

LAO PDR OFF-GRID RENEWABLE ENERGY ELECTRIFICATION PILOT DEMONSTRATION -- PROJECT SUMMARY

PROJECT IDENTIFIERS	
1. Project name: <i>Off-Grid Renewable Energy Electrification Pilot Demonstration, a subcomponent of the Laos Southern Provinces Rural Electrification (SPRE) Project</i>	2. GEF Implementing Agency: <i>World Bank</i>
3. Country or countries in which the project is being implemented: <i>Lao PDR</i>	4. Country eligibility: <i>Ratified FCCC on January 4, 1995</i>
5. GEF focal area(s): <i>Climate Change</i>	6. Operational program: <i>Promoting the Adoption of Renewable Energy by Removing Barriers and Reducing Implementation Costs (OP#6)</i>
7. Project linkage to national priorities, action plans, and programs: <i>As part of an effort to raise the electrification rate from 18% to 25% of the population through the SPRE Project, Electricité du Laos (EdL) plans to rely on "off-grid" power sources to serve portions of the more than 2 million people living in sparsely populated areas too distant to be connected to the national grid in the foreseeable future. Regional and international experience has demonstrated that diesel and micro-hydro powered mini-grids as well as solar powered battery charging stations should be part of the least cost rural electrification strategy. The proposed Off-grid Renewable Energy (RE) Electrification Pilot will provide initial operational experience to guide formulation of the RE elements of a rural electrification strategy, while the UNDP-implemented National Greenhouse Gas Inventory, funded by GEF, will provide key background data to the same.</i>	
8. GEF national operational focal point and date of country endorsement: <i>Letters from Bouathong Vonglokhom, President of State Planning Committee, and Thongpachan Sonnasinh, Director of the Department of International Economic Cooperation, Committee for Investment and Cooperation, dated 18 July and 30 July, 1997, respectively</i>	
GEF PROJECT OBJECTIVES AND ACTIVITIES	
9. GEF Project rationale and objectives: <i>General Objectives: to increase access to electricity in remote, rural areas of Laos, and to demonstrate that renewable energy technologies (micro-hydro mini-grids and solar battery charging) are viable off-grid electrification options to displace diesel power generation. Specific objectives are to:</i> <i>(i) establish local institutional, financial and technical capacity for sustainable implementation of off-grid RE power generation</i> <i>(ii) install RE demonstration systems</i> <i>(iii) demonstrate the potential to displace diesel generators with RE systems where possible thus reducing greenhouse gas (GHG) emissions, and</i> <i>(iv) develop the institutional arrangements and scope for a national off-grid rural electrification program incorporating RE technologies.</i>	Indicators: <i>An increase in access to electricity of Laos's remote rural population</i> <i>An increase in the percentage of off-grid electricity production from renewable sources</i> <i>(i) Increased staff and training in Electricité du Laos (EdL) and the private sector able to identify, assess and promote cost-effective, locally run off-grid RE power generation opportunities.</i> <i>(ii) Number of renewable energy installed and operational</i> <i>(iii) Application of a standard methodology for selecting optimum off-grid system (i.e. diesel vs. RE option)</i> <i>(iv) Incorporation of off-grid RE options in the national rural electrification plan</i>

