UNITED NATIONS DEVELOPMENT PROGRAMME
GLOBAL ENVIRONMENT FACILITY

PROPOSAL FOR PDF BLOCK B & C GRANTS

Country:	**Bolivia**
Project Title:	*Rural Electrification with Renewable Energy through the Popular Participation Process in Bolivia*
Amount of Funding Requested:	US$ 237,446
Co-Funding:	US$ 101,803 Secretaría Nacional de Energía (SNE)/Fondo Nacional de Desarrollo Regional (FNDR), National Rural Electric Cooperative Association (NRCA)
Implementing Agency:	UNDP
Executing Agency:	Secretaría Nacional de Energía (SNE)

Block B _x_ **Block C**

Block A Grant Awarded: No

I. Summary Project Objectives and Description

One of the highest development priorities for rural communities in Bolivia is to gain access to electric power. Currently, less than 20% of the rural population has access to electricity, in large part because provision of service via the national grid is in most cases prohibitively expensive. The existing alternative to grid extension has been diesel-powered electric systems operating with tremendously high losses, a high cost of power, and low level of reliability.

Renewable energy technologies provide an attractive alternative, but can only be adopted and disseminated widely if the appropriate institutional framework, financial mechanisms, technical and managerial know-how, supportive policies, and incentive systems are in place. This project, to be developed with PDF Block B resources, corresponds to **GEF Climate Change Operational Programme 2** which aims at **"Promoting the Adoption of Renewable Energy by Removing Barriers and Reducing Implementation Costs"**.

Renewable energy electrification programmes have been developed with noted success in several other countries, and in all cases, a concerted effort has been necessary to establish the institutional and technical capacities required for designing, implementing, and administering projects in a sustainable fashion.

In Bolivia in previous years, small-scale electrification projects[1] have been undertaken to illustrate that renewable energy projects can be implemented through a partnership of users and electric utilities, with cost recovery, proper maintenance and efficient administrative systems. Three years of experience with renewable energy systems in rural areas has provided a wealth of information on system performance from which equipment standards can be developed and a quality control program designed. As well, the Energy for Sustainable Development program and SNE have fostered the establishment of a revolving fund aimed at financing rural electrification on an on-going basis[2] .

At the same time, a consultative group was formed in 1994 chaired by SNE with participation from FNDR, and NRECA to examine options of designing and implementing a national electrification program that would include conventional and renewable energy-based technologies. The World Bank has partially supported this collaborative program through a rural energy grant to SNE.

Building on the momentum gained through these efforts, the National Secretary for Energy (SNE) has made rural electrification a program priority for 1996. At the same time, Bolivia's Popular Participation and Electricity Laws provide the appropriate legal, financial and decision-making frameworks for decentralized rural electrification.

The primary objective of the full-scale project - to be developed through PDF resources requested here - is to overcome the principal barriers to the initiation of a renewable energy rural electrification programme, thereby laying the foundation for its self-sustaining expansion throughout Bolivia. To this end, PDF resources will be used toward the development of a renewables-based rural electrification programme by identifying the institutional, policy and incentive frameworks, technical and managerial capacity-building requirements and activities, financial sustainability mechanisms, and information requirements associated with the cost-effective use and dissemination of renewable energy technologies.

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[1] These have included the USAID-funded ESD program: the GTZ-funded PROPER (*Programa de Promoción de Energías Renovables)* program: and the Spanish-funded ICI program in the altiplano.

[2] Under the Electrification for Sustainable Development Project (ESD), several projects with electric utilities were developed. Participating utilities were required to repay the funds that were invested through ESD to a central electrification fund. Over US$ 3.5 million have been committed to this facility to date, mostly for renewable energy projects. The fund that is being established to receive and recirculate these funds will be a Bolivian institution, managed by the borrowers/owners.

