36844

PROJECT EXECUTIVE SUMMARY

GEF COUNCIL WORK PROGRAM SUBMISSION

AGENCY'S PROJECT ID: P080054
GEFSEC PROJECT ID:
COUNTRY: Lao PDR
PROJECT TITLE: Southern Provinces Rural Electrification II Program
GEF AGENCY: World Bank
OTHER EXECUTING AGENCY(IES):
DURATION: 6 year Program; 3 year Phases 1 & 2
GEF FOCAL AREA: Climate Change
GEF OPERATIONAL PROGRAM: OP-5, OP-6
GEF STRATEGIC PRIORITY: S-3 (Power Sector Policy Frameworks Supportive of Renewable Energy and Energy Efficiency); and S-4 (Promote Productive Uses of Renewable Energy)
Pipeline Entry Date: April 2, 2004
ESTIMATED STARTING DATE: January 2005
IA FEE: PHASE I: $367,000
PHASE II: $113,000

FINANCING PLAN (US$)	
GEF	
Total (two phase) Program	5,000,000
Phase 1 *	3,750,000
Phase 2**	1,250,000
PDF B	330,000
Sub-Total GEF (Program)	5,330,000
CO-FINANCING*(PHASE I ONLY)	
IDA	20,000,000
Government (MIH & EdL)	7,880,000
Phase I Co-financing:	27,880,000
*Total Phase I Financing***:*	31,960,000
LEVERAGED RESOURCES: $4.35m from consumers	
PHASE II COFINANCING (EST): 40,000,000	

* Council is requested to approve this GEF co-financing for Phase I.
** Council is requested to authorize CEO to approve this GEF co-financing on achievement of Phase II triggers.
*** Total inclusive of PDF-B and exclusive of consumer contributions.

CONTRIBUTION TO KEY INDICATORS OF THE BUSINESS PLAN: S-3: Laos adopts power sector policies favorable to renewable energy and energy efficiency + Uptake of $25 million in renewable energy investments and $1-2 million in DSM and energy efficiency investments. S-4: 1 million people served with renewable energy.

RECORD OF ENDORSEMENT ON BEHALF OF THE GOVERNMENT(S):
Xayaveth Vixay, GEF Focal Point for Lao PDR, Prime Minister's Office, Science, Technology, and Environment Agency Date*: March 3, 2004*

Approved on behalf of the World Bank. This proposal has been prepared in accordance with GEF policies and procedures and meets the standards of the GEF Project Review Criteria for work program inclusion

Steve Gorman
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Date: July 1, 2004

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A. PROGRAM SUMMARY

a) Program Rationale

Since the early 1990s, the Government of Lao PDR (GoL) has helped achieve solid growth rates and significant reduction in poverty levels, but performance has weakened somewhat in the late 1990s. In an attempt to reinvigorate socio-economic development, GoL prepared a National Growth and Poverty Eradication Strategy (NGPES), which was approved by the National Assembly in January, 2004. The NGPES defines a national development vision comprising three central elements: (i) enabling environment for growth and development; (ii) enhanced governance; and (iii) poverty reduction. The energy sector is identified in the NGPES as one of the strategic growth sectors. It calls for both accelerated rural electrification and reinforcement of the electricity network to facilitate power exports.

Rural electrification has made tremendous strides of late, with the connection rate increasing from only 120,000 households in 1995 (16% of households) to 370,000 (almost 40% of households) by the end of 2003. Electricity de Laos (EdL's) planning and implementation capacities have also markedly improved through implementation of five projects funded by the IDA and the Asian Development Bank (ADB). However, the GoL's rural electrification goals are very ambitious and far from realized - 60% of all households by 2005, 70% by 2010, and 90% by 2020. Achieving these goals will require both substantial innovation and reform in financing and delivery arrangements as well as development of new ways to provide electricity access to increasingly remote areas where grid connection is not viable. The latter will require greatly expanded use of renewable energy technologies.

b) Program Development Objectives

The proposed Southern Provinces Rural Electrification II Program (SPRE II) will help GoL achieve its electrification objectives in the central and southern provinces (ADB is assisting in the north). SPRE II will be an Adaptable Program Loan (co-financed by two IDA Credits and GEF Grants), delivered in two phases totaling six years. This program approach and time-frame recognizes the time needed to develop and implement definitive plans for various reform and capacity-building activities, and the time required for project beneficiaries to obtain firm commitments to such plans in a consensus-style political environment. Under the APL approach, some reform commitments will be phased, with agreements in principle reached at the start of the first phase, and with more specific agreements acting as "triggers" for release of the second tranche of the credit/grant. The programmatic approach is also considered appropriate to help alleviate the "boom-bust" effect (from shorter projects) that is currently a feature of EdL and off-grid rural electrification.

The program development objective is to increase disposable incomes and improve living standards of abut 125,000 rural households through electrification of these households, a significant portion of which should be financed by non-traditional sources of funding.

The targeted households represent about one-quarter of GoL's national target for additional household electricity connections between 2004 and 2010.

In parallel to its development objective, the program has two global environment objectives: (i) Increase the contribution of renewable energy to Lao PDR's rural electrification program; and (ii) develop DSM programs that result in reduced need for thermal power production and lower GHG emissions in the region.

c) Program Outcomes and Indicators

Previous studies in Lao PDR have shown that provision of electricity to rural households immediately increases their disposable income, since the cost of electricity is less than means previously used for lighting (kerosene, candles, car batteries, dry cells etc.). Electricity also provides the opportunity for future increases in living standards by enabling increased economic production through activities that require affordable electricity (e.g. rice milling, ice-making, irrigation pumping) or that require lighting to extend productive hours. Longer-term effects have also been demonstrated as longer student study hours are reflected in increased years in school.

Achievement of these outcomes will be measured by socio-economic surveys in villages electrified under the project, the results of which will be compared with the baseline studies. These baseline studies are defining linkages between electrification and economic development and poverty alleviation and make it possible to establish patterns of demand growth with time in electrified villages and to obtain data to enable determination of economic benefits and impact on poverty of the proposed project.

The program's two global environmental outcomes are: (1) a sharply expanded role for renewable energy in GoL's rural electrification program (growing from a 7-10% share of all newly electrified households in SPRE to a 20% share in SPRE II); and (2) higher end-use electric energy efficiency, which in turn will result in increased exports of hydropower production to Thailand and eventual greenhouse gas savings, as the marginal production unit in Thailand are thermal power plants.

Achievement of the renewable energy outcome will be measured by the percentage of households electrified by renewable off-grid technologies in relation to the total number of households electrified by the proposed program, in comparison to the current baseline proportion. With respect to the end-use energy efficiency/demand-side management (DSM) outcomes, a detailed M&E program will be formulated to estimate the domestic electricity usage and cost savings, increased power exports, and regional carbon reductions that comprise the benefits of the proposed off-grid and DSM/energy efficiency components of SPRE II.

d) Program Activities

The Phase 1 project involving $20.00 million of IDA funding and $3.75 million of GEF financing would directly finance electrification of 55,000 households, of which 10,000

would be off-grid. It would also reform the existing power sector legal, regulatory and institutional framework to encourage other participants in sector development, provide a sound planning basis for electrification of the country, and increase efficiency of electricity delivery and consumption. It would be implemented over a 36 month period.

The Phase 2 project would involve $25 million of IDA funding and $1.25 million of GEF funding and would contribute to financing electrification of 70,000 households of which 18,000 would be off-grid. For this phase, it is expected that 25% of the financing will be obtained from non-traditional developers/financiers and through savings realized by increased cost recovery and sector efficiency. It would also be implemented over a 39 month period, but overlap the first project by three months to avoid a hiatus in electrification activities.

e) Phase 1 Project Components

The Phase 1 project has two components that will be executed by EdL and the Ministry of Industry and Handicrafts (MIH), respectively

The EdL component (total cost $30.16 million, of which IDA will finance $17.55m, EdL $7.64m, consumers $4.22m and GEF $0.75m) will contribute to the achievement of project objectives through electrification of rural households by grid extension, and indirectly through further advancing the commercialization of EdL, thus increasing EdL's self-financing capability. It consists of the following sub-components:

- Extension of the EdL grid to about 42,000 households in some 544 villages in seven central and southern provinces;
- Enhancement of EdL's existing and very modest loss reduction efforts (covering both technical and non technical losses) through implementation of a program of activities and investments developed and piloted under a PHRD financed study;
- Furthering integration of EdL headquarters and branch offices (BO) through rolling out the existing billing and accounting system (BAS) installed in Vientiane Office;
- Initiation of EdL's first Demand-Side Management (DSM) and energy efficiency activities, including the establishment of provisional institutional arrangements for DSM planning and energy efficiency policy development within EdL or MIH or both (further definition of this program is currently underway with ASTAE assistance)
- Development of tariff and subsidy policies, an associated tariff regime and an action plan to implement this regime.

The MIH component (total cost $6.02 million, of which IDA $2.45m, GEF $3m, others $.57m) will contribute to the project development objective through scaling up the current pilot off-grid program of rural electrification. It will also establish the enabling environment (together with the EdL tariff/subsidy studies) to encourage other participants to develop and finance power sector expansion under the Phase II project. It consists of the following sub-components:

- Electrification of about 10,000 households spread over 195 villages in 17 provinces through off-grid technologies (mostly renewable energy);

- Scaling up the existing MIH off-grid electrification program through establishment of the necessary legal and regulatory underpinnings, strengthening of organization and management arrangements, offering a wider range of off-grid technologies, and conversion of the existing electrification re-flow account into a Rural Electrification Fund (REF) to self-financing a greater proportion of the MIH electrification program;
- Detailed design of innovative rural electrification delivery models involving non-traditional developers and financiers and development and enactment of necessary legal and regulatory arrangements, including those necessary to open REF to other participants. Support to project preparation by non-traditional suppliers, including design of solicitation documents for "innovative delivery model" projects;
- Development of a rural electrification master-plan (including associated resource studies for distributed generation) and an electricity distribution database;
- Development of a power sector financing strategy, including models for solicitation for new generation and preparation of a small hydropower IPP project for sale to the EdL grid (policy, legal, regulatory, solicitation documents), assuming technical feasibility study carried out by JICA;
- Strengthening organizational and management arrangements within MIH to enable it to undertake an expanded role in the areas of rural electric regulation and planning.

IDA financing will generally be used to finance the physical investments in off-grid electrification. Substantial self-financing by MIH through re-flows from the REF is also envisaged.

GEF co-financing will support all the institutional development components. Co-financing from other sources is also being sought to supplement the GEF co-financing.

f) Assumptions and Risks

Limited implementation capacity for the off-grid component is a major risk that may affect achievement of the off-grid electrification target within the intended timeframe. The existing institutional arrangement, with an off-grid unit within MIH responsible for implementation of off-grid electrification, has worked reasonably well for the on-going SPRE project, but is not suitable for an expanded off-grid program under the SPRE II. This is because of constraints associated with the off-grid unit's position as a government office and its limited procurement and financial management capacity, which has previously lead to delays in its operations and difficulties in performing its work. For an initial period of about six months, the MIH off-grid unit will continue to be responsible for the physical off-grid investment component. Then it will be taken over by a private or joint venture company through a management contract. There is a political risk that the GoL will be reluctant to release the responsibility from MIH to the private or joint venture company. The risk is rated moderate.

Another major risk is associated with the sector reform component, which should lead to establishment and running of the Rural Electrification Fund by the end of Phase 1. A Government Decree needs to be issued to enable establishment of the REF, open access to other participants which are working in rural electrification, and allow management of

the REF by the private or joint venture company through the management contract described above. The REF will be a source fund for subsidies to foster the development of ESCOs for off-grid electrification where subsidy is required. This is another risk associated with Government decisions. The risk is rated moderate.

All above risks will be further discussed with Borrower during the appraisal and measures to address them will be built into the trigger conditions for release of Phase 2 or the conditions for credit and grant effectiveness, if necessary.

Delays in procurement, installation and commissioning of the on-grid physical component pose a risk to achieve the expected results of the on-grid component. Through carefully planned procurement installation and commissioning and with the existing EdL's implementation experience acquired with the on-going SPRE project, this risk is low.

Since the program does not have major social and environmental impacts and no dams will be built in Phase 1, no controversial issues and reputation risks for the IDA are envisaged.

There are other risks including risks associated with the capacity of implementation, monitoring and evaluation of social and environmental management plans, technical risks, risk of exchange rate, and risk of counter part fund contributions. These risks are rated low and manageable.

B) COUNTRY OWNERSHIP

a) COUNTRY ELIGIBILITY

The Lao PDR ratified UNFCCC on January 4, 1995

b) COUNTRY DRIVEN-NESS

Rural electrification is one of the more impressive achievements in the socio-economic development of Lao PDR, with the connection rate doubling from just 16% (120,000 households) in 1995 to 370,000 (more than 35% of all households) by the end of 2003. Recognizing the important linkage between economic and social development and electrification, the stated goal of the GoL is to connect 60% of all households by 2005, 70% by 2010, and 90% by 2020.

The power sector in Lao PDR occupies a pivotal place in the GOL's strategy to advance economic and social development. The underpinnings of this policy are provided in the "Power Sector Policy Statement of 2001", which sets forth the following overall goals:

- Maintain and expand an affordable, reliable and sustainable electricity supply in Lao PDR;
- Promote power generation for export to provide revenues;

- Develop the legal and regulatory framework to effectively direct and facilitate power sector development; and
- Strengthen institutions and institutional structures.

Key aspects of the Power Sector Policy related to rural electrification and energy efficiency include:

- Recognition of the linkage between poverty alleviation and access to electricity, including a stated policy of increasing national electrification as quickly as possible by extending electrification opportunities in all provinces and to all segments of the population. Recognizing the difficulty of grid extension to remote areas, the policy promotes "commercially prudent and sustainable electrification in off-grid areas". Towards this end an off-grid promotion and support office was established within MIH's Department of Electricity.
- Emphasis on reducing the use of imported fuels for electricity generation by substituting indigenous energy sources, principally hydropower but also solar and biomass.
- Priority for tariff policy is to move to cost recovery pricing and thereafter use transparency and predictability of electricity pricing to help customers make informed decisions about electricity use and investments.

C) PROGRAM AND POLICY CONFORMITY

a) FIT TO GEF OPERATIONAL PROGRAM AND STRATEGIC PRIORITY

The GEF financed activities will contribute to two GEF climate change operational program objectives – (i) removing the barriers to higher efficiency levels in urban and rural power end-use consumption (OP 5); and (ii) wider use of renewable energy technologies in rural power supply, especially off-grid (OP 6).