<p>10. Project outcomes:</p> <p>(i) installation of pilot renewable energy systems</p> <p>(ii) integration of RE into the national rural electrification program</p> <p>(iii) improved capacity to promote, install and operate RE systems</p>	<p>Indicators:</p> <p>(i) installation and operation of 6 micro-hydro and 20 solar battery charging stations</p> <p>(ii) draft national rural electrification plan, incorporating off-grid RE technologies</p> <p>(iii) trained staff within EdL's Electrical Construction and Installation Unit, competent to plan and manage RE-based off-grid systems</p> <p>(iv) number of village electricity associations</p> <p>(v) number of lease-to-buy contracts signed with third party operators of battery-charging stations</p>														
<p>11. Project activities to achieve outcomes (cost in US\$ '000s):</p> <table border="0"> <tr> <td>Institutional Capacity Building</td><td>560</td></tr> <tr> <td>Micro-hydro Mini-Grid</td><td>426</td></tr> <tr> <td>Solar Battery Charging</td><td>542</td></tr> <tr> <td>Monitoring and Evaluation</td><td>70</td></tr> <tr> <td>TOTAL</td><td>1,598</td></tr> </table>	Institutional Capacity Building	560	Micro-hydro Mini-Grid	426	Solar Battery Charging	542	Monitoring and Evaluation	70	TOTAL	1,598	<p>Inputs:</p> <p>International and local technical assistance and consultants mobilized, RE systems procured and installed</p>				
Institutional Capacity Building	560														
Micro-hydro Mini-Grid	426														
Solar Battery Charging	542														
Monitoring and Evaluation	70														
TOTAL	1,598														
<p>12. Estimated budget (in US\$ '000s):</p> <table border="0"> <tr> <td>PDF:</td><td>0</td></tr> <tr> <td>GEF:</td><td>744</td></tr> <tr> <td>Co-financing:</td><td></td></tr> <tr> <td>Govt. of Laos/Local Beneficiaries</td><td>84</td></tr> <tr> <td>IDA</td><td>610</td></tr> <tr> <td>PHRD</td><td>160</td></tr> <tr> <td>TOTAL:</td><td>1,598</td></tr> </table>	PDF:	0	GEF:	744	Co-financing:		Govt. of Laos/Local Beneficiaries	84	IDA	610	PHRD	160	TOTAL:	1,598	
PDF:	0														
GEF:	744														
Co-financing:															
Govt. of Laos/Local Beneficiaries	84														
IDA	610														
PHRD	160														
TOTAL:	1,598														
<p>INFORMATION ON INSTITUTION SUBMITTING PROJECT BRIEF</p>															
<p>13. Information on project proposer:</p> <p><i>Electricité du Laos, the national electric power utility originally established to serve Vientiane Province, was given a national electrification mandate in 1991. At that time, EdL began integrating provincial and regional operations into a national grid. EdL is the beneficiary of two Bank-supported projects, the completed Southern Provinces Electrification (\$25.8 million) and the ongoing Provincial Grid Integration Project (\$36 million). Under the latter project, EdL is upgrading its accounting and auditing capabilities to maintain full compliance with Bank accounting and auditing requirements.</i></p>															
<p>14. Information on proposed executing agency (if different from above):</p>															
<p>15. Date of initial submission of project concept to GEF Implementing Agency:</p> <p>18 JULY, 1997 (date of request letter from State Planning Committee)</p>															
<p>INFORMATION TO BE COMPLETED BY IMPLEMENTING AGENCY:</p>															
<p>16. Project identification number: N/A</p>															
<p>17. Implementing Agency contact person:</p> <p>Veronique Bishop (202-473-1556 tel.) and Mac Cosgrove-Davies (202-473-3121 tel.)</p>															
<p>18. Project linkage to Implementing Agency program(s):</p> <p><i>The Bank has been supporting Laos's power sector through a Southern Provinces Electrification Project (closed) as well as through the ongoing US\$36 million IDA Provincial Grid Integration (PGI) credit. The PGI project includes provincial electrification, a system efficiency component, institutional development, and development of plans for future grid expansion. The SPRE Project, proposed for Bank support would finance: (a) the expansion of distribution networks in southern and central Laos; (b) an off-grid electrification pilot and national implementation plan; and (c) planning studies for future grid expansion. The proposed GEF support would cofinance the off-grid electrification component. The Bank is also supporting a study under an Energy Sector Management Assistance Program (ESMAP) grant to examine generic issues in expanding rural electrification into remote areas. The ESMAP study will prepare, in cooperation with the GoL, a coordinated rural electrification strategy incorporating central grid expansion as well as remote "off-grid" systems based on a least cost strategy for delivering the needed energy services.</i></p>															

