THE WORLD BANK

Report No:

GEF PROJECT BRIEF

ON A

PROPOSED CREDIT

IN THE AMOUNT OF
USD 20 MILLION EQUIVALENT

AND

PROPOSED GRANT FROM THE
GLOBAL ENVIRONMENT FACILITY TRUST FUND

IN THE AMOUNT OF USD 3.75 MILLION

TO THE

LAO PEOPLE'S DEMOCRATIC REPUBLIC

FOR A

SECOND SOUTHERN PROVINCIAL RURAL ELECTRIFICATION PROJECT PHASE 1

July 1, 2004

Energy Sector Unit
Infrastructure Department
East Asia and Pacific Region

LAO PEOPLE'S DEMOCRATIC REPUBLIC

SECOND SOUTHERN PROVINCIAL RURAL ELECTRIFICATION PROJECT

GEF PROJECT BRIEF

EAST ASIA AND PACIFIC

EASEG

Date: June 30, 2004 Country Director: Ian Porter Sector Manger/Director: Junhui Wu Project ID: P075531 Lending Instrument: Adaptable Program Loan	Team Leader: Barry Trembath Sectors: Power (90%);General public administration sector (10%) Themes: Rural services and infrastructure (P);Regulation and competition policy (S) Environmental screening category: Partial Assessment Safeguard screening category: Limited impact

Global Supplemental ID: P080054 Lending Instrument: Adaptable Program Loan Focal Area: Climate Change Supplement Fully Blended?: Yes	Team Leader: Barry Trembath Sectors: Power (100%) Themes: Rural services and infrastructure (P)

Project Financing Data

[ ] Loan [X] Credit [X] Grant [ ] Guarantee [ ] Other:

For Loans/Credits/Others:
Total Bank financing (US$m.): 20.00
Proposed terms:

Financing Plan (US$m)

Source	Local	Foreign	Total
BORROWER/RECIPIENT	7.88		7.88
INTERNATIONAL DEVELOPMENT ASSOCIATION	1.32	18.68	20.00
GLOBAL ENVIRONMENT FACILITY		3.75	3.75
BORROWING AGENCY			
LOCAL COMMUNITIES	4.35		4.35
GAP		0.20	0.20
Total:	13.55	22.63	36.18

Borrower: Lao PDR

Responsible Agency: MIH and EdL

Estimated disbursements (Bank FY/US$m)									
FY	05	06	07						
Annual	3.8	7.5	7.5	1.2					
Cumulative	3.8	11.3	18.8	20.0					

GEF Estimated disbursements (Bank FY/US$m)									
FY	05	06	07						
Annual	1.00	1.50	1.00	0.75					
Cumulative	1.00	2.5	3.00	3.75					

Project implementation period: Start End: January 2005 – December 2007
Expected effectiveness date: December 31, 2004
Expected closing date: June 30, 2008

Does the project depart from the CAS in content or other significant respects? ***Ref. PAD A.3***	[ ]Yes [X] No
Does the project require any exceptions from Bank policies? ***Ref. PAD D.7***	[ ]Yes [X] No
Have these been approved by Bank management?	[ ]Yes [ ] No
Is approval for any policy exception sought from the Board?	[ ]Yes [X] No
Does the project include any critical risks rated "substantial" or "high"? ***Ref. PAD C.5***	[ ]Yes [X] No
Does the project meet the Regional criteria for readiness for implementation? ***Ref. PAD D.7***	[X]Yes [ ] No

Project development objective ***Ref. PAD B.2, Technical Annex 3***
The project development objective is to improve incomes and living standards of 123,500 rural households through electrification of these households.

Global Environment objective ***Ref. PAD B.2, Technical Annex 3***
There are two expected outcomes for the global environmental objective: (1) substantial adoption of 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) increased efficiency of energy consumption for EdL customers, that in turn will result in increased exports of hydropower production to Thailand and eventual greenhouse gas savings, as thermal power plants are the marginal production unit in Thailand over the project period.

Project description *[one-sentence summary of each component]* ***Ref. PAD B.3.a, Technical Annex 4***
Phase 1 EdL Component - Electrify of 42000 rural households through connection to the grid.
Phase 1 MIH Component- Electrify 10,000 households through off-grid technologies

Which safeguard policies are triggered, if any? ***Ref. PAD D.6, Technical Annex 10***
Environmental Assessment (OP/BP/GP 4.01)
Involuntary Resettlement (OP/BP 4.12)
Indigenous Peoples (OD 4.20, being revised as OP 4.10)

Significant, non-standard conditions, **if any**, for:
Ref. PAD C.7

Board presentation: None
Loan/credit effectiveness: None Covenants applicable to project implementation: See Section 6

LAO PEOPLE'S DEMOCRATIC REPUBLIC
Second Southern Provincial Rural Electrification

CONTENTS

A. STRATEGIC CONTEXT AND RATIONALE

1. Country and sector issues

Lao PDR is classified as a Least Developed Country (LDC) with an estimated per capita income of US$320 in 2003. This situation ranks the country among the poorest in the East Asia region, leaving approximately 29% of the population below the national poverty line of $1.5 a day (in 2002/03).

Progress Towards Rural Development and Poverty Reduction

Since the early 1990s, the Government of Lao PDR (GoL) has been successful in achieving solid growth rates and significant reduction in poverty levels but the trend has weakened somewhat in the late 1990s. In an attempt to reinvigorate socio-economic development, GoL has prepared the 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 as one of the strategic growth sectors in the NGPES, includes both rural electrification and reinforcement of the electricity network with a view to power generation for exports.

In response to the need for a clear sector policy and strategy, the Ministry of Industry and Handicraft (MIH) issued in 2001 a Power Sector Policy Statement followed up by a stakeholder workshop and action plan for implementation. The action plan identified three key impact areas: (i) expanding rural electrification; (ii) completing commercialization of Electricité du Laos (EdL); and (iii) defining a strategy for financing sector development.

Rural Electrification and Power Sector Issues

Rural electrification marks one of the remarkable achievements in the socio-economic development of Lao PDR with the connection rate increasing from approximately 120,000 households in 1995 to 370,000 households by the end of 2003. EdL's planning and implementation capacities have markedly improved through implementation of five projects funded by the IDA and the Asian Development Bank (ADB). However, as electrification moves to increasingly remote areas, grid connection becomes less viable. In response, GoL has promoted off-grid delivery models, favoring in particular renewable technologies.

EdL was corporatized in 1997 but remains wholly-owned by GoL. While cost/profit centers within EdL have been established, financial relations between EdL and GoL are still intertwined. EdL's financial viability relies to some extent on hydropower export revenues, a high level of Government equity, and from finance on concessional terms from some agencies. While there is rationale for some level of Government subsidy to EdL's extensive rural electrification program, a rational basis for determining EdL's tariff and government subsidies towards rural electrification has yet to be defined. EdL's

finances were strongly impacted by the dramatic currency devaluations brought on by the East Asia financial crisis. Significant improvements resulted from a Financial Recovery Plan (FRP) which brought the utility in line with financial covenants in 2002, however, continued improvements in planning, financing strategy and operations are required to maintain good performance. Loss reduction is one area where improvements have been recorded, but with 16% transmission and distribution losses there is further scope for financial gains. Also, headquarters and branch operations need to be integrated through further development of information technology and communications systems.

GoL plans an ambitious pace of power sector expansion with an overall goal of connecting 90% of households by 2020 (with intermediate targets of 70% by 2010 and 80% households by 2015), while also promoting hydropower export facilities. It is clear that these ambitious objectives will require financing from sources other than the traditional concessionary lenders. New financing models to take optimum advantage of non-traditional public and private financiers need to be identified and associated revisions to the regulatory framework adopted.

Power System Planning and Development Issues Including Regional Inter-Connection

At present there are 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. These cross-border high-voltage transmission and medium-voltage distribution linkages result in a high degree of electrical interconnection, 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.[1] These characteristics of the EdL grid have specific implications for the GEF's consideration of proposals for financing under OP-5 as discussed in Annex 15, Incremental Cost Analysis.

Barriers to achieving Global Environment Objectives

Other than large hydropower projects such as Nam Neung and the proposed Nam Theun 2, renewable energy development is still in its infancy in Lao PDR. The off-grid model currently being undertaken by the GoL's Ministry of Industry and Handicrafts (MIH) is still in its infancy and up until now lacks a firm regulatory and sustainability foundation, and technology and planning basis. Similarly, DSM and energy efficiency have not yet come under serious consideration by either government or consumers. Key barriers to creating conditions supportive of increased use of renewables include:

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

- Insufficient rural electrification planning capacity to prepare large-scale, integrated rural electrification projects (with both on- and off-grid components) that will deliver household access most cost-effectively.
- 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 scaling-up implementation of rural electrification.

The barriers to development of demand side management (DSM) and energy efficiency in Lao PDR are even more basic:

- Lack of any information about electricity consumption patterns by rate class or end use.
- Lack of public or private sector capacity for program planning and implementation.
- Lack of technical expertise or awareness by end-use customers as regards energy efficiency technologies and practices.
- Low level of understanding of the benefits of energy efficiency relative to current and future electricity costs.

Policy Fit with Lao PDR Climate Change Strategy

The GoL's climate change strategy is the responsibility of the Science Technology and Environment Agency (STEA) located within the Office of the Prime Minister. This is also the location of the GEF National Focal Point for Lao PDR. The climate change issues of greatest concern to STEA include consumption of fossil fuels, especially diesel oil, by the industry, transport and agriculture sectors; methane emissions from paddy fields, as well as use of fuel wood and charcoal, in the agricultural/rural sector; and reforestation and grasslands conservation issues.

