NICARAGUA
Offgrid Rural Electrification (PERZA)

GEF Project Document

Latin America and Caribbean Region
LCSFE

Date: March 2, 2002
Sector Manager/Director: Danny M. Leipziger
Country Manager/Director: Jane Armitage
Project ID: P073246
Lending Instrument: Specific Investment Loan (SIL)

Team Leader: Clemencia Torres
Sector(s): Power (60%), Renewable energy (40%)
Theme(s): Civic engagement, participation and community driven development (P), Regulation and competition policy (P), Infrastructure services for private sector development (P), Rural services and infrastructure (P), Indigenous peoples (S)

Global Supplemental ID: P075194
Sector Manager/Director: Danny M. Leipziger
Lending Instrument: Specific Investment Loan (SIL)
Focal Area: G
Supplement Fully Blended? Yes

Team Leader: Clemencia Torres
Sector(s): Power (60%), Renewable energy (40%)
Theme(s): Other rural development (P) , Environmental policies and institutions (S)

Project Financing Data

[ ] Loan **[X] Credit** **[X] Grant** **[ ] Guarantee** **[ ] Other:** National government, private sector

For Loans/Credits/Others:
Amount (US$m): US$ 12.00 million equivalent

Proposed Terms (IDA): Standard Credit

Financing Plan (US$m): Source	Local	Foreign	Total
BORROWER/RECIPIENT	1.84	0.00	1.84
IDA	7.08	4.92	12.00
LOCAL SOURCES OF BORROWING COUNTRY	4.89	0.59	5.48
GLOBAL ENVIRONMENT FACILITY	0.00	4.02	4.02
Total:	13.81	9.53	23.34

Borrower/Recipient: GOVERNMENT OF NICARAGUA
Responsible agency: COMISION NACIONAL DE ENERGIA
Address: P.O. Box CJ-159, Complejo de Cooperación Externa, Managua, Nicaragua
Contact Person: Alcalá Bolaños Ortega, Secretario Ejecutivo
Tel: 505-222-5576/7089/3385 Fax: 505-222-4629 Email: alcala@cne.gob.ni

P073246 Estimated Disbursements (Bank FY/US$m):

FY	2004	2005	2006	2007	2008			
Annual	4.61	3.88	2.11	0.96	0.44			
Cumulative	4.61	8.49	10.60	11.56	12.00			

P075194 (GEF) Estimated Disbursements (Bank FY/US$m):

FY	2004	2005	2006	2007	2008			
Annual	1.32	1.15	0.71	0.45	0.39			
Cumulative	1.32	2.47	3.18	3.63	4.02			

Project implementation period: Five years (2004 to 2008)
Expected effectiveness date: 07/01/2003 **Expected closing date:** 12/31/2008

A. Project Development Objective

1. Project development objective: (see Annex 1)

The main project development objective is to support the sustainable provision of electricity services and associated social and economic benefits in selected rural sites in Nicaragua, and strengthen the Government's institutional capacity to implement its national rural electrification strategy. This would be accomplished by (i) supporting the Government in the design and implementation of its national rural electrification strategy; (ii) implementing innovative public/private off-grid electricity delivery mechanisms in several pilot sites for later replication on a national scale; and (iii) demonstrating in the pilot areas the potential of targeted rural microfinance and business development services (BDS) to significantly enhance the development impact of rural electrification.

While Nicaragua has successfully unbundled its power sector and privatized distribution activities, about 89% of the population in the rural areas are still without access to electricity. Even though more than half of its population lives in urban areas, Nicaragua is a predominantly agricultural economy (32.7% of GDP came from the agricultural sector in 2000), and most of Nicaragua's poor live in the rural areas. Given these characteristics, the lack of electricity and other public services is a serious obstacle to the economic and social development of the country. To address this problem, the Comisión Nacional de Energia (CNE) is developing a National Rural Electrification Program (PLANER) aiming to achieve rural electrification rates of 70% by 2005 and 90% by 2012. As part of their effort to ensure the achievement of these access expansion targets, the Government of Nicaragua (GON) has requested World Bank support for the design and implementation of the national rural electrification strategy, which covers both grid extension and off-grid solutions. The requested support includes: (i) design and implementation of sector policies, and of appropriate financing mechanisms including output-based public incentives, that would improve the efficiency of the energy sector and the sustainable implementation of the GON's PLANER; (ii) transaction advice to CNE for all subprojects to be financed under the Nicaragua Offgrid Rural Electrification Project (PERZA); (iii) institutional strengthening of CNE and the regulatory agency, the Instituto Nicaragüense de Energia (INE), as well as training for the new service providers; and (iv) the reduction of existing market barriers to renewable energy technologies.

The new GON Development Strategy places a strong emphasis on the rapid achievement of results that will contribute to improve Nicaragua's competitiveness and reduce the poverty level. The Project reflects these GON priorities, as it includes the design and sequenced implementation of several locally adopted electricity service delivery mechanisms (mainly based on decentralized off-grid solutions) in various pilot sites that reflect the physical and socioeconomic diversity of remote rural municipalities of Nicaragua. The emphasis on off-grid electrification arises from the fact that CNE's strategy, as well as most of the international aid for rural electrification (RE), has hitherto focused exclusively on programs for grid extension. However, for a significant part of Nicaragua's poor, such grid-based solutions are economically unviable, because of their remoteness. The diversity of delivery mechanisms and off-grid technologies to be implemented in the pilot projects matches real local demand patterns in a more flexible way, and makes use of the diversity of renewable energy resources in Nicaragua, many of which are not only environmentally benign but economically competitive in these contexts. Amongst others, the Project will support a national credit line for Solar Home System (SHS), which are the least cost alternative for electricity provision to a majority of the disperse, mostly indigenous, population along the Northern Atlantic Coast, a region that lacks other sources of energy and has been overlooked by past RE efforts. Finally, the Project will actively support, through social and communications activities, public consultations, dissemination activities and a continuous dialogue with the local communities benefitted by the electrification sub-projects to ensure that project design will correspond to local priorities, and that users and operators are aware of their respective rights and responsibilities for the long run

sustainability of the sub-projects.

Nicaragua has substantial small hydro resources some of which have already been tapped by NGOs to provide power to independent rural mini- and microgrids, for domestic and productive uses. A large portion of the proposed PERZA investments is earmarked for selected minihydro pilot projects in various regions. Complementary to these efforts, a parallel UNDP-led initiative will be focused on the development of small hydropower (SHP) specifically for productive uses. The World Bank and the UNDP have formally agreed to cooperate fully in the development of this technology for rural electrification, including the carrying out of joint efforts to eliminate institutional, regulatory and financing barriers to its widespread application in Nicaragua.

The lessons learned from the pilot projects will help to fill vital gaps in the design of GON's national rural electrification strategy and ensure greater involvement of the private sector in future replication efforts. In parallel to implementing a portfolio of concrete RE projects, the Project aims at facilitating this replication process on national scale by providing the necessary technical assistance to CNE to further prepare and implement additional sub-projects as part of the implementation of PLANER. Financing for these additional projects would come from sources others than PERZA, but the design and implementation of these transactions will benefit from the lessons learned during the implementation of the PERZA's pilot sub-projects.

Electricity access increases the potential for greater economic activity and improved productivity, but it is not sufficient by itself to realize this potential. Therefore, the Project includes accompanying microfinance and business development services (BDS) components. The high up-front costs of most off-grid technologies have been identified as one of the key barriers to adoption by rural households, and the lack of monetary resources in many poor communities is known to limit the possibility of economic growth for the local economy. By providing microfinance services to the pilot areas, the Project will bring in much needed liquidity to cash-strapped local communities, thereby reducing this affordability barrier to households and microbusinesses and allowing micro-businesses to invest in and expand their businesses. To create a client base large enough to attract private sector interest, the microfinance services will be provided also to communities neighboring the pilot sites. There is a strong correlation between electricity and BDS. On the demand side, electricity can directly increase the productivity of rural businesses and thus raise income and employment -- while on the supply side, electricity service provision becomes more sustainable in turn due to the improved capacity-to-pay of these anchor clients. By developing targeted business development services, the Project will reduce the production, marketing, technology, and information bottlenecks of small and microbusinesses in the pilot sites and surrounding areas and thus increase the overall impact of electrification on the economic and social development of the target communities.

2. Global objective: (see Annex 1)

The Project's global environmental objective is to achieve greenhouse gas (GHG) reductions through the reduction of policy, information, financing and institutional capacity barriers that currently hinder renewable energy technology (RET) dissemination and market development in Nicaragua (GEF Operational Program No. 6). In support of this objective, the Project will engage the private sector in commercially sustainable activities that reduce long-term implementation costs and offer a strong potential for nationwide replication in Nicaragua and in other Central American countries.

3. Key performance indicators: (see Annex 1)

The key perfomance indicators of the Project, directly linked to the above development objectives are summarized below, and presented in greater detail in Annex 1. Specific indicators that will be used to monitor the Project's impact and outputs are included in CNE's Project Implementation Plan (PIP). In particular, indicators of sustainability are defined, to monitor whether the various outcomes: (i) have used technologies suitable to local conditions; (ii) are cost-effective; (iii) have included active consultations with, and participation of the targeted communities; and (iv) are efficient and reliable outcomes, and could, if appropriate, be replicated at a national level. These concerns will be incorporated into the monitoring and evaluation program for RET performance that will be one of the GEF-financed technical assistance activities.

1. National rural electrification strategy

- Adoption of a sustainable national rural electrification (RE) strategy by CNE, which integrates off-grid solutions and reflects the social diversity between the Atlantic and Pacific zones of the country.
- Improvement of the National Electricity Develoment Fund (FODIEN), for RE, completion of the regulatory and legal framework for rural electrification (on grid extension and off grid projects), and explicit integration of off-grid solutions in the National RE Strategy.
- Implementation of efficient and well targeted output based subsidies schemes for rural electrification, including off-grid electrification.
- Capacity building in CNE and in the regulatory agency INE *(Instituto Nicaragüense de Energía)* to implement and supervise the rural electrification strategy.
- Reduction of market barriers to renewable energy technologies through the replication of mechanisms used in project pilots and lessons learned from these experiences, as well as through the changes in current procedures adopted by the Government, while designing their RE Strategy.
- Application of lessons learned on integrating microfinance and/or BDS provision with off-grid electrification in national strategy.

2. Design and Implementation of off-grid pilot projects

- Successful implementation and operation of several locally adapted off-grid electricity service delivery mechanisms in pilot projects that are financially and technically viable, environmentally and socially sustainable, and suited for later replication on a national scale.
- Replication of successful off-grid pilot projects as part of the national strategy, as measured by results achieved by CNE in the preparation of a new portfolio of off-grid electrification projects.
- Increase in number of private operators providing decentralized rural electricity in a sustainable manner.

3. Microfinance services

- Successful implementation of replicable microfinance service delivery systems in pilot areas and surrounding communities, measured by the volume of outstanding loans for productive purposes (between US$500,000 and US$600,000), the number of households using microcredit to hook up to electricity systems, user satisfaction (from client surveys), and full cost coverage by microfinance service providers.
- Number of microfinance institutions offering solar household hookup loans.
- Increased number of microfinance institutions providing financial services in rural markets.

4. Business development services (BDS)

- Successful application of sustainable BDS delivery models and new products developed for the pilot areas and surrounding communities, as measured by the number of businesses paying for BDS services and client satisfaction (from client surveys), and an improving trend of significant cost recovery by BDS providers.
- Increased number of BDS providers offering services in rural markets.

5. GEF Performance Indicators

- Tons of CO_2 abated over 20 years by pilot projects.
- Additional CO_2 abatement through replication on a larger scale.

B. Strategic Context

1. Sector-related Country Assistance Strategy (CAS) goal supported by the project: (see Annex 1)
Document number: 25043 **Date of latest CAS discussion:** 4/9/98

The Project contributes directly to the three priorities highlighted by the 1998 Country Assistance Strategy (CAS) for Nicaragua: (i) consolidation of growth through private sector development; (ii) developing the rural sector and strengthening environmental protection; and (iii) developing human capital and protecting the poor. These priorities are also present in the broad principles expressed in the Government's Poverty Reduction Strategy Paper (PRSP), completed in 2001, and supported by the new CAS currently under preparation. The Bank Group assistance proposed in the forthcoming CAS aims to help the GON achieve the PRSP's overarching objective of reducing by half extreme poverty in the country by 2015 and uses as the basis for the IDA's lending strategy the four pillars and the three cross cutting themes that are the heart of the PRSP. These four pillars are: (i) broad-based growth with an emphasis on productive employment and rural development, (ii) greater and better investment in human capital of the poor, (iii) better protection of vulnerable groups, and (iv) the strengthening of institutions and good governance. These four pillars are intertwined with the three cross-cutting themes: (i) a reduction of environmental degradation and ecological vulnerability, (ii) an increase in social equity, and (iii) further decentralization.

The Project will directly contribute to achieve the strategic pillars of the PRSP supported by the CAS:

Broad-based growth with an emphasis on productive employment and rural development. The Project would facilitate equitable growth of the rural sector by focusing on areas that cannot be served economically by grid extension. It would maximize the productive impact of electricity services in these rural areas by providing microfinances and BDS along with the supply of electricity to the targeted communities. It would also ensure that improvements in these services are sustainable and can thus contribute effectively to the growth of the local communities, by supporting public/private partnerships in the provision of services that would seek to achieve economic and financial sustainability with a minimum subsidy.

*Better protection of vulnerable groups.*The Project would improve the social welfare of the rural poor by providing them with access to basic electricity services, microfinance services, and BDS to improve the productivity of their micro and small businesses. In particular, some of the pilot projects seek to improve, in a sustainable and participatory manner, the living conditions of indigenous and other minorities in the Atlantic Zone.

Good governance and institutional development. An overriding objective of the Project is to strengthen the capacity of CNE to design and implement a coherent rural electrification program, and to seamlessly integrate grid extension and offgrid solutions.

The Project will also support advancing in the cross-cutting themes advocated by the PRSP and the CAS:

Reducing environmental degradation and ecological vulnerability The Project would seek to demonstrate the competitiveness of RETs in these areas, which would lead to the commercialization of clean power technologies. The Project would also provide assistance to the communities that are piloting renewable energy technologies (e.g., battery charging centers or repair shops for solar home systems, SHS).

Promoting decentralization. The delivery of electricity, micro finances and business development services in the Project should be decentralized to a large extent, since many of the sites are located in remote areas of the country. To ensure the success of this approach, the Project would seek from the outset an active participation of the local communities in the design and monitoring of the service provision in the pilot sites; it would support the design of contractual arrangements and monitoring and evaluating systems that could be implemented without exclusive reliance on the intervention of the CNE or the regulator INE; it would promote a continuous dialogue between CNE, INE (regulator) and the representatives of the local communities and local operators.

1a. Global Operational strategy/Program objective addressed by the project:

The proposed Project is consistent with GEF Operational Program 6 on Climate Change, which promotes the adoption of new and renewable energy technologies by removing market barriers and reducing implementation costs. In keeping with this objective, the Project would promote commercialization of RETs by providing the proper policy framework for private sector participation, reducing information barriers (by conducting market assessments and profitability studies), and providing financing to surmount the high first-cost barrier of most RETs.

2. Main sector issues and Government strategy:

Rural Electrification

Background

The Electricity Sector in Nicaragua. Nicaragua's power sector underwent a deep restructuring during the late 1990s. The new Electricity Law (April 1998 - Ley No.272) unbundled the generation, transmission and distribution divisions of the state-owned *Empresa Nicaragüense de Electricidad* (ENEL), and allowed the privatization of the generation and distribution activities. A wholesale market was created, which allowed electricity trading through long term contracts between generating companies and the distribution company or large users. A spot market also exists. The law created four generation companies (GEMOSA, GEOSA, HIDROGESA and GECSA), a transmission company, *Empresa Nacional de Transmisión Eléctrica, S.A.* (ENTRESA) and two distribution companies (DISNORTE and DISSUR). GEMOSA was leased to a private company ORMAT in 2001 and GEOSA was sold in 2001. In 2002, the Government launched a bid for privatization of the remaining companies with mixed results. GECSA received no bids while HYDROGESA received two offers, and was granted to Coastal Energy (an affiliated of US El Paso Corporation). However, appeals by the losing bidder (Enron Nicaragua) and subsequent opposition in the National Assembly to privatization have effectively put a halt to the transaction. The transmission company, ENTRESA, is expected to remain public, and the National

Dispatch Center, which is responsible for the day to day management of the wholesale market functions as a separate unit within ENTRESA. The two distribution companies were sold to Unión Fenosa in September 2000, with a concession that covers the Western, Central and Northern zones of the country. With the exception of Bluefields in RAAS (*Region Autónoma Atlántica Norte)*, which is connected to the SIN (*Sistema Interconectado Nacional)*, and of Puerto Cabezas in RAAN, where ENEL is providing services through diesel-plants, the largely rural eastern part of the country along the Atlantic Coast remains heavily underserved in terms of electricity supply.

The law puts CNE in charge of formulating policies and strategies for the Energy sector and of designing and of extending electricity services into the rural areas. INE is established as the regulatory agency, awarding concessions for transmission and distribution, and approving tariffs. The *Ministerio para el Fomento, la Industria y el Comercio* (MIFIC) is in charge of granting concessions for the use of water in hydroelectricity projects.

Rural Electrification: Nicaragua has one of the lowest rural electrification rates in all Latin America. In absolute terms, it is estimated that a total of about 400,000 households in both urban and rural areas remain unserved, of which about 160,000 are beyond economic line-extension distances (offgrid areas). Within the concession areas, the obligation to serve of the private utility is limited to customers within 150 meters from the grid. Furthermore, more than half of the country, including half of the Rio San Juan Region, the Region Autónoma Atlantico Sur (RAAS), the Region autónoma Atlantico Norte (RAAN) and two thirds of the Jinotega region, Matagalpa, Boaco, Chotales and Rio San Juan, remain outside of the concession areas. Rural electrification is costly to implement especially for off grid sites, and the cost in Nicaragua, one of the poorest countries in Latinoamérica, is exacerbated because the population is very dispersed in the eastern part of the country, which represents a large part of the unserved areas. Off-grid electrification in Nicaragua today consists mainly of 30 installing diesel minigrids to serve some larger villages in remote rural areas. These isolated systems are currently operated by ENEL, often at heavy financial losses which need to be financed by GON on a continuous basis.

Issues in Rural Electrification

Lack of a sustainable financial mechanism for RE. The National Electricity Development Fund (FODIEN) was created in October 2000 under the CNE to be the financing vehicle for the rural electrification program. It was planned to be financed initially out of the privatization proceedings, with a total of US$80 million over several years. However, these contributions hardly materialized. Disbursements to FODIEN are decided every year, making their flow uncertain, and have been subject to further reductions below the allocated annual budget. This is a major barrier to potential private sector interest and does not allow for long term planning of efficient subsidy schemes. Furthermore, the current legal status of FODIEN is less suited than other alternatives to attract donor funds due to a less than optimal guarantee of sector specific disbursements. Finally, FODIEN lacks specific regulations and rules to determine the use and allocation of resources. FODIEN is for all intents and purposes inoperational at this time.

Lack of clear rules and difficulties of enforcement of obligations for the established concessionaire. While the Electricity Law (EL) defines the general rules for Nicaragua's Electricity Sector, serious deficits remain regarding the interpretation and implementation of the Law. The current lack of fine tuned rules has led to ongoing disputes with Union Fenosa over tariffs and other general issues which make it difficult for CNE to ensure the full compliance of Union Fenosa with its obligations for RE. In order to improve RE in Nicaragua, three issues are of importance: (a) the right arrangement for transfer of assets to Union Fenosa in cases where connections out of their obligation have been financed with local funds; and (b) to clarify if the l50 m rule that defines Union Fenosa's obligations to serve is limited

to l50 m from the existing lines, or if the area grows with new line extensions; and (c) to find a general solution for facilitating the expansion of service (if needed, with third parts service provision) to areas inside the concession area for which Union Fenosa has no obligation and/or no interest.

Barriers to the use of renewable energy. The wider use of renewable energy technologies for rural electrification is constrained by several hurdles. Existing hydrocarbon subsidies and faulty application of import duties hinder the development of renewable energy technologies (RET). While RET equipment, such as solar home systems, are in theory exempt from import duties, this is not reflected in current practice for equipment classification by customs. Furthermore, the development of hydroelectric projects, which could make use of an abundant and cheap resource in Nicaragua, has been brought to a halt because of a lack of specific procedures on how the concessions on the water rights for hydroelectricity should be granted and managed by MIFIC. The issue of this legal vacuum was originally raised in July 2002 by opponents in the Congress to the privatization of HYDROGESA, but pending further clarifications, it is affecting all hydroelectric projects regardless of their size or location.

Structural difficulties for off-grid electrification. These include: i) the high cost of providing access due to remoteness of the sites, dispersed populations and difficulty of the terrain; ii) the generally low income and low demand of the off-grid population, which makes it difficult to attract private providers of electricity; and iii) insufficient public funds and lack of capacity of government institutions traditionally charged with the provision of rural infrastructure.

Regulatory Framework for Off Grid Electrification. Rural electrification outside of the concession areas is currently not regulated. While INE has been tasked with reviewing and approving proposed tariff schemes in these areas, no guidelines exist to serve as a basis. There are no guidelines either on service quality for off-grid connections and on the management of the transition to grid service of existing isolated systems.

Lack of a strategy to minimize the fiscal burden of diesel generation by ENEL-Plantas Aisladas and improve quality of service. At present, ENEL- Plantas Aisladas is in charge of about 30 diesel plants, with an installed capacity of 8,000 kW. While the diesel generators are located in remote areas that otherwise would have gone unserved in the past, they provide a poor service (56% of factor charge, few hours of electricity per day), and represent a fiscal burden for the Government. Schemes with greater private or community participation and different technologies could improve quality of service, increase the development impact of electricity and reduce the cost for the Government. However, as of now, there is not a coherent vision for ENEL on how to deal with these assets, and as a result, it is very difficult to implement new schemes wherever ENEL has a presence.

Limited international support to off grid areas. Some bilateral-funded activities are supporting CNE's efforts to provide services through grid extension projects and through the installation of small hydro and photovoltaic systems. However, these efforts have tended so far to be small technology demonstration projects or to rely on heavily subsidized schemes. In both instances, they do not offer solutions that are technically or financially sustainable over time after the Project has ended, which is the crucial challenge in a country like Nicaragua with scarce public resources and dispersed rural communities that are expensive to serve. A recently completed study on off grid areas sponsored by the Inter-American Development Bank (IADB) has focused on the identification of development poles and the extension of the grid in urban areas in small cities, rather than on the expansion of the services into the rural areas. The only exception is a recently completed major study conducted through UNDP-GEF technical assistance that identified 30 minihydro sites and conducted prefeasibility assessment.

Participation and Diversity. The rural electrification program should reflect the great diversity of Nicaragua's rural areas. The communal structures of the predominantly indigenous rural population on the Atlantic side demand specific service delivery mechanisms and participatory implementation procedures, which are not in place today. Many low-income dispersed households require only the most basic electricity services rather than costly 24 hour, AC connections.

Government Strategy

The Government's sees the expansion of electricity services in the rural areas as part of its strategy to improve the competitiveness of the country through the strengthening of rural economic activities, and as a tool to fight poverty through the improvement of the living standards of the rural population. The GON however, is also aware that the electricity sector would be able to contribute to the achievement of these ambitious goal only if the structural issues described in the previous paragraphs are satisfactory resolved.

CNE has enlisted the support of the international community to support to address these issues and has started to build up internal consensus among the different actors involved in the sector. It is presently coordinating the execution of several donor activities and actively engaged in discussions with INE, ENEL, *Unión Fenosa,* representatives of the National Assembly and the members of the rural communities that would benefit from the implementation of the Plan. These include a proposal for a strategy to strengthen FODIEN and the elaboration of specific regulations and procedures and the design of policies to eliminate barriers and promote the use of different sources of renewable energy (hydro, wind, geothermal and biomass). To fill the legal vaccum that exists now for hydroelectric projects, MIFIC and the *Comisión Nacional de Recursos Hídricos*, of which CNE is a member, have prepared and presented to the *Secretariado de la Presidencia,* a draft law to promote the use of hydro resources to generate hydroelectricity, that sets clear procedure for MIFIC to grant the water rights of use to private operators and includes fiscal incentives to promote the use of these resources. The draft law will be presented to the National Assembly prior to negotations, and is expected to be generally well received. CNE is also collaborating with ENEL to devise a long term solution for the diesel plants, consolidation of rural electrification databases and demand projections. It has reached agreements with Union Fenosa on electricity tariffs, and procedures to build, finance and operate grid extension for rural electrification. It has also undertaken rural tariff studies in both concessioned and non concessioned areas to device new modalities of sustainable delivery mechanisms for electricity with participation of private providers. At the same time, CNE is working with the international donors to advance in the actual implementation of the PLANER with the electrification of specific sites through grid extension and off-grid electrification projects.

Rural Microfinance

Background

The Nicaragua microfinance industry has a well-developed set of institutions, including non-governmental organizations [*Asociacón de Consultores para el Desarrollo de la Pequeña, Mediana y Microempresa* (ACODEP), *Fundacion para el Apoyo a la Microempresa* (FAMA), the Foundation for International Assistance (Finca Nicaragua), and *Fundacion de Desarrollo Local Nitlapan* (FDL Nitlapan)], two large credit union movements (La Caruna and La Financiera, supported by the World Council of Credit Unions), and two finance companies (Confía, FIDESA). There are also smaller regional microfinance/business development institutions, such as Pana Pana, serving less developed parts

of the Atlantic coast. In overall terms, the industry is characterized by (i) high outreach (over 150,000 clients, large in comparison to microfinance coverage in other Central American countries); (ii) seasonal working capital products; (iii) access to short term funding, often from Government programs and donor grants (leading to a very low weighted average cost of capital); and (iv) marginally acceptable portfolio performance (portfolio at risk of 30 days in the range of 5% to 8%). An estimated 19,000 of the more than 150,000 clients (13%) live in rural areas.

Issues

Key constraints to the growth of sustainable microfinance in rural markets (including offgrid sites and surrounding communities) include a narrow credit product line, limited microfinance institutions (MFI) experience in rural markets, an unsupportive legal and regulatory framework, the presence of large government and donor-supported rural subsidized credit programs (resulting in an undisciplined rural credit culture), and a lack of access to best practice information and technical tools. With a few exceptions, Nicaraguan microfinance institutions only provide short term working capital and may need significant assistance if they are to expand their product lines to include innovative products (such as consumer loans for household hookups to off-grid grids and solar household systems). There are large parts of the country which have almost no access to institutional microfinance services, and must rely largely on moneylenders, suppliers, family and friends for short term seasonal loans. A recent study (Legovinni, 2002) demonstrated that supplier credit tends to result in greater indebtedness, but often not in a greater asset stock. There are no secure liquid savings options available to these households, which would enable them to build assets over time. Most MFIs are non-government organizations or foundations, and therefore are not legally permited to mobilize savings (since they are unregulated institutions).

There are both external and internal challenges as the national microfinance industry grows. The existing legal and regulatory framework is not supportive (due to the usury law in place), and an effort in the National Assembly to adjust the legal and regulatory framework governing microfinance poses potential dangers, by allowing savings mobilization by unregulated institutions. In addition, the MFIs face internal management challenges as portfolios grow, outreach expands, and new products are developed. The proposed legal and regulatory changes and a new alignment of the government's rural credit and transfers programs are being reviewed by a newly established public-private Microfinance Commission coordinated by the Technical Secretariat of Coordination and Strategic Planning of the Office of the Presidency, which is the International Development Association's (IDA) counterpart in the development of a Rural Financial Services Development Project.

Government strategy

Over the past five years, the Government has become much more supportive of the microfinance industry (to help with its poverty alleviation and employment objectives), yet the changes in the legal and regulatory framework and the practices of Government programs do not contribute to greater sustainable outreach to rural areas. When the Government closed the national rural development bank in 1998, the Fondo de Credito Rural was created as a second tier institution for microfinance institutions. However, the tight control on on-lending interest rates and margins failed to attract participation by MFIs. In 1999, the National Assembly approved *Ley No. 176 Reguladora de Prestamos entre Particulares*, which sets an artificially low ceiling on interest rates and makes sustainable rural lending extremely difficult. Combined with the tremendous destruction caused by Hurricane Mitch in rural areas, and a dramatic drop in international coffee prices, outreach to rural clients has become a major challenge for MFIs and

other financial institutions.

In recent months, there has been a growing awareness in the Government (especially the Superintendency of Banks and Other Financial Institutions, the Office of the Presidency, the Central Bank and the Ministry of Finance) that a different package of policies and programs would be more effective in increasing rural outreach by MFI, NGOs, credit unions, cooperatives and commercial banks. The microfinance institutions need help in identifying new pools of clients, designing attractive loan products, and obtaining reliable long term commercially priced sources of funds. The two Government second tier programs, instead of helping these financial institutions face such challenges, actually interfere with private sector market-based solutions by flooding local markets with subsidized credit. The *Fondo de Crédito Rural* and the *Instituto de Desarrollo Rural* tend to use subsidized credit and heavy targeting mechanisms, negatively affecting the incentive system in rural financial markets. These and the Fondo Nicaraguense de Inversion, which provides credit lines to commercial banks for micro and small lending, are expected to undergo major restructuring to insure that their practices and services support a vibrant and sustainable microfinance industry.

Rural Business Development Services

Issues

Studies in Nicaragua and around the world have shown that credit is not sufficient to insure that micro and small businesses grow significantly, especially in rural areas (Legovinni 2002, Ademcol 2001). These businesses also require help identifying new markets, designing new products, diversifying suppliers of key inputs, adopting new technologies, redesigning work flow, and planning for the firm's future. The problems with BDS provision, however, typically include a lack of appreciation of the immediacy of the client's needs and a concrete contribution to "bottom line" results.

The national market for BDS is characterized by a lack of scale, the dominance of supply-led approaches, and a strong urban bias. Of the 22 BDS providers identified in a recent study (Berrios, 2002), only one is a private firm, while non-governmental organizations dominate the market. In general, BDS is not yet seen as a marketable set of services for most firms, and there is little competition between providers. There is a great deal of interest in e-readiness, infocenters and high tech solutions to the marketing, production, and management issues confronted by local businesses. However, in rural areas, where computer literacy is exceptionally low and scale of operations and ability to pay for services are not likely to be high, these high tech approaches do not seem to hold much promise. BDS providers include one private company, one foundation, two producer organizations, two universities, four public institutions, and thirteen non-governmental organizations. These organizations provide a broad array of services, including technical assistance and training for the agriculture and animal husbandry sectors, as well as business training, such as marketing, basic accounting, client relations, and credit management. However, many do not charge full-cost recovery prices for their products, and have relied on donor support since inception.

A recent survey of demand (CAECOMP, 2002) and a household survey (Torres, 2002) identified a series of both actual and potential business clients with BDS needs and their willingness to pay for appropriate and timely services. These include (i) existing micro and small businesses (production, commerce and services such as those needing loans for sewing machines, small electric fencing and small irrigation systems); (ii) start-up micro and small businesses; and (iii) cooperatives (ranging from large milk cooperatives and cattle cooperatives in El Ayote to smaller, less formal groups in several sites).

Government Strategy

The Government's strategy is to strengthen rural businesses by diversifying rural economic activities, investing in the development of rural human capital and technology as well as by raising competitiveness, establishing links between the rural and the urban private sector. This goal is promoted in several Government programs of the Ministry of Agriculture and the Ministry of Industry (MIFIC), which receive significant support from donor projects. The Government strategy is to link rural producers to the national economy through: (i) upgrading agricultural technology, supported by the Agricultural Technology Project of IDA and the SME Technology Project of the IDB; (ii) integrated clusters and networks for the dairy sector, supported by the United Nations Industrial Development Organization (UNIDO), and the coffee sector, supported by the IDA Competitiveness Project; and (iii) the strategy of the Institute of Small and Medium Enterprises (INPYME) to train trainers to deliver business development services to rural areas. MIFIC is coordinating all of these programs in order to provide consistency in coverage, pricing and quality. There is also increased interest in information and communications technology approaches to BDS delivery, but there is little infrastructure and no private sector support at this time. None of these approaches covers the immediate, "bottom line" business needs that were identified through various surveys of businesses in project sites.

3. Sector issues to be addressed by the project and strategic choices:

Consistent with its main objectives, the Project will support the Government's efforts to address sector issues by:

- Seeking the adoption of appropriate policies and a clear legal and regulatory framework by the Government to efficiently manage resources and minimize subsidies, encourage private sector participation in off-grid electrification, expand access to microfinance services, and improve access to BDS in rural areas.

- Supporting CNE in the design of the National Rural Electrification Strategy, building on the work initiated with the assistance of various international donors, and capitalizing on the IDA's experience in this area.

- Supporting CNE in the implementation of the PLANER in remotes rural areas, through hands-on experience in designing and implementing efficient and sustainable delivery mechanisms of electricity and other complementary services, in off grid prjects for a representative sample of rural communities.

- Supporting CNE in the implementation of the PLANER within and around the concessioned area, by working with this institution in the definition of clear rules and regulations (FODIEN) to finance both grid extension and off grid electrification projects and by financing sub-projects of descentralized generation that would be connected to the grid. The hands on experience of implementing rural sub-projects connected to the grid (like El Bote and El Ayote) would provide CNE an opportunity to implement the rules, established after the restructuring of the electricity sector, for Independent Power Providers (IPPs) selling to the SIN.

- Supporting, through the technical assistance component described above, capacity building of CNE and INE in off-grid electrification issues, renewable energy applications and coordination of complementary services to electrification (microfinances and rural BDS), which are seen as an integral part of the 'energización' of the rural areas in Nicaragua.

To achieve these objectives, several strategic choices were made that guided the design of the Project:

- Complement the provision of electricity services in the selected rural pilot sites with the provision of microfinance and BDS services to facilitate the sustainability of the electrification pilot projects and maximize their impact on the economic and social development of the communities. Microfinance services should make electricity services more affordable to household and businesses, and should also facilitate the development of new micro-businesses and improved productivity of existing ones. BDS services will support the increase in social and economic benefits of rural electrification by providing business skills, information on input and output markets, and information about sector best practices to existing and new micro entrepreneurs in these sites.

- Provide support assistance support for broad, strategic initiatives in the electricity sector that are essential for the sustainable extension of services in the remote rural areas(regulations, procedures and national financing mechanism), and support the actual electrification of several rural communities, for their demonstration effect and the learning by doing value for CNE of these experiences.

- Select a representative sample of the sites to be electrified in order to maximize the learning value of the Project for CNE, and increase the likelihood of a successful implementation nationwide of the PLANER. For the sample to be representative, it was necessary to have flexible criteria of selection, based on location, technology, market and institutional arrangement. This flexibility meant notably that:

  (i) Although most selected sites are located off grid, in a few cases (like EL Bote Cua Bocay and El Ayote), the electrification plan includes a connection to the grid to sell electricity surplus generated by the local operator. This operator remains responsible for providing electricity to the local market (located outside Union Fenosa's concession), but it can also sell to the national spot market or to Unión Fenosa. This sub-project will provide a test case of the rules and agreement reached with Unión Fenosa to channel electricity generated by independent small generators into the integrated system;

  (ii) There is the option open to finance under Phase Two one site that would be located inside Union Fenosa's concession, but with no access foreseen to the grid for the forthcoming 15 to 20 years (an area that Unión Fenosa would have no obligation nor interest to serve); and

  (iii) The Project supports mostly site-specific investment in selected communities, but it includes also a national program to purchase Solar Home Systems, to account for the significant economies of scale that characterize this type of technology.

- Focus on demonstration activities at the operational level only, in both microfinance and BDS. Larger sectoral issues, such as legal and regulatory framework issues for microfinance institutions (that affect the range of services provided, such as savings mobilization) are being addressed through an ongoing policy dialogue by IDA, other donors, and experienced technical assistance providers. This means that, in the short term, the microfinance component will support a full range of financial services by regulated financial institutions, but only credit provision by unregulated NGO MFIs. Through the Competitiveness Project (PROCOMPE), IDA is also engaged in specific activities to support Government's effort to promote BDS market development and strengthen other elements of international competitiveness.

- Recognize the structural socio-economic differences between the Pacific/Central and the Atlantic zones of the country and integrate these differences in the design of each component. The main implication of these regional differences for the Project design was the need to:

(i) enlist regional entities in the design of the Project, under CNE's coordination rather than hiring a single contractor from the Pacific area;

(ii) encourage participation of a range of service providers (private firms, local cooperatives and NGOs), rather than settling for a single pre-determined scheme;

(iii) tailor the content of the Project outputs in terms of scope and quality of services to the local needs and payment capacity (inclusive of possible subsidies), rather than imposing a priori solutions.

C. Project Description Summary

1. Project components (see Annex 2 for a detailed description and Annex 3 for a detailed cost breakdown):

Component	Indicative Costs (US$M)	% of Total	Bank financing (US$M)	% of Bank financing	GEF financing (US$M)	% of GEF financing
1. Rural Electrification and Renewable Energy Policies and Strategies	1.16	5.0	0.73	6.1	0.33	8.2
2. Rural Electrification Sub-Projects 2.1. Phase I (Investments and TA) 2.2. Phase II (Investments and TA) 2.3. Fase III(Technical Assistance)	17.33	74.2	8.68	72.3	2.19	54.5
3. Microfinance Services for Rural Sub-Projects *	1.38	5.9	1.11	9.3	0.00	0.0
4. Business Development Services (BDS) for Rural Sub-Projects	0.91	3.9	0.75	6.3	0.00	0.0
5. Social Strategy, Consultations and Communication Activities	0.96	4.1	0.09	0.8	0.80	19.9
6. Project Management and Institutional Strengthening of CNE	1.61	6.9	0.64	5.3	0.70	17.4
Total Project Costs	23.35	100.0	12.00	100.0	4.02	100.0
Total Financing Required	23.35	100.0	12.00	100.0	4.02	100.0

*Does not include microfinancing needs of the solar PV program. This amount is subsumed in offgrid pilot investments category.

