both the cost of services for different classes of households would be examined along with how the benefits are distributed within the rural households. A major concern in all rural electrification projects is whether poor households can afford to pay for the costs of service, and whether they are excluded from receiving any benefits under a rural electrification project. Also, there is some evidence to suggest that women benefit significantly from rural electrification programs, mainly through benefits accruing within the households. This is an issue that can be addressed in both the qualitative and quantitative studies.

Participation in Service Establishment and Operation

3.20 Some evidence suggests that local participation is a significant feature of successful rural electrification projects. Local participation can take many different forms. During the time when the village is obtaining electricity, local people can assist by providing local labor for moving materials. Also, sometimes local energy committees interface with the rural electrification distribution company regarding any problems that arise in relation to the project. Among many electrification programs, there is often a practice of holding meetings to explain the service to rural people during the initiation of service, and sometimes periodic meetings are scheduled to take care of complaints or difficulties. This can often be measured by and counted towards the level of participation of local communities in the electrification process.

Institutional Support for Gender and Poverty

3.21 The degree to which rural electrification programs reach both women and the poor often is a matter of the organizations and policies within the program. Institutional support for reaching the broadest number of people in a community is very important. The goal would be to understand the dynamics of the community, and then develop a strategy to reach both genders and rich and poor people with appropriate levels of service. For instance, in very poor parts of the community it may be necessary to have less costly systems or service options to reach them. This can be affected by the degree to which poverty and gender expertise is reflected in implementing agencies and whether field teams also have these skills.

Policy Support for Gender and Poverty Participation

3.22 The extent to which there is a supportive policy environment for poverty and gender is another important project feature. This can be influenced by the extent to which a national sector policy for rural energy programs is present with sustainability and equity as explicit goals. It matters to what extent policies are aimed at enabling people of different genders and social classes to participate in the program. This issue can be evaluated at the level of the both the community and the institutions involved in promoting rural electrification.

Conclusion

3.23 The potential issues that can be assessed in the course of evaluation rural electrification projects are fairly large and complex in scope. However, as indicated, not all issues need to be examined in all projects. In any good evaluation of a project, the scope of the work will be focused on important project objectives. Such objectives can range from a concern that the poor should have favorable conditions for gaining access to electricity, and to giving consideration to offering poor populations subsidized pricing such as lifeline rates. They might also include whether women have access to appropriate appliances to reduce their drudgery, a common feature of women's work in rural areas. Likewise, the overall benefits and the costs of the project can be examined to ensure that the project is economically and financially viable. We have now examined the issues involved in such research. In the next section, we turn to practical steps involved in both qualitative and quantitative research that can be involved in the monitoring and evaluation of rural electrification projects.

4

The Demand-Oriented Approach to Monitoring and Evaluation

4.1 The demand-oriented approach to monitoring and evaluation involves several different steps and various types of research techniques. These steps and techniques can are fairly well-defined. Both the qualitative and the quantitative techniques follow some of the same steps, but the techniques vary significantly. In this chapter, the general techniques of the participatory and survey research methods are explained, and this is followed by more detailed accounts in the appendixes of this report.

Steps Involved in the Approach

4.2 There are several initial steps to follow in planning and preparing for demand-oriented monitoring and evaluation. These steps are common to both the participatory and the survey approaches, and in fact the way in which they are planned and carried out is very important. These steps include planning and budgeting, selecting and training the team, identifying the communities that will participate in the assessment and survey, and the actual gathering of community and household level data.

Planning and Budgeting

4.3 It is important that both the participatory approach and the socioeconomic survey are appraised and budgeted during project appraisal. There will be greater opportunities to coordinate the quantitative and qualitative analyses, and ensure that key questions are addressed, if this work is planned from the beginning. To plan and coordinate both components effectively, the appraisal team should include a sociologist or participatory development specialist with experience in poverty, gender, and participatory techniques.

4.4 The details of the overall monitoring and evaluation plan for the participatory assessment and the socioeconomic impact survey will include the timing, process of implementation, and detailed institutional arrangements. Of course the requirements will vary depending on the context and needs of the project. These details will need to be clearly defined during the project preparation and appraisal process.

Selecting and Training the Monitoring and Evaluation Team

4.5 The monitoring and evaluation team should be multidisciplinary, ensuring a mix of professional skills and expertise. To cover both quantitative and qualitative aspects of monitoring and evaluation, it will be necessary to have two teams. One will be responsible for the participatory assessments and the other will oversee the socioeconomic impact survey. These teams, however, should coordinate and interact closely. Each team should include at least one representative of the other team.

4.6 The participatory assessment team either can be made up of members of the project's monitoring and evaluation unit or can be contracted out to local NGOs or consultants with the relevant experience. In the latter case, however, it is critical to include members of the project's monitoring and evaluation unit in the team in order to build capacity and ownership within the unit. This will also ensure that participatory poverty- and gender-sensitive methodologies are employed throughout the project's life cycle. The data collection and analysis is a participatory process. The aim is not to extract information but to generate discussions to facilitate community analysis and action planning. This requires considerable sensitivity and patience of the team members. Training the participatory subteam to help them assimilate the methodology and its application is critical. During the training, the subteam becomes familiar with the concepts and tools of the methodology and gains experience and confidence in its application.

4.7 The socioeconomic impact survey subteam should be multidisciplinary, including economists, sociologists, and rural electricity specialists with experience in poverty- and gender- survey research. Local specialists can conduct most of the work, with some guidance from international specialists skilled in poverty- and gender-focused surveys to assist with the design and implementation and econometrics to assist with postsurvey analysis. Enumerators should also be skilled in conducting surveys, and should be fluent in the local language. It is important for the team members to conduct advance pilot tests of the questionnaire, both as a means to produce a better questionnaire and as training for the enumerators.

4.8 Thus, the overall team should consist of members from the selected community, representatives from the project agencies, a sociologist or participatory development specialist with poverty and gender experience, a poverty- and gender-sensitive survey specialist, and a rural energy/electricity expert familiar with the participatory techniques. If statistical analysis is intended, a development economist, sociologist, or statistician familiar with statistics and participatory methods will be needed. If econometric analysis is also planned, a specialist skilled in econometric analyses will also be needed. Experience with participatory methods and gender analysis are a must for the team. A local illustrator can help to prepare or adapt the participatory tools.

Community Selection

4.9 The community selection for each approach will follow somewhat different techniques. In some cases it may be advantageous for them to overlap, but in others each method will have its own method for selecting the communities to be involved in the monitoring and evaluation research.

4.10 The use of participatory assessments generally involves the purposive selection of different types of communities in order to obtain a diverse cross-section of the communities in the project. The reason for this is that in-depth information collected through participatory techniques can explore the reasons for the variation in the response to the project. The goal of community selection is therefore to enable the team to examine communities with a broad range of socioeconomic features.

4.11 The objective of the social impact survey is to obtain a sample population that represents the response of people in the general project area. Therefore, the selection of the communities will be based on random selection techniques. Although techniques can vary, the most common procedure for this type of survey is to randomly select a certain number of communities within a project area, and then within the community a second stage of random selection identifies households for interviews. Generally, such surveys cover a greater number of communities than is possible with participatory assessments. However, the "sample frame" for both efforts include the total number of communities in the project area, so there can be a great deal of collaboration in this phase of the research.

Information Gathering at the Community Level

4.12 Once the appropriate communities have been selected, the monitoring and evaluation team identifies and reviews all relevant documents and records as background information. Next, together with the local authorities, the team collects general data on the community and existing services. During the later analysis, this data can help assess whether community factors or other factors explain the success or failure of the project to reach particular populations. Examples of such factors might include the age or type of electricity system in operation or the relative level and divisions of wealth in the community.

Conducting the Participatory Assessment

4.13 The participatory assessment methodology gives consumers a greater voice in service delivery and helps to engage all parts of the community in the process. It takes into account that different beneficiaries may need or want different kinds of service. The issues that can be examined as part of such research have already been described, so this section concentrates on the practical steps necessary to conduct a successful participatory research study. The steps include identifying the population to be studied, conducting the fieldwork, analyzing the results, and then feeding these results back into

the planning process. The consultative processes listed below are aimed at developing a way to get the opinions, attitudes, and preferences of people that are to participate in the project.

Identifying Population To Be Assessed

4.14 In a participatory assessment, the research is validated through the use of a variety of methods of data collection, and developing an understanding of the process that makes for a successful project. The communities and individuals selected to participate in the research are the result of purposive selection procedures. The criteria for selecting participants include the selection of communities according to criteria established in the research design. These criteria might call for a wide variation in the features of the target population. The aim is to involve those communities that provide a good cross-section of the technical, social, economic, cultural, political, administrative, and environmental conditions in the project area minimizing the bias in selection. Low-income communities should be well represented. When the variation in conditions is large and resources limited, it is sometimes necessary to choose the zones representing the two extremes and an intermediate situation and draw the community sample from these. After the communities have been selected, community members should be selected based on how well they represent different social groups within the community. They should represent at a minimum both genders and main economic classes.

Participatory Tools

4.15 The participatory tools included in this section are well established research techniques. They range from the very well know technique of focus discussion groups to informal voting and discussions of key policy or operational issues. Some of these tools are designed to provide general background information and to help identify what sorts of social groups need to be considered as basic units for the analysis (see Box 4-1). Other tools are designed to collect information from the various groups on their energy needs, priorities, preferences, and constraints. All of them taken together can give a comprehensive view of rural communities and act as a way to get public input for the development of a project.

Box 4-1: Participatory Assessment Tools

1. Wealth classification
2. Community map
3. Focus group discussions
4. Transect walk with rating scales and system observation form
5. Pocket voting
6. Ladders
7. Stakeholder Meet
8. Policy-level assessment

Wealth Classification

4.16 The technique of wealth classification engages community members to use locally relevant and culturally appropriate criteria to classify the village population into economic categories. These classifications are used to identify groups with which to hold focus group discussions, to map the access of the poor and rich to energy services, and to identify differential rates of participation in community decisionmaking and management of services and benefits.

Community Map

4.17 With the help of the facilitator, community members map the layout of their village, identifying key landmarks. This would include the location of rich, intermediate, and poor households or neighborhoods according to the criteria agreed upon in the wealth classification exercise. In addition, they identify the location of all energy systems and related services. The community map exercise—and the discussions it facilitates—generates information about the community's situation regarding energy systems, including those acquired as a result of the project and those outside of the project. Particularly relevant at this stage is determining those with access to the energy systems, including access by the poor, rich, and middle-income households. The degree to which the energy systems meet expected needs can also be explored. It also depicts which households have women or men working in energy-related businesses or services. Among others, this exercise can be used for planning the route of the transect walk.

Focus Group Discussions

4.18 Focus groups are among the most widely used tools for obtaining preferences and opinions on a variety of topics. A focus group generally elicits information through discussions of about ten important issues relating to a project. A group of similar background is selected so that everyone is comfortable participating in discussions. The discussions start with the questions, but then can range over a variety of topics and issues, depending on the dynamics of the group. The persons facilitating the discussion take down extensive notes, and then summarize the main points that come out of the discussions.

4.19 Focus groups are particularly useful in this context for establishing group energy priorities and prioritizing practical and strategic needs. For example, the relative importance of different social development indicators might be discussed. Focus groups can also be used to assess energy expenditures by rural households, data that may be useful in analyzing willingness to pay.

Transect Walk

4.20 The transect walk is used to identify the locations and conduct a visual inspection of the condition of existing energy systems for a sample of the community that crosses rich and poor neighborhoods. During the walk, the team and community members observe the quality of energy systems using the systems observation form discussed later (Box 4-2). The group helps to select the aspects of service delivery satisfaction that are to be scored. This may include the degree of access to service, sufficiency of power to meet

all needs of men and women, regularity and safety of service, predictability of service, adequacy of operation and maintenance, fairness of costs, and fees or tariffs paid for the service. This exercise generates information on a variety of important topics.

Box 4-2: Information Generated During Transect Walk in Cambodia

In Cambodia, the transect walk provided the research team with a picture of the socioeconomic layout of the community. It also gave the team a chance to interact with a range people with or without electricity to get an understanding for their perceptions about electricity supply in their community. The team gathered information on the reliability and perceived value of service and the equitability of tariffs. The walk also provided a clear idea of the distribution condition of systems and pattern of wiring within the community. The information gathered from the walk was used to cross-validate information gathered later in the focus group discussions and interviews.

Pocket Voting

4.21 Pocket voting is used for understanding preferences, behaviors, and decisionmaking among various social and economic groups. The technique involves setting up a screen, with pockets underneath options under consideration. Each participant goes behind the voting screen and uses a card or slip of paper to select their favored option. The paper can be colored or marked based on the social class or gender of the participant. When this is completed, a volunteer takes out the slips from each pocket and a team member registers the votes on a paper version of the matrix, using different symbols for different groups' votes, so that those with no or low literacy can also analyze the results. After voting rounds have taken place, the cards and the contents of the respective pockets are laid out on the ground for the analysis. The facilitator helps the group discuss voting patterns and analyze lessons or implications of these patterns.

Box 4-3: Information Generated During Transect Walk in Cambodia

In one community in Cambodia where electricity was available in the market area, Pocket voting was used to collect information regarding levels of user satisfaction. Women were the primary managers of shops and restaurants in the market area, and thus the primary users of electricity. However, it was found that user satisfaction was higher among males than females. Women expressed their dissatisfaction with the lack of electricity available for domestic use, as it was primarily used to light bars and game shops at night, which were frequented primarily by men.

Ladders

4.22 The ladders tool can be used to assess the extent to which a service meets end user demand and to which the users consider the benefits worth their costs. This activity is done with different social groups, including separate groups of women and men in better-off and poor sections of the community. An example of the technique is to list benefits resulting from improved energy services using words, symbols, or pictures to illustrate them. Community members then select those cards that represent a demand currently being met by the service and rate the degree to which it as a group is receiving each benefit. The participants then discuss which of these benefits are worth their current contributions, in terms of payment, time, effort, and whatever else they contribute to sustain the service. The facilitator helps to calculate the overall scores of each benefit as a percentage of the maximum possible. The outcome of this activity gives an idea of the strength and variation in perceived costs and benefits of the different social groups.

Stakeholder Meet

4.23 The Stakeholder Meet is a separate workshop that follows the community level assessments. Depending on the size of the project, the Stakeholder Meet is usually organized at the district or province level and includes men and women from the relevant institutions involved in project planning, design, and implementation. During the meeting, participants join in focus group discussions, pocket voting, and other participatory exercises. The results are summarized publicly for each participant category by tallying information from the sheets collected by the facilitator, who also reads out the reasons given for selection of each score. This reveals the perception of different levels and types of staff regarding organizational support for working in a gender- sensitive and poverty-targeted manner. Facilitators also share the findings of the community-level assessment with all stakeholders and discuss implications and lessons (Box 4-4).

Box 4-4: Role of the Facilitator in Stakeholder Meet

The stakeholder meeting, by virtue of the range of participants, is a particular challenge for the facilitator. All efforts must be made to ensure that the hierarchy of systems does not get reflected in the proceedings. For example, the junior or female participants should not get relegated to the background, while the community elite and project staff take center stage. Special care must be taken to ensure equal participation for all. It is advisable to use the services of professional facilitators proficient in the local language. A team of one facilitator and one or two cofacilitators or recorders is preferable.

The facilitator and recorders must be very alert to capture special features of the group dynamics between the different participant categories and make notes when views differ consistently. The facilitator is further asked to record their intuitive feelings on the credibility of the data: Did all participants take the activities seriously and seem to answer truthfully? Were there any inhibitions among certain individuals or groups?

Source: Dayal et al. 2000.

Policy-level Assessment

4.24 The policy-level assessment is a means to provide feedback to policymakers on the findings from the participatory exercises. Depending on project needs and the local context, two types of techniques can be used for the assessment. One is a desk study of policy documents followed by one-on-one interviews with key policy officials. The second may be more applicable in larger countries with elaborate policy formulation systems, as it involves a formal meeting with relevant policymakers. In such a situation there might be a use for participatory tools, such as pocket voting, to stimulate dialogue on issues such as how the particular project compares to other projects, whether the project is meeting important objectives, and how tariff and subsidy policies affect project beneficiaries.

Results and Feedback For Project Planning

Visualizing and Self-Scoring

4.25 The use of open-ended and visual methods of the participatory assessments do not require literacy, and so allow those with lower or no literacy—often women, the poor, and older people—to voice their views on policies and issues that would otherwise not be possible. The technique is carried out in several steps. First, different social groups involved in the communities, agency personnel in sector institutions, or policy formulators at the national level use the techniques described above to evaluate relevant aspects of the projects. They produce a visual summary of their scores, such as marks along a rope, number of pebbles or beans in the cells of a scoring matrix, or the number of voting cards put in the pockets of a pocket voting matrix. Second, the group uses these outcomes to reach consensus on their score on the ordinal scale associated with the assessed aspect. Finally, they analyze the implications of the data for the project. On the basis of these agreed viewpoints, the groups of women and men are asked to identify where their community belongs on a ladder of scores for the particular indicator being measured. Agency personnel and policy formulators follow the same process of joint scoring on the matrixes at the institution and policy levels. Since the outcomes are visible to all, they generate discussion and the emergence of one or two consensus viewpoints.

Scoring Matrices

4.26 The scoring matrices consist of a series of scales with descriptive options. They are based on the indicators and subindicators from Table 3-1. The scoring matrices are used in conjunction with the tools described above to record perceptions of participatory indicators according to gender and social class. They translate relatively qualitative data into a quantitative form. Community members, project stakeholders, and managers may use such participatory results to compare progress over time or to make comparisons between different communities. Scoring is also a method to generate discussion and bring out any differences in perceptions and preferences among different social groups.

4.27 The scales generally range from zero to three or four, indicating low, medium, and high scores. A process of joint scoring on scales is followed at the community as well as the institution and policy level. During the team training, orientation, and work planning process, the team should develop recording forms for each scale separately on a page with space for team observations and notes to record the quantitative scores and qualitative information from the focus group discussions.

Lessons from Previous Studies

4.28 Experience with the use of participatory assessment to date has given rise to some lessons and conclusions. If the participatory approach is used like a conventional survey, or if the data is simply collected but not analyzed and discussed with the community afterward, the communities, practitioners, and project management lose the learning and the capacity building effects of the methodology. The teams should therefore avoid using participatory methods in such an extractive manner.

4.29 Although gender and poverty aspects are built into the approach, a conscious effort to highlight these issues at every stage is essential. The team should help participants to analyze outcomes on gender and discuss their implications. Women and poor individuals should be involved in all stages of the research method, including information gathering, analysis, and planning for the future.

4.30 Careful selection and training of participatory assessment teams are critical for success of the research effort. The training prepares the team to understand, analyze, and record accurately the views of different groups in a community. Prior experience in participatory research and gender analysis is essential for the team.

4.31 Finally, boxes and scales alone cannot catch the richness of community conditions, achievements, and problems. To elicit the full picture, it is essential to write down interesting information during the participatory sessions and inquire into other local factors. The team is advised to take copious notes and to include sections for note taking in field books and scoring matrixes.

Conducting the Socioeconomic Impact Survey

4.32 Statistical approaches to the development of a monitoring and evaluation methodology for rural electrification projects often involve the use of surveys based on random samples of households or individuals. The typical approach taken for evaluating projects is to survey households in a project area with and without electricity. This establishes a baseline for the people living in the project area. A survey or part of the survey can be conducted at periodic intervals during the execution of the project.

4.33 The approach in this study is to conduct the cross-sectional comparisons that allow for examining the long-term benefits of rural electrification and the use of period samples to track the progress of a rural electricity project over time. Both approaches are valid and have their own strengths and weaknesses. In this section we will

confine our description to the cross-sectional approach, which can be wholly or partially replicated in later years to yield times series data on the impact of the project.

4.34 It should be cautioned that because of the nature of project cycles, time series data at the end of a project lasting five years will not capture all of the long-term benefits that may result from the project. One weakness in many rural electrification project evaluation designs is that the time interval is too short to measure the longer-term benefits. For instance, the long-term education of children takes between 10 and 12 years. An evaluation approach that measures only the impact of a project after one to three years would miss the impact of electricity on long-term education. Though longer-term time series data is desirable, often project managers lack the resources or interest at the end of the project in developing a longer-term effort to measure the benefits of the project.

4.35 In this section, we identify the steps in developing and conducting a cross-sectional survey that can be utilized for generating quantitative measure of the socioeconomic impacts of rural electrification projects, the local markets for electricity services, and the benefits of the project to populations that have purchased systems/adopted service or might do so. These steps are listed in Box 4-5 and described in the following sections.

Box 4-5: General Steps in Conducting the Socioeconomic Impact Survey

1. Identify evaluation objective.
2. Establish research design.
3. Identify sample population and interviewees.
4. Design questionnaire.
5. Implement survey.
6. Analyze results.
7. Feed results back into project planning and implementation.

Identifying Evaluation Objective

4.36 The objectives of any survey must be defined well in advance of its application. Surveys are designed to measure specific types of information. The types of information collected are dependent on the objectives of the monitoring and evaluation program. Different countries, projects, and programs will have different objectives. For example, a conventional power distribution project may be more concerned with identifying rural markets for their services, as their primary interest may be to increase sales. Development institutions, on the other hand, may have greater interest in a project's social development impacts. Finally, donor agencies and governments may be primarily interested in the impacts a project has on society and lessons learned for projects elsewhere.

4.37 However, a rural electrification monitoring and evaluation program will not maximize its benefits if it focuses on narrow objectives. Even successful projects that

do not concern themselves with social development impacts may miss out on an opportunity to gain a better understanding of the markets for their services. On the other hand, rural electrification projects with significant social and economic benefits that have significant financial losses due to poor policies will prove financially unsustainable and ultimately fail. Thus, it is critical to design the survey with multiple objectives in mind.

Establishing Research Design

4.38 Evaluation research for rural electrification is similar to other types of project assessments in several ways. First, socioeconomic changes in the project areas must in some way be attributed to the rural electrification project, as opposed to impacts resulting from other interventions. The research design must therefore address how to isolate the impact of electricity use from other social infrastructure characteristics. For instance, to assess the impact of rural electrification, the use of different appliances before and after electrification can be compared. An alternative to this is to examine households with similar socioeconomic characteristics with and without electricity.

4.39 Further, comparing energy use patterns, social conditions, and the level of economic development or well-being within two closely spaced periods of time will not provide a fair evaluation of the effects of rural electrification. Empirical evidence shows that social changes due to electrification tend to be incremental and often take longer than a few years to detect. Therefore, it is useful to consider beforehand the number of years over which follow-up monitoring and evaluation must be conducted to assess changes. Five years is probably a sufficient period of time between major surveys. For on-going monitoring of the progress of rural electrification projects, two years between surveys is likely adequate.

Identifying Sample Population and Interviewees

4.40 It is usually difficult or cost-ineffective to measure the impacts of electrification on each individual, household, small business and community institution that benefits from the project. Thus, impacts are often measured from a sample of households and extrapolated to the entire population, which the sample represents. The evaluation design must therefore ensure that the results are representative and can be generalized to the intended population. A wide body of literature is available on selecting representative samples (see, for example, Bernard, 1995; Cochran, 1977; Kish, 1965; and Deming, 1950). The methodology selected will depend on the local context, time and resource availability, and needs of the project. The principles discussed above concerning the identification of relevant social groups are equally applicable here.

4.41 The socioeconomic impact study questionnaire should obtain information on adoption of electricity, electric appliance use, and the social and economic impacts associated with access to electricity. For this type of survey research, questionnaires or schedules of questions must be designed to collect information at the individual, household, and small business level.

4.42 At the household level, information should be obtained from both the male and female heads of household.[6/] There are several important reasons for gathering gender-disaggregated data:

- Empirical evidence shows that interviewing just the male head of household may not accurately represent all members of the household;
- Men and women have different roles in society and the household. Thus, they are involved in different activities and have different needs and priorities;
- Women and men may benefit from rural development and infrastructure projects/programs to different degrees and at different levels; and
- Researchers cannot understand the entire picture from only half the population (Range and Omondi, 2000).

4.43 In some cases, males and females will have similar responses, and in others, different responses. Ideally, the same set of questions should be asked separately of both the male and the female in a dually headed household. The responses can then be disaggregated by gender to determine differences between the views of men and women. In households with a single head, male or female, the same set of questions should be asked of this person. However, in practice this is both time consuming and difficult. If the budget is available for such interviews, then it is recommended. However, some questions about the household will result in very similar answers. For instance, it is doubtful that the estimation of the family size will differ according to the respondent. Thus, after pilot testing of the questionnaire, the team should determine the questions to be asked of men and women separately.

Questionnaire Design

4.44 After the broader research questions have been identified, the socioeconomic questions can be designed. These should be developed keeping in mind the priority needs identified by the communities during the participatory research. For rural electrification, several general categories of questions are important to address. These include questions designed to assess whether the market conditions are right for implementing or expanding projects or programs, questions on the socioeconomic impacts of rural electrification, and how the program will affect poverty and gender issues (Box 4-6).

[6/] For the purposes of this report, we assume that each household has one male (the husband or male partner) and one female (the wife or female partner) "head of household," unless the household is "headed" by only one adult, male or female, due to death of a spouse, divorce, separation, or single parentage.

Box 4-6: Possible Research Topics for Questionnaire

- Socioeconomic profile of actual and potential beneficiaries/customers.
- Fuel and energy use prior to improved electricity services, including energy from all sources, such as candles, biomass, batteries, the electric grid, diesel generator sets, etc.
- Monthly expenditures on fuels and energy by source.
- Potential and actual willingness to pay for energy services by application.
- Energy use as it relates to substitutes for improved electricity services (kerosene, candles, and others).
- Reasons for not connecting to the grid or purchasing improved energy devices.
- Barriers to the adoption of improved electricity technologies/services.
- Incentives to overcome barriers to adoption of improved electricity technologies/services.
- Appliances in rural households, including those with and those without electricity.
- Time use (males' and females') as it relates to existing energy use or appliances.

4.45 The next section identifies the types of information needed to shed light on the issues identified above.

Questionnaire Content

4.46 The project's objectives and needs should always direct the content of the questionnaire. Some standard types of information are present in most surveys. This section explains in general terms the type of information that might be covered in a socioeconomic impact survey for a rural electrification project (see Appendix 2 for details).

4.47 The socioeconomic survey questionnaire consists of questions designed to collect data from the consumer on the amount of energy consumed for each end use, as well as factors that influence consumption, energy expenditures, and the development impacts of electricity. If questions jump from one topic to another, the respondents may become confused and produce unreliable answers. Thus, each set of questions should be sequenced to follow the thought processes of respondents. Each topic must be included in both the baseline survey conducted before electrification and in follow-up surveys to assess the impacts of electrification.

Socioeconomic and Demographic Information

4.48 Background information on the respondent and family members is very important. This information should include the respondent's gender and whether the respondent is the female or male head of household. In addition, the demographic profile individual household members can be collected, including age, sex, educational level, school enrollment among school-age children, ability to read and write, and occupation. With such information, the research team can assess the impacts of electricity on different members of the household or community. For example, knowing the literacy level of

each household member before and after electricity will enable the team to assess whether electricity has had any impact on different household members' literacy levels.

Household Income

4.49 One of the most important types of socioeconomic information from any survey is household income. Generally, questions concerning household income are asked in a section separate from that on socioeconomic background. This is because income requires a series of interrelated questions to arrive at an accurate figure, especially in rural areas where often the majority of households earn income from agriculture. Household income can be used to measure the economic well-being of the household as a whole. Empirical evidence shows that a household with a greater number of adult family members usually has higher household income, while households with many small children or headed by a single woman tend to have lower income. Household income questions must address sources of income by family member. Such information will enable the researcher to link whether electricity has contributed to any increase or decrease in income from each specific activity.

