Guides for
Electric Cooperative Development and Rural Electrification



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Your Touchstone Energy® Partner

Glossary of Abbreviations

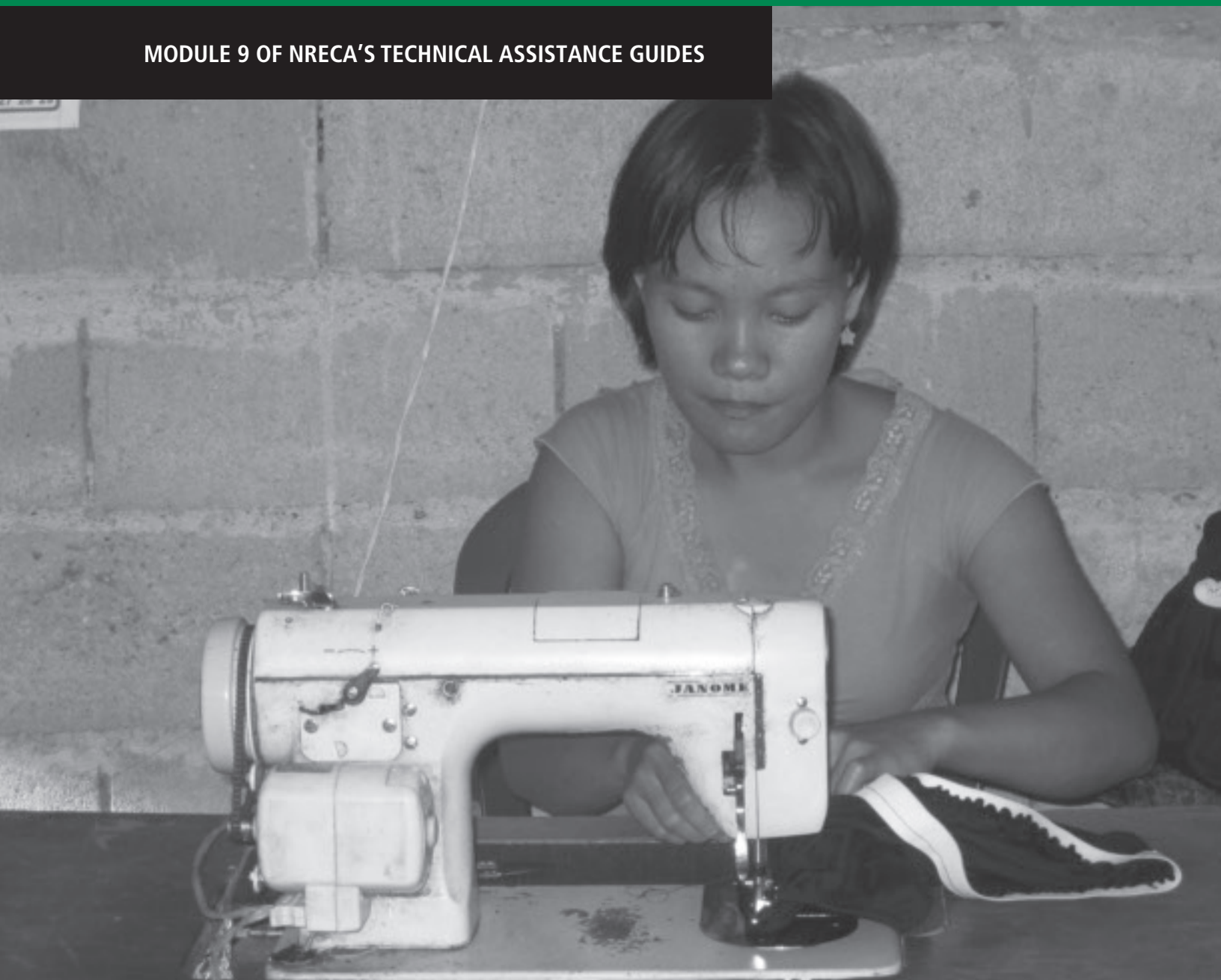
A	Ampere
AH	Amp-hour
AC	Alternating current
ACSR	Aluminum conductor, steel reinforced
A&G	Administrative and general
AWG	American wire gauge
CARES	Central American Rural Electrification Support Program
CCT	Correlated color temperature
CDA	Cooperative Development Authority (Philippines)
CEF	Fronteriza Electric Cooperative (Dominican Republic)*
CFC	National Rural Utilities Cooperative Finance Corporation, also known as NRUCFC (U.S.)
CFL	Compact fluorescent light bulb
CLARITY	Cooperative Law and Regulation Initiative
CONELECTRICAS	National Consortium of Electrification Companies of Costa Rica (Costa Rica)*
DC	Direct current
DISCEL	Electric Distributor of the Hydroelectric Executive Commission of Rio Lempa (El Salvador)*
EBIT	Earnings before interest and taxes
EBITDA	Earnings before interest, taxes, depreciation and amortization.
EEGSA	Electric Company of Guatemala, PLC (Guatemala)*
ESMAP	Energy Sector Management Assistance Program (World Bank)
FUNDAP	Foundation for Economic Development
G&T	Generation and transmission cooperative
GIS	Geographic information system
GPS	Global positioning system
HVD	High voltage disconnection
I	Electrical current, measured in amperes
ICE	Costa Rican Institute of Electricity (Costa Rica)*
IEC	International Electro-technical Commission
INDE	National Institute of Electrification (Guatemala)*
INE	National Institute of Statistics (Bolivia)*
IRR	Internal rate of return
ISPRA	National Institute for Protection and Environmental Research (Italy)
K	Kelvin
klmh	Kilo-lumen hour
kV	Kilovolt
kVA	Kilovolt-ampere
kVAR	Reactive kilovolt-ampere
kW	Kilowatt

kWh	Kilowatt hour
LED	Light-emitting diode
LPG	Liquefied petroleum gas
LVD	Low voltage disconnection
LVR	Low voltage reconnection
MRT	Single wire earth return*
MW	Megawatt
MWh	Megawatt hour
NEA	National Electrification Administration (Philippines)
NESC	National Electrical Safety Code
NGO	Non-governmental organization
NOAA	United States National Oceanic and Atmospheric Administration
NPV	Net present value
NRECA	National Rural Electric Cooperative Association International, Limited
OCDC	Overseas Cooperative Development Council
O&M	Operations and maintenance
PDB	Power development board
PUC	Public utility commission
PUE	Productive use of electricity
PV	Photovoltaic
PWM	Pulse width modulation
R	Electrical resistance
R&D	Research and development
RE	Rural electrification
REA	Rural Electrification Administration, an agency of the Department of Agriculture of the United States, now known as RUS
REB	Rural Electrification Board (Bangladesh)
RFP	Request for proposal
RFQ	Request for quote
ROE	Return on equity
RUS	Rural Utilities Services, an agency of the Department of Agriculture of the United States, previously known as REA
SWER	Single wire earth return
TAG	Technical assistance guide
UL	Underwriters Laboratory
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
USTDA	United States Trade and Development Agency
V	Volt
W	Watt
WH	Watt-hour
Wp	Watts peak
WtP	Willingness to pay

*English translation of Spanish abbreviation

Productive Uses of Electricity

MODULE 9 OF NRECA'S TECHNICAL ASSISTANCE GUIDES



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EXECUTIVE SUMMARY

Many national governments have committed significant financial resources to bring modern electric services to rural communities. Many families who live within reach of electric service, however, have learned to do without. This is primarily due to their inability to pay for service, which deprives them of a source of entertainment, security, and income generation.

The "productive use of electricity" concept assumes that electricity improves the competitiveness of rural enterprises. Within the framework of the concept, the electric cooperative or energy service provider becomes a promoter of rural enterprise, which in turn generates consumer goods and services, increases employment, and enhances the local economy. In developing countries, promoting the productive uses of electricity is an activity that host governments and rural communities cannot afford to ignore. Rural communities are part of a globalized world, full of risks and opportunities, where only the most competitive businesses survive.

This module presents a series of methods, tips, and recommendations that reflect approaches NRECA has successfully deployed throughout the world. These experiences have inspired the implementation of productive uses of electricity programs in several countries. Based on the lessons learned, this module identifies six key components for a successful productive uses of electricity program, which are:

1. Access to a reliable electric service
2. Access to a local market for goods and services
3. Availability of electric equipment
4. Access to financial resources
5. Qualified human resources
6. Coordination and promotion

NRECA's productive uses model integrates numerous variables, including efficiency and safety of designs and equipment, feasibility, social and environmental responsibility, and coordination among the players involved. It emphasizes creating an environment of trust and encouraging the participation of the community in all phases of the projects. This module provides concrete steps for the design of a productive uses of electricity program. It includes direction for initial information gathering; identification of participants (institutional and business owners); structuring of training strategies; options for obtaining technical assistance; financing options; selection of tactics pertinent to the unique conditions of the target area; sensitivity to sociocultural variables; and ways to achieve the inherent productive potential available.