PROJECT DESCRIPTION

Objectives and Rationale - The Off-Grid Renewable Energy Electrification Pilot of the proposed IDA Southern Provinces Rural Electrification (SPRE) Project is consistent with GEF Operational Program 6, *"Promoting the adoption of renewable energy by removing barriers and reducing implementation costs."* It seeks to increase access to electricity in remote, rural areas of Laos, and to demonstrate that renewable energy technologies (micro-hydro, and solar PV) are viable, and often preferable, off-grid electrification options that should be included in Laos's rural electrification program. Specific objectives of the RE elements of the Off-Grid Component are to: (i) establish local institutional, financial and technical capacity for sustainable implementation of rural renewable energy (RE) systems; (ii) install RE demonstration systems in rural areas; (iii) demonstrate the potential to displace diesel generators with RE systems when technically and financially possible, thus reducing greenhouse gas (GHG) emissions; and (iv) develop the institutional arrangements and scope for a national off-grid rural electrification program incorporating RE technologies.

Development of RE technologies is at an early stage in Laos. GEF resources are required to overcome barriers to RE technology adoption such as (i) lack of capacity to develop RE projects, (ii) reluctance of entrepreneurs to invest in RE projects with their high up-front start-up costs, (iii) lack of the necessary technical back-stopping, rural credit facilities and productive end-uses, (iv) inappropriate distribution and house wiring standards, and (v) unfamiliarity with participatory methods of assessing, planning, installing and operating off-grid electrification systems. The proposed GEF-supported pilot would complement the ongoing rural electrification policy and strategy preparation, which are underway with ESMAP funding.

Current Situation - By the year 2000 the Government of Laos (GoL) seeks to raise the electrification rate from the current 18% to 25% of the population. While there is an ongoing effort by Electricité du Laos (EdL) to serve an increasing portion of the population by extending the national grid out from the urban areas, most of the more than 2 million people living in sparsely populated areas are too distant to be viably connected to the national grid in the foreseeable future. Regional and international experience has demonstrated that diesel and micro-hydro powered mini-grids as well as solar powered battery charging stations should be part of the least cost rural electrification strategy.

Laos has four principal options for off-grid power generation: diesel, micro-hydropower, solar photovoltaics and wind. GEF support is requested to promote micro-hydropower and solar photovoltaics. Assessment of wind energy resources, a critical first step in determining the potential for its use in rural areas, is part of a proposed UNDP/GEF renewable energy effort in Laos. Diesel, micro-hydro, and solar present the following opportunities and obstacles:

- **Diesel** - The most frequently used off-grid rural electrification generation option is diesel generation using a village grid, usually with 5kW generation sets. It is the easiest option to implement, and both diesel fuel and the equipment are readily available wherever road access exists. Diesel units from neighboring China and Thailand are generally used. Systems generally are selected on the basis of first cost, with little consideration for life cycle cost, reliability, ease of service and procurement of spare parts. This approach makes the diesel system less reliable and higher life-cycle cost than it could be. Also, because of the lack of standard distribution and house-wiring standards, the existing village grids are sub-optimal. Although local skills need reinforcing, some expertise in maintaining and repairing generation sets has already been developed in Laos through the use of internal combustion engines for various modes of transportation and for rice milling.
- **Micro-hydro** - Experiences in the region demonstrate that local generation of electricity by micro-hydropower plants and local power distribution through a mini-grid is technically

feasible, well-developed and can be cost-effective, once the infrastructure and implementation and management mechanisms are in place. In Nepal, for example, more than 1000 modern steel turbines, manufactured by any of more than half a dozen local metalworking shops, have been installed throughout the country in the past two decades. Scattered examples of such development can also be found in northern Laos, most notably in the wide use of "family" hydropower plants imported from China and Vietnam to generate small quantities of electricity for lighting and entertainment. The barriers to more widespread use of micro-hydro schemes include general lack of familiarity with the technology, lack of appropriate stream flow data, inability to assess site potential, and inadequate local technical and financial management capacity for running a micro-hydro system.