4.50 Control over access to financial resources within the household is often a complex issue. It should not be assumed that women and men within the same household have equitable access to financial resources. Thus, it is important to ask income questions separately of the male and female members of the household. It is sometimes difficult to get reliable information on income in questionnaires, as people are usually reluctant to discuss this subject, and this is an issue that can be resolved during the pretest of the survey instrument.

Physical Housing Information

4.51 Household energy surveys should include questions related to the housing unit's physical structure, such as type of dwelling (e.g., apartment; attached, semidetached, or detached home), occupancy (year-round or seasonal), and property status (ownership, rental, or rent-free). Questions should also gauge accessibility of the household to major infrastructure such as schools, health centers, water supply systems, roads, and main access to the home to provide complementary information to evaluate the impact of rural electrification.

Households With Businesses

4.52 In many rural households, male and female household members engage in home business activities. This means that they use part of their home for income-generating activities. Thus, a set of questions must be formed to collect detailed information on these activities. Questions might include type of business, productivity and profitability, who is in charge of and engaged in the business, and whether electrification directly or indirectly impacts these business activities.

4.53 Impacts of electrification on home businesses can be measured in terms of changes in production or efficiency, increased ability to work or operate the business for longer hours, and changes in income or revenue from the business. Knowing whether households engage in business activities at home and the type of business also provides valuable market data for project managers and electricity service providers, as it allows them to assess potential productive uses of electricity in the community.

Existing Fuels Used in the Household

4.54 It is critical to understand what fuels and energy sources are being used in the project area, both before and after project implementation. This will assist in making decisions about which improved electricity technologies and services should be promoted through the project, and help in understanding the impacts of the improved electricity services. The survey questionnaire needs to identify the fuels or energy sources and sources of electricity used before and after electrification, including all fuels used for lighting, appliances, and businesses (Box 4-7).

Box 4-7: Typical Fuels in Rural Areas of Developing Countries

- Candles
- Fuelwood, animal dung, and other biomass
- Kerosene for lamp lighting (wick and hurricane lamps)
- Biogas
- LPG
- Diesel for lamp lighting (wick and hurricane lamps)
- Torch
- Source of electricity
  - Dry-cell batteries
  - Car batteries
  - Household-owned electric generator
  - Electric generator owned by neighbor
  - Electricity from the privately owned mini-grid, village/community grid
  - Electricity from national grid, or regional grid, or town grid
  - Pico- and micro-hydro electric generator
  - Solar PV home system

4.55 Empirical evidence from past surveys on rural electrification suggests that even after grid connected electricity becomes available in a community, a significant number of households may not adopt the service right away. This is true for several reasons. First, electricity is often expensive, precluding its use for activities that use large quantities, such as cooking, even for many wealthier families. Second, electricity must be used with appliances that can be costly; thus appliances are often only acquired incrementally. Third, the quality of grid electricity service is often poor. Fourth, house wiring problems and costs may limit the use of appliances. Finally, many people may prefer to continue using the energy sources with which they are familiar. Such reasons for the delay in adopting electricity from grid systems also hold true for renewable energy systems.

Energy Consumption and Expenditures

4.56 Once types of fuels and energy sources before and after electrification are defined, the next step is to assess the quantity consumed and associated expenditures for each energy source. This can be done by asking questions concerning average quantity of energy consumed per month by purpose, monthly expenditures on each fuel, and the average price paid for it, either in cash or labor used to collect it.

4.57 Knowing the quantity of energy consumed and its associated expenditures enables the team to evaluate and compare the costs of various types of energy. In this way, the expenditures and use can be compared both before and after the electrification project. Quantitative data on energy consumption and expenditures can be analyzed in conjunction with expenditures and use of particular appliances to quantify the quality and cost of energy use for particular applications. One technique used to measure the benefits of having electricity is to examine the price and quantity of lighting for a household before and after having electricity. This generally involves a switch from the use of kerosene lamps to electric lights. Also, what people consider "expensive" for each activity can often be very telling, and can vary greatly by gender.

Reasons for Adopting Electricity Service

4.58 Understanding why customers do or do not adopt electricity can be useful for finding ways to improve services, formulating marketing strategies, and developing ancillary programs to widen the use of electricity service. Often, this relates to a household's perspective of what is "expensive." As discussed above, evidence has shown that once electricity becomes available in a community, not all of the potential customers adopt it. Knowing the barriers that keep potential customers from adopting electricity will enable project managers and service providers to increase customer satisfaction and connection rates, which can increase the company's revenues.

4.59 Some common barriers to adoption include high connection costs, expensive house wiring, and lack of appliances. Other survey questions may be focused on assessing strategies to promote rural electrification and increase adoption or connection rates.[7/] For example, to help potential customers overcome up-front costs, rural electrification programs may decide to include a credit program for connection costs, and the survey can reveal whether households might take advantage of such a program. Questions concerning attitudes toward electricity can also be used to assess the characteristics of customers versus noncustomers, providing insight into the reasons for adopting electricity service.

7/ The use of information gathered from the participatory assessment can be useful in finding out why some choose while other choose not to adopt new electric services, and understanding the characteristics of nonparticipants. This information can then be used in designing the survey questions.

Quality of Electricity Service

4.60 It is very important to understand the quality and reliability of the electric service being provided to consumers, and how the service is perceived by different social groups. For example, a community may have access to the electric grid, but their service is unreliable. In other cases, off-grid systems have been installed, but have not been properly maintained leading to operational problems. Elsewhere, a small hydropower generator may supply electricity, but households may only use electricity only during the rainy season or for half of the year.[8/] As a result, customers continue to rely heavily on traditional fuels, such as candles, kerosene or rechargeable batteries for services that are inferior to those provide by electricity. To collect information on electricity services, questions must be designed to measure quality of services, such as frequency and length of electricity outages, and how well the system/equipment is maintained (Box 4-8).

Box 4-8: Assessment of Quality of Electricity Service

- Number of hours per day and number of days per week household/customer has access to electricity.
- Number of months per year the sampled household/customer has access to electricity.
- Number of power outages during the past month.
- Average length of time each power outage lasts.
- Whether the sampled household experiences any drop in voltage (dimming of lights) or unscheduled power cuts.
- Frequency of system/equipment breakdowns.

Appliance Ownership and Use

4.61 Appliance ownership and use greatly affects power supply and power load, and therefore both the impact of electricity for rural households and the financial viability of the electricity provider. Empirical evidence shows that the pattern of appliance acquisition and ownership among rural households after electrification is an incremental process. Typically, household customers acquire electric lighting as the first application (see Box 4-9); subsequent appliances usually are a fan, small radio and tape cassette, television, or other video equipment. Small business applications outside the home typically include lighting and fans, electrification of mechanical activities, and food processing and preservation. Understanding how decisions are taken to purchase these items is quite important.

[8/] Recent statistics from China's Ministry of Agriculture indicate that approximately 87 percent of rural farm households are electrified, but for some, supplies are limited to the rainy season (six to seven months per year).

4.62 Appliances can serve multiple functions. For example, an electric fan not only cools the air and provides comfort, but also blows mosquitoes and other disease-bearing insects away from users. Radio and television provide not only entertainment but also useful news and information.

4.63 The survey questions should include all types of appliances commonly used among rural households in the project area, and the number of appliances owned by each customer. Households may own more than one appliance of the same type; therefore, questions should check the number of appliances owned. Information on power tools and motive power equipment commonly used for income-generating purposes should also be collected. It is also important to know the wattage of each appliance, the intensity of usage, and the associated electricity cost. As an example of the utility of this information, the impact of electricity on the household can be measured by comparing cost and number of hours spent of watching television powered by a car battery with those made possibly by having the grid or a solar PV system.

Box 4-9: Impacts of Electric Lighting

Electricity is used for lighting in virtually all households with electricity. To measure the impact of electric lighting for rural households, it is important to know the number of lighting appliances used by the customers pre- and post-electrification. These appliances should include nonelectric equipment such as candles, kerosene simple wick lamps, regulated wick lamps (hurricane lantern), and pressurized kerosene lamps for households without electricity. For those with electricity the lamps would include incandescent lamps, fluorescent lamps, and compact fluorescent lamps. The questionnaire also must include the length of time that each lamp is used in a typical day. With this information, researchers can make comparisons for rural households with and without electricity in regards to the price and the quantity of lumen hours utilized. Typically, households with electricity consume more than 20 times more lighting than households with kerosene lamps, but the price per unit of light is substantially lower. Such information can be utilized to quantify the benefits of electric lighting for rural households using methods involving "willingness to pay" (see Appendix 2).

Time Use

4.64 Changes or differences in time use for a family adopting electricity can be an indicator of the impact of electricity on the lives of the rural poor and women. The quantification of the way men and women of different socioeconomic classes spend their time helps us understand the different roles, responsibilities, and burdens these different groups face. With this knowledge, we can assess whether improved electricity services have improved the ease, efficiency, or productivity of these activities, and whether additional time has been freed for other desired activities.

4.65 For those studies interested in gender differences, it is worthwhile to ask the same set of questions to both male and female respondents. For example, fuelwood collection has traditionally been considered a women's activity. However, recent studies show that men are increasingly involved in fuelwood collection. Women tend to gather fuelwood near the home, but rising resource scarcity is driving families to either travel farther to collect fuelwood or to buy it in the market. These latter activities tend to be men's responsibilities. Thus, time and resources permitting, the survey of time use would contain the same set of possible activities for both men and women.

Customer Attitudes Toward Electricity

4.66 Since the main objective of the survey is to measure the impact of electricity on the lives of rural households, the survey should contain a series of attitude questions on electricity and other household energy sources. The survey questions might contain information on the respondents' fuel preferences, attitudes toward different energy sources, attitudes toward renewable energy technologies, perceived costs and benefits of electricity, and the willingness to pay for electricity services. These can be developed in the form of statements with which the respondents are asked to agree or disagree.

4.67 The participatory assessment may provide a valuable source of information concerning which attitude questions are important to include in the quantitative survey. This might possible address the perceived value of electricity in terms of productive uses, education, health, and feelings of safety to name just a few issues. For gender analysis, these questions should be asked to both the main male and female if there is sufficient budget and time.

Survey Implementation

4.68 Qualified and well-motivated field staff and enumerators are critical to the success of any survey. The field staff should be organized into teams. Each team will consist of three to four staff including the supervisor, who will provide the oversight. Depending on the customs in the country, the staff will involve both male and female enumerators. The number of persons in a team generally is based on the assumption that one enumerator can complete two to three household interviews in a day. This will depend on the length of the survey interview and the number of household members that must be interviewed during the course of the survey.

4.69 Ideally, the interviewing team will consist of two enumerators per household for the purpose of interviewing men and women. The administration of the questionnaire can vary quite a bit because of local customs. In some cases it is absolutely essential to have both male and female enumerators present in the same household for the interview. In others, the questions can be asked in a group setting, with the appropriate responses coming from the individual that knows the most about the issue under discussion. In others, men and women will respond adequately to interviewers of either sex. Successful interviewing strategies are developed as part of the pretesting of the questionnaire.

Analysis of the Results

4.70 Information gathered during the socioeconomic survey can be analyzed at a number of different levels, using a number of different statistical techniques. An in-depth analysis, which involves the use of social or economic valuation techniques, can also be done. This can provide information useful to project managers and donor agencies in deciding on changes to improve project efficiency and effectiveness and in planning for future projects. As a minimum, the results of the analysis will be presented in the form of tables, and a report will be written that interprets and provides information and policy conclusions for projects and policy planners.

5

Conclusion and Recommendations

5.1 The monitoring and evaluation approach advocated in this report uses both qualitative and quantitative techniques to improve the quality of rural electricity projects. To improve their chances of success, rural energy projects should adopt such qualitative and quantitative research techniques in order to provide timely feedback to project planners. The reason that such research is important is that most successful rural electrification projects have involved solving problems that inevitably develop in implementation. The ultimate goal is to improve the quality of rural electricity projects so that they are sustainable over the long term. Without long-term sustainability, the benefits of rural electrification or rural energy projects can never be fully realized.

5.2 These monitoring and evaluation techniques that can be utilized in rural electricity projects involve both participatory and survey methodologies. The participatory method spans a variety of well-established qualitative methods including focus group discussions, pocket voting, and others. Under this approach, community members take an active role in the project by giving their preferences and opinions from the design stage through project execution. The survey approach is more quantitative involving the use of questionnaires, random samples of populations, and formal interviews. Both project participants and nonparticipants are interviewed to elicit their patterns of energy use and opinions about electricity and the project.

5.3 If these approaches are adopted within a project, the monitoring and evaluation evolves from a simple reporting of information to making a contribution to design and execution of projects based on input from its participants. The insights gained both from the different methods and for the various beneficiaries of the project provide regular feedback to those designing and implementing the project, leading to the more equitable and successful projects.

Greater Emphasis on Evaluation of Socioeconomic Development

5.4 In the past, those rural electrification projects with any emphasis on incorporating research into the planning process have been more successful than those that simply target the number of new connections to be achieved. Unfortunately, most rural electricity programs measure strictly quantifiable variables, such as the number of electricity connections made or the number of systems installed. They typically are not designed to measure social or economic impacts of projects, often resulting in a lack of knowledge concerning how the project can achieve higher levels of development with the same resources. These incomplete understandings of market forces and program impacts on members of the target community hinder the development of initiatives that have positive, equitable, and sustainable social development impacts.

5.5 By contrast, even for grid electrification, those projects that have been most successful have paid more attention to their consumers. The reason is that electricity sometimes can be a key element in enabling different social and economic groups to meet some of their strategic needs. These needs may include improvement in rural productive activities, creation of new productive activities, or enhancement of important social benefits such as reading or communications. This overall improvement in the quality of life can be tracked according to social class and gender.

Evaluation As An Ongoing Process

5.6 The advantages of using evaluation techniques from the early stages of the project through project completion far outweigh the relatively low overall costs in the context of a major investment project. Assessment methods are important to apply not only during project evaluation, but also during all stages of the project, from identification and design through closure. In most traditional rural electrification monitoring and evaluation, the research methods are applied only after the project is initiated. However, using participatory and survey methods in the early stages of project design is equally important. To the extent that the evaluations keep project managers focused on the ultimate beneficiaries of a development project, the use of evaluation techniques may save substantial amounts of money by avoiding problems.

5.7 Although there are great benefits to project evaluation, it should be kept in mind that project success is not automatically guaranteed because it involves an evaluation component. The success of projects depends on the interaction of project components with other important factors, such as the institutional setup of the project, the local level of wealth in participating communities, the access to community infrastructure and many others. Evaluations techniques help to focus project managers on the ultimate project goals, which to a large extent involve satisfying the expectations and needs of the project beneficiaries. Also, this approach is new for the energy sector, and will have to be further developed and applied as experience is gained from the application of these techniques discussed in this report.

Approach Valid for Rural Energy

5.8 The approach recommended in this report has been developed specifically with both centralized and decentralized approaches to providing electricity to people in rural areas. However, a variety of different types of energy are used in rural areas. These include firewood, charcoal, animal dung and other biomass, biogas, kerosene, diesel, and other oils. The energy devices in rural areas are also quite diverse including cookstoves, kerosene lamps, electric lightbulbs, televisions, radios, telephones and other technologies. The method developed for this study can easily be adapted to cover the other energy sources. Thus, the recommended needs-assessment process provides broad information to help project designers and communities make informed decisions about the energy technologies and services that will be promoted through the project.

5.9 In closing, the combination of economics, environmental, social, and cultural factors identified through the monitoring and evaluation research will enable both rural people and project planners to tailor appropriate solutions to problems faced by different genders and social groups in obtaining quality energy services. The methodology that should be followed identifies the issues involved in such programs and then develops a monitoring and evaluation research strategy to deal with the issues that are important in the sector. Rural energy projects that start with the assumption that a particular technological application is the only solution cannot possibly respond to the many pressing needs faced by rural populations. The advantage of starting with a needs and market assessment is that projects can be more easily tailored to the requirements of local populations.

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Appendix 1

Participatory Assessment Methodology

Training the Participatory Assessment Team

1. Participatory analysis requires more than participatory tools. The tools function well only in the hands of people trained in participatory approaches. All members of teams undertaking participatory assessments with community groups must be trained and experienced in the application of participatory methodologies to complement each other in the field.

2. It is important for the team members to participate in hands-on or role-play exercises after covering each tool, demonstrating how they will apply it in the field (Box A1-1). The training can be structured to focus on the three levels of the participatory assessment: individuals, communities, and policies. Training further encompasses preparing the field books, practicing gender and poverty analysis, entering data, and scoring. It also includes analysis of the results of individual sessions. At the end of the training, the research team should conduct several practice sessions before engaging in the actual work.

Box A1-1: The Training Process

1. Conceptual understanding of the demand-oriented approach for evaluating rural electrification projects.
2. Objectives of the assessment, implementation, and/or monitoring process.
3. How to deal with the expectations of the participants in relation to the objectives and/or other issues.
4. Facilitation process and logistic arrangements.
5. Definition of terms and concepts to ensure consensus on issues of interpretation and perception.
6. Review of the indicators, means of verification, coding, scores, and data entry.
7. Emphasize that the team will be expected to collect disaggregated data on gender, poverty and demand-responsive approaches and analyze how these factors affect project performance and sustainability.
8. Team involvement in development and adaptation of the participatory materials.
9. Hands-on experience with participatory tools and scoring matrix. Thorough review of the purpose and application of each tool or research instrument, how the materials for administering the tools are developed (e.g., pocket voting), and the information expected to emerge from each tool.
10. Selection of communities for pretesting and preparation for and implementation of field-testing.
11. Feedback session and modification of the participatory tools.
12. Definition of the scope of the study and sampling criteria.
13. Outline for written report agreed upon.

Developing the Team's Work Plan

3. As part of the training process, the team should jointly develop a work plan for implementing the participatory assessment (Box A1-2).

Box A1-2: Work Planning Tasks

1. Come to agreement on conceptual understanding of the participatory framework and issues.
2. Come to consensus on objectives of the participatory assessment.
3. Identify scope of participatory assessment, including the levels of analysis.
4. Define sampling criteria.
5. Modify and adapt participatory tools and research instruments, including field books for project needs and local conditions.
6. Define roles and responsibilities, including for data entry and report writing.
7. Develop action plan for the fieldwork, including logistics.

Participatory Assessment Tools

4. The participatory approach uses particular tools for specific purposes but has creative flexibility; the assessment team can choose among different tools or develop their own variations (see Table A1-1 for a summary of the tools and their function). This appendix includes these tools, a sample System Observation Form, interview guides, and a model Community Data Sheet as well as the Scoring Matrix for each of the variables and indicators in Table 3-1 in Chapter 3.

Table A1-1: Summary of Participatory Assessment Tools

Tool	Main purpose	Gathers data for which indicators
Community data sheet	To get general data on the participating communities and allow the identification of factors other than participation, gender, and demand responsiveness that may explain the variation in quality and maintenance of service.	Used as perspective against which to assess other indicators
Wealth classification	To classify the community's population into economic categories based on locally specific criteria, which are used for focus group discussions, community mapping, and other activities.	Used as perspective against which to assess other indicators
Community map	To learn about the community's current electricity systems and access of rich, poor, women, and men to them.	1. Effectively sustained service 4. Division of burdens and benefits 5. Participation in service establishment and operation
Focus group discussions (FGD)		1. Effectively sustained service 2. Equitable access and use 3. Degree of change in social development indicators 4. Division of burdens and benefits 5. Participation in service 6. Institutional Support for gender- and poverty-sensitive demand responsive participation

Tool	Main purpose	Gathers data for which indicators
Transect walk with rating scales and system observation form	To determine extent and nature of electricity services present in community, and quality of installed systems.	1. Effectively sustained service 2. Equitable access and use 4. Division of Burdens and Benefits
Pocket voting	To determine preferences, behaviors, decisionmaking, and perceptions. This is particularly useful when the subject being assessed is sensitive and people are reluctant to state their views publicly.	Can be used to gather data on all indicators, but particularly: 2. Equitable access and use 3. Degree of change in social development indicators 4. Division of burdens and benefits 5. Participation in service 6. Institutional Support for Gender- and Poverty-Sensitive Demand Responsive Participation
Ladders	To assess the extent to which a service meets the users' demand and to which the users consider the benefits worth their costs, and the impact of the electricity service on women's time and workload in relation to those of men.	2. Equitable access and use 3. Degree of change in social development indicators 5. Participation in service
Stakeholder Meet	To examine institutional indicators and shares the findings of the community-level analysis with all stakeholders.	6. Institutional support for gender- and poverty-sensitive demand responsive participation
Policy-level assessment	To assess degree to which national sector policies are present to support demand-responsive renewable rural electrification projects.	7. Policy support for gender- and poverty-sensitive demand responsive participation

5. Community-level assessments are comprised of a sequence of activities to be carried out in a community over a period of two to three days. The final schedule of activities must be determined in consultation with groups of participating women and men and activities must take place at a time and place of their convenience. Fixed workshop schedules are not appropriate. Sessions should be planned so as not to disrupt livelihood-related activities or domestic routines. Periods when communities experience seasonal stress or heavy workloads, such as agricultural planting and harvests, or festivals, should also be avoided. Table A1-2 below contains an illustrative schedule of work in and with a community. The actual schedule will be locally specific as convenient to community members, and will depend on whether the assessment covers household installations, community managed generators, commercial installations, or a combination of these; and whether the assessment is being used for preproject design, monitoring, or postproject evaluation.

6. Individual tools mentioned in the schedule are explained in the following pages.

Table A1-2: Sample Schedule for Community-level Assessment

Preparation	Contact leadership, both male and female. Explain assessment and seek participation. If positive response obtained, set dates and arrange logistics.
Day 1, morning	Review general approach and topics with community leaders, rural electricity entrepreneurs, M/F, local committees/groups (if applicable), at spontaneous gathering. Fill in Community Data Sheet. Organize for community mapping in afternoon or evening at convenient time/place with M/F, R/P.
Day 1, morning	Start record review and open discussion with females and males on functioning, finance, and access (continue on day 3). Start recording and scoring with community members. Cross-check validity and influence in open discussion: are other factors influential?
Day 1, late afternoon /evening	Wealth classification and community mapping. Use map to arrange transect walk route and participants (M/F, R/P) for next day. Assist community in transferring map to paper. Community mapping may be done before wealth classification as an icebreaker. Groups could return to community mapping after wealth classification to mark household economic categories. Continue recording, scoring and open discussion for other factors with community members.
Day 2, morning	Conduct transect walk and contact households with new and old electricity installations.
Day 2, morning and evening	Team splits in two. Start open discussion with focus groups on explanatory factors for findings on sustainability and use. Do participatory assessment using map on service operations, use and contributions: patterns of use (pocket voting), demand-responsiveness and costs v. benefits (ladder), time budgets for M/F (listing and scoring), income/expenses for M/F (100 seeds), and history of participation in information, decisions, and contributions (pocket voting matrix). Score with groups. Cross-check on validity, relevance, and other factors.
Day 2, evening	Recording and scoring group information.
Day 3, morning	Continue interviews and records review with rural electricity entrepreneurs and community leaders. Continue focus group sessions, scoring, reviewing with groups.
Day 3, evening	Record and score overall data from day 3.
	Team records and scores overall data of day 3. Team analyzes total scores from days 1 through 3. Team prepares report for plenary.
Day 4	Present findings to plenary and/or focus groups and check accuracy and completeness of findings: do the reported factors explain the level of sustenance and use, or are other factors involved? Discuss possible actions to address needs and problems (such as irregular service, equipment malfunction, lack of access to service, levels of safety, environmental pollution, availability of spare parts, etc.), including where support may be sought to address the priority concerns and actions.

7. Factors that might inhibit participation must be anticipated and strategies planned to deal with them. For example, in some countries women often hesitate to speak in front of men and figures of authority. Gender-segregated sessions are essential in such settings. The presence of government officials or the village chief may hinder free expression of views by women, the poor, or other user groups. One obvious strategy would be for a team member to tactfully remove the inhibiting person from the scene. He or she could take the person away, perhaps to inspect the installation, to review records, or to begin an individual interview elsewhere. A dominant participant who keeps speaking on behalf of everyone else could be treated in the same way or given a different role, for example as a co-rapporteur or a photographer of the participatory sessions.

8. Establishing trust before starting to work in a community is essential. The team can approach the community in a culturally appropriate manner, for example, by introducing themselves to the village elders and seeking their approval of the proposed assessment. To break the ice, the team can join in community functions and group activities with the approval of community leaders. Intermediaries (e.g., nongovernmental organizations, community-based organizations) who are known and trusted by the community can also introduce the team.

Records Review and Community Data Sheet

9. The participatory assessment team identifies and reviews all relevant documents and records, as background information. Next, together with the local authorities, the team collects general data on the community and existing systems/services, and records it on the Community Data Sheet. The purpose of this sheet is to get general data on the participating communities and allow the identification of factors other than participation, gender and demand responsiveness that may explain the variation in quality and maintenance of service. These are the exogenous factors that influence the variables considered in the participatory assessments. Not all of these are included in the framework (e.g., the type and complexity of the technology, age of the system, local mobility, communications and leadership situations, local gender and poverty conditions), but many can be captured through data collected in this community data sheet as well as open qualitative data recorded by the assessment team.

Wealth Classification

Purpose

10. To classify the village population into three economic categories (rich, poor, and middle-income) on the basis of locally specific criteria and using culturally appropriate terms. These classifications will be used to identify groups with which to hold focus group discussions, for mapping the access of the poor and rich to electricity, functions, and jobs, and to identify the group's differential rates of participation in community decisionmaking, management of services, benefits, and so forth.

Process

11. Discussion is started with groups, which must include women, about how they differentiate between households in their community. The types of criteria mentioned are noted and when socioeconomic criteria are mentioned (which typically happens very quickly), the facilitators provide some blank sheets of paper and ask the group to draw pictures of a typical well-off person in the community. When someone takes the pen and starts drawing, the facilitator asks others to draw a typical poor person and a typical middle-income person. The terminology to be used for rich or poor households should be taken from the group's own language, so as to be culturally acceptable. As the drawings are not professionally done they usually generate some good humor and serve as icebreakers for the group. The pictures are placed some distance apart on the ground.

12. Using the drawings as a starting point, the group begins to describe the characteristics of each category, one by one. As the answers emerge, someone from the group lists them under the picture in question. It is usually helpful to start with the "rich," move on to the "poor," and end with the "middle" category. The activity continues until at least six or seven characteristics have been identified for each category. Facilitators may probe to understand fully the rationale or community-specific reasons behind the stated characteristics. They may also ask questions about single-headed households. How common are they? Do they consist predominantly of single mothers? What is their socio-economic situation? How well can generalizations be made?

13. Participants then distribute a pile of 100 small stones or seeds (representing the total population of the community) across the three categories. They count the number of stones in each category to estimate what percentage of the population is in each. The group then records the resulting characteristics and percentages on a large sheet for ready reference during later assessments requiring differentiation between rich and poor.

Minimum Information to Emerge

14.
- Agreed criteria for classifying households as rich, poor, and middle-income.
- Approximate distribution of households in these categories.

Analysis and Scoring

15. Record the distribution of the community households across the three categories and their relative distance. This information will be used to identify the focus groups of rich and poor females and males with which the later discussions and assessment activities will be held. If all three economic categories have approximately equal proportions, equal numbers of rich and poor households can be chosen at random for the focus group discussions. If the intermediate and poor categories are of approximately equal proportions and there are only a few rich families (less than 10 percent) relatively far from the intermediate level, have separate discussions with randomly chosen intermediate and poor neighborhood groups as explained in the community mapping exercise. However, discuss with both focus groups how the rich families differ and add this as qualitative information to the Community Data Sheets. If the rich families differ only marginally in their characteristics from the intermediate group, the two groups can be taken together. If there are only a few poor households (less than 10 percent), hold focus group discussions with randomly chosen intermediate and wealthier groups. However, add qualitative information as to how the contributions and benefits differ for these poor households by interviewing them separately or, where socioculturally possible, inviting them to take part in the discussions in the randomly chosen intermediate group and indicate how their situation differs.