SPRE II is a close policy fit with the Lao PDR climate change strategy, which includes the following 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
- Promotion of the use of renewable energy such as small-scale hydropower development and electricity generation by wind, solar, thermal energy and biogas.[2]

[2] *Climate Change Issues and Policies in Lao PDR,* Syamphone Sengchandala, Climate Change Manager, STEA. Training Workshop on Climate Change Issues in Mekong Region, December 2002.

The GoL GEF Focal Point endorsed the proposed GEF financing of SPRE II in a letter to the Country Manager dated 3 March 2004.

2. Rationale for IDA and GEF involvement

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. However, it is considered that there is scope for attracting additional funding to rural electrification activities if appropriate arrangements are devised to meld grant or concessionary funding from public sources with private funding seeking a commercial rate of return. To this end, 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. The proposed arrangements involve a transition from those developed under the existing off-grid pilot project with IDA and GEF support.

Need for GEF Involvement. The proposed GEF financing for SPRE II will be a follow on to the invaluable support already provided to off-grid electrification in Lao PDR by a GEF component of SPRE. This predecessor Medium-Sized Project (MSP) provided $750,000 of technical assistance and capacity building necessary to develop the organizational, institutional, financial, and technical elements of the off-grid component of SPRE. A co-financing model similar to SPRE is proposed for SPRE II. IDA will provide the concessional financing appropriate to rural electrification, while GEF will provide continued grant financing of technical assistance activities central to both successful physical implementation of Phase 1 and preparing a more sustainable and economical approach to meeting the GOL's long-term goals for electrification. As with SPRE, 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.

Commercialization of EdL. IDA has closely collaborated with ADB in working to increase the commercialization of EdL. While the FRP will achieve overall tariff levels

in the order of those required for financial sustainability, an appropriate tariff structure and tariff arrangements that will clearly separate EdL's commercial objectives from GoL's social objectives have yet to be defined. Work has commenced in defining such a structure using PHRD funds, and is expected to result in an action plan for tariff reform to be fully implemented within the program period. The broader issues of power sector restructuring will be initially addressed by an ADB financed study, while the Government has requested the Bank to seek funding for a workshop to introduce the principles and options for independent regulation of the sector.

Financing Strategy. It is an explicit goal of GoL to attract private financing to complement public funding of sector expansion, and in recognition of the demanding requirements of private investors, IDA has engaged in improvements of the enabling framework of the sector. GoL also recognizes that attraction of private investment will require the adoption of new development models involving various forms of public private partnership, preparation and continuous review of least-cost planning scenarios, and upstream development work associated with favored expansion candidate projects. Studies in this regard have been initiated during the preparation of the current project. Development of a sector financing strategy and implementation of this strategy will be continued under the current project.

IDA's ability to play a leadership role in these sector reform activities are its primary "value added" beyond the provision of concessionary finance which could also be productively utilized in other sectors. The ability to play this role also relies on the relationship between IDA and GoL/EdL that has grown up over more than a decade's involvement in the sector, through which the counterparts regard IDA as a trusted partner in pursuing sector reform consistent with the context and pace of national reform efforts.

3. Higher level objectives to which the project contributes

NGPES and CAS Objectives. In line with the main objective of the government-owned NGPES and the existing CAS, the proposed project will support rural and national infrastructure development by targeting rural electricity consumers and 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.

Global Environmental Objective. 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). Furthermore, the strategies and outcomes that the proposed GEF financing will support are closely aligned with two of the six recently-adopted Strategic Priorities for the Climate Change Focal Area, especially creation of power sector policy frameworks supportive of renewable energy and energy efficiency (CC-3). The global benefits of the two GEF-supported SPRE II components are estimated as 4,050 te CO_2 lifetime for the

off-grid renewable electrification component and 40,250 te CO_2 lifetime for the DSM and energy efficiency component.

B. PROJECT DESCRIPTION

1. Lending instrument

SPRE II will be financed by an Adaptable Program Loan (APL), with two phases totaling six years. This approach was decided at the Project Concept Meeting taking into account current severe constraints to IDA funding and also to help ease the timing pressure in relation to sector reform activities. This recognizes the time taken to develop definitive plans for various reform activities, and the time required for project beneficiaries to obtain commitments to such plans in a consensus style political environment. Under the APL approach, some reform commitments can be phased with agreements in principle agreed at negotiations of the first project, with more specific agreements acting as "triggers" for the second tranche of the credit. The programmatic approach is also considered appropriate to help alleviate the "boom-bust" effect currently a feature of EdL and off-grid rural electrification. Even within each individual tranche it is proposed to schedule equipment deliveries such that installation occurs more or less continuously over a six year period.

GEF grant financing is proposed for the off-grid, DSM/Energy Efficiency, and sector reform components of both phases. Continuation of GEF support for Phase 2 be based on the same decision framework developed for the program overall.

2. Program objective and Phases

The program development objective is to increasing incomes and improve living standard of 123,500[3] rural households through electrification of these households, 8 % of such expansion to be financed from increased (non-traditional) funding to the sector. The targeted households represent 25% of GoL's target of additional connections between 2004 and 2020.

The Phase 1 project involving $20 million of IDA funding and $3.75 million of GEF financing would directly finance electrification of 52,000 households of which 10,000 would be off-grid. It would also involve development of existing 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 71,500 households of which 20,000 would be off-grid. Additional Financing will be drawn from non-traditional

[3] Phase 1 targets are 42,000 and 10,000 households through on-grid and off-grid electrification respectively and Phase 2 targets are another 51,500 on-grid and 20,000 off-grid households.

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.

A preliminary decision framework (Annex 3) has been discussed with the Borrower and will be firmed up during appraisal. Key triggers for moving from Phase 1 to Phase 2 are summarized as follows:

- **Rural Electrification Fund** in operation, Government agreement to extend to non-MIH participants and any necessary legal provisions in place; solicitation documents for "other model" projects completed.

- **Tariff and Subsidies**: Government agreement to proceed with phased implementation of detailed action plan

- Agreement of **Power Sector Financing Strategy**; completion of preparation of initial Small Hydropower Project for solicitation

3. Project Development Objective

The project development objective is to improve incomes and living standards of 123,500 rural households through electrification of these households.

Previous studies in Lao PDR[4] had 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 standard 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 ((see Box in Annex A). Longer-term effects have also been demonstrated as longer student study hours are reflected in increased years in school.

As part of preparation for the proposed project, detailed socio-economic surveys were carried out in sample villages electrified under three earlier Bank projects and proposed to be electrified under the proposed project (grid connected and off grid). The objective of these surveys was to utilize past experience to define linkages between electrification and economic development and poverty alleviation, 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 proposed project. The study was also designed to provide baseline data for income and other poverty indicators for sample villages and households to be electrified under the project. While analysis of data from these surveys is still underway, it is already very clear that the substantial economic and social benefits of access to electricity are reinforced by the results of the current surveys.

[4] Institutional Development for Off-grid Electrification. ESMAP June, 1999

Achievement of this outcome will be measured by socio-economic surveys in villages electrified under the project, the results of which will be compared with the baseline studies referred to above.

There are two expected outcomes for the global environmental objective: (1) substantial adoption of 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) increased efficiency of energy consumption for EdL customers, that in turn will result in increased exports of hydropower production to Thailand and eventual greenhouse gas savings, as thermal power plants are the marginal production unit in Thailand over the project period.

As described in Annex 3, achievement of the renewable energy objective will be measured by the percentage of households electrified by renewable off-grid technologies in relation to overall households in the proposed project, in comparison to the baseline established by the SPRE project. For the DSM and energy efficiency activities, 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 off-grid and DSM/energy efficiency components of SPRE II.

4. Project Components

The Project has two components one to be executed by each beneficiary EdL and MIH.

The EdL component 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:

(a) extension of the EdL grid to about 42,186 households in some 544 villages in seven central and southern provinces;
(b) enhancement of existing EdL 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;
(c) furthering integration of EdL headquarters and branch offices (BO) through rolling out the existing billing and accounting system (BAS) installed in Vientiane Office and some BOs to remaining BOs;
(d) implementing a program of Demand-Side Management (DSM) and energy efficiency activities in the country, including establishment of provisional institutional arrangements for DSM planning and energy efficiency policy development within EdL or MIH or both (further definition of this program currently underway with ASTAE assistance).
(e) development of tariff and subsidy policies and associated tariff regime and an action plan to implement this regime.

The EdL component will generally be IDA financed, except that DSM and energy efficiency activities will be financed by GEF. In all activities, EdL will provide substantial co-financing. The financing by source is provided in Annex 4 and a detailed financing plan is provided in Annex 5.

The MIH component will contribute to the project development objective through scaling up the 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 2 project. It consists of the following sub-components:

(a) provide electrification to about 10,000 households spread over 1109 villages in 17 provinces through off-grid technologies (mostly renewables);
(b) scaling up the existing MIH off-grid development program through establishment of necessary legal and regulatory underpinnings, strengthening organization and management arrangements, offering a wider range of off-grid technologies, and conversion of the existing re-flow account into a Rural Electrification Fund (REF) to provide a self-financing contribution to the MIH program.
(c) detailed design of other rural electrification models involving non-traditional developers and financiers and development and enactment of necessary legal and regulatory arrangements including those necessary to extend REF to other participants, and project preparation including solicitation documents for "other model" projects.
(d) development of a rural electrification master-plan (including associated resource studies for distributed generation) and an electricity distribution database;
(e) development of a sector financing strategy including models for solicitation for new generation and preparation of a small hydropower IPP project for sales to the EdL grid (policy, legal, regulatory, solicitation documents), assuming technical feasibility study carried out by JICA.
(f) strengthening organizational and management arrangements within MIH to enable it to undertake its expanded roles in the areas of 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 financing will support all of the institutional development components. The financing by source is provided in Annex 4 and a detailed financing plan is provided in Annex 5.

