

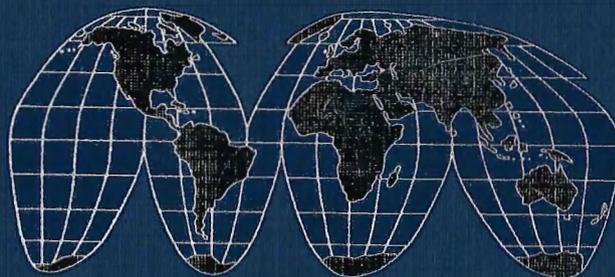
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**NRECA  
International  
LTD**

**Cooperative Development Program**

**Semi-Annual Progress Report  
July 1, 2000 – December 31, 2000**

**USAID/BHR/PVC  
Cooperative Agreement  
No. FAO-A-00-97-000012-00**



**National Rural Electric  
Cooperative Association**

# **Cooperative Development Program**

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**Submitted by:**

**NRECA International, Ltd.  
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**to:**

**The Office of Private and Voluntary Cooperation  
Bureau for Humanitarian Response  
U.S. Agency for International Development  
1300 Pennsylvania Ave. N.W. 7.6 D  
Washington, D.C. 20523**

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## List of Acronyms

- AES** – AES Corp. of Arlington, Va.
- CFC** - National Rural Utilities Cooperative Finance Corporation
- CDP** - Cooperative Development Program
- CDE** – Compania Dominicana de Electricidad (Dominican Republic)
- CER** - Cooperativa Electrica de Riberalta (Bolivia)
- CRE** - Cooperativa Rural de Electrificacion (Bolivia)
- ECFC** – Electric Cooperative Finance Corporation (Philippines)
- IDFC** – Infrastructure Development Finance Corporation (India)
- IDB** - Inter-American Development Bank
- IFC** - International Finance Corporation (World Bank Group)
- NRECA** - National Rural Electric Cooperative Association
- REB** - Rural Electrification Board (Bangladesh)
- REFC** - Rural Electrification Financing Corporation (Philippines)
- SARI** – South Asia Regional Initiative
- USDA** - U.S. Department of Agriculture
- WBREDC** – West Bengal Rural Electrification Development Corporation (India)

## EXECUTIVE SUMMARY

NRECA continued to make good progress with its CDP strategy during this reporting period, with the following highlights:

*Guatemala/Central America* – The rural electrification investment fund that was established with monetization proceeds from a USDA commodity grant of surplus U.S.wheat was augmented with the sale of a second tranche, bringing the total capital amount in the fund to nearly \$2 million. An evaluation of the project was carried out in November 2000. There has also been initial success in leveraging this funding with other sources and in expanding the concept to other countries.

*Philippines* – Formalization of the new electric cooperative financing corporation got underway during the reporting period with the financial commitment of some 15 electric cooperatives totaling nearly \$1 million in equity. A general agreement on NRECA/CFC's continuing support for this project was reached with the company's interim leadership group.

*India* – Work continued on several fronts to establish collaborative arrangements at the national level and in several States. NRECA was also awarded funding under the new South Asia Regional Initiative (SARI). The option for cooperative development as a solution to the country's deep and complicated rural electrification problems is gaining ground.

*Dominican Republic* – A proposal to USAID was made and accepted to conduct a national electrification plan in DR which will present options for revising the method of extending electricity to rural areas, including the establishment of electric cooperatives. NRECA is still contemplating the feasibility of contracting with AES Corp. to test this method in a project area that has been rehabilitated under NRECA's hurricane relief project.

*Bolivia* -- NRECA took over management and operation of the power plant serving the Riberalta electric cooperative in the northern part of the country. NRECA's technical assistance and training support to the electric cooperative in Santa Cruz continued to grow. A major proposal to USAID for additional funding under Bolivia's alternative development program was approved.

*Bangladesh* – No CDP activity during the period. NRECA was offered an attractive opportunity to promote electric cooperative development in Africa during this period and proposed dropping Bangladesh from the CDP in order to utilize CDP to pursue this opportunity.

## COUNTRY UPDATES

### Guatemala/Central America

NRECA's fourth-year CDP work plan priority is to leverage and expand its rural electrification trust fund in Guatemala. By the end of 2000, the initial tranche of capital in the fund -- \$900,000 -- was almost fully placed in projects, many in loans to municipalities. Projects financed by the NRECA fund include solar electrification projects, electric service upgrades on existing systems to increase commercial/industrial loads, and grid extensions. Over \$100,000 in interest has been earned and re-capitalized. Also, a second tranche of 10,000 tons of USDA wheat from a successful FY2000 proposal was in the process of being sold, which will add another \$1 million to the fund.

NRECA was aggressive about marketing the fund concept to other potential donors. Over \$2 million in additional funding proposals were pending to other donors, including the Dutch and Spanish governments. NRECA submitted another proposal to USDA for surplus wheat that has a good chance of being approved.

An evaluation of the project for USDA was carried out which found that the program is meeting or surpassing all of its intended first-year results (attached).

NRECA also took steps to expand the model in the Central American region: proposals were submitted to USDA for similar support in Honduras and Nicaragua, among other efforts to expand the funding base. NRECA is optimistic that one of these will be approved under the FY2001 program, most likely in Nicaragua. NRECA has carried on an extensive dialogue with the government of Nicaragua, including consultation on a new rural electrification project funded under a IDB loan. NRECA presented a proposal to carry out a \$500,000 planning study as the first stage of this projects, which will include recommendations on how to re-establish a successful electric cooperative program in Nicaragua.

Also in Guatemala, NRECA received a grant of \$1.5 million in Hurricane Mitch relief funds to undertake electric system rehabilitation and improvements in impacted localities.

### Philippines

NRECA, with the assistance of CFC, completed the feasibility study for the proposed Electric Cooperative Finance Corporation (ECFC). In July-September, the Filipino electric cooperative community began taking formal steps to implementing the recommended format for the entity, and among other things, set up a special account to receive capital funding contributions that would constitute the founding equity of the new company. In consulting with the Philippines government Securities and Exchange Commission, it was determined to change the name of the company to the Rural

Electrification Financing Corporation (REFC), and by the end of CY2000, the process of registering the REFC was formally underway.

The REFC project continues to be NRECA's focal activity for CDP in the Philippines. In October, NRECA negotiated a general agreement to provide an increasing level of commitment to the REFC, leading to a formal long-term role in its management and oversight. NRECA proposed to contribute in-kind services, equipment, and funding as may be obtained to support the REFC during its start-up and post-operational stages, in exchange for long-term funding support to continue this assistance in future years as part of REFC's operating budget. NRECA's CDP would provide part of this in-kind interim support, with other contributions to come from NRECA members and other sources.

One of the potential sources for NRECA's funding assistance to REFC would be from the proceeds of NRECA's proposed surplus rice monetization program that was presented to USDA during this reporting period. The proposal provided for a grant of approximately \$5 million in long-grain rice, to be sold in Philippines and used primarily as part of REFC's capitalization.

The executive summary of NRECA/CFC's feasibility study for the REFC is attached.

### **India**

The 4<sup>th</sup>-year work plan focus is on NRECA's proposed assistance program with the West Bengal Rural Energy Development Corporation (WBREDC). Several other opportunities were pushed along during the reporting period, as well. Activities and accomplishments were as follows:

- WBREDC NRECA received \$205,000 in funding from USAID to begin this project, in two parts. The initial part involves assisting WBREDC in its overall organizational development including strategic planning. A second part will focus on a specific region, including identifying the means and method for creating a viable form of electric cooperative.
- Nuchem NRECA began work on a project to determine, and then demonstrate, the feasibility of a local marketing strategy for small private power producers in the State of Haryana. This looks to the same basic strategy that is being proposed in West Bengal, including a combination of cooperative organization at the consumer level to improve collections, and distribution system efficiency and reliability improvements. Funding is coming from Nuchem, the private power supplier in the town of Tohana, and NRECA/CDP, plus the support of a small volunteers project funded by USAID/India.
- IDFC NRECA made a proposal to the Infrastructure Development Finance Corporation (IDFC) to establish a rural energy service company in India to

promote and implement projects modeled on the WBREDC/Nuchem experience, focusing primarily on system loss control. A copy of a concept paper presented to IDFC is attached.

Finally, NRECA was part of a successful bid to USAID for rural energy training and technical assistance under the South Asia Regional Initiative (SARI). The first formal event under SARI/Rural Energy will be a “showcase” workshop in Dhaka to present the successful rural electric cooperative model in Bangladesh that has been constructed with NRECA assistance over the past two decades. Funding from SARI should be helpful in promoting the CDP objectives, as well.

### **Dominican Republic**

This is the crucial year for determining NRECA’s long-term potential in promoting electric cooperatives in the Dominican Republic. Progress has been made toward the 4<sup>th</sup>-year CDP work plan objective of developing such a basis. In particular, NRECA and AES Corp. continued to build a joint-venture relationship to deal with AES’ outlying electric distribution systems which are best with poor physical quality conditions, high technical losses and electricity theft, and government-mandated subsidies to rural poor. An initial project, funded part by NRECA’s Hurricane Georges relief grant from USAID and part by AES, was substantially completed, and discussions got underway regarding NRECA’s continued role in system operator, including setting up a users’ association, or cooperative.

In addition, NRECA received USAID’s approval for a \$300,000 planning study to be conducted in collaboration with the Dominican Government to establish a national plan for expanding rural electrification. The study will be carried out during 2001, and could set the framework for a broad-based rural electric system improvements/expansion program in partnership with the two foreign-based owner-operators of CDE, the national power system.

Finally, NRECA submitted a proposal to USDA for a grant of US surplus commodities that could provide important capital support for implementing such a plan. By mid-2001 NRECA should have a fairly clear picture of whether a program of a sufficient scale of operation will be feasible in DR.

NRECA also prepared a proposal for USDA support in Haiti, as well, linked with a donation of a coal-fired power plant to alleviate severe electricity shortages throughout the country. The power plant is in the process of being removed from service by an NRECA-member electric cooperative in Michigan (see attached brochure). The addition of Haiti is intended to help improve the overall economy of scale for NRECA’s work on a Hispaniola-wide basis.

## **Bolivia**

NRECA's primary target for the 4<sup>th</sup>-year work plan in Bolivia was to establish a program in concert with the Government of Bolivia. A formal dialogue was initiated with modest success. The key will be to develop a common rural electric financing scheme including leveraging government resources. Several previous attempts by the GOB in this area have not been successful.

NRECA continued to support two electric cooperatives in Bolivia, one in Santa Cruz (CRE) and a smaller one in Riberalta (CER) under funding provided directly from contracts with the two cooperatives. In CER, NRECA executed a contract to take over direct operational control for the co-op's power generating plant, including a 1 MW biomass plant financed and built by NRECA in the mid-1990s.

Finally, NRECA received word that it would receive a \$5 million under USAID's on-going Alternative Development program in coca-growing regions of the country. NRECA's project will focus on the Chapare region of the state of Cochebamba, to continue developing rural electric infrastructure aimed at increasing new economic employment opportunities for the rural population.