16. Wealth classification provides a snapshot of the nature and extent of poverty in a community in the view of community members. This information is not relevant for analysis by itself. It should be used as perspective against which to assess financial data on community contributions, tariffs for services, the extent of subsidies,

and so on. No scoring is required for this tool. Its purpose is to understand the nature and extent of poverty in a specific community and identify groups for further sessions.

Materials Required

17.
- A few sheets of paper, approximately A-4 size
- Marker pens
- Large sheets of paper for recording results
- Stones or seeds or beads

Community Map

Purpose

18. The purpose of this tool is to learn about the community's situation regarding all electricity facilities (those acquired as a result of the project, as well as those acquired through other means) and access of the poor, rich, and middle-income households to them; and to depict which households (rich, middle-income, or poor) have women or men working (paid or unpaid) in the energy sector, and whether they have received training.

Process

19. The participants for this activity are the members of the community. The inclusion of women should be ensured. The day before this activity, discuss it with village representative (both female and male) and agree on the area to be mapped. For large villages, it may be cumbersome to map the whole village down to the household level. In such cases, draw a general map of the layout of the village and mark the old and new (created through the project) electricity supply systems, as well as the rich, intermediate, and poor households or neighborhoods, according to the criteria agreed in the wealth classification. Then select one or two subvillage zones or habitations served by those systems for detailed mapping, making sure that the zones represent both better-off and less-well-off households. Thereafter, ensure that the community group that participates in the community mapping accurately comprises the residents of the area to be mapped.

20. Ideally, the venue for this activity should be a public place that is easily accessible and can accommodate a large group. It should be adequately lit at night and protected from harsh weather. The activity can be carried out in one day. The facilitator explains the purpose of the exercise, helps start a discussion with the community group to develop a basic list of features that should be indicated on the map. These could include roads, lanes, paths, and homes (marked in some way to depict the income category they represent); major landmarks such as forests, hills, crop fields, schools; and mosques, churches, or temples; all electricity supplies, sources, and applications; facilities related to operation and maintenance of the system(s) (supply stores, recycling or disposal facilities, etc.); public uses (street lighting, schools, health centers); and homes with private systems, homes where the women's or men's work includes provision, use, or maintenance of electricity-related services, e.g., appliance sales and repair, and homes where men or women have received training of any kind for electrification-related skills or who provide related services or products.

21. Groups of men and women, jointly or separately depending on gender relations, draw a map of the local settlement. Depending on the local situation and availability of space and materials, they may choose to draw it on a large sheet of paper (e.g., 2 to 4 sheets of butcher paper taped together, using drawing materials with which they are familiar), on the floor, or on open ground. The relevant features are introduced using local materials, such as pebbles, seeds, flour, or twigs for a map drawn on the ground, or symbols for a map drawn on paper. When maps are made on the floor or on open ground, the literate villagers and team members transfer them to paper after completion. The team will use this map for further reference, particularly in planning the route and including participants for the transect walk.

Minimum Information to Emerge

22.
- Number, type and location of all electricity supplies, sources, and applications, as well as facilities related to operation and maintenance of the system(s).
- Degree to which the electricity applications meet expected needs; i.e., are there frequent power cuts, and if so, are users notified in advance; are there frequent voltage fluctuations, and are appliances or households goods (e.g. food storage) damaged as a result; are needs met only at certain times of the day or only during certain seasons of the year; and so forth.
- Frequency and timing of service interruptions.
- Predictability and influence on regular availability of electricity.

Analysis and Scoring

23. If the drawing was done in the soil, transfer and copy the map and its legend onto paper. Leave one copy in the community. Keep a second copy with the other assessment data for later aggregation of data. Use the map to plan the route for the transect walk. Include in the route both wealthier and poorer areas, as defined from the wealth classification. Invite representatives from these areas to join the walk, if possible. Use the map further to draw the sample for the focus discussion groups. Circle on the map the areas that will be sampled according to the decision taken after the Wealth Classification. Give each area a number. Write the numbers of the less-well-off areas on slips of paper, fold the slips, put them in a bag or hat, shake the contents, and draw one. Do the same for the better-off areas, if there is more than one, or for northern, southern, eastern, and western parts of the section if it is substantial. The two areas drawn by lot are the ones where focus discussions and assessments will be held.

24. To assess access to services, examine the locations of the facilities vis-à-vis the clusters of homes. Which clusters of households are well served, through proximity to facilities or household connections? Which clusters are not? Ask why. Facilitate the group discussion to bring out the rationale for and stories behind the site selection of facilities. Present the scoring format on proportion of people using the service and ask the group to select the score that represents the community situation. To assess quality of service, ask about the quality and reliability of service from the mapped facilities. Are there variations among them? Which ones are functioning well and which

ones are not? What are the reasons? The answers will explain aspects of management and financing of services.

25. To assess equity in sharing costs versus benefits, discuss what poor and rich households with electricity contribute to the service. Which appliances are used, and when/how are they used, between households (i.e., inside lighting to allow weaving at night vs. outside lighting to allow crop processing at night)? Do some households also use electricity for productive purposes? What type of households and for what type of uses? Are these uses reflected in the costs/fees/tariffs? In assessing equity in community management and capacity building, in the case of community-managed schemes, examine the map to identify the homes of people on the management committee and people who have received training in technical, financial management, and safe and environmentally appropriate use. Help the community group to find out how many men and women are on the committee, how many men and women received each type of training, and how many are from each economic class. Ask them to consider how many of those trained are making use of those skills. On the basis of the emerging information ask the group to score its community situation, by presenting scoring formats on types of skills created and practiced.

- System quality
- Effective functioning
- Equitable choice and access
- Affordability
- Efficient, safe, and environmental use
- Proportion of community using electricity for nonincome and income-generating uses
- Participation during establishment and operations
- Legal status and rules and tools of control for local electricity committee

Materials Required

26.
- Locally available drawing materials familiar to the participants, e.g., colored powders, brick dust, sand, chalk, charcoal, twigs, or matchsticks. More conventional materials such as sheets of newsprint or brown packaging paper and marker pens can be used where locally and cheaply available and if people are familiar with their use.
- Locally available marking materials or symbols such as seeds, pebbles, leaves, berries, pieces of twine or string, colored powders, paper squares with painted symbols, small flags, or household objects.

Focus Discussion Groups

Purpose

27. To get a better general understanding about the attitudes and preferences of particular groups or populations within the community on specific topics.

Process

28. The facilitator recruits a group with similar characteristics to discuss a particular topic. Focus group discussions should be held at a minimum with groups of community members, the local electricity committee, and service providers. Typical focus groups have 5 to 15 members, plus the facilitator. If the group is too small, it can be dominated by one or two participants; if it is too large, it can be unruly and difficult to manage. The facilitator starts a discussion by asking one or a few leading questions, then lets the group organically move into whichever topics it wishes to discuss. The facilitator takes extensive notes, and summarizes the main points made during the discussions.

Analysis and Scoring

29. No scoring is required for this tool. Its purpose is to get a better understanding of the topics of importance to the participants and their attitudes and preferences with regard to particular topics. Information generated in the focus discussion group will inform many of the other tools.

Transect Walk

Purpose

30. The purpose of this tool is to determine to what extent properly installed and well-maintained electricity services are present in the community, and to cross-check some of the information on the community map.

Process

31. During the walk, team members observe the quality of electricity system installations using the System Observation Form (see Table A1-4), discuss their observations with the community members, and record the findings. Households in the vicinity are questioned on the maintenance of electricity systems, their scope and nature of use, and any conflicting demands on them. To assess satisfaction with service delivery (demand-responsiveness), rating scales (see Box A1-3) drawn on the ground are used in each neighborhood visited during the transect walk. The group helps to select the aspects of service delivery satisfaction that are to be scored. This may include the degree of access to service, sufficiency of power to meet all needs of men and women, regularity and safety of service, predictability of service, adequacy of operation and maintenance, fairness of costs, and fees or tariffs paid for the service. After completing the walk, the team members split up and meet separately with the rich women, poor women, rich men, and poor men of the community. This is to ensure that each stakeholder category gives its own views openly and free of bias. At the end of the discussions, team members score the observations on the relevant scoring matrices in consultation with community members. In the evening the team members get together, compare notes, and prepare the final score.

Box A1-3: Visual Rating Scales

Rating scales are administered in separate groups for men and women. Using a 2-meter piece of rope, a scale is drawn on the ground. The ends are marked with two symbols indicating 'all satisfied' and 'not satisfied at all.' The midpoint and quarter points are also marked to indicate that it is a continuum. The group begins to discuss the concept being assessed and one volunteer takes up a position somewhere on the scale to reflect group opinion. The volunteer usually moves back and forth on the line, until the group is satisfied that his or her position accurately reflects their zero point ('not satisfied') of the scale and records it for each concept and group in accurate proportion on sheets of paper. These measurements are then converted to scores, on a 100-point scale.

Other teams have used a series of drawings of faces in which the mouths range from the deepest frown to the biggest smile, for the same type of scoring.

Source: Dayal et al. 2000.

Minimum Information to Emerge

32.
- System quality, functioning, and safety for electricity systems observed.
- Views of different socioeconomic groups regarding use of and access to services, adequacy, safety and regularity of system functioning, adequacy of management, operation, and maintenance, and affordability.

Scoring

33.
- System Quality
- Effective functioning
- Effective management: Level of service and quality and timeliness of repairs
- Effective management: Budgeting, metering, and keeping accounts
- Equitable choice and access
- Affordability
- Efficient, safe, and environmental use
- Cost/contribution sharing between and within households

Materials Required

34.
- System Observation Form (Table A1-4)
- Semistructured interview guide developed, with reference to the scoring system
- Precut piece of rope (2 meters is a good length)
- Two cards with smiling and frowning faces drawn on them

Pocket Voting

Purpose

35. To determine preferences and behaviors and to make decisions, and so forth. This is particularly useful when the subject being assessed is sensitive and people are reluctant to state their views publicly. For example, pocket voting can be used to gather information regarding current and desired energy uses, services, appliances, equipment, and location of fixtures. It can be used in focus group discussions during the community-level assessment as well as during the Stakeholder Meet.

Process

36. A screen is set up, with pockets representing each option in the relevant scoring matrix. Each participant goes behind the voting screen and selects the option(s) they prefer. When this is completed, a volunteer takes out the slips from each pocket and a team member registers the votes on a paper version of the matrix, using different symbols for men's and women's votes, so that those with no or low literacy can also analyze the results.

Minimum Information to Emerge

37.
- Which electricity technology is generally used or desired by the community and for what purpose(s).
- The internal consistency of the scores.
- Whether the new electricity installations/services (if any) have caused changes in the community's electricity use patterns, and the underlying reasons for change or lack of change.
- Participation history (if project already being implemented):
  - Who had access to what information during the planning phase?
  - Who participated in making the main decisions for any community-managed systems?
  - Who did not participate and why?
  - What information and choices were available to those involved in making the decisions?

Analysis and Scoring

38. After voting rounds have taken place, the cards and the contents of the respective pockets are laid out on the ground for the analysis. The facilitator draws the group's attention to voting patterns. Are there variations between the way men and women voted? What are the differences before and after project interventions? Did some people tend to participate in decisions while others were consistently excluded? The facilitator asks people's views about why these patterns, differences, or similarities emerged. Note the rationale and stories behind the results, probing further whenever something in the results seems unexpected or illogical.

39. Present the following scoring formats to the relevant group to agree on assessment scores. Information, voice and choice are scored by transferring cumulative scores from the pocket voting results on participation history into the scoring forms.

- Equitable choice and access
- Affordability
- Efficient, safe, and environmental use
- Proportion of community using electricity for nonincome- and income-generating uses

40. Project responsiveness to demand

- Degree of change in social development indicators
- Cost/contribution sharing between and within households
- Participation during establishment and operations
- Level of skill created and practiced
- Indicative strategy as reflected in service objectives, implementation strategies, and project performance criteria
- Expertise as reflected in type of agencies involved, field teams, and team approach
- Enabling organizational climate

Materials Required

41.
- Sturdy fabric, approximately the size of single bed sheet
- Sets of drawings, pictures, and symbols on postcard-size cards for the horizontal and vertical rows of the pocket voting chart, depending on what is being assessed
- Envelopes or paper bags, as many as there are cells in the scoring matrix
- Voting slips in required numbers for each participant, in different colors as required (e.g. for females, males, rich, or poor, depending on what is being assessed)
- A large chart paper or wrapping paper sheet for recording results
- 2 or 3 felt-tip markers
- Adhesive tape or pins to attach envelopes and cards to the fabric

Ladders

Purpose

42. To assess the extent to which a service meets the users' demand, the extent to which the users consider the benefits worth their costs, and the impact of the electricity service on women's time and workload in relation to those of men. This activity is done with women and men separately in better-off and poorer sections of the community.

Process

43. The facilitator starts a discussion about how the service has affected people's lives. Are they experiencing any benefits or negative effects from the service and its establishment? As they emerge, the benefits are listed on a flip- chart sheet or separate cards using words along with symbols or pictures drawn by a community member to illustrate the benefits. This is important to ensure that those who are illiterate are not excluded from the discussion. While doing this activity, be sure to ask participants to think also if there are possible benefits from the ways they have taken part in the service establishment processes and perhaps now take part in management, maintenance, or use- related activities. Once people feel they have listed all the benefits, they are invited to select those cards that represent a demand currently being met by the service and to put aside the rest.

44. Each group is invited to rate the degree to which it as a group is receiving this particular benefit. The members can do this by giving each pictured benefit a score between 5 (highest) and 1 (lowest) using beans or seeds as markers. Once the activity is completed, the cards are put into order from highest or lowest and the team member helps to calculate the total actual score obtained as compared to the total theoretical maximum (the number of identified benefits multiplied by the maximum possible score for each: five). Thus, if the users identify that the service meets 13 types of user demands, the maximum possible score would be 13 times 5, which is 65. The actual score is the sum of the individual demand scores as a percentage of 65. The participants are asked to look at their marking again, but now to discuss which of these benefits are worth their current contributions, in terms of payment, time, effort, and whatever else they contribute to sustain the service. In other words, if there are items for which they feel they contribute more than they are receiving in terms of benefits, they can remove beans. If there are certain benefits for which they would be willing to contribute even more than they do now, they can add beans. The team member then helps again to calculate their overall score as a percentage of the maximum possible. (For scoring the final percentage, see scoring formats.)

45. The total outcome of this activity gives an idea of the strength and variation in perceived costs and benefits of the users in general and of each group (poor women, rich women, poor men, and rich men). For community-managed systems, the results may partly explain why the system is (or is not) working and being maintained. The conclusions need to be checked, however, with each group in an in-depth discussion after the analysis of the scores, since an outsider's interpretation may be incomplete or incorrect.

46. A second ladder exercise similar to the first one is done with persons who spend time and effort maintaining the service. A series of small drawings (brought with the team) depicts work that is typically perceived as women's work. Another series depicts work that is typically perceived to be men's work (more cards can be drawn if necessary). Each group defines by discussing the typical female and male tasks that the group members now carry out, using the cards. These cards are then ordered in a daily sequence. A weekly or monthly sequence may be used in addition if there are tasks that are not carried out daily. Using matchsticks or other easy-to-count materials as counters, members of each group then estimate how much time they spent on each activity. They discuss the changes that have occurred as a result of the access to electricity. Has work

increased or decreased, or has the amount stayed the same? Have cooperation patterns in the household changed (i.e., women getting help from men and boys for typical "women's work," or vice versa)?

Minimum Information to Emerge

47.
- Community groups' perceptions of different types of benefits from the electricity service.
- Group perceptions of the extent of each type of benefit experienced (preferably done in separate groups of poor women, rich women, poor men, and rich men).
- Ranking of benefits considered worth paying for (in terms of money, time, effort, assets, or in any other way), according to the four categories.
- Who (female/male, rich/poor) does what work, including that related to procuring, using, maintaining and managing electricity (or energy more broadly, depending on the aims of the assessment).
- Changes in workload and work division within households as a result of the new electricity applications.

Analysis and Scoring

48. Types, division, and scope of benefits: Ladder results from different groups (women, men, rich, poor) help, when presented to the larger community group, in the public review of differences in costs and benefits. Facilitators may ask the gathering to examine whose demands are being met and whose are not, or whose demands are being met to a greater extent than the demands of others and why. If major inequities are discovered in the benefits experienced from the services and in the value for cost perceived by different groups, facilitate discussions to draw out reasons underlying them. The whole community needs to become aware of the inequities and identify the reasons for them so that collective decisions and actions can be determined. For example, if a certain group is deriving proportionately greater benefits from the services than others but is paying the same user fees, this could lead to a change in the rates of user fees to better reflect the differentials in consumption, and perhaps improving financial sustainability.

49. Division of workload: When the visual output is complete, facilitate a discussion on the sharing of burdens. Are the workloads and responsibilities for electricity use shared equitably between women and men? What about girls and boys? If yes, how did it happen? If not, who has a greater burden? What action can be taken, and by whom? Record the visual output and conclusions from the discussion. Score the outcome with the group on the scoring formats.

- User satisfaction
- Degree of change in social development indicators
- Level of skill created practiced

Materials Required

50.
- Cards with drawings of benefits usually associated with the use of the services (optional) and of typical men's and women's work
- Some blank cards for adding more drawings if necessary
- Marker pens
- Large seeds or berries
- One scoring sheet for each group

Stakeholder Meet

Purpose

51. To examine the indicators that measure institutional support for gender and poverty-sensitive, demand-responsive participation,[9/] within the institutions involved in the establishment of rural electricity services in the sampled communities. In the process, this method also shares the findings of the community-level assessment with all stakeholders.

Process

52. Historically, participatory tools were developed to empower and work primarily with communities with low or no literacy. Recognizing the powerful principles underlying the participatory rural appraisal (PRA) tools, the Stakeholder Meet applies the same principles to assessments within institutions. This tool has the potential to be effective not only for the learning assessment but also in triggering collective action to address some of the emerging issues.

53. Depending on the size of the project, the Stakeholder Meet is usually organized at the district or province level. If the project covers a wide geographic area, two or three such Meets may have to be organized and the results collated for reporting. The Stakeholder Meet should not be held at the office of the service agency. The duration of the meet is usually one to one and a half days. Scales should be scored on the spot. Refreshments should be provided during the activities.(See Box A1-4 for the role of facilitator.)

54. To the extent possible, representatives from the relevant institutions should include those persons who are involved in the planning, design, and establishment of the service in the selected communities, as the range of indicators to be tested relate to the rules and practices at the time of establishment. Care should be taken to include both male and female representatives. The suggested group mix is as follows:

- The project and service providers (e.g., the utility, rural electricity entrepreneurs, staff of the ministry responsible for rural electrification, equipment suppliers, etc., including technical, managerial, and social development staff).
- Village and/or local government leaders.
- Relevant social intermediaries, nongovernmental organizations, and/or community-based organizations.

[9/] See Table 3-1 in Chapter 3 for a complete list of variables and indicators.

- Representatives of other institutions, such as heads of schools and health centers.
- Male and female leaders of the community electricity control board, if applicable.

55. The process and group dynamics at the Stakeholder Meet are significant and revealing. It is therefore critical that the facilitator is assisted by recorders who take very careful notes and use them for reporting on the qualitative aspects. The meet is conducted in the local language.

56. In the formal opening of the Stakeholder Meet all the participants give a brief background on themselves and their interests. Some introductory icebreaker exercise compatible with local culture is necessary at this point to neutralize hierarchical barriers to interaction and create an informal, relaxed climate conducive to sharing and learning together.

57. The first step in the group process is an open discussion on the influence of institutional factors. For this purpose the facilitator begins by writing in large letters on a board, wall, or sheet: "What institutional factors are important in establishing sustainable and used electricity services?" Factors identified can be positive, negative, or constructive of any kind. Rather than letting one dominant person speak for the rest, it is advisable to have the different types of participants record their views on colored cards, for example, pink cards for technical agency staff, blue for social staff, yellow for village-level staff, white for community representatives, and so forth. If men and women write cards of different shapes, such as having men write on rectangular cards while women write on oval ones, the results are visually very telling. Writing should be done with thick markers and only one idea should be listed per card. The cards are displayed on the wall or floor.

58. The participants subsequently cluster the cards based on the similarity of ideas expressed on them. Each cluster is given a self-explanatory label. This activity reveals the answers to the above question as expressed by the whole group. The facilitator then helps the group to draw conclusions about the nature of factors and trends in views according to the participants' individual backgrounds. For example, do technical staff members have different views from social and/or village leaders? Are women's views different from men's?

59. The presence of hierarchical relationships among the participants may inhibit honest responses about agency factors. If that is the case, do this first exercise in three separate but parallel groups with the help of three facilitators, and collate results after the clustering and labeling is completed in each group. This will help bring out major disparities among different groups without threatening anyone. The exercises involve assessment of agency policy as reflected in service objectives, implementation strategies, and project performance criteria. The variable assesses policy at the time the service was or is being established in the selected communities.

60. "Enabling organizational systems" should be assessed only by personnel of each key institution that is involved in renewable rural electrification. Other

participants should not assess this but should be invited to comment on the results of the assessment, as described below. The aspects covered include planning and monitoring systems, expertise of agencies, expertise in field teams, and use of team approaches.

61. Several creative methods can be used to measure the degree to which the organization is perceived to support gender- and poverty- related issues. One is to use ribbons in different colors for each category. Participants fold the ribbons conforming to their opinion on the level of support (fully open if the support is 100 percent; folded four times if the support is only 25 percent) and stick the ribbons on a board. It is revealing to see how colleagues in the same organization or in other stakeholder groups view the organizational culture. Another alternative is to use pocket voting for each of the scales. Empty envelopes are taped to individual cards carrying descriptions for scores of 0, 1, 2, or 3 for each scale. Each set of cards is placed on a board turned towards the wall. Participants go behind the board one at a time and vote using color-coded tokens. Since the topics covered in this section may be sensitive, more honest assessments are made possible through voting in privacy. The results are then tallied in front of the whole group so that everyone can see the voting pattern, discuss the rationale for it, and agree on the overall scores.

62. Community representatives are asked to report their impressions on staff capacity, management support, and incentives. A plenary discussion is held on the reporting and on any emerging trends and issues.

63. To assess the organizational climate, each participant is given a sheet with the descriptions of scores for capacity building (see scoring matrices below). She or he selects the score that she/he feels best fits the project being assessed and writes her/his reasons for selecting that score on the sheet. Participants also record their gender and participant category on the sheet. The process is repeated for the scales for management support and incentives to staff. The results are summarized publicly for each participant category by tallying information from the sheets collected by the facilitator, who also reads out the reasons given for selection of each score. This reveals the perception of different levels and types of staff regarding organizational support for working in a gender-sensitive and poverty-targeted manner. An overall score is determined if consensus can be reached. If there are major variations among participant categories, the variations are reported by categories instead of using an overall score.

Scoring

64.
- Indicative strategy as reflected in service objectives, implementation strategies, and project performance criteria
- Expertise as reflected in type of agencies involved, field teams, and team approach
- Enabling organizational climate

Materials Required

65.
- Thick felt-tipped marker pens

- Portable pin boards or sheets of cloth sprayed with adhesive
- Different colored ribbons
- Flip charts
- Cards for writing, in 2 or 3 different shapes and 4 different colors
  -Colored adhesive dots or token for voting (cut from cards, buttons, etc.)
- Masking tape and scissors

Box A1-4: Role of the Facilitator in the Stakeholder Meet

The Stakeholder Meet, by virtue of the range of participants, is a particular challenge for the facilitator. All efforts must be made to ensure that the hierarchy of systems does not get reflected in the proceedings; for example, that the poorer or female participants do not get relegated to the background while the community elite and project staff take center stage. Special care must be taken to ensure equal participation for all. It is advisable to use the services of professional facilitators proficient in the local language. A team of one facilitator and one or two cofacilitators or recorders is preferable.

The facilitator and recorders must be very alert to capture special features of the group dynamics between the different participant categories and make notes when views differ consistently. The facilitator is further asked to record his/her intuitive feelings on the credibility of the data: Did all participants take the activities seriously and seem to answer truthfully? Were there any inhibitions among certain individuals or groups?

Source: Dayal et al. 2000.

Policy-Level Assessment

Purpose

66. To assess the degree to which national sector policies are present to support or inhibit the successful implementation of demand-responsive renewable rural electrification projects.

Process

67. At the policy level, the Structured Interview Guide can be used for discussion with policy officials involved at the time of service establishment. During the discussion, the facilitator will provide brief feedback on the outcomes of the assessments at the community and institutional levels. Researchers should review with the participants the following aspects of the project/program:

- Is the project/program in any way different from the other projects/programs under your jurisdiction.
- Card sorting: Where would you put this program with regard to its sector policy? (Provide four cards as in the scoring matrix for national sector policies, for rural renewable energy present with sustainable services and equity as explicit goal, a card for "no details known," plus a blank card to accommodate an answer different from the options given).
- Are electricity consumers (households, schools, health centers, etc.) expected to contribute to the service? For service establishments? For operation and maintenance? Other purposes?
- Discuss and agree where the answers given fit on the scales for Cost Sharing and Management. and why.
- On which project aspects should electricity consumers decide or codecide.
    - — Service initiation
    - — Choice of technologies
    - — Level of service
    - — Location and design of systems
    - — Construction companies and equipment suppliers
    - — Service provider
    - — Local maintenance/management system
    - — Local financing system
    - — Other
- Discuss and agree where on the scale for Participation in Decisions the answers fit, and why.
- Is the government providing any subsidies (i.e., to customer or service provider; for service establishment, for operation, for maintenance, etc.)? What is the rationale behind the subsidies?

68. A more participatory option is to organize a half-day workshop with the key officials at the policy level, national directors of assessed projects, and representatives of primary external support agencies and nongovernmental agencies working in the sector. It is ideal if the meeting is organized in collaboration with the agency responsible for sector coordination. It is important to ensure that all participants are familiar with assessed projects and the policies governing their design and implementation, and national sector policies and regulations at the time they were implemented.

69. The meeting can last for about three to four hours and should have three main content blocks:

1. Introduce and present results of the assessment at community and institutional levels;
2. Present the general idea of the policies relevant to the assessment and use open discussion based on the structured questionnaire; and
3. Use participatory exercises such as pocket voting and visualized scaling throughout instead of interviews. It is important to facilitate discussions on each indicator before agreement on a score can be reached.

Scoring

70. Policy support for gender- and poverty-sensitive demand responsive participation.

Sample Scoring Matrices Analysis

71. The data collected through the assessment can be analyzed at three levels of assessment: community, institutional and policy. Analytical techniques are described in detail in Chapter 4 of the MPA Metguide (Dayal et al. 2000). This section draws from that chapter.

Community Level

72. During a community-level analysis, men and women in the community assess various aspects of their services using participatory tools and produce a visual analysis of the data. The output of each participatory exercise is displayed for the participants, and participants discuss what each exercise has revealed. The relevant scoring matrix is presented to the group. The group discusses and agrees on a score, and the facilitator records the scores given according to each category of group (males, females, rich, poor).

73. The facilitator helps community groups add up scores for each subindicator to arrive at aggregate indicator scores. For example, scores for the indicator "effectively sustained," are derived by aggregating the scores achieved for system quality, effective functioning, financial viability of the service provider, and effective management (and all of the sub-indicators within those). The facilitator then presents the results of the aggregation and the maximum possible scores to the group in a visual format, such as a simple bar diagram, pie chart, etc. The diagram can be drawn on paper

or created on the floor with different lengths of rope, pieces of paper or cloth or other locally available materials. Once the group grasps the idea, repetition of the process is easy. The group compares the scores actually achieved and the maximum possible scores, and discusses what can be done to improve the situation.