Activities under the first component aim to support to Rural Electrification and Renewable Energy Policies and Strategies amd Strengthening of CNE in the design and implementation of sector strategies and policies that would improve the efficiency of the energy sector and the sustainable implementation of the GON's PLANER. They will also include capacity building activities for CNE and INE to implement and supervise the rural electrification strategy. This component will also promote the use of renewable sources of energy by supporting changes in current regulations and procedures applied to these renewable resources and technologies, and by supporting the realization of national surveys to assess the existing stock of wood and other renewable sources.

Sustainability of the results achieved under the Project and more generally under the implementation of

Government's PLANER will be enhanced by the support given to the CNE through this first component and also through activities included in the other components of the Project. For instance, it is expected that the mechanisms developed and the lessons learned in the electrification of the specific pilot projects under the second component will be applied to the implementation and financing of the overall PLANER. In the same spirit, several activities included in components two to four will actively support the development of a training program or institutional strengthening for the different services providers (electricity, microfinances and BDS) that could be replicated nationwide. The same replication principle holds for the communications and consultation campaign that will be developed under component five for the various pilot sites of the Project.

The Project pilot sites under component the second component have been selected to constitute a representative sample of the sites that have yet to receive electricity services throughout the country Small hydro resources abound in many remote areas of the country and represent an indigenous and renewable resource that could reduce dependence on imported fuels. Consequently, the technology choice for many of the pilot sub-projects involve mini-hydro power generation and electricity distribution to consumers through independent minigrids. Two minihydro sub-projects (El Bote-El Cua and El Ayote), however, will be interconnected with the SIN to enable the sale of excess power. This was made not only to improve the economics of the sub-project but to pilot cases that may be representative of many unelectrified sites with hydro resources. Other sites were deliberately chosen from dispersed, low-income communities in the Atlantic Zone, where the solution to be piloted is centralized battery charging stations powered by solar photovoltaic panels (SBCS) and small individual solar home systems (SHS). For truly dispersed users in other remote areas, self-contained individual systems with solar panels of 20-100 watts would be marketed at the national level, through a Solar PV Market Development Program (SPV).

In all cases, what will be piloted are not the technologies employed but new business models that ensure an efficient use of scarce public subsidies, maximize private sector participation in service provision and sharing of investment risks, and improve the chances for long-term sustainable operation, in the technical and financial sense.The minigrid sub-projects will be developed as investment "packages" where a combination of private equity, debt and government subsidy enables the private investor/provider to obtain adequate returns. The packages will be bided out with lowest subsidy amount. Because the subsidies are one-time capital expenditures subsidies and not on O&M costs (see below), operation of the subsidized systems could continue after the IDA-GEF project terminates. The business models for these pilot sites will aim for greater efficiency and sustainability, by implementing new forms of public/private partnerships in which the government will play the role of market enabler and subsidy provider, while the private sector or community based operators will share in the investment risk and deliver the service in an efficient and least-cost manner.

Subsidies to be provided would be output-based (OB), transparent, well targeted, minimized through appropriate bidding mechanisms, and designed in a way to minimize market distortions. Direct investment subsidies will be accompanied by market development measures, such as training to providers and users, as well as promotion campaigns (for the SHS credit line). Subsidy levels and method of allocation will depend on the choice of technology and on the capacity to pay of users and local service providers. In the case of minigrids, the largest part of the investment subsidy would be paid upon construction completion, and a smaller portion (up to 20%) would be paid against yearly connection targets. This balances the incentive effect of performance based subsidy allocation with the financial strength of cooperatives and other small producers in rural areas who do not have sufficient liquidity to bear delays in investment subsidy payments.

In principle, and following the approach adopted in the Electricity Law, subsidies, if needed, will only

finance investment costs - including the costs associated with the final connection to the user, initial higher cost of new technologies, or other clearly defined one-time costs, like the watershed management programs. However, two implications of this approach are worth mentioning: Given that some of the areas benefiting from the Project are extremely poor, CNE may later face a trade-off between target market penetration rates and amount of investment subsidies. Furthermore, for the same reason (low monetary income levels in some of the pilot communities), there may be the need for adopting a tariff structure that will include some degree of cross-subsidies, if a substantial rate of penetration is to be achieved.

In parallel, the Microfinance Services for Rural Projects Pilots component would support a set of increasingly sustainable financial institutions that provide a range of financial services to low income households and micro and small businesses in the Project sites and to communities nearby, which will enable local micro and small businesses to take full advantage of the opportunities provided by rural electrification. The Project aims to finance a loan portfolio of about US$600,000 for micro and small businesses in the sites and surrounding areas and matching grants for institutional development to participating MFIs (this, in addition to the financing needs of the national solar credit line). With planned matching investments by participating MFIs, the total loan portfolio would be about US$ 750,000.

The business development services (BDS) for Rural Pilot Projects component would provide grants to qualified BDS providers so that new BDS products and delivery models can be provided to the Project sites and surrounding communities. The BDS products will include appropriately designed technical and managerial courses and consulting services, access to market and technology information, and other support to improve the productivity and profitability of local firms. Appropriate BDS to assist small and micro enterprises in pilot sites and surrounding areas will be provided through a program of development grants (for new content and delivery mechanisms tailored to the local demand) for provision of BDS and through technical assistance to community based BDS providers.

To achieve financial sustainability of service provision, both the microfinance and BDS components have been designed for a broader coverage, reaching not only the targeted communities and electrification clients but also surrounding communities to allow for a broader client base.

Social considerations have been integrated from the outset in the preparatory work of the Project, with a strong emphasis on community consultations at the early stage of the Project design, and this approach will continue to be used during the implementation of the Project through consultations and communications activities included in the fifth component. In addition, since some of the sub-projects will benefit indigenous communities, preparation work (e.g. demand study) has paid special attention to an appropriate participation of indigenous groups and an Indigenous People Development Framework was prepared prior to appraisal. A detailed action plan will be completed prior to Board Presentation and implemented under the Project to ensure that the content of the components will take into consideration the particularities of these most vulnerable groups. The environmental guidelines that accompany the Project are contained in a general environmental framework. This framework has been applied already to evaluate four electrification sub-projects and will also be used to evaluate the environmental impact (and recommend eventual mitigation measures) of the remaning sub-projects.

Sequencing of Sub-projects. Based on the results of preparatory work, the eight to ten pilot sub-projects that have been already identified have been divided into two phases: Phase One would include the three pilot sites that are closest to implementation: (i) El Ayote, (ii) El Bote in the central region, and (iii) Francia Sirpe, Sagni Laya y Augwas Tini, three communities in the Northern Atlantic Zone - RAAN). Phase Two would include the remaining five to seven sites that have been studied during preparation but are still in the process of final selection. Phase Two also includes the national level Solar Photovoltaic

Program (SPV). In addition, technical assistance will be provided under the PERZA to CNE to prepare a Phase Three that would include a set of sub-projects to be financed through the FODIEN with resources yet to be determined.

Scope of PERZA: financing of the Pilot Sub-Projects and Participation of the Central American Bank for Economic Integration (CABEI). An important objective of the Project is to promote active participation of the private sector in the provision and financing of electricity and accompanying services in the rural areas of Nicaragua. This is why the financing package for the electricity sub-projects will include not only subsidies, but also equity contributions and debt financing of the operators. Initially, proceeds from the IDA credit had been allocated to provide the debt financing to all sub-projects, with the expectations that success in Phase One sub-projects would reduce the perceived risks of these transactions in rural areas and convince other financial intermediaries to lend their own resources to operators in Phase Two Sub-Projects. However, CABEI has come forwards and expressed interest in lending directly to the private operators up to US$ 3 million (FALIDES funds) in the two Phase One sub-projects (EL Bote and El Ayote). This would free resources from the IDA credit that could be used to expand the scope of the PERZA by financing the provision of services in a greater number of sites in Phase Two. Using a conservative approach, the PERZA budget presented in this document assumes that CABEI will finance only the operator, ATDR-BL in El Bote, granted that CABEI's due diligence of the project concludes satisfactorily. A similar evaluation for El Ayote should take place once the operator of this sub-project is selected. If it is satisfactory, and CABEI provides the debt financing for this sub-project, then Phase Two could be further expanded. CABEI has also expressed interest in providing additional financing through a concessional loan to the GON for up to US$ 5 million (FETS funds), to finance sub-projects to be implemented under the PERZA. While the PERZA's budget does not include these funds because they have not yet been secured, the loan from CABEI could widen the development impact of the PERZA project by providing resources to finance additional sites prepared under Phase Three of the Project.

Replication Strategy. The technical assistance to CNE under component one and two, in combination with the management assistance under component five, will focus to complete the overall regulatory and institutional framework for RE, and to transfer lessons learned in Phase One and Two to CNE's National RE Strategy (PLANER). The participatory monitoring and evaluation strategy which will be designed and implemented by CNE will assemble and analyze feed-back from the Phase One and Two sub-projects to allow for a phased learning effect: (i) the piloting of new off-grid delivery mechanisms will provide valuable lessons that will directly help to define and improve the new processes to be adopted under PLANER; (ii) the successful demonstration of these new, decentralized business models in the Nicaraguan context will help to attract private sector players and decrease perceived risk of market entry (and therefore interest rates for local commercial debt); (iii) in the third year of implementation, based on these lessons, a comprehensive replication strategy on national scale will be formulated by CNE, which will evolve around the new processes designed and improved during Phase One and Two implementation; and (iv) this replication strategy will include the identification of a set of new projects (Phase Three –investments not financed under this Project) that will be financed and implemented by CNE with the benefit of lessons learned under Phase One and Two and with additional technical assistance from the Project as needed. Future projects to be implemented under this replication strategy would then profit from the full enabling environment which will have been put in place as an output of assistance to CNE under component one.

This sequencing of the technical assistance component (to improve the framework for RE) and the pilot projects (to demonstrate and learn from new business models) is crucial for making both levels work together most effectively: The concrete pilot projects will be implemented fast to create success stories –

and will therefore mostly be pre-structured transactions which won't have to wait till the new enabling framework for RE will be fully in place. This is important because implementing all necessary changes to the regulatory and institutional framework – though identified by effectiveness – will take time. This is why component one is crucial to overall project success: in parallel to pilot project implementation, component one will assist CNE in finalizing the design of the new strategy, in building consensus for the needed changes, and in implementing the new framework.

UNDP-led initiative on small hydro power (SHP). This initiative, planned to be carried out in parallel to PERZA under CNE management, comprises proposed investments in SHP plants and technical assistance activities to build institutional capacity and strengthen the regulatory framework specifically in relation to the development of small hydro resources. Although the UNDP-led initiative will be carried out independently of PERZA, cooperation between the two initiatives in key areas will avoid duplication of activities, capture synergies and enhance overall benefits to the common client. The table below summarizes the component activities:

Table 2. UNDP-led initiative on small hydropower, Costs in US$millions

Components	GEF	Co-financing	Total
1. Adjust the existing Regulatory Framework to promote and develop small-scale hydroelectricity in isolated systems for productive uses	0.10	0.02	0.12
2. Strengthen the capacities of the public institutions, private businesses and NGOs in the national sphere	0.80	0.39	1.19
3. Strengthen local technical and administrative capacities to implement SHP projects	0.94	0.18	1.12
4. Demonstrate the validity of the SHP as a sustainable electrification option geared to productive uses (investments)	1.05	9.57	10.62
5. Contribute to the mitigation of natural disasters associated with climate change	0.28	0.31	0.60
6. Promote replication at a national and international level (outreach, monitoring and evaluation)	0.30	0.04	0.35
Total	3.48	10.52	14.01

The investments proposed in Component 4 include a portfolio of seven sites, selected by CNE and UNDP out of an initial set of 30 minihydros (See Annex 2). From these seven sites, the PERZA Project has agreed in principle to finance three sites, according to the priorities indicated by CNE, which put a particular emphasis on the potential for productive uses. Final selection of the sites will take place once the feasibility studies have been completed.

For these selected subprojects, IDA economic, financial and other operational guidelines will be applied. Furthermore, as indicated in section C.1. of the main text, as additional resources from the IDA credit have been made available due to the participation of CABEI in the financing of Phase 1 sites, PERZA could be able to include an additional SHP project, based on CNE's list of priorities. This will be discussed during the first months of project implementation.

2. Key policy and institutional reforms supported by the project:

- Adoption of a sustainable national rural electrification (RE) strategy by CNE, which integrates off-grid solutions and reflects the social diversity between the Atlantic and Pacific zones of the country.
- Improvement of the FODIEN, for RE, completion of the regulatory and legal framework for rural electrification (on grid extension and off grid projects), and explicit integration of off-grid solutions in the National RE Strategy.
- Adoption of Price and Subsidies Policies by Executive Decree to provide clear and transparent rules for electricity providers in rural and urban areas and give to the regulator INE the necessary guidelines to approve tariffs, specially in rural electrification projects.
- Adopton of clear rules and regulations on the granting by MIFIC of concessions to private operators for the use of water in hydro-electric projects.
- Support to CNE, ENEL and other actors involved to devise a long-term solution for the restructuring of ENEL, and in particulier for the management of ENEL's rural assets (ENEL-Plantas-Aisladas).
- Implementation of efficient and well targeted output based subsidies schemes for rural electrification, including off-grid electrification.
- Capacity building in CNE and in INE to implement and supervise the rural electrification strategy.
- Reduction of market barriers to renewable energy technologies through the replication of mechanisms used in project pilots and lessons learned from these experiences, as well as through the changes in current procedures adopted by the Government, while designing their RE Strategy.
- Application of lessons learned on integrating microfinance and/or BDS provision with off-grid electrification in national strategy.

3. Benefits and target population:

Households: The main direct beneficiaries are about 16,000 rural low-income households living in the remote pilot project areas, with a larger number of additional populations expected to benefit through the future large scale replication of the project as part of CNE's PLANER. As a result of electrification, households will enjoy a significantly higher quantity and quality of illumination (at lower unit costs) than that provided by kerosene lamps or candles (about 200 times brighter), improved safety and security (avoid accidental spills and fires), reduced indoor pollution (no smoke and soot), and inclusion effects due to the ability to operate radio and television. Children would be able to read and study at night and women would gain extended hours to complete domestic tasks or home-based business activities.

Small and microbusinesses: The project will benefit private entrepreneurs in rural areas by enabling (a) increased productivity of local micro and small businesses requiring electricity access, microfinance and BDS; (b) the creation of new businesses due to electricity access (e.g. refrigeration, electric fencing); and (c) the creation of a new, local electricity service supply industry through the development of a market for off-grid services and renewable energy equipment sales, installation and maintenance. Providing energy services in remote areas requires RET equipment, some of which could be produced by local industries in the medium term, thereby increasing the value added to the local economy. Existing businesses will be able to upgrade their operations to use new technologies and processes (especially those hooked up to the mini-grid), thanks to access to BDS providers and microfinance institutions, and will be able to work longer hours, with lighting available.

Public and communal uses: Residents of the pilot sites will benefit from the provision of electricity to schools, clinics and other public service centers through improved facilities and services (educational TV in schools, refrigeration of medicine in clinics, etc) and extended service hours. Lighting and TV in community centers will enhance or make possible important community activities that increase the social

capital. Street lighting is especially crucial for women and children, as it allows them to participate in community social activities during the evening hours – often the only time left after a long working day. The central and local governments will benefit by being able to fulfill their social and political commitment to improving the living conditions of people in remote and marginal areas of the country.

Indigenous Communities: The PERZA project has a special relevance, --beyond the benefits described in the previous paragraphs--for the indigenous communities on the Atlantic Coast, which have a population in extreme poverty and highly dispersed, and a scant presence of the Government**.** The Project provides a forum for the authorities and the population to collaborate and reinforce the local cultural identity while facilitating the insertion of the community within the national economy. It also promotes the exchange of information between the State and the local population (through an offer and demand for public policies) and the definition of local development priorities. In doing so, the Project contributes to reestablish the sense of national integration that has been extremely weakened in these areas, which have different cultural characteristics and have been historically marginalized from the rest of the country. The participatory approach implemented from the outset during project preparation should contribute by itself to the sense of ownership of the Project by these communities, to its sustainability, and to the development of a sense of citizenship and social responsibility. In this context, the implementation of electrification sub-projects in these indigenous communities of the Atlantic Coast constitutes an opportunity to define sustainable alternatives for a greater national integration of the country, even though it may represent a difficult challenge due to the costs and the characteristics of the communities.

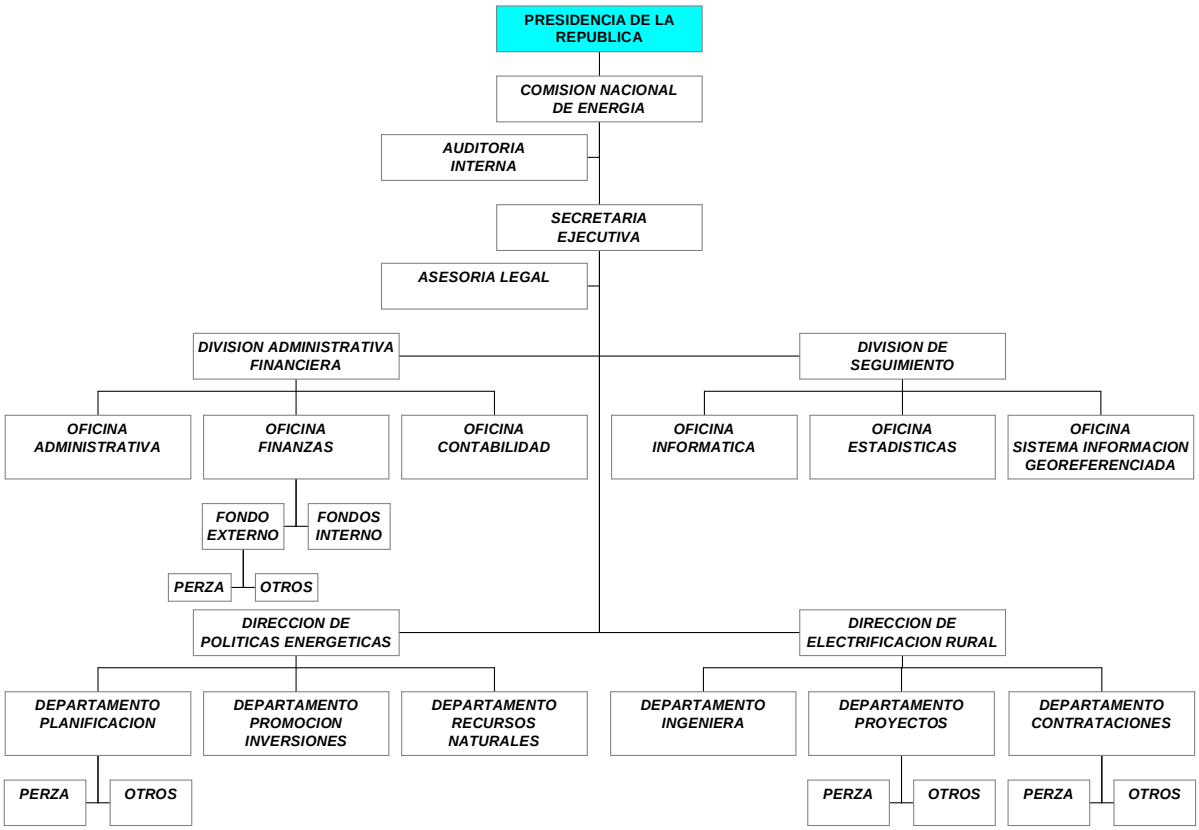
Other benefits: Expanding the use of indigenous renewable energy resources where feasible in the rural areas will have a modest but positive impact on Nicaragua's balance of payments deficit, as the country still relies heavily on fossil fuel imports. The use of RETs has the added benefit of reducing emissions and contributing to local and international environmental goals. Finally, investments in electrification of remote, off grid areas have many associated social benefits, including increased local employment opportunities. This contributes to reducing the pressure for marginal populations to migrate towards the major cities of Nicaragua.

4. Institutional and implementation arrangements:

***Implementation period*:** Five years (FY 2004 to FY 2008)

Executing agency: *Comisión Nacional de Energía* (CNE)

Project coordination: The *Comisión Nacional de Energía* (CNE) will be the implementing entity. CNE has assigned the team (referred to as PMU) that will coordinate all aspects of project implementation, including procurement, disbursement, financial management and selection of participating entities. The PMU project coordinator will oversee proper coordination with the technical, finance and procurement staff that constitutes the PERZA PMU, and will coordinate the work with the UNDP-led initiative on small hydropower. The PMU's Project coordinator and technical staff will report to the Division of Rural Electrification, except for the staff responsible of component one (policy issues) that reports to the Division of Energy Policies. Procurement staff will be under the Division of Rural Electrification, whereas the finance staff will be under the Administrative and Finance Division (DAF). An organizational chart is included below.



All the components will be managed by the PMU. In the case of the electricity component, the PMU will manage directly the technical assistance sub-component of both the policy-component and the sub-projects, and the investment subsidies that will be paid to the operators. At the same time, when the IDA credit agreement funds finance the portion of the debt financing investments in the mini-grid systems, a financial institution will be chosen on a competitive basis to administer the debt through a trust fund. In the case of the Microfinance Component, a credit committee including at least one representative of PMU and two from the private sector will qualify micro financing institutions and review their applications for credit lines and institutional development grants. The BDS component will

be supervised by the BDS specialist of the PMU, and the PMU will serve as a clearinghouse of information on existing BDS suppliers. A grant committee consisting of at least one PMU representative and two private sector representatives will review grant applications submitted by BDS suppliers. Finally, the PMU will manage directly the technical assistance activities of the social and communications component.

Flows of Funds.

Special Accounts (SAs) and Second Gneration Special Accounts (SGSAs)

There will be 2 special accounts, one for the loan and one for the GEF grant. The special accounts must be opened in the name of the Project. However, the Ministry of Finance would designate the Treasurer's (TGR) authorities as signatories of the SAs.

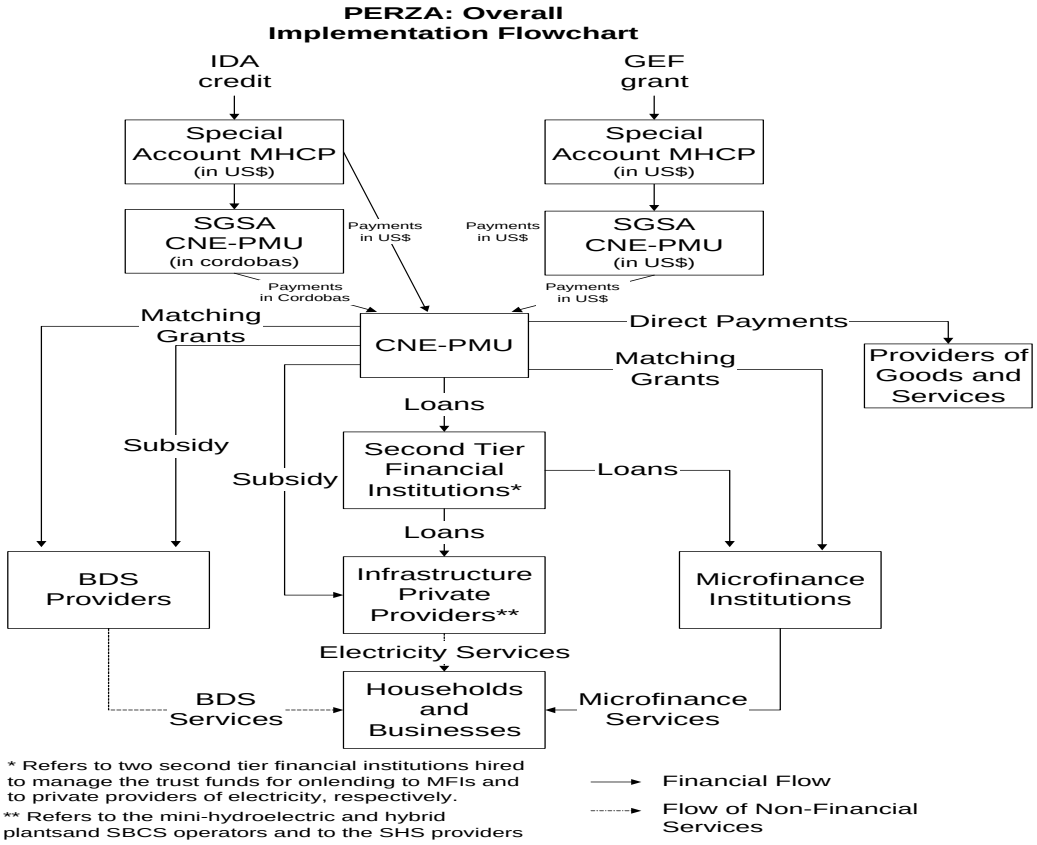
For local payments, credit agreement, the funds will be transferred to a bank account in Córdobas (the SGSAs) in amounts reasonable to prevent significant exchange rate losses, e.g. the weekly amount of pending payments (invoices, transfers to IFIs/MFIs, subsidies, grants, etc). GEF-grant funds will be transferred to a SGSA in US Dollars. Any exchange rate loss cannot be covered with loan and grant funds. Payments in US Dollars can be made directly out of the credit SA with the authorization of the Treasurer.

The CNE would report to the government's accounting system (SIGFA) for the recording of subsequent expenditures incurred and the request payments out of the SAs and transfer of funds to the SGSAs. Once SIGFA is implemented in CNE access to SIGFA will be direct. The TGR must be subject to service standards that guarantee prompt execution of the requests from the CNE.

The IDA credit funds and GEF grant will be channeled through a US Dollar account at the Central Bank of Nicaragua (BCN), Special Account (SA), identified as *MHCP- PERZA* and managed by the Ministry of Finance. Upon CNE's request and with the approval of the National Treasury (*Tesorería General de la República)* the BCN will transfer funds to the Project Second Generation Special Account (SGSA) opened by the CNE-PMU at a commercial bank acceptable to IDA. Both accounts, the SA and the SGSA, will be subject to IDA's controls for the Special Accounts. The IDA credit and GEF grant will be used to provide subsidies (in the rural electrification component), matching grants (in the micro finance and BDS components) and in the case only of the IDA credit resources, to provide loans to private operators, if needed, and to businesses and households to finance electricity connections and productive uses.

Counterpart funds. Funds will be transferred to CNE-PMUs by the MHCP on monthly allocations, based on the quarterly projections submitted by CNE, and up to the maximum ceiling of counterpart funding for the project approved in the GoN budget.

The chart below describes the overall flows of funds of the Project, while the PIP includes a more detailed description for each of the Project components.



The PMU at CNE will directly manage the GEF resources and all IDA funds that will be used for direct subsidies and matching grants, to allow for efficient implementation of the output based subsidy schemes, based on the PMU's monitoring of the providers' performance against pre-defined indicators (e.g. connection targets per year). PMU's capacity to fulfill this role will be strengthened through the Policy and Strategy and the Project Management Support components.

Mini-grid investments. When IDA funds are used to provide commercial debt for the private operators, the resources will be channeled through a financial intermediary institution (FI), chosen on a competitive basis to administer the funds. The FI could be a financial agent working for PERZA (and not taking on the credit risk), for a negotiated fee. It will execute due diligence based on a set of criteria defined by the Project's credit committee, following IDA guidelines. Alternatively, the FI could also use its own resources instead or together with the IDA funds to leverage the Project resources.

For the phase one, CABEI has already expressed a strong interest in financing the commercial debt of the operators in the case of El Bote and of El Ayote, and this will leverage the Project funds. It is hoped that the successful example of Phase one implementation will lead to a decrease in perceived risk of off grid projects by local banks and other FI, so that providing FIs would be willing to follow CABEI's example and lend to operators of Phase Two sub projects at their own risk, with little or no additional resources from the IDA credit. Furthermore, CABEI's proposal to provide up to US$ 5 million in a concessional loan to finance the provision of services in other sites yet to be electrified could expand the scope of the PERZA project and lead to the implementation of a phase Three as described in Section C1, whereby PERZA provides the experience acquired in the implementation of the two first phases, while CABEI provides the resources needed to provide integrated services (electricity, microfinances and BDS) to several new sites selected according to the Government's priorities defined in the PLANER.

Eligible to borrow from the selected financial institution or the participating banks for the debt portion of mini-grid sub-project investments financed with IDA funds are private companies selected by the PMU through competition or negotiations to execute the sub-projects. This lending institution will enter into a trust fund agreement with CNE-PMU. They will be responsible for screening, appraisal and approval of these sub-loans in accordance with their internal guidelines, the rules established in the Operation Manual, the terms of the management agreement, and the content of the contracts of the services providers.

The PMU will release the capital expenditure subsidy allocated to the specific sub-project to the executing company, after certification by its field inspectors, at agreed points in time during the construction phase and after completion of a batch of connections (an output-based aid approach).

For the SBCS sub-projects in the three RAAN communities, PMU will select a qualified NGO to manage all phases of the sub-projects for a fee, including construction of the stations, procurement of equipment and batteries, organization of the communities and selection of local operators, training of local operators, installation of associated home kits (lamps, wiring and regulator) and initiation of the charging operation business. A contract will be executed between the PMU and the NGO and the needed funds transferred, according to the payments and product arrangements agreed in the contract. Given the scant capacity to pay of these communities, the cost of the investment in the center for Solar Battery Charging is expected to be fully subsidized, while the users will have to purchase the battery itself and pay a fee for recharging the battery.

For the national solar PV program, commercial dissemination of PV systems will be carried out through the dealer or vendor approach, where users purchase the system from accredited dealers who will install the system and provide after-sales maintenance services. The user will own the system after it is fully paid for but will be responsible for needed replacements later (battery, lamps, etc). The user will make a down payment of 5-10% of the system costs. He pays for the balance monthly, through micro-financing assistance, over a period of three years. To make the systems affordable, their initial cost will be reduced by a combination of GEF grants and government subsidies. These are paid directly by the PMU to the dealers upon proof of purchase and verification of completed installation. Dealers will be accredited based their previous experience in the PV and/or rural retail business, submission of an acceptable business plan, and other criteria. Aside from eligibility to receive output-based subsidies for systems sold, GEF grant funded technical assistance will be provided to the accredited for market studies, and public education and promotions. Such Technical Assistance will be contracted directly by the PMU with third parties.

Micro Finance Component. Under this component, the PMU will disburse funds from the operating account to qualified microfinance institutions (MFI), through a trust fund established in a financial institution (in an agency arrangement, and not taking credit risk), which is selected on a competitive basis. The transfer of funds to the qualified MFI will be based on contracts (for the credit part of project support) and institutional development plans (for the matching grant element). As mentioned in the above paragraph, the loans will be provided by the qualified MFI to the clients of the mini-grid sub projects and of the national solar PV program, to finance household and business connections and productive uses credit (many of which will rely on the use of electricity). The matching grants will be used to strengthen these qualified microfinance institutions by providing institutional development matching grants as an integral part of the overall package of project support. Based on experiences in other countries working with MFIs, likely areas of grant use would include new product piloting (such as for solar home systems), methodology research and development, internal controls and audit systems, financial management training for senior managers and Board members, and loan officer training.

The BDS Component supports institutional strengthening and product innovation, emphasizing the development of new BDS products tailored to local needs, as well as supporting new commercial and ongoing relationships between BDS providers and micro and small businesses. This component is entirely based on matching grants for capacity building of BDS providers on a declining basis that will be disbursed by the PMU. A second tier BDS institution will be selected on a competitive basis and according to Bank's procurement rules, to assist with BDS provider grant proposal reviews and monitoring of component activities.

Monitoring and Evaluation. A detailed and practical M&E plan is being designed by consultants and expected to be completed before negotiations. The key performance indicators and the corresponding M&E process will be consistent with those broadly identified in Annex 1. The plan will provide advice on how to set up a monitoring system, with specific recommendations on setting baseline data, data collection instruments, frequency of data collection, timing, reporting format, etc. It will identify training needs of staff for this purpose and recommend the appropriate organizational arrangement. One key performance area in the PV component to be specially monitored and evaluated is the actual outcome of the commercialization strategy as outlined in Annex 2. The strategy hypothesizes that productive uses powered by PV in low income, dispersed areas are best promoted after domestic lighting and institutional needs, if any, are first met by SHS, and residents have had time to develop familiarity and confidence in the technology. Specialized technical staff of the CNE will be responsible to measure the client level impact and institutional sustainability of the microfinance activities, as well as the client level impact and full cost-recovery aspects of the BDS Component.

The participatory monitoring and evaluation strategy will have a very high return on costs as it will serve for a variety of uses that are central to the success of PERZA. Besides (i) its obvious importance for measuring project success against the defined performance indicators of the Project components, the M&E strategy would (ii) be used to assemble and analyze feed-back from the Phase One and Two sub-projects to allow for improvement of FODIEN, successful demonstration of new business models to attract private sector players, and replication in future CNE projects (phase three and beyond); (iii) be directly linked to the OBA approach of the Project, where performance indicators (such as number and quality of SHS installations) will have to be measured by CNE in an efficient way in order to disburse subsidies; and (iv) demonstrate to CNE and INE how the future regulation of new off grid providers in remote areas can be organized without excessive high costs to the regulator.

Project Implementation Plan/Operations Manual. Project management functions and responsibilities will be governed by the Project Implementation Plan (PIP) and associated Operations Manual, which will be finalized prior to project effectiveness and will cover, *inter alia*, project procedures, financial guidelines, staffing and staff responsibilities, contract supervision, flow of funds, special accounts, budgeting, auditing and reporting, as well as procurement, disbursement procedures and selection criteria for the selection of project pilots for access to electrification, microfinance and BDS services. A draft of the PIP is attached.

D. Project Rationale

1. Project alternatives considered and reasons for rejection:

Limit project to rural electrification only (without microfinance and BDS components), as has been the rule in past IDA rural electrification projects.In the present project, the decision was made to combine off grid electrification with BDS and microfinance because: (a) BDS and microfinance would enhance off grid electricity service provision by addressing the vital issues of affordability and productivity improvements in the typically low-income target communities; and (b) this innovative approach provides an opportunity to learn important lessons about intersectoral operations that could be later replicated in Nicaragua by combining the provision of other services, and abroad using the lessons learned in this project.

Focus investments on grid extension projects. Although a substantial number of people within economic line extension distances remain unserved, the decision was made to focus on off grid electrification because: (a) the problem is more difficult than grid extension, and CNE has identified it as a vital gap in the national electrification strategy which it needs assistance to address; and (b) through past and ongoing off grid electrification operations in Latinoamerica and other regions, IDA has a comparative advantage in providing assistance in this specific field.

Focus exclusively on off-grid electrification projects. While the Project covers sites that are mostly beyond the reach of the interconnected system, it was decided not to exclude a priori sub-projects where a connection to the grid was deemed appropriate even if they were outside the concession area or had decentralized energy generation. The rationale beyond this decision was twofold: (a) PERZA's main value added is to provide a learning-by-doing experience to CNE, and these cases were representative of what CNE may find out when selecting the most appropriate design to bring electricity to marginal areas; and (b) these cases bring a unique value to the sample of sites because they characterize the type of contractual arrangements and delivery mechanisms that will need to be crafted with the distribution company in the concessioned area (Union Fenosa).

Information and communications technology-based infocenters. During project preparation, consideration was given to the inclusion of rural infocenters, which would use solar and other RET to power small computer-based business development activities. However, consultant reports on these rural infocenters found that there is limited business activity (only a few large cooperatives, in fact) which would be interested and willing to pay for such services. Therefore, a more traditional transaction-based BDS approach has been included in the Project design. The interested cooperatives will be put in touch with existing Government ICT-based BDS programs, including the PROCOMPE project supported by IDA.

Combine the Project with rural telecom. The possibility of combining the present Project with a proposed nationwide program to extend telecommunications services to rural areas was considered. The decision was made not to merge the two initiatives because: (a) the combination of off grid electrification with microfinance and BDS is already a relatively complex mix; (b) the nationwide scope of the telecom project and the requirement for a minimum market size of 500 inhabitants do not fit with the present Project, which focuses on only 10 to 12 pilot projects, many of which would not meet the minimum size criterion for the telecom market; and (c) it would be better to consider a merger in the replication phase, when a much larger number of off grid communities would be involved, of which several may satisfy the minimum usage criteria of the telecom project.

2. Major related projects financed by the Bank and/or other development agencies (completed, ongoing and planned).

Rural Electrification. Recently completed rural electrification studies for Nicaragua include: a) development of a master plan for extension of the grid (SIN). The study was carried out as part of the *Proyecto Regional de Energia Electrica Istmo CentroAmericano* (PREEICA), a program financed by the Canadian International Development Agency (CIDA); b) development of a methodology for electrification of non-concession off grid areas. This study was financed by IADB and carried out by the National Rural Electrification Authority (NRECA). This study identified several potential projects to develop relatively large local grids. CNE expects to finance two of these projects with US $ 3.5 million from the IADB power restructuring loan; and c) identification of potential minihydro investment projects and measures to reduce market barriers to their development. This study was financed by a UNDP-GEF technical assistance to CNE.

There is also a proposed US$5 million grant assistance by the Government of Spain to install solar photovoltaic systems for home lighting and community-based services in selected rural areas. The *Instituto de Desarrollo Rural* (IDR) is the lead agency for the proposed project. However, the status of the grant remained uncertain at the time of writing

Finally, an ESMAP study has been initiated with CNE to formulate policies and strategies for the long-term development of renewable energy in Nicaragua, covering not only electricity-based applications but also thermal and others. It will also examine the potential for large-scale grid connected RET applications, using wind, geothermal and biomass resources.