A productive uses of electricity program is a basic tool for electric cooperatives and companies to move towards greater sustainability. It also helps governments to increase the common good and enables communities to achieve equitable development and improve their economic viability. The success of NRECA-supported productive uses programs in many countries has validated the approaches described in this module which place high priority on having local participants effectively promote the program and which emphasize sensitivity toward the predominant conditions in the target regions.

A productive uses of electricity program is a basic tool for electric cooperatives and companies to move towards greater sustainability.

INTRODUCTION

Background

Determining, developing, and implementing a feasible rural electrification project remains a key challenge for most developing country governments and for the institutions that carry them out. The level of electricity consumption and willingness to pay are two issues affecting project feasibility. An electric system's feasibility increases the more energy it sells to its consumers, as long as the tariffs cover all costs (for both current operation and future needs) and the consumers are able and willing to pay for what they consume. The "productive uses of electricity" (PUE) concept promotes the creation and growth of productive activities, ranging from micro-businesses to heavy industry. The greater the number of PUE's created or expanded, the greater the amount of electricity consumed. As profit margins expand for PUE owners, the more money they have available to consume electricity and pay electricity bills. Thus, as the paying capacity of consumers grows, revenues for the electric distribution cooperative or utility also grow.

The "productive uses of electricity" (PUE) concept promotes the creation and growth of productive activities, ranging from micro-businesses to heavy industry.

There are six major components fundamental to the success (or failure) of PUE programs:

1. Access to modern energy service
2. Market conditions
3. Availability of electric equipment
4. Financial resources
5. Human resources
6. Coordination and promotion

Other factors also exist that can have a marked influence on the success or failure of a PUE program. These include the legal and regulatory landscape as well as the host country's political, economic and social stability.

This module provides guidelines for the design, implementation, and evaluation of a PUE program, so that it benefits both the consumers and the electric distribution company, electric cooperative, private electric distribution company, or governmental entity responsible for electric service.

Definitions

Though its source is unknown, the simple definition often cited by the authors for a productive use of electricity is "Any use of electricity that generates income for the user."

A broader definition is the use of electricity for the common good. The common good includes productive development in any sector, including potable water, public lighting, education, health, etc.

Objectives and Scope

The purpose of this module is to help electric distribution utilities (whether cooperatives or other institutional models) implement a PUE program, where improvements in administrative efficiency and technical expertise are expected to increase profitability. NRECA prepared this module as part of a series of technical guides that promote financial and technical sustainability for distribution systems and electric cooperatives, with the goal of offering reliable, accessible, and sustainable electric service. This module can also aid governments in justifying the significant financial investment required for rural electrification, through the promotion of productive uses of electricity, as detailed in what follows.

Although this module is intended for use in developing countries, with consideration of the characteristics of the PUE sector inherent in each region, the fundamentals of its methodology may be useful to any electric distribution entity in the world.

JUSTIFICATION FOR A PRODUCTIVE USES PROGRAM

Many rural distribution systems or cooperatives require a conscious effort to promote productive uses of electricity for the distribution entity to justify their costs, and/or sustainably generate profits. Many electric grid expansion projects or electric generation investments in rural areas cannot be justified economically, unless a productive uses of electricity approach is used as a tool to spur development and generate new sources of income. Modern energy services are also an essential component of increased access to social and economic benefits for rural areas.

Historically, rural electrification projects have often been conceived solely as social investments. Projects of that nature are deemed complete once inaugurated, since their purpose is to primarily bring light to un-electrified residential homes. The concept of electricity as a development initiative has typically not been a driving force in decision making or prioritization of rural electrification projects.

A change of paradigm occurs, however, when decision makers establish the concept that rural electrification is not an end but a means. That implies that generating improved business competitiveness through productive uses of electricity will translate into better income, better community services, and in general, a better opportunity for integrated development. The addition of complementary development efforts, such as support infrastructure, education, training, technical assistance, and access to credit form part of this new development initiative. Together with the electric distribution system, the development efforts serve as a foundation for growth.

Productive uses of electricity programs have grown out of the notion gained though experience that access to electricity alone does not generate employment or increase income in rural areas. However, an economically depressed population will not have the capacity to pay the distribution company's tariffs without increased access to appropriate means to augment their income. Thus, a market-oriented productive uses of electricity program, which uses local resources and local labor, will promote business competitiveness and accelerate the learning process related to employing electricity as an economic stimulus for the target area.

COMPONENTS OF A PRODUCTIVE USES PROGRAM

The basic components of a PUE program include access to modern energy service, favorable market conditions, availability of electric equipment, financial resources, human resources, and coordination and promotion. What follows is a fuller discussion of these components one by one.

Access to Modern Energy Service

Productive uses activities require energy to produce goods or provide services. In addition, the energy needs to be reliable. A classic example to illustrate the importance of reliable electric service is an ice cream shop. No power, no more ice cream. Modern energy service reliability, both in continuity of supply and power quality, is key to assuring users that they will get a return on their investment and that their commercial and residential electric equipment will work safely and efficiently. Moreover, consumers must have confidence that excessive voltage fluctuations will not occur, which could damage their electric equipment or force users to disconnect the equipment to avoid damage or malfunction.

Distribution cooperatives or utilities have an obligation to meet minimum standards of service. They should of course strive to go beyond those minimums to meet customer expectations of quality and service. Put another way, distribution entities should be customer-oriented, with a focus on satisfying the needs and concerns of

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their consumers. As part of customer service, they should ensure that the electric consumer is well informed.

Favorable Market Conditions

Even if all of the other components of a PUE program are in place, if the market cannot or is not willing to absorb the increase in products and services, the program will fail. For example, if a small business pottery manufacturer gets excited about participating in a PUE program, it might well be able to increase production tenfold. Yet if a mere threefold increase in supply exceeds maximum market demand, the newly expanded business is not likely to survive.

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Electric service providers are typically not the entities that initiate marketing studies or identify new products that could be developed through the use of electricity. Most of the time distribution utilities join forces with a non-governmental organization to educate the potential program beneficiaries in the basic aspects of demand, supply, pricing, and analyzing market competitors, as well as the commercialization of goods and services. This educational effort should be directed to both local and national markets, depending on the nature of the new products and services. If an organization decides to promote a particular product through a productive uses of electricity program, that entity must also be in charge of carrying out the corresponding market study to help ensure successful program results.

Availability of Electric Equipment

A productive uses of electricity program promotes the use of electrical equipment and tools in commercial or industrial production. Consequently, the program should provide information and resources about where to acquire the equipment, the variety of models available (with different technical specifications), and financing options. In some cases, promoting the use of electrical equipment can be a simple coordination task with existing vendors in the program vicinity. In other cases, a strategy is needed to promote the availability of electrical equipment vendors. Alternatively, the distribution utility itself could assume responsibility for supplying the desired equipment. There are numerous approaches for bringing electric equipment providers and potential consumers together, including fairs, mobile demonstrations, promotional talks, mass media, and other marketing initiatives.

A successful PUE program identifies the best way to ensure that equipment is available and accessible to the beneficiaries of the program, using methods that are sensitive to consumers' income level and socioeconomic condition, while keeping in mind the country's legal system and regulations.

At the outset of a PUE program, it may be necessary for the implementing entity to guide the consumer in selecting of equipment, considering the unique aspects of each business and prevailing market environments. Vendors should be encouraged to provide technical assistance and information regarding the purchase of their equipment. However, until electrical service is well established, the implementing entity should actively coordinate the technical assistance required between vendors and consumers.

Although electrical equipment can be of significant benefit when it is properly operating, it also has inherent and serious dangers. Therefore, the PUE program must provide technical assistance and training to consumers, educating them on how to locate, select, acquire, install, operate, and maintain their equipment in a safe and efficient manner. Depending on the size of the target population and program budget, it is important to consider the depth of technical assistance that can be reasonably offered by the PUE program. It is advisable to coordinate efforts with other institutions that could assist in providing technical assistance to PUE program participants, such as universities, mid-level educational institutions, training centers, schools, business owners, equipment providers, artisan-teachers, financial

institutions, non-governmental organizations (NGOs), and other educational and developmental institutions.

These institutions can also contribute to disseminating technical information to the general population, especially with regard to safety and the benefits of modern energy service.

Financial Resources

Once the program beneficiaries are aware of the program possibilities, the market offerings, and the investment in equipment and working capital required, the program should turn its attention to financing options. In some cases, PUE beneficiaries may have their own capital ready to expend. However, a majority will likely require some form of credit to obtain the necessary equipment. To maximize program success, the PUE program should therefore provide information regarding available financial resources.