The strategies and outcomes that the proposed GEF financing will support are closely aligned with two of the six Strategic Priorities for the Climate Change Focal Area. In particular, support of improved institutional arrangements for planning, financing and implementing rural electrification, including a Rural Energy Fund, as well as creation of a Demand Side Management Office within EdL, will create power sector policy frameworks supportive of renewable energy and energy efficiency (Strategic Priority CC-3). Additionally, the project will contribute to Strategic Priority CC-4, by supporting the addition of 10,000 households provided with renewable-based access to electricity

The global benefits of the two GEF-supported SPRE II components are estimated as 4,050 te CO2 lifetime for the off-grid renewable electrification component and 40,250 te CO2 lifetime for the DSM and energy efficiency component.

b) SUSTAINABILITY (INCLUDING FINANCIAL SUSTAINABILITY)

Certain risks to the sustainability of the predecessor GEF SPRE I off-grid medium-sized project were identified in the *Interim Evaluation of the Lao PDR Off-Grid Renewable Energy Electrification Pilot Demonstration Project* conducted per the GEF prerequisites for successor projects. Key sustainability concerns included: (1) the risk of a collapse of the enabling environment set up for a nascent off-grid private sector, with a resulting loss of confidence by existing and prospective customers, resulting from gaps in funding; (2) incapacity of a government-housed off-grid operation to accommodate implementation of a diverse portfolio of renewable energy technologies; (3) absence of integrated rural development planning, with the result that income-generating electricity uses needed to make power supply economically viable are slow to develop; (4) Lack of sufficient capacity for the physical planning process, including integration of grid extension with off-grid and mini-/district grids necessary for optimal scaling-up of rural electrification; (5) insufficient funds flow to maintain the focus of key actors (users, village technicians, village committees, provincial and national companies, provincial and central government officials) on maintaining equipment and servicing customers; and (6) long repayment periods and likelihood of under-funding for intermittent reinvestment in batteries and spare parts.

There are no universal or fail-safe solutions to these and other threats to sustainability. However, the current project design has included important features that have proven effective in combating sustainability problems in other countries. Off-grid design features already in place that are conducive to sustainability include: (1) A robust financing system, which during SPRE had achieved a 97% repayment rate from customers. The system underpins sustainability by assuring that villagers, village technicians and managers, village oversight committees, and provincial companies, all have a financial incentive to keep all the equipment working and the payments flowing each month; and (2) Progressive increase in private investment. Under the off-grid component of SPRE, off-grid subscribers already significantly self-finance the electricity access (calculated as between 60% and 80% of hardware cost, delivery and 10-year support costs). The Electrification Service Companies (ESCOs) and Village Electricity Managers (VEMs) provide their own working capital, which is repaid through their share of the reflow payments. This provides a strong incentive to keep the customers happy and the off-grid electricity schemes operating reliably.

Additional design features supportive of sustainability will be added via the GEF-financed technical assistance to SPRE II off-grid component. These include:

- Establishment of a permanent facility, in the form of a Rural Energy Fund, for financing rural electrification in Laos. This will mitigate the funding gaps that result when all rural electrification financing is project-based;
- Comprehensive outsourcing of critical off-grid functions, inclusive of incentives that will stimulate greater technology diversity in provincial-level ESCO operations and specific features including the ESCO and VEM features that have proven effective so far;

- Technical assistance to key processes critical to sustainable electrification – an optimized physical planning process, and integration of grid- and off-grid electrification with other rural development efforts;
- Establishment of a regulatory framework that will install MIH in its appropriate role as regulator of the overall electrification process, including ensuring that individual ESCOs operate in ways that support long-term reliability of electrification schemes, including provision for reinvestment in spare parts and maintenance as necessary for reliable operation.

Sustainability of the DSM and Energy Efficiency Component. DSM and energy efficiency are mostly unknown at present, and significant effort is needed just to characterize the potential impacts and economics of such a program. For this Project the most basic design element conducive to sustainability will be the creation and organizational development of a DSM cell within EdL (and possibly a sister operation in MIH).

c) REPLICABILITY

The overall rural electrification program design is based on the experience of several predecessor projects, including the immediate predecessor SPRE I project, the Cambodia Rural Transmission and Distribution Project, and other recent rural electrification efforts in Chile and elsewhere. This project is expected to continue innovation around the basic framework for an off-grid component embedded within the context of a national rural electrification program where renewable energy plays a critical role in off-grid access provision. Of particular interest and potential for replication is the establishment of a permanent, independent, self-governing Rural Electrification Fund, which can attract both project-based concessional financing and other funds from donors and commercial banks, in support of rural and renewable electrification (and other power sector development) efforts. Other countries which would likely benefit from variants of this model include Nepal, Bangladesh, Papua New Guinea, Myanmar and others

We intend to mount a broad-based and comprehensive replication effort, as our feeling is that both the individual components and the overall approach of SPRE II will be of value throughout and beyond the region. Key elements of our replication approach will include: (1) a knowledge management activity which will document key aspects of each component of the design (this has already been started with a “best practice” report prepared to document the areas of success and areas of improvement needed in the current Off-Grid Promotion scheme); (2) an outreach and information dissemination effort which will include annual workshops on off-grid results (again, an early start has been made via the stakeholder participation workshops undertaken by the MIH OPS); (3) specific efforts to document and disseminate key features of the SPRE II design in appropriate technical and topical journals, especially the off-grid delivery outsourcing process, the creation of an integrated rural electrification planning process and computer systems, and the issues associated with setting up a Rural Electrification Fund; and (4) bilateral and regional experts’ forums (possible via ASEAN Energy or Rural Development Committees) to push the broad agenda for sustainable and renewable rural

electrification, as well as share results and best practice as regards the details. Finally, we hope that ESMAP and other trust funds will agree with us regarding the importance of replication of SPRE II components both in and beyond the region and thus we will approach them for incremental funding to support enhancement of several of the replication actions listed above.[1] In particular, such incremental support would allow more comprehensive and timely knowledge management and information dissemination efforts through reports and workshops not covered by the existing project scope.

The proposed DSM initiative will be a direct replication of earlier efforts that were co-financed by GEF in Thailand and Vietnam. Successful step-wise development of DSM and energy efficiency in Lao PDR, beginning with basic data collection followed by potential assessment, strategy development, indicative pilot projects, and program roll-out could be replicated in other high-growth, low per-capita electricity use countries including Cambodia, Nepal, Indonesia and Myanmar. A similar replication approach emphasizing knowledge management, outreach and information dissemination and bilateral and regional cooperation and exchange would be undertaken as part of the DSM development efforts.

d) STAKEHOLDER INVOLVEMENT

The predecessor GEF-supported SPRE I project has already established a strong basis for stakeholder participation which will be continued and expanded in SPRE II. Key stakeholders can be classed by the level of their involvement and interest in the project. Stakeholders in overall project design and performance include NGOs, other GOL agencies such as STEA, political organizations such as the Lao Women's Union, donors, and private sector entities including the ESCO managers, equipment suppliers, and potential management contractors. Stakeholders at the sub-project or village scheme level include consumers, closely followed by the village manager (VEM) and prominent village leaders (the chief, the president, the group of leaders), and district and provincial agencies and government.

The off-grid component of SPRE as managed by the Off-Grid Promotion and Support unit of MIH has organized workshops and meetings every year for five years, involving private sector bodies, NGOs, development agencies, agencies such as RDO and LWU, and central and Province government officials. They have proven helpful in identifying key issues and obstacles to be addressed. For example, an inception workshop in Feb 2000 established that a key stakeholder - private sector companies – were unlikely to be participate as providing off-grid access was perceived as a money-loser. Sustained engagement with NGOs, companies and government PDIH offices regarding a feasible and economically viable delivery model led to the current ESCO/VEM arrangement. A large national stakeholder workshop in early 2002 presented the SPRE off-grid scheme and invited comments on how the project should be refined.

[1] Such funding is not included in our current financing plan, as this would be incremental work to be funded with incremental financing that would be pursued after project start up.

A similar process of stakeholder involvement has been used in the preparation of SPRE II. A PHRD-financed study of Rural Electrification Frameworks has provided an ongoing forum, including an MIH-sponsored national workshop, for stakeholders (government, donors, NGOs, and the private sector) to consider the options for arranging the institutions responsible for planning, financing, implementing and regulating rural electrification. Subsequent workshops will take place specific to efforts to transition the current OPS into a management contractor arrangement with MIH providing guidance and oversight rather than performing implementation.

Stakeholder involvement at the community (village) level is effectively embedded within the planning component of the current SPRE project. Villagers are given a menu of technology types and consulted as to the type of ownership and investment they preferred. This consultative approach will be retained, and ESCOs are trained to follow the participative planning procedure carefully. The village also chooses its own electricity manager, and this manager earns a living depending on how well he supports the electricity consumers. System subscribers pay to become owners, and VHGS VEMs invest personal funds in starting electricity businesses in their own right. Even supervision responsibility is given to the village; a committee is elected by villagers to oversee the VEM, and mediate between him/her and the consumers.

This level of stakeholder involvement at the village or project level is not automatic. It only exists if it is carefully nurtured, by progressive refinement of the project and scheme designs to accommodate new circumstances (new technologies, new financing and delivery mechanisms). The intention is to use the oversight and regulatory capacity of MIH to ensure that the strong stakeholder involvement built in SPRE is carried forward to SPRE II.

As regards the DSM and energy efficiency component, stakeholder involvement will begin during the preparation phase, when prospective DSM cell staff will review the DSM and energy efficiency development history in Vietnam and Thailand. A consultative process will be established at the outset of DSM and energy efficiency planning to ensure that key stakeholders including government agencies, EdL, NGOs, donors, potential private sector ESCOs and large customers are involved in the process by which early DSM and energy efficiency activities are identified and undertaken.

e) MONITORING AND EVALUATION

Comprehensive monitoring and evaluation arrangements will be implemented under the overall SPRE II project umbrella. The proposed GEF-financed components will in particular comply with GEF guidelines and requirements for measurement and evaluation, including those contained in the *Monitoring and Evaluation Procedures Manual*, dated January 2002. An overall results framework (Annex 3) identifies key results indicators and the target values against which project success will be gauged. Preparation projects funded by PHRD, especially the socio-economic surveys and establishment of a rural electrification database, will provide baseline values. Subsequent

annual resurveys will provide the core of the be particularly useful in formulating the details of an M&E plan for the proposed component.

D) FINANCIAL MODALITY AND COST EFFECTIVENESS

Co-financing Sources (Phase 1 only)				
Name of Co-financier (source)	Classification	Type	Amount (US$)	Status*
IDA	Multilateral	Credit	20,000,000	To be confirmed at negotiations
GOL (EdL & MIH)	Government	Cash and in-kind	7,880,000	As above
Sub-Total Co-financing			27,880,000	

E) INSTITUTIONAL COORDINATION AND SUPPORT

a) CORE COMMITMENTS AND LINKAGES

The proposed program is fully consistent with the GOL's National Growth and Poverty Eradication Strategy (NGPES) and the World Bank's Country Assistance Strategy, both of which emphasize support for rural and national infrastructure development by expanding rural electrification and power sector-wide institution building. In this way, the project will respond to the NGPES objectives of poverty reduction and establishment of an enabling environment for growth and development while supporting the CAS objective of rural and national infrastructure development.

Rural electrification is an explicit component of the NGPES, and an area where GoL has achieved substantial success over the last decade, and where IDA has made a substantial contribution having financed 25-35% of national connections. GEF has made substantial contribution to the off-grid component of this electrification effort, having supported implementation activities totaling some 5,000 households to date.

While GOL has been successful in mobilizing funding for transmission and generation development from other (bilateral and private) sources, rural electrification has not yet attracted funding beyond ADB and the IDA. The concessional terms of IDA and ADB funding are appropriate to rural electrification where some level of capital subsidy is deemed to be appropriate if social objectives of providing electricity to the poorest consumers are to be realized. The proposed project provides for the establishment of a Rural Electrification Fund and associated regulatory arrangements to promote non-utility electrification and to attract financing from non-traditional sources.

As under SPRE I, the GEF will support activities including organizational development, capacity building, and creation of institutional arrangements that are designed to overcome the barriers to meeting global environmental objectives in tandem with meeting project objectives. These are generally activities which are outside the narrow scope of the physical electrification project but are nevertheless vital to securing the goals

of maximum participation by renewable energy and energy efficiency in the development of the Lao power sector.

b) CONSULTATION, COORDINATION AND COLLABORATION BETWEEN IAS, AND IAS AND EXAS, IF APPROPRIATE.

Besides GEF and PHRD, the project benefits from extensive coordination with other donor agencies. Firstly, Asian Development Bank (ADB) and the Bank Group have close cooperation in Laos. The proposed project follows previous agreements with the ADB on geographical division of project areas in order to avoid duplication and competition of activities (the ADB is engaged in the ten northern provinces of the country). ADB and IDA also cooperate on loan covenants and worked closely with the Bank on preparation and implementation of Financial Recovery Plan (FRP) for EdL. They were an active participant in the strategy workshop and are financing sector reform activities that complement those being financed by IDA. JICA have financed several studies in Lao PDR, the most relevant to the current project being the development of transmission and distribution master plan, and ongoing feasibility studies for hydropower based mini-grids which might form the basis for new electrification models proposed to be piloted in the Phase 2 project. China and India are financing local hydropower developments and transmission lines, the latter providing the basis for some rural electrification included in the current project. PPIAF funded the activities associated with the Implementation Strategy workshop. ESMAP financed a 1999 study "Institutional Development for Off-Grid Electrification" which provided the starting point for proposed studies under the project. ASTAE provided considerable assistance in project definition and in Bank supervision of PHRD financed studies.

C) PROJECT IMPLEMENTATION ARRANGEMENT

2. Institutional and implementation arrangements

The first phase of the program will be implemented over a three year period from the early 2005 to end 2007 and the second phase over a similar three-year time frame.

The program will be implemented by EdL and MIH jointly. EdL will be responsible for the EdL component as defined in Section (A) above. The project organization is generally divided into two functions, i.e. project office in headquarters and construction team at each of the five Branch Offices. The project office will be responsible for overall management and control of the project execution and to maintain close coordination with the IDA, while the Brach Offices will be responsible for implementation of individual physical sub-projects in the seven southern provinces.