## **Bangladesh**

There was no significant CDP activity in Bangladesh during the reporting period.

## **ATTACHMENTS**

- 1. “Electricity for Progress” Evaluation Report (Guatemala)**
- 2. REFC Feasibility Study Executive Summary (Philippines)**
- 3. Non-urban Electric Distribution Strategy Concept Paper to IDFC (India)**
- 4. Wolverine Power Plant Donation Brief**

## EXECUTIVE SUMMARY

### REFC Feasibility

The findings of this study indicate that, subject to effective management of the four critical success factors discussed below, a financial organization owned by and dedicated to Philippine electric cooperatives is likely to succeed. The demand for REFC's service is evident. The financing requirements of electric cooperatives ("ECs"), the fastest growing part of the nation's electric utility sector, are likely to exceed the capabilities of NEA or other accessible financing sources. There is widespread support for REFC's establishment among the ECs, agencies of the Government of Philippines including NEA, and international development organizations and recognition of the need to attract non-government capital to rural electrification in the Philippines. A solid core of ECs have demonstrated themselves to be financially strong enough to meet credit requirements of National Rural Utilities Cooperative Finance Corporation ("CFC"), REFC's counterpart in the United States. Further, a larger EC group has indicated willingness to invest significantly in REFC's equity capital. All of these conditions, and other findings of this study, point to REFC's feasibility.

### REFC Critical Success Factors

The study has identified four sets of challenges which require careful management in order for REFC to fulfil its responsibilities to complement NEA's missionary electrification role, to help improve the performance of its member ECs and to meet its own financial obligations. The four factors critical to REFC's success are:

- **Continuing credit improvement of ECs**  
As further discussed at Exhibit 2E-3, twenty-four (24) of the Philippines' 119 electric cooperatives were estimated to be eligible for loans under CFC-like credit standards applied to their financial performance of 1996, 1997 and 1998. In order to assure ECFC continuing loan demand from qualified borrowers, the Philippine electric cooperative sector must accelerate its progress with in-depth assistance from independent rural electrification experts.
- **Continuing NEA co-lending to REFC members**  
Approximately 42% of the envisioned REFC members' estimated financing needs are for expansion, NEA's traditional missionary electrification role (Exhibit 3A). In view of NEA's responsibilities (subject to its own budget constraints) and REFC's challenges in accessing capital (Exhibit 3B), REFC borrowers will need continuing access to NEA financing to fulfill their service responsibilities and to meet non-government market financial performance requirements.

- **REFC access to DBP or other low-cost debt**  
In order to shield its borrowers from abrupt increases in financing costs, REFC needs a substantial base of low-cost debt (Exhibit 5C-1). REFC must intensively explore borrowing from Development Bank of the Philippines and similar sources to allow time for Philippine capital markets to develop and for REFC to demonstrate its reliability as a credit intermediary.
- **NEA-REFC proportionately-shared EC collateral**  
In order to access capital at competitive costs, REFC must be able to offer its lenders and investors the strongest possible assets as collateral. CFC's experience in the United States is that, shared mortgage security in EC borrowers meeting objective credit criteria provides such assurance to capital sources (Exhibit 3C).

Exhibit 1A, that follows, highlights the important findings and conclusions of the study, covering the financial and operational status of the ECs and their financing requirements, and various institutional, organizational, legal, and financial aspects of the proposed venture. Exhibit 1B presents a listing of the feasibility study team.

As of the publication date of this document, REFC, with the assistance of NRECA/CFC and CORD, were preparing to elaborate a more specific organizational and financial plan for the REFC including the completion of negotiations and pre-operational plans in collaboration with NEA, DBP, IFC, and other interested stakeholders, with the expectation of opening REFC operations during the second half of 2001.

# **RURAL ELECTRIFICATION FINANCING CORPORATION**

## **Summary of Feasibility Findings**

<b>STUDY COMPONENT</b>	<b>FINDINGS</b>	<b>REFC CRITICAL SUCCESS FACTORS</b>
<p><b>*Preliminary Credit Assessment of Potential REFC Borrowers – Section 2</b></p> <p>A -- The Philippine Power Sector</p> <p>B -- Electric Cooperative Operations</p> <p>C -- The National Electrification Administration</p> <p>D – Electric Cooperative Power Supply</p> <p>E – Credit Overview of “Representative Cooperatives”</p>	<ul style="list-style-type: none"> <li>• Cooperatives are fastest growing part of sector.</li> <li>• NEA privatization creates co-op financing needs</li>   <li>• EC’s have established 63% of potential connections.</li> <li>• Energy losses and margins respond to investment.</li>   <li>• EC’s prepaid P382 million on NEA debt in 1998.</li> <li>• Improving NEA ratings reflect EC strength.</li>   <li>• Restructuring to provide more power at lower cost.</li> <li>• Power supply to be adequate for EC’s and others.</li>   <li>• National rating caps EC’s below investment grade.</li> <li>• At least 24 EC’s qualify for P817 million from REFC.</li> </ul>	<p style="text-align: center;"><b>Continuing credit improvement of EC’s</b></p>
<p><b>*Electric Cooperative Financing Needs and Alternative Sources – Section 3</b></p> <p>A – Financing Needs of “Representative Cooperatives”</p> <p>B – Financing Alternatives for Electric Cooperatives</p> <p>C – Proposed REFC-NEA Joint Financing</p>	<ul style="list-style-type: none"> <li>• REFC members need 250% of NEA budget.</li> <li>• “Expansion” accounts for about 42% of EC need.</li>   <li>• Capital markets and banks inadequate for EC needs.</li> <li>• DBP interest in EC’s is encouraging but insufficient.</li>   <li>• REFC must offer very strong collateral to attract debt</li> <li>• NEA generally supportive of REFC establishment</li> </ul>	<p style="text-align: center;"><b>Continuing NEA co-lending to REFC members</b></p> <p style="text-align: center;"><b>REFC access to DBP or other concessionary debt.</b></p> <p style="text-align: center;"><b>NEA-REFC proportionately-shared EC collateral.</b></p>



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**NRECA /USDA**  
**“Electricity for Progress” Program**  
***Project Evaluation***  
**Guatemala**

***Bringing light and prosperity to the poor, rural children  
of Guatemala***



**Victims of Hurricane Mitch**

**Senior Evaluator**  
**Ted Weihe**

## Executive Summary

With USDA support of donated surplus commodities, NRECA has successfully implemented a program to help bring light and prosperity to the poor, rural Guatemalans. Families and their micro-enterprises that are in remote agriculture areas now have electricity. They are beginning to enjoy the social, economic and educational benefits that come with electricity. When interviewed, they often say that "A new door has opened in their lives and a new light is shining on their future." This evaluation documents some of the impacts and makes recommendations on how to expand the program's effectiveness.

The Electricity for Progress Project is a joint project of NRECA International Ltd. and the U.S. Department of Agriculture (USDA) for rural electrification in Guatemala. The monetization of surplus wheat commodities results in local currencies that are deposited in a trust fund to finance electricity-related loans for agricultural production, rural development and poverty alleviation. Two shipments of 20,000 metric tons of high protein wheat, one in 1999 and the other in 2000, were provided to seven Guatemalan mills for bread production. Each shipment covers about four months of imports and does not disrupt normal U.S. or domestic commercial markets.

The local proceeds are kept in a separate account jointly administered by NRECA and Banrural and provided as loans on revolving basis. Applications for electricity-related activities are screened based on the plan of operations and technically reviewed for compatibility with project purposes. Counterpart contributions and guarantees are required for each project. NRECA provides technical assistance on a fee-basis for construction specifications and then assists applicants for contracting the work with local firms. NRECA monitors the construction to make sure that it meets specifications.

During November 2000 the evaluator visited four project sites:

- (1) Solar home lighting for remote fishing villages of Manabique and Quetzalito
- (2) Electrical upgrade, equipment and energy efficiency project for the Maderas de Milpas Altas, a furniture manufacturer
- (3) Three-phase grid extension to a wastewater treatment plant in the Fraijanes municipality
- (4) Electrical upgrade for an expanded calcium processing plant

Each project fully met the criteria in the operational plan: agricultural development, significant counterpart contributions, accessing power from grid or isolated systems (solar) and strong local leadership. Through improved electricity, the projects assist agricultural development in the following ways:

- The furniture manufacturing company will expand its production and export of quality wood products and increase efficiency by at least 10%.

- A municipal wastewater treatment plant will provide clean water for irrigation.
- A private-owned crushing plant will more than double its production of limestone as important inputs for melon and coffee production, fertilizer, and chicken production.

The projects also achieve environmental improvements:

- The furniture factory will achieve major energy savings and improved working conditions through a raised roof with better ventilation and lighting,
- The waste treatment plant will end the overflow of sewage from home septic tanks with public health benefits from reduced stream pollution.

The projects also improve the lives of Guatemalans through better living and working conditions (solar lighting for homes and improved working areas), increased jobs (doubling the number of employees at calcium crushing plant), and improved health and economic development (sewage treatment plant).

The evaluator met with millers and Banrural, who are partners in the project. The millers were pleased with the quality of wheat that is blended to make bread and sweet rolls, and indicated a willingness to increase their participation to 30,000 metric tons annual donation of U.S. wheat. Banrural administers the trust fund, carries out credit checks and is the depository bank for loans. The General Manager of Banrural wants to greatly expand the trust fund with a particular focus on isolated, off grid power for agricultural production (coffee bean and herb drying) for remote villages.

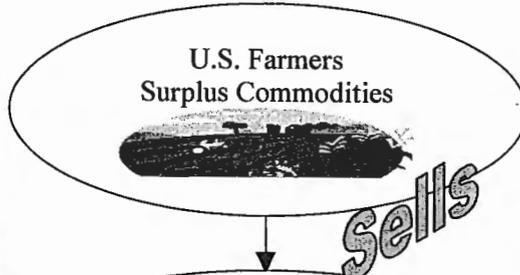
The evaluator offers the following key conclusions:

- The Trust Fund is having major economic and social impacts for rural Guatemalans. Project selection is sound with criteria that focuses on expanded productive activities of enterprises, line extensions from municipal distribution systems and off-grid, alternative power such as solar electricity to remote villages.
- The trust fund substantially leverages funds from private entrepreneurs, municipalities and local participants (counterpart funds). The trust fund operates at near market rates. Banrural closely screens all applicants for creditworthiness and requires guarantees (co-signers for loans). Banrural has proven to be a strong partner in the project. The trust fund should be enlarged with additional resources to fill the gap in the current Guatemalan efforts to provide electricity to 800,000 villagers.
- Since Guatemala is the Central American model, NRECA should prepare an analysis of the energy privatization process, its gaps and impact on rural electrification to share with other countries and organizations in the region.

