

Final Report

Implementation of the National Rural Electrification Plan (IPNER Program)

Prepared for:

**United States Agency for International Development (USAID)
Dominican Republic**

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Implementation of the National Rural Electrification Plan (IPNER Program)

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**NRECA International Ltd.
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EXECUTIVE SUMMARY

For decades the electric sector of the Dominican Republic has been plagued with blackouts. “In my 33 years I have never known a time without blackouts”, commented one young Dominican businessman recently. Grid power goes off frequently and can be off 20 hours or more. Nationwide losses are 30% and in some sectors are as high as 60%. Collections average about 70%. In 2007 the Government of the Dominican Republic subsidies to cover the electric sector losses reached US\$700 million. As of this writing it has already surpassed US\$900 million for 2008 with projections that it will reach US\$1.4 billion. But that is only a portion of the price tag of the disorder in the sector, since businesses and residential consumers must resort to costly alternative energy sources to keep the power on during outages.

Besides needing to deal with the woes that plague the electric sector in general, there is the challenge of extending electric service to those without. According to recent census data, approximately 300,000 families in the Dominican Republic, about 15% of the population, live in rural areas without access to electricity. In addition, approximately one million live in peri-urban areas where electric infrastructure is informal, dangerous, and service is so poor as to be without economically productive value.

In the context of the aforementioned realities, in 2001 and 2002, NRECA, at the request of USAID and in conjunction with the Rural Electrification Program of the Corporación Dominicana de Empresas Eléctricas Estatales (CDEEE) prepared a national electrification plan based on a geographic information system (GIS) of the entire country. As a consequence of the acceptance of the program by CDEEE and other government stakeholders, USAID asked NRECA to carry out a follow on project, referred to as Implementation of the National Electrification Plan, or IPNER in its Spanish acronym.

The IPNER program was designed to provide both technical guidance and program design assistance aimed at increasing access to reliable electric power for poor Dominicans, and to establish a viable method for sustaining the improvements. This is the final report submitted to USAID DR by NRECA International Ltd. for the IPNER Program which commenced with the signing of Cooperative Agreement CA-517-A-00-03-00117-00 on 16 May 2003 and ended 30 September 2008. The original CA contained eight tasks. The agreement was subsequently modified several times and this report describes the work performed under a total of eleven tasks. While the final list does not constitute a unified project design, it does represent NRECA’s efforts to carry out the desires of the sponsors, while maintaining a program focus on development of a new strategy for rural electrification.

The activities in the following list are those that comprise the final scope of the program as agreed upon between NRECA and USAID:

- Task 1: Rural Electrification Seminars
- Task 2: GIS Enhancement and Technology Transfer
- Task 3: Global Development Alliance/Electrification (GDA/E) Activities
 - Design of an electrification program structure, to support sustainable community based service options for unserved and underserved areas.
 - Tariff and subsidy study
 - Develop guidelines, tools and standards to be used in electrification program management
 - Design and support a productive uses loan program
 - Institutional support for formation of two electric cooperatives

- Design and support for the Las Galeras Project
- Task 4: Renewable Energy Project Evaluation and Implementation
- Task 5: Implementation of a Grid Rehabilitation Project
 - Fronteriza Project
 - Technical Assistance to CDEEE/UERS
- Task 6: Identification of Grid Rehabilitation Projects Based on DCA Financing
- Task 7: Energy Efficiency Program for Government Buildings
- Task 8: Provide Ongoing Technical Assistance and Training to Partner Organizations
- Task 9: Technical Assistance for Distribution Operation
- Task 10: Residential Energy Efficiency
- Task 11: Program Expansion

The two major indicators of special interest to USAID were the number of people with increased access to modern energy service and the number of electric partnerships. The grand total number of people with increased access to modern energy services for the entire IPNER Program was 44,070 (by means of 8,814 service drops) and the total number of partnerships developed was 15.

Other significant accomplishments of the IPNER Program are listed in the following table after the two major indicators.

Item	LOP, Achieved
Number of people with increased access to modern energy services	44,070
Number of electric partnerships developed	15
Initial seminar attendees	130
Distribution line design trainees	109
Attendees of coop organizational meetings	5,721
Renewable energy trainees	97
Energy Efficiency trainees	272
Consumer Education seminar attendees	146
Tariff and Subsidy Study	1
Model electric cooperative bylaws developed	1
Electric cooperatives created that completed the legal incorporation process with a decree signed by the President	2
Model contract prepared for electric coops to operate a portion of the electric sector	1
Trainers educated in residential efficiency education	59
Productive uses and appliance loan program	1
-- Number of productive use loans	450
-- Amount loaned	US\$ 374,310
New project site feasibility study	40 sites (3 grid, 37 micro-hydro)
Counterpart funds leveraged	US\$ 1,601,612

A candid look back at the five years spanned by the IPNER Program evokes both a sense of satisfaction and frustration. Satisfaction arises in recognition that over 44,000 people have

improved access to electricity, that the beneficiaries of the Las Galeras Project are receiving electric service 24 hours a day year-round, that two electric cooperatives successfully completed the legal incorporation process that requires going all the way to the President of the country for signing the incorporation decrees, that multiple studies including the tariff and subsidy analysis were completed helping to attract more technical assistance to the electric sector, and that hundreds of people were provided with training, among other accomplishments. The frustration comes from the lack of GORD counterpart support to allow vitally needed institutional changes to take full advantage of new electric infrastructure and maximize the benefit of technical assistance and training.

The IPNER Program highlights once again how important it is for institutional change to go hand in hand with technical improvements. Projects both before and during the IPNER Program demonstrated that it is possible to reduce losses, to improve collections, and to provide reliable electric service 24 hours a day in the Dominican Republic. This was proven with the pre-IPNER San Rafael and Boca de Yuma Project. While NRECA managed the reconstructed system in San Rafael, losses were below 10%, collection above 95%, and the power was on 24 hours a day. This was demonstrated again in the IPNER-financed Las Galeras Project where Luz & Fuerza, a privately owned and managed electric utility in Samaná, provides 24/7 service with very low outages, year round. In contrast, in Las Matas de Farfan where NRECA installed the same high quality robust electric infrastructure, but where the legally-incorporated Cooperativa Electrica Fronteriza has not been allowed to begin operation, the outages continue and losses remain at about 50% and collections at 70%. The difference is obviously the focus on institutional robustness, training, and dedication/discipline to provide high quality, reliable electric service.

In spite of the frustrations and the need to withdraw support from the primary activity financed by IPNER, we remain hopeful that positive change will occur in the Dominican power sector. For this to happen, a change in the political climate will be required to interject private, consumer-owned electric utility model as a means of promoting efficiency, reducing losses, and substantially increasing economic benefits to rural homes and businesses in the Dominican Republic. Finally, we wish to express our gratitude to USAID for the opportunity to invest US government resources to contribute to improvements in the quality of life for the people of the Dominican Republic, and to conduct this social experiment that showed so much promise at the outset of the IPNER Program.

Final Report

Implementation of the National Rural Electrification Plan (IPNER Program)

NRECA/USAID CA-517-A-00-03-00117-00
End Date: 30 September 2008

INTRODUCTION

For decades the electric sector of the Dominican Republic has been plagued with blackouts. “In my 33 years I have never known a time without blackouts”, commented one young Dominican businessman recently. Grid power goes off frequently and can be off 20 hours or more. Nationwide losses are 30% and in some sectors are as high as 60%. Collections average about 70%. In 2007 the Government of the Dominican Republic subsidies to cover the electric sector losses reached US\$700 million. As of this writing it has already surpassed US\$900 million for 2008 with projections that it will reach US\$1.4 billion. But that is only a portion of the price tag of the disorder in the sector, since businesses and residential consumers must resort to costly alternative energy sources to keep the power on during outages.

Besides needing to deal with the woes that plague the electric sector in general, there is the challenge of extending electric service to those without. According to recent census data, approximately 300,000 families in the Dominican Republic, about 15% of the population, live in rural areas without access to electricity. In addition, approximately one million live in peri-urban areas where electric infrastructure is informal, dangerous, and service is so poor as to be without economically productive value. The biggest hurdle in electrification in the Dominican Republic is not the provision of electrical infrastructure per se, but the resolution of commercial problems that result in high levels of losses and poor collections, resulting in chronic underfunding of the electricity sector.

In the context of the aforementioned realities, in 2001 and 2002, NRECA, at the request of USAID and in conjunction with the Rural Electrification Program of the Corporación Dominicana de Empresas Eléctricas Estatales (CDEEE) prepared a national electrification plan based on a geographic information system (GIS) of the entire country. The plan, or PNER in its Spanish acronym, identified over 500 grid extension projects and 19 renewable energy projects that would have provided electric service to more than 100,000 rural families within five years. The PNER also developed recommendations for institutional and service provider structures that could efficiently implement and extend the program.

As a consequence of the acceptance of the program by CDEEE and other government stakeholders, USAID asked NRECA to carry out a follow on project, referred to as Implementation of the National Electrification Plan, or IPNER in its Spanish acronym. The IPNER project commenced with the signing of Cooperative Agreement CA-517-A-00-03-00117-00 on 16 May 2003 and ended 30 September 2008. The IPNER program was designed to provide both technical guidance and program design assistance aimed at increasing access to reliable electric power for poor Dominicans, and to establish a viable method for sustaining the improvements.

PROGRAM STRATEGY

The strategy for the IPNER program was to provide support to both public and private stakeholders in the Dominican Republic for continuing advances and improvements in rural and peri-urban electrification planning, project development, and systems infrastructure. Under IPNER the plan was to promote implementation of a coherent electrification program whose goal was expansion of access to electricity for the rural and peri-urban poor. To address these electrification needs in the DR, local stakeholders including CDEEE/UERS, EDESUR, Luz & Fuerza, and line construction contractors were to be mentored and provided with technical assistance by NRECA. In addition, NRECA was awarded a USDA Food for Progress \$5.0 million commodity import grant. The funds generated from the sale of the imported commodities were to be used to finance rural electrification projects in coordination with IPNER as an integral component of a multi-faceted rural electrification program.

SCOPE OF ACTIVITIES

The original cooperative agreement, CA-517-A-00-03-00117-00, contained eight tasks. The agreement was subsequently modified to include a global development alliance project which eliminated some of the original tasks while adding others. Subsequently there were further modifications, including projects aimed at structuring a coordinating agency for rural and peri-urban electrification, a consumer education program, a tariff and subsidy study, and other modifications for work described herein. The final consolidated list of tasks included in the IPNER agreement consists of eleven activities. While this list does not constitute a unified project design, it does represent NRECA's efforts to carry out the desires of the sponsors, while maintaining a program focus on development of a new strategy for rural electrification.

Due to the multiple changes in scope there is some potential for confusion as to exactly what the total project scope actually was. The activities in the following list are those that comprise the final scope of the project as agreed upon between NRECA and USAID:

- Task 1: Rural Electrification Seminars
- Task 2: GIS Enhancement and Technology Transfer
- Task 3: Global Development Alliance/Electrification (GDA/E) Activities
 - Design of an electrification program structure, to support sustainable community based service options for unserved and underserved areas.
 - Tariff and subsidy study
 - Develop guidelines, tools and standards to be used in electrification program management
 - Design and support a productive uses loan program
 - Institutional support for formation of two electric cooperatives
 - Design and support for the Las Galeras Project
- Task 4: Renewable Energy Project Evaluation and Implementation
- Task 5: Implementation of a Grid Rehabilitation Project
 - Fronteriza Project
 - Technical Assistance to CDEEE/UERS
- Task 6: Identification of Grid Rehabilitation Projects Based on DCA Financing
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- Task 9: Technical Assistance for Distribution Operation
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ACTIVITIES AND ACCOMPLISHMENTS

The following section describes each activity contained in the final scope and reports accomplishments and issues that have been encountered and addressed

Task 1: Rural Electrification Seminars

In order to assist program partners to think through the process of analyzing program implementation options, NRECA held two seminars as priority events to initiate the IPNER program. The first seminar was designed to review issues related to program implementation models, while the second seminar was designed to concurrently present the results of the National Electrification Plan (PNER) as well as to present an analysis of program management challenges and opportunities.

After much discussion with USAID and CDEEE, it was decided to limit participation of the program implementation seminar in order to focus attention on practical solutions to the seemingly overwhelming programs facing PER (the rural electrification department of CDEEE latter renamed UERS). The invitees included PER personnel, CDEEE senior management, CNE management and selected staff, and other Dominican government agencies that were actively working on electrification activities. Service providers, including Union Fenosa and AES/Dominicana, were not included so as to facilitate more open discussions regarding program options and challenges. The seminar was held in a closed meeting in Boca Chica on May 2, 2003, and was entitled, "Sustainable Electrification in the Dominican Republic". Featured speakers included Daniel Waddle, James VanCoevering, and Leonel Fonseca, the former *Superintendente de Electricidad* of Costa Rica.

The seminar resulted in a great deal of discussion regarding the viability of cooperatives as an institutional form that could be used to facilitate investments and to manage rural electric systems. Multiple challenges were noted regarding formation of electric cooperatives in view of the existing concessions with Union Fenosa and AES, but it was clear that many parties felt that a change in direction was needed to assure sustainable investments and institutions to manage them for rural electrification (RE) projects. In spite of NRECA reluctance to recommend a cooperative solution, based on the somewhat troubled history of cooperatives in the Dominican Republic, the then director of CDEEE Cesar Sanchez announced the support of CDEEE for the formation and franchising of cooperative electric utilities in areas where the nature of the consumer mix would not support profit-based commercial utility operations.

The second seminar was held on June 5, 2003, and was meant to publicize the results of the National Electrification Plan (PNER) that was completed in early 2003. Accordingly, over 120 professionals, journalists, and program managers were invited and attended this event. It received widespread press coverage and was attended by the Presidential Chief of Staff, Lic. Sergio Grullón, Director Brenamen of USAID, Cesar Sanchez of CDEEE, and many other electric sector leaders and senior government officials. The seminar was very well-attended, reached a wide

spectrum of the principal players in the Dominican electric sector, and was highly publicized in the print and television media.

Task 2: GIS Enhancement and Technology Transfer

One of the most significant differences between the PNER and previous attempts at rural electrification planning was the application of a geographic information system with a national scope. The application of the GIS took much of the uncertainty out of the process of project design and selection by clearly showing where existing distribution lines were located, and how new line extensions could be added in a straightforward manner. The GIS included a financial analysis module that developed budgets for the new projects, predicted the number of new consumers to be served, and estimated the revenue to be generated by sales to those consumers. This tool showed great promise for streamlining the process of project selection and improving the efficiency of project investments by clearly showing exactly how much infrastructure needed to be built. That said, however, the GIS was an NRECA development, and it remained to assist CDEEE in realizing its potential in actual practice.

The objective of this task therefore was to enhance the GIS as a program management methodology and to transfer its capabilities to CDEEE/PER (later CDEEE/UERS) personnel. Early work in this area included the development of the ArcIMS interface to be used for posting the GIS on the Internet. During the third semester of the project that system was reconfigured to use Windows Server 2003, a more versatile web platform. Said change allowed more users to access the ArcIMS-based GIS at the same time. The site was originally configured estimating that it would have to handle 50 hits per week. In reality it registered more than 2000 hits in a three week period after it was put in operation and traffic until NRECA shut down the website in 2006.

Under this task a GIS Center was to be installed in CDEEE. NRECA was to provide specifications and CDEEE/UERS was to buy all the necessary equipment and software and hire technicians. Once the equipment had been purchased, NRECA was to provide assistance for the installation and training.

This activity proved problematic in part due to sporadic budget crises at CDEEE/UERS, which delayed acquisition of the necessary hardware and software until 2007. Staff turnover also hampered the training activity, as only one of the initial group of eight GIS technicians completed the training activity, at which time he was promptly hired away from CDEEE by another organization. A second set of GIS technicians has proven more stable, though challenges remain. In addition to GIS training, NRECA also provided training to field technicians in the use of the global positioning system (GPS) units used to locate facilities in the field. Acquisition by CDEEE/UERS of an adequate number of GPS units was also a challenge. Initial efforts to update the PNER by georeferencing all newly constructed rural electrification projects had to be carried out with NRECA GPS units and under NRECA supervision.

By the summer of 2007, all elements were in place, however, and CDEEE/UERS began an ambitious GIS project aimed at locating all existing distribution and subtransmission line in the southern quadrant of the country. NRECA continued to provide GIS training and support to CDEEE/UERS well into 2008.

