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**International Partnerships in Renewable
Energy: Promoting Climate Challenge
Partnerships by Small U.S. Utilities
Final Project Report**

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**NRECA INTERNATIONAL, LTD.
Arlington, VA
February, 1999**

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**International Partnerships in Renewable Energy:
Promoting Climate Challenge Partnerships by Small U.S. Utilities
Fourth Project Report**

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Final Project Report

International Partnerships in Renewable Energy: Promoting Climate Challenge Partnerships by Small U.S. Utilities

Background

The National Rural Electric Cooperative Association (NRECA) received a grant in October, 1996 from the Department of Energy (DOE) to implement a program to promote the participation of small U.S. electric utilities in Climate Challenge projects. The purpose of these projects is to introduce U.S. electric utilities to the process of reducing greenhouse gas emissions through investments in energy conservation, energy efficiency, and renewable energy technologies. Towards this end, NRECA's strategy has been to both to work in developing country electric sector environments to identify and profile project opportunities as well as to educate and promote investment opportunities within the community of small U.S. electric utilities. Promotional program through training provided in seminars, information brochures, and through the orientation regarding the benefits as represented in the pilot projects. This document will provide a quarterly summary of progress for the activities undertaken in implementation of this DOE-financed project.

Summary of Activities and Program Results

In this final report, two projects will be highlighted. Activities in Central America to promote the use of renewable energy technologies through the use of wind and biomass power will be described as well as the on-going efforts NRECA has been managing to continue the process of electrification in Bolivia. In addition, a summary of the promotional activities will be provided that have included the development of a web page in the NRECA web site and direct outreach activities that have.

As the Climate Challenge Partnerships by Small U.S. Utilities program comes to a close, NRECA has seen that this program has been difficult to sell in the face of an undefined position with respect to the Kyoto accord. Many of NRECA's members and associate members have been very interested in participating in greenhouse gas reduction programs, but have generally taken a "wait and see" attitude with respect to investments. While NRECA has found an abundance of good will and interest in investing in environmentally sound projects, most small utilities would prefer to do so once their benefit streams can be better valued from both financial and fiscal perspectives. NRECA believes that this will be the challenge that DOE will face in future programs.

Nonetheless, the activities that have been undertaken have been largely successful. NRECA has focused on two areas that include promotion and identification of projects in the field, and promotion of participation of NRECA members as well as other small utilities in these projects through outreach programs in the U.S. NRECA has used its extensive network of contacts to leverage participation, and has received donations of equipment as well as commitments to co-finance projects such as the Sonora solar

electrification project and the Bolivian solar electrification program. These activities will be described in more detail in the following sections.

Central America Program Financing Strategy

The focus of activities in Central America has been to both identify a large number of renewable energy projects as well as to design, develop, and launch an appropriate mechanism for mobilizing and coordinating resources among the participating beneficiaries (e.g. electric cooperatives worldwide). The result of the financing mechanism will be to coordinate project development effort as well as to solicit carbon emissions credits. Further, the project financing mechanism will serve as a focus of promotion activities for small U.S. electric utilities and among counterpart utilities in participating countries.

The mechanism's financial feasibility, its overall sustainability, and its ability to succeed from a capital subscription standpoint and from an operational standpoint as an investment vehicle, relies largely on the quality of projects that are identified. The funding provided through the DOE Climate Challenge project has been used to generate over 400 projects in Guatemala alone and many more in Nicaragua, El Salvador, and Honduras. Moreover, a significant portion of future development funds will be dedicated to further strengthening the financing mechanism's portfolio of high-impact projects. Projects will be selected that satisfy all of the following criteria:

- Increase efficiency in terms of better delivery and use of energy and plant capacity, provide quantifiable reduction or avoidance of GHG;
- Promote the principle consumer participation through cooperative formation and direct participation in energy saving programs;
- Facilitate compliance with regulatory and other policy standards relating to efficiency and quality of electricity service;
- Improve the capacity of the host cooperative to serve its membership and service area constituency; and
- Afford opportunity for application and export of U.S. technology products and equipment.

