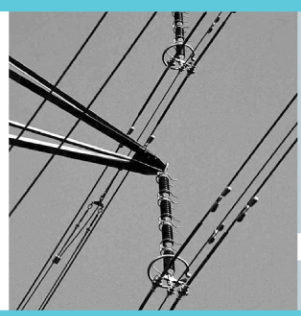
ESMAP Technical Paper 118/07
June 2007

Meeting the Energy Needs of the Urban Poor

Lessons from Electrification Practitioners



ESMAP

Energy Sector Management Assistance Program

Energy Sector Management Assistance Program

Purpose

The Energy Sector Management Assistance Program (ESMAP) is a global technical assistance partnership administered by the World Bank and sponsored by bi-lateral official donors, since 1983. ESMAP's mission is to promote the role of energy in poverty reduction and economic growth in an environmentally responsible manner. Its work applies to low-income, emerging, and transition economies and contributes to the achievement of internationally agreed development goals. ESMAP interventions are knowledge products including free technical assistance, specific studies, advisory services, pilot projects, knowledge generation and dissemination, trainings, workshops and seminars, conferences and round-tables, and publications.

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ESMAP is governed by a Consultative Group (the ESMAP CG) composed of representatives of the World Bank, other donors, and development experts from regions which benefit from ESMAP's assistance. The ESMAP CG is chaired by a World Bank Vice-President, and advised by a Technical Advisory Group (TAG) of independent energy experts that reviews the Program's strategic agenda, its work plan, and its achievements. ESMAP relies on a cadre of engineers, energy planners, and economists from the World Bank, and from the energy and development community at large, to conduct its activities.

Funding

ESMAP is a knowledge partnership supported by the World Bank and official donors from Belgium, Canada, Denmark, Finland, France, Germany, Iceland, the Netherlands, Norway, Sweden, Switzerland, United Kingdom, United Nations Foundation and the United States Department of State. ESMAP has also enjoyed the support of private donors as well as in-kind support from a number of partners in the energy and development community.

Further Information

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Meeting the Energy Needs of the Urban Poor: Lessons from Electrification Practitioners

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Energy Sector Management Assistance Program (ESMAP)

Produced in India
First printing June 2007

ESMAP reports are published to communicate the results of ESMAP's work to the development community with the least possible delay. The typescript of the paper therefore has not been prepared in accordance with the procedures appropriate to formal documents. Some sources cited in this report may be informal documents that are not readily available.

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Abbreviations and Acronyms

AEC	Ahmedabad Electricity Company
AES	Electricidad de Caracas
AMC	Ahmedabad Municipal Corporation
ANEEL	Agência Nacional de Energia
CBOs	Community-based Organizations
CDM	Clean Development Mechanism
CENN	Caucasus Environmental NGO Network
DAEP	Depressed Area Electrification Project
DISPAC	Distribuidora del Pacífico
EdF	Electricite de France
Eskom	South African Energy Supply Company
EPM	Empresas Públicas de Medellín
ESCAs	Energy Services Consumers' Associations
ESMAP	Energy Sector Management Assistance Program
IADB	Inter-American Development Bank
LPG	Liquefied Petroleum Gas
MERALCO	Manila Electric Railroad and Light Company
MHT	Mahila Housing SEWA Trust
NGOs	Non-Governmental Organizations
NDPL	New Delhi Power Limited
PNE	PN Energy Services Limited
O&M	Operations and Maintenance
PNE	PN Energy Services Limited
PRA	Programa Rede Ampla

PRONAI	Program for Normalization of Informal Areas
SEP	Slum Electrification Project
SEWA	Self-Employed Women's Association
SNP	Slum Networking Project
USAID	United States Agency for International Development
WTP	Willingness-To-Pay

Units of Measure

ha	Hectare (s)
kWh	Kilo Watt (s) Per Hour
kV	Kilo Volt
V	Volt

Currency Conversion

2.4352 Reals = US$1

Foreword and Acknowledgments

The present report was prepared on the basis of the findings of an international workshop held from September 12-14, 2005, in Salvador da Bahia. The workshop was designed and financed by the Energy Sector Management Assistance Program (ESMAP)/World Bank, the United States Agency for International Development (USAID), Cities Alliance, Electricité de France (Edf), the Inter-American Development Bank (IADB) and COELBA, the Electricity Company of Bahia. The richness of the material generated from the workshop led to the decision to issue an analytical document instead of standard proceedings, in order to capitalize on both the literature and the presentations and discussions during the workshop. The formal presentations from the workshop are included in the CD-ROM attached to the report.

The idea of the international workshop originated from various requests to ESMAP to share experience on the delivery of energy services, in particular electricity, in peri-urban areas in developing countries. An informal network started developing between ESMAP, USAID, EdF and Electricidad de Caracas (AES): agencies and companies which had been doing analytical or investment activities in this field for a number of years. A first learning event was conducted in April 2005 during the World Bank Energy Week which was enthusiastically received, and confirmed the need to focus on the critical issue of electrification in poor urban areas of developing countries. Cities Alliance, which has extensive programs with municipalities in developing countries, and the IADB agreed to cosponsor the workshop and COELBA agreed to host the workshop.

Special thanks are addressed to Ms. Connie Smyser, consultant to USAID, who coordinated the preparation of the Bahia workshop, and moderated the event; Ms. Sarah Adams, EdF, Ms. Simone Lawaetz, USAID, Mr. Jaime Millan, the Inter-American Development Bank, and Mr. William Cobbett, from Cities Alliance, who served with Ms. Dominique Lallement, ESMAP, on the organizing committee. Special

thanks are also addressed to the General Manager of COELBA, for hosting the event, to Ms. Ana Christina Mascarenhas, COELBA, and Ms. Nyra Wallace, ESMAP, for providing the logistics and Ms. Marjorie K. Araya and Ms. Ananda Swaroop, for the coordination of the publication. The report was peer reviewed by Ms. Simone Lawaetz, USAID, Mr. William Cobbett of Cities Alliance and Mr. Lucio Monari of World Bank.

Executive Summary

The Workshop

During September 12-14, 2005, the ESMAP/World Bank, USAID, Cities Alliance, EdF, IADB and COELBA cosponsored a workshop entitled "Meeting the Energy Needs of the Urban Poor: The Case of Electrification."

The workshop was held in Salvador da Bahia, Brazil, and was attended by delegations of three to five practitioners from 12 cities in Latin America, Africa and Asia. It had two main objectives:

- To share experiences on innovative solutions to provide electricity services in poor peri-urban and urban areas; and
- To develop a body of knowledge to be disseminated and used by a wide array of practitioners involved in the provision of energy services in those areas.

The workshop was divided into four modules where presentations of different case studies were made, illustrating the perspectives of utilities, communities, Non-Governmental Organizations (NGOs), Community-Based Organizations (CBOs), regulators and policy makers on the institutional, technical, financial and socioeconomic challenges of the different electrification efforts.

The Challenge of Sustainable Electrification in Poor Urban Areas

Much progress has been made over the past 30 years to deliver modern energy services to developing countries, in particular electrification. It is estimated that, overall, the rate of electrification in urban areas has reached over 90 percent, in sharp contrast with the rate of electrification in rural areas of barely 60 percent. There are, of course, significant regional disparities, with the best results achieved in East Asia and Latin America, while South Asia

and Africa continue to lag behind. The case of Eastern Europe and the former Soviet Union countries is quite different as, after World War II, they reached 100 percent of electrification about at the same time as most industrial countries. However, the civil and political changes which led to the break up of the former Soviet Union also led to significant disruptions and damages in power systems with the results that many households and businesses lost access to network electricity, a problem now largely resolved.

Despite the progress achieved in developing countries, governments have been struggling with extremely fast urban growth – at rates exceeding at times 15 percent a year – largely due to the immigration of poor or very low income populations from rural areas. These migrants establish themselves in informal settlements, often at the periphery of cities, characterized by lack of infrastructure at the time of settlement, lack of land tenure and high population density. Providing energy services to these settlements (slums, shanty towns), in particular electricity, water and sanitation, access roads and public lighting, has been a major challenge to local and central governments as well as utilities for decades.

Moreover, the wave of power sector reforms which swept through many developing and middle income countries over the past 15 years, has created new challenges both for electricity providers – distribution companies – and end users, in particular the poorest. At the core of power sector reform was the need to establish financially viable power systems, without relying on governments to finance infrastructure investments or to subsidize the service from State budgets. This change of approach called for an increased participation from the private sector, both to invest in infrastructure and to provide the service. Whether there was a change of ownership or not, one of the major issues that emerged was the inability of the lowest income consumers to pay for the service at rates substantially higher than previously when the service provider was a State-owned company receiving, one way or the other, significant subsidies from the government.

A whole chain of other issues resulted from this situation: debt arrears from poor consumers, disconnection of the service by the utility, illegal connections and electricity theft, take over of the distribution service by illegal operators, hostility between the consumers and the utility, fear between the consumers and the illegal operators, deterioration in the infrastructure, lack of safety and major accidents. Privatized utilities have had the mandate to serve low-income consumers according to the terms of their concessions. However, most of them have been struggling to deliver on their obligations. The need to share experience expressed by several companies led to the organization of the international workshop in Salvador da Bahia, in September 2005.

Learning from Experience

Electrification: a Solution to the Cost of Social Exclusion

One of the most important conclusions of the Bahia workshop was that excluding part of the population from access to energy on account of their poverty, marginalization and the informality of the settlements has enormous long-term social, economic and financial costs. The root cause of the contemporary difficulty in providing electricity and other infrastructure services through public or private utilities is decades of such social exclusion, poverty and marginalization which have led to total distrust between formal structures and consumers, and to the rise of illegal and costly electricity distribution systems, often managed by private illegal entrepreneurs.

The poor pay an extremely high price for electricity illegally sold to them by illegal private operators, or confront very high risks (fires, electrocutions, evictions) for individual illegal connections. Reciprocally, the risk profile of poor residents, the narrow streets and physical characteristics of slums make access costs and barriers high for serving this kind of consumers.

Though reaching the urban poor with electricity is a huge challenge, the benefits from scaling up slum electrification programs were highlighted during the workshop, including:

- Improved household disposable income from paying less for the utility services as compared to the services provided through illegal distribution, to increased income opportunities generated by the reliability of service, the time saved on the procurement of cooking fuels (although electricity only marginally replaces other cooking fuels);
- Health benefits: reduction in indoor air pollution, safe water when boiled;
- Security of households: less fires; light at night;
- Reduced violence on women;
- Increase in educational levels;
- Boost in social status, from social exclusion to social inclusion;
- Energy efficiency;
- Security from street lighting; and
- More investments in housing improvements once the neighborhoods are secure.

Servicing poor consumers is a "business proposition"

Encouragingly, several privately owned utilities recognize that providing electricity services to poor consumers is a value proposition, that it is feasible, and can yield returns to

shareholders as the cost to the utilities of illegal connections is higher than providing the service, as long as consumers can be legalized and made into reliable consumers. For private utilities to operate, however, strong support from local governments to the utilities is needed, in particular with respect to: a) land tenure; b) the provision of other infrastructure; and c) possibly some financing to subsidize rehabilitation programs. The experiences presented at the workshop provided interesting examples of how entrepreneurs, practitioners and policy makers are making significant progress in this type of electrification.

Building effective public-private-community partnerships: a prerequisite to success

When electrifying poor peri-urban and urban areas, the chances for the success of a specific program are greater if utilities operate in partnership with local governments and with the community. To recognize that utilities have limited power to combat fraud and theft, and that they do better when they partner both with the government to create a coherent legal framework to solve tenure problems, and with the community to endorse the legitimization of consumers and connections, is nothing new.

What is novel, however, is the recognition by the different stakeholders of their limited power to make it on their own. Hence, the workshop highlighted that the public-private partnership model is inadequate to work in slum areas. The alternative model which emerged is public-private-community partnerships which includes close cooperation between the utility and CBOs or NGOs, and the local and central governments, in particular. These partnerships are more critical in the initial pilot phase, when the utility is unfamiliar with the slum area and needs the assistance of an NGO or CBO to better understand the technical, financial and socioeconomic conditions in the area, and when it needs the support of the local and central authorities to design programs which reflect the specific socioeconomic environment of each slum.

In general, experiences showed that if user groups are not well represented and the utility does not exert pressure on government agencies, it is unlikely that the government will become interested in the problems faced by utilities in slums. However, for companies and the community, the government's intervention and its participation in such partnerships is indispensable for:

- Providing a coherent legal framework for "legitimizing" consumers and connections, and for solving land ownership problems;
- Applying reward-and-punishment systems through law enforcement institutions to increase compliance with electrification programs and reduce electricity pilferage;

- Accompanying electrification efforts with additional investments in other types of social infrastructure; and
- Reducing uncertainty by defining tariffs and subsidy levels before investment decisions are implemented.

Partnerships are strengthened when stakeholders have the self-imposed discipline of working within the partnership framework. However, the scant tradition of slum households of living under formal and legal rules which are common among richer households, makes them prone to return to informality, particularly when they are tempted by illegal service providers with attractive short-term proposals. For that reason, mechanisms should be in place to encourage the community to act as a watchdog against the pilferage of electricity, since the lack of effective, "exemplary" sanctions can persuade stakeholders to break and violate the terms of the partnership. In several success stories, different types of intermediaries were used to reach the goal of legalizing the service.

CBOs and NGOs help build trust and confidence toward energy stakeholders, mobilize the community to understand their rights and obligations, link utilities to slum dwellers and raise government awareness. Among other actions, they help place the subject of electrification and utility services on the public agenda, educate slum dwellers, collect dues and promote accuracy in billing, identify community leaders and convert former fraudsters into future electricians. Some utilities have also experimented legalizing the illegal distributors into "microenterprises" to whom they can contract some of the distribution activities. In other cases, intermediaries have intervened by means of microcredit institutions, in order to finance connections, refinance bills and pay upfront costs for meters. Thus, the role of the community as the guardian of equity and transparency is critical.

Experience also showed that it is necessary to define ex ante what the rights and obligations of each member of the partnership are: the delineation of the physical limit of service provision (for example, at the exit point of the meter), each party's responsibility to minimize risks and to assume the costs of the contingencies which arise. Best practice shows that incentives are needed for each stakeholder group in the partnership.

Creating microenterprises which allow communities to "comanage" electricity service provision, where utilities make a commitment to promote and support the community into creating self-organizing microenterprises, was mentioned as a useful alternative to improve the effectiveness of electrification programs. These microenterprises can perform different activities related to metering, billing, pilferage management, training and education.

By partnering with these NGOs and CBOs, utilities optimize the use of resources by delegating some activities to those who can perform them more efficiently, by saving resources, and by effectively reaching the desired targeted population. However, delegating certain tasks down the line does not release utilities from their responsibilities for the basic infrastructure and service provision.

Financing value-creating investments: bridging short- and long-term needs

Experiences presented at the workshop illustrated that utilities which ignore their low-income consumers are jeopardizing their own growth potential. The challenge, therefore, is to provide a level of service which is adequate to allow residents in slums to "live like the others," and to increase their disposable income in the long term.

One of the key aspects for making the provision of electricity to poor consumers feasible is the adoption of a long-term vision for servicing peri-urban areas. Focusing on the short-term economic gains derived from a drop in nontechnical losses is good. However, it is even better when utilities conceive appropriate development programs, in which services are adapted to provide the "right" deliverables in the short term, allowing residents in slums to reduce their expenditure on electricity and undertake additional economic activities which increase their disposable income in the long run.

Finally, slum electrification efforts face two main financial challenges. First, how to meet the financing requirements to cover the costs of providing the "right" deliverables and to meet partnership infrastructure needs. Second, how to raise and manage the financing to meet the needs of the energy poor.

Designing "Intelligent Subsidies"

The low levels of household income and the high cost of electricity delivery were the main limitations identified during the workshop for making electricity affordable to slum dwellers. In turn, two kinds of subsidy schemes were highlighted amongst those most commonly used within the different slum electrification programs as a mean to address the affordability constraint: i) a one-time subsidy used to finance connection fees; and ii) an income-bound (rather than time-bound) subsidy to enable a minimum level of consumption for all users (support to a lifeline tariff).

Subsidy schemes, however, must be analyzed within the broader context which explains connection costs and how to mitigate their impact on the urban poor with innovative

solutions. One of the lessons from the workshop was that consumers should be required to pay part of the connection cost in order for them to value the investment.

In turn, when designing lifeline tariffs, the main challenge is to arrive at the appropriate level of consumption to be subsidized, if inclusion and exclusion errors are to be minimized and perverse incentives avoided. Examples provided during the workshop discussions revealed that the governance structure of slums and the informal relations which characterize these settings make it difficult to reach the desired beneficiaries. In some cases, subsidies collected by the utilities through tariffs paid by existing consumers were channeled to the benefit of other consumers not in need, or, in the worst of cases, to the utility's benefit. In other cases, the subsidies provided to slum residents ended up in the hands of the illegal service provider.

Innovative techno-financial solutions, such as efficient metering systems with prepaid meters, were cited as an effective mean to minimize exclusion errors, as they allow for minimizing the proportion of intended subsidy recipients who do not actually get the services. However, exclusion errors may still appear if there is difficulty in accommodating household size in setting the tariff, something that can easily happen in overcrowded slum households.

Consequently, the objective of targeting slum dwellers within an "intelligent subsidy" design is to limit the benefit of the subsidy to only those eligible for support. How to transfer the subsidies is another highly relevant policy-making challenge. Further analytical work on subsidy delivery mechanisms still has to be done, and revision of alternative experiences with, for example, cash payments/transfers should be evaluated.

Managing Resources to Deliver the Right Output at the Lowest Cost

To design and implement a rational and a workable partnership, proposals have to go beyond the design of an efficient subsidy allocation mechanism. Proposals need to focus on adapting the service and ensuring product quality, as well as on the most effective means to deliver both.

Need for engineering with sociology

Many municipalities do not have a clear policy on slum development, whether to opt for slum upgrading that is, permanent settlement versus resettlement, an issue which goes beyond slum electrification. A global social program which combines engineering and sociological solutions is required to meet all basic infrastructure needs; water and sanitation utilities

often face constraints similar to those of the electricity utilities, although some of the solutions must be specific to the service provided. The "restructuring" of slums is a realistic solution when "engineering and sociology" are combined as part of a "global social program" involving the participation of the various stakeholders, of which electrification is often the first step.

The lack of relevant knowledge about the targeted communities, and the shortcomings of some methodologies of analysis used to identify the way in which those communities react to programs, were identified as two major problems faced by companies when defining the initial projects and the monitoring methodologies.

The need to learn from experience, identify delivery systems which are more likely to achieve electrification objectives, and understand the factors contributing to the success and failure of programs, has led some electricity companies to hire anthropologists, sociologists and demographers, increasing the effectiveness of their programs.

The use of an "epidemiological approach" (see below) to understand energy consumption patterns, and to weigh and select the most appropriate, cost-effective solution, has been crucial for the success of several programs. The concept of "epidemiological approach" refers to programs conducted in a series of stages which include, among others:

- A diagnostic phase, in which the causes for inadequate electricity service are confirmed;
- A descriptive phase, which describes the main characteristics of the targeted community, their consumption patterns and energy expenditure patterns;
- An experimental phase, in which pilot projects are tested;
- An analytical phase, in which the results produced by the pilot projects are analyzed;
- An intervention phase, in which appropriate control methods are modeled to evaluate scalability chances of programs, both from a techno-financial perspective and from a sociological perspective; and
- A monitoring phase, which takes place during the implementation of the programs to ensure that they are being properly implemented.

Still, additional quantitative information and analyses are needed to identify and measure relationships between observable facts, which can be interpreted independently from the meanings that communities attach to them. Extra quantitative analyses are required to improve monitoring methodologies, evaluation and cost-benefit analysis of the different technologies on household income and, most importantly, the scalability chances of projects. This may well be one of the areas where the efforts of donor agencies could concentrate in the future.