Another activity under this task was an agreement with the *Asociación para el Desarrollo de San José de Ocoa* (ADESJO) to develop a dedicated GIS for that province. The GIS was intended as both an operational tool for planning and project analysis, as well as a means whereby the impacts of projects could be measured over time. The GIS system for San José de Ocoa was developed and local staff trained in its use. It was implemented online via a secure web that

permitted only ADESJO personnel to access the tool with a password. This site was used to help improve programs of ADESJO with several governmental organizations like the Secretariats of Education and Health.

Unfortunately, the ADESJO GIS proved to be impossible to sustain and has been shut down. Problems included data loss and equipment damage resulting from persistent and frequent power outages, and the difficulty of locating and retaining key staff. Power outages disrupted system development in spite of the use of uninterruptible power supplies, due to their duration and frequency. Additionally, it was impossible to maintain an environment suitable for computers and plotters in the face of the power situation that made air conditioning only occasionally available. Also, given the depressed salary structures in the area, it proved difficult to recruit and sustain staff with the necessary technical qualifications.

Task 3: Global Development Alliance/Electrification (GDA/E) Activities

The purpose of the GDA activity was to promote partnerships that would facilitate sustainable electrification program activities in the Dominican Republic. Partnerships were to be formed with institutions such as CDEEE, CNE, AES, Luz y Fuerza de las Terrenas, and other potential partners. Shortly after the GDA activity was approved, significant and sweeping changes occurred in the Dominican Republic that directly affected the electric sector. And in fact, major changes continued to impact the electric sector throughout the life of the IPNER Program.

Among the sweepings changes and major upheaval during the past five years there was the period of rampant inflation, the withdrawal of Union Fenosa from the Dominican Republic, two national elections, the passing of renewable energy incentives law, and significant modifications to existing electricity law. In the face of these challenges, NRECA worked closely with USAID to adjust to the changes and to carry out GDA activities that best responded to the changes.

Progress on the GDA/E project was reviewed in a report prepared by NRECA and delivered to USAID on June 1, 2005. This report reviewed the goals and objectives of the project, the project partners, and documented the progress and activities and the changes in scope resulting from the upheavals in the Dominican electric industry since the GDA/E was authorized. The report was accepted by USAID and the revised GDA/E structure was used to guide future work. Activities by subtask are as follows:

Design of an Electrification Program Structure for Community Based Providers

When the GDA/E project was initially designed and proposed, it focused on establishing program support mechanisms with the Dominican government to design and manage a national rural electrification program. NRECA developed a white paper describing a proposal for a specific structure and set of roles for the proposed coordinating entity, tentatively referred to as the *Fundación para Electrificación Rural y Urbano Marginal* (FERUM). As indicated by the name, the entity would not be a government agency, but an independent government foundation with a board appointed by the government, but consisting of private individuals. The draft was submitted to the Hipolito Mejia government which ran out of time to give the FERUM legal identity before they left office.

For the incoming government dealing with this issue came at a moment of transition and during a time when all attention was centered on the electric sector crisis. Thus the government postponed work indefinitely on this area with an interest in exploring other options.

Tariff and Subsidy Study

Immediately following the elections in May 2004, the outgoing government apparently ceased making subsidy payments to the electric sector, with the result that outages increased substantially in frequency and duration as distributors were unable to make full payment for power purchases. During July, the *Organismo Coordinador* reported that unserved energy exceeded 40% of estimated demand, translating into power outages of more than 12 hours per day for most consumers. Emergency generators operated around the clock in wealthier neighborhoods, while barrio residents were forced to adapt to sporadic power availability.

In late July 2004, USAID requested that NRECA provide support to the new government by examining the causes of the crisis and evaluating tariff and subsidy options. In particular, the tariff portion of the plan was to be based on willingness to pay studies completed previously by NRECA. On 13 August 2004 NRECA made a presentation outlining the causes of the sector crisis and presenting the results of previous willingness to pay studies. The results clearly showed that the causes of the crisis were excessive losses and poor collections in the distribution sector. These failings were augmented by unexplained increases in operating cost in the publicly managed EDESUR and EDENORTE in the months prior to the election, and were compounded by uneven delivery of subsidy payments among the distributors by the government. Contrary to allegations made by others, there was little evidence of price gouging on the part of the generators.

Subsequently, NRECA was requested to prepare a tariff and subsidy plan based on new willingness to pay studies specifically designed to assess consumer response to the current crisis. The final study included consideration of specific measures necessary to improve the efficiency of the distributors, and specific tariff recommendations for the near and medium term with a goal of placing the sector on a sound financial footing and ending the crippling power outages. The report was delivered to the GODR, the World Bank, and others in December 2004. The analysis described several alternatives to rapidly reduce losses and improve collections that attracted the attention of the World Bank and other donors. As a consequence this USG funded effort helped to bridge technical assistance provided to the *Comisión Nacional de Energía* (CNE) in connection with the US\$7.3 million dollar World Bank loan approved after the tariff and subsidy study was completed by NRECA.

Develop Guidelines, Tools and Standards to be Used in Electrification Program Management

One of the primary beneficiaries of the GDA/E program is CDEEE. In a previous form, CDE was a national, vertically-integrated utility and as such, the owner and operator of generation, transmission, and distribution systems in the Dominican Republic. After a carefully prepared sector reform program, CDE was unbundled into generation, transmission and distribution companies. The distribution bundle was further divided along geographic lines into three distinct organizations serving the eastern, northern, and southern areas of the CDE distribution service

area, with company names EDEESTE, EDENORTE, and EDESUR. The three distribution enterprises were capitalized, with private operators holding 51% of the equity of the companies and exercising operating authority. CDEEE's role became that of acting as the representative of the government's continuing but non-controlling interest in the distribution companies. In addition, CDEEE, through the PER (now UERS) retained direct responsibility for construction of rural electrification projects, which would then be turned over to the distributors to operate.

CDEEE/rural electrification started with very few staff and a very meager budget. As the corporatization/privatization process concluded, emphasis began to shift from the reorganization and restructuring program to address some of the programs with peri-urban and rural areas that were not adequately served by the new utilities. The need for much stronger planning and program management functions within CDEEE became increasingly obvious. Recognition that an aggressive technical assistance program was necessary arose from several parties, including the Office of the President (*Secretariado Técnico de la Presidencia*), CNE, and within USAID. For this reason, NRECA developed a comprehensive series of technical assistance guidelines (TAGs) that cover the following topics:

1. TAG 1: Overview of the process of feasibility analysis for rural and peri-urban electrification projects.
2. TAG 2: Engineering design and cost estimation for electric distribution projects.
3. TAG 3: Feasibility study design and analysis for electrification projects using enhanced GIS.
4. TAG 4: Supervision and monitoring of cooperative performance using modified NRECA form 7. (Not prepared following decision by CDEEE to de-emphasize community service providers)
5. TAG 5: Policies and procedures for procurement of materials and services for rural electrification projects. (Not prepared as a consequence of CDEEE decision to retain procurement responsibility internally, which required application of normal Dominican government procurement rules)
6. TAG 6: Development and strengthening of cooperative utilities.
7. TAG 7: Board of director functions for rural electric utilities.
8. TAG 8: Preparation of business plans for rural electric utilities.
9. TAG 9: Engineering design and construction standards for rural electric systems, in 15, 25, and 35 kV voltage classes.
10. TAG 10: Design and operating standards for solar photovoltaic systems.
11. TAG 11: Productive use program promotion and loan procedures.
12. TAG 12: Economic analysis and willingness to pay design and analysis.
13. TAG 13: Project financial analysis practices and procedures.

In addition to preparation of the TAGs, NRECA carried out four one-week line design seminars for PER and other CDEEE staff. The purpose of the seminars was to provide training in the

application of TAG 9, engineering design, and the seminars were attended by a total of 109 professionals. The composition of the attendees is presented in the table under Task 9.

During the course of the project, a number of changes occurred that altered the situation. In 2005, the private operator of EDESUR and EDENORTE, the Spanish utility Union Fenosa, sold its shares back to the Dominican Government and withdrew from operation of the distribution companies. This placed CDEEE once again in a management position with respect to operations of the distribution utilities and essentially eliminated their interest in rural electrification reform. Further, in 2007, the responsibilities of the PER were merged with those of the Outage Reduction Program (PRA in Spanish), which administered a subsidy program in peri-urban neighborhoods considered commercially unmanageable. The merged entity changed its name to Rural and Peri-Urban Electrification Unit (UERS in Spanish) and embarked on an ambitious program of construction using funds provided by the PetroCaribe initiative. As a consequence of the pressure to complete projects, design and selection methodologies based on feasibility analysis were abandoned as too time consuming, and construction contracts were placed on a design-build basis that made de-emphasized the involvement of UERS staff in design and construction supervision in favor of completion of projects in a compressed time frame. It remains to be seen, now that the flow of projects has reduced, whether UERS will once again become interested in the type of individual project management strategy for which the TAGs were designed.

Design and support a productive uses loan program

The objective of this task was to expand a successful productive uses loan program between a savings and loan cooperative, the *Cooperativa Central* and NRECA. In January 2001, NRECA had signed an agreement with *Cooperativa Central* to work together to open a savings and loan cooperative branch in San Rafael de Yuma. In this project, NRECA and the *Cooperativa* invested matching funds to establish a \$US100,000 loan facility that provided productive use loans to community members to facilitate the purchase of electrical machinery for commercial, small industrial, and agricultural processing activities. Successful investments included refrigerated fish storage in Boca de Yuma that allowed local fishermen to exercise greater control over the prices at which they sell their catch, and a furniture factory in San Rafael de Yuma that brought 60 manufacturing jobs to the community.

Based on this successful collaboration, NRECA and the *Cooperativa Central* set out to establish a similar productive uses loan facility in the area of Matas de Farfan, where the *Cooperativa Central* is headquartered, and which is the principal town in the service area of the proposed Fronteriza project. NRECA reached an agreement to co-invest \$100,000 in a new funding, and to reinvest the \$50,000 reflows from the previous project in a productive uses program to serve the Fronteriza project area. Under the terms of the agreement, the *Cooperativa Central* was to provide matching funds to create a pool of financing with a total value of \$300,000.

In addition to establishing the productive uses loan facility, NRECA has designed a productive uses promotion program. Most often, local businesses, farmers, and small industries are not fully cognizant of the costs and benefits of purchasing and employing electrical machinery to reduce labor costs and increase production by employing electricity and machinery more effectively. For this reason, NRECA designed a promotion program for the Fronteriza project and implemented it in the fall of 2005. Specifically, NRECA and the *Cooperativa Central* established a team to implement this project, and specialized literature and brochures were designed and prepared. A customized radio campaign was also started in local stations of the region and over the course of two years several electric trade fairs were held. The fairs provided an opportunity for regional and

national stores specialized in supply of agricultural and other electrical equipment to present their products and for the *Cooperativa Central* to promote the loan program.

The productive uses loan program was to have accompanied service quality improvements resulting from system rehabilitation and improvement in commercial practices that are the subject of other tasks under the IPNER project. In fact, the hoped-for improvements in service quality were only partially achieved for reasons which will be discussed. The inability to ensure adequate service quality called into question the wisdom of encouraging consumers to take on debt for the purpose of acquiring electric productivity enhancing equipment, and NRECA deemphasized the promotional aspects of the program in 2008. Nonetheless, the productive uses loan program is ongoing and the *Cooperativa Central* reported that by end of June, 2008, a total of RD\$ 12,726,511 (approximately US\$ 374,310) had been disbursed in 450 loans. Repayment rates have remained over 95% for the duration of the project, a testimony to the proactive management provided by *Cooperativa Central* staff.

Institutional Support for Development of Two Electric Cooperatives

Scope

Electric cooperatives were identified in the seminar carried out under Task 1 as a promising new strategy for resolving the persistent failures of the Dominican electric sector. This was particularly true in rural and peri-urban areas where consumption, and hence revenues, tended to be small and of little interest to the private companies then involved in operation of the large distributors. The work was concentrated on support for the creation of two electric cooperatives, one in the Cristo Rey neighborhood in the city of Santo Domingo, and one in the rural area around Matas de Farfán, near the Haiti border, referred to as the *Zona Fronteriza*. Though the areas are completely different in terms of demography and rural/urban character, they share common characteristics in that residents are mainly small consumers who, under the current tariff in place in the Dominican Republic, do not generate any margins on their electric sales and are therefore not attractive commercially to the jurisdictional electric distributor. Also, electric service in both areas suffers high losses and poor collections that make the utility even less interested in maintaining service quality. As a consequence, voltage quality was very poor, outages frequent and load shedding common.

The Cristo Rey neighborhood is one of many in Santo Domingo in which electric service is chaotic, dominated by illegal connections and unmetered service. Since few consumers paid for their power, Edesur, the jurisdictional utility, felt free to disconnect the service frequently in an effort to minimize losses. The Cristo Rey neighborhood appeared on Edesur maps only as a blank space, and the company accepted no responsibility for connecting consumers, maintaining equipment or lines, or ensuring service quality within its boundaries. Service provision was largely in the hands of a large number of free lance local electricians who connected consumers using the most informal of methods and equipment, and in some cases charged monthly bills, but had no connection at all with Edesur.

Prior to NRECA's involvement, the Cristo Rey neighborhood, led by a local priest, had formed multi-services cooperative with no legal authorization to operate as a utility. Even though it did not have any legal status, this cooperative began registering and billing consumers in the Cristo Rey neighborhood, acting as a sort of shadow utility. This operation relied on the fact that Edesur line crews refused to enter the area due to the danger of public unrest, making it a sort of utility no-man's land. The cooperative did not remit any funds to Edesur in payment for wholesale

power, and was rightly considered by Edesur as a rogue organization, part of the problem and not the solution.

NRECA undertook activities to regularize and formalize the cooperative by establishing a set of bylaws and carrying out board training with the idea that once it obtained legal status, it would behave in a more professional fashion and could obtain the necessary agreements with Edesur to allow it to operate as a utility. Unfortunately, the access to the relatively easy money resulting from its informal operations had a corrupting influence on the board and it was not possible for NRECA to achieve the necessary level of discipline and transparency that might have led to a viable electric provider, and NRECA severed its relationship with the Cristo Rey cooperative in 2005. When efforts shifted away from a broader project in Cristo Rey, a small group of the original members continued to express interest in forming a pilot project in Las Flores, a neighborhood in Cristo Rey and NRECA continued its organizational efforts with this group.

In the case of the *Zona Fronteriza* a steering committee was elected in November 2003 and approached NRECA to request support. Following acceptance by both NRECA and CDEEE of the community proposal to implement an electric cooperative, NRECA provided support for a membership drive, development of bylaws and submittal of required documents to IDECOOP. Since IDECOOP had no experience with certification of an electric cooperative, it was necessary for NRECA to conduct training sessions for IDECOOP staff and to guide them in the execution of their responsibilities as regulators. This had to be repeated subsequent to the change in staff that occurred following the transition to the government of Leonel Fernandez in 2004.

The membership drive was able to register slightly over 400 members, enough to hold the first organizing assembly in August of 2004, at which the membership ratified the bylaws and elected its first board of directors. In spite of the delays imposed by the need to train IDECOOP, the *Cooperativa Eléctrica Fronteriza* (CEF) was duly certified by President Leonel Fernandez in July of 2005. The project was originally conceived with the hope of establishing a vibrant electric cooperative that would eventually serve 17,000 families (approximately 85,000 people) with a fully rehabilitated electric system in the region that would be owned and operated by the *Cooperativa Eléctrica Fronteriza* (CEF).

Organizational Activities

Because there have been no electric cooperatives in the Dominican Republic, it was necessary to prepare bylaws developed for the local context. Using sample electric cooperative bylaws from Argentina, Bolivia, Costa Rica, and the USA the NRECA team worked with lawyers from IDECOOP and CDEEE to ensure that the bylaws were in line with both the cooperative law and the electricity law of the Dominican Republic. The model bylaws developed by NRECA were used for constituting both the *Cooperativa Eléctrica Fronteriza*(CEF) and the *Cooperativa Eléctrica Las Flores*.

In addition to the development of bylaws, significant effort was required for training and guiding the board and committee members of the *Cooperativa Eléctrica Fronteriza* and the *Cooperativa Eléctrica Las Flores* as well as the committees elected in each of the nine districts of CEF. One of the most important requirements for formation of an electric cooperative is that its members understand their rights and responsibilities. The IPNER program did not originally envision the formation of electric cooperatives and therefore did not include a cooperative education program. A grant for \$35,000, referred to as the “Consumer Education for Community

Based Electricity Providers” was provided by USAID/EGAT to help develop a consumer education program in areas where cooperatives were in formation. The \$35,000 added to the Cooperative Agreement expressly for this purpose permitted the NRECA team to carry out the following activities.

