USAID

Innovative Approaches to Slum Electrification

Bureau for Economic Growth,
Agriculture and Trade
U.S. Agency for International Development
Washington, D.C. 20523

DECEMBER 2004

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Acknowledgements

This report was prepared by Advanced Engineering Associates International (AEAI) under the Energy IQC, a contract for the Office of Energy and Information Technology, US Agency for International Development (Work Order No. 168, Contract No. LAG-I-02-98-00004-00).

Connie Smyser served as project manager and principal author. The country case studies were prepared by Wendy Annecke (South Africa), Suzanne Maia (Brazil), Mary Louise Vitelli (Philippines), and Jim Sullivan (India). Wendy Annecke, a DevTech gender and energy expert, went on all the site visits except Manila and provided insights into the gender implications of slum electrification.

The authors wish to thank the entire USAID team, including Simone Lawaetz (project leader), Pam Baldinger, Omar Hopkins, and Jas Singh of the Energy Team, and Macol Stewart, Shirley Toth, and Debra Banks of the Office of Women in Development for their persistence in delving into the issues surrounding slum electrification. Special thanks go to Simone, Pam, and Omar for their accompaniment of the AEAI team members on the site visits that took us to some of the most interesting slums of the world, some electrified and some not.

Thanks also go to Teddy Regino for his energy, ability to set up meetings at the drop of a hat, and expertise in navigating the Manila slums; K.K. Bajaj for an excellent set of interviews and slum visits in Ahmedabad; Maletsatsi Wotini for her careful preparation of site visits to the townships of Cape Town and for setting up an itinerary that was eye-opening and informative; and Dave Sood of AEAI for his assistance in preparing the way for the India and Manila case studies.

Site visits would have been impossible without the strong support and involvement of the key project participants in each city visited. The authors would especially like to thank the electricity company counterparts: Ed Bernal/ MERALCO (Manila), Rosimeri Beninca and Glaucio Vidal/ PRONAI (Rio de Janeiro), Matt Mdingi/ PN Energy (Cape Town), Ana Christina Mascarenhas of Ibenbrasil/ COELBA (Salvador), and Murli Rangnathan/ AEC (Ahmedabad).

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INTRODUCTION

Development efforts of the past several decades have focused almost exclusively on the energy needs of the rural poor while largely ignoring those of extremely poor households in urban slums.[1] About 40% of the world's poor living in urban areas lack access to modern energy services that could improve living conditions and expand economic opportunities. Rapidly growing slums have overwhelmed most municipalities in developing countries, and many have ceased trying to address the problem of providing legal and safe connections to these areas.

Nevertheless, even within the poorest slums, electricity is almost universally available.[2] A closer look reveals that this electricity is usually stolen (largely by third-parties), which results in poor quality service provided at very high prices and extremely dangerous conditions. Faulty (and probably illegal) wiring or use of flammable energy alternatives when the power is cut off can cause devastating fires, destroying homes and displacing, killing, or injuring tens of thousands of people.

TRADITIONAL APPROACHES DO NOT WORK

The traditional approach to electricity service for poor consumers involves three stakeholders: the government, the electricity company, and the low-income resident.

In slum communities, this approach fails on all sides due to the social and economic conditions and governance structures unique to slum areas. In slums, most transactions are informal and, therefore, not regulated or controlled by the government. Because governments may be reluctant to recognize the illegal settlements and promote their permanent establishment, they do not enforce rules that would normally govern the development of a legally settled or subdivided area. Most services normally available to legally constituted and occupied areas are not legally available in slums. Informal systems grow in response to essential needs, such as water and electricity, and the isolated and informal nature of slums makes it possible for criminals to provide illegal services.

Electricity suppliers have low revenue expectations relative to the high costs of service provision in slum areas. Revenues are typically low and often sporadic, even without theft, because poor households cannot afford to purchase large amounts of energy even at subsidized prices. Electricity companies also face very challenging physical conditions and tenure issues in slums that are unlike those encountered in formal, legal settlements. Given that many slums consist of squatters who do not have land tenure, the electricity company faces difficult legal issues in providing service, including the lack of a means to obtain right-of-way for distribution system equipment. The very narrow streets and alleys typical in slums greatly impede traditional

1 For the purposes of this project, the term "slum" will be used interchangeably with the term "informal urban settlements." A value judgment is not implied by using the word "slum," which can be either legally constituted urban areas or spontaneous communities of squatters that lack a legal basis for their occupancy.

2 Even where electricity is available, evidence shows that 15-30% of residents do not have any connection to electricity, legal or illegal.

approaches to electrification and raise the cost of serving the areas. Physical safety of personnel and equipment, liability and compensation issues, and standardization of installation packages present additional challenges.

PROMISING APPROACHES TO LEGAL SLUM ELECTRIFICATION

A few electricity companies have forged new approaches in partnership with national and local governments, donors, nongovernmental organizations (NGOs), and the communities themselves to show that there are effective ways to achieve legal and safe electrification with generally low costs and improved service. As a first step toward finding effective solutions to the problems of providing electricity to the urban poor, the United States Agency for International Development (USAID) launched a study in May 2003 of innovative approaches to slum electrification. A literature review enabled identification of potential cases for in-depth study of promising program approaches and lessons learned. Out of 12 potential cases, five programs were selected that represented creative and distinct approaches to promoting legal access and addressing theft of electricity in urban slums. Site visits were conducted to each community during the last quarter of 2003.

The five slum electrification programs[3] presented in this report are:

- ***Manila, Philippines*** – MERALCO's Depressed Area Electrification Program (DAEP), in which communities were electrified by bringing distribution lines to the perimeter of slums; individual meters were placed on the meter walls; households were allowed to install their own wiring to reach their homes; and financing was offered for internal wiring;
- ***Cape Town, South Africa*** – PN Energy's Khayelitsha electrification project, in which a community-based distribution company was established to dramatically improve the quality and reliability of service; prepayment meters were installed to assist households to stay within their budgetary means; subsidy and finance for the connection fee were provided; and "ready-boards" eliminated the need for internal wiring;
- ***Rio de Janeiro, Brazil*** – Brazil LIGHT's Program for Normalization of Informal Areas (PRONAI), where community agents intermediated for the electricity company; community events were used to increase acceptance of the program; and debt relief and subsidized connection fees made it easier for households to enter the program;
- ***Salvador, Brazil*** – COELBA's Community Agent Program (COELBA), where the electricity company worked through an NGO to hire local agents who would interface on their behalf with the community. The community agents helped identify and resolve problems as well as provide education on energy conservation practices; the electric company replaced inefficient lighting and refrigerator seals and unsafe and inefficient internal wiring in homes, provided subsidies and financial assistance in connection fees, and established convenient locations for bill payment outlets; and

[3] The programs will be referred to in the report by the following acronyms: DAEP, PN Energy, PRONAI, COELBA, and AEC.

- ***Ahmedabad, India*** – Ahmedabad Electric Company's (AEC) Slum Electrification Program linked with ongoing slum upgrading efforts in partnership with the NGOs, local government and residents to design and implement the program, provided initial financing for the subsidized connection fee, and hired local residents to read meters.

RESULTS ACHIEVED IN CASE STUDY PROJECTS

The results are in large part based on qualitative and other information obtained during the visits, as reliable, quantitative data consistent across all the programs was not readily available. Efforts to obtain quantitative data focused on the program's costs of connection to the utility and the consumer, targeted and actual number of households electrified, and the level of subsidy to the consumer through "lifeline" tariffs[4] and reduced or waived connection fees or meter deposits. Figure S-1 presents a comparison of target versus the number of household electrified in each program.

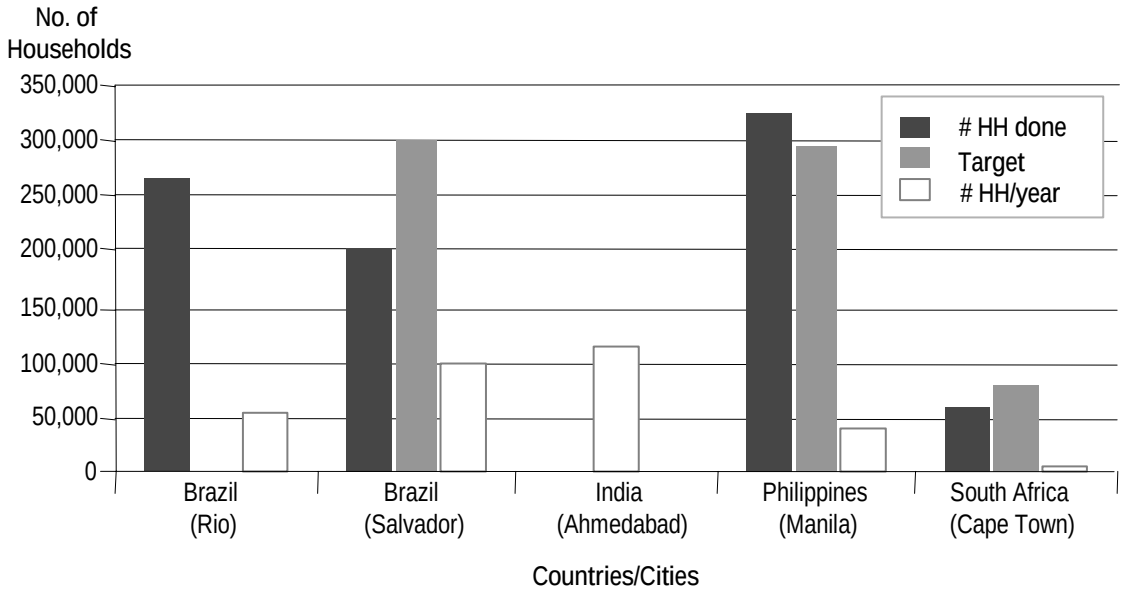

Figure S-1 Comparison of Targets vs. Number of Households Electrified

Four of the programs (Ahmedabad had just been launched) completed (electrified or regularized) between 750,000 and 1,000,000 households in an average of 7 years at an average cost of less than $250 per household. The range of costs per household for each program differs by almost a factor of four, with the Ahmedabad program reporting the lowest costs per household (not normalized for purchasing power parity) at $114, while Cape Town reported costs of more than $400 per household.[5]

The team received mixed messages about company satisfaction with slum electrification programs, even within a particular company. Apart from COELBA, the CEOs emphasized that

[4] The term "lifeline" tariff or rate refers in general to providing a limited (basic subsistence) amount of electricity at a lower tariff.

[5] Note that there are probably enough differences in the items included in the companies' cost calculations that these numbers should only be considered as illustrative.

the programs suffered from low revenues and high program costs for specialized technology, and intensive operation and maintenance activities and low revenues, and consequently they might breakeven at best. All of the programs reported very substantial reductions in their non-technical losses (i.e., on average, about a two-thirds reduction) directly attributable to program efforts although the two oldest cases had lost some of their initial gains (modest recidivism in the case of MERALCO and very significant in the case of PRONAI).

The site visits revealed enthusiastic support for, and satisfaction with, the electrification program among residents and the communities on the whole. This was especially true for women who generally carry most of the burden for providing alternative energy sources such as wood, kerosene, or charcoal, when there is no electricity. Most of the regularized or newly electrified slum consumers reported they were paying substantially less for the legal service than they had for the illegal service (based on monthly electricity bills).

A primary concern for all of the programs was the degree to which the connection fees[6] for the household should be subsidized. All programs had subsidized the fee (usually via cross subsidies from other electricity consumers) but in differing amounts. The Ahmedabad program benefited from a study on the willingness to pay at different fee levels per connection. This study identified the fee levels where participation in the program would decline rapidly (at about 50% of the connection cost). Most programs required some payment by the recipient household for the connection costs, arguing that the improvement would be more highly valued if the consumer had to make an investment. But the programs also recognized that the large up-front payment can be quite difficult for very poor households to manage. These households were able to manage the subsidized connection fee best when the electricity company or the NGO intermediary made it possible to pay over time.

National and local governments in all cases were very supportive of the continuing efforts to electrify slums and had assisted to some degree with land tenure issues. Regulators were relatively unaware of the slum efforts but generally were receptive to the programs as long as there were no significant impacts on other ratepayers. Regulators also seemed unaware that slum dwellers lacked access to lifeline tariffs (since they did not have legal connections and, based on fee/kwh, paid higher costs for illegal service). Illegal service providers provided little resistance to the electricity companies taking over their market but were quick to re-emerge when the programs faced recidivism and failed to adequately support community policing.

The study found that although domestic energy users are primarily women, men generally fill the roles of senior management, engineers, and technicians in electricity companies and government energy departments. Most of the slum electrification programs failed to explicitly incorporate a gender element in their program design. One notable exception was AEC, which used a women's organization, SEWA, as one of its intermediaries. SEWA campaigned for houses to be put in women's names so that they could not be evicted. In South Africa, PN Energy did not employ agents or fund NGOs directly, but 80% of the prepayment vendors were women. COELBA used women as their agents in the community as women were perceived to communicate more easily than men, be more familiar with the neighborhood, and pose little threat to the consumers.

[6] Typical costs for connecting a new customer include extending the distribution line to the household and the cost of the meter drop. Companies (and their regulators) in different countries differ in their treatment of these costs.

A key question is whether the slum electrification approaches studied offer solutions that are sustainable and replicable. This study encountered five programs at different stages of implementation (but all occurring within the window of 1990 to the present). Two programs (MERALCO and PRONAI) had ended after achieving significant electrification in slums but, in anticipation of restarting them, were being revamped to overcome problems (i.e., substantial recidivism in theft of power). Two of the three ongoing programs had good prospects for continuation. Only the ongoing and relatively recent COELBA project was being replicated elsewhere in the company's service territory.

LESSONS LEARNED ACROSS CASE STUDIES

Although the programs varied in their approach to slum electrification, some common themes contributing to the overall success of the program can be distilled. These are discussed below:

Engaging all stakeholders: Successful programs met the needs of the full range of stakeholders involved in slum electrification – governments, electricity companies, communities, service recipients, and intermediaries. For governments, these programs offered an opportunity to meet targets for improving the lives of the urban poor. Communities saw the promise of improvement in economic and social conditions. The electricity company aimed to reduce non-technical losses and increase revenues. Consumers valued the service enough to pay for connection fees and community and nongovernmental organizations believed that assisting with electricity programs would also benefit their efforts in other areas.

Designing for Slum Conditions: The challenge of poor physical starting conditions, including narrow alleys, poor housing materials and unsafe wiring, had to be planned for at the beginning of the project. Electricity programs should also plan for different loads at different stages of the program. With better quality electricity service, appliance use may increase over time.

Partnering with Intermediaries: All of the programs utilized intermediaries of different types to help the electricity company and other program stakeholders better understand the starting conditions they would encounter within the communities, the barriers to traditional service delivery that had soured the environment for their services in the past, and most importantly to assist them in putting together a program that would work under the extant conditions. The particular form that the intermediary interface took was quite different in the programs studied, including either community agents (COELBA), women's NGOs (AEC), community associations (mandated by MERALCO) or community distribution companies (PN Energy). In several cases, the question arose as to whether the intermediary could be eliminated after acceptance of the program and the electricity company by the community. COELBA briefly tried to penetrate new slum communities without their local partners but stopped after failing to achieve the same results. AEC has recently decided to roll-out its slum electrification program without the use of intermediaries. It is too early yet to determine the success of these efforts.

Competing With Illegal Service Providers and Controlling Theft: One of the fundamental reasons for theft of power is the relative ease of obtaining illegal access compared with the barriers to obtaining legal connections for slum dwellers. Each electricity company in the studied cases recognized that it must compete with the entrenched illegal access – in terms of price; ease of payment; and quality, reliability, and accessibility of service. Each company had to devise

specific program components and technologies to overcome the entrenchment of theft of electricity.

Making It Easier to Pay for Electricity: All of the electricity companies redesigned their service delivery to fit the needs of the poor communities they were targeting. A common element was community-based customer service centers for easier payment and complaint resolution. Flexibility in payment options and criteria for cut-off may be necessary given the uncertain income streams of slum residents. All programs also subsidized and financed connection fees.

Lowering Costs to the Electricity Company: All electricity companies considered measures to reduce the costs of connecting and serving slum residents. For example, PN Energy lowered costs by installing highly visible standardized meter boxes, using a ready board for internal connection, providing for prepayment codes, and placing the theft-proof boxes on utility poles serving 6 to 10 houses. MERALCO located all individual meters on a meter wall at the edge of the slum, thereby reducing the cost of extension of distribution lines into the community.

Government Policies Supporting Electrification: A common thread in all cases was government targets for improving the living standards of the urban poor, as well as determining the regulatory treatment of non-technical losses.

Recognizing Women's Roles in Electrification: The increase in women-headed or women-maintained households, noticeable in the COELBA, AEC, and PN Energy case studies, means that it is increasingly important to adopt a gender perspective to household electricity supply and demand to ensure that the utility is meeting the requirements of the primary users.

RECOMMENDATIONS

The following recommendations are based on findings from the literature review and the five country case studies and are organized according to the primary stakeholders.

Electricity Companies and Partners should:

- Recognize the gender, cultural, and economic differences for this class of customer and devise solutions based on these (e.g., use trusted intermediaries and work with the community's informal government processes; focus education campaigns on women's use of electricity in the home);
- Provide flexibility in payment options for connection fees, reconnection fees/fines, and electricity charges;
- Consider competition from illegal service providers in the program design and implementation;
- Maintain vigilance in disconnection of illegal connections and continue involvement in the community after initial electrification is accomplished to avoid recidivism.
- Where appropriate, work with intermediaries that are known and respected within the community. They must be prepared to:

  - Communicate particular community needs and issues, including gendered decision making with respect to energy use, to government and the electricity company during program design;
  - Participate in training by the electricity company and/or government to upgrade skills and learn functions assigned within the scheme as well as be prepared to train other community leaders; and
  - Provide constructive feedback periodically to other stakeholders.
- Involve slum communities, as they are crucial to the success of any scheme. Key activities for communities include:
  - Support the effort;
  - Set up activities for communication among the key stakeholders to help in understanding community needs and issues and how the electrification scheme will work;
  - Set up a self-policing function; and
  - Continue to work with stakeholders to keep the scheme working after implementation.
- Recognize and build in consumer responsibilities. Educational programs should communicate individual consumer responsibilities, such as:
  - Be prepared to pay (possibly in advance) for service;
  - Participate in community activities to prepare for electrification and assist in policing of illegal activities threatening the scheme;
  - Learn to use electricity within budgetary limits, including how to monitor usage and reduce consumption; and
  - Utilize consumer information and complaint processes.

National and Local Governments should:

- Set clear goals and policy directions, work through the electricity regulator and other key authorities to implement those policies;
- Provide an enabling environment, particularly regarding land tenure and right-of-way;
- Allow experiments in slum services and tariff/payment options, such as lifeline tariffs; and
- Coordinate related government activities, particularly slum upgrading efforts (which often exclude provision of electricity).

Donors and Local and International Organizations should:

- Add an electrification component to proposed slum upgrading schemes, either in parallel or as a follow-on to the basic upgrades;
- Test new approaches to slum electrification, including piloting new financing mechanisms and accommodating gender differentiation in service delivery;

- Establish a platform for sharing information, such as a website portal including links with existing relevant websites, on efforts to electrify slums amongst donors, governments, electricity companies, NGOs, and other stakeholders;
- Conduct further research to document the social and economic benefits of slum electrification; and
- Undertake a rigorous quantitative analysis of the electricity company's costs and benefits of implementing a slum electrification program to determine the financial implications of these programs for governments and utilities.

An estimated 40 percent of the population of 300 cities in very poor countries throughout the world lives in slums.[7] Increasing in-migration from rural areas into cities in developing countries has created these very dense informal settlements. Although it is nearly impossible to estimate accurately the size of slum populations because of their dynamic and transient nature, it is estimated that:

- Close to 1 billion people are currently living in slums in cities throughout the developing world;
- Populations in slums are growing at 2-5% a year on average, depending on the region;
- The growth rate is five times higher in the least developed region (Africa) compared with the most highly developed; and
- Almost all of the world's population growth for the foreseeable future will occur in the cities and towns of Africa, Asia, and Latin America.[8]

Such rampant urban growth, particularly in informal slum areas, has outpaced most developing country governments' abilities to provide traditional public services (e.g., water, sanitation, roads, and other public services). Globally, urban populations in developing countries are beginning to outnumber rural populations (mirroring migration and development patterns in industrialized countries), and in some regions the vast majority of a country's population now live in or on the periphery of cities in informal settlements. Despite the benefits of being nearer to potential employment and social services, these community areas are plagued with poor health, risky environments, and crime. Where they exist, slum-upgrading efforts tend to give improvements in water supply and sanitation a higher priority than electricity, as there are alternatives (i.e., theft) or substitutes for electricity even if the service is poor and inadequate for the most desired uses.

Being easy to steal, electricity is almost universally available in slums. Slum dwellers are willing to risk the associated physical danger and possible prosecution and steal power or enter into agreements with illegal service providers and pay more than they would in legal transactions to obtain electricity for essential services and improved quality of life. Clearly, slum residents highly value electricity for the benefits it brings their lives and typically pay for it at a higher per unit cost than do people in formal and legally served areas.

Recent reforms of electricity sectors have corporatized or privatized electric utilities with the expectation that they will then operate on a commercial basis and charge enough for their services to cover costs and make a return on their investment. Yet, governments expect, and

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8 United Nations Habitat, Human Settlements Programme, The Challenge of Slums, Global Report on Human Settlements, 2003.

sometimes require, that they also provide service to poor urban residents who consume low levels of electricity and have limited abilities to pay. Utilities have found this to be a difficult task, particularly where a culture of nonpayment is deeply engrained and the numbers to be served are growing faster than the population at large.

Nonetheless, the so-called "non-technical" losses (theft) associated with slum settlements can represent a loss of 3-5% of system-wide potential revenues and are therefore a significant concern to electric companies, regulators, and other ratepayers. Even where regulators in principle allow for such losses to be covered by other ratepayers through cross-subsidization, pressure from regulators and the other ratepayers to minimize tariff increases often results in reduced return on investment and service.

The very narrow streets and alleys that are typical in slums and the lack of a means to obtain right-of-way for distribution system equipment and infrastructure (because these areas are generally illegally settled) greatly impedes traditional electricity company approaches to electrification and raises the cost of serving the areas. Furthermore, there may be physical risks for utility staff, particularly those seeking payment, in entering slum areas. Combined with the low expected return if service were formalized, these risks can limit the electricity company's interest in undertaking slum regularization[9] and new electrification efforts.

Slum electrification is also impeded by residents' inability to pay for the high connection costs. Poor households are not able, or accustomed, to making large up-front payments and saving for such payments is particularly difficult. Competing illegal service providers often succeed where utilities fail because they are familiar with slum communities and can package their services in ways that poor households find more affordable, such as a monthly charge per appliance or flexible payment terms for connection and reconnection. As they do not have to pay the cost of production and transmission of the electricity to the location where they pick up the "distribution" activity, they have much greater flexibility in their terms of payment.

Some might argue that this makeshift arrangement is a relatively painless way for society to subsidize the energy needs of the urban poor, but they ignore:

- The very limited and poor quality of the power received;
- The high per unit cost to the very poor;
- The extreme dangers that are posed by illegal and makeshift connections;
- Degradation of the electricity distribution system caused by unforeseen loads on undersized equipment;
- The lack of transparency of the "subsidy" paid for by other ratepayers, the utilities' shareholders, and society at large to cover non-technical losses; and
- The inefficient price "signal" illegal and informal connections provide to the poor consumer about their power consumption.

[9] The term "regularization" is used here to cover the situation when illegal electrification is reconverted to a legal situation through the slum electrification program. Electrification is a catch-all term incorporating both regularization and initial electric connection for slum customers.

In sum, poor slum communities are being expensively and poorly served while electricity companies are losing revenues that should be accruing to them and legal consumers are cross-subsidizing illegal activity.

1.1 A CLOSER LOOK AT THE PROBLEM

Traditional approaches to electricity service delivery to residential communities involve three key stakeholders: the government, the electricity company, and low-income residents (see Figure 1-1). The role of government is to safeguard public health and safety, which in turn implies overseeing the safety, quality, and cost of supply of electricity and authorizing tariffs (possibly allowing for cross-subsidies for low income consumers.) Land ownership and tenure falls under government's purview and in the case of distribution infrastructure, encompasses required right of way for utility infrastructure, such as distribution lines and transformers. In the case of consumers, government plays a strong role in registering property ownership, regulating the sales of property, prescribing minimum construction (safety) standards, and providing permits to construct and occupy a residence under those standards.

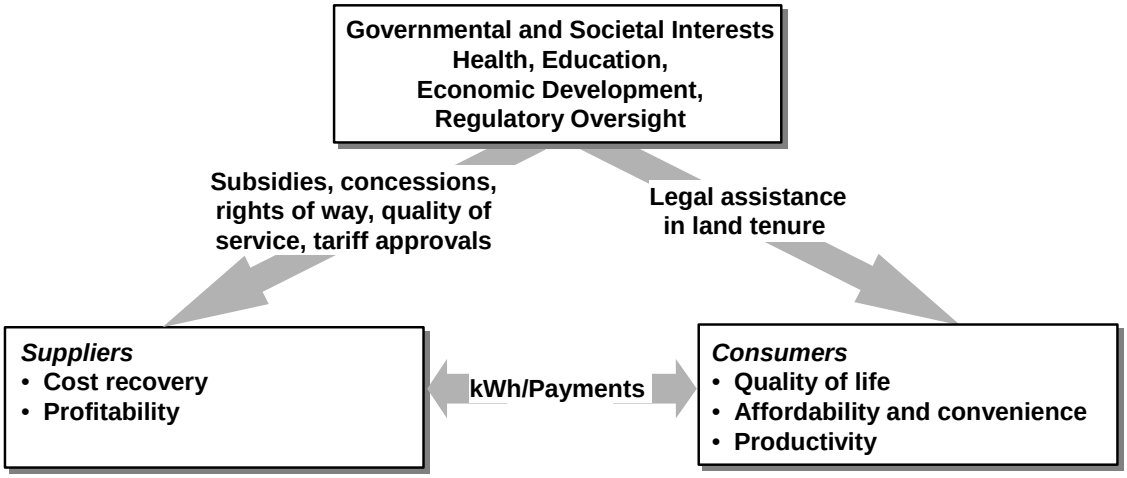

Figure 1-1 Traditional Approaches to Electricity Service to Households

The roles of electricity providers generally are limited to providing the infrastructure for supplying electricity, billing and collecting payments for the service, and maintaining the quality of the service provided, in accordance with the rules that govern electricity supply. Consumers traditionally have the expectation that when they flip the switch, the uses that electricity enables are automatically, reliably, and safely provided as long as they pay their bills.

Traditional approaches to slum electrification have broken down and are not working in the vast majority of the world's slums (Figure 2). In slum communities, most transactions are informal and, therefore, are not regulated or controlled by the government. As the areas do not officially exist, slum residents are left voiceless, unprotected, and without legal standing for property occupied.[10] Informal systems grow in response to essential needs, such as water and electricity,

[10] There is a strong sense of informal "ownership" in slums based on the fact that almost everyone pays someone for the right to build or occupy a structure. However, this sense only extends so far, as there is also a strong certainty that conditions could be changed and right to occupy could be swiftly taken away. The result is a reluctance to "invest" in permanent

and the isolated and informal nature of slums makes it possible for criminals to provide illegal services.