- **Solar Battery Charging** - At present, numerous private sector battery recharging stations throughout Laos receive their power either from the central grid or a diesel generator¹. Customers carry batteries to charging stations generally by foot, bicycle, motorcycle or bus, and return the next day to pick them up charged. However, vast areas of the country do not have access to the grid or the main road network, and therefore cannot benefit from grid-based or diesel charging stations. In these areas, solar energy could be used to recharge batteries. The principal barriers to PV adoption are lack of familiarity with the technology, lack of solar insolation data, inadequate marketing channels and inadequate technical and financial management capacity for running a solar battery charging venture.

Because Laos has limited experience with these systems, lacks local capacity for their design, installation and management, and the institutional, financial and technical structures necessary for sustainable deployment of such systems are not in place, EdL has requested Bank/ESMAP assistance to examine generic issues in expanding rural electrification into remote areas. The ESMAP study, now underway, will include preparation of a coordinated rural electrification strategy incorporating central grid expansion as well as remote "off-grid" systems based on a least cost strategy for delivering the needed energy services. In addition, a parallel UNDP/GEF renewable energy project is under preparation and would include resource assessments for solar and wind, an important element of an expanded off-grid electrification program.

Knowing that solar and micro-hydro will be key elements of an off-grid electrification program, EdL requested an Off-Grid Renewable Energy Electrification Pilot component within the SPRE Project, cofinanced by GEF, to initiate pilot capacity building, barrier removal and investment activities for RE applications. The experience from this pilot activity will be used in conjunction with the ESMAP study and results of the UNDP/GEF activity to develop a national off-grid electrification program plan. In the absence of GEF support, Laos would continue its rural electrification program based overwhelmingly on diesel mini-grid and battery charging systems, with limited, *ad hoc* micro-hydro investments.

Expected Project Outcomes, and Underlying Assumptions - The proposed Off-Grid RE Electrification Pilot is expected to establish the foundation for a vastly expanded use of renewable energy applications for off-grid RE electrification in the post-project period, reducing the large-scale proliferation of diesel generator sets. Whereas the GEF funds requested would not result directly in large GHG emissions reductions immediately (estimated at about 5,000 tons of CO₂ over the next 20 years), they would

¹ Today, battery charging in Laos is purely a private sector activity. A charging station can be set up with a new diesel engine and generator and a battery charger for less than \$2,000. Used equipment will halve the initial investment, but requires more O&M and has a shorter service life.

address initial barriers to the adoption of commercially competitive RE technologies in Laos as EdL begins large-scale off-grid rural electrification efforts.

Activities and Financial Inputs Needed to Enable Changes - Off-Grid RE Electrification Pilot activities would be divided into four areas: institutional capacity building, micro-hydro mini-grids, solar battery charging stations, and monitoring and evaluation. It would be implemented by EdL's Electrical Construction and Installation business unit over a five year period, in collaboration with private operators and off-grid communities.

Institutional Capacity Building - This activity will directly address the objective of creating capacity within the public and private sector to carry forward with a national off-grid RE electrification program. Project support will include management of the Off-Grid Pilot as well as training in technical, institutional, and financial aspects of off-grid systems. Under the proposed pilot, EdL would undertake an expanded program with heavy emphasis on systematic and widespread RE applications. Expatriate consultants, including a long-term Off-Grid Project Advisor, would provide training and assist EdL in managing the associated activities, bringing the cost of program management to \$560,000. The baseline cost for this component is estimated at \$185,000, and includes program management costs for limited *ad hoc* assessments of potential micro-hydro systems and preparation of specifications for low cost electrical distribution grid networks. The GEF incremental cost is the cost of consultant support for training and capacity building, estimated at \$375,000 for the five year implementation period.