74. The facilitator can aggregate the results of the indicators for that community and depict these in relation to those of other groups in the project area to help the community compare its performance to other communities. Out of such analyses emerge specific ideas about how a community may enhance the sustainability and effective use of its services. Facilitators should take a back seat at this point, as the group begins to turn the ideas into specific plans of action. The facilitator should ensure that these ideas and plans are recorded, and that someone in the group assumes responsibility for safekeeping of the assessment outputs. Facilitators should take away only their own notes and scoring matrices and copies they make of the outputs.

75. If for some reason it is not possible to analyze the results with the community at large, the participatory assessment team should present a summary of the results to a gathering of all households in the community. Community members should be encouraged to explain actions they agree to take as a consequence.

Institutional Level

76. The results of the community assessments should be summarized for project stakeholders at the Stakeholder Meet. This should be followed by a facilitated discussion on:

- Which are the high-, medium- and low-performing communities in terms of sustained and effectively used services? In terms of poverty and gender participation? Of demand-responsive services?
- Do these results match other monitoring information? If not, why?
- What factors emerge as strengths and weaknesses in the assessed communities? Are some common to all or most communities?
- What do the findings indicate about the agencies' project approaches?

77. An exercise like that described for the community level above then takes place at the Stakeholder Meet, to allow stakeholders to analyze the visual outcome of this exercise. Scores are discussed then agreed upon, and recorded on a large scoreboard, showing each achieved score against the maximum possible score. If consensus is not achieved, the differing scores are recorded as such and marked with the names of the stakeholder categories whose assessments they represent. The group uses the scoreboard to identify and jointly rank areas of institutional strengths and weaknesses. The facilitator then generates a plenary discussion on what can be done to build on the strengths and improve the areas of weakness. The participants discuss, agree upon, and record implications for action needed at the community, institution, and policy levels. Scores and agreed actions are recorded for future progress monitoring and for presentation at the Policy Assessment Dialogue.

Policy Level

78. If the policy-level assessment consists of interviews with policymakers, the results of the community- and stakeholder-level assessments are discussed with the policy makers as the interview progresses. If the participatory policymaker workshop is chosen, the process is very similar to that for the Stakeholder Meet.

79. In this case, the final scoreboard will depict the aspects assessed. The group identifies the policy-level actions needed on the basis of the results. The facilitator encourages the group to prioritize and establish a logical sequence for the needed changes. The country situation will determine how much specificity and detail are relevant at this workshop.

Statistical Analysis

80. Statistical analysis is possible if the sample of projects or communities within a project is large enough to warrant and allow this. A sociologist, economist, or statistician who is experienced in the use of non-parametric statistics as well as participatory tools should carry out such an analysis. The main functions will be to analyze frequencies and cross-tabulations, and to test the strengths of association between likely individual factors and among their levels of demand-responsiveness, participation, and sensitivity to gender and poverty, and the achieved levels in service sustenance and use (see Table A1-3).

Table A1-3: Sample Community Data Sheet

Name of recorder.....……..... Date..…….....

Socioeconomic Data

Name of community		
No. and names of settlements/ neighborhoods within community		
Population size and composition		
	Men	Women
Adults >15 years		
Children		
Total Population		
Total number of households		
Population density		
Location relative to electric grid		
Location in high or low income zone		
Local environmental conditions impacting availability of renewable energy (insulation, wind speed, etc.) at different times throughout the year		

Education Level

	Males >5 years	Females >5 years
No formal education		
Primary school level		
Secondary school level		
Above secondary school level		
Total		

Types of Preproject Energy Technologies

Traditional types of electricity supply (before project installations)	Units	Households served	Small businesses served	Community facilities served (e.g., schools, health clinics, streetlights, etc.)
Candles				
Biomass cookstoves (fuelwood/crop residue/animal dung)				
Coal cookstoves				
Kerosene/diesel lamps				
LPG				
Generator set				
Battery/ies (dry cell/car)				
Solar PV system				
Wind turbine				
Hydro system				
Electric grid				
Other				

Household Electricity

Total no. of households	
No. with electricity	
No. without electricity	
No. served by electric grid	

Institutional Electrification

Type of school	Total no. boys	Total no. girls	Type of electricity supply	Appliances electrified (e.g., lights, computers, etc.)

Type of health facility	Total no. males served*	Total no. females served*	Type of electricity supply	Appliances electrified (lights, refrigerators, etc.)

* Most recent annual data if possible; otherwise most recent month

Type of community facility (e.g., streetlights, community center, etc.)	Total no. males served*	Total no. females served*	Type of electricity supply	Appliances electrified (lights, radios, TVs, etc.)

* Most recent annual data if possible; otherwise most recent month

Types of Postproject Energy Technologies

New types of electricity supply (resulting from project)	Year in which operation started	No. of households served	No. of small businesses served	No. of community facilities served (and type)	Investment costs per person/business served*

* The installation/construction cost of the systems is taken from project documentation and records and verified against supplier contracts or village documentation. To arrive at per person cost, the figure is divided by the number of households served multiplied by the average family size over all the villages surveyed.

Total Per Capita Investment Cost, per Improved System

Types of improved system	Investment costs per person served*

* The installation/construction cost of the systems is taken from project documentation and records and verified against supplier contracts or village documentation. To arrive at per person cost, the figure is divided by the number of households served, multiplied by the average family size over all the villages surveyed.

Illustration of System Observation Coding

81. The System Observation Form is used during the transect walk to evaluate the technical quality of electricity system installations. It can and should also be used on a regular basis to evaluate the technical quality of systems as they are installed. During the assessment, the team and community members should conduct the observation jointly. Outside of the assessment, the evaluation should ideally be conducted by a qualified community member together with the end user and system installer to take advantage of ownership- and capacity-building opportunities, though the observation can also be conducted by a third party.

82. The scoring matrices consist of a series of scales with descriptive options. They are based on and correspond to the indicators and subindicators listed in Table 3-1 in Chapter 3. The scoring matrices are used in conjunction with the tools described above to record female, male, poor, and rich perceptions of the framework's indicators. They translate relatively qualitative data into a quantitative form, so that results may be used by community members, project stakeholders, and managers to compare progress over time or to make comparisons between different communities. Scoring is also a way to generate discussion and bring out any differences in perceptions and preferences among female, male, poor, and rich participants (see Table A1-4).

83. Most of the scales range from zero to three or four, indicating low, medium, and high scores. A few of the scales are cumulative. A process of joint scoring on scales is followed at the community as well as the institution and policy level. During the team training, orientation, and work planning process, the team should develop recording forms for each scale separately on a page with space for team observations and notes to record the quantitative scores and qualitative information from the focus group discussions.

Table A1-4: Descriptive Options for Scoring Matrices

EFFECTIVELY SUSTAINED	
System Quality (M/F, R/P) Construction matches design; quality of system components and installation. (This indicator should be scored for each type of installation present in the community, including household systems encountered during the transect walk.) ☞ *Community Map, Focus Group Discussions (FGD), Transect Walk, System Observation Form*	
Score (Cumulative)	**Criteria**
1	Good design: properly sized for expected loads and daily use; appropriate configuration (team observation and confirmation by M/F, R/P)
1	Quality components: respected brands with manufacturer guarantees (team observation and confirmation by M/F, R/P)
1	Installation according to design: properly sited; robust construction; proper wire sizing and connections; safe; tidy; accessible for maintenance; etc. (team observation)

Effective Functioning (M/F, R/P) Service operation in terms of quality, quantity, reliability, and predictability of electricity service ☞ *Community Map, FGD, Transect Walk*				
Score	**Quality**	**Quantity**	**Reliability**	**Predictability**
0	Consistently poor power quality (e.g., voltage fluctuation), according to users (M/F, R/P) and team	Frequent times when no power is available due to system undersizing or lack of renewable resource (electricity not being generated and/or batteries are completely discharged)	Frequent lack of service due to system malfunction or unexpectedly poor performance (1-2 times a week) (R/P)	Users (M/F, R/P) cannot predict hours of service (for minigrid), or do not adjust consumption patterns to account for environmental fluctuations (e.g., drought in case of microhydro; cloudiness in case of solar)
1	Occasional poor power quality, periodically or geographically (M/F, R/P)	Some electricity is always available from RE system, but sometimes not enough is generated or stored to meet expected needs (e.g., 2 lightbulbs per household, for expected duration—as understood by users)	Occasional lack of service due to system malfunction (1-2 times per month or several times a year)	Users (M/F, R/P) sometimes know or can predict when electricity is available
2	Mostly good power quality, with few exceptions	RE system almost always provides expected amount of electricity	Rarely lack service due to system malfunction	Users usually know or can predict when electricity is available
3	Consistently good power quality	RE system always provides expected amount of electricity	Never lack of service due to system malfunction	Users can always predict the service hours

Financial Viability of Service Provider Coverage of installation/connection and recurrent costs (operation and maintenance – O&M) ☞ *Records Review, FGD*			
Score	**Hardware and installation or connection ("income" refers to either users' ability to pay, or income to service provider for fee-for-service cases)**	**O&M (A) Service provider's ability to cover costs (in cases where users pay for O&M on a fee-for-service basis)**	**O&M (B) Users' ability to cover O&M costs (in cases where user responsible for O&M)**
		Fill out either A or B depending on case	
0	No income, or income partly covers installation/connection costs	No income, or income partly covers O&M costs	No income or income partly covers O&M costs
1	Income covers all installation/connection costs	Income covers all O&M costs	Income covers all O&M costs
2	Income covers all installation/connection costs and provides for expansion of service	Income covers all O&M costs and provides for expansion of service	Income covers all O&M costs and provides for expansion
3	Income covers all installation/connection costs, provides for expansion and allows replacement of major parts of the system	Income covers all O&M costs, provides for expansion and allows replacement of major parts of the system	Income covers all O&M costs, provides for expansion and allows replacement of major parts of the system

Universality and timeliness of payment (where systems are bought on credit, or in case of fee-for-service model),* and presence/nature of subsidies
☞ *Records Review, FGD*

Score	Timeliness of payment	Presence/Nature of subsidies * *
0	No payment records, or records are not consistently kept (e.g., by community or private service provider) and information about universality and timeliness of payment is not known	Project either offers technologies/services on a completely subsidized basis or does not include any type of subsidy at all.
1	Payment records kept, but some user households do not pay, although not formally exempted, or have arrears of 6 months or more	Equipment/service is offered at subsidized rate but end users must pay balance up front.
2	Payment records are properly kept and all user households pay (unless formally exempted) but some have arrears of more than 6 months (specify as above)	Equipment/service is offered at subsidized rate and end users may take out soft loan for balance.
3	Payment records are properly kept and all user households pay on time, unless formally exempted	Equipment/service is offered at reasonable commercial rate, and end users may take out soft loans for the entire cost.

* Questions to be asked of credit and/or service provider

* * The subsidy subindicator must be tailored to the specific context of the project structure and local conditions. Several types of subsidies that might be considered/offered, including capital subsidies, manufacturer subsidies, discounts/rebates to end users, low-interest ("soft") loans, etc. Subsidies may be offered by the donors of the project, government, local credit institutions, etc.

Effective Management (M/F, R/P)
End-user awareness and O&M capacity (in cases where system is installed in home)
☞ *Records Review, FGD*

Score	Level of user awareness of fees/tariffs and O&M costs	Level of user awareness of proper system use and capabilitieslimits	user capacity to troubleshoot problems
0	Users unaware of fees/tariffs for which they are responsible, and of expected O&M costs	Users unaware of proper system use and system limits	Users received no O&M instruction
1	Users aware of fees/tariffs for which they are responsible, but not of expected O&M costs	Users aware of proper system use, but actions reflect a disregard for system limits	Users received basic O&M instruction to address simple system failures (e.g., blown fuse, bad wire connections), but rely on service provider for most repairs
2	Users aware of fees/tariffs for which they are responsible, and of expected O&M costs	Users aware of proper system use, and demonstrate efforts to monitor and control use, with few exceptions	Users able to detect basic problems and make simple repairs, usually without error, but would contact service provider for more complex problems
3	Users aware of fees/tariffs for which they are responsible, and of expected O&M costs, and can demonstrate savings for these costs	Users aware of proper system use, and consistently maintain electricity consumption within system limits	Users capable of "intermediate" troubleshooting (e.g., controller failure) and able to replace basic system components without assistance

Effective Management (M/F, R/P)
Level of service, quality/timeliness of repairs and presence of mechanism to redress complaints
☞ *Records Review, FGD, Transect Walk*

Score	Level of service	Quality of repairs to system/Eequipment	Timeliness of repairs	Mechanism to redress complaints
0	Equipment vendor/ service provider does not offer guarantees (equipment, system, installation), and/or no service contract exists	Repairs have been ineffective	Downtime >2 days and lack of realistic alternatives (i.e., no other electricity sources, and no guarantees or contract to turn to)	No mechanism to redress complaints in place.
1	Service contract and guarantees in place, but service provider inaccessible, slow, or otherwise reluctant to comply	Minor repairs (e.g., replacement of charge controller) have been effective, but larger repairs have not	Downtime can be >2 days but users have and use other safe alternatives on own account	Mechanism in place to redress complaints, but provider inaccessible, slow or otherwise reluctant to comply
2	Service provider accessible and responsive to guarantees, but replacements or repairs take some time	Minor and more-major repairs (e.g., inverter repair or replacement) have been carried out successfully and minor upgrading (i.e., new wiring) has occurred	Essential repairs made within 2 days or management forewarns users and encourages safe alternatives	Service provider accessible and responsive to complaints, but changes take some time
3	Service provider responds rapidly to system problems, and goes beyond contract obligations for service	All repairs effective, and have extended the system or built other systems elsewhere (i.e., branch lines, commercial connections)	Essential repairs made within 1 day or alternative supply provided	Service provider responds rapidly to customer complaints and rapidly makes changes to address them

Effective Management (M/F, R/P)
Budgeting, metering, billing, and keeping accounts
☞ *Records Review, Transect Walk*

Score	Budgeting and accounting for service	Billing	Metering (where applicable, in fee-for-service situations)
0	No budget, or not based on true costs, and no accounting for service	No systematic billing system in place	No metering of electricity consumption, causing inequitable tariffs for varying service
1	Budget and collection based on financial requirements of service and account kept but not shared	Billing system in place but customers not billed on regular basis	No metering but some basic tariff distinction based on appliances utilized
2	Budgeti and collection based on financial requirements of service and accounts shared with some	Informal billing system in place in which customers are asked to pay on regular basis	Meters installed but only semi-consistent meter reading, and problems with illegal connections
3	Budget and collection based on financial requirements of service and accounts shared with all users/user representatives (M/F, R/P)	Formal, systematic billing system in place	Tariffs charged reflect equitable charging based on consistent and accurate meter readings and no problems with illegal connections

User Demand (M/F, R/P) Type and proportion of contribution at the time of service establishment ☞ *Records Review, FGD*		
Score	**Contribution in cash (A)**	**Labor and materials (in cases of minigrid systems) (B)**
	Fill out either A or B, depending on case	
0	No contribution	No labor or materials contributed
1	Contribution as contributors see fit	Labor contributions as contributors see fit (voluntary)
2	Flat rate contribution, compulsory	Fixed labor contribution per household, no weighing according to capacity
3	Contribution adjusted to different capacities to pay (e.g., poor pay less, charge is payable in installments)	Contributions adjusted to different capacities to contribute (i.e., poor contribute less than rich)

EQUITABLE ACCESS AND USE					
Equitable Choice and Access (M/F, R/P) ☞ *Community Map, FGD, Transect Walk, Pocket Voting*					
Score	**User choice in type of service**	**User choice in affordable equipment**	**User choice in affordable appliances**	**User choice in location of fixtures**	**Access to service (proportion)**
0	Users had no choice in type of service	Users had no choice in affordable equipment	Users had no choice in affordable appliances	Users had no choice in placement of fixtures (e.g., electrical outlets, lightbulbs)	Less than ¼ of community
1	Choice in type of service limited to small group of unrepresentative individuals	Choice in affordable equipment limited to small group of unrepresentative individuals	Choice in affordable appliances limited to small group of unrepresentative individuals	Choice in placement of fixtures limited to small group of unrepresentative individuals	Between ¼ and ½ of community
2	Choices determined by elected committee but not vetted via participatory process	Choices determined by elected committee but not vetted via participatory process	Choices determined by elected committee but not vetted via participatory process	Choices determined by elected committee but not vetted via participatory process	Between ½ and ¾ of community
3	Full choices made available to all community groups	Full choices made available to all community groups	Full choices made available to all community groups	Full choices made available to all community groups	More than ¾ but less than 100%
4	Full choices made available to all community groups	Full choices made available to all community groups	Full choices made available to all community groups	Full choices made available to all community groups	100%

Affordability (M/F, R/P)
☞ *Community Map, FGD, Transect Walk, Pocket Voting*

Score	Installation/connection costs	Service fee/tariff	O&M costs	Financing options
0	Less than ¼ of people (M/F, R/P) able to afford household systems or connection to mini-grid	Less than ¼ of users able to cover fee/tariff (flat or graduated) on regular basis	No savings plan exists for O&M expenses at household or community level	No financing options exist
1	Between ¼ and ½	Between ¼ and ½ of users able to cover corresponding fee/tariff	Few users saving for O&M	Financing options limited to small/ elite group, are too burdensome, or are otherwise inaccessible
2	Between ½ and ¾	Between ½ and ¾ are regularly covering fee/tariff	Most users are saving for O&M	Financing options open to majority of users, but some lack awareness or capability to access it
3	Greater than ¾ but less than 100%	Greater than ¾ but less than 100% are covering fee/tariff	Savings are adequate to cover ongoing O&M, including appropriate replacement parts (e.g., efficient lightbulbs, batteries, controllers)	Majority of those needing financing are accessing it
4	100% can afford direct system purchase or connection payment	100% can pay for service	Both households and community are self-sufficient in covering O&M (including spare parts supply/business)	All of those needing financing are accessing it

Effective Use
Efficient, Safe, and Environmentally Sound Use (M/F, R/P)
☞ *Community Map, FGD, Transect Walk, Pocket Voting*

Score	Efficient use	Safe use	Environmentally sound use
0	No user awareness of importance of efficient appliances and/or frequent evidence of inefficient practices	No user awareness of system safety issues and evidence of unsafe system use (e.g., loose wires, battery acid spills, no child safety measures)	No evidence of awareness or attention to environmental impact of system installation and/or use (e.g., lack of preservation of riparian area for hydro projects; polluting impacts of improperly disposed batteries
1	Some user awareness of efficiency issues but limited efficient practices (e.g., due to high cost or lack of availability of appliances)	Some user awareness of safety issues but limited safe practices	Some awareness of environmental impacts but few alternative options presented or available
2	Moderate to high user awareness and moderate evidence of efficient practices	Moderate to high awareness and frequent evidence of safe practices	Moderate awareness of environmental impacts and significant evidence of sustainable practices (e.g.,recycling and/or proper disposal of batteries)
3	Universal awareness and practice of efficient use of electricity	Universal awareness and no evidence of unsafe practices	Sustainable practices coordinated and observed on a universal/ community basis

Effective Use

Proportion of community using electricity for nonincome-generating and income-generating uses (M/F, R/P)

☞ *Community Map, FGD, Pocket Voting*

Score	Rich males (proportion)	Rich females (proportion)	Poor males (proportion)	Poor females (proportion)
0	<¼	<¼	<¼	<¼
1	UptoUp to ½	UptoUp to ½	UptoUp to ½	Up to ½
2	UptoUp to ¾	UptoUp to ¾	UptoUp to ¾	UptoUp to ¾
3	>¾	>¾	>¾	>¾

Demand-responsive Service

Project Responsiveness to demand (M/F, R/P): User voice in planning and design *

Score	Project initiation	Voice in end-use applica-tions	Voice in develop-ment of tech-nology options	Voice in levels of service and hours of avail-ability (if appli-cable)	Voice in location of install-ments	Voice in location of comple-mentary facilities (i.e., parts stores, recycling/ disposal facilities)	Voice in local service manage-ment enterprise/ organiza-tion	Voice in type and size of contri-butions to services	Voice in mainte-nance system
0	Outside agency worker team	Outside agency worker/ Team	Outside agency worker/ team	Outside agency worker/ team	Outside agency worker/ team	Outside agency worker/ team	Outside agency worker/ team	Outside agency worker/ team	Outside agency worker/ team
1	Local male leader(s)	Local male leader(s)	Local male leader(s)	Local male leader(s)	Local male leader(s)	Local male leader(s)	Local male leader(s)	Local male leader(s)	Local male leader(s)
2	Local female leader(s)	Local female leader(s)	Local female leader(s)	Local female leader(s)	Local female leader(s)	Local female leader(s)	Local female leader(s)	Local female leader(s)	Local female leader(s)
1	Male group or assembly, rich	Male group or assembly, rich	Male group or assembly, rich	Male group or assembly, rich	Male group or assembly, rich	Male group or assembly, rich	Male group or assembly, rich	Male group or assembly, rich	Male group or assembly, rich
2	Male group or assembly, rich +poor	Male group or assembly, rich +poor	Male group or assembly, rich +poor	Male group or assembly, rich +poor	Male group or assembly, rich +poor	Male group or assembly, rich +poor	Male group or assembly, rich +poor	Male group or assembly, rich +poor	Male group or assembly, rich +poor
2	Female group or assembly, rich	Female group or assembly, rich	Female group or assembly, rich	Female group or assembly, rich	Female group or assembly, rich	Female group or assembly, rich	Female group or assembly, rich	Female group or assembly, rich	Female group or assembly, rich
3	Female group or assembly, rich + poor	Female group or assembly, rich + poor	Female group or assembly, rich + poor	Female group or assembly, rich + poor	Female group or assembly, rich + poor	Female group or assembly, rich + poor	Female group or assembly, rich + poor	Female group or assembly, rich + poor	Female group or assembly, rich + poor
4	Male and female group or assembly, rich + poor	Male and female group or assembly, rich + poor	Male and female group or assembly, rich + poor	Male and female group or assembly, rich + poor	Male and female group or assembly, rich + poor	Male and female group or assembly, rich + poor	Male and female group or assembly, rich + poor	Male and female group or assembly, rich + poor	Male and female group or assembly, rich + poor

*Cumulative score, if more than one category applies

Demand-Responsive Service
User satisfaction: Ratio of user-perceived costs* and benefits (M/F, R/P)
☞ *FGD, Ladders*

Score	Cost/benefit ratio for rich females	Cost/benefit ratio for poor females	Cost/benefit ratio for rich males	Cost/benefit ratio for poor males
0	<10%	<10%	<10%	<10%
1	10-30%	10-30%	10-30%	10-30%
2	30-60%	30-60%	30-60%	30-60%
3	60-90%	60-90%	60-90%	60-90%
4	90-100%	90-100%	90-100%	90-100%

*Costs may represent contributions in money, time, etc.

DEGREE OF CHANGE IN SOCIAL DEVELOPMENT INDICATORS *
Education (M/F, R/P) * *
Ability to attend school, time spent on education, quality of education, and presence of teachers
☞ *FGD, Pocket Voting, Ladders*

Score	Ability to attend school (children)	Ability to attend school (adults)	Time spent on education at home	User's perception of quality of education at school	Presence of teachers in school(s)	Access to educational materials/tools
0	No school-age children attending school	No illiterate or under-literate adults attending adult school	No increase	No improvement	No increase	No increase
1	Some school-age male children attending school part-time	One illiterate or under-literate adult attending adult school sporadically	Slight increase	Slight improvement	Slight increase	Slight increase
2	Some school-age male and female children attending school full-time	All illiterate or under-literate adults attending adult school sporadically	More noticeable increase	More noticeable improvement	More noticeable increase	More noticeable increase
3	All children, male and female, attending school fulltime	All illiterate or under-literate adults attending adult school regularly	Significant increase	Significant improvement	Significant increase	Significant increase

* Many of the indicators/subindicators for this variable are scored on the basis of "no increase," "slight increase," "more noticeable increase," and "significant increase." These criteria are dependent on the local context and, thus, should be determined by the research team in consultation with community members.

* * Adults should be asked about these subindicators in reference to themselves and to their children, i.e., "Do you spend more time on education at home?" "Do your male children?" "Do your female children?" Ideally, children (male and female) should also be asked these questions of themselves.