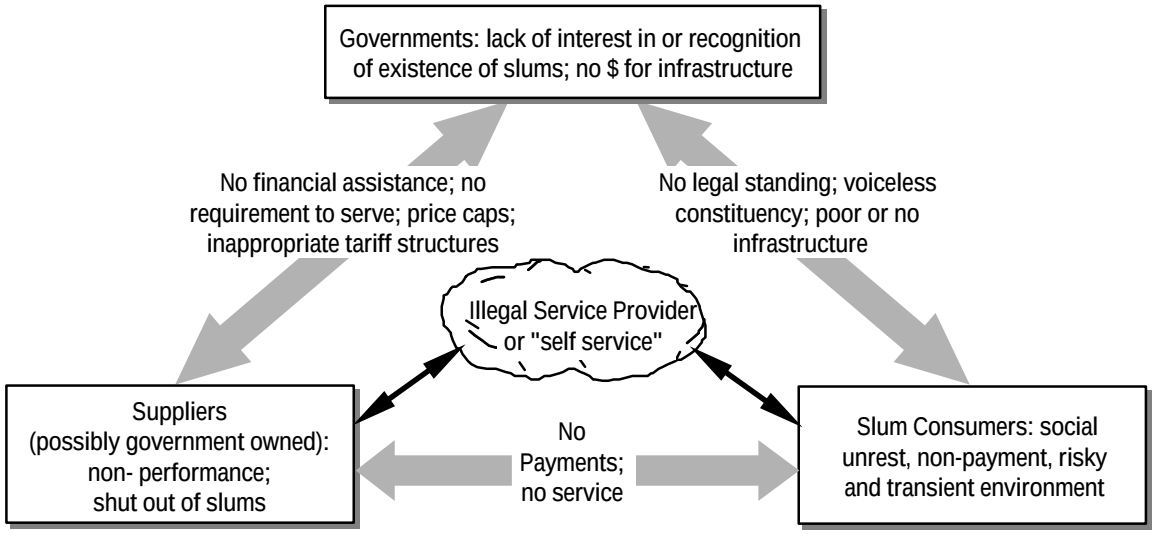

Figure 1-2 Why Traditional Approaches Do Not Work in Slums

Slum consumers generally comprise residential users and small businesses, often based in the home. Other electrification needs in slums include street lighting and power for communal infrastructure. Unemployment, under-employment, unstable employment, or seasonal jobs are the norm, leaving residents with minimal and often unreliable income streams and making it hard to make a monthly payment, particularly for a service that one pays for after consumption occurs.

This leaves electricity companies having to make up the losses from non-payment or theft somewhere else in their operations or from other consumers. Hostility from illegal service providers and other criminals, the ease of reconnection, as well as the difficult physical conditions in slums, provides little incentive for reducing theft. Innovative, or non-traditional, approaches are needed to break the cycle and reinstate the affordable electricity service that all consumers have come to expect as a basic necessity for an adequate quality of life.

1.2 OBJECTIVE OF THE STUDY

Literature reviews, interviews with development experts working on slum upgrading and related urban issues, and five on-site case studies were undertaken to unravel these complex issues and help all key stakeholders identify a way forward. The overall goals of this study were to provide a general understanding of the problem and what is being done about it; to explore in depth a variety of promising innovative approaches to dealing with the problem; and to extract lessons learned.

More specifically, its objectives were to:

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infrastructure. Even a meter and a connection fee might be considered too great a risk – on the part of the consumer as well as the electricity company.

- Identify barriers to increasing access to legal electricity services in slums, such as high connections costs for consumers, lack of land tenure, ease of theft, low revenue streams for the utility, etc.;
- Examine global experience with expanding access to electricity in slums and identify innovative approaches that have been, or are being, tried to achieve such expansion. The study will focus on those that forge public/private partnerships, were undertaken during periods of sector reform, or that grassroots movements have spearheaded; and
- Assess the relative effectiveness of the different approaches identified, analyze the role of women, and provide lessons learned and recommendations for use in the development of slum electrification programs.

Section 2 Methodology

This study was conducted in two phases. Phase 1 involved information gathering on slum electrification, identification of potential case studies for Phase 2, and preparation of an interim report. Interviews were conducted with key development workers involved with energy services for the urban poor (e.g., World Bank, US Agency for International Development, United Kingdom Department for International Development, Shell Foundation, and local country experts involved in slum electrification projects). In Phase 2, site visits to five slum electrification programs were conducted and case studies prepared for each. Many of the lessons learned presented in this report are drawn from these site visits.

The full case studies are provided in **Appendix A**. **Appendix B** lists the contacts made during the Phase 1 research and **Appendix C** provides a bibliography of the material consulted.

Of the initial dozen potential case studies uncovered in Phase 1, five distinct cases that varied by project approach, implementation and geographic region were selected for further study. Cases were selected using the following criteria:

- **Relevance.** Cases had to have a high degree of relevance and applicability to poor urban populations and strong potential for achieving a significant penetration in a relatively short time.
- **Replication.** Cases needed to show strong potential for replication and sustainability, particularly where the sector was being reformed to promote commercialization or privatization.
- **Innovativeness.** Innovative approaches include a unique combination of measures deemed necessary to expand access to electricity in slums in an otherwise untenable situation.
- **Sufficient experience.** Projects for case studies had to be more than three and preferably five years old to be assessed for sustainability. The program should have electrified a substantial number of homes. Information on how the project was conceived, organized, implemented, and evaluated should be available.
- **Good local partners.** The potential case should be recent or ongoing so that the full range of stakeholders involved can be identified.
- **Potential development target.** Programs should offer some potential target for future development and donor efforts, not only for areas targeted by the program but also as potential models for intervention and support.

The five programs chosen and the primary reasons for selecting them to be included in this report are briefly summarized in Table 2-1.

Table 2-1 Primary Reasons for Program Choices

Program	Location	Primary Reasons for Inclusion
MERALCO's Depressed Area Electrification Program	Manila, Philippines	Phased electrification of slums with low-cost, easily implemented individual meter walls at the perimeter of slums, as a solution that can work with a variety of slum upgrading efforts. Driven from the top by the government and the electricity company.
PN Energy's Khayelitsha Electrification Project	Cape Town, South Africa,	Community-distribution company approach and use of prepayment technologies to ease payments for consumers and ensure them for the distribution company.
LIGHT's Program for Normalization of Informal Areas	Rio de Janeiro, Brazil	Model for the more recent Salvador, Brazil project. Program is being restructured based on lessons learned in the first attempt.
COELBA's Community Agent Program	Salvador, Brazil	Incorporated lessons learned from two prior programs (Rio and Sao Paulo) with added strong end-user focus (e.g., on efficient use of energy and citizen's rights)
Ahmedabad Electric Company's Slum Electrification Program	Ahmedabad, India	A promising project that faces the challenge of scale-up with reduced subsidization.

During Phase 2, teams of USAID slum electrification experts conducted in-depth, on-site investigations (generally a week in each country) during the last quarter of 2003. In-country experts were identified to facilitate meetings with a range of participants in the selected countries. The team conducted interviews, inspected the projects, gathered relevant materials, and documented their findings. Participants in meetings included service providers, representatives of service recipients (both men and women), grassroots organizers, intermediaries involved in the service provision, and government policy makers. The research team worked closely with the USAID missions in the case study countries to ensure coordination with their broader objectives. The case study teams were made up of both men and women in Ahmedabad and Salvador and of women only in Manila (with a male interpreter/local contact) and Cape Town (all women except when accompanied by PN Energy personnel).

To ensure that gender considerations were mainstreamed in the study findings, a gender and energy specialist was appointed to the project. Briefing papers were prepared addressing gender and energy issues and provided to the research team during Phase 1. During Phase 2, questions were posed during the on-site visits, including both ad-hoc and prepared questions addressed to women and men. In Ahmedabad and Salvador, a structured set of questions was used during household visits and a focus group held with women in Khayelitsha.

Underlying the specific questions were the following general questions, which were intended to provide a structure for gender-related issues:

- What is the official position and actual situation regarding employment of women in the energy sector?
- What is the actual situation regarding women as a constituency of customers in slum electrification?
- How are women represented in the project being studied and what are they doing in relation to men?

The five programs selected represent creative and distinct approaches to promoting legal access and addressing theft of electricity in urban slums. The full case study reports are provided in **Appendix A**. In brief, the five case studies are:

- ***Manila, Philippines*** – MERALCO's Depressed Area Electrification Program (DAEP), where communities were electrified by bringing distribution lines to the perimeter of slums and installing meter walls with individual meters. Households installed their own wiring from the meter wall to their homes. Finance for internal wiring was offered.
- ***Cape Town, South Africa*** – PN Energy's Khayelitsha electrification project consisted of a community based distribution company, established to dramatically improve the quality and reliability of service; install prepayment meters to assist households to stay within their budgetary means; provide subsidy and finance for connection fees; and "ready-boards" to eliminate the need for internal wiring;
- ***Rio de Janeiro, Brazil*** – Brazil LIGHT's Program for Normalization of Informal Areas (PRONAI) used community agents to intermediate for the electricity company and community events to increase acceptance of the program. Debt relief and subsidized and financed connection fees made it easier for households to enter the program;
- ***Salvador, Brazil*** – COELBA's Community Agent Program used community agents, hired through a non-governmental organization, to identify and resolve problems as well as provide education on energy conservation and ventilation. Payments were made easier for consumers by locating bill payment outlets closer to slum communities and through subsidies and financial assistance with connection fees; and
- ***Ahmedabad, India*** – Ahmedabad Electric Company's Slum Electrification Program (AEC) used non-governmental organizations, linked with ongoing slum upgrading efforts, to work in partnership with the electricity company to design and implement the program, in particular providing finance for the subsidized connection fee and meter reading during the initial phase.

3.1 MANILA, PHILIPPINES—DEPRESSED AREAS ELECTRIFICATION PROGRAM

In 1990-92, with the assistance of a low-interest loan from the Japan Bank for International Construction (JBIC), the Philippine Government – through the President's Commission on Urban Poor (PCUP), the National Electrification Agency (NEA), and the Manila Electric Company (MERALCO) – began implementation of the Depressed Areas Electrification Program (DAEP). This program significantly expanded legal electricity connections and lowered costs, both for the connections and for electricity service in many low-income urban settlements throughout Manila over a period of 10 years. More than 300,000 households were either regularized or connected to electricity for the first time.

Manila, Philippines: Elements of the Value Equation

- *Electricity Company:* Achieved cost and theft reduction by placing meters in highly visible locations at perimeter of slum; informal distribution system managed and policed by the residents.
- *Households*: Became eligible for individual lifeline tariff that was substantially below illegal service provider charges; connection fee subsidized and house wiring loans offered.
- *Community*: Formed neighborhood organizations to manage payment for extension of distribution line and meter wall; took responsibility for system within the slums.
- *Government*: Set goal to upgrade and regularize slums; resolved land tenure issues; urban poor commission assisted in selecting and preparing communities for DAEP.

The project involved:

- The formation of household associations where intermediaries, such as nongovernmental or community based organizations, did not already exist.
- An innovative design for providing individual meters to households without having to secure legal right-of-way by locating individual meters on the perimeter of slum areas on meter walls;
- Identification by PCUP of 229 separate areas to be served under DAEP in Metro Manila;
- Waiver of the largest cost of connection (extending distribution lines to the DAEP meter walls);
- A very low (subsidized) connection deposit;
- Undercutting the prices charged by illegal service providers;
- No-interest loans to households for internal wiring repayable in 60 months;
- Individual responsibility for households to extend their own electric line from the meter to the household at their own expense; and
- Very rapid electrification once sufficient funds were amassed by the community organization.

The adopted program design improved upon an earlier approach (called "mother meter") in which a housing association collected from individual sub-metered households, which were members of the association. The households drew service via a single meter on a pole in the

middle of a group of the households in the slum area. This early attempt at electrifying slums failed due to the temptation to steal the relatively large amounts of funds collected in one place without proper controls.

DAEP had ended by the time of the case study site visit because project funds had been exhausted. At that time, MERALCO was actively considering how to restart the program without the benefit of a low-interest loan.

DAEP brought many benefits to Manila's slum population, but its biggest single accomplishment was a successful roll-out of an approach that demonstrated that it was possible to implement a relatively cheap, quick solution to legally and safely electrify a significant portion of the under-served Metro Manila population. MERALCO's approach relied on leaving it to households to install and police their own lines from the meters to their houses. In this way, the cost of managing MERALCO's distribution lines to slum households and enforcement was shifted to the community and the households served under the program. DAEP substantially undercut the illegal service providers with this low cost approach.

Unfortunately, in areas where land tenure was not secured and community governance systems were weak, there was significant theft among neighbors and subsequent disconnections of the meters of the victims who could not pay the run up of large bills. Some communities were just too poor or lacked appropriate community governance systems to maintain and "police" the infrastructure to keep the distribution wires to households in good condition and theft-free. Furthermore, the DAEP approach also easily outpaced parallel slum upgrade efforts, such as those of the National Housing Authority and various non-governmental organizations working in Manila's slums, and so could not take advantage of other efforts to develop and maintain community infrastructure. While theft led to significant recidivism, it also led to higher tariffs since the significant amounts of submetering and resale from neighbor to neighbor meant that tariff subsidies were not getting to their intended recipients.

3.2 CAPE TOWN, SOUTH AFRICA—PHAMBALI NOMBANE ENERGY INITIATIVE

Phambali Nombane Energy (PN Energy) – meaning Forward with Electricity – was started in 1994 as a pilot project by a joint venture between ESKOM, Electricité de France (EDF) and East Midlands Electricity of the UK[11] and continues to operate today. The project established a community based distribution company, named PN Energy, to electrify the Khayelitsha slum[12] on the outskirts of Cape Town, which was formerly served by the municipality of Tygerberg (now a part of Unicity). It was considered a pilot because it aimed to test a new scheme for providing electricity to a population with a track record of non-payment and theft of power from an electricity provider that was not well received within the slums in part because its service to the area had been very poor. It was also ESKOM's first urban retail venture as it was previously responsible only for wholesale electricity sales.

Cape Town, South Africa: Elements of the Value Equation

- *Electric Company*: Theft and supply cost reduction via hard-to-reach service drop and pre-payment meters.
- *Households*: Families have a means to keep within budget through pre-payment meters; no-interest financing for subsidized connection fee; low-tech, low-cost standardized internal wiring (ready board) and prepayment package.
- *Community*: Better electric service, leading to noticeable upgrading of homes and economic improvements. Project officers put a value on electrification of improving people's lives by 15-20%.
- *Government*: The program helped it to achieve an ambitious goal to electrify all poor households; provides part of subsidy for connection.

PN Energy is particularly noted for its results in Khayelitsha (pop: 700,000) that achieved an increase of 60,000 connections from 1994-2003 as well as reductions in non-payment from 70% in 1994 to 5% in 1998.

The scheme involved the following components:

- Use of a separate community-based distribution company (i.e., PN Energy) as the interface between ESKOM and the community;
- High quality and more convenient service in place of former low quality, unreliable service;
- Effective technical means for reducing theft with service drops high on utility poles easily seen from the road, and for reducing non-payment with prepayment meters;
- Lower costs of connection (through subsidization and standardization of connection and house wiring with "ready boards") and pre-payment that allowed households to control and use their budgets better; and
- High standards for business operation within PN Energy to improve profitability, including constant surveillance of consumption and physical structures to catch problems early.

11 East Midlands was bought out in the year 2000

12 Note that in South Africa the term used for slums is "township" but to avoid confusion we use the term slum consistently throughout the report.

PN Energy's staff of 28 is based in Khayelitsha and many employees also live there. The existing distribution system was fully upgraded; vendors of prepayment cards – and later codes to input to electronic keyboards on the ready boards – were set up within the community; and customer service hotlines and offices were provided.

PN Energy is at least breaking even at the time of the site visit. Its activities have evolved from an intensive electrification campaign to one of a distribution company, largely because of (1) the need to maintain areas already electrified, (2) the saturation of the market, and (3) a slowdown in electrifying the remaining households, which are located in areas unlikely to be allowed to remain, e.g., road right of ways, and therefore have not received approval from the municipality for electrification. PN Energy continues to face sustainability challenges, such as funding sources, and changes in regulation and sector structure.

3.3 RIO DE JANEIRO, BRAZIL—RIO LIGHT'S PROGRAM FOR NORMALIZATION OF INFORMAL AREAS (PRONAI)

In five years (1997-2002) Rio LIGHT's Program for Normalization of Informal Areas (PRONAI) either regularized or connected for the first time over 250,000 households in the slums[13] of Rio de Janeiro, areas notorious for crime and violence where electricity was stolen as a matter of course. PRONAI's biggest single accomplishment was its demonstration of how intense interaction with the community through a strong community-based set of "LIGHT agents" could open up the slums and change people's attitudes toward paying for electricity. Self-financing (through a commercial loan guaranteed by MIGA and the IDB) led to project approval by the company's management as well as the newly instituted Brazilian electricity regulator.

Rio de Janeiro, PRONAI: Elements of the Value Equation

- *Electric Company:* Theft and supply cost reduction through theft-proof meter boxes.
- *Households*: Lower connection fee, amnesty for prior debts from non-payment, education of energy efficient use, replacement of inefficient and unsafe internal wiring, and free energy saving lights.
- *Community*: Better service, safer, better appearance, economic improvements; community events.
- *Government*: Obligation to serve all of the population included in concessionaire contract upon privatization; regulator allows part of subsidy for connection to be cross-subsidized by other consumers.

Features of the PRONAI program included:

- The quality of service was improved and associated safety hazards were reduced through upgrading networks and connections. Extensive reconstruction of the distribution systems within the slums constituted a significant portion of program expenses. Internal house rewiring reduced fires associated with the abysmal electrical installations in the houses.
- Formal grid connection and legal purchase of electricity were made affordable and desirable through subsidies and financing. In addition to providing a "familiar face" with the LIGHT agents, the company offered strong economic incentives for participation, including subsidized connection fees with easy payment terms and amnesty from prior electricity debts and fines for theft and disconnection. Ease of payment was also improved with customer service offices added in many areas convenient to community members. Free efficient light bulbs were distributed in 2000 and 2001, which lowered the level of electricity consumption for participants. The program documented proof of residence for slum residents, which is necessary for getting a phone installed and establishing credit and is a highly valued benefit.
- LIGHT considers PRONAI to be a success in terms of its entry into the slums where utilities generally feared to tread, in the number of homes electrified (connected or regularized), and for its ability to at least break even in many areas. However, the economic duress caused by drought-induced energy crises in 2000-2001 led to its cancellation. Plans for its replacement are under consideration. At the time of the site

[13] The term typically used for slum in Brazil is "favela."

visit, the company was revamping its approach, based on its experience with PRONAI.

It is significant that COELBA, the electricity company for the Brazilian state of Bahia, has successfully applied the PRONAI approach with several modifications intended to reinforce the good results and eliminate the negative. It has electrified hundreds of thousands of slum households in Salvador, Bahia and other surrounding cities, as described in the following case study.

3.4 SALVADOR, BRAZIL—COELBA'S COMMUNITY AGENT PROGRAM

Salvador, Bahía, Brazil: Elements of the Value Equation

- *Electricity Company*: Expected return on investment with reduced costs and theft via technology improvements, such as standardized, visible service drop and meter kits as well as continued vigilance and corrective action for recidivism.
- *Households*: Flexibility and ease of payment for the consumer: nearby payment and service centers, subsidized connection fees, internal wiring replaced, energy efficient light bulbs provided free.
- *Community*: Events and assistance; better appearance; safer.
- *Government*: Program is a concrete means to achieve electrification and poverty alleviation goals

Since its privatization, COELBA has made capital and labor intensive investments to regularize illegal connections in slum areas. About 250,000 customers were included in COELBA's slum system upgrading and regularization programs during January 1998 through October 2003, in five cities in the state, of which 78% were in Salvador (about 181,000). Of the total number, about 150,000 legal customers with inadequate connections to the system benefited from upgraded distribution system technology and maintenance programs. Another 100,000 illegally connected homes were the focus of a regularization program. The grid was extended to cover 27% of the cases and provided a standard anti-theft technology package (with metallic meter boxes, multiplexed wiring and concentric cables, and short-circuit breakers) to upgrade regularized customers or substitute for illegal and unsafe connections. A concurrent consumer awareness and education campaign was conducted to persuade slum dwellers that informal connections were high risk, unsafe, illegal, and inappropriate for the quality of energy needed to best meet their requirements.

The number of new customers added to COELBA's system peaked in 2001, but more continue to be added to the program every year and it is expected that the program will continue for quite a few more years. With these investments, COELBA is expecting long-term market growth benefits and a 7-10 % return on its investment over 10-14 years. It has already reinvested some of the return on investments from its earliest program areas, including Bairro da Paz where of the R$3 million (1.0 million USD) return received, R$2 million has been reinvested in the program. Its system non-technical losses have been substantially reduced by 6%, and the overall delinquency rate (payment not made within 30 days of the due date) of 10-15% compares favorably to a company-wide rate that reaches 50% in some areas. The success in reducing delinquency appears to be due largely to the flexibility permitted to community agents in working out payment dates of choice as well as alternative debt payment plans with the customers for delinquent or hard-to-pay bills. Customer education on energy conservation has also helped reduce bills.

Socioeconomic studies commissioned by the electricity company were used in planning so that program staff were aware of the extent of social issues, such as high rates of unemployment and teenage pregnancy. While the electricity company did not consider that it had a role to play in addressing these directly, the program was designed to accommodate such realities.

Essential components of the program include:

- Use of a non-governmental organization to set up and operate the intermediary operation, including recruiting, selecting, employing, and supervising COELBA agents. The agents, who are selected from the community, are required to be literate, have completed high school, have demonstrated leadership qualities, and are respected in the community;
- Replacement of sub-standard wiring in homes (e.g., installation of circuit breakers and fuse boxes, switches, outlets and lighting fixtures) and introduction of energy efficiency measures to reduce household energy demand by 10-20%;

> ***'Our best agents are women. Women agents are better at getting money from clients, they ask in a better way, they don't give up, they are good neighbors themselves.'***
> *Local NGO, Salvador, Brazil*

- Intensively studying the communities before designing and implementing the program with extensive assistance of local community-based organizations and a prominent non-governmental organization;
- Substantially improving service, e.g., response times and outages; and
- Achieving an average usage reduction of about 13% by transforming inefficient customers into efficient consumers. A target of spending no more than 5% of the family's income on electricity consumption was established. To meet this target, an educational program on energy consumption and conservation was implemented, targeting customers with notable energy losses, bad consumer habits (e.g., not turning off lights.), appliances with poor efficiency, lack of good natural lighting and ventilation, inefficient artificial lighting, and dangerous electrical wiring in the home.

A recent survey of customer satisfaction within the program communities indicated a high degree of satisfaction (mostly over 90%) with most suggestions for improvements focused on lowering tariffs or taxes. Despite regulatory and policy uncertainties, COELBA is expanding its Community Agent program in 2004 not only in new areas in Salvador but also in other cities in the state. The second largest city in Bahia – Feira de Santana – has established the COELBA Agent program on a scale nearly equal to that of Salvador and completed 80,000 residences in 2003.

3.5 AHMEDABAD, INDIA—SLUM ELECTRIFICATION PILOT PROGRAM

Between late 2001 and mid-2003, the Ahmedabad Electricity Company (AEC) worked with local NGOs to implement a pilot Slum Electrification Project in Ahmedabad to develop a private sector/civil society partnership to extend critical legal and reliable modern energy services to slum communities. The project was partially funded by USAID. This pilot project subsidized connections for 820 households and provided each household with a legal private meter and a compact fluorescent bulb. The costs for connecting the customer and installing internal wiring was split between the household, USAID and AEC; the household paid Rs.3,350[14], and USAID and AEC each contributed Rs.2,200. Unique to this study, the utility conducted an ability-to-pay survey to help determine the level of subsidies.

Ahmedabad, India:
Elements of the Value Equation

- *Electricity Company*: Reduced service costs and theft with dedicated slum personnel and appropriate technology, such as standard meter and wiring kit and underground service drop;
- *Consumers*: Easier payment through subsidized costs of connection and loans through a CBO bank for the rest of connection costs; internal wiring replaced and efficient lighting provided;
- *Community*: Usually received upgrade of other services in advance or simultaneously.
- *Government*: Provided no objection certificate necessary to avoid land tenure barrier. Helps meet Government goal to eliminate slums.

The Slum Electrification Program augmented an existing slum upgrading scheme called *Parivartan* (meaning 'transformation' in the local language). The criteria for a neighborhood to receive subsidized connections were that it be in a slum that has been or is scheduled to be upgraded in the *Parivartan* program. Seven slums were included in the USAID pilot. The community had to have a "No-Objection Certificate (NOC)" that effectively ceded tenure to the slum dwellers. Obtaining such a certificate is relatively straightforward if the land is owned by the state but otherwise can be difficult to acquire.

AEC's Slum Electrification Project team worked with non-governmental organizations, announcing the program by megaphone, cloth banners, and handbills distributed door to door. In each slum, they arranged group meetings with what would become the community-based organization that implemented the program (e.g., did meter reading and billing while there were funds available). AEC provided onsite services to receive applications, accept payment of service line charges, and answer consumer inquiries. Women play a prominent part in the NGOs and CBOs and therefore are having significant influence on program design and implementation. For example, the non-governmental women's organization, SEWA, has campaigned for houses to be put in women's names so that they cannot be evicted, as was becoming a frequent occurrence. This also means that poor women are becoming visible as citizens and electricity consumers. AEC plans to follow up the USAID pilot project and to electrify 115,000 households by 2006, albeit with reduced NGO and CBO participation.

> ***'Men and women want electricity but women organize to get it, because they are ultimately responsible for the welfare of household.'***
> *Slum Resident (through NGO interpreter), Ahmedabad, India*

[14] The exchange rate in 2004 is Indian Rupees 45.00 to US $1.00

Details of the various slum electrification programs and their results are summarized below.

4.1 HOUSEHOLDS ELECTRIFIED

Four of the programs investigated electrified between three-quarters and 1 million households in 10 years or less[15]. One quantitative measure of the implementation effectiveness of slum electrification programs is the number of electrifications or regularizations completed versus the number planned. These statistics are available for several of the programs, but for others, only information on the number of electrifications completed was available (see Figure 4-1). Most programs met or exceeded their goals.

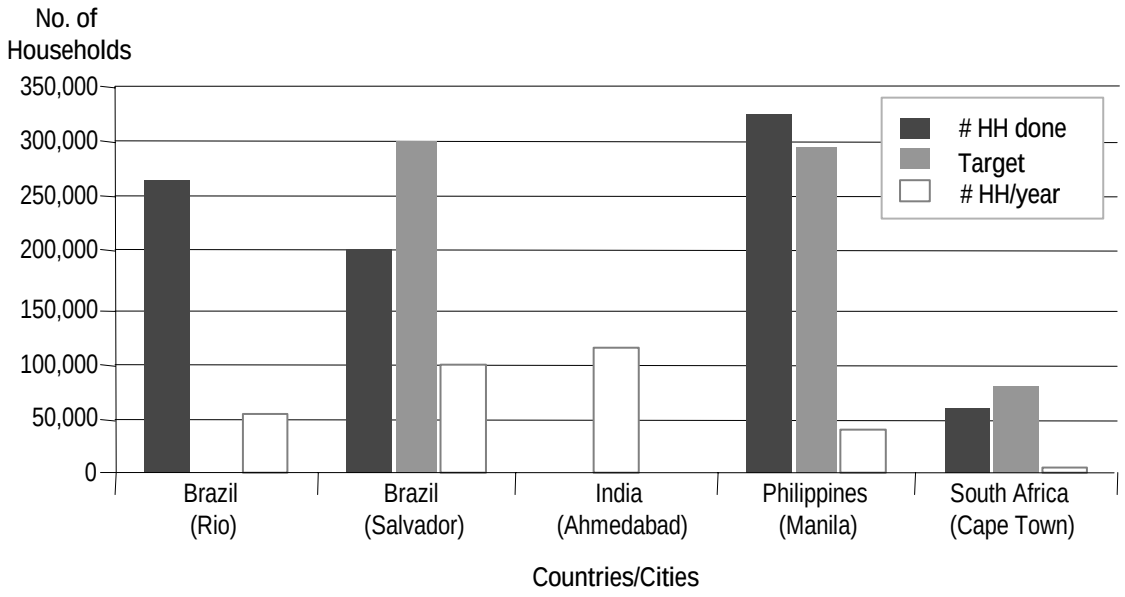

Figure 4-1 Comparison of the Number of Households Targeted vs. the Number Electrified

Another indicator of program effectiveness is the number of households electrified as a percentage of the total number needing electrification in the area targeted by the program. During our site visits, a few programs reported having completed in the range of 75% to 90% of the eligible slum households in the program area, but these percentages need some explanation. First, the number of households needing service is a moving target and, second, a substantial portion of the unserved populations may be ineligible for electrification as they may be along right-of-ways or land designated for other purposes. Slum populations are notoriously unstable and difficult to count reliably. Despite initial research to determine the numbers to be included in the program, in all cases, in-migration was clearly adding to the demand.