To finance the purchase of electrical equipment, it is necessary to involve financial institutions that are willing to participate in the PUE program. However, prior to defining alliances with a particular financial entity, it must be analyzed. Program implementers should examine the main indicators of institutional solvency, as well as resource availability, bad debt rates, customer service policies, and other operational aspects considered important to the implementation of a PUE program. Regional differences exist. Some programs have had successful experiences with rural creditors, while others have experienced failures. Therefore, it is important for the PUE program team to carry out due diligence on the various lending institutions before selecting program allies.

Another financing option is granting credit to PUE beneficiaries interested in connecting to the electric grid or in making improvements to their existing electrical installations to reflect the current standards of the country. Implementers should keep in mind that in some cases, consumers may require financial support to cover both the cost of connecting to the electric distribution system and the acquisition of electrical equipment.

Human Resources

Each productive use activity needs to have people with the skills necessary to make the business survive, and better yet, to thrive. There may be reliable electricity, available electric equipment and financing, and a favorable market, but if the business does not have the human resources required to operate it sustainably, it is doomed to fail. Here again, the program implementers must decide how much training the program itself will have to provide versus using existing institutions such as vocational schools, technical institutes, universities, and NGOs.

For the program itself to succeed in designing a productive uses program, those involved must understand the entire program, how and why it was conceived and its design, goals, and objectives. Personnel involved in the program should not only have a clear understanding of the project, but also be sensitive to the circumstances that prevail in the target population.

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It may be worth designating one or more full-time field professionals to work directly with the projected program consumers and vendors. The field professionals can promote ties among potential program consumers and coordinate with the electric utility, as well as with credit institutions and vendors. The appropriate level of human resources needed naturally relates directly to the program's scope and magnitude. The financing institution must equally designate qualified personnel to provide advice to consumers on equipment purchases, and to formalize financing contracts with their new clients. Depending on the volume of PUE participants and projects, the PUE promoter may advise the financing institution to establish an office in the target area of the program. All professionals involved in the productive uses program must be sensitive to the socioeconomic conditions and cultural diversity of the program beneficiaries.

Coordination and Promotion

During the design of the productive uses program, it is important to develop a clear strategy for coordinating the program's implementing entity, the electric distribution entity (which could be or could later become the implementing entity), the financial institution, the equipment vendors, and the consumers or beneficiaries of the program. How the program is to be coordinated depends on the consensus reached regarding expectations and responsibilities of each entity, as well as expectations of the program beneficiaries, the consumers.

A productive uses of electricity program is usually considered a complementary part of a larger rural electrification program.

A PUE program may have ambitious objectives and creative approaches, but the intended participants must become familiar with it to take advantage of it. Appropriate program marketing, oriented to local conditions, is exceedingly important for current and potential consumers of the electric service to learn how to work with the various PUE institutions, and how to participate actively in the program.

Periodically monitor and survey the program's promotion tactics and media, so as to determine whether marketing tactics and strategies are reaching users and whether any modifications are necessary.

In El Salvador and Guatemala, NRECA employed mobile demonstration units for productive use demonstrations. The mobile units, outfitted with a variety of electric tools, equipment, and appliances, arrived in targeted communities to demonstrate what can be accomplished when using electricity productively. Simple educational materials on topics related to safety, efficiency, business management, and the benefits of electrification were distributed during these presentations. Project teams found that these mobile demonstration units had a great impact on children and adults. However, the decision to use mobile demonstrations take into account the cost/benefit of the investment (cost of the mobile unit, equipment, etc.) and the cost of travel and personnel.

Another approach is to display electric equipment in operation at existing businesses. In this situation, coordinators of the PUE program identify proprietors who are willing to host a demonstration for interested parties at their place of business. Through prior arrangement, other potential entrepreneurs are invited to visit the business and experience first-hand the benefits of the demonstrated electric equipment.

PRODUCTIVE USES OF ELECTRICITY PROGRAM DESIGN

A productive uses of electricity program is usually considered a complementary part of a larger rural electrification program. PUE programs have also been successfully employed in communities that have long been electrified. In either case, a productive uses program can propel the development of micro, small and medium-sized enterprises.

General Objective

In the design of PUE programs, the standard stated objective of the program is to structure a program strategy, in conjunction with the rural electrification project, which helps integrate technical and financial efforts to promote and/or accelerate the productive, efficient, and safe use of electricity in target communities.

Specific Objectives

Specific objectives of a standard PUE program are as follows:

- Identify and bring together the various individuals and entities working to support economic development in the target region.
- Implement a needs assessment and identify existing productive activities in the target area.
- Sensitize all program individuals and entities (including the target population) to the financial,

economic, social, and environmental benefits obtainable through the implementation of a productive uses of electricity program.

- Seek input from all local players in developing the program design and action strategies related to promotion, technical assistance, and financing.

- Be sensitive to the productive, socio-economic, ethno-cultural, and environmental conditions of the target region.

Scope of a Productive Uses Program

To define the scope of a PUE program, implementers should conduct an initial study of the target communities and inventory the existence and capabilities of potential stakeholders. The study should evaluate each of the six basic program components described in this module. Using the Human Resources component as an example, the initial study would determine how well prepared the owners of potential beneficiary microenterprises are to manage, operate, and expand their businesses; how many, if any, vocational schools, technical institutes, universities, and NGOs exist; how many of these institutions could effectively train the personnel of the beneficiary productive use activities; and how many, and to what extent, these organizations could help coordinate the program in general. Based on the results of the study, the implementers would decide what type of training the beneficiaries need most and who would provide it, thus defining the scope of the human resources component of the program.

Applying the same process to each of the components and putting the whole picture together would define the overall scope of the PUE program. Assigning costs and benefits to various potential program activities and analyzing the various options allows planners to prioritize activities according to the greatest financial, economic, and social benefit. With that information, the program implementers can adjust the program scope to obtain the greatest benefit from the resources available to execute the PUE program.

Program planners should bear in mind that the sustainability of the program may hinge on how effectively they involve existing organizations from the start. The program scope should, by design, involve commitments in both finances and personnel on the part of the stakeholders (electric utility, credit institutions, equipment vendors, educational institutions, and beneficiaries) to the greatest extent possible.

Active participation by the electric service provider, educational centers, NGOs, and government entities is important for the success of the program. Strategic involvement of these players will help to institutionalize the program within the respective entities, inducing positive changes and the momentum necessary for a sustainable program.

To define the scope of a PUE program, implementers should conduct an initial study of the target communities and inventory the existence and capabilities of potential stakeholders.

Identification of the Players and their Roles in the Program

A productive uses program involves a number of stakeholders or players that are essential to its success. Table 1 shows a typical list of PUE project players within a community.

Success in development programs comes from combining the efforts of various players. Consequently, establishing parallel and related development initiatives (such as the improvement of the public water system) along with the PUE program can be useful. Implementers must remember to coordinate these efforts with the various players.

Program Strategies

A PUE program can embody, or complement, a larger strategic plan for the economic development of a community or a region. The strategic plan should comprise methods of providing training, technical assistance, and financing.

Table 1. PUE program players and activities

Player	Activity Carried Out
Proprietors of current micro, small and medium enterprises or potential commercial consumers of electricity	Represent the PUE sector, which uses electric energy as a productive input into current and/or potential processes
The electric distribution cooperative or utility	Provide reliable, safe, and financially accessible electric service to the beneficiaries of the program
Financial sector entities (formal and informal)	Provide financial services (credit and financial analysis)
Equipment vendors	Facilitate access to electric equipment and provide related technical assistance
Technical assistance providers	Governmental or non-governmental entities that create or strengthen technical capacities within the target communities
International aid agencies and/or other public or private organizations	Organizations that channel technical, financial and/or in-kind resources to support economic growth

A training strategy acquaints the community with the many applications of electricity as a way to make commercial/industrial processes and production more efficient.

This module emphasizes the empowerment of each player, especially the project beneficiaries within the PUE sector. The goal is to empower the local population to make decisions in their own best interest, through the transfer of knowledge, education, training, and the proper tools.

Training Strategy

A training strategy acquaints the community with the many applications of electricity as a way to make commercial/industrial processes and production more efficient. The players assigned educational responsibilities must decide how best to provide training on basic electricity and utilization of electric equipment, along with providing specific technical assistance. The financial institution(s) involved in the program should also provide financial services training.

Community Training

Community training should take place in each of the target regions. It should be directed at two levels of the population: the economically productive population and the student population.

Such trainings normally take place at a community meeting, which informs the population of the technical and financial effort involved in the electrification of their community (assuming the PUE program is being carried out as part of a greater rural electrification project). The meeting would also discuss opportunities created by electrification, using comparisons with other non-electrified communities. In an area where electric service already exists, the community training should also take place at a community meeting, discussing the technical and specific details of the PUE program, as well as the electric service needs in the area.

Training resources may include audiovisual material, educational modules, dramatizations, and/or direct demonstrations of the application of electricity in diverse activities commonly carried out in the community. Implementers should offer separate training opportunities for groups that show a greater interest and require more in depth details, as well as for school-aged children.