Making consumers in slums "reliable" consumers

The general belief that slum residents do not pay for the services provided to them or are unwilling to pay for regular electric connections is a gross misconception. It is correct, however, that consumers in slums are riskier than wealthier consumers, simply because of the greater variability of their own incomes.

The different experiences presented at the workshop demonstrated that consumers want to become legal, and enthusiastically support electrification programs which enable them to pay for the service. Consequently, electricity delivery schemes need to be designed to take into account the economic vulnerability of poor consumers living in slums and the volatility of their income, and to create favorable conditions for electricity services to be accessible and affordable.

Increasing accessibility involves different dimensions:

- Providing financing to help consumers afford the high entry cost of obtaining electricity connections, usually through subsidies;
- Providing access to credit for energy service suppliers in order to cover their initial investment costs; and
- Promoting revenue generating uses of energy.

Actions to make electricity accessible and affordable include measures to identify the amount of subsidy which has to be provided to finance connections, and oriented to identify the Willingness-to-Pay (WTP) for the service and the fee levels at which participation in the electrification programs would drop. With regard to this last aspect, the experience from surveys in some countries revealed interesting differences between the expressed and the revealed WTP for electricity.

Increasing consumers' reliability also involves adapting the billing system and payment options to the consumers' cash flow constraints. Experience reveals that, in the long run, it is more advantageous for service providers to provide more flexible payment options, rather than to let consumers recede into illegality. This does not mean reducing the tariff, but providing billing options adapted to the timing of their cash flow and payment capacity. Prepaid meters are the most common instrument used by practitioners to adapt payment options to consumers' financial limitations. Other actions discussed, included measures oriented to reduce (or restrict) the amount of electricity used, through technical devices (current limiters), educational programs on energy

savings and the rational use of energy and providing access to alternative and more efficient energy consumption options.

Technology offers constructive solutions

Utilities have developed very constructive sets of technical solutions to meet a range of constraints, for example, shortening the low voltage network to lower the cost of the distribution system, raising meters on poles or building alarm systems to protect the infrastructure from vandalism and installing prepayment meters to adapt to consumers' cash flows.

During the workshop, experiences with three different metering options were evaluated: i) prepaid meters; ii) retail meters; and iii) public fountains (collective).

Prepaid meters have an advantage over individual residential meters in that they provide poor consumers with the possibility to decide, ex ante, how much of their income they are willing to spend on electricity, and when they want to use the service. By contrast, individual retail meters, not easily readable by the consumer, make it more difficult for the consumers to control their electricity expenditure; furthermore, as these meters do not register the cost of the service, consumers only become aware of the amount of their bills, ex post, after consumption.

Public fountains were found to be a good solution, particularly, where access is difficult due to physical and geographical constraints (high population density in the slum), and where violence threatens swat teams and control units.

The use of innovative technologies to limit electricity pilferage, monitor consumer behavior, and, therefore, reduce losses, requires investments. Besides investments in technology, the various programs presented at the workshop command intensive operation and maintenance activities, resulting in higher costs. Consequently, the choice of technical options must reflect a careful balance initial investment costs and maintenance needs and cost.

Conclusions: Some Challenges Ahead

Do current regulatory systems support slum electrification? At the institutional level, it was confirmed that in the majority of the countries participating in the workshop, except for Brazil, electrification programs for poor peri-urban and urban areas are being deployed with a lack of appropriate regulatory frameworks to support these efforts. The regulatory

frameworks which have been developed for the general model of public-private partnership do not meet the need of distribution companies working in predominantly poor areas. In particular, they do not reflect the need for "innovative" technical characteristics and the informal sector relationships which characterize poor urban and peri-urban areas, nor are there regulatory mechanisms for risk-sharing or resolving disputes, for example, when the infrastructure is damaged. It would be important, therefore, to adapt regulatory frameworks for the various business models used to extend the grids to slums. Currently, utilities are left to their own devices to find out practical solutions. This is an area which was identified as needing more analytical work.

Various subsidization schemes were reviewed, but it was felt that there is not yet a strong body of good practice which analyzes the relative merits of various subsidization mechanisms for slum areas; this was also deemed as an area where more information is needed.

Follow-up work proposed includes:

- Further analytical work on regulatory issues for slum areas;
- Further analytical work on subsidy mechanisms, in particular to document more cases of good practices;
- Additional analytical work involving additional quantitative analyses are required to improve the monitoring methodologies, evaluation and cost-benefit analysis of the different technologies on household income and, most importantly, the scalability chances of projects; and
- More documenting on good practices, to a wider spectrum of municipalities and countries and utility models.

The further dissemination of existing knowledge, possibly through a side event at Energy Week, includes a handbook for practitioners and a distance learning course for practitioners in municipal governments, NGOs and CBOs, as well as utilities. Some of the participants also offered to host a follow-up workshop in the future.

1. Introduction

Much progress has been made over the past 30 years to deliver modern energy services to developing countries, in particular electrification. It is estimated that, overall, the rate of electrification in urban areas has reached more than 91 percent, with the rate of electrification in rural areas of barely 60 percent. There are, of course, significant regional disparities, with the best results achieved in East Asia and Latin America, while South Asia and Africa continue to lag behind. The case of Eastern Europe and the former Soviet Union countries is quite different as, after World War II, they reached 100 percent electrification about the same time as most industrial countries. However, the civil and political changes which led to the break up of the former Soviet Union also led to significant disruptions and damages in power systems.

Despite the progress, in developing countries, governments have been struggling with extremely fast urban growth – at rates exceeding at times 15 percent a year – largely due to the immigration of poor or very low income populations from rural areas. These migrants establish themselves in informal settlements, often at the periphery of cities, characterized by lack of infrastructure at the time of settlement, lack of land tenure and high population density. Providing energy services to these settlements (slums, shanty towns), in particular electricity, water and sanitation, access roads and public lighting, has been a major challenge to local and central governments as well as utilities for decades.

Moreover, the wave of power sector reforms which swept through many developing and middle-income countries over the past 15 years has created new challenges both for electricity providers – distribution companies – and end users, in particular the poorest. At the core of power sector reform was the need to establish financially viable power systems, without relying on governments to finance infrastructure investments, or to subsidize the service from State budgets. This change of approach also called for an increased participation from the private sector, both to invest in infrastructure and to provide the service. Whether there was a change of ownership or not, one of the major issues that came about was the inability of the lowest income consumers to pay for the service at rates substantially higher

than previously when the service provider was a State-owned company receiving, one way or the other, significant subsidies from the government.

A whole chain of other issues has resulted from this situation: debt arrears from poor consumers, disconnection of the service by the utility, illegal connections, takeover of the distribution service by illegal operators, hostility between the consumers and the utility, fear between the consumers and the illegal operators, deterioration in the infrastructure, lack of safety and major accidents. Privatized utilities have the mandate to serve these low-income consumers according to the terms of their concessions. However, most of them have been struggling to deliver on their obligations. The need to share experience expressed by several companies led to the organization of the international workshop in Salvador da Bahia in September 2005.

"Meeting the Energy Needs of the Urban Poor: The Case of Electrification:" International Workshop from September 12-14, 2005, in Salvador da Bahia

The objective of the workshop was twofold:

- To share experiences on innovative solutions to provide electricity services for poor peri-urban and urban areas; and
- To develop a body of knowledge to be disseminated and used by a wide array of practitioners involved in the provision of energy services in those areas.

Participants

The workshop was held in Salvador da Bahia, Brazil, and was attended by delegations of three to five practitioners from 12 cities in Latin America, Africa and Asia. The participants represented the perspectives of utilities, the community, NonGovernmental Organizations (NGOs) and Community-Based Organizations (CBOs), regulators and policy makers. A list of the participants can be found in Annex 1.

A steering group composed of experts from different organizations and backgrounds, conducted the workshop and selected the various case studies to be analyzed.[1]

[1] *The members of the steering committee were: Connie Smyser from Nexant/Smyser Associates, Jaime Millán from the Inter-American Development Bank (IADB), Simone Lawaetz from USAID, William Cobbett from Cities Alliance, Sarah Adams from Electricite de France (EdF) Access Program and Dominique Lallement from the World Bank – ESMAP.*

Methodology

The workshop was divided into four modules, covering different sets of issues:

- Institutional issues: How different kinds of institutional mechanisms, involving private providers, NGOs, CBOs and local governments, contribute to overcome the problems which arise when trying to electrify poor urban and peri-urban areas; how complex issues relating to the lack of tenure, to the scant relations between informal service providers and consumers, and consumers' lack of awareness of their responsibilities, are approached under such unique kinds of institutional environments;
- Technical issues: How technical approaches, such as the use of "public fountains" and "prepaid meters," can be instrumental in increasing transparency, avoiding pilfering, and reducing electricity waste by making it difficult for consumers to have illegal access to the grid; how innovative technological applications can help monitor consumption, allowing households to manage their energy consumption within their budgetary constraints;
- Financial challenges: How to integrate the concerns of all stakeholders – utilities, local governments and consumers – when designing and implementing electrification programs in low-income urban and peri-urban areas; how to enable service providers and consumers to control investment and service costs to deliver a quality service which is more affordable for poor consumers; and
- Social and economic issues: How to provide electrification in a complex socioeconomic environment, including in the context of a broader program involving the upgrading of other infrastructure and social services, and how to ensure that electrification will generate a positive impact on welfare and incomes.

The methodology used during the workshop comprised the presentation of case studies by each delegation, in most cases offering the perspective of each stakeholder on specific aspects of the above mentioned issues. Each panel was followed by a Q&A session encouraging discussion of the complex issues which could not only determine the success of the programs under analysis, but also learn from the failures. During the last day of the workshop, multidisciplinary teams were created and worked in breakout groups to discuss and propose solutions to the main problems which had been raised during the panels. The complete agenda of the workshop can be found in Annex 2.

Organization of the Report

Although there is a wide array of interesting and successful electrification experiences, these are not universal recipes for success. This, however, does not impede extrapolating some

generic lessons for broader application. Instead of summarizing the presentations and experiences presented at the workshop, this report presents an analysis of the workshop presentations and discussions with the aim to assist practitioners to consider the different dimensions of slum electrification, helping them recognize the key factors which can condition the success of a particular electrification effort. This document aims to give practitioners and policy makers an account of the nature of these experiences and why some approaches and "business models" work, why some fail.

Throughout the report, references are made to the different case studies and experiences presented during the workshop. All the presentations can be accessed in the CD accompanying the report.

The report is divided into nine chapters, the first of which is this Introduction. Chapter 2 describes the rationale for the need to develop alternative approaches for the electrification of poor urban and peri-urban areas. Chapter 3 outlines the characteristics of some partnerships and emphasizes the basic guidelines which can condition their sustainability. Chapter 4 analyzes the main financial aspects of proposed programs, focusing on the practices which generate value-creating investments and subsidy issues. Chapter 5 looks at the causes which are leading some companies to hire social scientists – anthropologists, sociologists and demographers – and to learn more about their consumer base; it emphasizes the lack of adequate tools for analysis, particularly quantitative metrics, which hinder the evaluation of the potential scalability of proposed programs. Chapter 6 describes the instruments used by several companies to make the consumers who have rejoined the formal sector, and Chapter 7 discusses the advantages and disadvantages of technical tools used to electrify slums. Chapter 8 makes reference to regulatory concerns which were briefly touched upon by participants in the workshop. Conclusions can be found in Chapter 9.

2. The Challenge of Slum Electrification

During the various sessions of the workshop, panelists underscored the need to understand demographic trends and, particularly, the challenges which they entail for policy makers. For instance, it is estimated that, in 20 years' time, 70 percent of the world's population will live in large conurbations of more than 1 million people, and 60 percent of them will be below the poverty level, while one-third already live in slums.

Meeting the energy needs of the poor urban population, and the electrification of low-income settlement areas they inhabit, cannot be accomplished using traditional electrification approaches. For multiple reasons, including slum topography, governance and socioeconomic attributes of slums, electricity supply to the dwellers of these poor areas requires alternative and nonconventional approaches.

The presentations of the first session converged on certain key characteristics of slum areas which make the provision of electricity and other infrastructure services particularly challenging:

- High degree of informality in land tenure arrangements and registration, and delivery of services;
- Low-income users turns slum areas into a high-risk low-return market;
- High transaction costs: given that consumers in slums have limited disposable income, are short of cash, and are difficult to access, markets are deficient (for example, lack of credit) and are more difficult to monitor;
- Lack of a strong constituency: because they are socially underprivileged, consumers find it harder to partner with formal institutions, to form strong constituencies with organizing power to ensure provision of basic infrastructure; and
- High degree of mobility of dwellers.

Field studies show that cooking fuels is the most critical issue for the poor, and that women carry most of the burden for providing alternative energy sources such as wood, kerosene and charcoal, when there is no electricity.[2]

Evidence also shows that the poor spend a higher share of their disposable income on poorer quality energy services than the better-off. For example, and as presented in Figure 2.1, survey findings show a great disparity in the consumption of energy services, in particular for households in the lowest income groups, which tend to pay more for poorer quality energy services, such as wood, charcoal and kerosene.[3]

While, in the last decade, many countries made progress in implementing utility reform, the impact of such reform has rarely reached the poor inhabitants of urban and peri-urban areas. The reasons are manifold, but two were frequently mentioned across the various presentations.

- The migration of the population from rural to urban areas is occurring at such a rapid pace, that in certain regions, the number of homes to be supplied in slums and shanties has doubled in a short period of time. For example, in Malawi, only 14 percent of the population lives in urban areas, and just 60 percent of the urban households are electrified. However, electrification of urban areas must always "catch up" due to high population growth and migration from rural areas, which has led to a rapid growth of the urban population.[4]

Although in many cases the reforms have advocated an expansion of the electric service through "universal coverage," the poor population of urban areas has grown at higher rates than service providers can cater to with basic infrastructure, whether public or private. For example, while the overall population of Rio de Janeiro increased by 7 percent in 2000, the population living in the "favelas" of Rio increased by 24 percent.[5]

- In multiple contexts, there are restrictions of a legal nature which prevent "formal" service providers from serving the needs of the population in slums and shanties. For that reason,

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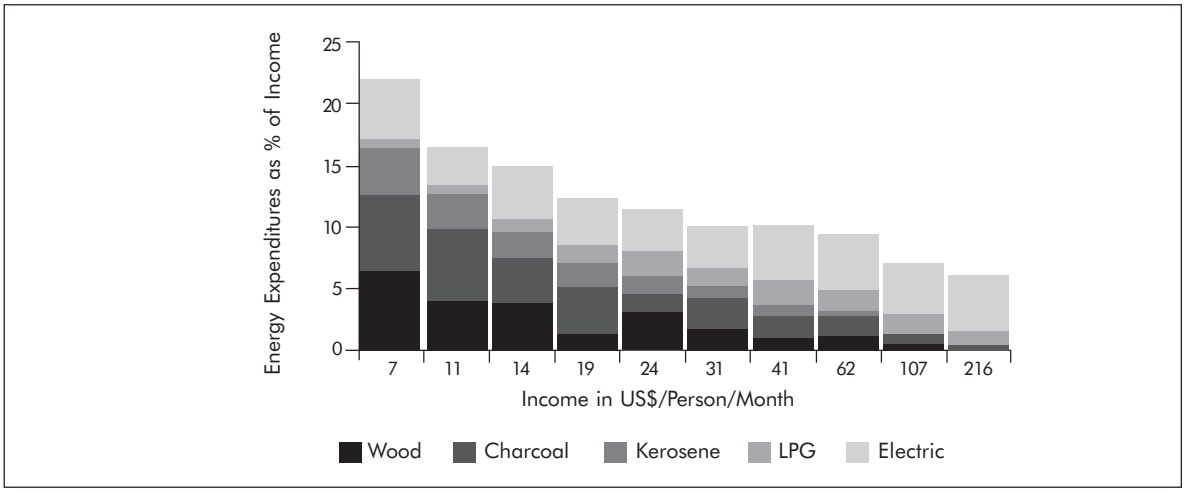
[2] *"Innovative Approaches to Slum Electrification," USAID, December 2004.*
[3] *Dominique Lallement, opening presentation. One-third to one-half of the planet's population rely on traditional biomass woodfuels, charcoal and dung for their basic energy needs: heating for cooking.*
[4] *Margaret Njirambo Matinga. Presentation: Attempting to Electrify the Urban Poor – A View of the Mbayani Low-cost Electrification in Blantyre, Malawi.*
[5] *Between 1991 and 2000, the population growth rate per year of Rio de Janeiro was 0.73 percent, while in the "favelas" it was 2.4 percent. Fernando Cavallieri , Instituto Pereira Passos. Presentation "Favelas in Rio – Data and Changes."*

Figure 2.1: The Poor Spend More of their Income in Poorer Quality Energy Services



Source: Dominique Lallement, opening presentation.

in some cases, even if service providers have the responsiveness needed to serve illegal settlements, they cannot always do it.

For example, the target area of Manila Electric Railroad and Light Company (MERALCO's) "Depressed Area Electrification Project (DAEP)" in the Philippines, covers 3,122.50 Hectare (s) (ha) (5 percent of the entire metro Manila area). Of these areas, 73.6 percent of the settlements are on privately-owned land, while 12.6 percent are on government-owned land and 13.8 percent on land of undetermined ownership. The average level of electrification in such areas is lower than 70 percent. MERALCO only services 35 percent of these settlements, 44 percent are serviced by illegal operators and 21 percent are illegally connected.

The risk profile of poor residents, the narrow streets and physical characteristics of slums and, in some cases, the stressing conditions under which the personnel of electricity service providers has to operate, increase the access costs and barriers for serving these settlements. Nonetheless, it is difficult to conceive how households in slums can work their way out of poverty without utilizing some form of modern energy.

As detailed in all the presentations of the workshop, for the poor, the social and economic benefits of electrification are very high. Electricity and other quality energy services are crucial for households to fulfill other economic needs. The main benefits from electrification, clearly identified by the various practitioners, included:

- Lower costs of electricity service and, therefore, an increase in household disposable income (the poor usually pay more for illegal service provision, candles, wood

and charcoal).[6] For example, in the MERALCO's Depressed Area Electrification Project (DAEP) in Manila, the monthly bill for program beneficiaries ranged from US$3.84 to US$14.08, while with illegal service providers it ranged from US$40 to US$200;[7]

- More effective, safer, and more reliable service and therefore more investments in home improvements; when households feel greater security, they improve their houses and invest more in consumer durables;
- Improved household safety, particularly from lesser risk of fires;
- Positive health impact, from the reduction in indoor air pollution and lesser incidence of related diseases;
- Increase in educational levels of the household, particularly for children who can read and study for longer hours;
- Individual and community health and hygiene improvements, when reliable electricity supply enables improved water supply and sanitation services;
- Time saved, especially for women who generally carry the burden of providing household energy sources such as charcoal, wood and kerosene, giving them more time to engage in work/income-related activities;[8]
- Increased local income-generating activities when power and lighting is available;
- Boost in the social status of people, since they are "empowered to live like the others";
- More efficient use of electricity when electrification programs include adequate training components; and
- Inclusion and reinsertion into society of fraudulent consumers and electricity suppliers, when illegal consumers are legalized, and former fraudsters are helped to create real businesses as electricians.

Despite the welfare gains from an increase in household disposable income and other benefits described above, reaching the urban poor with electricity services remains a challenge, one that will demand building knowledge as rapidly growing urban population and increased impoverishment threaten the social sustainability of urban areas.

To meet the challenge of electricity service provision, quite a number of creative experiences have been deployed over the past years in various parts of the world.

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[6] Though the different programs presented mentioned as an advantage the increase in household disposable income, just two presentations provided statistics comparing the monthly cost of electricity for the household before and after the program.

[7] In the presentation of the Ahmedabad Slum Networking Project, data were provided regarding connection costs before and after the pilot project. For example, before the pilot project, connection costs for households of the same slum ranged between US$136 and US$204. After the pilot project, a uniform cost of US$118 was downscaled for all households in the slum. Today, the one-time connection cost is of US$52.

[8] During her presentation, Wendy Annecke made special emphasis on how women in Khayelitsha (South Africa) and Merlo (Argentina), manage electricity/energy in urban areas much as they managed wood and use it for domestic tasks. Presentation "Socioeconomic Conditions in Low-income Electrification Areas."