As a part of the consumer education component of the IPNER program NRECA organized six seminars – three for each of the two co-ops. The seminars were provided for elected members of boards and committees as well as other key invited participants from the two electric cooperatives in the process of formation. A summary and breakdown of the 146 participants by cooperative and by gender is presented in the table of indicators under Task 8.

NRECA brought Misael Monge from Costa Rica to help with this activity. Mr. Monge a seasoned leader of electric cooperative formation and management helped prepare the materials for the seminars and was the principal instructor for the first two seminars. For the Cooperativa Eléctrica Fronteriza those benefited by this training included the Education Committee as well as the Administrative Board (Consejo de Administración), Audit Board (Consejo de Vigilancia), and representatives of all nine district committees. Other invited participants included representatives of the regional IDECOOP office.



Participants with their certificates at the close of the first seminar in Las Matas.



Participants in the first seminar for the Las Flores steering committee

Volunteers, and institutions supportive of the projects helped to defray some of the seminar expenses. For the seminars held in Las Matas de Farfán the Cooperativa Central permitted the use of their meeting room and facilities. For the three seminars for the Las Flores Cooperative, facilities were provided free of charge at the Plaza de la Salud (auditorium seen in the two pictures), the home of one of the steering committee members, and a church meeting room. Other in-kind support included the use of an IDECOOP multimedia projector for one seminar, and the help of volunteers with transporting and serving refreshments at some of the seminars.

Another noteworthy item was that the Peace Corps assigned two volunteers to support the *Cooperativa Eléctrica Fronteriza* project. One volunteer was located in Hondo Valle and the other in Las Matas de Farfan.

Consumer education efforts also included the preparation and distribution of a color booklet with simple language and cartoon characters that outlined the basics of how to create an electric cooperative, and ongoing scheduling of informational and membership-drive meetings throughout the proposed service area of the *Cooperativa Eléctrica Fronteriza*. A summary of the indicators is presented in the table under Task 8. Participants were presented with a vision of their responsibility in educating both potential and existing cooperative members, were provided with extensive printed and oral material, were instructed on how to prepare annual consumer education programs, and were then asked to divide into small work groups to draft programs for their cooperatives. The educational levels, and the capacity to absorb and apply the material, varied widely among the participants. The most encouraging signs of institutionalizing and applying what was learned in the seminars were initially seen in the La Fronteriza Cooperative. In their own more informal way, however, and given the short time that they had existed, the Las Flores

steering committee made impressive strides in getting the word out in their sector to sign up more than the requisite 200 members needed to found a public service cooperative.

Results

CEF held its founding general assembly on 1 August 2004, and succeeded in obtaining legal incorporation by decree of President Leonel Fernandez (Decree 397-05) on 13 July 2005. It successfully held regular board meetings and Annual Meetings of 2005, 2006, 2007, and 2008. During the course of its existence, CEF reached a high of 2100 members, almost 20% of the registered EDESUR consumers in the area, even though it had no authority to operate the system and could not therefore improve the quality of electric service. In spite of all the efforts, and the initial support of both CDEEE and EDESUR, the jurisdictional utility serving the area, it proved impossible to arrive at a final agreement that would have authorized the cooperative to operate the system in the project area. In particular changes in management at both CDEEE and Edesur resulted in changes in mindset and a reluctance to pursue a cooperative based approach to improving the technical and commercial performance of the electric system in the project area.

In the case of the Cooperativa Las Flores, the cooperative succeeded in signing up the minimum of 200 members required to establish a public service cooperative, presented its documentation to IDECOOP for certification and obtained the decree of legal incorporation signed by President Leonel Fernandez. In spite of the willingness of the small cooperative to behave professionally, EDESUR refused to consider any sort of contracting medium under which the cooperative could have progressed to an operating entity. In part this was due to the small size of the initial project which covered only two city blocks and would have made the service area difficult to segregate from the rest of the neighborhood. Notwithstanding the size of the project, a demonstration could have been devised, but EDESUR was not interested.

The need for appropriate institutional structures in the electric sector at all levels but the need is especially acute at the distribution level in the Dominican Republic. With the failure of the government-owned and investor-owned utilities to provide reliable service, NRECA worked very hard on a third institutional model – the creation of electric cooperatives, but was not successful in making the transition to an operating model.

Design and Support for the Las Galeras Project

The purpose of this activity was to partner with Luz y Fuerza Las Terrenas (Luz y Fuerza), one of the few truly private electric utilities in the Dominican Republic in the development of a rural electrification project in the area of Las Galeras.

Las Galeras is a community on the northeastern tip of the Samana peninsula. Prior to the project, Luz y Fuerza served the approximately 400 consumers in Las Galeras with a single 250kW diesel generator. Costs were high and reliability poor due to the lack of backup capacity, and even at the high tariffs Luz y Fuerza was forced to charge, the service represented a financial loss.

NRECA had previously identified the bluffs overlooking the Atlantic Ocean at La Guazuma, approximately 10 km south of Las Galeras as an area with high potential for wind generation, and Luz y Fuerza proposed to construct a wind farm there. However, due to the low load of the

existing Las Galeras system, the amount of wind generation that could have been integrated into the system was very limited, on the order of 25kW, and unit costs would have been correspondingly high. Accordingly, Luz y Fuerza and NRECA defined a project that would increase by 1150 the number of consumers served by the Las Galeras system as well as interconnecting the wind generation in order to allow for a greater production of wind energy and a lower unit cost.

The project eventually defined consisted of construction of 32 kilometers of 12.5kV lines to incorporate the three communities of Punta Balandra, Los Tocones/Playa Rincon y La Guazuma. Initial development of the wind site would be with a single 70kW wind turbine. NRECA carried out integration studies of the wind turbine to show that up to 200kW of wind generation could be accommodated by the new, more extensive system, allowing for considerable expansion of the wind generation resource.

NRECA carried out system studies as well as line design, material procurement, solicitation of construction contractors and supervision of construction. The project was completed in June 2006, following delays in delivery of materials due to the Gulf coast hurricanes of fall 2005, which both delayed shipping and absorbed a large amount of available materials.

An additional 3,750 people now enjoy 24 hour a day electricity and the Las Galeras electric system. The increase in project demand not only allowed for incorporation of the 70kW La Guazuma wind generator, but also allowed for installation of additional diesel units at the plant in Las Galeras, improving system reliability even when the wind is not blowing. The wind generator has been operating since August 2007, and has averaged a plant factor of 20% during that time.

Approximately \$550,000 was provided by NRECA from USDA commodity grant funds as a loan to Luz y Fuerza. To date Luz y Fuerza has met its repayment obligations to NRECA on schedule and without delays. Said financing was complemented by \$792,000 in counterpart funding from Luz y Fuerza for installation of the wind turbine and by connection fees of approximately \$30,000 from local communities. In addition, CDEEE provided a \$50,000 in-kind grant in the form of a donation of new conductor. USAID GDA/E funds in the amount of \$80,000 were used for design and construction supervision.

Map of the Las Galeras Project

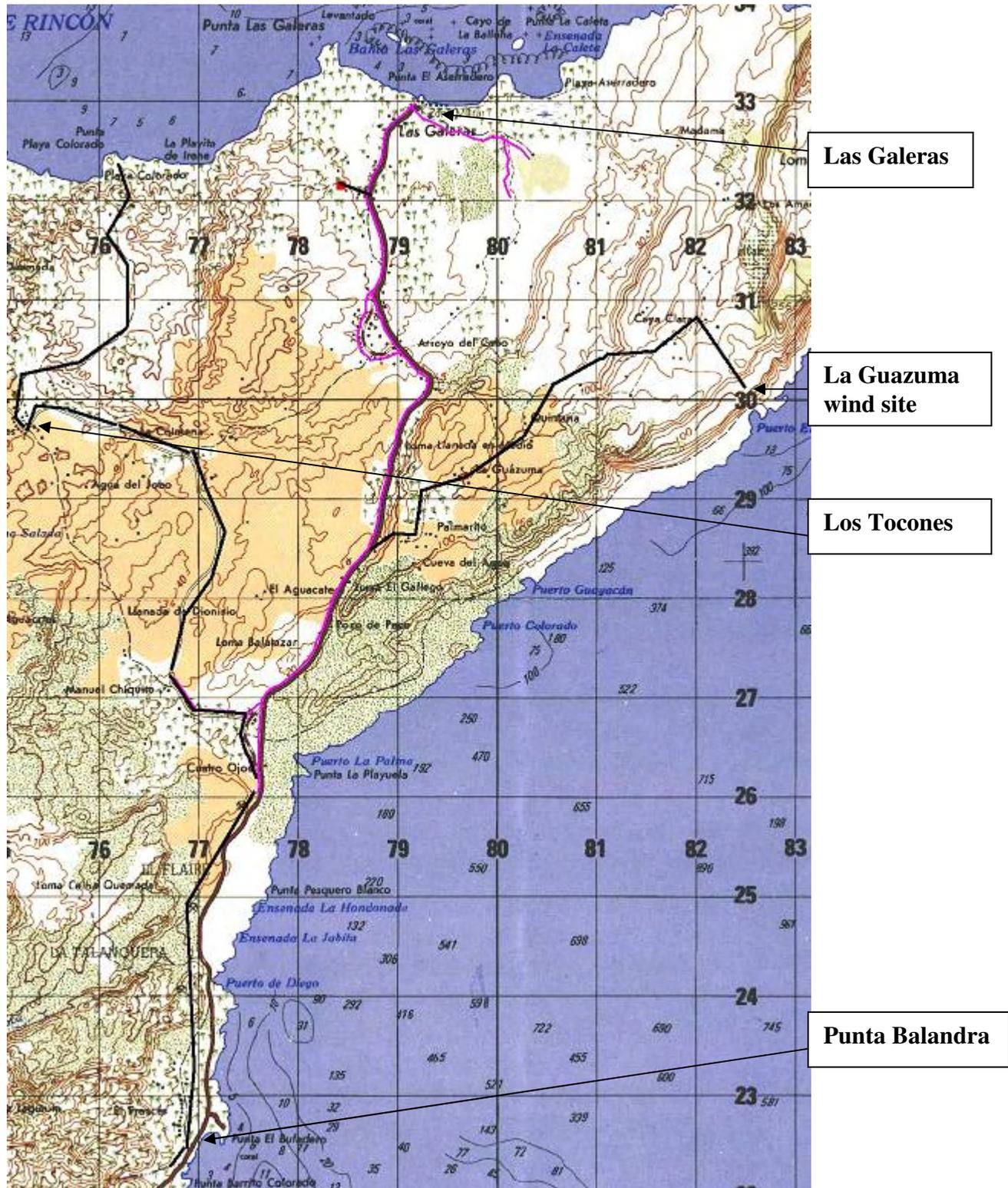


Photo on left: Assembling structures on the Las Galeras Project. The completed project benefited 3,750 people and interconnected a 70kW wind plant.



Photo on right: Stringing conductor on the Las Galeras Project. Approximately half the conductor required for this project was provided as counterpart by CDEEE.



Completed 70 kW wind turbine.



Students of the Castellalito School in Los Tocones, Municipal District of Las Galeras, Samaná Province, celebrate the arrival of reliable electricity with the *Las Galeras Project* implemented by NRECA and Luz & Fuerza de Las Terrenas (23 June 2006).

Task 4: Renewable Energy Project Evaluation and Implementation

The objective of this task was to contribute to improving the methodology for analyzing and executing renewable energy projects. Renewable energy technologies will play a continuing role in providing electric service to those communities that lie beyond the national grid.

NRECA coordinated with GTZ, UNDP, INTEC and ADESJO, in an effort to pursue various projects using renewable technologies. With INTEC, NRECA finalized the study of the electrification of the rural community in Ceja Fresca, Monte Cristi, which was to include 25 solar home systems, one school, and a water pumping and purification system. This project was presented to the *Secretaria de Estado de Industria y Comercio* (SEIC).

With ADESJO, NRECA continued reviewing studies, making visits, and compiling data to identify several potential sites to install small hydropower generators. The GIS for ADESJO was finalized and handed over to them and was being used to develop a rural electrification strategy for several communities in the province as well as serving as a tool with which to follow-up on some existing activities related with community projects implemented in these areas. ADESJO utilized the data to prepare a proposal to the European Union for funding of some of the projects, though this funding did not materialize.

In conjunction with ADESJO, NRECA personnel visited with representatives from the Secretariat of Commerce and Industry (SEIC) several schools from the total of 106 schools selected previously. In each of the ten schools selected NRECA analyzed and designed a PV system to

supply electricity for basic lighting, water pumping, water purification and communication. A final report was submitted to ADESJO and the SEIC. The majority of the funds for the construction of these projects were to come from SEIC.

NRECA prepared and assisted FUNDASUR (a local NGO) and PROPESUR (a special project of the Education Secretariat of the GORD) to implement renewable energy projects. NRECA was responsible for design, procurement, installation and the training of the local users of 10 PV school systems in very remote areas of the DR which were covered by a special adult literacy program of the GORD.

NRECA also supported several initiatives of CNE, SEIC and the energy commission of the Dominican congress in order to develop the Renewable Energy Incentive Law. NRECA provided support as a technical advisor to the energy commissions of both chambers of congress. After a number of years of effort it was signed into law by the President in late 2007.

Under the partnerships signed with GTZ and UNDP, NRECA pursued three activities: 1) a training seminar for 29 Dominican technicians in design and administration of small micro hydro systems, 2) a feasibility study of “Paso de la Perra” and “Angostura” hydroelectric sites, and 3) evaluation for final construction for seven other projects. Early efforts related to micro-hydro laid the groundwork for the major shift in the rural electrification support strategy at the end of the Cooperative Agreement, see the renewables activity under the Funded Extension progress later in this report.

Task 5: Implementation of a Grid Rehabilitation Project

Approximately two million people in the DR are without electric service, with a significant portion living in rural areas. Such electric service as there is often derives from privately owned networks of individual service drops that provide very poor quality service when any is available at all. It is difficult to maintain commercial discipline in such areas; losses are high and collection efficiencies low. Previous attempts to resolve this problem had been piecemeal and had been imposed from outside the area.

This task was designed to break the cycle of poor service leading to resistance to pay, by attacking the problem from both the institutional and technical standpoints. NRECA proposed to partner with community organizations as well as electricity providers in one or more rural or peri-urban areas. The objective was to devise and obtain community acceptance of commercial mechanisms that keep total losses to less than 10 % and collection rates over 85 %, in exchange for which NRECA would construct a new distribution system to provide utility grade service. Initial surveys by NRECA identified Los Mulos, near La Romana, as a candidate peri-urban area, in partnership with AES-Dominicana (operator of EdeEste) and an area on the Samana Peninsula, in partnership with Luz y Fuerza Las Terrenas as candidate for a rural area. Discussions with Luz y Fuerza were successful and resulted in the Las Galeras project, presented above.

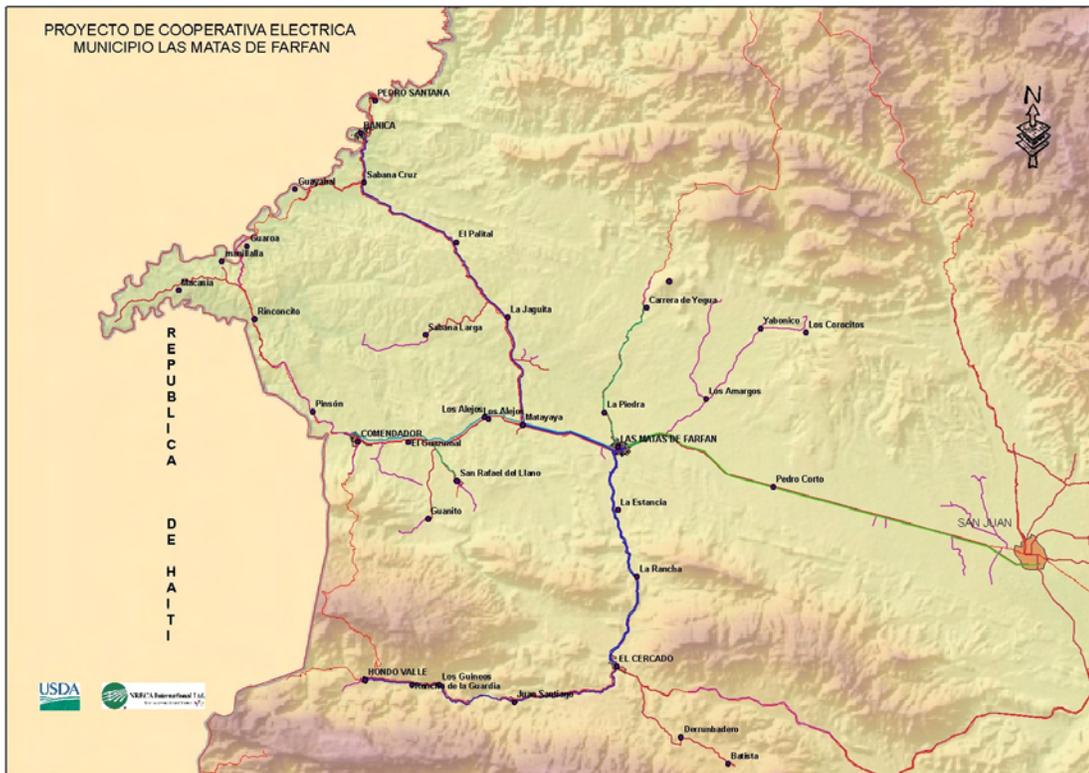
Discussions with AES Dominicana were conducted for almost two years, during which NRECA made contact with all the neighborhood associations in Los Mulos, and prepared engineering designs and lists of materials for the system improvement aspect of the project. Changes in management at AES Dominicana reduced their interest in the project, however, and by the end of 2003 it was clear that an agreement would not be forthcoming and it was decided to seek other project opportunities.