NRECA has developed mobile demonstration units that become a main source of attraction in community trainings. These units are typically electrically self-sufficient, so that they succeed as training tools in non-electrified communities and communities with poor power quality. The mobile demonstration units are effective in motivating families to consider productive uses of electricity.

To efficiently use limited financial and technical resources, any training strategy should focus initially on the main community centers, and then extend progressively outside the major population centers, until the entire target region has been reached.

Community trainings involve all program players, i.e. community leaders, neighbors, the implementing entity, the local electric distributor, the financing entity, equipment suppliers, and other local entities.

The following set of steps illustrates how community training activities can be coordinated and promoted.

1. Select the project region and communities in a coordinated manner, involving all players, so as to meet the objectives of the program.

2. Promote community PUE training through contact with local leaders. The community training objective is to inform the population regarding the PUE program. Therefore, the support of local leaders is needed to identify the most appropriate training location and to select and convene the participants.

3. Choose the date and hour of the community meeting with the aim of ensuring the greatest level of local population participation.

4. Place promotional banners and posters in strategic locations within the community. Make house-to-house calls, and depending on the local customs, arrange for a vehicle with a loudspeaker to travel throughout the community announcing the activity in the local language, emphasizing the date and hour of the meeting.

5. Before carrying out the community training, prepare a detailed report to identify existing and potential PUE activities. Share this information with the electric equipment vendors and with participating financing agencies.

6. Conduct the community meeting and training following a previously prepared agenda. Take the names of participants who are interested in equipment or financing. End the meeting with an announcement stating the dates and times for upcoming special meetings for those individuals interested in acquiring equipment and for those interested in receiving financing.

7. Hold special sessions on electric equipment and financing opportunities to introduce equipment and financing options, including the associated costs.

8. Finally, set up and carry out personal appointments with individuals interested in discussing details of equipment or financing, with assurances that the plans and/or financial situation of each individual will be kept confidential.

Commercial Management Training

The second phase of the PUE program's training strategy is designed specifically for individuals interested in creating new businesses or in strengthening existing businesses. The objective is to teach best management practices and share methods that improve administrative efficiency and business productivity.

The second phase of the PUE program's training strategy is designed specifically for individuals interested in creating new businesses or in strengthening existing businesses.

This educational effort promotes the active participation of the players involved. Its successful implementation improves business sustainability for those involved. The following suggestions make the management training more effective.

Training Prior To Financing And Business Startup

Before loans are made or equipment is purchased for new businesses, this training provides an opportunity for financing entities and equipment suppliers to become more familiar with potential customers and to identify those who have a defined project compatible with the philosophy

of the PUE program and a qualifying credit history. In this phase to the program promoter should share enough detailed information with the productive uses entrepreneurs to allow them to make an informed decision regarding whether or not to participate in the PUE project.

This training consists of two sessions, as follows.

All training must be sensitive to the participants' educational levels and cultural backgrounds.

Content of the first session:

- General program introduction and objectives
- Who are we? Introduction of participating parties and explanation of their roles
- Distribution of information regarding financing options and commercially available equipment
- Definition and discussion of financing
- Planning business requirements, based on production, administration, and existing and potential markets

Content of the second session:

- Introduction
- Managing credit effectively
- Preparing and complying with a work plan
- Forming a support committee to help the business succeed

The sessions should be scheduled to have the greatest possible benefit. For example, the second session could take place after customer credit approval, but before disbursement of the loan. In order to avoid business failures, implementers should consider postponing credit disbursement or equipment delivery until the entrepreneur or customer participates in the second session.

Training For Existing Businesses

This training is for individuals who already have existing businesses and who may or may not be interested in obtaining loans. The training content concerns improving management of productive uses of electricity activities and includes both required and elective courses.

Required courses: These courses provide a basic understanding of how to run a business and are a prerequisite for those that want to apply for financing:

- Simple accounting (accounting for non-accountants)
- Budgeting and cost control
- Basic administration
- Basic marketing

Elective courses: Offered after completion of the required courses. Topics are generated to meet the individual customer's specific needs, and can be defined when such needs are identified.

Typical elective topics include:

- Strategic planning
- Organization
- Efficiency and safety
- First aid

All parties interested in acquiring financing or obtaining a special discount from equipment vendors must participate in the required training, and a selection of elective courses, selected in consultation with the PUE trainers.

All training must be sensitive to the participants' educational levels and cultural backgrounds. It should emphasize creating a business that will

be competitive in a market-driven economy (whether local, national, or international). The training provides beneficiaries with information and methods that can help contribute to ongoing business success.

Training Associated with Financial Service Entities

Small and medium-sized enterprises often lack access to traditional financing mechanisms. The financial services infrastructure is often concentrated within urban centers and has minimal outreach to rural areas. Also, frequently rural business proprietors and those interested in started a business have little documentation regarding their identity and assets (equipment, land, productive infrastructure). Therefore, they do not have acceptable collateral or proof of credit worthiness.

To address this issue, a portion of the productive uses training program should focus on working with financial entities to expand their programs to reach entrepreneurs who are eager to begin or expand productive use activities but lack access to credit.

Financial services trainings are usually oriented towards lending agencies, although they could also include others such as equipment vendors involved with the program.

The recommended approach is to conduct a workshop for formal and informal financial institutions, such as small local microcredit programs. This training aims at sensitizing financial entities to include rural enterprises in their financing programs. The training ultimately helps to introduce rural inhabitants to, or expand their knowledge of, the credit sector and its potential as a catalyst for rural development. By combining credit with access to electricity, these two inputs can become major drivers of rural economic development.

Often financing organizations already work with productive uses in urban or peri-urban areas. Nevertheless, these organizations frequently lack the basic knowledge of how to properly assess and reduce the risks inherent in loans even in those populated areas. They are even more likely to lack the knowledge of how to effectively extend their services to rural areas. Therefore, the training program should address the fundamentals of sound credit assessments as well as best practices for offering loans to rural clients.

Technical Assistance Strategy

The technical assistance strategy for the PUE program's business participants provides credit seekers with the necessary technical support for the selection, purchase, use and maintenance of electric equipment. It also helps with the design, execution, and maintenance of their electric installations and provides the marketing support needed to promote their goods and services.

By combining credit with access to electricity, these two inputs can become major drivers of rural economic development.

The availability and scope of technical assistance varies, depending on the scope and magnitude of the PUE program. The electric cooperative, electric equipment vendors, financial institutions, or an institution specialized in providing training could each be the provider of such assistance. The technical assistance may include the following components.

Pre-Financing Technical Assistance

Pre-financing technical assistance support goes to individuals who are interested in the PUE program but have not received credit or have not acquired equipment. Technical assistance during this phase relates to three areas:

Selecting the Best Equipment for the Job

PUE program promoters who are familiar with the equipment needs of participants should explain the reasons for and at least three price quotes for the desired equipment and assist with obtaining them.

The assistance must emphasize the importance of obtaining quotes from recognized companies

that guarantee the equipment, offer a competitive price, quality, spare parts, and maintenance. The objective is to gather sufficient information to compare the advantages and disadvantages of various equipment options, so the potential user has sufficient information to select the option that best responds to their needs. The implementers should convey the message that the final equipment selection decision is the responsibility of the entrepreneur alone.

The PUE participant must receive training regarding requirements for electric equipment installation and maintenance.

Support During the Equipment Purchase to Obtain the Best Deal and Warranty

After selecting the necessary equipment, the PUE promoter helps make the arrangements necessary to facilitate the purchase. This may include supporting the entrepreneur in financial dealings with the financial institution and/or accompanying the individual during the payment process. The PUE promoter must verify that the equipment selected is received with all accessories, manuals, and warranties and must verify that the equipment meets the specifications quoted by the vendor.

Basic Orientation on the Correct Use of Equipment

Commonly, equipment vendors are responsible for educating the buyer on the correct operation and maintenance of the equipment purchased. Additionally, the vendor should provide detailed information regarding the performance characteristics of the equipment. The information should include minimum requirements for electric installation (conductor size, protective devices, grounding, etc.) and other characteristics of the working environment, (ventilation, temperature, minimum safety considerations, lighting, etc.). Such training enhances the safety of the operators and keeps them from voiding warranties.

Post-Financing Technical Assistance

Post-financing technical assistance comes into play immediately after credit has been granted or after the equipment has been installed. It involves support for the entrepreneur through a direct relationship with the PUE promoter, who provides support primarily via site visits to the business. Through observation, appropriate suggestions are made for improving weak areas of operation. In addition, the PUE promoter can arrange for specialized trainings with other entities, if needed.

Assistance in the post-financing phase concentrates on activities such as the following.