[15] Ahmedabad had only been operating for a limited time as a pilot project when the team visited.

4.2 COSTS OF ELECTRIFICATION

The cost per household for regularization or electrification will be important for other companies considering starting a similar program. As shown in Figure 4-2 the range of costs differs by almost a factor of four, with the Ahmedabad program reporting the lowest costs per household (not normalized for purchasing power parity) at $114 per household, while Cape Town reported over $400 per household. However, it should be cautioned that the cost elements included in these reported per household figures were not consistently provided. For example, one company may be including the cost of extending overhead lines and upgrading system equipment while another might only be reporting the cost of the actual service drop. Also, exchange rates have fluctuated substantially over most of the programs' lives. Therefore, these figures provide only a rough comparison. More thorough investigation of the actual costs and the cost elements included in the estimates would be useful.

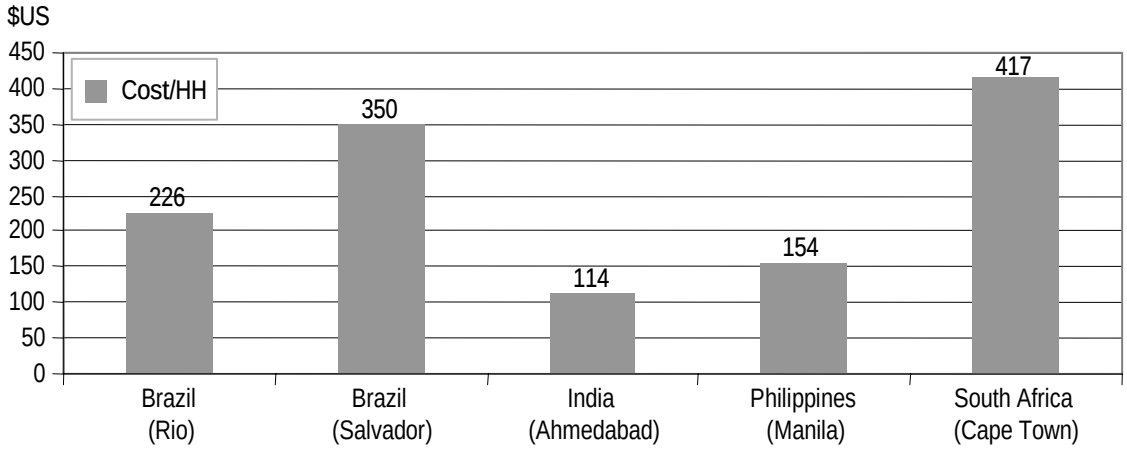

Figure 4-2 Comparison of Connection Costs per Household

4.3 CUSTOMER ACCEPTANCE OF PROGRAM

Effectiveness can also be measured in terms of consumer acceptance. In our informal discussions with slum program participants, we found that most were pleased with the new or restored service, and satisfaction surveys, such as those conducted by COELBA, confirmed this view. That so many households readily switched from an illegal service provider to the electricity company service is in itself a testament to the effectiveness of the efforts. Note that all of the programs provided a number of inducements: a subsidy for, or financing of, connection fees; amnesty or very favorable financial terms for prior unpaid bills or reconnection in the case of theft; lifeline tariffs or, in South Africa, a minimal level of free energy; and assistance to control consumption (rewiring and efficient devices and/or prepayment). However, how much incentive and/or subsidy to offer requires a case-by-case analysis, particularly for a commodity that seems to be in such high demand.

The team received mixed messages about company satisfaction with slum electrification programs, even within a particular company. Apart from COELBA, the CEOs emphasized that the programs suffered from low revenues and high program costs for specialized technology, and intensive operation and maintenance activities, and consequently they might breakeven at best.

At the same time, they acknowledged the social responsibility that these programs were fulfilling despite the low revenue expectations.

Yet, the electricity companies all reported significant reductions in non-technical losses, typically in the range of 75-90% in the targeted slum areas. As non-technical losses are a key incentive for entering into such programs, this must be seen as a positive sign of effectiveness. However, two programs (MERALCO and PRONAI) experienced significant recidivism after several years of operation. Although the return to theft in MERALCO's case was due to theft among residents, it still led to disconnections, subsequent sub-metering, and resale in a way that provided fewer benefits to residents than if the program had been designed to avoid this situation. The team judged that, in the case of MERALCO, the scheme failed to anticipate the likelihood that neighbors would steal from each other with the aid of illegal service providers and that some communities could not effectively police themselves. An additional project component to strengthen community governance and monitoring might have helped address this problem. The PRONAI program appears to have failed because the utility did not crack down on lack of payment, eventually leading to renewed theft. In Section 4, Lessons Learned, the sustainability problems encountered in all the programs are discussed.

4.4 OUTSTANDING PROGRAM ACHIEVEMENTS

While the site visits provided many useful insights and information on each program, little statistically comparable data was available on such important areas as project costs and benefits. More intensive data collection than the team was able to accomplish during one-week site visits is needed to conduct a statistical analysis of project results. Nonetheless, the site visits and literature review yielded sufficient information to identify project achievements and undertake preliminary analysis of the quantitative data collected. The outstanding achievements of each of the programs are summarized in Table 4-1 below.

Table 4-1 Exceptional Program Achievements

Location	Program	Exceptional Achievements
Manila, Philippines	DAEP	Number of households served; exceeding program target within budget
Cape Town, South Africa	PN Energy	Project sustainability Innovation: community distribution company
Rio de Janeiro, Brazil	PRONAI	Ground breaking program design that included community agents
Salvador, Brazil	COELBA	Comprehensive program design and speed of implementation Important contribution to human development and capacity building through agents Innovative use of women's skills as COELBA agents Program scale-up
Ahmedabad, India	AEC	Effective use of intermediaries (non-governmental organizations/ community-based organizations in combination) Low cost of service to consumer

The study identified a number of key features that helped achieve program goals. These included:

- Engaging all stakeholders – government, electric company, slum consumers, communities, intermediaries, and donor organizations – in the process.
- Studying and incorporating challenging starting conditions into program design.
- Partnering with intermediaries as key actors in the scheme to radically change the approach to service delivery, gain acceptance in the community, and diminish or eliminate the control of the illegal service providers.
- Competing effectively with illegal service providers and making it harder to steal electricity.
- Making it easier for poor households to pay, including subsidies and convenient payment facilities, and improving local participation that facilitates discussion and identification and resolution of any problems early on.
- Incorporating a means to reduce costs for the electricity company, including various simple but effective technological innovations to make electricity harder to steal.
- Providing an enabling environment, particularly to deal with land tenure and right of way issues.
- Taking gender into account and using women in the community to play significant roles in the program.
- Promoting community organization, community education, and participation.

Each of these features is discussed in the following sections.

5.1 ENGAGING ALL STAKEHOLDERS

The study showed that across the case studies, a notable departure from the traditional approaches to slum electrification was the engagement of all stakeholders and the efforts made to meet their needs.

- **Governments** saw a need and an opportunity to significantly improve the quality of life for slum communities and were ready to allow and assist experiments, which in turn might imply novel regulatory and legal treatment.
- **Communities**, including community-based organizations, saw a promise of significant overall improvement in the economic and social conditions of the community and were also ready to assist in making it happen.
- The **electricity company** saw some prospect of at least breaking even on the investments it would have to make in the slum area without jeopardizing the safety of its personnel or increasing liability without a means of mitigation; found acceptable means to engage the community, usually through a community based intermediary;

and seriously considered and countered the competition from illegal service providers.

- **Participants (service recipients)** valued the service enough to pay a significant sum for connection and to pay for electric service received, particularly valuing the better service and quality than they had received from illegal sources.
- **Other community stakeholders,** such as non-governmental organizations, felt that the activity would benefit their own efforts and assisted in making the program successful.

Figure 5-1 illustrates some of the key actors in the approaches studied.

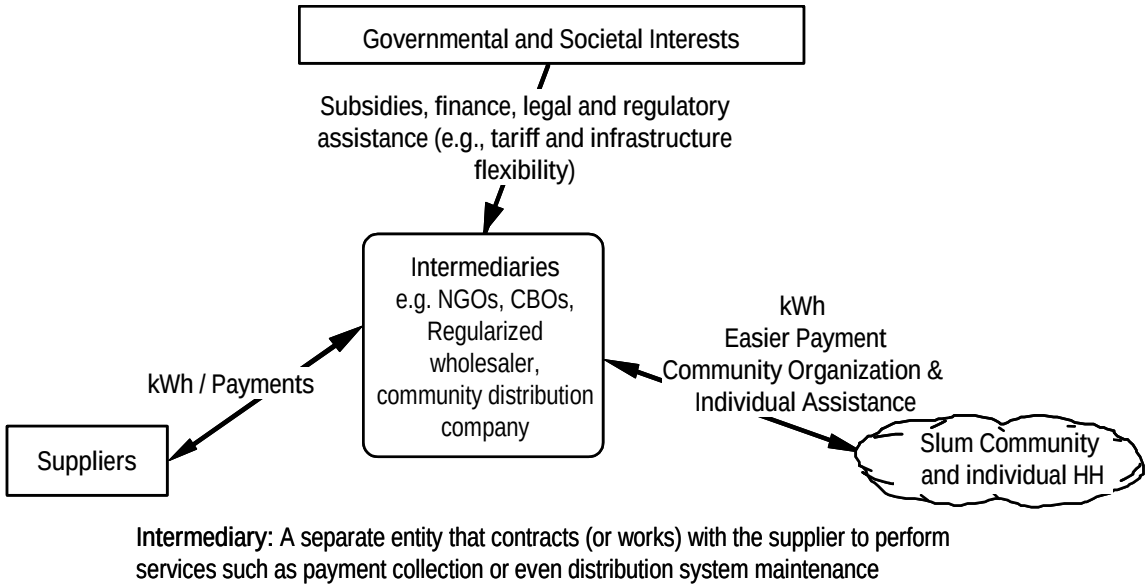

Figure 5-1 A Model for Successful Slum Electrification Programs

5.2 DESIGNING FOR POOR STARTING CONDITIONS

The urban slum areas that might be targeted for slum electrification efforts, either on the outskirts or within urban areas, are generally composed of poorly built and congested tenements or shacks in an unhygienic environment. They are also generally lacking adequate infrastructure services, particularly electricity, and water and sanitation, but also proper roads and other amenities considered necessary for a quality of life above subsistence and for some degree of productivity needed for economic advancement.

All the slums visited had very poor living conditions and were often crowded and dirty, at least outside the homes; often they were quite tidy and clean on the inside. Although all the slums we visited were characterized by very poor housing materials, there was a range of quality among slums in a city and among the different cases:

- Many or most shacks made of scavenged material – Cape Town, Manila, and Ahmedabad.

- Permanent houses with several stories – Rio de Janeiro, about 50% in Salvador, and to a lesser extent in Manila.
- Newer slums tended to have more shacks made of poorer materials.

Some slums were far more entrenched than others, with a range of ages from 5 years or less to over 40 or 50 years old. Older slums were characterized by more permanent structures often with several stories.

These poor starting conditions constitute an extreme challenge for prospective legal service providers, and preparing for this environment is essential. Fixing a meter to a wall made of cardboard or to a house that could blow away entirely in a windstorm requires new technological solutions, particularly when shacks extend out over bodies of water or are located on hillsides with extreme pitch. Finding cost-effective ways to provide service despite the poor quality of the homes through simple technological solutions is imperative in slum electrification program design.

The locations of the slums vary:

- ***Manila:*** Slums are intermixed with other residential, commercial, and industrial sites.
- ***Ahmedabad:*** Slums are mainly in the oldest part of town near former factories.
- ***Rio and Salvador:*** Slums tend to be on hillsides and are older, more developed.
- ***Manila, Cape Town, and Ahmedabad:*** Settlement on right of ways are common.

In Manila and Salvador, stilt houses built out into bodies of water are a factor. Proximity of electricity distribution lines to the slum project area may be a major cost consideration. Starting a program in communities closer to distribution lines has obvious cost advantages. In design and roll out of its program, an electricity company might start with the more "well off" slum areas to test its program first on those most likely to participate and to get sufficient participation to help amortize the higher start-up costs and build community trust.

Although slum dwellers are mostly very low-income people, they are far from homogeneous and there is an income spread within the community. Degrees of poverty vary not only among countries and cities within countries but also among the slums of a particular city. Economic circumstances can vary widely in one neighborhood or even among neighbors, and they also can vary within a family or household depending on the stability of the income stream. The density of slums in Ahmedabad and Manila made the poverty in them look much worse than in Rio, Salvador, or Khayelitsha, where there was more space between houses and more green space.

The type and condition of the appliances found in slum households also varied considerably within a particular city and among cities (see Figure 5-2). Lighting, television, fans, irons, kettles, and stoves were seen in abundance. There were also air-conditioners, refrigerators, washing machines, microwave ovens, and small appliances, such as blenders. Acquisition habits may not follow rational needs-based decisions, and electrification programs should plan for different loads at different stages in the life of the program. Determining who makes the decisions with regard to using electricity, i.e., what appliances are bought, and in what order,

may also prove useful in understanding how to market a slum electrification program successfully.

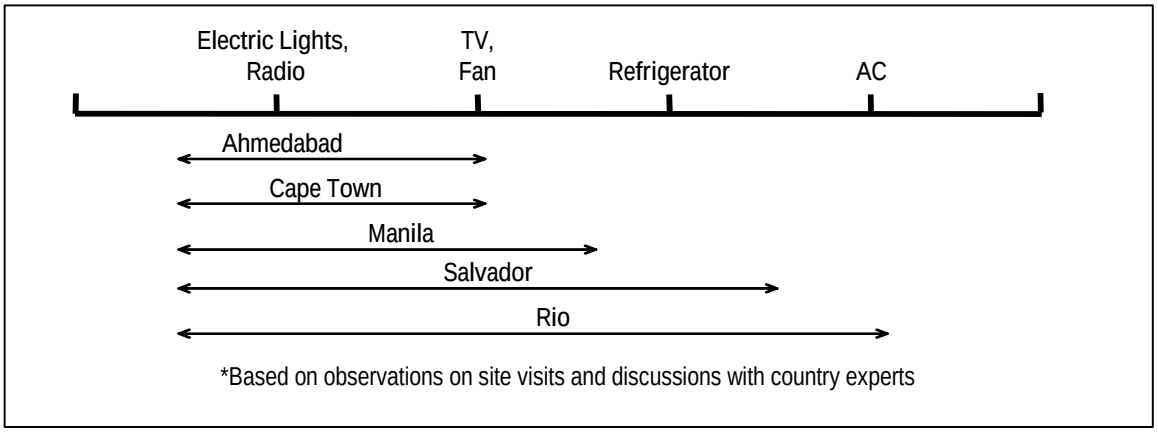

Figure 5-2 Comparison of Electricity Uses

Average electricity usage also varies considerably with the differences in appliance saturation observed (see Figure 5-3). As appliance ownership is a major determinant of electricity use, collecting baseline data on appliance saturation, age and condition is a key first step in an electrification program. As better quality power begins to encourage additional expenditures on new appliances or productive activities at home, patterns of appliance acquisition are likely to change. The literature on the impact of electrification recognizes that there are more televisions than stoves bought in the first year of electrification. In the slums visited for this report, all households, headed by women or men, tend to use electricity for lighting and television foremost. A television may be more affordable and more desirable for leisure, status, and entertainment than an electric stove.

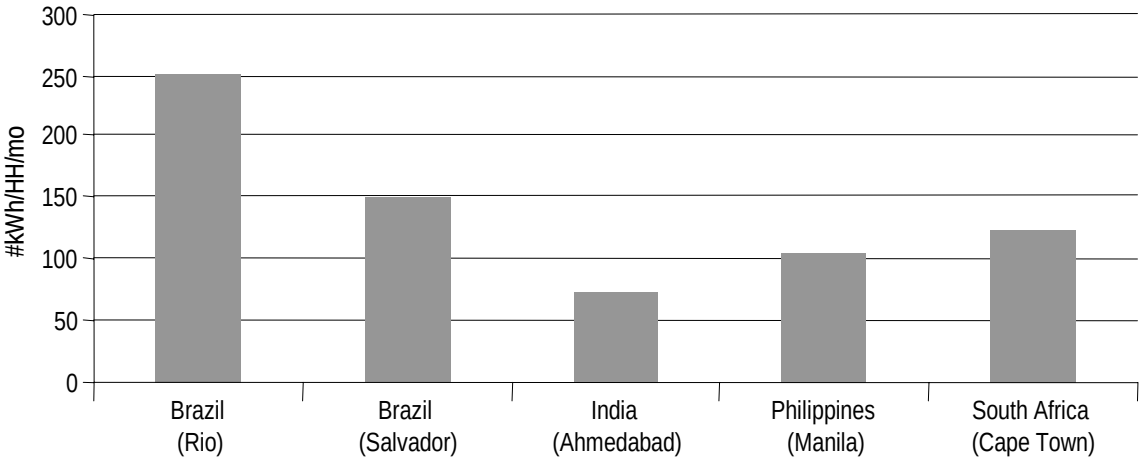

Figure 5-3 Comparative Electricity Usage (kWh per Household per Month)

It is often said that it is expensive to be poor, and appliance ownership is one place this is manifest – second-hand appliances were common and often inefficient. For example, in the slums of Salvador in Brazil, refrigerators had leaking seals and were rusted so that the doors do

not fit snugly, and old air conditioners were energy inefficient and ineffectual. Electrification programs should specifically address the need to upgrade highly inefficient appliances, lighting, and wiring. In slums, safety with regard to exposed wires and illegal connections is always a concern. Programs should recognize the need for education on the dangers of illegal connections and how to recognize unsafe wiring conditions.

5.3 PARTNERING WITH INTERMEDIARIES

Gaining acceptance of the program within the targeted slums prior to, and during, its implementation is critical for the success of slum electrification programs. Taking personnel and equipment into areas that are renowned for their high crime rates and unsafe building practices raises safety and liability issues for an electricity company. All of the programs produced public relations materials and undertook activities to generate awareness and participation in the program. However, in no case was the publicity effort considered sufficient to counteract the difficulties in launching such a program in established slum areas.

The most important commonality we found in gaining community acceptance of the program is the incorporation of intermediaries in the program design. This design feature appears to be crucial, at least to the initial success of all of the programs we studied. The electricity company and, in some cases, the government rely on these intermediaries to assume their traditional roles (i.e., to complete the service cycle in the case of the electric company and to deal with land tenure issues in the case of the government.)

However, the type of intermediary and their roles within the service scheme varied significantly among the programs. For example:

- **MERALCO** used intermediaries primarily to organize households within a slum area into associations of large enough size to reduce the cost of the meter wall per household to a level affordable to the participants. The company (along with the urban poor commission) helped the communities to form these associations (where they did not already exist) but did not insist on or facilitate their continuation after electrification (which might have contributed to the recidivism observed)
- **ESKOM** went so far as to create a community-based distribution company which not only organized the community and launched the electrification program but continued to operate post-electrification to perform standard distribution company collections, customer service, operations and maintenance. PN Energy engaged in extensive consultation with non-governmental organizations, community-based organizations, and street committees for six months prior to electrification and continues to have contact with representative groups. Women constitute the majority of street committees and were thus directly consulted regarding program design. Elements of a community-based distribution company are:
  - Operates community-based services, e.g., meter reading and bill collection.
  - Can allow for flexible payment schedule (with adequate monitoring and follow-up).
  - Operates and maintains distribution system facilities and trouble-shoots technical problems; provides quick dispatch of service trucks because of proximity.

  - Investigates and addresses theft.
  - Contracts and controls vendors of prepayment cards.
  - Utility personnel drawn extensively from the community.
- **AEC** used a combination of non-governmental organizations and community-based organizations to perform certain intermediary functions such as customer recruitment, meter reading and bill distribution. Some of these functions were more important in the organizational stages and roll out. One of the non-governmental organizations, SEWA, a women's organization, provided an essential service – financing connection costs.
- **COELBA (and PRONAI)** successfully used both a trusted local non-governmental organization and Community Agents hired from the community. The community agents' role in the community includes:
  - Safety issues
  - Customer classification
  - Customer billing
  - Suspected cases of electricity theft or third party energy suppliers
  - Needed extensions of distribution grid
  - Theft of installations and equipment

Slum electrification cannot be done on a house-by-house basis because of the relatively large capital outlay to extend distribution lines and improve the reliability of the system. To obtain greater financial viability, all programs organized the households in an area to have the number necessary to justify an electrification program in the area. The process of organizing a community is not a typical electricity company function and falls naturally into the purview of organizations with experience organizing such communities – hence, the need for intermediaries, particularly in the initial stages of electrifying a slum area.

Intermediaries that have been active within the targeted slums prior to program introduction bring the added advantage of experi4.020andknowledge of the community and can draw synergies between the earlier programs and the new electrification program. An attraction for intermediaries is the potential income from providing services to the electricity company. However, most intermediaries that have a prior mission within a community will want to have their expertis20and methodologies incorporated into the program design, some of which might appear "foreign" to the electricity company.

In the case of Ahmedabad, the non-governmental organizations already deeply involved in slum upgrading in the city pushed AEC and others to launch the slum electrification program. These organizations recognized the danger to the community of accidents0and fires associated with illegal connections0and inadequate0and faultywiring within homes0and sought the addition of electrical upgrading (as0a second phase) to the communities that had already received0an upgrade package of road improvements, street lighting, water, and sanitation. The Ahmedabad program

design was improved by the initial input of ideas from these non-governmental organizations, and its successful implementation appeared to the team to depend on them acting as intermediaries and administrators of financing connection costs. However, it should be noted that AEC has since decided to "go it alone" in its plans to scale-up its slum electrification efforts.

While the case studies revealed that various types of work in the slum electrification schemes was "outsourced" to intermediaries, there were limitations to this strategy, particularly regarding collecting payment and theft. In Cape Town, problems developed with the vendors of prepayment cards (e.g., theft), and PN Energy found it necessary to improve the scheme to avoid these losses. Cashiers in PN Energy's payment office were behind glass, giving the impression that this was to prevent crime. COELBA had an airy customer service office where no payments occurred; it outsourced payment receipt operations to highly protected bill payment stations in areas near to the slums served.[16] MERALCO's original mother meter scheme failed due to theft by the intermediaries, who collected payments from the individuals connected to the single master meter.

As programs mature and take on more traditional distribution company service functions, intermediaries may become less important. For example, AEC is in the process of expanding its program without the use of intermediaries, but it remains to be seen whether this change will make a difference in program success. However, intermediaries continue to play an important role in the COELBA and PN Energy programs. After establishing initial close working relationships with non-governmental organizations and using them as intermediaries, COELBA briefly tried to penetrate new communities on their own but found that they were not able to achieve the same results without their local partner organizations. The use of intermediaries at various stages of slum electrification programs could be the subject of further investigation to see which are more effective and more essential to the success of the schemes.

5.4 COMPETING WITH ILLEGAL SERVICE PROVIDERS AND CONTROLLING THEFT

From the literature and anecdotal evidence, it appeared that illegal service providers would constitute a considerable barrier to regularization of electricity service. However, during the site visits, the illegal service providers were reported to have readily disappeared once legal connections were made available to consumers. Once there were legal connections, the illegal service provider's role was over and this was accepted whether it was a single woman supplier in Khayelitsha, a man in Salvador, or a previously powerful household in Ahmedabad. The AEC in Ahmedabad reported that they met no resistance from the illegal service providers, because when connections were regularized and people were ready to pay the AEC, the illegal service provider's influence apparently disappeared.

Some companies, most notably COELBA, had aggressive anti-theft programs for all consumer groups. Alternatively, PRONAI seemed to have completely lost control of theft (in the slums, as well as regular residential and commercial areas) after an initial highly successful result, which was a major reason for significantly revamping the approach. In addition, PRONAI needed to find technical and other means to reduce the cost of service.

[16] Payments for various telephone and utility services were received there.

5.4.1 Using Technology to Deter Theft

All of the companies focused on simple innovations and standardization of supply and metering equipment to reduce the cost per household served and reduce the ease and likelihood of theft of power. These technological innovations include:

- All companies made meters and service drops highly visible so that detecting theft would be easier; for example, MERALCO put the meter wall on the perimeter of slum where it could be easily viewed by the company's anti-theft representatives (although this was not a completely effective solution).
- AEC put distribution supply lines underground up to the household. However, the company was skeptical about the result and stated that there were still significant opportunities for theft as an illegal connection made by digging and connecting to the underground cable would be very difficult for the company to discover.
- PN Energy separated supply (high and visible on a pole serving 8 to 10 residences) from the clearly visible meter, changed to prepayment meters, provided standard ready boards for internal wiring, and performed system-wide monitoring to detect likely fraud/theft situations.
- COELBA developed standardized "metallic" kits, including shielded cables and meters completely enclosed in clear plastic, which were located in highly visible locations and could be installed and performed system-wide monitoring to detect likely fraud/theft situations.
- PRONAI was moving to totally enclosing meters in clear and visibly placed plastic boxes that had to be broken to access the meter.

PN Energy and the adjacent Cape Town slum electrification program[17] were the only cases that we studied where prepayment meters were used. AEC reported to have considered them but found them to be too expensive compared with the cost of conventional meters. COELBA and PRONAI were actively considering them. Both Cape Town electricity companies seemed highly satisfied with the effectiveness of the prepayment meters and considered them less costly than conventional meters. It is likely that the companies were using different elements in their cost comparisons. A comparative analysis of the costs and benefits of prepayment meters as an alternative and the factors that contribute to their successful use would be very useful to clarify this technological choice for electricity companies.

Although very different in their approaches, the community presence established by COELBA, PRONAI, and PN Energy helped to reduce theft by constant, but gentle surveillance of irregular situations and quick and firm remedy (cut off). However, one of the weak points of the PRONAI program was a failure to continue the surveillance and disconnection in the case of return to theft of power (coupled with a very low reconnection fee). This was one contributing factor of the return to pre-program levels of non-technical losses. Making facilities most subject to theft openly visible to company personnel and following up on any return to theft of power through

[17] The team also investigated Cape Town or Unicity's approach to slum electrification. The Cape Town electrification program is described in the attached case studies.

legal means or imposition of high reconnection fees appear to be essential ingredients for any slum program.

5.5 MAKING IT EASIER FOR POOR HOUSEHOLD TO PAY

Two key issues for slum consumers seeking to obtain legal electricity are the availability and affordability of connecting to the service and the affordability of using the service. To increase affordability of connection and service, all of the programs used a combination of the measures explored in detail below.

5.5.1 Tariffs

A common assumption is that lifeline tariffs are sufficient for meeting the budgetary constraints of poor households. However, unless a household has its own individual meter, it cannot access such tariffs because it is not part of the formal billing and metering system.