Although approaches and solutions have been developed on a case-by-case basis to respond to the specific characteristics and idiosyncrasies of each slum, generic lessons can be extrapolated for broader application to the provision of electricity services across other poor peri-urban and urban areas. These lessons are addressed in subsequent chapters.

3. Building Effective Public-private-community Partnerships

As mentioned in the Introduction of this report, one of the most relevant conclusions of the workshop was that electrification programs for poor peri-urban and urban areas have more chances to succeed when the utilities operate in partnership with local governments and community organizations. These partnerships allow to firm up government policy on slum upgrading (instead of slum eradication), and to devise "comprehensive programs" which include all kinds of social infrastructure investments and activities besides electrification.[9] Taking into account the different presentations and discussions of the workshop, the aim of this section is to evaluate what characteristics and factors can condition the success of these partnerships.

Such partnerships are indispensable to generate tangible benefits for most users – the users who ultimately pay for the needed services. However, these partnerships can be sustained only as long as they call upon the spontaneous compliance by the largest number of stakeholders (powerful or significant), whether formal or informal. Who are these stakeholders? How can they be mobilized to comply and how can their interest in partnering be elicited?

Creating Partnerships

For the last two decades, most utility services development models have focused on public-private partnerships, although they met with limited success in poor peri-urban and urban areas. More recently, when confronted with the challenge to find a bridge with users, utilities and governments found that partnering with the community has been more effective in building understanding and trust with consumers.

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[9] The concept of social infrastructure used in this report makes reference to the following social components of investments: sewerage and water systems, day-care centers, sports centers, parks, community participation and educational activities like professional training, environmental education, support for high-risk groups and income-generating activities.

One of the key outcomes of the workshop was to identify a three-pronged partnership as a more effective approach than the two-pronged public-private partnership, the three main stakeholders being: the formal utility (usually private, but it could also be publicly owned), the community – represented by the users or their organizations as well as by other decision-making structure in the slum – and the local or national government.[10]

The experiences presented at the workshop also showed that one of the main functions of these partnerships is to provide some kind of arbitration in the resolution of conflicts between stakeholders, a system in which disputes are processed according to certain formal and informal rules and principles. According to the presentations, conflicts appear in four basic forms:

- Between formal providers and users: the nature of the conflict does not have to do with the lack of service but rather with its cost and quality, electricity theft and the proliferation of illegal connections;
- Amongst different classes of users: when connected to the network of a legal consumer, illegally connected users not only increase the monthly bill of that consumer, but also expose him to hazards, such as fires and electrocutions;
- Between formal and illegal providers: energy theft is a substitute (competitor) for the legal energy suppliers; thus, informal providers are interested in seeing the formal provider fail, so as to take advantage of the situation and take over its position. Reciprocally, legal providers are interested in terminating the activities of all the illegal suppliers as they increase nontechnical losses, create a messy market within the community[11] and increase risks and failures of the power distribution network; and
- Between the municipality and users: households can be denied legal access to electricity for a number of reasons, mostly relating to the illegality of their settlement and the lack of land tenure; it is to be noted that female-headed households are at an added disadvantage, in many countries, where women are not allowed property titles in their own name. While electricity companies face legal issues for servicing slums, local governments are fearful that authorizing electricity (or water connections and sanitations services) would mean de facto recognizing illegal settlements, and, therefore, encouraging their permanent establishment.

[10] Examples of different active government partners mentioned during the presentations, include: Brazil's regulatory agency Agência Nacional de Energia (ANEEL), the Philippines President's Council on the Urban Poor and Ahmedabad Municipal Corporation (AMC) in Ahmedabad, India.
[11] In this report, the concept "messy market" refers to a "disorganized" market characterized by a high level of nontechnical losses due to pilferage, illegal clandestine connections, tampering of meters and service provided by legal and informal companies.

The range of conflicting interests determines various forms of multistakeholder partnerships, where the strength of the relationship between all the partners is not necessarily even. In some, two of the partners, for example, the utility and the community users, will more easily share objectives than the local government, in others the local government and the utility will share the objective of legalizing the informal suppliers. In addition, the partnerships provide an inter-temporal character to the conflicts stemming from the stakeholders' wide range of interests. For example, the role of these partnerships is more critical in the initial or pilot phase of an electrification program when the utility is unfamiliar with the shanty town and needs the assistance of an NGO or CBO to better understand the technical, financial and social conditions in the area.

The discussion of the various experiences discussed at the workshop revealed the wide range of partnership forms and schemes in which stakeholders participate. Table 3.1 illustrates that the participation of the various stakeholders can take different legal, contractual and institutional forms.

Making Public-private-community Partnerships Work

The two main contractual forms between governments and utilities discussed during the workshop were: i) concessions, in which capital investments, Operation and Maintenance (O&M) and commercial risks are borne by the utilities; and ii) management contracts, in which capital investments are financed by the State, but implemented by a contractor/ operator, who is also in charge of O&M activities and bears the commercial risk.

Contractual agreements can also be established between the utilities and the community. For example, New Delhi Power Limited (NDPL), a utility in India, delegated some of its responsibilities by appointing an NGO, INDCARE Trust, as the franchisee organization in charge of electricity distribution for the Bhalla Factory slum in northern Delhi.

Experience also exists both with formal agreements and informal commitments developed on mutual trust. For example, in the Atlantic region of Colombia, the Superintendent of Public Services has promoted partnerships with the two major electricity distribution companies (Electrocosta and Electricaribe) serving 145 localities, municipalities and the community in which the various stakeholders signed formal agreements. The stakeholders' respective commitments are as follows:

Table 3.1: Different Kinds of Partnerships and Institutional Arrangements

Country	*State/City*	*Program*	*Members of Partnership*	*Stakeholder Represented*	*Type of Contract*
India	Ahmedabad	Slum Networking Project – SNP Slum Electrification Project – SEP	Ahmedabad Municipal Corporation – AMC Ahmedabad Electricity Company – AEC Gujarat Mahila Housing SEWA Trust SAATH CBOs	Municipality Utility NGO NGO Community	To facilitate the Slum Electrification Project, AMC decided to give the AEC a No Objection Certificate, which would act as a legal framework. The AMC also provided a permanent road opening permission, specially for electrification in slums
	Sultanpuri, Delhi	Bhalla Factory Project	INDCARE Trust New Delhi Power Limited (NDPL) Community Grassroots Organizations	NGO Utility Community	INDCARE Trust was appointed by the utility as the franchisee organization in charge of electricity distribution for the Bhalla Factory slum
Colombia	Choco (Pacific Coast)	Public-private Partnerships for Serving Depressed Areas	Distribuidora del Pacífico (DISPAC) Public Service Superintendency	Private Contractor Central Government	Management contract: i) Operation and Maintenance (O&M) carried out by DISPAC; ii) Capital investments are financed by the State, but implemented by the operator; and iii) Commercial risk is borne by the operator
	145 Localities in the Atlantic Coast	Promoción de Microempresas Gestoras de Electricidad	Electrocosta, Electricaribe (Unión Fenosa) Public Service Superintendency Municipalities through the major's office CBOs	Private Utilities Central Government Local Government Community	Agreements between all the stakeholders have been signed, in which the following commitments were made: Community – to pay for the electricity service; Municipality – to provide the financial means to improve the quality normalizing informal networks; Superintendency – to assist with financing for normalizing networks in violent areas and support community microenterprises
	Medellin and 28 Neighboring Municipalities	Home Upgrading Program	Empresas Públicas de Medellín (EPM) Local Municipalities	Public-owned Utility Local Government	Concession contract in which O&M, capital investments and commercial risks are borne by the publicly owned utility EPM provides multiple services (telco, electricity, water and sewerage)
Venezuela	Caracas	Barrio Eléctrico Project	Electricidad de Caracas – AES Local University Community of Barrio La Moran	Private Utility Academic Community	Concession contract in which O&M, capital investments and commercial risks are borne by the private utility Contracted University to carry out socioeconomic analysis
Morocco	Casablanca	Shantytowns Electrification Project	Lydec (EdF) Housing Department & Local Authorities	Private Utility Local Government	Management Contract
Brazil	Rio de Janeiro (State)	Program for Normalization of Informal Areas – PRONAI	Light City Halls and the State Government NGOs ANEEL	Private Utility Local Government Community Regulator	Concession contract. Light has carried out joint actions with local community associations, universities, local governments and the regulator
	Salvador de Bahia	Community Agent Program "Agente COELBA"	COELBA CDM /Agents Consumers University of Salvador	Private Utility NGO Community Academic	COELBA contracted CDM (NGO) to implement community communication, education, mobilization and organizational activities. CDM selects, contracts and trains the agents who will support COELBA's access and credibility in the community
Georgia	Telasi	Development of Local Capacities and Public Awareness for Better Energy Governance	Caucasus Environmental NGO Network (CENN) Georgia National Electricity Regulatory Comm Municipality	NGO Regulator Local Government	CENN mobilized consumers to create the Energy Services Consumers' Associations (ESCAs) to increase public awareness and citizens' responsibilities over energy use

- The community is to pay for the electricity service;
- The municipalities are to provide the financial means to improve the installations inside the homes;
- The utilities are to provide a quality service and upgrade the informal distribution networks to norms; and
- The Superintendent is to provide financing for network upgrades in violent areas and for community microenterprises developement.

Participation and representation within a partnership is not homogeneous. As shown in Table 3.2, they can also take on various modes, depending on the stakeholders involved. For example, the agreements between the utility and the local government will usually be a formal agreement, but the agreement with the utility and illegal suppliers will be informal.

From the experiences presented, there was no significant difference in the type of interaction between the utilities and the public or private contractors they hire to interact with the community.

For example, and as shown in Table 3.2, the "COELBA Agent Project" developed by Grupo Neoenergia in Salvador da Bahía, uses social workers for building relationships with the community. These workers are usually issued from the community itself, including amongst unemployed youths and also amongst women, who have an intimate knowledge of the household's energy consumption pattern and strong communication skills. Many of them are already "organized," and members of an NGO or of a CBO in the slum. They are hired by COELBA to do the following:

- Educate people on the rational use of energy;
- Advise on-home electrical installations;
- Take complaints from users; and
- Teach users to read and understand electricity bills.

Table 3.2: Different Ways of Participating in Partnerships

City and Country	Program	Members of Partnership	Relation with Other Stakeholders in Partnership
Ahmedabad, India	Slum Electrification Project	SEP-AMC, AEC, SEWA Trust, SAATH, CBOs	AMC-AEC: Facilitate legal framework and road access to slums AEC-NGOs: impart training to NGOs so that they can perform operational tasks (collectables, billing, reading of meters) in turn NGOs-Consumers: SEWA and SAATH link slum dwellers to and AEC by submitting slum dwellers applications, train CBOs in billing and meter reading

City and Country	Program	Members of Partnership	Relation with Other Stakeholders in Partnership
Delhi, India	Bhalla Factory Project	INDCARE Trust, NDPL, Community Grassroots Organizations	INDCARE-NDPL: facilitate legal electrification by linking slum dwellers to NDPL INDCARE-Community: raised awareness by means of a concerted advocacy campaign, facilitated attitude change toward safety and legal electrification and provided microcredit to increase affordability
Atlantic Coast, Colombia	Promoción de Microempresas Gestoras de Electricidad	Public Service Superintendency, Municipalities, Utilities (Electrocosta, Electricaribe) and CBOs	Agreements between all the stakeholders have led to the creation of 37 community microenterprises who carry out collectables, billing and reading of meters. Also, 54 conciliation centers have been created where consumers and utilities can solve problems
Medellín, Colombia	Encadenamientos Productivos (Productive Development)	EPM, Municipality and Community	An agreement between the local government, community and EPM intended to integrate independent small producers in an entrepreneurial way. The Program is focused on energy-intensive activities normally using illegal connections. EPM also carries out other educational programs in which the utility interacts directly with the community ("EPM a su servicio-energy efficiency," "Aló EPM-Radio," "Cuidamundos-environmental")
Caracas, Venezuela	Barrio Eléctrico Project	EDC (AES) and the slums La Moran, El Junquito and 23 de Enero	EDC worked with the community to assess energy usage and the Willingness-To-Pay of slum dwellers
Casablanca, Morocco	Shantytowns Electrification Project	Lydec, Housing Department and Local Authorities, Community	Lydec-Housing Department: Assistance to public contracting authority Lydec-Community: "shared management"by involving slum dwellers when evaluating the "value" of improved services, and bringing support to social intermediaries
Rio de Janeiro (State), Brazil	Program for Normalization of Informal Areas – PRONAI	Light, ANEEL, local community associations, city halls, universities, NGOs	Light-NGOs: several consumer service agencies are managed by NGOs. Has delegated to some local community associations some billing activities. Community agents intermediate for Light Light-ANEEL: has partnered with the regulator to assess new technologies, and has provided funding for social and energy efficiency actions Light-State government: have worked together in a program for improving lighting arrangement in schools and educating on sustainable energy consumption Light-Universities: has sponsored studies, papers and programs-related energy and poverty research
Salvador de Bahia, Brazil	Community Agent Program "Agente COELBA"	COELBA, CDM/agents, Community, Universidad de Salvador	COELBA-CDM: the key partner for COELBA, since it facilitates work in slum communities, improving COELBA' s access and acceptance CDM/Agents-communities: agents educate consumers on how to make efficient use of electricity, reduce their bills, and are critical for increasing support to COELBA's programs and objectives COELBA-Universidad de Salvador: they partner to work for the improvement of the architecture of slum houses (natural light, ventilation), and on the improvement of the slum
Telasi, Georgia	Development of Local Capacities and Public Awareness for Better Energy Governance	ESCAs, Community, Electricity Distribution Company, Regulator (GNERC)	ESCAs-Distribution Company: mediates disputes between consumers and the distco ESCAs-Consumers: monitors decisions and performance of the distco, sharing it with consumers ESCAs-Government-Regulator: organizes general multistakeholder round-tables and experts' meetings

Two other companies of the same group, Celpe and Cosern, established a partnership with the University of Salvador and the State University of Feira de Santana to improve ventilation and natural light in poor homes in the "favelas," as a means to reduce energy demand. No significant difference was found in the content of the work and approach taken by the workers hired directly by COELBA and those from the universities. However, the latter often have to also hire workers, for example, enumerators, from the "favela" itself, in order to be able to access the households.

In the interaction between utilities and the users, a wide range of options was illustrated:

- Individual users can relate directly to the utility, which is an efficient option when the utility has a powerful system and structure in place to facilitate direct contact with the users in the community. For example, the Colombian publicly-owned utility, Empresas Públicas de Medellín (EPM), has a wide range of educational programs to foster community relations. Among other programs presented, the radio program ALO EPM is a good illustration: it has been implemented to establish a permanent communication channel between the utility and residential consumers, for the prompt communication of company guidelines and decisions, and as a means to listen to consumers' complaints and needs; and
- Groups of users can pool their efforts and convey their concerns to companies by means of CBOs or NGOs. For example, the Energy Services Consumers' Associations (ESCAs) in Georgia played a key role in helping to build confidence between the utility TELASI and consumers by: i) acting as a watchdog for monitoring the decisions and performance of the utility and sharing this information with consumers; and ii) mediating disputes between private consumers and the electricity distribution company.

As regards their relationship with the local government, undoubtedly community claims carry more weight when they are aggregated by an NGO or a CBO. As shown in Box 3.1, these organizations act at the grassroots level as consumer rights protection units, and lobby for reforms, leading to better and more equitable electricity provision for all consumers.

Greater disparities exist in the way government bodies partner with other stakeholders in slum electrification programs. In general, experiences show that if users' groups are not well represented and the utility does not exert pressure on government agencies, it is unlikely that the government will become interested in the problems faced by utilities in the slums. Informal relationships and illegality in these settlements are a nuisance for government officials, who claim to have insufficient legal tools at their disposal to control and affect the slums' governance structures.

Box 3.1: The Role of NGOs and CBOs in Lobbying for Reform – the Experience from Ahmedabad, India

One example which is worth mentioning of how community organizations can lobby for reform is that of the Slum Networking Project in the city of Ahmedabad, Gujarat State, India.

In 1998, the Ahmedabad Municipal Corporation (AMC) initiated the Slum Networking Project in collaboration with two NGOs, SAATH and Mahila Housing Self-Employed Women's Association (SEWA) Trust (MHT). Besides organizing and mobilizing the communities in their slums to voice their demands for the legal supply of electricity, the most important contribution of these NGOs was to facilitate the negotiations between the utility and the municipality, to provide a legal framework for slum electrification.

After meddling for six months around the stringent legal norms of electrification which impeded initiating the project, both NGOs played a key role bringing the Ahmedabad Electricity Company (AEC) and the AMC to a consensus, allowing for a loosening of the norms. Instead of demonstrating legal ownership of land, proof of residence and copies of electricity invoices to be able to benefit from the project, the AMC issued a letter stating that the beneficiaries of the slum networking program would not be evicted by the municipality for a period of 10 years. This pragmatic but odd legal recourse – the "informal tenure" compromise of noneviction for 10 years provided by the municipality – increased the readiness of households to invest in their houses in the slum, leading to the Slum Electrification Program.

In another case in 2001, also in Gujarat, in accordance with the ruling of the High Court, regular electric connections could be provided only if there was a "building use" permission for the construction. As a result, both AMC and AEC concluded that slums do not have "building use" permission, and, hence, cannot access services. This led SAATH to file a complaint asking the High Court to clarify the ruling. The High Court clarified it stating that slums do not require "building use" permission to access services, allowing for the beginning of a pilot electrification project.

However, without the participation and involvement of the local and national governments, it is unlikely that any positive results can be achieved on electrification process. For companies and the community, the government's intervention and its participation in such partnerships is indispensable, at least in four different ways:

- Utilities and the community require a coherent legal framework from government for "legitimizing" consumers and connections, and for solving land ownership problems (Box 3.1);
- Given their limited power to combat fraud and theft, utilities also require the support of law enforcement institutions to implement reward-and-punishment systems, and increase compliance with their electrification programs;
- Investments by the utility often have to be matched by public investments in other types of social infrastructure (Box 3.2); where this has taken place, programs have been relatively more successful; and
- Operators/concessionaires must know both tariff and subsidy levels before they can make investment decisions.[12] This requires a smooth process and transparent information between the government which decides on the amount of the subsidy, the regulator which proposes the tariff and the utility which needs to be financially solvent.

Box 3.2: Rio de Janeiro, Brazil: Public Policies and Investments in Social Infrastructure in the "Favelas"

During the presentation of the electrification programs carried out in the "favelas" of Rio de Janeiro, Brazil, emphasis was also laid on the urban and social components of these "global programs."

- Urban components: Roads and lanes, sewerage, zoning laws, day-care centers, sport centers and parks; and
- Social components: Children day care, community participation, income-generating activities, support for high-risk groups, professional training and environmental education.

Source: Presentation by Fernando Cavallieri, Instituto Pereira Passos: "'Favelas' in Rio – Data and Changes."

Sustaining Public-private-community Partnerships

Electrification programs in poor peri-urban and urban areas are complex and represent a long-haul effort over several years. It is, therefore, critical that the partnering of stakeholders

[12] *When tariffs are not defined, electrification programs can be implemented using alternative procedures to reduce uncertainty. For example, in the "Barrio Eléctrico Project" carried out by the utility Electricidad de Caracas (AES), prepaid meters have been installed in a low-cost grid for 300 dwellings which work with "tokens" sold by the utility. In this case, the nondefinition of tariffs by the regulatory entity has led the utility to use prepaid meters which run with tokens. But there are cases in which tariffs are incorrectly designed, as in Haiti, where pilot programs in Jacmel and Village de Dieu have a partial positive impact due to the unique tariff which has been inadequately established throughout the country.*

last over time. From the experiences shared during the workshop, several lessons emerged on the conditions of success or failure of partnerships.