MIH will be responsible for the implementation of the MIH component, including the off-grid investment component. During the first 6-12 months of project there will be an intensive institutional strengthening effort expended on the management of the off-grid component. The thrust of the institutional strengthening activity will be a comprehensive program of management outsourcing, based on the recommendations of the Interim

Evaluation of the Off-Grid Component, and discussions during previous missions, as well as the Draft Decree on the Rural Electrification Fund. PHRD and ASTAE funds have already been directed towards development of Terms of Reference (TORs) and a procurement strategy for outside contracting of most off-grid implementation functions currently performed by the OPS. This includes central procurement, establishment and capacity building of ESCOs, provision of marketing materials, village marketing, planning, and preparation procedures, and provision of technical support. The outsourcing process will systematically address the current short-comings of MIH's OPS as described above by establishing necessary functional capacity, strengthening organization and management arrangements, providing for a wider range of off-grid technologies, and conversion of the existing purchaser repayment account into a Rural Electrification Fund (REF) that can potentially lead to a self-financing off-grid operation. The current arrangement will be maintained until the outsourcing process is complete.. After the transition, MIH will oversee the off-grid program while continuing to implement activities associated with MIH under the sector reform and DSM components.

ANNEX A: INCREMENTAL COST ANALYSIS

OVERVIEW OF LAO PDRS' ELECTRIC POWER SECTOR AND SECTOR DEVELOPMENT OBJECTIVES

Lao PDR is one of the least developed and least-electrified countries in Southeast Asia. Only about 36% of Lao households (about 25% in rural areas) have access to electricity and annual average per capita electricity consumption is only about 140 kWh. Rural areas beyond the reach of the national grid are characterized by either high energy costs or no modern energy supply at all. Without any access to electricity, rural living standards are limited by low agricultural productivity and very few opportunities for non-farm employment or other value-adding economic activities.

During the past 15 years, the World Bank through the International Development Association (IDA) and the Global Environmental Facility (GEF) has been actively involved in rural electrification efforts with the Government of Laos (GoL) and Electricite du Lao (EdL). IDA supported the electrification of more than 40,000 households through the earlier Southern Provinces Electrification (SPE) and Provincial Grid Integration (PGI) projects. The ongoing Southern Provinces Rural Electrification (SPRE) project will connect an additional 55,000 households by June 2004, including over 5,000 households that will be provided with off-grid electricity from renewable energy. The SPRE project was supported by a GEF Medium-Sized Project (MSP), which provided $750,000 of technical assistance needed to develop the institutional, financial, and technical capacity necessary for the off-grid operation.[2]

The government's goal for rural electrification is to increase the electrification ratio for the whole country from the current level of about 36% to 90% by 2020, with intermediate targets of 60% in 2005 and 70% in 2010. According to the Electricity Law of 1997 and the Power Sector Policy Statement of 2000, this goal will be achieved through:

- Off-grid village and household electrification, which has only been demonstrated to date on a pilot scale but has been assigned an ambitious target of 150,000 households by 2020. This target envisages that up to 20% of the rural population, located in isolated areas, can be powered with indigenous energy resources, including solar, pico-hydro generator units, biomass, or even wind in some mountainous locales
- On-grid household electrification, involving conventional investment in extending Electricity de Lao's (EdL's) main network, in order to meet the bulk of the 90% target.
- Other planned rural electrification activities, reflective of the particular rural conditions in Laos, including installation of isolated/mini distribution grid systems

[2] An interim evaluation of this ongoing predecessor project was undertaken in accordance with the GEF's *Guidelines for Implementing Agencies to Conduct Terminal Evaluations.* Results of this interim evaluation and application to the successor project design is also contained in the "Description of the GEF Project Alternative" section below.

powered by either diesel generating sets, cross-border supplies, mini hydro power stations (i.e. 100 kW – 5 MW) or micro hydro power (i.e., 1 kW – 100 kW)..

BARRIERS TO ACCELERATING RURAL ELECTRIFICATION AND OFF-GRID RENEWABLE ENERGY DEVELOPMENT

In order to achieve these ambitious electrification targets, Lao PDR needs assistance to address the following major barriers at the power sector level:

- Insufficient rural electrification planning capacity to prepare large-scale, integrated rural electrification projects that will deliver household access most cost-effectively.
- Too little rural household/income and renewable energy resource data to be able to prepare and appraise off-grid electrification projects.
- Insufficient availability of concessionary financing in amounts large enough to maintain the planned pace of electrification.
- Excessively low tariffs currently charged to rural households, which, coupled with their relatively low electricity consumption, means that rural electricity services do not cover costs and are a drain on the financial viability of EdL.
- Absence of integrated rural development planning, with the result that income-generating electricity uses needed to make power supply economically viable are slow to develop.
- Lack of private sector capacity for scaled-up implementation of rural electrification.

THE SECTOR REFORM AND CAPACITY-BUILDING AGENDA

Overcoming these limitations in the current technical, financial and institutional arrangements for rural electrification will require the following power sector reforms:

- Improved Rural Electrification Planning Information and Process. The starting point must be the collection of adequate data at the sub-district level on the number of households, local availability of renewable energy resources (wind, biomass, hydro, solar insolation, etc), proximity of grid step-down transformers, existing electricity demand and potential load, and type of income generating activities that could benefit from electricity. This database is necessary for a coordinated planning effort at the provincial and national levels, using appropriate technical and financial analysis procedures. In addition to data, there is a need for an improved electrification master planning process that would be capable of determining, for each village in the country, the most economical method of providing electricity, including grid extension, distributed or district grids, or off-grid solutions. Such a capability would require linkages to resource inventory studies (hydropower, wind, biomass) ensuring that all opportunities for economical application of renewable energy are captured.[3]

[3] Substantial inventory data is available from previous studies supported by the Japan International Cooperation Agency (JICA) and the Asian Development Bank (ADB), but it is largely incomplete and not available on a spatial data frame.

- Improved Institutional Arrangements for Financing, Implementing and Governing Rural Electrification. Some progress has been made in identifying the institutional arrangements needed to realize the GoL's ambitious rural electrification program; however, the technical assistance necessary to move the process forward has not been available. There are several key areas where improved institutional arrangements are needed:

    1. **Rural Electrification Financing.** The Ministry of Industry and Handicrafts (MIH) has established an off-grid electrification account into which will flow the currently-modest lease payments from purchasing households. If appropriately re-structured and expanded, the account could evolve into a national Rural Electrification Fund able to attract the additional concessionary financial resources needed to accelerate rural electrification, including renewable off-grid and distributed generation investments. The Fund could provide, in a transparent and rule based manner, on-lending of concessionary credit and possibly also smart subsidies on a performance basis to organizations interested in participating in the Lao PDR electrification effort. However, substantial start-up investment is needed to design this Fund and get it into operation, including determining its composition, facilitating participation by other donors, developing its rules and procedures, and supporting its operations.

    2. **Alternative Delivery Mechanisms.** The hire-purchase scheme demonstrated in the soon-to-be-completed SPRE I off-grid component was mostly successful in delivering Solar Home System (SHS) technology, which offers only limited potential for developing productive uses of electricity. The grid extension component relied on the conventional model of financing and implementation by the state-owned integrated power provider. There is now a need to pilot alternative financing and electrification delivery mechanisms and models, borrowing from other approaches that have been successful in the region. Candidate schemes include: (i) Distributed generation and isolated grid systems, to support development of small power networks powered by diesel and/or small hydro facilities serving remote population centers; (ii) Rehabilitation/repair of existing mini/micro hydro stations[4]; (iii) Scale-up of other existing delivery mechanisms, such as the Sunlabob Solar PV Rental Model; (iv) Private-sector distribution models, in which private sector developers/operators are invited to bid on development and operation of small distribution systems; and (v) Franchise schemes, in which retailers and/or commercial Electrification Service Companies (ESCOs) are granted regulated concession areas to develop. Once again, substantial start-up investment is required to establish the organizing frameworks, support detailed design of these alternative rural electrification models, and develop and enact the necessary legal and regulatory arrangements to make implementation possible.

    3. **Creating Sector Governance Capacity at MIH**. MIH and its Department of Electricity will take on a vital role in governing and coordinating the development

[4] There are an estimated 39 small isolated grids serving some 5,000 households which are not currently operational

of the power sector in Lao PDR, including oversight and regulation of the national rural electrification effort. However, MIH has only very basic capacity at present and substantial investment is required to build its sector governance ability, including setting program policy and standards, regulating ESCOS and other private sector providers of RE services, rationalizing and setting tariff and subsidy levels, and monitoring overall progress towards GOL rural electrification goals.

ROLE OF RENEWABLE ENERGY AND CURRENT STATUS OF RENEWABLE ENERGY DEVELOPMENT

Many of the areas in Laos without electricity service are relatively remote and under-developed, making the provision of electricity access via grid extension too costly to be economical. These practical constraints to grid extension have boosted the potential of off-grid alternatives, such as isolated mini grids supported by small hydropower, biomass waste-fueled generation, wind or engine-generator sets, as they are often a more economical way to provide access for remote areas. For very small load centers, provision of 24 hour, all-season electricity is not economically justifiable, in which case solar home systems that charge batteries primarily used for lighting and small appliances is the most realistic option.

Table 1 shows the recent progress of electrification in Lao PDR. Electrification has been achieved mainly through new grid connections; however, off-grid supplies (predominantly solar and hydro) have grown in significance over the past five years.

Table 1. Electrification Rate

Year	Households in Lao PDR	HHs electrified	Off-grid HHs	Overall Electrification rate	Off-grid Share of HHs electrified
1995	754,265	120,100	3,858	16%	3.21%
1996	758,036	136,280	4,689	18%	3.44%
1997	761,808	196,998	4,853	26%	2.46%
1998	765,579	226,004	7,460	30%	3.30%
1999	768,142	254,610	10,897	33%	4.28%
2000	818,668	293,495	18,051	36%	6.15%
2001	866,277	303,690	19,224	35%	6.33%

The off-grid village electrification component of the SPRE is being implemented by an off-grid project office (OPS, or Off-Grid Promotion and Support Office) within MIH, which has been substantially supported by a GEF MSP.[5] Current projections are for this off-grid electrification component to provide power to 5,200 households by the closing date of SPRE I, considerably more than the original target of 4,600 households. With GEF support, the unit cost per household for the solar home systems has been systematically reduced and now stands at approximately $200 per household for an average 30 W system, inclusive of planning and community mobilization. Financial remediation has consisted of a hire-purchase arrangement with individual households that provides for an

[5] OPS is not the exclusive provider of off-grid renewable electrification. There are also donor-funded distributed generation projects (JICA and ADB) as well as private providers such as Sunlabob

up-front payment, which covers the cost of batteries, house wiring and lamps and fixtures, plus a monthly repayment charge, based on the size of the system purchased (customers may choose between a 20, 30, 40, or 50 W system, which accommodates the different electricity needs and purchasing power of individual households) and the term of repayment (5 or 10 years). The concessionary IDA credit terms are basically passed along, but the customer repays the full system purchase cost, out of which is drawn a contribution to a service arrangement with the Village Electricity Manager (VEM), who looks after the individual systems and collects the monthly repayments. The VEMs operate under a performance incentive scheme that allows them to retain a small amount of the householder's monthly repayment stream, thus providing an incentive to keep the individual systems operating and the customers happy. The scheme works, as the percentage of households that default on their monthly repayment is only 3%. The accomplishments of MIH's OPS under SPRE are shown in Table 2 below.

Table 2: Physical Accomplishments through end-April 2004 – SPRE I Off-Grid

Province	Subscribers			Operational		Waiting	
	HHs	Villages	Technology[6]	HHs	Villages	HHs	Villages
Vientiane	743	29	SHS	743	29	0	0
Oudomxai	1162	44	SHS	625	18	537	26
Luang Namtha	901	32	SHS	771	31	130	1
Champassak	1249	19	SHS	1,060	18	189	1
Luang Prabang	58	1	VH	58	1	0	0
Xiengkhouan	188	2	GS	94	1	94	1
Sayabouri	409	9	SHS	0	0	409	9
TOTALS	**4,710**	**136**		**3,351**	**98**	**1,359**	**38**

BARRIERS TO RENEWABLE ENERGY DEVELOPMENT FOR OFF-GRID ELECTRIFICATION

The basic delivery arrangements piloted by the OPS have worked at the "pilot project scale", with seven provincial ESCOs and some 140 VEMs. However, in order to broaden the geographic coverage of the off-grid component and increase the pace of installations, the following barriers must be overcome:

- Lack of technology diversity in off-grid solutions. The design of the current hire-purchase scheme, including contracts with ESCOs and community planning mechanisms, were designed to be technology-neutral. However, the reality (see Table 2) is that the off-grid component has thus far yielded mostly solar home systems, with unimpressive results for VH and other off-grid supply technologies. The reasons for this are well known - a strong villager preference for SHS (as against a distrust of hydro and gen-set systems); general utility of the individual ownership model, including the ability to purchase different system sizes accommodating a range of affordability and electricity demands; and ease of implementation, as the SHS planning, procurement and installation process is fairly quick and easy for the ESCOs, VEMs and subscribers.

[6] SHS = Solar Home Systems; VH = Village Hydro; GS = Village Engine-Generator Set

For the off-grid rural electrification effort to expand and move into provinces where there are more hydro resources and less solar resources, it will be essential to develop more effective outreach and planning procedures that embrace a broader range of off-scale renewable technologies. Any new procedures designed to increase technology diversity must be culturally acceptable, economically justified and sustainable in the context of each village, especially as regards the need for community mobilization around the chosen power supply scheme.

- Insufficient capacity to scale-up the off-grid program. To date, six of the seven provinces targeted by the off-grid cell of MIH through the SPRE I project have been in the middle-income North and Northwest of the country. Even this modest scale of activity has strained the resources and capacity of MIH's existing off-grid PMU. The current plans for scaling-up off-grid investment call for continuing the present efforts in the seven current provinces while simultaneously expanding to serve as many as 10 new provinces, including several with promising solar and micro-hydro potential. Table 3 shows the planned expansion program.

Undertaking this geographic expansion will require more involvement of provincial governments, especially the Provincial Departments of Industry and Handicrafts, as well as additional provincial and national ESCO concessions. There will be an increased need for timely and efficient oversight of the planning and implementation process as well as regulation of the performance of RESCOs and VEMs. A key area of capacity building will be in the area of participatory planning and community mobilization, as its importance will increase as the program expands to lesser developed, lower-income provinces where the likely village electrification modality will be generator sets and/or micro-hydro rather than solar homes systems.