The full scale project will establish renewable energy systems in selected areas of rural Bolivia; provide the required training for the design, management, and effective operations of these systems; establish a financing strategy in which renewable energy projects can be co-financed among participating communities, end-users, private sector partners, and the federal government; develop a financial infrastructure by which funds recovered from projects can be revolved into future renewable electrification activities and; establish the necessary linkages between private sector, electric utilities, production cooperatives, and other institutions, required to sustain a national programme for a twenty to thirty years duration.

II. Description of Proposed PDF Activities

PDF resources will be used to undertake the following project preparation activities:

i) identify a number of rural communities (possibly around 25) where the necessary partnerships with the private sector, electric utilities, production cooperatives, and other groups and institutions necessary to initiate a national renewable electrification programme can be established in a way which will lead to successful community-based electrification;

ii) formulate a programme to build the capacities of rural communities, local operators, collaborating NGOs, and government institutions in the design, management and administration of renewable-based energy systems;

iii) design and adaptation of renewables-based electrification systems for the communities identified above, based on an assessment of electrification needs and priorities, as well as least-cost potential for renewable energy applications (e.g., wind, solar), including quality control procedures for technology procurement, and battery recycling;

iv) design of a revolving fund to ensure the financial sustainability of a full-scale renewables-based electrification programme for rural Bolivia;

v) design of fiscal incentives to facilitate the procurement and dissemination of renewable energy technologies;

vi) formulation of a full-scale project proposal for funding by the GEF and identified co-financing sources.

1. ***Identify a number of rural communities (possibly around 25) where the necessary partnerships with the private sector, electric utilities, production cooperatives, and other groups and institutions necessary to initiate a national renewable electrification***

programme can be established in a way which will lead to successful community-based electrification;

This PDF activity will inventory the municipalities that lie more than 15-20 kilometers from the grid with a sufficiently low electric demand to be considered candidates for a renewable energy electrification programme. Existing digitized population, political, and electric grid maps will be used to identify contiguous groups of communities lending themselves to more effective administration and lower operating costs. Digitized maps will be overlaid on locations of municipalities, concession areas of existing electric utilities, and, to the extent the information is available, non-government organizations and production cooperatives to determine what administrative options exist for the larger programme to be developed. This last step will provide institutional options for each grouping of participating communities.

Based on the above considerations, a number of communities will be identified to participate in the initiation of the full electrification programme. Project implementation will involve the finalization of co-financing commitments from their municipal budget allocation (see *National Level Support*, below) for investment in renewable energy systems. At the same time, each participating family will be asked to commit to financing a portion of the installation cost directly. Other cofinanciers will include FNDR, SNE, and prospective local private organizations.

2. ***Identify a programme to build the capacities of rural communities, local operators and collaborating NGOs and government institutions in the design, management and administration of renewables-based energy systems;***

While the *Popular Participation Law* provides local stakeholders with the authority to design programmes through the municipalities in which they reside, it does not, however, provide the municipalities with the technical capacity to assist them in project design, implementation, management and administration. In the past these services have been performed by the centralized line agencies or in the case of rural energy, by FNDR and SNE.

However, neither FNDR nor the SNE currently have the staff capabilities to undertake a national rural electrification programme without external assistance. While FNDR has been charged with the responsibility of developing and financing the rural electrification program, their staff requires extensive training and technical assistance to implement the programme. At the same time, SNE currently has only a small staff addressing policy changes to the electric sector, as well as reviewing the requirements for the national electrification programme.

This PDF activity will consist of an assessment of existing capacities and technical requirements for the application of renewable energy technologies, as well as the design of a corresponding training programme including a workshop designed to orient project stakeholders in the use of

the technology, its capabilities, and limitations, related operational costs and options for financing, as well as information and assistance regarding service providers.

The proposed training programme - addressing skills requirements and the local and national levels - will be developed in close coordination with FNDR and SNE, and tested in several target communities, as well as collaborating institutions to determine changes to make them more effective.