5. Lessons learned and reflected in the project design

The project takes into account IDA wide lessons of rural electrification including those from the following sources: *Rural Electrification: A Hard Look at Costs and Benefits; OED Precis, May 1995 and*. Project team members and peer reviewers also bring lessons

from other IDA projects and studies in Bangladesh, India, Sri Lanka, Philippines, Vietnam and Cambodia.

IDA has had four rural electrification projects in Lao PDR, of which the most recent (Southern Provinces Rural Electrification (SPRE) Credit # 30470) is nearing completion. Key lessons learned from the grid extension program include the high elasticity of connection rates to upfront house-wiring costs; choices in relation to connection capacity help to deal with the affordability issue; large cost savings are achievable through optimization of grid-extension designs and that loss reduction investments are very cost effective.

A formal interim evaluation of the GEF MSP supported off-grid program concluded that constraints associated with the off-grid project management unit being a government office led to delays in its operations and difficulties in performing its work. The evaluation recommended that the management of an expanded off-grid program undertaken under the SPRE II program be transitioned to a private or joint venture company, allowing for more efficient operations and increased flexibility in design, a greater focus and transparency in its work and stronger incentives through the linking of payments to the company to its performance. Any outsourcing or management contracting solution would need to transfer the authority to take procurement and other decisions, where delays currently often occur, while be accountable to MIH regulation and IDA oversight. These recommendations have become a central element of the SPRE II design, which will emphasize outsourcing of off-grid planning and implementation functions and development of alternative delivery mechanisms, among other institutional innovations.

The project design also reflects lessons learned from other recent and ongoing GEF co-financed projects, notably Cambodia, Chile, Swaziland and Ethiopia, each of which include rural energy funds and similar institutional arrangements in support of long-term electrification programs. Key lessons from these operations reflected in the design of the off-grid component of SPRE II include:

- To ensure institutional and financial sustainability, rural energy programs must maximize private sector participation
- To develop viable small- and medium-size rural energy entrepreneurs, it is critical to provide early hand-holding enterprise development services combined with modest amounts of start-up financing.
- To achieve desired impacts on living standards, it is critical to take an integrated approach that links RE services with livelihood support and income generating activities.
- The most critical role for governments is to put in place a sound regulatory framework, an adequate tariff structure, and a dedicated rural electrification agency that can look after mobilization of concessionary financing
- Rural electrification programs should be an integral part of the power sector.[5]

[5] *A Review of the ESMAP Rural Energy and Renewable Energy Portfolio*, April 2004.Joint UNDP/ESMAP Publication.

The current design most closely resembles a parallel operation in Cambodia, which involves a Rural Energy Fund that is being established specifically to enable attainment of a long-range electrification program through four categories of activities: coordination and dissemination of information, technical assistance to improve supply side options, grants to co-finance project preparation, and grants to co-finance project investment. The REF will comprise a Secretariat including information, planning and evaluation, finance, and administration functions and will be governed by both a Rural Electrification Board with government, donor and financial sector participation and will report to both the Ministers for Energy and Finance. The REF will assist private sector developers in providing new connections, electricity to households using solar home systems, and add as well mini-hydro, and micro hydro capacity.[6]

Project design has also greatly benefited from the results of Japanese PHRD financed studies on five topics carried out during project preparation stage: (a) a social-economic survey of electrified and non-electrified villages and households in areas served by earlier IDA supported projects as well as proposed project areas including the design and initial population of a rural electrification database; (b) an EdL tariff study to identify an appropriate tariff structure and tariff arrangements that will clearly separate EdL's commercial objectives from GOL's social objectives and to define an clear and transparent subsidy and cross subsidy mechanism; (c) a rural electrification framework study including review of existing off-grid delivery models and examining alternatives for scaling up off-grid electrification; (d) a study to define the overall financing strategy for the energy sector; and (e) a power distribution system loss reduction study to define the proposed sub-component

6. Alternatives considered and reasons for rejection

The institutional development and sector reform activities in the project reflect the priority activities identified in the Lao PDR Power Sector Policy – Strategy for Implementation of Proposed Reforms. These fell into the following categories: (a) completing the commercialization of EdL; (b) tariff policy for EdL Grids; (c) implementation models for rural electrification; (d) financing of EdL System Development and IPP Export Program. The APL financing approach was chosen in preference to a SIL for the reasons set out in Section B1.

The alternative of proceeding without the GEF-supported technical assistance to organizational development, institutional strengthening, capacity building, and framework creation was considered With respect to renewable energy development, this alternative would have the effect of continuing the current situation wherein the planning and implementation of the off-grid component is undertaken by the Off-Grid Promotion and Support Office (OPS) of the Ministry of Industry and Handicrafts (MIH). In this alternative there would be no steps taken to improve the efficiency of the operation through outsourcing or other arrangements. The only financial support to the operation

[6] Report No: 27015-KH, Project Appraisal Document, Rural Electrification and Transmission Project, November 21,2003.

would be the reflow account, which is not enough to fund the level of technical assistance required to undertake geographic expansion or other scaling-up of the off-grid component. Lack of funds would erode capacity to maintain Solar Home System (SHS) program quality and cost and make it impossible to undertake efforts towards increased technology diversity via planning and implementation of village hydro (VH) and other off-grid schemes. In addition to hamstringing the ability of the existing off-grid component to expand and improve, the lack of GEF support would make it impossible to undertake the capacity building and institutional arrangements necessary to more broadly improve the overall Lao PDR rural electrification program. Without GEF support for improving the physical planning process, developing alternative delivery arrangements, establishing and building a Rural Energy Fund, and creating a needed regulatory framework embracing MIH, the long-term sustainability of the Lao rural electrification effort would materially suffer.

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.

Another alternative considered was proceeding with GEF support but without transitioning of crucial off-grid implementation functions from the he current MIH/OPS model to a management contractor/outsourcing model. This alternative was considered, as it has been proven successful by meeting financial and physical targets of SPRE, but was ultimately rejected because of the strong recommendations of the interim evaluation of the SPRE GEF MSP[7], subsequent discussions with rural electrification stakeholders in Lao PDR, and the overall direction being taken by the Rural Electrification Fund decree activity. All of these sources point towards outsourcing of all but MIH's regulation and oversight responsibilities and use of multiple, competing delivery arrangements as the preferred long-term rural electrification approach.

[7] Lao PDR: Evaluation of Off-Grid Renewable Energy Electrification Pilot Demonstration Project. Draft Report, December 2003. Submitted to GEF by: Economic Consulting Associates.

C. IMPLEMENTATION

1. Partnership arrangements

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.

Consultations have also occurred with the emerging private sector off-grid service companies, such as Diamond Electrical and Sunlabob. The effort to create a Rural Electrification Master Plan, including a Rural Electrification Data Base comprising socioeconomic as well as resource information, will require close collaboration with other project-implementing agencies, notably JICA's Master Plan Study on Small Hydropower in Northern Laos.

2. Institutional and implementation arrangements

Implementation period. The Project will be implemented over a 2.5 year period implemented from beginning 2005 to middle 2007. This Project comprises Phase 1 of an Adjustable Program Loan (APL) as described in B (1) above.

Implementing agencies. The Project will be implemented by EdL and MIH jointly.

EdL will be responsible for the EdL component as defined in Section ( ) above. The project organization is generally divided into two functions, i.e. project office in headquarters and construction team at each of the five BOs. 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 BOs 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 as defined in section --- above, 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 shortcomings 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.

Capacity constraints.

Procurement Capacity Constraints: While EdL has acquired practical procurement experience through the pervious IDA financed projects, it would still need external assistance in finalizing technical specifications and preparing bidding documents up to a good standard. As such, an international consulting firm has been selected to assist EdL in all aspects of project preparation and implementation including procurement and subsequent contract management.

On the MIH side, it has done reasonably well in handling the consultant selection process (QCBS) for three preparation studies funded by PHRD grant. However, it has no ICB experience. As such, an individual procurement consultant (who knows the IDA procurement guidelines and procedures) will be hired to provide training to MIH staff on ICB procedures and assistance in preparation of ICB bidding documents.

Financial management capacity constraints: Financial management of the project would be separately handled by EdL and MIH. While EdL is familiar with the IDA financial management and disbursement procedures through implementation of the previous IDA funded projects, it would still need some trainings on preparation of Financial Monitoring Reports (FMRs) required by the proposed project. In addition, (i) the bookkeeping of the existing SPRE project, carried out in Excel spread sheet, would be automated by using the newly installed financial accounting system by EdL--BAS; (ii) technical assistance will be provided to the Internal Audit Department to enhance their capacities.

On the MIH side, even though it is not responsible for bookkeeping of the existing SPRE project, but the financial transactions have been kept track for its internal monitoring purpose by using in-house developed accounting program. With minor modification needed, the program should better serve the requirements of the SPRE II project. In addition, considerable training will be provided to MIH staff on IDA financial management and disbursement procedures.

Funds Flow. IDA funds would be made available to Government at standard terms. The Government would on lend the Credit proceeds for the EdL component to EdL under a Subsidiary Loan Agreement.

Credit/Grant proceeds will be channeled either through Special Accounts to EdL and MIH or through direct payment. EdL counterpart funds will be channeled through normal EdL payment procedures. Government counterpart funds are expected to be mobilized from the re-flows associated with ongoing rural electrification activities. These currently flow into a locked account, but under the project this is expected to be converted to an REF with the ability to co-finance IDA investments. Disbursement from the IDA and GEF Credit and Grant would be made on the traditional system.