CNE is closely coordinating all of the above activities to ensure complementarity with the present operation. Aside from informal consultations already made by the IDA team with staff of NRECA, IDB, UNDP and CIDA, CNE organized in April 2001 a donors meeting in Managua to ensure that all actors are fully informed of each other's work. One concrete outcome of this coordination was the agreement reached with UNDP and CNE, under which several minihydro sites identified in the UNDP GEF PDF-B-financed study will be targeted for investment financing in the second phase of the PERZA project.

Microfinance. Five donors are actively supporting the national microfinance industry, in a variety of ways. USAID currently has three microfinance projects in Nicaragua, which are expected to be extended until December 2002. The counterparts are Confia, Finca and Promujer. The Mitch reconstruction project included a US$ 2.6 million microfinance component as well. USAID provides support to FAMA through a technical assistance grant to *Acción International* (ACCION) and a technical assistance grant to the World Council of Credit Unions (WOCCU) to support the credit union movement. SIDA (Sweden) supports the FONAGRO project, which provides long term credit for agricultural production or livestock raising. COSUDE (Swiss) is providing technical assistance grants to several of the leading microfinance institutions, while GTZ (Germany) recently supported the transformation of FINDE from non-government organization to finance company. IFAD supports the PROSESUR project, a US$6.8 million integrated rural development initiative. Finally, IDA is developing a Rural Finance Development Project, which includes a focus on regulation and supervision of second-tier operators and other sectorial issues. This project is expected to be presented to the Board in October, 2003. This would be consistent with the PERZA microfinance component design and work in regions not covered by PERZA.

Business Development Services. With support from IDA, the Presidential Competitiveness Commission is implementing the Competitiveness Project (PROCOMPE). This effort supports the development of clusters (in four predominantly rural sectors, including coffee, dairy products, tourism and light

manufacturing), the development of a private sector-led BDS market, and policy reforms in the areas of foreign direct investment, competition policy and training policy. Business development services will provide training, consulting and other business services for micro and small entrepreneurs, through a variety of delivery mechanisms, including ICT where viable. In addition, as part of the support to the extension of telecommunications sectors to the rural areas, the IDA telecoms project intends to support the installation of 55 telecenters. However, as noted above, PERZA sites are likely to be best served by traditional BDS approaches. During project preparation, an institutional relationship has been built between PROCOMPE and PERZA, to insure efficient coordination and technical consistency in BDS issues and activities.

The experience with similar Bank projects elsewhere is shown below:

Sector Issue	Project	Latest Supervision (PSR) Ratings (Bank-financed projects only)	
		Implementation Progress (IP)	Development Objective (DO)
Bank-financed			
Private sector delivery of energy services	Sri Lanka Energy Services Delivery Project (P010498)	HS	HS
Commercialization of renewable energy technologies	India Renewable Resources Development Project (P02449)	S	S
Electrification of offgrid areas through private concessions	Argentina PERMER	S	S
Renewable energy in rural electrification--dealer model	Indonesia Solar Home Systems (P035544)	S	S
Renewable energy in rural electrification--grid connected	China Renewable Energy Development Project (P046829)	S	S
Improved National Competitiveness and Productivity	Competitiveness Learning and Innovation Project (P070016)	S	S
Other development agencies			

IP/DO Ratings: HS (Highly Satisfactory), S (Satisfactory), U (Unsatisfactory), HU (Highly Unsatisfactory)

3. Lessons learned and reflected in the project design:

The Project builds on lessons learned from similar projects, including :

Off-grid rural electrification

- the need to adhere to least-cost principles in designing power supply systems, and ensuring that the most practical technologies are provided;
- the need to aim for operational sustainability, which comprise both financial and technical aspects of the operation;
- the need for careful selection of target sites and market segments: the desire to address the needs of the poorest of the poor must be balanced with the goals of sustainability, minimization of subsidies and improving project success;
- the importance of ensuring that any subsidy mechanism must be targeted, transparent and least distortionary;
- the need to design technology delivery mechanisms with clearly distinct roles for government and the private sector--the government plays the role of market enabler and subsidy provider while the private sector delivers the services in an efficient and least-cost manner;

- the need to support different contractual arrangements (private operators, local cooperatives or NGOs) in off-grid projects where the attractiveness of markets may fluctuate a great deal according to the income level of the communities;
- the importance of providing timely assistance to local providers, who may lack business or technical experience, in how to start and run their businesses efficiently;
- the efficiency of off grid service provision in remote areas can be increased significantly if local technicians are involved in the service delivery process. Local technicians are close to the users and communities which allows to meet their specific demands better and faster, reduces transaction costs and non technical losses and increases user satisfaction;
- the importance of promoting ownership by maximizing local participation; and
- the need to keep political pressures from interfering with technical and economic decisions.

Rural Microfinance

- investments in institutional development for microfinance institutions are a critical ingredient to long term sound growth of these institutions;
- economies of scale play a key role in the financial sustainability of the MFI;
- interest rate subsidies have had an adverse effect on credit culture, repayment discipline and poverty alleviation; however, a one-time up front subsidy to help households and businesses install energy systems does not adversely affect client repayment behavior;
- different microfinance models (individual loans, solidarity groups, village banks, a community model, and a third-party supplier credit model) can all be appropriate, depending on local conditions and practices. In Nicaragua, the preference is for individual loan methodologies; and
- private provision of microfinance services by specialized microfinance institutions has proven more successful and sustainable than government-sponsored projects.

Business development services

- cost recovery and a commercial orientation in the client-provider relationship are important objectives to adopt from the beginning of the design stage;
- market-oriented BDS has proven to be more effective than publicly-provided or donor-driven BDS; and
- BDS for poor, remote communities must use innovative financing and delivery mechanisms.

4. Indications of borrower and recipient commitment and ownership:

In November 2000, CNE hosted, along with IDA's Energy Sector Management Assistance Program (ESMAP) a stakeholder workshop in Nicaragua, opened by the new President-elect, to discuss innovative mechanisms for off grid electrification and the intent of the proposed IDA project. As a result of this workshop, the GON requested the support of the Bank and of GEF to develop a project that would support the Government's efforts to expand electrification services to the rural areas throughout the country, as a mean to improve the competitiveness of the country and the living standards of the poorest segments of the population.

Over the past year, CNE has been working closely with IDA and GEF to develop a project that would advance the agenda of Rural "Energización" with innovative schemes that would maximize the economic and social impact of the PLANER. To this end, CNE has actively participate in the detailed design of all the components to ensure that the overall project will achieve these objectives, while taking into account the practical difficulties of implementing such a complex approach. CNE has also mobilize resources from other donors and coordinate their efforts to ensure that the work supported under PERZA would capitalize on the results already achieved with other donors and complement the on-going

cooperation with all the actors in the electricity sector in Nicaragua. Finally, CNE has committed substantial human resources in the preparation of the Project and intends to continue this intense participation during the implementation participation, as a mean to ensure the successful realization of the Project and reap the benefits of a sustainable capacity build-up of its own staff, which will be in charge of implementing the PLANER as a whole.

CNE has also taken an active stance in the design and implementation of Sector legislation and regulations that are needed to provide a sustainable framework for the PLANER, a long term objective of PERZA. In particular, CNE has been instrumental in the formulation of the draft law for the promotion of hidroelectric projects and is committed to support the passage of this Law in the General Assembly.

For the Microfinance and BDS Components, CNE has demonstrated technical competence and initiative in identifying technical training areas, experienced consultants, and strategic alliances with industry leaders. With a view to assume a catalystic role in the provision of these services to rural areas, CNE has actively developed a strong working relationship with other Government and Private entities which are directly involved in these Micro finances and BDS.

5. Value added of Bank and Global support in this project:

The value of IDA and GEF support to this project transcends the mere provision of financing. Over the past several years, similar projects in both Latin America and other regions have been prepared as combined IDA/GEF operations and the benefits to the client are clear. Consequently, IDA provides a wealth of experience in the formulation of operations in this specialized field. While it promotes the role of the private sector in the new electricity service provision mechanisms, IDA is also in a position to advise the Government and influence the adoption of supportive sector policies. The involvement of GEF, on the other hand, in both PERZA and the UNDP parallel initiative, enables the pro-active consideration of still relatively more expensive but GHG-mitigating renewable energy technologies through its "incremental cost" financing facility. Of particular importance are photovoltaic (PV) systems that are often not only the least cost options but also the only way to provide basic electricity services to dispersed populations. Without GEF intervention, it is unlikely that a systematic program to initiate market development and fill a gap in the government's current off grid electrification strategy will occur. Finally, the integration of rural electrification with microfinance and rural BDS in a combined operation would not have been considered without IDA/GEF intervention.

E. Summary Project Analysis (Detailed assessments are in the project file, see Annex 8)

1. Economic (see Annex 4):

● Cost benefit NPV=US$ million; ERR = % (see Annex 4)

○ Cost effectiveness

○ Incremental Cost

○ Other (specify)

[x] Cost benefit [x] Cost effectiveness [ ] Other [specify]

The economic analysis has been performed separately for each of the four types of subprojects which will be financed under PERZA (see Annex 4 for details): (i) solar home systems, (ii) solar battery charging stations, (iii) mini-hydro projects (with connection to the SIN), and (iv) isolated village minigrids. The economic analysis draws on real data for all four types of subprojects.

Summary of Cost Benefit Analysis Sub-Projects - All Costs in constant Year 2002 Thousand US$

Sub-Project	Type	NPV (Costs)	NPV (Benefits)	**NPV (Net Benefits)**	**EIRR**
El Ayote	Village Minigrid - Offgrid	2,721	4,180	**1,459**	**23%**
El Bote	Mini Hydro - Grid connected	2,306	6,001	**3,696**	**40%**
Francia Sirpe	Solar Battery Charging Stations	639	849	**210**	**27%**
SHS Credit Line	Solar Home Systems (total 20, 36, 50Wp)	4,403	6,119	**1,716**	**34%**

The economic analysis yields positive and robust results for all four sub-projects of PERZA. For all four subprojects, NPV of Minimum Total Net Benefits is positive, and minimum EIRR ranges from 23% to 40%, well above the hurdle discount rate of 14%.

The economic costs consist of investment costs, replacement costs and operating and maintenance costs of the new systems in the project sites. The minimum benefits were estimated conservatively from (i) current substitutable expenditures for fuel and batteries (or tariff, where appropriate), (ii) net lighting consumer surplus, and (iii) global environmental externalities.

Additional qualitative benefits: Beyond these three direct benefit types that have been counted towards Total Net Benefits in this analysis, there is a broad range of additional direct and indirect benefits of rural electrification (see Annex 4), including: increased productivity of existing and new local businesses (this benefit will be specifically targeted by PERZA and is therefore expected to be at least as high as in comparable past projects); time savings for household chores; improved returns on education and wage income (multiplied by electrification of schools); additional consumer surplus from less expensive and expanded use of ICT (radio, TV, phone, fax, PC); health benefits (through decreased indoor kerosene use (particles; burns) and improves service in health stations (emergency lights; vaccines); social benefits to the community (street light increasing safety and allowing women to participate in community life at night); multiplier effects on local and national level from replication of the successful pilot sites; and synergy effects from bundling services. Many of the additional benefits from rural electrification are difficult to estimate. For PERZA economic analysis, only those benefits readily quantifiable with standard World Bank methods have been counted towards EIRR; the ranges of other benefits have been estimated where possible (and will have an additional positive contribution to Net Benefits of the project), but have not been counted towards the conservative EIRR used for project economic analysis.

2. Financial (see Annex 4 and Annex 5):

NPV=US$ million; FRR = % (see Annex 4)

The main financial issues in the PERZA project revolve around the lack of commerce financing available for rural electrification projects in Nicaragua. Commercial debt finance for renewable energy developers (grid-connected and off-grid) and consumers (solar pv) in such poor country is virtually non existent. Part of this problem arises from the general limited level of development of the Nicaraguan financial services industry, and part of it is due to the lenders' perspective that the risks associated with these activities are high. This circumstance had prompted IDA to provide basic subsidies and study the provision of debt in order to attract private investors. The problem has been mitigated by the participation of CABEI in the financing of debt for El Bote, and very likely also for El Ayote sub-projects. However, commercial local banks still appear reluctant to finance sub-projects in the rural areas, and for that reason, the Project team will work with banks as well with microfinance institutions to determine what actions could be undertaken to increase availability of commercial debt finance on terms that meet the needs of the renewable energy industry.

While the PERZA team is finding alternatives to this problem, the financial analysis has considered the provision of alternative sources of debt within the framework of IDA funds. Part of the analysis has focused on obtaining the right combination of subsidy, debt and equity that will make each sub-project sustainable and at the same time will provide attractive enough returns on equity. This task has been challenging, as Annex 5 shows, for each sub-project. Different percentages of equity, subsidy and debt are recommended per sub-project. Despite those efforts, in the case of Francia Sirpi, a PV- only alternative in one of the poorest rural areas of the world, the subsidy had to cover the total investment in order to bring electricity to the Miskito communities of the region.

Additional challenges, at the sub-project level, came from the fact that the Projects had to cover their debt service (as the IDA will act as the main creditor and donor) while preserving some cash for future capital expenditures. Sub-projects' Equity and Project IRRs and NPVs as well as cash flow analyses are provided in Annex 5.

Fiscal Impact:

From the point of view of tax collection, sub-project legal entities will be private corporations that will be taxed at 25% corporate tax rate in Nicaragua, during the years that they present taxable gross incomes.

3. Technical:

No significant technology issues are expected since mature technologies will be used. The overwhelming investments are in small hydropower plants, a rural power option with which Nicaragua has over a decade of familiarity. It is planned to establish one pilot diesel/renewable hybrid power plant in the second phase of the Project, which will be either a diesel/wind/battery hybrid or a diesel/PV/battery hybrid depending on resources availability in the chosen site. The technical design and operation of such hybrids are fairly well-known; what will be tested is whether the fuel-saving benefits could offset the higher capital cost. The solar battery charging station (SBCS) is also a mature technology which has even better potential to be more operationally sustainable in remote areas than a diesel powered charging station. Finally, individual PV systems or solar home systems are fairly rugged systems that have been tested in several projects by the IDA and other institutions. Most solar panels now have 20 years manufacturers warranty.

4. Institutional:

Project coordination and management. The PMU in the CNE (see section C.4) is already partly organized to a large extent. It consists presently of a project coordinator, a project assistant also in charge of the financial management of the Project, a procurement specialist, and a lead expert for each of the four main components: rural electrification, microfinance, business development services and social and communications components. At appraisal, CNE agreed to strengthen the PMU by hiring before Board presentation, a senior expert in IDA procurement procedures, an accounting assistant and by enlisting the support of an additional CNE expert in electricity for the electrification component. CNE also agreed to hire prior to effectiveness an administrative/treasury assistant for the PERZA project. All PMU staff will be provided training in IDA guidelines and procedures for project implementation. The PERZA-PMU coordinator will be responsible for the coordination of PERZA and the parallel UNDP-led initiative on small hydropower, to ensure efficiency and proper coordination in the implementation of the two projects.

FODIEN. The reorganization of FODIEN and the strengthening of its procedures for financing future RE projects and allocating subsidies in an efficient rational manner will also be addressed by the Project. However, due to the need to start implementing PERZA's subprojects as soon as the Project becomes

effective, IDA and GEF funds for the Project will not be channeled through FODIEN, but through the PMU-CNE and several financial intermediaries (FI) to be competitively selected by the CNE-PMU, as explained in the Project Implementation Plan (PIP) and above under C4.

4.1 Executing agencies:

The CNE is the Project's executing agency. See above.

4.2 Project management:

CNE has assigned the team that will coordinate all aspects of project implementation, as explained in sections C.4 and E.4, above. It was agreed during appraisal that the members of the PERZA-team in the CNE would be integrated within the current organization of the institution rather than constituting a separate Project Unit. The exact organization of the CNE-PERZA team (PMU) within the CNE is presented in section C4. The decision to integrate the PMU within the CNE reflects the dual objective of the Project of achieving a successful implementation of all project components and of strengthening the institution to ensure a successful execution of the overall Government Program for Rural Electrification in the whole country. This notwithstanding, it is clear that such organization of the PMU will require additional efforts by CNE to maintain the necessary coherence and coordination of all team members to ensure that the project will be successfully executed. CNE is aware of this challenge and is committed to mobilize the human resources needed to ensure it will have the capacity to manage successfully and in a timely manner the implementation of the Project.

4.3 Procurement issues:

The PMU will follow IDA guidelines for the procurement of goods and recruitment of consultants, and will use standard bidding documents for all IDA-financed procurement. Procurement arrangements and thresholds for procurement methods and prior review are presented in Annex 6A. The Project will follow the Procurement Plan (that forms part of the Project Implementation Plan or PIP), which will be updated annually and submitted to IDA for approval. A Procurement Plan was reviewed and discussed with the PMU during the appraisal mission. A review of procurement aspects has been conducted during the appraisal mission to assess CNE's capacity to undertake the procurement for the Project preparation activities, and subsequent project implementation, according to the guidelines of IDA. An action plan has been agreed upon with CNE, based on the conclusion of the assessment, to address the gaps and deficiencies that were identified.

4.4 Financial management issues:

Country Financial Management (FM) issues relevant to the project. The IDA projects in Nicaragua have faced various deficiencies, such as tardiness in the contracting of the external auditors, insufficiency of counterpart funding, disbursements requests not reconciled with project records, and low implementation of programmed annual activities. All these issues prevent operational efficiency and sound personnel management in the financial management of the projects. An action plan has been agreed with CNE to ensure that these issues are properly addressed and that an adequate financial management system is in place by project effectiveness.

Assessment. The CNE has a sound organizational structure and has assigned the team for the PERZA project (PMU), however at the time of appraisal, IDA's financial management assessment concluded that the CNE did not have in place an adequate financial management system specific to the Project that meets IDA requirements. Implementation of the agreed action plan would result in proper financial management arrangements in place by the effectiveness date. Further details are found in Annex 6 of the PAD - Financial Management.

Audit compliance. As of the date of appraisal, there were two projects with overdue audit reports in the country portfolio. No audit compliance issues relevant to the proposed project were identified in the audit of the Japanese Grant for the preparation of the PERZA, Grant No. TF026676.

National Counterpart Contributions for first year of project implementation. A key obstacle for the implementation of the Project was the lack of counterpart funds available for 2003. The SECEP had indicated during the appraisal mission that no funds had been allocated by the Government for PERZA's implementation for 2003, since the Project was not yet signed when this year's budget was prepared. Two solutions were proposed, which actually are complementary. First, the CNE indicated that it could approach the UNDP to request its support to finance this budgetary gap. Second, the international donors have offered to finance with grant money the national counterparts for 2003 of the projects that the Government would consider to have a high priority for the country. MOF indicated that it could include the PERZA project in this list to be proposed to the international donors, once it would have received the technical endorsement of the Project by the SECEP. (The two proposed solutions are actually one, since UNDP is part of the pool of donors that have approached MOF.) The MOF would then have to obtain a firm commitment from one or several donors, but this could expect to be easy once the Project is included in the Government's list of priorities. To give enough time for the Government to secure the counterpart funds for 2003, it was agreed to make their availability a condition of project effectiveness, rather than of project negotiations. See Annex 6B of the PAD - Financial Management.

Project financial reporting arrangements. Quarterly financial monitoring reports (FMRs) will be prepared by CNE and submitted to the Bank within 45 day after the end of each reporting period. See Annex 6 of the PAD - Financial Management.

Audit arrangements. Annual audits of CNE, the project, and the trust funds financial statements will be conducted by an independent accounting firm selected following Bank's procedures. The audit reports will be submitted to the Bank within the 6 months after the end of the fiscal year. See Annex 6 of the PAD - Financial Management.

5. Environmental: Environmental Category: B (Partial Assessment)

5.1 Summarize the steps undertaken for environmental assessment and EMP preparation (including consultation and disclosure) and the significant issues and their treatment emerging from this analysis.

The Project has prepared an environmental framework report --included in the Project Files (see Annex 8) and available at the Infoshop-- which: (i) briefly summarizes the potential for renewable energy projects in Nicaragua; (ii) proposes screening criteria and procedures for ensuring compliance with IDA safeguard policies for small renewable energy projects; (iii) outlines the main environmental and social issues that would have to be discussed in EA reports; and, (iv) outlines the procedures for review and clearance of safeguard policies. This framework has been discussed and agreed with the Government.

Initially, three sub-projects are proposed for financing under PERZA: two mini-hydros and one solar (PV battery charging stations in five communities). Each individual sub-project was screened using the framework, and summary Environmental Assessments (EA) documents were prepared which outline key issues such as project location, social and environmental baseline data, site sensitivity, need for ancillary infrastructure, policies triggered, identification of possible environmental and social impacts, description of mitigation measures and their respective indicators, and public consultation undertaken during the EA process. These summary EAs are also included in the Project Files and available at the Infoshop.

Further sub-projects will be identified during project implementation. Prior to effectiveness, a workshop will be held for local consultants and government regulatory agencies to train them in the framework

application. Future sub-projects will follow a similar procedure for EA, i.e. the application of the established framework, and the review and approval by the environmental specialist on the Project task team before they are included for financing under the Project.

For the micro-enterprise development component, the EA developed a screening mechanism and eligibility criteria for the businesses that can be included. Businesses that are harmful to the environment or against IDA policies (such as tobacco and firearms production) are excluded. These requirements will be included in the Project operational manual in the form of a "negative list".

5.2 What are the main features of the EMP and are they adequate?

The Environmental Management Plans (EMPs) for each sub-project will be developed as sub-projects are proposed. The EMPs will follow a prescribed format, which will ensure comprehensiveness and identification of adequate monitoring indicators.

5.3 For Category A and B projects, timeline and status of EA:
Date of receipt of final draft: November 8, 2002

5.4 How have stakeholders been consulted at the stage of (a) environmental screening and (b) draft EA report on the environmental impacts and proposed environment management plan? Describe mechanisms of consultation that were used and which groups were consulted?

As part of the EA process, stakeholders in local areas were consulted. The summary EA reports include a section on the public consultation process, wherein the groups consulted and their comments are detailed. Each additional future sub-project will undertake such consultation prior to consideration of project financing.

The EA framework is available at the offices of the Project implementation unit. Future summary EAs will similarly be made available to the public. All documents are posted on IDA's Infoshop website.

5.5 What mechanisms have been established to monitor and evaluate the impact of the project on the environment? Do the indicators reflect the objectives and results of the EMP?

Mitigation measures will be included in the bidding documents of contractors. Environmental indicators will be monitored by the implementing agency. The overall impact of the Project on greenhouse gas reduction will be monitored as a key development indicator.

6. Social:

6.1 Summarize key social issues relevant to the project objectives, and specify the project's social development outcomes.

Off-grid electricity service provision aims specifically at improving the quality of life of the rural poor. However, an important issue for the pilot project is how to balance the objective of serving the poorest communities with the need to develop business packages that will be attractive to private energy equipment and service providers. Thus the Project does not focus exclusively on the poorest communities, where a vast majority of households cannot afford conventional electricity service. In such communities, service providers will be given incentives to offer less expensive basic services to households(e.g., batteries charged in central stations, and smaller solar home systems). In addition, the Project will achieve a broader social impact through its business development and microfinance components, which will link small and micro-businesses to reliable, affordable, and convenient sources of credit, market information, and business contacts. These developing businesses will form a broader and more sustainable client base for the service providers.

Since some beneficiaries will be indigenous groups (Miskitos, Mayangas) of the Atlantic zone, special attention has been given during project preparation and will continue under implementation to take into account in the Project components and outputs, their economic, cultural, and social characteristics. Participatory activities and consultation material (surveys, focus groups) will be offered in the local languages whenever appropriate; and delivery mechanisms and monitoring and evaluation procedures will take into account the communal social structure of these groups. The consultations will be consistent with the Bank's Operational Guideline 4.20, and as well as all local guidelines. In addition, an Indigenous People Development Framework has been prepared through a participative process, and a detailed action plan will be finalized prior to Board presentation, to confirm which indigenous communities will be affected by the Project, and to determine the social impact of the Project in these communities, and put in place safeguards to prevent or mitigate any negative impact.

6.2 Participatory Approach: How are key stakeholders participating in the project?

User participation. One of the key lessons learned from past off grid electrification projects is the crucial role of beneficiary participation in project implementation. Off grid systems are by definition decentralized, remote, and far from existing infrastructure. Therefore, users will play a crucial role in preventing, detecting and solving problems. Technical assistance activities to ensure participation will be on several levels:

- Extensive market surveys will analyze local demand, and match the supply models and products to local preferences and willingness to pay.
- Focus group interviews will involve local residents, businesses, and opinion leaders in the process of defining the best service solutions for each community.
- By offering a variety of products (e.g., batteries and SHS of various sizes), the Project gives users a choice of different service levels and maintenance arrangements.
- Users will pay for part of the service and often own part of the systems, thereby increasing ownership.
- Users will be trained by the operators (who will, in turn, be trained by the Project, under a train the trainer activity) to ensure satisfaction with the service and regulate their own demand. In several cases, communities members will be involved in the basic maintenance and operations of the village mini grid systems.
- Users will be part of the system to monitor service quality through complaints procedures and customer satisfaction surveys. Periodic surveys of consumer satisfaction will be part of the monitoring and evaluation plan during implementation.

Social diversity / indigenous communities. Two of the three pilot communities in the Atlantic Zone (around Francia Sirpi) are predominantly Miskito and the third community is Mayenga; these indigenous groups have distinct languages and cultures, and their members live mostly in the Atlantic zone and in Honduras. Due to the ethnic diversity of the Atlantic zone (in contrast to the more homogenous Pacific zone), some of the Phase 2 pilots are also likely to also benefit minorities (Miskitos, Mayangas, Garifunas, Afro-Americans, etc.). To ensure that minorities can participate in the Project at a very early design stage, surveys have been translated into local languages, and focus group discussions in minority communities will take place in their language. The project team has worked in close coordination with the LCSEO on the social assessment to ensure that the IDA's safeguards are satisfied (see previous sections).

Other stakeholders. The other key project stakeholders are the private companies in Nicaragua and their external partners, if any, that are potential participants in investment, installation, and supply of equipment; and the national and local governments. The national government and its agencies involved in rural development have been consulted at the project's inception and during the pre-investment work

carried out with CNE. In addition, a consultation workshop was held in Managua in November 2000 for government personnel, Nicaraguan private sector companies, NGOs, and municipal officials. Participants learned about the Project's objectives and proposed implementation plan, and voiced their suggestions and concerns. In September, 2002, four leading microfinance institutions participated in a discussion of the opportunities and risks of moving into project sites and surrounding areas. In October 2002, a roundtable discussion on microfinance was held with seven leading donors to discuss industry issues (such as regulation and supervision, dissemination of international best practices, and institutional development issues for MFIs in Nicaragua). In November,2002, a consultant collected information on the services, costs, regional presence and other aspects of existing private sector BDS providers in Nicaragua, to build a database of providers who could serve businesses with BDS needs. In December 2002, CNE elaborated an IPDP, based on surveys and other consultations with the targetted communities of RAAN, and it will finalize a detailed action plan suited to the cultural and socioeconomic characteristics of the indigenous communities, by March 2003. This work will be based on the survey and studies already completed and will be done through workshops in each of the indigenous communities selected by PERZA.

6.3 How does the project involve consultations or collaboration with NGOs or other civil society organizations?

All the preparatory studies for the Project have been based in participatory methodologies that include semi-structures interviews and focus groups with local leaders, municipal authorities, local NGOs and potential partners in project activities. Local groups and NGOs consulted include ATDER-Ben Linder, Proleña, PANA-PANA, FURCA, *Asociación de Desarrollo Campesino* (ADEC), U*nion Nacional de Agricultores y Campesinos* (UNAG), *Fondo de Desarrollo Local* (FDL) *de UCA/Nitlapán, Cámaras de Comercio locales, Cooperativas de Ahorro y Crédito*. Some of these NGOs are likely to be involved in the implementation of some of the component of the Project, based on their area of expertise.

6.4 What institutional arrangements have been provided to ensure the project achieves its social development outcomes?

From the outset, PERZA has emphasized the importance of integrating the perspectives and viewpoints of the segments of the population that will be affected by the different components. This covers both government institutions (local and national) as members of the civil society. Special attention has been given to municipal governments in the selected communities, central government institutions that will impact on local development and the leaders of the NGOs and other civil organizations in these areas. The Indigenous Peoples Development Plan (IPDP) Framework and the preparatory work for the Project in general has taken into account the particular forms of social organization of the indigenous communities and their leaders in the Council of Elders. The IPDP will continue to promote ownership of the Project among these communities. The consensus built around PERZA's objectives will ensure the ownership and sustainability of the social impact of the Project. Finally, the PMU in CNE will include a specialist in social issues who will monitor the achievements of the social objectives of the Project.

6.5 How will the project monitor performance in terms of social development outcomes?

For the communities in the Pacific, consultants have been hired who will identify social development indicators that will be affected by PERZA and will be included as part of the monitoring indicators of the Project after having been discussed and validated with the communities. In the case of the indigenous population, the Development Plan will include monitoring and evaluating indicators that would have been agreed with the communities.

7. Safeguard Policies:

7.1 Are any of the following safeguard policies triggered by the project?

Policy	Triggered
Environmental Assessment (OP 4.01, BP 4.01, GP 4.01)	● Yes ○ No
Natural Habitats (OP 4.04, BP 4.04, GP 4.04)	● Yes ○ No
Forestry (OP 4.36, GP 4.36)	○ Yes ● No
Pest Management (OP 4.09)	○ Yes ● No
Cultural Property (OPN 11.03)	○ Yes ● No
Indigenous Peoples (OD 4.20)	● Yes ○ No
Involuntary Resettlement (OP/BP 4.12)	○ Yes ● No
Safety of Dams (OP 4.37, BP 4.37)	○ Yes ● No
Projects in International Waters (OP 7.50, BP 7.50, GP 7.50)	○ Yes ● No
Projects in Disputed Areas (OP 7.60, BP 7.60, GP 7.60)*	○ Yes ● No

7.2 Describe provisions made by the project to ensure compliance with applicable safeguard policies.

An environmental framework for renewable sources of energy projects was elaborated for Nicaragua, and an environment assessment has been completed for the first four sites of the Project. (Included in the Project Files and availbale at the Infoshop).

Attention to the particularities of the indigenous communities has been paid from the outset in all the studies and surveys done to prepare the three components of the Project. An Indigenous People Development Framework (IPDF) has been prepared and a detailed Development Plan will be completed prior to the Board presentation to ensure that these communities reap the full benefits of the Project. (Included in the Project Files and availbale at the Infoshop).

F. Sustainability and Risks

1. Sustainability:

Electricity Service Provision. PERZA's private sector operated electrification projects are expected to be commercially sustainable. Cost recovery and profitability for the private providers have been key principles of project design and financial analysis.

Affordability. A demand study has determined the willingness-to-pay (WTP) of users in the pilot sites based on current substitutable energy expenditures. Service levels have been adopted to the stratification of WTP and current demand patterns. As a result, users will have the choice to opt also for smaller SHS sizes. This approach permits a fairly accurate assessment of the service providers' cash flows, and enables interested private companies to manage risks. Market studies for Phase Two sites will be financed by GEF grants and their results disseminated to all interested private participants. The demand studies show average WTP levels from US$5 to US$13 per month.

Subsidies. Based on the WTP stratification, product mix and business models for each project site, and on the market penetration targets of CNE, the subsidies required to close the affordability gap (difference between WTP and life cycle costs) has been estimated. In all sub-projects, subsidies will be lower than initial capital expenditures. At the minimum, all customers will pay full operating and maintenance (O&M) costs; in most sites their monthly fee will furthermore recover significant parts of the initial investment. Thus, the individual pilot sub-projects can be sustained commercially even if planned replications are delayed. The financial analysis shows that for all cases, cash flow will fully cover the

recurring costs, even under unfavorable conditions. All users will pay an initial connection fee, to assure ownership from the outset. Investment subsidies from the Government are needed to improve profitability for the private service provider in very low-income areas. During PERZA's five year duration, government subsidies will be blended with GEF grants to buy down the high first cost of SHS to dispersed consumers, for whom this is the only practical solution. While the Government is willing to significantly subsidize well-known solutions today, (such as line extensions and isolated diesels) it doesn't have the same experience for SHS yet and needs to learn more about its tremendous potential value to the RE program. PERZA intends to achieve this outcome such that the subsidy gap left by GEF after PERZA's completion will be picked up by the Government through FODIEN. However, the availability of public funds for future replication remains a risk, which can only partially be mitigated by the technical assistance to FODIEN under component one. It is foreseen that the subsidy required for SHS will eventually decline with market growth. All sub-projects will show a much higher sustainability over time than current solutions practiced by ENEL for remote off grid sites: the latter are based exclusively on diesel generation and are hence fully dependent on recurring subsidies on diesel fuel cost. The off grid alternatives piloted by this project are based mostly on Renewable Energy Technologies and are therefore not vulnerable to fuel costs for all practical purposes.

Liquidity. Even after accounting for the investment subsidies to be provided, many users will not have the liquidity to pay the relatively high up front connection costs that are typical for Renewable Energy off grid solutions, as applied in the project (front-loaded cash flows). This liquidity gap has been identified as a main risk to SHS projects in an evaluation of the GEF SHS portfolio. The Project mitigates this risk explicitly through the accompanying micro finance component.

Service quality over time is ensured by long-term maintenance agreements with the service providers. In addition, a fraction of the subsidies will be disbursed against performance targets (i.e. number of new connections per year; and service quality for existing users). Winning bidders will receive substantial training on managerial and technical issues (hydro minigrids).

Impact on Productivity. In many past rural electrification projects, impact on productivity and employment has been less than promised at project initiation. PERZA addresses this issue, amongst others, by (a) assuming more realistic estimates for benefits and outputs; (b) adopting service delivery solutions tailored to the local demand; (c) accompanying the electricity access with targeted BDS and micro-finance services in the same target areas, to address additional bottlenecks for local productivity growth; and (d) applying decentralized service models that involve local micro-enterprises in service provision and hence create employment also on electricity supply side.

Private Sector Interest. An additional risk faced by any sub-project with competitive bidding is the number of qualified bidders. PERZA addresses this risk through its sequenced implementation. During Phase One, transactions will be largely pre-structured, to allow for relatively secure, quick success stories at low risk, under the current framework. It is assumed that CABEI will provide debt financing for El Ayote, and it is expected that it will do the same for El Bote. For Phase Two, it is hoped that the example of Phase One in addition to the technical assistance under component one will have increased the interest of local banks to provide commercial debt for the next PERZA transactions, so that no debt would have to come from the Project to reach financial closure. Finally, for future replication under Phase Three, a full enabling framework should be in place (new FODIEN), and future transactions could be facilitated by CNE with increased private sector interest, and at lower commercial interest rates (because of reduction in perceived risks). Phases One and Two foresee a subsidy range that would allow for a satisfactory Equity IRR, plus training to be provided to the future operators and users. For each of the Phase One sites, as well as for the SHS component, several interested bidders have already been

identified. Securing the transaction for each sub-project under PERZA as far as possible is a key task of the transaction advice to CNE which has been launched prior to appraisal.

Legal Framework for Minihydro Projects. A serious risk for the implementation of the mini-hydro projects, --which constitute the bulk of the electrification sub-projects-- is the lack of clear rules for the granting of water rights to private operators of minihydro projects. This legal vacuum arose because MIFIC lacks specific guidelines and procedures to grant these rights, and all hydro projects are now in a standstill situation. (See section B.2.) To eliminate this uncertainty and promote the use of water resources for electricity, the *Comisión Nacional de Recursos Hídricos* (of which CNE is a member) and MIFIC have drafted and presented to the Secretaría de la Presidencia a draft law that sets the rules to grant and manage water rights for electricity generation, and actively promotes hydro-electric projects. To ensure that PERZA's implementation will not be hindered by this situation, the presentation to the National Assembly of this draft Law is a condition for negotiations, and the approval of that Law will be a condition for disbursement of all PERZA mini-hydro projects.

Project Management and Monitoring. The decision to integrate the PMU within the organizational structure of CNE, rather than creating a separate PMU, is consistent with the dual objective of the Project of achieving a successful implementation and of strengthening the institution in charge of the Program for Rural Electrification beyond the lifetime of the Project. This notwithstanding, there is clearly a risk that the PMU might not be able to execute the Project in an efficient and timely manner if it does not maintain the coherence and coordination of all its team members regardless of their location within CNE. To mitigate this risk, CNE has indicted that it is fully committed to mobilize the human resources needed to ensure it will have the capacity to successfully manage the Project. To this end, the personnel assigned to the PMU has be chosen based on their professional capacities, and the new members of the PMU are been selected by CNE based on terms of references and qualifications approved by the Bank. Furthermore, the Project actively supports capacity building activities to train component managers and administrative members of the PMU.

Micro-finance Component. For micro-finance, the on-lending interest rate will be set by the micro-finance institution, since it is accepting the credit risk. Nonetheless, it is common practice in Nicaragua to structure the on-lending interest rate so that it matches the cash-flow and profitability of the micro-businesses which are expanding with the introduction of affordable electricity, and the ability of households to pay for initial installation costs over time. Through the matching grant mechanism, the component will support the adoption of technologies and methods that increase the efficiency financial services delivery and decrease transaction time. In terms of household connection to electricity systems and micro-business productive loans, there are some risks to keep in mind: In the event that subsidies are delayed, unreliable, or inadequate, rural households and micro-businesses may be unable to connect to the new systems. Micro-finance institutions may be unwilling to provide short term or long term loans for households and micro-businesses, if the potential productive uses prove less profitable than expected. In other circumstances, MFIs might prefer to lend to enterprises, where cash-flow will be readily generated. This would limit access to electricity by lower income households, and would not spread the electricity provider’s costs over a large number of users. Lending for solar systems represents a new product for the entire national microfinance industry, and will require adjustments and technical assistance support during the life of the project. MFIs will not be directly involved in the provision of subsidies offered under the project, maintaining a strictly commercial relationship with clients.