With respect to the projects themselves, NRECA is working on several fronts. It has worked and continues to work on models for sustainably implementing renewable energy projects that include mini- and micro-hydro projects in isolated, off-grid communities. It has been actively pursuing wind and biomass generation projects for on-grid power production and fuel substitution.

In the area of energy efficiency, NRECA has been working on distribution improvements

that include training and technical assistance to reduce technical and administrative losses, SCADA development matched with load management; and technology/operational improvements for electric utilities in several countries. These efforts are focused on modernization of practices and technology used in electric distribution systems as well as fuel substitution efforts through the introduction of renewable energy systems.

Once the financing mechanism is fully functional, it will invest in energy efficiency and renewable energy projects that include fuel substitution (principally wind energy systems); solar photovoltaic electrification programs; biomass and small hydro distributed generation; and wind-hybrid systems for village electrification. Moreover, in recent negotiations with two local banking institutions, commitments have been made for up to \$5 million per year to invest in rural electrification projects, the majority of which will be for renewable energy and energy efficiency projects.

Bolivia Solar Electrification Initiative

Over the past several years, NRECA has developed an extensive solar electrification initiative in Bolivia. The focus has been on providing electric service to areas that cannot be economically connected to grid service via installation of solar home systems that consist of a modest 50 Wp solar panel, a charge controller, a storage battery, and light fixtures.

The key in all rural electrification projects is to insure that the projects will be sustained through collections for service provided over the long term, and to likewise insure that the technology that is used will be adequately maintained and will provide reliable service. Therefore while NRECA has focused a great deal of effort on developing reliable technical solutions for its solar electrification program, it has worked equally diligently on designing appropriate and sustainable institutional structures.

Projects have been financed in several areas including the Department of La Paz, the Department of Santa Cruz, the Department of Oruro, and the Department of Chuquisaca. The Government of Chuquisaca expressed an interest in developing a 200 module solar electrification program in 1998 which would be co-financed by GPUI, a U.S. electric utility that owns and operates a power generation station in Santa Cruz, Bolivia.

With this in mind, NRECA developed the bid specification and reference documentation to manage the Chuquisaca solar program. The solicitation was completed in November, 1998 and equipment delivery is expected in early 1999. The expected cost of the project will be \$145,000 for the solar home systems and an undetermined amount for cost of schools and water pumping systems. Project costs will be shared by the Government of Chuquisaca, GPUI, and the beneficiaries themselves. DOE has supported the project development efforts for this project as well as a portion of the cost of the bid specification and management process. All equipment will be purchased from U.S. and local Bolivian suppliers (electronic items that can be assembled in Bolivia will be purchased there while solar panels and other accessories will come from U.S. suppliers).

The project will directly benefit 200 families (approximately 1,200 persons) and, through the school electrification and water pumping program benefit approximately 1,000 additional families. A conservative estimate of the carbon savings is 1,000 metric tons over the 20 year life of the solar photovoltaic systems.

In the future, NRECA will solicit funding from the rural electric cooperative community for projects like this one in Bolivia and other Latin American countries. NRECA has completed a market study for the installation of solar home systems and estimates the market at 1,000 installations per month for at least five years. This market is realizable if the cost of the systems can be restricted to about \$600 each.

Projects are also underway in Oruro and Santa Cruz, and requests for solar electrification projects are presented to the NRECA/Bolivia office every month for communities across Bolivia. In a similar manner to the financing infrastructure that has been developed in Central America, NRECA believes that the future for solar rural electrification will be sustained through a rural electric financing institution. The institution will channel investments from electric utilities and other financing sources to projects that satisfy an appropriate set of project development criteria.

Sonora, Mexico Solar Electrification Initiative

As was reported in the last periodic report, the Sonora solar electrification project was completed in early 1998. The project resulted in a total of 97 families receiving electric service through solar photovoltaic systems in a project that was cost-shared by Arizona Electric Power Cooperative and Salt River Project.