Except for the recent introduction of free electricity (the first 50 kWh) for the very poor in South Africa, no tariffs specific to slums (i.e., aside from lifeline tariffs) were found in any of the case studies. The main benefit to slum consumers of slum electrification programs was that they were at last able to take advantage of lifeline tariffs that were generally available for low-income consumers in the country. The teams found some variations in the way that lifeline tariffs were constructed. Essentially, both the Philippines and India had lifeline tariffs that provided very large discounts if consumption was kept below a certain level – in both cases, 50 kWh. In the Philippines, the discount diminishes up to 100 kWh and then disappears. The team did not obtain figures on how many households were consuming under these very low amounts. As shown in Figure 5-3 above, a number of slum households would not be eligible for the discounts at their reported levels of average consumption**.** But, they would receive a discount on the first tier of electric tariffs.

5.5.2 Subsidized Connection Costs

The company and the newly connected or regularized consumers can share the benefits of lower connections costs due to lower cost options and approaches. However, all programs found that a lower connection cost might still be too high to attract sufficient participation in an area. Other financial assistance was almost always provided, e.g., no-interest finance with payments spread out over a significant period such as five years. There was no doubt that connection costs had been a barrier to connecting prior to the program and that financing of the connection cost was a key factor in increasing participation.

AEC in Ahmedabad experimented with the degree of subsidization of the connection fee and, in response, the non-governmental organization (SAATH) did an analysis of connection fees and number of households willing to connect at different levels. They found an optimal point where above a certain fee level likely participation began to drop off steeply. Willingness to pay and ability to pay for electricity service and the types of subsidies that are likely to make a difference in the acceptance of the program are subjects that could use more investigation, particularly in the program design stage for a particular city.

Table 5-1 provides a summary of the types of subsidies provided to consumers as part of slum electrification programs. It should be remembered that the largest and least transparent cross-

subsidy is that provided to the illegal service provider who steals from all ratepayers in order to sell electricity to slum inhabitants. Moving toward more transparent subsidies that go to the intended target instead of the illegal service provider must be seen as a vast improvement and encouraged.

Table 5-1 Subsidies in Slum Electrification

Potential Areas for Subsidization		
Cost Item	Who Normally Pays	Typical form of subsidy in slum electrification programs
Connection Fee for Service Drop/Line Extension	Consumer	Significant reduction in fee: low cost financing
Meter deposit	Consumer	Waived; low cost financing
Distribution system upgrade	Electricity Company/ Ratepayer	NA or waived
Reconnection Fee (after service interruption)	Consumer	Lower to encourage participation initially and higher if it is a case of recidivism
Tariffs	All consumers in a class	None specifically for slum residents; lifeline tariff for low consumption/low income applies equally with individual meter. The class can also be limited by voltage or amperage of service.
Bad Debts	Individual customer	Waived or repaid over long time period

5.5.3 Flexible Bill Payment Terms

Another component of affordability is whether the household has been able to save up enough funds to pay the bill when it arrives. Payments at fixed times may not be convenient for poor households with irregular income. Some programs dealt with this problem by allowing for flexible payments to be negotiated without penalty (COELBA) and for more frequent billing (AEC). These alterations in billing practices may have contributed to the relatively good payment records that both companies experienced from their slum communities.

5.5.4 Developing Efficient Consumers

The team observed very different levels of appliance ownership among slums within a city but even more important differences between countries, as was shown in Figure 5-2 above. A key feature of several of the programs (particularly in Brazil) was helping newly connected or regularized slum consumers to understand the relative electricity usage of different appliances and how to reduce consumption effectively. COELBA reported particularly impressive results in this respect. On average, households employing new energy efficiency measures reduced energy consumption by about 10-20%. Helping slum consumers reduce consumption in Brazil is particularly important given the high level of appliance ownership and electricity consumption. Observations made during the field visits suggest that there is a need to educate customers and make them aware of ways to reduce energy electricity use.

Several programs (AEC, PRONAI, and COELBA) went as far as replacing inefficient light bulbs with one or more efficient compact fluorescent lamps. COELBA also replaced leaky refrigerator seals (which would not necessarily be applicable in all slums studied as several did not on average have refrigerators). In addition, several of the programs replaced unsafe and inefficient internal wiring (COELBA, AEC, PRONAI, and PN Energy). COELBA did an evaluation of the savings to consumers from this measure alone and found significant energy savings (10% on average).

5.5.5 Value of Indirect Benefits of Slum Electrification

Although comparable data on the possible indirect benefits of electrification, such as increased economic opportunities and increased value of shacks was difficult to obtain, one such benefit – providing a legal identity for the slum resident – was evident in most case studies. However, once legal identity has been secured, the incentive for continuing with the slum electrification program may be lost. For example, the recidivism observed under the PRONAI program may be partly due to the fact that once a resident had a legal identity by having an electricity bill, the value of continuing to be a legal customer may have dropped.

5.6 LOWERING COSTS FOR THE ELECTRICITY COMPANY

Electricity companies are motivated to undertake slum electrification projects by the possibility of reducing non-technical losses and potentially making a profit. In some cases (e.g., MERALCO and AEC), a sense of social responsibility helped tip the scales in favor of going ahead with a program that looked marginal at best on paper. However, without the recent changes in governmental treatment of non-technical losses and requirements in concession contracts to serve all potential customers, electricity companies would not be very motivated to address the electricity needs of slum residents. Thus, government policies are needed to ensure that the electricity companies give priority to serving this difficult sector. At times, the regulatory treatment of the large non-technical losses (or refusal to keep raising tariffs to cover escalating costs) can provide the impetus to develop special programs and reduce losses. Once these policies and regulations are in place, the electricity provider can approach slum electrification in ways that minimize financial losses to the company, even if it does not succeed in providing a return on investment.

In developing slum electrification programs, the electricity companies attempted to reduce their non-technical losses (which, in the case studies, ranged from 3-5% of gross revenues) in such a way that increased revenues would cover the costs of the slum electrification program. However, MERALCO and AEC stated that the increased revenues from electrifying slums did not cover their increased costs of supplying these areas. A financial case study of the MERALCO program concluded that, even with its use of loan funds with very favorable terms, the program would at best barely break even.[18] AEC wanted to increase the connection fee paid by the consumer to improve the economics of its program; however, this increase was resisted by their non-governmental organization partners, who argued that the company was receiving the expected

18 Macasaet, Jess Alfonso A. "The MERALCO Depressed Area Electrification Program, A: Financial and Economic Cost Benefit Analysis," from Cases on Corporate Responsibility in Asia, Miguel Luz, Editor, Asian Institute of Management, pp 45-67, 2002.

amount based on the original financial plan, and an increase would cause a dramatic reduction in participation.

On the other hand, two of the companies indicated positive returns on their investments. PN Energy stated that it was breaking even (but it was unclear whether the initial capital investment by ESKOM and its partners was included in the calculation). COELBA was the most confident in predicting a break even or a modest return on investment. However, it was not entirely clear how it was considering the original funds available from the so-called 1% energy efficiency fund[19]. If these were accounted for as sunk costs not attributable to the program (because the company was required to spend the money in any case), then a significant source of funds was not considered in its financial evaluation.

The companies featured in the case studies approximated connection costs per household (see Figure 3.2). All of the companies focused on innovations (and standardization) in their supply and metering equipment in order to reduce the cost per household served in addition to lowering the ease and likelihood of theft of power. COELBA's "metallic" service drop kits (standard, low cost meter and pole) and shielded cables were typical. Lower costs were also achieved by electrifying an entire area at one time. However, we were unable to obtain equivalent information on operating costs once a consumer was connected. For example, some stated that costs of policing and disconnecting illegal connections had decreased, but none had estimated what the actual savings were. COELBA reported that its connection costs were rising over time as they reached more marginal areas, farther from existing distribution lines. Given the considerable differences in approaches and operational modes, we were unable to obtain good comparative data on start up and operating costs of the programs studied; thus, such data would be a good area for future research.

5.7 GOVERNMENT POLICIES SUPPORTING ELECTRIFICATION

Common to all cases was a strong motivational push by governments to set targets for improving the living conditions of the urban poor and establish regulations for non-technical losses:

- ***Manila, Philippines:*** Rapid redress of Marcos era repression, including slum upgrading
- ***Cape Town, South Africa:*** Rapid electrification for all non-electrified poor (urban and rural)
- ***Rio and Salvador, Brazil:*** Electric power for everyone: obligation to serve all written into concession contracts
- ***Ahmedabad, India:*** Elimination of slums by 2013

In the Philippines and South Africa, major changes in the government after a long period of dictatorship and/or repression led to new initiatives focused on improving public services for the poor. In the Philippines, the urgent need to address the desperate situation of the poor after the ousting of Marcos in the late 1980s led to new efforts to deal with the very poor housing conditions and service availability throughout the country, both rural and urban. The formation

[19] The Brazilian regulator set up a requirement for distribution companies and concessionaires to expend 1% of gross revenues for R&D and energy efficiency, split 50/50. For details, see the Salvador case study.

of the President's Council on Urban Poor and the subsequent designation of areas in Manila that needed immediate and urgent upgrading brought a focus on the poor that had previously not existed.[20] At that time, MERALCO's owners and management elected to contribute through an electrification program (both rural and urban), despite the near assurance that the program would not do any better than break even.

Similarly, in South Africa repressive apartheid conditions had left large unserved or underserved populations, both rural and urban. These poor conditions demanded immediate attention when apartheid was revoked. The government's goal was a rather arbitrary one of electrification of 2,000,000 people. Municipal governments owned the electric distribution companies serving the cities, and the national government owned ESKOM. Hence, national goals were translated into action without having to enact major changes in the sector's organization or to concession contracts.

Brazil has had a long-standing commitment to better serve the poor and improve living conditions. During energy sector reforms and privatization of electricity companies, service requirements in new concessionaires' contracts reflected government commitment to "electricity for all."

Finally, the Ahmedabad city government recently set goals to eliminate its slums by 2013 and the AEC responded with a company goal to electrify all slums by 2010. While this was not the original impetus for launching the program, it is certainly strengthening resolve to continue and expand the pilot program to full scale.

In several cases, the electricity regulator's actions influenced utilities' decisions to implement slum electrification programs. For example, in Brazil, ANEEL recently instituted a cap on "allowable" non-technical losses (i.e., a limit on recovery of losses through ratepayers of 90.7 % of actual losses.) This cap is expected to pressure utilities to increase their efforts to reduce technical and non-technical losses. In Manila, for example, the regulator had been routinely denying rate increases to MERALCO, in effect forcing the company to find ways to reduce costs. Note that neither of these examples of regulatory pressure focused specifically on slums, and it was the utilities themselves that decided to take on slums as a target for loss reduction.

Government incentives of various types were also very important in promoting slum electrification. In the immediate aftermath of electricity company privatization in Brazil, utilities that undertook slum electrification programs – mainly aimed at the reduction of non-technical losses – were permitted to use an industry-wide energy efficiency improvement fund, targeting demand-side efficiency. For example, Salvador was allowed to use funds set aside for energy efficiency for slum electrification. In South Africa, the national government, through NEA, is providing funds from general revenues for subsidizing slum electricity connections and is also requiring that first 50 kWh be supplied for free (via cross subsidies) to qualifying poor households (nearly all slum residents). The regulatory body for the state of Gujarat, India with oversight of AEC, allows slum electrification program costs to be compensated through cross-

[20] Formerly, government decrees had attempted to sweep away the problem by declaring squatting to be illegal, obviously to no effect.

subsidies from other ratepayers, but our discussions with the regulator gave the impression that these subsidies could be limited.

A common barrier to all programs was the lack of legal status of most slum dwellers. The programs addressed this barrier in various ways. In India, AEC was able to use the same "No Objection Certificate" procedure that had been developed for slum upgrading under lack of tenure conditions. This allowed the program to work in most government-owned properties with slums. Private sector lands required going through the legal process to establish abandonment by the private owner (India) or buying out the owner (Philippines). This was a significant barrier to expansion of program benefits in both countries.

In contrast, in Rio and Salvador, any private land that had been so occupied for more than 5 years was legally treated as abandoned, and the electricity company could ignore land tenure issues for most slums. Tenure issues were not significant in the majority of the cases in South Africa, as small plots of land had been given to occupants after cessation of apartheid. The more recently arrived squatters on rights of way and other marginal areas did not have tenure and could not participate in the program. The company would ignore tenure only if the municipality would give permission to go ahead or if the area had been occupied for more than five years without redress as this period apparently indicated a stable enough situation for the company to risk its investment in the area.

In all cases, except Cape Town, the slum layouts made access for electricity company infrastructure and service equipment highly problematic. Even if physical access were relatively easy, some companies, such as MERALCO, maintained that they needed right-of-way to protect themselves from liability. Right-of-way on land with disputed ownership is particularly difficult to obtain. MERALCO solved its problem by limiting its service to the perimeter of the slums and was able to serve virtually all the areas targeted by the program. Right-of-way was less of a concern in other areas.

Lack of land tenure can be a major impediment to the number of households that can eventually be serviced under slum electrification schemes and is another key area for government activity. We found that it may not be necessary to give tenure outright but rather to find creative solutions to removing it as a roadblock for the introduction of public services into slums such as the NOC in Ahmedabad. In all cases it was clear that some people were excluded from participation in slum electricity programs as a result of not having land tenure. However, solid figures on how many people were being left out were generally not available. A significant proportion of slum population might be deemed ineligible because of lack of tenure or inability to resolve tenure issues even where a process existed for doing so. This area could use some additional investigation, both to determine the true extent of the problem as well as how tenure issues are being handled in other types of slum upgrading efforts.

5.8 RECOGNIZING WOMEN'S ROLES IN ELECTRICITY

The increase in women-headed or maintained households, noticeable in the COELBA, AEC, and PN Energy case studies, means that it is increasingly important to adopt a gender perspective to household electricity supply and demand to ensure that the utility is meeting the requirements of the primary users. Very little documentation on the role of gender in, or even socio-economic

impacts of, slum electrification programs was found in the Phase 1 literature review[21] (ESMAP 1998 is one of the few exceptions).[22] Primary data on gender and electrification was gathered during interviews and discussions and is, for the most part, of the snapshot kind; anecdotal, individual, and rich in texture and experience, rather than exact, measurable, and predictable. The majority of slum residents interviewed during the site visits were women. Some illegal suppliers were reported to be women although none were interviewed.

None of the urban electrification projects studied explicitly included gender or women as a particular category of stakeholders. Some of the companies visited, such as PRONAI and COELBA, were actively using intermediaries for service delivery in their slum programs. These intermediaries were primarily NGOs and community based organizations which in turn primarily used women for service delivery. In PRONAI, women agents were contracted to disseminate information because women were perceived to communicate more easily than men, be more familiar with the neighborhood, and pose little threat to the consumers. The companies were universally supportive of the work that women were doing for them within these organizations.

Most electricity company management and technical support staff of the electricity companies implementing the case study projects are men. However, two notable exceptions were COELBA and PRONAI, where a few women were at management and technical levels of the slum electrification programs. A woman from the COELBA program's parent company, Iberdrola, had championed that program within the company. The original motivator for the MERALCO project in the late 1980s was a woman who is currently a vice president for the company. Two women – a senior technician in LIGHT and a head of the architectural faculty at the University of Rio de Janeiro – had been involved in the Rio de Janeiro program. The only professional women that the team met in India and South Africa were in non-governmental organizations.

Electrification is only complete when someone turns the switch on and uses the electricity. The electricity company needs to become known and respected within the community for effective service delivery, and for this it must be able to communicate with men and women alike. Women in slums are recognized to be the primary managers of household energy services. They are the ones most likely to be at home during the day and engaged in the activities that are most energy intensive – cooking, cleaning, and washing – and they will be using multiple forms of energy including electricity.

Planners should take into account that women are key energy consumers in the household. For example, the success of efforts to educate users about energy conservation will depend on finding ways to effectively communicate with the end-users – primarily women. Working with non-governmental organizations and others involved in education for women and girls will improve their understanding of the efficient use of different energy sources. Lessons from the case studies show that there must be ongoing communication between the supplier and consumer on this issue, rather than isolated promotional activities.

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21 The South Africa urban studies that include gender-disaggregated data are an exception. See the bibliography for these references.

22 Where extensive socio-economic assessments have been done, e.g., rural electrification, women and gender have begun to be recognized as important variables, and a gender focus has been introduced. (ESMAP 2002, EnPoGen 2002).

The needs of all stakeholders—electricity company, slum consumers, governments, communities, and intermediaries—must be considered in the design of effective programs for the safe delivery of electricity in slum communities. The economics of slum electrification must make sense for the electricity company. As this is a very difficult area to obtain a return on investment, attention has to be paid to lowering the costs of such programs and reducing opportunities for theft. Access to electricity is inadequate in itself for slum consumers; rather, the electricity needs to be affordable, safe, and reliable, and paying for the service has to be easy. Making it more attractive and easier for poor households to pay and improving local participation was fundamental to all the programs reviewed. Education about energy services and energy efficiency is essential and was found to be easily addressed in the slum electrification programs reviewed. Governments at all levels have an important role, particularly in dealing effectively with land tenure and right-of-way issues. Intermediary organizations are needed to play the important role of facilitating communication among the other stakeholders, especially the company and consumers. To develop effective future projects, more systematic information is needed about women as key customers and decision makers in electricity use.

6.1 PROGRAM DESIGNERS AND PARTNERS

In designing programs for electrifying and regularizing slum communities, electricity companies and their partners should:

- Design for and involve the specific communities to be served from the outset.
- Include the key stakeholders and consider the use of effective intermediaries in service design.
- Have flexibility to adapt to changing conditions and discoveries during implementation.
- Remove the temptation to steal as much as possible (using simple technology, such as standardization, high visibility, and prepayment meters) but rely on community educational efforts and policing to solidify the effort.
- Take into account household roles and decision making, especially women's traditional responsibilities in the home in the design, implementation, and marketing of slum electricity programs.
- Provide flexibility in payment options for connection fees, reconnection fees/fines, and electricity charges; consider the pros and cons and applicability of prepayment meters and other technologies.
- Recognize the gender, cultural, and economic differences for this class of customer and devise solutions based on these (e.g., using trusted intermediaries and working with the community's informal government processes in addition to central government and targeting women and men differently in campaigns and education).
- Consider competition from the illegal service provider in the program design and implementation.

- Maintain its part in the value equation or face recidivism (e.g., vigilance in disconnection of illegal connections and continued engagement with the slum communities after initial electrification is accomplished, to identify problems early on).
- Recognize and build in consumer responsibilities. Educational programs should communicate individual consumer responsibilities, such as:
  - Be prepared to pay (possibly in advance) for service
  - Participate in community activities to prepare for electrification and assist in policing of illegal activities threatening the scheme
  - Learn to use electricity within budgetary limits, including how to monitor usage and reduce consumption (e.g., what appliances use the most)
  - Rely on consumer information and complaint functions when needed
- Involve slum communities as they are crucial to the success of any scheme and can be enlisted to assist in design, implementation, and operation of slum electrification schemes. Some key activities for communities are:
  - Support the effort
  - Set up activities to communicate among the key stakeholders to help in understanding community needs and issues and how the electrification scheme will work
  - Set up a self-policing function
  - Continue working with stakeholders to keep the scheme working after implementation
- Rely on intermediaries and partners. Intermediaries should be known and respected within the community, have effective service delivery and communication skills, and must also be prepared to:
  - Communicate particular community needs and issues, including gender-related decision making with respect to energy use, to government and the electricity company during program design
  - Participate in training by the electricity company and/or government to upgrade skills and learn functions assigned within the scheme as well as be prepared to train other community leaders
  - Provide constructive feedback periodically to other stakeholders

6.2 ROLE OF NATIONAL AND LOCAL GOVERNMENTS AS PARTNERS

National and local governments can assist in making slum electrification successful in the following ways:

- Set clear goals and policy directions and work through the electricity regulator and other key authorities to implement those policies.

- Provide an enabling environment, particularly regarding land tenure for slum residents and rights-of-way for utility needs, and do it quickly and inventively to keep pace with demand.
- Allow experiments in slum services and tariff/payment options, such as lifeline tariffs or tariffs differentiated by size of service.
- Coordinate and integrate related government activities, particularly slum upgrading efforts but without holding back progress on electrification.

6.3 ROLE OF DONORS

International donors should work with government authorities, electric utilities, electricity regulators and other mandated institutions to raise awareness of the problem and identify potential solutions. Particular attention should be paid to developing measures that incentivize program participants to produce results, such as providing caps on non-technical losses; designing and implementing tariffs that recover costs and encourage efficient consumption; and raise awareness that in most cases tariffs designed to provide subsidies to low income consumers do not reach the targeted consumers.

The economic and financial implications of slum electrification programs should be more systematically investigated. The analysis could encompass such issues as the lowering of costs with reduction in theft and non-payment; lower costs associated with a more reliable distribution system; and the value of stemming the tide of a growing social problem and projecting a socially responsible image. A comparative analysis of the costs and benefits of prepayment meters as an alternative and the factors that contribute to their successful use would also be very useful to clarify this technology choice for electricity companies.

Donors and local and international organizations working on slum upgrading should consider:

- Adding an electrification component to proposed slum upgrading schemes, either in parallel or as a follow-on to the basic upgrades.
- Testing new approaches to slum electrification, including piloting new financing mechanisms and accommodating gender differentiation in service delivery. Research on willingness and ability to pay for electricity connection, use and patterns of energy consumption, and appliance purchases would be useful analysis for the development of a slum electrification project.
- Establishing a platform for sharing information on efforts to electrify slums among donors, governments, electricity companies, non-governmental organizations, and other stakeholders.
- Incorporating gender considerations into slum electrification programs, including encouraging the inclusion of women electricity professionals and technical specialists in the program planning and design stages to improve the gender quality of the program and delivery of services.

Appendix A
Case Studies

Depressed Area Electrification Program—Manila, Philippines

Contents

Section Page

1 Introduction

This case study illustrates the approach to slum electrification in the metro Manila area of the Philippines by investigating the design, implementation, and outcomes of the slum electrification program implemented under the "Depressed Area Electrification Program" (DAEP) in Manila's urban poor communities. The DAEP was implemented between 1990 and 1999 in communities where land tenure is not secure and squatters reside. The areas covered in this case study include San Roque; North Triangle, Quezon City; Mandaluyong; Tangapang Masa; Malabon; Laperal; Guadalupe; Makati; and Payatas.

DEAPs objective was to install distribution facilities and provide electricity to inhabitants in the 229 depressed areas in metro Manila, representing approximately 2 million people in 350,000-400,000 households.

2 Background

In the wake of dramatic political changes resulting from the fall of the Ferdinand Marcos regime in the Philippines, an array of community-based activities emerged to receive the support of new government attitudes and funding. An outcome was increased inflow of rural residents to urban areas. In 1986, the "People's Power Movement" resulted in new Presidential initiatives under President Corazon Aquino. A Presidential Commission on Urban Poor (PCUP) [1] was established and considerably increased political attention was given to the plight of urban poor, notably in the metro Manila area. The PCUP was dedicated to urban land, services, economic development and related reform activities. PCUP systemized its operations by encouraging local government involvement via the creation of Urban Poor Affairs Offices (UPAOs), many of which continue to operate – many of these UPAOs earlier served as implementers of local DAEP initiatives. PCUP identified critically impoverished urban areas as well as non-government organizations active in each urban area.

2.1 Motivation for Slum Electrification

Electricity rates in Philippines had been supported by subsidies since 1965 and covered the first 60 kWh of monthly consumption for all residential customers. Subsidized consumption was later increased to 120 kWh in 1972 and 200 kWh per month in 1974. In 1985, a subsidy reduction program was initiated for a six-year period[2]. Soon thereafter, the State utility, Manila Electric Company (MERALCO), began to transform into a market-based entity and government sought improved fiscal discipline - various measures to reduce theft of power and increase consumer payments for services were explored.

Over the years, "colorum operators" (middlemen) sprung up in some of the urban slum areas in metro Manila that were either un-served or poorly served by MERALCO. These colorum operators were either legitimate MERALCO customers that resold power at increased rates to

1 The PCUP was founded to be a direct link between urban poor and the Office of the President.

2 Today, the subsidy remaining for small residential consumers is borne by industrial, commercial and other residential payments.

others or illegal customers that tapped MERALCO lines and similarly resold power. Customers inevitably paid more to these colorum operators than they would directly to MERALCO - provided they were able to afford legitimate connection and service fees. MERALCO had been unable to fully serve areas where "colorum operators" had operated in the past for several reasons. MERALCO could not obtain a "right of way" to install necessary facilities in the communities since the land ownership was either being contested or was undetermined. MERALCO also experienced practical difficulties in installing equipment in the absence of roads on which its trucks could safely travel. Potential customers in these areas had no ability to pay for service extensions from the MERALCO facility to the house/neighborhood area - often a distance of 30 meters or more from the facility. MERALCO itself was suffering financial losses and undergoing major restructuring including subsidy reduction and corporatization.

In 1989, as part of the PCUP agenda and in response to the voice of urban poor, PCUP leadership commenced a collaboration with the MERALCO to explore options for providing legitimate electricity access to these un-served and poorly served areas in metro Manila areas. The National Housing Authority (NHA) and the Housing and Urban Development Coordinating Council were also asked to contribute to the program design and implementation.[3] The program was named "Depressed Area Electrification Program", commonly referred to as the "DAEP". Its objective was to provide direct electricity service in areas with virtually no access to electricity or otherwise served by the "colorum operators."

2.2 The "Urban-Poor" Service Territory

Recognizing that relocating urban poor was not a sustainable approach to addressing urban poverty, the Philippine government had identified 244 areas for priority development (APDs) back in 1979. Fifteen of these 244 APDs were designated for non-residential purposes, leaving 229 residential APDs. These 229 APDs are spread over 3,122 hectares, or 5% of metro-Manila. The households in these areas are illegally set up on land that is 73.6% private and 12.6% government (13.3% is of undetermined ownership). It is estimated that approximately 2 million people reside in these 229 APDs in 350,000-400,000 households.

The housing construction materials in these areas range from corrugated steel to thin wood and trash. Structures are extremely densely packed, and generally more than one family resides in extremely limited space. "Roads" tend to be footpaths and narrow alleyways that are generally unpaved. Open sewers and even flowing streams of contaminated water are common. It is estimated that 14-17 million urban poor reside in the Philippines. Individuals tend to be casually employed, jobless or live a "scavenger" existence.

3 The Department of Energy did not play a key role in the program design or implementation.

3 Description

3.1 Program Design and Implementation

3.1.1 The Depressed Area Electrification Program (DAEP)

In 1990-1992, with the assistance of a loan from the Japan Bank for International Construction (JBIC), the Philippine government's PCUP, the National Electrification Agency (NEA) and MERALCO jointly began implementation of the DAEP. This program for low income, peri-urban settlements was initially prepared as a 5-year initiative (1989-1994) and was later extended through 1999. The program was aimed at expanding legal electricity connections and lowering costs. The targets were to provide 224 km power lines, 37,035 poles, and service to a total of 229 APDS.

Three DAEP technology options were developed: 1) individual meters; 2) mother meter with sub-meters; and 3) a "meter wall" housing individual meters. The advantages and disadvantages of the three options is summarized in Table 1 below. The "meter wall" option was an innovative approach to providing individual meters to households without having to secure legal right-of-way through the slum areas and was predominantly used. Under this scheme (preferred over the other two options), the utility used an H-frame "meter wall" placed at the edge of the slum. The cost of extending distribution lines to the DAEP meter walls was waived for existing consumers. New legitimate customers were entitled to a very low connection deposit and individual households were responsible for extending the electric line from the meter to the household at their own expense. Loans were provided to households for internal wiring, and these were repayable to MERALCO over 60 months. More than 300,000 metro Manila households benefited from DAEP between 1990-1999.