Equipment Installation

The PUE promoter must orient the businessperson regarding the following:

- Suitability of the location where the machinery or equipment will be installed for the nature of the equipment
- Arrangement and setup of the equipment, based on space required and production needs
- Equipment installation according to manufacturer's requirements
- Lighting and ventilation needs to guarantee operators' safety
- Integration with other equipment and production processes

Electric Installation

The PUE participant must receive training regarding requirements for electric equipment installation and maintenance. The implementers should consider carefully the protection of operators and equipment. Whenever possible, a qualified technician, following the electric utility's standards, should carry out the electric installation. Where no national standards exist, base the installation on the United States National Electric Code to avoid potential warranty issues. In addition, take the following into account:

- Use quality materials and accessories (according to safety standards).
- Create and properly execute an installation plan to ensure that the equipment is correctly insulated and installed according to standards.
- Make sure all electric circuits where equipment will be connected meet the appropriate protection and safety standards.
- Keep the medium voltage circuits out of reach of people and machinery.
- Install dedicated circuits and independent protection for special equipment.
- Ensure that all installations are physically grounded.
- Install equipment so technicians can easily access equipment for maintenance.

Equipment Protection

Protecting equipment is of vital importance, because it is typically the business's most valuable asset. Train the PUE recipient to follow these practices:

- The work area should be orderly and clean, particularly where electric installations are located.
- Make all connections with equipment designed for the specific corresponding purpose.
- All equipment must be disconnected and switches turned off when the equipment is not in use.
- Cover all equipment when it is not in use. If the equipment is mobile, it must be kept clean and in a locked location.
- Install equipment in a secure and safe environment, stored in a place of business, rather than in a residence or other location where unauthorized access to the equipment is possible.

Maintenance of the Equipment/Machinery

The PUE promoter must verify that the entrepreneur is carrying out the correct maintenance indicated in the manuals and recommended by the vendor. The business supervisor must oversee that the following steps are taken:

- Clean equipment at the end of each workday.
- Lubricate and grease parts as required, according to the manual.
- Periodically inspect circuits, conductors, connections, protection, and switches.
- Examine and maintain such things as belts, tensioners, shock absorbers, augers, blades, bearings, and support and positioning mechanisms, in accordance with the manufacturer's recommendations.
- Monitor ventilation conditions, illumination, space layout, waste, odors, airborne particulate matter, etc.

Handling and Use of Equipment

As a complement to the information in the pre-equipping phase, address the following aspects:

- After the equipment supplier's demonstration, the PUE promoter must visit the business to verify that the business activities and equipment are proceeding according to the vendor's instructions.
- If possible, the vendor should be encouraged to examine the equipment installation and verify proper operating conditions.
- Make an unannounced visit to verify that proper operating conditions exist. Equipment

Install equipment in a secure and safe environment, stored in a place of business, rather than in a residence or other location where unauthorized access to the equipment is possible.

modifications should be examined to ascertain whether they are in keeping with manufacturer instructions and the warranty and whether they pose a safety risk for the operator or the equipment.

Worker Hygiene and Safety Conditions

The business must promote good operational practices, provide protective equipment to workers (according to tasks), and handle waste and scrap materials adequately (liquids, solids, and gasses, etc.). Additionally, the employer must provide workers with basic knowledge on accident avoidance strategies, as well as what to do in the event of an accident.

The financing strategy should primarily focus on helping entrepreneurs purchase items necessary to improve the productivity or diversity of their products.

The PUE promoter should therefore take the following steps to confirm worker hygiene and safety:

- Review safety and security measures in areas where raw materials are stored.
- Verify that workers have access to a first aid kit.
- Propose separate handling and storage of dangerous chemical products (due to risk of toxicity or flammability).
- Evaluate the space used for raw materials and other production inputs and investigate potential dangers, and suggest improvements.
- Verify that there are fire extinguishers, tools, sand, water, or other means to suppress a fire (remember the fire triangle: a potential fire = oxygen + combustible material + ignition source).
- Verify that protection equipment exists and is being used by equipment operators (masks, gloves, eye protection, caps, helmets, work shoes/boots).
- Verify the safe handling of waste and scrap materials.
- Confirm that workers understand the risk of dangerous materials and know how to proceed in the event of an accident.

Ask the employer to keep a logbook regarding the PUE promoter's visits. The promoter should sign the book on each visit and record recommendations regarding problems identified during the visit. Additionally, the promoter should keep an independent written record of each technical assistance visit, including the details observed, problems identified and recommendations made.

Financing Strategy

A financing strategy should expand upon the target population's vision concerning the types of financing and financial institutions available. Educate the target population on the basic requirements necessary to qualify for financing. Where a particular financial entity is part of the PUE program, the education should go beyond the basics and provide information on the details of the financial services offered by that development partner.

The financing strategy should primarily focus on helping entrepreneurs purchase items necessary to improve the productivity or diversity of their products. Implementers should target the financing toward elements necessary to achieve sustainability, efficiency, and safety of the product or service that generates income, thus contributing to improved living standards and promoting a more competitive product.

The financing strategy should also take into account the essential characteristics of the target population, including ethnicity, education level, income level, and paying capacity. These considerations are typically incorporated into the strategy implemented by the financial entity chosen to work with the program.

PRODUCTIVE USES PROGRAM IMPLEMENTATION

This section describes the main activities involved in launching a productive uses program.

Coordination with Program Participants

Program participants typically include the PUE program implementing entity, the electric distribution utility (which may be, or eventually become, the implementing entity), the financial institution(s), the electric equipment vendors, and the program beneficiaries (customers). Other potential players are non-governmental organizations (NGOs), national and local governments, and other development entities working in the region.

If the electric distribution utility does not assume leadership of the PUE program, then the program implementing entity (the project's main sponsor, in many cases) must take the lead in coordinating all other players. They must coordinate directly with the electric distribution utility regarding the following key areas:

- Confirm that the electric distribution utility is willing and able to offer reliable and safe electric service to the future program beneficiaries.
- Explore whether the electric distribution utility could provide financing related to the cost of connecting to the electric system.
- Determine whether the electric distribution utility will designate certain personnel or administrative units to work on the program as necessary, depending on the size of the program.

Next, the program implementer must coordinate with the financing institution in these areas:

- Define financing conditions required of program beneficiaries.
- Evaluate whether the financial institution has the necessary liquidity, or whether additional funding sources are required.
- Evaluate whether the financial institution should designate certain personnel to oversee the program and work directly with participants and whether it is necessary to open new offices in the program area.

The implementing entity must also coordinate certain aspects with equipment vendors, such as:

- Determine availability of equipment that program beneficiaries will need and purchase.
- Confirm supplier financing arrangements (if any) and conditions.
- Explore possibilities of opening an office in the project area, if necessary.
- Provide technical assistance and training to program beneficiaries so they can operate and maintain the purchased equipment.

Last, the implementing entity should educate future program beneficiaries concerning the benefits provided by the PUE program as it relates to the electric utility, financing institution, and the equipment providers.

Field Work

Field work involves accurately identifying existing productive uses in the program area as well as the potential participants in the new PUE program. Advance planning aids in obtaining the largest quantity of information and verifiable data in the shortest time period, with the smallest investment of resources.

Factors such as the following should be considered in planning field work:

- Geography and distances needed to be covered within the project area

Field work involves accurately identifying existing productive uses in the program area as well as the potential participants in the new PUE program.

- Range and quantity of productive uses activities to be investigated
- Time required to fill out a survey form
- Number of surveyors required, and the training time necessary
- Travel time required to get from one site to another

Based on this information, develop a work schedule and budget.

To have a realistic idea of the volume and diversity of productive uses activities in the target area, they must be identified and quantified through field work.

Obtaining and Analyzing Historical Data

To obtain the necessary data for the PUE program, begin with existing statistical sources, such as the country's national repository of statistics (known by various names), regional or national government agencies, and NGOs or other entities that work in the project area.

Plan the field work using the historical data obtained, leaving time to accommodate complications that typically arise once work begins. Once the survey team arrives at the field work location, schedules can be adjusted to reflect differences between statistical data and local realities.

In some cases, very complete and reliable data exist, but in other cases, the available data are minimal and potentially useless. In any instance, always proceed with the field work to validate any existing information. If no reliable information exists, the first field work priority is to obtain reliable data. Visiting the area provides information about the topography, infrastructure, and physical barriers that could influence program implementation. It also permits verification of the quantity and type of existing productive uses activities in the area, transportation options and their quality, physical access to the area, the condition of the existing electric system, the distances, and the economic development of the area in general. During the visit, observations of the behavior and character of the inhabitants may provide clues regarding their likely reaction to a PUE program (e.g., they may accept, reject, or remain indifferent to the program).

As an example of what can be accomplished, in the Cochabamba Lower Valley (Bolivia), a team of six surveyors visited 77 communities in 17 days. In that time period, 487 survey forms were filled out, and 586 productive uses activities were identified. That equates to each surveyor filling out an average of five survey forms per day.

Identification of Existing Productive Uses

There are two main groups of productive uses activities: those that are already connected to the electric grid, and those that are not. For those already grid connected, the survey team should identify how those PUE activities could take increased advantage of the electricity they already use. For those not connected to the grid or not yet electrified from any source, the team should investigate the factors motivating the use of alternative or traditional energy sources, and under what conditions users would be willing to utilize grid electricity in their production processes.