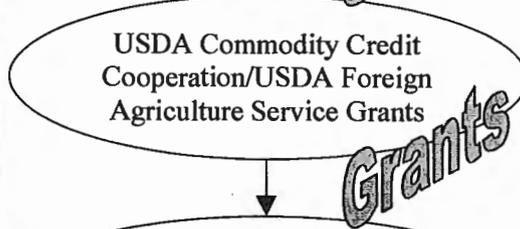
# NRECA/USDA "Electricity for Progress" Program



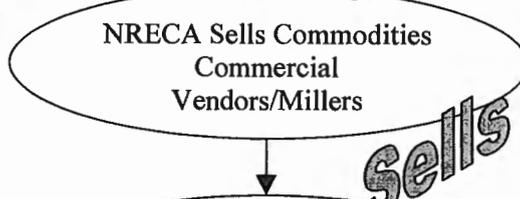
Surplus Farm Commodities



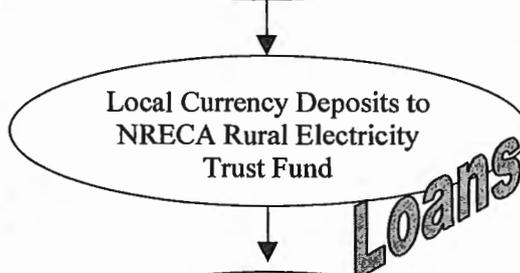
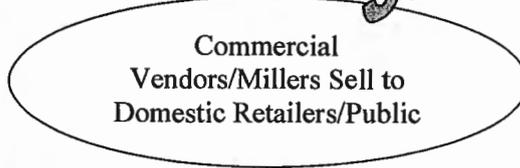
*Sells*



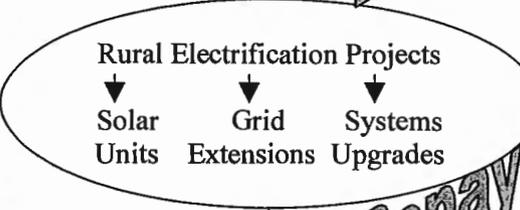
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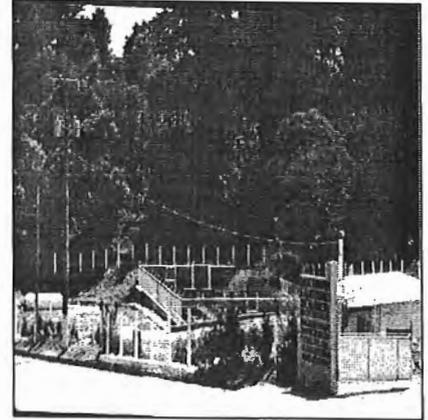
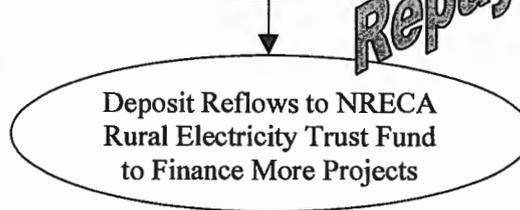
*Sells*



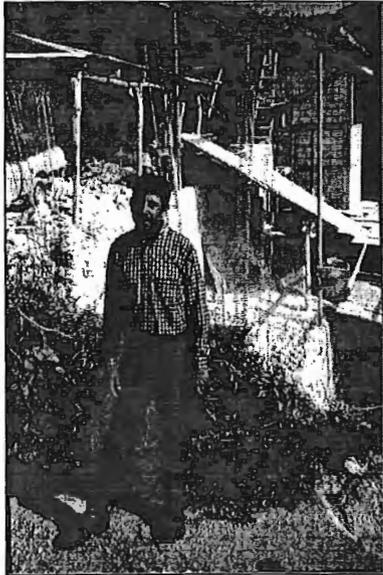
*Loans*



*Repays*



Grid Extension to Power  
Waste Treatment Plant



System Upgrade to Power  
Motors for Rock Crushing



Solar Units for Villages/  
Schools Lights

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## I. Project Methodology

The Electricity for Progress Project is a joint project of NRECA International Ltd. and the U.S. Department of Agriculture (USDA) to expand rural electrification in Guatemala through the monetization of surplus wheat commodities. The Food for Progress program operates through a trust fund that supports electricity-related loans for agricultural production, rural development and poverty alleviation in Guatemala. Two shipments of 20,000 metric tons of high protein, hard winter wheat were provided to seven Guatemalan mills for bread production, one each in 1999 and 2000. Each shipment covers about four months of imports and does not disrupt normal U.S. commercial markets (Refer to attachment 1 for more information on monetization).

The local proceeds from the donated commodities are transferred when the vessel leaves the U.S. port and placed into a separate NRECA account. The millers truck the wheat from the Guatemalan port to their warehouses for blending with other grains for bread production. The funds are placed in a trust fund jointly managed by NRECA and Banrural. The fund operates on a revolving basis at near market rates of interest. Applications for electric activities are screened and technically reviewed for compatibility with project purposes. Counterpart contributions are required for each project and Banrural reviews the applicants' credit worthiness. Loan guarantees are required from co-signers or from municipalities in the case of community grid extension (See attachment 2 for project implementation process).

NRECA provides technical assistance on a fee-basis for construction specifications and then assists applicants for contracting the work with local firms. NRECA monitors the construction to make sure that it meets specifications.

Out of the 26 applications, the project has completed two projects, approved five for implementation, is reviewing 12, and has rejected five. These projects break down as 12 for grid extension, 12 for power upgrades and energy efficiency and 2 for village solar (See attachment 3 for project details).

The evaluator visited the following four project sites:

- (1) Solar home lighting for remote fishing villages of Manabique and Quetzalito.
- (2) Electrical upgrade and energy efficiency project for the Maderas de Milpas Altas, a furniture manufacturer.
- (3) Three-phase grid extension to a wastewater treatment plant for the Fraijanes municipality.
- (4) Electrical upgrade for a private calcium-processing plant.

In addition, the evaluator visited two villages where refugees from Hurricane Mitch have been resettled and will be electrified with grid extensions from complementary USAID funds.

Each of the visited projects fully met the criteria in the operational plan: agricultural development, significant counterpart contributions, accessing power from grid or isolated

systems (solar) and strong local leadership. All of the projects represent major impacts on the lives of rural Guatemalans including improved quality of life, increased production and job creation. Specifically, the projects contribute to agricultural development:

- Village solar lighting improved the lives of fisherman, extending their working hours.
- The furniture company will expand its operations, purchase better equipment and increase production by 10%.
- The municipal wastewater treatment plant will provide clean water for irrigation.
- The calcium-processing crushing plant will more than double its production as critical inputs for melon and coffee production as well as chicken production.

The projects also achieve environmental improvements:

- The furniture factory will achieve major energy savings by lowering its electric bill by 25%. It will also improve its working conditions and reduce electricity consumption by raising roof with better ventilation and including translucent roof panels for natural lighting. In addition, the plant only uses certified lumber from the Forest Service.
- The wastewater treatment plant will end the overflow of sewage from septic tanks that pollute streams and achieved major public health benefits.
- Non-polluting energy provides home lighting to villages next to a national wildlife preserve.

The projects improve the lives of Guatemalans through better living conditions (solar lighting for homes and work areas), increased jobs (increased from 15 to 30 employees for calcium-crushing plant), and improved health and economic development (sewage treatment plant).

The evaluator also met with millers and Banrural who are partners in the project. The millers were pleased with the quality of wheat that is blended to make bread and sweat rolls. They indicated a willingness to increase their participation to 30,000 metric tons of donated U.S. wheat.

Banrural strongly supports the program, administers the trust fund, carries out credit evaluations of applicants and adequate guarantees and is the depository bank for loans. The General Manager of Banrural wants to greatly expand the trust fund with a particular focus on isolated, off grid power for agricultural micro-enterprises (coffee bean and herb drying) for remote villages.

In a meeting with the Minister of Energy and Mining, Raul Castaneda, he indicated that there is a potential partnership of the NRECA-USDA Trust Fund. The Fund could help support independent municipal distribution system with upgrades, loss reduction efforts and extension to peri-urban areas; the creation of consumer-owned distribution systems in

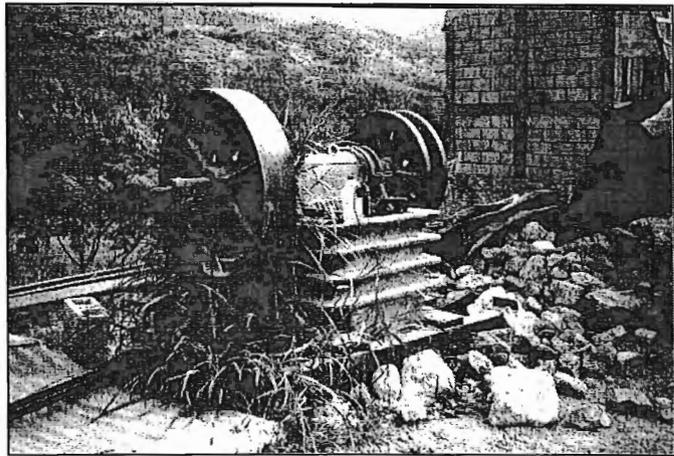
remote, less profitable regions near the Mexican border, and increased productive uses of electricity in rural areas.

## **II. Project Impacts**

### **Calcium Crushing Plant**

The Pulberizadora El Terreadero is a privately owned calcium crushing plant that produces calcium for soil improvement for melon and coffee, chicken production and cement for ceramic floors. The plant currently has 15 full time employees with a capacity of 500 100-lb bags per day from a 32 horsepower crusher. The plant owner is Otto Bran Veliz.

The project will install a new, higher voltage line and three transformers that will increase power by a factor of five. A second, larger parallel crushing operation will increase employees from 15 to 30 and produce 2,500 100-lb bags per day. The additional crusher will produce phosphate for fertilizer. The 80 horsepower \$15,000 crusher is made by Universal Crusher Company of Cedar Rapids; transformers are also U.S. built. The project will provide a loan of \$14,000 (22 % of costs) with the owner constructing an improved building for the service drop and internal wiring. The new production line will reduce technical losses by about five percent. The plant fully meets all environmental standards and avoids the traditional method of “cooking rocks” in which old tires are burned and water splashed on them to “explode” the rocks.

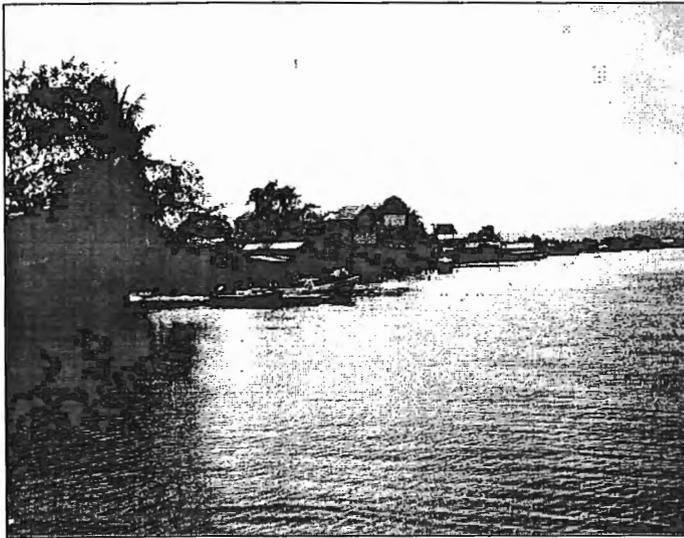


**A 80-horsepower crusher made by Universal Crusher Company of Cedar Rapids.**

While most plants in the area are for lime production, this crushing plant represents a new industry that is likely to expand. Rocks are about 99.5 % calcium, which was discovered when cows licked the stones. The project was identified through NRECA partner, Rotary International which provided the economic analysis and market assessment. NRECA designed the power system (100 kVA transformers, 280 meters of line).