Table 1 MERALCO Assessment of DAEP Service Schemes

Type of Service Scheme	PROS	CONS
(1) Individual Metering	Most desired by customers Less prone to pilferage Customer pays cheaper MERALCO rates	Most expensive Not applicable to areas with no defined roads/right of way
(2) 1 "Mother meter" with multiple sub-meters	Least project cost. MERALCO has to handle only one account. Applicable to areas even without roads, right of way.	Customers may be charged at higher rates. Association leaders are tempted to run away with collections. Success is dependent on the handling of collections and oversight by association leaders. There can be discrimination. Technical standards may not be observed.
(3) Multi-metering scheme using "H-frames" to house the meters, generally at the edge of slum community areas	Much less expensive. Customer pays cheaper MERALCO rates. Applicable to areas even without roads, right of way.	Customer pays for the metering wall; Prone to pilferage; Numerous service wires are lumped together - could be a safety/fire hazard and is aesthetically not acceptable.

The DAEP program sought to improve an earlier, failed approach under the "Community Electrification Program" which MERALCO operated with 19 urban poor associations in the early 1980s. In this program, payments to the utility were based on consumption recorded on a single meter placed on a pole in the middle of the households in the slum area, and a local housing association collected fees from sub-metered households. To date, only two of the 19 "associations" remain in operation, primarily due to corruption on the part of association managers who had a tendency to collect unregulated amounts on power delivered.

DAEP had to overcome several social and legal barriers and required a certain level of community governance and oversight beyond the intermediary role earlier played by the colorum operators. To implement the DAEP meter-wall, a community organization had to be established to organize sufficient participation to make the scheme viable, and to aggregate individual contributions to the construction of the meter wall.

3.1.2 DAEP Management

At least quarterly meetings were conducted with the PCUP, MERALCO and various community leaders. MERALCO however was primarily responsible for program implementation and management oversight. To manage DAEP, MERALCO established a well-staffed unit and the management structure included:

- The DAEP Project Administration Team (DRPAT) as the overseer and coordinator of the program
- DAEP Branches (departments) that processed applications, conducted the public information campaign, and installed meters
- The Design Team that designed distribution facilities and obtained "right of way" for lines
- Stock Management staff that coordinated the planning and ordering of required materials to support DAEP
- Distribution staff to install equipment (poles, wires, transformers)
- Logistics staff to supervise house wiring[4]

The DEAP implementation process is illustrated in Figure 1.

4 Many residents preferred to install house wiring themselves or hire a local electrician at significantly lower cost rather than use MERALCO's installation staff.

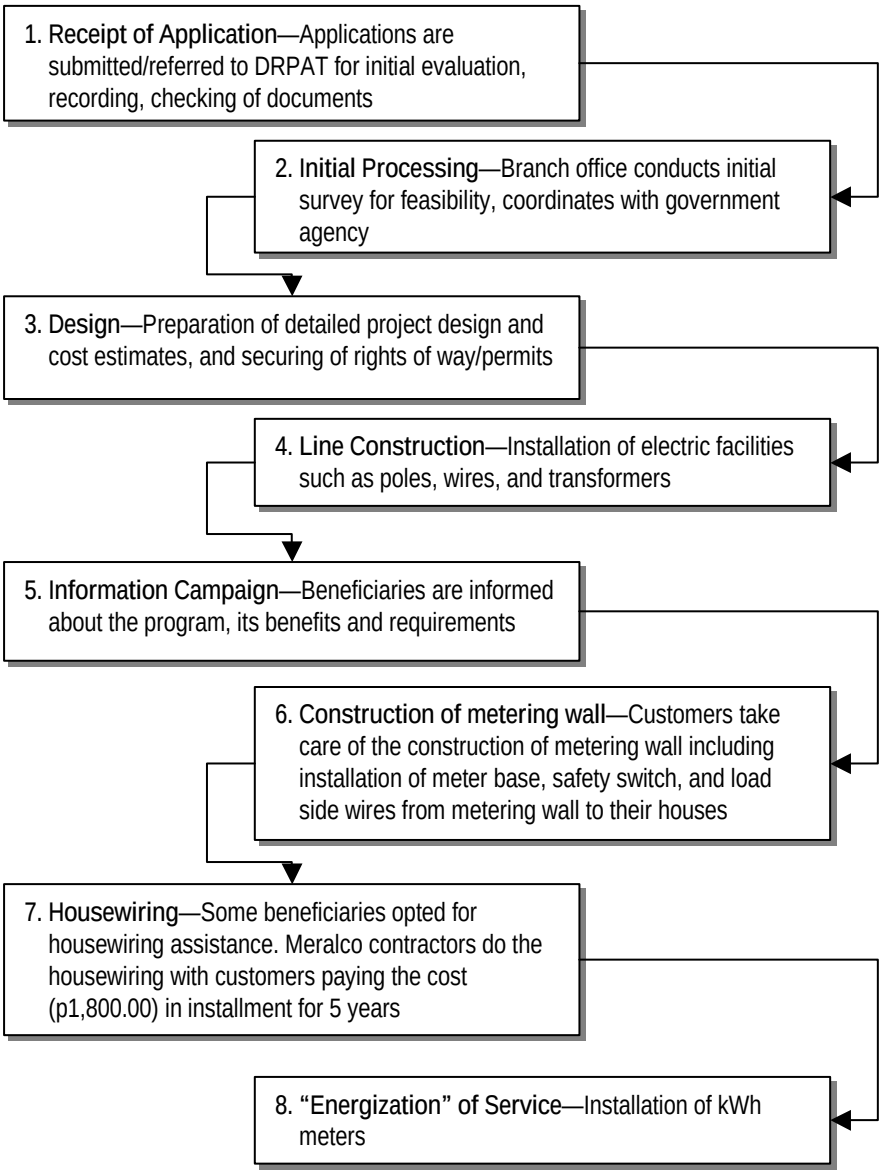

Figure 1 DAEP Procedures

3.2 Costs and Financing

The DAEP was not an inexpensive program. At the request of the Government of Philippines in 1988, the Japanese Bank for International Cooperation (JBIC) funded DAEP. The loan amount was 5,066 million yen (approximately $USD50m at current exchange rates). The 30-year loan was at 2% to the GoP and the onlending rate to MERALCO was about 6%. The loan proceeds financed the purchase of cables, wires, transformers and related labor costs for installation.

3.3 Program Partners

3.3.1 Government

The Government's role in financing and monitoring the program was essential for the success of DAEP. A number of government institutions were actively engaged in the project either through direct participation (PCUP, local governments) or indirectly in creating awareness (National Electricity Agency, National Housing Agency).

3.3.2 Donor Agency

DAEP may not have been possible without donor lending. The JBIC was active in monitoring the program and was extremely satisfied with program implementation.

3.3.3 Community Role

Trustworthy community association leadership and some semblance of community governance to achieve monitoring of the distribution lines for theft were critical to the success of the DAEP. Strong local leadership, communication amongst community members and commitment to making the DAEP succeed via peer pressure to pay proved to be essential to successful implementation of local DAEP initiatives.

3.3.4 Participant's Role

DAEPs success was dependent on program participants making their initial payment for connections, making timely payment of their electricity bills and, repaying loans where house wiring was financed by MERALCO.

4 Results

4.1 The Program

MERALCO as a public utility has an obligation to serve all customers without distinction, but there are no regulatory requirements to electrify slum areas. From the utility's perspective, the DAEP program was driven more by the need to reduce theft, regularize and increase the customer base, increase bill payments and improve service quality and respond to new government policies to alleviate urban poverty.

About 234,000 households in 229 communities were identified as eligible to participate in DAEP. However, as of the close of the DAEP program in 1999, some 320,000 households had participated in the DAEP (see box). This roughly translates to about 2 million people being provided legitimate access to electricity.

The program was a success despite several obstacles faced by the utility. MERALCO managers faced a variety of financial difficulties and technicians frequently encountered dangerous situations when they attempted to install and/or remove meters, poles and lines in various slum communities. At a time when the utility itself was coming to grips with a newly restructured sector and a developing regulatory regime that mandated fiscal discipline and market practices,

MERALCO can be commended for its commitment to the DAEP activity. The program was also a success because of donor financing.

4.2 Program Benefits

JBIC, the donor agency, conducted an evaluation of the DAEP in 1999[5] and found the following program benefits in DAEP communities:

- Lower cost of electric service.
- More effective and reliable service.
- Increased peace and order.
- Improved living conditions.
- Increased local income generation activities.

MERALCO - DAEP

Year	Households
1990	167
1991	5,707
1992	13,080
1993	32,183
1994	51,980
1995	47,327
1996	75,327
1997	43,479
1998	28,293
1999	22,617
TOTAL	320,160

The DAEP also led to customers purchasing more appliances including light bulbs, fans, radios, television sets, irons and refrigerators, thereby improving the quality of their lives. This increase in electricity consumption also made the program more cost-effective. Participants not making regular bill payments or repayments on their loans were disconnected. But this again resulted in theft of power.[6]

A consequence of the DAEP was that the provision of legitimate supply in areas with uncertain legal land ownership tenure led to communities seeking, and at time succeeding, in obtaining legitimate land tenure. This was generally achieved with the support of local politicians as well as through PCUP and NHA initiatives.

4.3 Community-Based Associations

The implementation of DAEP required the formation of community associations, which helped improve the governance of urban poor communities.

In the mother-meter with sub-metering scheme, the "associations" were actually local entrepreneurs who did not necessarily reside in the community. These small business networks controlled the mother-meter and received the MERALCO electric bill. The businesses were responsible for payment and its leadership would split costs of the sub-meters in accordance with its internally established procedures and meter reading costs. Generally, these "businesses" tended to abuse their intermediary role and significantly overcharged customers.

In the meter-wall scheme, the associations formed were more organizational than entrepreneurial. These associations were based in the community and staffed with a small local

5 JBIC conducted a case study (1998/1999) in the Balikatan Magkakapitgbahay Association area, surveying 506 households.

6 In some cases DAEP beneficiaries began to "resell" electricity to neighbors who had been cut off or who were never initially connected to MERALCO. The company has made no effort to stem this practice as it results in more households receiving power. Also, while the enclosed meters were largely secure, the long wires between meters and household were unprotected and easy to tap.

management team. They sometimes grew into local action offices that are addressing other issues in addition to electricity including water, safety, education, land tenure and local funding.

4.4 Customer Satisfaction

The DAEP provided legitimate electric power supply and safe installations in densely populated urban slums. This resulted in better service, increased safety and lower bills than those charged by middlemen. Even in cases where electricity bills were higher, customers reported a preference to legitimate service that was regular over their earlier illegal service that was cut-off by the utility. Customers also purchased more appliances to improve the quality of their lives. The increased lighting in homes and community street lighting made people feel more secure after dark, and as per some reports reduced petty thefts.

4.5 Replication, Expansion, and Future Plans

MERALCO staff are enthusiastic about the merit of the DAEP; the program was considered a success. However, the utility was concerned about the financial viability of the DAEP. While the utility reaped the benefits of increased number of consumers and connections in the slum regions around metro Manila, the cost of obtaining and retaining these consumers was high in cost, time and safety of MERALCO workers.

In the absence of renewed funding, the DAEP program is neither being expanded nor being replicated. The urban poor who were not participants in DAEP are now forced to pay high charges for legitimate connections, essentially rending out of reach legitimate electricity access. Legitimate customers that initially participated in DAEP at affordable rates are now increasingly experiencing theft of their power leading to increased power bills. As a result, about 30% of the meters in former DAEP communities have been disconnected as MERALCO removes the once-legitimate meters of non-paying customers.

5 Conclusions

While DEAP was a success in terms of exceeding the program's electrification targets, it failed to create a sustainable approach to slum electrification. Thus, there are no plans and measures in place to continue to assist communities with monitoring the infrastructure for theft or to subsidize a DAEP-like program. The JBIC loan made no conditions for follow-on activities to DAEP.

The implementation of DAEP required the formation of community associations to benefit urban poor communities and help them develop better community governance. A positive outcome has been the growth of these associations, based in the community and staffed with a small local management team, into local action offices that are addressing other issues in addition to electricity including water, safety, education, land tenure and local funding.

Absent any regulatory requirement to provide electricity access to slums, the role of the government is critical to the initiation and success of DAEP-like programs. DAEP was a success because of the government's role in making available the JBIC loan to finance the program. A

number of government institutions were actively engaged in the project either through direct participation (PCUP, local governments) or indirectly in creating awareness (National Electricity Agency, National Housing Agency).

6 Attachments

Acronyms

ADB	Asia Development Bank
AEAI	Advanced Engineering Associates International
APD	Areas for Priority Development
DAEP	Depressed Area Electrification Program
DRPAT	DAEP Project Administration Team
HRSC	Human Settlements Regulatory Commission
JBIC	Japan Bank for International Cooperation
JODA	Japan Overseas Development Authority
MERALCO	Manila Electric Company
NEA	National Electricity Administration
NHA	National Housing Authority
PCUP	Presidential Commission on Urban Poor
PNB	Philippines National Bank
USAID	US Agency for International Development

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PN Energy—
Khayelitsha, South Africa

Contents

1 Introduction

Phambili Nombane Energy (meaning Forward with Electricity), or PN Energy or PNE as it is now known, was started in 1994 as a pilot project by a joint venture between Eskom, Electricite de France (EDF) and East Midlands Electricity of the UK, and continues to this day. The project's goals were to electrify the slums in Khayelitsha on the outskirts of Cape Town, South Africa. The pilot aimed to test a new scheme for providing electricity to a population with a track record of non-payment and theft of power.

The PNE program provides an example of an integrated, government driven "community" distribution company that employed a variety of measures including subsidies and prepayment meters to reduce costs and ensure revenue collection.

2 Background

2.1 Motivation for Slum Electrification

During the *apartheid* era there had been forced removals in Cape Town (as in other parts of South Africa) of black and so-called colored people from the inner city to outlying areas. Vast tracts of land were cleared and re-settlement areas were constructed. Basic services were supplied irregularly or not at all to hundreds of thousands of households in these marginal areas.

Over the last ten years since 1994 (a time the South Africans call the new dispensation), there has been a continual stream of migrants to Cape Town, primarily Xhosa-speaking people and ex-farm workers and immigrants from Africa. It is estimated that some 4,000 migrants move to Cape Town every month. The newcomers build shacks wherever they can using mostly waste materials: cardboard, wood, metal and plastic. Fires, which destroy a number of shacks at a time, are frequent, especially during the summer months. Despite a massive, subsidized, low-cost housing program, the backlog in formal, low-cost housing is said to be about 250,000, a number that is increasing by 10,000 every year. The decision by the City of Cape Town to electrify shacks was seen as a progressive move that recognized that informal housing could not be wished away over the medium term. Also, it was in keeping with the objective of universal access to electricity as intended by the Energy White Paper of 1998.

2.2 The Utility and its Service Territory

Eskom is among the seven largest utilities in the world with a turnover in excess of R27 billion[1] in 2003. Within South Africa, it has a monopoly in the generation and transmission of electricity and in some distribution areas. Eskom spearheaded the national electrification program in South Africa. A National Electrification Fund (NEF) has been established recently with funds from the national budget under the Department of Energy Affairs to provide the substantial funds needed to continue subsidizing the cost of connection to formerly unconnected poor customers throughout South Africa. The National Electricity Regulator (NER), which has jurisdiction over all electric utilities, has administered this fund.

[1] Approximately US $4.4 billion. US $1.00 = 6.12 Rand

In the early 1990s, Eskom started a national accelerated electrification program to provide greater access to black populations – previously only 30% of the black population had access to electricity. In 1994 Eskom set a national target of 2 million additional household connections by 1999, a target that was reached quite easily. Thereafter, electrification continued more slowly and by 2002 nearly 3 million low-income households throughout South Africa had electricity connections. This electrification program was implemented without donor loans or funding. Connection costs were highly subsidized largely by the utility and partially by the government[2].

In the early stages, Eskom experimented with a variety of supply options and revenue collection schemes ranging from limited current supply options to flat rate tariffs and prepayments meters. The average cost per connection is now between R 2,200- R 3,500 [3] (urban and rural respectively). New customers are required to pay only a nominal amount (which has varied between R40 and R150 over the years and in different areas). Credit arrangements are made by the utility for customers who cannot afford even this nominal amount.

The PN Energy project functions in Khayelitsha, a township (the term used for marginalized urban populations in South Africa) on the outskirts of Cape Town and formerly served by the municipality of Tygerberg (now a part of Unicity). At the time of the establishment of PN Energy, Khayelitsha fell under the supply area of Eskom and has remained so. There are between 625,000 and 1 million people living in Khayelitsha in some 85,000 dwellings of several types: un-serviced informal shacks, site and service shacks, municipal houses, bonded houses and houses built by the People's Housing Project. The continuous process of upgrading informal, unstructured shacks into planned settlements with services does not keep pace with immigration into the area. In 1994 the breakdown of houses was as follows:

- 10,000 permanent houses characterized by a relatively high electricity consumption of about 150 kWh/month;
- 40,000 informal dwellings, of the type that were without electricity at the beginning of 1994 -- 33,000 of these are on legal plots and have been electrified.

It is estimated that about 80% of the households have access to electricity. The number of illegal electricity connections is relatively low compared with other townships (such as Soweto in Gauteng). A variety of energy sources are used in the households: paraffin, electricity, wood, LPG and candles for lighting.

These settlements are largely a cash based economy. Unemployment levels vary from 20% - 50% in informal areas, and recent reports are that the population has got poorer over the past five years.

2 Initially costs per connection were as high as R6,000 per household (about $975), but experience, experiments and advances in technology progressively reduced costs.

3 As of January 2004, the exchange rate between the United States Dollar and South Africa Rand was 1USD + 6.7 ZAR. Therefore , the average cost of a connection would be between US$ 328-522.

The City of Cape Town also put in place its own model for slum electrification with a focus on safety and provision of electricity to previously neglected communities. A description of the Unicity's slum electrification program is also provided at the end of this case study.

3 Description

3.1 Program Design and Implementation

PN Energy was started in 1994 as a pilot project by a joint venture between Eskom, Electricite de France (EDF) and East Midlands Electricity of the UK to electrify the slums in Khayelitsha. The three utilities had considerable expertise in low-cost electrification and loaned personnel to run the operation. Midlands later withdrew from the Joint Venture and EdF and Eskom, two of the largest and most powerful public electricity utilities in the world, are the owners of the JV. The pilot aimed to test a new scheme for providing electricity to a population with a track record of non-payment and theft of power. The joint venture that formed PN Energy had the following objectives when it was established:

- Match or reduce Eskom's cost per connection per house while upgrading the quality and reliability of existing networks
- Legitimize PN Energy as the sole distributor
- Maximize the value of customer service
- Set up a legitimate infrastructure for revenue management
- Minimize non-technical losses
- Focus on customer services
- Increase consumption levels
- Prove that a Joint Venture could be a successful solution to low-cost electrification

While the objectives were laudable, PN Energy faced some daunting conditions when it was initiated in 1994:

- A customer base of 6,000—80% of which had conventional meters, with the remaining 20% equipped with pre-paid meters. However, it was estimated that some 90% of the pre-paid meters had been tampered with and commercial losses amounted to 80%.
- There was no database of meter reading and bill collections
- The local authority was considered illegitimate[4], and the electricity supplier did not consider the community as a stakeholder
- The supply networks were in a state of disrepair, outages were at record highs and resources (personnel, tools and equipment) were insufficient
- There was a 'culture of non-payment' of rent and services payment

4 They were considered agents of the apartheid regime, and thus illegitimate

The challenge for PN Energy was to design a program that would address all the above conditions. To overcome these challenges, and in keeping with its goals and objectives, the PN Energy scheme was characterized by the following key elements:

- Provision of high quality service in place of the former low quality, unreliable service
- Service drops high on utility poles to reduce theft of power
- Deployment of prepayment meters
- Use of a community-based distribution company (PNE) to serve as an interface between Eskom and the community
- Standardization of connection and house wiring to lower connection costs
- Easier payment terms
- High corporate standards in PNE to improve profitability through constant monitoring of the system
- PNE's staff of 28 was based mostly in the Khayelitsha office and many employees were from the township
- The existing distribution system was fully upgraded
- Vendors of prepayment cards were set up within the community
- Provision of customer service hotlines and offices

3.2 Commitment to Customer Service

An important condition for successful program implementation was to create a legitimate utility and prove credibility with the consumers. PNE thus adopted a two-pronged approach:

- *Communication with the community*—Initially the Communications and Training Manager went on local radio, up to four times a week, to explain the scheme and get name recognition (Phambili Nombane, as it was then known). Meetings with community representatives were held. Between 1994 and 1995 more than 1,000 on-site group sessions were held to inform and train customers on the safe use of electricity and the pre-payment scheme.
- *Visible improvements and changes to the distribution network*—The distributed system was upgraded and labor-intensive jobs were created to employ local persons where possible. Maintenance and preventative work was done to reduce outages. Customers in arrears were persuaded to take pre-payment meters in exchange for debt cancellation. Theft was made more difficult by using service drops high on utility poles. New connections were made using pre-payment meters enclosed in tamper-proof boxes elevated on highly visible poles with only non-load bearing wires into prepayment "switch" meters in the home. Highly visible connection boxes were installed at the entrance to the house. Initially pre-payment card technology was used, but tampering and theft proved too easy. A punch-in code meter was then used. To

counter corruption, the use of contractors to install the meters was discontinued, and only PN Energy staff was used for meter installation.

PN Energy made a strong commitment to customer service. A customer service center was built in Khayelitsha to house the PN Energy staff of 28 members (11 were technical staff). Many employees come from or lived in the township. PNE installed a toll-free number to cater to customer enquiries and meets with the Khayelitsha Development Forum to address various complaints. Twenty-seven outlets were established throughout the service area to sell pre-paid cards for the prepayment meters, and these vendors were trained in business systems and use of computers. Four of the vendors were open 24 hours a day. Each vendor was expected to serve about 2,000 customers and earn a commission on sales thus making it a desirable employment opportunity.

PN Energy developed and maintains a customer database and monitors transactions and systems operations to ensure smooth operations and keep costs low. Disconnections due to continuing theft problems are handled through a community based organization. The company allows several incidents (with increasing fines) before resorting to disconnection. PN Energy reduced the re-connection fee from R1000 to R600 in an effort to maintain good relations and encourage customers to maintain legitimate connections.

3.3 Program Management

A South African Managing Director and a Board of Directors manage PN Energy. The latter consists of 50% shareholders from Eskom Enterprises and 50% shareholders from EdF. The joint committee meets at least once a year in South Africa.

Four operational units - Operations, Finance, Training & Community Relations, and Software & IT - are each headed by a manager. Several members of PN Energy staff were seconded from Eskom.

3.4 Costs and Financing

In 1994 Eskom, EdF and Midlands[5] each invested R1 million in startup capital to establish and initiate the electrification program in Khayelitsha.

In South Africa an average consumption rate of 355 kWh per month is generally required to break even on capital cost repayment, and the normal connection fee is of the order of R 2200 to R2600. However, low-income households use substantially less electricity—in the region of 120-150 kWh/month—and the connection costs to these customers are subsidized.

3.5 Low-Income Tariffs

All municipalities in South Africa are obliged to provide free basic supply of 50 kWh to all low-income earners. Some municipalities, such as Cape Town Unicity, supply only 30 kWh of free

5 The original members of the joint venture that formed PN Energy. Edf and Eskom bought out Midland's ownership in the year 2000.

supply. Eskom has not subscribed to this policy, which it argues is unsustainable, and the areas supplied by Eskom or its agent PN Energy are not extended this lifeline tariff. Customers in these areas are thus very unhappy with the situation.[6]

3.6 Key Program Partners

3.6.1 Government

The Government in place prior to 1994 did not initiate the national accelerated electrification program. This interim government had no clear electrification policy when Eskom embarked upon its program to electrify townships. However when the Government of National Unity came to power in 1994, it endorsed the targets that had been set in the Reconstruction and Development Program (RDP) of the previous interim government. The Department of Minerals and Energy has been consistently supportive of the electrification program, although in a more diluted form since 1999 when the RDP targets were reached. Also the Energy White Paper of 1998 recommends "Energy for All."

3.6.2 Utility

Eskom played the driving role in the national accelerated electrification program, electrifying areas that lay beyond the municipal boundaries, subsidizing municipalities who did not have the capacity to electrify the townships within their demarcated areas of responsibility. PN Energy, Eskom's agent, was tasked with electrification in an area that was in dispute with the local council over service and arrears. At the height of the accelerated electrification program, there was a real buzz of energy within the utility, with regions vying to achieve the highest number of connections at the lowest cost.

3.6.3 Community

PN Energy and the City of Cape Town agree the project could not be undertaken without significant consultation with local communities and their support. The utilities liaise with civic and political organizations ranging from women's and religious organizations to political party branches. The City has a mobile unit that provides education and creates awareness. Both PN Energy and the City employ liaison officers

3.6.4 Participant's Role

The individual household has to take responsibility for applying for electricity, buying kWh credits and keeping their prepayment meter and wiring in working condition. To date, although there is tampering with meters, there has not been a call to boycott vendors. It is in the participant's interest to attend local meetings on electricity service. PN Energy makes service announcements on posters and calls meetings by driving around the township with loudhailers.

6 The City of Cape Town and Eskom are in negotiations and the Unicity has said that Eskom will begin supplying 'free' electricity as the election draws close in 2004.

4 Results

4.1 The Program

PN Energy is particularly noted for its results in the township of Khayelitsha (pop: 700,000), which achieved an increase of 60,000 connections from 1994-2003, as well as reductions in non-payment from 70% in 1994 to 5% in 1998. The success of the program is evident from the fact that PNE is now breaking even on its costs, and its activities have migrated from an intensive electrification campaign to one more resembling a distribution company. This is in large part due to the fact that the program has been extremely successful and has largely electrified the township. A few un-electrified pockets remain, but these are generally due to disputed land rights and right-of-way issues. PN Energy is still connecting new customers as new migrants move to the area

PN Energy however faces challenges in sustaining the program because of funding requirements, increase in demand and changes in regulation. Theft and tampering continue to be a problem. Losses, which were reduced to 5% in the first few years of operation, are now between 11 and 12%. Attrition in trained technical and maintenance staff due to HIV/AIDS is also becoming a serious problem. Also, as more people move into these peri-urban settlements, a negative aspect of regularizing electricity service to these slum areas is perceived as perpetuating the old practice of racial segregation.

4.2 Program Benefits

People prefer to have legitimate electricity connections, which are perceived as being safe. Having legitimate electricity connections has also hastened the recognition of land tenure rights. Subsidized connection charges have made electricity access more affordable and the prepayment meters have made it far easier to control consumption based on the consumer's ability to pay. Anecdotal evidence and a recent survey indicate that over the years households in Khayelitsha have increased appliance ownership, even among the very poor. The increased electricity consumption has made the electrification program more viable.

4.2.1 Prepayment Meters

Prepayment meters have made a significant improvement in revenue collections and reduced metering, billings and collection costs. Initially prepayment meters were unreliable and technical failures were frequent. However, they have improved substantially over time and are now perceived to be reliable. Prepayment meter costs have also been reduced and a meter costs about R320 (an ordinary conventional meter is R80-R100 less). Prepayment meters have however been a big boon to poor consumers who can control their electricity consumption based on their ability to pay and not get into debt to pay their electricity bills. But despite the benefits, PN Energy and Eskom admit given the low levels of consumption, the return on investment on prepayment meters is poor.

4.2.2 Community-Based Organizations

Community based organizations play a crucial role in the success of these slum electrification programs. They help mobilize people to come to meetings and represent the collective opinion of the community. They are also instrumental in educating consumers on the safe use of electricity. While PN Energy does not directly work through NGOs it enlists their support.

4.3 Customer Satisfaction

The economic and social benefits of electrification have not been directly evaluated but anecdotal evidence indicates that there has been a 15-20 % improvement in the quality of life of connected dwellings, and only months after connection people start buying appliances and making improvements to their dwellings.