CDEEE had previously requested assistance in implementing improvements to service in the area along the Haiti/Dominican Republic border, and in November 2003, a committee of local residents in the border area requested assistance in forming a community electric cooperative. It was decided to pursue a project in which the electric system would be reconstructed jointly by NRECA and CDEEE, and operated by the electric cooperative. This project became known as the Fronteriza project.

Fronteriza Project

The area along the border between Haiti and the Dominican Republic is known as the Fronteriza region. From near Monte Cristi in the north to Pedernales in the south, this region has for decades been the poorest in the country. Jobs are scarce, education is substandard, health and other services often nonexistent, and infrastructure in poor condition. When a community committee from Matas de Farfan, a town in the Fronteriza region, approached NRECA in the fall of 2003 asking assistance for formation of an electric cooperative, it was clear that here was an unprecedented opportunity not only to pilot the concept of an electric cooperative as an alternative electricity provider, but to contribute to the economic development of a seriously depressed portion of the country.

The organizing committee had already defined the boundaries of the future cooperative to include the municipalities of Matas de Farfan, Comendador, El Cercado, Hondo Valle, Banica, Pedro Santana, and El Llano and Vallejuelo. The region is shown on the map below:



System Studies

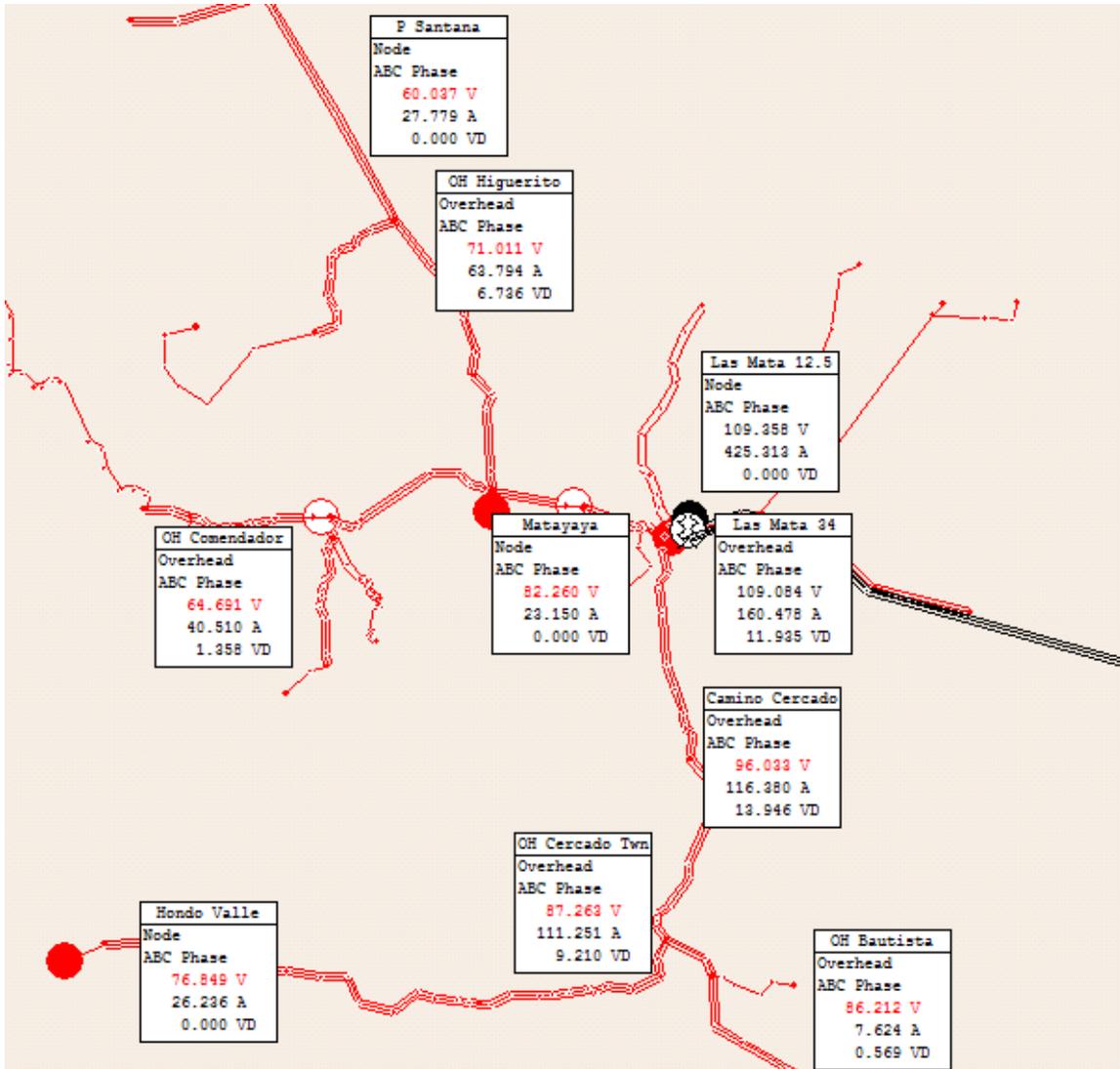
At the same time that the organizing activities for the *Cooperativa Eléctrica Fronteriza* were going on under Task 3, engineering was undertaken for the system rehabilitation. The first step was to carry out an evaluation of the existing system to identify physical problem areas and rehabilitation requirements, as well as to prepare an electrical model of the system to evaluate current performance and identify the need for additional capacity. NRECA, as part of the national rural electrification plan had obtained information on existing lines, but initial surveys showed that this information was generally inadequate for an investment study. NRECA technicians therefore prepared a new GIS map of all existing lines in the area. This required development of base maps using aerial photography which had to be geo-referenced in the field and then processed to eliminate scale and distortion errors. Technicians then carried out a field survey using GPS equipment to locate lines and transformers, which are not visible on aerial photographs. The results were the best system maps developed heretofore of any electric system in the Dominican Republic.

The evaluation of line condition was carried out NRECA engineers who examined all three phase and single phase lines and rated them according to the level of replacement required. The table below summarizes the results of this evaluation for rural lines.

Línea	Longitud Km.	Poles to Replace	Structures to Replace	Comments
Matas de Farfán Elias Piña	24.0	20%	50%	Postes y crucetas madera Riendas y anclas faltan
Matas de Farfán Cruce Vallecito	20.5	35%	65%	Postes y crucetas madera Estructuras H mal estado Riendas y anclas faltan
El Cercado Hondo Valle	26.0	36%	46%	Postes y crucetas madera
Cruce Vallecito Batista	10.0	0%	10%	Poste de concreto, crucetas de acero
CruceVallecito Vallecito	3.7	0%	10%	Monofásica con postes de concreto.
Matayaya-Los Jobos	5.0	84%	90%	Ataque por pájaros carpinteros
Los Jobos Km 22.	17.0	100%	100%	Estructuras H mal estado
Km 22 Pedro Santana	9.7	20%	30%	Poste y cruceta madera
Higuerito Sabana Larga Hato Viejo	17.3	0%	20%	Poste concreto, crucetas de madera. Línea monofásica a Hato Viejo
Sabana Cruz Guayabal	5.6	10%	33%	Postes y crucetas madera Casi sin carga
Elías Piña Dos Bocas	25.6	80%	100%	Línea prácticamente destruida. Pocos usuarios
Total	164.40	40%	58%	

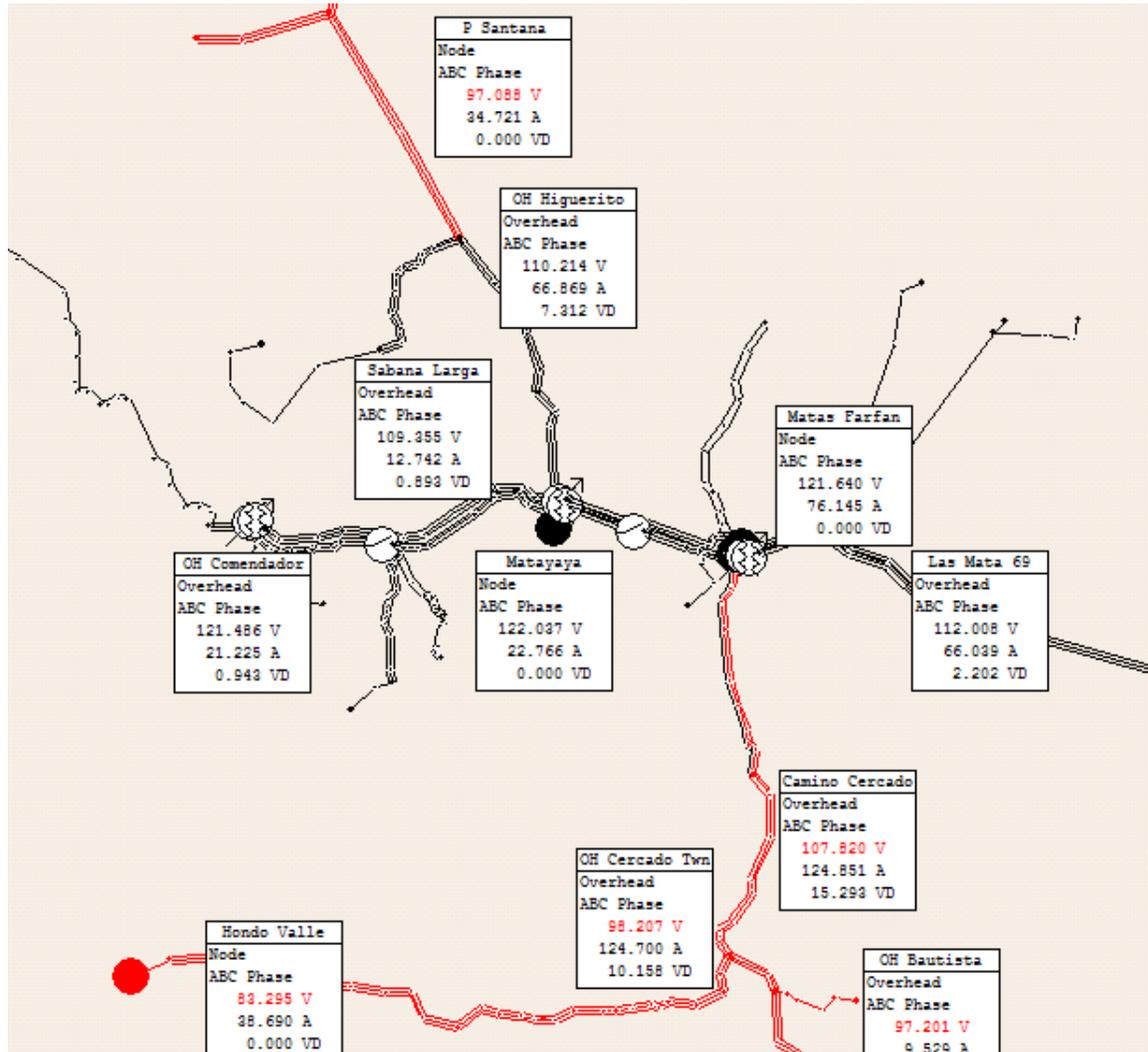
The table shows that 40% of the poles and 58% of the structures on rural lines require replacement. A similar evaluation was carried out for the urban system with the result that most of the existing urban distribution network requires replacement due to its poor condition.

Following preparation of the GIS and assessments of condition, engineers obtained load information from measurements and EDESUR information with which to carry out the evaluation of system performance. NRECA carried out studies using Milsoft Windmill, a versatile distribution analysis package that is widely used by the US electric cooperative system. The results of the evaluation of existing system performance are shown below:



This graphic shows the voltages at different points in the system, expressed in service voltage, that is, the voltage at a consumer’s residence, with 120 volts being normal. Service voltage levels of 76 in Hondo Valle, 64 in Comendador and 60 in Pedro Santana confirm anecdotal information and in field spot measurements. Service voltages of less than 108 volts are considered unacceptable, so it is clear that the existing system cannot provide acceptable service even for existing loads.

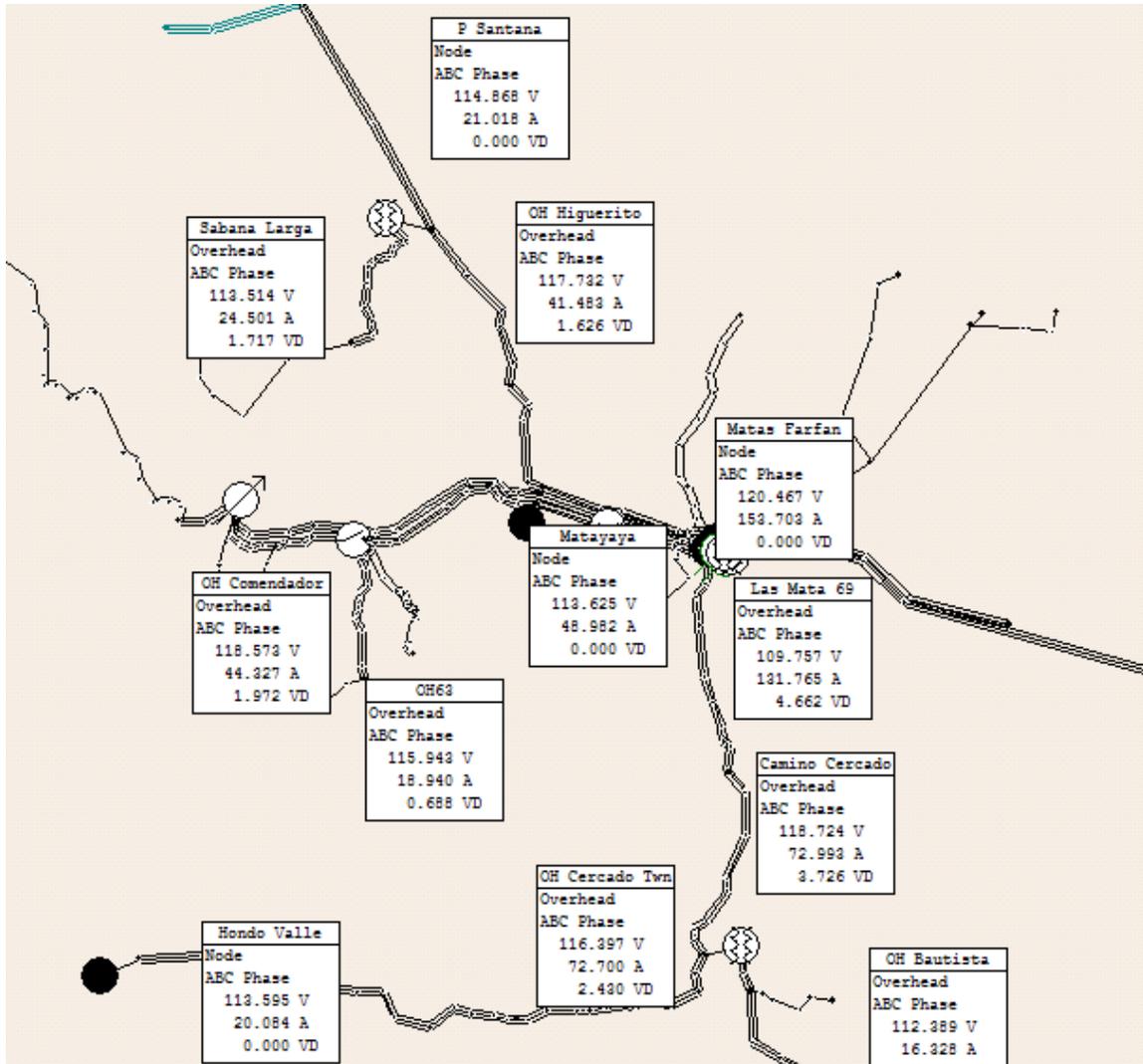
In part the poor performance of the existing system is due to the fact that the entire area is fed by a single 34.5kV line from San Juan. CDEEE had previously committed to construction of a 69kV line from San Juan to Comendador, and operating without the benefit of power flow analysis had proposed installation of new substations at Matas de Farfan, Matayaya and Comendador to feed the existing 12.5kV system. The power flow simulation below shows the performance of this proposed system with existing loads.