3. Monitoring and evaluation of outcomes/results

GEF-financed M&E: Comprehensive monitoring and evaluation arrangements will be implemented under the overall SPRE II project umbrella. In addition, the proposed GEF-financed component will comply with GEF guidelines and requirements for measurement and evaluation, including those contained in the *Monitoring and Evaluation Procedures Manual,* dated January 2002.

The M&E plan will use the logical framework approach (LFA) per the *Procedures Manual* and will provide for collection of baseline data before project implementation and collection of key performance indicators as well as other quantitative data. Several study projects planned as part of project preparation and funded by PHRD, especially the socio-economic surveys and establishment of a rural electrification database, and evaluation of the benefits of both on-grid and off-grid electrification, will be particularly useful in formulating the details of an M&E plan for the proposed component.

4. Sustainability and Replicability

Sustainability of the off-grid component. Certain risks to the sustainability of the off-grid component were identified in the *Interim Evaluation of Off-Grid Renewable Energy Electrification Pilot Demonstration Project.* Key concerns were: (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; (6) long repayment periods and likelihood of under-funding for intermittent reinvestment in batteries and spare parts.

There are no universal solutions to the sources of sustainability problems listed above. 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;[8] 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 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;
- 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.

Sustainabilty of the DSM and Energy Efficiency Component. DSM and energy efficiency are mostly unknown at present, and significant and rudimentary effort is needed just to characterize the potential impacts and economics of such a program. For this Project the

[8] The reflow account, expected to be the underpinning of an eventual Rural Energy Fund, had a balance of 67,000 USD by the end of 2003. It is possible to anticipate the eventual removal of GEF grant financing, with progressive replacement for certain types of expenditure from the reflow account, within the scope of this project.

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). This DSM cell will be charged with the basic planning and potential studies necessary to give a broad outline of the possible DSM and energy efficiency strategies and programs suitable to the Lao energy and power sectors.

Replicability of the Off-Grid Component. The project design put forward here is already 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. Successful continued innovation of the basic framework for an off-grid component undertaken in the context of a national program of grid and off-grid access provision where renewable energy plays a critical role and financing is undertaken both through concessional financing and other sources coordinated by a national Electrification Fund will likely follow throughout the East Asia and adjacent regions. 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 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. 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.

Replicability of the DSM and Energy Efficiency Component. 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.

5. Critical risks and possible controversial aspects

For on-grid electrification an important risk is that achievement of the development objectives may be constrained by affordability of house wiring by rural households in electrified villages. In the SPRE project, household wiring costs varied somewhat among provinces and a strong demand/price elasticity was shown to exist. The house wiring charge policy will be reviewed under SPRE II with time payment included in the options. Precise arrangements will be discussed with EdL at appraisal.

Risks to component results: The implementation capacity of the off-grid component is a major risk that may affect achievement of the off-grid electrification target within the designed 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. As an interim arrangement according to the design of the Project implementation, the physical off-grid investment component will continue to be responsible by the MIH off-grid unit for about 6 months before it is took over by a private or joint venture company through a management contract. There is a political risk that whether the GoL will 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 shall lead to establishment and running of the REF 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 built into the trigger conditions for release of Phase 2 or the conditions for credit 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 Project 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.

Risks	Risk Mitigation Measures	Risk Rating with Mitigation
To project development objectives		
Affordability for house wiring charges of households in targeted villages to be electrified.	GoL endorses adequate subsidy policy and EdL implements reformed house wiring charge policy in Phase 1 to ensure house wiring charges affordable by most of the households in the target villages to be electrified by grid extension.	L
To component results		
Implementation capacity of the off-grid investment component	Spin-off the implementation responsibility from MIH to a private or joint venture company through a management contract.	L
GoL endorsement of establishing the REF and running the REF through a management contract with open access to other participants in rural electrification business	Built the commitment of GoL into the decree to be issued for set-up and operation management of the REF, and make issuance of the decree and necessary GoL endorsement as triggers for releasing Phase 2 credit.	L
Overall Risk Rating		M

6. Loan/credit conditions and covenants

1. Effectiveness Condition
Execution of subsidiary loan agreements

2. Condition of Disbursement to MIH
Presidential approval of Off Grid Decree satisfactory to IDA

3. Other

Agreements Reached with Borrower

Flow and Utilization of Project Funds

On-lending terms to be discussed at appraisal

Management and Financial Aspects

Take all necessary actions including adjustments of tariffs to enable EdL to realize satisfactory operating, cash generation and debt limitation ratios.

Take all necessary actions to carry out an Accounts Receivable Action Plan to assist EdL in reducing outstanding Government arrears in electricity payments.

Safeguard Aspects

Prepare and Carry out EMPs RAPs and EPDPs for MIH component in accordance with respective framework documents agreed with IDA.

Agreements reached with EdL

Management Aspects

Prepare and implement in an efficient and transparent manner, satisfactory to IDA a Power Investment Plan; And (b) provide information to IDA on any energy, generation, transmission and distribution projects to be implemented outside the Power Investment Plan, and allow IDA to comment on such investments.

Safeguard Aspects

Prepare and Carry out EMPs RAPs and IPPs for the EdL component in accordance with respective framework documents agreed with IDA.

Financial Aspects

Financial covenants for EdL as for SPRE project (with temporary adjustments agreed with IDA as per FRP). To be further discussed at appraisal

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D. APPRAISAL SUMMARY

1. Economic and financial analyses

Summary Project Analysis (Detailed assessments are in the project file, See Annex 9)
Cost Benefit NPV= US$ million; ERR = %

Economic analysis is performed only on the physical component of electrification for Phase 1 of SPRE II, prepared under the APL. Physical component of US$30.65 million is distributed as: access to electricity with grid connection (87%); off-grid systems (8%); and loss reduction component (5%). Separate analysis is performed for grid-connection and for off-grid systems. It is assumed that the loss reduction component of US$1.75 million has the same returns as the other two components.

Among the several benefits of rural electrification that are expected to bring widespread modernization and significant socio-economic development with its direct and indirect impacts, only benefits from enhanced lighting could be quantified with data gathered by the 3,500 household surveys in the electrified and non-electrified villages. Household consumption patterns in the low, medium and high income categories, are translated into demand curves of lumen consumption with and without electricity. The basis of consumer surplus rests on the fact that the derived 'consumer willingness and affordability to pay', which is simply equal to the ' price per lumen consumption' without electricity, is higher than the price of electricity per lumen consumption. The analysis is conducted under the assumption that households make complete shift to electric lamps once electricity is available.

The benefits derived from consumer surplus gains from electric lighting are conservative and are based on a simplistic approach. Positive externalities like safety, convenience, time saving, enhanced ability to read, better air quality etc. are not accounted for. Based on such conservative assumptions on the valuation of benefits, the project still yields high EIRR for both components over a period of 30 years reflecting the low risk of the project.

Grid Electrification Target: 42,186 Households

B/C	IRR	NPV	Comment
4.2	51%	US$ 114	@10 % discount rate
3.8	49%	US$ 92	@12% discount rate
1	**67%**	**0**	**EIRR**

SHS Target: 9,000 Households

B/C	IRR	NPV	Comment
3.0	24%	US$ 5971	@10 % discount rate
2.7	22%	US$ 4693	@12% discount rate
1	**36%**	**< 9**	**EIRR**

EdL's current financial situation and compliance with financial covenants for FY02-03 had been satisfactory largely due to the implementation of financial strengthening measures under the Financial Recovery Plan, the application of proceeds from the refinancing of its investments in Theun Hinboun Power Company (THPC), and the dividends received from these investments. To maintain its future financial health, EdL needs to address key financial issues of commercialization, electricity tariffs and subsidies, Government's overdue bills, investment program and its financing, and treatment of its non-operating income. The financial projections show that its future finances would be greatly impacted by the level of capital expenditures in generation and transmission in FY04-06. It is therefore necessary for the Government and EdL to agree

on the critical capital expenditures in this period taking into account optimal allocation of public resources in the long term, the projects that should and could be developed by the private sector, the available financing from external sources, and the direct support that could be provided by the Government to achieve EdL's required covenants.

2. Technical

Grid component. The rural electrification design adopted in the project conforms to best practice methodologies used for this type of network development. Following from the experience under SPRE 1 (both designed and overseen during implementation by international consultants), EdL has improved its capacity to design economical network configurations that ensure a good balance between technical performance (allowable voltage drop and loss characteristics) and construction costs. Accordingly a number of network configurations have been used in the design to meet various load characteristics. These include 22 kV medium voltage (MV) lines of three phase, two phase and single phase, single wire earth return (SWER) systems. Efforts have also been made to optimize the low voltage (LV) network configurations with appropriate sizing of transformers (often using multiple transformers for each village) and line phasing. The designs carried out by EdL under the supervision of the SPRE implementation consultant is also being reviewed by the new implementation consultant for SPRE II who are now carrying out this work. Any further improvements identified by the new consultants will be incorporated to the project design and material procurement will follow such accepted final designs.

Loss reduction component. This work will be designed and supervised by international consultants already selected under a project preparatory PHRD grant. The consultants have already selected software for the technical studies (which is in current use in many power utilities around the world) and the work is proceeding according to schedule. The guidance provided by experienced international consultants with knowledge also of utility practices augurs well for a successful outcome. For the technical loss reduction component the program will use current state-of-the-art software and project evaluation methodologies and for the non-technical loss reduction component the program will use tested techniques based on information from the billing data base, measuring instruments to be used in the field, and targeted exercises in selected locations.

Off-Grid Component. Institutional strengthening of the off-grid electrification component will be an early priority, with the thrust of the institutional strengthening activity will being a comprehensive program of management outsourcing. The outsourced implementation operation will be arranged so as to facilitate handling of remaining technical problems in the component, including the lack of technology diversity in the off-grid portfolio (too many SHS, not enough VH) as well as difficulties in keeping spares and maintaining key components locally; finding reliable supplies of appropriate appliances to suit village scale productive applications, and quality problems encountered when sourcing equipment, which require careful performance tracking.