BDS Component The same cost-recovery and sustainability principles will be applied to the BDS component The BDS Component focuses on improving the ability of existing BDS providers to develop innovative products and delivery mechanisms for rural micro and small businesses in project sites and

surrounding communities. While the costs of developing these specialized products are subsidized through the competitive matching grants mechanism, the relationship between the BDS provider and clients (or groups of clients) will be based on full cost-recovery principles. BDS providers will also be monitored based on the scale of operations, full cost recovery performance, and level of client acceptance (all key elements in establishing sustainable BDS provider-business client relationships). Nonetheless, there are four risks faced by the component. First, there may be a limited response from BDS providers, who may find the sites too small or isolated to be profitably served. The second risk is that demand may be low in project sites and surrounding areas, given that BDS is seen as a cost more than an opportunity to improve business performance in the short term. (This is mitigated by the presence of a BDS provider in some of the more isolated areas in RAAN). An additional risk could arise in other sites, with the presence of Government subsidized services, making it less attractive for clients to pay for private sector BDS services. The fourth risk is one of coordination between the BDS activities and the other components of the PERZA project. To mitigate this risk, the Microfinance Component manager has participated in BDS component design discussions, while the BDS Component Manager has taken part in design discussions and presentations to the microfinance industry for the Microfinance Component.

1a. Replicability:

See Replicability Strategy in section C1, above.

2. Critical Risks (reflecting the failure of critical assumptions found in the fourth column of Annex 1):

Risk	Risk Rating	Risk Mitigation Measure
From Outputs to Objective		
1. Lack of response by private investors, service providers, local financial institutions and business development services providers to invitations to participate in off grid sub projects.	S	1. Advanced discussions with prospective cooperatives, NGOs, financial institutions, equipment vendors and international solar energy companies held during project preparation. Investment support subsidies and other incentives appear sufficient to attract participation.
2. Absence of a legal framework to grant water rights for hydro electric projects blocks the implementation of all the mini-hydro sub-projects of component two of the Project.	S	2. A draft Law that gives clear instructions on how to grant and manage water rights for electricity generation was prepared by MIFIC and the Comisión Nacional de Recursos Hídricos and it is expected to be approved by the Assembly prior to the disbursement of Project funds to finance the minihydro projects
3. Public funds allocated for off grid infrastructure and social services are insufficient to blend with IDA credit and private financing sources.	S	3. GON formal commitment to required counterpart funding will be sought at negotiations. For counterpart funds required in 2003, the GON has indicated that international donors could provide the necessary resources.
4. Legal issues related to ENEL's mandate and ownership of isolated area generation/distribution assets are not resolved in reasonable time.	M	4. The preparation of the bidding transaction for El Ayote sub-project has provided a forum for active consultations among CNE, ENEL and IDA on options to manage ENEL's assets. In addition, a specific TA activity has been

		included in the Project to devise a long term solution for ENEL- Plantas Aisladas.
From Components to Outputs		
4. Government implementing agencies and financial institutions do not execute the Project activities in an effective and timely manner.	S	PMU team has been selected based on qualifications and experience in the various areas of the project, and will be supported by project to receive necessary training.. Microfinance institutions and rural BDS providers will be carefully selected based on track record.
5. Political interference has significant adverse impact on project implementation.	M	Government is committed to implementing the Project based on agreed-upon firm choices of sub-project sites, service provision schemes, and setting of tariffs and subsidies.
6. Low capacity of rural technical, financial and BDS providers to deal with special off grid demand characteristics	M	Project includes sufficient support for capacity building and training of all participating entities.
7. Low demand by potential clients for offered electricity, financing and business development services.	M	Extensive market and demand studies have been carried out during preparation and will be continued at implementation.
Overall Risk Rating	S	

Risk Rating - H (High Risk), S (Substantial Risk), M (Modest Risk), N(Negligible or Low Risk)

3. Possible Controversial Aspects:

None.

G. Main Conditions

1. Effectiveness Condition

- The GoN is committed to provide the required counterpart funding for the implementation of the Project, especially for the first year of project implementation.
- The Subsidiary Agreement has been executed on behalf of the Borrower and CNE
- Financial management arrangements, satisfactory to the Bank, shall have been established for the Project and become operational.
- Operational Manual has been prepared, which includes the Project Implementation Plan (PIP), and makes reference, among others, to: (i) the Environmental Framework, (iii) the Indigenous People Development Framework, (iv) the negative list of sub-projects; and (v) the guidelines for project construction.
- The bidding process for El Ayote Sub-Project has been launched.
- CNE has reached an agreement (endorsed by INE) with ATDR-BL, the operator for El Bote, on the performance indicators that will trigger the payment of output-based subsidies, and on the monitoring of these indicators.

2. Other [classify according to covenant types used in the Legal Agreements.]

Negotiations Conditions

- The Law for the Promotion of the hydro-electric sub-sector has been presented to the National Assembly.
- The short list of Phase two sites has been finalized according to CNE's priorities.
- An initial RFP draft for El Ayote Sub-Project bidding has been prepared, which includes a contractual arrangement for the future operator to manage ENEL's existing diesel plant assets at this site, and is accompanied with non-binding letters of interest from potential bidders.
- ATDR-Benjamin Linder, has requested from INE a concession extension that includes the new facilities to be built in El Bote, and has obtained from MIFIC an explanation on whether or not the operator already has a concession for water use that would cover the new facilities.
- Global Procurement Plan has been finalized.
- Draft PIP has been prepared.
- Negotiations conditions in the FM action plan have been implemented.

Board Conditions

- Endorsement of the GEF components of the Project by the GEF's CEO.
- Indigenous People Development Plan has been finalized.
- A draft RFP for El Ayote Sub-Project bidding has been completed and agreed with the Bank.
- Selection of a Senior Procurement Expert and of an Accounting Assistant.

General Disbursement Conditions

- Trust fund agreements have been entered between CNE and the financial institutions providing micro-finance and debt financing for operators.

Disbursement Conditions for Hydro Electric Sub-Projects

- The Law for the promotion of the hydro-electric sub-sector has been approved by the National Assembly.

H. Readiness for Implementation

☒ 1. a) The engineering design documents for the first year's activities are complete and ready for the start of project implementation.

☐ 1. b) Not applicable.

☐ 2. The procurement documents for the first year's activities are complete and ready for the start of project implementation.

☒ 3. The Project Implementation Plan has been appraised and found to be realistic and of satisfactory quality.

☐ 4. The following items are lacking and are discussed under loan conditions (Section G):

i. An Indigenous People Development Plan will be finalized before Board presentation.
ii. A Manual of Operations will be prepared prior to project effectiveness
iii. An automated finanacial management system will be implemented and FMRs will be generated prior to effectiveness
iv. Additional PMU personnel will be selected prior to Board presentation and efectiveness, as scheduled..
v. Trust fund agreements between CNE and the financial institutions providing micro-finance and debt financing for operators will be prepared before disbursement of Project funds.

vi. A Law for the promotion of the hydro-electric sub-sector would have been approved by the National Assembly prior to disbursement for hydro-electric sub-projects

I. Compliance with Bank Policies

☒ 1. This project complies with all applicable Bank policies.
☐ 2. The following exceptions to Bank policies are recommended for approval. The project complies with all other applicable Bank policies.

Clemencia Torres	Danny M. Leipziger	Jane Armitage
Team Leader	**Sector Manager/Director**	**Country Manager/Director**

Annex 1: Project Design Summary

NICARAGUA: Offgrid Rural Electrification (PERZA)

Hierarchy of Objectives	Key Performance Indicators	Data Collection Strategy	Critical Assumptions
Sector-related CAS Goal:	**Sector Indicators:**	**Sector/ country reports:**	**(from Goal to Bank Mission)**
1. Broad-based growth with an emphasis on productive employment and rural development.	1.1.Evidence of wider and more equitable access to, and enhanced efficiency of electricity services, micro-financing and BDS in rural areas, with increased participation of private providers.	1. GON energy and macroeconomic data.	Broader national and international macroeconomic conditions are favorable Government maintains commitment to rural poverty reduction
2. Better protection of vulnerable groups.	2.1. Increased living standards and opportunities for the inhabitants of the targeted low-income communities, (including indigenous towns) that have benefited from the services provided by the Project (electricity, microfinance, and BDS).	2. Household surveys (both national level and project sites).	Government continues to undertake meaningful sector reforms and encourage private sector participation
3. Strengthening of institutions and good governance.	3.1. Capacity Strengthened in CNE, INE, and microfinance institutions.	3. Project evaluation reports.	
4. Reduction of environmental degradation and ecological vulnerability.	4.1. Improved environmental management through the use of renewable energy technologies (RETs) and community programs in targeted communities.	4. GON energy and rural development program documents.	
5. Promoting decentralization.	5.1 Successful demonstration and replication of new decentralized 'offgrid' energy solutions and business models that can be implemented and managed at the local level.	5. GON energy and rural development program documents.	

Hierarchy of Objectives	Key Performance Indicators	Data Collection Strategy	Critical Assumptions
GEF Operational Program:	**Outcome / Impact Indicators:**		
Mitigation of climate change caused by GHG emissions through reduction of market barriers to wider use of clean energy technologies – (GEF Operational Program No. 6).	1. Increased number of RET projects in Nicaragua. 2. CO_2 emissions per GWh remains at or below Year 2000 level	1. GON energy and rural development program documents. 2. Project evaluation reports.	Project interventions will enable removal of market barriers

Hierarchy of Objectives	Key Performance Indicators	Data Collection Strategy	Critical Assumptions
Project Development Objective:	**Outcome / Impact Indicators:**	**Project reports:**	**(from Objective to Goal)**
The main project development objective is to support the sustainable provision of electricity services and associated social and economic benefits in selected rural sites in Nicaragua, and strengthen the Government's institutional capacity to implement its national rural electrification strategy. This would be accomplished by: 1. supporting the Government in the design and implementation of its national rural electrification strategy; 2. implementing innovative public/private off-grid electricity delivery mechanisms in several pilot sites for later replication on a national scale; and 3. demonstrating in the pilot areas the potential of targeted rural micro-finance to significantly enhance the development impact of rural electrification.	1.1. Adoption of a sustainable national rural electrification (RE) strategy by CNE, which integrates off-grid solutions and reflects the social diversity between the Atlantic and Pacific zones. 1.2. New portfolio of offgrid projects applies lessons from piloted schemes. 2.1. Successful implementation and operation of several locally adapted off-grid electricity service delivery mechanisms in pilot projects that are financially and technically viable, environmentally and socially sustainable, and suited for later replication on a national scale. 2.2. Increase in number of private operators providing decentralized rural electricity services in a sustainable way. 3.1. Successful implementation of replicable micro-finance service delivery systems in pilot areas and surrounding communities, measured by the volume of outstanding loans for productive purposes (between $500,000 and $600,000), the number of households using microcredit to hook up to electricity systems, user satisfaction, and full cost coverage by micro-finance service providers. 3.2. Number of microfinance institutions offering SHS loans. 3.3. Increased number of micro-finance institutions providing financial services in rural markets.	1.1. Project Evaluation. 1.2. CNE statistics. 1.3. Household and micro-enterprise surveys in project sites. 1.4. Bi-annual reports by project service providers 3. Reports from participating MFIs; CNE and financial institutions monitoring reports. Independent client surveys	Continued government support for programs to improve access to electricity in rural off-grid areas. Continued government commitment to efficient private sector participation. Private sector willing and able to invest and participate in rural electrification. Continued interest by Microfinance Institutions and BDS providers to provide service

4. demonstrating in the pilot areas the potential of targeted rural business development services (BDS) to significantly enhance the development impact of rural electrification.	4.1. Successful delivery of sustainable BDS delivery models and new products developed for the pilot areas and surrounding communities, as measured by the number of businesses paying for BDS services and client satisfaction., 4.2 An improving trend of significant cost recovery by BDS providers (income greater than subsidy). 4.3. Increased number of BDS providers offering services in project sites and extended economic zones.	4. Reports from participating BDS providers; independent client surveys; CNE monitoring reports.	
5. Social Strategy, Consultations and Communications	5.1. Support the strengthening of the community organization with better coordination among community members to develop an action plan.	5.1 Minutes of at least 6 meetings per year among local actors to evaluate the implementation of the plan	Sound selection and support to local promoters.
	5.2. Acceptance of PERZA and its social impact promoted through efficient media dissemination of the project and it's social impact, with eight meetings at the different national and regional dialogue forums.	5.2.a Written commitments on the projects goals and objectives. 5.2.b Minutes of eight regional and national meetings.	Methodologies used have been adapted to local cultures. Native language is used.
	5.3. Community participation in several activities such as workshops, meetings, hearings held in radio and TV programs, etc.	5.3.a. Public opinión surveys. 5.3.b Activity report.	Native language is used. Survey design, methodology, and implementation are appropriate to local cultures.
6. Strengthening CNE's institutional capacity.	Strengthen the capacity of CNE to implement and supervise the Rural Electrification Electrification Program	Independent assessment (consultant's report). Project progress reports	
GEF Global Development Objective	**GEF Performance Indicators**		
Reduction of market barriers to wider use of clean energy technologies.	1. Actual tons of CO2 abated by pilot projects. 2. Estimated CO2 abatement through replication of project pilots on a larger scale.	1. GON energy and rural development program documents. 2. Project evaluation reports. 3. Household surveys (both national level and project sites).	

Hierarchy of Objectives	Key Performance Indicators	Data Collection Strategy	Critical Assumptions
Output from each Component:	**Output Indicators:**	**Project reports:**	**(from Outputs to Objective)**
1. A national rural electrification strategy that integrates offgrid electrification and the use of renewable energy technologies (RETs).	1.1 CNE adopts and implements renewable electrification strategy. 1.2. Formal adoption by CNE of a national rural electrification (RE) strategy with off-grid solutions piloted in the Project. 1.3. Completion of FODIEN reorganization and its adoption of a financing scheme with rationalized subsidy allocation and tariff formulation for rural electrification projects.	1.1 National Strategy document as approved by CNE. 1.2. Regulations for Rural Electrification. 1.3 Consultation results, Project reports. 1.4. Project Implementation Reports. 1.5. CNE statistics, Output Based Aid cash-flow and Project progress reports.	Continued GON commitment to rural electrification.
2. Off-grid pilot projects demonstrate viability and the delivery mechanism for public/private investments.	2.1 At least 1 MW of decentralized offgrid systems established at end of Project, operated by private sector. 2.2. At least 2 PV companies accredited and marketing systems nationwide, and at least 3,000 additional stand-alone PV systems installed at end of Project.	2.1 Project implementation progress reports by executing agencies. 2.2 Business Surveys: Before and After.	Sufficient public funds for off grid infrastructure and social services available to blend with IDA loan and private financing sources. Interested and capable operators from private companies, vendors, NGOs or local groups exist.
3. Provision of microfinance services by sustainable MFIs is available to increase affordability of off-grid systems for households and hookups and productive plans for micro and small businesses.	3.1 At least 30% of households and businesses that connect to systems use microfinance services. 3.2. Microfinance products and delivery models suited for household and businesses have been developed and tested in pilot areas. 3.3. MFIs cover all costs related to providing services to project sites by end of project.	3.1 Financial indicators and portfolio growth of the MFIs in project areas. 3.2 Information provided by qualified MFIs. 3.3 Information provided by qualified MFIs.	MFI providers decide to cover newly electrified rural areas.
4. Business Development Services are provided to support the increase in social and economic benefits of rural electrification.	4.1 Increased access to BDS (e.g. skills training and market information) for MSBs in project areas. 4.2 Number of clients served by the BDS providers, fees generated are greater than the value of the subsidy. 4.3 BDS Client Satisfaction (at least 80% find BDS	4.1 Surveys with small and microbusiness operators using BDS Component services. 4.2 BDS provider records. 4.3 User surveys. 4.4 Number of new products	BDS providers decide to cover newly electrified rural areas.

	satisfactory).	designed by BDS providers (based on component matching grant mechanism).	
5. Social Strategy, Consultations and Communications			
5.1 Complete a social evaluation and community development Plan prior to Phase I and II	5.1 A community development action plan is elaborated by the community and enjoys community ownership.	5.1 Evaluation and action plan report.	Elaborate the action plan based on a participatory methodology, adapted to local cultures.
5.2 Implement a participatory monitoring and evaluation system of the project's social impact.	5.2. Follow up and community training .	5.2 Minutes of forty-one (41) field trips to pilot sites.	Sound selection and support to local promoters. High influencing and negotiating capacity at the different spaces
6. Project management and Strengthening of CNE	6.1. Monitoring and Evaluation of the Project adequately performed by CNE, and reflected in periodical update of PSR and project progress reports.	6.1 Project Progress Reports.	PMU manages pilot project competently and in timely manner.
	6.2. PMU manages pilot project competently and in timely manner.	6.2 Project Progress Reports.	

Hierarchy of Objectives	Key Performance Indicators	Data Collection Strategy	Critical Assumptions
Project Components / Sub-components:	**Inputs: (budget for each component)**	**Project reports:**	**(from Components to Outputs)**
1. Rural Electrification and Renewable Energy Policies and Strategies	US$ 1.16 M	Project progress reports, supervision reports and mid-term review.	• "Packages" of communities with sufficient number of consumers to enable business operations are identified.
2. Rural Electrification Sub-projects	US$17.33M	CNE's annual Progress reports, Financial records, and Procurement records.	• Component implementation procedures are effective.
●*Phase I (Investments and TA)*	US$ 6.56 M		
●*Phase II (Investments and TA)*	US$ 8.18 M		• Political interference has minimal impact on project implementation.
●*Phase III (Technical Assistance and Training)*	US$ 1.92 M		
3. Microfinance Services for Rural Sub-projects	US$ 1.38M		• Capable, experienced technical assistance providers can be attracted to support component activities.
4. Business Development Services (BDS) for Rural Pilot Projects	US$0.91M		
5. Social Strategy, Consultations and Communications Activities	US$ 0.96M		
6. Project Management and Institutional Strenghtening of CNE	US$ 1.61 M		

Annex 2: Detailed Project Description
NICARAGUA: Offgrid Rural Electrification (PERZA)

By Component:

Project Component 1 - US$1.16 million

Rural Electrification and Renewable Energy Policies and Strategies. Cost US$1.16 million; Credit Financing US$ 0.73; GEF Grant US$ 0.33 million.

This component would include a host of technical assistance activities that will support CNE in addressing strategic issues for the sector, the implementation of the PLANER and the promotion of renewable sources of energy. The main topics to be addressed under this component are the following:

(i) Strengthening of FODIEN: The project would support CNE in formulating and implementing a proposal to reform current FODIEN regulations to ensure that the latter can function efficiently to receive and channel the funds available for RE, as well as to manage and allocate these funds according to the priorities defined in the PLANER. This support will include: (a) Development of a proposal for reforming and strengthening FODIEN; (b) Presentation of proposed reforms by CNE to the Government, consultations with other relevant government insititutions, and adoption by the Government of a plan to reform FODIEN, and; (c) support to CNE to implement the reform adopted by the Government;

(ii) Rationalization of tariffs and subsidies: Upon CNE's request, the project would promptly provide consulting assistance to develop electricity tariff and subsidies policies that would provide the policy guidelines for INE to set tariffs, both in urban and rural areas. These policies would be completed by June 2003, and would be established by the GON as a Presidential decree, aiming to attract private investment for electrification;

(iii) Strategy for ENEL restructuring: This component would support CNE in developing a proposal for ENEL restructuring, especially regarding the status of ENEL's off-grid plants and the process of making them sustainable and privately managed;

(iv) Woodfuel survey: A woodfuel survey would be developed, in order to analyze the environmental impact of this widespread energy generation method in Nicaragua and propose more environmentally sound alternatives; and,

(v) Other policy and strategy studies: Studies on the quality of rural services and public dissemination of sector policies and strategies will be defined in greater detail during project implementation.

Project Component 2 - US$17.33 million

Rural Electrification Subprojects. Cost US$ 17.33 million; Credit financing US$ 8.68 million; GEF Grant US$ 2.19 million.

This component would finance pilot installations to provide electricity services to up to 16,000 households, public centers and productive users in selected pilot sites remote from the main grid. What will be piloted are not the technologies employed but new business models that ensure an efficient use of scarce public subsidies, maximize private sector participation in service provision and sharing of investment risks, and improve the chances for long-term sustainable operation. The pilot sites were chosen based on the following principal criteria: a) potential replicability: sufficiently diverse physical and socioeconomic characteristics representative of offgrid communities in Nicaragua; b) remoteness:

situated so far away from the existing grid (at least 30 km) so that line extension is not a viable option for the foreseeable future; c) economic potential: where minigrid establishment, particularly using hydropower, have the greatest potential to expand existing microbusinesses or create new ones; and d) improvement of existing service: some communities presently served by ENEL isolated diesel systems will be included to demonstrate more new technologies and more sustainable approaches. The component would also finance a number of technical assistance activities to prepare new sites, train operators, evaluate performance of power systems and establish standards and certification for PV equipment.

Phase I Subprojects (total US$6.56 million; credit financing US$ 2.79 million; GEF grant US$ 0.04 million).

El Bote-El Cua minihydro: The project will finance the establishment of a 2 x 450 kW minihydro power plant at El Bote-El Cua, its connection to the existing 230 kW minihydro plant in San Jose Bocay and interconnection of the system to the SIN about 20 km away, so that excess power could be sold to the spot market. This subproject would be representative of many unelectrified sites in Nicaragua, where the combination of relative proximity to the nearest tapping point of the SIN and the presence of substantial hydro resources well in excess of local demand, make interconnection to the SIN and sale of excess power the most economic option. Its implementation will provide CNE with valuable experience in, among others, negotiating with the private distributor, since this will be one of the first cases to apply the regulations that govern the access to the grid for IPPs. on the fair pricing of excess power. The subproject will complete the partly finished minihydro civil works at El Bote and install new distribution and transmission lines. About 2,300 total connections are projected. Until the turbine becomes operational, the existing ENEL diesel gensets (75kW and 90kW) will continue to be operated. For dispersed households, the use of batteries charged in central stations connected to the minigrid will be promoted.

Interconnection to the grid significantly improves the economics of the subproject. Energy sales to the spot market are assumed to be at 4 US cents per kWh. The total investment cost is estimated to be US$2.53 million. Financial analysis indicates that with a 20% equity provided by the private investor/operator, 70% debt and 10% capex subsidy provided by the Government, the Equity IRR could reach 38.64%. Alternatively, ATDR-BL, the NGO that will operate this sub-project, has indicated that it would be ready to have a lower IRR in the project, if this will allow it to propose lower average tariffs for INE's approval. This reduction in tariffs, while reducing the Equity IRR, will not require a higher subsdiy from the Government.

Among the sub-projects that have already been identified, El Bote-El Cua is the only one where the operator, ATDR-BL, has already been identified. According to the Nicaraguan sector legislation, concessions for distribution of electricity with self generation capacity can be granted, either through a competitive bidding or in response to the demand of an interested operator. In either case, the granting of the concession by INE entails exclusive rights as well as obligations to serve the given area, and the approval by the regulator of tariff levels and structure proposed by the operator. In the case of El Bote-El Cua, it was ATDR-BL, with long experience in operating hydroelectric projects in the rural areas of Nicaragua, that requested the concession to INE for this project, and brought it to the attention of CNE and the IDA, at the outset of PERZA preparation.

El Ayote minihydro: El Ayote is a relatively new and bustling community that has become a center of commerce for surrounding communities. It has many existing productive and commercial enterprises (milk and cheese production, livestock raising, etc). The project will finance the establishment of a 700 kW total minihydro power plant, distribution lines that will serve the municipality of El Ayote and adjacent communities (about 1,700 projected connections) and the necessary transmission lines to connect it with the main grid (SIN) and, like the El Ayote case, enable excess power to be sold to the

private utility, Union Fenosa. Until the first minihydro turbine becomes operational, the existing ENEL diesel gensets (280 kW+ 180 kW) will continue to be operated. For dispersed households (living outside town), the use of batteries charged in central stations connected to the minigrid will be promoted.

The total investment cost is estimated to be US$2.68 million. As in the El Bote case, the tariffs are monthly flat fees in different user type blocks. Energy sales to Union Fenosa is assumed to be at US$0.04 cents per kWh. Financial analysis indicates that with a 38% equity provided by the private investor/operator, 32% debt and 30% capex subsidy provided by the Government, an equity IRR of 18% could be attained. Two local cooperatives and another private investor have expressed interest to be the operator/concessionaire of the proposed minihydro power plant. Bidding documents are now being prepared and the bidding process is expected to be completed prior to effectiveness of the project.

Francia Sirpi, Awastingni and Sangni Laya solar battery charging stations. The purpose of this subproject is to pilot the operation of an option that may be the only way to provide basic electricity services to the poorest of the poor in Nicaragua. These are mainly the indigenous communities in the coastal areas of the Atlantic Zone that have very low monetary income, highly dispersed household configuration and extremely remote locations. In this context, full subsidy of the capital costs for SBCS is justified on social equity grounds.

The project will finance the establishment of six central solar battery charging stations (SBCS): 3 in Francia Sirpe, 2 in Awastingni, 1 in Sangni Laya, to serve about 300 households, or about 73% coverage. All three are in contiguous areas in RAAN. The six stations with about 1 kW photovoltaic array each will be strategically positioned in the communities. Each participating household will be provided with a "house kit," consisting of a low-maintenance automotive battery, two 10W flourescent lamps and a regulator. Although a diesel genset could be used for charging, transporting diesel fuel to the area is extremely difficult. Operating and maintaining the genset will also be difficult under existing conditions. The solar home system (SHS) alternative could provide the same level of service but would require commitment to a monthly fee for service or to amortize the purchase of the unit. The advantage of the SBCS option is that the low-income battery users need not make any regular payment commitment but only pay for charging whenever they have the capacity to pay. The capital cost of the SBCS (about US$15,000 each) is planned to be fully subsidized. In-kind contribution by the community, such as labor, will be sought. The batteries and house kits will be partly subsidized and the balance microfinanced. To eliminate the need for salaried dedicated operators, each station will be set up on or near an existing microbusiness (e.g., a *pulperia*) or community center so that existing personnel could also be trained to be the SBCS operator. The charging fees would provide the incentive for the additional work.

The NGO, Pana Pana, that is based in Puerto Cabezas, has been invited by CNE to submit a proposal to manage the first year of subproject implementation. The tasks will include, prior to construction: promoting the project to the community, identifying station locations and potential operators, firming up in-kind contributions, etc.; during construction: monitoring of progress and reporting to CNE-PMU; after construction: conduct of training courses for operators and users; installation of house kits, monitoring of operations, including usage of stations, user satisfaction, etc.; after one year of monitoring: preparation of a report evaluating performance of stations, and recommending improvements and replication, as needed. The total investment cost for this subproject is about US$300,000 inclusive of the management contract with the NGO.

Phase 2 Subprojects (total US$8.84 million; credit financing US$5.56 million; GEF grant US$0.55 million)

Small Hydro Electric sub-projects (UNDP-GEF/CNE). From the 30 minihydro sites identified in the UNDP-financed study, CNE and UNDP has selected the following 7 sites, of which the PERZA Project has agreed in principle to finance the first three sites, according to the priorities indicated by CNE, which put a particular emphasis on the potential for productive uses. Final selection of the sites will take place once the feasibility studies have been completed. Furthermore, as indicated in section C.1 of the main text, as additional resources from the IDA credit have been made available due to the participation of CABEI in the financing of Phase 1 sites, PERZA would be able to include an additional SHP project, based on CNE's list of priorities. This will be discussed during the first months of project implementation.

Location	Department	Alcaldia	Households	Potential (kW)	Est. costs*, US$m
1.Cano El Homiguero	RAAN	Siuna	320	250	1.00
2. Naranjo Alto	Matagalpa	Waslala	474	180	0.63
3. Salto El Humo	Boaco	Camoapa	117	200	1.12
Wamblan	Jinotega	Wiwili	292	200	1.48
Salto Mollejones	RAAS	El Rama	800	450	1.74
Rio Bravo Arriba	Matagalpa	Waslala	380	100	0.44
Salto Kepi	RAAS/RAAN	Mulukuku	2,204	800	3.59

The cost estimates are drawn directly from the UNDP-financed study. They include not only the power plant costs but distribution, transmission, roads and other site improvements. A consultant study will be commissioned to further refine these cost estimates, and ensure that the minihydro plants themselves in the finally selected sites are all within the international norm of about US$2,500 per kW installed or less. If needed, additional candidate sites will be drawn from the remaining 23 sites identified in the UNDP study.

Private participation. As with the minihydro subprojects in Phase 1, the approach is to develop project "packages" with equity IRRs sufficiently attractive to the private sector, through the judicious use of capital cost subsidies. Where more than one party expresses interest in a package, the private service provider will be selected through bidding for the least subsidy required. It was assumed that the equity contribution of investors/developers in the Phase 2 minihydro subprojects would be about 15% on the average. At least 20% equity would be required for private concessionaires interested in the more attractive sites while 10% equity would be sufficient for other sites attractive only to local cooperatives.

Potential cofinancing by CABEI. The number of sites to be eventually financed will depend on the proposed participation of CABEI, with which IDA and CNE have had advanced discussions. It appears very likely that the CABEI will cofinance the debt portion of the El Ayote and El Ayote (Phase 1) investments to a total of about US$3 million, and thus free up a significant amount of IDA credits. Taking a conservative approach, the base case scenario adopted in this document assumes that CABEI will provide financing for El Bote, the sub-project that is the closest to being ready for implementation. In this case, the amount available for the Phase 2 minihydros would increase to about US$9.28 million. If CABEI's financing for El Ayote also comes through, resources for Phase 2 will increase to about US$10.3 million. Furthermore, if as discussed earlier, CABEI also commits to cofinancing the debt portion of the Phase 2 minihydro subprojects up to a total of US$5 million (third scenario), these

resources could be used to finance new projects under Phase 3 of the Project, and this will significantly increase the development impact of the PERZA.

La Union diesel/minihydro. Several electrification options were analyzed for this community of about 250 households: line extension, a 50 kW hydropower plant supplemented with diesel, a 188 kW hydropower plant interconnected with and selling excess power to the SIN, and diesel only. The 50 kW option came out at over US$10,000 per kW installed. Line extension had the highest levelized energy cost. The interconnected 188 kW had the lowest levelized energy cost; however, it had the highest investment cost at about US$1.7 million. In addition , hydrological knowledge was incomplete and further studies were needed. The diesel option had an energy cost of US$0.31-0.37 cents per kWh depending on whether 12 or 24 hr service was provided. At a cost per user of about US$550, it had the lowest investment requirement. The diesel option was thus chosen for La Union; whether 12 or 24 hour service is provided will be determined after a more detailed study of the load profile. Although, in general, a hydro option is preferred as it avoids subsidies for recurring fuel costs, diesel appeared to be the most practical option for La Union. It is likely to be the same case for many other unelectrified rural communities in Nicaragua. Execution of this small project will differ from that planned for the much larger Phase 1 hydropower plants. A community-based electricity company will be organized, with representation from the local government, NGO and private sector. The company will put up 10% equity and will be assisted in obtaining debt financing. Subsidy will be provided, the level of which will be determined by the consultant analysis. The company will appoint a plant manager, who will then hire three or four plant operators. Procurement for plant construction will be handled by the PMU. The PMU will arrange training (e.g., by ATDER or the construction company).

San Juan del Norte diesel/wind/battery hybrid. This is a fishing community located along the Atlantic Coast south of Bluefields. It is at least 100 km distance from the SIN. The primary need for power is for refrigeration of fish, which would significantly improve local incomes. It is planned to install a wind/diesel hybrid of about 200 kW capacity—the diesel component guaranteeing 24 hour electricity supply, and the wind component enabling significant savings in diesel fuel. Implementation will be through a community based company, organized similar to that of La Union. The estimated cost of the subproject is US$770,000. A feasibility study will be carried out and completed within six months of project effectiveness.

The inclusion of at least one diesel/RET hybrid installation in PERZA is for the purpose of contributing to present GEF knowledge, which is scarce, of the appropriateness of such systems for offgrid electrification. The least cost generation mix of a minigrid depends highly on the aggregated load curve and resources available for each specific village. If energy needs to be available only during four to six hours a day, the “traditional” diesel minigrid is often the solution of choice. However, whenever 24 hours of service are needed (e.g., for fish refrigeration), backing up the diesel with a battery can reduce life cycle cost through savings in diesel operation hours and fuel. Depending on the actual energy demand of users, fuel cost and renewable resources available at each site, the integration of parallel RET generators (e.g. wind, PV) can further reduce life cycle costs. The photovoltaic (PV) system and, if desired, an added battery bank would reduce fuel costs, while the diesel component would guarantee availability of power to the community even during periods of low solar insolation. However, the capital cost of the hybrid is significantly higher than that of a pure diesel system. A GEF grant of US$600 per kW to finance the “incremental costs” will be provided so that the pilot hybrid will be cost-neutral to the users.

Triangulo Minero Minihydro sites. CNE requested of the mission three minihydro sites in Bonanza, Siuna, and Rosita (located in the Triangulo Minero area), considering the high priority that GON's assigns to the development of these communities. It was agreed that these sites would be financed under Phase 2 of the PERZA, either as an alternative or in addition to the San Juan del Norte subproject. The

final decision in this regard should depend on availability of funds and feasibility studies to be undertaken under PERZA.

Solar Credit Line. In Phase 2, the project will launch a program to promote PV systems not only in the selected pilot sites but anywhere in the country where market demand exists. The program will complement centralized battery charging initiatives in the pilot sites by offering dispersed households a choice. The program, which will target the installation of a total of about 150 kW over the 5-year project life, aims to establish the beginnings of a sustainable local PV industry structure and fill a gap in remote electrification plans. The target capacity would be spread over different types of users: households, microbusinesses and institutions (schools, clinics,etc). Considering household users alone with average system size of 25 Watts peak each, the total target is equivalent to some 6,000 households.

Dealer approach. Commercial dissemination of PV systems in PERZA will be carried out through the "dealer or vendor approach," where users purchase the system from accredited dealers who will install the system and provide after-sales maintenance services. Although the one implementing company option offers economy of scale, it was considered that the monopoly operation will result in the demise of the existing small local dealers in Nicaragua. Based on successful experience elsewhere (e.g., Sri Lanka), the dealer model promotes competition that eventually translates to lower cost and better service to consumers. The user will own the system after it is fully paid for but will be responsible for needed replacements later (battery, lamps, etc). This is in contrast to the fee-for-service approach, where the provider owns the system and the user makes a monthly payment for the electricity service only. The provider is responsible for all needed replacements and maintenance.

Consumer financing. In the PERZA approach, the user will pay a downpayment of 5-10% of the system cost. He pays for the balance monthly, through microfinancing assistance, over a period of about three years. To make the systems affordable, their initial cost will be reduced by a combination of GEF grants and government subsidies. These are paid directly to the dealers upon proof of purchase and completed installation. To be refined later by a more detailed consultant study, the table below shows a possible consumer financing plan. The smallest system (20W) that is likely to comprise the bulk of the market requires an affordable monthly payment of no more than 100 Cordobas, for example.

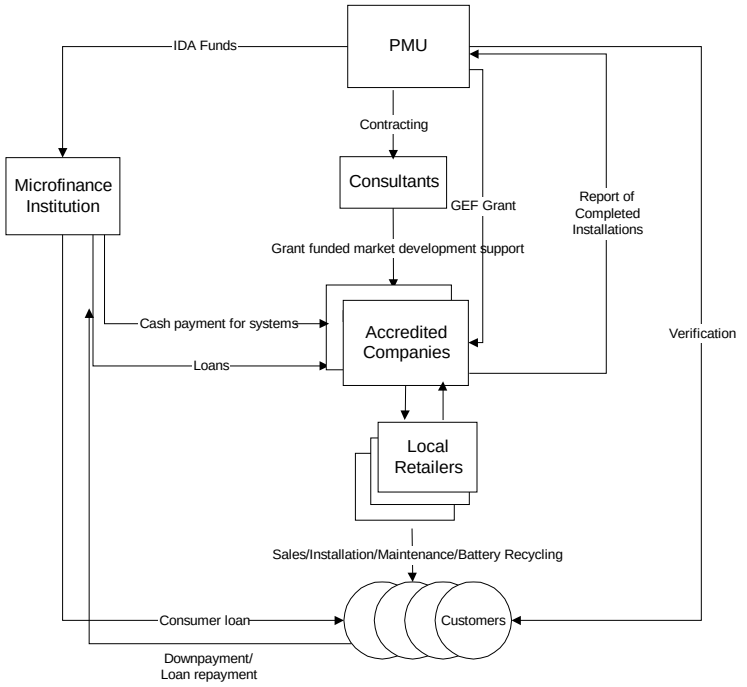
PV System Size, Watts peak	**20**	**36**	**50**
Estimated Unit Cost, US$	425	488	600
Estimated Unit Cost, C$	6,072	6,981	8,576
Downpayment (10% for 20W; 20% for larger)	304	698	858
GEF Grant,C$ at C$53.63 per peak Watt	1,073	901	772
Government Grant, C$	1,970	1,500	1,375
Loan balance, C$	2,726	3,882	5,571
Monthly Payment for 3 years at 18% interest, C$	99	140	201
Percent of GEF & Govt Subsidy to Capex	50%	34%	25%

Based on 1 US$=14.3 C$

The yearly costs of this subproject are shown in the table below:

Disbursement Profile (Millions of Current US$)					
Year	**Consumer Down Payment**	**Govt Subsidy**	**GEF Grant**	**Consumer Loan (Microfinanced)**	**Total Cost**
2003	0.02	0.08	0.04	0.14	0.28
2004	0.03	0.12	0.07	0.23	0.46
2005	0.04	0.16	0.09	0.31	0.59
2006	0.04	0.17	0.09	0.35	0.65
2007	0.06	0.25	0.14	0.53	0.98
Total	0.19	0.77	0.43	1.57	2.96

Accreditation of dealers. The CNE-PMU will accredit at least 2 dealers initially, and add more later. The accredited dealers will be required to establish rural distributors, which could be existing local businesses. Eligible companies could be local or foreign. All must have demonstrated capability and a track record in PV distribution and/or the rural retail business. The PCs will be allowed to procure their systems and parts from any supplier of their choice but all systems and components, as well as the installation itself, must comply with minimum technical standards. For their participation, the accredited dealers would receive substantial assistance in market studies and product promotions The main incentive is eligibility to receive a cash subsidy from the government for each qualifying unit sold and installed. The implementation procedure for this subproject is shown in the above flowchart.