It was generally observed that for partnerships to work and be sustained, they must provide their members with a prospect which allows them to advance their interests, and that it be sufficiently strong for them to confront and accept periodic, albeit temporary, setbacks.

It was also noted that the terms and functions of the partnerships vary over time, and all expectations cannot be simultaneously met. However, the partnership can be a useful forum to recognize that all stakeholders are vulnerable to exogenous factors, such as the volatility of households/consumers' incomes, or the instability of regulatory frameworks, the rise in hydrocarbon prices and the fluctuations in governments' social infrastructure budgets depending on the country's macroeconomic stability.

Three main principles were identified to sustain partnerships for electrification programs in poor peri-urban and urban areas.

The need to sustain the level of stakeholders' commitment to the partnership

Partnerships are strengthened when stakeholders have the self-imposed discipline of working within the partnership framework, that is, when all (or most) relevant stakeholders find that the best solution is to continue setting aside their individual interests and values for the sake of their commitment to the outcome expected from the partnership. Evidence indicates that the lack of commitment to the partnership goals by the major stakeholders must be viewed as a serious threat for the program, precisely because of its strong impact on the confidence of other stakeholders.

There are two aspects to the level of commitment for each stakeholder: i) commitment to partnership rules, whether formal or informal; and ii) the codes of punishment for noncompliance.

Regarding the first aspect – commitment to partnership rules – the scant tradition in slum households of living under formal and legal rules which are common among richer households, makes them prone to return to informality, particularly when they are tempted by illegal service providers with attractive short-term proposals. For that reason, in several success stories, different types of intermediaries and instruments were used to build up the cohesion amongst stakeholders and contribute to sustaining the program.

CBOs, NGOs and other types of community organizations help build trust and confidence toward energy stakeholders, mobilize the community to understand their rights and obligations, link utilities to slum dwellers and raise government awareness. Among other actions, they help place the subject of electrification and utility services on the public agenda, educate slum dwellers, collect dues and promote accuracy in billing, identify community leaders and convert former fraudsters into future electricians. These intermediaries have allowed consumers and utilities to better understand the starting conditions of programs, including grasping the impact and scope of the fraud committed by other users, the rise in unsafe practices and the potential abuses by (illegal) providers.

The example of COELBA's approach in Salvador da Bahia, Brazil, has been cited in a paragraph coming under the heading "Making Public-private-community Partnerships Work" in the earlier part of this Chapter. Another example is that of AEC in India, which hired NGOs and CBOs to collect the dues of the slum dwellers on its behalf, to conduct home visits and street meetings to raise awareness and motivate slum dwellers to access legal electrification. The program managed by Light, one of the distribution companies in the State of Rio de Janeiro, Brazil, uses community electricians to make connections and repairs, and NGOs and CBOs to manage local consumers services booths to handle bill collection.

Table 3.3 summarizes the expectations, costs and responsibilities of the various groups of stakeholders which were discussed through the various presentations at the workshop.

In some cases, intermediaries have intervened by means of microcredit institutions, in order to finance connections, refinance bills and pay upfront for meters. This was the case of INDCARE in Delhi, India, which intervened with microcredit to enable slum dwellers to afford access to legal electricity connections, and to support them in initiating economic activities at the micro level. INDCARE also focuses on women, who generally account for the majority of the poorest.

The second aspect – codes of punishment for noncompliance to the terms agreed under the partnerships – is quite difficult to implement. It is difficult to establish penalties for those who break the rules, precisely in view of the informal nature of the partnerships. Some members of the community may actually benefit when other members "default." For instance, when consumers fail to comply with the payment of their electricity bills, illegal service providers reemerge, quickly offering opportunities for recidivism. Therefore, community-based mechanisms need to be in place to protect against infrastructure vandalism and electricity pilferage.

Table 3.3: Partnerships: Needs and Interests of Stakeholders

	Stakeholder			
	Communities			
	Consumers	*NGOs & CBOs*	*Formal Electricity Providers*	*Government*
Expected Benefits/Interests	Usually lower cost of electricity service More effective, safe and reliable service Increases security in neighborhood – cities (street lighting) Increases security of the household Positive impact on the health status of slum residents Improve conditions of women Increased local income generation activities Confidence and self-esteem improved for bringing former fraudsters into legality	Build trust and confidence toward energy stakeholders Develop strategies to upscale programs at other levels Benefit efforts in other areas, fostering the formation of community organizations which later addressed other issues such as water, safety, education, land tenure Opportunity for converting former fraudsters into electricians	Reduce commercial and technical losses, as theft and fraud decrease Increases revenues, as regular electricity usage rate increases Opportunity to overcome barriers to traditional service delivery Opportunity to improve relation with the community Meet their business objectives	Opportunity to improve lives of urban poor Opportunity to enforce rules in an illegally settled area Legalizing and legitimizing informal systems which respond to essential needs Increase levels of safety in poor urban areas Political gains from increasing living conditions in poor urban areas
Costs/Responsibilities	Subsidized connection fee (extending the distribution line to the household and the meter drop) Challenge of becoming a reliable client Reject illegal providers, pilferers and fraudsters	Conduct home visits and street meetings to motivate the slum dwellers to access legal electrification Act as watchdogs against pilferage of electricity Act as watchdogs by monitoring decisions and performance of the utility	Challenging physical conditions Installation of individual and alternative metering systems Billing: Establish metering and flexible bill recovery system Education programs for NGO and consumers Pilferage management on occasions in unsafe areas Energy conservation measures Intensive O&M activities Competition from illegal service providers, and accessibility	Investments by the utility should be accompanied by investments in other types of social infrastructure Assist with legal framework to solve land tenure issues Support from law enforcement institutions to implement systems of rewards-and-punishment Regulator has to define tariffs, government subsidy levels Regulator has to define how to treat connection costs Regulator has to define nontechnical losses allowed to operators and transition periods

Municipal governments also have a major role to play. Law enforcement authorities can contribute to put in place reward-and-punishment systems. The challenge is to identify credible mechanisms which are independent from pressures and political interests.

There are rich experiences in this regard, both in Haiti and in Colombia. In both cases, the electricity distribution companies seek to guide and educate consumers as soon as they settle in the slum and try to gain illegal access into the electricity distribution network. In the city of Jacmel, Haiti, the company's guiding principle is that "everyone, without exception, becomes a consumer," and, therefore, every effort is made to serve them immediately. In the second case, every year EPM faces some 15,000 new low-income consumers who settle along the service area, looking for access to the electricity distribution network, usually illegally. To avoid disrupting the market, the company promptly identifies new consumers and tries to "control" them by providing a legal connection, billing them from the start, and creating a culture of payment. Disconnecting consumers from the system for lack of payment, and subsequently offering different payment options, has enabled EPM to keep an organized market.

In some extreme cases, the regulator has had to intervene to offset deleterious initiatives from local governments. This was the case some years ago when the Superintendent of Public Services had to intervene in several localities in the Atlantic Coast of Colombia, where the political authorities and small town mayors had encouraged consumers to burn their bills and not to pay for electricity service.

The need for transparent partnership rules for all stakeholders

As stated in Chapter 2, the socioeconomic environment of poor peri-urban and urban areas is complex. Electrification programs may provide more opportunities to some groups within the community; alternatively, other groups may be prone to try to consolidate their political base through the program.

The expected outcomes from the partnership agreements – formal or informal – should, therefore, be clear to all stakeholders, and the decision-making process should be transparent and predictable.

For instance, mention was made on several occasions during the workshop of the way in which the government can contribute to reduce uncertainty by defining tariffs and subsidies in a timely manner, and publishing the tariffs.

For their part, companies providing electricity services can also contribute to lower uncertainty by offering their consumers several payment alternatives to fit their payment capacity and the seasonality of their cash flow. In turn, consumers need to be forthcoming on their situation, so that companies are able to assess the reasons why consumers were or relapse into the informal sector. One of the challenges for the companies who enter the slums for the first time is to decode the complexity of the socioeconomic environment, and to build up trust with all stakeholder groups in the community.

The need for clarity in the legal framework of the partnership

The third principle relates to the need for partnerships to have a clear legal framework for their actions, and for the responsibilities and obligations of their members.

As mentioned at the beginning of this chapter, one of the problems that give rise to legal and regulatory uncertainty to develop electrification programs is the illegal nature of settlements and the lack of land tenure. To provide an enabling environment, particularly regarding land tenure and the right-of-way for the distribution network, is not an easy task for governmental authorities. Therefore, to extend the benefits of urban electrification to the poorest in society, it will usually be necessary to find "alternative" ways of supplying illegal settlements.

As illustrated by the positive experiences presented during the workshop, commercial solutions can be found, but they can succeed only where political support exist. For example, AMC, India, committed to the utility, AEC, to an informal 10-year tenure arrangement of noneviction of slum dwellers, so that AEC could provide the service. This solution constituted a pragmatic but odd legal recourse, but it opened the way for the Slum Electrification Project (Box 3.1).

It is also necessary to define, ex ante, the rights and obligations of each member of the partnership. For example, by delineating the physical boundaries of service provision, by defining the rights and obligations of consumers and service providers, the distribution of responsibilities is made clear, including for assuming the costs of the contingencies which may arise. It is important to highlight, however, that given the usually high illiteracy rates in slums, any contract or document provided to consumers should be simple and easy to understand.

Experience also shows that the definition of the "boundary" has to be related to the extent of each stakeholder's control over the factors that give rise to risks. The rationale

behind this is that stakeholders should have incentives to mitigate/eliminate the adverse events from which risks emerge. For instance, and when defining the rights and obligations of consumers and service providers, the physical limit to the supplier's responsibility can be set at the exit point of the meter, though other options can be explored. If consumers damage the network "downstream" from the meter, it becomes their responsibility to cover for the repairs.

The various experiences presented at the workshop confirmed that the demarcation of this boundary between the service provider and the consumer is necessary to solve disputes, and to guarantee the financial sustainability of the utility. Three different examples helped to illustrate this point:

- What happens when the electricity service has to be suspended because equipment is destroyed through acts of vandalism (bullets, stones), fire, and so on, and so forth? When defining the rights and obligations of the different stakeholders, it is crucial to outline which party has to pay for the replacement of the equipment. For example, in Rio de Janeiro, in order to avoid the destruction of meters, the distribution company, Light, has built bulletproof shields;
- A more complex case to typify is the robbery of equipment, especially when it is difficult to find a company which provides insurance policies for this kind of contingencies. In this case, who is responsible for the replacement of the equipment? In principle, the consumer should be made responsible, since their obligations involve taking care of the equipment, and because it is impossible for the service provider to keep permanent track of the conditions under which the equipment is handled. However, within the obligations of the service provider, engineering specifications can exist which prevent robbery and set antitheft standards. For example, in Manila, MINERALCO – the distribution company – has placed meters in very high poles, where they are difficult to access by bandits; and
- A third case is related to the warranty for the home installations carried out by the service provider, CBO, local electrician, or by the dweller him/herself. Who should be in charge of the warranty? Experiences have demonstrated that problems with luminaries, power outlets and other home installation are correlated to the kind of use and care that each consumer provides to the equipment. It is for this reason that consumers should normally be responsible for the maintenance and repairs of their own installations. It is also important that the company provide proper information on how to use and maintain these installations.

Overall, the model of public-private-community partnerships for electrification programs in peri-urban and urban areas is pretty encouraging, and provides enough flexibility to

adapt to the specific conditions of each slum. However, some aspects are more uncertain than others. This is particularly the case of the legal issues related to the possibility of legalizing service in illegal settlements. This was identified during the workshop as an area for meticulous and detailed study in the future. Although it is true that pragmatism is essential to implement slum electrification programs, the incentives which some legal resources may generate and the signaling effect on other programs have to be considered, particularly when property rights are involved.

4. Understanding Value-creating Investments

The informal relations which characterize slum areas, the risk profile of their residents and the stressing conditions under which the personnel of electricity service providers work in slums, pose a management challenge to utilities. Experience shows that electrification programs in slums break-even at best:

- On the one hand, slum electrification programs are costly because they require intensive O&M activities, tailored technologies, while the revenues from serving poor volatile consumers are low; and
- On the other hand, if correctly designed and implemented, this kind of programs result in substantial reduction of nontechnical losses and in the organization of a previously "messy" market.[13]

The various experiences analyzed during the workshop showed that, even in the short term, there is considerable scope for "value-creating investments," if consumers are kept under payment compliance, are made "reliable," and if utilities operate in partnership with local governments and the community to develop a successful electricity market in poor areas.

The aim of this section is to highlight two key aspects which increase the value of investments in electrification programs: i) adopting a long-term perspective when implementing adapted services; and ii) understanding the conditions under which the electrification programs should be financed.

Practicing a Long-term Perspective

As mentioned in the previous chapter, public-private-community partnerships provide their members with a prospect which allows them to advance their interests

[13] *See the evaluation made by USAID of six slum electrification programs, in different parts of the world, in 2004. "Innovative Approaches to Slum Electrification," USAID, December 2004.*

in the long run; encouraging them to accept possibly less favorable results in the short term.

Though one must not lose sight of short-term financial results, adopting a long-term perspective is key to understanding the rationale behind any slum electrification program. This is also inherent to the electricity distribution business. First, no utility can afford to neglect a significant part of its market segment. Neglecting this segment of the consumer base would mean not only not meeting its mandate under the terms of the concession, but it would also deprive the company from potentially significant revenues, while continuing to incur costs. Second, electricity concessions and operation contracts are usually long-term, 30 years or more, in many cases, even when there are provisions for renegotiation every five, 10 or 15 years.

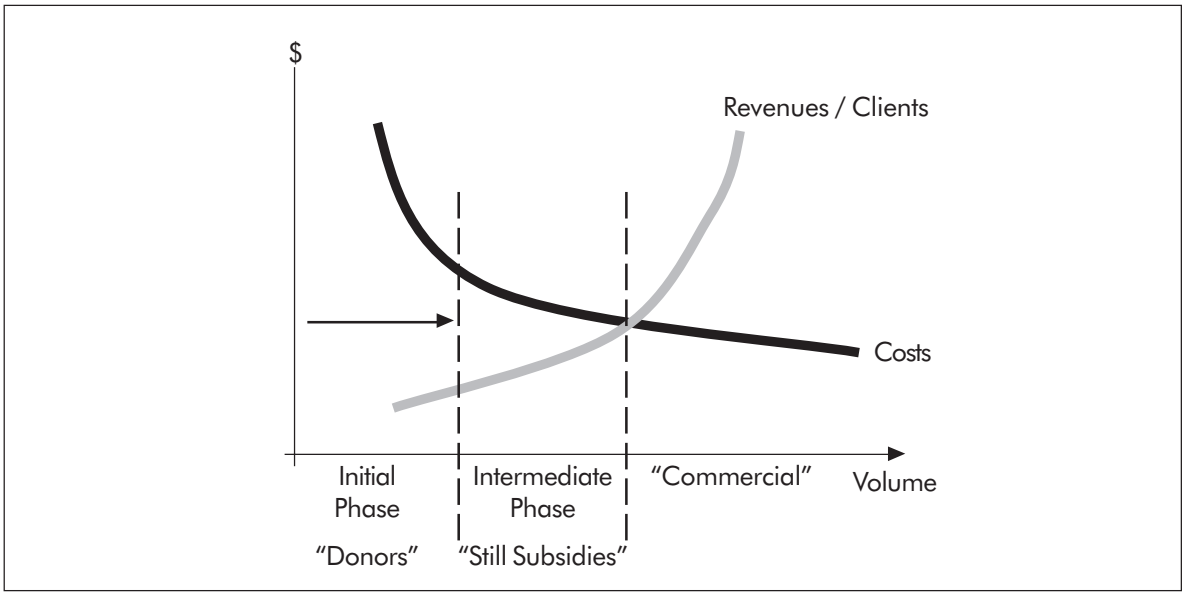
The significance of the "poor market segment" was well illustrated during the workshop: 40 percent of the city's total population served by AEC in Ahmedabad is poor; as well as in Merlo, Buenos Aires and Khayelitsha, Cape Town; 75 percent of the population served by the utilities, Edenor and PN Energy Services Limited (PNE) respectively, live below the poverty line. In the northeast of Brazil, 80 percent of the targeted consumers of the concessionaire Neoenergia, are low-income consumers. Further to the south, 15 percent to 20 percent of the total population within Light's concession, in the State of Rio de Janeiro, live in approximately 1,000 "favelas." In Medellín, Colombia, 80 percent of the population is low-income and 60 percent of those served by the public utility, EPM, live below the poverty line.

Hence, utilities which ignore their low-income consumers are jeopardizing their own growth potential. On the contrary, when utilities undertake slum electrification programs as a business rather than a charity, they are investing in the middle class of the future.

Focusing on the short-term economic gains derived from a drop in nontechnical losses is good. But it is even better when utilities conceive appropriate development programs, in which services are adapted to provide the "right" deliverables in the short term, allowing residents in slums to reduce their electricity expenditures and undertake additional economic activities which increase their disposable income in the long run.

"Look at trends, do not get lost in the short run" was a major proclamation by the participants during the last round of discussions in the workshop. As shown in Figure 4.1, practicing a long-term perspective requires beginning with costly efforts on the supply-side (for example, in the short term, by the utility, [donors] and governments). Then, the community (demand) will come to look for the utilities' services.

Figure 4.1: Practicing the long-term: The Dream Chart



Source: Presentation of the "Latin American UtilitiesTeam"– Group Sessions.

Knowledge Challenges

Lack of knowledge and familiarity with best practices was cited as a major impediment by members from utilities participating in the workshop, particularly in those cases when utilities have to adapt their services to accomplish the goal of providing the "right" deliverables to slum dwellers. Areas where knowledge is weak included:

- Technical aspects: adjusting the standards to the reality of low-income areas, but still providing a service with quality and regularity. This is further discussed in Chapter 7 of this report;
- Social aspects: self-organization, allowing communities to "comanage," as discussed in Chapter 3; and
- Financial aspects: identifying and managing the financial resources in order to meet the needs of all the relevant stakeholders in the partnerships. The creative financial solutions developed by utilities to meet the poor's cash flow profile to make them reliable consumers, are further discussed in Chapter 6. Other financial challenges are analyzed below.

Financial Challenges

Partnerships created to promote slum electrification programs face two main financial challenges. First, how much money is required to finance the costs of delivering the electricity

service and to meet partnership infrastructure needs. Second, how the money required for meeting those needs and services should be raised and managed.

The answer to the first question should serve to identify the size of the financing gap existing between the investments needed and the financial sources available. The answer to the second problem constitutes the cornerstone of the partnership's long-run viability, credibility and sustainability.

Financing the Gap

During workshop discussions, interesting debates took place on how to finance the gap existing between the investments desired by the partnership and the financing sources available. The immediate answer was not surprising: subsidies were suggested as a possible alternative to full cost recovery through tariffs by the utility. However, it was also noted that electricity subsidies are not sufficient to meet all the costs of slum electrification, as there are additional costs not directly related to the electricity infrastructure and service which the utility or the government must, nevertheless, incur for the success of the electrification program.

Subsidies are typically provided to fund the gap between what it costs to deliver the desired level of electricity and what it is possible to finance through user charges. But the financial needs of partnerships are greater. As emphasized earlier in the preceding chapters, to be successful, electrification programs in poor urban and peri-urban areas should be accompanied by upfront socioeconomic analyses, which may be costly to undertake, and with other investments in social infrastructure and services. Those additional investments cannot necessarily be linked to electricity subsidies. Financing these other investments and expenditures pose complex challenges to utilities and governments, as shown in Box 4.1, and may even comprise different kinds of resources from the different stakeholders within the public-private-community partnerships. Subsidies are, therefore, relevant but not sufficient.

The concept of "intelligent subsidies" was raised frequently during workshop discussions, mainly because subsidies should only be applied where it can be demonstrated that they are needed and where they can be delivered effectively, and that is not always the case in slums.

The low levels of household income and the high cost of electricity delivery are the main limitations for making electricity affordable in slums. In turn, this limited affordability depicts

the two kinds of subsidy schemes which are most commonly used within the different electrification programs for slums: i) a one-time subsidy used to finance connection fees; and ii) a recurrent subsidy to subsidize a minimum level of consumption for all users through a lifeline tariff.