3. Fiduciary

Procurement aspects: To ensure competition and achieve economy & efficiency, majority of procurement will be done through ICB procedures, including the procurement for the off-grid component. Two packages (concrete poles and concrete cross arms) will be procured through NCB procedures since there are qualified suppliers available in the country and such items are unlikely to attract any foreign suppliers. Accordingly, EdL has prepared a draft Procurement Plan which was reviewed during pre-appraisal and found generally acceptable. MIH will prepare a Procurement Plan for the off-gird component. Both Plans will be finalized and agreed during the project appraisal. Any subsequent update or change to the procurement plans will be subject to IDA review and approval.

For the on-grid component, except for the BAS, bidding documents for all other ICB packages have been prepared and are being revised based on IDA comments and in line with the latest SBD (May 2004).

A procurement capacity assessment has been carried out and the report is available in the project file. While EdL has adequate experience and certain capacity in carrying out procurement, MIH has no ICB experience (all the procurement under the off-grid component of SPRE was done through shopping procedures). As majority of procurement will be carried out by EdL, the overall procurement risk is rated as "average". To address any capacity constraints, external assistance will be provided as follows: (a) an international consulting firm has been engaged to assist EdL in project preparation and implementation including procurement and contract management; and (b) an individual procurement consultant will be hired to assist MIH in finalization of technical specifications and ICB bidding documents. See Annex 8 for details.

Financial management aspects. A financial management (FM) capacity assessment has been carried out and the report is available in the project files. The overall financial management risk is rated as "average". FM of the project would be separately handled by EdL and MIH, which would ensure an adequate flow of funds to each component, report on, monitor, and track the use of project funds. The project accounts to be maintained by EdL will be automated by using the newly installed BAS. The project accounts to be maintained by MIH will be automated by in-house developed accounting program using Access software. Both systems are acceptable. The mission will follow up on the modifications needed during appraisal. The intensive training on IDA FM and disbursement policies and procedures will be provided by the IDA mission during the Project launch workshop. While EdL is familiar with the IDA FM and disbursement policies and procedures, it will provide assistance to MIH during the transition in preparation of SOEs and withdrawal applications.

The FMRs will be separately prepared by EdL and MIH and submitted to the IDA within 45 days of the end of each quarter after project effectiveness. EdL will responsible for preparing the consolidated project financial statements at the end of the year. As a revenue generating entity, the annual corporate financial statements of EdL is also

required. An independent auditor acceptable to IDA will be appointed to audit both EdL corporate financial statements and consolidated Project financial statements, in accordance with International Standards on Auditing, under TOR satisfactory to IDA. The audit reports will be submitted to the IDA within six months after the end of each fiscal year. See Annex 7 for details.

4. Social

The Project is expected to yield positive social impacts through increase access to electricity among rural households. Data collected through the baseline survey undertaken during the project preparation shows that access or improved access to electricity would (i) significantly increase the quality of lighting as well as disposable income of rural households since cost of electricity is less than other energy sources previously used for lighting (diesel lamp lighting, candles, car batteries, and dry cell batteries); (ii) provide opportunity for rural households to engage in income generating activities, allow households member to have flexible working hours and/or work longer in the evening, and immediately improve quality of life through improvement of lighting, better and cheaper access to news, information and entertainment; (iii) reduce cost of obtaining news, information and entertainment through means such as radios;
and (iv) allow children to study in the evening after the sun sets (see Annex 10).

5. Environment

Phase 1 on-grid component is clearly defined and will have MV and LV lines extended mainly along the existing roads to villages, and very limited land requisition for poles is expected--0.4 ha for the first year program including 47 sub-projects for 394 targeted villages. The first years off-grid component will provide SHS for 9,000 households and possibly VH and GS for 1,000 households in the later stage of Phase 1. Therefore no major environmental impacts are expected. Since the SPRE II will take an APL approach and the off-grid component will be further defined during the process of the Phase 1 period, environmental policy frameworks were prepared for both the On- and Off-grid components. Under these frameworks, EMPs were prepared for 38 of the 47 sub-projects for the first year program under the on-grid component and the rest would be prepared by the mid June 2004. For the SHS activities, no EMP needs to be prepared due to very limited impacts. If VH and GS activities are more clearly defined in the later stage of Phase, environmental impacts will be further reviewed and EMPs prepared if necessary according to the environmental policy framework. There are two 115 kV transmission lines which are not financed by IDA but are linked to the SPRE II project. A detailed environmental assessment was carried for the two projects and reports are recorded in the project files.

6. Safeguard policies

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment (OP/BP/GP 4.01)	[X]	[ ]

Natural Habitats (OP/BP 4.04)	[ ]	[ ]
Pest Management (OP 4.09)	[ ]	[ ]
Cultural Property (OPN 11.03, being revised as OP 4.11)	[ ]	[ ]
Involuntary Resettlement (OP/BP 4.12)	[X]	[ ]
Indigenous Peoples (OD 4.20, being revised as OP 4.10)	[X]	[ ]
Forests (OP/BP 4.36)	[ ]	[ ]
Safety of Dams (OP/BP 4.37)	[ ]	[ ]
Projects in Disputed Areas (OP/BP/GP 7.60)*	[ ]	[ ]
Projects on International Waterways (OP/BP/GP 7.50)	[ ]	[ ]

Policy Framework for On- and Off-Grid Components. The Phase 1 project will include MV and LV subprojects for grid extension and focus on using SHS and VH and GS for off-grid electrification. Limited land acquisition and resettlement impacts are expected. Given the APL approach adopted for the project and potential resettlement and environmental impacts, a resettlement policy framework has been developed for both grid and off-grid component, and environmental policy framework has been prepared for on- and off-grid activities respectively. EDL agrees to apply the same resettlement policy to the associated 115 kV transmission projects even though they are not financed by IDA.

Action Plans for First Year On-Grid Program. For grid extension component, the first year program will include 47 subprojects for electrification of 394 villages, only 0.4 ha land areas will be required with 20 percent being farmland, and about 33,000 trees will be affected. RAP for 47 subprojects and EMPs for 38 of the 47 subprojects were prepared in line with the policy frameworks and submitted to IDA. EMPs for the rest of the subproject will be submitted to IDA by mid June. For off-grid component, since the first year program does not include VH and GS schemes, no RAP and EMP is required.

Ethnic People Development Plan. Significant portion of the project beneficiaries are ethnic villages and populations. An Ethnic People's Development Plan (EPDP) was prepared in compliance with relevant Bank policies for both components to ensure that affected ethnic populations benefit from the project and adverse impacts are avoided or mitigated through a consultative process. The EPDP introduces the basic legal, cultural and socio-economic conditions for ethnic groups in Lao PDR, particularly pertaining to land tenure and natural resource use. In addition, specific consultation procedures and institutional arrangements are proposed to address the particular needs and circumstances of ethnic groups during project implementation. It aims to ensure that development progress fosters full respect for their dignity, human rights and cultural uniqueness.

7. Policy exceptions and readiness

The project is in compliance with IDA policies and procedures. There are no policy exceptions.

The project meets the readiness criteria for implementation:

* *By supporting the proposed project, the IDA does not intend to prejudice the final determination of the parties' claims on the disputed areas*

- Institutional arrangements for project implementation (EdL PMUs at head office and branches; MIH Off-grid Promotion and Support Office) are in place. International consultants for project preparation and implementation mobilized.
- Fiduciary (financial management and procurement) arrangements are in place.
- Safeguards requirements met (including Environmental Management Framework, Resettlement Policy Framework, Resettlement Action Plan for first year program, Ethnic Minority People Development Plan).
- Disclosure requirements met.
- Bidding documents for most of the procurement packages required under the project have been prepared and approved.
- Counterpart funds are budgeted.

Annex 1: Country and Sector Background
LAO PDR: Second Southern Provinces Rural Electrification Project

General[9]

Lao PDR is one of the poorest countries in the East Asia region with an estimated per capita income of US$320 in 2003. Nearly 77 percent of its population live on less than US$2 a day, and 29 percent are below the national poverty line of $1.5 a day (in 2002/03), this nonetheless, represents a remarkable reduction compared to the 39 percent which was registered in 1997/98. Social indicators remain low and among the worst in the region, particularly rural areas suffer from poor or even no social services. The situation in rural areas is exacerbated by a lack of income generating opportunities because of weak linkages to markets and production centers combined with poor access to infrastructure.

GoL is responding to the constraints through the National Growth and Poverty Eradication Strategy (NGPES), which was approved by the National Assembly in January, 2004. The NGPES is a far-reaching socio-economic growth and development strategy encompassing three macro-level objectives: (i) enabling environment for growth and development; (ii) enhanced governance; and (iii) poverty reduction. This strategy should help the country achieve the Millennium Development Goals (MDG) by 2015 and ensure that Lao PDR graduates from its status as LDC by 2020. The energy sector is identified as one of the strategic growth sectors in the NGPES, this includes both rural electrification and strengthening of the central network with a view to power generation for exports.

Lao PDR has grown rapidly and reduced poverty significantly since the early 1990s. Real GDP grew by 7 percent during 1992-97 period and by 5.8 percent a year during 1999-2003, with the intervening years adversely affected by the East Asian crisis. Exports also grew at a rapid rate over this period. The growth rates are based on abundant natural resources including agriculture, forestry, hydro-electric power and (increasingly) minerals. Agriculture remains the major sector of the economy, contributing around 51 percent of GDP and employing over 80 percent of the labour force.