Table 3: Indicative Expansion Plan for the SPRE II Off-Grid Investment Component

SPRE II - Scope of Off-grid Component

	Provinces	No. villages	No.hh	No. of ESCO	No. of hh with techno. SHS Set	Avg cost hh ($)	VH/GS Sey	Avg cost hh ($)
1	Vientiane	55	1,850	1	500	192.75		82.30
2	Oudomxai	65	3,250	1	500		50	
3	Luangnamtha	101	5,120	1	600		50	
4	Champasak	279	17,550	1	600		50	
5	Luangpabang	19	901	1	500		50	
6	Xaiyabuly	111	7,491	2	700		50	
7	Xiengkuang	40	2,644	1	550		500	
8	Houaphanh	52	2,917	1	500		250	
9	Bolikhamxai	44	2,158	1	500			
10	Khamuane	54	3,224	1	500			
11	Savannakhet	56	2,364	1	500			
12	Salavan	42	2,794	1	500			
13	Sekong	31	754	1	500			
14	Attapeu	36	4,337	1	500			
15	Phongsaly	32	3,493	1	500			
16	Bokeo	76	4,858	1	500			
17	Xaisomboon SR	16	970	1	550			
	Total		66,675		9,000		1,000	

- Limitations and Operational Inefficiencies in Off-Grid Program Administration and Management. The location of all administrative and management functions within the MIH's Off-Grid Promotion and Support Office (OPS) was necessary during the planning and start-up of the off-grid component of SPRE 1. Such a centralized approach and concentration of function was necessary due to the almost complete lack of local capacity regarding renewable technology, off-grid electrification modalities, community planning and mobilization, and so on. The OPS provided a viable means to "incubate" the key components of the off-grid project design., including the recruitment and development of provincial RESCOs. However, the OPS is becoming ill-suited to the demands of an off-grid program that is growing in size (more villages and households), scope (more provinces, more RESCOs), and complexity (more technologies, more delivery models). Some of the shortcomings of the PMU-based off-grid operation were identified in an interim evaluation of the SPRE I GEF MSP, and included: (i) delays operations and difficulties in performing work due to competing priorities for management's attention; (ii) weaknesses in monitoring and enforcement mechanisms, due to administrative barriers to action which in many cases result from OPS' position as a government office;· (iii) failure to mobilize the private sector to make long-term capital investments towards the off-grid rural electrification business; (iv) over-reliance on SHS installations as the modality for off-grid electrification; and (v) difficulties in attracting and retaining staff with valuable and specialized expertise and skills.

- Remaining Technical Barriers. The physical and financial accomplishments of the SPRE I off-grid component took place despite some persistent technical problems. The following problems need to be systematically addressed, either through regulation or central administration, in order to continue reducing the costs and increasing the reliability of off-grid technologies:
  - Difficulties in keeping spares and maintaining key components locally;
  - Finding reliable supplies of appropriate appliances to suit village scale productive applications, especially rice mills, icemakers, grinders, and pumps.
  - Quality problems encountered when sourcing equipment, which require careful performance tracking.

ELECTRIC POWER DSM OPPORTUNITY AND POTENTIAL

A detailed description of the Lao power sector and the power development planning process is provided in Annex 1 of the Brief, *Country and Sector Background.*

In way of a summary description, domestic electricity use in Laos is growing rapidly, with retail consumption forecast to continue growing at 12 % per annum due both to expanded grid access and to higher consumption by urban customers (see Table 4).

Table 4: Forecast Domestic Electricity Consumption in Lao PDR

	Unit	2005	2010	2015	2020
Billed Energy	(GWh)	1337	2093	3138	4320
Losses	(GWh)	334	470	628	762
% Losses		19.98%	18.34%	16.68%	14.99%
Total Energy	(GWh)	1672	2563	3765	5082
% Growth Annual Billed GWh		14	11.3	10.0	7.5

EdL serves four principal unconnected power grid systems in the country, each of which has a different supply and demand mix and separate interconnections to Thailand and Vietnam. It is an oddity of the EdL system that simultaneous import and export exchanges for economy, reliability, balancing and other purposes may be taking place between EdL, EGAT, and EVN on a given day or over a given week. These cross-border high-voltage transmission and medium-voltage distribution linkages represent a high degree of electrical interconnection including indirect synchronization, especially between the load centers and power plants in Lao PDR and Northeastern Thailand. Although there are long-term plans to interconnect the three largest load centers (Central 1, Central 2, and Southern), the high cost of doing so means that the EdL's power development plan in effect consists of four sub-national area plans, each of which has a distinct outlook for balancing power supply and demand over the period of the SPRE II project and beyond.[7]

Historically, Lao PDR has exported surplus power to Thailand, which earns it valuable foreign exchange and helps Thailand avoid more costly power generation investment as well as reduce its greenhouse gas emissions (because Lao hydropower substitutes for Thai thermal generation). Table 5 shows the recent historical patterns of production, consumption, and cross-border power exchanges for EdL, together with a derived forecast for the SPRE II project time frame. At present all hydropower stations belonging to EdL can generate on average about 1,514 GWh annually. However, year-to-year variations due to water flow availability are considerable, as shown by the sharp downturn in both production and energy exports in 2003. Even assuming stable domestic hydropower production, a steady 12% growth in domestic consumption together with the forecast growth of imports needed to balance regional supply and demand will result in the cross-border balance of trade switching to a net import of energy from Thailand beginning in 2005.

Table 5: Historical & Forecast Generation, Imports, Exports & Consumption - EdL

Year	Generation		Imports		Exports		Consumption	
	(GWH)	Growth (%)	(GWh)	Growth (%)	GWh	Growth (%)	(GWh)	Growth (%)
1995	1,085	-9	76.8	34	675.4	-19	337.5	20.8
1996	1,248	15	87.6	14	792.4	17	379.9	12.5
1997	1,219	-2	101.6	16	710.2	-10	434.1	14.3

[7] Power Development Plan (PDP 2004-2013), March 2004. Prepared by System Planning Office, Development Division, Electricite du Laos.

1998	947.8	-22	142.3	40	405.2	-43	514.6	18.5
1999	1,169	23	173.4	22	598.1	48	567	10.2
2000	1,578	35	162.6	-6	862.9	44	648.7	14.4
2001	1,554	-2	185.2	14	796.4	-8	728	12.1
2002	1,570	1	200.8	8	771.4	-3	785.4	8
2003	1,317	-16	237.9	18	452.2	-41	905.7	15
2004	1514		235		486		1,014.4	12
2005	1514		465		364		1,136.1	12
2006	1514		560		228		1,272.4	12
2007	1514		560		75		1,425.1	12
2008	1514		560		-96		1,596.2	12

EdL intends to expand its domestic hydropower production, both by financing its own construction program (Nam Mang, and Xeset 2) and by entering into power purchase agreements with private sector developers of hydropower IPPs. However, the time frame for these additions is the period 2008-2012, nor will these additions eliminate the need for continued imports to individual load centers or the effect that Lao hydropower exports to Thailand will have on the need for thermal power production in that country. Based on this analysis and the power development plan promulgated by EdL for the SPRE II project period, we may conclude for purposes of benefits evaluation that the marginal unit of production required to satisfy domestic Lao electricity growth will be thermal power production imported from Thailand.

MIH and EdL are both interested in starting a DSM program. As there is little or no current information available about DSM and energy efficiency potential in Lao PDR, nor any organized DSM or energy efficiency activity, a DSM program would necessarily start with very basic activities such as data collection and potential assessment.

The DSM potential in the Lao PDR will most likely be confined to the Central 1 Area. This is the major network in the country, comprising 70% of total EdL consumption and including the capital city Vientiane.The 115 kV transmission grid serving the region connects EdL's major hydropower facilities, Nam Ngum 1 and Nam Leuk, as well as EGAT's Northeastern grid, and EdL and EGAT have been exchanging power for load balancing, economy and reliability reasons for many years. Growth is forecast at 11% for the period 2005 to 2010, which will result in net energy imports for this region over the period 2005-2010. The need for imports peaks at 30% of requirements in 2007 but remains for the full period of the SPRE II project. Based on this forecast marginal unit of production for 70% of EdL's customers (and almost all of its urban population) is thermal power production imported from Thailand. [8] This is the basis used below to estimated greenhouse gas benefits of a grant-financed DSM and energy efficiency program.

BARRIERS TO INSTITUTING DSM

At present, EdL does not have the capacity to estimate or analyze electricity use patterns on a tariff or customer level. There are no load research meters or end-use survey

[8] See *Power System Development Plan for Lao PDR. Draft Report.* May 2004, Meritec Limited., and *EGAT Power Development Plan (PDP 2003),* EGAT System Planning Division, April 2003.

capabilities in place. Retail and MV customers are billed on non-time-differentiated rates and there are no interval meters except at the transmission level, and these are for bulk power billing purposes. There is load shape information available at the system and provincial grid level and this data shows recent rapid growth in EdL's peak demand around Vientiane (Central Area 1), with occasional network constraints as a result.

There is no DSM, energy efficiency, or integrated power sector planning capacity within EdL or MIH. Similarly, there is little or no private sector capacity (including manufacturers/suppliers and potential service providers) in terms of DSM or energy efficiency services providers, with the exception of the Rural Electrification Services Companies (RESCOs) established by MIH's Off-grid Promotion and Support Office (OPS). Not surprisingly, there is also an almost total lack of technical expertise or awareness by end-use customers as regards energy efficiency technologies and practices.[9]

At such a rudimentary stage it is essential that any DSM or energy efficiency program be carefully developed and properly positioned as regards the larger context of power sector reform, including marginal cost revenue allocation and pricing, elimination of subsidies, efforts to reduce non-technical losses and uncollected revenues[10], and overall rationalization of the tariff structure, including the scheduled trajectory of 2.3 % monthly increase in tariff rates for all customer classes from May 2002 to April 2005.[11]

THE BASELINE OR BUSINESS-AS-USUAL SCENARIO

The baseline scenario with respect to sector reform and capacity building is that EdL (the IDA borrower) will undertake a power tariff study and certain IT improvements. However MIH, which has the responsibility for both overall rural electrification planning and the design of institutional and financial arrangements, including mobilization of financing, has no income, few resources and cannot afford to borrow. Under the baseline scenario (i.e. in the absence of GEF support) MIH would be unable to finance the measures needed to overcome the major reform and capacity barriers to accelerated rural electrification and renewable energy development outlined above.

The baseline scenario with respect to renewable energy development is continuation of the current modest-scale, SHS-based off-grid electricity supply program. However, capacity to deliver the program would erode, which would raise system costs, reduce quality and reliability, and lengthen installation delays to subscribers as a result of a lower level of operating efficiency. The predictable outcome would be a downward spiral in SHS customer service and equipment performance, which in turn would undercut the customer satisfaction necessary for the ten-year period of account repayment and consumer demand for new systems. With respect to other RE technologies, no steps would be taken to either build technology diversity into the off-grid portfolio or to

[9] An exception is the Lao Plaza Hotel, which uses efficient lighting ballasts and best practice housekeeping

[10] This is a particular problem with GOL agencies, an issue that has been reflected in financial covenants on Bank operations

[11] As tariffs continue a steady climb there may be an additional reason for GOL and EdL to undertake energy efficiency programs - helping poor customers cope with these price increases

outsource of key administrative and management functions to potentially more efficient private or joint venture companies.

The baseline DSM and energy efficiency scenario is that EdL, not having the capacity, information or equipment with which to analyze and potentially manage electricity use patterns, would take no actions to promote energy efficiency or introduce DSM. The baseline scenario therefore is continued 12% average annual growth in domestic electricity consumption, a consequent loss of power export opportunities to Thailand and higher Thai GHG emissions.

GEF ALTERNATIVE PROJECT

Under the GEF Alternative Project, EdL and MIH would strengthen the management of its off-grid component in anticipation of expanding its off-grid/renewable investments; undertake broad-based reform and improvement of its rural electrification arrangements; and launch a power efficiency and DSM program, as outlined below.

INSTITUTIONAL STRENGTHENING OF THE OFF-GRID COMPONENT (GEF $ 1.0 MILLION, ASTAE $25,000, PHRD $75,000)

This sub-component will provide the institutional strengthening necessary to improve the efficiency of off-grid administrative and management while at the same time scaling-up the component's provincial coverage and level of activity. The thrust of the institutional strengthening activity will be a comprehensive program of management outsourcing, based on the recommendations of the Interim Evaluation of the Off-Grid Component, and discussions during previous missions, as well as the Draft Decree on the Rural Electrification Fund. PHRD and ASTAE funds have already been directed towards development of Terms of Reference (TORs) and a procurement strategy for outside contracting of most off-grid implementation functions currently performed by the OPS. This includes central procurement, establishment and capacity building of ESCOs, provision of marketing materials, village marketing, planning, and preparation procedures, and provision of technical support. The outsourcing process will systematically address the current short-comings of MIH's OPS as described above by establishing necessary functional capacity, strengthening organization and management arrangements, providing for a wider range of off-grid technologies, and conversion of the existing purchaser repayment account into a Rural Electrification Fund (REF) that can potentially lead to a self-financing off-grid operation.

GEF will support the following activities necessary to finalize and implement a program to transition selected administrative and management functions of the current off-grid project management organization to private or joint venture companies via a competitive bidding process. The MIH would retain overall jurisdiction over the program, including setting program policy and standards and regulating RESCOS, but would outsource day-to-day operations. The program for MIH capacity building is separately discussed in Sub-Component (f) below. Technical assistance activities are as follows:

- Specialist Consultants for the Tendering Process for Off-Grid Management Contractor(s). TA will provide for placement of key specialist consultants including ICB procurement, financial management, and community planning specialists that will help MIH to complete preparation of Terms of Reference and conduct the outsourcing process for one or more off-grid management contractors to take over the functions of the current MIH OPS.

- Management of the Off-Grid Repayment Fund. This TA will support the evolution of the current off-grid repayment fund into a more versatile Rural Electrification Fund, including recruitment of a Fund Manager and local support staff, development of operating regulations for the Fund, consideration of subsidy policy for both on-grid and off-grid electrification in cases where consumer financing is not possible, development of publicity / supporting materials for use in donor fundraising, and liaison with potential donors / lenders.

- Village Hydro Planning. TA will provide for training of provincial ESCO staff in the specialist skills required for VH site identification and system development. Once trained, the consultants will identify / develop VH system designs for up to 15 remote villages (about 900 households).

- Integration of Pico Hydro technologies into household and village-level access solutions. Extensive informal use of pico hydro already exists in several central and northern provinces where hydro is plentiful. TA is needed to develop pilot projects and then procedures for how to upgrade/integrate/rehabilitate existing pico and add new pico facilities so as to effect household-level, household cluster-level and village-level hydro solutions that are acceptable to local populations and financially and technically sustainable.

- Devolving the accounting and financial management system, management information system, quality assurance mechanisms, operation and maintenance, fee collection mechanism, selection criteria of provinces, and customer relationships necessary for the off-grid management contractors to operate on an autonomous basis.[12]

RURAL ELECTRIFICATION SECTOR REFORM AND IMPROVEMENT

GEF-financed technical assistance to the reform of the energy sector will focus on two critical components: the physical planning process, especially compilation and accessibility of key data and information; and improving the institutional arrangements for all aspects of rural electrification, including planning, coordination, financing, implementation, and integration into other rural development activities, and building the capacity of the sector regulator.