Box 4.1: Colombia: Conditions Under which the Superintendency of Public Services Supports Electrification Programs

Partnerships: responsibilities and obligations

- Central government (Superintendency): commitment to provide the financial resources and means for normalizing networks in urban and rural areas which are difficult to serve, mainly because of violence problems. Also, commitment to financially support community microenterprises and small businesses to manage electricity service activities, and commitment to support social capitalization funds;
- Community: commitment to pay for the electricity service;
- Local Municipality: commitment to provide the financial resources to improve the internal installations of households; and
- Utility: commitment to provide a service with quality (reducing the frequency and duration of interruptions), commitment to invest in normalizing informal networks and transformers and commitment to promote and organize the community so that self-organizing microenterprises are created.

Source: Presentation by Eva Maria Uribe, Superintendent of Public Services, Colombia.

Subsidizing Connections

High connection costs have been identified by the utilities as a major barrier to improved access to, and affordability of, electricity. There is a need to take a broad view of the issues lying behind connection costs and to make innovative suggestions as to how to mitigate their impact on the urban poor. One of the lessons from the workshop was that consumers should be required to pay part of the connection cost in order for them to value the investment.

Providing finance for connections and home installations, even when the cost is subsidized, has proved a powerful instrument to increase the rate of legal connections. In Meralco's DAEP in Manila, the Philippines, beneficiaries can be financed not only for the connection, but also for the internal wiring of their house, for a period of five years. Likewise, in Rio de Janeiro, the Light electrification program included a 42 percent discount over the regular

charge to finance the connection for low-income residents. Light also had a microfinance program to fund connection costs in 24 payments of 3 reais each.

In the case of Medellín, Colombia, the utility EPM has carried out a program for providing financial and technical support to connect poor household since 1964. Since then, more than 300,000 low-income consumers, approximately 35 percent of the total consumer base, have been connected through this program. Besides providing financing for the connection, residential consumers in the poorest categories get a subsidy of up to 50 percent of the monthly service cost through cross-subsidies applied to the wealthiest consumers and to nonresidential consumers.

Subsidies to Support Lifeline Tariffs

Subsidies to support a minimum level of consumption, for example, through lifeline tariffs for all users, have also been used in several of the cases reviewed during the workshop. When financed through cross-subsidization from higher income groups or nonresidential consumers to low-income consumers, this kind of scheme is based on the premise that it enables the subsidy to flow to those with limited consumption needs, while ensuring that those with higher levels of consumption pay a higher price, allowing cross-subsidization in part, or in whole.

For example, in South Africa, municipalities are compelled to provide a free basic supply of 50 Kilo Watt (s) Per Hour (kWh) to all low-income earners.[14] In turn, in Casablanca, Morocco, household tariffs are classified into four different blocks for which progressive tariffs are applied.[15]

In other cases, the wealthiest groups can be made to pay for a higher consumption at a price which enables meeting the cost of the subsidized level. For example, Colombian legislation classifies residential consumers into six different categories, according to economic level, 1 being the lowest and 6 the highest. Tariffs for Level 1,2 and 3 consumers are subsidized (up to 50 percent of service cost), through a fund financed by the national government budget and contributions from Levels 5 and 6 residential consumers and nonresidential consumers.[16]

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[14] However, PN Energy (Eskom) does not agree with this kind of lifeline tariff. Until 2004, PN Energy did not extend this lifeline tariff to the areas it served in Cape Town.

[15] The first block ranges from 0 to 100 kWh and has a price of 0,8,460 MDh/kWh; the second block ranges from 101 to 200 kWh and has a price of 0,9,187 MDh/kWh; the third block ranges from 201 to 500 kWh and has a price of 0,9,995 MDh/kWh, and the fourth block includes consumptions > 501 kWh and is priced at 1,3,659 MDh/kWh.

[16] Besides, consumers in some critical conditions have an additional subsidy of US$40/kWh (1.8 US cent/kWh).

As mentioned earlier, the governance structure of slums and the informal relations which characterize these settings make it difficult to reach the desired beneficiaries. In some cases, subsidies collected by the utilities through tariffs paid by existing consumers were channeled to the benefit of other consumers not in need, or, in the worst of cases, to the utility's benefit. For example, one of the flaws of the electrification program in Mbayani, Malawi, stems from the low flat rate tariff that has been implemented, which subsidizes richer households at the expense of the poorer. While the flat tariff is beneficial to all consumers, it hurts the utility's finances, and does not provide it with enough cash flow to expand service to low-income consumers. Another issue mentioned by the utilities is that, many times, the subsidies provided to residents in slums frequently ended up in the hands of the illegal service provider, that is, when consumers are paying a person to "steal" electricity for them.

One of the major challenges in providing subsidies to slum residents lies in minimizing errors of inclusion; that is, minimizing the proportion of subsidy recipients who are not deserving consumers. Thus, how to transfer subsidies becomes a truly relevant policy issue. The study of subsidy delivery mechanisms as well as the relative merits of alternative experiences, for example, with cash payments and transfers, was identified as an area deserving further analytical work.

Another challenge is the design of lifeline tariffs, in order to arrive at the appropriate level of consumption to be subsidized, if inclusion and exclusion errors are to be minimized and perverse incentives are to be avoided. Some mechanisms, such as effective metering systems, like the prepaid meters discussed in Chapter 7, can be used to minimize exclusion errors; that is, the proportion of intended subsidy recipients who do not actually get them. However, exclusion errors may still emerge if there is difficulty in accommodating household size in setting the tariff, something that can easily happen in slums. For example, in the slums of Casablanca, the Lydec program reported an important impact of the electrification program on economic activities, with 40 percent of consumers coming from inside the slums and 60 percent being nonresidents setting their business close to or in the slums in order to benefit from the subsidized tariffs.

Consequently, the objective of any **targeting** exercise within "intelligent subsidy design" is to restrict the benefit of the subsidy only to those eligible for support. In turn, subsidies are **efficient** when just the right amount of subsidy is delivered to cause the desired demand and payment response, curtailing perverse incentives (market distortions).[17] Finally, subsidies

[17] *Global Partnership on Output-based Aid, "Output-based Aid: Supporting Infrastructure Delivery through Explicit and Performance-based Subsidies," March 2005.*

are **sustainable** when they are part of a program which is linked to actual service delivery, in which funding is guaranteed and the source of the funding is identified.

The discussions held with practitioners during the workshop highlight that "intelligent subsidy design" is not an easy task. Instead, they raise concerns regarding the cost effectiveness of the targeting and delivery mechanism which is chosen to deliver electricity subsidies in slums.

However, successful cases of both targeted subsidies and electrification programs highlighted some common aspects:

- Strong and direct involvement of the targeted population of slums from the start of the process;
- Programs designed based on the assessment of unserved people's willingness and ability to pay for basic services, like the Ahmedabad program in India, explained earlier in this report, and the Programa Rede Ampla (PRA) Program in the Dominican Republic, which is reviewed in Chapter 6;
- Subsidies, not exceeding a ceiling of a share of total investment costs required to ensure access, normally financed directly by the State to the beneficiaries and are not channeled through the utility; and
- The utility's systematic effort to serve all new consumers on a commercial basis once they are connected to the network, while assuming all related commercial risks.

Managing Resources

Understanding the preferences of households and communities, and their ability to pay for improved electricity services, is an essential starting point for any project aimed at improving welfare in an effective and reliable manner. However, the expansion of service will need to be staged in such a way as to accommodate two principal limitations.

The first is the financial capacity of the utility to fund the installation of primary distribution circuits, transformers, service drops and meters, and of the partnership to fund the other social infrastructure services which should accompany the electrification program.

The second is the physical capacity of the utility to meet increased electrical demand in a hostile context. Thus, to design and implement a rationale and a workable partnership, proposals have to go beyond the design of an efficient subsidy allocation mechanism. Proposals need to focus on: i) "adapted service" and product quality; and ii) the most effective means to deliver both.

"Adapted service" and product quality

One of the greatest challenges faced by electrification programs has to do with the tension that exists between the need to accurately specify the level of service to be provided by the utility to allow slum dwellers to "live like the others," and the need to allow the provider certain flexibility for service provision innovation. In order to ease this kind of tension, the experiences presented at the workshop show that it is indispensable to drill three key concepts:

- Always adopt a "service provider" approach. This notion is necessary because even if the utility subcontracts certain tasks, it is always an integrated service provider approach by definition. As presented in Chapter 3, in some experiences, commercial relations with slum consumers are conducted through CBOs or NGOs. By partnering with such organizations, utilities optimize the use of resources by delegating some activities to those who can perform them more efficiently – by saving resources, and effectively by reaching the desired targeted population. However, delegating tasks down the line does not release utilities from their responsibilities. When electrifying slums, it is necessary to demystify the word "delegation" and to differentiate between "responsibilities" and "tasks." While responsibility cannot be delegated, ordinary and regular tasks can;
- Define "service standards." Even when the operator has more freedom to respond in an innovative way to consumers' demands by focusing on the "desired output," the adoption of a results-oriented process requires a definition of the minimum specifications of the product/service to be delivered. This includes outlining the service provider's obligations in terms of: a) number of users to be connected; b) the quality of service to be provided; and c) the minimum service administration and maintenance standards; and
- Manage risks. The volatility of bill collections makes slums a low-return market for utilities. If, in addition, a high percentage of the costs of serving slums are fixed by mechanisms outside the utilities' control, risks are increased to a point that electrification is discouraged. Thus, a key consideration in the risk allocation process is the degree of control over service costs which utilities have.

Effective Service Delivery

Creating microenterprises which allow communities to "comanage" electricity service provision, where utilities make a commitment to promote and organize the community, so that self-organized microenterprises are created, was mentioned as a useful option to improve the effectiveness of electrification programs. This option arises from the need to accurately specify the level of service demanded by slum residents and the provider's flexibility to innovate. It also stems from the need to optimize the limited financial resources which characterize electrification programs in poor areas.

The community-based microenterprises can perform different activities related to metering (installation, revision, and monthly reading), billing (manage bill collection or recovery system), pilferage management (help monitor consumption pattern and identify pilferage), and training and education (energy efficiency and savings, awareness raising on the benefits of legal electrification).

Therefore, coadministration by community organizations – microenterprises, community agents, CBOs or NGOs – and their active participation in the process, has multiple advantages, three of which being:

- The user consultation process enables the identification, prior to the execution of the electrification process, of any potential technical, financial and institutional obstacles which might hinder program execution. Such early identification of obstacles allows the utility to design a flexible scheme for mitigating the major problems and transparently allocating identified risks;
- If utilities, through these community organizations, adequately interpret and expeditiously adopt users' demands and preferences, asking for their input and involvement, it is less likely that they will encounter a high degree of opposition to the program; and
- Consultation with prospective users gives utilities the opportunity to design a process which is attractive for enough program participants, openly encouraging them to join the program. In this regard, users will express a higher interest in the program as long as they perceive its simplicity and usefulness. In this case, simplicity is synonymous with transparency.

5. Need for Engineering with Sociology

Electricity companies are facing growing pressure to use their resources as efficiently as possible. The need to learn from experience, identify delivery systems which are more likely to achieve electrification objectives and understand the factors contributing to the success and failure of programs, has led some electricity companies to adopt innovative program design and evaluation schemes.

The goal in this Chapter is to describe how, by hiring social scientists – sociologists and anthropologists – many electric companies are managing to increase the effectiveness of their programs. The Chapter also identifies areas to improve on evaluation methodologies and program designs.

Program Design: "Knowledge is an Issue"

Understanding the needs for energy services of the poor is crucial for finding adequate solutions for electrification programs. One of the lessons derived from the workshop is that there is an interesting dichotomy between the kind of information used to justify electrification programs, and the information used to analyze and appraise them.

The evidence presented in the different sessions showed that peri-urban and urban electrification programs are largely based on statistical information covering mainly:

- Poor communities' energy consumption patterns, for all energy services including electricity;
- Use and cost of accessing services through informal and fraudulent actions;
- The WTP of potential consumers; and
- Gender issues, albeit very rarely, in electricity access and use, and even more rarely, in access and use of other energy sources.

The outcome of programs is mainly assessed with qualitative information. The few quantitative analyses which are carried out only evaluate the following:

- The coverage ratio for network electricity, comparing targeted vs. actual number of households electrified;
- The cost of connection under the programs;
- The level of subsidies, mostly the reduced or waived connection fees;
- Reduced technical and commercial losses; and
- The financial returns to the utility.

The lack of relevant knowledge about the targeted communities – for instance, how they are organized, the geographical distribution of settlements and infrastructure, the sources and distribution of incomes and the shortcomings of analytical methodologies to identify the communities' potential receptivity to the proposed programs, were identified as two major problems faced by companies when defining pilot projects and parameters to monitor implementation results. Furthermore, the lack of adequate analytical tools makes it difficult to evaluate the potential scalability of programs.

Notwithstanding these shortcomings, there are positive, innovative experiences, where companies providing electricity services acknowledged the need to build knowledge on information, both to design the programs and appraise the results. These experiences stem from the premise that the conditions of each area to be serviced are unique and, therefore, each program must be tailored to match the circumstances of each community. This implies not only taking a look at the big picture but also establishing relationships with the community. This had some companies hiring anthropologists, sociologists and demographers to learn more about their consumer base, design an approach to "connect" with the communities and increase the chances of success.

The companies who have worked with social scientists in preparing and implementing slum electrification programs, it seems that an approach akin to an "epidemiological approach" is the most effective in order to understand energy consumption patterns, weigh and select the most appropriate and cost-effective solutions. The concept of "epidemiological approach" refers to the phasing of programs in several stages which include:

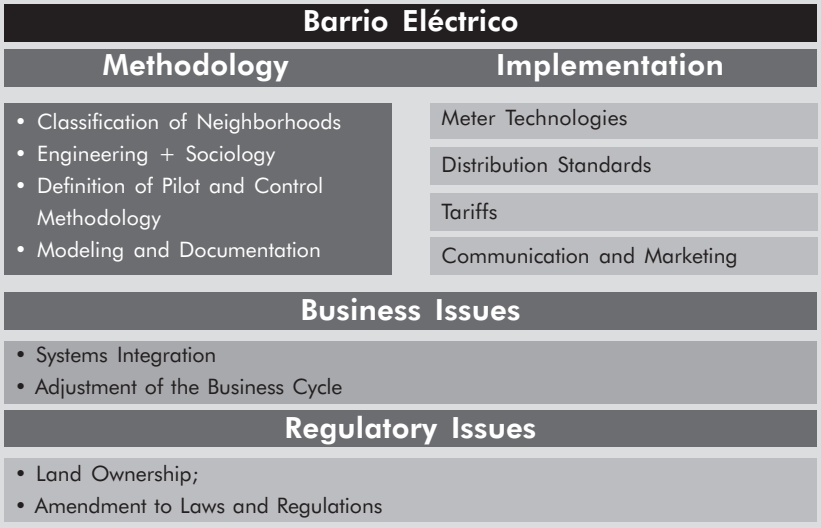
- A diagnostic phase, in which the causes for inadequate electricity service are confirmed;
- A descriptive phase, which describes the main characteristics of the targeted community, their consumption habits and energy expenditure pattern;
- An experimental phase, in which pilot projects are tested;
- An analytical phase, in which the results produced by the pilot projects are analyzed;

- An intervention phase, in which appropriate control methods are modeled to evaluate the potential scalability of the programs;[18] and
- A monitoring phase, which takes place during the implementation of the programs to ensure that they are being properly implemented, and that lessons are learned to take corrective action if needed.

For example, the "Barrio Eléctrico" project implemented by Electricidad de Caracas (AES) in some of the poor urban neighborhoods of Caracas came out of a pilot program where engineers and sociologists articulated a value proposition focused on scalability and supported by quality of life statistics, crime statistics, cost tracking and feasibility beyond the pilot project.

As shown in Box 5.1, by working with sociologists in the Barrio Eléctrico Project in Caracas, AES was able to obtain useful information for understanding the direct energy needs of the community, their energy consumption patterns and for weighing and selecting the most appropriate cost-effective solutions for electrification. The positive results from the initial pilot phase allowed AES to develop a comprehensive strategy, with a standard methodology which is being replicated in seven other low-income neighborhoods of Caracas, and even in other AES companies.

Box 5.1: Standard Methodology which Allows for Replication in other Low-income Neighborhoods and even in other AES Companies



Source: "Electricity at the bottom of the pyramid," Ivar Petterson, EDC-AES, 2005.

[18] *Scalability refers to the possibility of replicating the program in a different setting.*

In other experiences, the identification of women's role in the use of electricity contributed to identify the key entry point to design efficient energy programs.[19] For instance, in Khayelitsha, Cape Town, race, class, education level and gender were identified as the key barriers to the effectiveness of electrification programs. Women in poor households were identified as the key decision makers and managers of the household's energy needs, as they control the use of energy for cooking, warming water for washing and cleaning, ironing, and they control children's use of lighting to study. However, studies showed that they are seldom consulted by the utilities. The Khayelitsha experience also demonstrated that when educating consumers on energy efficiency, utilities have to take into account gender issues and recognize the valuable role that women play in managing electricity and other energy sources within the household.

Program Evaluation: Methodological Issues

Electrification of poor urban and peri-urban areas is usually implemented in complex economic and social environments, with intricate governance structures which make it difficult to assess the extent to which effective or unsuccessful outcomes were the result of program design and management. Taking this into account, workshop participants discussed at length the relative merits of qualitative versus quantitative evaluation methodologies, with a strong preference emerging for qualitative methods of program evaluation to complement quantitative information as a means to better assess program results and impacts.

Household surveys, interviews, and questionnaires were common practices mentioned during the workshop presentations, to track program compliance, identify the reasons behind consumers' payment arrears, and to evaluate households' and small businesses' (shopkeepers and craftsmen) consumption patterns.

Social scientists were identified as key players in making these types of evaluations. For example, Edenor, a private utility operating in Buenos Aires, Argentina, hired a sociologist to appraise the impact of prepaid meters installed in the poor peri-urban area of Merlo. Based on surveys, evaluations were carried out on two fronts: i) prepaid meters as instruments to improve access to electricity; and ii) as instruments which increase the welfare of households. The results of the evaluations are shown in Box 5.2. The sociologists were particularly instrumental in helping "decode" households' own interpretation of the welfare impact from the service.

[19] *Presentation by Wendy Annecke of the International Network on Gender and Sustainable Energy.*

Box 5.2: Understanding the Impact of Prepaid Meters in Buenos Aires

Do prepaid meters facilitate access to electricity?

Before

- 48 percent were illegally connected;
- 25 percent had irregular payment patterns;
- 67 percent households had their electricity supply interrupted;
- 46 percent households with a frequency higher than three times/year;
- 91 percent households had electricity disconnected due to lack of money; and
- 49 percent households remained without electricity for one day or more.

Now

- 100 percent are within the system;
- 37 percent households have their electricity supply interrupted;
- 63 percent households with a frequency of once every two-month period;
- 69 percent have their electricity supply interrupted because they forgot to buy it; and
- 82 percent households remain without electricity for less than six hours.

Does the prepaid system improve the welfare of households and individuals?

Negative Aspects

- Lack of use of their refrigerator;
- A reduction in washing and ironing; and
- A reduction in house heating.

Positive Aspects

- Improves management of household expenses;
- Increases household disposable income due to lower consumption;
- An increase in energy-efficient practices;
- An increase in activities outside the home and in the community;
- Redistribution of tasks within the household; and
- Dignifying poverty.

Source: Edenor.

Quantitative and qualitative information and analyses were identified as complementary to identify and measure relationships between observable facts, which can be interpreted independently from the meanings that communities attach to them. Quantitative analyses are also required to improve the monitoring methodologies, evaluation and cost-benefit analysis of the different technologies on household income and, most importantly, the potential scalability of projects.

