

PROPOSAL FOR REVIEW

PROJECT TITLE: ARGENTINA: RENEWABLE ENERGY IN RURAL MARKET PROJECT

GEF FOCAL AREA: Climate Change

COUNTRY ELIGIBILITY: Ratified FCCC on March 11, 1994

TOTAL PROJECT COST: US\$225.7 million

GEF GRAND TOTAL: US\$13.6 million

GEF FINANCING: US\$13.5 million

GOVERNMENT COUNTERPART FINANCING: US\$57.9 million

COFINANCING:

IBRD	US\$60.0 million
Concessionaires	US\$81.9 million
Customers	US\$12.3 million

ASSOCIATED IBRD PROJECT: Renewable Energy in Rural Market Project

GEF IMPLEMENTING AGENCY: World Bank

LOCAL EXECUTING AGENCIES: Secretariat of Energy and Ports (SEP), Provincial Governments (PGs)

ESTIMATED APPROVAL DATE: June 1998

PROJECT DURATION: 5 years

GEF PREPARATION COSTS: US\$115,000 PDF Block B

Block 1: Project Description

1. Project development objectives (see Annex 1 for key performance indicators):

The project objectives are to:

- Provide rural areas with reliable electric supply in a sustainable manner, using renewable energy technologies, where feasible;
- Support the consolidation of the power sector reform strategy of the Government of Argentina (GOA);
- Support the GOA strategy to expand private sector participating in the provision of electricity in rural areas;
- Strengthen the regulatory function of provincial governments (PGs) in the power sector; and
- Improve the standard of living of rural population.

Global GEF objectives are to: (i) promote environmentally sound energy resource development in Argentina and reduce the energy sector's dependence on fossil fuels; (ii) remove market barriers to application, implementation, and dissemination of renewable energy sources; and (iii) reduce global warming through lessening GHG emissions that would be produced by thermal generation using hydrocarbons.

Brief Project Summary

The GOA has almost completed the reform of the power sector. The market has been unbundled (generators, transmitters, distributors, and large users) and the main power utilities and plants have been privatized. Now, the GOA and the PGs are gradually progressing in the transformation of the provincial power systems. GOA has divided the services area in the provinces to privatize the electricity sector in two markets: (i) the concentrated or grid-connected market and the dispersed rural or off-grid market. Most of the 23 provinces have privatized their concentrated markets or are in the process of doing so.

The GOA has initiated the implementation of the "Electric Supply Program for the Rural Dispersed Population (PAEPRA)", which aims at supplying electricity to about 1.4 million inhabitants (300,000 households) and about 6,000 public services (schools, first aid medical centers, police stations, civil services). The main characteristics of the PAEPRA are: (i) the program will be implemented through concession of electricity service for lighting and basic communications in each province; and (ii) the electrification of the households will be made mainly using Renewable Energy Systems (RES).

The proposed project would assist the GOA and the PGs to: (i) consolidate the reform of the power sector; (ii) strengthen and enhance the regulatory functions of the Provincial Regulatory Agencies (PRA); and (iii) implement the PAEPRA in at least 15 provinces.

It is recognized that the dispersed rural market will require some subsidies to enable the poorest households to afford the service or installations, and to attract the participation by the private sector. The idea is to bid out the concession of the dispersed rural market in each province, with the winner being the private company asking for the least subsidy. The concession typically is 15 years, renewable up to 45. Tariffs are to be reviewed every five years.

The electrification will be through a variety of means, including photovoltaics (PV), centralized windpower, minihydro, and diesel. It is anticipated that due to the low population densities in the dispersed rural market, some 75 percent of the installations will be individual solar home systems (SHS) of 30-400 watts each for households and larger PV systems in public service centers.

2. Project Component, Cost and Financing

The following table shows project components, project cost, incremental cost, and financing requirements from each source.

<u>Component</u>	<u>Category</u>	<u>World Bank</u>	<u>Local^{1/} Counterpart US\$million</u>	<u>GEF</u>	<u>TOTAL</u>
A. Installation and Operation of RES					
1. Provision of SHS to about 116,000 households	Physical	38.6	95.6	6.5	140.7
2. Provision of Decentralized Electricity Supply to about 4,400 public service institutions	Physical	2.9	7.7		10.6
B. Installation and operation of minihydro and small diesel power plants for small communities:					
1. 450 mini-hydro plants, 3-10 kW each, for the provision of energy to about 13,500 households	Physical	2.0	5.3		7.3
2. 500 diesel plants, 3-10 kW average each, for the provision of electricity to about 15,000 households	Physical	1.8	4.7		6.5
C. Installation of two (2) pilot wind home systems subproject					
	Physical/Institutional Building	0.2		0.4	0.7
D. A capacity building program. This component would provide technical assistance and training for:					
1. Consolidating the regulatory reform of the power sector	Institutional Building	3.5			3.5
2. Strengthening the PRA, including the monitoring and evaluation of renewable energy operations of the concessionaires	institutional Building	0.7		0.7	1.4
3. Supporting renewable energy activities	Institutional Building	0.6	0.2	3.2	4.0
4. Implementing, supervising, monitoring, and evaluating the project by a Project Coordination Unit (PCU)	Project Management	1.7		1.3	3.0
E. Others. Contingencies and financial costs during project implementation					
		8.0	38.6	1.3	47.9
	Total	60.0	152.1	13.5	225.6

^{1/} It includes customer payment, electrical funds, and concessionaire and central government counterpart

The incremental cost proposed to be supported by GEF grant amounts to 13.5 million, and its optimal allocation will be determined during project appraisal. The current allocation estimate is as follows (details are presented in Annex 2):

- US\$6.5 million to support the installation by concessionaires of about 116,000 SHS in the provincial rural market. The 15 provinces that have reformed the power sector or are in the process of doing so may participate in the project. The GEF grant would finance the incremental costs of 50W and 100W solar home systems.
- US\$400,000 to support a pilot/demonstration program involving the installation of two pilot Wind Home Systems (WHS) in two communities in Argentina. This pilot project component is expected to demonstrate the commercial viability and long-run economic potential of wind home systems (small turbines for individual homes) in Argentina, and to catalyze future development by private investors. The concessionaire will be trained and assisted in the installation, operation and maintenance of the WHS. An evaluation of the performance and economics of the systems will be made after one year of continuous monitoring.
- US\$750,000 to support the strengthening of the PRAs of the participating provinces. It includes the monitoring and evaluation of the performance of concessionaires in renewable operations.
- US\$3.2 million to support technical assistance activities related to removing the barriers to adoption of renewable energy technology and reduce concessionaire risks. The GEF grant would assist the SEP and the PRAs in: (i) preparing detailed market studies; (ii) promoting SHS and public education programs; (iii) carrying out feasibility studies for centralized renewables systems; (iv) conducting dissemination workshop for concessionaires, PRA, customers, and NGOs and develop training programs for SEP's and PRA's Staff; (v) establishing standards and certification systems for equipment and installers; (vi) improving the solar/wind information; and (viii) preparing a study to review how the available DC appliances in the market match with SHS requirements.
- US\$1.3 million to support the implementation of the project, including support to the PCU and the PRA in activities related to management, monitoring, supervision, and evaluation of the project.
- An additional US\$1.3 million has been included as physical contingencies in the number of SHS units, and price contingencies on the technical assistance.

3. Benefits and target population:

The ultimate beneficiaries and target population of the project are the low-income households living in the rural dispersed areas of Argentina. These households will be provided electricity services for lighting and basic communications. Apart from the physical benefits, there will be a remarkable improvement in the quality of life of this population due to the ability to enjoy a superior level of illumination. There will be a positive impact on education, productivity and social development. The project will also benefit the private sector in Argentina by enabling the creation of sustainable business operations through the concessions and expansion of the market for renewable energy equipment. A large part of this equipment will be produced by local industries. The central and provincial governments will benefit by having a social and political commitment to the electrification of rural dispersed population achieved through a system expected to be managed efficiently by the private sector.