[12] Much of these procedures have already been documented in the Operational Procedures Manual of the OPS.

RURAL ELECTRIFICATION (RE) MASTER PLAN AND DATA BASE (GEF US$ 0.5 MILLION, ASTAE $75,000, PHRD US $ 0.1 MILLION, OTHER US$ 0.2 MILLION)

This component is for the development of a Rural Electrification Master Plan (including associated resource studies for distributed generation) and an electricity distribution database. During the 2.5 years of Phase 1 there will be an emphasis on physical planning, in particular preparation of a Rural Electrification (RE) Master Plan that in turn builds on resource inventory studies that will define the potential renewable energy sources suitable for off-grid electrification on a sub-provincial (district or village) basis. GEF-financed TA is requested for both the resource inventory process and the off-grid aspects of the rural electrification master planning process

A total of $500,000 in funding, or about $200,000 per year, is requested from the GEF for refining the physical planning processes related to the off-grid and renewable components, including establishing a comprehensive rural electrification data base which includes detailed renewable energy resource information. Two studies, RE Framework study, and Social Economic Survey and RE Database financed by PHRD and ASTAE are already under way for preparation of the physical planning aspects of the SPRE II project. These studies will review the previous and current studies on resources, collect social and economic data associated with RE and set up an initial GIS supported RE database, and define a ToR and a framework for development of RE Master Plan.

This component under SPRE II will follow recommendations of the PHRD studies for development of the RE Master Plan. The activities under this component include: (a) to review existing RE targets and planning practices in Lao PDR; (b) to obtain and input new RE data into the existing MIH RE database and GIS so that it provides a comprehensive resource suitable for RE planning; (c) to prepare an RE Master Plan using the RE database and GIS; (e) to train MIH staff in the ongoing maintenance and upgrading of the RE database and RE Master Plan; and (f) to disseminate the outputs of RE Master Plan to provincial and district organizations involved in its implementation.

The outputs expected include:

(i) An updated RE database and GIS (including procurement, installation and commissioning system hardware and software) to a level where it can be used for effective preparation of a RE Master Plan covering the whole country;

(ii) A comprehensive database of location-specific information relevant to developing off-grid electrification schemes using solar, wind, hydropower, and biomass.

(iii) A report documenting principles, guidelines and detailed methodology for RE planning using the RE database and the GIS, manual for updating and maintaining of the RE database and GIS, and criteria and methodology for deciding which villages will be electrified by which method, as well as data formats and collection forms, survey forms etc.

(iv) An RE Master Plan, covering the period up to 2020. The Master Plan will also include estimates of the capital expenditure required to complete implementation of the RE Master Plan. It will list all villages to be electrified from central (EdL), provincial and district distribution grids along with proposed timing for electrification, and all villages to be electrified through off-grid systems (along with suitable off-grid electrification approaches). Villages where pre-grid electrification approaches can be deployed will be identified; and

(v) Training and dissemination of knowledge, including EdL and MIH staff in the ongoing maintenance and upgrading of the RE database and the RE Master Plan, and dissemination of the RE Master Plan to provincial / district organizations and the public through a series of participatory planning workshops at the provincial level in the central and southern areas of the country.

ALTERNATIVE RE DELIVERY MODELS (GEF $750,000, OTHER FINANCING $150,000)

Both on-grid and off-grid rural electrification efforts in Lao PDR have so fare relied on proven but limited delivery models. The hire-purchase scheme piloted in SPRE's off-grid component was quite successful in delivering Solar Home System (SHS) technology, which offers only limited potential for developing productive uses of electricity, but was much less successful in delivering village or district hydro alternatives. The grid extension component relied on the conventional model of financing and implementation by the state-owned integrated power provider. This conventional delivery model also has limitations, requiring concessionary financing and falling short of desired household connection rates.

There is a need as part of SPRE II to pilot alternative financing and electrification delivery mechanisms and models, borrowing from other approaches that have been successful in the region, that may offer new potential or overcome the limitations of the delivery models now in use. Candidate schemes include: (i) Distributed generation and isolated grid systems, to support development of small power networks powered by diesel and/or small hydro facilities serving remote population centers; (ii) Rehabilitation/repair of existing mini/micro hydro stations[13]; (iii) Scale-up of other existing delivery mechanisms, such as the Sunlabob Solar PV Rental Model; (iv) Private-sector distribution models, in which private sector developers/operators are invited to bid on development and operation of small distribution systems; and (v) Franchise schemes, in which retailers and/or commercial Electrification Service Companies (ESCOs) are granted regulated concession areas to develop. Once again, substantial start-up investment is required to establish the organizing frameworks, support detailed design of these alternative rural electrification models, and develop and enact the necessary legal and regulatory arrangements to make implementation possible.

GEF-financed Technical Assistance support to the institutional development process will focus on maintaining current momentum towards creation of institutional arrangements

[13] There are an estimated 39 small isolated grids serving some 5,000 households which are not currently operational

that will enable sustainable Rural Electrification investment, notably a Rural Energy Fund with an independent governance scheme and direct access to grant and lending-based financing resources. These institutional arrangements will extend to and include developing the legal and regulatory mechanisms for oversight of funds management and disbursement and setting overall policy and priorities for rural electrification. Other funding will also be requested to support the establishment of a broadly-based Fund for financing electrification investments of all kinds.

TA will be provided to develop promising alternative financing and delivery mechanisms for rural electrification by way of either on-grid extension or off-grid household or village systems. GEF support is proposed to identify two or three distinctive and promising models/mechanisms and pilot them in the course of SPRE II. Of particular interest will be mechanisms and models which could apply to both on-grid and off-grid electrification modes and which maximize the productive application of renewable energy.

In Northern Laos a delivery model of particular interest is the rehabilitation of existing micro-hydro systems. There are currently about 37 existing micro hydro systems (with capacities in the range of 10 – 100 kW) serving more than 5,000 rural households in Laos. Of these, 12 micro hydro systems (with an aggregate installed capacity of 426 kW) are currently not operational, and about 9 of these are considered suitable for rehabilitation. TA will support pre-feasibility studies and environmental assessments aimed at identifying a program of rehabilitation and repair of existing micro hydro stations, and establishing the scope, viability and institutional / implementation arrangements for a sub-project that could be supported under the SPRE II – Phase 2 Loan. Appropriate arrangements for implementation of the rehabilitation work will be suggested, probably by the private sector through a number of rehabilitate-operate-transfer concession arrangements. The TA will include collation and presentation of data on existing micro hydro systems that can be entered (by others) into the national rural electrification database.

ORGANIZATIONAL STRENGTHENING OF MIH (GEF US$ 750,000)

GEF support is requested for organizational development, upgrading of staff capabilities, retention of key special expertise, and targeted capacity building within MIH to enable it to undertake its expanded roles in the areas of regulation, sector reform, planning and coordination, tendering and procurement, and other functions related to oversight and governance of the energy sector. GEF would provide critical technical assistance to MIH and its Department of Electricity as they take on a new and critical role in overseeing the rural electrification effort. Even after spinning-off its responsibility for implementation of the off-grid investment component and overseeing the Rural Electrification Fund, the MIH would retain overall jurisdiction over the RE effort, including setting program policy and standards, regulating RESCOS and other private sector providers of RE services, and monitoring overall progress towards GOL rural electrification goals. This TA would provide training and capacity building necessary to take on these new responsibilities.

- TA will support the placement of an off grid advisor who will be retained by MIH's Department of Electricity and will provide high-level expertise and technical support to the regulation and oversight of the outsourced off grid investment component. The off grid advisor will be charged with assisting in the preparation of Terms of Reference and the overall tendering process for outsourcing of off-grid efforts operations to private or joint venture management contractors, assisting in development of new delivery arrangements, especially recruitment of new ESCOs at the national or provincial level, improve resettlement and compensation arrangements with respect to land required for construction of village electrification systems, liaising with other off-grid or distributed electrification efforts underway by other donors (JICA) and other GOL agencies (STEA), reviewing and approving quarterly reports submitted by the off-grid management contractors and preparing overall off-grid component quarterly reports to the Bank in the Bank's format.

- TA will provide for ongoing MIH engagement, using local consultant assistance, in the identification of productive uses and cross-sectoral linkages that can be incorporated with off-grid rural electrification initiatives to improve their development impact (such as weaving / handicrafts, health centre improvements, education improvements, water pumping, electrification of diesel rice mills). This will involve liaising with a wide range of stakeholders including GoL agencies, Lao Women's Union, Poverty Reduction Fund, NGOs, bilateral donors, etc. Potential applications for solar PV water pumping (for irrigation and/or water supply purposes) will be demonstrated in two locations.

DSM AND ENERGY EFFICIENCY (GEF US $ 0.75 MILLION, ASTAE US$75,000)

GEF grant financing for a program of Technical Assistance for both EdL and MIH covering both DSM and energy efficiency is proposed. The GEF grant will support early exploration of the potential and opportunities for DSM and energy efficiency in the country, including establishment of provisional institutional arrangements for DSM planning and energy efficiency policy development within EdL or MIH or both. A total of $750,000 in funding, or $300,000 per year, is requested for this activity. The World Bank has already mobilized $75,000 in ASTAE trust funds to support detailed planning of this DSM Technical Assistance activity, including collection of existing data on customer electricity uses, consultations regarding organizational arrangements for DSM planning and implementation, review of DSM models and arrangements in use at other utilities within SE Asia, and detailed study of the DSM and energy efficiency planning and implementation arrangements in use in Thailand, Vietnam and Malaysia.

The TA funding will support the following priority capacity building needs:
- Establishing a DSM cell within MIH or EdL or both;
- Formal survey research on end-use patterns of each of EdL's customer rate classes;
- Formal load research into the load shapes of each of EdL's customer rate classes;
- Regional cooperation on DSM issues within the GMS region;
- Conducting DSM Potential Study to establish the priority markets for DSM in Lao PDR;

- Development of a DSM planning process, and coordination with the Power Sector Planning process of EdL and MIH;
- Development of initial recommendations for DSM and energy efficiency national strategies;
- Outreach and public awareness efforts to increase consumer knowledge of energy efficiency;
- Stakeholder consultations with industrial and commercial customers; and
- development of pilot project ideas and preparation of pilot project plans for key DSM markets identified in the DSM Potential Study, such as efficiency lighting subsidies for households and facility energy audits for commercial and industrial customers

Table 6 summarizes the proposed GEF support to various components of SPRE II.

Table 6: GEF Financing Plan ($millions)

Technical Assistance Activity		Funding Request		Co-Funding	Co-Funding
		Phase 1	Phase 2		Sources
Off-Grid Institutional Strengthening		1	1	0.08	ASTAE, PHRD
RE Sector Reform					
	RE Planning	0.5	0	0.38	ASTAE, ESMAP, PHRD
	RE Institutional Arrangements	0.75	0	0.15	ESMAP
	MIH Organizational Strengthening	0.75	0	0.00	
DSM/Energy Efficiency		0.75	0.25	0.08	ASTAE
Total		3.75	1.25	0.68	

PROJECT BENEFITS

The main benefits and beneficiaries of GEF-financed TA support are as follows:

- For institutional strengthening of **off-grid implementation,** the beneficiaries are those rural households whose off-grid electrification has been enabled or accelerated as a result of the IDA investment in co-financing and the GEF support of capacity building. An estimated 80,000 total rural households will be provided with access to electricity via SPRE II, with up to 20,000 of these households provided with access via off-grid schemes at the household and village level. With access to electricity, rural households would experience significant increases in quality of lighting as well as a rise in their disposable income, since cost of electricity is less than other energy sources previously used for lighting (diesel lamp lighting, candles, car batteries, and dry cell batteries).[14] Of the target villages for SPRE II, about 85% of households rely on diesel lamps (simple wick and hurricane lantern) for lighting. These rural households receive useful lighting delivered of 3.1 Kilo-lumen hours and spend up to 13,000 Kip per month for diesel purchases. Baseline survey estimates that about 41% of households living in the villages expected to be electrified under SPRE II project are currently using car and motor cycle batteries to provide electricity for the

[14] It should be noted that in Laos, diesel is used to substitute kerosene for lamp lighting.

household, primarily lighting, television and radio. The average total monthly spending on recharge and the cost of battery is estimated to be 25,914 Kip per month. On the contrary, rural households with access to electricity through previous World Bank rural electrification projects pay on average as follows: (i) for grid access, 135 Kip per kWh, use about 63 kWh per month, and spend only 10,895 per month for electricity from the grid; (ii) for off grid access through SHS or VH, their monthly cost consists of their contracted repayment amounts, which average about 10,000 Kip per month.

In addition to cost savings, greater access to electricity provides opportunities for rural households to engage in income generating activities, allows households member to have flexible working hours and/or work longer in the evening, and generally improves rural livings standards through improvement of lighting, better and cheaper access to news, information and entertainment. Children are also be able to study, reading and doing homework in the evening after the sun set. Surveys reveal that women in electrified households spend up to one extra hour per night engaged in income generating activities (handicraft, agricultural activities, and tending livestock), housework, and entertainment (television, radio, and reading. Formal research on socioeconomic impacts of off-grid electrification in Lao PDR is underway, although considerable informal impacts information has already been collected by the MIH off-grid PMU. A typical characterization of off-grid electrification, especially as regards income-generation activities, emerged from conversations with householders using off-grid technologies in the SPRE I villages of Pakoup and Tapen. Box 1 below provides some anecdotal evidence in this regard.

Box 1: Economically Productive Use of Household Lighting in Pakoup and Tapen

In the village Pakoup, 46 of the 52 houses supplied with solar home systems were using electric lighting to increase their production of woven scarves and skirts. Researchers found that the looms had been moved into the main rooms of each house, and one of the solar lamps placed nearby. The women and teenagers doing this work were proud that they could contribute to family incomes by up to 5$ per month from evening work net of costs, and were happy to be able to do this after nightfall with the family gathered around. Fishing incomes were declining at that time in Pakoup, and this contribution was not considered insignificant – it certainly more than covered the hire-purchase payments made on the solar systems.

Villagers in Pakoup were routinely using their solar systems to charge the portable 6V batteries used by Lao villagers to power torches (flashlights). These lights are used to hunt fish and frogs during the night, both for the family and for sale. In addition, several fishermen are able to take their fishing nets out onto the lake more frequently to increase their incomes, now that electric light is available to mend nets in the evening (Pakoup is on a reservoir containing many submerged trees which snag the nets).