During the break-out group sessions, which were designed to discuss and propose solutions to the main problems which had been raised during the workshop, a proposal was made for establishing benchmarks which can be used to improve project evaluation. Besides measuring technical and nontechnical losses, service coverage and improvements in service coverage, benchmarks could include the cost of access to service, the cost of energy, taxation (specificity and level) and comparisons between the legal and illegal electricity services.[20]

In conclusion, the use of statistics and project evaluation techniques which integrate a broader range of quantitative and qualitative methods is highly recommended, both to improve the understanding of how program operations are affected by exogenous factors, and the factors which condition the level and distribution of project impacts. This could also be one of the areas for donor agencies' support in the future.

[20] *This proposal was made by the "French utilities" Team, in the group discussions held during the last day of the workshop.*

6. Making Consumers in Slums "Reliable" Consumers

Slum residents are generally perceived as defaulting on the payment of their electricity bills, or as being unwilling to pay for regular electric connections. This perception is often misconstrued: residents in slums do pay a significant share of their income for electricity, and can become reliable consumers provided the service is accessible and affordable. This Chapter provides first, a few illustrations of consumers' payment records and of their Willingness-To-Pay (WTP), second a description of a range of tools used by utilities to make electricity accessible and reliable, and third, some illustrations of companies' efforts to facilitate the payment of electricity to poor consumers.

End Users Actually Pay for Electricity

"End users always pay, either for an informal or a legal service," was a quotation shared by different stakeholders of electrification projects during the workshop. The evidence presented from different contexts shows that WTP in slums is very high, people are ready to pay to meet a range of needs, depending on their means.

In Casablanca, Morocco, 400 slums and illegal settlements had been deprived of any access to public services, as municipal authorities struggled with the issue of legalizing tenure and urban restructuring. After Lydec was granted the electricity and water concession in 1997, the collection rate for electricity reached 96 percent, demonstrating that legal electricity seemed affordable as compared to previous informal solutions.

In the Dominican Republic, a study carried out under the PRA documented that end users have a very high "revealed willingness-to-pay" as illustrated by the very high level of household expenditures – US$16.72/month, for electricity (legal or illegal connections) and other energy sources such as candles, batteries, kerosene, and so on and so forth. Brought back to unit costs for lighting, this represented a tariff of US$0.43/kWh, which is three or four times the electricity tariffs in the United States.

In Ahmedabad, households who do not have access to the legal electricity service are willing to pay twice as much for an illegal connection and service. For legally connected households, consumption is about 36 kWh per month, costing around US$2.5 (Rs.108) per month. For consumers with an illegal connection, the same level of consumption costs twice as much, around US$5.1 (Rs. 216) per month.[21]

Making Electricity Accessible

How to legalize consumers illegally connected to the network, how to make a legal service accessible to poor households is therefore a tremendous challenge for electricity distribution companies. In city slums, consumers operate mostly in the informal market for their sources of income and employment, and they are highly vulnerable to economic cycles. For example, the DAEP carried out by MERALCO in Manila, the Philippines, identified that most of its consumers are employed informally, are scavengers or jobless. Likewise, a survey carried out by the utility EPM, in the city of Medellín, Colombia, to evaluate different aspects of their disconnected consumers, identified the following six reasons for lack of payment:

- Sudden variations of family income, especially of those most vulnerable;
- Unexpected consumption increase;
- Electricity theft opportunity;
- Having been disconnected in the past;
- Unemployment; and
- Violence in the neighborhood.

These findings confirm that the vulnerability of slum consumers and the volatility of their income require that favorable conditions be created for electricity to be accessible to such consumers. Even though from a commercial perspective consumers in slums are high-risk, experience shows that they are keen to be legal consumers and enthusiastically support electrification programs which allow them to pay less for the service.

Increasing accessibility involves at least three main elements: i) lowering the initial connection costs or providing financing to help consumers pay for the high entry cost of obtaining electricity connections, usually through subsidies; ii) providing access to credit for energy service suppliers in order to cover their initial investment costs of installations within the household, possibly including electricity-consuming appliances; and iii) promoting revenue-generating uses of energy.

[21] *Based on anecdotal information about rates charged for illegal connections by middlemen. "Innovative Approaches to Slum Electrification," USAID, December 2004.*

Actions discussed during the workshop, to make electricity accessible, centered on the initial investment costs and on the productive use of energy. They included:

- The provision of subsidies for connection costs, paid directly to the supplier or the provision of microcredit to the households to finance the connection cost. The positive role played by international donors, NGOs and microfinance institutions to lessen or finance connection costs over time was highlighted. For example, in the Mbayani electrification program in Blantyre, Malawi, compact boards (meters) are financed over a period of five years. While compact boards cost on an average US$300, consumers pay a flat tariff of US$5 per month, of which 79 cents cover the compact board costs which are amortized over five years (at a 3.7 percent interest rate). Another example is that of INDCARE Trust, an NGO which designed and implemented a microcredit program in the Bhalla Factory slum of New Delhi to finance slum dwellers' access to legal electricity connections; and
- Actions oriented to identify the WTP for the service and the fee levels at which participation in the electrification programs would drop. Experiences reveal that the decision about electrification should not only respond to the "willingness to pay" which some poor households demonstrate, it should also look into the reasons for allocating a specific amount of their income to this basic need. The experience of the PRA program in the Dominican Republic summarized in Box 6.1 is highly enriching in this respect.

The evidence presented shows that while reaching the poor is not charity and should be seen as a business, there are still too few cases documented on how to approach the poorest of the poor.[22] This is another area which calls for more extensive action – research in the future.

Making Electricity Affordable

Once the accessibility of electricity has been ensured, utilities need to maintain their slum consumers as "reliable" consumers. The goal is to keep the consumers under payment compliance while providing a service with a quality which allows them to "live like the others." Most of the time, the response to this challenging situation is a management solution, that is, to make the electricity service affordable with innovative and flexible payment options.

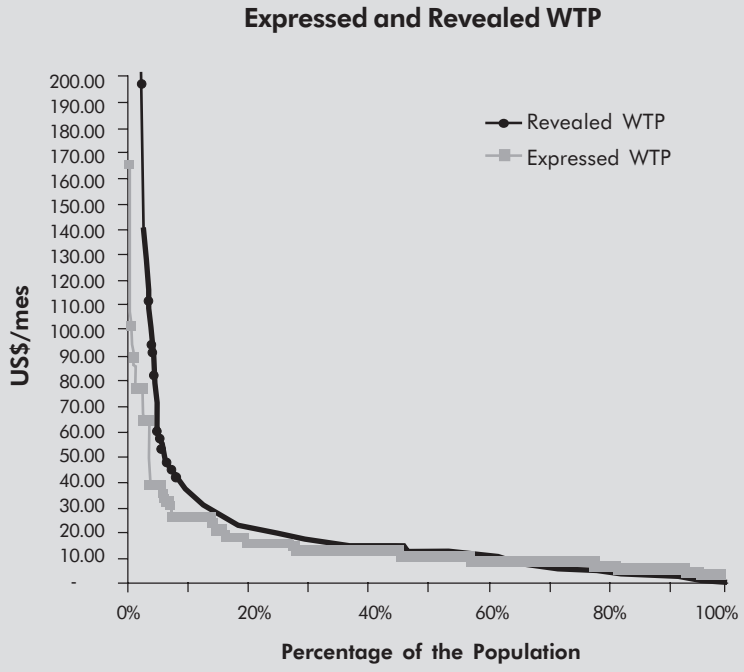
[22] *During INDCARE's presentation, this issue was raised while explaining that in the Bhalla Factory slum, nearly 39 percent of the families belong to poorest of the poor category. Making electricity accessible to these poorest of the poor has proven extremely difficult.*

Box 6.1: Dominican Republic: PRA Program (Programa de Reducción de Apagones)

Willingness-to-pay Study: A study was carried out supported on random surveys which clearly differentiated between the following concepts:

- *WTP:* the maximum amount an individual is willing to pay to acquire some good or service;
- *Effective Demand:* the demand for goods and services which is supported on means/resources to pay for it;
- *Expressed WTP:* the maximum amount an individual is willing to pay to acquire an electricity service of quality, permanent and reliable on theory; and
- *Revealed WTP:* what surveyed people declare that they effectively pay for electricity and other energy sources like candles, batteries, kerosene, etc.

As shown in the graph below, the results from surveys found interesting differences between the expressed and the revealed WTP, particularly on the first two deciles of population.



Source: Presentation by Danilo Carranza and Connie Smyser, "The energy need of the urban poor: Dominican Republic."

The most frequently used method to increase affordability to electricity is to adapt the billing system and payment options to the consumers' financial constraints. This does not mean reducing the tariff, but adapting the payment system to the consumers' cash flow cycles, or finding a way to match their consumption levels and payment capacity. This can be achieved through the use of technical devices such as current limiters and prepaid meters to reduce (or restrict) the amount of electricity used, allowing consumers to auto-ration their households' consumption and lower the amount of their electricity bills. Commensurate results can also be achieved through educational programs on energy savings and energy efficiency, including by providing access to alternative and more efficient energy consumption options through fuel-switching (for example, between electricity and Liquefied Petroleum Gas (LPG) for cooking).

Prepaid meters have been found as one of the most effective instrument in adapting payment options to consumers' financial limitations. There is a wide range of positive experiences with prepaid meters: Edenor in Merlo, Buenos Aires (documented in Box 5.2); the "Barrio Eléctrico" project carried out by EDC-AES in La Morán, Caracas; a small pilot project carried out by EPM in Medellín; and the experience of PNES in Khayelitsha, Cape Town. In all of them, the new connections were coupled with prepaid meters. As it will be further discussed in the Chapter, prepaid metering systems provide consumers with the possibility of deciding how much they are able to consume and spend on electricity, thus having a significant welfare impact on the household. From the fact that the prepaid system works on demand, it enables the utilities to adapt, at low cost, their billing system to the limitations and seasonality of each consumer's cash flow.

The creation of a payment culture was also identified as a key element to increase consumers' commitment toward the timely payment of their bills. As mentioned earlier, in the case of Medellin, the utility made it a company policy to connect new slum dwellers as soon as they moved in and to bill them immediately. Developing a payment culture is more complex and a long-haul effort when the utility deals with consumers who have been functioning in the "illegal" market for a long time.

Consequently, once slum consumers are connected legally, utilities should monitor closely their consumption behavior and identify those who could easily fall into nonpayment. As soon as those risky consumers are identified, the utility should offer them flexible payment plans, to prevent them from abandoning the payment circuits and returning into illegality. Experience shows that once consumers default, it is very hard for utilities to bring them back to the formal system. In the long run, it is more advantageous for service providers to provide flexible payment options, rather than to let consumers recede into illegality.

7. Technology Provides Solutions

Technology does not constitute a constraint; to the contrary, the experiences presented during the workshop showed that a range of technological applications can be advantageous for both consumers and electricity service providers. The aim of this Chapter is to describe the benefits from metering technologies, and how some technological applications can contribute to the management of nontechnical losses.

Advantages and Disadvantages of Various Metering Options

For consumers, metering technology can be beneficial in two ways. First, some metering appliances can assist consumers to manage their consumption, allowing them to reduce their electricity consumption and expenditure. Second, technological appliances foster the rational use of energy by making consumers more responsible in the use of electrical appliances.

During the workshop, experiences with three different metering options were assessed: i) prepaid meters; ii) retail meters; and iii) public fountains (collective). As described in Table 7.1, the first two metering systems are more beneficial to utilities and consumers. However, public fountains are necessary in some cases, particularly, where access is difficult due to physical and geographical constraints; and where violence threatens swat teams and meter controllers and readers.

Positive experiences were presented of the same utility using different kinds of metering options, depending on the specific configuration of the slum or section of a slum. In El Junquito, a slum located in Caracas, Energy Development Corporation (EDC-AES) had to install different kinds of meters given that numerous kinds of direct connections or "tangles" were identified.[23] In the "Barrio Eléctrico" electrification project, EDC-AES installed 175

[23] *In one case, more than 280 families were connected to one single electricity pole.*

residential meters, three collective meters and six prepaid meters. Overall, they have been able to remove 686 illegal connections, recovering on an average 729,000 kWh annually.

As shown in Table 7.1, prepaid meters have a comparative advantage over individual residential meters in that they provide poor consumers with the possibility to decide, ex ante, how much of their income they are willing to spend on electricity. When individual retail meters are not visible, for example, because they have been installed high on a pole to prevent vandalism, it is more difficult for consumers to control their electricity expenditure, as they only become aware of the amount of their electricity consumption, ex post. Public fountains have proved particularly well adapted in crowded slum sections, but depending on the sociological situation of the slum, they may be more difficult to manage as they require a collective agreement both for monitoring the electricity consumption of each household, and for bill collections.

Table 7.1: Advantages and Disadvantages of Different Metering Options

	Prepaid Meters	*Individual Residential Meters*	*Public Fountains (Collective)*
Allows consumer to manage its consumption	Yes. As it is visible, consumers can monitor, on a permanent basis, their consumption behavior.	Not always. If the meter is not visible, it is difficult for consumers to keep a track of their consumption.	No. As metering is collective, there are no incentives for each household/individual, to reduce its/his consumption
Helps to reduce electricity expenditure	Given that poor consumers have a budget constraint, it provides them with the possibility to decide, **ex ante,** how much of their income they are willing to spend on electricity	When visible, consumers can regulate their consumption according to their payment capacity. If not visible, it is more difficult for consumers to control their electricity expenditure, as they only become aware of the amount of their bills, after consumption, **ex post**	No. As billing is collective, free riding is encouraged. Electricity expenditure is not allocated according to each household/individual's consumption
Fosters rational use of energy	Makes consumers more responsible in the use of electrical appliances	When visible, can make consumers more responsible in the use of electrical appliances	No. Tragedy of the commons: since billing is collective, each household has no incentive to reduce its own consumption. Instead, total consumption may actually increase
Increases transparency	Promotes payment culture	Individual metering is essential to avoid deterioration of legal connection and payment culture	No, it deteriorates payment culture
Helps to target subsidies	Only if the utility is able to monitor the amount of energy sold to each household	Yes, the utility can monitor how much each household spends and consumes in electricity	No, since each household consumption cannot be identified
Helps to improve household welfare	Yes, as it increases household savings by reducing electricity expenditure, literacy rates in children and adults, and their sense of belonging to society, among others. However, negative aspects that have been identified include: reduction in the use of refrigerators, ironing and washing, and of heating devices.	Yes	Yes
Increases collectables	Yes	Yes	Rarely
Easy to tamper	Yes, unless it is sealed	Yes, unless it is not visible and the consumer cannot have easy access to it.	Usually sealed to avoid tampering

Prepaid meters are a good illustration of how technology can provide constructive solutions to help consumers manage consumption according to their needs and ability to pay, while enabling utilities to make consumers responsible, to promote a payment culture and to increase transparency in consumption, billings and collections.

However, it is worth mentioning that some negative welfare aspects have been reported from the rationalization of households' electricity expenditures due to prepaid meters. In Merlo, Argentina, and Khayelitsha, South Africa, the use of prepaid meters led households to limit their use of heating devices and refrigerators and to heat less water, increasing health risks and food wastage.[24]

Managing Technology

The narrow streets which characterize slums, their physical characteristics and, in some cases, the dangerous conditions under which the personnel of electricity service providers have to operate, encourage the use of innovative technologies to obstruct electricity pilferage and monitor consumer behavior.[25] Different types of electricity pilferage usually take place because almost anyone can access an illegal connection without facing major technical problems or legal sanctions. Besides, although the risk of accidents increases, in many cases, household security is not severely compromised when connecting to an illegal source. Thus, for the utilities, a range of technological applications are crucial tools to monitor consumers, increase transparency, legality and personnel safety.

During the workshop, two different experiences were evaluated in depth, in which utilities have used different technological tools to combat electricity theft and improve the management of nontechnical losses.

PNE is a joint venture established between Electricite de France (EdF) and South African Energy Supply Company (Eskom) in 1994 to tackle a history of poor service delivery, nonpayment and high electricity theft in Khayelitsha, Cape Town. Actions to reduce nonpayment and pilferage implied carrying out efforts in three main areas.

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[24] These negative welfare impacts were highlighted during Wendy Annecke's presentation about the socioeconomic conditions in low-income electrification areas, and in the presentation carried out by the Argentinean team.

[25] For example, during the presentation of the Light program in Rio de Janeiro, Brazil, the following violent actions were reported for 2004: 530 physical aggressions to employees, 30 temporary arrests of employees in service, seven robberies to employees in service, 11 invasion threat/ destruction of facilities, 361 reported cases of false employees dressed in the company's uniform, 80 cases of reported theft of equipment and materials, 120 cases of gunshots on facilities and transformers, 26 car thefts and 200 wiring thefts.

First, metering was made reliable by using antitheft meters: split meters were installed and meters were sealed. In addition, all new connections were done with prepaid meters, some of which were also sealed. Second, a reliable software support system, which allows for close consumer monitoring, was put in place. The software enables the company to keep a database with the whole history of each consumer's payment record (buying credits), tampering interventions, disconnections (including by the consumer), meter-sealing activity and meter replacement. The software provides critical information to carry out routine tampering investigation and detection, and to perform special audits on consumers with consumption levels below normal. Third, special network and service upgrades were made to bring consumers onto the network. In particular, actions included shortening the low voltage network and installing individual service cable (concentric) from the pole, and placing statistical meters to compare consumption levels at 66 Kilo Volt (kV)-11 kV-400 Volt (V) levels.

PNE's experience demonstrates that the crucial role of human resources to support the technological solutions. Revenue protection teams are in place to carry out audits and are highly visible. Though costly, swat teams are visible at all times in the areas not only for policing, but also to provide a channel for consumer service, and to improve consumer relation with the utility.

Another useful example analyzed during the workshop was that of Rede Ampla in the state of Rio de Janeiro, Brazil. When evaluating the main causes of theft, four different types of illegal actions were identified by the Rede Ampla program: i) direct connections to the network, through a clandestine cable attached to poles; ii) destruction and robbery of installed meters; iii) tampering of meters by altering the gearing pieces of the system; and iv) tampering of digital meters by inverting the polarity of the internal circuits.

The program includes two different projects, one with a component for normalizing consumers by carrying out targeted inspections, and another which consists of the construction and modification of electricity networks to avoid theft.[26] For example, within the normalizing component, 1.2 million consumers were inspected and regularized. This resulted in the reduction of losses by 1.7 percent. Every percentage point in loss reduction represents approximately 20 million reais in revenue for the company.

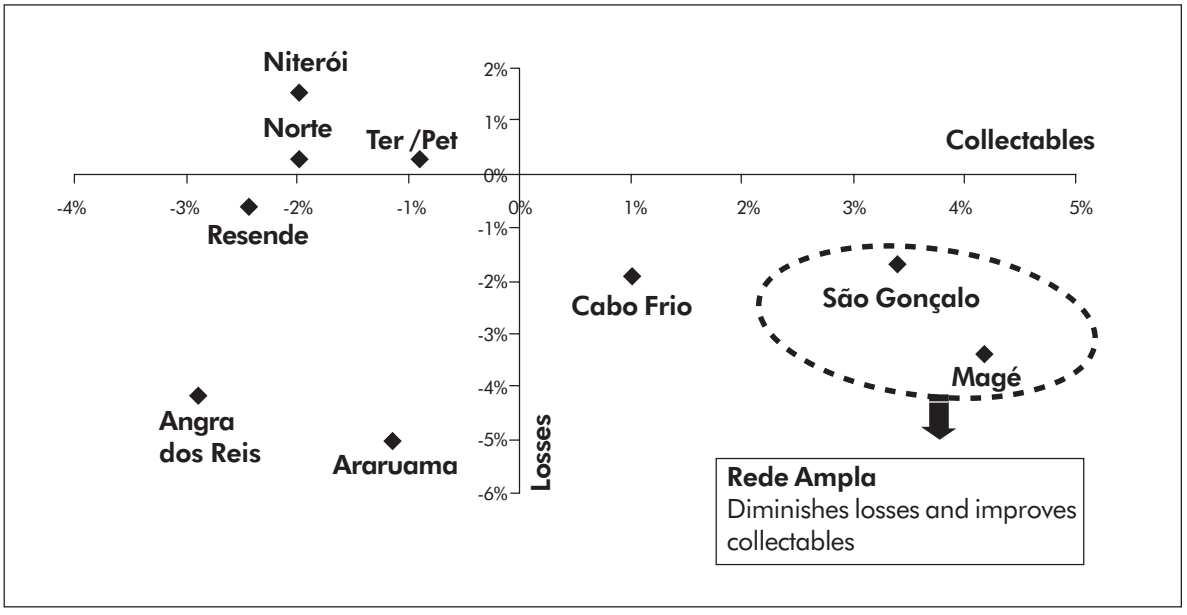
The Rede Ampla program has considered three different solutions to diminish theft and nontechnical losses. The first solution is similar to what is being done in Khayelitsha by PNE,

[26] *This component of the program is called "Projeto de Investimentos em Medidas Técnicas."*

in the sense that it involves shortening the low voltage distribution network and installing for each consumer a small transformer built into the meter. The second entails including in the network a noisy signal which could obstruct the use of electrical equipment by installing consumption limiters at the consumer level. The third solution is to protect the network with an effective physical barrier. At the time of the workshop, only the third option was being implemented, as the technological prototypes to carry out the first two options were still being developed.[27] The results of the program can bee seen in Figure 7.1. In the communities of Sao Goncalo and Magé, where the program has been implemented, losses have diminished and collections improved.