### **Solar Home Systems in Manabique and Quetzalito**

Manabique and Quetzalito are two very remote fishing villages on a peninsula surrounded by the Refugio de Vida Silvestre, a wildlife nature preserve. The villages can only be reached from Port Barrios by boat. The project provided 43 solar home units, each of which consists of a photovoltaic panel, pole, regulator, battery and three lamps per house. In addition to lighting, there is sufficient power for a television and a radio that most villagers now own. Homes were self-constructed either with sand floors or on stilts.



**Guatemalan communities along the Caribbean coastline.**

The project costs about \$30,000 (34 % of total) in which each family contributed about \$130, the Ministry of Energy provided a grant of \$13,000 and the municipality, a loan of \$10,000. The installation of solar electricity replaced candles—with a flip of a switch comes a leap into the 21<sup>st</sup> century.

The villagers indicated that the lighting resulted in a feeling of greater security “just like the city,” extended hours for socializing, their children can study in the evenings and it allowed for later meals. The fishermen can also repair nets at night. Electric lights enhance a small rustic hotel and improve its services. The villagers were all trained in using the system including a photo chart by each battery of “dos and don’ts”. Solar power is nonpolluting to this natural reserve area with rare species of plants and wildlife.

The project strengthened the Association of Fisherman and linked them closer with the municipality. They are asking the newly elected mayor for assistance in obtaining improved nets to meet conservation requirements and for a deep water well with an electric pump. They also need new roofing since they cannot use traditional thatch since they are not permitted to cut down the mature trees in the reserve.

### **Energy Efficiency for Furniture Manufacturing Plant**

The largest project involves a major power system upgrading and the raising of the plant’s roof for better ventilation, clear roof panels for energy, and improved working conditions at the Maderar Milpas Altas factory. The plant produces high quality furniture (e.g., armors, mantles, tables, chests and dressers) for export to the U.S. (290 containers a year). With 400 employees, the factory produces furniture from raw wood to finished product with annual revenues of about \$5 million.

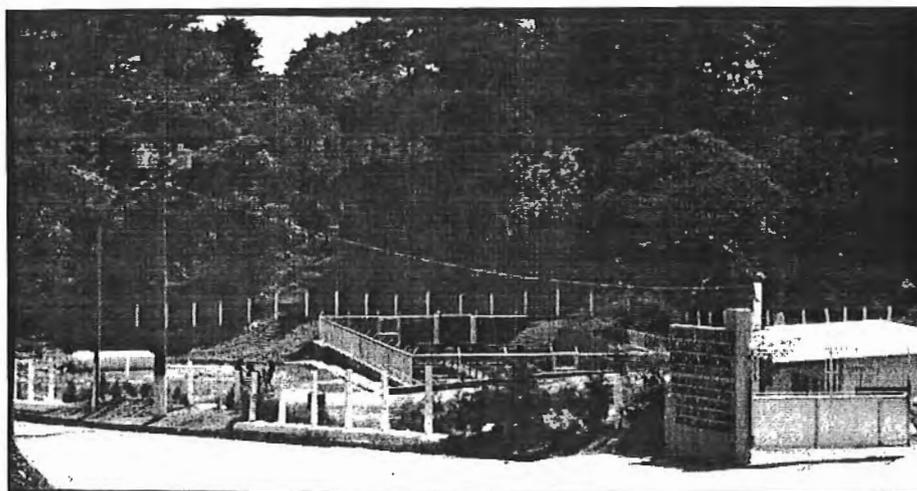
The project will provide upgraded transformers, translucent and raised roof, more efficient equipment (saws, sander, planer) and internal wiring at a cost of \$135,000. The project will result in major energy savings of about 25 %. The current monthly bill is about \$15,000 and is substantially higher because of peak power requirements that will be reduced with more efficient transformers and design. It will improve the plant working areas through reducing water leaks and providing better layout, ventilation and lighting. It is expected to improve production efficiency by 7 to 10 % and reduce overtime and mistakes (poor cuts, finishing) by 10 %. The plant uses only certified wood by the Forest Service (from managed forests), produces furniture from rubber trees (fast growing trees that are usually scrapped for fuel) and has won many environmental awards.



**Placing translucent panels in the roof will reduce electricity demand.**

### **Line extension for Municipal Sewage Treatment Plant**

The initial NRECA-USDA project provided a three-phase line extension for a wastewater treatment plant for the municipality of Fraijanes. The line cost of about \$29,000 (12 % of total project cost, including treatment plant) for six kilometers of line, three transformers, 60 poles and a service drop for a new wastewater treatment plant built by the U.S. firm of Wallace & Tiernan from New Jersey. The municipality paid for the plant, land and site preparation through a combination of federal and local funding sources. Homes in the town will pay for hook up charges and monthly operations. NRECA provided technical support for the line extension. The plant's capacity is 100,000 gallons, sufficient for 15 years of municipal growth.



**The sewage treatment plant in Fraijanes.**

The new sewage water treatment plant will have major environmental and health benefits since current septic tanks are inadequate and overflow onto streets. The wastewater was polluting streams and resulted in Dengue Fever for children. Water from the plant will be used for irrigation to grow tomatoes and other vegetables. It will also provide water for the municipal soccer field. Water will be metered at each house that will result in major water conservation.

### **Other Projects**

The program recently approved grid extensions for three coffee farms in Santa Cecilia, Los Angeles and La Providencia. These projects will increase productive capacities through upgrading coffee drying and sorting for improved incomes. The project is about to approve a grid extension for new low income housing in San Pedro, Ayampuc and for the municipality of Santa Maria. In addition, several micro-enterprises are getting together for line extensions for their woodworking and metal operations as well as a line of credit for electricity to an association of cooperatives in Huehuetenango, located in the Peace Zone. Two new villages, where refugees of the floods from Hurricane Mitch have been resettled, were provided with roofs, floors and collective water and sanitation. With separate funds, NRECA will provide grid extension to these 40 or so homes.

### **III. Rural Electrification and Privatization**

Guatemala has sold its electric distribution system to Union FENOSA, a Spanish firm. Under the privatization agreement, FENOSA is obligated to make connections to houses and businesses within 200 meters of the grid, and taps a "privatization fund" for more distant connections that are included in its rate base. However, 14 independent municipal distribution systems remain and off-grid, remote areas are not included in the agreement. The problem with this privatization approach is that FENOSA will make connections when it can use the fund (\$650 per connection) and is in no hurry to make nearby connections where costs are higher than potential revenues. There is little incentive for rural electrification, especially in remote areas of Guatemala where 800,000 villagers still do not have power.

The evaluator met with the Minister of Energy and Mines (Ministro de Energia y Minas), Raul Castaneda. The ministry provides regulatory authority but leaves it up to the marketplace for meeting electric needs. The government retains control over power generation (INDE) and is attempting to support continued rural electrification. According to the Minister of Energy and Mining, the government is considering applying the profits from power generation to off grid, rural electrification. The government's strategy is to force the private national utility, Union FENOSA, to do line extensions under its privatization agreement, help municipal systems extend their systems to rural areas and assist in isolated distributed systems such as along the Mexican border. The ministry is open to consumer ownership of distribution systems in remote regions.

There is a potential partnership with the NRECA-USDA Trust Fund to support independent municipal distribution system with upgrades, loss reduction programs and extension to peri-

urban areas; the creation of consumer-owned distribution systems in remote, less profitable regions; and productive uses of electricity in rural areas. This partnership would require a major increase in the trust fund and greater participation by the ministry.

#### **IV. Productive Uses and Micro-enterprises**

Banrural is owned by the government and micro-finance institutions (MFIs). It is in the process of becoming a second tier bank to wholesale loans through MFIs. In a meeting with the General Manager, Adolfo Gernando Pena Peerez, he expressed strong support for the NRECA-USDA Trust Fund as a means of helping micro-enterprises with electricity. He said, "Electricity is the key to micro-enterprises in rural areas." In particular, electricity is important for irrigation (replacing diesel pumps with alternative energy sources), small-scale manufacturing (sewing, carpentry) and the processing and drying of coffee and herbs such as cardamom.

NRECA and Banrural – partners in the trust fund – are interested in seeking increased resources from donors, lenders and others to expand their rural electrification program. Banrural manages the fund, determines creditworthiness and obtains guarantees from borrowers. The bank is linked to MFIs that, in turn, can help identify clients who require electricity for productive activities. With its technical know how, NRECA brings its experience in rural electrification, alternative power systems, productive uses, and design and contracting capabilities to such a partnership.