This system design resolves low voltage issues along the Matas de Farfan/Comendador corridor, but not at the extremes of the system, where voltages are still at 83 volts (Hondo Valle) and 97 volts (Pedro Santana). Since this result is for the situation of existing load, it is clear that performance will suffer as load increases.

Faced with the need to resolve voltage issues throughout the service area of the proposed Fronteriza electric cooperative, NRECA proposed construction of a new distribution/subtransmission lines at 34.5kV from a new 69/34.5kV substation at Matas de Farfan to Hondo Valle and Pedro Santana. Given the additional capacity of the 34.5kV system, the

substations at Comendador and Matayaya could be dispensed with. The following simulation shows the performance of this system with double the existing load. This case shows that, even with 200% of existing load, the system provides acceptable voltage at the extremes of the system with 113 volts at Hondo Valle, and 114 volts at Pedro Santana.



A budget was prepared for the system construction based on experience with the Las Galeras project. The budget is as follows:

Item	Cost
Distribution Lines	
New Lines	\$1,237,274
Line Repairs	\$272,256
Village Distribution Systems	\$2,562,132
Substations	\$743,040
Distibution Transformers	\$448,010
Service Drops	\$1,161,654
Total Construction Labor and Material	\$6,424,365

Following completion of system studies, the results were presented to CDEEE/UERS and the system design was approved for construction.

Facility Design

In January 2005, following approval by CDEEE of the results of the system analysis, NRECA began design of the facilities to be constructed. This involved selection of conductor sizes and design of structure types in accordance with the requirements of design codes, and the field design of lines as well. Field design was carried out by NRECA teams who surveyed all the line routes and established the locations of new poles and transformers. This is a process called staking, and resulted in the preparation of staking sheets which contain all the information on a particular pole, including the span, the pole height and class, structure type, need for guys and anchors, transformer and secondary line requirements and the number of service drops anticipated. Staking sheets are the basis for determining material requirements as well as assessing the number of consumers to be served. During the course of the design process, NRECA staking crews surveyed and staked almost 300km of line, including new distribution systems for Matas de Farfan, Commendador, El Cercado, Hondo Valle, and upgrades for Banica and Pedro Santana. Smaller community systems were left until closer to construction and allowances made in material estimates.

In addition to line design, substation sites were located and substation designs were developed. The existing 34.5/12.5kV 7.5 MVA substation transformer in the existing substation in Matas de Farfan is a dual voltage unit, that is that it can be switched to operated at 69kV, and the existing San Juan 69/34.5kV, 10 MVA transformer could also be reused in the proposed 69/34.5kV substation in Matas de Farfan. Power flow simulations showed that the combined capacity of the two transformers would be sufficient to serve the area for approximately ten years.

Prior to accepting the use of the existing transformers, however, NRECA carried out a non-destructive inspection of the two units by withdrawing oil samples and having them tested for moisture contamination, and combustible gas evolution which is a sign of insulation deterioration. The 69/34.5kV transformer actually in service in San Juan was found to be in good condition, but the 69x 34.5/12.5kV unit in Matas de Farfan was found to have an unacceptably high level of moisture. This was no doubt the result of the fact that the transformer seals had failed at some point and that the transformer had absorbed air.

As a consequence of the fact that the existing transformer at Matas de Farfan was not considered usable for a new substation, NRECA pursued donation of power transformers from US cooperatives. This is a process by which US cooperatives donate used by serviceable equipment to NRECA International for use in overseas projects. The Dominican Republic has been the beneficiary of transformers donated by US cooperatives in the past, when Socorro Electric Cooperative in New Mexico donated a 5 MVA substation transformer for use by NRECA in a small substation in Benerito, a community near Higuey in the EDESTE service territory. NRECA published a request for donations and in June 2005, Glades Electric Cooperative in Moore Haven, Florida offered an 11MVA substation transformer and associated regulators and other equipment that was to be removed from service in the near future. The transformers were to be available in early 2006.

Contract Negotiations

At the same time that system design was underway, negotiations with CDEEE were carried out during the first six months of 2005, with the objective of defining a project participation arrangement and specifying the responsibilities of the two parties. In spite of the change in government which occurred in the fall of 2004, CDEEE, now under new management continued to express interest not only in participating in the rehabilitation of the Fronteriza distribution system, but also in the establishment of the Cooperativa Eléctrica Fronteriza as an operating entity for the system.

On 13 July 2005 NRECA International and CDEEE signed a contract under which CDEEE committed to finance up to US\$4 million of materials for the Fronteriza Project and to support the creation of the Fronteriza Electric Cooperative to operate the electric system in the target area of the project. NRECA committed \$1.5million of USDA grant funds to hire construction contractors to complete the project construction. The contract included the lists of materials which had been developed during the design and staking phase.

Material Supply and Construction

Unfortunately, once the CDEEE/NRECA contract was signed, no action was taken by CDEEE to pursue procurement of materials to fulfill its commitments. NRECA assisted in the development of solicitations and draft contract, but it was not until the summer of 2006 that CDEEE solicited bids for material. By the end of 2006, five contracts had been awarded by CDEEE, but were not funded. In fact, through the end of March 2008, three of the five contracts remained unfunded, only one fully funded, and another partially funded. Some materials, mainly poles and a small amount of hardware were eventually delivered, but the material was not sufficiently complete to allow for any construction.

In late 2005, NRECA, alarmed at the slow pace of CDEEE acquisition activities, carried out a solicitation for materials with which to begin an initial phase of the project consisting of reconstruction of the distribution system in the headquarters town of Matas de Farfan. Intended only as a spur to CDEEE activity, the material purchased by NRECA was partial, and did not include some items, such as meters, necessary to complete even the initial phase of the project. The strategy was partially successful, as noted, and CDEEE materials were bid about the time that NRECA-procured materials began to arrive. Accordingly NRECA prepared construction bids for phase I of the project and awarded construction contracts in December of 2006.

As part of the process of preparing for construction, NRECA held a construction contractor's training seminar in July 2006. Attendance at the seminar was a precondition of being allowed to bid and a total of 50 contractor personnel were present at the training seminar. The trainees participated in classroom activities designed to inform them about the construction unit method of construction, under which a line construction is priced not on the basis of staked kilometers of line, but on the basis of the specific assemblies to be constructed. The trainees also participated in field exercise in which approximately three spans of line were constructed, including pole setting, structure assembly, transformer installation and grounding, guy and anchor construction. Trainees were shown what constituted acceptable construction and what defects would call for an assembly to be removed and reconstructed at the contractor's expense.

Subsequently, a contract was bid on 01 August 2006, and opened on 07 September 2006, in the presence of representatives from CDEEE/UERS. Ten companies presented bids and contracts were awarded to the qualifying sub-contractors. When all was in place with the materials ordered by NRECA for Phase I, the construction began in early 2007 and was completed in March of 2007. The material obtained by NRECA for Phase I was only partial, and did not include service drop materials. It was expected that CDEEE would fulfill its obligations to purchase materials during the course of Phase I construction, but this turned out not to be the case. Accordingly, some compromises had to be made when it came time to connect consumers. Although no new service drop materials were available, existing service drops were spliced and reconnected to the new lines. NRECA refused to re-connect unregistered consumers, so EDESUR established a contracting task force to register consumers who then were required to display their contracts to the NRECA inspector before being allowed to reconnect. While no new meters were installed in this project, a total of 1000 new consumers were registered by EDESUR in this way.

Due to the failure by CDEEE to fund their materials contracts, construction had to be suspended for lack of material following partial completion of Phase I. NRECA subsequently issued a solicitation for additional materials, aimed at finishing the Phase I project in Matas de Farfan, but in view of the lack of progress on funding the bulk of the CDEEE materials, a decision was made to suspend processing of the procurement pending a clarification of CDEEE's intent with respect to the project. Another casualty of the slowdown in CDEEE material purchase was the donated transformer from Glades Electric. Given the uncertainty in the future of the project and the impossibility of completing it solely with funds available to NRECA, it was decided to decline the offer of the donated transformer.

While an incomplete project, the Phase I construction benefited over 3000 consumers in Matas de Farfán through improved service quality. In addition, the project constructed line in the communities of San Jose and La Flor, 100-year-old communities south of Matas de Farfan that had never had electricity. A feature of the project in San Jose and La Flor was the intervention of the NRECA International Foundation, which provided funds to enable two linemen from cooperatives in Illinois to travel to the Dominican Republic and assist in construction activities in San Jose and La Flor. In addition to working on the project themselves, the two linemen trained contractor staff in safety and efficient construction procedures.

Technical Assistance to CDEEE/UERS

One of the ways the program leveraged the presence of NRECA in the country was in providing technical assistance to CDEEE/PER (later named CDEEE/UERS) for multiple rural electrification project that they implemented with GORD funds. The connections made in this manner did not require direct investment in hardware by the IPNER project. The cumulative total beneficiaries under said modality was 24,570 people (by means of 4,914 service drops). The

assistance provided by NRECA came in the form of GIS support. NRECA GIS technicians supported UERS technicians in inspecting the lines constructed under UERS rural electrification projects. These inspections verified the state of completion of the work and allowed UERS to better control its line construction expenditures. As part of this activity NRECA mentored six new engineers that were hired by UERS and assigned to participate in training programs provided by NRECA. Over the course of one year they were to become specialists in electric line construction project supervision and inspection.

Task 6: Identification of Grid Rehabilitation Projects Based on DCA Financing

It was initially expected that the extension of NRECA's work with community groups to develop cooperatives would require considerably more resources than NRECA's USDA grants allowed. In such situations, it was thought that DCA guarantee may be useful to reduce the project risk and lower the cost of financing the project. Previous attempts to take advantage of the DCA in the Dominican Republic had not resulted in a sufficiently low financing cost to be of interest for such high risk financing, but NRECA proposed to develop an inventory of electrification projects in which DCA might be a valuable component.

In the early stages of the IPNER program, DCA guarantees were considered as a component of financing for the Los Mulos project. However, AES' deteriorating financial position and the upheaval in the Dominican economy were key factors that made the environment for DCA financing unfavorable, and, in the final analysis, the Los Mulos project did not come to fruition for other reasons.

As it worked out, no further opportunities for DCA financing were identified.

Task 7: Energy Efficiency Program for Government Buildings

The largest electricity consumer in the DR is the government and most energy consumed by the government is used for lighting and cooling government buildings. The Secretariat of Commerce and Industry (SIC in Spanish) and National Energy Commission (CNE) were tasked with developing a portfolio of investments in high impact projects that will reduce the government's electricity bills.

NRECA began the process by working with CNE staff to develop a database of electricity consumption in public buildings in the Dominican Republic. The objective was to classify buildings according to their use and identify those classes of buildings with the highest energy consumption in relation to their occupied floor area. This is a recognized method of prioritizing energy efficiency investments and was to have been used in the selection process for the ten buildings to be audited. A problem that was encountered early on was that there was no reliable information on individual public buildings. Since public buildings had never been billed for electricity consumption, or even been registered as consumers during the years that CDE was the power supplier, there was a tremendous lack of information. Even five years after the capitalization of the system, very few public buildings had electric meters, and many did not even have accurate addresses. In part, it was in the interests of the distributors to continue with this ambiguity, as it allowed them to continue estimating bills with little fear of any oversight audits. As a consequence, NRECA found it very difficult to obtain consumer listings of public buildings for the purpose of classifying public buildings.

Based on the available data, NRECA established teams of CNE staff and trained them to carry out preliminary audits of those public buildings that could be identified. These audits were intended to determine to the extent possible the characteristics of the buildings, such as square footage, lighting type and level, level of air conditioning, and costs of energy, whether for electricity or for alternate sources. A total of 272 inspectors were trained and approximately 102 buildings were inspected when the government changed and all inspectors were discharged, effectively stopping the program.

In an effort to continue audits during the interim period before new CNE appointments were finalized, NRECA staff installed monitoring instrumentation in three large office buildings to determine consumption patterns. Instrumentation included units that detected lighting levels, temperature, and humidity in occupied spaces. Additional instruments were applied to backup generators to determine when power was being supplied from the principal source and when from the backup. The main finding of the instrumentation program was that consumption patterns were drastically different when energy was supplied from mains power as compared with backup sources. For instance, few public buildings have sufficient backup capacity to provide air-conditioning in all spaces when on backup power, forcing workers to open windows when mains power was lost. Paradoxically, this increased the burden on air-conditioning units when the power did come back, due to the need to recondition the humid air.

As was agreed to with the new CNE authorities in November 2004, IPNER re-designed the energy efficiency program aimed at reducing consumption in government buildings. Because of the limited resources and the focus of the CNE efforts, said month was used to re-schedule the implementation plan. In February 2005 work began on the reprogramming of the meters of the 102 pre-audited buildings to collect sample data. For a time IPNER/CNE continued collecting information for the public buildings selected. After the transition to a new government tremendous efforts were invested in training new personnel of CNE given that nearly 80% of CNE's personnel were changed. In a speech in early July 2005 the President of the DR announced that efforts must be made to reduce the high level of energy consumption in government buildings. This situation caused a tremendous demand for technical assistance in the governmental organizations. With the assistance of IPNER, 127 local committees were formed in 40 governmental organizations responsible to pursue and coordinate energy efficiency activities in each institution. The name of these committees was CIURE that stands for "*Comites Institucionales de Uso Racional de Energía*". IPNER prepared and trained these Energy Efficiency committees through three workshops developed in August 2005. During 2005 with the help of the training and some analytical procedures and tools that IPNER provided, the CIUREs reduced the total consumption of electricity by more than 8% in the month of September 2005. All the activities developed by the CIUREs were in the area of non-cost activities in order to cut energy expenses. The CIURE of the Central Bank was able to identify and implement initiatives that reduced their total energy bill by nearly 18% (which represents savings on the order of 60% in their illumination expenses) for the month of September 2005.

A training program was designed in 2004 to develop energy auditing capacity for CNE employees and contractors. CNE signed agreements with the Universities of Santo Domingo and Santiago to implement an Energy Audit certification (*Diplomado en Auditorías Energéticas*). A special training was initiated in September 2005 to form 50 auditors from a selected group of students from these universities. As a part of these trainings, these "junior" auditors were assigned to conduct preliminary audits in several governmental institutions. With this group of auditors CNE expanded the energy efficiency program to the rest of the public and industrial sector as well.

In addition, NRECA and CNE staff carried out 15 detailed energy audits of government installations of many types, including a hospital, a jail, large office buildings, and a CAASD water pumping station. Results indicated a surprisingly uniform potential energy savings on the order of 20% with paybacks of one year or less. Approximately half of these savings can be realized at little cost with interventions such as improved maintenance of air conditioning systems. The results also highlight the importance of energy efficiency in water pumping, which accounts for 37% of government energy consumption. Though additional work would need to be done with a larger sample, it appears that a 23-25% energy savings in pumping could be achieved with a 4-month payback from right-sizing and retrofitting of high efficiency motors.

Task 8: Provide Ongoing Technical Assistance and Training to Partner Organizations

The purpose of this task was to support program development and management through technical assistance and training over the course of the IPNER Program implementation. The following tables allow the reader to see a summary of the number of persons that attended the various seminars and meetings by gender and totals.

Task 1 Seminars

Participants in the two seminars performed under Task 1.