Micro-hydro Mini-grids -The subcomponent would begin with training of EdL headquarters staff in identifying potential hydropower sites, followed by field training in site-selection for province-based technicians in provinces with the greatest potential for harnessing micro-hydropower resources, such as Luang Namtha and Phongsaly. Second, data on micro-hydro resource potential would be collected and interpreted, permitting EdL to begin assembling a database of suitable sites and stream flow data. Third, it would provide training to Lao engineers and contractors in micro-hydropower project design and project implementation, based upon classroom sessions as well as design and construction of pilot projects in the field. Site selection and project design training would involve courses and field back-stopping in assessing communities' interest in and ability to support a micro-hydro system, using participatory methods and agreed screening criteria². Fourth, EdL would select six pilot project sites and install micro-hydro systems procured by EdL and sold on credit terms to those villages having expressed an interest to electrify and who are willing to pay 20% of the investment cost in advance. Participating villages will agree to be responsible for O&M, to design a tariff based on cost recovery, and to collect payments to repay over a three year period the investment plus EdL's costs. These pilots will serve as training platforms for future micro-hydro efforts. Simultaneously with the identification of pilot sites, EdL would research and design appropriate standards for village electrification³ and management mechanisms for village electrification associations.

² Selection criteria include: (i) conditions must exist to ensure adequate backstopping over time; (ii) sites must be accessible most of the year; (iii) communities must express an explicit interest in getting access to electricity; (iv) energy resources to the site should be sufficient to meet demand and be acceptable to the community; and (v) sufficient domestic and productive end-uses of electricity must be realistically possible and the electricity supply must be affordable to ensure financial sustainability.

³ This is necessary because much rural electrification has been done using national standards, often designed for use in urban areas but inappropriate for rural mini-grids. This (re)design effort could positively affect how rural electrification is handled by EdL because hydropower supplies the national grid, principally. Redesigning distribution and house wiring standards could lead to more cost-effective grid extension, which would further reduce the use of fossil fuels and fuel wood.

Without GEF support, GoL would not develop a national micro-hydro program, including developing methodologies for and training in careful hydropower site-selection. EdL would probably invest in about the same number of sites (6), but would rely on map studies to select the sites, whose cost is estimated at \$20,000. The baseline cost would therefore consist of (i) site selection based on map studies (\$20,000), and (ii) investment costs for micro-hydro systems (\$271,000). The GEF alternative would include (i) the proposed training of EdL staff and potential micro-hydro system managers, (ii) collection/interpretation of data on micro-hydro potential and community commitment/capacity to support a system, (iii) village organization for installation, operation, and maintenance of the micro-hydro system, and (iv) appropriate design and installation of 6 micro-hydro systems. The total cost of the with-GEF subcomponent would be \$426,000. GEF incremental costs for training and application of improved site selection, design, village organization, operation, and maintenance activities would amount to \$135,000.

Solar Battery Charging - Solar charging station kits would be procured by the EdL and leased to local entrepreneur or village cooperatives (i.e. the "local operator") under a lease-to-buy contract. Expatriate consultants would train EdL, the Ministry of Industry and Handicraft (MI&H), and private sector staff in site selection (including selection of the local operator), system installation, and proper operation of the solar battery charging station. Site selection would be made by EdL and local MI&H staff, with consultant assistance on the basis of factors including the following: i) lack of reliable access to diesel fuel; ii) interest of the village in the scheme; iii) existence of a suitable local operator; and iv) adequate solar resource. Each local operator would operate the battery charging service as a business and be responsible for operation, maintenance and lease payments for the equipment. At the end of the lease period, the operator would take ownership of the solar battery charging system. Initially, 10 solar battery charging stations would be installed. Based on early experiences with these sites, an additional 10 battery charging stations would be installed during the course of the Pilot.