#### **V. Conclusions and Recommendations**

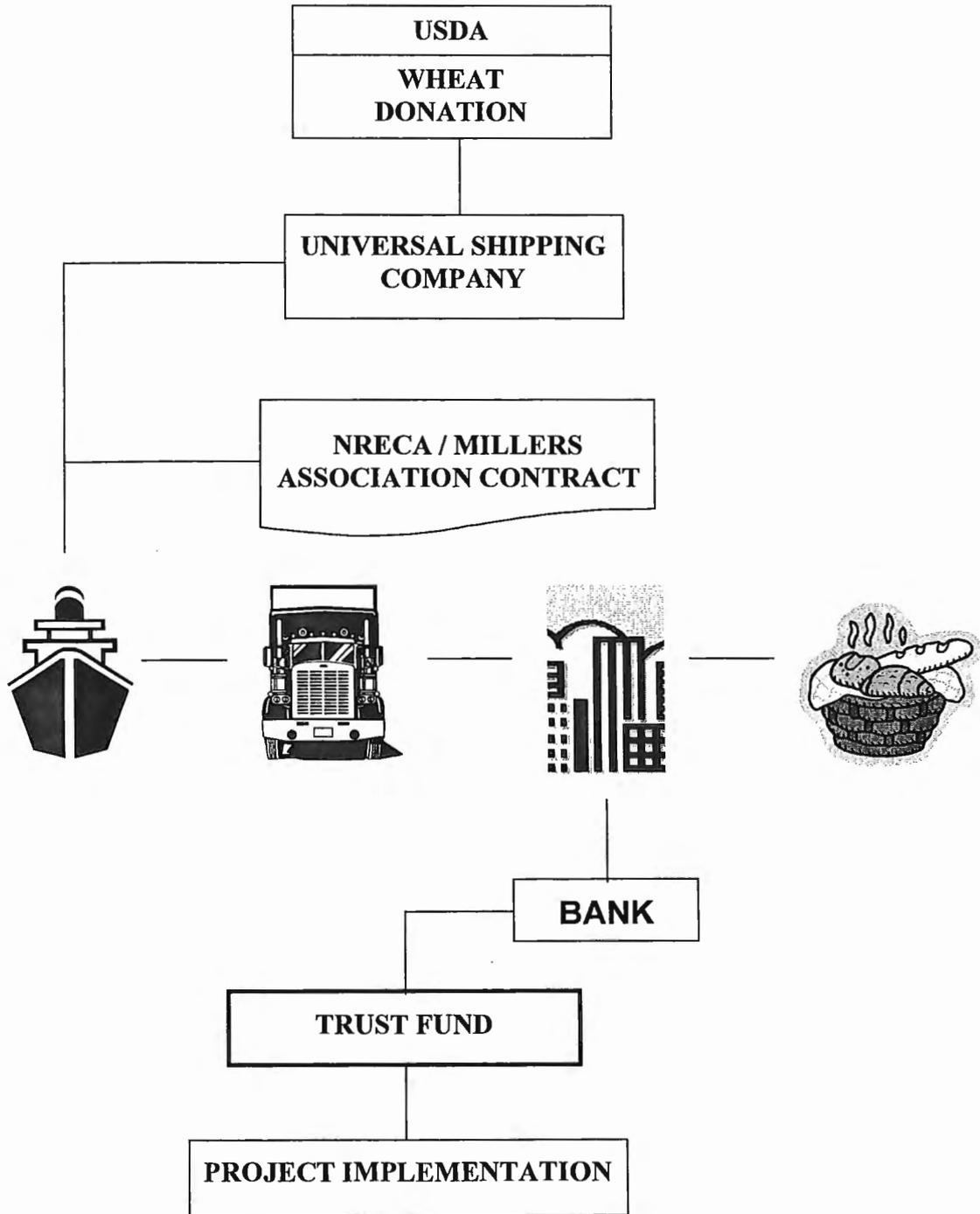
1. Electrification projects through the Trust Fund are having major economic and social impacts for rural Guatemalans. Project selection is sound with criteria that focuses on expanded productive activities of enterprises, line extensions from municipal distribution systems and off-grid, alternative power such as solar electricity to remote villages. Additional opportunities exist to expand projects to include electricity to micro-enterprises in remote area such as drying and processing of coffee and cardamom.
2. The monetization process from the point when quality, surplus wheat was shipped to the point it was delivered to seven Guatemalan mills for producing bread worked well. Local currencies are deposited in a local bank and transferred to Banrural that jointly manages the trust fund with NRECA. Two shipments of 10,000 metric tons of hard winter wheat (high in protein necessary for bread production) were provided each in 1999 and 2000. The monetization of wheat can be increased to 30,000 metric tons annually without any disruption in U.S. or local markets.
3. The trust fund substantially leverages counterpart contributions from private entrepreneurs, municipalities and local participants. The trust fund operates at near market rates (with technical assistance usually provided on a fee basis from NRECA outside of the loan itself). If the technical assistance were included in the loans, it would reach market rates. Banrural closely screens all applicants for creditworthiness and requires guarantees (co-signers for loans). Banrural has proven to be a strong partner in

the project. There was some delay in setting up the trust fund because of due diligence by NRECA.

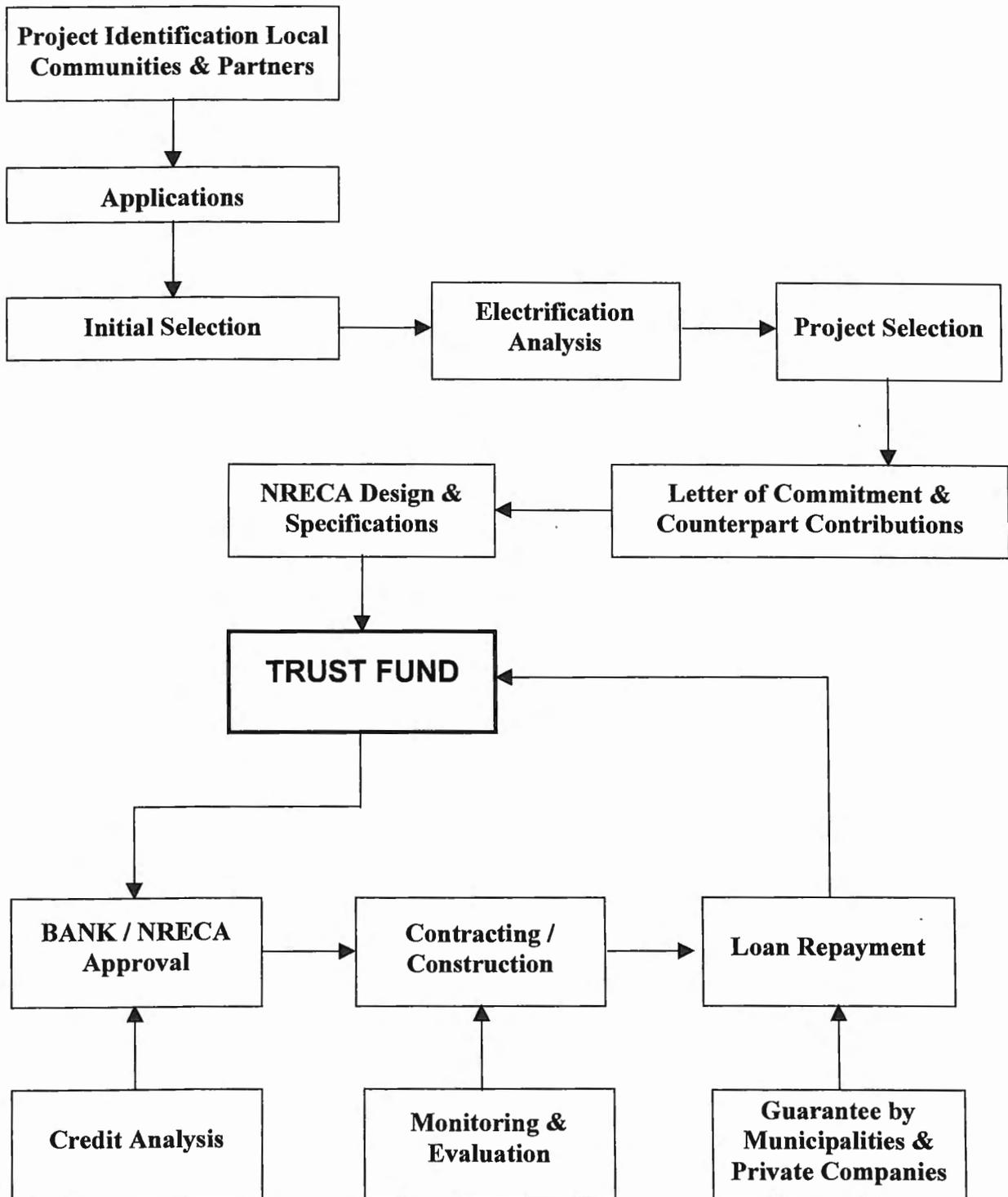
4. The trust fund should be enlarged with additional resources (including monetization) to fill the gap in the current Guatemalan efforts to provide electricity to 800,000 villagers. Union FENOSO, as a private utility, is unlikely to extend electric lines to areas that are not profitable, especially after the current subsidies for line extension (privatization fund) are exhausted. The trust fund can be used for line extensions from the 14 independent municipal distribution systems and to reach more remote areas, especially with off grid, alternative energy system such as a solar, wind and small hydro. Power projects, even for social activities such as home lighting, should be combined with productive uses to increase incomes of rural Guatemalans.
5. NRECA/Guatemala should focus on a major increase in the trust fund through seeking additional funds from USDA monetization programs, INDE power generation profits, municipal governments, cooperatives and micro-enterprises interested in isolated electric productive uses, and other donors. Specifically, NRECA should explore USAID's Direct Credit Authority and IDB's Multilateral Investment Fund as sources of additional funding or guarantees. NRECA should seek commercial bank funding for the trust fund based on its current and possibly additional guarantees.
6. NRECA/Guatemala should prepare an analysis of the energy privatization process and its impact on rural electrification. The analysis should make recommendations to the Ministry of Energy and Mining on how to achieve rural electrification under the privatization approach and make recommendations to other governments in the region that are using Guatemala's experience as their blueprint. In particular, lessons learned would be valuable to Honduras as part of a policy dialogue.
7. NRECA/Guatemala should integrate its project activities to better use surplus equipment to strengthen the municipal distribution systems. NRECA should consider carrying out an analysis of these system's equipment needs to match available surplus equipment from U.S. rural electric cooperatives. NRECA Guatemala also should explore obtaining surplus pickup trucks and "monetize" them as a strategy to increase resources in the trust fund. Vehicles could be provided to non-profit organizations including Banrural and other partners at near market rates.
8. NRECA/Guatemala should attempt to create a rural electrification network of partners who are committed to bringing power to unserved villages and enterprises. Partners should include local NGOs, cooperatives, MFIs, development organizations, the Ministry of Energy and Mines, INDE and others.