What the experiences of PNE and Rede Ampla reveal is that reducing losses requires investments. The purpose of these investments is to make it difficult for the consumer to gain illegal access to the system, therefore, positively contributing to reductions in nontechnical losses. However, besides the investments in technology, such programs command intensive O&M activities, resulting in higher costs. A careful balance must be, therefore, achieved between the investment and recurrent costs for the programs to break-even or be profitable.

Figure 7.1: Collectibles vs. Losses: Variations Between Communities Within the Rede Ampla Program



Source: Rede Ampla, Diretoria de Recuperação de Mercado.

[27] *It also includes shielding meters.*

8. Some Regulatory Concerns

Regulatory concerns were addressed during the workshop only insofar as they expanded on the perspectives brought out by the utilities, the consumers, and the other stakeholders, in particular the NGOs and CBOs, and the local or central government bodies. One of the implicit conclusions of the workshop was that the regulation of the electricity industry is seldom consistent with the objectives and business models used to electrify poor urban and peri-urban areas. Furthermore, there has been little support from clear and consistent regulations to implement alternative, nonconventional electrification systems based on technologies and features customized to meet the needs of specific contexts of poor peri-urban and urban areas.

Evidence of this are the regulatory transition periods assigned for companies to bring technical and nontechnical losses down to acceptable levels, given that on several occasions regulations have overlooked the starting conditixons of industry players and the complexities of the environments in which those regulations had to be applied.[28] In most cases, regulatory demands to adjust utilities' performance standards were broadly defined, with little or no consideration for the initial conditions of the network or of the consumer base.

As a result, existing regulations, which are generally very meticulous, and have high technical standards, have rarely been applied in slum areas because they are not apt to the alternative and innovative technologies and business models needed to serve slums. Emphasis on formulating regulations has been stronger than on effectively applying them. The inconsistent application of regulations has harmed the reputation of the regulator, and the absence of predictable and credible rules adapted to the slum conditions, discredited regulatory efforts. When formal requirements were clearly

[28] *For example, during her presentation, the Superintendent of Public Services of Colombia, mentioned the case of the Choco province, the poorest State in Colombia. The utility serving this State was imposed standards similar to those of other utilities serving wealthier provinces. This inconsistent regulation was one of the causes which led the utility in Choco into bankruptcy.*

inapplicable, utilities and local authorities have had to bypass or unilaterally amend them in order to meet the targets of the electrification programs.

The workshop made it clear that regulators were unaware of the various efforts carried out by the different partnerships to electrify slums. Moreover, the only two issues which seemed relevant were tariff-setting issues and the transition periods granted for utilities to diminish technical and nontechnical losses. From the utilities' perspective, one regulatory aspect which needs to be urgently addressed is dispute resolution, in particular, over infrastructure damages.

The importance of the regulatory issues cannot be underestimated. The lack of a proper regulatory framework for resource allocation and control, permitting long-term sustainability of electrification programs – mainly for systems O&M – is one of the reasons which explain the lack of investments in slums. The absence of a proper regulatory framework has two other serious consequences:

First, it can make users living in slums captive consumers of a monopoly provider, unprotected against potential abuses of power from a utility, which may use various discretionary pretexts to justify its lack of investment in underprivileged areas. In this case, the typical status quo, the experience presented at the workshop shows that the consumers will always end up paying an informal provider for a more expensive and lower quality electricity service; clearly a lose-lose outcome for both the consumers and the utility.

Second, the lack of a regulatory framework may leave operators interested in serving only the slums not covered by the law, thus hindering the further deployment of the investments necessary to upgrade the service in those slums.

Regulation is a means to an end; and not an end in itself. When drafting a regulation for providing electricity services in poor urban and peri-urban areas, it is, therefore, necessary to emphasize the need for a light-handed type of regulation which: (i) allows to find solutions adapted to the characteristics of electricity provision in slums; and (ii) does not compromise the reputation of programs and/or the legitimacy of the regulator.

In turn, this raises the question whether it would be necessary to have a different kind of regulation for poor peri-urban areas, and areas which have specific socioeconomic and land tenure characteristics, and for which utilities need to devise tailor-made technological and system management solutions. This could also entail the risk of higher transaction

costs by making regulation more "specific." For that reason, the workshop recommended that additional thinking and analysis be done to better identify the sector policy and regulatory elements have a "horizontal" impact on all segments of electricity markets as distinct from the specific elements which would address, and have a "vertical" impact on slum electrification, in terms of technical standards, economic instruments and processes.

9. Conclusion

Several constructive and encouraging lessons were drawn from the workshop. One of the most important lessons is that excluding groups of people from access to energy on account of their poverty, marginalization and the informality of the settlements has enormous long-term social, economic and financial costs. This Chapter sums up some of the main conclusions from the workshop.

Slum Electrification is a Surmountable Challenge

The root cause of the contemporary difficulty in providing electricity and other infrastructure services through public or private utilities is decades of such social exclusion, poverty and marginalization which have led to total distrust between formal structures and poor consumers, and the rise of illegal and costly electricity distribution systems, often managed by private, illegal entrepreneurs.

On the one hand, the poor pay an extremely high price for electricity illegally sold to them by illegitimate private operators, and are at increased risks of accidents (fires, electrocutions) and evictions when participating in the informal electricity supply chains. On the other hand, the risk profile of poor residents, the narrow streets and physical characteristics of slums makes access costs and barriers high for the utilities to serve such consumers.

Though reaching the urban poor with electricity is a huge challenge, the benefits from scaling up slum electrification programs were highlighted during the workshop, including:

- Improved household disposable income from paying less for the utility services as compared to the illegal distribution, to increased income opportunities generated by the reliability of service, the time saved on the procurement of cooking fuels (electricity is first used to boil water but does not fully replace other cooking fuels);

- Health benefits, from the reduction in indoor air pollution and the increase in safe water when boiled;
- Households' safety, with less hazardous fires and improved lighting at night;
- Reduced violence on women;
- Increased educational levels, when lighting permits children to study longer hours;
- Improved social status, from social exclusion to social inclusion;
- Energy efficiency;
- Security from street lighting; and
- More investments in housing improvements once the neighborhoods are secured.

Slum Electrification is a Value Proposition

Encouragingly, several privately owned utilities recognize that providing electricity services to poor consumers is a value proposition, that it is feasible, and can yield returns to shareholders as the cost to the utilities of illegal connections is higher than providing the service, as long as consumers can be legalized and made into reliable consumers.

Several utilities are now making progress with service provision in South Africa, Brazil, Morocco, the Philippines, Venezuela, Argentina, Colombia and India. Their experiences – analyzed in the workshop – reveal that, even in the short term, there is considerable scope for "value-creating investments" if consumers are kept under payment compliance, and are provided with the *right* deliverables and quality of service so that slum dwellers perceive they can "live like the others." Furthermore, even though connection costs indeed represent a barrier to access by the poor, the lack of availability of formal connections is much more costly to society.

Participants saw as important that consumers pay at least a portion of the connection cost so that they can value the infrastructure, and a "free" minimum consumption level as in South Africa was not considered a viable option.

Utilities and governments have also developed very creative financial solutions, ranging from cost recovery mechanisms in installments to meet the poor's cash flow profile, microcredit managed by NGOs for connection and initial operating costs charges, to prepayment distribution system.

Building Effective Public-private-community Partnerships

When electrifying poor peri-urban and urban areas, the chances for the success of a specific program are greater if utilities operate in partnership with local governments and the

community. However, recognizing that utilities have limited power to combat fraud and theft, and that they do better when they partner both with the government to create a coherent legal framework to solve tenure problems, and with the community to endorse the legitimization of consumers and connections, is nothing new.

What is novel, though, is the recognition by the various stakeholders of their limited power to make it on their own. Hence, the public-private partnership model is inadequate to work in slum areas. The model which emerged is public-private-community partnership which includes close cooperation between the utility and CBOs or NGOs, and the local governments in particular. These partnerships play an essential role in the initial pilot phase, when the utility is unfamiliar with the slum area and needs the assistance of an NGO or CBO to better understand the technical, financial and social conditions in the area.

The utilities represented in the workshop considered CBOs and NGOs as indispensable to access consumers. Such organizations provide a conduit to understand the structure of their demand for energy as well as their ability to pay, to educate consumers on the service which the utility can provide and to train them in the efficient use of electricity itself to meet affordable consumption levels. Some utilities have also experimented legalizing illegal distributors into "microenterprises" to whom they can contract some of the distribution activities. Thus, the role of the community, as the guardian of equity and transparency, is critical.

Need for Engineering with Sociology

Strong support of local governments to the utility is indispensable, in particular with respect to: a) land tenure; b) the provision of other infrastructure; and c) possibly financial support. Many municipalities do not have a clear policy on slum development, which goes beyond slum electrification, as they have no definite policy on slum upgrading (enabling the slums to become permanent settlements) versus resettlement of slum dwellers. Global social programs, which combine engineering and sociological solutions, are required to meet all basic infrastructure needs; water and sanitation utilities often face constraints similar to those of the electricity utilities, although some of the solutions must be specific to the service provided. Restructuring rather than eradicating slums is a realistic solution when "engineering and sociology" are combined to mobilize the participation of all stakeholders, and design solutions well adapted to the needs and economic conditions of slum dwellers.

Several companies are now hiring social scientists – sociologists, anthropologists, demographers – to acquire the relevant knowledge about the targeted communities prior to designing electrification programs. This seems to be a promising approach to enhance the scalability of slum electrification programs. However, improvements in methodologies

to evaluate slum dwellers' receptivity to electrification programs, to monitor implementation results and impacts, including on the various income and gender groups, are still needed.

Making Poor Residents into "Reliable" Consumers

The vulnerability of consumers in slums and the volatility of their income reveal that favorable conditions need to be created for electricity to be affordable and accessible. Making electricity affordable includes measures to reduce (or restrict) the amount of electricity used to match affordability levels, through technical devices (current limiters and prepaid meters), educational programs on the rational use of energy and options for end user energy efficiency improvements.

The most frequently used method to increase accessibility to electricity is to adapt the billing system and payment options to the consumer's financial limitations. This does not mean reducing the tariff, but adapting billings to consumers' cash flow cycles and payment capacity. Prepaid meters was the most common instrument used by practitioners to adapt payment options to consumers' financial limitations.

Technology Offers Solutions

Utilities have developed technical solutions to meet a range of constraints, to lower the cost of the distribution system (for example, shortening the low voltage network), to protect the infrastructure against vandalism (installing meters high up on poles, alarm systems) and to adapt to consumer needs (prepayment meters).

Some Challenges Ahead

One of the major deficiencies identified at the institutional level is the lack of appropriate regulatory frameworks to support electrification programs for poor peri-urban and urban areas. The regulatory frameworks which have been developed for the general model of public-private partnership do not meet the need of distribution companies working in predominantly poor areas. In particular, they do not recognize the difficult initial conditions encountered by the utilities, both in terms of the conditions of the infrastructure and the socioeconomic conditions of the consumer base in the slums. Adapting regulatory frameworks to the business models used to extend the grids to slums is a priority in order to scale up such programs, while presently, utilities are left to their own device to find out practical solutions.

Other areas identified for further analytical work include:

- Subsidy mechanisms, in particular to document more cases of good practices, and the relative merits of different subsidization schemes;
- Program design and monitoring and evaluation methodologies, in particular to assess the potential scalability of pilot approaches; and
- Documenting good practices to cover a wider spectrum of municipalities and countries, and utility models.

The further dissemination of existing knowledge possibly through other events such as the World Bank Energy Week, or in-country workshops; preparing a handbook for practitioners and a distance learning course for practitioners in municipal governments, NGOs and CBOs and utilities, would be extremely useful.

Annex 1

Workshop Participants

Name	Delegation	Organization
Mr. Bijal Bhatt	Ahmedabad, India	Gujarat Mahila Housing SEWA Trust
Mr. Raj Joshi	Ahmedabad, India	SAATH
Mr. Anand Patel	Ahmedabad, India	Ahmedabad Municipal Corporation
Ms. Manpreet Kaur Chadha	New Delhi, India	INDCARETRUST
Ms. Hughete Leila	Angola	CARE
Mr. Isequiel Sebastião Manuel	Angola	EDEL
Mr. Armando Avena Filho	Brazil	Ministry of Planning
Mr. Marcelo Correa	Brazil	Neoenergia
Mr. Alexandre Mancuso	Brazil	USAID Brazil
Mr. Roberto Moussallem de Andrade	Brazil	Ministry of Urban Development
Mr. Márcio Pereira Zimmerman	Brazil	Ministério de Minas e Energia
Ms. Aloísio Vasconcelos	Brazil	Electrobras
Mr. Jerson Kelman	Regulator, Brazil	ANEEL
Mr. Ricardo Vidinich	Regulator, Brazil	ANEEL
Mr. Acacio Barreto	Rio de Janeiro, Brazil	Ampla Energia e Serviços S.A.
Mr. Fernando Cavallieri	Rio de Janeiro, Brazil	Rio de Janeiro City Government's Pereira Passos Municipal Institute for Urban Affair
Ms. Marcia Coutinho	Rio de Janeiro, Brazil	LIGHT SA
Mr. Adilson de Oliveira	Rio de Janeiro, Brazil	Universidade Federal do Rio de Janeiro
Mr. Marcos Lacerda	Rio de Janeiro, Brazil	Instituto Terrazul
Mr. Thierry Lange	Rio de Janeiro, Brazil	LIGHT SA
Mr. Marcos Almeida	Salvador, Brazil	COELBA
Mr. José Roberto Bezerra de Medeiros	Salvador, Brazil	COSERN-COELBA
Ms. Beatriz Loureiro Cerqueira Lima	Salvador, Brazil	Caixa Econômica Federal

Name	Delegation	Organization
Mr. Wilson Couto	Salvador, Brazil	COELBA
Mr. Mário de Paula G. Gordilho	Salvador, Brazil	Conder
Mr. Roberto Manoel Guedes Alcoforado	Salvador, Brazil	CELPE
Mr. Luciana Marques	Salvador, Brazil	COELBA
Ms. Ana Christina Mascarenhas	Salvador, Brazil	COELBA
Mr. Roberto Musser	Salvador, Brazil	COELBA
Pe. Clodoveo Piazza	Salvador, Brazil	Secretário de Combate à Pobreza e às Desigualdades Sociais
Mr. Antonio Carlos da Costa Pinhel	Salvador, Brazil	COELBA
Ms. Tania Maria Almeida	Salvador, Brazil	Superitendente de Habitacao
Mr. Marialba Endelli	Buenos Aires, Argentina	ESENERG
Mr. Jorge Rigamonti	Buenos Aires, Argentina	EDENOR S.A.
Mr. Claudio Damiano	Regulator, Argentina	ENRE
Ms. Wendy Annecke	Cape Town, South Africa	Energia/Gender and Energy Research and Training
Mweli Benu	Cape Town, South Africa	Khayelitsha Development Forum
Mr. Mac Mdingi	Cape Town, South Africa	PN Energy Services
Ms. Glynn Morris	Cape Town, South Africa	Agama Energy
Ms. Liliana Aranguren	Caracas, Venezuela	Electricidad de Caracas S.A.
Mr. Marco De la Rosa	Caracas, Venezuela	AES Corporation
Mr. Angel Mendez	Caracas, Venezuela	Asociación Civil Moran-Silsa
Mr. Enrique Perez	Caracas, Venezuela	Ministerio de Energía y Petróleo
Mr. Ivar Pettersson	Caracas, Venezuela	C.A. Electricidad de Caracas
Mr. Fouad Djerrari	Casablanca, Morocco	LYDEC
Mr. Arthur Jobert	Casablanca, Morocco	EDF R&D Division

Name	Delegation	Organization
Mr. Mohamed KADIRI	Casablanca, Morocco	Ministère de l'intérieur
Mr. Mohamed Sajid	Casablanca, Morocco	Conseil de la ville de Casablanca
Mr. Carlos Rufin	Commentator	Babson University
Mr. Emad Hassan	Contractor	NEXANT INC.
Mr. John Mollet	Donor	International Copper Association Limited
Mr. Miguel Riquelme	Donor	International Copper Association Limited
Mr. Danilo Carranza	Dominican Republic	NRECA, DR
Mr. Pierre-François Sildor	Haiti	Canadian International Development Agency (CIDA)
Ms. Marcelino Madrigal	IADB	Inter-American Development Bank
Mr. Magi Matinga	Malawi	HEDON
Mr. Percival C. Chavez	Manila, the Philippines	Presidential Commission for the Urban Poor
Mr. Jose Dulin	Manila, the Philippines	MERALCO
Mr. Ferdinand T. Salvosa	Manila, the Philippines	MERALCO
Ms. Eva Maria Uribe	Colombia	Superintendente de Servicios Públicos
Mr. Ricardo José Arango	Medellin, Colombia	Empresas Públicas de Medellin
Mr. Gabriel Betancourt	Medellin, Colombia	Empresas Públicas de Medellin
Ms. Ruth McLead	Observer	SDI
Ms. Sheela Patel	Observer	SPARC
Mr. Oscar Sánchez	Observer	Luz y Fuerza del Centro
Ms. Sarah Adams	Organization Committee	EDF Access Programme
Mr. William Cobbett	Organization Committee	Cities Alliance
Ms. Dominique Lallement	Organization Committee	ESMAP-World Bank
Ms. Simone Lawaetz	Organization Committee	USAID

Name	Delegation	Organization
Mr. Jaime Millán	Organization Committee	Inter-American Development Bank
Ms. Connie Symser	Organization Committee	Nexant/Smyser Associates
Ms. Suzanne B. Maia	Rapporteur	Brasil Sustentavel
Mr. Juan Manuel Rojas	Rapporteur	ESMAP-World Bank

Annex 2

Agenda

Meeting the Energy Needs of the Urban Poor: The Case of Electrification

September 12-14, 2005; Salvador da Bahia, Brazil

Day 1, Monday, September 12, 2005

Venue: Mercure Hotel
Salvador da Bahia, Brazil

8:00-9:30 **Registration Continental Breakfast**

9:30-10:00 **Welcoming Remarks (by sponsors)/Introduction to Workshop**

President of COELBA, Ms. Simone Lawaetz, USAID, Mr. Jaime Millan, IDB

10:00-10:30 **The Challenge of Providing Energy Services in Low-income Urban Areas: Lessons from ESMAP**

Speaker: Ms. Dominique Lallement, Manager, ESMAP

10:30-11:30 **Panel: Institutional Aspects I**

This session will explore unique institutional arrangements and mechanisms tried to overcome the challenges faced in electrifying poor urban areas, such as consumers' lack of tenure, poor relations between the utility and the consumer and improving consumer understanding of their responsibilities under the electrification program.