In Tapen, where 58 houses are supplied by a 2.5 kW VH system, families using electric light make baskets in the evening, adding about $20 of net income per month. The Tapen villagers also sell miniaturized baskets passing tourists, who also buy cold drinks. An ice maker constructed by a local engineer and driven from the turbine during daytime hours produced enough ice for both the tourists demand and a neighboring village. One villager is using the electricity to power a refrigerator that she uses to make sweets for local sale, as well as to charge batteries for customers from nearby villages who pay a fee for this service. Another lady is using the electric light to extend her sewing business into the evening hours, adding about $5 a month to her net income – much more than her monthly expenditure on electricity. It was also found that a carpenter was operating power tools for his furniture and wood preparation business.

In Tapen various ideas and plans for using electricity productively are discussed with enthusiasm. For example, the village electricity manager is planning to install a 7kW hydro-driven generator that would power a rice mill mechanically (this application is universal to most villages with enough hydro potential and in almost all cases the amortization cost of increased capacity is more than covered by the revenues of the milling operation). But even with the current capacity, Mr. Sinh is planning to incubate poultry, and a weaving co-op is under discussion that would benefit from light in evening hours. To satisfy strong demand by tourists for local paper, a papermaking co-operative is planned which would use electrically or mechanically driven pulping machine.

- For support to **rural electrification reform,** including improving rural electrification planning methods and databases and development of more effective and sustainable institutional arrangements for electrification financing and implementation as well as sector governance and regulation, the beneficiaries broadly comprise the 65% of rural households and villages that do not currently have electricity but are scheduled to receive access over the next fifteen years. The benefit of GEF-financed technical assistance to the national rural electrification program will be to create conditions most suitable for meeting the goals of GOL's national rural electrification program.[15]

- For technical assistance to the establishment of a **DSM and Energy Efficiency planning and strategy capacity**, the main beneficiaries include the electricity customers of EdL, who will ultimately be able to more readily access energy-efficient goods and services, as well as participate in DSM programs, and consumers of all modern energy types, who will benefit from the early development of plans and strategies at the national level to combat inefficient energy use. The GOL and EdL and its ratepayers will benefit as well, as efforts to reduce the rapid growth in domestic energy consumption will help maintain the current level of export earnings from bulk power sales to EGAT.

GLOBAL BENEFITS

Both the off-grid investment component and the DSM/Energy Efficiency components of SPRE II will yield significant carbon benefits. As regards the off-grid component, the technical assistance provided by the GEF will allow the IDA credit to be invested more expeditiously and more efficiently, and with greater embrace of technology diversity, than would occur in the baseline case. Furthermore, without the ongoing support provided by the grant-financed technical assistance provides, neither the current off-grid PMU within the MIH or any successor implementation management contractor would likely be able to maintain the ten year lifetime and exemplary repayment record of the current hire-purchase scheme.[16] The fall-off in sustainability is estimated by assuming half of the subscribers drop-out by the half-way point (five years) of the ten-year repayment scheme. Base on this comparison of the Baseline vs. GEF Alternative we

[15] The GoL's stated goal for rural electrification is to increase the electrification ratio for the whole country from the current level of about 36% to 90% by 2020, with intermediate targets of 60% in 2005 and 70% in 2010.

[16] Under the current arrangements the only other sources of off-grid PMU budgetary support are the MIH share of the up-front subscriber payment and the ongoing monthly repayment flows over the ten-year life of the hire-purchase arrangement. Neither of these flows is sufficient to support the current level of capability of the off-grid unit.

estimate 25% of the total program lifetime greenhouse gas potential reduction will only be achievable with the contribution of the GEF financed support to the investment component.

The DSM/Energy Efficiency component is 100% GEF financed, allowing the entire amount of DSM and energy efficiency savings to be counted as global benefits. As described elsewhere, both the highly interconnected nature of the EdL and EGAT power systems and the long-standing commercial arrangements as regards bulk power exchange between the two utilities are such that any reductions in domestic energy use due to DSM or energy efficiency activities during the project timeframe will either reduce the net imports flowing into Laos from Thailand or, if there is surplus EdL hydropower available for export, substitute for thermal power production in Thailand. The direction of the net power flow depends on season, rainfall, location, system reliability considerations, and other variables. As gas- or oil-fired thermal power constitutes the marginal production unit for both EGAT and EdL[17], any change in domestic consumption in Lao PDR due to DSM or energy efficiency incremental exports will have the same carbon benefits (other than adjustment for transmission losses) as an equivalent DSM or energy efficiency program in Thailand.[18]

We assume a provisional DSM program including pilot programs could save 1% of grid-connected electricity consumption in Central and Southern Laos each year beginning in 2006, which works out to about 15.3 GWh of EdL avoided power production. Depending on where and when the energy savings are distributed, they will either reduce the need for imports of thermal power production from EGAT or increase the amount of thermal power-displacing exports from EdL. Either way, the reduced energy consumption has the effect of avoiding thermal power production by either EGAT or Thai IPPs, yielding annual greenhouse gas savings of about 8,050 te of CO_2 annually.[19] If we assume the energy efficiency measures implemented have an average lifetime of five years, we can calculate a program lifetime energy savings of 76.5 GWh and lifetime carbon impacts of at least 40,250 te of CO_2.

As regards the global benefits of GEF financed technical assistance to energy sector reform activities, no attempt is made at a numerical estimate. Qualitatively, it is likely that improved planning methods and institutional arrangements for financing and implementation would accelerate the rural access trajectory relative to any baseline, thus displacing very significant amounts of diesel and kerosene fuels currently used for lighting and battery charging in most rural areas awaiting on- or off-grid electrification.

[17] Oil is the marginal unit during the peak months of April and May; otherwise, the marginal unit is a gas-fired CCGT

[18] See *Power System Development Plan for Lao PDR. Draft Report.* May 2004, Meritec Limited., and *EGAT Power Development Plan (PDP 2003),* EGAT System Planning Division, April 2003.

[19] CO_2 emissions factors for Thailand exclusive of T&D losses taken from *Standardized Baselines and Streamlined Procedures for Selected Small-Scale Clean Development Mechanism Project Activities: A Guide for Project Developers.* The Netherlands Ministry of Housing, Spatial Planning and the Environment, December 2001.

The estimated global benefits directly attributable to the GEF-financed portions of both the off-grid implementation and the DSM/Energy Efficiency efforts are shown in Table 7 below. The incremental costs and benefits are detailed in Table 8.

Table 7: Global Benefits of GEF Support to SPRE II

Component	Basis	Baseline	GEF Alternative	Carbon Benefits due to GEF Support
Off-grid Implementation (10,000 HHs)	Average per-HH lighting fuel use: 5 liters diesel per month = 13.5 kg CO_2[20] = 162 kg CO_2 annually = 1.62 te CO_2 over a ten-yr program life	For each HH in the off-grid program, 100% of diesel fuel for lighting is initially displaced. However, half of the HHs/HH units drop out/stop working by Year 5; thus, 25% of the potential carbon savings for the program lifetime are lost	Full program potential is realized as HH and VH systems are maintained and operating	25% of the program lifetime potential of 16,200 te CO_2 = **4,050 te CO_2**
DSM/Energy Efficency	Lao Domestic use grows at 14% over the period 2005-2009, necessitating growing Thai imports. Each MWh of Thai thermal production generates 0.526 te CO_2 [17]	2006 domestic use: 1,531 GWh 2006 imports: 550 GWh	1% reduction in Lao domestic use saves 15.3 GWh in imports in 2006 and 76.5 GWh over a five-year equipment life.	Carbon benefits of reducing Thai imports are **8,050 te CO_2** annually and **40,250 te CO_2** lifetime assuming a 5-yr life for any energy efficiency investments
Total				44,300

[20] Calculating, Monitoring, and Evaluating Greenhouse Gas Benefits from Solar Home Systems in Developing Countries. Steven L. Kaufman, Sunrise Technologies Consulting. Working paper prepared as part of the Renewable Energy Policy Project's (REPP's) and funded by The Joyce Mertz-Gilmore Foundation.

Table 8: Incremental Cots and Benefits

Sub-Component	Baseline	GEF Alternative	Increment
Strengthening Off-Grid Management	No GEF support. The current off-grid program continues under MIH/OPS management. No steps are taken to improve the efficiency of the operation through outsourcing or other arrangements. The only support to the operation is the reflow account, which isnot enough to fund the off-grid component. Lack of funds erodes capacity to maintain program quality and cost. Quality and reliability suffer, subscriber waiting periods get longer, repayment arrears grow, & there is a downward spiral in customer service, equipment performance, and customer satisfaction. End result is shortfall on targets and useful life of systems, resulting in rebound of diesel use for lighting.	$1,000,000 in support over 2.5 years supports comprehensive program of management outsourcing of most off-grid implementation functions currently performed by the OPS, including central procurement, establishment and capacity building of ESCOs, provision of marketing materials, village marketing, planning, and preparation procedures, and provision of technical support. The outsourcing process will address the current short-comings of MIH's OPS by establishing additional functional capacity, strengthening management arrangements, providing for a wider range of off-grid technologies, and conversion of the existing purchaser repayment account into a Rural Electrification Fund (REF).	Technical assistance allows the IDA credit to be invested more efficiently, and with greater embrace of technology diversity. With this support the management contractor(s) can maintain the ten year lifetime and exemplary repayment record of the current scheme. We thus assume 25% of the program lifetime greenhouse gas reduction possible and program lifetime consumer cost savings will only be achievable with the contribution of the GEF financed support to the investment component. Incremental benefits are then 4,150 te CO_2 and $100,000 in additional disposable income for off-grid subscribers over the life of the program.
RE Sector Reform, including: • Improved Planning • Alternative RE delivery mechanisms • MIH capacity building	No GEF support, without which MIH would be unable to finance the measures needed to overcome the major reform and capacity barriers to accelerated rural electrification and additional renewable energy development needed to meet GOL's RE targets	$2,000,000 over 2.5 years supports improved rural electrification planning methods and databases, development of more effective and sustainable institutional arrangements for on- and off-grid electrification financing and implementation, as well as sector governance and regulation	Beneficiaries are the 65% of rural households without access scheduled to receive it. GEF-financed technical assistance to the national rural electrification program creates conditions suitable for meeting the rural electrification goals.
DSM/Energy Efficiency	No GEF support. Neither EdL or MIH undertake any data collection or policy or program development as regards customer energy use and efficiency. Demand growth continues at 12%, exports to EGAT decline to zero.	$750,000 of GEF support over 2.5 years yields phased effort to establish DSM planning capacity, understand customer use patterns, identify DSM/EE potential, design pilot projects, resulting in a 1% decrease in EdL consumption by 2006	17 GWh annual savings starting 2006; EdL revenues increase by $500,000; EGAT purchases of hydro yield CO_2 reductions of 9,000 te per year

ANNEX B: PROJECT LOGICAL FRAMEWORK

Proposed Adjustable Program Credit
Decision Framework

(1) EDL Component					
Component	*Project Preparation*	*Appraisal*	*Phase 1*	*Triggers*	*Phase 2*
EDL Grid Extension	MV design and optimization Subproject selection LV design and optimization Bid documents Institutional arrangements for implementation Safeguard Frameworks Preparations for Implementation Study	Fine tune project scope for Phase 1. Appraise (technical, economic, financial). Agree triggers for moving to Phase 2. Agree tentative scope for Phase 2.	Implement Phase 1 of grid extension. Project preparation for Phase 2.	Agreed completion status of Phase 1	Implement Phase 2 of grid connection
EdL Tariff	EdL Tariff study to develop strategy for tariffs and subsidies	Agree to develop detailed tariff, subsidy plan based on PHRD study	Detailed design of tariff structure and subsidy arrangements and phased implementation plan Necessary legal, regulatory measures to allow phased implementation	Agreement to proceed with phased implementation	Phased Implementation
EdL Loss Reduction	Loss reduction study. Introduce new methodologies. Define scope of loss reduction investments, studies and capacity building to be included in Phase 1	Agree scope for Phase 1 and tentative scope for Phase 2.	Implement as agreed	Agreed completion status of Phase 1	Further loss reduction assistance if required
DSM	Define scope of DSM component	Agree scope of Phase 1	Implement Phase 1, identify scope for Phase 2 and prepare accordingly.	Satisfactory implementation of Phase 1	Further DSM assistance if required

(2) MIH Component					
Component	*Project Preparation*	*Appraisal*	*Phase 1*	*Triggers*	*Phase 2*
Off Grid Investment	Define scope of scaling up of MIH off-grid component to be included in Phase 1	Fine tune project scope. Appraise (technical, financial, economic). Agree triggers for moving to Phase 2. Agree tentative scope for Phase 2.	**Implement Phase 1 of off grid component..** Project preparation for Phase 2	Agreed completion status of Phase 1	Implement Phase 2 of MIH off-grid
RE Framework	Prepare RE Fund Decree and Draft Regulations. Framework study to review MIH model and define other RE models.	Tentative scope for Phase 2 agreed. RE fund decree revised and submitted to Council of Ministers. Operations Manual for MIH Fund endorsed. Interim management arrangements for Phase 1 in accordance with endorsed Operations Manual established. New models agreed based on RE Framework recommendations. Scope of preparation work for new models to be included in Phase 1 and triggers for Phase 2 agreed. Tentative scope for Phase 2 agreed.	Prior to establishment of fund, existing MIH arrangements used on interim basis. Management contract awarded on competitive bidding basis. Fund established (initially restricted to MIH projects). Arrangements for extension of fund to other participants designed and legal and regulatory provisions drafted and approved. Project preparation and solicitation documents for "other model" projects.	Fund up and running. Agreement to extend to other participants and any necessary legal provisions in place Solicitation documents for "other model" projects completed	Implement "other model" projects
RE Master Plan	Develop framework and TOR for RE Master Plan Study and associated resource studies	Agree scope of Master Plan and associated resource studies to be completed in Phase 1(depending on finance availability). Tentative scope for Phase 2 also agreed.	Carry out Phase 1 Master Plan and associated resource studies	Completion of Phase 1 Master Plan and associated resource studies	Complete Master Plan and associated resource studies
RE Database	Define Structure of RE Database. Carry out socio-economic surveys and analysis.	Agree scope of database preparation to be included in Phase 1 and tentative scope for Phase 2.	Phase 1 database development	Agreed completion status	Phase 2 database development
Sector Financing Strategy	Financing Strategy Study	Agree, during Phase 1, to develop financing strategy based on consultants study. Agree that each new version of EdL	Revise PDP in line with PSDP. Develop financing strategy based on consultants study.	Agreement of Financing strategy. Completion of	Possible additional assistance in this area if required.

		Power development plan should be discussed with Bank	Prepare small hydro IPP project (policy, legal, regulatory, solicitation documents, assumes physical preparation carried out by JICA)	preparation of initial SHPP solicitation	Solicitation and implementation of SHPP.
(3) For both MIH and EdL Components					
EdL and MIH Capacity Building	Study to identify capacity building needs (including for RE Master Plan and database studies)	Agree scope of capacity building in Phase 1	Implement capacity building component	Satisfactory completion status of Phase 1 component	Further capacity building assistance as identified in Phase 1 as required.