The recent slow-down in growth rates indicates that Lao PDR has reaped the "easy gains" of initial liberalization and natural resource exploitation. Accordingly, there is a need for economic diversification in order to continue sustainable growth. The country is still heavily reliant on external support; in 2002/03, donor funded programs accounted for 7 percent of GDP, 39 percent of total public expenditure, and 61 percent of the capital budget.

Sector Context

Lao PDR has prodigious hydropower resources. Hydropower is the main indigenous energy resource in the country (Lao PDR has no confirmed oil or gas resources).

[9] Figures are taken from Lao PDR – Economic Monitor, April, 2004

Technical potential is estimated at 26,500 MW. Only a small proportion has been developed, providing substantial exports and most of the generation needs of the country. As can be seen from the following table, over 97% of total generating capacity in Lao PDR is based on hydropower resources. Surplus (partly seasonal) energy from the plants is exported to Thailand while imports cover peak hour shortages. As domestic power demand grows, exports from these plants are steadily declining. Peak domestic demand at the end of 2003 was about 250 MW.

Table 1: Power generation in Lao PDR

Name	**Year of commercial operation**	**Capacity**	**Category (main market supplied)**	**Ownership model**
Nam Ngum	1971	150 MW	Domestic	GoL/EdL
Xeset	1991	45 MW	Domestic	GoL/EdL
Theun-Hinboun	1998	210 MW	Export	IPP
Houay Ho	1999	150 MW	Export	IPP
Nam Leuk	2000	60 MW	Domestic	GoL/EdL
Nam Mang	2005	40 MW	Domestic	GoL/EdL
Mini/micro-hydro		11.5 MW	Domestic	Provincial
Diesel generators		17.5 MW	Domestic	Provincial
Total		**683 MW**		

Four separate transmission systems supply the four regional centers. There is therefore no "National Grid" in Lao PDR. However, as a result of the various interconnections with Thailand and formalized "wheeling agreements" with EGAT, the regions are indirectly synchronized and have adequate reliability. In addition to HV cross-border connections, a vast number of MV connections from Thailand, China and Vietnam supply provincial load centers which are located too far from EdL's own network.

Power System Development Planning and the Marginal Unit of Production[10]

Domestic electricity consumption served by EdL comprises four regional load centers – Central, Central 1, Southern, and Northern. Table 2 provides historical growth for each load center. Annual growth in consumption for the whole country has averaged 13% over the past five years, with particularly dramatic increases for energy consumption in the South due to household electrification and irrigation pumps.

None of these load centers are interconnected, while each has strong cross-border interconnection as well as nearby sources of hydropower production. Over the time period of the SPRE II project EdL will continue to develop its power development plans on a regional basis.

[10] This discussion is drawn from *Power Development Plan (PDP2004-2013)*, March 2004, prepared by EdL; *Power System Development Plan for Lao PDR*, March 2004, prepared by Meritec/Lahmeyer International; and EGAT Power Development Plan, April 2003, prepared by System Planning Division, EGAT.

Table 2: Historical Load Growth by EdL Load Center

Area/Year	93	94	95	96	97	98	99	00	01	02	03	99-03 Avg % Growth
Northern				1	2.8	4.4	5.5	7	15.7	18	22.2	
Central 1	201	213	259	288	323	375	402	462	518	557	645	13
Central 2	38	45	53	62	72	87	102	114	119	126	141	8
Southern	18	21	25	29	36	48	57	65	75	85	97	14
All Laos	257	279	338	380	434	515	567	649	728	785	906	13

Table 3 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 3: 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
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

This situation analysis is reflected in EdL's PDP2004-2013, which includes the following regional analyses:

- **Central-1 Region.** 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. This is shown in Figures 1 (a) and (b) below. 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.

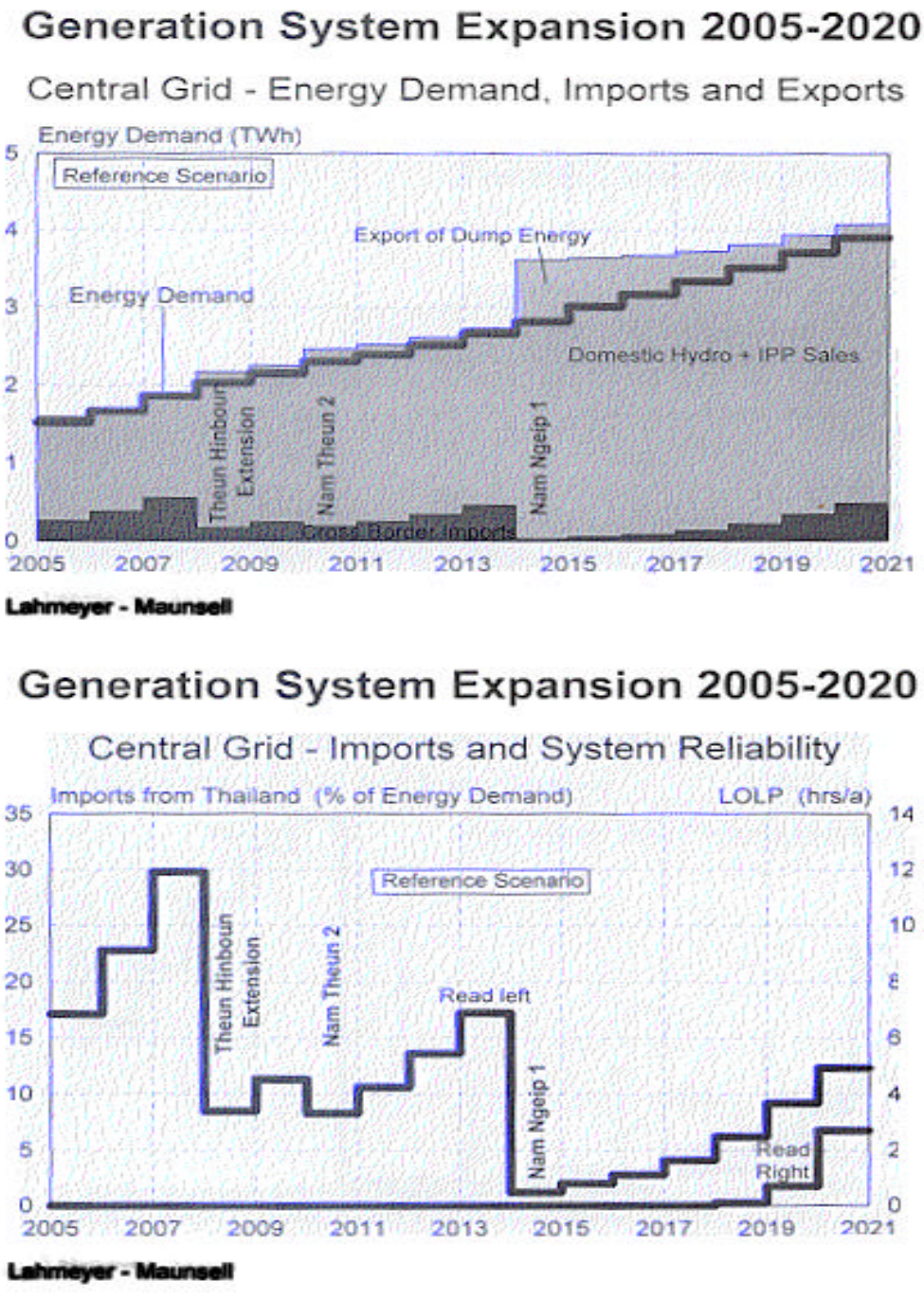


Figure 1(a) and (b): EdL's Central Grid Supply Demand Balance, 2005-2021

- **Central-2 Region.** This is the second-largest load center served by EdL, accounting for about 16% of total 2003 consumption This region is served entirely by

interconnection to both medium-voltage distribution and high-voltage transmission lines to Thailand and a medium-voltage connection to EVN. Consumption will almost triple in 2005 as a gold/copper mine expands. Industrial load in this area is growing quickly, as is household load due to rural electrification. EdL's power development plan for this region will continue to rely on imports, partially offset when the domestic share of Nam Theun 2 comes on line in 2010.

- **Southern Region.** This is the third-largest load center served by EdL, with 10% of the total 2003 energy consumption. This region has domestic supply sources in the form of the EdL-owned Xeset 1 and Selabam hydropower plants as well as a 115 kV interconnection with EGAT. Imports are currently at 40% of requirements and will grow to over 50% of requirements before dropping back to 30% with the 2011 planned addition of the Xe Kaman 3 hydropower projects.

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 in the years 2008-2012, nor will their addition eliminate the need for continued imports to individual load centers. 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.

Power Sector Policy and Reform

In order to advance the power sector, MIH published a "Power Sector Policy Statement" in 2001, in which four policy goals were set out. These were:

- maintain and expand an affordable, reliable and sustainable electricity supply in Lao PDR to promote economic and social development;
- promote power generation for export to provide revenues to meet GOL development objectives;
- develop and enhance the legal and regulatory framework to effectively direct and facilitate power sector development; and
- strengthen institutions and institutional structures to clarify responsibilities, strengthen commercial functions and streamline administration.

At a subsequent workshop the Policy Statement was further scrutinized and it was agreed that the immediate objectives were to: (i) expand electrification, (ii) complete the commercialization of EdL, and (iii) develop a financing strategy for domestic and export developments.

Rural Electrification

Lao PDR covers an area equivalent to Great Britain but hosts a population of only around 5.5 million, approximately 23 persons per square kilometer, this is the lowest population density in the region. Despite its geographical characteristics, EdL's electrification performance has been impressive as electrification rates have increased from 16% in 1995 to 40% by the end of 2003. This achievement, however, hides an electrification coverage in rural areas which is estimated at 20 to 25%.