3. ***Design of renewables-based electrification systems in selected rural communities, based on an assessment of electrification needs and priorities, as well as least-cost potential for renewable energy applications (e.g., wind, solar), including quality control procedures for technology procurement, and battery recycling;***

Experience has shown that one of the most important elements to successfully managing renewable energy electrification programmes is the design of a highly reliable system and careful selection of equipment. By definition, the renewable energy systems will be located in remote, sparsely populated areas, increasing maintenance costs if the systems have problems with key components, such as charge controllers, electronic ballasts, and batteries. While very high quality components exist in the market place, they must be matched carefully to ensure that the voltage set points, for example, are consistent for the battery and charge controller, and that the ballasts are designed for long life and minimum interference with other appliances, such as radios and television sets.

This PDF activity will review expected energy demand in various parts of the country including the altiplano, the high valleys in Cochabamba and Chuquisaca, the lowlands in Santa Cruz and the Beni, and the Yungas and Chapari regions in La Paz and Cochabamba. The demand data will be used to set standard system designs for a range of system sizes and costs. Given the system sizes, optional solar photovoltaic panel configurations with matching battery capacities will be designed. Given battery characteristics, charge controller and electronic ballast specifications will be written.

Once system designs have been determined, local equipment suppliers will be consulted to determine their ability to comply with the standards, and workshops will be held with the suppliers to: (i) acquaint them with the specifications that have been developed, and (ii) solicit their input to modify system designs and specifications.

Once the standards have been finalized, a quality control procedure will be designed to ensure that resulting specifications are followed by the selected suppliers for future procurement. The demand assessment, specifications, and quality control procedures will be documented in an integrated report that will be developed in close coordination with FNDR and SNE, and published as a public document under the national electrification programme.

Finally, a specification will be drafted to be included in the standard bid package that will address battery recycling procedures to insure that lead-acid batteries are not discarded in landfills and streams after use in the renewable energy household systems. This will include a standard contract with local battery manufacturers to recycle batteries at a pre-established price, and a means of collecting and transporting batteries from the communities to the factory.

4. *Design of a revolving fund to ensure the financial sustainability of a broader renewables-based electrification programme for rural Bolivia;*

Under the full-scale project, the Popular Participation Programme is expected to finance a portion of each renewable energy system, estimated as approximately 30%; each user will independently finance a portion, covering 10 to 20%; the remainder needed for project implementation will come from FNDR, SNE, and/or private sector organizations, such as electric utilities, NGO's, or production cooperatives.

This third-tier financing may be borrowed through the revolving fund that is being capitalized through the Electrification for Sustainable Development Project (ESD) project and through other sources. The purpose of establishing a revolving fund for renewable energy technologies will be to centralize the third party financing in such a manner as to increase volume within a single institution, reduce administrative costs of the loans, and "capitalize" the knowledge needed to assess electrification projects so as to reduce the level of risk within the programme.

This activity will determine what additional sources of capital might be available for loans and the minimum staff requirements necessary to operate a renewable energy revolving fund. The concept will be presented to local commercial banks potentially considered to assume the banking functions necessary for the fund, and pro-forma financial analyses will be undertaken of several typical projects. These pro-forma analyses will be included in the business plan of the fund to illustrate the feasibility of co-financing projects under commercial terms with FNDR and the communities in a manner that assures full cost-recovery.

5. *Design of fiscal incentives to facilitate the use and dissemination of renewable energy technologies;*

Fiscal incentives will be designed for National Senate analysis, discussion and potential approval with the aim of facilitating the entry and transfer of renewable energy systems to be financed under the national electrification programme. The need to encourage investment in rural areas has been manifested by the present and past presidential administrations and acknowledged by the Senate Committee on Rural Development, thereby providing the impetus to effect the required legislative changes.

PDF activities will be executed by SNE with a project team composed of SNE, local contractors, and NRECA.