The GEF eligible technologies (SHS and WHS), would reduce CO₂ emissions by displacing the use of conventional technologies. It is anticipated that the project would abate about 1.8 million tons of CO₂.

4. Institutional and implementation arrangements: Implementation Period: Five years (1998-2002)

The recipient of the proposed GEF grant and Bank loan will be the Government of Argentina. The Bank Loan and the GEF grant will be transferred to the PGs on a grant basis together with funds from the Electricity Investment Development (FEDEI) and Tariff Compensation (FCT) funds. Institutional and implementation arrangements for the project are based on a Project Implementation Plan prepared by the SEP, which was discussed during project preparation and would be agreed upon during project appraisal.

Project Coordination:

The SEP will be in charge of the general coordination and supervision of the implementation of the proposed Project through a Project Coordinating Unit (PCU). The PCU, composed of a project manager assisted by four experts, will receive administrative support from the Financial Unit at the SEP for processing requests for disbursement of the Bank Loan and GEF Grant, and maintain separate accounts of the project.

The PCU will be responsible for: (i) project preparation; (ii) project promotion in the provinces and private sector; (iii) creation and dissemination of a database on potential dispersed markets for renewable energy; (iv) establishing a standard concession contract for providing electricity service based on RES (mainly photovoltaics - PV) to dispersed population in rural areas; (v) providing consultant services to the provinces for implementing the project.

The preparation of the project is managed by the PCU, with support of the GOA, Bank, GEF, and the National Rural Electrification Laboratory, USA, (NREL). So far, the following activities have been carried out:

- Two pilot concession contracts in the provinces of Jujuy and Salta. The SEP assisted the governments of these two provinces in preparing the bidding documents and the draft contract for the concession of the electricity market. The current concessionaire of the concentrated market in these two provinces is also in charge of providing electricity to rural customers using renewable sources technology. The total individual customers to be served by these two concessionaires are estimated at 14,000. An evaluation report of the performance of the concessionaires in supplying electricity to the rural market will be provided before appraisal.
- Studies carried out by consultants and financed by the NREL. The following studies were carried out by consultants: preliminary market surveys; willingness to pay by potential rural customers; tariff structure and level.
- Studies financed by GEF. The following studies are under way and would be completed before appraisal: evaluation of existing renewable energy sources; global environmental benefit and CO₂ mitigation; economic evaluation for each renewable energy project component; and an assessment of the performance of the pilot concessions.

Project Implementation

The participating provinces will be selected among those which have reformed the power sector and either privatized or are willing to privatize the provincial power utility. The PRA of these selected provinces will coordinate the project activities at the provincial level. The PRA will award the concession contract through international competitive bidding (ICB). Concession contracts already awarded in which the concessionaires must serve the dispersed rural market in addition to the concentrated market, would be eligible for Bank/GEF support if and only if: (i) the Bank has no objection to tariffs schedules revised and adapted to serve dispersed rural consumers; and (ii) procurement of equipment to more dispersed rural consumers is done through ICB. The PRA will be assisted by the PCU and consultants financed by the Bank and the GEF in: (a) implementing the procurement by PRA or the concessionaire's bidding process, and b) monitoring and supervising the execution of the project by the concessionaire. The training and promotion programs will be carried out by the

SEP and PRA

The physical components of the project will be implemented by the private sector through concession contracts granted by the PRA of the participating provinces.

Given the innovative nature of this lending operation, close Bank supervision and monitoring of project performance will be carried out. A mid-term review mission will be conducted in December 1999. Performance indicators, based on Annex 1, will be agreed with GOA at appraisal.

Block 2: Project Rationale

5. CAS objective(s) supported by the project:

(CAS Report No. 16505-AR of April 24, 1997, and discussed by the Board on May 15, 1997)

The Bank strategy supports efforts by the GOA to: (i) develop regulatory framework. The project would assist the GOA to consolidate the reform of the power sector in the country and to enhance the regulation functions of the PRA; (ii) promote private sector participation. The project would assist the PGs in speeding up the privatization process of the rural electricity service by providing financial support and enhancing its regulatory functions; (iii) improve the standard of living of rural population. The project would provide electricity to dispersed rural households and to public institutions located in dispersed rural area for social communications purpose; and (iv) promote sustainable management of natural resources by modernizing the role of the public sector. The PRA would be trained in the monitoring of RES operations.

GEF Operational Strategy/Program Objective Addressed by the Project:

The proposed project is fully consistent with the GEF Climate Change Operational Program "Promoting the adoption of renewable energy" because its goal is to remove barriers and reduce implementation costs. GEF support would help to reduce information barriers to both investors and customers, address high first cost barrier for RES, and train the regulatory agencies in the monitoring of renewable energy operations of concessionaires.

6. Main sector issues and Government strategy:

There are four main issues: (a) about 4 million inhabitants live in rural areas (12.4% of the country population), of which 35% have no access to electricity service; (b) the high investment cost required to provide electricity to dispersed rural population; (c) the limited financial capability of the PGs to provide electricity services to this population; and (d) the lack of institutional capability of the PRA to develop their regulatory functions mainly in RES.

The GOA strategy to address these issues comprises: (a) the creation of a regulatory and policy environment to encourage private sector participation in providing electricity supply to rural areas; (b) the improvement of the efficiency of energy services delivery; and (c) the strengthening of the PRA capability.

The GOA has also received a GEF EA grant for developing its UNFCCC national communication report, which will provide information on a national climate change strategy and priorities for achievement. The report would include the promotion of renewable energy technologies, which has been identified as a priority.

The GOA's basic strategy to promote electrification of dispersed areas consists of:

- a) support for electrification of public service centers that provide important communal benefits;
- b) extension of its existing lifeline tariff policy in the urban sector to the lowest income households in dispersed areas;
- c) policy and institutional support to create an environment where the private sector can take the lead role through the concession system in providing electricity services to all other households in these areas.

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

The project would address the following sector issues: (a) lack of access to energy supply by rural population; and (b) limited financial capability of the PGs. The project's approach is to develop a sustainable electricity market in dispersed areas, served and financed by private concessionaires and using renewable resources and environmentally clean technologies, wherever feasible. The private concession approach for off-grid services has many potential advantages but has not been tried anywhere. The challenge is to design a scheme that minimizes government subsidies but enables private investors to obtain a fair return for their participation. The main market barriers are:

- (i) Insufficient information for prospective concessionaires to make the decision to participate in the bidding process. These include information on market size and characteristics, the costs of operation and maintenance of systems in dispersed and difficult terrain, failure rates of systems and components, adequacy of proposed tariffs, and potential difficulty in bill collection.
- (ii) Need for substantial investment resources at the front end, due to the high capital cost-low recurring cost nature of renewable energy investments.
- (iii) Risks associated with market reception of a relatively new technology. Even in the case where the shift to renewable from traditional fuels or conventional electricity systems is more advantageous to the consumer economically, the shift will not necessarily occur if left entirely to the market. The reason on the consumer side includes inadequate information on the benefits of the new technologies and high first costs.

Lack of information on market characteristics, real costs for operation and others will be addressed by a number of market profile and demand studies and more detailed analysis of typical cash flows in a concession in each of the provinces participating in the project. GEF grant financing for these studies, as well as training of provincial regulators in the regulation of renewable operations, will be sought. It is understood that only incremental costs, i.e., costs exceeding those required for a conventional least-cost program that does not address low-carbon emission goals, could be requested from the GEF. The financing barrier will be addressed by the application of the IBRD, GEF and GOA counterpart funding. The investment requirement for the project would be shared by the World Bank Loan, GEF, GOA funds and Concessionaire equity.

The risks to consumer acceptance will be addressed by combination of: (a) promotion and demonstration programs to educate rural area dwellers on the benefits of the new technologies; (b) judicious application of GEF grants and GOA subsidy funds to reduce the high costs to customers of the new technologies, and (c) assistance to the concessionaires in meeting the high maintenance costs of systems in dispersed areas, particularly in the early years when the number of consumers using the new technologies is still low.

The lack of the PRA capability will be addressed by training the staff of the PRA and providing technical and legal assistance to strengthening its institutional capability.