Since completion, NRECA has been working with both project sponsors and a third party to seek expansion of the program to the entire state of Sonora. A copy of the proposal that was developed is included as Annex 1 to this report.

Promotional Activities

Promotional activities for the Climate Challenge program were initiated at the outset of the project when NRECA developed an information brochure and held an introductory session during the 1997 NRECA Annual Meeting. NRECA staff have also promoted the program through a series of direct meetings with NRECA members and through meetings with groups of electric cooperative members at regional meetings.

NRECA also developed a web page in which it advertised the projects it developed under the climate change program. The URL for the web page is www.nreca.org/about/international/climate_challenge.html. Projects have been added to the page as they have been completed by the Climate Challenge project staff.

While the feedback from NRECA membership has been encouraging, the level of

enthusiasm has been restrained. The principal areas of concern have been two-fold. First and foremost, small electric utilities are relatively risk averse and often voice concern with respect to the project risk that individual projects represent. This has been one of the principal factors that has motivated the focus on developing portfolios of projects that will be managed by financing intermediaries. Investing in a portfolio spreads risk and allows smaller investors to leverage their limited capital over a larger and less risky set of projects.

The second concern that was voiced over and over was the lack of definition of U.S. policy on climate change and carbon credits. Most of the NRECA membership buy power that is at least partially derived from coal-based generation. For this reason, the level of exposure is rather high, and there is consequently both a resistance to become openly involved in carbon reduction projects before the greenhouse gas reduction policy is officially adopted. The dilemma is that the small utilities do support these projects for both economic development and for environmental reasons. But the projects do carry a certain amount of political risk for the utility industry, at least until the U.S. government policy is on record and allows them to take credit for the investments they make.

Concluding Comments

As mentioned above, the project has been successful in many respects, but the ultimate determination of success or failure of future participation in energy efficiency and renewable energy projects undertaken for carbon emission reduction targets will be determined by the policy that is adopted by the U.S. government. The experience of managing this project has clearly shown NRECA that there is interest and willingness to engage in carbon reduction projects, but the interest and willingness is bounded by a lack of fiscal incentives that would make the projects more attractive from a financial perspective.

But there are clearly opportunities to engage in clean energy projects in many developing countries and there is a growing capacity to develop project portfolios for investment-minded utility organizations as well as other investors. The DOE Climate Challenge program has enabled the process to make many preparatory steps towards the goal of active participation of U.S. investment in energy efficiency and renewable energy projects. The future of the U.S. policy will largely determine how soon the program will reach full implementation.

Annex 1. Sonora Electrification Proposal

In 1996, NRECA International was contracted by the Salt River Project and Arizona Electric Power Cooperative (AEPCO) to assist in implementation of a pilot solar photovoltaic project in Sonora, Mexico. SRP was already engaged in an effort to develop a cross-border transmission project with Mexico as well as to assist in managing the relationships related to the solar PV project with the Comisión Federal de Electricidad (CFE) and Sonoran government officials. The solar pilot project's objectives were to demonstrate that a privately financed and implemented solar electrification project could be successfully implemented with the participation of the local government and with a co-investment on the part of the community. The project in this regard was a resounding success. However, the greater goal of demonstrating project sustainability was not realized due to limited scope of the pilot effort. A rather aggressive scale up effort will be required to reach this goal in a second stage of the project that would expand the program to include all of the state of Sonora.

The pilot project included installation of 93 solar photovoltaic systems in two communities. The two communities were Puerto Lobos in the municipio of Caborca and Las Zinitas in Puerto Peñasco. The families participating in the project paid \$125 towards the cost of the solar systems and SRP/AEPCO paid approximately \$375 or the balance of the equipment and installation cost. NRECA managed the system design, procurement, coordination with the communities and the municipalities to which they belonged, trained local technicians, and managed installation of the equipment at each site.