The identification of productive uses activities in relation to the electric system is not a simple sorting of electricity users into residential, commercial and industrial categories, as is done with most electrification and utility data. Each of those categories might contain a number of different productive uses. Therefore, more detailed information is needed. As an example, in the Lower Valley of Cochabamba (Bolivia), over 50% of the total productive uses activities were already connected to the electric system and fell within the residential consumer category. To have a realistic idea of the volume and diversity of productive uses activities in the target area, they must be identified and quantified through field work.

The survey team must be knowledgeable about the PUE program and trained to carry out their work efficiently. They must all understand the mission and objectives of the PUE program, and be able to explain them to others. The survey team must be observant, since productive uses activities are not always advertised or identified by company signs, especially in rural areas. For example, the sound of a circular saw in a carpentry shop, or the bright flash in an arc welding shop, or the electronic music of a pub or disco, or the fragrant aroma from a bakery could all serve as clues to seek out potential PUE beneficiaries. Remember that in many developing countries these businesses are often found inside residential homes. The surveyor must pay attention to the entire spectrum of sounds, sights, colors, and smells that a business could emit.

In addition, train the survey team to identify non-electric machinery productive activities in the electrified areas. The project promoters must establish whether it might be financially beneficial for the business to connect to the electric grid and use electric equipment. Examples of non-electrified productive activities include pumps or mills driven by internal combustion engines, as well as many other activities that use diesel, gasoline, natural gas, firewood, waterpower, or simply human energy.

Finally, the program's implementing entity must determine whether it is necessary to carry out a beneficiary analysis in the project area. This analysis provides information regarding how the local inhabitants view the current electric service and the current electric distribution utility. This information is valuable, especially for the electric distribution utility, since challenges in this area must be overcome before the productive uses of electricity program can succeed. Some common issues are poor quality of service, mistrust of meter readings, billing problems, or poor customer treatment by utility employees. The existence of these problems and the lack of will to resolve them can undermine the performance and success of the PUE program.

Information Analysis

Analyze field data carefully. Hasty interpretations could lead to poor decisions causing severe implications for the beneficiary population. If projects are not appropriately sensitive, or are driven solely by financial factors, certain local resources, values, and customs may be altered.

The following are suggested basic elements to use in formulating a productive uses project.

Market Analysis

Prior to implementing a PUE program, the planners should ask themselves some of the same market analysis questions that prospective beneficiaries of such a program would have to ask themselves. They should reflect on the basic question of whether there is a market for the PUE program itself. Beyond that, project promoters should review the questions below to understand how productive use owners will have to analyze the market to decide whether or not to launch a new business or expand an existing one.

An integral analysis begins with knowing the market. This serves as the best starting point for conceiving and implementing the project and lays a solid foundation for its future success. Carefully consider the following questions during market analysis.

Product or Service Questions

- Is the product clearly defined?
- Is it new, or does it already exist?
- Does it meet quality standards?
- What are its strengths, opportunities, weaknesses and threats?
- Are there opportunities to create ancillary products?

- Is it indispensable or easily substituted?
- How will the product be transported to market? What reliable transportation alternatives exist?

Market Questions

- Who are the target clients?
- Where is the target market (local, regional, national, or international)?
- What is the current and potential demand?
- Will demand grow, decrease, or fluctuate seasonally (e.g. with flowers)?
- Does unsatisfied demand exist?
- Who are the competitors, and where are they located?
- How will the quantity produced be determined?
- What is the long-term prospect for the market of these products?

Product Technical Analysis

As with the market analysis, PUE program promoters should put themselves in the place of the productive use owners to think through the technical issues and how such decisions will affect the PUE program overall.

Product technical analysis involves a wide range of issues. Careful analysis of all information is critical, since it can directly affect the sustainability of the business. Key considerations in product technical analysis include:

- Availability of raw materials and source sustainability
- Availability of electric energy, distance, voltage (quality), transformer capacity
- Condition of electric service infrastructure (grid)
- Characteristics of the installed power capacity: existing equipment, power equipment, daily consumption pattern, seasonal pattern
- Manufacturing plant size needed to be competitive, space availability, terrain conditions
- Integration of production processes
- Possibilities to expand installation
- Critical inputs that determine growth or stability of the business
- Experience and availability of a qualified labor force and equipment
- Comparative strengths, weaknesses, opportunities, and threats of competitors
- Technical impediments and foreseeable legal issues

Environmental Analysis

This is yet another area for PUE project planners to consider on two levels, the environmental impact of the program as a whole and the impact of the various productive uses found in the target area. Environmental considerations are increasingly important in evaluating PUE projects. For example, if the PUE program will help construct or finance infrastructure for productive use, each of those construction projects must address environmental issues. It is crucial to determine whether a project environmental impact study is required prior to implementation.

Environmental considerations include:

- Environmental impacts in all phases (raw materials, processing, waste management, etc)

As with the market analysis, it behooves PUE program promoters to put themselves in the place of the productive use owners to think through the technical issues and how such decisions will affect the PUE program overall.

- Permits required
- Regulatory impediments
- Threatened resources (natural, cultural, or social)
- Work environment characteristics
- Mitigation measures and implementation costs
- Environmental financial implications over the life of the project
- Environmental legal framework

Socio-cultural Analysis

Project planners also need to consider cultural and social factors during the design, implementation, and operation of PUE projects. In most rural areas, traditions, customs, ancestral rituals, and deeply entrenched organizational structures exist. These must be respected and included as variables for the design of the productive uses of electricity program. Sociocultural analysis creates a vehicle through which the project can recognize the cultural heritage of indigenous and tribal populations, guaranteed through several international treaties.[1]

Rural populations are usually deeply attached to their ancestral roots. However, they also often suffer from extreme levels of poverty. Social issues emerging from either cultural or ancestral traditions, such as equity in participation (ethnic, creed, and gender), education level, access to services, etc., demand special attention when designing strategies and tactics for a sustainable PUE program.

Financial Analysis

Financial analysis is crucial in determining project feasibility and in making implementation decisions. This analysis should incorporate all previous considerations and assumptions to portray the true costs and the benefits of the project as accurately as possible.

Many projects in rural communities are solely the result of the project promoter's business instincts. Often the rural entrepreneur has little or no comprehension of costs, prices, or concepts such as return on investment.

Normally, existing business projects have a minimal investment in productive assets, poor documentation, and few or no financial records. This resembles the situation often found in family businesses within the informal sector of the economy, such as a local convenience store.

Many projects in rural communities are solely the result of the project promoter's business instincts. Often the rural entrepreneur has little or no comprehension of costs, prices, or concepts such as return on investment.

In businesses where no formal financial documentation exists, management expertise can be established through training on income patterns, seasonal market changes, as well as through managing external financing. Normally, incorporating electricity into the business process within rural businesses creates incremental increases in financial benefits, due to cost savings, quality improvements, and/or increases in productivity.

Projecting the financial viability of an entire PUE program or of an individual productive use is essential to determine whether or not the project or business can attract financing and reach financial sustainability. Determining financial viability is a matter of weighing future cash outlays against projected revenues, so as to define the project's profit or loss.

Promotion of Productive Uses

Resource potential, entrepreneurial intuition, and practical action options can provide insights into what is achievable within a region, if it were possible to rationally combine labor and capital. The challenge for the project visionaries is to promote sound PUE project options that truly apply for the business community of the region.

[1]C169 Indigenous and Tribal Peoples Convention, 1989, of the International Labor Organization.

Identification and Characterization of the Target Population

Electrification has proven to be a collaborative agent that brings about greater utilization of resources in a region, rather than causing industrialization. Experience gained in implementing PUE programs in different latitudes has led NRECA to employ greater sensitivity to specific target population characteristics. These considerations are essential to designing a successful program.

An initial analysis of the target population helps identify variables that will assist in program design, such as levels of education. Such information also helps define the appropriate methods for approaching the target population. This is especially critical in regions that are multi-ethnic and multi-lingual, and where the microclimactic variations within regions can influence a wide range of productive use activities.

Researchers should identify the following target population characteristics:

- Existing services in the area (education service, health service, access to water, communications, etc.)
- Local ethnic groups and languages
- Population dispersion
- Percentages of indigenous populations (for predominant ethnic groups)
- Student population levels and highest level of education available
- Level of illiteracy
- Levels of electricity consumption without a productive uses of electricity program
- Transportation options, road conditions, and distances to other major cities, ports, etc.
- Current productive activities and characteristics
- Degree of electric equipment utilization
- Potential productive use activities in the area
- Types of usable electric equipment available
- Available electricity infrastructure description
- Reliability of the electric service in the area
- Resources availability (human, natural, and financial)
- Development organizations and programs in the area
- Most utilized communication medium
- Community needs that can be met with electricity (water pumping, health services, irrigation, etc.)
- Access to markets to sell finished products and buy raw materials

Communication Media

The communication and promotional media used to inform and educate a community must be designed based on the information about the community. Some variables to keep in mind are:

- Local ethnic groups and common languages
- Percentage of indigenous population
- Illiteracy rate
- Population dispersion
- Access conditions

- Predominant socioeconomic characteristics

Experience has shown that a variety of media work best to approach a community, with human contact as the common denominator. People learn in different ways, and therefore different media of communication must be utilized as well. The mix of different media and communication methods should be sensitive to local characteristics, including language and the literacy rate. Among the methods to consider are the following.