8. Project alternatives considered and reasons for rejection:

Technical options

Small consumers. The preferred alternative is the use of SHS because of its technical simplicity, non-polluting feature, and the willingness of the international community and the GOA to overcome its higher investment cost during an initial period of about five years. After that period, it is expected that the use of SHSs (or equivalent systems) will benefit from economies of scale derived from massive production of SHSs to be reflected in lower initial investment and operation costs. Although the option of providing electricity to small consumers by installing small diesel generators could be possible, it was evaluated as an inferior solution because of: (a) the requirement for local qualified technical expertise to operate and maintain the equipment; (b) the need to supply diesel fuel to remote rural areas, and (c) the polluting nature of the technology.

Small communities. The option of providing electricity to small consumers by extending the existing medium voltage grid to remote dispersed rural population was discarded because it is not the least cost solution.

Delivery mechanism

The option of implementing the project through individual private dealers was discarded because: (a) it is less suited to the task of providing electricity service to a relatively large market of dispersed population over a period of at least 15 years; (b) with 15 provinces involved, it will be harder to manage from the GOA's point of view; and (c) there is already substantial experience with the concession system in Argentina. The market concession contract is the option chosen by the project because the private concessionaire, who will be selected in a competitive process, will be committed and obligated to provide electricity services (upon request from the customers) to a relatively large market of dispersed population over a period of at least 15 years.

Financial arrangement.

The option of providing a credit line to support the financing of the concessionaire's investment program was also discarded, because of the distortion it could introduce in the capital markets of the country. Instead, a subsidy to those customers connected during the initial five years of the project, shall be granted once the PRA (or its representative) certifies that the SHS (or equivalent systems) has been installed by the concessionaire in accordance with pre-established standards and conditions.

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

<u>Sector issue</u>	<u>Project</u>	<u>Latest Form 590 Ratings</u>	
		<u>IP</u> (Bank-financed projects only)	<u>DO</u>
<u>Bank-financed</u>			
Supported the reform of the national power sector and the privatization of the main national distribution utilities, which were successfully implemented	SEGBA V (AR-PE-5998) US\$276 million. Related technical assistance completed	S	S
Support the reform in eight provinces. The privatization and deregulation of the provincial economy and improved managerial tools were implemented	First Provincial Reform Loan (AR-PE-6035, US\$300 million), signed in FY95, expected closing FY98	HS	HS
Assist the PGs in implementing financial management reforms, and strengthening their capacity to plan, program, finance, execute, and monitor investment programs. It also provides financing for institutional development and investments	Provincial Development II Project (AR-PE-6018, US\$225 million), signed in FY96, expected closing FY02	U	U
<u>Bank-Financed Projects Outside of Argentina:</u>			
Bank/GEF-supported solar home system project and village hydro subprojects. Private participation, sustainable energy supply. Energy efficiency and conservation	Sri Lanka Energy Services Delivery Project (LK-PE-10498:IDA-16.9 million and LK-GE-3995:GEF-US\$5.9 million), signed on 4/22/97, not yet effective	S	S
Bank-supported solar home system project. Private participation. Sustainable energy supply	Indonesia Solar Home Systems project (ID-PE-35544, US\$20 million, signed on 3/11/97, not yet effective	-	-
Bank/GEF-supported solar home system project. Private participation. Sustainable energy supply	Indonesia Solar Home Systems project (ID-PE-42882:US\$66.4 million, GEF:US\$4.0 million), approved 6/24/97, not yet effective	S	S

10. Lessons learned and reflected in proposed project design:

No similar project has been financed in Argentina. Lessons derived from Bank studies and ongoing projects are described below in italics font.

- *Solar home system projects must: (i) overcome the first cost barrier created by their high initial cost (compared to conventional alternatives) to gain an*

adequate potential market size; (ii) establish responsible and sustainable PV sales and distribution infrastructure; and (iii) provide quality product and services (World Bank Technical paper #324, best Practices for Photovoltaic Households Electrification programs, 1996). The concession contract will establish adequate cost recovery, financing conditions, and tariff to make affordable to the rural customer the payment for the service and installation of the SHS. The concessionaire will create the necessary infrastructure to supply and operate the SHS in a sustainable manner. All SHS will be required to comply with technical specifications, ensuring quality products and services.

- *SHS project should: (i) operate on a full cost-recovery basis; (ii) provide adequate consumer information; and (iii) ensure adequate management skills in local implementing organizations.* (World Bank technical paper #304, Photovoltaic applications in Rural areas of the developing World, 1995). Each concession contract will include a full cost-recovery condition. Each proposed contract will be reviewed by the Bank and the PCU. A program to promote among the rural population the use of electricity services based on RES will be designed. The institutional capability of the PRAs will be strengthened to ensure adequate monitoring of the concessionaire's compliance with the contract.
- *Implementation of a standardized small power purchase agreement (SPPA) and tariff, derived from (i) published purchase prices not to exceed the utility's avoided cost, and (ii) standard and efficient small power market, are central to the realization of a sustainable and efficient small power market.* Indonesia second Rural Electrification Project; Ln 3845-IND). The contract will clearly establish the obligations of the concessionaire (in particular the obligation to connect a customer upon request) and the tariff to be paid by the customer for the electricity service. The concession contract will also establish the amount of the initial subsidy to be granted to the customer and the procedure (including required certification of installation) to be followed by the concessionaire to claim it from the corresponding PG.
- *Rigorous economic and financial analysis of rural electrification projects and an increased attention to cost recovery are key to successful project implementation* (OED Report #13291, Rural electrification in Asia: A review of Bank experience, June 1994). Economic and financial analyses are required for each proposed concession.
- *Demonstration of commercial renewable energy technologies can remove information barriers and facilitate widespread replication.* The windfarm component of the India renewable resources development project (Loan 3533-IN/Cr 2449-IN). (mid-term evaluation report, November 1995). Use of SHS at the scale proposed for Argentina will generate substantial operational experience and ease replication of the concession-approach in other parts of the world. The two wind home systems (WHS) pilot components aim to demonstrate that given adequate wind resources individual WHS can be as cost effective as SHS.
- *Government incentives, including taxes, duties, and subsidies, must be consistent with national and sectoral objectives for maximum long-term impact* (Mid-Term Evaluation Report of the India renewable resources development Project, November 1995). At present, import duties do not discriminate against RES; discussions are under way to explore the possibility of gradually reducing duties to favor RES technologies.

11. Indications of borrower commitment and ownership:

National government: The GOA, through the Secretariat of Energy and Ports (SEP), has prepared a national program (PAEPRA) to promote the use of renewable energy in rural market. The GOA has requested and is now utilizing a GEF PDF grant (US\$115,000) to supplement its resources for preparatory studies. With its own funds, SEP organized a project coordinating unit staffed with four professionals that have been carrying out a variety of technical, economic and resources availability studies. This unit is also providing technical support to the provincial government and provincial regulatory agencies for preparing bidding documents and additional market demand studies. GOA has also enlisted the help of external experts from the US National Renewable Energy Laboratory (NREL). The Argentina concession approach to the delivery of renewable energy services has been presented by GOA in various international fora and is now recognized as sound. The Argentine GEF focal point, located at the Ministry of External Affairs, has endorsed the request for GEF support for the proposed project. (see Annex 3).

Provincial governments: The PGs have shown strong interest in participating in the proposed project. A letter of agreement will be signed by the PGs accepting the condition to participate in the project. The provinces of Jujuy and Salta have signed concession contracts with private investors to supply energy to rural dispersed areas using RES.

Private Sector: Strong interest in the project has been expressed by various potential foreign and local private investors. A workshop will be carried out before appraisal, with the assistance of private investors, provincial power regulators, and NGOs to publicize the project, obtain technical and other inputs to project design from various stakeholders and assess concerns to prospective investors.