The provision of safe connections has significantly reduced the risk of shack fires and the building of access roads by the utility is also a positive development. The provision of streetlights is highly appreciated by the local community since it has led to a reduction in the incidences of violent crime. The availability of electricity has also reduced the use of traditional fuels like fuel wood and kerosene leading to improved air quality.

4.4 Replication, Expansion, and Future Plans

The township has largely been electrified and the same level of service will continue to be maintained. The provision of free electricity (for consumption below 50 kWh/month) is unlikely to be sustainable and it is unclear if this provision will be maintained after the elections.

A likely problem could be increased migration to the township, which would strain the supply system. PN Energy is capable of electrifying another 33,000 shacks if given permission to do so. The primary constraint is land and land tenure and the municipality's (Unicity) rules. Since the constitution of the Unicity in 2000, PN Energy has had to apply to the Unicity for permission and funding to electrify shacks. The Unicity through a survey determined the shacks to be electrified, usually between 2,000 to 3,000 a year.

5 Conclusions

The project has been very successful in electrifying the slum areas. The utility will however need to modify and refine its approach as the project evolves and the utility learns more about the challenges and constraints of slum electrification. Critical factors in the success of this pilot project include the following:

5.1 Factors Critical to Success

A. Major Commitment by Local Utilities: A strong management and technical team backed by two large and financially sound utilities (EdF & Eskom) were key drivers of this successful slum electrification program. PN Energy made it a "mission" to create a legitimate utility and prove credibility with the consumers. They did this by focusing on communicating closely with the community and educating them about the program and its benefits. Simultaneously, they

made visible improvements to the distribution system by improving service, reducing outages and installing tamper proof prepayment metering systems.

However, vendors for prepayment meters are proving to be the weak link in the electrification strategy, due primarily to corruption and the high rates of violent crimes prevalent in South Africa. There are not enough vendors (1:2,000 instead of the planned 1:1,000) and vendors 'run out' of electricity. PN Energy gave vendors a credit ceiling and when the credit cap was reached, vendors have to bank money before another tranche of credit is granted. But keeping cash and/or carrying cash around a township in search of bank are a dangerous proposition. In some areas customers take a taxi to buy electricity credits to ensure their personal safety.

B. Human Contact and Local Presence: PN Energy also made a strong commitment to customer service and built a customer service center in the township and also installed a toll-free number to cater to customer enquiries. Vendors for prepayment meter codes were placed in the township, and local people were trained and employed.

To ensure payments, the utility and the municipality have also tried to involve customers through education campaigns, face-to-face meetings and negotiations, credit extensions and easy payment measures.

C. Role of the Intermediary: In the early years of the program, the credibility of Eskom and the municipality was such that the concept of an intermediary worked well. PN Energy was able to come in and establish a friendly, customer-orientated service, providing vastly improved quality over what the township was used to. The number of connections per day (200 at peak) made a visible difference to the area and people's lives. The real innovation lay in:

- Selling the electrification scheme and building customer relations, and
- Lowering the capital costs of electrification using overhead cables, local labor, advanced technology and prepayment metering.

Now that Eskom has new-found political legitimacy and a transformed bureaucracy, PN Energy's persona may not be as important as it was in 1994. Fieldworkers report that the population would now rather have Eskom (assuming that Eskom provides free basic electricity). People in the area complain of "weak" electricity – that is, brownouts or power cuts, and some would prefer a 60A supply rather than the 20A they receive.

The role of the intermediary is bound to change as the situation changes, and allowances for this should be built into the planning.

6 Attachments

The Unicity's approach to Slum Electrification

In 1999 the City of Cape Town made a decision to electrify informal areas. It formulated its objectives somewhat differently to the Phambili Nombane project. The program's focus was more on ensuring the provision of safe electricity service to previously neglected groups of people, and less on finding a business solution to the problem.

The Unicity's objectives

The City's goals are a mixture of addressing development, redistribution and human rights issues:

- To eliminate the illegal wiring crossing the public roads and around informal settlements which are a danger to the public.
- To provide electrical connections to entrepreneurs.
- To provide electricity to community facilities such as halls and crèches.
- To provide electricity supplies to as many dwellings as possible within the limits of engineering practicalities in order to raise living standards, stimulate home industries and enable students to study at night.
- To render the supply of electricity to informal townships as safe as possible in terms of the Occupational Health and Safety Act.
- To address the following Strategic Priorities determined by the Council:
  - An equity and redistribution strategy
  - A strategy to target zones of poverty and/or social disintegration
  - An economic development and job-creating strategy
  - The promotion of community safety (City of Cape Town 1999-04-22)

Program Design

The City's strategy is to electrify every dwelling possible using the government subsidy for the capital costs. A new connection costs approximately R1,400. Each household pays R154 connection fee for a standard 60A supply, a pre-payment meter, and ready-board. The City made a political decision that all households should receive a 60Amp supply, and that all new houses, whether built in wealthy or poor areas, should have pre-payment meters. The City supplies key-in pre-payment pads, similar to those used by PN Energy. Of the City's 520,000 domestic consumers, 330,000 have pre-payment meters. Internal wring is the responsibility of the householder.

The City's policy is to overlook tenure issues unless the land settled is private and/or in dispute or 'encumbered'. This includes low-cost formal houses and informal dwellings on public land but not informal dwellings on private land or encumbered areas such as access roads, alongside

railways lines and swampland. These dwellings are estimated to number about 10% of the total housing stock. If an informal settlement has been in existence for more than three years and is relatively stable, it will be electrified. Depending on the area and housing type, overhead and 'maypole' wiring (up to fifteen individual houses may receive electricity from one pole) is used in informal areas such where permanent housing has not yet been built. Joe Slovo is an example of such an area.

Program Results

The City supplies 30 kWh of free electricity to each household (government policy is 50 kWh). Non-poor consumers subsidize the free electricity through a stepped tariff. The City avoids confrontation over non-payment, choosing persuasive means of revenue collection instead. The City estimates that it has achieved 94-95% coverage in its demarcated supply area.

The City applies to the National Electrification Fund (NEF) for the subsidy per connection in its electrification program and uses its own funds. The City says that at current rates electrification costs are affordable. The subsidized tariff (30kWh) is funded by an allocation to the Department of Minerals and Energy, and from rates. At present 13% of revenues from electricity are used to provide other services. The City of Cape Town's Electricity Tariffs increased by 5% on 1 July 2003 and Eskom's by 6.5%.

Major changes in the entire organization of the electricity sector are ongoing. The structure being decided at this time involves setting up 6-8 regional electricity distribution companies to serve the entire country. Another initiative underway is to rationalize tariffs as they vary considerably from one service territory to another.

Both utilities active in Cape Town acknowledge that electrification for low-income areas fulfills social responsibility obligations rather than a profit motive.

Comparison between PN Energy and City of Cape Town

	PN Energy	City of Cape Town
Subsidy per connection	Fee-for-service from Eskom	Funded by the NEF
Cost of connection to customer	R150	R154
Service provided	20A	60A
Poverty tariff	None	30kWh per month
Payment method	Pre-payment punch-in	Pre-payment punch-in
Disconnection fee	R600	

Acronyms

AEAI	Advanced Engineering Associates International
AEC	Ahmedabad Electricity Company
AUDA	Ahmedabad Urban Development Authority
CWD	Catholic Welfare and Development
DME	Department of Minerals and Energy
HSRC	Human Sciences Research Council
NEF	National Electricity Fund
NER	National Electricity Regulator
PNE	Phambile Nombane Energy
RDP	Reconstruction and Development Program
USAID	US Agency for International Development

Conversion Rate:
R 7.50 = 1 US$
Highly volatile –
R4: 1 US$ in 1994
R12: 1 US$ in 2003
R7: US$1 in 2004

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Program for Normalization of Informal Areas—Rio de Janeiro, Brazil

Contents

1 Introduction

Rio LIGHT, the electric utility serving most of the population of Rio de Janeiro State, including the metropolitan area of Rio de Janeiro City (RJ) in Brazil, launched a major campaign in 1997 - 2002, called PRONAI or the "Program for Normalization of Informal Areas". During this program, over 250,000 households were either regularized or connected to electric service for the first time. PRONAI's goal was to provide safe, legal power connections in the city's favelas (slums) and other low-income communities while ensuring customers were billed for electricity consumption. The approach to accomplish this goal was three-pronged:

- Improving the quality of service and reducing associated safety hazards through upgraded networks and connections
- Making grid connection and legal purchase of electricity affordable and desirable through subsidies and financing
- Improving the company's image and ability to operate in slum communities.

2 Background

Privatization of electric utilities in Brazil began in 1996; currently, about 40% of the nation's distribution assets and 60% of its generating assets remain under government control. The electricity regulatory agency, *Agencia Nacional de Energia Eletrica* (ANEEL), was established at the end of 1998 with the responsibility to establish and oversee regulated retail tariffs, bulk power market prices, implementation of concession contracts, quality of customer service, and to promote competitive markets through the establishment of adequate industry technical and operating standards.

2.1 Motivation for Slum Electrification

Privatization of many electric companies began in Brazil in the mid-1990s. LIGHT was the second electric utility to be restructured and privatized, in advance of the structural and regulatory changes that created the present elecricity sector structure in Brazil. Although virtually all of the privatized distribution concessionaires had contractual obligations to serve all customers under new industry rules, there was no enforcement and little oversight of this aspect. The enactment of a new law (no. 10.438) approved in 2002 formally mandated 100% electricity coverage in all service areas of distribution concessionares. Following privatization, utilities' motivation for undertaking slum electrification, upgrading and regularization programs mainly stemmed from a desire to reduce non-technical losses and expand the number of bill-paying customers. More recently, a cap on losses (actually a limit on recovery of losses through ratepayers of 90.7 % of actual losses) was instituted, providing further motivation to reduce losses.

During the late 1990s, the government continued to permit use of the RGR – a general fund financed by a fee on all electricity customers for subsidizing electrification in urban as well as rural areas, and rates for very low-income consumers. In addition, the concessionaire contracts also contained a clause to establish an efficiency investment fund for the utility to improve the

demand-side efficiency of their operations area. The resources for this program were raised through a 1% levy on the utility's gross receipts. The privatized electricity distribution companies initially were permitted to use some of these funds to undertake slum electrification initiatives – e.g., in COELBA's utility program launched in Bahia and the Eletropaulo initiative in Sao Paulo, as well as the initial LIGHT PRONAI model in RJ – with ex-post facto review by ANEEL of the utility expenditures on such projects. Since 2002, however, only utilities in the Northeast and North, which are the poorest regions of Brazil, are still allowed to use financial resources from the efficiency fund for urban electrification, and this is limited to 50% of the fund's total resources, with the other half of the 1% going to R&D initiatives.

Since the election of President Lula in 2002, a number of changes are being made in the policy for and regulation of the electricity sector in Brazil. New policies lay far greater emphasis on quality electricity service for all and inclusion of marginalized economic groups, through direct and indirect subsidy programs and stronger enforcement of contractual and legal obligations to provide service and emphasis on acts of social responsibility by corporations and citizens. In addition, the enactment of Law No. 10.438 is likely to significantly affect slum (and other) electrification efforts, as it will oblige electricity distribution companies to achieve 100% electrification in their respective service area by a certain date.

The future form and scope of ongoing slum electrification programs in Brazil, however, are a matter of concern to utilities that have made considerable investments in this area, pending the definition of the new rules for implementing this law. For example, the amount and source of financing, the ability to earn a return on or at least recover the capital investment, the extent and enforceability of the utility's obligations to provide a certain level of service and customer options, among other factors, will affect the timeframe, number, manner and geographical/socio-economic basis for extending electricity services to all households and other consumers, and the overall sustainability of these efforts. Furthermore, the resources of a new fund, known as the CDE fund, established in 2002 to replace the existing RGR fund, are being funneled specifically for urban and rural electrification purposes, as well as for low-income consumer subsidies. With these changes in perspectives and approaches, utilities in the richer South and Southeast regions may no longer be allowed to utilize the RGR/CDE fund to finance future slum connection programs and will probably have to invest internal funds. Utilities in the North and Northeast regions of the country will likely be allowed to continue using the internal energy efficiency fund as well as the cited national funds for electrification programs[1].

After a prolonged drought, rationing was introduced in 2001 resulting in a very significant and sustained reduction in electricity consumption (on the order of 20%, the goal of the rationing). During this period, emergency regulatory actions imposed on the electricity distributors' prices considerably reduced or eliminated profits in the sector – though some regulatory decisions and other governmental actions were taken to restore the financial health of the most critically affected utilities. The crisis not only achieved an overall reduction in consumer demand but also a shift of major or sensitive commercial and industrial consumers to self-generating modes. The financial impacts from the crisis, post-crisis sustained conservation, regulatory price caps, and

[1] New rules require that only 50% of the efficiency fund be used on electrification and the remaining be used for R&D activities.

the low investment attraction (return on investment) in low-income areas contributed to the scaling back or elimination of many slum electrification programs such as PRONAI during the 2002-2003 period.

3 Description

3.1 Program Design and Implementation

In 1997 Rio LIGHT launched the "Program for Normalization of Informal Areas" (PRONAI), which lasted until 2002. Over the duration of the initiative, some 250,000 households were either regularized or connected to electricity service for the first time. PRONAI's goal was to provide safe, legal power connections in the city's favelas (slums), in particular the Rocinha favela, and other low-income communities, and bill consumers for electricity use. The project would upgrade power networks, expand electricity coverage through metering installation, and educate consumers on conservation and legalization of residency. The approach involved: 1) improving the quality of service and reducing associated safety hazards by upgrading networks and connections, 2) making grid connection and legal purchase of electricity affordable and desirable through subsidies and financing, and 3) improving the company's image and ability to operate in slum communities.

3.2 Costs and Financing

The total cost reported for the LIGHT program is R$ 52.8 Mn (or around $20 Mn at an exchange rate of 2.5 R to $US 1). LIGHT maintains that it used its own company resources from its 1% efficiency fund, to finance the PRONAI program. The utility had simultaneously administered funds from a World Bank loan ($200 Mn) generally destined for system upgrades throughout LIGHT's service territory.

The funds used for PRONAI were for distribution system upgrades, public lighting, connections and meters as well as "soft" investments, such as program marketing and "roll out". LIGHT invested R$10 Mn to lay 28 km of low tension wires, raise 600 utility poles, erect enclosures for transformers, install 24,000 meters, build an underground distribution system and provide 28 km of public lighting over a two-year (2000-2002) period.

3.3 Customer Benefits

LIGHT provided non-recourse financing[2] (over 2 years in 24 payments to be paid along with the monthly utility bill) to program participants to improve affordability of the "low-income" (low amperage) meters installed, taking a considerable risk that these consumers would indeed pay their utility bills. To improve participation, LIGHT offered an exemption from prior fraud or theft if the client became normalized. LIGHT also offered tariff "discounts" for customers registered as low income - residential single-phase service with an average consumption of 140 kWh/month or less.

[2] A type of debt for which a borrower is not personally liable. If a borrower defaults on a non-recourse loan, the lender must recover the amount by foreclosing on the property/goods by which the loan is secured.

3.4 Key Program Partners

A major problem for LIGHT initially was that its workers could not safely enter the favelas because of gang activity and general resistance to the inevitable disconnection of illegal tapping of nearby electricity lines. LIGHT, to overcome these obstacles, worked with local community organizations, some public agencies active in the area, and non-government organizations to explain and promote the program, and train local community members to serve as program representatives. Over 200 local students drawn from the communities and usually in their teens were trained to be LIGHT Agents (always in a casual but recognizable uniform of T-shirts and baseball caps with logos), to provide a community interface between the company and the slum residents. The agents reinforced the message by going door-to-door and talking with each family. The agents also made presentations and held community meetings, in addition to taking stock of the current situation, which was important in determining what steps the company needed to take. LIGHT worked closely with other activities aligned with its goals, including those sponsored by the City of Rio Janeiro, local community organizations and slumlords, and the industry association of Rio, FIRJAN.

The program also worked hand-in-hand with local non-governmental organizations (NGOs) in order to make sure people understood what the effort entailed; obtain their buy-in; help them access special lines of credit, participate in diverse social programs, and fill out forms or obtain information through the internet at its local service branches; and participate in other training or organizational support activities sponsored by the utility.

4 Results

4.1 The Program

LIGHT's PRONAI received the "Prize for Social Responsibility" in 2001 and 2003. PRONAI started with a market that was characterized by rampant theft of power and non-payment for the small percentage legally connected to LIGHT. Because of the "free" electricity, residents had a large number of appliances and correspondingly, a relatively high usage that would be unsustainable if full cost were paid. In the four to five years of its activity, the PRONAI program regularized 265,000 homes and implemented metered service in 251 different informal areas (communities) in RJ.

PRONAI was an important pilot with an innovative approach for Brazil. It was estimated to take about *five years to generate a profit once the program began operating* in a neighborhood. However, from 2001 on, factors beyond the control of the program (the economic downturn, the energy crisis, lower demand and vacillating availability of energy as a result of the drought, and ensuing changes in government rules with respect to rationing and recovery of economic losses) resulted in increasingly negative results in slum electrification programs. The utility's ability to prioritize investments for maintaining or expanding them was greatly diminished as other issues more critical to the utility's financial condition and obligations to its shareholders took precedence. As a result, where the program was not maintained with an active LIGHT presence and continuing investments, the participating communities fell back on earlier practices of either non-payment of their energy bill and ultimate service disconnection, or to theft of power from

the system. Nevertheless, before these "force majeure" events, five out of six communities in the program that were studied in depth for the financial implications of the program showed a positive return on investment for the electric company.

4.2 Program Benefits

Almost half of LIGHT's non-technical losses are incurred in favelas and low-income neighborhoods, amounting to over R$ 100 Mn in 12 months. The primary action taken by PRONAI regarding theft was to provide more theft proof meter boxes located in visible places. Adding NGOs to the scheme and having a community face was a substantial damper on recidivism experienced after the program was implemented in an area. For example for a community with 75% non-technical losses and/or non-payment prior to the program, losses/non-payment dropped to 42% immediately after implementation but then climbed back to 62% without a continuing presence in the community. By adding back community presence, LIGHT found it could bring losses/non-payment back down to around 50% despite harsh economic conditions during this period (and of this only 5% was reported to be from theft). Maintenance and surveillance of the system within the community is considered key to keeping theft down.

4.3 Payments

The average income of families living in the *favelas* may vary somewhat, but a standard range for a typical family of 3 to 4 members would be R$200 or around US$65-80 per month.[3] So, the residential slum customer's ability to pay for connection fees and ultimately for actual energy consumption was, and remains, a major concern. Lower tariffs for low usage customers, financing for customer connection costs as well as a subsidy for connection (meter) contributed to the attractiveness of the program for the target population. For low-income residents, the connection cost was lowered to about R$30, providing a 42 percent discount over the regular charge. LIGHT had a microfinance program that allowed residents to make 24 payments of R$3 to cover the expense. PRONAI wiped the slate clean – i.e., did not press charges or try to collect fines or compensation - for participating customers' prior illegal connections. Additionally, the donation of 328,560 CFLs (via an ANEEL-sponsored energy efficiency program) in 2000 and 2001 lowered the level of electricity consumption for participants. Ease of payment was also improved with customer service offices added in many areas more convenient to community circulation patterns. However, higher tariffs responding to increased generation and service costs, as well as 50+ % inflation over the last 5 years, have offset the gains achieved by PRONAI by eroding the customer's ability to pay and the company's ability to absorb the high degree of non-technical losses. PRONAI included training for program participants in the efficient use of energy and reading the meter to understand their consumption patterns, as well as the utility bill, and provided other information and general support to respond to service complaints.

4.4 Customer Satisfaction

PRONAI definitely improved safety conditions and reduced electrical hazards in the slum communities by replacing the illegal wiring and applying modern and correct practices according

[3] Note: this would not include typical non-monetary adders such as food baskets, or account for transportation allowance and non-documented sources of income, which could easily add a value of another R$150 per person working outside the home.

to standard electrical codes. The quality of the energy provided to customers was also considered far superior and satisfactory to that supplied under haphazard and illegal connections, and enabled more appliances to be utilized by managing the household's energy loads according to the training on energy conservation and usage provided by LIGHT. The program also documented proof of residence for favela residents, and the installation of meters and customer billing established a legal address and proof of residence for participants, which in turn enabled them to get telephone lines installed.

5 Conclusions

In the four years of the PRONAI program around 250,000 homes were regularized and service metered in 260 different informal areas. In the two years that the program operated in Rocinha favela, losses were reduced from 76% to 40%. Furthermore, five out of six communities studied showed a positive return on investment for the electric utility. Major challenges exist for a post-PRONAI program, however. For example, the sustainability of such a program without additional external funding remains in question. Furthermore default rates on payment have returned to the same levels as prior to the program without continued intervention.

Nevertheless, in terms of extending electrification coverage, the program has been a success and some of the key factors are described below.

5.1 Factors Critical to Success

Replicable success factors include:

- Making Electricity and Electrification More Affordable and Easier to Pay
  - Financing/credit for hardware was offered to lower the initial installation costs of meters and amnesty from theft prosecution and prior debts given if client joined the program
  - Extensive education on energy conservation and safety was provided by the utility's representatives drawn from the community (aka Light Agents)
- Easing the transition to legal electrification and improving local participation
  - Community input with Light was encouraged via intermediaries (i.e. local leaders or community based organizations) to promote education and dialogues on consumer needs
  - Local government was encouraged to extend land tenures thereby legalizing occupancy and providing an incentive to pay bills regularly
- Making electricity harder to steal and usage easier to monitor
  - "New" meter enclosures with special locks were designed to deter energy theft (more recently moving to boxes glued together and are 90% tamper proof).
  - Studies are being done to place distribution lines underground so as to reduce electricity theft

- Adding Value in the Community
  - Community investments and donations to social causes and development activities
  - Providing "citizenship" rights through the designation of an address and proof of residence

5.2 Human Contact and Local Presence

The PRONAI program was considered to be a success in terms of its "breaking into" the slums where utilities generally feared to tread, in the number of homes electrified (connected or regularized), and for its ability to at least break even in many areas. However, the economic duress caused by drought-induced energy crises, economic downturn, etc. caused its cancellation and replacement by an evolving new approach. *It is clear to LIGHT that it alone cannot resolve enough of the slum areas' social and economic problems* to bring the optimal benefits and development impacts that electrification would normally stimulate. Therefore, LIGHT plans to work more closely in the immediate future with other key programmatic and local development partners and activities aligned with its goals. LIGHT's 2004 electrification plan, involving an integrated approach with the state, local governments, the RF Federation of Industries (FIRJAN), NGOs, universities and other partners, shows a continued commitment to finding an effective way of electrifying slums in the context of overall economic and social development promotion and would mirror the "lessons learned" in its earlier PRONAI approach.

LIGHT and its NGO partners made substantial investments in each community in addition to the electrification, regularization, upgrading of power quality/availability. The agents were used along with utility personnel to bring about social benefits to community residents: i.e., to document important data about the areas and to profile the customers. Financial support was provided to community projects and events, information courses, professional training and donations of computers, furniture, school materials, and toys to appropriate social organizations.

5.3 Other Factors

The primary concern is recidivism as reflected in the still high default/theft rates (around 60% and reportedly even higher in some areas). The LIGHT agents have been maintained in a limited number of areas where LIGHT has determined to maintain its investment and interests, through a pro-active approach and in combination with various other company programs, particularly in the area of energy efficiency and conservation.

Introducing greater flexibility in payment terms for utility bills is also being considered to make payment reflect the realities of low-income wage earners' situations (e.g., sporadic income). Nevertheless, a final challenge is the continuing growth within slum areas. Every year another 2,000 to 2,500 households move into LIGHT's service territory and require connections, and the growth rate in slums is four times greater than for the rest of the population of the city of RJ, constantly eroding the proportion of paying vs. non-paying customers. LIGHT's resources to make these connections are being stretched and indeed the company is not keeping up with them. Prepayment meters are being considered as an option to help poor consumers stay within their means.

6 Attachments

6.1 Sources

Discussions with and power point presentations of LIGHT during visit by US AID slum electrification team on 12/15/03

Maia, Suzanne, "Innovative Approaches to Slum Electrification, A Case Study Brazil: COELBA Project Community Agent" (prepared for US AID, primarily highlighting the COELBA program in Bahia largely copying the LIGHT PRONAI approach with added notes regarding PRONAI visited in December 2003) AEAI, Washington, DC, January, 2004.

Overviews of the project on MIGA website.

Community Agent Program—Salvador, Bahia, Brazil

Contents

1 Introduction

This case study illustrates the approach to slum electrification in the city of Salvador, capital of Bahia state in Brazil. It describes the design, implementation, and outcomes of the slum electrification program implemented by COELBA, the utility operating in the city.

Electricity distribution utilities in Brazil are the primary drivers of slum electrification efforts, though they may partner with other institutions to implement specific programs aspects or to develop complementary initiatives. Slum electrification programs have been implemented by several utilities in Brazil with varying degrees of success. Utility programs in three major urban centers of Brazil – Sao Paulo, Rio de Janeiro, and Salvador – were considered. Programs in each city had already electrified or "regularized" electric connections to over 100,000 residential customers. The program operated by COELBA in Salvador was chosen for this case study since it demonstrates the innovativeness with which it formed alliances with local institutional partners and members of the slum communities to deliver a successful program in one of the poorest regions of Brazil. The program incorporates key factors necessary to sustainability and the utility is committed to continuing the initiative.

2 Background

Privatization of electric utilities in Brazil began in 1996; currently, about 40% of the nation's distribution assets and 60% of its generating assets remain under government control. The electricity regulatory agency, *Agencia Nacional de Energia Eletrica* (ANEEL), was established at the end of 1998 with the responsibility to establish and oversee regulated retail tariffs, bulk power market prices, implementation of concession contracts, quality of customer service, and to promote competitive markets through the establishment of adequate industry technical and operating standards.

2.1 Regulatory Motivation for Slum Electrification

Although privatized distribution concessionaires are obligated to serve all customers under the reformed sector's rules, there has been little enforcement or oversight. During the late 1990s, the government continued to permit use of a general sector fund (RGR) financed by a fee on all electricity customers for subsidizing rural and urban electrification and provision of special rates for very low-income consumers. Thus, in the immediate aftermath of privatization, utilities undertook slum electrification and regularization programs mainly aiming to reduce costly non-technical losses.

The electricity distribution companies were initially also permitted to use some of the funds from the RGR and the energy efficiency improvement fund,[1] to undertake slum electrification initiatives – e.g., COELBA's utility program launched in the state of Bahia, the Eletropaulo initiative in Sao Paulo, and the initial Light PRONAI model in Rio de Janerio – with *post facto* review by ANEEL of the utility expenditures on such projects. However, since 2002, it appears

[1] The utility concessionaire contract contains the provisions for this fund, to which 1% of a utility's revenues were allocated. The fund was created to finance demand and supply-side efficiency improvements.

that only utilities in the Northeast and North, which are the poorest regions of Brazil, have been allowed to use financial resources from the efficiency fund for urban electrification, and this too is limited to roughly 50% of the fund's total resources, with the other half of the 1% going to R&D initiatives.

In 1999, ANEEL began to require utilities to submit annual energy efficiency plans, thus encouraging greater efforts by concessionaires to incorporate energy efficiency education and technology improvements for end-users in slum areas, where consumption levels were above the customer's economic ability to pay but the quality of installations and other conditions presented considerable opportunities for reducing demand.