Manuals

Manuals can be used in combination with training instructors, usually including technicians from local organizations, community leaders, financial institution personnel and local authorities. Design the material for simplicity, explaining the PUE program and its different components. It is essential to use the appropriate language or languages, as well as their vocabulary and locally understandable examples, easily grasped by the target population.

Pamphlets

Educational information of this nature should include how to start a business, safety, efficiency, benefits of productive use initiatives, management control, and other subjects. The material should include a variety of visual images and easy-to-read text.

Theater or Dramatization

Theatrical or dramatic performances offer an innovative and practical approach for explaining how a productive uses of electricity program works, what benefits exist, and the steps to follow. Create examples that are compatible with the community's way of life, using the local language, local jokes and nicknames, but without offending or being disrespectful.

This form of communication succeeds when it proceeds with a simple script and easy-to-understand scenes that an audience of diverse ages and educational backgrounds can grasp.

Try to carry out this activity in an appropriate room or hall where the acoustics are conducive to allowing all in attendance to hear. Consider using a sound amplification system where available. For example, in Bolivia puppet theater performances were presented in schools with great success.

Mobile Demonstration Unit

Mobile demonstration units are a highly effective method for communicating productive use information since they tend to arouse the curiosity of the local population about the productive uses program.

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This approach requires a vehicle that can carry a variety of electrical equipment and that is suited for rural roads. Select equipment for a community demonstration depending on the type of productive use activities identified in the community during the survey phase.

Demonstrations encourage creative thinking and foster new ideas within the audience. For maximum impact and understanding, however, it is helpful to follow a sequenced set of actions. The following are the most important components of a mobile demonstration:

- The local authorities must officially open the meeting and introduce the participants (electric utility, financing entities, NGOs, suppliers, and other special guests).
- Announce the objective of the demonstration.
- Detail the benefits of electricity for homes and businesses.
- Detail what a safe electric installation entails (show components and functions).
- Describe how to read an electric meter.

- Describe how to read an electric bill.
- Describe how to save electricity at home and in the place of business.
- Describe how to use electricity and electric equipment safely.
- Explain the name and function of the various equipment that could be used for local productive use activities.
- Perform a demonstration of the equipment.
- Conduct a raffle as a means to attract a wider audience.
- Announce that at the end of the presentation, a variety of productive use activities will be demonstrated (sharpening of knives or machetes, carpentry activities, wheat grinding, etc.). This will create a further public attraction and method for demonstrating the benefits of the electric equipment.
- Introduce equipment suppliers and financial entity representatives.

NRCECA recommends holding two demonstrations within the same community: a morning session with school-age children and an afternoon session for the entire population.

Videos

Videos are another important medium for illustrating productive uses of electricity. They are usually part of the agenda of a community training session. A video can show PUE projects in other communities, giving people an idea of activities they may want to replicate in their own community.

Videos are a novelty and highly effective as part of a presentation for local authorities, institutions, and other individuals that want to understand the productive use of electricity concept. They are also very popular at the community level, where the use of TV and video forms part of the productive uses program.

Preferably, videos should include simple characters and activities that are easily recognized. On occasion, mainstream video material can be used, such as "The Powerful Atom", a Walt Disney video, which is highly educational, informative, and entertaining, and related to electricity. The promoters may also customize their videos to promote specific programs, using special characters or locations with recognizable names common to the project region.

Photographs

It is helpful to use posters or banners in any group presentation, as well as digital photographs projected through audiovisual equipment. These types of media help explain the program to a varied audience. However, an audiovisual presentation requires access to electricity, so that arrangements must be made for the use of a generator in non-electrified communities.

A photographic presentation can demonstrate examples of successful productive uses, good production practices, as well as errors often encountered in production processes.

Identification of the Program's Administrative and Marketing Team

An ideal administrative team includes the electric distribution utility, the rural financing entity, NGOs, suppliers of quality equipment, and a project promoter or implementing entity to coordinate the efforts of all players. In some cases (as in Bolivia), NRECA hired a company with expertise in marketing and communication for promoting key aspects of its rural electrification projects.

Project promoters must determine whether an adequate marketing entity exists that could assume responsibility for implementing all

An ideal administrative team includes the electric distribution utility, the rural financing entity, NGOs, suppliers of quality equipment, and a project promoter or implementing entity to coordinate the efforts of all players.

promotion efforts for the productive uses of electricity program, beginning with the first community contact and extending to all promotion tasks thereafter. The entity might also play an important role in integrating all the players' efforts to promote the program.

Selection of the marketing company should comply with the following profile:

- Conscious of the importance of productive uses of electricity
- Sensitive to conditions and characteristics of the target population
- Knowledgeable about the region and sensitive to the cultural, linguistic, ethnic, and economic situation of that region
- Recognized as a leader on issues related to the productive uses of electricity or in rural area communications
- Understand the entrepreneurial spirit
- Have experience with community development projects, particularly dealing in marketing efforts aimed at increasing social awareness toward specific development objectives
- Have good relations with the local authorities, financial sector organizations, vendors, and other development entities in the area

In Guatemala, Honduras, and Nicaragua, a mixture of NGOs that were responsible for financing, training, and technical assistance, assumed a leadership position for handling the promotional efforts at the community and institutional level for various PUE programs. These NGOs coordinated efforts with the electric distribution utilities (many of which had limited resources) to promote and implement the productive use programs.

NGOs may use their internal staff or subcontract services from other local private companies to promote the PUE program. However, a lead organization must be established to avoid confusion or misunderstanding among the various players.

MONITORING AND EVALUATION OF THE PRODUCTIVE USES PROGRAM

Monitoring and evaluation of productive uses programs begins upon project implementation. Monitoring and evaluation consists of verifying that the PUE program's planned activities are carried out according to the approved project schedule and budget. Identifying variations from planned activities allows for quick adjustments, avoiding adverse effects on program performance.

Monitoring scheduled activities and goals involves verifying time frames for completion of program tasks and comparing the estimates for material use and human resources with the actual program experience.

Monitoring scheduled activities and goals involves verifying time frames for completion of program tasks and comparing the estimates for material use and human resources with the actual program experience. Often the time and resources required to accomplish program tasks differ from initial estimates. Avoid tight scheduling of tasks, to better accommodate unforeseen situations.

A program budget is an integral part of any productive uses of electricity program. It identifies the financial resources necessary to carry out program tasks in a specific time frame. Budget monitoring compares the estimated revenue and expenditures figures with actual amounts. Conduct monthly budget-to-actual comparisons and prepare a written report explaining variances. In addition, prepare quarterly and year-to-date financial reports to identify trends in spending and resources use. This process creates a method to recognize budgeted versus actual differences at an early stage and assists in evaluating the necessity of program adjustments at key intervals.

Specialized software helps systematically monitor program execution. Microsoft's MS Project software is one project management resource.

However, standard spreadsheet software also provides acceptable results.

The post-program evaluation determines whether the objectives and the goals of the PUE program were met and whether the expectations of the players were fulfilled. For example:

- Did the electric cooperative's sales increase because of the program?
- Did the businesses increase revenues because of using electric energy in production processes?
- Did the financial entity reach loan placement targets with acceptable collections?

In addition to evaluating whether the program objectives and goals were met, it is also important to evaluate the quality-of-life improvements and economic enhancement experienced by families in the community.

Impacts on the local economy should also be measured, because PUE programs can generate significant and measurable growth in commerce, industrial production, agricultural production (e.g., the use of water pumps), etc.

Post-program evaluations can be very detailed, depending on the requirements of the program players, and especially if funds for the program were granted through an international donor agency (e.g. USAID or the World Bank). PUE program promoters must keep detailed records of all program benefits and accomplishments throughout program implementation. Keeping up to date with benefits data enables a more efficient evaluation process.

In addition to evaluating whether the program objectives and goals were met, it is also important to evaluate the quality-of-life improvements and economic enhancement experienced by families in the community. Other program aspects to evaluate include equitable participation in the program by all participants, gender-related issues, and environmental impacts. The depth of evaluation of each of these issues depends on the requirements of the entity requesting the evaluation. Many donor agencies and some host governments require reports on environmental impacts or mitigations, as well as data related to equal gender participation in the project. Again, keeping current with such data is advisable.