12. Value added of Bank and GEF support:

Bank and GEF participation in the project will complement GOA's own resources and expertise and ensure the design of a sustainable delivery mechanism for renewable energy services that is innovative and has potential for replication in other countries. The only large-scale commercial SHS project so far is the Bank/GEF project in Indonesia, which focuses on development of a private SHS dealer industry (installation, maintenance, customer relations) as the mechanism for disseminating SHS technologies. The GOA has indicated that its desire for Bank/GEF involvement is due not only to the financial resources to be provided but, equally important, to the Bank's expertise and experience that are vital to pioneering projects of this type. Finally, the Bank's involvement ensures that the renewable energy project is designed and implemented within the framework of the reformed electricity sector. GEF involvement will permit more rapid implementation and penetration of renewable energy technologies than would normally be the case, including broader provincial coverage, and more intensive monitoring and evaluation of the project, which is appropriate for innovative project of this nature.

Block 3: Project Preparation

13. Has a project preparation plan been agreed with the borrower (see Annex 2 to this form) Yes Date Submitted: 7/15/97 No Date Expected: MM/DD/YY

A project preparation plan was agreed with the SEP (Annex 2)

14. Has borrower drafted a project implementation plan (See Attachment for suggested content) Yes Date Submitted: MM/DD/YY No Date Expected: 1/16/98

Main project components have been agreed upon with the SEP and a preliminary project implementation plan is under discussion with the SEP. The final plan will be reviewed during the appraisal mission

15. Advice/consultation outside country department Within the Bank: ENVGC; ESMAP Other development agencies:

The expert from the STAP roster concluded that the project:

- a) is consistent with GEF goals;
- b) is innovative and a good model for replication;
- c) proposes appropriate technical solutions/approach; and
- d) is based on a financing plan that distributes costs appropriately across project stakeholders.

The expert made a number of specific recommendations for further study and analysis prior to approval. The project team plans to address these during final preparation and appraisal. The incremental cost annex attached has been revised to address the expert's comments in this area, and will be further reviewed prior to appraisal. The STAP experts comments are attached as Annex 4.

16. Issues Requiring Special Attention

a. Economic

(list issues below, e.g., fiscal impact, pricing distortions, etc.) To be defined None

There are three main economic issues: (i) the uncertainty about the actual size of the dispersed market in rural areas, and the willingness and capacity to pay of the potential customers; (ii) the economy of scale (price reduction due to bulk purchase) of RES (mainly photovoltaics) in Argentina; and (iii) the return on investment expected by the private investors over an extended period of time.

The first issue is being addressed by carrying out in depth field studies in the rural areas of the potential participating provinces.

The second issue is being addressed by requesting detailed indicative quotation from potential international and national suppliers of RESs. The SEP, upon request of the Bank, expects to have results on these issues before project appraisal.

The third issue will be addressed by simulating the operation of a model concession company. A reasonably high discount rate (one no less than the interest rate in the capital market plus a margin for the risk perceived by the concessionaire for the investment in the project) would be applied to the model and would allow to determine the service tariff that could attract private investors (ceiling tariff). The concession would be granted in an international competitive bidding to the investor proposing the lowest tariff below the ceiling tariff.

Economic evaluation methodology: Cost benefit Cost effectiveness Other [specify]

Economic analysis will follow Bank guidelines (Bank OP 10.04). The GEF grant will be counted as the global environmental benefit while local benefits will be approximated by households willingness-to-pay for SHS. The GEF grant size was calculated as the "incremental cost" necessary to make the current economic costs of the renewable energy technologies equal to the conventional alternatives. This results in a near zero net present value (NPV). GEF support is required to make this project economically feasible. Since conservative assumptions were used in the economic analysis, the risk of the NPV falling below the above value is considered low. The ERR is estimated at about 14 percent.

In the case of the mini-hydro and diesel components, the economic benefits were based on the avoided expenditures in kerosene lighting and battery use. Because data is insufficient to calculate the benefits derived from higher light and communication quality, they were not included in the analyses. In future projects, these benefits may be quantified, through the experience gained in this and other projects currently in execution (Sri Lanka Energy Service Delivery Project and Indonesia SHS projects). The rate of return of each project component and their sensitivity to changes in volume of the market, renewable system costs, and project benefits will be analyzed at the time of project appraisal.

The project will have a positive impact on the GOA's fiscal balance by generating revenues from taxes on concessionaire's investments and operations; reducing government investment in rural electrification; and by establishing a framework leading to full cost recovery in the longer term without subsidies.

b. Financial

(list issues below, e.g., cost recovery, tariff policies, financial controls and accountability, etc.) To be defined None

Tariff level and structure, and subsidy to customers. Although the final tariff design still needs to be developed jointly with GOA at appraisal stage, there is agreement on the basic principle that the tariff must minimize government subsidies but ensure a fair return for investments by the concessionaire. The high initial investment cost of RES and low payment capacity of the dispersed rural population prevent full recovery of cost of service from all classes of customers. Consequently, a subsidy from the FEDEI and FCT will be provided to the lowest level income rural customers (approximately 30 per cent of the population) such that their tariff covers only the recurring costs of service (replacement and maintenance). This is equivalent to the lifeline tariff currently provided to the poorest urban customers. Customers of income levels above this class will be charged a monthly service tariff that

permits recovery of capital, replacement and operating and maintenance costs and a reasonable profit margin to the concessionaire. The GEF grant, intended to offset incremental costs to households of shifting from traditional fuels to the new technology, will be provided to users of the 50W and 100W that are not enjoying lifeline tariffs. The initial GEF grants will be approximately US\$125 for the 50W system and US\$85 for the 100W system. These grants are expected to gradually decline because as the customer base expands, economies of scale and a proportional reduction of O&M costs will be achieved. This will lead to a zero grant beginning the year 2003. The grants will be used to buy down the high first cost of SHS to this market segment and create an initial consumer base. Users of higher end systems (150W and up) will not get GEF grants since their shift to PV has negligible or negative incremental costs. Depending on income levels and initial costs of equipment, the connection fees of certain classes of customers may also be subsidized with FEDEI funds. All customers will be asked to pay a downpayments, in the form of a connection fee, to ensure commitment. Therefore, except for the lowest income class of customers that are provided lifeline tariffs, the rest of the population are expected to eventually pay the full cost of service, with only short-term assistance provided to stimulate the creation of a critical mass of paying consumers. The public service centers, such as schools, health clinics and police stations, will be a guaranteed paying market and serves to partly offset the higher risks faced by the concessionaires in servicing nonsubsidized households. A financial model is being developed for an efficient concession company. The model will be used at project appraisal to estimate the financial rate of return and other standard financial indicators of an efficient concession company.

c. Technical

(list issues below, e.g., appropriate technology, costing, etc.)

To be defined

None

The renewable energy technology supported by the proposed project is technically sound and demonstrated worldwide. Technical viability is further supported by Argentina's prior experience in some provinces with mini-hydro, hybrid solar/wind systems, and SHS.

d. Institutional

(list issues below, e.g., project management, M&E capacity, administrative regulations, etc.)

To be defined

None

The PCU located at the SEP will be in charge of the general project implementation and capacity building activities. The PRA will be in charge of the bidding process and monitor and supervise project implementation by the concessionaires. The PCU will provide the technical support required by the PRA. It is considered that this arrangement is appropriate for the project and would provide an adequate balance of flexibility and accountability. The detailed project management and implementation structure will be reviewed and agreed upon during project appraisal.

e. Social

(list issues below, e.g., gender, protection of indigenous and other vulnerable groups, etc.)

To be defined

None

Project preparation included extensive consultation with public and private sector. The proposed project would have a positive social impact by providing initial electrification services to about 149,000 rural households currently without access to electricity service. Women and children are expected to benefit the most from these rural services. The improved lighting will allow time to undertake additional income generating activities. Women also note that better lighting enables them to respond more quickly to infant needs at night. Children benefit from the additional time to study. Television and radio access will be improved for the entire family.

f. Resettlement

(list issues below, e.g., resettlement planning, compensation payments.)