FLOWCHART FOR SOLAR PV SUBPROJECT

In addition to the above investments, the electrification component includes several grant-funded technical assistance and training activities that will support preparation work for new sites, evaluate performance of renewable energy systems deployed, provide standards and certification services for photovoltaic systems and train power plant operators.

Project Component 3 - US$ 0.85 million

Microfinance Services. Cost US$ 1.38 million; Credit financing US$1.11 million

Objective: To support a set of increasingly sustainable financial institutions that provide a range of financial services to low income households and micro and small businesses in project sites and extended economic zones, which are therefore able to take full advantage of the opportunities provided by rural electrification.

Local context. Given the geographic location of the first stage sites, there are a set of microfinance institutions that could respond to the market opportunities presented by the introduction of electrification in the nucleus and periphery of each site. It is important to realize that this client base, the markets, and the products and services required are all new in Nicaragua. Due to their legal status, microcredit non-government organizations (such as ACODEP, FDL Nitlapan, Pana Pana and Prodesa) are able to provide credit for business uses (and could lend for household and business hookups), but are not legally permitted to mobilize savings. In other cases, credit unions or savings and loan cooperatives are in the best position to serve the local project sites and surrounding markets, which would permit asset accumulation in a local financial institution. The legal and regulatory framework and supervision requirements for microcredit institutions which wish to mobilize savings are under study by the Superintendent of Banks and Other Financial Institutions, and the Economic Commission of the National Assembly, and are the subject of another Bank operation under development (Nicaragua Rural Finance). The services offered to households and businesses in each site will therefore be determined by local circumstances and the legal status and business plan of the interested, qualified microcredit or microfinance provider.

Demand for Financial Services. There are four types of credit which are needed in the first phase sites, based on market studies of the first phase sites by consulting firms Mesoamerica (microfinance), CAECOMP (business development services), Mr. Pierre Mathieu (larger productive investments), and a household survey led by Mr. Jose Eddy Torres. These include the following *estimated* loan sizes (which will be provided in cordobas but are presented in US dollar terms below):

(i) A loan of about US$40 to US$50 for an individual household hookup to central mini-grid systems in population centers;
(ii) A loan of about US$110 for an individual solar system hookup for households in more remote peripheral communities;
(iii) A loan ranging from about US$200 to US$500 (for raising small animals, traditional and export-oriented crops, service businesses, local shops and traders) to about US$800 (for small machinery and equipment purchases of microbusinesses); and
(iv) A loan for start-up energy-related firms (such as battery rechargers, solar panel repair service firms, and other local businesses).

This mix of products would insure a diversified portfolio of loans, while enabling households and businesses to hook up quickly and affordably to the mini-grid or the solar household system. In the case of solar housing systems, the initial investment of about US$110 may be too small to fit an individual loan methodology, requiring either (i) a group-based approach, (ii) a local fund with a collateral substitute involving local government approval and backing, or (iii) a supplier credit approach either financed by the operator or supported by a financial institution. The proposals of the microfinance institutions, based on market research and local experience with similar clients, will guide the selection of the methodology to deliver this loan product.

In addition, it is expected that there will be interest in savings products. In a long list of countries, studies have shown that savings were the most popular financial service in low income communities, as long as it is secure, convenient, at least partially liquid and offers a return at least slightly above the rate of inflation (Robinson 2002, Rutherford, 2001). In project sites, household surveys (Torres, 2002) also found significant interest in access to monetary savings in secure financial institutions, although a very small percentage had direct experience with such institutions. It should be noted that savings services are not a focus of the project and may not be provided by private financial institutions in some project sites and surrounding areas, given the legal restrictions on which types of financial institutions can mobilize savings.

Qualified Suppliers of Rural Financial Services. During pre-appraisal, a seminar was held in Managua to present the characteristics, geographic location and demand of financial services in first phase sites, and to get their input into the design of component services. Five leading microfinance institutions expressed serious interest (including ACODEP, FDL Nitlapan, Prodesa, Pana Pana and FAMA), especially for sites relatively near their existing operations. Interested financial institutions would be reviewed by CNE using financial and outreach indicators and measures of soundness established in the component operational manual (focusing on indicators of efficiency, portfolio quality, leverage, and adjusted profitability/sustainability).

Private sector banks and finance companies are the most likely lenders for the fourth product, given the amount involved, the type of pre-investment analysis required, and the concentration of risk this would represent for a microfinance provider. Discussions with two commercial banks show that there is potential for lending to private firms have been identified as potential investors in these types of investments. In addition, it is likely that finance companies Confia (formerly the microfinance institution Chispa) and FUNDESA would be interested in some types of clients.

Principles of the Component. IDA Policy guidelines (OP 8.30) and international best practices have been incorporated into the component design, although they have been adapted to local rural community circumstances and the realities of the national industry. The figures cited in some cases below (such as the percentage of the required loan portfolio match by MFIs) may be adjusted based on local considerations during the life of the project.

1. To qualify for component resources, financial institutions would have to be legally registered, meet prudential requirements (when regulated by the Superintendency of Banks and Other Financial Institutions), have experience with microbusiness clients or consumer loans (though not necessarily in rural areas), confirm its interest in project sites and expanded economic zones, and meet specific performance indicators (provided below). Financial institutions would also be required to submit an institutional development plan and could qualify for a 50% matching grant up to US$40,000 (the objective of this matching grant is presented below).
2. The entire credit risk would be assumed by the financial institution (there is no guarantee mechanism provided by the component), and therefore the participating financial institution will set the rules of the game (methodology, list of financial products, interest rate, other charges, and collateral requirements).
3. A draft negative list of subprojects has been developed, to insure that there are no negative environmental effects.
4. A significant percentage of the portfolio (at least 60%) should be provided to clients who live in project sites (including the nucleus town and outlying settlements).

Role of the CNE. The CNE Microfinance Component manager will be responsible for the following: (i) management of the overall component (including close coordination with the IDA team and preparation of periodic reports); (ii) promotion of the component with leading national, regional and local financial institutions; (iii) measurement of impact and client satisfaction (including spot checks of compliance with the subproject negative list); (iv) development of prototype performance-based loan contracts with qualified financial institutions; and (v) participation on a credit committee which will review specific proposals by qualified financial institutions. In addition, to maintain a high level of coordination with the BDS Component, the Microfinance Component manager may participate in the grant review committee.

Component Services.

Detailed market studies. For the first phase sites, these studies demonstrate the scale and variety of credit demand, and have been built on household and business surveys, interviews with village leaders, and focus groups with leading local entrepreneurs and microbusiness operators.

Credit line. Commercially priced, performance-based loans to qualified financial institutions would be provided (the application and review process is summarized in a component of the operation manual). The maximum credit line per qualified financial institution per site will be set in the operational manual and the credit regulations of the component. The financial institutions will be instructed to include information on the subproject negative list to potential clients with proposed subprojects.

Institutional Development matching grants. These matching grants would provide matching grants to eligible financial institutions to support technical assistance and asset purchase to improve financial management systems (such as audits, internal controls, loan officer training in new products), the development of streamlined loan review processes) and new product development and piloting.

Supervision and Key Performance Indicators. Supervision would be performed at the site level (to measure client satisfaction through periodic surveys), as well as through audited financial statements and discussions with the managers of participating financial institutions. The CNE Microfinance Component manager would be responsible for visiting the sites, designing the annual component evaluation, reviewing applications from financial institutions, and monitoring the performance indicators and conditions of contracts with approved financial institutions. The participating financial institutions will provide annual audits, to demonstrate their fundamental soundness.

Project Component 4 - US$0.75 million

Business Development Services. Cost US$ 0.91 million; Credit financing US$ 0.75 million

Objective: To support a set of demand-driven business development services (BDS) providers that provide courses, consulting services, and other support in technical areas such as business management, new market development, new product development, financial management and technology so that micro and small businesses in project sites and extended economic zones can improve productivity and profitability.

Local context. In Nicaragua, there are both private sector and public traditional BDS providers (which offer short technical courses, on-site consulting services, marketing and production process trouble shooting). There are also a few new information communications technology-based BDS providers (using high tech infocenters to provide services to computer-literate business operators). Based on the market studies by Mesoamerica and CAECOMP of Phase I project sites, CNE and the IDA have chosen a traditional BDS approach, because it is a more appropriate means of reaching business operators in project sites (due to the lower initial and operating costs, less infrastructure and no need for computer

literacy). In exceptional cases where high tech solutions are likely to be the most efficient in project sites, a formal arrangement has been established with the Ministerio de Fomento, Industria y Comercio (MIFIC), which has an infocenter program (supported by IDA's Competitiveness Project).

The component's traditional BDS system will strengthen BDS suppliers in other areas and provide them with incentives (the matching grant) to offer services in project sites and extended economic zones, since there are very few BDS providers in and near project sites. These sites have clients with specific cost limitations and a need for immediate results – a new type of client for the existing BDS suppliers. In each case, the technical and business management needs are specific to the product, sector, scale, clients and geographic location of the producer. Therefore, a competitive matching grant system will be developed, largely dedicated to the development of new products and delivery capacity matching local business demand. This will not affect the new commercial relationships built between BDS providers and local firms, which will be built on full cost recovery and repeat business by satisfied clients.

Qualified Suppliers of BDS. A recent survey of BDS providers in Nicaragua was conducted in October, 2002, revealing that there are 22 businesses providing BDS, including one private company, one foundation, two producer organizations, two universities, four public institutions, and thirteen non-governmental organizations. The range of services includes business management, production and processing assistance, market information and contacts, feasibility studies, credit management and accounting, and sector-specific technical assistance. At the same time, the Ministry of Industry (MIFIC) database has over 90 private providers (many are individual consultants).

Underlying Principles of the Component. For this component, the "Guiding Principles for BDS" of the Committee of Donor Agencies for Small Enterprise Development Donor Group (correct name) have been reviewed and adapted to local conditions. Based on these guidelines, the following principles are the basis of the component.

1. The component will strengthen the supply side of BDS markets. The grants will be provided through a competitive system managed by a using mixed public sector (CNE) and private sector board, with a private sector orientation and performance indicators.
2. A second tier institution will take care of all administrative arrangements for providing subsidies to BDS providers and coordinate monitoring and evaluation activities with CNE.
3. The determination of eligibility of BDS providers will take place on an ongoing basis (so new providers who meet the established criteria can participate).
4. The component will encourage a commercial approach, characterized by full cost recovery, low cost replicable solutions and significant scale in project sites and extended zones.
5. Support for BDS providers will be temporary in nature to generate marketable BDS solutions, not a permanent subsidy.
6. The definition of BDS will be extensive, including a wide variety of non-financial services such as labor and management training, extension, consultancy, counseling, marketing and information services, technology development, bulk purchasing assistance and input diversification, auditing and financial control assistance, and mechanisms to improve business linkages through subcontracting and franchising.

The Role of the CNE. The CNE BDS Component manager will be responsible for the following activities: (i) management of the overall component, including the relationship with the second tier contracted firm and maintaining close coordination with the IDA team, (ii) promotional campaigns in the project sites and surrounding communities, (iii) measurement of impact and client satisfaction, (iv) development of prototype performance-based matching grant contracts with BDS providers, (v) participation on a review panel which will qualify BDS providers and approve the grant contracts, and

(vi) delivery of sectorwide technical courses for BDS providers (both qualified and other BDS providers)

Component Services.

Matching Grant facility for BDS providers. An average matching grant of US$40,000 to US$50,000 will be provided to BDS firms that provide credible work plans for the development of BDS products and delivery models for PERZA sites and surrounding communities. Grants will be awarded based on credible business plans and projections (see performance indicators description below).

Declining subsidy to lower BDS services costs to clients. Since the component is building a BDS market, it is necessary to provide a short term subsidy to potential eligible BDS clients to encourage them to experiment with the new BDS services. While the matching grant (described above) is intended to cover the research and development costs associated with the supply side of the new BDS market, the declining subsidy will be provided to lower initial costs to clients. This subsidy will be provided through a lower price for services offered by BDS providers, rather than through a voucher or other direct subsidy mechanism. The subsidy will decline on an annual basis, thereby encouraging clients to begin to use BDS services early in the life of the project.

Market studies of Phase II sites. The CNE will commission market studies in Phase II sites, to enable BDS providers to efficiently determine the potential for specific types of services. These studies will be shared with all BDS providers which express interest in component activities.

Supervision and Key Performance Indicators. Supervision would be performed at the firm level and the BDS provider level to measure coverage, quality, client satisfaction, and sustainability of services. The CNE BDS Component manager would be responsible for visiting the sites, designing the annual component evaluation, reviewing applications from BDS providers, and monitoring the performance indicators and conditions of contracts with approved financial institutions. Performance indicators would be included in the proposed business plan of each BDS provider, and would be likely to include financial sustainability (within three years) cost effectiveness, client satisfaction, and geographic coverage (percentage of support provided in project sites).

Project Component 5 - US$0.96 million

Project Communication and Social Participation. Cost US$ 0.96 million; Credit Financing US$ 0.09 million; GEF Grant US$ 0.80 million

Social issues are addressed thoroughly in the design of the different project components, since local participation and ownership are key to the success of all aspects of the project. Specific activities that will strengthen the social impact of the project in addition to social elements embedded in other project components, and that will support the implmentation of the Indigenous People Development Plan include:

(i) Community participation design: including field trips to pilot sites in the Atlantic coast and the Central Region of the country for social monitoring and evaluation, meetings with local authorities;

(ii) Promotions and public education: through project presentations to CONPES, autonomous authorities in the Atlantic Coast, civil society, as well as communications campaigns in the autonomous regions in Central Nicaragua and the Atlantic region of the country. Project promotion will also be sought through workshops, office supplies, and a theater show;

(iii) Social acceptance analysis: undertaking of annual and final evaluations to assess PERZA's social

impact;

(iv) Dissemination workshops: to ensure understanding of the schemes used in the provision of the different services: electricity, micro-finances and BDS; and

(v) Other social/communications tasks

Project Component 6 - US$1.61 million

Project Management Support. Cost US$ 1.61 million; Credit financing US$ 0.64 million; GEF Grant US$0.70 million

This component would finance activities to: a) enable the project to be properly coordinated, supervised and monitored by the CNE-PMU; and b) strengthen PMU's capacity through training and provision of selected equipment and software. The TA activities would be financed by IDA credits, GEF grants and in-kind government contribution.

Management of technical assistance activities. The PMU will administer all of the funds intended to be used for TA in all components. At project effectiveness, the PMU will prepare for submission to the Bank a final list and description of all studies, workshops, capacity building, promotions, monitoring and evaluation and other activities under each of the components shown in the above summary list. The specific activities must be consistent with those approved by IDA and the GEF at the project appraisal stage. The proposal to be submitted to IDA for no-objection must include a brief description of the activity, total cost, name of the local staff who will manage the activity, the type of consultants that will need to be hired, and the timetable. For capacity building activities, the proposal must include the names and positions of persons who will undertake long and short term training, the audience of each workshop or seminar, the potential consultants or firms that will provide the training, and the timetable. A breakdown by activity of the cost sharing, if applicable, among the GON, IDA credit and GEF funds should also be provided.

After obtaining a no-objection response from the Bank, the PMU will prepare a detailed Terms of Reference for each major activity to be financed. The PMU may engage the services of consultants to help prepare the TORs of highly specialized activities.

Annex 3: Estimated Project Costs
NICARAGUA: Offgrid Rural Electrification (PERZA)

Project Cost By Component	Local US $million	Foreign US $million	Total US $million
1. Rural Electrification and Renewable Energy Policies and Strategies	0.57	0.47	1.04
2. Rural Electrification Sub-Projects	8.02	7.58	15.60
3. Microfinance Services for Rural Sub-Projects	1.17	0.07	1.24
4. Business Development Services (BDS) for Rural Sub-Projects	0.53	0.29	0.82
5. Social Strategy, Consultations and Communication Activities	0.77	0.08	0.85
6. Project Management and Institutional Strengthening of CNE	1.36	0.07	1.43
Total Baseline Cost	12.42	8.57	20.99
Physical Contingencies	1.49	0.86	2.35
Price Contingencies	0.00	0.00	0.00
Total Project Costs[1]	13.91	9.43	23.34
Total Financing Required	13.91	9.43	23.34

Project Cost By Category	Local US $million	Foreign US $million	Total US $million
Goods	0.77	0.88	1.65
Works	2.17	1.06	3.23
Services	4.16	2.40	6.56
Training	0.00	0.00	0.00
Operational Costs	1.09	0.00	1.09
Credit and Subsidy Programs	1.95	2.35	4.30
Concessions	3.78	2.74	6.52
Total Project Costs[1]	13.92	9.43	23.35
Total Financing Required	13.92	9.43	23.35

[1] Identifiable taxes and duties are 0 (US$m) and the total project cost, net of taxes, is 19.32 (US$m). Therefore, the project cost sharing ratio is 62.11% of total project cost net of taxes.

Annex 4: Cost Benefit Analysis Summary
NICARAGUA: Offgrid Rural Electrification (PERZA)

A. Results and General Approach

Methodology

This Annex summarizes the results of the economic analysis for the four types of subprojects which will be financed under PERZA: (i) solar home systems, (ii) solar battery charging stations, (iii) mini-hydro projects (with connection to the SIN), and (iv) isolated village minigrids. The economic analysis draws on real data for all four types of subprojects. All sites for Phase One have been intensively analyzed during preparation and a detailed demand study four each site has been conducted, allowing for a good estimate of demand growth and benefits. The sites in Phase One have therefore been used directly for the economic analysis. Phase Two sites will be selected according to the same criteria as Phase One sites; therefore, Phase One sites are representative of future Phase Two Sites. As for Phase One, one of the key criteria for Phase Two site selection will be a positive NPV; and the best technology alternative for each site will be determined by comparative least-cost and cost-benefit analysis. The short list for Phase Two sites includes more sites that would fulfill these conditions than will be needed for the PERZA Pipeline (e.g. UNDP hydro sites).

Each subproject has been analyzed separately in three steps:

1. In a comparative least-cost and cost-benefits analysis, the best alternative for each subproject was identified.
2. Based on this alternative, an economic analysis of the incremental costs and benefits was performed for each subproject, using the 'with-and-without project' criterion.
3. The results of the economic analysis were then compared to the results of the financial analysis (see Annex 5) for each site, to confirm the overall quality of each subproject.

The economic costs consist of investment costs, replacement costs and operating and maintenance costs of the new systems in the project sites. The minimum consumer benefit is estimated conservatively from (i) current substitutable expenditures for fuel and batteries (or tariff, where possible), plus (ii) the lighting net consumer surplus, plus (iii) global environmental externalities. The net benefits of each subproject are aggregated to calculate the Economic Internal Rate of Return EIRR) and Net Present Value (NPV) of each sub-project. Many of the additional direct and indirect benefits from rural electrification are difficult to estimate. For PERZA economic analysis, only those benefits quantifiable with standard World Bank methods have been counted towards EIRR and NPV. The additional benefits from rural electrification (e.g. via improvements in education, health, communication and productivity) are treated in a separate paragraph at the end of this Annex. They have not been counted towards the conservative EIRR used for quantitative cost benefit analysis. Both taxes and import duty on equipment for the subprojects will be zero for first three years. As all projects are front-loaded (all renewable energy based generation alternatives show high upfront investment costs as compared to lifecycle costs), the tax and duties after year three are relatively low (mainly a 25% income tax on operation profits). Therefore economic IRR and project IRR (at zero subsidy) in financial analysis are very similar.

Main Results

The economic analysis yields positive and robust results for all four sub-projects of PERZA. For all four subprojects, NPV of Minimum Total Net Benefits is positive, and minimum EIRR ranges from 23% to 40%, well above the hurdle discount rate of 14%. For all subprojects, least cost analysis has also been

performed to identify the best technology alternative. Economic Analysis of each Sub-Project is given below; Financial Analysis of Sub-Projects is given in Annex 5.

Summary of Cost Benefit Analysis Sub-Projects - All Costs in constant Year 2002 Thousand US$

Sub-Project	Type	NPV (Costs)	NPV (Benefits)	**NPV (Net Benefits)**	**EIRR**
El Ayote	Village Minigrid - Offgrid	2,721	4,180	**1,459**	**23%**
El Bote	Mini Hydro - Grid connected	2,306	6,001	**3,696**	**40%**
Francia Sirpe	Solar Battery Charging Stations	639	849	**210**	**27%**
SHS Credit Line	Solar Home Systems (total 20, 36, 50Wp)	4,403	6,119	**1,716**	**34%**

Additional qualitative benefits: Beyond these three direct benefit types that have been counted towards Total Net Benefits in this analysis, there is a broad range of additional direct and indirect benefits of rural electrification. These include: increased productivity of existing and new local businesses (this benefit will be specifically targeted by PERZA and is therefore expected to be at least as high as in comparable past projects); time savings for household chores; improved returns on education and wage income (multiplied by electrification of schools); additional consumer surplus from less expensive and expanded use of ICT (radio, TV, phone, fax, PC); health benefits (through decreased indoor kerosene use (particles; burns) and improves service in health stations (emergency lights; vaccines); social benefits to the community (street light increasing safety and allowing women to participate in community life at night); multiplier effects on local and national level from replication of the successful pilot sites; and synergy effects from bundling services. As noted above, all these additional benefits have not been counted towards Total Net Benefits and would come on top of the conservative EIRR and NPV used for project economic analysis.

The benefits that will be generated by PERZA stem from households, micro-enterprises and social uses 'stepping up the energy ladder' by substituting electricity for traditional energy (improving service quality and unit costs). Rural users currently mainly use kerosene and batteries for lighting and communication, plus diesel generators in few cases (all assumptions based on data from detailed demand studies PPIAF2000 and EMERZA2002 in all Phase One subproject sites). All four subprojects will achieve a significant improvement to the current situation regarding energy quality, energy cost, service reliability, and sustainability. Village minigrids (used by two of the subcomponents) provide a different and higher level of service to the consumer and can potentially have a higher impact on economic development and social well-being than the electricity made available from isolated diesel generators or from solar PV (used by the two other subcomponents). However, the latter allows for a level of service that is still far superior to existing solutions to basic needs in non-electrified households (e.g. lighting, radio, TV). A large majority of rural households are low-intensity consumers, using less than 50 kWh per month. This level of service is consistent with the power available from off-grid electricity systems, when used in conjunction with compact fluorescent lamps (CFLs). Grid extension is not a viable option for any of the offgrid sites that will be implemented by PERZA (notable exception is El Bote, where a combined solution is least cost).

B. Sub-component: Micro grid with SIN connection – El Bote Sub-Project

Short Sub-Project Description

The sub-project for El Bote consists of several interconnected village minigrids with local hydro generation and connection to the National Interconnected System (SIN). The system will serve a total of almost 3,000 local users towards the end of the 20 year time base used for economic and financial analysis (565 users in year 0). Excess energy will be sold to the SIN. The operator will deliver AC energy in 110/120V to productive and domestic users, street light, schools, health stations and public administration.

Assumptions

- All costs are given in Constant Year 2002 US dollars. This allows for comparison the financial analysis, which is dollar driven.
- 14% discount rate (business as usual capital cost rate in Nicaragua)
- 20 years project life
- Diesel economic costs are US$ 1.14 per Gallon
- 25% market penetration in the first year of operation and 4% increase afterwards
- Population will naturally grow at a 5% rate
- Costs have been analyzed in detail by CNE and three separate consultant studies.
- Projects are excluded from tax and duties for the first three years, and are set zero in economic analysis for investments after year 3. Income tax is set zero
- Environmental Benefits are estimated based on PCF method at US$ 7 per t CO2 avoided.

Analysis of Technology Alternatives for Sub-Project

The comparative economic analysis of alternatives for this case compares four basic technology options that are summarized in below. Least Cost Analysis shows that Option C (two new hydro turbines totaling 900 kW with connection to the SIN) is the best alternative. The choice is confirmed by the financial analysis (see Annex 5).

TABLE: Present Value of Lifecycle Costs and Energy Costs of different technology alternatives for El Bote

Alternative	NPV (thousand US$)	US$/kWh	US$/user
Diesel 12 h	731	0.0333	380
Diesel 24 h	638	0.0290	332
A	1,126	0.0511	585
B	1,355	0.0426	462
B + sell to SIN	2,020	0.0408	689
C	**2,304**	**0.0285**	**786**
D	2,581	0.0222	880
Buy from SIN	1,167	0.0358	398

TABLE: Comparative costs and description of the four main options for El Bote-El Cua Sub-Project

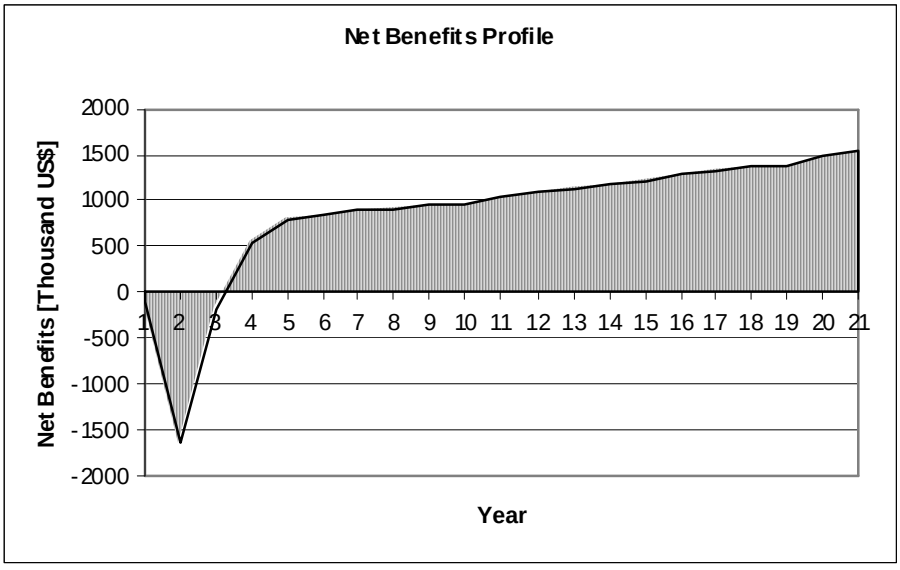
Description	Units	Option A	Option B	Option C	Option D
Installed capacity Mini-hydro 1	kW	450	450	**900**	900
Installed capacity Mini-hydro 2	kW		230	**230**	230
Installed capacity Mini-hydro 3	kW				425
Support Generation Type		Diesel	Diesel	**SIN**	SIN
Capacity of Support 1	kW	75	75		
Capacity of Support 2	kW	90	90		
Total Generation Power Population Centers Serviced:	kW	615 El Cua, El Bote, El Galope, Chico Estrada, El Chilamate, Villa Nueva and Bocaycito	845 El Cua, El Bote, El Galope, Chico Estrada, El Chilamate, Villa Nueva, Bocaycito and extension to La Camaleona area - El Cedro and La Unión	**1,130** **El Cua, El Bote, El Galope, Chico Estrada, El Chilamate, Villa Nueva, Bocaycito and extension to La Camaleona area - El Cedro and La Unión**	1,555 El Cua, El Bote, El Galope, Chico Estrada, El Chilamate, Villa Nueva, Bocaycito and extension to La Camaleona area - El Cedro and La Unión
Cost per user	US $	585	462	**786**	880
Cost per kWh	US $ / kWh	0.0511	0.0426	**0.0285**	0.0222
Cost per kW	US $/kW	1,506	1,506	**1,015**	1,469
Net Present Value @ 14%	US $	1,126	1,355	**2,306**	2,581

Cost Benefit Analysis for Sub-Project

The resulting EIRR of this subproject is 40%. NPV of Total Net Benefits is about US$4M. The results are robust, and benefits have been estimated conservatively, in order to determine the minimum for NPV

and EIRR. While PERZA is mainly looking at demonstrating sustainable 'offgrid' solutions for remote rural areas of Nicaragua that have been hitherto overlooked by CNE's rural electrification efforts, in some of these cases, the development of local hydro resources makes a connection to the grid viable ex post. Wherever such a solution is preferable to the offgrid alternative, based on economic cost benefit analysis, PERZA will implement the grid-connected alternative. El Bote is an example for such a case: Comparative economic cost benefit analysis clearly shows the superiority of a local hydro generation, combined with a new connection to the SIN in order to sell excess energy. The economic benefit of the sold energy has been estimated at the minimum value of US$ 30/MWh. Real benefits (from avoided generation costs) are above this value, so that the real contribution of this benefit type to Total Net Benefits is probably higher than estimated here.The economic cost benefit analysis of the Sub-Project El Bote, and the Sub-Project Net Benefits Profile are shown below:

		Costs (1000 US $)					Benefits by Type						
Ref. Year	Year	Investment	O & M	Fuel	Total Costs	Energy Generation (kWh)	Benefit0 tariff	SIN	Benefit2 global env.	Benefit3a Net CS Light	Benefit3b Net CS ICT	Total Benefits (min.)	Net Benefits
0	2002	74	0	0	74	0	0	0	0	0	not counted	0	(74)
1	2003	1,620	0	0	1,620	429,556	0	0	3	262		265	(1,355)
2	2004	311	0	0	311	460,933	0	0	3	274		277	(34)
3	2005	0	100	0	100	4,794,591	105	168	4	352		629	529
4	2006	0	109	0	109	4,844,126	177	154	6	584		922	812
5	2007	0	104	0	104	4,864,848	190	152	7	617		966	862
6	2008	0	106	0	106	4,880,689	204	148	7	652		1,012	906
7	2009	0	109	0	109	4,897,831	219	145	8	689		1,061	952
8	2010	0	111	0	111	4,918,494	235	141	8	727		1,111	1,000
9	2011	0	114	0	114	4,944,430	251	138	8	766		1,164	1,050
10	2012	0	117	0	117	4,972,454	269	134	9	807		1,219	1,102
11	2013	0	120	0	120	5,006,722	288	129	9	850		1,277	1,157
12	2014	0	123	0	123	5,045,950	308	125	10	895		1,337	1,214
13	2015	0	126	0	126	5,088,305	329	120	10	941		1,400	1,274
14	2016	0	130	0	130	5,134,047	351	114	11	990		1,466	1,336
15	2017	0	133	0	133	5,183,459	375	108	11	1040		1,535	1,401
16	2018	0	141	0	141	5,236,850	401	101	12	1093		1,607	1,465
17	2019	0	364	0	145	5,294,553	428	94	13	1148		1,682	1,536
18	2020	0	145	0	150	5,356,934	456	86	13	1205		1,760	1,610
19	2021	0	150	0	155	5,424,385	487	77	14	1265		1,843	1,688
20	2022	0	155	0	155	5,497,338	519	68	15	1327		1,928	1,774
	Net Present Value @	14.00%			**2,306**	**80,944,293**	1,857	1,010	45	4,322		6,001	**3,696**
												Resulting ERR	**40%**



C. Sub-component: Isolated Village Microgrid (without SIN connection) – El Ayote Sub-Project

Short Description Sub-Project

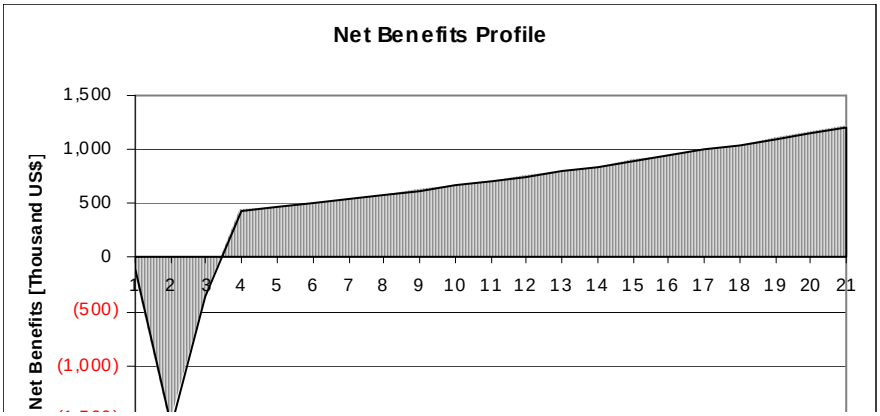
The sub-project will serve a total of about 1,750 users (initially 500) and will not be connected to the grid, as the SIN is too far away. The village minigrids will be powered by a combination of hydro generation and a diesel generator, and deliver energy in 110/120V AC for productive and domestic users, as well as street lighting, health station, school and public administration. Main assumptions are same as for El Bote Sub-Project

Analysis of Technology Alternatives and Cost Benefit Analysis

The sub-project analysis has analyzed four alternatives: two mini-hydro-diesel combinations, and two diesel only scenarios (diesel 12 hours and diesel 24 hours). The hydro-diesel combination with the smaller hydro generator size (485 kW) is the best alternative. In El Ayote, almost 500 users are already being served by a local minigrids with diesel generation, with a 12 hour service and frequently occurring power black outs. One of the diesel-based options has come very close to the winning alternative (combination of hydro-diesel generation), and has in fact shown a slightly lower levelized energy cost over 20 years. However, the total benefits were higher for the winning alternative, mainly because of (a) the better service quality of the hydro solution (e.g. more brown-outs of diesel only solution, and fuel shortages during rainy season due to transportation problems), (b) the higher environmental benefits of the hydro solution, (c) the higher rest value of the hydro solution (civil works last up to 40 years), (d) the sustainability problem and transaction costs of ongoing subsidy transfers from Government for the diesel only solutions.

The resulting EIRR of this subproject is 23%. The NPV is about US$1.5M. The economic cost benefit analysis of the Sub-Project El Ayote and the Sub-Project Net Benefits Profile are shown below:

		Costs (all constant Year 2002 thousand US Dollars)				**Energy**	**Benefits by Type**								**Total Net Benefits**
Ref. Year	**Year**	**Investment**	**O & M**	**Fuel**	**Total Costs**	**Energy Generation (kWh)**	Benefit0 tariff	venta SIN	Benefit1 (savings) unel. HH	el. HH	all HH	Benefit2 global env.	Benefit3a Net CS (Light)	Benefit3b Net CS (ICT)	
0	2002	104	0	0	**104**	0	0	0	0	0	0	0	0	not counted	**(104)**
1	2003	1,766	77	33	**1,876**	884,585	61	0	5	99	105	3	255		**(1,558)**
2	2004	586	78	35	**699**	884,585	64	0	36	99	135	3	267		**(365)**
3	2005	0	79	0	**79**	1,073,100	98	0	42	99	141	4	407		**430**
4	2006	0	81	0	**81**	4,292,400	105	0	49	99	148	4	437		**466**
5	2007	0	82	0	**82**	4,292,400	113	0	56	99	155	5	468		**503**
6	2008	0	84	0	**84**	4,292,400	120	0	63	99	162	5	499		**541**
7	2009	0	85	0	**85**	4,292,400	128	0	70	99	169	5	532		**580**
8	2010	0	86	0	**86**	4,292,400	136	0	77	99	177	6	565		**621**
9	2011	0	88	0	**88**	4,292,400	144	0	85	99	184	6	600		**662**
10	2012	0	89	0	**89**	4,292,400	153	0	93	99	192	6	635		**705**
11	2013	0	91	0	**91**	4,292,400	162	0	101	99	200	7	672		**750**
12	2014	0	92	0	**92**	4,292,400	171	0	110	99	209	7	710		**795**
13	2015	0	94	0	**94**	4,292,400	180	0	118	99	217	8	749		**842**
14	2016	0	96	0	**96**	4,292,400	190	0	127	99	226	8	789		**891**
15	2017	0	97	0	**97**	4,292,400	200	0	137	99	236	8	830		**941**
16	2018	0	99	0	**99**	4,292,400	210	0	131	99	230	9	873		**993**
17	2019	0	101	0	**101**	4,292,400	221	0	131	99	230	9	917		**1,045**
18	2020	0	102	0	**102**	4,292,400	232	0	131	99	230	9	963		**1,100**
19	2021	0	104	0	**104**	4,292,400	243	0	131	99	230	9	1,010		**1,157**
20	2022	0	106	0	**106**	4,292,400	255	0	131	99	230	9	1,058		**1,216**
		Separate NPV @ 14.00%			**(2,721)**	**20,644,675**	**804**				**1,081**	**33**	**3,342**		**1,459**
						75,813,070							**Resulting Total NPV @ 14%**		**1,459**
													Resulting ERR		**23%**



D. Sub-component: Photovoltaic SHS – Solar Credit Line

Short Sub-Project Description

About 6,000 users will be electrified by installation of Solar Home Systems (SHS) based on photovoltaic power generation. Households will be able to choose between three sizes: 20Wp, 36Wp and 50Wp. For schools and health stations, larger systems will be offered. For economic analysis, the latter have been treated as multiples of equivalent household SHS systems. This yields the right results for environmental benefits and avoided costs, but underestimates the consumer surplus and multiplier effects on Total Net Benefits; the total EIRR is therefore conservative.