PRODUCTIVE USES OF ELECTRICITY PROGRAMS: NRECA'S EXPERIENCE

Bolivia – Lower Valley of Cochabamba

When NRECA began the implementation of the USAID-funded *Electrification for Sustainable Development* Project (ESD Project) in Bolivia, it designed a productive uses component for it. This section focuses on the lessons learned from that project.

Objective

The objective of the Lower Valley of Cochabamba PUE project was to promote the productive use of electricity in an area where NRECA worked with the local utility to more optimally use the existing electric grid. The target population primarily included small-scale artisans and merchants, along with a lesser proportion of industry.

Implementation

The program combined the participation of both the electric company and an independent credit agency. NRECA provided the credit agency with seed capital for loans to program beneficiaries.

Businesses that needed to connect to the electric grid obtained financing directly from the electric company, while those interested in acquiring electric equipment received financing through the credit agency. In both cases, program participants bought their equipment and accessories on the open market and at their own convenience.

NRECA made an initial investment of US$112,000, of which US$75,000 was assigned to the loan portfolio and US$37,000 to the credit agency. At

the outset of the program, repayment of the loan fund was not anticipated, but due to the success of the program, all funds assigned to the loan portfolio were repaid to NRECA. Subsequently, NRECA later reinvested the repaid funds into a similar initiative with the Rural Electrification Cooperative of Santa Cruz, Bolivia (CRE).

Results

The project goal was 50 productive uses loans. However, 101 loans were actually granted. Recipients ranged from proprietors of businesses with six or seven electric textile machines for garment production, to small commercial stores and manufacturing centers, to individuals selling juices in the local market. Eighty-three shops and businesses benefited, of which 38 used credit to purchase electric machines and the other 45 used credit to purchase raw materials for production. Although increases in energy sales were not significant for the electric company, public relations from the company's involvement in the program were highly positive. Loan placement and collection were successful as well.

Guatemala

Experiences gained in Guatemala changed the paradigm for many organizations working in community development and electrification. This process of organizational change began with NRECA's participation in the Central American Rural Electrification Support Program (CARES), where a productive uses of electricity program was a significant component.

The following are examples of productive uses of electricity programs in Guatemala.

Phase III Rural Electrification Program

From 1987 to 1996, CARES promoted electric use as a tool for business development in rural Guatemalan communities. As part of Guatemala's Rural Electrification Program - Phase III, the Foundation for Economic Development (FUNDAP) administered a productive uses of electricity program, in conjunction with the electric distribution company (National Institute for Electrification, known by its Spanish acronym INDE). The program targeted the western highlands region.

FUNDAP created a strategy to integrate promotion, training, technical assistance, and access to financing as key components of business development. Its approach included promotional material, videos, dramatizations, and mobile unit demonstrations to facilitate financing, technical assistance, and training.

The productive uses program educated families and business owners on the safe, efficient, and productive use of electricity. Businesses gained access to financing, as well as training and technical assistance. Experience in various countries has shown that successful microfinance programs have interest rates that can be as high as 50% per year. Though those rates may sound high, they reflect the cost of providing loans as small as US$100 and all the associated training and follow-up to collect the loans. Note also that these rates are actually very attractive when compared with the exorbitant rates of informal loan sharks. Given these realities, the 30% annual interest rate of FUNDAP did not deter individuals from seeking credit to strengthen their businesses and improve their quality of life.

Program successes included job creation, increased involvement by equipment and raw material suppliers, and increased handicraft and agricultural product exports. Average electric consumption increased from 27kWh/month to 45 kWh/month (including residential and businesses), according to calculations made by the INDE Phase III team.

Although NRECA's support ended in 1996, FUNDAP institutionalized the program, and it continues promoting business development in the rural areas.

Génisis Empresarial / EEGSA (Guatemala Electric Company)

The success of the productive uses program in Guatemala's western highlands led to expanding the program to other regions. In one area, an alliance was created with both a nationally recognized financing entity and an electric distribution company. NRECA was actively involved in this initiative from 1995 to 2006.

Génesis Empresarial, the financing entity, had experience providing loans, technical assistance, and training for small and medium businesses in the urban and peri-urban areas. However, their evaluation criteria for financing proposals did not consider electricity use as a valuable production input.

A partnership developed between Génesis Empresarial and the Empresa Eléctrica de Guatemala Sociedad Anónima (EEGSA) (Guatemala Electric Company) to promote electricity as a means to increase productivity, efficiency, and profitability. The electric company sought to provide incentives for productive use of electricity in rural areas, to improve the paying capacity of rural clients, and to make its investment more profitable by expanding the electric distribution network in rural areas.

These two entities established a productive uses of electricity program with components described in this module. Communication media (e.g. dramatization, videos), technical visits, and training were designed to meet the needs of a local indigenous population. The project used a mobile demonstration unit in community training and promotion. Annual interest rates of 30% covered the cost of an integrated package of services that included the loan, technical assistance, training, a business assessment, and the direct involvement of a credit advisor.

NRECA and EEGSA provided technical training to the Génesis Empresarial financing team, which helped them provide better guidance to business owners and secure loans with less risk. Program representatives made on-site visits to businesses to evaluate installations, perform risk analyses, and assist owners to create specific risk reduction and efficiency improvement plans.

Equipment suppliers (selling sewing machines, carpentry equipment, refrigeration equipment, water pumps, and other items) also played a major role in the success of the program, providing training and technical assistance to buyers and offering competitive prices and equipment warranties.

Génesis Empresarial continues to maintain a productive uses program as a means to strengthen the business sector in rural Guatemala.

El Salvador

With the support of USAID, NRECA began a productive uses of electricity program to complement the National Electric System Reconstruction Program, which built and reconstructed electric distribution lines in El Salvador. The objective was to make rural electrification investments financially attractive and to encourage the use of electricity as a means to improve the productivity and competitiveness of depressed economies in war-torn environments.

From 1987 to 1996, NRECA assisted DISCEL, a government electric distribution entity, by establishing a community selection model linked to the productive potential in communities. NRECA provided concentrated support and human resources training during the reconstruction process.

DISCEL provided leadership in the promotion and training of the productive use of electricity program. DISCEL partnered with various financial entities in each region to provide financial assistance for the program. Banco Nacional de Desarrollo Agrícola and the Fundación para el Desarrollo de El Salvador, were among the entities

that took the lead in financing, allocating funds and personnel to coordinate closely with the NRECA and DISCEL team. NRECA provided technical assistance and training throughout the duration of the program, especially in aspects related to safety and energy efficiency.

CONCLUSION

Productive uses of electricity programs are a key element of any rural electrification initiative, rural electric cooperative expansion program, or rural development in general. PUE programs build solid links between an area's electric service provider, financial institutions, governmental authorities, and local business entrepreneurs. For many rural communities, electricity is used mainly for lighting and entertainment, and therefore it is often underutilized as a source of income generation. Local government authorities also tend to have a limited view of electricity promoting its use for such specific purposes as street lighting yet failing to grasp its significance as a key input for business production.

Therefore, the role of the PUE program promoter is multifaceted. He or she must be able to coordinate the efforts and interests of the various players mentioned above, while keeping the big-picture goals of the program in mind. PUE programs must be tailored to the target community. Promoting ill-conceived PUE activities that fail to consider the reality of the community will only frustrate those involved and waste limited resources.

Implementers should employ a multitude of media to promote the PUE program. These can include printed materials (flyers, pamphlets, etc), theatrical presentations, fairs, mobile demonstration units, videos, puppets, and others. Because all individuals learn and retain information in different ways, it is important to utilize more than one medium of communication when promoting the PUE program.

Financing and technical assistance are key components of any PUE program. The PUE promoter must establish links and loan programs with local financial institutions or through the electric distribution utility and equipment suppliers. Through these, program participants can gain access to credit for purchasing electric machinery or funding a connection to the electric grid. Establishing partnerships with financial institutions, both formal and informal, is a key task of the PUE project promoter.

Having a market for the various goods and services produced in the target area is another vital part of a PUE program. All the other components can be in place – reliable electricity, available electric equipment, access to credit, well-educated and capable human resources, cost-effective and efficient production – but there is not sufficient demand for a particular good or service, a productive use initiative will fail.

Finally, keep in mind that the PUE program participant is the center of any PUE program. The businesses or individuals that will benefit from the PUE program will be, in the end, the key determinant of project success. It is important to conduct various levels of training for PUE program participants, on both elementary topics of electricity as well as advanced topics of business management. The PUE promoter must also have a close working relationship with the PUE participants, to provide proper guidance as well as proper program monitoring and evaluation.

The use of electricity as a driver of economic growth cannot be overlooked in any community, especially in rural areas. Gathering knowledge about the community, its cultural and social norms, and the different project players and personalities, enhances the PUE program's chance of success. Electricity is not a means to economic growth in and of itself. Without it, however, lasting and sustainable economic growth is not possible.

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