To be defined

None

No resettlement is envisioned because the project does not involve land acquisition.

g. Environmental

i. Environmental issues:

Major:

To be defined

None

ii. Environmental category:

A

B

C

iii. Justification/Rationale for category rating: The proposed project would yield net positive environmental effects. No major or significant impacts are expected from small (lower or equal to 3-10 kW) photovoltaic, small wind turbine and micro hydro plants. The concession contract and the certification and installation standards will include environmental rules to be followed by the concessionaire.

iv. Status of Category A

EA start-up date:

assessment:

Date of first EA draft:

Current status:

v. Proposed actions:

vi. Status of any other environmental studies: The following studies are under way: An environmental/economic evaluation of existing energy renewable sources in the country, comparison of electricity supply with renewable and conventional sources in rural areas, and estimates of global environmental benefits

vii. Local groups and NGOs consulted: (List names):

viii. Borrower permission to release EA: Yes No

ix. Other remarks:

h. Participatory Approach

Preparation

Implementation

Operation

Beneficiaries/community groups

Consumers, private investors (CON)

Customers, private investors (IS)

Concessionaire (COL)

Intermediary NGOs
Academic institutions

Local government

SEP, Ministry of Education, Regulatory Agency of Jujuy and Salta, National Regulatory Agency (COL)

PRA, SEP (COL)

PRA, SEP (COL)

Other donors

NREL, World Business (planned) (COL)

Other

[Note: Information sharing (IS); consultation (CON); and collaboration (COL).]

i. Sustainability

Due to the manner by which the financing of individual systems is structured (a mix of GEF grant funding for incremental costs, GOA lifeline tariffs/connection fee assistance, and consumer payments), full cost recovery is assured for those customers who sign up for services during the project period. In other words, the sustainability of systems installed with project support is assured for the 15 year concession contract period.

Beyond the project life, it is expected that new customers could be signed up, even in the absence of the GEF grant, because expansion of the consumer base during the project life and achievement of economies of scale would have reduced operational costs by at least the amount of the initial GEF assistance.

j . Critical Risks (see fourth column of Annex 1):

	<u>Risk</u>	<u>Risk Rating</u>	<u>Risk Minimization Measure</u>
Project outputs to development objectives	<ul style="list-style-type: none"> Rural Market for renewable energy systems (RES) does not materialize Transfer of rural electricity service to the private sector is not accomplished. 	M	<ul style="list-style-type: none"> Program to promote among the rural population the electricity service based on RES. Detailed market studies and willingness to pay Program to promote interest of private investors in serving rural population with electricity based on RES. Creation of a database. Technical assistance to the PG to create/enhance their legal and regulatory framework.
	<ul style="list-style-type: none"> PG unable to perform regulatory function. 	L	
Project Components to outputs	<ul style="list-style-type: none"> Concessionaire fail to provide electricity service based on RES. 	M	<ul style="list-style-type: none"> Bidding documents to award concessions based on ICBs will be comprehensive and very detailed on the potential market, the maximum allowable tariffs, the subsidies available to customers, the standards to be met by the service installations, and will include a draft of the standard concession contract. The Bank will review the tariff schedules prior to enforcement of the concession contract by the PRA. Set up standards and certification system for equipment and installers. Training program for staff of the PRAs, and close Bank supervision. Customers will be shifted to individual SHS supply. Adequate selection of the manager and project staff of the PCU.
	<ul style="list-style-type: none"> Service tariffs are politically distorted. 	M	
	<ul style="list-style-type: none"> Technical problems with installed equipment. 	L	
	<ul style="list-style-type: none"> PRA are unable to carry out their functions. 	M	
	<ul style="list-style-type: none"> Community minihydro and diesel sites found not feasible. 	L	
	<ul style="list-style-type: none"> Unsatisfactory institutional arrangement and managerial capability of the PCU and PRA. 	M	
Overall Risk Rating		M	

k. Possible Controversial Aspects

At this stage, no controversial aspects are foreseen.

Block 4: Conditionality Framework

17. [Identify the critical policy and institutional reforms sought, and where appropriate, the likely areas of conditionality.] To be defined

It is expected that any conditionality would be project-related.

Conditions of appraisal

- a) Signing of participating agreement, satisfactory to the Bank, between the SEP and the eligible PG;
- b) final report of the study financed by GEF;
- c) market and willingness to pay studies to be carried out in the dispersed rural market of five selected Pgs;
- d) report on the actions taken for gradually reduce custom duties on RES;
- e) a report presenting the economic, financial, and technical analysis for the potential installations of wind, hybrid (wind/or solar/diesel) to be installed during the first two years of project implementation; and
- f) Terms of reference of the technical assistance for the GOA and the PGs.

Condition of negotiations

- a) final draft of a model concession contract. The main characteristics and parameters of the concession contract will define: market structure, duration and renewal of the concession, maximum tariff level and structure, conditions to provide service to public agencies and individual customers, compliance with environmental rules and standards for RES performance, and remedies in case of breach of contract or non-compliance with the schedule to provide service
- b) signing of a project implementation agreement, acceptable to the Bank, between the SEP and the eligible PG, establishing the support to be given by the SEP, and the conditions: (i) for Bank loan and GEF grant disbursement; and (ii) to be complied with by the PG for implementing, supervising, and monitoring the project

Block 5: Checklist of Bank Policies

18. This project involves (check applicable items):

- | | |
|--|--|
| <input type="checkbox"/> Indigenous peoples | <input type="checkbox"/> Riparian water rights |
| <input type="checkbox"/> Cultural property | <input type="checkbox"/> Financial management |
| <input type="checkbox"/> Significant environmental impacts | <input type="checkbox"/> Financing of recurrent costs |
| <input type="checkbox"/> Natural habitats | <input type="checkbox"/> Local cost sharing |
| <input type="checkbox"/> Gender issues | <input type="checkbox"/> Cost-sharing above country three-year average |
| <input type="checkbox"/> Involuntary resettlement | <input type="checkbox"/> Retroactive financing above normal limit |
| <input checked="" type="checkbox"/> Significant consultation | <input type="checkbox"/> Disputed territory |
| <input type="checkbox"/> Significant participation | <input type="checkbox"/> Other |

19. Describe issue(s) involved:

[signature]
Task Manager:

[signature]
Country Manager:

Annex 1

Project Design Summary

Narrative Summary	Key Performance Indicators ¹	Monitoring and Supervision	Critical Assumptions and Risks
<p>CAS Objective</p> <ol style="list-style-type: none"> Support development of regulatory framework Promote private sector investment in power Promote sustainable management of natural resources <p>GEF Objective</p> <ol style="list-style-type: none"> Promote environmentally sound energy resource development in Argentina Remove market barriers to application, implementation, and dissemination of RES Reduce GHG emissions 	<ul style="list-style-type: none"> All national power utilities are already privatized in 1997 10 provincial power utilities are already privatized in 1997 15 provincial power utilities will be privatized by 2002 CO2 avoided 	<ul style="list-style-type: none"> Bank-GOA dialog on power sector policy will continue focused on private sector participation and regulatory framework By end-1997, a Seminar for private investors on RES 	<ul style="list-style-type: none"> GOA and PGs will maintain their commitment to power sector reform, and power services provision by private investors (specifically, for using RES in this project) Barriers to the application of RES in Argentina could be removed with support by the international community, particularly the GEF
<p>Project Development Objectives</p> <ol style="list-style-type: none"> Consolidate the reform of power sector Provision by private sector of off-grid energy services using environmentally sustainable renewable energy systems Strengthen the provincial regulatory function 	<ul style="list-style-type: none"> In 1996, Jujuy and Salta have concession contracts to provide electricity service using RES in the rural market By end-1999, at least six concession contracts for RES in the rural market By end-2002, at least 15 concession contracts for RES in the rural market In 2000, the consolidation of the power sector reform is completed In 1999, 8 PRA provinces are expected to include regulations on RES In 2002, 15 PRA are expected to include regulation on RES 	<ul style="list-style-type: none"> Quarterly project progress report submitted by the SEP Project mid-term review by year 1999 Implementation Completion Report (ICR by year 2002) 	<ul style="list-style-type: none"> Rural market for RES will materialize Private sector will be interested in concession contracts for RES in rural areas PGs perform regulatory functions on RES Political commitment by the GOA and Pgs.
<p>Project Outputs</p> <ol style="list-style-type: none"> Concession contracts for providing electricity services Installation and operation of RES PRA's regulatory function improved Barriers for a sustainable market of RES removed 	<ul style="list-style-type: none"> In 1998, standard concession contract By 2000, installation in rural areas of about 6 MW of SHS and two pilot WHS By 2000, connection to RES of about 43,000 households and 2,000 public agencies By 1999, training courses and seminars on RES would have been given to the staff of PRA and SEP Standards and certification procedures for RES issued By 2002, installation of a total of about 14 MW in RES By 2002, the training program would be completed By 2002, connection of about 116,000 households and 4,400 public agencies By 2002, pilot individual WHS successfully proven 	<ul style="list-style-type: none"> Bank supervision reports Quarterly progress report by SEP PRA annual reports Concessionaire annual reports Mid-term review Number of RES installed broken down in SHS, mini-hydro, eolic Tariff schedules Records on events of the training program Records on events of the RES promotion program 	<ul style="list-style-type: none"> Rural Market for RES materialize Concessionaires provide electricity service based on RES in rural areas PGs perform regulatory functions
<p>Project Components</p> <ol style="list-style-type: none"> Installation and operation of RES Installation and operation of RES in agglomerated villages: Pilot Wind Home System sub-project Capacity Building Program 	<p>Inputs of IBRD and GEF funds according to schedule</p> <ol style="list-style-type: none"> By the end of 1999 20% of Bank loan and GEF grant committed, and 15% disbursed By the end of 2000, 60% of Bank Loan and GEF grant committed and 40% disbursed By the end 2001, 90% of Bank loan and GEF grant committed and 70% disbursed 	<ul style="list-style-type: none"> Bank supervision reports Quarterly project progress report by SEP Procurement and disbursement records PRA annual reports Concessionaires annual reports Project mid-term review 	<ul style="list-style-type: none"> Concessionaire provide electricity service based on RES Service tariffs are politically distorted Technical problems with installed equipment PRA unable to regulate RES operations Community minihydro & diesel sites found not feasible Unsatisfactory institutional arrangement and managerial capability of the PCU

¹ Baseline and targeted values should be shown, with the latter divided into values expected at mid-term, end of project and full impact.

Incremental Costs and Benefits

Broad Development Goals and Baseline

Energy policy goals and rural electricity

The goals and policies of the Government of Argentina (GOA) for the development of the energy sector are: to continue the expansion of private sector participation in the power business, to diversify the use of primary energy resources, to minimize negative impacts of energy use on the environment and the society, and to make energy services available to the population at large. To reach these goals, the GOA is making every effort to consolidate the power sector reform in the country by: (i) strengthening the power sector regulatory framework and institutions in the provinces; (ii) promoting more private investment in the sector; and (iii) making rural electrification and deployment of renewable energy systems a key and integral part of its rural development strategy. The GOA's basic strategy to promote electrification of dispersed areas consists of: a) support for electrification of public service centers that provide important communal benefits; b) extension of its existing lifeline tariff policy in the urban sector to the lowest income households in dispersed areas; c) policy and institutional support to create an environment where the private sector can take the lead role through the concession system in providing electricity services to all other households in these areas.

The Baseline Situation

Private concession system

The GOA's intended program for electrification of dispersed areas is one where private concessionaires are expected to:

- Continue the provision of electricity services to public service centers and agglomerated communities already electrified with diesel and other systems. The higher cost of doing so (compared to concentrated markets) will be offset with subsidies.
- Provide new electricity supplies and services to designated public service centers and agglomerated communities that are not currently electrified. The public service centers will be subsidized. Subsidy to households in agglomerated communities will depend on income level.
- Provide basic electricity supply and services to dispersed individual households. The poorest segment of the market will be entitled to subsidies. The GOA considers this as equivalent to the provision of lifeline tariffs to low income households in the grid markets.

- In general, all other not electrified private consumers would be provided basic electricity supply and service at their cost.

In the absence of specific measures to remove barriers to renewables utilization, it is expected that the mix of supply technologies would be weighted toward grid extension, diesel minigrid and stand-alone diesels. Low load densities would render isolated areas uneconomic or financially unviable to serve with conventional options, leading to a continued dependence on low quality traditional energy forms.

Market barriers to renewables

The three main barriers are:

- a) insufficient information for prospective private investors to compete for investment in a concession system based on renewable energy. These include information on market size and characteristics, the costs of operation and maintenance of systems in dispersed and difficult terrain, adequacy of the proposed tariffs, potential difficulty in tariff collection, etc.
- b) need for substantial investment resources at the front end, due to the high capital cost/low recurring cost nature of renewable energy investments. These capital resources are at risk from the potential for consumer default or termination of service and these risks are partially mitigated through the consumer connection fee.
- c) market reception of a relatively new technology : will clients accept it ? or, will clients be able and willing to pay for the system or service ? (In surveys, for example, many not electrified rural people in Argentina express a preference for AC service or are not interested in SHS, thinking it will reduce their chances of being selected for grid-connection in the future). The reasons on the consumer side include inadequate information on the benefits of the new technologies and high first costs.

In the concession system, the concessionaire acts like a utility or an Energy System Company (ESCO), providing service rather than selling equipment. However, it can be shown that the cost barrier is similar to both situations. One can consider the provision of a SHS service to a household in the Argentina case as equivalent to selling the system. The concession period is 15 years, roughly equal to the nominal life of a SHS (mainly the panel). The connection fee may be thought of as the downpayment while the monthly tariff can be considered as equivalent to the monthly amortization of the system (including component replacement costs) plus Operation and Maintenance (O&M) payments. For example, a 50W SHS with installed cost of \$700, may require a \$70 connection fee (10% downpayment) and a monthly tariff of \$14 over 15 years at 14% interest. This tariff is equal to the amortization (unsubsidized) of the equipment of \$8 per month and a payment for recurring costs (replacements, O&M) of \$6 per month.

The point is that the concessionaire in this case is faced with the same risks of consumer acceptance as in the case of a straight sale hire-purchase. The consumer may not be buying equipment but he must still make a decision whether the first cost of \$70 and the monthly payments of \$14 are acceptable to him. This decision will depend, among others, on the level of his monthly income and his present energy expenditures.

Global Environmental Objective

Barrier removal strategy

Lack of information on market characteristics, real costs of operation and others will be addressed by carrying out a number of market profile and demand studies and detailed analysis of typical cash flows in a concession in each of the provinces, and disseminating it among private investors. GEF grant financing for these studies, as well as the training of provincial regulators in the regulation of renewable operations, will be sought. It is understood that only incremental costs, i.e. costs over and above those required for conventional fuel-based concession systems, could be requested.

The front-end barrier will be addressed by:(a) the IBRD loan and GOA counterpart funding; and (b) financing the incremental cost of the renewable energy systems with the GEF for a limited time until unit costs decline with increased market volume..

The risks related to consumer acceptance will be addressed by combination of: (a) promotion and demonstration programs to educate rural area dwellers on the benefits of the new technologies; and (b) judicious application of GEF grants and GOA subsidy funds to reduce the high first costs to consumers of the new technologies; and (c) judicious application of GOA subsidy to consumers to meeting the high recurrent maintenance costs of systems in dispersed areas, particularly in the early years when the consumer base is still small.

Global Environmental Benefits

The GEF alternative will lead to the abatement of about 1.8 million tons of CO₂. The cost of the CO₂ abatement by applying the GEF grant would be less than \$9/ton². These calculations by SEP will be refined during project appraisal.

GEF Alternative

Main characteristics

The project agreed upon with GOA is a situation where, to the extent feasible, environmentally benign renewable energy technologies such as solar home systems (SHS) and centralized wind or wind/diesel/PV hybrids are chosen instead of fossil fuel-based

² Based on about 10 kg of CO₂ is abated for every kWh of PV electricity when substituting for kerosene lighting (See DeLucia 1994). Assume 4 hr. use every night.

technologies to supply electricity to the household and public service centers within each dispersed area concession. The purpose is not merely to substitute renewable for carbon-emitting systems but to do so in manner that will contribute to the accelerated development of the market for renewables, both in Argentina and globally.