Seminar	Male trainees	Female trainees	Total trainees
Sustainable RE Programs	38	12	50
National RE Plan	65	15	80
Totals	103	27	130

Distribution Line Design Courses

Seminar	Male trainees	Female trainees	Total trainees
Distribution Line Design (1st Semester)	24	1	25
Distribution Line Design (4th Semester)	35	2	37
Distribution Line Design (5th Semester)	14	0	14
Distribution Line Design (6th Semester)	33		33
Totals	106	3	109

Global Development Alliance Activities

Cumulative Table up through Seventh Semester (through 31 March 2006)

Attendees of informational, organizational, and planning meetings in the process of creating two electric cooperatives.

Cooperative Information Meetings	Male attendees	Female attendees	Total attendees
La Fronteriza (2 nd Semester)	257	130	387
La Fronteriza (3 rd Semester)	516	442	958
La Fronteriza (4 th Semester)	564	576	1140
La Fronteriza (5 th Semester)	684	287	971
La Fronteriza (6 th Semester)	148	73	221
Cristo Rey (2 nd Semester)	62	29	91
Cristo Rey (3 rd Semester)	250	120	370
Las Flores (4 th Semester)	277	262	539
Las Flores (5 th Semester)	348	252	600
Las Flores (6 th Semester)	212	232	444
Totals	3,318	2,403	5,721

Renewable Energy

Renewable Energy Seminars	Male trainees	Female trainees	Total trainees
Seminars (4 th Semester)	36	2	38
Seminars (5 th Semester)	27	2	29
Local Tech Training (6 th Semester)	30	0	30
Totals	93	4	97

Energy Efficiency

Energy Efficiencies Seminars	Male trainees	Female trainees	Total trainees
Seminar 1 (2 nd Semester)	31	0	31
Seminar 2 (3 rd Semester)	17	0	17
Seminar 3 (5 th Semester)	154	20	174
Seminar 4 (6 th Semester)	50	0	50
Totals	252	20	272

Consumer Education

Seminars with Electric Cooperatives	Male attendees	Female attendees	Total attendees
La Fronteriza (1 st Seminar)	14	9	23
La Fronteriza (2 nd Seminar)	12	2	14
La Fronteriza (3 rd Seminar)	28	14	42
Las Flores (1 st Seminar)	10	5	15
Las Flores (2 nd Seminar)	10	7	17
Las Flores (3 rd Seminar)	15	20	35
Totals	89	57	146

The six seminars in the table above were deliverables under the \$35,000 grant for consumer education activities.

Task 9: Technical Assistance for Distribution Operations

The technical assistance was designed to help get the *Cooperativa Eléctrica Fronteriza* (CEF) up and running in preparation for operating the newly rehabilitated and expanded Fronteriza electric system. Under an earlier phase of work the cooperative had been legally incorporated in July 2005 but lacked the authorization to operate the electric system in the Fronteriza area. This task therefore had two components

- Negotiate an agreement among *Corporación Dominicana de Empresas Eléctricas Estatales* (CDEEE), EDESUR, and *Cooperativa Eléctrica Fronteriza* (CEF) that would provide for the transfer of administrative control to CEF under acceptable terms.
- Provide support for initial operations of the cooperative. This would have involved hiring and salary support of staff during the period of training prior to actual takeover of operations, as well as provision of capital items such as a customer information system for billing.

Contract Negotiations

The mechanism for achieving the first goal, that of making CEF the operator of the Fronteriza system, evolved over time. At the time of the project agreement was signed between CDEEE and NRECA, it was thought possible to grant a concession in favor of CEF in the Fronteriza area. A concession would have established CEF as a distribution utility entitled to invest in the system and recover its costs. In order to do this, it would have been necessary for the electricity regulator to sever the Fronteriza territory from EDESUR and reissue it to CEF. The Dominican electricity law does not specifically address this sort of arrangement, but it was felt that a provision allowing modification of concession terms with the approval of the regulator would provide the necessary cover. Implementing such an arrangement would require the support of EDESUR, of course, but initial consultations indicated that this might be achievable.

The project agreement committed CDEEE to support the concept of issuing a concession to CEF, and as CDEEE was by then the sole stockholder in EDESUR, it was felt that CDEEE could

provide the necessary encouragement. This was especially the case when it was pointed out to EDESUR that the Fronteriza region not only constituted a very small portion of the company's sales, less than 1%, but that the region as a whole generated financial losses on the order of \$3million per year to the company, due to high losses, and poor collections. When the need to rehabilitate the distribution system was included in the equation, it was clear that it was in EDESUR's interest to divest itself of the area. Unfortunately, shortly after the project agreement was signed, the Dominican manager of EDESUR was replaced, at the insistence of World Bank, with an expatriate contractor whose objective was to maintain the value of the assets of EDESUR. As a consequence of this change in focus, EDESUR no longer considered it prudent to permanently divest itself of the concession in the Fronteriza region. At the same time, discussions with the regulator made it clear that they were uncomfortable with the concept of fractioning a concession, for fear that the Fronteriza case would constitute a precedent that might have serious repercussions in areas that were of greater interest to the distributors.

A complication that would have made a concession difficult for CEF was the fact that the Dominican Republic has a unitary tariff structure, i.e. tariffs are the same for all grid connected distributors. This would not have been too problematic, but in an effort to contain popular dissatisfaction with increasing electricity prices, the regulator had established a cross subsidy within the tariff structure that gave preferential rates to smaller consumers, recovering the cost by increasing tariffs for large consumers. The subsidized tariff for small consumers is actually less than the wholesale cost of power, which makes service to this class of consumer a complete financial loss. The cross subsidy arrangement functioned on average for the large distributors because they all had a mix of both large and small consumers, but it would have been fatal for CEF. Over 80% of the consumers in the Fronteriza region would have been subsidized, and there are almost no large consumers to pay for the cross subsidy. This means that CEF would have been nonviable regardless of how efficiently it operated. Logically, since EDESUR was divesting itself of this loss making territory without losing the large consumers that were paying the cross subsidy, it should have been possible for EDESUR to rebate to CEF the level of cross subsidy that it was already receiving, but this concept was not understood, and it appeared that CEF, in addition to asking EDESUR to divest a portion of its property, was also asking for a subsidy. This contributed to making the issue non-resolvable as well.

In an effort to make the operating agreement a reality, NRECA changed course and pursued development with CDEEE and EDESUR of an operating contract instead of a concession. An operating contract would make CEF a subcontractor to EDESUR for specific purposes, and not an independent utility. This would eliminate the concern over the cross subsidy, since the CEF consumers would actually continue to be part of the EDESUR system, and CEF would receive a fee for its services. The CEF board initially resisted acting as a subcontractor to EDESUR because of the history of load shedding and general poor service that they associated with EDESUR, but they agreed in the interests of making the cooperative a functioning entity.

NRECA drafted an operating agreement to be signed among CDEEE, EDESUR, and CEF and presented it to CDEEE, expecting to receive the support required by the participation agreement. CDEEE, perceiving that the issuance of an operating agreement may well not be limited to the CEF case, decided to hire a consulting group to develop a model that could be applied for similar projects anywhere in the Dominican Republic. A consultant under contract to CDEEE began work on the model in September 2007 and the final negotiations with CDEEE, EDESUR, and the consulting group appeared to be off to a good start.

Thinking that this effort would result not only in an operating contract for the *Cooperativa Electrica Fronteriza*, but also in a model that could be used for similar projects throughout the

DR, NRECA in good faith dedicated considerable effort to working with CDEEE, EDESUR, and the consultants to hammer out the details of the model and associated operating contract. The negotiations were suspended on 21 November 2007 when an announcement was made that CDEEE would have to approve the model before a final agreement could be reached between the cooperative and EDESUR. The model was presented to the Distribution Committee of CDEEE and slowly made its way through a review, revision, and approval process. By the time a finished product was approved and distributed in March 2008 the model had evolved into something that made no mention of cooperatives and essentially excluded them by requiring that the private firms that aspire to operate portions of the electric system under an agreement with one of the existing distributors must have previous utility experience and must provide their own financing.

In a parallel effort, NRECA participated, beginning in the spring of 2007, in efforts to reform the Electricity Law. The reforms had been requested by the World Bank in an effort to criminalize electricity theft and give the distributors enhanced tools to combat pilferage, but a group was pushing to include recognition of cooperatives as service providers who could be granted concessions to operate renewable energy projects. NRECA felt that this was an excessively narrow focus and conducted a campaign aimed at opening the concession rules to address CEF's situation. NRECA made presentations to senators and representatives, both in Santo Domingo as well as to the group of Dominican congressmen that had traveled to the NRECA annual meeting in Las Vegas, Nevada in February. NRECA efforts went so far as to provide redrafted language for the entire electricity law.

Unfortunately, in August 2007 the Electricity Law was passed with the original modifications including the very narrow definition of an electric cooperative as an entity operating a system supplied by renewable energy independent of the regulated system. EDESUR's interpretation of the definition was that the *Coopertiva Eléctrica Fronteriza* did not qualify as an authorized service provider under the new law due to its status as an electric cooperative. The irony is that under the newly introduced narrow definition, CEF does not qualify as an electric cooperative either. This combination of circumstances bogged down the negotiations completely and NRECA appealed to CDEEE in a letter to Radhames Segura to define its position on the Fronteriza Project including its commitment to getting the cooperative operational. At a meeting in May 2008, Mr. Segura read a letter from EDESUR in which EDESUR concluded that the operating agreement proposed by NRECA on behalf of CEF was non-viable. Mr. Segura said that though he could convene a CDEEE board meeting to consider this issue, he was not going to so, stating that CDEEE would stand behind the EDESUR opinion. This effectively ended NRECA efforts to obtain an operating agreement for CEF.

Operating Support

NRECA considered it best not to hire any staff and contractors for operation of CEF nor to procure the billing software, furniture, and essential equipment for CEF until operating authorization was granted. Nevertheless, much effort went into having all in readiness for the moment the authorization would be given. Preparatory work included developing a business plan for CEF, preparing a list of the items that would be procured to establish the first offices, and identifying the potential candidates for the position of the Management Advisor to act as General Manager for the first year of operations.

Conclusion

Given the suspension of the Fronteriza Project, NRECA requested and obtained approval from USAID for a budget realignment. The adjustment permitted using the majority of the remaining

funds to work on the identification and implementation of micro-hydro projects while also closing out the Fronteriza Project.

As of the end date of the CA further efforts by CEF and others to have CDEEE honor its commitments had been fruitless. On various occasions during meetings and in a letter dated 14 July 2008, CDEEE said that they would reimburse NRECA for its costs if the Fronteriza Project was terminated. NRECA drafted a letter to CDEEE to request reimbursement and sent the draft to USAID for review. The final version of the letter to CDEEE was delivered in October 2008 with copy to USAID.

A concern of NRECA is the institutional fate of CEF. The cooperative has signed up over 2000 consumer members and has received over \$RD1.0 million in membership contributions. NRECA has always insisted that these funds be placed in bank accounts and not be used by the cooperative until an operating agreement is reached. Since it appears that this will not be possible, it is important that these funds be returned to the membership. CEF has not made a formal decision to dissolve itself, and until it does the funds are at risk. Given the history of failed enterprises and disappearing community contributions that is endemic to the area, it is important that CEF not make the same mistake. It will require vigilance on the part of NRECA and USAID to ensure that CEF, in addition to being a failed enterprise is not perceived as a dishonest one.

Task 10: Residential Energy Efficiency

The Residential Energy Efficiency task had the objective of encouraging the use of high efficiency lighting and other efficient strategies as a means of minimizing the burden to users once they would have to pay full electricity bills. Many of the registered consumers in the area have no electric meters and pay a fixed monthly assessment to Edesur. In many cases this assessment is less than their actual consumption, and NRECA anticipated that when meters would have been installed it was likely that there would be protests. This project component was designed to ameliorate this problem first by educating the populace of the potential impact of metered electricity, and secondly by encouraging the use of efficient lighting strategies and other energy efficiency measures.

The Residential Energy Efficiency task was planned and implemented during March through May 2008. The training-of-trainers' courses on home energy audits, meter reading, and CFL light bulbs was conducted in seven towns. An estimated fifty-nine (59) people were directly trained in the above mentioned subjects, and a total of sixty-eight (68) people received training on the basics of residential energy efficiency (specifically on CFLs and the efficient use of refrigerators). A break down of people trained specifically on how to conduct the home energy audits, and those that were trained on the basics of residential energy efficiency, by gender, are as follows:

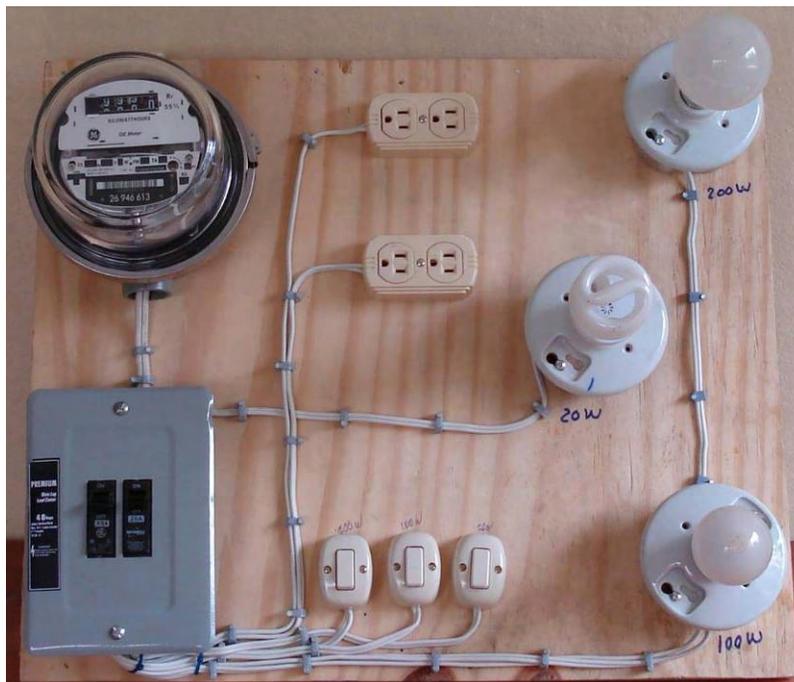
People Trained on How to conduct a Home Energy Audit

Location	Total	Men	Women	Children
El Llano	4	4	0	0
Sabana Cruz	24	4	12	8
Banica	9	5	4	0
Pedro Santana	10	7	3	0
Hondo Valle	4	2	2	0
El Cercado	5	4	1	0
Elias Pinas	3	2	1	0
Las Matas	0	0	0	0
TOTAL	59	28	23	8

Total Number of People Trained on REE basics

Location	Total	Men	Women	Children
El Llano	13	5	4	4
Sabana Cruz	24	4	12	8
Banica	9	5	4	0
Pedro Santana	10	7	3	0
Hondo Valle	4	2	2	0
El Cercado	5	4	1	0
Elias Pinas	3	2	1	0
Las Matas	0	0	0	0
TOTAL	68	29	27	12

At the end of each training session a demonstration was given on the real time consumption of a 200 W, a 100 W and a 20 W light bulb using the demonstration board presented in the photograph below:



Demonstration board used during REE training-of -trainers

The demonstration board contains a disk/electric meter, a breaker box (with 2 breakers), a 200 W, a 100 W, and a 20 W light bulb. There are also four outlets available for the demonstration of different appliances, mostly irons and radios were used during the trainings conducted. Each light bulb was turned on, starting with the 200 W light bulb, the trainees were then instructed to watch the meter's disk spin as the electricity passed through it and was consumed by the light bulb. The goal of the demonstration was to show visually what the trainees had already calculated by hand using the energy audit form. The point was then made that for the same level of daily usage, one 200 W light bulb consumes as much as ten 20 W light bulbs. When this amount was translated into Dominican Pesos, the trainees could then more easily notice the level of saving available with low consumption/efficient CFLs.

Finally, the implementation of financing options for efficient residential appliances through Cooperativa Central completed its initial implementation phase. The department which deals with financing of Productive Uses of Electricity within Cooperativa Central agreed to take on the above mentioned program for financing of residential high efficient appliances. The REE expert provided those members of the department of Productive Uses with trainings on: the process of how to conduct a home energy audit and its importance, why financing for efficient appliances (especially refrigerators) is important in both economical and energy saving terms, as well as how to calculate the electrical consumption of a refrigerator over a year. In total, the two members of the Productive Uses team, and the Director of Finance were trained on these topics.

Task 11: Program Expansion

This initial focus of this task was to prepare a feasibility study for a site for a replication of the Fronteriza project. It was felt that, in spite of any success achieved by CEF, a single demonstration project would not be enough to establish a new institutional model for management of rural electrification. As it turned out, of course, even the Fronteriza project did not achieve its objectives, so this task had to be modified.