PDO/Global Environmental Objective	Outcome Indicators	Use of Results Information
GEF Operational Programs: Remove Barriers to Energy Efficiency & Energy Conservation (OP 5); Promote Adoption of Renewable Energy by Removing Barriers & Reducing Implementation Costs (OP 6) **Strategic Priority: CC-3:** Power Sector Policy Frameworks Supportive of Renewable Energy & EE		
Global Environmental Objectives: Increase the contributions of renewable energy to Lao PDR's rural electrification program Develop DSM programs resulting in reduced need for thermal power production in the region	**Double the "market share" of off-grid renewable HHs from SPRE to SPRE II** Measurable reduction in Lao PDR domestic consumption from forecast levels	YR 1: Estimate potential for scaling-up off-grid YR 3: Maximum potential of renewable energy in follow-on efforts YR 1: Establish targets YR 3: Estimate potential for scaling-up DSM/EE
Project Development Objective: Improve living standards, increase access to economic opportunities and increase the disposal income of rural populations in seven southern & central Lao provinces	Electrified HHs will have measurable improvement in a to-be-defined living standard index[21], measurably increased access to economic opportunities, and a 5% increase in disposal income	YR 1: Establish baseline values and target values YR 3-4: Gauge early impacts of electrification
Intermediate Results	**Results Indicators**	**Outcome Monitoring/Uses**
EdL – Grid Electrification Undertake a program of grid extension in seven central & southern Lao provinces	• Provide MV grid extension to 600 villages and LV connections to 45,000 HHs. • Increase % of HHs with grid access to	Quarterly project progress reports (MIH, EdL) <u>Grid:</u> YR 1: Effectiveness of project design YR 2-3: Achieving village w/o achieving HH goals suggests consumer financing shortfalls <u>Off-Grid:</u> YR 1: Verify portfolio goals YR 2-3: Insufficient village hydro share suggests participatory planning shortfalls
EdL – Reform & Improved Efficiency Establish organizations and build organizational capacity needed to reduce non-technical losses and increase energy efficiency of EdL customers	• DSM cell established • Pilot projects underway • Loss Reduction Program • Tariff studies pursuant to reform	
MIH –Off-Grid Electrification Expand the provincial coverage, increase the size, and diversify the renewable energy portfolio of the off-grid program	• Expand coverage from 7 to 17 provinces • Provide off-grid electricity service to 200 villages and 10,000 HHs • Increase village hydro share to 10% of HHs electrified	
MIH – Reform & Improved Efficiency Establish improved institutional arrangements, physical planning capacity, new delivery mechanisms, and regulatory frameworks necessary for a sustained rural electrification program not totally reliant on project-based financing	• RE Fund operating • Improved delivery mechanisms • RE Data Base • RE Master Plan • MIH RE regulator in place	

[21] A living standard index specific to the objectives of this project will be established during appraisal. The specific living standards indices, survey methods and measurement tools will be derived from the Bank's Living Standards Measurement Study

Arrangements for Results Monitoring

		Target Values		Data Collection and Reporting		
Outcome Indicators	**Baseline**	**Year 1**	**Year 3**	**Frequency and Reports**	**Data Collection Instruments**	**Responsibility for Data Collection**
Global Environmental Outcome: Double the "market share" of off-grid renewable HHs from SPRE to SPRE II. Measurable reduction in Lao PDR domestic consumption from forecast	Off-grid "market share" of total HHs electrified during SPRE (8%) 2003 EdL PDP forecast of 2007 domestic consumption		16% of newly-electrified HHs have solar/VH 1% reduction	Yearly reports Qtrly project progress reports	RESCOs, MIH, PDIH EdL billing data	EdL, MIH EdL
Project Development Objective: Electrified HHs will have measurable improvement in a to-be-defined living standard index, measurably increased access to economic opportunities, and a 5% increase in disposal income	2004 socio-economic survey of project area	Verify baseline, establish TBD target values	TBD % improvement living standard index and access to economic opportunities, 5% increase in disposable income	Yearly cumulative reports	Annual socio-economic surveys	EdL
Results Indicators						
EdL – Grid Electrification: Undertake a program of grid extension in seven central & southern Lao provinces	2004 provincial access levels – 42 % villages 35 % HHs	Verify baseline and target values	Avg access level over 7 provinces increases to 48% of villages and 40% of HHs	Yearly cumulative reports		EdL
EdL – Reform & Improved Efficiency: Establish organizations and build organizational capacity needed to reduce non-technical losses and increase energy efficiency of EdL customers	2004 domestic use & losses	DSMO in place	1% reduction in EdL forecast usage T&D losses @ 15%	Yearly cumulative reports	EdL billing data & forecasts	EdL
MIH – Off-Grid Electrification: Expand the provincial coverage, increase the size, and diversify the renewable energy portfolio of the off-grid program	Currently 5,000 HHs in 7 provinces Only 150 not SHS Only hire-purchase OPS only delivery	3000 new HHs, 12 provinces, 5% VH, outsourcing underway	10,000 new HHs over 17 total new & old provinces, 10% VH, new delivery mechanisms	Monthly and quarterly reports from the MIH PMU	Qtrly project progress reports	MIH
MIH – Reform & Improved Efficiency: Establish improved institutional arrangements, physical planning capacity, new delivery mechanisms, and regulatory frameworks necessary for a sustained rural electrification program not totally reliant on project-based financing	None	RE fund in place	RE Data Base	Yearly cumulative reports	MIH	MIH

ANNEX C: RESPONSE TO PROJECT REVIEWS

a) **Convention Secretariat:** None received
b) **STAP Review**: See below
c) **Task Team Response to STAP Review**
d) **Response to Comments from GEF Secretariat at Pipeline Entry:** see Section C
e) **Response to comments from GEF at work program inclusion:** see Section D.

b) STAP Review

Dr. Jan Hamrin, Center for Resource Solutions
June 28. 2004

World IDA Loan/Grant to the Government of Lao PDR (GOL)
Second Southern Provincial Rural Electrification Project

This is a complex project involving rural electrification, energy conservation and improved transmission efficiency, completing commercialization of Electricité du Laos (EdL); and defining a strategy for financing sector development. In general the plan seems appropriate for the country given the current situation. Some portions of the plan are more fully explicated than others and as a result comments are not evenly distributed for all of the plans subparts.

Key Issues
Scientific and technical soundness of the project

Has the most appropriate and effective approach been used to remove the barriers?
Several of the barriers are directly addressed by this approach such as insufficient rural electrification planning capacity, concessionary financing, tariff reforms, and lack of private sector capacity for scaled-up implementation of rural electrification. A couple of the barriers, however, are not being addressed and could continue to frustrate successful results. Those include:

- Too little rural household income and renewable energy resource data prepare and appraise off-grid electrification projects; and
- Absence of integrated rural development planning, with the result that income-generating electricity uses needed to make power supply economically viable are slow to develop.

Good thinking has gone into the village screening process, design optimization and sector reforms and capacity building. There are also excellent ideas of how to allow the private sector to make useful contributions (though I do not know how compatible this is with the Lao political structure). The following discussion reinforces some of the points made in the project description and suggests some strategies that might expand the project's benefits.

Discussion
Rural Electrification: Though the broader introduction of electricity to rural population will, in theory, increase rural household income through income-generating electricity uses, that does not

happen automatically. In many cases, households may predominately use the electricity for general lighting, entertainment and keeping beverages chilled. Additional effort with community development workers is required to help people understand how and where electricity can add value to rural micro-enterprises and support the creation of new micro-enterprises and local economic development. Capacity building to help community development workers understand and use resource inventories and economic renewable energy applications will greatly increase the potential program benefits.

International experience has shown positive benefits especially for women run rural enterprises but larger, community-based enterprises run by men may be slower to evolve without direct help and support. If micro-enterprise and increased rural economic development is a major goal of this project, capacity building and the availability of rural financing mechanisms should be key components. The availability of micro financing to support such investments as an electric sewing machine, power drills and sanders, or other small equipment can make the difference between a significant economic improvement and an incremental improvement in the quality of life.

Resource assessment data (including training of in-country people who can provide such assessments on an on-going basis) should also be a key element of non-grid tied rural electrification using renewable resources. Not only do you need to know the type and quality of the resource to be used but also to what uses the electricity will be put before a micro-grid or home electric system is designed.

People do not take long to find all kinds of things to do with their new source of electricity beyond what was originally envisioned. The reason non-grid connected renewable energy systems often cease functioning is that too much load is eventually connected to the system and the batteries are soon destroyed. Not only is Operation/Maintenance training important and storage of replacement parts, but also anticipating how the system will actually be used including designing in appropriate types of circuit breakers to prevent system overload.

In the discussions of hydro, it was unclear what type and size of hydro facilities are going to be encouraged. Small hydro can be up to 30 or 80 MW in size (depending upon the definition. Even though impoundments will be smaller than for large hydro, still the siting, and environmental, social and cultural mitigation are critical elements that must be developed in concert with local communities. There are now some excellent micro- and pico-hydro technologies manufactured in Asia that can be very cost-effective, efficient and compatible with community agricultural and social life. In addition, the statement was made that there were too many solar home systems and not enough small hydro. However, no criteria were mentioned as the basis for making this statement or for allocating funds in the future. The criteria should be explicit and easily understood by the consumers who will receive and use the systems. It is also unclear why so many micro-hydro systems are not operational and how this can be avoided in the future (another area that would benefit from some explicit information).

Energy Efficiency: Development of an energy efficiency program is another excellent element for this program however details are sketchy at best. It appears that any energy efficiency

programs will be an improvement where none have existed up to this time. But let me suggest some possible priority areas:

- Development of some appliance standards (particularly for such things as refrigerators, air conditioners, water pumps and small motors. As the economy grows, these are some of the first things people will add to their households. To the extent that they buy inefficient equipment (including equipment that is 'dumped' by developed countries where it is no longer allowed), this will require more electricity than necessary continuing the cycle of scarce capital and electricity facilities for rural areas. It will also contribute to a longer-term problem of trying to get rid of these inefficient appliances later. If people in Laos have few appliances now, there is the opportunity to leapfrog some of the problems that have developed in the western world.
- Stock small appliances and low wattage lighting for rural use. Since the resources for rural electrification are scarce, it is beneficial to use these resources wisely, that means attention to the loads that will be drawing electricity. Educating people about energy efficiency is not enough. Particularly for those living in rural areas, they need to have access to efficient lighting and small appliances at reasonable prices. Otherwise they will end up wasting their electricity and their money compared to what could have been done with the resources at hand.

Electricity Sector Reform and Improvement: It appears that a lot of thought and effort has gone into planning the electricity sector reform and improvement. The only question I would pose here is the extent to which this addresses the problem of "non-technical losses and uncollected revenues" noted on page 31 of the report. If this were a major problem now for conventional electricity service, one would think it would be an even greater problem for rural electrification. Of particular concern is the tendency for people to 'steal power' from T/D lines. Since 80 percent of the rural power will be achieved through line-extension, that would seem to substantially increase opportunities for "non-technical losses." Moreover, since rural populations often have less money than urban populations, expanding rural electricity services without addressing this problem of 'uncollected revenues' would seem to exacerbate that problem even further.

Identification of the global environmental benefits and drawbacks of the project
If successful, this project claims it could yield significant carbon benefits. However, I do not have sufficient information concerning the composition of Laos existing electricity system (though my impression is that it is predominantly hydro) to make an independent judgment. Small hydro development is not without its negative environmental impacts including increased GHG production due to inundation of new areas currently covered with plant life. After inundation, these plants will rot producing methane and other GHG. There inundation also reduces the carbon sequestration capacity of the landscape. New hydroelectric sites must be carefully selected, prepared and the facilities well operated to avoid negative environmental impacts. In addition, the key words here are "if successful." This will be a difficult and complex program to successfully implement, but if successful, many benefits could accrue from it.

How the project fits within the goals of the GEF as well as the operational strategies, program priorities, GEF Council guidance and the provisions of relevant conventions? It

appears that this project fits perfectly within the GEF, its operational strategies, program priorities, Council guidance and provisions of relevant conventions.

Regional Context – The project is well integrated into the regional context. However, one potential claim does not seem consistent with the program: "The expected outcomes of the global objective is substantial adoption of renewable energy in GOL's rural electrification program and increased efficiency of energy consumption for EdL customers, that in turn will result in increased exports of hydropower production to Thailand." Unless new hydro development is sized beyond what is needed for rural electrification purposes, and unless the energy efficiency is very successful and there is little or no growth in electricity demand within Laos, I am not sure where the increased hydro-electricity exports will come from.

Replicability of the project – If this project is successful, it could provide valuable experience and models that would be applicable in many parts of the globe.

Sustainability of the project – If successful (and that means that sufficient training and capacity building are done to support in-country expertise, and the issue of non-technical losses is addressed), the project is designed in a manner that is sustainable.

Involvement of stakeholders and capacity building in the project – For the areas where non-grid connected renewable energy development is to take place, I strongly suggest involving community development workers and community leaders early in the process so they have a feeling of ownership in the projects as they develop. Though there is a plan for screening communities for grid-extensions, it is unclear how communities/households will be selected for the home and mini-grid systems. My experience has been that rural people want electricity but may be ill prepared to identify how it might be most beneficially used without some outside help and support. This type of help can result in tangible plans for micro-enterprises, public works projects (e.g. water purification, water pumping, health clinics and meeting centers) that might otherwise be vague ideas that never come to fruition.

As mentioned several times previously, capacity building should also be a key ingredient in every aspect of this project if it is to be successful. I do not see funds set aside for this purpose in relation to community development workers or community leaders capacity development to prepare them to efficiently use the electricity they are to receive in a manner that leads to tangible economic and micro-enterprise development.