Although there have been many instances worldwide of commercial or semi-commercial deployment of SHS, all involve relatively small numbers of installations. The World Bank project in Indonesia is the largest so far and targets 200,000 homes. The delivery mechanism chosen in that case is through individual private dealers, competing to make sales in an “open market” system. The option contemplated in Argentina, where unelectrified rural households are estimated to be nearly 350,000, is the “exclusive market” approach, where private companies compete to obtain rights to serve a whole area (e.g., a whole province). The concession is essentially an ESCO with exclusive rights to a market area. While concession operation in each province is monopolistic, competition will be fostered at the bidding stage. Furthermore, since different companies will be operating separate concessions in the different provinces, there will effectively be competition in performance. There are several potential advantages to the concession approach:

- a) provides market of sufficient critical mass for business
- b) attracts larger, better organized private companies with own sources of financing or lead to the creation of such companies in the country
- c) easier administration and regulation (one large operator instead of many small ones to monitor)
- d) better chances of covering a large number of customers in a few years, and
- e) good potential for reducing unit costs of equipment (through volume discounts), transactions (selling, collection, etc.), operation and maintenance (one vehicle serving 200 customers instead of 20), and spreading the fixed administrative cost over a large number of customers.

The concession system is not the only effective approach to large-scale commercial deployment of renewable. The approach being implemented in Indonesia and Sri Lanka through competitive operations by individual SHS dealers has many advantages as well, given the situation in these two countries. As more international experience in these different delivery models is obtained in the coming years, it is anticipated that not one but several models will be found effective depending on the particular country context

The success of the concession system in Argentina and its replication in other countries can accelerate bulk purchases of PV systems in the world market, effect more rapid deployment of SHS in rural areas, lead to a reduction in PV costs per peak watt globally and, of course, mitigate more quantities of GHG. GEF support of the Argentina project is therefore not simply for Argentina’s benefit. A concession approach patterned after Argentina’s is already being seriously considered by the Brazilian Government for a proposed World Bank project to provide SHS to dispersed areas in three states in the Northeast: Bahia, Ceara and Minas Gerais.

Sustainability

At the end of 5 years, it is expected that cost reductions in operations and maintenance achieved through substantial expansion of the consumer base will obviate the need for the GEF grants. Through GIS data and information on O&M costs in the Jujuy and Salta concessions, SEP has calculated that reducing the number of kilometers per consumer serviced per month will reduce O&M costs per unit from \$4.96 to \$3.71 per month or an NPV of about \$56 per unit, as the number of customers increase from 100 to 350 for each maintenance team³. Considering other possibilities for cost reductions (such as global drop in PV prices in the next 5 years), it is not unreasonable to expect that the GEF grants can be lifted after 5 years without impacting program sustainability. Finally, it must be noted that the GEF grant level proposed is only about 10% of the system costs, well within the profit margin of the concessionaire and existing tax levels.

Scope of the Analysis

The scope of the analysis is essentially national as it includes the national government, the participating provinces/government, bidders/concessionaires and the consumers.

Costs

Baseline costs

Based on GOA socioeconomic surveys of the dispersed areas in four provinces, the not electrified households belong to essentially four levels of energy expenditures:

Income Type	Income/month	Percent of Households	Energy Expenditures/month
I	Less than \$150	19%	\$10.06
II.	\$150 to \$250	40%	\$14.94
III.	\$250 to \$400	27%	\$24.95
IV.	Greater than \$400	14%	\$38.12

* Energy expenditures are for kerosene, candles, dry cells and battery charging. These values are leveled monthly expenses, including replacement costs.

Current energy expenditures are the best indicator of capability and willingness to pay, and it is believed that the consumers cannot afford monthly payments higher than their current energy expenditures, regardless of the technology and institutional arrangements used to supply them. In the particular case of Type-I income consumers, their monthly energy expenditures are roughly similar to the lifeline tariff provided to urban markets and, consequently the GOA will subsidize them as long as they fit in this category.

³ The simulation was carried out for the province of Santiago del Estero, with 40,000 potential users. The users are assumed to be dispersed uniformly over the province. The scenario starts with one O& M team situated in the Capital and ends in five years with several branches established. The calculations will be refined during project appraisal.

Type II households use Petromax, wick lamps and some candles for lighting plus dry cells for powering simple radios. There is little or no car battery charging. Considering normal life of these appliances, typical costs in the rural areas and surveyed hours of usage, the net present value of their energy expenditures during 15 years is estimated at \$1,245. It includes equipment replacements over time.

A Type III household, on the other hand, uses Petromax or LPG lantern, as well as wick lamps for lighting. For powering radios and black and white TV sets, the household uses a car battery charged at a central station about twice a month, as well as some dry cells. The net present value of their energy expenses during 15 years is estimated at \$2,070.

For the Technical Assistance component, the baseline costs have been taken as the higher of: (a) estimated costs for the same elements within a standard private sector concession program without the renewable energy emphasis, or (b) already programmed GOA administrative budget support.

GEF alternative cost

GOA wants the concessionaire to provide SHS services in the levels of 50W, 100W, 150W and up to 400W. Based on the customer income profile, while other groups require at least 50W systems. The Table below shows some estimates of economic costs for 50 and 100W SHS system for which GEF assistance will be sought. The costs are broken down in installation cost, net present value costs of O&M and replacement, and the levelized monthly payment required to recover them.

SHS size	Installation (\$)	O&M (\$)	Replacement (\$)	Total (\$)	Payment (\$/month)
50W	733	306	331	1,370	16.44
100W	1,247	306	602	2,155	25.87

Discount rate: 12 percent
Term: 15 years

Incremental costs

The different dispersed area market segments will have different incremental costs:

Public service centers: electrification of this segment is by edict, not by consumer choice. GOA is the customer. Therefore, even if PV or other renewable are chosen as the electricity supply, it does not qualify as a direct market development activity. (Nevertheless, it must be noted that the additional requirement for PV hardware in such centers contributes to the size of the PV business and therefore its attractiveness to the private sector). *No GEF assistance is contemplated for this segment.*

Agglomerated markets, regardless of households income level. In cases where existing or new diesel generators would be the least cost supply option *no GEF assistance is contemplated..*

Dispersed lowest income households (Type-I income level): these are customers with less than \$150 per month income and fuel expenditures (kerosene, candles, dry cells) of less than \$7 per month. GOA wants this segment of the population to be provided with electricity for basic lighting, radio, etc. The system to be provided is 50W. GOA is prepared to subsidize this segment to the extent similar households in the grid-connected markets are being provided lifeline tariffs. *No GEF assistance is contemplated for these consumers.*

Dispersed low income households (Type-II and Type-III income level): it is estimated that households in this market segment may be able to afford 50W to 100W systems, provided the connection fee is low and the tariff required for full cost recovery is spread over the concession period (15 years). The GOA expects the concessionaire to exert full efforts to “sign up” this market but is not willing to subsidize the consumer to the same extent as the lowest income group. The baseline for this market segment is the existing situation where the households obtain energy for basic lighting and entertainment by the use of kerosene, dry cells and battery charging. Because the life-cycle cost of this case is at present lower than the alternative of using 50-100W renewable systems, *GEF assistance will be sought to finance the incremental cost of the hardware and the promotional and market definition activities*

Other dispersed households (Type-IV income level). Preliminary analysis indicate that this group —households already doing heavy battery charging—will even reduce their life-cycle costs by switching to individual SHS (negative incremental costs). This is a present-day “win-win” situation that nevertheless needs intervention to break market barriers at the consumer level.. *GEF assistance will be sought to finance the promotional and market definition activities only*

Investment component

Type I households (lowest income level at less than \$150 per month) will be subsidized significantly by GOA and therefore are not considered. Type IV households are also not considered because their incremental costs are estimated to be negligible or negative. Type II households earning between \$150 and \$250 per month, have energy use patterns considered suitable for the 50W SHS. Type III households, earning between \$250 and \$450 per month, are considered suitable for 100W SHS. Thus, the incremental cost estimates match these two income types with SHS capacity accordingly.