Presentations from the following delegations:

Ahmedabad, India: Mr. Anand Patel, AMC; Mr. Siddharth Oza, AEC; Ms. Bijal Bhatt, SEWA; and Mr. Rajendra Joshi, SAATH

Caracas, Venezuela: Mr. Ivar Pettersson, EDC; Ms. Liliana Aranguren, EDC; Mr. Enrique Perez, Energy Ministry; Mr. Angel Mendez, La Moran and Mr. Marco De la Rosa, AES.

Tblisi, Georgia: Mr. Levan Murusidze, Telasi, and Ms. Nana Janashia, CENN

11:30-12:30 **Discussion: Institutional Aspects I**

12:30-1:30 **Lunch (at the hotel)**

1:30-2:30 **Panel: Institutional Aspects II**

This panel will debate the advantages and disadvantages of various distribution network schemes tried, such as the "public fountain" or master meters, and how poor urban households can transition from these secondary networks to individual metering.

Presentations from the following delegations:

Casablanca, Morocco: Mr. Fouad Djerrari, Lydec; Mr. Mohamed Kadiri, Interior Ministry; and Mr. Mohamed Sajid, President of the City Council.

Medellín, Colombia: Mr. Juan Felipe Betancourt, Empresas Publicas de Medellin; Ms Eva Maria Uribe, Superintendent of Public Services, Colombia; and Dr. Manuel Maiguashca, Ministry of Mines and Energy

Haiti: Mr. Pierre-François Sildor, CIDA, formerly MD of EDH

2:30-3:30 **Discussion: Institutional Aspects II**

3:30-4:00 ***Coffee/Tea Break***

4:00-5:00 **Panel: Technical Aspects**

Panelists will present a variety of technical approaches tried to discourage theft and help households keep their electricity consumption within their budgetary means. Nontechnical losses can also be controlled through significant upgrading of generation and distribution infrastructure, leading to higher service quality and satisfied consumers.

Presentations from the following delegations: Buenos Aires, Argentina: Mr. Christian Gosse, Edenor; Mr. Claudio Damiano, ENRE; and Ms. Marialba Endelli, NGO.

Cape Town, South Africa: Mr. Mac Madingi, PN Energy; Mr. Mzanyaw Ndibongo, SANCO; Mr. Glynn Morris, Agama; and Ms. Wendy Annecke, Energia.

Mbayani, Malawi: Ms. Margaret Matinga, HEDON

Rio de Janeiro, Brazil: Mr. Acacio Barreto, AMPLA

5:00-6:00 **Discussion: Technical Aspects**

7:00 **Dinner Offsite (Hosted by COELBA)**

Day 2, Tuesday, September 13, 2005

Venue: Mercure Hotel
Salvador da Bahia, Brazil

7:00-8:00 **Continental Breakfast**

8:00-9:00 **Panel: Financial Aspects**

This session will investigate the financial implications of an electrification program for the government, utility and the consumer, as well as measures which can be put in place to reduce the costs for both.

Presentation from the following delegations:

Manila, the Philippines: Mr. Ferdinand T. Salvosa and Mr. Jose A Dulin Jr, Meralco; and Mr. Percival Chavez, Presidential Commission for the Urban Poor.

Rio de Janeiro, Brazil: Thierry Lange, Light; Marcos Santana Lacerda, Instituto Terrazul; Fernando Cavalieri, Instituto Perreira Passos; and Adilson de Oliveira, Universidade Federal do Rio de Janeiro.

Dominican Republic: Mr. Danilo Carranza, NRECA, and Ms. Connie Symser, Smyser Associates

9:00-10:00 **Discussion: Financial Aspects**

10:00-10:30 **Coffee/Tea Break**

10:30-11:30 **Panel: Socioeconomic Aspects**

This panel will discuss the social and economic implications of an electrification program, particularly where electricity service is improved together with upgrades in other infrastructure services.

	Presentation from the following delegations: Tirana, Albania: Mr. Toru Konishi, World Bank (invited); Mr. Gjergi Thomai (invited), Ministry of Territorial Adjustment and Tourism; and Mr. Dritan Shutina, Representative, Co-Plan Vietnam: Mr. Mayumi Kato (invited), World Bank Medellín, Colombia: Mr. Ricardo José Arango, EPM New Delhi: Ms. Manpreet Kaur Chadha; INDCARE Cape Town and Buenos Aires: Ms. Wendy Annecke, Energia
11:30-12:30	**Discussion: Socioeconomic Aspects**
12:30-2:00	***Lunch Presentation: Agente COELBA Program***
2:00-5:00	**Agente COELBA Program Site Visits**
7:00	**Reception at the Hotel (Hosted by ESMAP)**

Day 3, Wednesday, September 14, 2005

Venue: Mercure Hotel
Salvador da Bahia, Brazil

8:30-09:00	**Continental Breakfast**
9:00-9: 30	**Organization of Breakout Sessions: Connie Symser**
9:30-11:00	**Breakout Session 1** Chair: William Cobbett Task: Prepare prioritized set of issues on the largest challenges needing resolution in a successful scheme. Organization: Six groups of 10-12 persons, organized by stakeholder perspective (for example, NGOs and CBOs, utilities, government)
11:00-11:30	**Coffee/Tea Break**
11:30-1:00	**Presentations of Issues by Groups**
1:00-2:00	**Lunch (at the hotel)**
2:00-3:00	**Breakout Session 2** Chair: Lucio Monari Task: Develop recommendations for resolving issues identified in Breakout Session 1 Organization: Six groups of two to three delegations, each representing a city, exchange views on how the issues had been (or were to be addressed) by their scheme

3:00-3:30	**Coffee/Tea Break**
3:30-5:00	**Presentations of Recommendations by Groups**
5:00-5:30	**Closing**

List of Technical Reports

Region/Country	Activity/Report Title	Date	Number
	SUB-SAHARAN AFRICA (AFR)		
Africa	Power Trade in Nile Basin Initiative Phase II (CD Only): Part I: Minutes of the High-level Power Experts Meeting; and Part II: Minutes of the First Meeting of the Nile Basin Ministers Responsible for Electricity	04/05	067/05
	Introducing Low-cost Methods in Electricity Distribution Networks	10/06	104/06
Cameroon	Decentralized Rural Electrification Project in Cameroon	01/05	087/05
Chad	Revenue Management Seminar. Oslo, June 25-26, 2003. (CD Only)	06/05	075/05
Côte d'Ivoire	Workshop on Rural Energy and Sustainable Development, January 30-31, 2002. *(Atelier sur l'Energie en régions rurales et le Développement durable 30-31, janvier 2002)*	04/05	068/05
Ethiopia	Phase-Out of Leaded Gasoline in Oil Importing Countries of Sub-Saharan Africa: The Case of Ethiopia - Action Plan	12/03	038/03
	Sub-Saharan Petroleum Products Transportation Corridor: Analysis and Case Studies	03/03	033/03
	Phase-Out of Leaded Gasoline in Sub-Saharan Africa	04/02	028/02
	Energy and Poverty: How can Modern Energy Services Contribute to Poverty Reduction	03/03	032/03
East Africa	Sub-Regional Conference on the Phase-out Leaded Gasoline in East Africa. June 5-7, 2002	11/03	044/03
Ghana	Poverty and Social Impact Analysis of Electricity Tariffs	12/05	088/05
	Women Enterprise Study: Developing a Model for Mainstreaming Gender into Modern Energy Service Delivery	03/06	096/06
	Sector Reform and the Poor: Energy Use and Supply in Ghana	03/06	097/06
Kenya	Field Performance Evaluation of Amorphous Silicon (a-Si) Photovoltaic Systems in Kenya: Methods and Measurement in Support of a Sustainable Commercial Solar Energy Industry	08/00	005/00
	The Kenya Portable Battery Pack Experience: Test Marketing an Alternative for Low-Income Rural Household Electrification	12/01	05/01
Malawi	Rural Energy and Institutional Development	04/05	069/05
Mali	Phase-Out of Leaded Gasoline in Oil Importing Countries of Sub-Saharan Africa: The Case of Mali - Action Plan *(Elimination progressive de l'essence au plomb dans les pays importateurs de pétrole en Afrique subsaharienne Le cas du Mali — Mali Plan d'action)*	12/03	041/03
Mauritania	Phase-Out of Leaded Gasoline in Oil Importing Countries of Sub-Saharan Africa: The Case of Mauritania - Action Plan *(Elimination progressive de l'essence au plomb dans les pays importateurs de pétrole en Afrique subsaharienne Le cas de la Mauritanie – Plan d'action.)*	12/03	040/03

Region/Country	Activity/Report Title	Date	Number
Nigeria	Phase-Out of Leaded Gasoline in Nigeria	11/02	029/02
	Nigerian LP Gas Sector Improvement Study	03/04	056/04
	Taxation and State Participation in Nigeria's Oil and Gas Sector	08/04	057/04
Regional	Second Steering Committee: The Road Ahead. Clean Air Initiative In Sub-Saharan African Cities. Paris, March 13-14, 2003	12/03	045/03
	Lead Elimination from Gasoline in Sub-Saharan Africa. Sub-regional Conference of the West-Africa group. Dakar, Senegal March 26-27, 2002 *(Deuxième comité directeur : La route à suivre - L'initiative sur l'assainissement de l'air. Paris, le 13-14 mars 2003)*	12/03	046/03
	1998-2002 Progress Report. The World Bank Clean Air Initiative in Sub-Saharan African Cities. Working Paper #10 (Clean Air Initiative/ESMAP)	02/02	048/04
	Landfill Gas Capture Opportunity in Sub Saharan Africa	06/05	074/05
	The Evolution of Enterprise Reform in Africa: From State-owned Enterprises to Private Participation in Infrastructure-and Back?	11/05	084/05
Senegal	Regional Conference on the Phase-Out of Leaded Gasoline in Sub-Saharan Africa *(Elimination du plomb dans l'essence en Afrique subsaharienne Conference sous regionales du Groupe Afrique de l'Ouest Dakar, Sénégal. March 26-27, 2002.)*	03/02	022/02
	Alleviating Fuel Adulteration Practices in the Downstream Oil Sector in Senegal	12/03	046/03
South Africa	South Africa Workshop: People's Power Workshop.	09/05	079/05
Swaziland	Solar Electrification Program 2001 2010: Phase 1: 2001 2002 (Solar Energy in the Pilot Area)	12/04	064/04
Tanzania	Mini Hydropower Development Case Studies on the Malagarasi, Muhuwesi, and Kikuletwa Rivers Volumes I, II, and III	12/01	019/01
	Phase-Out of Leaded Gasoline in Oil Importing Countries of Sub-Saharan Africa: The Case of Tanzania - Action Plan	04/02	024/02
Uganda	Report on the Uganda Power Sector Reform and Regulation Strategy Workshop	12/03	039/03
		08/00	004/00
	WEST AFRICA (AFR)		
Regional	Market Development	12/01	017/01
	EAST ASIA AND PACIFIC (EAP)		
Cambodia	Efficiency Improvement for Commercialization of the Power Sector	10/02	031/02
	TA For Capacity Building of the Electricity Authority	09/05	076/05
China	Assessing Markets for Renewable Energy in Rural Areas of Northwestern China	08/00	003/00
	Technology Assessment of Clean Coal Technologies for China Volume I-Electric Power Production	05/01	011/01
	Technology Assessment of Clean Coal Technologies for China Volume II-Environmental and Energy Efficiency Improvements for Non-power Uses of Coal	05/01	011/01
	Technology Assessment of Clean Coal Technologies for China Volume III-Environmental Compliance in the Energy Sector: Methodological Approach and Least-Cost Strategies	12/01	011/01
	Policy Advice on Implementation of Clean Coal Technology	09/06	104/06
	Scoping Study for Voluntary Green Electricity Schemes in Beijing and Shanghai	09/06	105/06
Papua New Guinea	Energy Sector and Rural Electrification Background Note	03/06	102/06
Philippines	Rural Electrification Regulation Framework. (CD Only)	10/05	080/05
Thailand	DSM in Thailand: A Case Study	10/00	008/00
	Development of a Regional Power Market in the Greater Mekong Sub-Region (GMS)	12/01	015/01
	Greater Mekong Sub-region Options for the Structure of the GMS Power Trade Market A First Overview of Issues and Possible Options	12/06	108/06

Region/Country	Activity/Report Title	Date	Number
Vietnam	Options for Renewable Energy in Vietnam	07/00	001/00
	Renewable Energy Action Plan	03/02	021/02
	Vietnam's Petroleum Sector: Technical Assistance for the Revision of the Existing Legal and Regulatory Framework	03/04	053/04
	Vietnam Policy Dialogue Seminar and New Mining Code	03/06	098/06
	SOUTH ASIA (SAS)		
Bangladesh	Workshop on Bangladesh Power Sector Reform	12/01	018/01
	Integrating Gender in Energy Provision: The Case of Bangladesh	04/04	054/04
	Opportunities for Women in Renewable Energy Technology Use In Bangladesh, Phase I	04/04	055/04
	EUROPE AND CENTRAL ASIA (ECA)		
Azerbaijan	Natural Gas Sector Re-structuring and Regulatory Reform	03/06	099/06
Macedonia	Elements of Energy and Environment Strategy in Macedonia	03/06	100/06
Poland	Poland (URE): Assistance for the Implementation of the New Tariff Regulatory System: Volume I, Economic Report, Volume II, Legal Report	03/06	101/06
Russia	Russia Pipeline Oil Spill Study	03/03	034/03
Uzbekistan	Energy Efficiency in Urban Water Utilities in Central Asia	10/05	082/05
	MIDDLE EASTERN AND NORTH AFRICA REGION (MENA)		
Turkey	Gas Sector Strategy	05/07	114/07
Regional	Roundtable on Opportunities and Challenges in the Water, Sanitation And Power Sectors in the Middle East and North Africa Region. Summary Proceedings, May 26-28, 2003. Beit Mary, Lebanon. (CD)	02/04	049/04
Morocco	Amélioration de d´Efficacité Energie: Environnement de la Zone Industrielle de Sidi Bernoussi, Casablanca	12/05	085/05
	LATIN AMERICA AND THE CARIBBEAN REGION (LCR)		
Brazil	Background Study for a National Rural Electrification Strategy: Aiming for Universal Access	03/05	066/05
	How do Peri-Urban Poor Meet their Energy Needs: A Case Study of Caju Shantytown, Rio de Janeiro	02/06	094/06
	Integration Strategy for the Southern Cone Gas Networks	05/07	113/07
Bolivia	Country Program Phase II: Rural Energy and Energy Efficiency Report on Operational Activities	05/05	072/05
	Bolivia: National Biomass Program. Report on Operational Activities	05/07	115/07
Chile	Desafíos de la Electrificación Rural	10/05	082/05
Colombia	Desarrollo Económico Reciente en Infraestructura: Balanceando las necesidades sociales y productivas de la infraestructura	03/07	325/05
Ecuador	Programa de Entrenamiento a Representantes de Nacionalidades Amazónicas en Temas Hidrocarburíferos	08/02	025/02
	Stimulating the Picohydropower Market for Low-Income Households in Ecuador	12/05	090/05
Guatemala	Evaluation of Improved Stove Programs: Final Report of Project Case Studies	12/04	060/04
Haiti	Strategy to Alleviate the Pressure of Fuel Demand on National Woodfuel Resources (English) *(Stratégie pour l'allègement de la Pression sur les Ressources Ligneuses Nationales par la Demande en Combustibles)*	04/07	112/07
Honduras	Remote Energy Systems and Rural Connectivity: Technical Assistance to the Aldeas Solares Program of Honduras	12/05	092/05

Region/Country	Activity/Report Title	Date	Number
Mexico	Energy Policies and the Mexican Economy	01/04	047/04
	Technical Assistance for Long-Term Program for Renewable Energy Development	02/06	093/06
Nicaragua	Aid-Memoir from the Rural Electrification Workshop (Spanish only)	03/03	030/04
	Sustainable Charcoal Production in the Chinandega Region	04/05	071/05
Perú	Extending the Use of Natural Gas to Inland Perú (Spanish/English)	04/06	103/06
	Solar-diesel Hybrid Options for the Peruvian Amazon Lessons Learned from Padre Cocha	04/07	111/07
Regional	Regional Electricity Markets Interconnections - Phase I Identification of Issues for the Development of Regional Power Markets in South America	12/01	016/01
	Regional Electricity Markets Interconnections - Phase II Proposals to Facilitate Increased Energy Exchanges in South America	04/02	016/01
	Population, Energy and Environment Program (PEA) Comparative Analysis on the Distribution of Oil Rents (English and Spanish)	02/02	020/02
	Estudio Comparativo sobre la Distribución de la Renta Petrolera Estudio de Casos: Bolivia, Colombia, Ecuador y Perú	03/02	023/02
	Latin American and Caribbean Refinery Sector Development Report - Volumes I and II	08/02	026/02
	The Population, Energy and Environmental Program (EAP) (English and Spanish)	08/02	027/02
	Bank Experience in Non-energy Projects with Rural Electrification Components: A Review of Integration Issues in LCR	02/04	052/04
	Supporting Gender and Sustainable Energy Initiatives in Central America	12/04	061/04
	Energy from Landfill Gas for the LCR Region: Best Practice and Social Issues (CD Only)	01/05	065/05
	Study on Investment and Private Sector Participation in Power Distribution in Latin America and the Caribbean Region	12/05	089/05
	Strengthening Energy Security in Uruguay	05/07	116/07
	GLOBAL		
	Impact of Power Sector Reform on the Poor: A Review of Issues and the Literature	07/00	002/00
	Best Practices for Sustainable Development of Micro Hydro Power in Developing Countries	08/00	006/00
	Mini-Grid Design Manual	09/00	007/00
	Photovoltaic Applications in Rural Areas of the Developing World	11/00	009/00
	Subsidies and Sustainable Rural Energy Services: Can we Create Incentives Without Distorting Markets?	12/00	010/00
	Sustainable Woodfuel Supplies from the Dry Tropical Woodlands	06/01	013/01
	Key Factors for Private Sector Investment in Power Distribution	08/01	014/01
	Cross-Border Oil and Gas Pipelines: Problems and Prospects	06/03	035/03
	Monitoring and Evaluation in Rural Electrification Projects: A Demand-Oriented Approach	07/03	037/03
	Household Energy Use in Developing Countries: A Multicountry Study	10/03	042/03
	Knowledge Exchange: Online Consultation and Project Profile from South Asia Practitioners Workshop. Colombo, Sri Lanka, June 2-4, 2003	12/03	043/03
	Energy & Environmental Health: A Literature Review and Recommendations	03/04	050/04

Region/Country	Activity/Report Title	Date	Number
	Petroleum Revenue Management Workshop	03/04	051/04
	Operating Utility DSM Programs in a Restructuring Electricity Sector	12/05	058/04
	Evaluation of ESMAP Regional Power Trade Portfolio (TAG Report)	12/04	059/04
	Gender in Sustainable Energy Regional Workshop Series: Mesoamerican Network on Gender in Sustainable Energy (GENES) Winrock and ESMAP	12/04	062/04
	Women in Mining Voices for a Change Conference (CD Only)	12/04	063/04
	Renewable Energy Potential in Selected Countries: Volume I: North Africa, Central Europe, and the Former Soviet Union, Volume II: Latin America	04/05	070/05
	Renewable Energy Toolkit Needs Assessment	08/05	077/05
	Portable Solar Photovoltaic Lanterns: Performance and Certification Specification and Type Approval	08/05	078/05
	Crude Oil Prices Differentials and Differences in Oil Qualities: A Statistical Analysis	10/05	081/05
	Operating Utility DSM Programs in a Restructuring Electricity Sector	12/05	086/05
	Sector Reform and the Poor: Energy Use and Supply in Four Countries: Botswana, Ghana, Honduras and Senegal	03/06	095/06
	Plan d'Action National Energie pour la Réduction de la Pauvreté	06/07	117/07
	Meeting the Energy Needs of the Urban Poor: Lessons from Electrification Practitioners	06/07	118/07

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