Assumptions

- 6,000 SHS installed is equivalent to 4% of total dispersed households, or 13% of estimated SHS market potential.
- 20 years PV Module life. Replacements (batteries, lamps) see household EIRR below.
- 14% discount rate (business as usual capital cost rate in Nicaragua). All costs are in US dollars, as the financial analysis is dollar driven.
- Projects are excluded from tax and duties for the first three years, and are set zero in economic analysis for investments after year 3. Income tax is set zero
- GEF Incremental Costs have been used to estimate global environmental benefits. Therefore NPV of benefits is zero by definition when counting only avoided costs and global environmental benefits; it is above zero when adding consumer surplus from improved lighting.

Analysis of Technology Alternatives

Solar Home Systems are the least cost solution for a significant fraction of the remaining unelectrified rural households in Nicaragua: wherever users are too remote or dispersed to allow for economically viable grid extension (unit costs increase), and where no local village minigrid is feasible, SHS are the only economically viable alternative to provide electricity to rural households. The total size of this market segment in Nicaragua is estimated at about 144,000 users, of which about 46,000 could potentially afford SHS at the subsidy range considered by PERZA. SHS are well adopted to the typical demand pattern of rural users in Nicaragua (as confirmed by CNE's PPIAF2000 and EMERZA 2002 demand studies). Several SHS sizes will be offered by PERZA, to allow for user choice on service level. While the total net benefits may be smaller than those for full grid extension (or mini grid) based-electrification, for areas where such electrification strategies are not cost-effective, SHS have higher Net Benefits (because of the high costs of the other solutions) and represent an economically efficient solution.

Cost Benefit Analysis

The economic analysis of the solar homes component of the project shows high economic returns. Under conservative assumptions the economic rate of return (EIRR) for the total PERZA SHS component is 34%. The economic returns of the SHS component are robust, and risks are small. The benefits are consistent with those estimated in other countries for similar projects (e.g. 30% EIRR as estimated by the ICR for a similar project component in India, and 12% EIRR from kerosene and global environmental benefits only - i.e. without consumer surplus - in the recently approved Sri Lanka ESSD project). They reflect the high willingness to pay and consumer surplus from the improved levels of lighting service.

For the analysis, the total 6,000 SHS to be installed by PERZA have been treated in three groups of system sizes: 20Wp, 36Wp and 50Wp. This product mix is based on a market segmentation analysis, using the demand surveys PPIAF2000 and EMERZA2002 that have been conducted during project preparation. For each system size, NPV of economic lifecycle costs was compared to: (i) avoided costs (current substitutable energy expenditures for kerosene, candles, dry cells, and battery charging); (ii) net gains in consumer surplus from switching to PV powered SHS; and (iii) global environmental benefits, based on the GEF incremental cost of US$2.8 per Wp installed. EIRR was calculated for the different SHS system sizes separately (following the assumptions on installation rhythm) and then aggregated. The results are summarized in the tables below.

Nicaragua
PERZA-Solar Home Systems Component
Economic Cost Benefit Analysis

(in constant Year 2002 US Dollars)

		Costs			Benefits					
					Total Benefits			Net Benefits		
Year	Installed Systems	Initial Capital Expenditures	Replacement Costs	**Total Costs**	Avoided costs	Total User Benefits from Lighting	Global Benefits (GEF)	Net Consumer Surplus (Light)	Net Consumer Surplus (ICT)	**Total Net Benefits**
2003	510	207,693	-	**207,693**	12,498	68,278	36,271	34,133	not counted	**-103,143**
2004	1,370	350,228	65,472	**415,700**	33,573	183,415	55,047	186,060		**-177,238**
2005	2,780	574,210	132,856	**707,067**	68,126	372,185	81,226	287,121		**-253,656**
2006	4,290	614,935	205,019	**819,954**	105,130	574,343	78,288	401,567		**-167,323**
2007	6,000	696,383	286,740	**983,123**	147,034	803,276	79,792	401,567		**-100,055**
2008	6,000	-	286,740	**286,740**	147,034	803,276		401,567		**516,536**
2009	6,000	-	286,740	**286,740**	147,034	803,276		401,567		**516,536**
2010	6,000	-	286,740	**286,740**	147,034	803,276		401,567		**516,536**
2011	6,000	-	286,740	**286,740**	147,034	803,276		401,567		**516,536**
2012	6,000	-	286,740	**286,740**	147,034	803,276		401,567		**516,536**
2013	6,000	-	286,740	**286,740**	147,034	803,276		401,567		**516,536**
2014	6,000	-	286,740	**286,740**	147,034	803,276		401,567		**516,536**
2015	6,000	-	286,740	**286,740**	147,034	803,276		401,567		**516,536**
2016	6,000	-	286,740	**286,740**	147,034	803,276		401,567		**516,536**
2017	6,000	-	286,740	**286,740**	147,034	803,276		401,567		**516,536**
2018	6,000	-	286,740	**286,740**	147,034	803,276		401,567		**516,536**
2019	6,000	-	286,740	**286,740**	147,034	803,276		401,567		**516,536**
2020	6,000	-	286,740	**286,740**	147,034	803,276		401,567		**516,536**
2021	6,000	-	286,740	**286,740**	147,034	803,276		401,567		**516,536**
2022	6,000	-	286,740	**286,740**	147,034	803,276		401,567		**516,536**
2023	6,000	-	286,740	**286,740**	147,034	803,276		401,567		**516,536**
NPV(14%)		1,784,125	1,531,454	**3,315,579**	797,796	4,358,509	247,144	2,416,662		**1,290,075**

EIRR	**33.5%**

In addition, the EIRR from household's viewpoint was calculated for each system size. The result for a 36Wp SHS is given here as an example; it highlights the cost structure of these systems:

Poor Household Economic Analysis - 36 Wp PV System

	Costs (US$)					Benefits (US$)				
	Costs ($C)	Battery	Light Bulbs	Controller	**Total Cost**	Total User Benefits from Lighting	Global Benefits (GEF)	Net Consumer Surplus Light	Net Consumer Surplus ICT	**Total Net Benefits** (min)
2003	444.24	0.00	0.00	0.00	**444.24**	0.00	123.57	0.00	not counted	**-320.67**
2004	0.00	0.00	5.40	0.00	**5.40**	133.88	0.00	66.93		**128.48**
2005	0.00	78.00	5.40	0.00	**83.40**	133.88	0.00	66.93		**217.28**
2006	0.00	0.00	5.40	0.00	**5.40**	133.88	0.00	66.93		**139.28**
2007	0.00	78.00	5.40	0.00	**83.40**	133.88	0.00	66.93		**217.28**
2008	0.00	0.00	5.40	48.60	**54.00**	133.88	0.00	66.93		**187.88**
2009	0.00	78.00	5.40	0.00	**83.40**	133.88	0.00	66.93		**217.28**
2010	0.00	0.00	5.40	0.00	**5.40**	133.88	0.00	66.93		**139.28**
2011	0.00	78.00	5.40	0.00	**83.40**	133.88	0.00	66.93		**217.28**
2012	0.00	0.00	5.40	0.00	**5.40**	133.88	0.00	66.93		**139.28**
2013	0.00	78.00	5.40	0.00	**83.40**	133.88	0.00	66.93		**217.28**
2014	0.00	0.00	5.40	48.60	**54.00**	133.88	0.00	66.93		**187.88**
2015	0.00	78.00	5.40	0.00	**83.40**	133.88	0.00	66.93		**217.28**
2016	0.00	0.00	5.40	0.00	**5.40**	133.88	0.00	66.93		**139.28**
2017	0.00	78.00	5.40	0.00	**83.40**	133.88	0.00	66.93		**217.28**
2018	0.00	0.00	5.40	0.00	**5.40**	133.88	0.00	66.93		**139.28**
2019	0.00	78.00	5.40	0.00	**83.40**	133.88	0.00	66.93		**217.28**
2020	0.00	0.00	5.40	48.60	**54.00**	133.88	0.00	66.93		**187.88**
2021	0.00	78.00	5.40	0.00	**83.40**	133.88	0.00	66.93		**217.28**
2022	0.00	0.00	5.40	0.00	**5.40**	133.88	0.00	66.93		**128.48**
2023	0.00	0.00	5.40	0.00	**5.40**	133.88	0.00	66.93		**128.48**
				Net Present Value:	**757.71**	887	124	443		**868.35**
										EIRR 52.9%

For the SHS component, it is possible to conclude a positive NPV of Total Net Benefits even without calculating the incremental consumer surplus explicitly, simply by starting from the Incremental Costs that have been approved by GEF Project: Standard Bank procedure uses GEF incremental costs as the estimate for global environmental benefits of this component (based on WTP of international community for global environmental effects). Incremental costs are defined as the gap between avoided costs and lifecycle costs of the SHS. Therefore, the discount rate used for Incremental Cost calculation equals EIRR when only (i) avoided costs and (ii) environmental benefits are considered for Total Benefits. Given that additional benefits from lighting consumer surplus and other additional benefits are certainly above zero, the SHS component's NPV is higher than zero by definition. However, the EIRR and NPV have been estimated explicitly to illustrate the degree of its benefits.

As noted above, the calculated household EIRR does not include the broad range of important additional direct and indirect benefits from switching electrification, such as additional increases in consumer surplus from ICT (TV, radio, cell phones where signal exists), the avoidance of burn injuries and fires; the benefit to families of higher levels of educational achievement; time savings for household chores; and the benefit of attaining higher levels of family income.

The result of net economic benefit is robust with respect to input assumptions in the plausible range. A switching values analysis shows that increases in initial cost, problems in system performance, and assumptions about the shape of the demand curve pose relatively small risks to achieving the project benefits. With 6,000 systems as the goal for PERZA, the risks of having overestimated market size is small. The input assumption with the most significant potential effect on EIRR is the life of the PV modules, which we assume at 20 years in the base case. However, because of the large magnitude of benefits, significant erosion of EIRR occurs only if model lives are below 6 years (switching value), which seems unlikely based on experience in other countries (some PV module manufacturers give a 20 year guarantee today). We make the conservative assumption that incomes in poor households have tightly constrained energy expenditure budgets, and that increases in the world oil price (and hence local kerosene price) are accommodated by a reduction in the level of kerosene lighting, which makes the EIRR relatively insensitive to the oil price. In the absence of energy budget constraint, economic returns

at higher oil prices would be even higher than estimated. Although distributors of solar home systems will need to make up-front business development investments, payment of government and GEF subsidies are linked to actual installation of systems, which necessarily implies customer willingness-to-pay for the system. Thus the worst-case outcome is that subsidies are not disbursed. The risk of making uneconomic investments is very small.

E. Sub-component: Solar Battery Charging Stations (SBCS) – Francia Sirpe Sub-Project

Short Sub-Project Description

This sub-component or PERZA specifically addresses the needs of the mostly indigenous, extremely poor remote rural households along the Atlantic Coast of Nicaragua. The sub-project to be implemented in Phase One will serve about 800 families in five communities (Awastagni, Ulwas, Francia Sirpi, Saklin and Sangni Laya). Based on the demand study, it is assumed that about 85% of the users will be served by battery charging from Solar Battery Charging Stations (SCBS) and about 15% with SHS systems (see above for SHS component of PERZA).

Assumptions

- 14% discount rate (business as usual capital cost rate in Nicaragua).
- 20 years project life
- The base case involves all five communities being supported by the same service-provider and management entity.
- All costs are in US dollars, as the financial analysis is dollar driven.
- Projects are excluded from tax and duties for the first three years, and are set zero in economic analysis for investments after year 3. Income tax is set zero.
- The operator will deliver on average 12.8 Ah/day in 12V DC.
- 3% yearly growth in new users

Analysis of Technology Alternatives and Cost Benefit Analysis

The resulting EIRR of this subproject is 27%; the NPV is small, but positive.

The SBCS are an important alternative to SHS for the decentralized, mostly indigenous population of the Atlantic Coast. Several communities around Francia Sirpe have been selected for Phase One because of their representativity for the Atlantic Coast. In the past, rural electrification efforts in Nicaragua have overlooked these areas. The extreme remoteness makes traditional solutions based on grid extension or diesel generation economically unviable. At the same time, extreme poverty makes cost recovery difficult even for more adopted systems. The two most promising alternatives for these areas to improve their energy services are SHS and SBCS. These two solutions are very similar regarding technology and costs: Both are based on local generation with PV modules, both charge batteries through charge controllers, in both cases the typical appliances powered by one battery per household are a few (efficient) light bulbs, a radio and maybe a b/W TV. The main difference is that the batteries are charged centrally in the SBCS (and then transported to the users), while each battery is charged decentrally in the case of SHS, where each household has its own small PV module and charge controller. The advantages of SBCS are potential economies of scale in management and battery charging, as well as the potential to adopt payment rhythm to local needs. The main advantages of SHS are the increased convenience and the household charge controllers which avoid deep discharging and increase battery lifetime. To decide amongst these two alternatives is difficult ex ante: international experience has shown that local preference and use patterns make the difference. In general, SBCS become more interesting towards the lowest income segments. PERZA will let the market decide on the local preference for these two options: In Phase One, SBCS will be installed, in Phase Two, small SHS (20Wp) will be offered as an option for 'stepping up' through the SBCS operators (who will then also offer replacement parts for the SHS). The economic Net Benefits of SBCS tend to be lower than those of SHS, because the cost per kWh used is often slightly higher (because of the shorter battery lifetime), while benefits are slightly lower (because the households usually keep using a higher portion of kerosene in their energy mix). For benefit calculation, this was considered by: (i) using the monthly payment that was estimated based on the demand survey for the specific subproject site (based on avoided costs in kerosene and candles), (ii) lighting net consumer surplus (based on a partial substitution of battery power for kerosene and candles), and (iii) the external environmental benefits, based on GEF incremental costs. SBCS costs have been determined by a detailed Consultant study for the specific project site. The economic cost benefit analysis of the Sub-Project is shown here:

		Costs						Benefits				
year	users	Modules, Bateries, Lamps	Material	Invest	M&O	Equipment Centers	**Total Econ. Costs**	Savings	GEF	Net Consumer Surplus Lighting	Net CS ICT	**Total Net Benefits**
0	0	246,470	61,618	308,088	0	29750	**337,838**	0	117,600	0	not counted	**-220,238**
1	789	7,616	1,904	9,684	28,188	-	**37,873**	35,873		56,808		**54,808**
2	813	7,394	1,849	9,400	28,706	-	**38,106**	36,949		58,512		**57,355**
3	837	7,616	1,904	9,684	29,236	-	**38,920**	38,058		60,268		**59,405**
4	862	7,844	1,961	9,978	29,777	-	**39,754**	39,199		62,076		**61,521**
5	888	8,080	2,020	10,280	30,376	4,814	**45,470**	40,375		63,938		**58,843**
6	915	8,322	2,081	10,591	30,940	-	**41,531**	41,587		65,856		**65,912**
7	942	8,572	2,143	10,912	31,515	-	**42,427**	42,834		67,832		**68,239**
8	970	8,829	2,207	11,242	32,103	-	**43,345**	44,119		69,867		**70,641**
9	999	9,094	2,273	11,582	32,754	21,091	**65,427**	45,443		71,963		**51,979**
10	1,029	9,367	2,342	11,932	33,366	478	**45,777**	46,806		74,122		**75,150**
11	1,060	9,648	2,412	12,294	34,324	35,883	**82,500**	48,210		76,345		**42,055**
12	1,092	9,937	2,484	12,665	34,958	557	**48,180**	49,657		78,636		**80,112**
13	1,125	10,235	2,559	13,049	35,659	6,083	**54,790**	51,146		80,995		**77,351**
14	1,159	10,542	2,636	13,443	36,319	591	**50,353**	52,681		83,424		**85,752**
15	1,193	10,858	2,715	13,850	36,993	609	**51,452**	54,261		85,927		**88,737**
16	1,229	11,184	2,796	14,269	37,682	627	**52,578**	55,889		88,505		**91,816**
17	1,266	11,520	2,880	14,700	38,443	6,539	**59,682**	57,566		91,160		**89,043**
18	1,304	11,865	2,966	15,144	39,161	665	**54,971**	59,293		93,895		**98,217**
19	1,343	12,221	3,055	15,602	39,894	685	**56,181**	61,071		96,712		**101,602**
20	1,384	12,588	3,147	16,074	40,642	706	**57,422**	62,903		99,613		**105,095**
NPV (14%)		$303,538		$380,740	$208,569		**$639,021**	$283,261	$117,600	$448,568		**$210,409**
											EIRR	**27%**

F. Background on the Estimation of Benefits of Rural Electrification

Benefits from electrification include a variety of effects, and have been estimated in past World Bank projects in several ways. While estimating minimum benefits via tariffs, cost savings, consumer surplus through improved lighting and global benefits is straightforward, estimating the multitude of additional direct and indirect benefits of electrification (e.g. via improvements in education, health, communication and productivity) is more difficult. However, it is important not to forget the latter when judging the real net gain in benefits from rural electrification. By combining electrification with BDS and microcredit, PERZA specifically aims at increasing the indirect benefits in its pilot sites.

Recent research has estimated some of the indirect benefits for the Philippines and India (Barnes 2002), with resulting Monthly Total Benefits from US$80 to US$150 per household, without counting some of the additional qualitative benefits. While a direct transfer of these results to Nicaragua is obviously not possible, these results give an idea of the range of additional benefits that can be derived from rural electrification. All these benefits would come on top of the conservative Total Net Benefit Estimate used in the quantitative cost benefit analysis. A qualitative description of selected additional benefits is given below, together with a diagram showing the input-output relations of selected benefits, and a table listing the various benefit types.

FIGURE: Benefits from electrification - Relationship between electricity inputs and selected outputs (Barnes 2002)

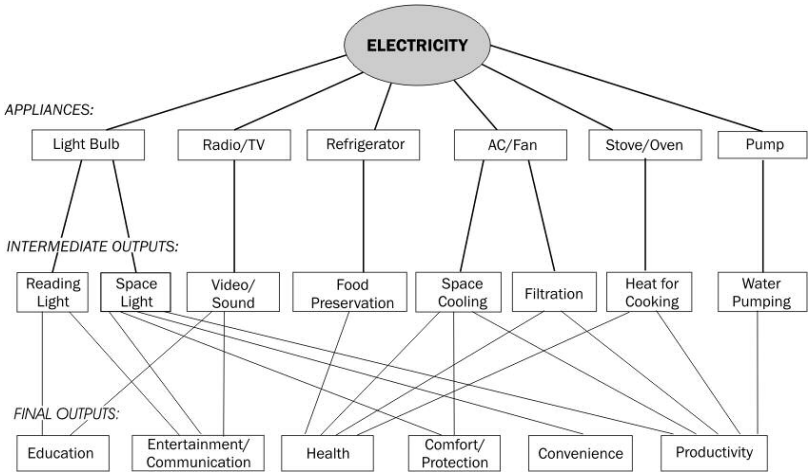
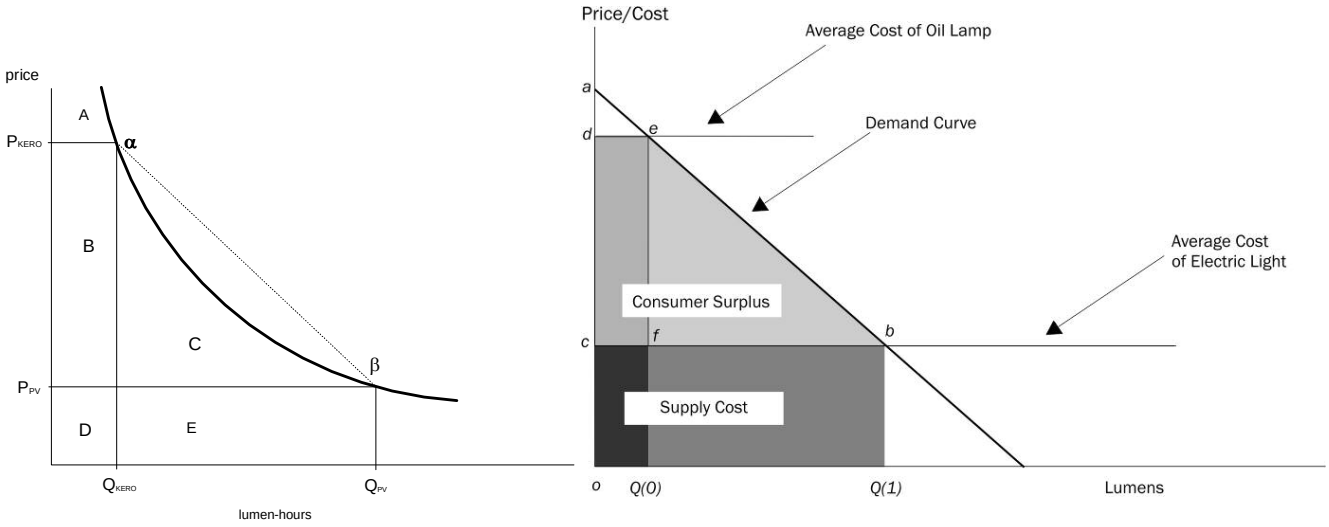


TABLE: Types of benefits and treatment in PERZA economic analysis. Only the first four benefit types (bold) have been counted for economic analysis of subprojects, as all others are difficult to quantify. However, contribution of all others to NPV would be positive and hence further increase NPV and EIRR.

enefit Type	**Quantification**	**Contribution to NPV**
ariff	**Based on existing data from Nicaragua surveys and current tariff structure in existing ENEL diesel minigrids in isolated rural sites; plus WTP survey in target areas.**	**>0**
avings	**Based on current substitutable energy expenditure in project sites from Nicaragua Demand Study. Used instead of tariff as estimate for minimum WTP in sites without existing electricity tariff.**	**>0**
lobal Environmental	**Taken from GEF incremental cost analysis for Solar PV and SBCS. Based on PCF WTP (7$/t CO2) for Nicaragua minigrids.**	**>0**
et Consumer surplus Lighting CSL)	**Incremental consumer surplus from reduced lumenhour costs. Based on standard Bank methodology and real data from PERZA sites as assembled in PPIAF2001 and EMERZA2002 demand surveys.**	**>0**
et Consumer Surplus ommunication: TV, radio, obile phone, PC)	Range estimated, based on Barnes2002 methodology and Nicaragua data from PPIAF2001 and EMERZA2002 demand surveys. Net CS (ICT) >30$ per HH and month for new minigrid users.	>0
lucation, Wage Increase, Time avings	Ditto	>0
ealth	Ditto	>0
oductivity	Ditto	>0
educed Fuel Imports	Not quantifiable	>0
nproved local administration	Ditto	>0
ecreased marginalization	Ditto	>0
educed necessity of future going O&M subsidies to sites	Ditto	>0
eplication of successful offgrid odels in more sites	Ditto, Multiplier effect	>0

Lighting Consumer Surplus: Illustration of contributions and demand curve parameters used for the PERZA cost benefit analysis. Note: To adjust for the fact that the shape of the lumenhour demand curve for each site is not known (we have only three points on the curve), the results for lighting net consumer surplus from an assumed linear demand curve have been multiplied with a factor of 0.5, to produce a conservative estimate of minimum net consumer surplus (this is consistent with the results of a recent ESMAP Consumer Surplus study in the Philippines).



Price and Quantity of Light Used in Nicaragua Rural Households. Input for Net Consumer Surplus Estimates:

Parameter	*Value**	*Unit*	*Assumption (average)*
P(0)	$0.33	Per klm hr.	Kerosene cost/klm hr.
P(1)	$0.035	Per klm hr.	PV cost/klm hr. (36 Wp HH)
P(2)	$0.004	Per klm hr.	Minigrid electricity cost/klm hr. (Ayote, Bote)
Q(0)	1.3 to 3.4	Klm/mo.	Consumption of non-electrified households
Q(1)	96 to 153	Klm/mo.	Consumption of PV households
Q(2)	204 to 284	Klm/mo.	Consumption of minigrid households (24h service)

Source: Nicaragua Rural Energy Demand Surveys PPIAF2000 and EMERZA 2002

Summary of Benefits and Costs:
See above.

Main Assumptions:
See above.

Sensitivity analysis / Switching values of critical items:
See above.

Annex 5: Financial Summary

NICARAGUA: Offgrid Rural Electrification (PERZA)

TABLE 1: FINANCIAL ANALYSIS PERZA PHASE 1 SUBPROJECTS		
USD 1,000	**EL AYOTE**	**EL BOTE-EL CUA**
Total investment costs	2,684	2,239
% Subsidy	30%	10%
% Equity	38%	20%
% Debt	32%	70%
Project IRR without subsidy	2.68%	14.16%
Project IRR with subsidy	6.01%	15.63%
Equity IRR without subsidy	6.04%	26.57%
Equity IRR with subsidy	17.61%	38.64%
WACC without subsidy	10.75%	8.56%
WACC with subsidy	7.53%	7.70%
Project NPV@ 14% w/ S	(804)	199
Project NPV@ WACC w/ S	(233)	1,509
Equity NPV @ 14% with S	110	804
Equity NPV @ WACC w/ S	544	1,825

TABLE 2: SUB-PROJECTS INVESTMENT COSTS		
USD 1,000	**EL AYOTE**	**EL BOTE-EL CUA**
--Initial Project Cost	2,454	2,005
--WCR	125	50
--Total Initial Investment	**2,579**	**2,055**
--Capital expenditures during project's life	99	174
--Financial Costs during construction	6	11
--Total Investment Costs	**2,684**	**2,240**
Equity	967.00 38%	411.00 20%
Debt	838.00 32%	1,438.00 70%
Subsidy	774.00 30%	205.00 10%

EL AYOTE SUB-PROJECT FINANCIAL ANALYSIS

1. Assumptions

The sub-project financial analysis involves choosing between two mini-hydro options. Only the preferred option (700 kW) is analyzed here, and includes a base case and a sensitivity analysis.

The sub-project will serve a potential 1,500 users and will not be connected to the grid.

The model used for the financial analysis involves the following assumptions:

- 25% market penetration in the first year of operation and 5% increase afterwards
- Population will naturally grow at a 5% rate
- Subsidy covering 30% investment costs
- Monthly tariffs are flat fees and are modeled separately but linked to the financial model. They have been created in different blocks as explained in earlier chapters. Tariffs increase at a 6%

yearly rate

- Demands per blocks have also been modeled separately and included in the financial model
- 1.7% inflation in dollars: financials are analyzed in dollars since tariffs in Nicaragua are indexed to the US dollar
- 14% discount rate (business as usual capital cost rate in Nicaragua)
- 20 years project's life
- The business will deliver energy in 110/120 v. for industrial and domestic consumption

Percentages of Equity, Debt and Subsidy are calculated over the total pre-operating investment cost plus working capital requirements, not considering neither future capital expenditures (paid by the project cash flows) nor financial costs during construction.

2. Sub-project performance

Project NPV is US$804,000 prior to subsidy. Sub-project non-viability is turned around by a 30% subsidy that makes Project NPV US$110,000. Equity IRR is 6.04% without subsidy, but the subsidy boosts it up to 17.61% in order to attract private investment to the project (see Table 1). Cash flow projections are shown in Table 3. As the performance analysis shows, only the right combination of World Bank subsidies and loans can attract private investment to this sub-project.

TABLE 3: CASH FLOW PROJECTIONS EL AYOTE

Año índice		0	1	2	3	4	5	6	7	8	9	10	11	12
Año Calendario		*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*
Ingresos														
Pago de Energía BT1			0	0	16	17	26	29	32	34	37	41	44	47
Pago de Energía BT2			0	0	16	17	27	29	32	35	38	41	44	48
Pago de Energía BT3			0	0	20	21	33	36	39	42	46	50	54	58
Pago de Energía BT4			0	0	16	17	26	29	32	34	37	41	44	47
Pago de Energía BT5			0	0	6	6	9	10	11	12	13	15	16	17
Pago de Energía BT1			0	0	26	28	29	31	33	36	38	40	42	45
Sistemas Solares Aislados			0	0	0	0	0	0	0	0	0	0	0	0
Honorarios de Conexión			0	0	37	8	8	8	9	9	9	9	10	10
Venta al SIN			0	0	16	127	125	122	119	117	113	110	106	102
Beneficios Totales			0	0	152	241	284	295	307	319	332	346	360	375
Gastos de Operación														
Administración			0	0	40	41	42	42	43	44	44	45	46	47
Operación y Mantenimiento (O & M)			0	0	32	32	33	33	34	35	35	36	36	37
O & M Adicional			0	0	0	0	0	0	0	0	0	0	0	0
Seguros			0	0	9	9	10	10	10	10	10	10	11	11
Arrendamiento de Plantas Diesel (Si Aplicable)			0	0	0	0	0	0	0	0	0	0	0	0
Arrendamiento de Terrenos			0	0	0	0	0	0	0	0	0	0	0	0
Mantenimiento de Líneas de Trasmisión			0	0	12	13	13	13	13	14	14	14	14	14
Combustibles (Diesel)			0	0	0	0	0	0	0	0	0	0	0	0
Conexión					37	8	8	8	9	9	9	9	10	10
Peaje de distribución					6	42	41	40	39	38	37	35	34	32
Gastos Totales de Operación			0	0	136	145	146	147	148	149	149	150	151	151
Flujo de Caja de la Operación			0	0	16	96	138	148	159	171	183	196	209	224
Menos Depreciación			0	0	(123)	(123)	(123)	(123)	(123)	(123)	(123)	(123)	(123)	(123)
Utilidad (Pérdida) de Operación			0	0	(107)	(27)	15	26	36	48	60	73	87	101
Menos Pagos de Intereses			0	0	(59)	(54)	(50)	(45)	(40)	(34)	(28)	(22)	(15)	(8)
Utilidad antes del Pago de Impuestos			0	0	(166)	(81)	(35)	(19)	(3)	14	32	51	71	93
Menos Impuestos de Empresa			0	0	0	0	0	0	0	(3)	(8)	(13)	(18)	(23)
Depreciación agregada			0	0	123	123	123	123	123	123	123	123	123	123
Flujo de Caja Operativo			0	0	(43)	41	88	103	119	133	147	161	176	193
Gastos de Capital	0	(229)	(1,764)	(586)	0	0	0	0	0	0	0	0	0	0
Subsidio	0	69	529	176	0	0	0							
Valores de Rescate														
Flujo de Caja antes del Servicio d	0	(160)	(1,235)	(410)	(43)	41	88	103	119	133	147	161	176	193
Acum. Flujo de Caja antes del Serv.	0	(160)	(1,395)	(1,806)	(1,849)	(1,807)	(1,719)	(1,616)	(1,497)	(1,364)	(1,217)	(1,056)	(880)	(687)
Préstamos Bancarios		74	573	190	0	0	0							
Amortización de Deuda			0	0	(61)	(65)	(69)	(74)	(80)	(85)	(91)	(97)	(104)	(112)
Acciones del Capital		86	662	220	0	0	0	0	0	0	0	0	0	0
Incrementos de Capital Adicionales		0	0	0	0	0	0	0	0	0	0	0	0	0
Flujo de Caja Neto		(0)	(0)	0	(104)	(24)	19	29	40	48	56	64	72	81

3. Risks

Financial risks are summarized as follows:

- Legal and Institutional Risks: despite Government of Nicaragua's wide endorsement of PERZA, some complications are expected from the fact that ENEL holds the mandate to provide electricity service to El Ayote and owns the current diesel plants that will be substituted by the mini-hydro. Private concessions have been requested by CNE for El Ayote and different legal solutions have been proposed to ENEL in order to transfer the operation and/or property of assets to the new private operator.
- Sub-project risk of default: we think that this risk is also low, but it is worth to be mentioned here. Sub-project design includes a provision of working capital requirements since short-term loans availability is scarce for this type of projects in Nicaragua.
- Execution risks: community involvement will be key in the project implementation. Local knowledge and CNE's involvement will also mitigate implementation risks.
- Standard project risks: political, economic or technical risks are not anticipated to be higher than the normal for this type of projects.

EL BOTE-EL CUA SUB-PROJECT FINANCIAL ANALYSIS

1. Assumptions

The sub-project financial analysis involves choosing between four mini-hydro options. Only the preferred option (Option C, two turbines totaling 900 kW in El Bote) is analyzed here, and includes a base case and a sensitivity analysis. The rational for this choice is better visualized in Table 4 where we can see that this option bears the least cost per installed kW.

Table 4: Comparative costs of different options for El Bote-El Cua Sub-Project

Description		Option A	Option B	Option C	Option D
Mini-hydro 1		El Bote	El Bote	El Bote	El Bote
Installed capacity Mini-hydro 1	kW	450	450	900	900
Mini-Hydro 2			San José Bocay	San José Bocay	San José Bocay
Installed capacity Mini-hydro 2	kW		230	230	230
Mini-Hydro 3					La Camaleona
Installed capacity Mini-hydro 3	kW				425
Support Generation Type		Diesel	Diesel	SIN	SIN
Capacity of Support 1	kW	75	75		
Capacity of Support 2	kW	90	90		
Total Generation Power	kW	615	845	1,130	1,555
Population Centers Serviced:		El Cua, El Bote, El Galope, Chico Estrada, El Chilamate, Villa Nueva and Bocaycito	El Cua, El Bote, El Galope, Chico Estrada, El Chilamate, Villa Nueva, Bocaycito and extension to La Camaleona area - El Cedro and La Unión	El Cua, El Bote, El Galope, Chico Estrada, El Chilamate, Villa Nueva, Bocaycito and extension to La Camaleona area - El Cedro and La Unión	El Cua, El Bote, El Galope, Chico Estrada, El Chilamate, Villa Nueva, Bocaycito and extension to La Camaleona area - El Cedro and La Unión
Infrastructure Hydro 1	US $	677,796	677,796	913,296	913,296
Infrastructure Hydro 2	US $				
Infrastructure Hydro 3	US $				955,230
Cost/installed kW	US $/kW	**1,506**	**1,506**	**1,015**	**1,469**
Mini-grid Costs Hydro 1	US $	364.602	777,456	1,162,799	1,162,799
Mini-grid Costs Hydro 2	US $				
Mini-grid Costs Hydro 3	US $				89,403
Total Implementation Cost	US $	**1,075,432**	**1,455,253**	**2,076,095**	**3,120,728**

The sub-project will serve a potential of 1,500 users and will be connected to the National Interconnected System (SIN) and to the existing mini-grid of San Jose de Bocay, managed by APRODELBO, a local community-based organization.

The model used for the financial analysis involves the same basic assumptions as El Ayote Sub-project.

2. Sub-project performance

Project NPV is US$21,000 prior to subsidy and US$199,000 with subsidy, both discounted at 14%. Discounted at Weighted Average Cost of Capital (WACC) Project NPVs improve to US$626,000 without subsidy and US$804,000 with subsidy. Equity IRR is 26.57% without subsidy and 38.64% with subsidy (see Table 1). Those figures suggest that subsidy is less necessary in projects that are connected to the grid and that private investors will be sufficiently attracted to this investment. The impact of the sales to the National Interconnected System has a dramatic effect in ramping up returns and thus ensuring financial viability. Cash flow projections are shown in Table 5. As the performance analysis shows, El Bote-El Cua Sub-project is perfectly sustainable and financially sound with a minimum subsidy from the PERZA project.

TABLE 5: CASH FLOW PROJECTIONS EL BOTE-EL CUA													
(USD 1,000)													
Año índice	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Año Calendario	***2002***	***2003***	***2004***	***2005***	***2006***	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***	***2013***	***2014***
Ingresos													
Pago de Energía BT1		0	0	25	43	46	50	53	57	62	66	71	77
Pago de Energía BT2		0	0	25	43	46	50	54	58	62	67	72	77
Pago de Energía BT3		0	0	31	53	57	61	66	71	76	82	88	94
Pago de Energía BT4		0	0	25	43	46	50	53	57	62	66	71	77
Pago de Energía BT5		0	0	9	15	17	18	19	21	22	24	26	27
Pago de Energía BT1		0	0	24	40	43	45	48	50	53	56	59	62
Sistemas Solares Aislados		0	0	0	0	0	0	0	0	0	0	0	0
Honorarios de Conexión		0	0	23	9	10	10	11	11	12	12	13	13
Venta al SIN		0	0	168	154	152	148	145	141	138	134	129	125
Beneficios Totales		0	0	331	400	416	432	449	467	486	507	529	552
Gastos de Operación													
Administración		0	0	27	27	28	28	29	29	29	30	30	31
Operación y Mantenimiento (O & M)		0	0	16	17	17	17	18	18	18	19	19	19
O & M Adicional		0	0	0	0	0	0	0	0	0	0	0	0
Seguros		0	0	8	8	8	8	8	8	8	9	9	9
Arrendamiento de Plantas Diesel (Si Aplicable)		0	0	10	10	0	0	0	0	0	0	0	0
Arrendamiento de Terrenos		0	0	0	0	0	0	0	0	0	0	0	0
Mantenimiento de Líneas de Trasmisión		0	0	17	17	17	18	18	18	19	19	19	20
Combustibles (Diesel)		0	0	0	0	0	0	0	0	0	0	0	0
Conexión				23	9	10	10	11	11	12	12	13	13
Peaje de distribución					21	24	25	26	27	28	29	30	31
Gastos Totales de Operación		0	0	100	109	104	106	109	111	114	117	120	123
Flujo de Caja de la Operación		0	0	231	291	312	325	340	356	372	390	409	429
Menos Depreciación		0	0	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)
Utilidad (Pérdida) de Operación		0	0	130	191	211	225	240	256	272	290	309	329
Menos Pagos de Intereses		0	0	(101)	(93)	(86)	(77)	(68)	(59)	(49)	(38)	(26)	(13)
Utilidad antes del Pago de Impuestos		0	0	30	97	126	148	172	197	224	252	283	315
Menos Impuestos de Empresa		0	0	0	0	0	0	0	0	0	0	0	0
Depreciación agregada		0	0	100	100	100	100	100	100	100	100	100	100
Flujo de Caja Operativo		0	0	130	198	226	248	272	297	324	352	383	415
Gastos de Capital	(124)	(1,620)	(311)	0	0	0	0	0	0	0	0	0	0
Subsidio	12	162	31	0	0	0							
Valores de Rescate													
Flujo de Caja antes del Servicio de Deud	(111)	(1,458)	(280)	130	198	226	248	272	297	324	352	383	415
Acum. Flujo de Caja antes del Serv. de Deu	(111)	(1,569)	(1,849)	(1,719)	(1,521)	(1,295)	(1,047)	(775)	(478)	(155)	198	581	996
Préstamos Bancarios	87	1,134	218	0	0	0							
Amortización de Deuda		0	0	(104)	(111)	(119)	(128)	(136)	(146)	(156)	(167)	(179)	(191)
Acciones del Capital	25	324	62	0	0	0	0	0	0	0	0	0	0
Incrementos de Capital Adicionales	0	0	0	0	0	0	0	0	0	0	0	0	0
Flujo de Caja Neto	0	0	0	26	86	107	121	135	151	168	185	204	224

3. Risks

Financial risks are summarized as follows:

- Legal and Institutional Risks: Private concessions have been requested by ATDER-BL, one of the proposed project operators and project sponsor of the San Jose de Bocay mini-grid to INE.
- Execution risks: community involvement will be key in the project implementation. Local knowledge by ATDER-BL, APRODELBO's experience and CNE's involvement will certainly mitigate implementation risks.