Health Care and Safety (M/F, R/P)
Access to and quality of health care, access to medicines, change in presence of doctor(s)/health worker(s), safety in the home, and safety outside the home
☞ *FGD, Pocket Voting, Ladders*

Score	Access to health care	User's perception of quality of health care	Access to medicines	Presence of doctor(s)/health worker(s)	Safety in the home	Safety outside the home
0	No increase	No improvement	No increase	No increase	No increase	No increase
1	Slight increase	Slight improvement	Slight increase	Slight increase	Slight improvement	Slight improvement
2	More noticeable increase	More noticeable improvement	More noticeable increase	More noticeable increase	More noticeable improvement	More noticeable improvement
3	Significant increase	Significant improvement	Significant increase	Significant increase	Significant improvement	Significant improvement

Domestic Productivity (M/F, R/P)
Ability to conduct and efficiency of household (nonincome generating) responsibilities (i.e., childcare, meal preparation, fuel/water collection, etc.)
☞ *FGD, Pocket Voting, Ladders*

Score	Ability to conduct household responsibilities	Efficiency of conducting household responsibilities
0	No increase	No increase
1	Slight increase	Slight increase
2	More noticeable increase	More noticeable increase
3	Significant increase	Significant increase

Income-Generating Activities (M/F, R/P)
Ability to conduct income-generating activities, productivity/efficiency and profitability
☞ *FGD, Pocket Voting, Ladders*

Score	Ability to conduct income-generating activities	Productivity/efficiency	Profitability
0	No increase	No increase	No increase
1	Slight increase	Slight increase	Slight increase
2	More noticeable increase	More noticeable increase	More noticeable increase
3	Significant increase	Significant increase	Significant increase

"Strategic" Needs (M/F, R/P)
Ability to undertake new/desired activities, participation in household decisionmaking, and voice in community decisions
☞ *FGD, Pocket Voting, Ladders*

Score	Ability to undertake new/desired activities	Participation in household decisionmaking	Voice in community decisions
0	No increase	No increase	No increase
1	Slight increase	Slight increase	Slight increase
2	More noticeable increase	More noticeable increase	More noticeable increase
3	Significant increase	Significant increase	Significant increase

Access to Information and Communications (M/F, R/P)
Access to news and information on income-generating activities, health and safety, and family planning, and access to communication with distant family members
☞ *FGD, Pocket Voting, Ladders*

Score	Access to information useful for income-generating activities	Access to local/national/ international news	Access to information on health and safety issues	Access to information on family planning	Increased communications with distant family members
0	No increase	No increase	No increase	No increase	No increase
1	Slight increase	Slight increase	Slight increase	Slight increase	Slight increase
2	More noticeable increase	More noticeable increase	More noticeable increase	More noticeable increase	More noticeable increase
3	Significant increase	Significant increase	Significant increase	Significant increase	Significant increase

Convenience/Comfort (M/F, R/P)
Leisure time and time spent sleeping, socializing, watching TV/listening to radio/reading for enjoyment
☞ *FGD, Pocket Voting, Ladders*

Score	Sleeping	Leisure time (resting, napping)	Socializing	Watching TV for enjoyment	Listening to radio/reading for enjoyment
0	No increase	No increase	No increase	No increase	No increase
1	Slight increase	Slight increase	Slight increase	Slight increase	Slight increase
2	More noticeable increase	More noticeable increase	More noticeable increase	More noticeable increase	More noticeable increase
3	Significant increase	Significant increase	Significant increase	Significant increase	Significant increase

DIVISION OF BURDENS AND BENEFITS		
Cost/Contribution Sharing Between and Within Households (M/F, R/P) ☞ *FGD, Transect Walk, Pocket Voting*		
Score	**Division of unskilled/skilled labor**	**Sharing of labor time within households**
0	No change in number of poor and women accessing skilled labor employment.	No change in labor sharing
1	Slight increase in the number of poor or women newly accessing skilled labor employment.	After the improved electricity service, women spend more hours working on other tasks than men
2	Medium increase in the number of poor and/or women newly accessing skilled labor employment.	The improved electricity created a net reduction in working hours for women, though they are still higher than men's
3	Significant increase in the number of poor and women newly accessing skilled labor employment.	Men assist women to achieve a more balanced division of the household workload

Division of Decisionmaking (M/F, R/P) ☞ *FGD (Committee interview)*		
Score	**Women's participation in local electricity committee***	**Participation of the poor in local electricity committee***
0	No women on local electricity committee at all, or in name only	No poor members of community on local electricity committee at all, or in name only
1	Women are members of community electricity committee but do not regularly attend management meetings	Poor community members are members of community electricity committee but do not regularly attend management meetings
2	Women are members of local electricity committee and attend management meetings, but do not share in decisionmaking	Poor community members are members of local electricity committee and attend management meetings, but do not share in decisionmaking
3	Women are members of local electricity board and attend management meetings and take decisions together with men	Poor community members are members of local electricity board and attend management meetings and take decisions together with rich
4	Males and females both participate in meetings of higher-level electricity management board (e.g., district, region) and take decisions jointly	Rich and poor both participate in meetings of higher-level electricity management board (e.g., district, region) and take decisions jointly

*Or equivalent organization

PARTICIPATION IN SERVICE ESTABLISHMENT AND OPERATION	
5.1 Participation During Establishment and Operations (M/F, R/P) Degree of control in construction schedules and quality of installations/construction ☞ *Records Review, Community Map, Pocket Voting*	
Score	**Control over timing and quality of design and installation/construction**
0	Neither committee nor users have information and influence
1	Male and/or rich committee members/users can mention one aspect of installation/construction over which they exercise some influence or control
2	Female and/or poor committee members/users can demonstrate one way of checking and influencing installation/construction
3	Male and female, and rich and poor committee members/users can demonstrate one way of checking and influencing implementation

Legal Status and Rules and Tools of Control for Local Electricity Committee,* as Present and Known to M/F, R/P ☞ Records Review, Community Map, FGD (Committee interview)		
Score	**Legal Sstatus**	**Rules and tools**
0	Committee does not have legal status	No statutes on management and use; no separate informal or formal account for electrification
1	Implicit legal status derived from formal administrative organization to which electricity committee is attached	Informal rules, separate fund; no person in charge (signatory powers)
2	Formal legal status for electricity committee itself	Formal rules and statutes on management and use; built-in protection against misuse of electricity and funds

*Or equivalent organization

Coordination Between Local Electricity Committee and Service Provider(s) ☞ *Records Review, FGD (Committee interview, service providers' interview)*	
Score	**Degree of coordination**
0	No coordination between committee and provider
1	Provider and committee meet occasionally, when special problems arise
2	Provider and committee meet on set, periodic basis
3	Provider actively consults committee on a regular basis and regularly takes the committee's recommendations into account

Level of Skill Created and Practiced (M/F, R/P) ☞ *FGD (Committee interview), Pocket Voting, Ladders*					
Score	**Organize and conduct meetings/assemblies**	**Understand and manage effective functioning and use**	**Understand and manage maintenance and repair**	**Make and understand budgets and accounts**	**Understand and practice safe use and environmentally Sound recycling/disposal**
0	No training provided	No training provided	No training provided	No training provided	No training provided
1	One or more male heads of household* received training	One or more male heads of household* received training	One or more male heads of household* received training	One or more male heads of household* received training	One or more male heads of household* received training
2	One or more female heads of household* received training	One or more female heads of household* received training	One or more female heads of household* received training	One or more female heads of household* received training	One or more female heads of household* received training
3	Both male and female heads of household received training	Both male and female heads of household received training	Both male and female heads of household received training	Both male and female heads of household received training	Both male and female heads of household received training
4	Male heads of household can demonstrate skills** and indicate where/when practiced	Male heads of household can demonstrate skills** and indicate where/when practiced	Male heads of household can demonstrate skills** and indicate where/when practiced	Male heads of household can demonstrate skills** and indicate where/when practiced	Male heads of household can demonstrate skills** and indicate where/when practiced
5	Female heads of household can demonstrate skills** and indicate where/when practiced	Female heads of household can demonstrate skills** and indicate where/when practiced	Female heads of household can demonstrate skills** and indicate where/when practiced	Female heads of household can demonstrate skills** and indicate where/when practiced	Female heads of household can demonstrate skills** and indicate where/when practiced
6	Both male and female heads of household can demonstrate skills** and indicate where/when practiced	Both male and female heads of household can demonstrate skills** and indicate where/when practiced	Both male and female heads of household can demonstrate skills** and indicate where/when practiced	Both male and female heads of household can demonstrate skills** and indicate where/when practiced	Both male and female heads of household can demonstrate skills** and indicate where/when practiced
7	Male and female heads of household, plus one or more children from each household can demonstrate skills** and indicate where/when practiced	Male and female heads of household plus one or more children from each household can demonstrate skills** and indicate where/when practiced	Male and female heads of household plus one or more children from each household can demonstrate skills** and indicate where/when practiced	Male and female heads of household plus one or more children from each household can demonstrate skills** and indicate where/when practiced	Male and female heads of household plus one or more children from each household can demonstrate skills** and indicate where/when practiced

* Within target household or business (in case of home- or small business-based systems), or from affected households (in case of community-based systems)

* * Indicative skills for each subject area to be defined.

Perceived Transparency in Accounts (M/F, R/P) ☞ *Records Review, FGD (Committee interview, end-users' interview)*	
Score	**Criteria**
0	No accounts are shared
1	Accounts are shared with the office bearer
2	Accounts are shared with the community – mainly rich males
3	Accounts are shared with the community – mainly rich and poor males
4	Accounts are shared with the community – mainly rich males and females and poor males
5	Accounts are shared with the entire community – rich and poor, females and males

INSTITUTIONAL SUPPORT FOR GENDER- AND POVERTY-SENSITIVE, DEMAND RESPONSIVE PARTICIPATION			
Enabling Organizational System Indicative strategy as reflected in service objectives, implementation strategies, and project performance criteria ☞ *Stakeholder Meet, Pocket Voting*			
Score	**Sustained service for all**	**Community owned and managed**	**Poverty- and gender-sensitive and balanced**
0	Focus was on achieving rural electrification targets	Community owned and managed, state owns service and state utility manages service	Access to women and poor was not mentioned in agency sector policy, objectives, and strategies
1	Focus was also on continuing adequate supply and service	State owns service but certain management tasks have been delegated to community	Agency's sector policy and strategy documents positioned women and poor as passive beneficiaries or target groups for separate programs
2	Focus was also on continuing adequate supply and service for all, including marginal groups	Community owns and manages service after completion, but has no special powers	Special activities and programs encouraged women and poor in new roles in decisionmaking, maintenance, management, and construction and ensured service access
3	Focus was also on continuing adequate supply and service for all, safeguarding management for continuing quantity, quality, reliability, and predictability	Community owns and manages service after completion and powers have been delegated to it to manage the service (e.g., community set its own charges)	Objectives, strategies, and performance criteria aimed at balanced division of burdens and benefits between women and men, rich and poor, in connection with project implementation, O&M, management, use and development effects

Gender- and Class-Disaggregated Planning and Monitoring Systems in Operation ☞ *Records Review (project planning and document monitoring), FGD*	
Score	**Planning and monitoring systems**
0	No gender and poverty considerations in planning and monitoring systems of projects
1	Planning and monitoring systems disaggregated data by gender and socioeconomic strata
2	Planning and monitoring systems collected specific information on participation of and effects for M/F, R/P
3	Data on participation of and effects for M/F, R/P were used to adjust strategies and human resources development

Expertise as Reflected in Type of Agencies Involved, Field Teams, and Team Approach ☞ *Stakeholder Meet, Pocket Voting*			
Score	**Expertise of agencies**	**Expertise in field teams**	**Team approach**
0	No agency or department with social expertise is involved	No social expertise is present in field teams	No interdisciplinary team approach is used
1	Social agency or department took part in service establishment, but had no specific expertise on gender, poverty, and demand responsiveness	Field teams include social expertise, but without specific know-how in gender, poverty, or demand responsiveness	Social and technical specialists work in parallel
2	Social agency or department is one of the project agencies, and has expertise on gender, poverty, and demand responsiveness	Field teams include social expertise with knowledge and skills in gender, poverty, and demand responsiveness	Social and technical teams coordinate their activities and plans
3	Social agency or department is one of the project agencies and has expertise in gender, poverty, and demand responsiveness, and management of the technical agency can explain the relevance and cite strategy elements of a gender- and poverty-sensitive approach	Field teams include social expertise with knowledge and skills in gender, poverty, and demand responsiveness, plus technical team members appreciate a gender- and poverty-sensitive approach and can show elements of such an approach in their own work	Social and technical teams prepare and implement program together and have integrated procedure manual

Enabling Organizational Climate

Capacity building, managerial support, and staff performance incentives

☞ *Stakeholder Meet, Pocket Voting*

Score	Capacity building	Support from management	Incentives
0	Funds for staff training are absent or <5% of investment funds; capacity and skill building and tools development do not include participation aspects	Management is not conscious of demand, gender, and poverty issues in the sector or it considers them outside their realm of tasks	Gender and poverty consciousness in staff is not acknowledged by the staff's management and superiors; or if acknowledged, is discouraged by management and superiors
1	Capacity building in social aspects exist, but events are ad hoc and underfunded (10% of technical training); methods and materials are conventional (classroom lectures, handouts) and trainees are unable to use training in the field (specify reasons)*	Management defines women as passive beneficiaries or target groups for other programs; demand responsiveness is defined as acceptance or nonacceptance of agency choices, with at most marginal adjustments	Individuals can practice a participatory, gender and poverty conscious approach, but management and superiors do not recognize or appreciate these attitudes and actions; staff performance indicators are strictly quantitative (e.g., no. of systems installed, % of funds disbursed, no. of training programs held, etc.)
2	Capacity building in social aspects exists as part of regular training and orientation for all staff; is funded in balance with technical training (approx. 1:3), uses participatory training methods and tools that are then applied in the field, but does not include poverty and/or gender sensitivity and equity aspects	Management sees new roles for women as a means to increase the effectiveness of projects and programs; the need for broader user choice is recognized but without sex and class differentiation	Management and superiors informally acknowledge and appreciate attitudes and approaches that enhance participation and gender and poverty balance in processes and results; staff performance criteria also includes qualitative criteria (e.g., degree of community participation in planning and performance, etc. – specify)
3	Sector agencies use specialized personnel to design and conduct capacity building interventions and tools; capacity building events are part of regular training and orientation for all staff, are funded in balance with technical training (1:3), use participatory training methods and tools that are then applied in the field, and include poverty and/or gender sensitivity and equity aspects	Gender as a concept is defined correctly in project documents, and management can explain why a gender and poverty sensitive approach is practiced; can describe what gender and poverty strategies are practiced in the rural renewable program and can mention some of the effects on the project or program and on the people	Management and superiors formally acknowledge and appreciate attitudes and approaches that enhance participation and gender and poverty balance in processes and results; staff performance criteria includes qualitative criteria and gender and poverty sensitivity and equity in activities, outputs and results

* The assessment of whether those who go for training are able to apply what they learn may open up several issues of organizational culture. In the discussions, get staff involved in implementation to come up with their own information on indicators by which their organization judges staff performance.

POLICY SUPPORT FOR GENDER- AND POVERTY- SENSITIVE, DEMAND-RESPONSIVE PARTICIPATION

National sector policies for water and sanitation present with sustainability and equity as explicit goals

☞ *Policy-level Assessment*

Score	Sustainability	Equity
0	Sector policies aimed at installations/connections; sustained functioning and use are not mentioned	Policies set targets of % of population covered, but do not define "coverage" (e.g., presence of system or system use), the unit of measurement (e.g., community or user households), and the nature of those left unserved
1	Sector policies aimed at the establishment of services, systems and facilities that continue to be maintained and to function (no criteria of functioning included)	Policies set targets for use by all of sufficient and reliable electricity services
2	Sector policies aimed at the establishment of services systems and facilities that continue to be maintained and to function (no criteria included) and be used by (unspecified percent of) the target population	Policies set targets for use by all of sufficient and reliable electricity services; achievement of targets is monitored and programs are adjusted if required
3	Sector policies aimed at the establishment of services, systems and facilities that continue to be maintained and to function according to set standards and to be used by a specified percent of the population	Policies set targets of enabling all men, women and children to use a sufficient amount of reliable electricity for their respective purposes, and to maintain that level of use; achievement of targets is monitored and programs are adjusted if required

System Observation Form: Example of Photovoltaic System

84. Table A1-5 below is just one example of an off-grid renewable energy system observation form, this one developed for evaluating stand-alone photovoltaic (PV) systems. System observation forms must be tailored to the technology/technlogies being used in the installations (i.e., PV, small hydro, biomass, etc.); a system observation form to assess PV systems will be very different than one used to assess minihydro systems, for example.

85. This PV Systems Acceptance Test was developed by New Mexico State University's Southwest Technology Development Institute and Winrock International in 2000 for use in distance education programs in Mexico and Central America. It was developed in Spanish, and translated into English by Lilia Ojinaga, Winrock International. The Spanish version is available on-line at www.solar.nmsu.edu/guia.

Table A1-5: PV Systems Acceptance Test

General Information

Project Name: _____ Geographic Location: _____ User: _____

Vendor: _____ Installation Date: _____ Inspector: _____

Inspection Date: _____ Time: _____ Lat/Long: _____

Purpose: ❑ Installation evaluation ❑ Failure Diagnosis ❑ Preventive maintenance ❑ Reparation / Replacement

Batteries

Brand/model: _____

Configuration: _____ S _____ P

Name plate capacity: _____ Ah

Rated voltage: _____ V

Yes	No	
❑	❑	Good physical condition
❑	❑	Installed in proper place
❑	❑	Has plastic cover
❑	❑	Strip terminals
❑	❑	Terminals and caps clean
❑	❑	Tight terminals
❑	❑	Terminals protected against accidental contact
❑	❑	Adequate water level
❑	❑	Access for maintenance
❑	❑	Adequate disconnects
❑	❑	Adequate over current protection
❑	❑	Enough reserves of distilled water

Lights

Brand/model: _____

Nominal rating: _____ W

Yes	No	
❑	❑	Turn on fast and efficiently
❑	❑	Tubes without dark points / spot s
❑	❑	Work without blinking or noise
❑	❑	Steady and permanent assembly

Comments:

PV Modules

Brand/model: _____

Configuration: _____ S _____ P

Rated wattage: _____ W

Inclination: _____

Orientation_____

Yes	No	
❑	❑	Good physical appearance
❑	❑	Free of shadows (10am-3pm)
❑	❑	Good orientation and inclination
❑	❑	Steady and permanent structure
❑	❑	Metal structure corrosion resistant
❑	❑	Module frames firmly connected to ground
❑	❑	Sealed connection boxes
❑	❑	Diodes are blocked
❑	❑	Adequate conductors
❑	❑	Tight electrical connection
❑	❑	Strong release connections
❑	❑	Module junction box

Inverter

Brand/model: _____

Nominal Rating: _____ W

Yes	No	
❑	❑	Light indicators working
❑	❑	Tight electrical connections
❑	❑	Steady and permanent assembly
❑	❑	Connection protected against accidental contact

Controller

Brand/model:

_____

Nominal voltage: _____ V

Nominal amperage: _____ I

Yes	No	
❑	❑	Good physical appearance
❑	❑	Light indicators working
❑	❑	Tight electrical connections
❑	❑	Steady and firm assembly
❑	❑	Connections protected against accidental contact
❑	❑	Batteries overcurrant protection (LVD for c.c./ o.c. loads)

Other Elements

Yes	No	
❑	❑	Adequate grounding system
❑	❑	Electrical parts of the system are ground connected
❑	❑	Adequate interior wiring
❑	❑	Interior cable in good working order
❑	❑	Adequate surge protection
❑	❑	Disconnection switch for the PV array
❑	❑	Load center with adequate circuits
❑	❑	Minimal accident risks for users
❑	❑	Good workmanship

System Evaluation

Yes	No	
❑	❑	Installed and working suitably
❑	❑	PV system passed the inspection (if not, why)

Appendix 2

Socioeconomic Impact Survey Methodology

1. The following sections contain an explanation of the individual survey components and some actual questions for measuring key socioeconomic information for the households. Not a rigid prescription for conducting rural electrification surveys, it is a guide to help construct and conduct rural electrification surveys. It can help assess the social development impacts of rural electrification projects. It includes questions that have been developed and tested in such projects around the world. These questions should, however, be modified and refined with further application.

The Socioeconomic Impact Survey Team

2. The socioeconomic information survey team should be multidisciplinary, including economists, sociologists, and rural electricity specialists with experience in poverty- and gender-sensitive survey research. Most of the work can be conducted by local specialists, with guidance from international specialists skilled in poverty- and gender-focused surveys to assist with the design and implementation of the survey and econometrics to assist with postsurvey analysis. Enumerators should also be skilled in conducting poverty- and gender-sensitive surveys, and should be fluent in the local language. It is important for the team members to conduct advance pilot tests of the survey, both as a test of the questionnaire and as a training exercise for the enumerators.

Conducting the Socioeconomic Impact Survey

3. Surveys can be time intensive, not only for the researcher but also for those being interviewed. The researcher should not barge in on a household or business unexpected and should not disrupt the interviewee's normal daily activities. The researcher should consult with the interviewee in advance and agree on a time and place that is mutually convenient. The researcher should make sure the interviewee is clear about the objectives of the survey and knows approximately how long the interview will last. The researcher should tell the interviewees what will be done with the results of the interview and make the results and analysis available to them.

4. To assess different gender responses, ideally males and females should be interviewed *separately*, and responses and findings should be disaggregated by gender. However, it is not often practical to ask every question in a standardized household survey to all adults in a household. Based on local circumstances, the pretesting of the survey instrument can determine whether a particular set of questions should be administered separately to males and females. In this regard, it is important to consider literacy and cultural factors in communications with the interviewees. The researcher should ensure that the interview is planned for and conducted at a time and place convenient for the interviewee, and in a space in which the interviewee feels comfortable speaking frankly.[10/]

Socioeconomic Impact Survey Components

Socioeconomic and Demographic Information

Purpose

5. To gather information on the socioeconomic and demographic profile of the respondent and his/her household members.

Process

6. Each row in this section corresponds to information to be collected on each individual household member, including name, age, gender, living status, marital status, education level, school enrollment status, and time spent study, or reading at night. It is important that this information is recorded for each individual household member to allow the impacts of electrification to be measured on the entire household.

7. The questions on education capture relevant information on school enrollment, status of school-aged children, and the educational status of adults. The education questions also ask the literacy level of each household member, and whether adults are enrolled in an adult education program. The last two questions involve time spent by individual household members n reading, writing, and studying, on a daily basis.

8. Each household member should be assigned an identification number that must be strictly used throughout the questionnaire as the reference number for that person. This will allow the researcher to analyze data gathered through the survey at both the individual and household level, and to disaggregate data for different groups (i.e., for males and females).

[10/] Several good methodologies and manuals for conducting poverty and gender sensitive surveys are available. *A Guide to Gender Analysis Frameworks* by March, Smyth and Mukhopadhyay (1999) contains step-by-step instructions for using different gender-analysis frameworks and examines the advantages and potential pitfalls of different methodologies. See also Parker, Rani, Gender Analysis Matrix (1993); the Harvard Analytical Framework (Overholt et al, 1985); and Range and Omondi, *Chrysalis: Leadership Training for Pioneering Women* (2000).

Minimum Information to Emerge

9. - Information about the respondent and the members of his/her household: name, age, gender, living status, marital status, education level, school enrollment status, and time spent study or reading at night.

Household Income

Purpose

10. To collect information about the income-generating activities of the respondent and his/her household members.

Process

11. For most rural households, measuring household income and economic status requires collecting basic information on farming and agricultural production, as the majority of rural families' livelihoods come from the agriculture sector. Agricultural production and other farming activities usually take place over the entire year. Additionally, many rural families, or particular members within the family, engage in nonagricultural activities, either because they are not involved in agricultural work or to supplement their agricultural income. As a result, survey questions must be structured to allow for multiple sources of income from different kinds of income-generating activities.

12. For rural farming households, estimated cash income from agricultural production (i.e., total sales from each crop) and sale of livestock and fowl is recorded as a net benefit. Generally, farm income is considered a return on the labor of the farming family. Net farm income calculates the value of the crop or livestock produced, sold and consumed, minus cash expenses. Costs refer strictly to agricultural production and other farming costs, such as purchased assets, fertilizer, and land rental fees. Household consumption of produced food goods is valued at the local market price. Questions on income from agricultural production should be season specific (i.e., types of crops sown in different seasons), and interviewers must be able to combine income from all seasonal agricultural production into one annual income.

13. Information should also be collected on agricultural holdings, including total arable land used for agricultural production, as well as the amount of land owned and rented.

14. Measuring the value of livestock can be difficult. The approach taken for most energy questionnaires implemented in areas where livestock is an important source of income is to identify the value of the most common animals owned by the household. For most surveys it is only practical to record the value and number of holdings at the time of the interview, as most herding households sell their livestock only on an intermittent basis.

Minimum Information to Emerge

15. - Information about agricultural and nonagricultural cash income and expenditures, and land and livestock holdings.

Physical Housing and Home Business Information

Purpose

16. To collect information about the main type of dwelling and whether any part of the home is used for business activities.

Process

17. Questions on physical housing structure must be adjusted to the types of housing materials used in different regions. This section also contains information about the location of the household in relation to various types of social infrastructure, including the electricity grid and other energy supply systems, schools, health clinics, water and sanitation systems, roads, and other infrastructure that can enhance rural quality of life and social and economic development.

Minimum Information to Emerge

18. - Main type of dwelling unit and construction materials;
- Whether any part of house is used for business activities. If so, what type and who operates them; and
- Access to social infrastructure, such as water facilities, schools, and roads.

Existing Fuels and Energy Sources

Purpose

19. To gather detailed information on existing fuels and energy sources.

Process

20. The responses to these questions can be used to calculate the impacts of electricity versus other types of energy for customers. To be able to calculate these impacts, the survey should identify the types of fuels used for each end use (i.e., lighting, information dissemination, income-generating activities). Questions are designed to identify particular energy sources and their frequency of use; estimate the relative quantity portion of fuel used for each purpose; to estimate the average quantity consumed and total monthly expenditures for each fuel; and to identify the end uses associated with each energy source. The enumerator uses a checklist to ensure that respondents do not leave out any relevant fuels or energy sources.

21. The questions involve whether the respondent or other household members have used each particular fuel at any time during the past 12 months. If the answer is no, no further information collected on this source. If the answer is yes, the enumerator goes to a section on that source and completes the details of the energy

sources used. The respondent is asked about the frequency of use of each particular source. Once the relative level of use is established, subsequent questions identify end-use activities and estimate the portion of fuel used for each activity (for fuels with more than one use, such as kerosene). For example, the respondent might be asked to estimate the relative percentage of kerosene used for lamp lighting and cooking.

22. A series of questions is then asked on the average amount consumed, monthly expenditures, and average effective price per unit paid by the household for the particular source. While some questions can be asked simply, others can be more complicated because of the traditional and lack of standard units involved in collecting or purchasing the fuel. Thus, it is recommended that the researcher examine fuel/energy source market before conducting the interview to determine how each fuel is commonly sold (i.e., type of unit and quantity and weight per unit for each source in the market). This will help ensure that correct weights and volumes are collected during the course of the survey. For instance, for kerosene and diesel purchases, some households use beer or soda bottles to store the fuel. In these cases the volume of a typical beer or soda bottle must be known to accurately calculate the total consumption and price per liter. Further, the formatting and structuring of the questions should reflect how the typical customer purchases these energy sources. Such information can reveal whether low-income households end up paying higher prices, since they tend to make smaller, more frequent fuel purchases.

23. The last set of questions in this section is designed to collect end-use information. Survey questions should ask, for example, whether each source is used for lighting, income-generating, news/information, entertainment, and so on, and for which specific purposes within these categories, such as lighting for studying, doing housework, etc. Questions should also ascertain the length of time each source is used for these purposes each day.

Minimum Information to Emerge

24.
- The different types of fuels/energy sources used;
- Estimated average monthly expenditures for each particular source;
- Type and quantity (in units) usually purchased;
- Where relevant, average and quantity weight of the particular fuel per unit and price per unit; and
- Estimated number of units used each month.

Electricity Consumption and Expenditures

Purpose

25. To gather information on the nature, quality, and quantity of customers' electricity consumption, the length of time customers have been using electricity, and the nature of their payment structures.

Process

26. Questions addressing the consumption of grid electricity have to be structured quite differently from those addressing individually owned systems. There are many different models by which electricity can be used and paid for by rural individuals, households, small businesses and communities. This section is designed to determine the status of household electricity connection, use, management, and demand.

27. Information on the number of years the consumer has used electricity is necessary because it is one of the factors that influences household consumption patterns and attitudes. Customers who have had electricity for a longer period of time tend to use more electricity than those who have recently been connected. Questions should be designed so that the electricity planners can follow up or track any changes in the use of electricity and appliances. Five years is the recommend time period for tracking household electricity consumption pattern changes.

28. In many countries, customers purchase electricity from their neighbors. Thus, it is necessary to ask questions regarding the source of electricity connection and number of customers that share the same electric meter. For example, if households share electricity with their neighbors, the numbers of units (kWh) registered on the meter or electric bill are adjusted to reflect the number of households that share the service. Asking respondents questions such as, "To whom do you pay your electricity bill," and "How many customers share the electricity bill," can elicit this information. The source and status of the electricity connections can provide useful information for assessing connection policies and practices.

29. The basis for collecting information on quantity of electricity consumed, expenditures and unit prices can come from several different sources, including utility billing records, the customer's most recent electric bill, direct meter reading by the interviewer, and the customer's recollection of the average electric bill. This is essential in any household energy survey. If electricity is purchased from a utility company, consumption and costs may also be collected directly from the company. Relying on customer billing records from the utility company allows the researcher to collect consumption records over time and thus document changes in electricity use over time. Unfortunately, billing systems and record- keeping practices in many countries contain a high number of errors. In some cases, meter-reading procedures are not systematic, resulting in electric bills that are estimated and not actually read. In addition, as indicated above, many customers share a single electric bill or meter, which may also result in inaccurate billing. Thus, the researcher should always cross-check information gathered from the provider and the customer, and make note of any discrepancies.

30. The questionnaire must reflect the billing format and design so that the enumerator can easily transfer information from the electric bill to the survey questionnaire and thus reduce potential errors. The researcher should consider recording the account and meter numbers, along with the unit (kWh) consumed and amount owed, to allow for future verification or addition of consumption data from the billing records.

However, past household survey experience suggests that only about one-third of households can provide their two most recent electric bills. Many discard their bills after payment, while others have only old bills.