While the pilot project focused on demonstration of the means by which communities could work with U.S. institutions, the second phase of the project proposed herein will focus on designing a sustainable business of providing those services. It has been amply demonstrated that solar PV energy systems can be used for domestic electric purposes in developing countries, that is, that the technology risk is relatively low. But the depth of a Sonoran market to sustain a rural electric business has not yet been analyzed. Questions of how the business would manage itself, which commercialization model would be employed, and what level of capitalization would be required over what period of time to make the business viable be investigated in the second phase of the project that is the focus of this proposal.

NRECA proposes to establish a user-owned rural electric corporation in Sonora as a model that can be replicated in neighboring states throughout Mexico. To accomplish this goal, NRECA will develop a business plan, will legally incorporate the project company as a special purpose corporation, and will partially capitalize the project company with the value of the grant funding that was contributed to the pilot project by SRP/AEPCO. NRECA will seek to leverage this seed capital to achieve the critical financial resources necessary to grow the business to maturity.

The objectives of the Sonora solar electrification project proposed herein are the following:

1. To analyze the economic and technical sustainability of a state-wide SHS project in Sonora;
2. Contribute to improved quality of life and economic development for rural inhabitants in Sonora by initiating a private-public partnership in rural electrification processes;
3. Promote the use of solar photovoltaic systems as a clean, zero-emission energy alternative;
4. Promote the use of solar photovoltaic systems as a lower cost electrification alternative, more appropriately scaled to the demand profiles of rural users for domestic and some commercial energy uses; and
5. Provide an avenue for direct benefits to U.S. investors, electric utilities, and the Mexican communities that provide labor and infrastructure to the U.S. industrial sector participants seeking to invest in these communities.

To accomplish these objectives, NRECA proposes to secure capital that will enable the Sonora project company to reach a minimum market penetration of 1000 homes electrified households. This level of program growth would require capital resources of approximately \$500,000, with additional costs for development and installation.

To determine if the Sonoran market can sustain this level of solar electrification, NRECA proposes to undertake several concurrent analyses and fund raising activities. The project team would start with a thorough market analysis to determine the penetration rates for the technology and to identify the areas with highest potential for program participation. The team will design the project finance structure and will identify private, public, and community participants in equity formation and on-going program financing. The team will then develop the administrative, technical design, and maintenance practices necessary to run the solar electrification business. The result of these activities will include a formal business plan that will be used in discussions with financial institutions and an operations guide that will be used once the program is operational. It is possible that some portion of the capital costs will be subsidized through the Sonoran state government or other public sector organizations. However, these avenues have yet to be explored fully and it is unclear whether they could be secured as fiscal incentives (i.e., tax holidays) or as actual public funding of the project through a public trust fund active in this part of the Mexico, such as the "Fideicomiso de Riesgo Compartido" (FIRCO). These options will be investigated during project implementation.

NRECA proposes to establish a project company as a means of promoting a rural electrification strategy that combines the interests and financial resources of all stakeholders in Northern Mexico's rural electric sector. The players in the program will include NRECA, the federal and state governments, the consumers and communities to be served, businesses or industries that derive services and benefits from the communities, and other private-sector interests including U.S. electric utilities that have business interests in Mexico. By implementation of this strategy the project will demonstrate the effectiveness of establishing and empowering private-public partnerships through which the self-interest of the beneficiary communities assume responsibility for their rural electric

service system development and maintenance. NRECA believes that the development of such a program could provide an avenue for sustainable rural economic development in Northern Mexico, a movement that will yield direct benefits to U.S. investors, electric utilities, and the Mexican communities that provide labor and infrastructure to the U.S. industrial sector participants seeking to invest in these communities.