Diesel battery charging is the baseline for calculating incremental costs. Installation of 20 diesel-powered stations at similar sites, including O&M costs, are estimated at \$374,000. In areas not served by such stations, the estimated economic cost of diesel fuel (including transport) is \$0.70 per liter and above. At this fuel cost, the economic life-cycle net present value (NPV) of costs is estimated at \$18,700 for a diesel battery charging station servicing about 10 batteries per day (100 or more households). A solar battery charging station of similar capacity would have an NPV of about \$23,100, resulting in a GEF incremental cost of \$4,400 per system⁴. Incremental technical assistance would also be needed as local capacity to promote, manage and operate solar-powered stations is low. The total cost for solar battery charging activities is \$542,000. GEF incremental costs of \$168,000 comprise incremental investment costs (\$88,000) and technical assistance support (\$80,000).

Monitoring and Evaluation - Project monitoring and evaluation activities will be coordinated with the other components of the SPRE Project, and will be supervised by Bank supervision missions. Monitoring activities will include regular reporting from off-grid system operators on system performance, customer satisfaction, problems, etc. A small stipend (about \$100 per year) would be provided to each operator for maintaining such records. In addition, monitoring equipment (about \$2,000 per site) would be installed on the solar battery charging stations to aid in assessment of their technical performance. Targeted surveys also would be undertaken to establish the baseline energy and economic situation prior to installa-

⁴ Future solar battery charging station costs can reasonably be expected to decline for the following reasons: i) bulk PV module purchases will allow cost reductions of about \$1 per watt; ii) standardized charging station design will reduce or eliminate system design costs and uncertainties associated with first-time use of the selected design; iii) the Pilot (and possible follow-on project) will allow the establishment of a supply, distribution and support network which represents a significant cost burden for program start-up, but once in place, will result in reduced product costs.

tion of selected off-grid system, as well as periodic post-installation follow up. A mid-term evaluation and an implementation completion report will also be prepared to take stock of project performance and extract lessons from this pilot activity. The total cost of these monitoring and evaluation activities is estimated at \$70,000. Monitoring under the baseline scenario would be extremely limited, and would cost about \$4,000. GEF incremental costs for monitoring and evaluation would therefore amount to \$66,000.

Sustainability and Risks - Sustainability of off-grid pilot investments would be maximized by: (i) promoting involvement of the private sector as well as beneficiaries; (ii) operating the off-grid systems on a cost-recovery basis; (iii) defining and strengthening appropriate institutional and financial mechanisms; (iv) a heavy emphasis on training and capacity-building; and (v) developing designs to minimize costs.

Risks to long-term sustainability include the following: (i) Inability on the part of EdL to manage effective RE planning and investments after the implementation period. This risk will be mitigated through continued Bank support for off-grid project implementation. (ii) Markets for PV systems may not develop sufficiently to permit the economies of scale that will bring down the cost of PV systems relative to diesel gensets. Experience in this pilot phase will be used to assess the broader market for PV systems in the country. (iii) Private operators may not be forthcoming to invest in RE systems. The GoL recognizes that its role in the initial phases of off-grid project development will require financial assistance to beneficiaries. This will improve market conditions, and increase interest in private sector participation. (iv) Solar resource assessments may be inadequate for incorporating solar PV technologies into Laos' rural electrification strategy. This risk will be mitigated by a proposed parallel UNDP/GEF activity which includes resource assessment.

Social and Participation Issues - Stakeholders include local beneficiaries, village cooperatives, entrepreneurs, NGOs, EdL and government policy makers. Involvement of local beneficiaries has often been overlooked in past off-grid electrification projects, but is recognized as critical to the success of this pilot. Project design ensures that maximum interaction is maintained with all stakeholders at all phases of the project. For example, in the micro-hydro pilot, after EdL headquarters staff receive training in identifying potential hydropower sites, they would work with consultants to provide field training in site-selection for province-based technicians. The advisor would also organize a training course for Laotian engineers and contractors in micro-hydropower project design and project implementation. Field visits by the advisor and EdL staff would provide back-stopping as well as on-the-job training in participatory methods for implementing rural electrification projects. An initial list of candidate pilot sites would be compiled through a publicity campaign to solicit community interest, followed by an iterative discussion process with communities. During all phases of the project, maximum interaction would be maintained through field visits and workshops, both with the relevant communities to ensure sustainability of commissioned RE systems, and with government departments, NGOs and other development agencies to ensure maximum productive (i.e., income-generating) use is made of the power generated. The Solar Battery Charging initiative would be implemented in an equally participatory manner.