31. One strategy that can be used to get a more accurate estimate of electricity consumption is for the survey enumerators to read the electric meter directly and record the kWh used at the time of the interview. After a specified period of time (at least 25 days), the enumerator can return to take a second reading so the total electricity consumption during the interim time period can be accurately measured. There are still problems with this method for customers serviced by poorly run utilities, as their meters may be broken or miscalibrated. If the customer does not purchase electricity from utility company or cannot provide previous electric bills and billing records, the customer provides answers based on their recollection. Using this approach, the researcher asks the customer how much is paid per month, and then determines the kWh used from the provider's records. This can also be determined by monthly estimates of appliance usage.

32. The methods described above have their related advantages and disadvantages. To design effective questions/techniques for collecting electricity consumption data, it is recommended that the researcher take the following steps.

- Before initiating the survey, assess the reliability of consumption data from the customer's electric bill.
- If possible, collect consumption data from several sources. The sources can include electricity bills, returning to read the meter after two or three weeks to get the quantity of electricity consumed, and through questions involving recall of the electricity or charges. Collecting data from such sources makes it possible to compare and cross-check the consistency and accuracy of electricity usage data. A determination can be made regarding the most reliability of the methods by comparing the advantages and disadvantages of each. It should be remembered that month-to-month fluctuations in electricity use are less common in warmer-climate developing countries than in colder-climate countries. This may be useful in deciding between using data from billing records and from direct meter readings. Knowing which information source is most accurate (the primary source) will be useful in the final analysis and for future data collection.
- After adopting the specific technique for determining electricity consumption, design the format and form of questions so that the enumerator can easily transfer consumption and expenditure data to the questionnaire form.

33. This section also includes questions about the quality of electricity services and any problems customers experience with their service. This should include questions about power failures, power drops (dimming), and whether households receive their expected hours of service each day.

Minimum Information to Emerge

34.
- Length of time customer has been using electricity;
- Source and status of electricity connection (e.g., utility company, neighbor, or community);
- Whether customer shares electricity with others;
- Number of customers that share electricity bill;
- Nature of customers (i.e., households, businesses, etc.) sharing electricity bill;
- How electricity bills are paid (e.g., directly to utility company, included in the rent, or free of charge);
- Quantity of electricity used, total electricity expenditures, and price paid by the customer; and
- Quality of electricity service.

Electric Appliance Ownership and Use

Purpose

35. To collect data on appliances owned and used, and the energy consumption associated with them.

Process

36. Capturing the number of months customers have owned appliances is especially important in countries where ownership has increased significantly in recent years or may be increasing among certain segments of the population. This tool tracks the trend of appliance ownership among new electricity customers. Experience from past surveys demonstrates that accuracy of recall is limited to about five to six years and is less reliable for minor appliances. For all appliances, the researcher should ask questions on patterns of use, such as, "How many hours per day do you listen to the radio/watch TV?"

37. Collecting data on appliance wattage ratings during the interview is both difficult and time-consuming. It is preferable to conduct a small market survey on appliances sold commercially prior to conducting the survey. Data should be recorded on brand names, models, and power ratings of commonly used, commercially available appliances. This information is consolidated in a codebook that the enumerator uses during the interview. Enumerators are trained to inspect and visually identify appliance brand names, models, and sizes; the codebook references particular appliances, including wattage ratings and coding instructions.

Minimum Information to Emerge

38.
- Types and number of appliances owned;
- Wattage rating of each appliance owned;
- Patterns and frequency of use;
- Number of months respondent has had the appliance; and
- Intention to buy appliances.

Electric Lighting

Purpose

39. To collect information on the type, number and, capacity of each lighting device and the approximate length of time each device is used per day.

Process

40. Because electric lighting is a common application for rural electricity, survey questions should address the type, number, and capacity (kWh) of each lighting device (including both lightbulbs/tubes and portable lamps) and the approximate number of hours each type of lighting device is used in a 24-hour period. The researcher should cross-check the information received from the respondent by identifying and inspecting the devices described. The researcher may decide to collect data on only the lightbulbs and lamps used regularly by the household, with the definition of "regularly" to be determined and standardized before the survey is conducted. (Typically, this refers to bulbs or lamps turned on for a minimum of 20 minutes during a 24-hour period.)

41. Typically, several types of questions are asked. These include the following:

- "What type of electric lighting devices (lightbulbs/tubes and lamps) do you have?" The researcher should inquire about and list each lighting fixture one by one. If two electric devices of the same type have different wattage ratings, they should be listed separately. The researcher should indicate only devices that are operational.
- "What is the wattage of each device?" The researcher should cross-check by personally inspecting the devices.
- "How many bulbs/tubes/lamps do you own of the same type and wattage?"
- "How many minutes/hours do you use each device per day?" For devices of the same type and wattage, the researcher should determine the usage time for each and add them. For example, if there are two fluorescent bulbs with the same wattage (40 watts) in use, and one tube is used for 3 hours while the other is used for 5 hours, the total number of hours used per day for all 40-watt fluorescent tube lamps is 8 hours.

Minimum Information to Emerge

42.
- Types and numbers of electric lighting devices (lightbulbs/tubes and lamps);
- Wattage of each device; and
- Length of time lighting devices are used per day.

Reason for Adopting/Not Adopting Electricity System/Service

Purpose

43. To ascertain, where relevant, why customers decide to connect or not connect to the electric grid.

Process

44. Typical reasons for connecting to the electric grid include the prospect of better/more reliable service, the prospect that monthly expenditures will be lower than what they previously paid. Typical reasons for not connecting include a lack of affordability caused by high connection costs, high house-wiring costs, expensive monthly charges, or the cost of appliances. Other reasons for not adopting electricity service given by consumers include a lack of appreciation of the benefits of electricity service and a satisfaction with their current energy sources.

Minimum Information to Emerge

45.
- Whether household would like to have electricity (if doesn't already have it);
- Reasons for connecting to electric grid or purchasing off-grid electric system (if it has); and
- Reasons for *not* connecting to electric grid or *not* purchasing off-grid electric system (if it hasn't).

Time Use

Purpose

46. To gather information on the different activities that males and females and different socioeconomic classes spend their time on.

Process

47. It is critical that the same set of time-use questions be asked of both male and female respondents. This is because respondents are asked to give the proportion of their time spent on various activities in a 24-hour or a 1-week period, depending on the topic. For example, meal preparation may be a daily activity, but fuelwood and water collection may be an activity that does not necessarily occur every day. Common activities which should be included in this section include food processing, fuel collection, cooking, water collection, clothes washing and house cleaning, bathing, childcare, shopping, income-generating activities, sleeping, socializing and other leisure time-activities, religious practices, watching TV, listening to the radio, reading, studying,

and others. It is critical that the same set of questions be asked of male and female respondents. It should not be assumed that particular activities are women's and others are men's. However, under budget-constrained situations, a possible compromise might be to interview women in the family.

Minimum Information to Emerge

48. How much time respondent (male and female) spends on various activities, including preparing meals, income-generation, childcare, collecting fuel/water, resting, sleeping, watching TV, and others.

Customer Attitudes Toward Electricity and Other Energy Services

Purpose

49. To collect information about customers' attitudes about and preferences for different electricity and other energy sources.

Process

50. The use of attitudes is very common in most types of market surveys. They are important because they reveal consumer preferences for different types of energy and energy services. Some examples of such questions are provided in a component entitled "Household Energy Attitudes." For these questions, the interviewer reads a statement for the respondent, and then asks them to "strongly agree," "agree," "disagree," or "strongly disagree" with the statement.

Minimum Information to Emerge

51. Respondent's attitudes about several topics related to electricity or energy service.

Analysis of the Results

52. A survey and methodology similar to the one being advocated in this paper was used in the Philippines to calculate the impacts of electric lighting. The analysis principles described here can also be applied to calculate the impacts of other electricity services.

53. Electricity impacts were estimated using conventional economic analysis involving calculations of willingness to pay for lighting services. In the Philippines it was reasonable to assume that a hypothetical household without electricity moves from a total reliance on kerosene lanterns for lighting to a total reliance on a mix of incandescent or florescent lamps. Both the electricity and the kerosene consumption figures are based on actual lumens produced by the lamps. As indicated in Table A2-1, households without electricity do, in fact, use energy sources other than kerosene for lighting but these uses appear to be minor. The assumed shift from kerosene lamps to lightbulbs, and the associated assumption that the demand curve has only two observable consumption levels, one for each lighting source, does not seem to be too far off the mark.

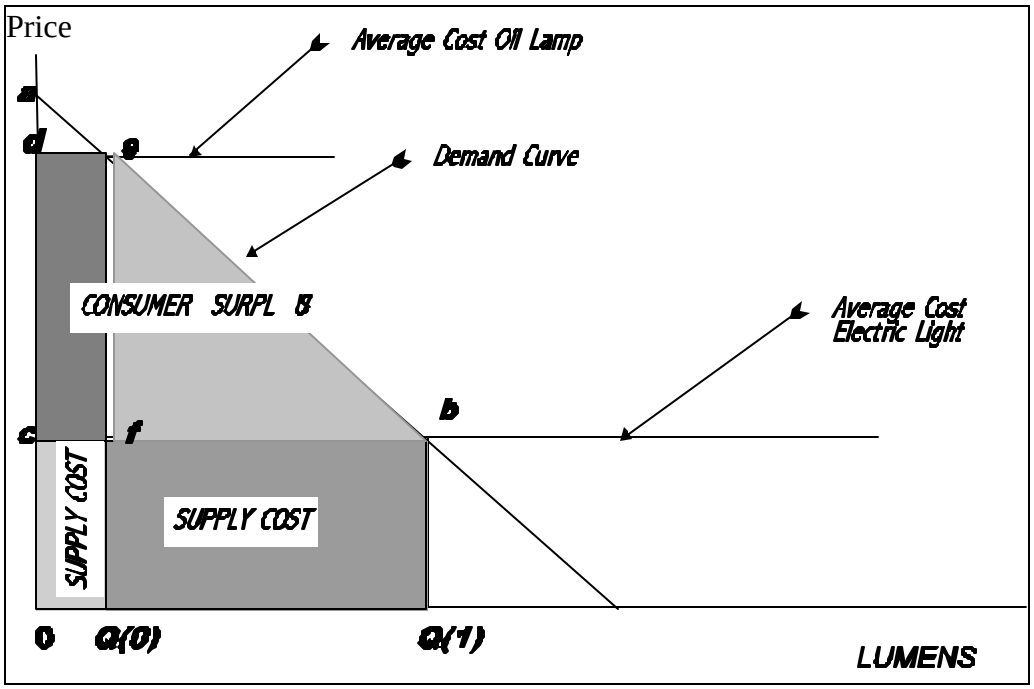
Table A2-1: Lighting Source of Households Without Electricity *

Rural Philippines, 1998					
	Mt. Province	Nueva Ecija	Batangas	Camarines Sur	All households
Kerosene	89.1	92.4	96.6	95.7	93.0
LPG	1.2	--	--	0.4	2.3
Drycell Batteries	1.8	2.9	--	2.6	2.3
Other Batteries	--	4.8	--	--	0.9
Candles	3.0	6.6	27.6	5.2	6.4
Population	6,112	12,948	5,122	31,621	55,803

* Households may use more than one type of energy. All figures are percent of households without electricity from the grid.

54. The assumption of a linear demand curve allows for the direct computation of impacts according to the model illustrated in Figure A2-1. Specifically, in the simple linear case, impacts, or consumer surplus/shortage, is estimated by the sum of the green and blue areas indicated in the diagram: the difference between the change in the total willingness-to-pay for lumens less the cost of the (higher) consumption level with electrification. Thus, the change in lighting benefits for our hypothetical household is equal to the initial consumption level ***Q(0)*** times the difference in the lumen price with and without electricity (***P(1) -P(0)***) plus one-half the difference in price times the change in lumen consumption (***Q(1)-Q(0)***). Based on survey data and assumed lumen costs with and without electricity, we assign the values shown in Table A2-2 for the computation.

Figure A2-1: Benefit Estimation Derived from Demand Curve for Lumens



55. These parameters yield an estimated gain in lumen benefit for our hypothetical household without electricity of $36.75 per month. If this household is representative of the approximately 4 million households without electricity in the Philippines, the total national lumen benefit from electrifying these households would be about $147.5 million per month.

Table A2-2: Price and Quantity of Light Used in Rural Households

Rural Philippines, 1998			
Parameter	Value	Units	Assumptions
P(0)	$0.36	Per kilolumen hour	Average kerosene cost per kilolumen hour
P(1)	$0.0075	Per kilolumen hour	Average grid electricity cost per kilolumen hour
Q(0)	4.1	Kilolumens per month	Average consumption for households without electricity
Q(1)	204.4	Kilolumens per month	Average consumption for households with electricity

56. Of course, these estimates may be too high or too low if the underlying assumptions fail to hold. In particular, there are two important reasons for possible error. The demand curve could deviate from the assumed linear form. For example, if the consumption of lumens were very insensitive to price changes for low levels of consumption but very highly sensitive to price changes for high levels of consumption, the demand curve could curve towards the axes, carving out a much smaller area for consumer surplus. If this were the case, then the above estimates would be far too high. Of course, other nonlinear demand forms (e.g., ones that curved away from the axes) could, instead, lead to much higher estimates. Unfortunately, accurate demand curve estimation is fairly data intensive. While our data set was reasonably large, it still was not large enough to allow us to observe a wide range of pre-electrification lumen prices and consumption levels. The actual lumen consumption by different energy sources is listed in Table A2-3, which indicates that very similar patterns to those described above.

Table A2-3: Lumen Consumption by Energy Type

Rural Philippines, 1998						
		Lumens consumed by energy source (users only)				
Electricity status		**Candles**	**Kerosene**	**Batteries**	**Grid**	**All sources**
No electricity	Average	0.156	5.14	6.915	--	5.08
	HH*	98	588	2	0	601
Electricity	Mean	0.125	4.26		203.41	205.68
	HH*	449	556		1,068	1,068
All households	Mean	0.130	4.71	6.915	203.41	133.44
	HH*	547	1,144	2	1,068	1,669

Note: Figures vary slightly from those in previous tables because of missing values. The figures are only for those using an energy source for lighting.

* HH= households using the energy source.

57. In addition to the deficiency related to the linearity assumption, the assumption of a single demand curve ignores possible shifts in demand as the household's income rises. If the households recently receiving electricity continue to adhere to their original, low-income demand curve for lumens, then our estimates of their lumen consumption with electrification will be too high. As a result, our benefits estimates will be too high as well. On the other hand, should they choose to behave like wealthy households with high lumen demand curves, our estimates may be too low. Although, the assumption of a single demand curve may be a good compromise between these two situations, a more sophisticated way of controlling for income effects on demand would be desirable.

Sample Socioeconomic Impact Questionnaire

58. What follows is a sample questionnaire with examples of questions that can be asked in a survey for rural electrification projects. While it is based on previous experience with rural electrification projects around the world, it is not a comprehensive template. Ultimately, the final selection/design of questions will have to depend on the objectives and needs of the particular project, and should be informed by the information gathered in the participatory assessment. This questionnaire has been designed to be applied at the household level, but could easily be revised to be applied at the small business level as well.

Table A2-4: Sample Survey for Rural Electrification Projects

SOCIOECONOMIC AND DEMOGRAPHIC INFORMATION ON ALL MEMBERS												
			Age		Sex			Education			Reading or studying	
Person ID number	**Name**	Rela-tionship with head of HH	Yrs	Mos	M = 1 F = 2	Marital status 1 = single 2 = divorced 3 = widowed	No. mos. eat & sleep in this HH during past 12 mos.	Can read & write No = 0 Yes = 1	No of yrs. of education completed	Presently enroll in school No = 0 Yes = 1	Hours spent at home reading or studying last 24 hours	Of which hours reading or studying done at night
1												
2												
3												
4												
5												
6												
7												
8												
9												
10 etc.												

Relationship codes:

[0]=Head of household	[1]=Father	[2]=Mother	[3]=Husband	[4]=Wife	[5]=Brother
[6]=Sister	[7]= Son	[8]=Daughter	[9]=Father-in-law	[10]=Mother-in-law	[11]=Brother-in-law
[12]=Sister-in-law	[13]=Son-in-law	[14]=Daughter-in-law	[15]=Uncle	[16]=Aunt	[17]=Cousin (male)
[18]=Cousin (female)	[19]=Nephew	[20]=Niece	[21]=Domestic helper (ma	[22]=Domestic helper (fer	[23]=Grandfather
[24]=Grandmother	[25]=Other (specify)				

Age: Enter the total number of years and months. For example the person is 34 years and 5 months old enter 34 in the years column and 5 in the months column

Education codes: Number of years of education completed: Enter the total number of years of education the person completed. Enter: - 7 for questions that do not apply, for example answer -7 on education and occupation for infant.

Information on Income, Expenditures, and Agricultural Activities				
Nonagricultural Cash Income				
INC1.0	What was your household's -nonagricultural cash income over the past 12 months?			
INC1.1	Cash income from sale of livestock/fowl/fish	_____	INC1.1	
INC1.2	Secondary cash income	_____	INC1.2	
INC1.3	Worker wages and bonuses	_____	INC1.3	
INC1.4	Government income, such as pension or veterans benefits	_____	INC1.4	
INC1.5	Remittances from relatives	_____	INC1.5	
INC1.6	Income from interest or rental property, such as land or agricultural equipment	_____	INC1.6	
INC1.7	Other cash income, specify	_____	INC1.7	
INC1.8	Total noncash income	_____	INC1.8	

Agricultural Income

Please tell me about all the crops your household grew during the past 12 months.

Type of crops	Total amount		Price	Total production	Total revenue
	Production	Sold	per unit	expenses	(net)
	AG1.0	AG1.1	AG1.2	AG1.3	AG1.4
	AG2.0	AG2.1	AG2.2	AG2.3	AG2.4
	AG3.0	AG3.1	AG3.2	AG3.3	AG3.4
	AG4.0	AG4.1	AG4.2	AG4.3	AG4.4
	AG5.0	AG5.1	AG5.2	AG5.3	AG5.4
	AG6.0	AG6.1	AG6.2	AG6.3	AG6.4

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.

	Nonagricultural Expenditures			
EX1.0	What were your household's nonagricultural expenditures last year?			
EX1.1	Food and foodstuff		EX1.1	
EX1.2	Housing, such as repair or rent (excluding rent for agricultural production)		EX1.2	
EX1.3	Medical care		EX1.3	
EX1.4	Other expenditures		EX1.4	
EX1.5	Total nonagricultural expenditures		EX1.5	

	Agricultural Land			
LA2.0	Please describe your land that was under cultivation last year (in hectares).			
LA2.1	Total area under cultivation		LA2.1	
LA2.2	Portions of fields that were irrigated		LA2.2	
LA2.3	Portions of fields flooded		LA2.3	

	Livestock Holdings			
LI3.0	Please describe the livestock currently raised by your household.			
LI3.1	Pigs		LI3.1	
LI3.2	Cattle and/or water buffalo		LI3.2	
LI3.3	Domestic fowl		LI3.3	
LI3.4	Other, specify		LI3.4	

	Housing Unit Information			
HU3.1	Main type of dwelling unit [1] = Row house (wood construction) [2] = Row house (brick construction) [3] = Row house (brick and wood construction) [4] = Semidetached home [5] = Single, detached home [6] = Apartment [7] = Other, specify.....	_____	HU3.1	
HU3.2	Is any part of your house used for business activity or commercial purposes? Coding: [0] = No, If "No," go to HU3.5; [1] = Yes	_____	HU3.2	
HU3.3	If part of your house is used for business activity, please indicate type. [1] = Crop processing [2] = Hair salon or barber shop [3] = Food/beverage shop [4] = Grocery and beverage shop [5] = Beverage shop [6] = Retail sales [7] = Laundry [8] = Furniture-making or carpentry shop [9] = Handicraft production/sales [10] = Repair shop (e.g., appliances) [11] = Other, specify	_____	HU3.3	
HU3.4	If "Yes," *who in your household* is the principle operator of the above business activities? Enter person identification number shown in "Socioeconomic and Demographic Information."	_____	HU3.4	
HU3.5	Does your household own or rent this house? Coding: [0] =Own; [1] = Rent		HU3.5	

	Access to Social Infrastructure		
	What is the distance from your home to the nearest elementary school?		
INF1a	_____ kilometers	INF1a	
INF1b	_____ meters	INF1b	
	What is the distance from your home to the nearest secondary school?		
INF2a	_____ kilometers	INF2a	
INF2b	_____ meters	INF2b	
	What is the distance from your home to the nearest health center or health clinic?		
INF3a	_____ kilometers	INF3a	
INF3b	_____ meters	INF3b	
INF3	What is the source of your household **drinking** water supply		
	Code: [1] = Tapb water inside home [2] = Tapb water outside home but within the household premise; [3] = Tube well (privately owned) [4] = Tube well (government owned) [5] = Well [6] = Pond [7] = River/canal		
	What is the distance from your home to the nearest drinking water source mentioned above? (Enter "0" for tap inside home)		
INF4a	_____ kilometers	INF3a	
INF5b	_____ meters	INF3b	
INF6	What is the source of your household -**nondrinking** water supply		
	Code: [1] = Tap water inside home [2] = Tapb water outside home but within the household premise; [3] = Tube well (privately owned) [4] = Tube well (government owned) [5] = Well [6] = Pond [7] = River/canal		
	What is the distance from your home to the nearest **nondrinking** water source mentioned above? (Enter "0" for tap inside home)		
INF7a	_____ kilometers	INF7a	
INF7b	_____ meters	INF7b	
INF8	What is the best description of the main access to your home?		
	Code: [1] = Paved road/street [2] = Unpaved road/street [3] = Path to walk [4] = River/canal/sea [5] = Other		

	Fuels and Energy Sources		
	Code:[0]=No [1] = Yes		
EG1	Candle	EG1	
EG2	Kerosene /diesel for lamp lighting	EG2	
EG2	Torch	EG2	
EG3	Solar lantern/lamp	EG3	
EG4	Fuelwood	EG4	
EG5	Charcoal	EG5	
EG6	Animal dung	EG6	
EG7	Charcoal	EG7	
EG8	Biogas	EG8	
EG9	Coal	EG9	
EG10	Crop residues	EG10	
EG11	LPG	EG11	
EG12	Dry cell battery	EG12	
EG13	Car battery	EG13	
EG14	Solar PV home system	EG14	
EG15	Household-owned electric generator set	EG15	
EG16	Electric generator set owned by neighbor/local supplier	EG16	
EG17	Electricity from the privately owned minigrid, village/community grid	EG17	
EG18	Electricity from national grid, or regional grid, or town grid	EG18	
EG19	Others, specify _____	EG19	

	Candle		
CAN1	During the past 12 months how often did your household use candles?	CAN1	
	Code: [0] = Do not use candles, ***go to next section*** [1] = Used sometimes/seldom [2] = Always		
CAN2	How many candles does your household buy per purchase?	CAN2	
CAN3	On the average, how much does your household spend on candles at each purchase?	CAN3	
CAN4	How many days does your typical purchase of candles last?	CAN4	
CAN5	On average, how much does your household spend on candles each month?	CAN5	
CAN6	What is the average weight (in grams) of one candle?	CAN6	
	Uses of candlelight for household activity Now I would like to ask you some questions about evening activities that require candlelight. Do any household members use candlelight in the evening for the following purposes?		
CAN7	**Reading/writing/studying** (i.e., read newspaper, bible, novel, write letter, do homework for school, prepare for examination) [1] = Yes; [0] = No	CAN7	
CAN8	**Area lighting** [1] = Yes; [0] = No	CAN8	
CAN9	Generally, how many <u>hours per evening</u> does your household usually use candles for lighting? _____ Hours/evening	CAN9	

	Torch		
TO1	During the past 12 months how often did your household use a torch/torches for lighting? [0] = Do not use torch for lighting If "Do not use torch'" go to next section. [1] = Used sometimes/seldom [2] = Always	TO1	
TO2	On average, how much does your household spend on torch each month? _____per month	TO2	
TO3	**Area lighting** [1] = Yes; [0] = No; If "No" ***go to next section***	TO3	
TO4	Generally, how many hours per evening does your household usually use a torch/torches for lighting? _____Hours per evening	TO4	

	Kerosene		
KER1	During the past 12 months how often did your household use kerosene? Code: [0] = Do not use kerosene, ***go to next section*** [1] = Used sometimes/seldom [2] = Always	KER1	
KER2	On average, how many liters of kerosene does your household usually buy per purchase?	KER2	
KER3	What percentage of the kerosene you buy per purchase is used for the following purposes?		
KER3R3a R3R3a	Cooking and boiling water for drinking, %	KER3a	
KER3b	Heating water (for bathing, washing clothes), %	KER3ab	
KER3c	Lighting, %	KER3c	
KER3d	For home business, %	KER3d	
KER3e	Other, % (specify)	KER3e	
	(Total must add up to 100%)	Total	100%
KER4	On average, how much does your household spend on kerosene per purchase?	KER4	
KER5	On average, how many days does your typical purchase of kerosene last?	KER5	
KER6	On average, how much does your household spend on kerosene per month?	KER6	
KER6a	How much kerosene did your household use last month?	KER6a	
KER6b	What was the average price of kerosene that you paid last month?	KER6b	

	Uses of Lamps/Lanterns		
KL1	How many simple wick kerosene lamps does your household have? (*Enter "0" for none, if "None"* ***go to next section***	KL1	
	Do you or any of your household members use simple kerosene wick lamps for the following purposes.		
KL2	**Reading/writing/studying** (i.e., read newspaper, bible, novel, write letter, do homework for school, prepare for examination) [1] = Yes; [0] = No	KL2	
KL3	**Area lighting** [1] = Yes; [0] = No	KL3	
KL4	On average, how many hours per day does your household use simple wick lamps?	KL4	
KL5	How many regulated wick lamps (hurricane lanterns, e.g., Coleman, Petromax) does your household have? *(Enter "0" for none, if "None"* ***go to next section.)***	KL5	
	Do any household member use regulated wick lamps for the following purposes.		
KL6	**Reading/writing/studying** (i.e., read newspaper, bible, novel, write letter, do homework for school, prepare for examination) [1] = Yes; [0] = No	KL6	
KL7	**Area lighting** [1] = Yes; [0] = No	KL7	
KL8	On average, how many hours per day does your household use regulated wick lamps?	KL8	
KL9.	How many pressurized kerosene lamps does your household have? *(Enter "0" for none, if "None"* ***go to next section)***	KL9	
	Do any household member use pressurized kerosene lamps for the following purposes.		
KL10	**Reading/writing/studying** (i.e., read newspaper, bible, novel, write letter, do homework for school, prepare for examination) [1] = Yes; [0] = No	KL10	
KL11	**Area lighting** [1] = Yes; [0] = No	KL11	
KL12	On average, how many hours per day, does your household use pressurized kerosene lamps?	KL12	
	Do any of the household members use a solar lamp/lantern for the following purposes.		
KL13	**Reading/writing/studying** (i.e., read newspaper, bible, novel, write letter, do homework for school, prepare for examination) [1] = Yes; [0] = No	KL13	
KL14	**Area lighting** [1] = Yes; [0] = No	KL14	
KL15	On average, how many hours per day does your household use the solar lamp/lantern?	KL15	

	Dry Cell Battery		
DBAT1	During the past 12 months did your household use a dry cell battery for any of the following applications: torch, radio, tape cassette, other? Code: [0] = Do not use dry cell battery, ***go to next section*** [1] = Used sometimes/seldom [2] = Always	DBAT1	
DBAT2	On average, how many dry cell batteries does your household buy per purchase? *Enter number of dry cell batteries usually buy regardless of size*	DBAT2	
DBAT3	On the average, how much does your household spend on dry cell batteries per purchase?	DBAT3	
DBAT4	On average, how many days does your typical purchase of dry cell batteries last?	DBAT4	
DBAT5	On average, how much does your household spend on dry cell batteries per month?	DBAT5	