Annex 6(A): Procurement Arrangements
NICARAGUA: Offgrid Rural Electrification (PERZA)

Procurement

A) Procurement Arrangements: Procurement for the proposed project will be carried out in accordance with the World Bank "*Guidelines: Procurement Under IBRD Loans and IDA Credits*", published in January 1995 (revised January/August 1996, September 1997 and January 1999); and " *Guidelines: Selection and Employment of Consultants by World Bank Borrowers*" published in January 1997 (revised in September 1999 and January 1999), and the provisions stipulated in the Credit Agreement. The objective of the Project is to support the effort of the National Commission for Energy (CNE) to develop and implement a coherent off-grid rural electrification program. The Project is broken down into six components as follows:

1. Policy and Strategy – (US$1.16 Million): This component will support the design and implementation of the National Rural Electrification Program (PLANER). This component will finance mainly technical assistance activities that will include off-grid market development activities, training, etc.

2. Rural Electrification – (US$17.33 Million): This component will focus on the design and actual implementation of the 10-12 off-grid pilot sites. The technology choice for many of the pilot subprojects involve minihidro power generation and electricity distribution to consumers through independent mini grids. This component is divided in three phases.

Phase 1:

a) One 700 kW minihydro power plant and the necessary transmission and distribution lines for an independent minigrid, to be built and operated by competitively selected ('new')concessionaires.

b) Two X 450 kW minihydro power plants, its connection to the existing minihydro plant and interconnection of the system to the SIN about 20 Km away, to be built and operated by an existing concessionaire, ATDR-BL. This concessionaire who has experience in operating hydroelectric projects in the rural areas in Nicaragua. The concession has been approved and granted following all Nicaraguan legal requirements. The regulator approves the tariff levels and the structure proposed by the operator.

c) Six solar battery charging stations (SBCS). A local NGO will be contracted to implement this subproject including coordination with the community leaders to select the operators of the stations, provision of training to the selected operators, supervision of the construction of the stations, etc. During project preparation, after an extensive analysis, it was determined that only one NGO had the qualifications and experience to carry out this task. This justifies it's hiring on a sole source basis. The NGO has been requested to submit a proposal for evaluation by CNE. A contract will then be negotiated. Bidding for the supply and installation of the SBCS will be carried out by the PMU following Bank procurement rules and regulations.

d) Technical assistance to develop business models, select and train electricity providers of the mini-hydro plants and battery charging described above.

Phase 2:

a) Three to five mini hydro systems to be built and operated by competitively selected ('new')concessionaires.

b) Two diesel/renewable energy technology hybrid installations to be built and operated by competitively selected ('new') concessionaires.

c) Technical assistance to undertake preparation studies and consultations, develop business

models, select and train electricity providers of the mini hydro systems and hybrid installations described above.

Phase 3:
a) Technical assistance to support preparation of new project sites.

New concessionaires will be selected competitively to provide electricity services. This selection will be the result of an open bidding process that will, *inter alia,* measure the efficiency of the electricity providers as indicated by their proposed level of tariff or subsidy, and by the content and cost of the bidders' proposed investment plan to satisfy the coverage and quality of services requirements of the bidding documents. Given the high investment cost of extending electricity services to the rural areas, and the generally low capacity to pay of populations in those remote communities, the initial cost of the investment and of the connections will be reduced by government subsidies (from the IDA credit) to be paid to the selected concessionaires. Payments of these subsidies will be made by the CNE-PMU against the verification of satisfactory services, as measured by the achievement of performance indicators included in the concession contract (for instance, number of connections per year). Commercially priced loans to finance the debt of the new concessionaires could also be provided by IDA funds, if needed through a trust fund created in a commercial Bank. IDA and CNE-PMU's focus will be on the selection and performance of the electricity services providers, rather than on the procurement by those providers of goods, services, etc.. It is expected that the new concessionaires will procure goods, works and services needed to meet the services targets, using established commercial practices. This is why the activities related to these new concessionaires will be classified as ' services' in the procurement categories, and the procurement method used will be referred as "others".

Solar photovoltaic or PV Market Development Program. This program will be launched separately at the National Level. The objective is to provide basic electricity through individual solar PV systems to about 8,000 users nationwide. Commercial dissemination of PV systems will be carried out through the “dealer or vendor approach” where users will purchase the systems from accredited dealers who will install the systems and provide after sales maintenance services. The CNE-PMU will accredit the dealers who must have demonstrated capability and a track record in PV distribution and /or the rural retail business. To make the systems affordable, their initial cost will be reduced by a combination of GEF grants and government subsidies. These will be paid directly to the dealers upon proof of purchase and completed installation. Funds and appropriate training would be provided by PERZA to selected Microfinance Institutions (MFI) which would then use the funds for consumer loans. The MFI would pay for the units directly to the local dealer. Consumers would pay the MFI in monthly installments at prevailing terms. Therefore, there are no procurement activities connected to this component.

3. **Microfinance** (US$1.38 Million): The Project will complement the Rural Electrification component with the provision of targeted rural microfinance Services to communities in the pilot sites and surrounding areas to maximize the development impact of the pilot projects.

This component is divided in two areas:

a) Loans to beneficiaries in the pilot sub-project communities in the benefited communities and surrounding areas: Commercially priced loans will be available for eligible micro-financial institutions (MFI) to onlend funds to households and businesses for financing electricity connections, acquisitions of SBCS and other business purposes. These funds will be made available as a credit line established as a trust fund in a selected financial institution (FI). The hiring of this FI through a competitive process is connected to the 'services' procurement category, whereas there are no procurement activities connected

to the actual granting of the loans.

b) Institutional development subprojects: Providing matching grants to eligible financial institutions to support improved systems and technical assistance to insure sound growth.

To qualify, the MFIs will have to be legally registered, have experience with microbusiness clients or consumer loans and meet specific performance indicators. The entire credit risk would be assumed by the FI. CNE will develop a marketing strategy that attracts at least one sound financial institution to each project site. In some project sites there is one microfinance institution (MFI) already serving the region. In others it might be possible to stimulate competition, however the small size of several markets may limit such competition. After approval, the MFI would sign a contract with CNE. The contract would specify the amount of the loan, the terms of the loan, the performance criteria, etc.

The work in the areas described above will be accompanied by technical assistance activities that will focuss on:

a) Market studies for Phase II sub-projects to demonstrate the scale and variety of credit demand;
b) Supervision and evaluation exercises to measure client satisfaction.

4. Business Development Services (US$0.91 Million): The Project will also complement the Rural Electrification component with the provision of targeted rural Business Development Services to communities in the pilot sites and surrounding areas to maximize the development impact of the pilot projects.

The BDS component is divided in four areas:

a) Matching grant institutional development program for BDS providers: A competitive process which provides matching grants to eligible BDS providers to support micro and small businesses; includes market studies of phase 2 sites.
b) Sector-wide training and best practices seminars: Provide short technical courses on BDS to both eligible BDS providers and other BDS providers interested in experimenting with new methodologies.
c) Subsidies to lower the cost of BDS services. These subsidies will be granted on a declining basis to eligible BDS providers.
d) Supervision exercises to measure coverage, quality, client satisfaction and sustainability of services. These exercises will be carried out at the firm and BDS provider level.

A second tier Financing Institution will take care of all administrative arrangements and coordinate the BDS grant review process. Candidates for this position will be determined through a competitive process. The component will encourage a commercial approach. The grants will be provided through a competitive system managed by a mixed public sector (CNE) and private sector board, with a private sector orientation and performance indicators. CNE will develop prototype performance based matching grant contracts with BDS providers and participate in the review panel that will qualify the BDS providers and approve the grant contracts.

An average matching grant of US$40,000 to US$50,000 will be provided to BDS firms that provide credible work plans for the development of BDS products Grants will be awarded based on credible business plans and projections that will be evaluated by a committee that will include CNE, BDS and Microfinance Component Managers.

5. Project Communication and Social Participation (US$0.96 Million): This component will focus on social issues. It involves studies, promotion and awareness campaigns, etc.

6. Project Administration and Management and CNE Institutional Strengthening (US$1.61 Million): This component is targeted at supporting the Project Implementation Unit (PMU) in the CNE to assure effective project management and coordination, and strengthen the capacity of this institution to implement and supervise their National Rural Electrification Strategy.

1) Procurement methods: The methods to be used for procurement are described below, and the estimated amounts for each method, are summarized in Table A. The threshold contract values for the use of each method are specified in Table B.

Procurement of Works: Works procured under this project include civil works related to the Mini Hydro Electric plants and Solar powered plants. Works estimated to cost more than US$1.5 Million will be procured through International Competitive Bidding (ICB). Works estimated to cost between US$50,000 and US$1.5 Million will be procured through National Competitive Bidding (NCB) procedures, using Standard Bidding Documents agreed in advance with the IDA. Works estimated to cost less than US$50,000 may be procured through Shopping, three quotations.

Procurement of Goods: Goods procured under this project will include solar panels and attachments. To the extent possible, contracts for these goods will be grouped into bidding packages of more than US$150,000 equivalent and procured following International Competitive Bidding (ICB) procedures, using IDA-issued Standard Bidding Documents (SBDs). Goods estimated to cost between US$25,000 and US$150,000 may be procured using National Competitive Bidding (NCB) procedures and standard bidding documents agreed with IDA. Contracts for goods which cannot be grouped into larger bidding packages and estimated to cost less than US$25,000 per contract, may be procured using Shopping (National /International) procedures based on a model request for quotations satisfactory to the IDA.

BOO Procurement: The contracting method for the provision of electricity services will be a BOO transaction under a concession regime Facilities will be constructed and operated under a contract awarded to an entrepreneur on the basis of bidding procedures acceptable and approved by the Bank. The goods, works and services required for the construction of said facilities will be procured in accordance with the applicable procedures of said entrepreneur.

Selection of Consultants: Consulting Services are estimated to cost US$5,450,000 equivalent and would be procured using Bank Standard Request for Proposals. The selection and cost of the service fees for the Financial intermediaries and micro finance institutions will be governed in accordance with the criteria set forth in this section..

Firms: All contracts for firms would be procured using QCBS except for small and simple contracts estimated to cost US$100,000 equivalent or less that may be procured using LC or Consultants' Qualifications. Depending on the nature and complexity of the services, direct contracting may be utilized for very small contracts, less than US$25,000 where it is not possible or justified to obtain competitive proposals.

Individuals: Specialized advisory services would be provided by individual consultants selected by comparison of qualifications of three candidates and hired in accordance with the provisions of paragraphs 5.1 through 5.3 of the Consultant Guidelines.

2) Prior review thresholds: The proposed thresholds for prior review are summarized in Table B.

B) Assessment of the agency's capacity to implement procurement: The Capacity Assessment was approved by the office of the RPA on February 27, 2003. Procurement activities will be carried out by the Project Implementing Unit (PMU). The PMU is staffed by a Project Coordinator, an Administrative assistant, a Technical unit with three staff and a Procurement unit with one procurement officer.

A Capacity Assessment of the PMU to implement procurement was carried out during appraisal. It has provided the means to identify certain risks concerning the PMU. The issues, recommended actions and the deadlines for their completion are as follows:

Area	Actions	Deadline
(a) Procurement Cycle Management.	Finalize General Procurement Plan	By negotiations
(i) Procurement planning	Finalize a complete Operations Manual	By effectiveness
(ii) Preparation of documents	Prepare SBDs for all types of procurement.	Immediately.
(iii) Contract Administration	Define areas of responsibility	Immediately
(b) Organization and Functions		
(i) Organization of unit and functions	Hire a Procurement Specialist.	By Board
(ii) Internal manuals and instructions	Finalize Operations Manual	By project effectiveness.
(c) Support and Control Systems		
(i) Technical and administrative controls	Details must be included in Operations Manual.	By effectiveness.
(d) Staffing		
(i) Existence of experienced and capable staff	Hire experienced procurement specialist	By Board
(ii) Clear written standards and delegation of authority	Must be included in OM.	By effectiveness.

Considering the nature and complexity of the procurement actions under the project and The overall project risk for procurement is considered to be HIGH.

C) Procurement Plan:

A procurement plan has been developed in as much detail as the possible. The task team and the staff at the PMU have provided the information required to determine the procurement methods (Table A). At the beginning of each calendar year, the Borrower will update the Procurement Plan with a detailed procurement schedule for the coming year.

D) Frequency of Procurement Supervision: It is recommended to carry out annual supervision missions to provide advice in general procurement issues and to reassess the capacity of the PMU to carry out procurement in order to review the prior review thresholds.

Procurement methods (Table A)

Table A: Project Costs by Procurement Arrangements
(US$ million equivalent)

Expenditure Category	Procurement Method[1]				Total Cost
	ICB	NCB	Other[2]	N.B.F.	
1. Works	1.83 (0.93)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	1.83 (0.93)
2. Goods	0.68 (0.13)	0.24 (0.11)	0.17 (0.04)	0.00 (0.00)	1.09 (0.28)
3. Services	0.00 (0.00)	0.00 (0.00)	19.33 (10.74)	0.00 (0.00)	19.33 (10.74)
4. Miscellaneous Operational Costs	0.00 (0.00)	0.00 (0.00)	1.09 (0.05)	0.00 (0.00)	1.09 (0.05)
Total	2.51 (1.06)	0.24 (0.11)	20.59 (10.83)	0.00 (0.00)	23.34 (12.00)

[1/] Figures in parenthesis are the amounts to be financed by the Bank Credit/Grant. All costs include contingencies.

[2/] Other: Includes goods to be procured through national shopping, consultant services, services of contracted staff of the project management office, Banking Services and Electricity Services.

Services by Category

Services Category	Total Cost (US$m)
A. Consultant Services	**7.17** 0.88
B. Banking Services	**0.85** 0.62
C. Electricity Services	**11.31** 9.24
Total	**19.33** 10.74

Table A1: Consultant Selection Arrangements (optional)
(US$ million equivalent)

Consultant Services Expenditure Category	Selection Method							
	QCBS	QBS	SFB	LCS	CQ	Other	N.B.F.	Total Cost[1]
A. Firms	5.10 (0.53)	0.00 (0.00)	0.00 (0.00)	0.53 (0.10)	0.10 (0.01)	0.00 (0.00)	0.00 (0.00)	5.73 (0.64)
B. Individuals	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	1.38 (0.24)	0.00 (0.00)	1.38 (0.24)
Total	5.10 (0.53)	0.00 (0.00)	0.00 (0.00)	0.53 (0.10)	0.10 (0.01)	1.38 (0.24)	0.00 (0.00)	7.11 (0.88)

[1] Including contingencies

Note: QCBS = Quality- and Cost-Based Selection
QBS = Quality-based Selection
SFB = Selection under a Fixed Budget
LCS = Least-Cost Selection
CQ = Selection Based on Consultants' Qualifications
Other = Selection of individual consultants (per Section V of Consultants Guidelines), Commercial Practices, etc.
N.B.F. = Not Bank-financed
Figures in parenthesis are the amounts to be financed by the Bank Credit/Grant.

Prior review thresholds (Table B)

Table B: Thresholds for Procurement Methods and Prior Review[1]

Expenditure Category	Contract Value Threshold (US$ thousands)	Procurement Method	Contracts Subject to Prior Review (US$ millions)
1. Works	>1,500 >50 <1,500	ICB NCB Three quotations	All All All
2. Goods	>150 >25<150 <25	ICB NCB Shopping	All All Non (Post Review)
3. Services Firms	>100 >25<100 <25	QCBS QCBS, LCS,CQ LCS,CQ,DC	All All
4. Miscellaneous Individuals	>50 >20<50	See Section V of Guidelines	All (TOR, Contract, CV)

Total value of contracts subject to prior review: US$Million 12.00

Overall Procurement Risk Assessment: **High**

Frequency of procurement supervision missions proposed: One every months (includes special procurement supervision for post-review/audits)

[1] Thresholds generally differ by country and project. Consult "Assessment of Agency's Capacity to Implement Procurement" and contact the Regional Procurement Adviser for guidance.

Annex 6(B) Financial Management and Disbursement Arrangements
NICARAGUA: Offgrid Rural Electrification (PERZA)

Financial Management

1. Summary of the Financial Management Assessment

Implementing Entity

The Comision Nacional de Energía (CNE) was created under Law 272, Ley de la Industria Eléctrica" published on the official newspaper La Gaceta on April 23, 199, as an inter-institutional entity reporting to the Executive Branch. CNE is in charge of formulating objectives, policies, strategies, and guidelines for the energy sector, as well as development and promotion for the optimal use of the energetic resources. CNE is integrated by the President o Nicaragua, Ministry of Economy, The Instituto Nicaraguense de Energia (INE), and two representatives of the civil society. An Executive Director nominated by CNE is in charge of the entity administration.

The Comision Nacional de Energía (CNE) will be the implementing entity. With the purpose of ensuring institutional efficiency, while ensuring compliance with its regulatory framework, the CNE has assigned the team that will coordinate all aspects of project implementation, including procurement, disbursements and selection of participating entities, thereon referred as PMU.

Staffing

CNE' s Administrative and finance Division (DAF) has staff with experience in GoN' administrative and finance requirements, has established adequate segregation of duties and there adequate supervision and approval of processing of payments, recording and reporting of the institution transactions. CNE ha hired a financial officer with experience in financial management for Bank's project, and during the appraisal it was agreed the hiring of an accountant and administrative assistant.

A technical staff headed by the Project coordinator and reporting to the Divisions of Rural Electrification, procurement staff will also be under this Division, and the finance staff under the Administrative and Finance Division (DAF), integrates the PMU.

Four additional staff positions will be hired, two assistants for the financial administration of the Project, one procurement specialist and a RET specialist.

Flow of funds.

Two special accounts (SAs) will be opened, one for the IDA credit and one for the GEF grant, as described below.

Credit. The IDA credit funds will be disbursed to a US Dollar account at the Central Bank of Nicaragua (BCN), the Special Account (SA), opened by the MHCP with CNE's concurrence, identified with the *name of the project. For local payments and* at CNE's request, the National Treasury (*Tesorería Nacional)* will authorize the Central Bank, the transfer funds to a Second Generation Special Account (SGSA) in Córdobas established by the CNE in a commercial bank acceptable to the Bank. Both accounts, SA and the SGSA will be subject to same controls as the special Account, and will be used to pay project eligible goods and services only. Direct payments in US Dollars for international providers of goods and services from the Project account at the

Central Bank can be made. The National Treasury's (Tesorería Nacional) will authorize the Central Bank payments of CNE's requests.

Grant. The GEF grant funds will be disbursed to a US Dollar account at the Central Bank of Nicaragua (BCN), Special Account (SA), opened by the MHCP with CNE's concurrence, identified as *MHCP- Recursos Externos –Name of the project*. The National Treasury will authorize the Central Bank, at the request of the CNE, the transfer of funds to a Second Generation Special Account (SGSA) in Dollars established by the CNE in a commercial bank acceptable to the Bank. Both accounts, the SA and the SGSA will be subject to the Bank's controls for the Special Account, and will be used to pay eligible expenditures under the grant agreement only.

Transfer of funds from SA to the Project SGSAs will be subject to the justification of at least 75% of the prior transfer, which should be processed trough the MHCP financial system (SIGFA).

With the new MHCP arrangements for the credit and grant funds, in accordance with decree issued by the Central Bank, the process of transfer of funds to the SGSAs would take additional time, consequently the CNE would have to prepare in advance the request of the estimated transfer of funds, to ensure the funds are transferred opportunely and available for payments. Transfers of credit funds should be estimated for payments of at least the next two weeks, but in no case to exceed to project needs of 30 days, as the maximum outstanding balance in local currency allowed by the Bank, if necessary, is for a limited period of 30 days. Limit of 30 days apply to grant funds also. Losses dues to exchange rate are not to be covered with credit/grant funds.

Bank statements of both the Special Account and the SGSAs will accompany the monthly requests for disbursement submitted to the Bank, in order to document the timely transfer of resources.

Microfinance Institutions. Credit line for the minigrid and solar VP subprojects, the PMU will disburse funds from the operating account to the qualified microfinance institutions, through a trust fund established on a financial institution. Disbursement will be based on a signed contract, with an initial advance equivalent to two months of estimated placement of loan portfolio, subsequent transfer will be based on approved eligible financing portion of the placed portfolio, less the outstanding balance, plus the estimated placement for the next period. A signed trust fund agreement for the microfinance will be signed between CNE and the financial institution, stating the use of funds, handling of the line of credits, the microfinance institutions, use of reflows, record keeping, auditing, and reporting. For the matching grants, PMU will disburse funds directly to the qualified microfinance institutions from the GEF Special Account based on the satisfactory implementation of agreed institutional development plans. The MFIs will provide loans to the clients under the minigrid and the solar PV subprojects.

Minigrid – investment. When private financing of the debt cannot be obtained, IDA funds will be provided to the developers of mini-grid systems for the investment of the mini-grids. In this case, a financial institution will be chosen on a competitive basis to administer the IDA funds, in the form of a trust fund (fideicomiso). The trust fund agreement, signed between CNE and the financing institution will state the use of funds, handling of the line of credits, use of reflows, record keeping, auditing, and reporting.

The BDS Component, which is entirely grant-based for capacity building of BDS providers, will be managed through and administrator agency, selected on competitive basis with the Bank's no-objection.

The subsidy portion of IDA funds provides capital expenditure subsidy to minigrid subprojects, the solar battery charging station (SBCS) subprojects and the solar Photovoltaic (PV) program. All IDA subsidy funds will be held in the special accounts and/or the SGSA, with transfers to the SGSA and project operating account, as needed. GEF grant funds will be held in the Special account and/or SGSA, managed and disbursed by the PMU. As a rule, subsidies will be provided by the PMU to households, businesses and developers and other parties.

For the SBCS subprojects in three RAAN communities, PMU will select a qualified NGO to manage all phases of the subprojects for a fee, as explained in section C.4. A contract will be executed between the PMU and the NGO and the funds will be transferred, according to the payments and product arrangements agreed in the contract.

Counterpart contribution. By effectiveness the CNE will provide evidence on the availability of counterpart funds for FY 2003. CNE will coordinate with the SNIP, GON institution in charge of budgeting for public investment and with the Ministry of Finances, the allocation of additional funds for the Project. CNE will ensure, until the completion of the Project, that the required counterpart funds are incorporated in the GON budget, and follow-up the opportune transfer of funds to the Project with at least quarterly balance equivalent to the counterpart funding requirements for the next three months of project activities as provided in the annual budget. It is CNE's policy to deposit the counterpart funding for the Projects funded by international organizations into one single account, from where payments are made for each project.

Counterpart funds will be transferred by the MHCP on monthly allocations, to a separate project bank account established by the CNE-PMUs, based on the quarterly projections submitted by CNE, and up to the maximum counterpart funding for the project approved in the GoN budget.

Counterpart in kind: It was agreed with CNE that the time devoted by the PMU to the PERZA project would count towards the national counterpart contribution to the Project. The wages of PMU employees would be included under the Project (Component 6: Project Management) in proportion to the time devoted to the PERZA. These are clearly additional costs associated with the management of the Project because CNE has a minimum fixed budget, and a large part of its resources come directly from the Government's counterparts for the projects managed by the institution.

This contribution in kind was estimated to amount to US$784,698.39 over the five-year period of project implementation. This value correspond to wages paid to the following CNE staff members that constitute the CNE-PERZA team (PMU) (the share of their time devoted to PERZA is indicated in parenthesis):

- Ing. Herminia Martínez, project coordinator (100%),
- Lic. Ruth Arguello, financial management (100%),
- Lic. Xiomara Jiménez, procurement (100%),
- Lic. Gioconda Guevara, sector policies and strategies (40%)
- Ing. Víctor Valencia, rural electrification (50%)
- Lic. Miriam Cuadra, Microfinance (100%)
- Lic. Harold Somarriba, BDS (75%)
- Ing, Ruben Smart, Social strategy and communications (50%)
- Ing. Leopoldo Herrera, rural electrification (50%)
- Senior Procurement Specialist, to be hired (100%)
- Accountant, to be hired (100%)

· Treasurer, to be hired (100%)

Accounting Policies and Procedures

Information Systems. CNE keeps its accounting records manually, in Excel spread sheets, which permit for the separate recording of the Japanese and GEF grant funds, however, the accounting manual system will not be adequate to properly record and report under the PERZA project. There are adequate internal controls as segregation of duties, review and approval of transactions, and supervision of staff is excersised,, but CNE's lacks of an administrative procedures manual. CNE will: (a) implement an automated financial system taking into consideration SIGFA's requirements; and (b) develop and administrative procedures manual.

CNE will maintain an adequate financial management system including records and accounts in accordance with International Accounting Standards. Administrative procedures will be in place to ensure that financial transactions are made with consideration to safeguarding project assets and ensuring proper and opportune entry in the accounting/ monitoring systems. The Project accounting system will have the capacity to record assets, liabilities and financial transactions of the Project, and produce financial statements useful to project management and meeting IDA's fiduciary requirements. CNE will prepare an operational manual, which will include adequate financial and administrative procedures and internal controls.

Budgeting. The credit and grants agreements, the cost tables, and the Project Implementation Plan (PIP) will be the main input for the project budgets. The PMU will prepare:

§ Annual working program submitted to the IDA for approval, with goals/objectives, activities broken down by component, sub-component, financing source, and period of implementation during the year.
§ The annual budget proposal, for incorporation in the GON annual budget to be submitted to the Congress, specifying the sources of funds.
§ After approval of the budget by Congress, the counterpart funds are requested on monthly basis, or other period according to the GON availability of funds, by GON budget line item.
§ Monthly report on budgetary execution on counterpart funding to be issued within 5 days after the end of each month.

Project financial reporting arrangements. The quarterly financial monitoring reports will include the Statement of Sources and Uses of Funds, and the use of funds by project activities. These project financial statements, along with the physical progress and procurement sections of the Financial Monitoring Reports (FMRs), will be submitted to the Bank no later than 45 days after the end of each reporting quarter.

For IDA purposes, the annual financial statements will include, additionally, the schedule of Statements of Expenditure (SOEs), or FMRs for report based disbursements, presented during year in support of Withdrawal Applications, and the Statement of the Special Account and the SGSA.

Safeguard over assets. Assets acquired by the Project, excluding those transferred trough subsidies, will be in the custody of the CNE. For the proposed project, the PMU will keep detailed subsidiary records of equipment acquired. The amounts in this register will be reconciled monthly against the respective accounting balances. The PMU staff will undertake at least one annual physical inspection.

Internal Audit. The CNE as a GoN entity is subject to review by the Contraloría General de la República. Although CNE's organization chart indicates the position of an internal auditor, this person is to be hired. A recommendation in this regard has been included in the financial management action plan.

Audit compliance. No audit compliance issues relevant to the proposed project were identified in the audit of the Japanese Grant for the preparation of the PERZA, Grant No. TF026676. At present no audit of CNE's financial statements has been conducted, see audit arrangements below.

2. Audit Arrangements

Annual audits will be conducted for: (a) project financial statements; (b) CNE's financial statements; and (d) project trust funds for microfinance and debt financing of minigrids (if applicable). The audits will be audited in accordance with International Standards on Auditing, by an independent firm and in accordance with terms of reference (TORs) both acceptable to the IDA, and submitted to the IDA no latter than six (6) months after the end of the fiscal year. The auditor's report on the project financial statements should include, opinions on project financial statements, project accounts at the Central Bank-MCHP (Special Accounts) and SGSAs, and Statements of Expenditures (SOEs), and when disbursements are FMRs based, the audit will also report on the eligibility and reasonableness of the expenditures reported in the FMRs.

The CNE will appoint the auditors within three months after effectiveness, preferably for a minimum period of two years. Subsequently, the auditors should be appointed not later than within the first quarter of each year.

The CNE will prepare, when applicable, an action plan to address any issues and recommendations contained in the audit reports. The action plan and follow-up activities would be communicated to the Bank.

The table below summarizes audit requirements:

Audit Report	***Due Date***
Project financial statements	6 months after the end of the reporting period (coincides with CY)
SOE, or FMRs if applicable	Same as above
Special Accounts and SGSA	Same as above
CNE's financial statement	Same as above
Project trust funds financial statements	Same as above

Supervision Plan

A financial management supervision mission prior to effectiveness is needed. After effectiveness, a FM Specialist must review the annual audit reports and should perform one supervision mission per year.

Financial Covenants

The additional requirements described below should be included in the agreements:

Section 3. Require sufficient annual budgetary allocations for external and local funds needed for the Project.

Section 4.01. In addition to the audit of the project financial statements, add the requirement of annual audit of the CNE's financial statements as a whole, and the financial statements and the project trust funds for the microfinance, debt financing investments of the minigrids, and the BDS.

The annual audit reports would be furnished to IDA not later than six months after the end of each fiscal year.

Section 4.02 . The due date for the first FMRs is 45 days after the end of the quarter in which effectiveness takes place.

Strengths and Weaknesses

CNE has a well-defined structure, and although there are no written administrative procedures, it was observed there is adequate supporting documentation of the institution transactions and consistency in the procedures applied. However, the Bank's FM assessment concluded that the CNE did not have in place an adequate FM system specific to the project, and the action plan below was agreed. CNE commitment to implement the recommendations included in the financial management action plan, and already took action by assigning the PMU staff, and place the PMCU within the institution organization cahrt.. The Action Plan (below) aims at addressing the weaknesses identified during the financial management assessment.

Action	Estimated Completion Date
Negotiations	
1. Submit to the Bank the terms o reference and short list for the contracting of external auditors, including PHRD, GEF, PERZA funds and CNE financial statements	Complied
2. Prepare Chart of accounts	Negotiations
3. Submit formats of FMRs	Draft by 1/25/03, final format by Negotiations
4. Submit draft of the operational manual	Complied
5. Finalize flow of funds procedures	Negotiations
6. Submit plan to implement automated financial management system	Negotiations
Effectiveness	
1. Finalize operational manual	Effectiveness
2. Purchase financial management system software and additional hardware	Effectiveness
3. Implement automated financial management system and FMRs being generated	Effectiveness
4. Hire additional financial management staff	Effectiveness
5. Provide evidence of approved counterpart funding in the GoN Budget	Effectiveness
6. Appoint external auditors	Within 3 months after

	effectiveness
Disbursement conditions	
1. Set up the project Special Accounts, IDA and GEF funds, and the Second Generation Special Account for IDA funds.	Disbursement
Other recommendations	
1. Set –up of the arrangements and Trust fund agreements for the Microfinance and debt financing of the minigrid investment.	
2. Submit the annual working program (POA)	
3. Hire an internal auditor	

3. Disbursement Arrangements

Total advances to the Special Account at any given time would not exceed the "authorized allocation" specified in the Credit and Grants Agreements.

For replenishment of the advance, the CNE- PMU will prepare monthly (in any case, no more than quarterly) requests for reimbursement of expenditures made. When disbursements are report based (FMRs) the replenishment will be on quarterly basis.

Use of statements of expenditures (SOEs). Credit withdrawal applications can be supported by SOEs for expenditures relating to contracts that are not subject to IDA's prior review (see Table B). Reimbursement of other expenditures would require submittal to the Bank of full supporting documentation.

Documents in support of SOEs must be maintained by the CNE at least until one year after the Bank has received the audit report for the fiscal year in which the last credit and grant withdrawal was made. Such documents must be available to review by the external auditors and Bank staff.

Other procedures. Upon request from the Borrower and subject to the IDA's approval, payments may be made: (i) directly to a third party (supplier or consultant) for goods, works, and services; (ii) to a procurement agent; or (iii) to a commercial bank for expenditures against a World Bank Special Commitment covering a commercial bank's letter of credit.

Retroactive financing. Eligible expenditures can be financed for a maximum of US$1,200,000 (10% of the loan) of the credit funds retroactive up to December 15, 2002

Method and allocation of credit and grant agreements proceeds (see Table C)**.** The proposed IDA credit and GEF grant would be disbursed over an implementation period of about five years; the loan closing date would be June 30, 2008 . Disbursements would be in accordance with guidelines set out in IDA's Disbursement Handbook (i.e., "traditional" disbursement procedures).

Allocation of credit/grant proceeds (Table C)

Table C: Allocation of Credit/Grant Proceeds

Expenditure Category	Amount in US$million	Financing Percentage
Works	0.40	85%
Goods	0.28	100% foreign 100% local ex factory 85% local others
Consultant Services	0.88	91%
Operational Costs	0.05	Up to 100% the first US$ 0.3 million Up to 90% the next US$ 0.15 million Up to 80% for the remaining US$0.13 million
Credit program	3.78	85%
Concessions	6.61	91%
Total Project Costs	12.00	
Total	12.00	

Table C1: Allocation of GEF Grant

Expenditure Category	Amount in US$ million	Financing Percentage
Works	0.00	
Goods	0.1	100% of foreign expenditures; 100% of local expenditures (ex factory cost); and 85% of local expenditures for other items procured locally.
Consultant Services	2.67	100% for international consultants hired for six months or less; 91% for local consultants and international consultants for more than six months.
Operational Costs	0.10	100%
Credit Program	0.43	85%
Subsidies for New Concessionaires	0.12	91%
Contingency	0.6	
Total	**4.02**	

Use of statements of expenditures (SOEs):

Special account:

Annex 7: Project Processing Schedule
NICARAGUA: Offgrid Rural Electrification (PERZA)

Project Schedule	Planned	Actual
Time taken to prepare the project (months)		
First Bank mission (identification)	07/10/2002	07/10/2002
Appraisal mission departure	12/09/2002	
Negotiations	01/27/2003	
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Bank staff who worked on the project included:

Name	Speciality
Clemencia Torres de Mästle	Regulatory Economist
Charles Feinstein	Lead Energy Specialist
Ernest Terrado	Rural Electricity Specialist
Kilian Reiche	Rural Electricity Specialist
Michael J. Goldberg	Sr. Private Sector Development Specialist
Robert D. Vickers	Consultant
Michaela Weber	Private Sector Development Specialist
James C. Hanna	Lead Operations Officer
Francisco Fernandez-Asin	Financial Specialist
Malcom Cosgroves-Davies	Sr. Energy Specialist
Mauricio Perea	Investment Officer
Kirsten Oleson	Operations Analyst
Violeta Granera	Social Development and Civil Society Specialist
Mariangeles Sabella	Counsel
Luz Meza-Bartrina	Sr. Counsel
Luis R. Prada Villalobos	Procurement Specialist
Romelia Schneider	Procurement Analyst
Manuel Vargas	Financial Management Specialist
Luz A. Zeron	Financial Management Specialist
C. Monica Rojas de Arnez	Financial Analyst
Camelia Izquierdo-Gonzalez	Financial Assistant

Annex 8: Documents in the Project File*
NICARAGUA: Offgrid Rural Electrification (PERZA)

A. Project Implementation Plan

B. Bank Staff Assessments

World Bank Reports:

- Environmental Framework for Nicaragua.
- Environmental Assessments for El Ayote, El Bote, Francia Sirpe, and La Unión.
- Marco General para la Elaboración del Social Assessment and Indigenous Peoples Development Plan (IPDP).
- Uganda: Energy for Rural Transformation Project (Project ID P069996 - Credit 3588), Project Appraisal Document (Report No. 23195).
- Sri Lanka: Renewable Energy for Rural Economic Development (Project ID P077761 - Credit 3673), Project Appraisal Document (Report No. 23886).
- Argentina: Renewable Energy in the Rural Market Project (Project ID P006043 - Loan 4454), Project Appraisal Document (Report No. 17495).
- Bolivia: Hydrocarbon Sector Social and Environmental Management Capacity Building Project (Project ID P065902 - Credit 3378), Project Appraisal Document (Report No. 20389).
- Philippines: Strengthening the Non-Conventional and Rural Energy Development Program in the Philippines: A Policy Framework and Action Plan, ESMAP Report No. ESM243.