Table: Electrification rate

Year	Households in Lao PDR	Number of HH electrified	EdL connections	Non-EdL
1991		83,400		
1992		92,900		
1993		102,900	101,138	1,762
1994		111,200	111,226	-26
1995	754,265	120,100	117,922	2,178
1996	758,036	136,280	134,084	2,196
1997	761,808	196,998	165,308	31,690
1998	765,579	226,004	198,330	27,674
1999	768,142	254,610	226,317	28,293
2000	818,668	293,495	249,648	43,847
2001	866,277	303,690	273,825	29,865
2002	890,000	337,363	307,521	29,842

It is the target of GoL to reach 90% electrification by 2020. While most new connections have flowed from grid expansion, it is recognized that as the connection rate rises and unconnected areas become more remote and sparsely developed, grid connection will become more costly and less economically justifiable. Therefore, GoL has embarked on an off-grid electrification program to complement grid electrification. Under the SPRE 1 credit, pilot off-grid systems have proven successful, holding great potential for scale-up. A large number of inventory studies have confirmed that renewable energy resources are available, mainly from hydro and solar but possibly also biogas. Notwithstanding, a complete picture of available energy resources is still missing.

There is general agreement that the rural electrification strategy must build on a combination of grid and off-grid solutions. For this purpose a Rural Electrification Fund is under review at ministerial level. While the short-term strategy will predominantly focus on grid extension and off-grid solar systems, long term plans are to introduce differentiated delivery models and tariff schedules, depending on willingness-to-pay and local endowments.

Commercialization of EdL

EdL was corporatized in 1997 with nomination of a Board of Directors and revision of the organizational structure, thereby establishing separate cost centers. The utility

remains 100% owned by GoL but a Contract Plan with GoL is agreed on a three-year basis. Despite the corporatization, there is confusion among government's various roles as: owner of EdL, regulator of EdL (inter alia tariff approvals), on-lender of loans received by GoL, tax collector and electricity consumer (in relation to which EdL carries large receivables from government agencies).

In sum, political interference is still present in operations as well as planning. On-going activities supported by ADB are straightening the accounts receivables from government agencies. Likewise, current activities are expected to lead to a better separation of EdL's finances. One important component is current practices of cross-subsidies across consumer categories but mainly from export earning to tariff subsidies. A tariff adjustment is under implementation with monthly increases of 2.3%. The adjustment will eventually bring the average tariff to a level of 665 kip/kWh (estimated to be equivalent to US$0.0518). An on-going tariff study will analyze whether this level fully reaches cost-recovery, at the same, other mechanisms, e.g. time-of-day use will be considered.

EdL completed in 2002 a Financial Recovery Plan which enabled the utility to comply with financial covenants. Apart from tariff adjustments, pertinent components included revaluation of assets, temporary relaxation of debt services, and debt-equity conversion by GoL. EdL implemented conjunctively a new accounting system which is in compliance with International Accounting Standards. Also, an IT Strategy and computerized billing mechanisms are now being introduced to facilitate auditing and accounting across provincial BOs.

Sector Financing

Financing of EdL system expansion has traditionally been provided by multilateral and bilateral agencies through soft loans and grants. With annual growth rates now coming off a higher base, capital requirements are increasing at a time when the power sector's traditional lenders are re-focusing their programs on other sectors. On the other hand, non-traditional lenders, China and India, are playing an increasing role through provision of export credits (with significant grant element) for projects where goods and construction services are sourced through their respective countries. Lao PDR's earlier successes with export generation projects demonstrates that the international private sector (particularly the Thai private sector) can play a role and the nascent local private sector and domestic IDAs should not be ruled out as a source of capital for smaller projects.

A Financing Study will give advice on financing modalities, including public-private development models and standardized legal agreements for small-scale operators. Further regulatory strengthening is likely to be required in addition to present tariff adjustments towards full cost recovery. GoL has showed commitment to necessary reforms with the liberalization of off-grid operations and an approved action plan for sector strengthening.

Supervision ratings of the ongoing SPRE 1 Project are satisfactory (with Project Management rated highly satisfactory). While performance ratings of the completed Provincial Grid Integration Project were deemed unsatisfactory, given EdL's critical financial situation, the successfully completed Financial Recovery Plan has brought the utility in line with financial covenants.

Annex 2: Major Related Projects Financed by the IDA and/or other Agencies

LAO PDR: Second Southern Provinces Rural Electrification Project

Ongoing IDA-financed Project	Sector Issue	Latest Supervision (PSR) Ratings (IDA-financed projects only)	
1.		Implementation Progress (IP)	Development Objective (DO)
Southern Provinces Rural Electrification Project (Cr. 17142-LA)	Rural electrification and capacity-building in EdL and sector agencies	S	S

Completed IDA-finance Projects		OED Evaluation		
		Outcome	Sustainability	ID Impact
Provincial Grid Integration Project Cr. 2425-LA	Rural electrification and capacity-building in EdL (completed in 1999)	S	U	M
Southern Provinces Electrification Project Cr. 1826-LA	Rural electrification and capacity-building in EdL (completed in 1994)	HS	L	SB
Nam Ngum Extension Project Cr. 1197-LA	Hydropower extension and capacity building in EdL	NR	NR	NR

S = Satisfactory; L=Likely; U= Unlikely; SB = Substantial; M = Modest; NR= Not Rated

Other development agencies	
Northern Area Rural Power Distribution Project II (ongoing)	ADB
Northern Area Rural Power Distribution Project I (completed)	ADB
Vientiane Distribution System Improvements (completed)	ADB
Off-grid Renewable Energy Electrification Project (ongoing)	UNDP/GEF
Southern Provinces Transmission Development I (ongoing)	China EXIM IDA
Southern Provinces Transmission Development I (ongoing)	India EXIM IDA
Transmission Development Project (ongoing)	Lane Xang Minerals Ltd.
Nam Mang 3 Hydropower Project (ongoing)	China EXIM IDA
Transmission Line and Substation System Master Plan (completed)	JICA
Institutional Development for Off-Grid Electrification (completed)	ESMAP
Power Sector Policy Reform (completed)	PPIAF

Annex 3: Results framework and monitoring
LAO PDR: Second Southern Provinces Rural Electrification Project

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	Define Structure of RE	Agree scope of database preparation	Phase 1 database	Agreed	Phase 2 database

Database	Database. Carry out socio-economic surveys and analysis.	to be included in Phase 1 and tentative scope for Phase 2.	development	completion status	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 Power development plan should be discussed with Bank	Revise PDP in line with PSDP. Develop financing strategy based on consultants study. Prepare small hydro IPP project (policy, legal, regulatory, solicitation documents, assumes physical preparation carried out by JICA)	Agreement of Financing strategy. Completion of preparation of initial SHPP solicitation	Possible additional assistance in this area if required. 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[11], 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) Grid: YR 1: Effectiveness of project design YR 2-3: Achieving village w/o achieving HH goals suggests consumer financing shortfalls Off-Grid: 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	

[11] 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[12]	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

[12] Both the exact expression of the living standard index, baseline values and preliminary targets for improvement will be set during appraisal and negotiations. These preliminary target values will be verified in the first year by comparing the baseline values with the results of the first annual socio-economic survey

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 4: Detailed Project Description

LAO PDR: Second Southern Provinces Rural Electrification Project

1. Background

SPRE II will be financed by an **Adaptable Program Loan (APL**), with two phases totaling 5 ½ years. This approach was decided at the Project Concept Meeting taking into account current severe constraints to IDA funding and also to help ease the timing pressure in relation to sector reform activities. This recognizes the time taken to develop definitive plans for various reform activities, and the time required for project beneficiaries to obtain commitments to such plans in a consensus style political environment. Under the APL approach, some reform commitments can be phased with agreements in principle agreed at negotiations of the first project, with more specific agreements acting as "triggers" for the second tranche of the credit. The programmatic approach is also considered appropriate to help alleviate the "boom-bust" effect currently a feature of EdL and off-grid rural electrification. Even within each individual tranche it is proposed to schedule equipment deliveries such that installation occurs more or less continuously over a six year period.

GEF grant financing is proposed for the off-grid, DSM/Energy Efficiency, and sector reform components of both phases. Continuation of GEF support for Phase 2 will be based on the same decision framework developed for the program overall.

2. Project Components

Components. The Phase 1 project consists of two components: (i) EdL component; and (ii) MIH component.

The total cost of these components is estimated Kip 405.44billion or US$ 36.18 million equivalent, including US$ 30.16 million for EdL component and US$ 6.02 for MIH component. The cost estimation was based on the actual unit prices of the on-going SPRE project, and both physical and price contingencies were included (see details in Annex 5).

2.1 The EdL component

The EdL component is designed to contribute to the achievement of project objectives through electrification of rural households by grid extension, and through furthering the commercialization of EdL. It consists of the following sub-components:

(a) **Grid Extension:** extension of the EdL grid to about 42,000 households in some 544 villages in seven central and southern provinces;
(b) **Loss Reduction:** enhancement of existing EdL 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;
(c) **Billing and Accounting System:** integration of EdL headquarters and BOs through rolling out the existing BAS to remaining BOs.

(d) **DSM:** implementing a program of DSM and energy efficiency activities in the country, including establishment of provisional institutional arrangements for DSM planning and energy efficiency policy development within EdL or MIH or both (further definition of this program currently underway with ASTAE assistance).
(e) **Tariff Reform:** development of tariff and subsidy policies and associated tariff regime and an action plan to implement this regime.