The present value incremental costs between SHS usage and baseline energy expenditures usage have been estimated by SEP as indicated in the Table below:

User Income Type	SHS Size	Incremental Cost
------------------	----------	------------------

I	50W	-
II	50W	\$125
III	100W	\$85
IV	150W and up	negative

GEF grant assistance to the 50W and 100W systems will effectively bring the SHS costs to roughly the level of current energy expenditures of the target consumer segments and stimulate the creation of an initial consumer base. It is expected that the households will choose SHS sizes in rough relation to their income levels and energy needs.

During the five-year project implementation, the GEF grant will be collected by the concessionaire upon proof of completion of an agreed number of installations. The GEF grant will be available only for installations made during the 5 year period of the Bank project, providing additional incentive for the concessionaire to complete as many installations as possible within 5 years.

The main real SHS market share comprising consumers Types II and III is as follows:

SHS Size	Estimated Market Over 5 Years	GEF Incremental Cost/Unit	Total GEF Grant* US\$million
50W	38,000	\$125	4.7
100W	43,000	\$85	3.6
		Total:	8.3

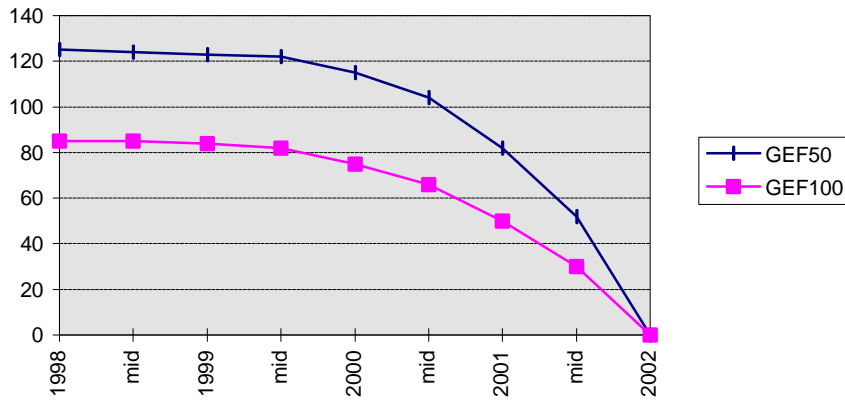
* excludes contingency costs; 1.0\$ = 1.0 US\$

The application of the GEF contribution will not necessarily be in the exact amounts estimated for each of the two SHS sizes. The optimal allocation will be determined during implementation based on a review of actual demand for each unit size by the different types of households.

Declining GEF Grant

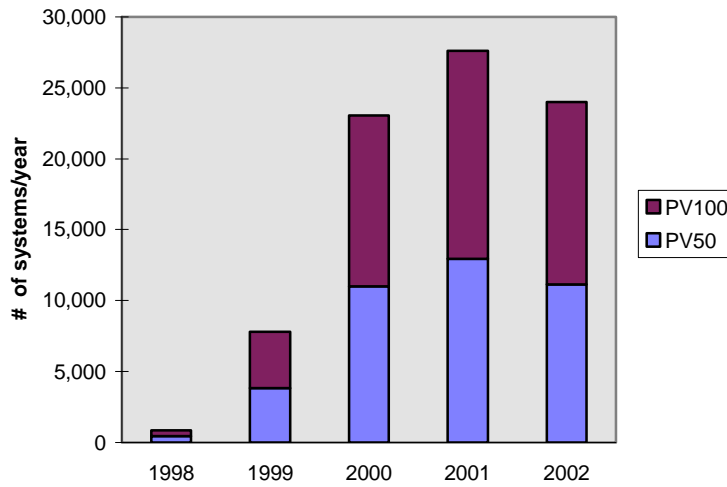
As the customer base expands, economies of scale in procurement and a proportional reduction of O & M costs are expected to enable a gradual lifting of the GEF grant per system without affecting final consumer costs, reaching zero subsidy at the beginning of year 2003. The rate of decline will vary from province to province, given different market potentials and different concessionaires. From an overall basis, the decline is expected to roughly follow the pattern shown below:

GEF Support per SHS Unit (\$/ System)



The installation of 50W and 100W units to Type II and Type III households is projected to be as shown below:

Projected Annual PV System Installations



Given the preceding assumptions, the estimated total GEF grants for the installations over the project life are:

SHS Size	Estimated Market Over 5 Years	Initial GEF Incremental Cost/Unit	Total GEF Grant* US\$million
50W	38,000	\$125	3.8
100W	43,000	\$85	2.7
		Total:	6.5

* excludes contingency costs; 1.0\$ = 1.0 US\$

Incremental Cost of Wind Home System Pilot Subproject

The pilot subproject hopes to test the cost-effectiveness of employing small wind turbines (about 300-600 watts each, rated at 12 m/sec windspeeds) rather than PV in windy areas. No significant-sized pilot activity of this kind has been done anywhere and the results will be of benefit to future projects internationally. It is planned to identify two communities of about 100 households each in dispersed areas with good wind regimes for the experiment. The estimated cost of the subproject is as follows:

<i>Cost Item</i>	<i>US\$</i>
Equipment & Installation	250,000
Project Design & Technical Supervision	200,000
Monitoring: Equipment, Analysis, etc	200,000
Total	650,000

Given the general intermittency of wind regimes, it is expected that each WHS installation will provide a level of service equivalent to a 50W SHS. The incremental cost items are the costs of project design, monitoring and technical analysis needed for the pilot activity. As these households would otherwise be candidates for SHS, the marginal cost of the design and monitoring services in the baseline would essentially be zero. Therefore, the total incremental cost of the WHS subproject is \$400,000.

Technical Assistance component

Several studies and activities will be carried out within the project to reduce information barriers at the concession and consumer levels, enhance the capability of provincial regulators to monitor the performance of concessionaires in the new technology areas, put in place standards and certification procedures for renewable energy equipment and installations, and to fine tune all aspects of project implementation. These activities have the ultimate objective of reducing or removing barriers to the sustainable marketing by the private sector of renewable energy technologies for rural electrification. The incremental cost of this component is estimated to be about US\$5.2 million, as detailed in the following Table:

<i>Activities</i>	<i>Total</i>	<i>Baseline</i>	<i>GEF</i>
Implementation Support Activities			
Support to Project Coordinating Unit (PCU)	3.05	1.75	1.30
Detailed Market Studies	0.60	0.10	0.50
Promotions/Public Education Programs	0.75	0.25	0.50
Improved Commercial Availability of PV Appliances	0.20	0.00	0.20
Feasibility Studies for Centralized Renewable	0.75	0.10	0.65
Improving Solar/Wind Resource Information	0.50	0.10	0.40
Capacity Building Programs			
Technical Support for Regulatory Reform	3.50	3.50	0.00
Strengthening of Provincial Regulators in Renewable	1.35	0.60	0.75
Workshops for Concessionaires	0.50	0.10	0.40
Standards and Certification System	0.50	0.00	0.50
Total (US\$ million)	11.70	6.50	5.20

Incremental Cost Matrix

	Costs	Domestic Benefits	Global Environmental Benefits
Baseline	\$1,245/50W household \$2,070/100W household	Lighting and other appliances <i>with</i> smoke and fumes	1.8 million ton of CO ₂ emissions
Alternative	\$1,370/50W SHS \$2,155/100W SHS	Lighting and other appliances <i>without</i> smoke and fumes	0 million tons CO ₂ emissions
Increment	\$125/50W SHS \$85/100W SHS \$14 million for 116,000 households	Elimination of smoke and fumes in households and public services of rural areas	Abatement of 1.8 million ton of CO ₂

Process of Agreement

The incremental cost parameters described herein have been derived by SEP on the basis of market studies and economic models developed in the course of project preparation. These parameters will be confirmed at project appraisal and formally agreed between the GOA and the Bank at negotiations.