# Attachments

## 1. Electricity for Progress Project Monetization



## 2. Electricity for Progress, Project Implementation



### 3. Electricity for Progress, Projects in Guatemala

ID	Category	Name	Location	Responsible	Amount Required (Q)	Total Project Cost (Q)	Percent of Total	Beneficiaries	Status
1	PUE	Three-Phase Grid Extension for Water Treatment Project	Fraijanes, Guatemala	Marco Tulio Meda, Municipal Major	361,935	2,950,000	12%	28,000	Approved by BANRURAL, the project is in the execution phase. The project was authorized on February 2000.
2	SOLAR	Solar Home Systems in the villages: Manabique and Quetzalito	Puerto Barrios, Izabal	Mario Chigua, Municipal Major	82,800	240,800	34%	43	Approved by BANRURAL, the project has been executed. The project was authorized on August, 2000.
3	GRID	Grid Extension for Village Juan Pablo II Community	Zacapa, Zacapa	Carlos Pineda	77,000	110,000	70%	66	This project is now part of the RREICA portfolio projects.
4	SOLAR	Solar Home Systems in the village Nueva Esperanza	Ixcán, Quiché	Bonifacio Francisco Cuá	96,000	216,000	44%	36	Pending the other contribution
5	GRID	Grid Extension for Three Rural Villages	Fraijanes, Guatemala	Marco Tulio Meda, Municipal Major	243,360	405,600	60%	77	The work plan draft was delivered to the Municipality for its revision.
6	PUE	Calcium Processing Plant, El Terreadero, Agua Salobrega	Sanarate, El Progreso	Otto Ramiro Brán Véliz, Owner	110,000	500,000	22%	24	Technical design elaborated by NRECA which is preparing the documentation for BANRURAL
7	Grid	Transformer Station in Municipal Electric Utility of Jalapa	Jalapa	Mervin Sánchez		700,000	0%	8,000	The Municipality bought the transformer from another company that gave it a better price.
8	Grid	Tri-Phase Grid Extension for the Coffee Mill San Antonio / Anexo	Villa Canales, Guatemala	José Luis Del Cid, Owner	240,000			35	The Work Plan has not been completed; the business plan draft is ready for revision.
9	PUE	Energy Efficiency Project for Wood Processing Plant, Maderas de Milpas Altas	Santa Lucia Milpas Altas, Sacatepequez	Haroldo Montenegro, Manager	1,000,000			400	Collateral is still pending to be confirmed. Pending final approval.
10	PUE	Water Pumping System for Intensive Agriculture in Agro Dos Valles	Río Hondo, Zacapa	Hernan Roldan, Owner	150,000	300,000	50%	200	Waiting for the approval of the business plan by the client
11	PUE	Water Pumping System for Intensive Agriculture San José	Teculután, Zacapa	Hernan Roldán, Owner	150,000	300,000	50%	200	The client found a better credit plan.
12	Grid	Sincronization Project in Hydroelectric owned by Municipal Electric Utility of Retalhuleu	Retalhuleu	Municipal Electric Utility	-	-		4,800	The client has not presented the credit request form; the project profile has not been created by NRECA.
13	PUE	Municipal Pumping System	San Jose Nacahuil	Eduardo Avalos Figueroa, Municipal Major	168,000	324,535	52%	12,000	The work plan in draft was elaborated, pending the project profile elaboration.
14	PUE	Wood Industry WorkShop	Cubulco, Baja Verapaz	Juan De La Cruz	36,687	51,012	72%	6	Rejected because it has not applied for credit. It is possible that they get together with the project No. 15 to make a better project profile.
15	PUE	Metal Workshop	Cubulco, Baja Verapaz	Juan De La Cruz	27,263	41,213	66%	6	Rejected because it has not applied for credit. It is possible that they get together with the project No. 14 to make a better project profile.
16	PUE	Municipal Pumping System for Village Chijax	Chimasat, Chimaltenango	Raymundo Juárez, Municipal Major	342,224	570,373	60%	33	Documents have to be completed by the authorities also pending business plan.
17	PUE	Coffee Mill La Nueva Esperanza of Xibalbá	Cubulco, Baja Verapaz	Emilio Santos	45,000	75,000	60%	60	Documents have to be completed by the owners also pending business plan.

\* Conversion rate: US\$1 = Q 8 (Q = Guatemalan Quetzales)

18	PUE	Water Pumping in Village of Chillani	San Pedro Sacatepequez, Guatemala	Edgar Ajcip, Municipal Major			-	400	Waiting an answer from the authorities
19	PUE	Municipal Pumping System for San Pedro Sacatepequez	San Pedro Sacatepequez, Guatemala	Edgar Ajcip, Municipal Major	300,000		-	0	Waiting an answer from the authorities
20	GRID	Three-Phase Grid Extension and Bank of Transformer for Coffee Farm Santa Cecilia	San Pedro Necta, Huehuetenango	Mariano Castillo Herrera, Owner	164,219		-	120	Completing the final details.
21	GRID	Three-Phase Grid Extension and Bank of Transformer for Coffee Farm Los Angeles	San Pedro Necta, Huehuetenango	Ana María Ortega Villatoro, Owner	73,901		-	130	Completing the final details.
22	GRID	Three-Phase Grid Extension and Bank of Transformer for Coffee Farm La Providencia	San Pedro Necta, Huehuetenango	Virginia Del Tránsito Pinto Aguirre, Owner	164,220		-	150	Completing the final details.
23	PUE	Metal and Wood Shops in San Juan Ixcoy	San Juan Ixcoy, Huehuetenango	Andrés Tercero Bautista	155,340	235,340	66%	12	Completing the final details.
24	GRID	Grid Extension for New Housing Project for Low Income Families	San Pedro Ayampuc, Guatemala	Walter Osvaldo Marroquín Quintana, Manager MARBOLE.	60%	40%		900	Pending approval by the internal committee and by NRECA / USA.
25	PUE	Umbrella Credit for Small Coffee Growers with ASDECOHUE	Huehuetenango	Daniel Palacios				2,000	Pending definition of the program and approvals
26	GRID	Grid extension as part of the Municipal Rural Electrification Plan	Santa María Cahabón, Alta Verapaz	Mariano Caal Choc, Municipal Major	2,100,000	3,790,267	55%	923	Pending final coordination and agreement for technical assistance contract.

#### **4. Evaluator's Resume**

Currently, Ted Weihe is Executive Director of the U.S. Overseas Cooperative Development Council which consists of eight national cooperative organizations engaged in over 75 long-term projects in some 60 countries with over \$155 million in annual revenues. He is also a consultant and evaluator for these organizations.

He has initiated over 30 successful development projects worldwide, totally some \$100 million, including telephone cooperatives in Poland, alternative micro-finance for small businesses and NGOs in Romania, dairy associations in Albania, Bulgaria, Montenegro and Poland, Farmer-to-Farmer volunteer programs worldwide, and cooperative development in the West Bank. He initiated Participa, one of the most successful grassroots democracy programs in Chile that was instrumental in its return to democracy.

He has prepared over 30 evaluations, conducted strategic planning workshops and published numerous articles including for the Christian Science Monitor and the Washingtonian. He was a contributing author to Promoting Democracy: Opportunities and Issues (Praeger, 1988).

Currently, he serves on the USAID Advisory Committee on Voluntary Foreign Aid and led its partnership efforts to revise its Strategic Plan. Mostly recently, he gained passage of the Overseas Cooperative Development Bill that expands USAID's mandate to promote all types of cooperatives overseas. He founded the Campaign to Preserve U.S. Global Leadership, composed of over 300 companies, NGOs and the U.S. Chamber of Commerce, that has reversed the decline and helped increase the 150 International Affairs Account by over \$2 billion.

He serves on the executive committee of the Cooperative Development Foundation and chairs its United Cooperative Appeal which last year raised \$100,000 for domestic and international cooperative development. Prior to his current position, he was coordinator of USAID's cooperative development programs and worked in USAID's Bureau of Legislative Affairs. He led public policy efforts for the National League of Women Voters in international and environmental issues including co-chair of the National Clean Air Coalition and organizer of a broad-based coalition of NGOs for foreign assistance reform. He headed a regional citizen group involved with urban growth issues. He has been a Hill reporter for a trade association and a Captain in the U.S. Air Force.

He is active in numerous Arlington civic organizations including serving as chairman of the Neighborhood Conservation Program and the Committee of 100 as well as president of the Yorktown Civic Association.

He holds a B.S. in Foreign Service from Georgetown University and a Masters in Environmental Planning from the University of Virginia

**DISCUSSION PAPER**

**TOWARD AN ACTIONABLE STRATEGY FOR INDIA'S  
NON-URBAN ELECTRIC DISTRIBUTION SECTOR**

**Prepared for the IDFC Power Sector Policy Advisory Board**

**Paul J. Clark  
NRECA International, Ltd.  
Arlington, Va.**

**May 2000**

# **Toward an Actionable Strategy for India's Non-Urban Electric Distribution Sector**

**NRECA International, Ltd.  
May 2000**

## **A. Suggested strategy for the non-urban electric distribution sector**

### **1. Background**

The inter-relationship between the evident operational and commercial inefficiencies and large un-funded liabilities/mandates (*i.e.*, subsidies) that are afflicting India's electric distribution systems, on one hand, and the capital access constraints of the SEBs, on the other, is well defined in the IDFC power sector draft Vision Paper. A combination of (a) subsidies to large classes of consumers and (b) overwhelming losses resulting from theft, under-billing and under-collection of bills, and technical inefficiencies due to deferred maintenance and investment has rendered distribution investments in non-urban areas unattractive to investors. Hence they remain a financial burden on government and on other consumers, especially industry, who cover these losses. Investors would be willing to take on the urban sector, but the prevailing policy trend is against transferring these economically more attractive distribution systems apart from the non-urban sectors, with all of their losses and lower revenue potential. The consequence is that the entire distribution sector could remain fenced off from private operators' management expertise and capital. In the meantime, the distribution systems remain in their existing state of mismanaged deterioration, making the situation all the worse.

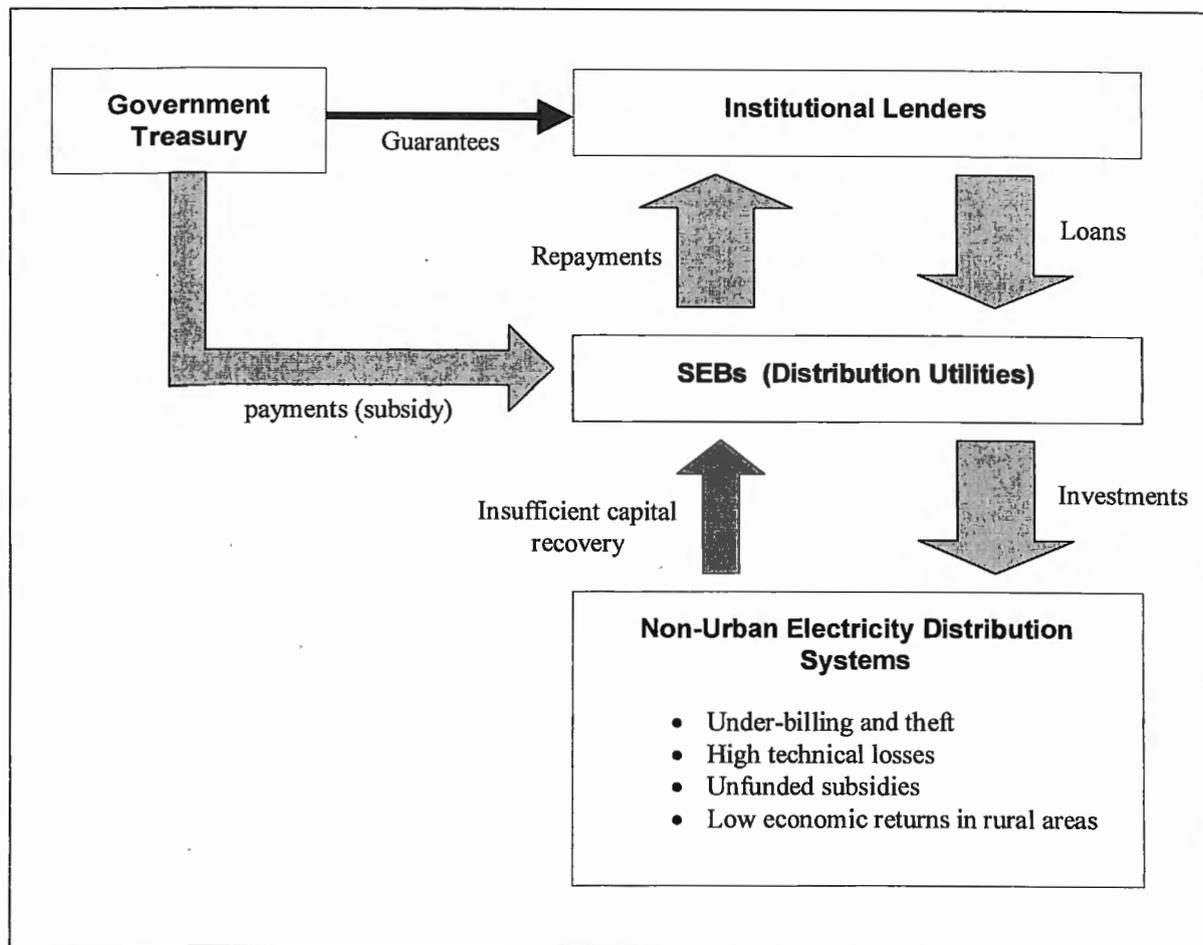
As implied in the Vision Paper, the consequences are more far-reaching. Some of the broader sector goals outlined in the paper – *e.g.*, increasing the rate of deal closure on IPP contracts and widening the flow of private capital into the power sector, in general – will remain hostage to the logjam at the distribution level. Increasing rural electrification, one of the implicit goals of the government's broader power sector restructuring strategy, is another of the hostages. The only likely source of financing for

rural electrification, under these conditions, will be from State and Central Government treasuries, since the major institutional lenders would not be inclined to 'throw good money after bad.'