Summary – This project seems to be fairly well conceived though there are a number of blanks in the introductory "Strategic Context and Rationale" that make evaluation difficult. If the project is successful, it will make an excellent contribution to Laos as well as the many similarly situated countries in which it could be replicated. However, the complexity of the strategy requires a lot of capacity building and hand-holding to bring about success.

c) Task Team Response to STAP Review

Comment	Response and Reference
Barriers that could frustrate successful results that don't seem to be addressed include: • Too little rural household income and renewable energy resource data to prepare and appraise off-grid electrification projects; and • Absence of integrated rural development planning, with the result that income-generating electricity uses needed to make power supply economically viable are slow to develop.	The lack of data on household incomes and renewable energy resources will be addressed by the large-scale and comprehensive rural electrification data base and master planning effort to be partially financed by the GEF. Outputs of this work will include a comprehensive database of location-specific information relevant to developing off-grid electrification schemes using solar, wind, hydropower, and biomass and criteria and methodology for deciding which villages will be electrified by which method that includes likely near-term prospects for productive use.
Additional effort with community development workers is required to help people understand how and where electricity can add value to rural micro-enterprises and support the creation of new micro-enterprises and local economic development.	Regarding integrated rural development planning and attention to the need for micro-credit, we agree this is a key element to any sustainable rural electrification program and for that reason have included GEF-financed TA to develop improved approaches to integrated rural development. TA will be provided to MIH to help identify productive uses and cross-sectoral linkages to be incorporated with off-grid rural electrification initiatives to improve their development impact (such as weaving / handicrafts, health centre improvements, education improvements, water pumping, electrification of diesel rice mills, etc.). This will involve liaising with a wide range of stakeholders including GoL agencies, Lao Women's Union, Poverty Reduction Fund, NGOs, bilateral donors, etc.
The reason non-grid connected renewable energy systems often cease functioning is that too much load is eventually connected to the system and the batteries are soon destroyed. Not only is Operation/Maintenance training important and storage of replacement parts, but also anticipating how the system will actually be used including designing in appropriate types of circuit breakers to prevent system overload.	We agree that ongoing attention to how end-users actually operate the off-grid scheme is crucial to sustainability. In the present (SPRE) off-grid scheme the provincial ESCOs and their village-level representatives (VEMs) are responsible for ensuring proper operation of either individual SHS or VH schemes. They are in fact trained to be aware of improper use of systems and pass this training along to the system users. As the VEMS are located at the village level, they are in the best position to oversee the subscribers and redress any problem behavior. The sustainability benefits of an

	on-site network of staff with technical training are so large that we to retain the essential elements of this ESCO/VEM scheme in SPRE II, regardless of delivery mechanism used.
In the discussions of hydro, it was unclear what type and size of hydro facilities are going to be encouraged. Small hydro can be up to 30 or 80 MW in size (depending upon the definition. In addition, the statement was made that there were too many solar home systems and not enough small hydro. However, no criteria were mentioned as the basis for making this statement or for allocating funds in the future. The criteria should be explicit and easily understood by the consumers who will receive and use the systems. It is also unclear why so many micro-hydro systems are not operational and how this can be avoided in the future (another area that would benefit from some explicit information).	A priority of SPRE II will be to address the lack of renewable technology diversity found in the SPRE off-grid component. A key strategy for doing so will be to embrace hydropower technology of every sort, from household scale pico hydro to district-level small hydro. So it is fair to say that the project will seek appropriate and economical off-grid hydro applications from 100 W to 100 MW. Our goal for Phase 1 of SPRE II is to grow the hydro portion of the off-grid portfolio from the 1% level to the 10% level (of total off-grid households), which seems a good start. This is possible because the off-grid component will expand to ten new provinces in the center and north of the country where the hydro potential is greater than in the current seven provinces covered. Regarding why some existing mico-hydro systems are not operational, this is the subject of a JICA study underway now whose results will be considered in developing any small/district hydro access delivery schemes.
Suggestions for possible priority DSM/EE areas: • Development of some appliance standards (particularly for such things as refrigerators, air conditioners, water pumps and small motors); and • Stock small appliances and low wattage lighting for rural use.	These are good suggestions and the project will take them under advisement. Note that the design of the DSM component emphasizes a step-wise approach, in recognition of the very rudimentary level of DSM and energy efficiency in Lao PDR at the moment. The program suggestions provided can be considered during the pilot project planning process, to be undertaken after data on consumer use patterns and load shapes is developed and an overall potential assessment of DSM and energy efficiency for Lao PDR is conducted.
Regarding the sector reform component, to what extent is the problem of "non-technical losses and uncollected revenues" addressed, especially given more opportunities for people to 'steal power' as the rural power grid is extended?	The T&D loss reduction component will be funded entirely by IDA and will include both investment and technical assistance. As budgeted it will double or treble the current level of investment by EdL in activities designed to mitigate both non-technical losses (stealing, diversion and tampering) and

	(stealing, diversion and tampering) and uncollected revenues. This reflects the important of minimizing unnecessary losses to both the commercial viability of EdL and the overall ability of the sector to continue financing investments needed for rural electrification and satisfying demand growth. Each provincial office of EdL will have its own loss reduction target and budget and will be provided with the TA necessary to address any increase in non-technical losses due to growth in the size of the rural grid or the number of rural customers served.
Small hydro development is not without its negative environmental impacts including increased GHG production due to inundation of new areas currently covered with plant life. After inundation, these plants will rot producing methane and other GHG. There inundation also reduces the carbon sequestration capacity of the landscape. New hydroelectric sites must be carefully selected, prepared and the facilities well operated to avoid negative environmental impacts.	The single hydro scheme included in the SPRE off-grid component was run of river. All of the hydro schemes expected to be added in Phase 1 of the SPRE II off-grid component will also be run of river. There is a possibility that the GHG emissions from rotting inundated plant life may be an issue with larger hydro schemes or rehabilitated small hydro schemes, but these will not come into play until the second phase of this APL. Additional detail can be found in the Safeguards technical annex of the PAD.

c) Response to Comments by GEF Secretariat at Pipeline Entry

Comment	**Response and Reference**
Please provide more background on SPRE II consistency with national energy policies and country drivenness.	Both the 2004 NGPES (National Growth and Poverty Eradication Strategy) and the 2001 (PSPS) Power Sector Policy Statement stress the importance of rural electrification within the overall social and economic development plan of the country. The PSPS further specifies the role of both renewables and off-grid electrification as vital to the ability to meet the overall goals of 70% electrification by 2010. Finally, the SPRE II is a close policy fit with the Lao PDR climate change strategy, which includes as priority policy objectives energy conservation and improvements in energy efficiency through upgrading of currently employed technologies, introduction of advanced technologies that are more efficient or based on renewable energy

	sources, and promotion of the use of renewable energy such as small-scale hydropower development and electricity generation by wind, solar, thermal energy and biogas.
The PM suggests to drop the OP5, DSM component or to demonstrate a regional approach, including documented endorsement and commitment of purchasing power from Lao PDR by the government of Thailand.	A regional approach is most appropriate to considering the global environmental benefits of DSM and energy efficiency in Lao PDR. As a practical matter, the physical network and commercial arrangements between EdL and EGAT are such that the two systems can be considered fully interconnected. The *EGAT Power Development Plan 2003* (EGAT System Planning Division, April 2003) includes forecast EdL send-outs as firm contracted capacity and energy over the 20 year period of the plan, including the 2010 scheduled addition of Nam Theun 2. This reflects the long-standing and long-term commercial arrangements and power development cooperation of the two countries. *PDP 2003* also clearly identifies thermal power production (gas or oil fired) as the marginal production unit over the entire SPRE II APL period (2005-2010). From the Lao perspective, the *Power system Development Plan for Lao* PDR identifies that, if the 12% demand growth in domestic consumption continues, the marginal unit of production for EdL's domestic consumption beyond 2005 will be thermal power generation imported from Thailand. This degree of system interconnection along with the interchangeability of Lao hydro imports and Thai thermal power production provides a firm regional basis for calculating equivalent regional carbon benefits (less transmission losses) for any DSM or energy efficiency program whether it is in Lao PDR or Thailand.
Please describe is some detail how the business model adopted by SPRE II addresses sustainability.	The current project design (SPRE) includes features proven effective in combating sustainability problems in other countries: (1) A robust financing system, which during SPRE had achieved a 97% repayment rate from customers. The system underpins sustainability by assuring that villagers, village technicians and managers, village oversight committees, and provincial companies, all have a financial incentive to keep all the equipment working and the payments flowing each month; and (2) Progressive increase in private investment. Under

	the off-grid component of SPRE, off-grid subscribers already significantly self-finance the electricity access (calculated as between 60% and 80% of hardware cost, delivery and 10-year support costs). The Electrification Service Companies (ESCOs) and Village Electricity Managers (VEMs) provide their own working capital, which is repaid through their share of the reflow payments. Additional design features supportive of sustainability will be provided by the GEF-financed technical assistance to SPRE II off-grid component, including: • Establishment of a Rural Energy Fund that will mitigate the funding gaps that result when all rural electrification financing is project-based; • Comprehensive outsourcing of critical off-grid functions, inclusive of incentives that will stimulate greater technology diversity in provincial-level ESCO operations and continuation of the ESO and VEM features of SPRE; • Technical assistance to an optimized physical planning process, and integration of grid- and off-grid electrification with other rural development efforts. • Establishment of a regulatory framework that will install MIH in its appropriate role as regulator, making sure that individual ESCOs operate in ways that support long-term reliability of electrification schemes, including provision for reinvestment in spare parts and maintenance as necessary for reliable operation.
This project off-grid component is described as a partial replication of ongoing similar experiences in Asia; please explain what is original and provide the rationale for the GEF contribution, and include a specific replication plan in the region.	The project design is an amalgam of several other projects, including the immediate predecessor SPRE project, the Cambodia Rural Transmission and Distribution Project, and other recent rural electrification efforts in Chile and elsewhere. What is original about SPRE II is the comprehensive and long-term oriented approach taken. The technical assistance will develop the “four pillars” of a sustainable national electrification program: • Establishment of a permanent Rural Electrification Fund that will mitigate the

	funding gaps that result when all rural electrification financing is project-based; • Comprehensive efforts, including outsourcing and pursuit of alternative delivery mechanisms, that will maximize capacity available, especially in the private sector, for efficient and economical electrification; • Investment in key processes critical to sustainable electrification – an optimized physical planning process, and integration of grid- and off-grid electrification with other rural development efforts. • Establishment of a regulatory framework that will install MIH in its appropriate role as regulator of the overall electrification process, including ensuring that individual ESCOs operate in ways that support long-term reliability and sustainability. We intend to develop the requested replication plan as part of the project implementation and intend to fund this replication activity with supplemental Suplemental funding for the MIH component of the project.
Please include a detailed stakeholder involvement plan, including also NGOs and CBOs.	The predecessor GEF-supported SPRE project has already established a strong basis for stakeholder participation which will be continued and expanded in SPRE II. Key stakeholders can be classed by the level of their involvement and interest in the project: (i) Stakeholders in overall project design and performance include NGOs, other GOL agencies such as STEA, political organizations such as the Lao Women's Union, donors, and private sector entities including the ESCO managers, equipment suppliers, and potential management contractors; (ii) Stakeholders at the sub-project or village scheme level include consumers, closely followed by the village manager (VEM) and prominent village leaders (the chief, the president, the group of leaders), and district and provincial agencies and government. The off-grid component of SPRE as managed by the Off-Grid Promotion and Support unit of MIH has

	organized workshops and meetings every year for five years, involving private sector bodies, NGOs, development agencies, agencies such as RDO and LWU, and central and Province government officials. They have proven helpful in identifying key issues and obstacles to be addressed and building broad-based support for the program. A similar process of stakeholder involvement has been used in the preparation of SPRE II. A PHRD-financed study of Rural Electrification Frameworks has provided an ongoing forum, including an MIH-sponsored national workshop, for stakeholders (government, donors, NGOs, and the private sector) to consider the options for arranging the institutions responsible for planning, financing, implementing and regulating rural electrification. Subsequent workshops will take place specific to efforts to transition the current OPS into a management contractor arrangement with MIH providing guidance and oversight rather than performing implementation. Stakeholder involvement at the community (village) level is effectively embedded within the planning component of the off-grid component. Villagers are given a menu of technology types and consulted as to the type of ownership and investment they preferred. This consultative approach will be retained, and ESCOs are trained to follow the participative planning procedure carefully. The village also chooses its own electricity manager, and this manager earns a living depending on how well he supports the electricity consumers. System subscribers pay to become owners, and VHGS VEMs invest personal funds in starting electricity businesses in their own right. Even supervision responsibility is given to the village; a committee is elected by villagers to oversee the VEM, and mediate between him/her and the consumers. This level of stakeholder involvement at the village or project level is not automatic. It only exists if it is carefully nurtured, by progressive refinement of the project and scheme designs to accommodate new circumstances (new technologies, new financing and delivery mechanisms). The intention is to use the oversight and regulatory capacity of MIH to ensure

	that the strong stakeholder involvement built in SPRE is carried forward to SPRE II. As regards the DSM and energy efficiency component, stakeholder involvement will begin during the preparation phase, when prospective DSM cell staff will review the DSM and energy efficiency development history in Vietnam and Thailand. A consultative process will be established at the outset of DSM and energy efficiency planning to ensure that key stakeholders including government agencies, EdL, NGOs, donors, potential private sector ESCOs and large customers are involved in the process by which early DSM and energy efficiency activities are identified and undertaken.

D) Response to Comments by GEF Secretariat at Work Program Inclusion

Comment	**Response and Reference**
The project is not consistent with the strategic priority S2 (access to local sources of financing).	The Team agrees, per our informal upstream consultation. S2 dropped.
The table quantifying the global benefits (page 32 in the draft Executive Summary) is unclear and the numbers do not correctly sum up.	Table 6 (*Global Benefits of GEF Support to SPRE II*) in the Executive Summary has been strengthened and additional text substantiating the Table added.
The replication plan is weak and must be better articulated.	An expanded replication discussion is included in Section C of the Executive Summary and Section 4 of the GEF Brief.
The project brief does not make a strong case for the DSM component. It is required to include much more information on the baseline and the power sector reform in Lao PDR and its next steps. The achievement of global benefits, including the regional component of selling energy to Thailand, must be substantiated with more background information and figures.	An expanded discussion of the Lao power sector planning process is included in Annex 1 of the Brief, including a substantiation of the basis for global benefits for DSM in Lao PDR. Parts of this discussion are reiterated in Annex A of this Executive Summary. As regards DSM and the power sector reform process, the creation of a DSM entity with the ability to collect data on and better understand the characteristics of customers will help EdL in its efforts toward tariff and subsidy reform, both of which are key components of power sector reform. DSM may also have an important role in addressing the perennial problem of GOL under

	collections, wherein EdL is unable either to collect bills from or refuse service to Government agencies. Finally, strategic DSM programs, such as energy efficient lighting, can play an important role in helping domestic and small commercial customers cope with the current price increase trajectory of 2% per month until May 2005.[22] As DSM is a very flexible instrument which can mold itself to country-specific conditions, it should serve as a versatile tool to help EdL accommodate its customers to the more-painful impacts of reform from the customers' perspective.

A. Samson Kaber
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[22] IDA was advised that the GOL has placed a cap on tariff increases, as the rapid pace of monthly increases has caused political difficulties. This will be a key issue during appraisal and negotiations.