C. Other

- Diseño preliminar y factibilidad económica y financiera del Subproyecto El Bote-El Cuá, de las Sub-proyectos de: Al Ayote, Francia Sirpi (incluyendo Sangni Laya, Auas Tingni, Ulwas y Saklin) (RAAN), y de Diseño Preliminar del Subproyecto La Unión (Nueva Guinea). Consorcio formado por a) ITPower LTD; b) Multiconsult; c) Fundación Solar. Octubre, 2002. (PHRD TF026676).

- "Evaluación de las condiciones dadas para el uso de TIC y el Diseño de Servicios de Desarrollo Empresariales SDE´s Tradicionales y con Base TIC". H&S CAECOMP Ltda. Agosto, 2002.

- Primeros Resultados de la Encuesta de Mercado de Electrificación Rural en Zonas Aisladas de Nicaragua EMERZA 2002 (parte I, II, y III). Dr. José Eddy Torres. Agosto, 2002.

- Identificación de las Aplicaciones Productivas de la Energía Eléctrica en Sitios Pilotos del Proyecto PERZA Nicaragua. (Informe Final-Borrador). Pierre Mathieu. Agosto, 2002.

- Análisis de Mercado de las Microfinancieras en el Diseño de producto y la identificación de proveedores interesados (primer final). MESOAMERICA, Servicios Financieros. Agosto, 2002. (PHRD TF026676).

- Estaqueo, Diseño de Líneas y Redes de Distribución Eléctrica para el Subproyecto el Ayote (primer borrador del informe final).

- Identificación de Oferentes de Servicios de Desarrollo Empresariales (SDEs) en las Zonas Extendidas del PERZA y el Diseño para el Mecanismo de Entrega de los SDEs Tradicionales

(second draft). (PHRD TF026676).

- Adecuación de Encuestas Mercado para la Electrificación de Zonas Alejadas de la Red, Microcredito y Servicios de Desarrollo Empresarial en Sitios Pilotos con Población Indígenas Significante (Informe final). (PHRD TF026676).
- Descripción detallada del Programa de Desarrollo del Mercado Solar Fotovoltaico.
- Descripción detallada de la iniciativa de electrificación rural del PNUD en Nicaragua.
- Revisión del tema de hidroelectricidad en pequeña escala para usos productivos en Nicaragua, preparado por STAP (Daniel Bouille).

*Including electronic files

Annex 9: Statement of Loans and Credits

NICARAGUA: Offgrid Rural Electrification (PERZA)

04-Nov-2002

Project ID	FY	Purpose	Original Amount in US$ Millions IBRD	IDA	GEF	Cancel.	Undisb.	Difference between expected and actual disbursements[a] Orig	Frm Rev'd
P056018	2002	LAND ADMINISTRATION PROJECT	0.00	32.60	0.00	0.00	34.59	0.00	0.00
P055823	2001	SECOND RURAL MUNICIPAL DEV. PROJECT	0.00	28.70	0.00	0.00	20.23	3.42	0.00
P064906	2001	NI Poverty Red.&Local Dev. FISE	0.00	60.00	0.00	0.00	55.70	33.40	0.00
P070016	2001	NI Competitiveness LIL	0.00	5.00	0.00	0.00	4.54	1.89	0.00
P064916	2001	Natural Disaster Vulnerability Reduction	0.00	13.50	0.00	0.00	12.73	-1.14	0.00
P068673	2001	Road Rehabilitation and Maintenance III	0.00	75.00	0.00	0.00	66.34	-11.13	0.00
P055853	2000	NI - TELECOMMUNICATION REFORM	0.00	15.90	0.00	0.00	1.94	1.41	0.00
P056087	2000	NI Pension and Financ. Market Reform TA	0.00	8.00	0.00	0.00	3.36	-3.30	0.43
P064915	2000	AG TECHN & RURAL EDU (APL)	0.00	23.63	0.00	0.00	12.18	4.55	0.00
P049296	2000	NI ECONOMIC MANAGEMENT TAC	0.00	20.90	0.00	0.00	6.80	-13.00	0.00
P050613	2000	NI SECOND BASIC EDUCATION PROJECT	0.00	52.50	0.00	0.00	19.79	-31.41	0.00
P040197	1999	NI FISE III	0.00	45.00	0.00	0.00	3.51	4.97	0.00
P052080	1999	FORESTRY	0.00	9.00	0.00	0.00	2.93	2.79	0.00
P035753	1998	NI HEALTH SECT II	0.00	24.00	0.00	0.00	7.51	4.59	0.00
P053705	1998	TRANSPORT II	0.00	47.40	0.00	0.00	5.35	2.82	0.00
P041790	1997	GEF NI Atlantic Biological Corridor	0.00	0.00	7.10	0.00	3.72	6.96	5.10
		Total:	0.00	461.13	7.10	0.00	261.23	6.84	5.53

NICARAGUA
STATEMENT OF IFC's
Held and Disbursed Portfolio
Jun 30 - 2002
In Millions US Dollars

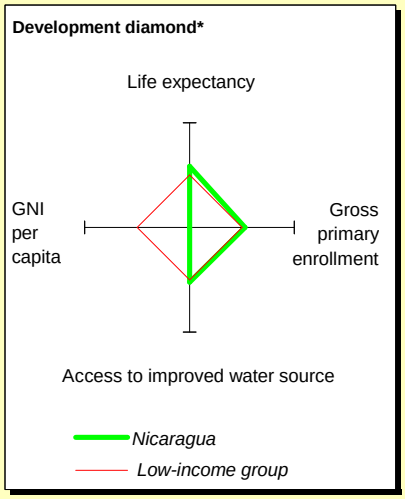
		Committed IFC				Disbursed IFC			
FY Approval	Company	Loan	Equity	Quasi	Partic	Loan	Equity	Quasi	Partic
2001	BANEXPO	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2000	Finarca	1.40	0.60	0.00	0.00	1.40	0.00	0.00	0.00
1998	Frutan	0.94	1.00	0.00	0.00	0.94	0.64	0.00	0.00
1998	La Colonia	3.63	0.00	0.50	0.00	1.63	0.00	0.50	0.00
1999	SEF Dicegsa	0.75	0.00	0.00	0.00	0.75	0.00	0.00	0.00
	Total Portfolio:	11.72	1.60	0.50	0.00	4.72	0.64	0.50	0.00

		Approvals Pending Commitment			
FY Approval	Company	Loan	Equity	Quasi	Partic
	Total Pending Commitment:	0.00	0.00	0.00	0.00

Annex 10: Country at a Glance

NICARAGUA: Offgrid Rural Electrification (PERZA)

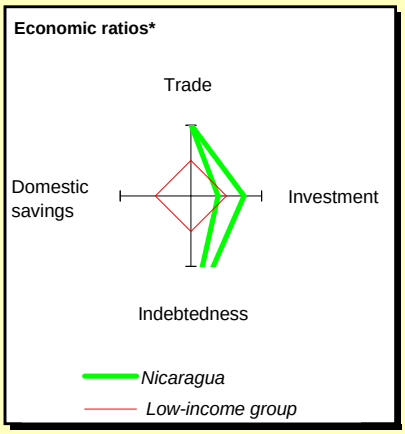
POVERTY and SOCIAL	Nicaragua	Latin America & Carib.	Low-income
2001			
Population, mid-year *(millions)*	5.2	524	2,511
GNI per capita *(Atlas method, US$)*	..	3,560	430
GNI *(Atlas method, US$ billions)*	..	1,862	1,069
Average annual growth, 1995-01			
Population *(%)*	2.7	1.5	1.9
Labor force *(%)*	3.8	2.2	2.3
Most recent estimate (latest year available, 1995-01)			
Poverty *(% of population below national poverty line)*	..	..	..
Urban population *(% of total population)*	57	76	31
Life expectancy at birth *(years)*	69	70	59
Infant mortality *(per 1,000 live births)*	33	29	76
Child malnutrition *(% of children under 5)*	12	9	..
Access to an improved water source *(% of population)*	79	85	76
Illiteracy *(% of population age 15+)*	33	11	37
Gross primary enrollment *(% of school-age population)*	102	130	96
Male	100	131	103
Female	103	128	88



KEY ECONOMIC RATIOS and LONG-TERM TRENDS

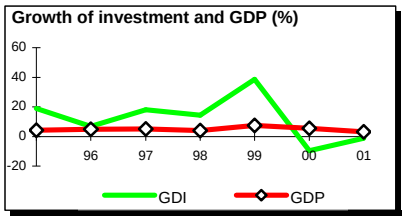
	1981	1991	2000	2001
GDP *(US$ billions)*	2.5	1.5	2.4	2.6
Gross domestic investment/GDP	23.6	20.8	34.9	30.4
Exports of goods and services/GDP	22.3	21.8	35.9	32.5
Gross domestic savings/GDP	4.2	-9.9	-11.1	-15.2
Gross national savings/GDP	-3.1	-31.2	-6.4	-11.6
Current account balance/GDP	-26.7	-57.2	-38.0	-38.1
Interest payments/GDP	3.7	13.1	3.3	2.6
Total debt/GDP	99.8	736.1	321.8	279.1
Total debt service/exports	37.9	141.2	23.7	24.0
Present value of debt/GDP	..	..	228.2	..
Present value of debt/exports	..	..	399.7	..

	1981-91	1991-01	2000	2001	2001-05
(average annual growth)					
GDP	-2.5	4.1	5.5	3.0	3.9
GDP per capita	-5.0	1.3	2.8	0.5	1.7
Exports of goods and services	-3.3	8.9	13.9	6.8	7.0

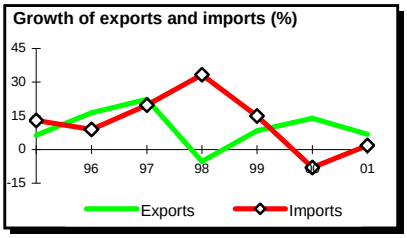


STRUCTURE of the ECONOMY

	1981	1991	2000	2001
(% of GDP)				
Agriculture	20.2	29.1	32.7	32.3
Industry	32.9	22.0	22.3	22.3
Manufacturing	26.7	17.9	14.3	14.2
Services	46.9	48.9	44.9	45.4
Private consumption	73.9	89.4	92.5	95.1
General government consumption	21.9	20.6	18.6	20.2
Imports of goods and services	41.8	52.5	81.9	78.1



	1981-91	1991-01	2000	2001
(average annual growth)				
Agriculture	-2.9	6.5	11.4	3.1
Industry	-2.9	4.7	3.1	3.2
Manufacturing	-3.8	2.1	2.8	2.6
Services	-2.0	2.3	3.1	2.9
Private consumption	-1.1	5.1	-2.7	0.3
General government consumption	-1.3	1.4	2.0	9.4
Gross domestic investment	-7.1	11.9	-9.7	-1.1
Imports of goods and services	-2.0	11.0	-8.0	1.8

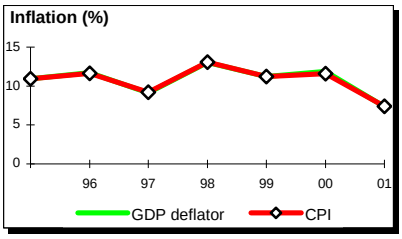


Note: 2001 data are preliminary estimates.

* The diamonds show four key indicators in the country (in bold) compared with its income-group average. If data are missing, the diamond will be incomplete.

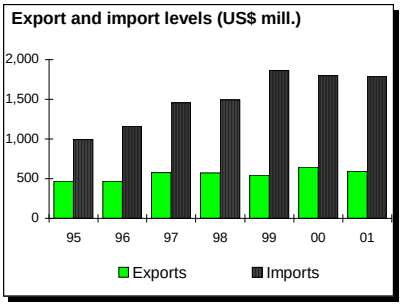
PRICES and GOVERNMENT FINANCE

	1981	1991	2000	2001
Domestic prices				
(% change)				
Consumer prices	23.9	2,945.0	11.6	7.4
Implicit GDP deflator	11.7	4,523.7	11.9	7.4
Government finance				
(% of GDP, includes current grants)				
Current revenue	..	..	24.5	22.4
Current budget balance	..	..	2.3	-4.7
Overall surplus/deficit	..	..	-14.2	-19.4



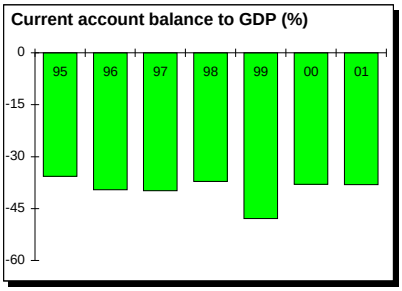
TRADE

	1981	1991	2000	2001
(US$ millions)				
Total exports (fob)	514	272	645	592
Coffee	137	36	171	105
Shrimp and lobster	20	13	112	76
Manufactures	79	61	232	252
Total imports (cif)	828	751	1,800	1,789
Food	166	179	418	474
Fuel and energy	176	115	291	269
Capital goods	138	191	444	414
Export price index *(1995=100)*	78	86	84	76
Import price index *(1995=100)*	61	91	117	115
Terms of trade *(1995=100)*	129	94	71	66



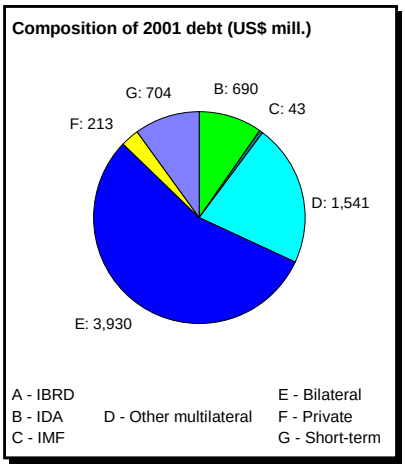
BALANCE of PAYMENTS

	1981	1991	2000	2001
(US$ millions)				
Exports of goods and services	561	350	956	919
Imports of goods and services	1,044	843	1,991	1,983
Resource balance	-483	-492	-1,035	-1,064
Net income	-178	-375	-287	-311
Net current transfers	0	15	400	402
Current account balance	-661	-852	-922	-972
Financing items (net)	714	868	893	801
Changes in net reserves	-53	-16	29	171
Memo:				
Reserves including gold *(US$ millions)*	118	169	497	383
Conversion rate *(DEC, local/US$)*	..	4.9	12.7	13.4



EXTERNAL DEBT and RESOURCE FLOWS

	1981	1991	2000	2001
(US$ millions)				
Total debt outstanding and disbursed	2,471	10,959	7,819	7,121
IBRD	118	124	5	0
IDA	53	113	654	690
Total debt service	223	530	329	321
IBRD	17	248	6	5
IDA	0	6	6	7
Composition of net resource flows				
Official grants	25	795	255	241
Official creditors	324	-7	147	147
Private creditors	-17	-3	141	141
Foreign direct investment	0	0	254	289
Portfolio equity	0	0	0	0
World Bank program				
Commitments	0	114	53	182
Disbursements	43	54	87	63
Principal repayments	7	114	7	6
Net flows	36	-60	81	56
Interest payments	10	141	5	5
Net transfers	26	-201	76	51



Additional GEF Annex 3: Incremental Cost Analysis
NICARAGUA: Offgrid Rural Electrification (PERZA)

Broad Development Goals and Baseline

Nicaragua's power sector underwent a deep restructuring during the late 1990s The new Electricity Law (Ley No.272 of April 1998) unbundled the generation, transmission and distribution divisions of the state-owned *Empresa Nicaraguense de Electricidad* (ENEL), and opened the sector to private sector participation. The law created four generation companies (GEMOSA, GEOSA, HIDROGESA and GECSA), a transmission company (ENTRESA) and two distribution companies (DISNORTE and DISSUR). The transmission company is expected to remain public. All the other companies would be in private hands. The law established the *Comisión Nacional de Energia* (CNE) as the administration in charge of formulating policies and strategies for the energy sector while the *Instituto Nicaraguense de Energia* (INE) was established as the regulatory agency.

The national electrification rate is 50%. For rural areas, however, about 89% are still unelectrified (one of the lowest rural electrification rates in all Latin America) and an estimated 60 % of the still unelectrified rural customer are beyond economic line-extension distances. Within the concession areas, the private utility's obligation to serve is limited to customers within 190 meters from the grid. Furthermore, more than half of the country, including half of the Rio San Juan Region, the *Region Autonoma Atlantico Sur* (RAAS), the *Region Autonoma Atlantico Norte* (RAAN) and two thirds of the Jinotega region, Matagalpa, Boaco, Chotales and Rio San Juan remain out of the concession areas. Thus, despite the privatization of distribution in the concentrated markets, substantial numbers of unserved populations, mostly in the rural areas, still need attention from the government.

CNE is now developing a National Rural Electrification Program (NREP) with the goal of equitable economic development. Providing access to electricity to Nicaraguans in remote areas is hoped to improve their living conditions and enable them to enjoy at least part of the economic and social benefits already enjoyed by their countrymen in urbanized areas.

National Rural Electrification Program

The NREP aims to achieve rural electrification rates of 65-70% by 2005 and 90% by 2012. The Program is focused on the deepening of coverage through line extension in unserved areas close to the National Interconnected Network (SIN) but beyond the distances where the private utilities have obligation-to-serve.

For remote rural areas beyond economic line-extension distance—the "offgrid areas"—the Program consists mainly of installing diesel minigrids to serve some larger villages. These isolated systems are currently operated by ENEL, often at heavy losses which need to be financed by GON on a continuous basis. While some local efforts exist to develop minihydro village systems (mainly through the NGO ATDER-Linder), there have been little efforts to promote other renewable energy solutions. Some bilateral funded activities in the past have resulted in the installation of photovoltaic systems in a few places, and the PNUD is undertaking feasibility studies for developing minihydro plants. However, these efforts tended to be small technology demonstration projects, without offering solutions for sustainable long term service provision, which is the crucial challenge in remote areas. There is a clear need for a coherent rural electrification strategy for isolated and offgrid areas that goes beyond the piecemeal and unsustainable efforts of the past. The major impediments to offgrid electrification include: i) the high

cost of providing access due to remoteness of the sites, dispersed nature of the populations and difficulty of the terrain; ii) the generally low income and low demand of the offgrid population; and iii) insufficient public funds and lack of capacity of government institutions traditionally charged with the provision of rural infrastructure.

Global Environmental Objective

The project's global environmental objective is to achieve greenhouse gas (GHG) reductions through the reduction of policy, information, institutional capacity and financing barriers that currently hinder renewable energy technology (RET) dissemination and market development internationally (GEF Operational Program No. 6). While the absolute magnitude of GHG reduction would not be high in the context of this pilot project in a small country like Nicaragua, the methodologies developed for reducing market barriers to the use of RETs in offgrid electrification through innovative public/private partnerships could provide an important contribution to efforts of this nature in other countries of the Central America region and elsewhere. In particular, several renewable hybrid mini-grids and centralized PV battery charging stations will be piloted in the project with the aim of obtaining operational experience in these relatively untested GHG-mitigating technologies for offgrid electrification. There is as yet little experience with these highly promising RETs in GEF-supported projects worldwide.

The GEF Alternative

The proposed GEF alternative is a revised national rural electrification program which seamlessly integrates the needs of offgrid areas into the original program, and maximizes the role of environmentally benign renewable energy sources. These include small hydro, which resources are abundant and found in many parts of the country, and applications that utilize solar and wind energy. While biomass is also an important resource, the resources tend to be highly location specific (e.g, near agro-processing plants that generate large amounts of "captive" wastes) and are not presently considered for lack of information. The RETs to be developed in the alternative program would include run-of-river small hydropower, photovoltaics for individual solar home systems (SHS) and centralized stations for battery charging, small wind turbines and diesel/renewables hybrid systems. The number of new users to be electrified in the alternative program will be substantially greater than the original program because they include dispersed households that could not be connected to the centralized minigrids. The alternative program addresses both baseline development goals and the global environmental objectives. (Detailed descriptions of the project components are found in Annexes 2 and 2A).

Scope of the Analysis

The analysis compares the cost of investments and magnitude of GHG emissions associated with carrying out the original NREP (line extension plus isolated diesels) as opposed to implementing the GEF alternative plan (line extension plus isolated diesels plus RETs) for the project duration of about 5 years. For isolated minigrids powered by hydro or other renewables the comparator technology is a diesel system of equivalent capacity. For Solar Battery Charging Stations (SBCS), the comparators are diesel systems and kerosene lamps. For individual SHS for dispersed households where the main use is for lighting, the comparator is kerosene lamps. For larger stand-alone PV systems (about 500W average) for public or productive applications, the assumed baseline comparator is a small gasoline engine. The type, number and capacities of the technologies to be used in the project are fairly well known for Phase One and slightly less defined for Phase 2 (See Annex 2). These and other information enable the estimation of the GEF "incremental costs" based on lifecycle cost comparisons. The amount of GHG emissions mitigated is then calculated on a per year basis, as well as the total amount mitigated over the life of the

principal RETs (assumed to be 15 years on the average).

Many of the planned RET installations are small hydro-powered minigrids in the capacity range of 100-800 kW. The minihydro systems are in general more costly in terms of lifecyle costs than the equivalent diesel systems. However, the cost difference is mainly due to the added investment in the transmission lines; most of the hydro resources are far from the load centers. This cost difference does not qualify for GEF incremental cost grant financing. However, the government and the subject communities prefer the minihydro option for various reasons. The key reason is the simplicity of providing one-time government subsidy to the investment cost of the minihydro, in contrast to the need for continuing subsidy for the recurring cost of diesel fuel.

Aside from physical investments, the type and costs of technical assistance, capacity building and other supporting activities that must be carried out to reduce market barriers to the deployment of RETs are also considered in the analysis. Although the Government's NREP includes the implementation of some of these activities, the baseline program is severely limited.

Finally, the analysis considers that the domestic and global benefits of the project are not only physical and environmental, but also programmatic, i.e., they extend beyond the brief project duration and beyond national boundaries. There are vital domestic benefits that accrue to the country's future situation, in the form of capacity built and local markets developed. The international community would benefit from the experience generated by the project in terms of the added demand for RETs and the reduction of perceived risks of investments in these environmentally-benign technologies globally.

Incremental Cost Estimates

A. Investments

Diesel/RET/Battery Hybrids. As noted earlier, the advantage of a hybrid over a pure diesel system is the potential to use an intermittent resource to cause significant fuel savings, while guaranteeing continuous power to certain productive applications. Although the system capacities for the diesel/PV and diesel /wind hybrids planned to be installed are more or less known, the load curves for the specific sites can only be determined at project implementation. The true incremental costs will vary significantly depending on the shape of the load curve and hence the cost-effectiveness of the combination in the specific sites. Absent this site-specific information, assumptions had to be made on "generic" load profiles consistent not only with the present energy consumption profile of the communities but with the situation where some conservative daytime productive loads have been promoted by the project. This method yields an approximate estimate of US$600 per kW as the incremental cost of the hybrid system, a figure consistent with those calculated for similar applications in other recent Bank/GEF projects.

While this and a diesel/wind hybrid planned for Phase Two is not expected to significantly reduce hybrid capital costs within 5 years in the context of a small country like Nicaragua, operation of the pilots/demonstrations will a) help identify specific load situations in Nicaragua where adding diesel/RET hybrids could be potentially cost effective, and b) add immensely to the current dearth of operational experience worldwide on diesel/RET hybrids.

Solar Battery Charging Stations. In many parts of Nicaragua, battery charging (from grid-based or diesel-fueled chargers) is already practiced, with people using public transport to charge their batteries in towns as far way as 60 km. SBCS allow stations to be located close to the points of demand, thereby decreasing health and safety hazards substantially (compared to current practice). GEF intervention on SBCS will help remove barriers to its wider use in the RE program. The barriers include: a) current complete lack of familiarity with the SBCS technology, application, characteristics, performance and economics on the part of both rural potential beneficiaries and government planners. There is consequently low willingness to test this solution and finance/pay for it, b) high initial introduction/distribution costs of the systems in dispersed markets, and c) liberal subsidies to ENEL isolated diesels, that extend even to O&M costs.

The SBCS are an important alternative to SHS for the decentralized, mostly indigenous population of the Atlantic Coast. Several communities around Francia Sirpe have been selected for Phase One because of their representativity for the Atlantic Coast. In the past, rural electrification efforts in Nicaragua have overlooked these areas. The extreme remoteness makes traditional solutions based on grid extension or diesel generation economically unviable. At the same time, extreme poverty makes cost recovery difficult even for more adopted systems.

The two most promising alternatives for these areas to improve their energy services are SHS and SBCS. These two solutions are very similar regarding technology and costs: Both are based on local generation with PV modules, both charge batteries through charge controllers, in both cases the typical appliances powered by one battery per household are a few (efficient) light bulbs, a radio and maybe a black and white (b/w) TV. The main difference is that the batteries are charged centrally in the SBCS (and then transported to the users), while each battery is charged decentrally in the case of SHS, where each household has its own small PV module and charge controller. The advantages of SBCS are potential economies of scale in management and battery charging, as well as the potential to adopt payment rhythm to local needs. The main advantages of SHS are the increased convenience and the household charge controllers which avoid deep discharging and increase battery lifetime. To decide amongst these two alternatives is difficult ex ante: international experience has shown that local preference and use patterns make the difference. In general, SBCS become more interesting towards the lowest income segments. PERZA will let the market decide on the local preference for these two options: In Phase One, SBCS will be installed, in Phase Two, small SHS (20Wp) will be offered as an option for 'stepping up' through the SBCS operators (who will then also offer replacement parts for the SHS).

The economic Net Benefits of SBCS tend to be lower than those of SHS, because the cost per kWh used is often slightly higher (because of the shorter battery lifetime), while benefits are slightly lower (because the households usually keep using a higher portion of kerosene in their energy mix). For benefit calculation, this was considered by: (i) using the monthly payment that was estimated based on the demand survey for the specific subproject site (based on avoided costs in kerosene and candles); (ii) lighting consumer surplus (based on a partial substitution of battery power for kerosene and candles); and (iii) the external environmental benefits, based on GEF incremental costs. SBCS costs have been determined by a detailed Consultant study for the specific project site.

The capital and operating costs of SBCS installations vary with the station capacity and charging layout, solar insolation at the site and the type of batteries used. Based on studies of SBCS experience in Brazil, Morocco, Philippines and Thailand (SGA Energy Report to the IDA, 1998), the average incremental cost per customer for the 1 to 1.2 kW SBCS planned in the project is determined to be about US$130. This represents the higher lifecycle cost of the SBCS compared to an equivalent capacity charging station powered by a diesel generator. One 1 kW SBCS could serve about 40-50 customers. Fourteen stations are planned for Francia Sirpi and 4 surrounding communities.

Individual Solar PV Systems. The present solar market in Nicaragua is insignificant, serving only the top 1-2% of the potential market, primarily on a cash sales basis. Institutional procurements are carried out with little standardization, driven largely by donor initiatives. The number of solar applications supporting productive activities such as lighting and small appliance use for shops, restaurants, and cottage industries are even more insignificant. In areas far from the grid, rural enterprises, institutions, and households rely primarily on 19th century fuels such as kerosene and candles for interior lighting. Dry cell batteries are used to power radios. This is the *baseline* situation that is expected to continue without GEF intervention.

The *GEF alternative* would support development of a commercial framework for private provision of rural solar PV services and installation of about 200 kW of rural PV systems for households, businesses, and institutions, including SBCS installations in the poorest areas. The bulk of the installations will be for small systems (20Wp) suitable for lighting in households, shops, restaurants, etc. Individual systems up to 50 Wp would be eligible for GEF support. In addition, GEF funds would be used to catalyze PV installations for commercial/ institutional applications.

Through PERZA's microfinance and business development services, assistance will be provided to solar PV dealers and SBCS operators in preparation of business plans and market conditioning activities (local market assessments, publicity and promotional campaigns,etc). Microfinance dramatically increases affordability of both SHS units and batteries, thus significantly expanding the potential PV market. The key importance of microfinance has been amply demonstrated in similar Bank-supported projects in the Asia region (e.g India, Indonesia, Sri Lanka). Business development services also will assist potential productive use customers in determining the business value of PV service. Given the importance ofthese two services to expanding the PV market, it is expected that most of the sales supported by the project will be in the vicinity of the Phase One and Phase Two investments. However, there will be no limitations on PV dealer service areas.

A key aim of the IDA/GEF support would be to establish the basic conditions for development of the private market. These include: i) *sufficient market density* to establish rural sales and service outlets, which will be enhanced by the provision of cofinancing grant support as well as microfinance and business development services, ii) *market stability*, which will be promoted by means of the sustained multi-year support of the project as well as by adoption of performance based standards which provide increased confidence to the market and a level playing field for the providers; and iii) business and financial support, to maximize the potential for sound business development and access to capital for growth.

On the hardware side alone, the *incremental cost* of shifting from traditional fuel usage for lighting and basic home communications to the use of a PV system could be estimated from data on system costs and household energy consumption profiles (PPIAF Report, 2000). Most rural households in Nicaragua seem to have very modest requirements, and could be well served with 20 Wp PV systems. Considering only expenses potentially replaceable by PV, a household spending about US$6.65 per month on kerosene and batteries would receive comparable service from a 20Wp solar home system. The 15-year net present value (NPV) of these base case expenses comes to US$554. The 15-year net present value of a 20W solar home system is estimated at US$610, implying an incremental cost of US$56 per system, or US$2.80 per Wp. It is estimated that about 8,000 SHS systems of average slightly above 25W would be installed in the project, for an estimated capacity of about 205,000 Wp, with an estimated incremental cost of US$ 570,000.

With GEF intervention, the five-year PERZA project would result in the systematic creation of a commercial market for PV in Nicaragua by stimulating demand and enabling the creation of the needed rural sales/maintenance infrastructure. Experience with PV programs worldwide shows slow market growth in the initial years so full market development is not likely to be achieved in Nicaragua within the project's time horizon. However, although subsidies are likely to be still needed at the end of PERZA, they are expected to be reduced as the cost per unit installed declines with volume. The subsidy gap left by the GEF is expected to be covered by the Government, once it sees the practical importance of PV to its offgrid electrification strategy. This importance is not fully appreciated at present because of the perception that PV is only for a specialized niche of users. Without GEF intervention, PERZA will be limited to the development of minigrids and would be unable to improve electricity access to dispersed rural populations.

Table 1 below summarizes the results of the analysis of the incremental costs of investments in RETs:

Table 1: Incremental Costs of Investments

Phase	Site	Supply system type	New generation (kW)	Indicative Investment Cost, US$M	Estimated Incremental Cost, US$
1	El Ayote	hydro minigrid	700	3.40	n/a
1	El Bote	hydro minigrid	900	2.60	n/a
1	Francia Sirpi,etc	SBCS	6 x 1 kW	0.35	0.04
2	2-3 sites	hydro minigrid	500-600	2.56	n/a
2	La Union	diesel (TBD)	150	0.54	0.00
2	San Juan del Norte	Diesel-wind hybrid	200	0.76	0.12
2	National	PV systems, 20Wp up	150 kW	3.40	0.43
Totals			2,606-2,706	13.61	0.59

B. Technical Assistance

Table 2 below lists the market barrier reduction activities for RETs considered essential to the project. Many of the activities are inextricably linked with activities that deal with the baseline program but need incremental cost financing. For example, while a general financing and subsidy scheme must be developed for normal program implementation, the use of RETs requires special attention because technologies such as individual solar home systems deliver a different type of service than a diesel minigrid connection or a grid extension connection. In this case, the project loan will finance the baseline work; the additional cost of the special study dealing with RETs will be financed with a GEF grant.

The TA activities are essentially in three categories: Strategy Formulation (US$1.3 million total), Capacity Building/Market Development (US$2.5 million) and Technical Studies (US$0.95 million).

Strategy Formulation: This category comprises closely related activities to integrate offgrid solutions into the overall rural electrification program that is currently focused on conventional grid extension. A replication strategy that draws upon the experience of the pilot operations (both minigrids and PV) will be developed midway through the project. An important input to this strategy is a rational policy for setting tariffs and subsidies. Other important inputs would be the results of studies on social acceptance, participatory procedures and market characterization of new offgrid sites.

Capacity Building/Market Development. Capacity building involves institutional strengthening of CNE to enable it to manage implementation of the project in an efficient manner, particularly as regards the relatively new area of renewable energy applications in rural electrification. This would be accomplished through training of officials and staff in specialized areas, and supporting their participation in selected local, regional and international seminars and conferences. Assistance will also be provided to improve the operational capacity of FODIEN, the existing financing mechanism for the rural electrification program that is likely to be the financial intermediary for GEF grants for PERZA. Officials and staff of INE will also be provided training opportunities similar to CNE but more focused towards regulatory aspects. Training courses and workshops will be held to build capacity of the selected service operators in the pilot sites of the project in the areas of business planning, best practice and technology. This is especially important for selected operators of the Solar Battery Charging Stations who would be local residents with no technical or business background. For minihydro sites selected as pilots under PERZA, training will be coordinated with the parallel UNDP executed small-scale hydroelectricity project. Other TA in this category aim to help develop the market for RET applications in rural electrification (promotions, standards and certification) in support of the private operators.

Technical Studies. This category consists of important studies that will monitor performance of RET installations, assess critical success factors, evaluate renewable energy resources an identify potential productive uses at new sites for the replication phase, and develop site selection criteria for RET-powered ICT centers planned under the BDS component.

Table 2. Market Barrier Reduction Activities, US$ Millions

Activity	Total Cost	Baseline	Increment
Integration of Offgrid Solution into Overall Framework			
Replication strategy for offgrid electrification	0.40	0.10	0.30
Rationalization of subsidy & tariffs for offgrid	0.16	0.03	0.13
Design of community participatory procedures	0.10	0.01	0.09
Market studies/screening for new offgrid sites	0.65	0.20	0.45
Social acceptance of RET	0.11	0.02	0.09
Capacity Building /Market Development			
Institutional strengthening of CNE and INE	0.65	0.10	0.55
Training/Workshops for private/community operators	0.20	0.03	0.17
Public education and promotions	0.55	0.10	0.45
Standards & Certification for RET equipment and installations	0.52	0.18	0.34
Dissemination workshops	0.20	0.03	0.17
Technical Studies			
Identification of productive applications of RETs in target sites	0.10	0.01	0.09
Critical success factors for RET hybrids	0.10	0.01	0.09
Critical success factors for central PV battery charging	0.10	0.01	0.09
Resources assessment in new sites	0.25	0.04	0.21
Monitoring of RET performance in pilot sites	0.25	0.04	0.21
Totals	**4.34**	**0.91**	**3.43**

Finally, Table 3 below summarizes the preliminary results of the above analysis in a matrix that shows the costs, domestic benefits and global benefits associated with the baseline course of action and the proposed alternative course of actions. The increments are then calculated.

Table 3:
Incremental Cost Matrix
(Basis: project life of 5 years)

	Baseline	**Alternative**	**Increment**
Domestic Benefits			
a) physical	New line extensions* plus offgrid connections with diesel minigrids to 8,000 concentrated users over 5 years. Continued use of kerosene lighting by dispersed populations.	New line extensions plus offgrid connections with minigrids powered by diesel, RET/diesel hybrids and minihydro plus battery charging and SHS to total of 16,000 users (excluding line extensions)	8,000 dispersed users provided basic electricity service
b) programmatic	NREP focused on line extensions, and isolated diesel systems	New national strategy incorporating offgrid electrification with high renewables component	Reduction of perceived risks in renewables-based offgrid electrification projects
	Minimal local capacity to develop renewables-based projects for offgrid electrification	Participation by CNE, INE, private sector in planning, design and execution of offgrid renewables-based electrification projects	Up to 100 GON staff at various levels, up to 100 private sector persons and up to 500 community residents trained/experienced in renewables-based offgrid electrification
Global Benefits			
a) environmental	428,000 tonnes of CO2 over 20 years from diesel and kerosene use	8,000 tonnes of CO2 over 20 years (from diesel part of hybrids)	420,000 tonnes CO2 abated over 20 years
b) programmatic	Limited international experience in diesel/renewables, SHS and centralized PV charging operations for offgrid electrification High perceived risks by govt/investors/communities in above systems	Over 1,400 kW total of diesel/renewables hybrids, hydro, SHS and centralized PV charging systems providing demonstration effect/combining impact with similar demo plants globally	More govt programs/private investors in similar countries in Central America and elsewhere willing to consider renewables-based options for rural electrification

			Incremental addition to global knowledge on hybrids, central PV battery charging, private-led offgrid operations
Costs (M$) a) Investment: Capital Costs	(Cost of line ext program*+fossil fuels-based systems assumed installed instead of renewables+ continued use of traditional lighting fuels)	(Cost of line ext program* + hydro, hybrid, SHS, central PV installations)	US$780,000
b)Technical Assistance	US$850,000	US$4,250,000	US$3,400,000
Total	US$13,740,000 + LE Cost	US$17,920,000+LE Cost	US$4,180,000

Notes:

1. The tonnes CO_2 abated by installations in the GEF alternative was estimated over 20 years, the average lifetime of most of the installations. For minihydros, only about half of the abatement figure was counted, on the assumption that about half of the minihydro installations would have been established anyway, even without PERZA/GEF. The baseline generation avoided by the construction of the minihydros and hybrids in PERZA is assumed to be diesel. It is assumed that 50% of the hybrid capacity is diesel. For PV, the avoided emissions were all assumed to be due to kerosene use in lamps for lighting. Technical figures on carbon content of diesel and kerosene, specific fuel consumption and carbon dioxide emissions per kWh of operation are all based on standard data.

2. The incremental cost of investments were estimated without counting the cost of line extensions which would be offsetting in the two scenarios. In other words, it was assumed that the baseline RE program and the alternative RE program (PERZA/GEF) would both have the same number of line extensions carried out.