	ITEM	**Do you use dry cell battery for any of these devices?** **[0] = No** **[1] = Yes**	**No. of hrs. used per day**	**No. of batteries used to operate the device**
DBAT6	Flashlight	DBAT6a	DBAT6b	DBAT6c
DBAT7	Battery-powered lamp	DBAT7a	DBAT7b	DBAT7c
DBAT8	Radio and/or tape cassette	DBAT8a	DBAT8b	DBAT8c
DBAT9	Other, specify _____	DBAT9a	DBAT9b	DBAT9c

	Motorcycle/Car Battery		
CBAT1	During the past 12 months, did your household use car or motorcycle battery to supply electricity? Code: [0] = Do not use motorcycle/car battery, ***go to next section*** [1] = Used sometimes/seldom [2] = Always	CBAT1	
CBAT2	During the past 30 days, did your household use a motorcycle/car battery to supply electricity? Code: [0] = No, did not use, ***go to CBAT3*** [1] = Used as supplementary source of electricity [2] = Used as the main source of electricity *If answered [1] or [2]"* ***go to CBAT4***	CBAT2	
CBAT3	What are your reasons for not using car battery during the past 30 days? Code: [1] = Out of order [2] = Recharge is too costly [3] = No transportation [4] = Others, specify _____	CBAT3	
CBAT4	How many storage (car) batteries does your household have? If the household has more than 2 car batteries, only ask for the most often used.	CBAT4	
CBAT5 First Battery			
CBAT5a	What is the voltage of your first car battery?	CBAT5a	
CBAT5b	What is the amp-hour rating of your first car battery?	CBAT5b	
CBAT5c	How much did the first car battery cost?	CBAT5c	
CBAT6 Second Battery			
CBAT6a	What is the voltage of your second car battery?	CBAT6a	
CBAT6b	What is the amp-hour rating of your second car battery?	CBAT6b	
CBAT6c	How much does the second car battery cost?	CBAT6c	
CBAT7a	How many months did your previous battery last? *(Enter "0" if you did not own any battery before)*	CBAT7a	
CBAT7b	What did you do with your previous battery(ies) after it (they) was/were no longer usable? [1] = Sell to recycle person; [2] = Discard; [3] =Take the lead out and discard; [4] = Sell to the store where bought the new one; [5] = Other, specify.	CBAT7b	
Questions for All Car Batteries			
CBAT8	On the average, how many days per week does your household use electricity from storage/car battery (ies)?	CBAT8	
CBAT9	On the average, how many hours per day does your household use electricity from storage/car battery (ies)?	CBAT9	
CBAT10	On the average, how many times in a month does your household recharge your battery?	CBAT10	
CBAT11	How much does each recharge cost?	CBAT11	

CBAT12	On the average, how much do you spend on recharging all your batteries each month?	CBAT12	
CBAT13	How many days does the battery give you electricity before the next recharge?	CBAT13	
CBAT14	How far (in km) is the recharging station from your home? (If less than 1 kilometer, indicate fraction)	CBAT14	
CBAT15	Which mode of transport does your household use to go to the recharge station? Code: [0] = Walk [1] = Bicycle/rickshaw/motorcycle [2] = Boat [3] = Car/truck [4] = Bus [5] = Animal/animal driven [6] = Other, specify [Align codes and col 1 entries]_____	CBAT15	
CBAT16	What is the average round-trip transportation cost (in local currency) to the recharging station? (Enter "0" for no transportation cost incurred.)	CBAT16	
CBAT17	What type of energy source does your battery charging station use? Code: [1] = Grid [2] = Solar [3] = Microhydro [4] = Diesel generator-set	CBAT17	

	Item	**Do you use a car battery for any of these devices? [0] = No [1] = Yes**	**Average no. hours used per day**
CBAT18	Black & white TV	CBAT18a	CBAT18b
CBAT19	Color TV	CBAT19a	CBAT19b
CBAT20	Radio and/or tape cassette	CBAT20a	CBAT20b
CBAT21	Karaoke	CBAT21a	CBAT21b
CBAT22	Video VCR/VCD machine	CBAT22a	CBAT22b
CBAT23	Lighting appliances	CBAT23a	CBAT23b
CBAT24	Other appliances/equipment, specify _____	CBAT24a	CBAT24b

	Solar PV System		
	During the past 12 months how often did your household use solar PV system?		
PV0	Code: [0] = Do not use solar PV system, ***if not, go to next section*** [1] = Used sometimes/seldom [2] = Always	PV0	
	Please tell me whether electricity supply which you are using now is:		
PV1	Code: [1] = Not enough for household need [2] = Just enough for household need [3] = More than enough for household need	PV1	
PV2	What is the size (in watt-peak, Wp) of the solar PV panel?	PV2	
PV3	What is the rating (in Amp-hour) of the battery/battery system used for PV system?	PV3	
PV4	On the average, how many **hours per day** do you usually use your PV home system?	PV4	
PV5	On the average, how many **days per week** do you usually use your PV system?	PV5	

Does your household use solar PV home system for the following devices, and if "yes" how many hours does your household use/day?
If for example, use only 2 days in a week and one hour each day, calculate the average hours used per day over 7 days, use decimal point if needed.

	Item	**Do you use a solar PV system for any of these devices? [0] = No [1] = Yes**	**Average no, hours used per day**
PV5a	Black & white TV		
PV5b	Color TV		
PV5c	Video (VCR/VCD)		
PV5d	Radio		
PV5e	Karaoke /tape cassette		
PV5f	Lighting devices		
PV5g	Fan (table/ceiling)		
PV5h	Refrigerator		
PV5i	Iron		
PV5j	Electric stove/oven		
PV5k	Electric mixer/grinder		

PV5l	Security light		
PV5m	Other (specify)		
PV6	Did your PV system need any repairs in the past 12 months? Code: [0] = No, ***go to PV9*** [1] = Yes	PV6	
PV7	If yes, which part has broken down?	Code: [0] = No [1] = Yes	
PV7a	Lamp	PV7a	
PV7b	Charge/discharge controller	PV7b	
PV7c	Inverter	PV7c	
PV7d	Solar panel/module	PV7d	
PV7e	Ballast	PV7e	
PV7f	Others, specify _____	PV7f	
PV8	How much is the total cost (in local currency) of repair including materials and labor for the items enumerated above for the past 12 months?	PV8	
PV9	What year did you acquire your PV system?	PV9	
PV10	How did you acquire it? Codes: [1] Loan/rent to own, ***go to PV11*** [2] Cash payment, ***go to PV12*** [3] Rented , ***go to PV13*** [4] Through project, ***go to next section*** [5] Other, specify _____, ***go to next section***	PV10	
PV11	**If acquired through loan:**		
PV11a	What is the total cost (in local currency) of your system?	QPV11a	
PV11b	Have you paid off your loan? Code: [0] = No [1] = Yes	QPV11b	
PV11c	How much is your initial down payment?	QPV11c	
PV11d	What is your monthly amortization?	QPV11d	
PV11e	What is the maturity (in months) of your loan? (Enter 60 if more than 5 years)	QPV11e	
PV12	If paid in cash, what is the total cost (in local currency) of your system?	PV12	
PV13	If rented, how much (in local currency) the monthly rental?	PV13	

Small Electric Generator Set			
GEN1	Does your household use electricity generated from diesel generator set (gen-set)? Code: [0] = Do not use, ***go to next section*** [1] = Use electricity from village/community or private entrepreneur-owned generator –set [2] = Use electricity from neighbor/relative generator set [3] = Use electricity from family- owned generator set, ***go to next question*** [4] = Others, specify_____	GEN1	
GEN2	How many months has your household been using electricity from village- or neighbor- owned gen-set?	GEN2	
GEN3	On average, how many **hours per day** does your household receive electricity services from the above source?	GEN3	
GEN4	On average, how many **days per month** does your household receive electricity services from the above source?	GEN4	
GEN5	How many households including your household are sharing electricity from the same source?	GEN5	
GEN6	How much (in local currency) does your household pay for electricity per billing period?	GEN6	
GEN7	How many days does each bill cover?	GEN7	
GEN8	How is your household charged for electricity bills? Code: [1] = Charged by kWh used, ***go to GEN9*** [2] = Charged by number of lightbulbs/tubes or appliances, ***go to GEN10*** [3] = Charged by agreed fixed monthly fee, ***go to next section*** [4] = Other methods, please specify _____	GEN8	
GEN9a	**KWh Billing** If household is charged/pays by kWh, how much electricity does your family usually use (kWh) per billing period?	GEN9a	
GEN9b	How much does electricity cost (in local currency) per kWh?	GEN9b	
GEN10a	**Load Billing** If household is charged/pays by number of lightbulbs or tubes and/or appliances, how many lightbulbs or tubes and/or appliances does your household have?	GEN10a	
GEN10b	What is the average wattage of all light bulbs or tubes and appliances?	GEN10b	
GEN11	**Family-Owned Gen-set** How many gen-sets does your household have?	GEN11	
GEN12	How many months has your household been using your own electric gen-set to generate electricity?	GEN12	
GEN13	What do you think about the price of your gen-set? Code: [1] = Very expensive [2] = Expensive [3] = Right price [4] = Cheap	GEN13	
GEN14	How much (in local currency) did you spend in purchasing your gen-set?	GEN14	
GEN15	What is the rating in kVA of your gen-set?	GEN15	

	Status of Connection To Electric Grid, Consumption, and Expenditures		
ELE0	What is the name of the utility company providing electricity services in your area? _____	ELE0	
ELE1	How many months have you had your electricity connection? _____ months.	ELE1	
ELE2	How many customers share the same electric meter? *[0] = If the utility company providing services does not install meter to its customers.* [1] = Do not share meter with other. [2] = Your household and one other customer [3] = Your household plus 2 other customer [4] = Your household plus 3 other customer [5] = Other	ELE2	
ELE3	What is the source of your electricity connection? [1] = Utility (name) [2] = Neighbor/relative who is connected through utility [3] = regional/provincial/town electricity services [4] = Neighbor/relative who connect to regional/provincial/town electricity services [5] = Other, specify	ELE3	
ELE4	Who do you pay for your electricity services: [1] = Utility (name) [2] = Neighbor/relative who pays to utility [3] = Regional/provincial/town electricity services [4] = Neighbor/relative who pays to regional/provincial/town electricity services [5] = Other, specify	ELE4	
ELE5	On average, how much does your household pay for electricity for each billing period? _____ (in local currency)	ELE5	
ELE6	How many days does each bill cover? _____days	ELE6	
ELE7	How does your household pay your monthly electricity bill? [1] = Pay by kWh used [2] = Pay per number of lightbulbs/tubes & appliances [3] = Fixed monthly cost (If answer [2] or [3] go to ELE9a)	ELE7	
ELE8	If pay by kWh used, how much does your household pay per kWh _____ per kWh	ELE8	
ELE9	If pay by number of lightbulbs/tubes or appliances or fixed monthly cost:		
ELE9a	How many lightbulbs/tubes do you have? _____ lightbulbs/tubes	ELE9a	
ELE9b	What is the average wattage of all lightbulbs/tubes? _____ Watts	ELE9b	

ELE10	Does your household use electricity to cook rice? [1] = Yes; [2] = No	ELE10	
ELE11	Does your household use electricity to boil water? [1] = Yes; [2] = No	ELE11	
ELE12	Does your household use electricity for radio/tape? [1] = Yes; [2] = No	ELE12	
ELE13	Does your household use electricity for TV? [1] = Yes; [2] = No [Delete following rule]	ELE13	
ELE14	Does your household use electricity for other appliances? (specify) [1] = Yes; [2] = No	ELE14	
Quality of Electricity Services			
ELE15	How many hours during the day do you have electricity service? _____ hours during the day	ELE15	
ELE16	How many hours during the evening/nighttime do you have electricity service? _____ hours	ELE16	
ELE17	Do you use any of the following sources of energy to supplement electricity? Code: [1] = Yes; [0] = No	ELE17	
ELE17a	Candles	ELE17a	
ELE17b	Kerosene/diesel lamp	ELE17b	
ELE17c	Pressurized lamp	ELE17c	
ELE17d	Car/motorcycle battery	ELE17d	
ELE17e	On average, how much does your household spend per month to supplement electricity?	ELE17e	
ELE18	How many times last month did your household experience power failures that lasted more than 15 minutes? (*If none enter "0")*	ELE18	
ELE19	How often last month did your household experience dimming or have difficulty turning lights or other appliances? Code: [1] = Often [2] = Rarely [3] = Never	ELE19	

Electric Appliance Ownership and Use *			
EA1.1	How many **plug-in radios** does your household have? *(Enter "0" for none, if "none" **go to next appliance**)*	EA1.1	
EA1.2	On average, how many hours per day does your household use your plug-in radio? *(Enter total hours of all plug-in radios use)*	EA1.2	
EA1.3	What is the wattage rating of your plug-in radio? *(If own more than one enter the average wattage rating)*	EA1.3	
EA2.1	How many **wind-up or battery operated radios** does your household have? *(Enter "0" for none, if "none" **go to next appliance**)*	EA2.1	
EA2.2	On average, how many hours per day does your household use your wind-up/battery operated radio? *(Enter total hours of all wind-up/battery operated radios in use)*	EA2.2	
EA2.3	What is the wattage rating of your wind-up/battery operated radio? *(If own more than one enter the average wattage rating)*	EA2.3	
EA3.1	How many **b&w TVs** does your household have? *(Enter "0" for none, if "none" **go to next appliance**)*	EA3.1	
EA3.2	On average, how many hours per day does your household use your b&w TV? *(Enter total hours of all b&w TVs used)*	EA3.2	
EA3.3	What is the wattage rating of your b&w TV? *(If own more than one enter the average wattage rating)*	EA3.3	
EA4.1	How many **color TVs** does your household have? *(Enter "0" for none, if "none" **go to next appliance**)*	EA4.1	
EA4.2	On average, how many hours per day does your household use your color TV? *(Enter total hours of all color TVs used)*	EA4.2	
EA4.3	What is the wattage rating of your color TV? *(If own more than one enter the average wattage rating)*	EA4.3	
EA5.1	How many **fans** does your household have? *(Enter "0" for none, if "none" **go to next appliance**)*	EA5.1	
EA5.2	On average, how many hours per day does your household use your fan? *(Enter total hours of all fans used)*	EA5.2	
EA5.3	What is the wattage rating of your fan? *(If own more than one enter the average wattage rating)*	EA5.3	
EA6.1	How many **nonelectric flatirons** does your household have? *(Enter "0" for none, if "none" **go to next appliance**)*	EA6.1	
EA6.2	On average, how many hours per day does your household use your nonelectric flatiron? *(Enter total hours of all nonelectric flatirons used)*	EA6.2	
EA7.1	How many **electric flatirons** does your household have? *(Enter "0" for none, if "none" **go to next appliance**)*	EA7.1	
EA7.2	On average, how many hours per day does your household use your nonelectric flatiron? *(Enter total hours of all electric flat irons used)*	EA7.2	
EA7.3	What is the wattage rating of your electric flatiron? *(If own more than one enter the average wattage rating)*	EA7.3	
EA8.1	How many **water heaters** does your household have? *(Enter "0" for none, if "none" **go to next appliance**)*	EA8.1	
EA8.2	On average, how many hours per day does your household use your water heater? *(Enter total hours of all water heaters used)*	EA8.2	
EA8.3	What is the wattage rating of your water heater? *(If own more than one enter the average wattage rating)*	EA8.3	
EA9.1	How many **rice cookers** does your household have? *(Enter "0" for none, if "none" **go to next appliance**)*	EA9.1	

EA9.2	On average, how many hours per day does your household use your rice cooker? *(Enter total hours of all rice cookers used)*	EA9.2	
EA9.3	What is the wattage rating of your rice cooker? *(If own more than one enter the average wattage rating)*	EA9.3	
Ea10.1	How many **refrigerators** does your household have? *(Enter "0" for none, if "none" **go to next appliance**)*	EA10.1	
Ea10.2	What is the wattage rating of your refrigerator? *(If own more than one enter the average wattage rating)*	EA10.2	
EA11.1	How many **washing machines** does your household have? *(Enter "0" for none, if "none" **go to next appliance**)*	EA11.1	
EA11.2	On average, how many hours per day does your household use your washing machine? *(Enter total hours of all washing machines used)*	EA11.2	
EA11.3	What is the wattage rating of your washing machine? *(If own more than one enter the average wattage rating)*	EA11.3	
EA12.1	How many **nonelectric drills** does your household have? *(Enter "0" for none, if "none" **go to next appliance**)*	EA12.1	
EA12.2	On average, how many hours per day does your household use your nonelectric drill? *(Enter total hours of all nonelectric drills used)*	EA12.2	
EA13.1	How many **power drills** does your household have? *(Enter "0" for none, if "none" **go to next appliance**)*	EA13.1	
EA13.2	On average, how many hours per day does your household use your power drill? *(Enter total hours of all power drills used)*	EA13.2	
EA13.3	What is the wattage rating of your power drill? *(If own more than one enter the average wattage rating)*	EA13.3	
EA14.1	How many **nonelectric saws** does your household have? *(Enter "0" for none, if "none" **go to next appliance**)*	EA14.1	
EA14.2	On average, how many hours per day does your household use your nonelectric saw? *(Enter total hours of all nonelectric saws used)*	EA14.2	
EA15.1	How many **power saws** does your household have? *(Enter "0" for none, if "none" **go to next appliance**)*	EA15.1	
EA15.2	On average, how many hours per day does your household use your power saw? *(Enter total hours of all power saws used)*	EA15.2	
EA15.3	What is the wattage rating of your power saw? *(If own more than one enter the average wattage rating)*	EA15.3	
EA16.1	How many **video players (VCR/VCD)** does your household have? *(Enter "0" for none, if "none" **go to next appliance**)*	EA16.1	
EA16.2	On average, how many hours per day does your household use your video player (VCR/VCD)? *(Enter total hours of all video players used)*	EA16.2	
EA16.3	What is the wattage rating of your video player (VCR/VCD)? *(If own more than one enter the average wattage rating)*	EA16.3	
EA17.1	How many **karaoke machines** does your household have? *(Enter "0" for none, if none" **go to next appliance**)*	EA17.1	
EA17.2	On average, how many hours per day does your household use your karaoke machine? *(Enter total hours of all karaoke machines used)*	EA17.2	
EA17.3	What is the wattage rating of your karaoke machine? *(If own more than one enter the average wattage rating)*	EA17.3	
EA18.1	Others (specify)	EA18.1	

* The specific appliances in this section should be determined based on information gathered in the Participatory Assessments, and should include both electric and non-electric appliances.

Electric Lighting			
Incandescent Bulbs (INC) (Bulbs used for more than 30 minutes daily only)			
INC1	25 [MAKE LOWER CASE]		
INC1.1	Number of bulbs	INC1.1	
INC1.2	Total hours used per day	INC1.2	
INC2	40 [LOWER CASE]		
INC2.1	Number of bulbs	INC2.1	
INC2.2	Total hours used per day	INC2.2	
INC3	50 [LOWER CASE]		
INC3.1	Number of bulbs	INC3.1	
INC3.2	Total hours used per day	INC3.2	
INC4	60 [LOWER CASE]		
INC4.1	Number of bulbs	INC4.1	
INC4.2	Total hours used per day	INC4.2	
INC5	100 [lower case]		
INC5.1	Number of bulbs	INC5.1	
INC5.2	Total hours used per day	INC5.2	
Fluorescent Tubes (TUB) – Straight and Circular (Tubes used for more than 30 minutes daily only)			
TUB1	10 watts straight		
TUB1.1	Number of tubes	TUB1.1	
TUB1.2	Total hours used per day	TUB1.2	
TUB2	20 watts straight		
TUB2.1	Number of tubes	TUB2.1	
TUB2.2	Total hours used per day	TUB2.2	
TUB3	40 watts straight		
TUB3.1	Number of tubes	TUB3.1	
TUB3.2	Total hours used per day	TUB3.2	
TUB4	22 watts circular		
TUB4.1	Number of tubes	TUB4.1	
TUB4.2	Total hours used per day	TUB4.2	
TUB5	32 watts circular		
TUB5.1	Number of tubes	TUB5.1	
TUB5.2	Total hours used per day	TUB5.2	
Compact Fluorescent Lamps (Only those used 30 or more minutes per day)			
COM1	Less than 12 watts		
COM1.1	Number of tubes	COM1.1	
COM1.2	Total hours used per day	COM1.2	
COM2	12 Watts		
COM2.1	Number of tubes	COM2.1	
COM2.2	Total hours used per day	COM2.2	
COM3	18 Watts		
COM3.1	Number of tubes	COM3.1	
COM3.2	Total hours used per day	COM3.2	
COM4	20 Watts		
COM4.1	Number of tubes	COM4.1	
COM4.2	Total hours used per day	COM4.2	
COM5	25 Watts		
COM5.1	Number of tubes	COM5.1	
COM5.2	Total hours used per day	COM5.2	

Reasons for Adopting/Purchasing and Not Adopting/Purchasing Electricity			
RSN1	Would you like to have access to electricity, or would you prefer to continue using your present energy sources? Code: [1] = Electricity [0] = Prefer present energy sources	RSN1	
	Reason for not connecting to grid electricity		
RSN2	Please give me reasons why you prefer present energy sources. Code: [0] = No; [1] = Yes		
RSN2a	Can't afford to pay for the costs associated with connection	RSN2a	
RSN2b	Can't afford to pay for wiring house	RSN2b	
RSN2c	Can't afford to pay monthly usage fee of electricity	RSN2c	
RSN2d	Can't afford to buy electrical equipment	RSN2d	
RSN2e	See no application	RSN2e	
RSN2f	Satisfied with present energy sources	RSN2f	
RSN2g	Other, specify	RSN2g	
	Reasons for connecting to grid electricity		
	Please tell me the Reason why your household decided to obtain electricity. Code: [0] = No; [1] = Yes		
RSN3a	For children's education	RSN3a	
RSN3b	For better lighting	RSN3b	
RSN3c	For entertainment	RSN3c	
RSN3d	For information/news	RSN3d	
RSN3e	To improve income-generating opportunities	RSN3e	
RSN3f	Electricity we are using is cheaper than kerosene and other fuels.	RSN3f	
RSN3g	Other (specify)	RSN3g	

	Reasons for Not Purchasing Off-grid Electricity System *		
	Please give me reasons why did your household decide not to purchase an off-grid electricity system. Code: [0] = No; [1] = Yes		
OFF1a	Do not have enough money to pay for the system	OFF1a	
OFF1b	Do not think that the system could supply enough electricity for use at home	OFF1b	
OFF1c	Do not want to borrow money from anyone	OFF1c	
OFF1d	See no applications	OFF1d	
OFF1e	Satisfied with present energy sources	OFF1e	
OFF1f	Other, specify	OFF1f	
	Attitudes/Perceptions **		
	The following statements concern electricity use and other issues. Please tell me if you strongly agree, agree, are indifferent, disagree, or strongly disagree with these statements. ***Use the following codes for answers:*** Code: [1] = Strongly agree [2] = Agree [3] = Indifferent/neutral [4] = Disagree [5] = Strongly disagree		
ATT1	Having electricity is important for my children's education.	ATT1	
ATT2	Because of good light, children study more at night.	ATT2	
ATT3	Presently in my house, it is easy to read in the evening.	ATT3	
ATT4	Reading is easier with electric lights/lamps compared to candles or kerosene lamps/lanterns.	ATT4	
ATT5	Presently, it is difficult for my family to get news and information.	ATT5	
ATT6	My family is extremely happy with the energy we get from our current fuels/sources.	ATT6	
ATT7	Using kerosene or diesel can cause health problems.	ATT7	
ATT8	Car batteries are a good source of electricity.	ATT8	
ATT9	Solar PV is a good source of electricity.	ATT9	
ATT10	Electricity is very beneficial to housework/childcare.	ATT10	
ATT11	Electricity is important to our water supply.	ATT11	
ATT12	We often socialize with friends, relatives, or neighbors at our home in the evening.	ATT12	
ATT13	Compared to 10 years ago, life is better for my family today.	ATT13	

ATT14	Compared to 10 years ago, life is better for me today.	ATT14	
ATT15	I would rather wait for electricity from the grid than invest in an off-grid electric system.	ATT15	
ATT16	Buying an off-grid electric system is one of my family's investment priorities.	ATT16	
ATT17	Buying solar PV home system is one of my family's investment priorities.	ATT17	
ATT18	Monthly electric bill is or would be a financial burden for my family.	ATT18	
ATT19	Monthly spending for nonelectric energy sources is/was a financial burden for my family.	ATT19	
ATT20	If someone/government/NGO/bank were willing to lend me money to buy a solar PV system, I would seriously consider it.	ATT20	
ATT21	If solar PV were to become easily available, I would seriously consider buying it even if I have to try to borrow money to pay for it.	ATT21	
ATT22	If grid electricity were to become available, I would seriously consider connecting to the grid even if I have to borrow money to pay for the connection.	ATT22	
ATT23	I feel safe in my house in the evening.	ATT23	
ATT24	I feel safe outside my house in the evening.	ATT24	
ATT25	Electricity makes it easier to get news and information.	ATT25	
ATT26	Watching TV provides my family with great entertainment.	ATT26	
ATT27	News and information from radio and televis ion provide good knowledge for everyone in the family.	ATT27	
ATT28	News and information from radio and television provide good information relevant for conducting business.	ATT28	
ATT29	News and information from radio and television provide good information about agricultural activities	ATT29	
ATT30	News and information from radio and television provide good knowledge on family health issues.	ATT30	

* This section should be specific to the type(s) of off-grid system(s) available, e.g. solar PV system, diesel gen-set, etc., and should be determined by the specific needs of the project.

* * These statements should be specific to the energy sources/energy systems relevant to the local context and project objectives/needs, and should be informed by the information generated in the Participatory Assessment.

Time Use

Average time allocation by adult on various activities yesterday.

Give proportion of time spent on various activities by male and female household members yesterday (time in hours and minutes). All answers should be for a 24-hour period, except TU4 and TU5, which should be for a one-week period. Translate any (M) minutes into hours (H). Total should sum to 24 hours.

TU1	Food processing (grinding, flour making, pounding) _____ M H	Hours	**TU1**		
TU2	Fuel collection _____ M H	Hours	**TU2**		
TU3	Cooking (including cleaning dishes, pots and pans) and serving (including carrying food to field) _____ M H	Hours	**TU3**		
TU4	Water fetching _____ M H	Hours	**TU4**		
TU5	Washing clothes and household cleaning _____ M H	Hours	**TU5**		
TU6	Taking meals _____ M H	Hours	**TU6**		
TU7	Bathing and/or beautifying yourself _____ M H	Hours	**TU7**		
TU8	Caring of children (i.e., bathing, feeding, dressing) _____ M H	Hours	**TU8**		
TU9	Food shopping, inc. trip to market, and other shopping _____ M H	Hours	**TU9**		
TU10	Income-producing activities (agriculture, animal grazing, care of business, etc.) _____ M H	Hours	**TU10**		
TU11	Resting (day nap, night sleep) _____ M H	Hours	**TU11**		
TU12	Leisure time (watching TV for fun, listening to radio for fun, socializing) _____ M H	Hours	**TU12**		
TU13	Religious practices, i.e., praying _____ M H	Hours	**TU13**		
TU14	Watching TV _____ M H	Hours	**TU14**		
TU15	Reading, studying, or doing homework _____ M H	Hours	**TU15**		
TU16	Listening to radio _____ M H	Hours	**TU16**		
TU17	Other specify, _____ M H	Hours	**TU17**		

Appendix 3

Application of Approach to Cambodia: Terms of Reference

1. Poverty and gender are critical issues in Cambodia. Almost 40 percent of the population is poor, and 90 percent of the poor live in rural areas.[11/] Cambodia continues to deal with the impact of nearly three decades of intermittent war and internal political struggle. Under the Khmer Rouge regime between 1975 and 1979, widespread executions, forced labor and famine killed an estimated 12 to –25 percent of the population. Large numbers of educated civil servants and professionals were executed, and many Cambodians fled to other countries.[12/] Approximately one-quarter of all households are headed by females. Rural women in Cambodia experience poverty more acutely because of their multiple burdens of child rearing and care, household work, lower incomes, and responsibilities for community activities.[13/] Thus, any rural development programs being planned for Cambodia must take poverty and gender issues into account, and the monitoring and evaluation systems that accompany them must pay special attention to these issues.