It was decided to divide the project into two focus areas, as follows:

- Traditional grid-connected projects that would be executed under a different institutional structure that would be less threatening to the existing jurisdictional utility
- Renewable energy based projects, isolated from the grid that would be executed under the new Dominican Renewable Energy Incentive law.

Projects under either focus were to be selected on the basis of the following criteria:

- Project success would result in improvement in rural economic development indicators such as increased employment in rural areas and improved rural family income
- To the extent possible the projects would support the goal of improved agricultural productivity in the project area
- Projects in the western half of the country would be better fits for the strategic initiatives under consideration at USAID
- Projects would be operationally and financially sustainable
- All projects would be leveraged by including other funding partners, as well as a local community contribution

Grid Connected Projects

In view of the institutional resistance to the cooperative model encountered in the Fronteriza project, NRECA modified its approach for the potential grid connected expansion projects. Instead of proposing the establishment of a new cooperative entity that would take over the operation of the project area, NRECA determined to propose construction of system improvements under a loan agreement that would leave operation of the upgraded system in the hands of the current jurisdictional operator, with technical support provided by NRECA. Under the agreement, the performance of the jurisdictional operator's staff in the project area would be monitored by NRECA, and targeted support provided. It was hoped that such an arrangement would have assisted in differentiating the performance of the project territory from others in the distributor's service area, resulting in an incentive for overall improvement.

NRECA proposed this strategy to the Administrator of EDENORTE in July 2007 and received a generally positive response. The Administrator actually indicated that he would prefer to deliver a project area to NRECA as a contractor and supply power at wholesale only, with NRECA responsible for operations. While this approach would have been closer to the original Fronteriza model, it did not provide for an exit strategy for NRECA and a transition to a locally staffed, managed and capitalized entity, so it was not pursued. NRECA staff pursued definition with EDENORTE staff of projects that would be of interest, and identified three projects which will be described below.

Similarly, this strategy was proposed to the owner of Luz y Fuerza Las Terrenas, NRECA's partner in the Las Galeras project and also received a positive response. Luz y Fuerza staff identified and suggested a single project for NRECA consideration, which will also be profiled below.

No approach was made to EDESUR, based on the negative results of the Fronteriza project negotiations, nor was any approach made to EDESTE due to the geographical preference for projects in the western part of the country.

Projects identified by the utility staff at EDENORTE and Luz y Fuerza were analyzed by preparing power flow models and simulating current and future loadings. EDENORTE has completed a quasi-GIS which provided line length and transformer location information. EDENORTE provided information from its customer information system and its load monitoring system to establish existing loadings of lines and substations. Luz y Fuerza had completed a one-line diagram that was used to prepare a GIS from existing NRECA project maps prepared for the Las Galeras project. Loads were estimated from plant production data provided by Luz y Fuerza. Project reports documenting the analysis of the identified projects were submitted to USAID separately, but the projects analyzed are profiled below:

Rio Limpio Extension

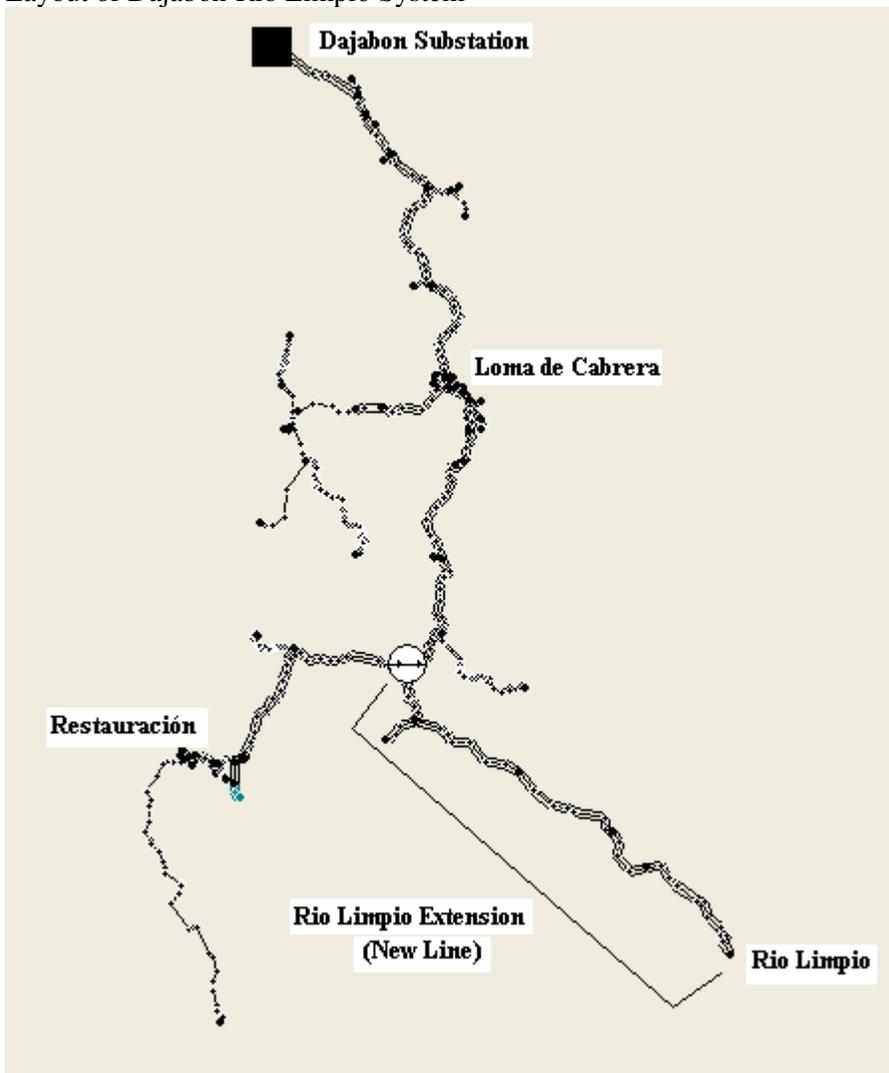
Rio Limpio is an un-electrified community in Dajabon province on the Haiti border immediately to the north of the Fronteriza area. The district is fed by a single 46km long 12.5kV line from the Dajabon substation north of the project area to Restauración to the west of the project area. The existing line had 3695 registered consumers at the beginning of 2008 and maximum demand measured at Dajabon was 2.4MW. Total circuit losses averaged 31% in 2007. The Dajabon substation is slightly unusual in that it consists of a series connection of two transformers, a 138/34.5kV, 14MVA unit feeding a 34.5/12.5kV 7MVA unit. In addition a 5MW power plant is connected to the 12.5kV bus. This arrangement was intended to provide capacity for a 34.5kV

subtransmission network, but no such network was ever built and there is no line exiting the 34.5kV bus.

The Dajabon/Restauración area is devoted to dry land agriculture with some coffee and cacao grown in the hills. Land tenancy is mainly small holdings and most cropping is for subsistence. A total of 56% of the households in the province were classed as “poor” in the 2002 census, and 15.2% as “extremely poor”. There is no canal irrigation system due to the terrain, and any irrigation would require pumping, which is impractical due to the unreliability of the power system. Agriculture in the Rio Limpio area is more productive with rice and bananas as well as coffee grown. The lack of power has limited development of agricultural potential in the area.

The Rio Limpio extension would require construction of 17.1 km of new 12.5kV line and serve a potential group of 854 new consumers. The layout of the system is shown below:

Layout of Dajabon-Rio Limpio System



A field review of the condition of the existing line from Dajabon to Restauración indicates that it is in very poor condition with a high percentage of broken crossarms and poles suffering from

woodpecker attack. In order to provide adequate service the existing backbone line would have to be extensively repaired.

A power flow simulation of the project indicates that the existing line cannot provide adequate voltage service even at the existing load level. In order to provide for load growth to 150% of existing load, it will be necessary to construct a 34.5kV line from the Dajabon 34.5kV bus 25.4km to the point at which the Rio Limpio extension taps the existing Dajabon/Restauración line. At this point a 34.5/12.5kV substation would be established with three circuits, one facing Restauración, one facing Lomas de Cabrera, and one facing Rio Limpio. Cost for the project is estimated as follows:

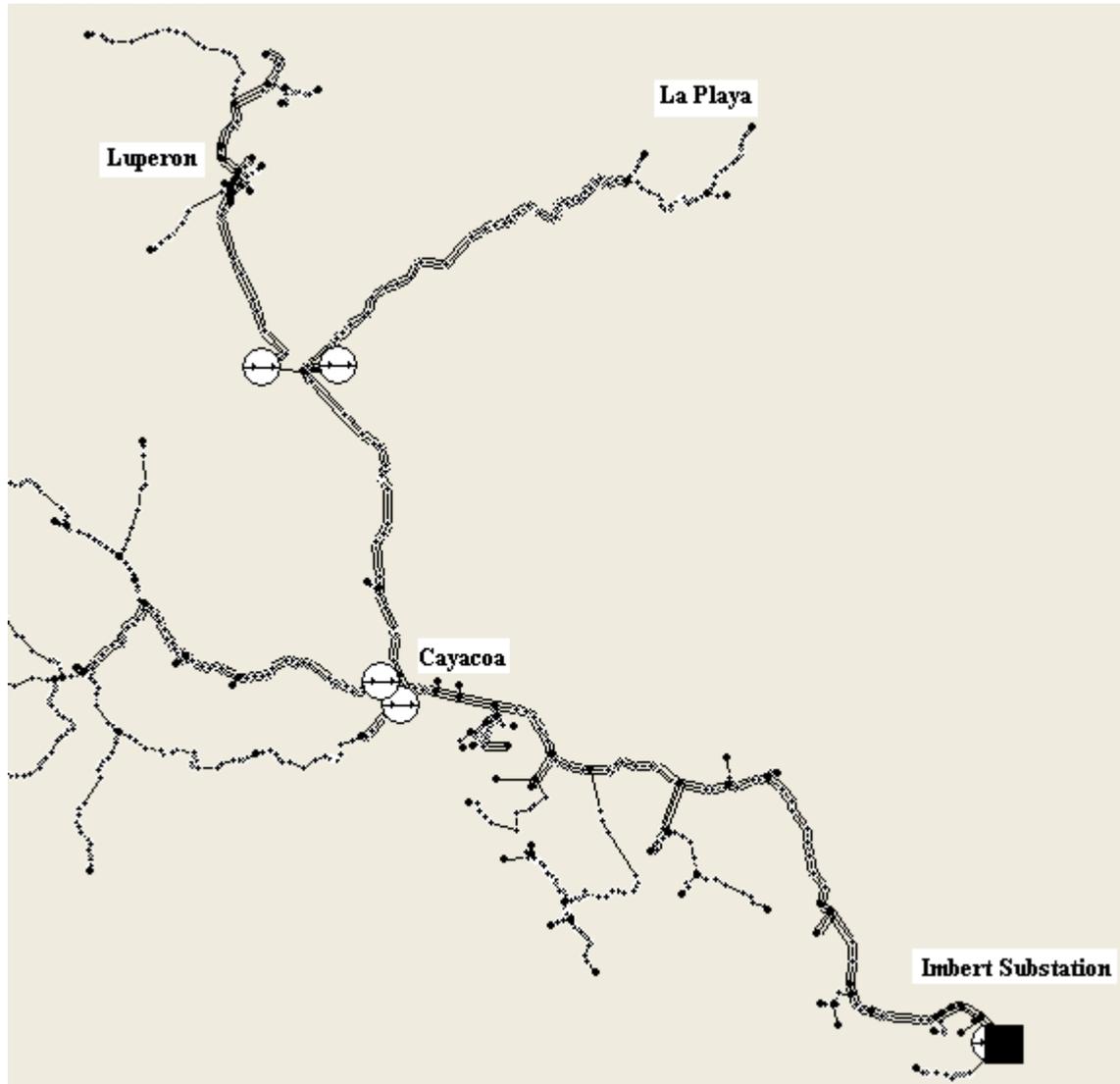
Item	Descripción	Cantidad	Costo (US\$)	Importe (US\$)
1	Terreno nueva subestación	900 m ²	10.00	9,000.00
2	Bahía línea 34.5-kV	1 lote	63,730.50	63,730.50
3	Transformador 3/5 MVA 34.5 /12.5 kv	1 lote	168,741.00	168,741.00
4	Bahía Línea 12.5-kV	3 lote	34,722.35	104,167.05
5	Obra Civil y Estructuras	1 lote	135,184.58	135,184.58
6	Protección y Servicios Auxiliares	1 lote	52,943.00	52,943.00
8	Línea de distribución trifásica 12.5 kV, Poste Madera, Conductor Ames #2 AAAC	18.3 Km	22,047.48	403,468.81
9	Línea de distribución trifásica 34.5 kV, Poste Madera, Conductor Azuza 1/0 AAAC	25.4 km	30,352.35	770,949.74
10	Regulador de Voltaje 250. Amp, 7.2-kV	3 unidades	13,250.00	39,750.00
11	Reparación Línea de distribución trifásica 12.5 kV, Poste Madera, Conductor Anaheim 2/0 AAAC	26 Km	5,050.70	131,318.20
Total General (US \$)				1,879,252.87

Imbert Circuit 102 Upgrade

Imbert substation is located approximately halfway between Santiago and Puerto Plata in Puerto Plata province, and circuit 102 extends north and west to the coastal town of Luperon. The main length of the circuit is 28km and the existing line had 3835 registered consumers at the beginning of 2008. Maximum demand measured at the Imbert substation was 4.3MW. Total circuit losses averaged 48% in 2007. The Imbert substation consists of a single 69/12.5kV 20MVA transformer with two 12.5kV circuit exits. The substation site is extremely restricted and any new construction would probably require padmounted switchgear and underground getaways.

The area served by Imbert 102 is devoted to cattle raising and is showing the beginnings of a tourism industry, though the growth of this activity is limited by lack of reliable power supply. A total of 44% of the households in the province were classed as “poor” in the 2002 census, and 8% as “extremely poor”. The objective of the project would be to improve service to existing consumers and thereby provide an impetus to the nascent tourism industry. No new line extensions are planned. Given the high level of losses, it is likely that a large number of consumers are unregistered, and the project would include an effort to register and meter all consumers. The layout of the system is shown below:

Imbert Circuit 102



A field review of the condition of the existing line from Imbert to Luperon indicates that the 12.5kV line is generally in relatively good condition with a few exceptions. Lateral lines tapped off the main line are generally in poorer condition, with patched conductor and non-standard structures. In order to provide adequate service the existing backbone line would require a modest level of repairs and the laterals rather more. The field review did show that the system generally lacks a formal secondary system. Many consumers are fed directly from the transformers through long, informal service drops that cannot provide adequate service and which are difficult to control commercially. The system clearly needs investment in the low voltage system.