Financing Plan and Incremental Cost Assessment (in US\$000)

This initiative will address initial barriers related to EdL's and other local entities' capacity to utilize RE technologies effectively in off-grid contexts. Consequently, most of the requested GEF funds will support technical assistance, training and other forms of capacity-building, and program management. The GEF subsidies requested for the pilot solar battery charging stations would substitute a RE technology for a diesel-based technology, and diesel gensets were used as the basis for calculating the subsidy. Total costs of the Pilot are estimated at \$1,598,000, of which \$744,000 represent incremental costs. IDA, GoL, international donors and local beneficiaries will contribute \$854,000, representing

baseline investment, operating, and program management costs. No PDF preparatory resources were used to prepare this request.

	BASELINE SCENARIO			PROPOSED ALTERNATIVE	INCREMENT
	IDA	GoL/ Beneficiaries/ Other Donors	Baseline Total	TOTAL	Increment requested of GEF
I - Institutional Capacity Building	25	160	185	560	375
II - Micro-hydro Mini-Grid	231	60	291	426	135
Design/Site Selection/Training/ etc.		20	20	155	135
Investments	231	40	271	271	0
III - Solar Battery Charging	354	20	374	542	168
Design/Site Selection/Training/ etc.	-			80	80
Investments	354	20	374	462	88
IV - Monitoring & Evaluation	-	4	4	70	66
TOTALS	610	244	854	1,598	744

The lessons learned from the Pilot, together with the ESMAP-funded strategic planning and a proposed UNDP/GEF resource assessment, would ensure that other financing in the sector is used most effectively to benefit the global environment.

Project Budget (US\$000)

Expenditure Type	GEF	IDA	GoL/Other	Project total
Equipment	88	585	60	733
Consultant Services	656	25	160	841
Local Administrative Budget			24	24
TOTAL	744	610	244	1,598

Estimated GEF Disbursements (Bank FY/US\$000)

	1998	1999	2000	2001	2002
Annual	150	200	150	144	100
Cumulative	150	350	500	644	744

Procurement

Procurement of goods and equipment financed by the GEF grant will be conducted through procedures specified in the World Bank's *Guidelines: Procurement under IBRD Loans and IDA Credits*, and will be open to qualified bidders from eligible source countries as defined in the guidelines. Given the small contract values, limited international bidding or international/national shopping will be used to procure most equipment. Consulting services will be selected in accordance with the World Bank's *Guidelines: Selection and Employment of Consultants by Bank Borrowers*. Consultants will be selected using an international competitive process among short-listed firms that takes into account the quality of a proposal and cost of services.

Project Implementation Plan -

DURATION OF PROJECT (IN MONTHS):60											
ACTIVITIES	PROJECT-MONTHS										
	0	6	12	18	24	30	36	42	48	54	60
Institutional Capacity Building (60 months)	-----										
Micro-Hydro Mini-Grids											
Site Selection/Design (18 months)	-----]										
Procurement (12 months)	-----]										
Installation/Training (24 months)	-----]										
Operation/Monitoring (ongoing)	-----]										
Solar Battery Charging											
Design (4 months)	----]										
Procurement (12 months)	--Batch 1----] Batch 2---]										
Installation/Training (4 months)	-----]										
Operation/Monitoring (ongoing)	-----]										
Monitoring & Evaluation (ongoing)	-----]										

—
bcc: MTE, AD, CC, DA, FR, Circulating BB, Project file