Recent changes in the rules governing the electricity sector have however had a significant impact on slum electrification programs:

- Power rationing at both the utility and the consumer level was introduced in 2001 after a prolonged drought resulted in a deficit of electricity in hydro-dominant Brazil. This rationing program caused very significant and sustained reductions in electricity consumption due to energy conservation measures successfully adopted by consumers that effectively reduced national consumption by 20%.
- The approval in April 2002 of Electricity Sector Law No. 10.438 formally mandated, among other measures, that utilities must achieve 100% electricity coverage in their respective service areas by dates to be established for each utility.[2]
- A number of changes are being made in the policies for and regulation of the electricity sector in Brazil since the arrival of President Lula's administration in January 2003; there is far greater emphasis on quality of electricity service for all and inclusion of marginalized economic groups in public services, through direct and indirect subsidy programs and stronger enforcement of contractual and legal obligations to provide service and emphasis on acts of social responsibility by corporations and citizens.

Thus, the future form and scope of ongoing slum electrification programs in Brazil are a matter of uncertainty and concern to utilities that have made considerable investments in this area. In addition, the resources of a new fund, known as the CDE fund, established in 2002 to eventually replace the existing RGR fund, are being aggressively funneled for urban and rural electrification purposes, as well as for low-income consumer subsidies. Finally, ANEEL has recently instituted a cap on losses (i.e., a limit on recovery of losses through ratepayers of 90.7 % of actual losses), which is expected to pressure utilities to increase their efforts to reduce technical and non-technical (commercial theft) losses.

In summary, the financial impacts on utilities resulting from the energy crisis, lower demand due to sustained conservation in the post-crisis period, regulatory price caps, the reduced amount of available funds coupled with the chronic low return on investment for electrification in low-

[2] To date, the enactment of the law's implementing measures have been only partially defined and approved in 2003, with some legal issues being contested and resolution of some key issues yet pending action in 2004 under President Lula's (Luis Ignacio Lula da Silva's) government, which took office in January 2003.

income areas all contributed to the scaling back or elimination of many slum electrification programs during the 2001-2002 period. The utility industry is facing a period of tough policy and regulatory actions, more severe enforcement, and increased service obligations, and a real possibility that there will be insufficient offsetting adjustment in terms of tariffs, financing resources, or flexible implementation.

2.1.1 COELBA – The Utility and Its Service Territory

COELBA is a private, investor-owned distribution utility in the Northeastern state of Bahia, Brazil. Its service territory includes the city of Salvador, the state capital and one of the oldest as well as the third largest city in Brazil with approximately 2.5 million inhabitants in 768,000 households spread over an area of 324 km^2. About 30% of Salvador's entire population is at or below the poverty level[3]. According to a demographic study of Salvador[4], some 32.4% of the urban area of Salvador has been occupied informally since the 1940's. The population has rapidly increased through resettlements that are not yet legalized and informal occupations by landless groups. These densely populated areas (300 inhabitants per 10,000 m^2) of the city represent 60% of the city's total population, and are characterized by low levels of education/literacy. Overall, 53.2% of Salvador's occupied urban area is characterized as being deficient in "good" living standards as characterized by availability of infrastructure, public services, housing, etc., and some 11.8% is deemed as having inadequate living standards.

A socio-economic study conducted by COELBA, PROCEL, and DIAGONAL in 1999, concluded that 35% of the heads of households in low-income neighborhoods were unemployed (at least, formally) with 50% having a fixed income and the remainder varying levels of income. According to anecdotal accounts, nearly half of the households in these communities are headed by women (divorced or single with children), who have limited means to make a living outside the home – usually as low-wage maids – unless they have support from family for minding children. These households headed by women are most likely to be in the lowest minimum wage brackets. In these households, if there are children, it is unlikely that the mother receives significant or regular financial support from the father. The typical household has a small kitchen, living room area, one or two bedrooms, and one bathroom with a shower stall. Generally, there were only one or two small high windows, and these were often blocked by a refrigerator, closet, curtain, or clothes. Second floors generally were an open room serving as a bedroom, with one or two lights, a window or two (depending on the size), and often a (second) television. Appliances typically observed by the team included a small, antiquated four-burner stove; small refrigerator; old-fashioned iron; television, radio, or small stereo; one or two fans; and three to four light bulbs (one per living space). Almost all cooking stoves in Brazil are propane or wood fueled (though wood stoves are not so common in urban areas), and ovens are not used much for daily cooking.

Statewide, the utility has more than 3,000,000 low-income customers, representing over 50% of its residential customer base. Despite the utility's efforts, an estimated 50,000 customers in

3 The official poverty level is defined as US$ 960 per year or $80 per month for a family of four. Nationally, 25% of Brazil's 180 million inhabitants live at or below the poverty level, and 12% have zero income (at least, as formally registered).

4 Souza, A. G. Limites do Habitar: Editora da Universidade Federal da Bahia, Salvador, BA-Brazil 2000.

Salvador are without electricity service, though of these, an estimated 15,000 are illegally connected to the system. ANEEL, under Law 10.438 referred to above, is requiring that COELBA provide electricity service to 100% of the population of Salvador by the end of 2004.

Upon privatization, COELBA's new owners were faced with high technical and commercial system losses, high levels of non-paying customers, an elevated number and duration of system outages, poor customer satisfaction levels, and general inefficiencies in all operating areas. To respond to these challenges, the company invested on a large scale in human capital, reorganization and efficiency, technical and technological improvements, and marketing and public relations programs. It remedied technical and technology problems, educated and wooed customers, trained its personnel, sought experts in non-traditional utility areas to analyze and help resolve problems, invested in hardware and software to provide the necessary tools to support improvements, decentralized functions to geographic areas while centralizing information flows and databases, selected partners to consolidate efforts through complementary activities, and cracked down on illegal activities. At the same time, it maintained a least-cost business approach that was nonetheless cognizant of difficult social and humanitarian conditions and promoted itself as a service company with an investment and responsibility in the well being of its customers.

3 Description

3.1 Program Design and Implementation

The slum electrification program currently known as *Agente COELBA* (COELBA Agent) was launched in 1998 with the primary motivation of reducing its commercial losses, particularly from non-paying legally connected customers, which was estimated to result in a greater revenue loss than from illegal connections. Other objectives of the program included normalization of illegally connected customers and upgrading of legal but poor quality installations. The program offered special tariffs for low-income consumers, educated customers on controlling electricity consumption, provided a practical payment system for irregular and low wage customers combined and made other qualitative and safety-related improvements.

COELBA launched its social action program for poor communities based on the following key elements:

- Orientation of single phase customers on the efficient use and conservation of electricity;
- Regularization of illegal connections and customers who were disconnected and reconnected themselves;
- Negotiation of overdue debts;
- Substitution of interior substandard wiring;
- Creation of a model "Efficient Customer" definition as a goal and basis for incentive programs.

Source: Presentation "Agente COELBA" by Marcos Antonio Souza de Almeida, COELBA (translated), December 2003.

COELBA initially used existing studies and databases to formulate the program but later undertook additional studies from 1999 onwards to better characterize and understand the challenges in each neighborhood of its Salvador service area on the basis of income, heads of households, dwelling features, electric installations,

appliances and other elements[5]. After evaluating data relevant to strategic issues in 12 districts focusing on land ownership, access to public services (e.g., health, education, water, sanitation, energy, transportation, telecommunications), energy use and customer behavior, and a further study on social and educational conditions in three selected communities, the company launched the *Agente COELBA* initiative.

The COELBA Agent initiative aimed to develop an effective methodology through which the utility could implement interventions in low-income communities.

3.1.1 The COLEBA Agent

A key element of the program was to select and train community residents to act as COELBA Agents in the community to educate customers about the utility's objectives and to motivate them to conserve electricity and reduce their bills. For instance, the Agents are critical in informing or preparing residents for new initiatives, such as substitutions of incandescent with CFLs, promotions for new refrigerators or other more efficient appliances, etc. The Agents also serve to channel service requests, complaints, problems and other information to COELBA's centralized operations Call Center to improve coordination and reduce time in attending service calls.

The Role of the Agents is to inform COELBA about:

- Energy safety issues;
- Any potential errors identified in customer classification or activity (for ensuring correct tariff application);
- Suspected cases of fraud, theft or third-party energy suppliers;
- Needed extensions of distribution grid system;
- Location of meters inside residences;
- Theft of installations/equipment;
- Connected customers who have not received their bill.

Source: Marcos Antonio de Almeida, COELBA presentation Dec. 2003

The Agents selected by the utility were required to be literate, have completed high school, have demonstrated leadership qualities, and be respected in the community – as indicated by their nomination by community members or residential associations – and pass a selection process in competition with other candidates. These positions are highly sought after and attract a a large number of applicants. Agents were selected, contracted, trained, and supervised by an NGO – Cooperation for Human Living and Development (CDM)[6] – which COELBA contracted to implement community communication, education, mobilization, and organizational activities.

There are generally three assigned Agents in each community (depending on the population of the community), and each Agent is responsible for some 2,000 customers. If an Agent moves to

[5] One baseline study was conducted in 1999 by COELBA, PROCEL (the national energy efficiency program run under Eletrobras, the national holding utility) and the consulting company, DIAGONAL Urbana (Pesquisa Trio da Economia, Relatório Diagnóstico Sumário, Salvador, BA, 1999), evaluating income, head of household features, condition of domiciles, electric installations and other socio-economic-electric features per each neighborhood in Salvador. The study also indicated poor condition of dwellings. For instance, barely 10% of dwellings had sufficient natural light or ventilation necessary for a minimal level of comfort, over 70% of the homes had dangerous wiring with no fuse boxes or circuit-breaker panels, and other hazardous electrical installations such as the inappropriate use of materials (deodorant cans, plastic bags) as switches, connectors or insulators.

[6] Cooperação para o Desenvolvimento e Morada Humana (CDM) is a Brazilian non-profit NGO that promotes social and economic improvements for community development.

another community, he or she can no longer continue as the Agent in the original community. The Agents are equipped with a cell phone (for safety, to call in problems, check on pending actions), and must wear identifying tee shirts or hats when working. Their role is to advertise the program through word of mouth, community meetings and networks, local events, and other activities supported by COELBA. They help identify customers for various programs and register the information collected from interviews with the client (family head-of-household or key decision-maker) with COELBA for input into the mainframe database (This data base allows the customer's address to be registered and shown on the billing envelope, which is important as proof of address when the customers request telephone or social services, participation in credit programs, opening accounts, etc.).

This creation of the customer database begins developing a profile for that customer that expands rapidly when the connection to the home is made and a theft-resistant meter installed. The Agent schedules one day to install new wiring in the home. On the same day that the interior house wiring is installed, the meter is read. The meter is read again a week later by a COELBA technician. All data is sent to central operations to be entered into the company's database. A date is then set with the customer to read the meter every 30 days. The Agents must visit each customer at least twice a year after the regularization or upgrading installations have been achieved.

COELBA Agents participate in and may assist other specialists in training activities to help new participants in the regularization program to understand how to match their electricity consumption with their ability to pay, as well as basic principles of energy conservation, safety, and advantages of legally connected electricity service.

The Agents are supported by outsourced company electricians assigned to a specific group of communities, who help to evaluate technical requirements, send in the data to COELBA's central operations where the design and layout of the electrical installations will be prepared by engineers and sent back to the electricians for implementation. The requirements for electricians include having a high school diploma, basic technical training by SENAI (National Learning Service), and additional technical training by COELBA personnel. These electricians also serve as trouble-shooters, provide periodic maintenance, and help to identify dangerous or illegal installations. A separate (COELBA or contracted service) person is responsible for reading meters. Special teams of other engineering and technical staff support the local technical Agents in resolving more complicated problems.

3.1.2 Efficiency Improvement Programs

One of COELBA's efficiency strategies deployed through its *Agent* program was to educate customers about energy consumption, opportunities for conservation (e.g., turning off lights, using appliances with high efficiency such as CFLs, utilizing natural lighting and ventilation, etc.), and safety issues (such as dangerous electrical wiring in the home). Most slum dwellings had an average consumption ranging between 96 and 139 kWh/month, which in COLEBA's estimate could be lowered with minimal changes in consumer behavior and attitudes to between

81 and 121 kWh/month (a reduction of some 13% [7]). Participants in educational meetings that were aimed at transforming such customers into "Efficient Customers"[8] were given cards, which, when a sufficient number of stamps recording attendance were obtained, were entered into drawings for new PROCEL-approved efficient refrigerators or other major appliances.

The company's approach evolved over the five years of the program, melding different programs to work together to transform inefficient customers into efficient consumers. COELBA defined efficient customers as those spending no more than 5% of the family's income on electricity consumption, which was the "sustainable" level as calculated by IBGE. However, for the utility, a level of electricity consumption "sustainable" for the customer to purchase may not necessarily be a financially viable customer to service. Based on the above metric of money spent on electricity, about 35% of families who could afford to purchase only 45 kWh per month were uneconomical for the utility to service. 55% of the families in the program with an average affordable monthly consumption of 100 kWh represented a threshold group for the utility. Families that can afford to purchase 150-250 kWh/month are classified by the utility as truly sustainable consumers and represent just 10% of the target population.

3.1.3 Bill Payments

Bills are paid at a local utility branch office or at a COELBA-certified commercial Agent's place of business, such as a lottery house, local telephone operator, or store. This certification of other Agents provides greater convenience for the customer and has lowered operational costs to the benefit of both COELBA and the customer. Most payment transactions can also be made through on-line banking or credit transactions (these are less common for low-income persons, who most often do not have bank accounts or credit cards, but a computer with internet banking access is allocated for customers at service branch offices).

3.2 Costs and Financing

Since its privatization, COELBA has made annual investments of about R$2 million just in regularizing illegal connections in slum areas, expecting long-term market growth benefits and a 7 to 10 % return on its investment (10-14 years). It has already reinvested some of the return on investments from its earliest program areas, including Bairro da Paz (of the R$3 million return received, R$2 million has been reinvested in the program). It operates the program on the basis

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7 A survey of households found that it is common practice to have the radio and television on simultaneously throughout the day and keep lights on when not required. The study showed that lighting represented 35% of household electricity consumption (the average household had four 60-W incandescent lamps). In addition, 35% of the mostly secondhand refrigerators present in 69% of the households had leaky seals, with 34% of them in truly bad condition.

8 This is a customer whose consumption is reduced to sustainable levels, i.e., that which is appropriate for the family's income level but which also provides better quality energy and comfort for the customer. The Research Group on Family Budget (POF – Pesquisa de Orçamentos Familiares) of IBGE, the Brazilian Institute that conducts census and other surveys of geographically located economic, social and demographic data, has estimated that expenses on electricity should not exceed about 5% of income in order to be sustainable. COELBA also defined the level of consumption that would be ideal in terms of "efficiency" for low-income households with given appliances. Among surveyed communities, households with up to two minimal salaries consistently consumed more than the sustainable level, and those with five minimal salaries or more were spending less on electricity than they could. This reflects, among other factors, the ability to acquire newer or more efficient appliances and/or pay for maintenance in higher income households. In one of the poorest slums, Bairro da Paz, conserving energy was restricted by having fewer appliances in the homes, and these being of poorer quality/efficiency.

that it can aggregate any number of functions to the organizational and service basis it has established in the communities, thus reducing incremental investments for launching new programs or activities.

COELBA covered the costs of subsidies for household connections for low-income program participants and other investments in its overall electrification program from the internal "energy efficiency fund" described earlier. Recently, the use of this fund's resources has been modified, to allow only 50% of the available total to be used for slum regularization, upgrading, and education programs, with the remaining amount reserved for research and development. Of the available amount, COELBA has earmarked 70% to continue the COELBA Agent Program in 2004.

Through October 2003, COELBA had invested R$41.5 MM in customer regularization without grid extension[9]; R$17.1 MM for customer regularization with grid extension (including 19,000 poles); R$10.2 MM on meters; and R$29.8 MM for metallic kits (a theft-resistant meter box with entry points).

3.2.1 Low-Income Tariffs

Low-income electricity customers qualify for a Social Electricity Rate[10]. Low-income customers are defined as: single-phase residential customers with an average monthly consumption of under 80 kWh as calculated over the past 12 months, which never exceeds 120 kWh in any given month; and single-phase residential customers with an average monthly consumption between 81- 220 kWh, calculated over the previous 12 months who are also registered with one or more of the following social assistance programs - school stipend, citizen stipend, citizen card or citizen card with the federal government. Table 1 below shows the discount given to low-income consumers.

Table 1: Percentage Discount from Normal Residential Rates for Qualified Low-Income Consumers, by Consumption Level

Consumption Level	% Discount from normal rate
0 to 30 kWh	65.97%
31 to 100 kWh	41.97%
101 to 140 kWh	12.54%
140 to 150 kWh	2.99%

Source: COELBA – Informativo Comercial do CAP n° 01/2002. (Courtesy of A.C. Magalhães.)

3.3 Key Program Partners

COELBA initially tried to form partnerships with other service utilities, the local government and others to enter into the disadvantaged communities together in an integrated manner and work simultaneously on the different infrastructure and social problems they each faced thereby reinforcing each other's activities and opportunities for success. However, COELBA soon

[9] The utility's average cost for connecting a client under the regularization program was R$515 (about US$170), of which the customer paid R$60 (US$20). Customer payments can be spread over 20 payments of R$3 each charged on the monthly bill.

[10] The 2002 electricity law 10.438 (ANEEL Resolutions 245 and 485)

discovered that these partners required much more time to get organized. Therefore, although it encourages the entry of these partners and provides them with information or other types of support, it does not wait for these other potential partners to get ready - they follow COELBA into a community at a generally expedited pace thanks to COELBA's pre-established presence that provides them with important advantages and facilitates preparations for their entry. Some of the key partners are described below.

3.3.1 Cooperação para o Desenvolvimento e Moradora Humana (CDM)

The most important partner directly contracted by COELBA to facilitate work in the slum communities is CDM, a Salvador-based NGO working in health, education, environment, and sustainable development areas. CDM's role is to hire, train and supervise the COELBA Agents selected from the community, organize events and educational programs, participate in planning and otherwise support COELBA's access, acceptance and credibility in these communities. COELBA values the role of the NGO, which already commands respect and trust in the communities, to help define the approaches that will work best with these populations who generally tend to think of the utility as being law enforcement or a bill collector and not interested in their well-being or development.

3.3.2 The University of Salvador

(UNIFACS) is also working together with COELBA to redesign the architectural features of houses and/or neighborhoods, to add better natural lighting and ventilation features, using different materials, windows, doorways, location of appliances, lighter paint colors, etc., to minimize energy losses and overall demand.

3.3.3 Telecommunications Company

The telecommunications company often shares utility poles with COELBA, but sometimes COELBA observes and reports to the phone company the unsafe and substandard phone system connections that are fairly common in these neighborhoods.

3.3.4 Ibenbrasil (Iberdrola Empreendimentos do Brasil)

A company under the same holding group as COELBA and two other utilities in Northeast Brazil (COSERN and CELPE), provides strategic advisory services to help concessionaires execute projects to support low-income communities on energy conservation, in order to improve their ability to pay their electricity bills while providing them with greater control over consumption and the quality of energy. Ibenbrasil is responsible for the overall coordination of the COELBA Agent program and supervises CDM.

3.3.5 The Municipal Government

The city is trying to legalize resettlement areas, build new housing to replace the worst dwellings in low-income areas – employing the architectural design improvements for natural light and ventilation and thus emphasizing energy efficiency – supporting the sanitation, water and telecommunications utilities' entry into areas already initiated by COELBA, improving streets and traffic impediments, and building retaining walls on the hilly slopes where the greatest

danger to slum dwellers lies during the season of heavy rains, among other initiatives. Some staff members at the Public Works department and at City Hall have previously worked in COELBA, thus providing positive links between the city government and the utility.

3.3.6 The Federal Government

ANEEL, the electricity sector regulatory agency, was a passive participant in slum electrification initiatives, mainly dealing with low-income tariff regulation and preparing for universal service utility plans to be submitted under Law no. 10.438. It has not promoted any particular slum electrification model, although utilities sponsoring such initiatives have submitted reports on the results of these initiatives and programs to the agency. The Ministry of Mines and Energy (MME) has participated in various discussions with COELBA's leadership on issues related to efficiency and electrification initiatives, including sources of funding, legal and contractual parameters, incentives for utilities and consumers, etc. Eletrobras, the government's main holding company and implementing arm of the government, responsible for diverse areas of research and rural electrification through grid extension, has worked with COELBA on studies related to efficiency and technology issues. Federal financial institutions, such as the Caixa Economica (Federal Savings Bank) or the Banco do Brasil have facilitated development funds for complementary community projects, such as those executed by CDM.

3.3.7 The Customer

The customer is also a key partner, because ultimately it is in the customer's interest to become a legal consumer of the system. The customer communicates directly with the Agent on issues relating to energy efficiency, lowering bills, safety and comfort, dispute resolution, etc. that increases the program's chance of success.

4 Results

4.1 The Program

About *250,000 customers were included in COELBA's slum system upgrading and regularization programs* during the January 1998 to October 2003 period, in five cities in the state, of which 78% were in Salvador (about 181,000). Of the total number, about 150,000 legal customers with inadequate connections to the system were benefited with upgraded distribution system technology and maintenance programs. Another 100,000 illegally connected domiciles were the focus of a regularization program, which required grid extension in 27% of the cases. A standard anti-theft technology package (with metallic meter boxes, multiplexed wiring and concentric cables, short circuit breakers) was deployed to upgrade regularized customers. Consumer awareness and educational program were aimed to persuade slum dwellers that existing informal connections or third-party providers were high risk, unsafe, illegal, and inappropriate for the quality of energy needed to best meet their requirements.

The overall effort resulted in 81,994 customers incorporated in the program in 1998, followed by 61,477 customers in 1999, 38,959 in 2000 and dropping, with the onset of the energy crisis, to 17,818 in 2001, 26,297 in 2002, and 21,858 in 2003. During the December 1997 to November 2003 period, the number of customers increased by 46.6%, or 1.106 million.

4.2 Program Benefits

COELBA asserts that consumers want to participate in the program because[11]:

- They will have a registered residential address that enables them to apply for various credit and social welfare programs;
- The cost of the electricity may actually drop if they learn how to manage their consumption according to the instruction provided,
- The quality of the energy in their homes is better and safer;
- They can reschedule bill payments if they encounter difficulty in making the payment on time; and
- They become eligible for other COELBA programs, such as replacing leaky refrigerator door seals and incandescent light bulbs.

COELBA's marketing aimed at persuading consumers that it was offering legal and good quality electricity under affordable and flexible terms with additional benefits that only it could provide. Its competitors were – and still are – illegal service providers (who steal energy from the grid or use the grid to transport energy from another source). Anecdotal reports are that power from illegal service providers is often erratic with dangerous wiring and changes in prices that include frequent reconnection charges. Illegal suppliers can not offer the non-energy benefits of providing a legal address, which enables consumers to register for credit and social programs, education programs, technical support, and budget plans that aim to ensure the viability of payments, as well as promotional appliance programs and other incentives for improving home comfort levels and the quality of appliances.

4.2.1 Payments

It appears that COELBA has been at least relatively successful in its education program since it currently has an overall delinquency rate (payment not made within 30 days of the due date) of 10-15% among its low-income clients participating in the COELBA Agent program, compared to a utility-wide rate that reaches up to 50% for some areas. The success of this indicator is also in large part due to the significant flexibility permitted to community Agents in working out payment dates of choice as well as alternative debt payment plans with the customers for delinquent or hard-to-pay bills.

While COELBA is willing to bend over backwards to enable the consumer to make payments and achieve sustainability, in the cases where energy service is cut for non-payment or other infringement, 70% of the customers reconnect themselves (unofficially) and the remainder either divert energy from their neighbors (with their neighbors collaboration and agreement to pay their share of the neighbor's bill) or simply do without power. The utility indicated that as a measure of last resort, repeat offenders have occasionally been jailed for a day or so for illegal connections. It wanted to show its willingness to prosecute illegal actions that prejudice the company and all of its other clients, but it is wary of coming down too hard on cases that will

[11] This is supported by the community members, COELBA Agents, and NGOs

raise community sympathy for the miscreant as an underdog. Generally, it seeks to find a negotiated solution where the consumer is legally connected and is supported with information, flexible payment plans, and monitoring.

4.2.2 Effectiveness of COELBA Agents

After the evolutionary phase of the program and based on recommendations of a study, significant negotiating flexibility was permitted to the community Agents in working out payment dates of choice as well as alternative debt payment plans with customers unable to pay their monthly bills or with delinquent bills. This feature has successfully reduced incidences of non-payment. The presence of COELBA representatives in the community has had a significant impact on the quality of service, with the number of days required to connect customers reduced from 12 to one, improvements in maintenance response time, reduced duration and frequency of system blackouts, and provision of multiple locations and options for bill payments.

There has been only one case of aggressive behavior (life threats) against or problems with these Agents, according to COELBA. Therapy is being provided to this Agent, and the company hopes that the Agent will go back to work in the community. The lack of more numerous aggressive acts in these areas, however, may indicate that the program and Agents are well received and respected in the communities.

4.3 Technical Improvements, Energy Savings & Demand Reduction

COELBA has reduced its technical and commercial losses from 18% in 1997 to 12% in 2001. The utility has been able to considerably reduce both the duration and frequency of power outages in its post-privatization period and reduce its response time to customer complaints by 50%. It established decentralized teams of three electricians in each of its six regional operating divisions in Salvador. These local teams also have responsibility for implementing new electrical connections in the neighborhoods where Agent COELBA is active and for submitting information to central operations on the connection schematic for customer and community connections and technical problems. It has also developed new approaches to reducing service disruptions, installation, and maintenance problems caused by tree growth.

The COELBA Agent program's approach was adapted to the requirements and regulations – including a system of penalties, cut-offs, and incentives – applied during the May 2001 to April 2002 national energy crisis, during which an overall reduction of 20% in energy demand throughout Brazil was mandated by the special emergency committee created to direct the sector during the crisis and given ministry status. Data (based on various studies of average monthly residential consumption in 10 low-income neighborhoods in Salvador, covering pre-, post-, and the May 2001-April 2002 energy crisis period) indicate that COELBA Agent electrification measures coupled with energy efficiency initiatives reduced consumption. In addition, the data appear to indicate that from June to July, at the end of the crisis, consumption rose somewhat but to far less than the pre-crisis level, reflecting the likelihood that energy conservation habits and efficiency adjustments made during the crisis endured. Further evaluation of the data for 2002 and 2003 for all 33 communities participating in the COELBA Agent program confirms evaluations by COELBA and Ibenbrasil personnel indicating that the crisis-accelerated positive

impacts on energy conservation and efficiency behavior by customers targeted by the COELBA Agent program were sustained.

COELBA substituted deficient wiring and electrical installations with correct, safer and more theft-resistant and efficient technology including meters, approved standard electrical ducts, circuit breakers, fuse boxes, outlets, light bulb fixtures, lighting switches, and correctly dimensioned wiring and cables. The upgrades were accompanied by educational programs on energy consumption and conservation practices, Agent orientation on services, and negotiations with the customers on flexible payment options. The improvement in quality of electricity and customer service, safety, and clarifications on equipment use, bill reading, consumer and utility obligations and responsibilities resulted in better customer buy-in to the program, including willingness to pay for the energy use and take advantage of a payment plan (up to 20 months) for the subsidized cost of legal connection. In tandem, projects to exchange seals on leaking refrigerators, make consumers aware of ratings by PROCEL for energy efficiency of appliances, and trade in 60 watt (W) incandescent light bulbs for 15 W fluorescent ones were offered to customers with excessive consumption and difficulty in making electricity payments.

At times, the energy efficiency measures have resulted in mixed results. For example, in 2001, 184 rubber seals for refrigerators in homes were distributed among 13 Salvadoran communities. Of this sample, 47% of the households reported lowered demand, averaging about 20%. The remainder did not experience the same reduction, which is attributed to the refrigerators being too old and run-down to have the seal replacement have any impact. In 2001, the program's replacement of substandard wiring in homes including installation of circuit breakers and fuse boxes, switch, outlets, and lighting fixtures resulted in energy savings of about 10%. In another program for 370 customers in four communities (including Bairro da Paz), the combination of wiring upgrades and replacement of three to four 60-W incandescent light bulbs with 15-W CFLs resulted in energy demand reduction of 20% or more.