In short, it is arguable that the distribution dilemma must be resolved in order to accelerate the flow of new financing into the power sector and into expanding electricity access. More specifically, a solution is needed for the non-urban distribution sector, constituting 40% of all electricity use in the nation. There are three economic hurdles to overcome:

1. A high percentage of usage is by subsidized classes of consumers, but there is no defined system of subsidy transfer from government who granted the subsidies to these consumers. As a practical matter, State budgets end up bailing out the SEBs. Larger users pay higher tariffs, an economic distortion that pays some of the subsidy. Thus far, sector reforms have not effectively addressed this issue, evidently leaving it to the inheritors of the SEB distribution system to absorb these losses in some manner or other.
2. Technical and administrative losses are high where SEB personnel are not diligent about going into villages and homes to collect bills and stop theft. There is also corruption, which accounts for some of the losses. Distribution utilities are permitted to build a loss allowance into their tariff but these are not sufficient to cover the gap; furthermore, utility regulators in reform states can be expected to reduce these allowances.
3. Financial viability in rural areas is low, even without losses and subsidies. NRECA's experience with rural electric cooperative development projects around the world is that, typically, up to a decade or more of load growth is needed to achieve a commercially feasible scale of operation and, therefore, some form of subsidy is required initially.

As a general option for addressing the non-urban sector, NRECA proposes a strategy made up of several components, in two separate stages, which may be implemented under a variety of State distribution sector policy stances and ownership structures. The strategy also implies a *lead investor* role for IDFC, possibly in a consortium relationship with NRECA and others. The strategy requires the following elements:



**Fig. 1. “Non-Urban” Electric Distribution Sector (Existing Dysfunctional System)**

- A policy<sup>1</sup> to adjust the existing rural distribution configuration, at the utility administration level, into appropriately-sized segments that can be organized to serve locally managed *energy cooperatives* at a feasible economy of scale. These service territories, in effect, would not be separate, poles-and-wire distribution utilities, at least initially. Rather, they would be administrative sub-divisions of an existing distribution utility, commensurate in size and service area to serve the new energy cooperatives. The envisioned cooperative format would similar to

<sup>1</sup> This policy could be adopted by an SEB or a private distribution utility with non-urban as well as urban territory, provided in the latter case that the government adopts a parallel policy to provide funding support. A determination is needed as to whether any legislative or regulatory action would also be required.

a new type of electric cooperative that is emerging in the U.S. as a result of new policies aimed at stimulating competition by opening access to the retail market.

- A conforming administrative and legal system for contracting, sub-licensing, leasing, or other legal instrument to engage competent management and operational expertise for a period of time to implement a combination of (a) support services to the new energy cooperative and (b) improvements to the distribution company's electric distribution infrastructure according to a prescribed and pre-approved plan.
- A qualified agent who can bring specialized expertise to the task of optimizing the efficiency of rural-based electric distribution systems, and -- in particular -- who can also serve in the role of sponsor/developer of energy cooperatives.
- A system for assuring access to reliable power by energy cooperatives that are successfully formed.
- A dedicated, soft-term funding mechanism to make rural electrification investments commercially sustainable on a project-specific, needs-determined basis.
- A local authority empowered to act on behalf of the State government (*e.g.*, SEB or a special rural electrification corporation as is being set up in West Bengal) to provide for, and administer, any necessary contractual mechanisms (*i.e.*, distribution system transfer and distribution system operator engagement) and rural electrification funding.

The last two elements are not required to address the basic problems in the distribution sector. However, it is suggested that the strategy should incorporate a reasonable plan to expand rural electric service as part of the States' distribution reform strategy for political and social reasons.

## 2. Non-urban Electric Distribution Strategy Activities

*Activity 1: Fix the distribution system.* The first activity of the strategy is to undertake a program of physical and operational improvements in the distribution infrastructure resulting in (1) increased reliability (minimize service interruption), (2) more uniformity in the voltage quality at the consumer level, (3) reduction in system losses, and (4) appropriate metering and cost recovery of *all* energy consumption. This activity accomplishes two important objectives. First, it provides the basis for changing consumer attitudes toward accepting responsibility to pay for the service by offering better quality of service. There is no future in cooperative development, nor for that matter in any other type of strategy to increase the rate of billing and bill collection, without accomplishing tangible improvements in the service quality. Second, since this step implies a major reduction in system losses (technical and non-technical) it could generate a source of internal financing to implement the broader strategy including a cooperative development program with a variety of customer service and development features, plus contributing to the implementation cost of extending rural service.

*Activity 2: Develop the energy cooperatives.* The second activity entails a voluntary system of cooperative participation and organization. This activity will involve the establishment of the co-op charter, by-laws, policies and procedures that would cover aspects such as membership fees/equity contributions, election of directors, staffing, disconnections/reconnections, *etc.* The cooperative development activity would be implemented at time of the service connection/metering improvement during the distribution efficiency improvement activity. Importantly, it is suggested that this entail offering a package of benefits that would be available to any who join the cooperative. The cooperative benefits could consist of the following items:

- discounted electricity rates, linked with the value of avoided bill collecting costs;
- access to demand-side energy services and other energy services (*e.g.*, LPG distribution);
- credit and technical assistance in end-use promotion, especially for income-yielding investments in machinery and equipment; and

- cost discounts for service connections for new electricity customers.<sup>2</sup>

NRECA's concept would also provide opportunity for co-op members to participate in the distribution improvements program, which is described further in the Section B.

All of these features are mutually supporting in a "win-win" operational model. Lowering the cost of energy as a component of the retail tariff, increasing service connections (densification of load), and intensifying energy sales through end-use promotion add to capacity utilization of the distribution system and to the distribution company's revenue base. Also, the demand-side elements add to the net energy value enjoyed by the consumer. As indicated, not every consumer in the co-op service territory need join the co-op to make it feasible. However, NRECA believe that, if the program is properly presented, most people who have the opportunity to join the cooperative would do so. This would facilitate the successful implementation of the cooperative development component, as will be shown in the Section B of this paper. Consumer awareness building and public education will be required to achieve this stage successfully. Identification and recruitment of community leaders and opinion-makers will be important, since universal participation may be necessary to assure the success of the scheme.

*Activity 3: Arrange reliable power supply.* The third and crucial activity, which must be planned for and secured in advance, is an air-tight arrangement to deliver wholesale power to the cooperative on a reliable (non-interruptable) basis. In some cases, a complementary investment in distributed power in a captive arrangement, most likely involving an energy wheeling/trading/stand-by purchase agreement with the SEB (or its successor), may be necessary in order to assure that the overall system reliability level is sufficient to achieve the attitudinal change among consumers. There is little point in undertaking any of the foregoing activities without this component firmly in place.

*Activity 4: Carry out rural electrification.* Finally, the fourth activity, which will constitute a separate stage entirely and will be possible only after

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<sup>2</sup> NRECA is able to obtain quantities of meters and service drop material from its member cooperatives in the U.S. which could make it possible to offer this as a promotional tool, to the extent that these donations are available.

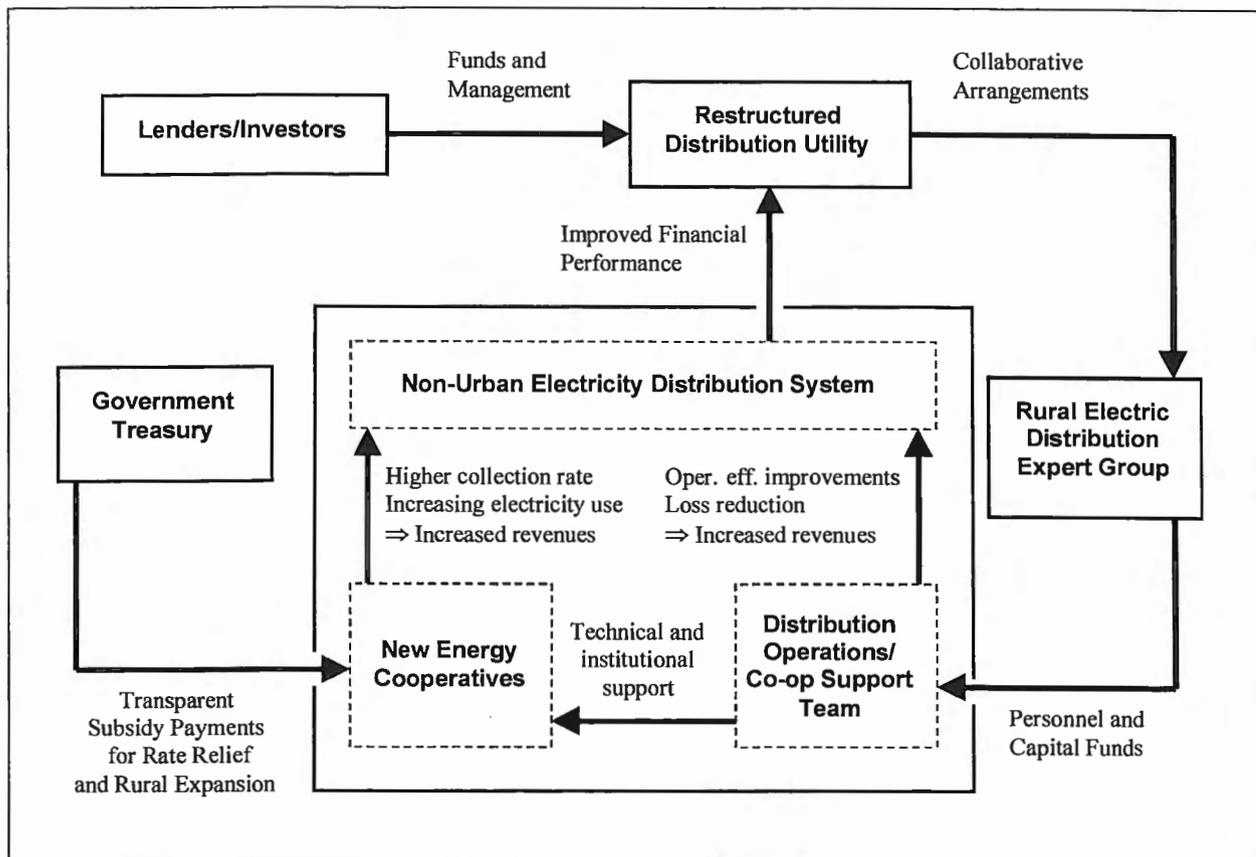
the aforementioned components are completed, is financing and execution of rural electrification extensions as additions to the distribution system *and* to the cooperative. The cooperative will participate in sponsoring and financing rural electrification extensions and the distribution system expert/operator would execute the extension. Rural extensions will be undertaken on the basis of an engineering and financial analysis of each extension project. Those that are economically feasible will be financed in one of two ways: commitment of long-term concessional-rate financing from the dedicated rural electrification finance facility or commercial-term financing supplemented by a contribution-in-aid of construction by the same facility and/or other donors. In either case, the concessional portion of the construction cost financing may be determined by the financial analysis which takes into account the demand level, the construction cost, and the tariff structure of the cooperative to yield the amount of financing aid necessary, and in a transparent and economically valid system.