A power flow simulation of the project indicates that the existing line cannot provide adequate voltage service even at the existing load level. In order to provide for load growth to 150% of existing load, it will be necessary to reconductor the main line from the Imbert substation 12.5kV bus 15km to the point at which the line has a major lateral at Cayacoa. Cost for the project is estimated as follows:

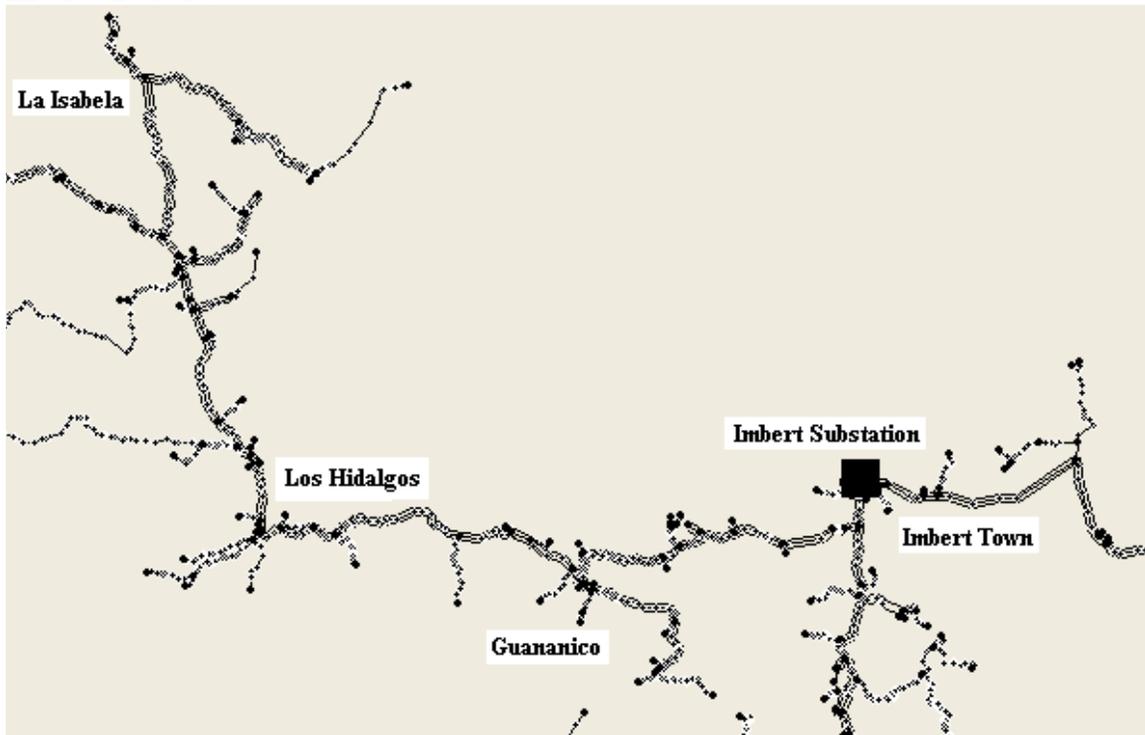
Item	Descripción	Cantidad	Costo (US\$)	Importe (US\$)
1	Línea de distribución trifásica 12.5 kV, Poste Madera, Conductor Cairo 465.4 KCMIL AAAC	15 Km	29,625.00	444,375.00
2	Desmantelamiento Línea de distribución trifásica 12.5 kV, Poste Madera, Conductor Anaheim 2/0 AAAC	15 km	8,171.79	122,576.79
3	Regulador de Voltaje 300 Amp, 12.5 kV	3 unidades	22,500.00	67,500.00
4	Regulador de Voltaje 220 Amp, 12.5 kV	3 unidades	15,007.72	45,023.16
5	Kilómetro Secundario Triplex 1/0	28 Km	5,050.70	141,419.60
6	Acometidas	5,024 unidades	136.13	683,871.58
Total General (US \$)				1,504,766.13

Imbert Circuit 103 Upgrade

The second circuit leaving Imbert substation is circuit 103 which serves the town of Imbert, extends west to Guanatico and north to La Isabela. The main length of the circuit is 34km and the existing line had 11,553 registered consumers at the beginning of 2008. The majority of the consumers are in the town of Imbert, but no data was provided as to the number of rural consumers. Maximum demand measured at the Imbert substation was 11.5MW. Total circuit losses averaged 58% in 2007.

The area served by Imbert 103 is devoted to cattle ranching, mountain agriculture (small plots of coffee and bananas) and commerce. There are the beginnings of a hotel industry, but unreliable power supply has essentially halted this development. The objective of the project would be to improve service to existing consumers outside of the town of Imbert and thereby provide an impetus to the nascent tourism industry. No new line extensions are planned. Given the high level of losses, it is likely that a large number of consumers are unregistered, and the project would include an effort to register and meter all consumers. The system layout is shown below:

Imbert Circuit 103



A field review of the condition of the existing line from Imbert to la Isabela indicates that the 12.5kV line is generally in relatively good condition with a few exceptions. Lateral lines tapped off the main line are generally in poorer condition, with patched conductor and non-standard structures. In order to provide adequate service the existing backbone line would require a modest level of repairs and the laterals rather more. As with Imbert Circuit 102, the field review did show that the system generally lacks a formal secondary system. Many consumers are fed directly from the transformers through long, informal service drops that cannot provide adequate service and which are difficult to control commercially. The system clearly needs investment in the low voltage system.

A power flow simulation of the project indicates that the existing line cannot provide adequate voltage service even at the existing load level. In order to provide for load growth to 150% of existing load, it will be necessary to construct a new 12km 69kV line from the vicinity of Imbert to Los Hidalgos and install a new 10MVA substation there. The circuit would then be split with the new substation feeding the existing line from Guanatico to La Isabela, and the existing Imbert substation covering the remainder. Cost for the project is estimated as follows:

Item	Descripción	Cantidad	Costo (US\$)	Importe (US\$)
1	Terreno nueva subestación	1,500 m ²	30.00	45,000.00
2	Bahía línea 69-kV	1 lote	127,461.00	127,461.00
3	Transformador 10/14 MVA 69 /12.5 Kv	1 lote	224,988.00	224,988.00
4	Bahía Línea 12.5-kV	1 lote	53,419.00	53,419.00
5	Obra Civil y Estructuras	1 lote	207,976.27	207,976.27
6	Protección y Servicios Auxiliares	1 lote	52,943.00	52,943.00
7	Línea de transmisión 69-kV, Poste Madera, Conductor Alliance 4/0 AAAC	12 Km	64,500.00	774,000.00
8	Línea de distribución trifásica 12.5 kV, Poste Madera, Conductor Alliance 4/0 AAAC	2 Km	28,143.75	56,287.50
9	Desmantelamiento Línea de distribución trifásica 12.5 kV, Poste Madera, Conductor Anaheim 2/0 AAAC	2 km	8,171.79	16,343.57
10	Regulador de Voltaje 548 Amp, 7.2-kV	3 unidades	26,500.00	79,500.00
11	Kilómetro Secundario Triplex 1/0	20 Km	5,050.70	101,014.00
12	Acometidas	9,820 unidades	136.13	1,336,754.31
Total General (US \$)				3,075,686.65

Las Terrena-Las Galeras Intertie

Luz y Fuerza las Terrenas (Luz y Fuerza) has constructed the first unit of what is intended to be a 1.0MW wind farm on the bluffs above the Atlantic Ocean near Las Galeras on the northeastern tip of the Samana peninsula. As discussed previously, the construction of the 12.5kV line interconnecting the La Guazuma wind plant to the Las Galeras diesel station was carried out under a GDA project by NRECA. Luz y Fuerza wishes to expand the plant to its full capacity, but the capability of the Las Galeras load to absorb wind generated power is only about 200kW. Accordingly, Luz y Fuerza wishes to construct an interconnection between its main service area in Las Terrenas and the Las Galeras system to be able to utilize the full output of the wind farm.

The area to be crossed by the proposed interconnection is very hilly with varying degrees of agricultural activity. The principal economic activity on the Samana peninsula at this time is tourism, and Luz y Fuerza's principal consumers are hotels. A significant portion of residences

are occupied by employees of the hotels. The objective of the interconnection would be to displace the use of diesel fuel and heavy fuel oil at the Luz y Fuerza plant in Las Terrenas with wind power generated at the Las Galeras wind farm.

A power flow simulation shows that the distance is such that it will not be possible to interconnect the two systems at 12.5kV, but that it will require construction of 55km of 34.5kV line and the installation of two substations. The layout of the system is shown below:

Las Terrenas-Las Galeras Interconnection



The cost of the system is given below:

Item	Descripción	Cantidad	Costo (US\$)	Importe (US\$)
1	Autotransformador/base. 19.9/7.2-kV, 333 KVA	6 unidades	11,356.06	68,136.36
2	Reconector trifásico hidráulico en vacío, 12.5-kV, 50 A	2 unidades	12,544.00	25,088.00
3	Línea de distribución trifásica 34.5 kV, Poste Madera, Conductor Azuza 1/0 AAAC	55 Km	25,773.75	1,417,556.25
4	Regulador de Voltaje 50 Amp, 7.2-kV	2 unidades	7,674.40	15,348.80
Total General (US \$)				1,526,129.41

Renewable Energy Projects

After the shift in the rural electrification support strategy in May of 2008 which included an added emphasis on renewable energy projects, NRECA dedicated significant effort to the identification, analysis, and ranking of potential micro-hydro electric projects. As of the end of the cooperative agreement 79 sites had been identified, 45 visited, 37 analyzed, and 10 projects were considered to be worth pursuing seriously. For further detail, see the separate report on this effort submitted to USAID.

As a part of the this task, NRECA signed a Memorandum of Understanding (MOU) with Junta Yaque in representation of the communities of Paso de la Perra and Angostura and with the Small

Grants Program of the United Nations (UN)¹ for this collaborative renewable energy project. The NRECA portion of the project is to build the local mini-distribution grids using USDA funds. The communities have received funding from PPS and other sources for the micro-hydro plants and associated civil works.

NRECA also drafted MOU's that are in the final stages of edits and approvals to be signed with USAID-RED and PPS to pursue the implementation of renewable energy projects that can provide reliable electricity for rural economic development.

As already discussed in detail above, given the complications with the Fronteriza Project, NRECA focused its attention on the Program Expansion task in the closing months of the CA. Work progressed on two fronts: 1) the identification and analysis of potential micro-hydro projects, and 2) potential grid-connected projects. To identify project partners, NRECA met with USAID-RED, Pro Mango, PPS, EdeNorte, and Luz & Fuerza Las Terrenas. There was also preliminary contact with an engineer from a well-established cacao producer and exporter (Nazario Rizek) to consider the feasibility of a micro-hydro project on one of its farms.

Finally, under this task selected materials were to be procured to be used in the construction of distribution systems for one or more micro-hydro sites. The procurement was accomplished and a portion of the remaining USAID funds was used toward payment for poles and cross arms that will be used in the construction of distribution systems associated with micro-hydro projects.

USAID-DR PMP Progress Indicators and Other Accomplishments

The two major indicators for the IPNER Program were the number of people with increased access to modern energy services as a result of US Government assistance and the number of partnerships. The cumulative number of people with increased access to modern energy services for the entire IPNER Program was 44,070 and the Program developed a total of 15 electricity partnerships. As can be seen in Task 8 and elsewhere in this report, the Program also carried out a significant number of training activities. Other noteworthy accomplishments include the Productive Uses Loan program and multiple studies, guidebooks, and documents.

Number of People with Increased Access to Modern Energy Services

The largest project whose construction was managed directly by NRECA was the Fronteriza Project that in spite of being terminated prematurely benefitted 15,750 people (by means of 3,150 service drops). The other significant project managed directly by NRECA was the Las Galeras Project benefitting 3,750 people (by means of 750 new service drops).

Though it was not a direct construction activity, NRECA provided technical assistance to CDEEE in the form of training of line staking engineers and in the reception of a number of rural electrification projects. This support took the form of identification of projects using the GIS tool, and in reviewing the quality of construction. For example, in FY 2004, CDEEE implemented projects serving a total of 20,000 new consumers, of which 3,900 consumer connections were supported by technical assistance provided under IPNER. The cumulative total beneficiaries under the modality of technical assistance to CDEEE was 24,570 people (by means of 4,914 service drops). These connections did not require direct investment in hardware by the IPNER project.

¹ Known as PPS in Spanish.

The grand total number of people with increased access to modern energy services for the entire IPNER Program was 44,070 (by means of 8,814 service drops).

Partnerships

The table below lists the 15 total partnerships developed under the IPNER Program.

Table of Partnerships

No	Partner	Purpose
1	CDEEE	General technical assistance for Rural Electrification
2	EdeEste/AES	General technical assistance with PRA Barrios with emphasis on Los Mulos project
3	Luz y Fuerza	Electrification of Las Galeras
4	CNE	Energy Efficiency
5	GTZ	Renewable energy
	UNDP	Renewable energy
6	ADESJO	Preparation of GIS
7	INTEC	Conventional and Renewable energy
8	Electric Coop. Fronteriza	Construction and operation of the Fronteriza electric system
9	IDECOOP	Electric Cooperatives development
10	CDEEE (Fronteriza)	US\$ 4 million committed to the Fronteriza Project
11	Cooperativa Central	Productive Uses
12	PROPESUR	School electrification
	FUNDASUR	School electrification
13	GTZ, UNDP	Paso de la Perra micro-hydro Project
14	GTZ, UNDP	Angostura micro-hydro project
15	Las Flores (Cristo Rey)	Electric Cooperative formation

Other Accomplishments

In the table below various other significant accomplishments of the IPNER Program are listed after the two major indicators.

Item	LOP, Achieved
Number of people with increased access to modern energy services	44,070
Number of electric partnerships developed	15
Initial seminar attendees	130
Distribution line design trainees	109
Attendees of coop organizational meetings	5,721
Renewable energy trainees	97
Energy Efficiency trainees	272
Consumer Education seminar attendees	146
Tariff and Subsidy Study	1

Model electric cooperative bylaws developed	1
Electric cooperatives created that completed the legal incorporation process with a decree signed by the President	2
Model contract prepared for electric coops to operate a portion of the electric sector	1
Trainers educated in residential efficiency education	59
Productive uses and appliance loan program	1
-- Number of productive use loans	450
-- Amount loaned	US\$ 374,310
New project site feasibility study	40 sites (3 grid, 37 micro-hydro)
Counterpart funds leveraged	US\$ 1,601,612

FINANCIAL REPORT

A summary of the estimated financial situation for the IPNER Program through 30 September 2008 can be seen in the table below.

NRECA International, Ltd.
Agreement #: 517-A-00-03-00117-00
USAID - Implementing a National Rural Electrification Plan
Estimated Expenditures through September 30, 2008

Line Items	FEDERAL SHARE					COST SHARE			Combined Total
	USAID Budget	ITD Estimated Expenses as of SEP-08	Estimated Obligations as of SEP-08	Total Est. Exp. & Obligations Thru SEP-08	Budget Remaining	Cost Share Budget	ITD Estimated Expenses as of SEP-08	Budget Remaining	ITD Estimated Expenses Thru Sep-08
1. Salaries & Benefits	\$1,135,104	\$ 1,103,728	23,235	\$ 1,126,963	8,141	\$ 180,000	\$ 439,088	\$ (259,088)	\$ 1,566,051
3. Travel & Per Diem	124,753	125,343	0	\$ 125,343	(590)	-	-	-	125,343
4. Other Direct Costs	601,142	628,173	0	\$ 628,173	(27,031)	-	-	-	628,173
5. Equipment	104,883	81,417	0	\$ 81,417	23,466	1,020,000	1,162,524	(142,524)	1,243,941
6. Supplies	-	-	0	\$ -	-	-	-	-	-
7. Contractual Services	145,021	142,031	0	\$ 142,031	2,990	-	-	-	142,031
8. Indirect Costs	933,324	940,301	0	\$ 940,301	(6,977)	-	-	-	940,301
TOTAL	\$3,044,227	\$ 3,020,992	\$ 23,235	\$ 3,044,227	(0)	\$1,200,000	\$1,601,612	\$ (401,612)	\$ 4,645,839

CONCLUSION

A candid look back at the five years spanned by the IPNER Program evokes both a sense of satisfaction and frustration. Satisfaction arises in recognition that over 44,000 people have improved access to electricity, that the beneficiaries of the Las Galeras Project are receiving electric service 24 hours a day year-round, that two electric cooperatives successfully completed the legal incorporation process that requires going all the way to the President of the country for signing the incorporation decrees, that multiple studies including the tariff and subsidy analysis were completed helping to attract more technical assistance to the electric sector, and that hundreds of people were provided with training, among other accomplishments. The frustration comes from the lack of GORD counterpart support to allow vitally needed institutional changes to take full advantage of new electric infrastructure and maximize the benefit of technical assistance and training.

The IPNER Program highlights once again how important it is for institutional change to go hand in hand with technical improvements. Projects both before and during the IPNER Program demonstrated that it is possible to reduce losses, to improve collections, and to provide reliable electric service 24 hours a day in the Dominican Republic. This was proven with the pre-IPNER San Rafael and Boca de Yuma Project. While NRECA managed the reconstructed system in San Rafael, losses were below 10%, collection above 95%, and the power was on 24 hours a day. This was demonstrated again in the IPNER-financed Las Galeras Project where Luz & Fuerza, a privately owned and managed electric utility in Samaná, provides 24/7 service with very low outages, year round. In contrast, in Las Matas de Farfan where NRECA installed the same high quality robust electric infrastructure, but where the legally-incorporated Cooperativa Electrica Fronteriza has not been allowed to begin operation, the outages continue and losses remain at about 50% and collections at 70%. The difference is obviously the focus on institutional robustness, training, and dedication/discipline to provide high quality, reliable electric service.

In spite of the frustrations and the need to withdraw support from the primary activity financed by IPNER, we remain hopeful that positive change will occur in the Dominican power sector. For this to happen, a change in the political climate will be required to interject private, consumer-owned electric utility model as a means of promoting efficiency, reducing losses, and substantially increasing economic benefits to rural homes and businesses in the Dominican Republic. Finally, we wish to express our gratitude to USAID for the opportunity to invest US government resources to contribute to improvements in the quality of life for the people of the Dominican Republic, and to conduct this social experiment that showed so much promise at the outset of the IPNER Program.