2. The World Bank has a unique opportunity to achieve a significant, positive social development impact through a planned project on renewable energy and rural electrification in Cambodia. By understanding the different impacts of energy programs and projects on rich and poor and on men and women from the beginning of the project, planners can increase the benefits of this energy project to the rural populations. By using this approach, project planners can also increase program responsiveness to the specific needs of all customers (men, women, rich and poor), increasing the overall effectiveness of the project from a business perspective.

3. For these reasons, it is recommended that the project employ the planning and management tool described in the main body of this report. This tool can be used for assessing end-user needs and evaluating the social development-related *impacts* of the project, with a focus on poverty and gender implications. The monitoring and evaluation component will be useful for not only postproject evaluation, but also for project design

11/ Meritec Limited 2001b.
12/ US GAO 2002.
13/ Meritec Limited 2001b.

and on-going project implementation and assessment. This annex outlines recommendations for tailoring the monitoring and evaluation approach described in this paper to the proposed World Bank renewable energy and rural electrification project in Cambodia. A brief overview of administrative responsibilities are followed by typical terms of references for the participatory and survey approaches described in this report.

Overall Approach to Monitoring and Evaluation

4. To evaluate the impact of rural electrification projects on development, it is necessary to have a sound methodology and research strategy. Evaluation research methods are designed to ensure that changes in economics and social conditions for household that adopt or gain access to electricity are in fact attributed to the rural electrification project and not to other infrastructure or development programs. Generally, this is accomplished by conducting surveys or participatory assessments both prior to the project and when the project is in the process of implementation. Both the participatory approaches and the survey methods can be utilized to measure the impact of rural electrification on development.

Responsibilities for Monitoring and Evaluation

5. As part of the project, a rural electrification monitoring and evaluation unit would be created to assess the progress and the impact of the national rural electrification program. Ideally, the resources and the staff of the monitoring and evaluation unit should be budgeted separately. The responsibilities and staff job descriptions must be well defined, thus avoiding time and the financial constraints that often plague such programs.

6. In the initial stages of the project, most of the monitoring and evaluation research is likely to be awarded by the unit on a contract basis. The role of the unit would be to supervise the research contracts. Thus, to conduct the research described in this report, the surveys and participatory studies would be contracted out local or international consultants or NGOs with expertise in this type of work.

Selecting Communities Where Assessments Should Occur

7. The participatory assessment and the socioeconomic impact survey should overlap. To facilitate cooperation, both types of assessments can be carried out in similar types of communities and regions. The main purpose of applying the logical framework is to engage project participants themselves in a planning and learning process. The size of the community sample for each activity will depend on the size of the project and the purpose of the assessments or surveys. Though different samples will be used for the communities involved in the participatory assessments and the surveys, the goal would be to obtain information from similar populations within the project area.

Indicators for Cambodia Project

8. The goals of the World Bank/GEF Cambodia Renewable Rural Electrification Project are to achieve Cambodia's overall rural electrification goal of 70 percent of rural households by 2030 and build a sustainable power generation mix in the country. The project's objectives are to encourage private investment and entrepreneurship, build the foundations for sustainable, environmentally sound development, maximize the economic development impact of rural electrification, and maximize the use of local natural resources and the use of least-cost supply options in the power sector.

9. Some traditional project indicators must be evaluated during the execution of the project. Examples of these traditional indicators are listed below. The indicators would include the number of:

- New quality electricity services to households, businesses, schools, health centers, and pagodas in rural areas serviced by EDC and by privately owned rural electricity enterprises, village hydro organizations, and/or businesses;
- People directly and indirectly benefiting from improved delivery of electricity services;
- Public-private sector partnerships between EDC and larger rural electricity enterprises for rural electrification;
- Strong medium-scale enterprises and renewable energy businesses providing new, quality rural electricity; and
- Trained rural and renewable electricity employees in different institutions.[14/]

10. These traditional indicators can be combined with the new approaches recommended in this report. The focus of the new indicators is on rural transformation and the quality, affordability, and uses of new electricity services. This should be done during the pilot tests of the participatory approaches and surveys. The pilot tests can be used to narrow and prioritize the list of proposed indicators in collaboration with end users, rural energy entrepreneurs, project staff and managers, and sector policymakers. The data gathered should help answer the question of whether the provision of new energy services increases the quality of life for women, men, children, poor, and rich as separate groups.

[14/] World Bank 2001a.

Feedback Mechanisms and Coordination

11. The monitoring and evaluation unit has primary responsibility for ensuring that information from the participatory assessments and the survey are incorporated into project planning and implementation. This will be facilitated by the reports generated by the different teams on the results of, and lessons learned from, the community assessments and surveys.

12. The participatory and survey approaches involve different methodologies, and as a consequence most likely separate teams will carry them out. A great deal of coordination is desired between the participatory approach and the surveys. At least one shared team member should serve on both teams to ensure a high degree of coordination. The teams should meet on a regular basis to discuss the outstanding issues related to training of field staff, findings, data processing, analysis, and presentation of the data. These meetings will also be opportunities for each team to discuss and resolve challenges or problems in their respective areas of work. Such coordination is absolutely necessary for the delivery of information that can be integrated into the project.

Relevance For the Project Logframe

13. Before turning to the specific terms of references for conducting both participatory and survey components of the monitoring and evaluation, we would like to comment on the usefulness of these approaches as they relate to the logical framework (logframe) approach to project design which is a standard practice within the World Bank and many other donor agencies. The research methods advocated in this paper are very complementary to the logframe approach used for improving project design and management. Key steps in the this approach include: identifying and analyzing all key stakeholders, enlisting participation from the stakeholders to identify and prioritize problems, analyzing the problems, defining project objectives, and defining the most appropriate strategies to achieve the selected objectives.

14. The methods and research approaches advocated in this study can be used to help in both the preparation of a project and its logical framework matrix. During project identification and preparation, participatory assessments identify and analyze stakeholders and enlist their participation in defining and prioritizing problems and project objectives. The framework's variables, indicators, and subindicators help to guide selection of key performance indicators to be included in the logframe matrix. Participatory assessments can help identify potential risks and external factors that are likely to affect project success. During project monitoring, the framework's participatory assessment and survey tools can be used to gather and analyze performance data as it relates to the logical framework.

15. The overall background and rationale on the two approaches has now been provided. In the next two sections, possible general terms of reference for the participatory and survey approaches are provided for Cambodia.

Participatory Assessment Terms of Reference

Rationale for Participatory Assessments

16. Rural electrification is a key element in rural development and can bring tangible social and economic benefits to poor, rural populations. The possible benefits can include household lighting, the ability to refrigerate food and medicine, and food processing. Access to electricity also can make grain milling and agricultural processing less expensive and more convenient. The presence of electricity in a village also can result in better lighting for schools, health clinics, and public streets. The use of electric pumps can improve productivity in agriculture and provide cleaner water for the public water supply. Finally, the availability of electricity can have a positive psychological impact through a lessening of the sense of exclusion, remoteness, and vulnerability often felt by rural populations.

17. Yet, while rural electrification offers the potential to achieve many benefits, such benefits are not guaranteed simply by introducing electricity into rural communities. Since conventional electricity technologies and appliances are often prohibitively expensive for remote populations, the benefits of electricity often initially flow mainly to the rural elite unless efforts are undertaken specifically to reach poor segments of society. In many poorly run or planned programs, rural electrification has actually widened the gap between the relatively better- and worse-off populations. Since women make up 70 percent of the world's poor, inequitable distribution of electricity services hits them hardest. In addition to being disproportionately represented among the poor, women have often not been consulted about their energy needs or involved in the design or implementation of rural electrification programs. To meet the needs of the poor and rural women, electrification programs must be designed and implemented in ways that are accessible to them. To assist in this process, it is important to have a program that evaluates the success of various approaches for reaching out to these populations.

18. A goal of this project is to have a clear understanding of the rural energy-related development needs of the women and the poor. As indicated, rural electrification projects often have been slow to incorporate poverty considerations, and even slower to evaluate the implications for rural women. Numerous methodologies for incorporating poverty and gender considerations into development projects exist, but these have not been applied consistently in the energy context.

19. To accomplish this, this project will facilitate the use of a demand-oriented approach for planning and promoting rural electrification. The approach is to be used for planning and managing the course of the project by evaluating the socioeconomic and development impacts of rural electrification, with a focus on poverty and gender.

20. The approach is comprised of two main components: a participatory assessment and a socioeconomic impact survey. The socioeconomic impact survey is to be carried out under a separate terms of reference. The objective of the participatory approach under these terms of reference is to ensure the active engagement of all project beneficiaries, including males, females, rich, and poor. The methodology gives

consumers a greater voice in service delivery and helps to engage all parts of the community in the process.

Team Composition, Training, and Expected Level of Effort

21. Expertise and experience with participatory methods and gender analysis are mandatory for all members on the team. The aim of this approach is not to extract information, but rather to generate discussions to facilitate community analysis and action planning. This requires consistent feedback of results to the population and considerable sensitivity and patience of the team members. The assessment team is to be multidisciplinary and should contain the following expertise (see Table A3-1).

Table A3-1: Staff Composition and Expected Level of Effort for Participatory Assessment

Staff	Description
Team leader	A participatory development specialist, experienced in the participatory methodology and expertise in poverty and gender approaches.
Coordinator	A rural energy/electricity expert familiar with participatory techniques.
Member of survey team	Knowledgeable in survey methodology and local context, for continuity and to ensure collaboration between participatory and survey teams.
Field staff	Familiar with local context and fluent in local language, and trained in participatory methodology, to conduct interviews and lead discussions in communities. Usually there is six field staff to one supervisor.
Members of selected community	To help with selection of sites for conducting the assessment, building rapport, etc.
Project representative	Is familiar with project procedures, to act as liaison with project and other government officials, and to facilitate capacity building in project.
Statistician	If statistical analysis is intended, a development economist, sociologist, or statistician familiar with nonparametric statistics and participatory methods will also be needed.
Local illustrator	To help prepare or adapt participatory tools.

Scope of Work for the Participatory Assessment

22. The consultant will assume primary responsibility for conducting participatory assessments at the community level. Once the required information has been collected, a database will be established to organize the information and track changes in data over time. The development and management of the database is to be closely coordinated with the survey team. Following each assessment, the consultant will draft a report. This will be presented to project managers and the survey team at regular, predetermined intervals.

Designing the Research

23. The consultant will design the participatory assessment using methods that are to be agreed upon with the planning unit of the rural electrification project. The consultant will work with project managers to determine the communities in which the pilot participatory assessment will take place. The pilot testing will be utilized to test the participatory techniques for ease of use and relevance for the goals of the project.

Pilot Testing the Participatory Assessment

24. The consultant will work with project managers to determine the communities in which the pilot participatory assessment will take place. The pilot testing will be utilized to test the participatory techniques for ease of use and relevance for the goals of the project.

25. The sample should be drawn from the communities included in the rural energy project. For the pretest, the communities should be similar to those expected to be served under the project. They might include a mix of different types of communities being served with electricity under different models. For instance, there might be one community where there is a rural energy entrepreneur who is affiliated with the project, one community where there is an independent entrepreneur who is not affiliated with the project, and one community where there is no rural energy entrepreneur supplying electricity.

Conducting the participatory Assessment

26. The participatory assessment will be conducted according to the generally accepted guidelines. For example, this will include applying all relevant participatory tools, including the Stakeholder Meets and policy-level assessments, and working with participants to complete the self-scoring exercises scoring matrices.

27. The goal is to involve those communities that provide a good cross-section of the technical, social, economic, cultural, political, administrative, and environmental conditions in the project area. Low-income communities should be well represented. The team should look for a cross-section of the key areas of concern and variability. It may be necessary to stratify zones by level of development and draw the community sample from these zones.

Results Analysis

28. The consultant will work with participants to complete the analysis of the research. The participatory approaches involve the participants in the analysis at every level. The analysis is carried out in three steps. First the relevant groups including men and women in project communities and some agency personnel in sector institutions would use participatory tools to assess relevant aspects of their respective services and policies. Second, the results from the participatory techniques would be tabulated for the different groups. For instance, during this period the team should develop recording forms for each scale separately on a page with space for team observations and notes to record the quantitative scores and qualitative information from the focus group

discussions. Finally, the results would be analysis and the report would be produced for each community. The scoring matrices can be used to translate relatively qualitative data into a quantitative form, so that assessment results may be used to compare progress of the project within a community over time or to make comparisons between different communities. Eventually, all of the community reports will be summarized for the project planners and policymakers.

Reporting the Results

29. The report must contain, but not be limited to, the analysis and discussion of the following topics:

- Characteristics of the communities and region.
- Availability of energy resources within or nearby communities.
- Profiles of participants.
- Descriptions of each participatory exercise conducted.
- Completed community data sheet and scoring matrices.
- Recommendations for potential market for various types of energy, including renewable energy and off-grid electrification.
- Challenges faced in conducting the participatory study and how they were overcome.

30. The consultant must provide project managers with an outline report for approval. Subsequent drafts should also be submitted to project managers to get feedback on adequacy and accuracy. Project managers can give suggestions on the types of information to be included, and on enhancing the level of discussion on certain topics. The consultant will prepare the final report, based on all of the communities involve in the participatory assessment. The report will follow a general outline agreed upon with the project managers, and will include background research as well as the primary results from the communities.

Collaboration with Socioeconomic Survey Team

31. The consultant will ensure collaboration with the survey team. It is extremely important the two teams collaborate from the very beginning of the project. This can be accomplished through participating in common meetings and through having members of each team periodically participate in fieldwork.

Timetable for the Project

32. Table A3-2 illustrates a typical timetable for conducting a full participatory assessment. No months are given in this table because the duration of the project will depend on the number of communities and the type of data that are required for the project. Thus, this will need to be filled in based on the level of effort required for individual projects.

Table A3-2: Timetable for Participatory Assessment

Activity	Project month
Design of draft research plan	
Pretest of fieldwork	
Field work for participatory assessments, with community and team analysis	
Data entry and preparation of report	
Submission of draft report to project managers and SIS team	
Submission of final report	

Payment Schedule for the Project

33. The total budget for the village and household survey component described above is to be assessed based on the level of work. The payments for the work of the contractor can be divided as shown in Table A3-3. The timing and payment amount will depend on the level of effort involved in the project.

Table A3-3: Payment Schedule

Activity	Timing of activity	Payment %	Payment USD
Initiation of the contract and fieldwork		25%	
Receipt of acceptable summaries for the communities involved in the project		35%	
Receipt of acceptable draft report		30%	
Receipt of acceptable final report		10%	
Total		100%	

Socioeconomic Information Survey Terms of Reference

Rationale for Rural Energy Surveys

34. Rural electrification is regarded as one of many key infrastructure development projects necessary for rural development. Under the proper conditions, rural electrification can promote improved socioeconomic conditions for rural people. This can be accomplished through increasing farm productivity, improving the household quality of life through the use of electric lamps and other appliances, and improving the level of education and health in a community by providing energy for schools and health clinics. Households and individual persons in the household are the ultimate

beneficiaries of rural electrification. However, in past studies, the benefits of rural electrification have sometimes been underestimated because of the complex infrastructure linkages involved in rural development. This is partly because many household level surveys, including living standards and income and expenditures surveys, lack proper questions to measure the quantity and quality of energy services in rural communities. The goal of the socioeconomic information survey component is to collect household and individual level data on a variety of issues that can be influenced by rural electrification. In addition, the goal is to monitor the development of the rural electrification project and measure its socioeconomic impact.

35. The use of household and individual data with the proper survey research design will enable the policymakers to understand the connection between rural electrification and rural development in all of its facets. For example, rural families may benefit because irrigation pumping leads to higher income. Similarly, children may be more able to study in the evening and consequently might be more likely to attend school. The goal of the study is to evaluate the impact of rural electrification on men, women, children, and on various income classes within rural areas.

Survey Objectives

36. As indicated, the main objective of survey studies is evaluate and monitor the impacts of the rural electrification project on rural households, and in particular for women. Thus, the study will rely on information collected for the household as a whole, and for female members of the family.

37. The household survey will collect a variety of information on the socioeconomic characteristics of the family. This information would include the school enrollment of school-age children, the demand for electricity and other energy sources, and the use of electric and others appliances. Also, to be examined would be the utilization of energy for lighting, the ability and willingness to pay electricity service, and the attitude towards various sources of electricity and other energy.[15/]

38. The questionnaire module for the women in the family would assess how women use electricity in rural areas.[16/] The use of appliances such as electric lights, food-processing appliances, and others can result in changing patterns of time use for rural women. This might have an impact on various activities, including resting, listening to radio, reading, and watching television during the day or at night. The survey also will examine the attitude towards various energy sources including electricity, and their benefits for the households.

[15/] For baseline survey or pre-electrification survey, most of the sample households would probably not have access to electricity. However, a few households may have access to electricity. For post-electrification survey, the household survey will have to cover households that choose to electrify under the project as well as households that do not choose to. Therefore, it is pertinent that the survey collects data on both electricity and other energy sources for lighting.

[16/] Ideally in the survey their should be a similar module for men, so the responses between women and men can be compared. This can be added if budget and interview time are not a constraint.

39. In practice the information for both the household and women can be combined into one survey. Based on the study objectives, the questionnaire for the household survey would be designed to collect information at the household level to assess and measure impact of electrification at the household level. An in-depth interview should be conducted with head of the household or knowledgeable household member. To assess and measure impact of electrification on women, a questionnaire module would be utilized to collect information at the individual level, and an in-depth interview would be conducted with the main female in the household, which would include any female head of the household.

Coordination of Socioeconomic Survey and Participatory Assessment

40. The quality of the survey will be significantly improved if it is conducted in coordination with a participatory assessment of rural communities. The strength of the participatory assessment is that some unexpected issues faced by rural households can be evaluated or confirmed in the survey. The information collected will be useful for designing the questionnaire and in the analysis of survey data. The statistics and findings of the any quantitative survey can be given more life by referring to the findings of participatory research. Also, survey results can feed into the preparation and execution of the community participatory assessment.

41. The survey team at a minimum will appoint representatives to attend coordination meetings. The coordination team will meet on a monthly basis to discuss the outstanding issues related to training of field staff, coordination of field surveys, data processing, data analysis, and study results. Thus, coordination between these two research agencies is critical.

Scope of Work for the Household Survey

42. The contractor is expected to undertake household survey with an extensive component on women's issues. Once the required information has been collected, a database combining both household and women's information will be created. Finally, the contractor will draft a report assessing the impact of rural electrification in Cambodia and provide the government with a full view of current situation regarding the benefits of rural electrification for the country. To conform to the survey research methodology requirements, several specific guidelines need to be followed by the contractor, and they are listed below.

Key Element of Sample Design

43. A key objective of the study is to evaluate impact of rural electrification for both households and rural women. The sampling strategy depends on the policy issues involved in the study and the cost of sending research teams to the field to interview representatives of both of these groups. However, it is possible to develop a sample that is valid for representing both groups. For the rural households, the sampling strategy would involve conducting a baseline random sample of households, making sure

that both rich and poor households are represented in the sample. After that, depending on the design of the study, the main woman in the household could be interviewed. As a practical measure, in most instances only one woman in the household will be interviewed to represent the view of all adult women in the household.

Survey Instruments

44. For all questionnaires in the study, the contractor will conduct interviews. The questionnaires developed for these interviews must conform to international practices. These would include the following requirements.

45. The questionnaire should be printed in large fonts. The space intended for the respondents' answer should be large enough so that enumerators will avoid putting the answers in the wrong space. A new section should start on a separate page, even though the survey form may have some empty space.

46. For a quantitative survey, it is important to minimize open-ended questions by precoding all the possible answers for each question. The household survey and questions addressed to women should share the same coding numbers for key common variables, such as household identification number and the name of village, district, and region. This is because cross-analysis of the information is essential, and a single database is required for the final analysis.

47. The focus group technique should be conducted prior to pretesting the questionnaire to gain further insight on the characteristics and profile of households and women in terms of their energy consumption, energy expenditures, attitudes, and preferences. Knowledge gained from this exercise should be used to further improve the questionnaire by adding needed information or eliminating areas that are found to be not applicable in the households and/or villages.

48. Questionnaires for all surveys must be pretested and revised accordingly before being used in the field. It is efficient to combine the pretesting activity during the training of trainers/field supervisors, which will be conducted by the contractor. The trainers or supervisors in turn will train the enumerators assigned to them.

49. It is imperative that during the pretesting, the supervisors/trainers carefully assess all aspects of the questionnaires, including the questions themselves, the sequence of the questions, the phrasing of the questions, and the derivation of data through computations. The pretesting is intended to ensure that the respondents as well as the interviewers understand each survey question. This would allow the supervisor to evaluate the field operation, including the time spent in each interview. Also, this permits the enumerators and encoders to check the accuracy of the codes used in the questionnaire as well as the data entry program. Finally, the field supervisors gain hands-on experience in conducting the surveys; and this can be important for the final revisions to the questionnaire.

50. Finally, the results of the pretesting should be entered in the data entry program developed for the project to debug any errors on program, data entry, coding, and the questionnaires.

Organization and Training of Field Survey Staff

51. Qualified and well-motivated field staff and enumerators are critical to the success of any survey. The contractor should organize field survey staff into teams. Each team will consist of three to four staff including the supervisor, who will provide the oversight. The number of persons in a team generally is based on the assumption that one enumerator can complete two to three household interviews in a day. This will depend on the length of the survey interview and the number of household members that must be interviewed during the course of the survey.

52. Field interviewers and supervisors are required to receive training prior to the field assignment. Some staff hired to complete the surveys may be unfamiliar with the interview approach. Therefore training should cover the basic techniques of conducting household interviews. In addition, the training should provide the basic information necessary to conduct interviews on the following topics:

- Specific concepts and operational definitions used in the questionnaires;
- Household energy usage, specifically for lighting and electricity. It is also necessary to understand the energy consumption of rural industries, such as cottage industries, furniture making, and rice mills;
- Community characteristics including the typical energy being used, resources available, community facilities available, existing and potential livelihood activities, among others;
- Characteristics of household electric-generating equipment/devices, such as electric generator, solar PV, car battery, mentioned in the questionnaires;
- Characteristics of household electric appliances, electric lighting. and nonelectric lighting equipment;
- Type and characteristics of fuels, amount consumed, unit of measurements, and other types of information; and
- Probing techniques to determine the total amount of energy consumed in a month and the portion spent for lighting purposes and electricity from car batteries, dry cells, and generator sets.

Field Implementation and Supervision for Quality Control

53. The supervisors will ensure that survey team produces accurate and reliable survey results. During the course of the fieldwork, the supervisors are generally responsible that all facets of the study are carried out in a professional manner. The responsibilities include but are not limited to the following:

- Help interviewers follow the sampling procedures,
- Assign to the enumerators the households that will be interviewed,
- Exercise spot checking and quality control,
- Review the completed questionnaires prior to data entry,
- Check the computations made by the enumerators,
- Check if the codes are properly entered, and
- Check for inconsistencies in the filled-in survey forms.

54. During the field survey, questionnaires must be thoroughly reviewed and checked. Enumerators, who have been found to have committed errors—such as unclear or irrelevant answers, inconsistencies, incomplete entries—will be asked to go back to the field to complete the questionnaires. Extra attention should be given to the consistencies of answers, particularly in the estimation of consumption and expenditures for fuels, portion of energy dedicated for lighting, and overall household income and expenditures. Cross-checking of responses is necessary.

55. Every field supervisor is required to maintain and submit interview records to the project leader. A short report shall be prepared describing how the survey was conducted, problems encountered during the survey, and the solutions provided to remedy them. In addition, the project leader must develop appropriate mechanisms to ensure that all the activities of the survey teams are well coordinated and properly managed. The project leader needs to regularly check the quality of the data collected and the progress of the survey, and in some cases, to visit the sample villages. There might be a need to review the survey forms completed by the enumerators to identify common errors in order to eliminate the same mistakes in succeeding interviews.

Data Processing

56. The contractor must make sure that the data encoder is knowledgeable in the use of the data entry software and has a clear understanding of the questionnaire. Before putting information into the database, the data encoders should consult with the field interviewers on any ambiguous or uncertain data found in the survey form. The contractor is required to use acceptable statistical software, such as SPSS or SAS, for data entry and analysis.

Creating Database

57. The contractor will create a database for the household survey and the woman survey. The coding of numbers for region, province, and village/growth center for these surveys must be the same. The contractor must prepare a guide to ensure that the common codes are the same for both components of the survey. Weights to allow representation of national or regional levels must be provided within the survey database, as necessary.

Data Analysis and Tabulation of Survey Result

58. The contractor will submit to the World Bank for review the preliminary findings of the survey (weighted and unweighted if relevant) in tabulated form. The following are examples of output tables that can be generated from the study based on the questionnaires formulated:

- Socioeconomic indicators;
- Sources of income including agricultural income;
- Household experience with credit;
- Household energy use for lighting (by types of energy and sources of electricity);
- Household energy expenditure (by types of energy, sources of electricity, and total expenditure);
- Household preference and attitude toward different forms of energy, including renewable energy;
- Percent of households who have heard about renewable technologies, such as PV home systems, small wind systems, PV/wind hybrid system, pico- and microhydro systems;
- Socioeconomic profile of villages and growth centers;
- Type of energy resources or energy markets within village or in nearby villages; and
- Preference and attitude of women toward, and perceived benefits from, different forms of energy.

Report Writing for Rural Energy Study

59. The report must contain, but not be limited to, the analysis and discussion of the following topics.

Household Survey

60.
- Characteristics of the villages or region;
- Availability of energy resources within village or nearby;
- Socioeconomic characteristics of households;
- Profile of households that are using various types of energy sources, including electricity;
- Collection time for use of biomass for cooking energy;

- Matching of demand and supply;
- Potential market for various types of energy including renewable energy and off-grid electrification.

Woman Survey Module

61.
- Socioeconomic characteristics of woman;
- Profile of woman using various types of energy sources, including electricity;
- Collection time for use of biomass energy for productive uses;
- Matching of demand and supply for woman;
- Potential market for various types of productive uses of energy including renewable energy;
- Women's time use in woman activities as it relates to energy use.

Timetable for the Project

62. The total time required to complete the study will vary depending on the size of the sample and the complexity of the survey schedule of questions. The detailed timetable of the project can be approximated by reference to Table A3-4.

Table A3-4: Project Timetable

Activity		Timing of activity (date begin and complete)
Design of the draft questionnaire		
Pretest of the questionnaire		
Submission of final questionnaire		
Fieldwork for survey		
Data entry and data cleaning		
Submission of cleaned dataset to World Bank		
Preparation of tables and codebook for project		
Submission of draft report		
Comment by World Bank		
Submission of final report		

Payment Schedule for the Project

63. The total budget for the village and household survey component described above will be based on the size and the complexity of the survey. The payments will be divided as shown in Table A3-5.

Table A3-5: Project Payment Schedule

Activity	Timing of activity	Payment %	Payment USD
Initiation of the contract and fieldwork			
Receipt of acceptable codebook, preliminary tables, and cleaned data set			
Receipt of acceptable draft report			
Receipt of acceptable final report			
Total			