The result of the project will be a legally established rural electrification corporation that will be capitalized by several equity participants. The participants will include:

1. Private sponsors;
2. The municipios that participated in Phase I of this project (the municipios would contribute equity in the form of the title they hold to the 92 SHS that were installed in 1997 in Puerto Lobos and Las Zinitas);
3. Other municipios that wish to participate in electrification activities to benefit communities in their geographic areas; and
4. The communities themselves through purchase of shares in the corporation that would guarantee participation in future electrification programs.

With this composition of shareholders, the project company will qualify for a self-generation permit from the Comisión Reguladora de Energía (CRE, the federal energy regulatory body). With this permit the project company will qualify for federal financing including working capital loans from Mexican development bank institutions such as NAFIN and BANOBRAS, as well as bilateral and multilateral debt financing. The project company may also qualify for project financing through medium and long-term leases with vendors.

The project implementation plan will include several data collection and analysis steps, together with an assessment of the political and investment environment. The NRECA team will lead field data collection and market assessment analysis as well as will focus on assessing the potential commercial and political barriers and analyzing the financial viability and the "bankability" of the process.

The market assessment will consist of several tasks. The assessment will begin with a mapping exercise to geographically reference the communities in Sonora that do not have electric service. The map will indicate the highest concentrations of un-electrified households, the size of the communities, and will provide a measure of the level of economic activity for each community.

The project team will then visit selected sites to meet with community leaders to survey energy demand, identify energy sources currently being employed, and to determine the interest in receiving solar electric services and the willingness to pay for solar PV systems. Meetings will also be held with community leaders to explain the corporate structure that is being contemplated for this project to determine to what degree the community would be willing to participate in the formation of the energy corporation.

The team will also meet with municipal leaders to present the Puerto Lobos-Las Zinitas project and to determine to what degree the municipios would be interested in dedicating funds for the formation of the project company. The goals and purpose of the project will be explained to the elected officials together with the role local government contributions will play in the project. While local government funding is not essential to project success, contributions from the municipios will greatly enhance project viability especially to generate the initial paid in capital to finance initial operating costs.

A business plan will be drafted that incorporates the technical, demographic, and financial data and analyses performed. The business plan will examine: (1) the market for the corporation; (2) the ability of the users to pay for the services to be offered; (3) the contributions that can be expected from state agencies; (4) the paid-in capital in the form of initial tariffs from customers; (5) financial resources that can be generated from other financing agencies to form both debt and equity for the electrification corporation; (6) the management plan for the project company; (7) a risk analysis; and, (8) detailed financial analysis of project feasibility, including a detailed analysis of capital, operating, maintenance, and other associated costs.

The NRECA team will include Pete Smith, Danilo Carranza, together with local contractors. The team will examine the interest and the benefits for U.S. utilities to participate in the project initiative, including climate change related benefits. These benefits will be analyzed together with the financial and institutional feasibility and presented in the business plan.

The development hypothesis of this program initiative is that the Mexican renewable energy electrification program will be enhanced by initiating a private solar PV electrification in the northern states in collaboration with communities and local government agencies. The program will seek to achieve more effective results by collaborating with several partners in this process that will include community leaders, shared risk programs, local vendors, and private service providers. The intended results will be increased capacity of the implementation partners for the Mexican renewable energy electrification program as witnessed by the successful completion and financing of the Sonoran business plan for rural electrification. These results are directly related to the development challenge of increasing access to renewable energy technologies, promoting the use of renewable energy technologies for rural economic development, and strengthening host country institutions to manage rural development programs.

The program will address all of the IR's by assisting the Sonoran government to develop policies to find creative mechanisms to promote renewable energy rural electric programs. The IRs will be addressed by triggering private sector mechanisms; assisting private sector organizations to invest in renewable energy through increased access to market information and enhanced understanding of the market for services; and by providing direct support to communities and local governments to initiate a private electrification corporation.

The proposed activity will result in increased use of solar energy technologies in rural areas of Mexico for domestic lighting, school electrification, and village water supply applications. The indicators of success will be the level of capitalization of the Sonora project company that will implement the solar PV renewable energy electrification program.