Figures 2 and 3 present a general view of the envisioned new structure for non-urban electric distribution management.

### 3. Discussion

*An essential assumption underlying this strategy is based on successful NRECA experience suggesting that, even low-income rural consumers value having access to good-quality, consumer-friendly electric service. Under such conditions, furthermore, consumers can be made to participate in a giving-value-for-receiving-value public utility economy. This is the fundamental "touchstone principle" that must be put to work.*

Packaged with member support to maximize the economic efficiency and benefit of electricity service, this was the hallmark of the highly successful experience of the U.S. rural electrification program that drove an economic juggernaut across the rural expanse of the U.S. during the middle decades of the 20<sup>th</sup> Century. A similar story has been unfolding in the rural areas of Bangladesh during the past 20 years under the supervision of USAID-funded support by NRECA.

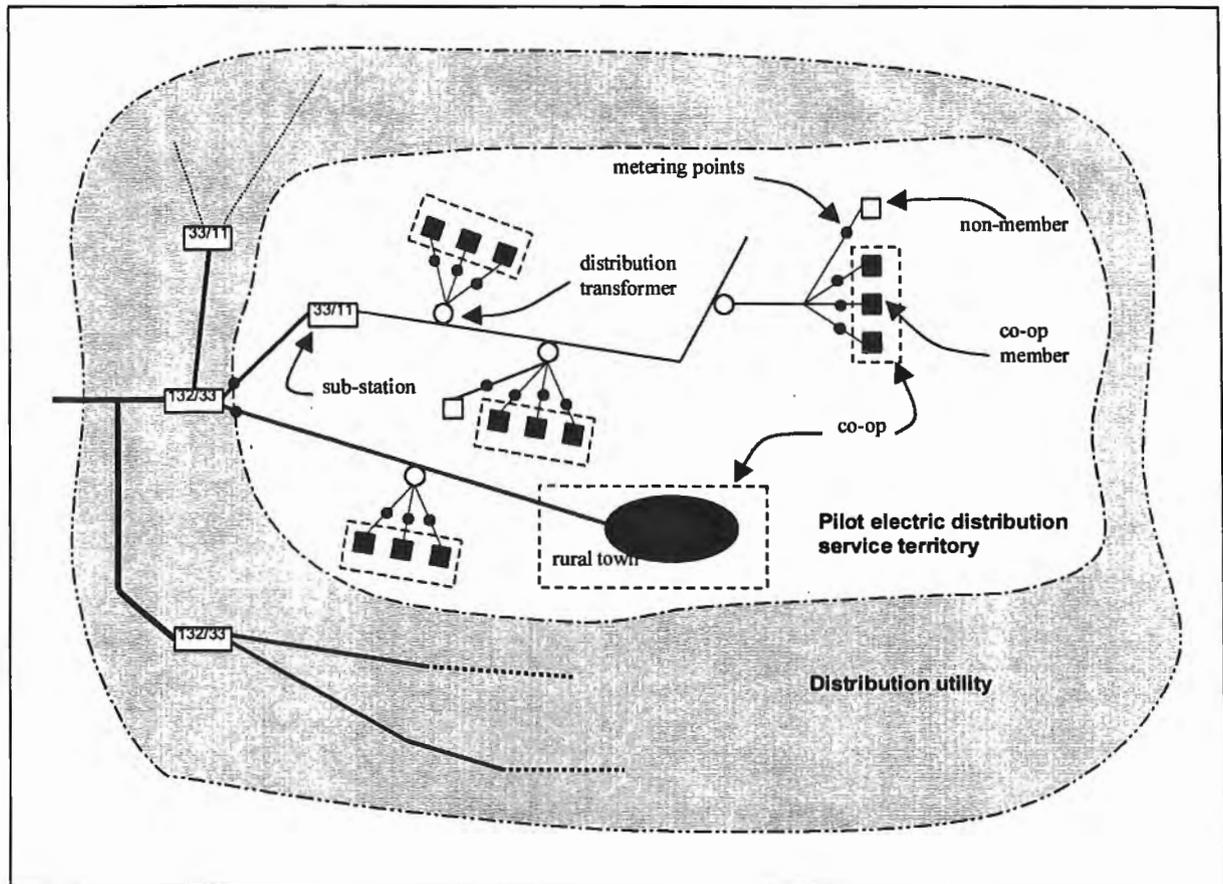


**Fig. 2. “Non-urban” electric distribution sector under re-structuring.**

The strategy’s main operational concept is to separate distribution from the retailing function of today’s SEBs as a way of isolating the separate problems of distribution inefficiency and bill collection. This will allow work to proceed on distribution investments with the returns accruing to those making the investments and/or operators they engage, facilitate transparency in allocating energy consumption subsidies, and also establish a rational system of rural electrification investment. Such a system would also facilitate subsidy transfers to classes of energy users who qualify for specially-priced energy rates administered at the wholesale market,<sup>3</sup> as a

<sup>3</sup> NRECA does not endorse the notion of energy subsidies, except perhaps in a “power preference” rule exception where rural energy cooperatives are granted access to the output of lower-cost power facilities owned by the State. The primary form of subsidy recommended for rural electrification would be in the form of capital grants-in-aid of construction payable to distribution entities who would be required to make extensions on the demand of new energy cooperative groups.

more efficient way for government to deliver benefits to the poor. Moreover, if and when true market competition occurs, this aggregation arrangement also allows the energy co-op members, even at the low-end of the electricity retail market, to take advantage of consumers' new liberty to seek lower-cost energy in the wholesale marketplace.



**Fig. 3. Illustrative example of the makeup of a pilot electric distribution service territory.**

Looking down the road, it is worth noting that this general model applies equally to urban and industrial sectors, even after restructuring effects improvement in the basic service quality of the T&D system, especially for smaller commercial and industrial users. That is, aggregating into groupings of electricity consumers could be found to be advantageous by urban housing cooperatives, industrial parks, small towns, *etc.*, in order to arrange for better electricity prices in an open market. In States of the U.S.

U.S. that have moved into the era of “open access,” NRECA is finding consumer aggregation cooperatives to be a viable and attractive option across a wide range of different consumer types covering all of these examples.

It should be evident in this strategy that the role of government is strictly confined to various enabling measures, especially in the financing aspect of rural electrification, with no direct involvement in the cooperative development and support, other than regulatory functions. The basic weakness of the electric cooperative experience in India to date can be traced to the “top-down” and political orientation of these efforts and also to the absence of a nurturing and powerful support agency in areas of technical assistance, intervention with government policy, and other strategic services. This implies that the implementation of the strategy be carried out essentially in a private-sector mode. It is recommended, therefore, that the strategy’s implementation focus primarily in States that are reform-minded and where international donors are active in supporting the process.



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## **44 MW Coal-Steam Power Generation Plant Donation**

Wolverine Power Supply Cooperative is a Generation and Transmission (G&T) Cooperative headquartered in Cadillac, Michigan selling wholesale electricity to five electric distribution cooperatives in central-northern Michigan. The distribution cooperatives own and govern Wolverine, and together serve 192,000 member/customers. In 1953, Wolverine built and commissioned a new coal-steam power generating facility located on the shore of Lake Michigan near Charlevoix. The plant was expanded in 1968 with a third unit and upgraded again in 1993 to reach a maximum generating capacity of 44 megawatts (MW). In recent years, Wolverine's management and Board determined that the Charlevoix facility would no longer be competitive with other supply options and de-commissioned the plant in 1998. That year, Wolverine began discussing the possibility of donating the plant to NRECA's international program to use as part of its international program. Wolverine is planning to put the facility up for scrap value if no use for it can be found.

This complete, fully operational plant has a replacement value of approximately \$50 million. The plant has 3 units, one of 29 MW installed in two stages 1968 and 1993, plus two original turbine-generators of 7.5 MW each that operate in tandem with a single boiler. The plant generates at 13.8 kV and transformers step this up to a transmission voltage of 69 kV. The plant was retired due to rising operational cost primarily due to the increasing cost of labor in the U.S. This plant uses coal as its primary fuel with fuel oil as the auxiliary fuel used only when the coal is extremely wet. The heat rate for this plant is about 13,000 BTU/kWh. The kWh output cost averaged between US\$0.04 and US\$0.05 when it was operational.

Wolverine has made this asset available to NRECA for only a limited amount of time. NRECA would like to use the facility as part of an on-going or planned electrification program overseas, and will accept Wolverine's offer only if the financial, operational and all other arrangements are clearly defined and committed, including funding for a feasibility study. The entire plant is available as-is, including coal conveying equipment, boiler, turbine/generators, substation, and other accessories. It must be disassembled, packaged, and shipped to destination. Some equipment uses PCBs and asbestos which must be removed and properly disposed of. The buildings are bolted-steel construction and capable of being disassembled in a manner that can be reassembled. Rolling stock, including a crane and coal handling equipment, does not convey with the plant and would have to be procured separately as part of the cost of reinstalling the facility to operational status. Once financing can be arranged, NRECA would supervise a feasibility study to determine the technical, institutional, and economic bases of the project including the total cost and implementation plan and timetable.

**Wolverine Power Supply Cooperative  
44 MW Coal-Steam Power Generation Plant at Charlevoix, Michigan**

**General Operating Specifications**

**Units #1 and #2**

- Boiler was manufactured by the Springfield Boiler Company in 1952
- Installed in 1953
- Steam flow is 90,000 lbs/hr at 625 psi, 825 °F
- Fuel: pulverized coal
- Auxiliary fuel: fuel oil
- DeLaval steam turbine/generator set, rated at 7,500 kW each
- Heat rate: approximately 13,000 BTU/kWh at full load

**Unit #3**

- Boiler was manufactured by the Babcock & Wilcox Company in 1965
- Installed in 1968
- Steam flow is 250,000 lbs/hr at 880 psi, 950 °F
- Fuel: pulverized coal
- Auxiliary fuel: fuel oil
- General Electric steam turbine/generator set, rated at 22,000 kW
- Unite steam turbine/generator was upgraded in 1993; operates at approximately 29,000 kW
- Heat rate: approximately 12,500 BTU/kWh