III. PDF Outputs

The PDF project will produce the following outputs:

(i) selection and partnership agreements with at least 25 communities, including co-financing commitments;

(ii) fully designed training programme based on a comprehensive needs assessment;

(iii) design of renewable energy systems, including standards for quality control and waste disposal;

(iv) design of a revolving fund, with corresponding institutional framework, and related procedures and pro-forma financial analyses of typical projects illustrating the viability of commercial loans from a central revolving fund;

(v) design of fiscal incentives to promote the transfer and dissemination of renewables-based systems;

(vi) Formulation of a UNDP/GEF full scale Project Document and project brief for presentation to the GEF Operations Committee and the GEF Executive Council.

IV. Eligibility

Bolivia ratified the UN Framework Convention on Climate Change 3 October 1994.

The aim of the full-scale project - to be developed with PDF Block B funding requested here - falls squarely within the second Operational Programme of the GEF Operational Strategy, as follows:

Promoting the adoption of renewable energy by removing barriers and reducing implementation costs.

3.26 The purposes of this operational program are to:

(a) Remove barriers to the use of commercial or near-commercial renewable energy technologies.

(b) Reduce high implementation costs of renewable energy technologies due to low-volume or dispersed application.

V. National Level Support

Bolivia's recently enacted Popular Participation Law has dramatically changed the way resources for rural infrastructure are allocated. This law has essentially decentralized the decision-making process for all but the largest of projects financed by the public sector, providing funding, technical assistance, and political autonomy to municipalities throughout Bolivia. The law allows communities to directly determine how and to which projects funds will be allocated, and to control the resources they are provided through allotments released to them.

At the same time, the new Electricity Law provides a new framework through which rural electrification projects will be financed. This new law builds on and complements the Popular Participation decision-making framework, and provides a new financial mechanism by which donor and private sector funds can be channelled to new electrification projects.

The Senate Committee for the Promotion of Rural Development and the Ministry of Sustainable Development and the Environment have recognized the proposed renewable energy electrification programme as essential to the national goals of sustainable development. National-level support is clearly demonstrated by the commitments by FNDR and SNE to co-finance the PDF activities as well as the follow-on full-scale project. Additional cofinancing commitments will be obtained from other sources during the course of implementation of the PDF Block B.

VI. Items to be Financed

The following components will be financed with PDF funds and counterpart financing:

Outputs	GEF Funding (US$)	FNDR/SNE/NRECA Counterpart (US$)
1. partnership agreements with 25 communities, including co-financing commitments;	66,101	64,330
2. fully designed training programme based on a comprehensive needs assessment;	66,390	6,660
3. design of renewable energy systems, including standards for quality control and waste disposal;	51,762	6,330
4. design of a revolving fund, with corresponding institutional framework, and related procedures and pro-forma financial analyses of typical projects illustrating the viability of commercial loans from a central revolving fund;	31,458	18,153
5. design of fiscal incentives to promote the transfer and dissemination of renewables-based systems;	21,735	6,330
TOTAL	**$ 237,446**	**$ 101,803**

Budget Table by Outputs & Inputs
(over 6-month period)

Outputs/Inputs	Personnel		Subcontracts		Equipment		Miscellaneous		Totals		TOTAL
	GEF	In-kind	GEF	In-kind	GEF	In-kind	GEF	In- kind	GEF	In-kind	
Partnership agreements/Site selection	30,385	8,090	21,496	19,470	6,000	20,500	8,220	16,270	66,101	64,330	130,431
Training Programme	27,637		28,524				10,229	6,660	66,390	6,660	73,050
Energy system design	21,735		16,798		3,000		10,229	6,330	51,762	6,330	58,092
Revolving Fund	23,238	5,179		4,124			8,220	8,850	31,458	18,153	49,611
Fiscal Incentives	6,083		11,212				4,440	6,330	21,735	6,330	28,065
TOTAL	**109,078**	**13,269**	**78,030**	**23,594**	**9,000**	**20,500**	**41,338**	**44,440**	**237,446**	**101,803**	**339,249**