COELBA estimates a 21% reduction in energy consumption which it credits to the rationing program and its bonus incentives for achieving more than the targeted level of conservation that continued even after the rationing program was removed in April 2002.

4.4 Customer Satisfaction

A recent survey of customer satisfaction with the program indicated a high degree of satisfaction (mostly over 90%) with most of the suggestions for improvements focusing on lowering tariffs or taxes. (Survey provided by COELBA to ANEEL.) As previously mentioned, COELBA has significantly improved its technical service call response time and the duration and frequency of power outages. This has significantly improved customer satisfaction levels in the targeted neighborhoods as well as for other customers.

4.5 Replication, Expansion, and Future Plans

A strong indicator of success is that COELBA is continuing and expanding its community Agent program in 2004, despite regulatory and policy uncertainties, not only in new areas in Salvador but also in other cities in the state. The second largest city in Bahia – Feira de Santana – has

already established the Agent COELBA program on a scale nearly equal to that of Salvador, with 40 Agents working in 13 communities with 80,000 residences in 2003.

In 2004, COELBA plans to at least maintain its level of investment in the Agent program, and increase the number of communities attended in Salvador from the current 33 to 60 (of a total of 452 communities in the metropolitan area), representing an additional 60,000+ clients in Salvador (200,000 company-wide). By the end of 2004, under ANEEL's implementing provisions for Law 10.438, the utility is required to complete electrification in Salvador based on the year 2000 census figures. Although now only 50% of the energy efficiency fund can be invested in the COELBA Agent Program, according to ANEEL, COELBA will invest 70% of the available fund amount as well as reinvest return on investments already being realized from its earliest program areas, and supplement this with funds from CDE (or other sources) expected to be allocated by the federal government for meeting universal service standards under the above-cited law.

Involved COELBA program managers consider that a pre-payment program will be a future step for the program to take, providing customers with greater control over their consumption and further reducing energy consumption and the risk of late or skipped bill payments.

COELBA also is concerned about the inefficiencies and lack of transparency represented by the multiple and onerous taxes superimposed on electricity consumption that it is required to carry and collect via its monthly bills. It is supporting the reduction of these taxes for low-income classes to enhance their ability to pay for actual services.

Most of the distribution utilities in Brazil were restructured and privatized between 1996 and 1999. In addition to having to adapt to a whole new culture of operation under a changing regulatory structure, the utilities faced major economic and financial stress brought on by the energy crisis of 2001-2002. Recent regulation has also required greater corporate social responsibility from the utilities. These common factors make possible the replication of good program practices and models across utilities operating in large urban centers in Brazil.

5 Conclusions

Not only COELBA, but most Brazilian utilities that undertook slum electrification in the post-privatization period accessed their internal energy efficiency fund established by ANEEL with a 1% set aside of revenues. This type of seed money – tied with energy efficiency objectives – may be a key feature to promote utility initiatives in this area of considerable risk. Some factors critical to the success of the project and that also increase the potential of its replicability are presented below.

5.1 Human Contact and Local Presence

COELBA managers acknowledge that the presence of intermediaries in the communities in the form of Agents, who intimately understand the community and are trained professionally to represent program interests, is fundamental to the success of the initiative. They also acknowledge that the utility could not have implemented the program with the same results

without the NGO managing and overseeing community relations and Agent training. Indeed, COELBA tried to do the program in Feira de Santana without using the NGO intermediary, but found that community members were suspicious of the motives and interests of the utility, and lacked the necessary trust to effectively make headway with the program. (It then returned to use the NGO intermediary model and achieved successful outcomes.) A non-profit organization with interests in the social development and improvement of basic conditions in the community is needed to present the program, provide orientation to the utility in the approach to be adapted to sell it to the target population, to proactively oversee the interface with the community, monitor acceptance levels and other results, and to propose adjustments as needed. Such organization knows how to provide the human and personal touch that wins over customers and allies in these neighborhoods.

Moreover, COELBA stresses the local presence of technical team members – i.e., the electricians, engineers, and other that are also assigned to particular areas – in order to improve the time in identifying and responding to service problems, complaints, and requests. The establishment of its Central Operating Base to collect and direct orders for service (new, corrective, or reactive) is seen as a critical aspect of this ability to be technically responsive to the communities, as well as providing a means to collect and organize data centrally for analysis, dissemination, and reporting needs.

5.2 Linkage to Energy Efficiency

COELBA considers the 2001-2002 energy crisis to have been a practical incentive and accelerant in the process of consumer education about energy conservation and efficiency. Even after the energy crisis, consumption increased only 4.9% in the participating households in the targeted communities, whereas it increased by an average 15% for other households in low-income areas where rewiring and lighting replacement had not been undertaken. The information to the consumer during the crisis helped to reinforce the educational efforts of the COELBA Agent program, and the monetary incentives to reduce consumption stimulated this customer class to seek the financial bonuses or other benefits (appliances, CFL bulbs) offered by various promotions.

COELBA used energy efficiency improvements both to fund electrification and to achieve better results for the utility and consumers. The customers' ability to pay was improved by keeping electricity consumption at a manageable level through diverse technical approaches, specific technology kits, educational and monitoring programs, and an overall effort to facilitate customer access to information, support, and payment options. COELBA also made sure that the customers felt the benefits of the program by emphasizing its advantages: more reliable, affordable, and safer energy; opportunities to improve living conditions; and educational initiatives to support efficient consumers. The impact of the regularization and consumer program on consumption is directly measurable in all communities.

5.3 The Role of the Government

The government has had only a minor, indirect, and mostly passive role in utilities' efforts to provide service in distressed urban areas. This role has been expressed mainly through oddly

juxtaposed measures – the "stick" of regulation and policies that appear to support universal electricity service regardless of the complexity of the issues or their cost and the "carrot" of initial monies made available to utilities for efficiency improvements that were liberally used in various utility slum electrification efforts. Currently, other funding sources are specifically and formally targeted for support of electrification and subsidizing tariffs for low-income consumers. The utilities have proceeded on their own to experiment with ways to regularize and improve the viability of low-income and slum populations, taking advantage of the energy efficiency improvement and other funds made available to them.

6 Attachments

6.1 Acronyms

ANEEL	Agencia Nacional de Energia Eletrica
CBEE	Comercializadora Brasileira de Energia Emergencial
CDM	Cooperação para o Desenvolvimento e Moradora Humana
COSIP	Contribuição para Custeio da Iluminação Pública
FIRJAN	RF Federation of Industries
ICMS	Imposto sobre Circulação de Mercadorias e Serviços
NGO	Non-Governmental Organization
PRONAI	Program for Normalization of Informal Areas
UNIFACS	The University of Salvador

6.2 Sources

The case study team was:

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Suzanne B. Maia, Local Expert, AEAI; and
Alexandre Mancuso, Energy Advisor to the USAID-Brazil Mission

The following meetings and site visits were held in Salvador, Bahia, Brazil December 8 to December 12, 2003:

- **Day 1:** Met with representatives from COELBA, Ibenbrasil (COELBA's holding company), and CDM (Cooperação para o Desenvolvimento e Moradora Humana), an NGO.
- **Day 2:** Visited two slum communities – Bairro da Paz and Pernambues; held a meeting with the Municipal Secretary of Public Works and toured retaining wall works in poor areas of the city.
- **Day 3:** With COELBA escorting, visited community where the technical team had recently completed installations, community where legal connection were being installed, and branch office and payment center; CDM headquarters, and John Paul II Educational Center and Day Care Center; the Novos Alagados environmental recovery and housing area being provided with legal electrical metering by COELBA.
- **Day 4:** Met with Ana Cristina Magalhaes of Ibenbrasil, one of the key advisers of the *Agente COELBA* program.

Slum Electrification Pilot—Ahmedabad, India

Contents

1 Introduction

This case study reports on a collaboratively funded pilot slum electrification project in Ahmedabad, India, that extended legal and reliable electricity services to slum communities. The U.S. Agency for International Development (USAID) provided partial funding for this project, which was initiated in 2002. The project subsidized electricity connections to 820 households and provided each household with a separate meter and a compact fluorescent light bulb. This project was a unique and innovative partnership between the local government, the utility, and community-based organizations, and demonstrates a community-based approach to reducing commercial losses and theft of power.

2 Background

Ahmedabad is the largest city in the Indian state of Gujarat and has a population of approximately 3.5 million. The city is a major industrial and financial center and accounts for 60% of the total productivity of the state of Gujarat. Ahmedabad's civic body or city government, the Ahmedabad Municipal Corporation (AMC), was formed in 1950 and is considered to be one of the better-administered municipal bodies in India. It was the first local government in India to be credit rated and issued the first municipal bonds in India without a state government guaranty.[1]

Ahmedabad has been a major center of India's textile trade and industry since the 15th century and is traditionally known as the 'Textile Capital of India'. Textile manufacturing peaked around 1980 when some 100 factories employed approximately 140,000 people. Since then the number of factories has decreased by half and about 60,000 workers have been laid off. Despite the decline in the textile industry, there is evidence since 1990-1991 of a turnaround in the local economy. A striking development is the decrease in the percentage of households in the lowest income group (less than Rs.25,000[2] per year) from 35.3 percent in 1985/86 to 11.4 percent in 1995/96. At the same time, households with incomes ranging from Rs. 25,000 to 50,000 increased from 39.3 to 43.0 percent. Although a significant number of the poor live above the poverty line, many lack basic services and amenities. The percentage of housing categorized as slums increased from 17.2% in 1961 to 25.6% in 1991 and it is estimated that some 41% of the population lives in slums and chawls[3].

2.1 Motivation for Slum Electrification

The AMC targets eliminating slums by 2013 and to reach that goal, it has forged a number of partnerships with nongovernmental organizations (NGOs), private industry, educational institutions and international agencies to enhance its capabilities for urban development. It has launched several public-private partnerships for urban development including the Slum Networking Project (SNP) or 'Parivartan' (meaning 'transformation' in the local language) to

1 The bonds were issued for the Ahmedabad Water Supply and Sewerage Project. The Bond issue was for Rs. 1000 million.

2 In November 2003 Rs. 43.9 = US$ 1.00.

3 Densely populated and often squalid buildings housing a large number of small 1-2 room apartments. Chawls are sometimes referred to as 'multi-storey concrete slums'.

provide basic services to the slums. Infrastructure services provided by Parivartan include paved roads, water supply and underground sewerage to individual households, storm water drainage, street lighting, solid waste management and some landscaping. The SNP began in December 1995 as a partnership between the slum community, Arvind Mills[4], AMC and a local NGO named SAATH.[5] SAATH is also credited as the organization that instigated the "Parivartan" program.

Each partner has a distinct role in the Parivartan scheme. The AMC coordinates and facilitates projects undertaken by the partnership. Arvind Mills implements upgrade work in the slums and promotes development of skills for employment. The NGOs mobilize slum residents and manage a bank that provides micro credit to slum residents. The NGOs, because of their trusted relationship with the community, provide basic access to community residents and help resolve disputes. Community residents organize themselves into neighborhood groups to help implement the Parivartan programs. The Ahmedabad Urban Development Authority (AUDA, a local government authority) is responsible for planning and maintaining infrastructure in suburbs around Ahmedabad. It also provides "No Objection Certificates" (NOCs) to allow slum electrification in its jurisdiction.

2.2 The Utility and its Service Territory

Ahmedabad city receives its power supply from the Ahmedabad Electricity Company (AEC), a public limited company. AEC has a capacity of 490 megawatts and its service territory of 293 sq. kms in Ahmedabad includes 1,666 slum settlements[6] with some 322,000 households. Few slums are wired for in-house electric power; in most cases residents are connected illegally and typically pay Rs.50 per 'power point' (light bulb connection), resulting in a payment of Rs 200-300 per month. This amounts to 10 to 15 percent of monthly income for a household making Rs. 25,000 per year.[7]

AEC reports that in slum areas that are fully converted to legal connections, the total distribution losses are approximately 5% compared to 30% in areas with widely prevalent illegal connections. AEC estimates that annually 27 million KWh of electricity are unaccounted in slum areas (attributed to theft).

3 Description

3.1 Program Design and Implementation

AEC developed its Slum Electrification Program on a pilot basis to augment the Parivartan scheme by providing in-house electrical power. The first phase of the pilot project provided each

4 A large modern textile mill whose management has actively championed social projects

5 SAATH means together, a partnership, co-operation, a collective or support

6 AEC categories 708 of these settlements as slums or 'informal' settlements and 958 as 'chawls' as 'formal' or 'tenement' slums.

7 As of March 2004, the conversion rate between United States dollars ($US) and Indian Rupees (INR) was 1 USD = 45.3 INR. Therefore, a "power Point" connection would cost $1.10, resulting in a monthly payment of $4.41-$6.62 out of an average annual income of $551.87.

household with a legal connection and compact fluorescent light bulb (CFL). Only slums already identified for development under the Parivartan program were eligible to participate in the pilot. Another condition for eligibility was obtaining a No Objection Certificates or NOC from the AUDA, which effectively cedes land tenure to the slum dwellers. Seven slums were included in the pilot project. Working with local NGOs, the AEC team disseminates its program through announcement by megaphone, cloth banners and handbills distributed door to door. In each slum they arrange group meetings with participants and constitutes local community-based organizations to implement the program

The costs for connecting the customer and installing internal wiring was split between the household, USAID and AEC; the household paid Rs.3,350 and USAID and AEC each contributed Rs.2,200.

3.2 Customer's Willingness to Pay

A survey was conducted by SAATH to estimate slum dwellers willingness to pay (WTP) for legal electricity connections. The results of this survey are present in Table 1. The electricity consumption in legally connected households in the slum areas is typically about 36 kWh per month, which at prevalent tariffs would cost Rs.108 per month. For customers with an illegal connection, the same level of consumption would cost Rs. 216 per month (based on anecdotal information about rates charged by middleman for illegal connections). The survey assumed that to finance the initial connection costs, the customer would take a loan from a local moneylender (not a regular bank) at a very high rate of interest payable over a 3-year period and amortized the cost to arrive at a monthly repayment schedule. The total monthly cost to the customer is thus the sum of the monthly loan repayment and the average monthly charge for electricity consumption. As shown in the Table, there is a precipitous drop in customers' willingness to pay as the connection fee increases beyond Rs. 2,000. This indicates that absent subsidies, customer penetration in the slum electrification program would be low. However, the survey results are at variance from AEC reported data on customers willingness to pay, which indicates that 40% of consumers are willing to pay up to Rs. 8,000 in connection costs.

Table 1 Willingness To Pay for Legal Grid Access*

Customer Survey by SAATH[1]				
Connection Fee (Rs)	Monthly Installment Payment for Connection (Rs)	Monthly bill for electricity Consumption (Rs)	Total Monthly Cost (Rs)	Percent of households Willing to Pay
1,000	60	108	168	98%
1,500	91	108	199	88%
2,000	121	108	229	84%
2,500	151	108	259	28%
3,000	181	108	289	6%
AEC Reported Willing to Pay Survey[2]				
0	0	216	216	80%
8,000	483	108	591	40%

Notes: 1. Survey size of 50 households was conducted by SAATH.

2. Based on data provided by the AEC. The Rs. 0 connection charge corresponds to illegally purchased electricity which attracts no connection charges, but the average monthly bill is based on the average reported cost of purchasing illegal electricity. The Rs. 8,000 connection charge is based on average connection costs for a legal connection from AEC without any subsidies.

3.3 Key Program Partners

Three aspects of USAID's Slum Electrification Project in Ahmedabad stand out: the role of NGOs and civil society in the project, the bold and innovative role that AMC has played in establishing partnerships, and the strong role that gender plays in achieving project results.

3.3.1 Role of NGOs and Community Based Organization

USAID's pilot program was implemented only in communities that had already worked with SEWA[8] (Self Employed Women's Association) and SAATH to form community-based organizations. These CBOs are essentially women's cooperatives with members paying a small annual fee (approximately Rs.20). Both the NGOs and the AEC work with the CBO to identify a member (usually a woman) whom they then train to read the individual household meters. AEC then pays the CBO Rs.10 per meter read each billing cycle. The meters are read biweekly and bills are sent monthly or every two months.

SEWA and SAATH have provided the women community leaders with effective organizational and leadership skills that serve to build stable associations. They also help the women's groups provide basic social services such as credit and education. The NGO credit organization, the SEWA bank[9], provides a possible option for residents to finance their electrical connection. World Vision (a Christian relief and development organization) coordinated and worked with the NGOs, AEC, and AMC on the slum electrification project.

According to AMC, SEWA and SAATH serve essential roles as intermediaries between the government and the utility on one hand, and the community based organizations on the other. For example, to provide an electric connection, AEC requires from slum dwellers proper documentation regarding land ownership, income levels, proof of payment, taxes, etc.; something that most slum residents do not have. SEWA works with slum dwellers to help meet the AMCs documentation requirements.

SEWA has been active in slum electrification before the USAID pilot project. The first slum electrification project in 1997 took two and half years to electrify 43 households, mostly struggling to obtain 'no objection certificates'. SEWA's experience there taught them that the process and sequencing of program elements are critical factors in slum electrification. SEWA's participation in the project brings confidence to slum dwellers who do not generally trust utility staff.

8 'sewa' means humans service, assistance or duty in the local language

9 SEWA is a trade union for self-employed women that was founded in 1972 to ensure full employment for its members. SEWA now includes a cooperative bank with 125,000 self-employed women depositors and has distributed, without traditional collateral, over Rs. 350 million ($8 million) for shelter related credit.

3.3.2 Role of Government and the Private Sector

The Ahmedabad Municipal Corporation's good financial management and the city's economic turnaround in the 1990's has enabled AMC to undertake innovative urban partnerships, in particular its Slum Networking Project. The SNP is considered a unique experiment that makes slum dwellers partners in the process of development rather than passive beneficiaries of a welfare-oriented scheme.

The AEC's position on the Slum Electrification Program is one of enlightened self-interest. It views it as part social responsibility and part an effort to reduce losses. Losses due to theft in slums are estimated to have reduced the company's gross revenues by 3%. Thus efforts to regularize electricity service in slums can potentially increase its customer base and hence revenues and also reduce losses. The Company has thus established a Slum Electrification Cell, though it is not yet clear how deeply committed utility management is to this program. Permanent staff assigned to the project is necessary to ensure that utility staff develop a strong relationship with community-based organizations.

The government/private sector issue that looms large in expanding slum electrification is that of land tenure. India's Electricity Law prohibits electricity hookups for those illegally occupying the residence (or land). Thus a "no objection certificate" is required before AEC can provide regularized service. Where AMC owns the land, NOCs are quickly forthcoming. But for privately owned land (over 70 percent of slums are on private land) obtaining an NOC is a major obstacle.

4 Results

4.1 Program Benefits

The pilot project was considered a great success; 820 households in 8 slums were electrified (see Table below).

Name Of Community	Number of households electrified
Sharifkhan Pathan's Chawl	52
Jai Shakti Nagar	98
Ramesh Dutt Colony	259
Kailash Nagar	43
Pravin Nagar-Gupta Nagar	302
Bhikha Deva No Vado	26
Vadhiyari Nagar	40

4.2 Customer Satisfaction

Anecdotal reports indicate that the slum communities electrified under the pilot project were unanimous in their enthusiasm for the introduction of regularized electricity. Illegal connections were unreliable, expensive and dangerous, and the provision of legal connections provided certainty and reliability in service. Women mentioned increased ability of children to read at

night and the possibility of running sewing machines or other productive appliances. Community organizers exhibited a sense of pride in their accomplishment.

4.3 Replication, Expansion, and Future Plans

Following the success of the USAID pilot project, AEC plans to electrify 115,000 poor urban households between 2003 and 2006. AEC has already launched this initiative and provides onsite services to receive applications, accept payment of charges and address consumer inquiries. AEC however prefers a lower level of participation by NGOs and the local community in the project, and is considering alternative metering options including remote metering. AEC has decided that it will charge a single price of Rs. 5,200 for all new service connections[10], including its own subsidy. Meeting AEC's target of electrifying 115,000 households by 2006 will require Rs. 598 million or US$13.6 million. Meeting AMC's target of being slum free by 2013, which would require extending electrical services to approximately 322,000 households, will require roughly Rs. 1.7 billion or US$ 38 million.

AEC would prefer not to provide loans to consumers to finance the upfront connection costs. In the past consumers were charged the actual cost of connecting their homes to the grid. Because consumers were scattered these costs were quite high and hence only a few households were willing to pay to have a legal connection. The AEC pilot study targeted entire neighborhoods that were willing to pay for legal connections and this helped bring down connection costs.

5 Conclusions

The Ahmedabad Slum Electrification Program depends on innovative partnerships established among stakeholders from government, and the for-profit and voluntary private sector. The role of NGOs and civil society in the project and the bold and innovative role that AMC played in establishing partnerships were defining factors in the success of this pilot project.

5.1 Factors Critical to Success

The factors critical to the success of the approach to slum electrification include the following:

- The partnership approach taken in Ahmedabad's Slum Networking Project and in the Slum Electrification Project was key to the success of the pilot project.
  - The probability of project success is increased by partnering among government, the private sector and non-governmental and community organizations
  - Building trust among partners is of the highest priority
  - A clear vision and common commitment are necessary for such partnerships to work
  - Electrification program should only proceed where there is clear demand for it by community residents

10 Rs. 5,000 charge and Rs. 200 security deposit

  - Community involvement sooner rather than later is crucial to successful project design and implementation. Community organizations play an essential role in instigating reform, in providing access to slum residents, and serve as intermediaries in project implementation.
  - Local government must be bold and innovative in its adoption and use of partnership approaches to community development. A willingness to experiment is essential.
  - Resolution of land tenure and other legal issues is essential to project viability.
  - Voluntary organizations need, and should receive, support and cooperation from government, private sector and donor organizations.
  - Women play a key role in motivating slum improvement and in organizing community residents.
- Timing—pacing and sequencing of the program—is critical to successful slum electrification efforts. In particular, basic water, sanitation and paving of paths should precede household electrification, as these are critical health requirements in the slum communities and supersede the need for electricity.
- AEC's plans to scale up the pilot project and expand it to other slums and chawls requires resolution of some key issues such as restructuring and reorganization within AEC and the desirability of creating a separate distribution company to serve slum areas. The company would either buy bulk power from AEC and distribute to slum customers or would manage AEC's metering and bill collection services in the slum communities.
- More detailed and extensive financial analysis needs to be carried out by AEC to assess the financial feasibility of metering and wiring slum households.
  - What is the actual cost to the utility of providing a legal connection? How does this depend on number of households electrified and on density of settlement?
  - Are slum householders willing to pay a surcharge on their electricity bills to cover the connection charge? If so, how much? How much of an upfront charge would they be willing to pay?
- Options to finance electrical regularization through AMC, AEC, SEWA or other mechanisms need to be explored and analyzed.

6 Attachments

Acronyms

AEC	Ahmedabad Electricity Company
AMC	Ahmedabad Municipal Corporation
AUDA	Ahmedabad Urban Development Authority
CBO	Community Based Organization
CERS	Consumer Education and Research Society
CFL	Compact fluorescent lamp
CV	Contingent value
GEB	Gujarat Electricity Board
GERC	Gujarat Electricity Regulatory Commission
IBT	Increasing Block Tariff
kWh	kilowatt-hour
MU	Million units (kilowatt hours)
NGO	Non governmental organization
NOC	No objection certificate
Rs.	Indian Rupees (In November 2003 approximately US$ 1 = Rs. 43.9)
SEWA	Self Employed Women's Association
USAID	United States Agency for International Development
WTP	Willingness to pay

Case Study Contact List

Organization	Contact
CHETNA	Ms. Bhanu Makwana
SEWA	Ms. Bijal Bhatt
SAATH	Mr. Rajendra Joshi
PRASHANT	Fr. Cedric Prakash
SANCHETNA	Dr. Hanif Lakadawala
ASAG	Mr. Rajesh Bhatt
Ministry of Power Government of Gujarat (GoG)	Dr. Manjula Subramaniam
Gujarat Electricity Board (GEB) Sabarmati, Ahmedabad	Mr. R. P. Joshi
Ahmedabad Electiricy Co. (AEC)	Mr. Murli Rangnathan Mr. Siddarth Dza
Gujarat Electricity Regulatory Commission (GERC)	Mr. R. K. Sharma
Ahmedabad Municipal Corps. (AMC)	Mr. Anand Patel
Ahmedabad Urban Development Authority (AUDA)	Mr. Surendra Patel
Centre for Enviornment Policy and Training (CEPT)	Mr. P. U. Asnani
Sardar Patel Institute of Economic & Social Research (SPIESR)	Prof. R. G. Nambiar

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The following communities were visited between November 19 – 23, 2003:

Name & location of the slum	NGO involvement
Jaishaktinagar slums- Hansol	SEWA
Ramesh Dutt Slums- Hansol	SEWA
Guptanagar slums – Juhapura	(illegal connections)
Pravinnagar slums - Vasna	SAATH
Gulbai Tekra slums- Panchvati	SEWA
Rag Picker's slums- Sola Bridge	--
Textile Worker's slums- ASARWA	Majoor Mahajan
Textile Workers slums- Madhupura	Majoor Mahajan
Slum in GEB area-Gandhinagar	--

Formal meetings were held with the AEC, AUDA, AMC and GERC as well as a number of NGOs and other program:

Name of Organization	Contact person	Position
Self Employed Women's Association (SEWA)	Ms. Bijal Bhatt	President
SAATH	Mr. Rajendra Joshi	Managing Trustee
World Vision	Mr. Davidson Solanki	Manager
Textile Labour Association	Mr. Amthabhai Desai	President
Prashant	Fr. Cedric Prakash	Director
United States –Asia Environmental Partnership	Mr. P.V. Asnani	Director

Appendix B
Contacts and Websites Consulted

Appendix B Contacts and Websites Consulted

African Development Bank, Planning, Policy & Research, http://www.afdb.org

Asian Coalition for Housing Rights, David Crosbie

Asian Development Bank, Karti Sandilya, Resident Director, Infrastructure and Poverty

Asian Institute of Management (AIM), Miguel Luz

Business Partnership for Development, http://www.bpdweb.org

CHF International (Cooperative Housing Foundation), John Chromy

Cities Alliance Program, Mark Hildebrand, Billy Cobbett

Department for International Development (DFID)

Electrocosta - Electricaribe - EPSA Union Fenosa, Víctor Cruz Vega

ENERGIA, http://www.energia.org/

Enerkey, Pasi Valoranta, Chief Executive
Gamos/ERDC, Simon Batchelor

Global Health Council (GHC), http://www.globalhealth.org/
Global Village Electrification Project, Ellen Morris

GTZ, Karin Soldan

InterAmerican Development Bank, Jaime Millan, Jose Brakorz

Inter-American Foundation, Blanca Suarez, Emilia Rodríguez-Stein

International Finance Corporation, Power Department, Tonci Bakovic

International Institute for Environment and Development (IIED), Human Settlements Programme, Gordon McGranahan

IP3 (Institute for Public-Private Partnerships), Kathleen Slattery

ITDG, The Schumacher Centre for Technology and Development, Ms Alison Doig
MIGA, Harvey D. Van Veldhuizen, Policy & Environment, Lead Environmental Specialist
MIT Upgrading Urban Communities, SIGUS - Special Interest Group in Urban Settlement, School of Architecture and Planning, http://web.mit.edu/urbanupgrading

World Bank, Doug Barnes, Fernando Manibog, Rosanna Nitti, Dominique Lallement, Ivo Imparatu

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World Bank, EnPoGen, http://www.worldbank.org/astae/enpogen/

World Resources Institute (WRI), Institutions and Governance Program, Navroz K. Dubash

Appendix C
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Appendix C Bibliography of Materials Consulted

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