The EdL component will generally be IDA financed, except that DSM and energy efficiency activities will be financed by GEF. In all activities EdL will provide substantial co-financing. Overall financing contributions for the Phase 1 activities are estimated as follows:

Sources	**IDA**	**GEF**	**EdL**	**Consumer**	**Total**
US$ million	17.55	0.75	7.64	4.22	30.16
Percentage	58.2%	2.5%	25.3%	14.0%	100.0%

(a) Grid Extension (US$ 26.16 million)

This component includes extension of EdL grid to about 42,000 households in some 544 villages in seven central and southern provinces. The cost of this component is estimated at $26.16 million, including works, goods and necessary TA to support the implementation of the component. Financing of this component includes US$15.30 million by IDA, $6.64 million by EdL and a consumer contribution for house wiring of US$ 4.22 million.

Scope. The on-grid component under this phase includes 68 sub-projects to extend MV and LV lines to cover the 613 villages in the seven provinces. The investment activities include procurement, installation and commissioning of 1,412 km of 22 kV, 42 km of 12.7 kV and 1,060 km of 0.4 kV transmission lines, 626 sets of transformers in various types and capacities, and house wiring in about 42,186 households (see table below).

SPRE 2 - Scope of On-grid Investment (Phase 1)

Province	No. Village	Household	0.4 kV	Trans former				22 kV Distance		
				3phase	mono	Swer	Total	22 kV	12.7 kV	Total
Bolikhamxay	59	5,936	125,663	44	26	-	70	192,571	-	192,571
khammouane	102	5,777	158,530	77	43	12	132	334,279	35,000	369,279
Savanakheth	155	10,788	323,640	84	64	16	164	301,397	2,740	304,137
Saravan	93	7,614	150,371	70	30	-	100	119,356	-	119,356
Sekong	24	1,490	36,268	13	12	2	27	56,296	4,714	61,010
Sub total (14-15)	117	9,104	186,639	83	42	2	127	175,652	4,714	180,366
Champassak	92	8,300	206,595	82	31	-	113	347,398	-	347,398
Attapeu	19	2281	59,315	20	-	-	20	60,417	-	60,417
Sub total (16-17)	111	10,581	265,910	102	31	-	133	407,815	-	407,815
Grand Total	544	42,186	1,060,382	390	206	30	626	1,411,714	42,454	1,454,168

This component also include TA (US$ 0.75 million, including contingencies) to EdL for the implementation of the investment program. An international consultant hired for the preparation of the SPRE II will also make recommendations for the TA program needed for the implementation of the on-grid investment activities, which is expected to include ICB procurement and financial management capacity building, project scheduling, supervision etc. for this component.

Village Screening Process. Villages to be electrified and associated sub-projects were first identified based on the following factors: (i) proximity to existing major roads; (ii) priority to villages with larger number of households; and (iii) priority to villages with greater economic and social activities, measured by the numbers of clinic, hospital, saw mill, rice mill, school, temple, irrigation and other small industries. Different weights were assigned to connections with larger weights applied to connections likely to generate economic use of electricity such as saw mills and schools, based on which weighted connections numbers were derived . Then the scope of sub-projects and associated villages were defined through applying cut-off rates on cost per weighted connection, which is calculated with the total cost of each subproject divided by the number of total weighted connections served by the subproject. Finally the scope was adjusted to include priority villages specially identified by provincial governments for promoting economic growth or achieving other social objectives (e.g. development for minority people). See Attachment 1 for the detailed screening process.

Design Optimization. The rural electrification design adopted in the project conforms to best practice methodologies used for this type of network development. Following from the experience under SPRE, which was designed and overseen during implementation by international consultants, EdL has improved its capacity to design economical network configurations that ensure a good balance between technical performance (allowable voltage drop and loss characteristics) and construction costs. Accordingly a number of network configurations have been used in the designs to meet various load characteristics. These include medium voltage (22 kV) lines of three phase, two phase and single phase, single wire earth return (SWER) systems. Efforts have also been made to optimize the low voltage network configurations with appropriate sizing of transformers (often using multiple transformers for each village) and line phasing. The designs carried out by EdL under the supervision of the SPRE implementation consultant and the newly appointed SPRE II implementation consultant is reviewing the designs. Any further improvements identified by the new consultants will be incorporated to the project design and material procurement quantities will be adjusted accordingly.

The scope for Phase 2 grid extension investment has also been tentatively defined with assumptions of US$ 24 million from IDA financing, US$ 8.0 million from EdL self-financing and US$ 5.16 million from consumer contribution for house wiring, and same criteria and assumptions for cost estimation for Phase 1 were used. Selection of the villages and sub-projects and design has gone through the same screening and design optimization processes as described above. The scope and design will be further refined and finalized in the later stage of the Phase 1 project.

SPRE 2 - Scope of On-grid Investment (Phase 2)

Province	No. Village	Household	0.4 kV	Trans former				22 kV Distance		
				3phase	mono	Swer	Total	22 kV	12.7 kV	Total
Bolikhamxay	64	5,680	222,817	25	55	23	103	220,089	111,000	331,089
khammouane	148	7,684	245,300	113	12	-	125	332,711	-	304,211
Savanakheth	229	13,557	406,710	115	108	56	279	560,993	112,110	673,103
Saravan	149	8,078	320,389	83	109	-	192	256,574	-	256,574
Sekong	25	1,154	43,052	11	24	-	35	32,204	-	32,204
Sub total (14-15)	174	9,232	363,441	94	133	-	227	288,778	-	288,778
Champassak	118	12,245	409,755	128	-	-	128	365,852	-	365,852
Attapeu	30	3,172	104,275	27	-	-	27	89,073	-	89,073
Sub total (16-17)	148	15,417	514,030	155	-	-	155	454,925	-	454,925
Grand Total	763	51,570	1,752,298	502	308	79	889	1,857,496	223,110	2,052,106

(b) Loss reduction (US$ 2.00 million)

This component is to enhance existing EdL 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. This component is estimated to cost $2.0 million, with financing equally split between IDA and EdL.

A loss reduction study is being carried out now by international consultants under a project preparatory PHRD grant. Under this sub-component, recommendations of the PHRD financed study will be implemented, including implementation of state-of-the-art software and hardware, project evaluation methodologies for reducing technical losses, and tested techniques based on information from the billing system, measuring instruments to be used in the field, and targeted exercises in selected locations for non-technical loss reduction. TA from international and local consultants is also expected for research, testing, and guidance of activities aimed at loss reduction.

Loss Reduction Component – SPRE II Phase 1

Item	Description	IDA cost ($)	EdL cost ($)
Technical Assistance	International and Local Consultants	250,000	
Domestic Revenue Meters	30,000 ($15/meter average)	450,000	
Commercial Revenue Meters	400 ($500/meter average)	200,000	
Instrumentation and Equipment	$45,000	100,000	
Network reinforcement equipment			960,000
Labor and works costs			40,000
TOTAL		$1,000,000	$1,000,000

(c) Billing and Accounting System (US$ 1.00 million)

This component is to integrate EdL headquarters and BOs through rolling out the existing BAS installed in Vientiane Office of EdL to the reset of EdL's BOs. The cost of US$ 1.00 million estimated, including contingencies, will be financed by IDA.

Under the on-going SPRE project, hardware and software for the BASs associated with EdL's operations throughout Vientiane Municipality were installed, and will be expended to cover ten provincial branches by end of October, 2004. The proposed sub-component will roll out the systems to the remaining BOs. International consultant services for guidance and supervision of installation, testing and commissioning are also included.

(d) Demand-Side Management (US$ 0.75 million)

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 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. Similarly, there is no DSM, energy efficiency, or integrated power sector planning capacity within EdL or MIH. 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.[13]

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[14], 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.[15]

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 is proposed for this activity and will be financed by GEF. The World Bank has already mobilized $75,000 in ASTAE trust funds to support detailed planning of this sub-component, including collection of existing data on customer

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

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

[15] 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

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 efficient lighting subsidies for households and facility energy audits for commercial and industrial customers

(e) Tariff Reform (US$ 0.25 million).

This component comprises development of tariff and subsidy policies and associated tariff regime and an action plan to implement this regime. IDA will finance this component.

2.2 MIH component

The MIH component will contribute to project objectives through scaling up the pilot off-grid program of rural electrification and through development of the enabling environment to encourage other participants to develop and finance power sector expansion. It consists of the following sub-components:

(a) **Off-grid Investment Program:** provide electrification to about 10,000 households spread over 1109 villages in 17 provinces through off-grid technologies;
(b) **Institutional Strengthening:** scaling up the existing MIH off-grid development program through establishment of necessary legal and regulatory underpinnings, strengthening organization and management arrangements, offering a wider range of off-grid technologies, and conversion of the existing re-flow account into a Rural Electrification Fund (REF) to provide a self-financing contribution to the MIH program;

(c) **Alternative RE Delivery Models:** detailed design of other rural electrification models involving non-traditional developers and financiers and development and enactment of necessary legal and regulatory arrangements including those necessary to extend REF to other participants and project preparation and solicitation documents for "other model" projects;
(d) **RE Master Plan and Database:** development of a rural electrification master plan (including associated resource studies for distributed generation) and an electricity distribution database;
(e) **Sector Financing Strategy:** develop a sector financing strategy including models for solicitation for new generation and prepare a small hydropower IPP project (policy, legal, regulatory, solicitation documents), assuming technical feasibility study carried out by JICA;
(f) **MIH Organization Strengthening:** strengthening of organizational and management arrangements within MIH to enable it to undertake its expanded roles in the areas of regulation and planning.

The MIH component will generally be IDA and GEF. Financing for development of RE Master Plan, alternative RE delivery models, and Sector Financing Strategy will come from several sources, including reflows of the existing off-grid operations. Overall financing contributions for the Phase 1 activities are estimated as follows:

Sources	IDA	GEF	Others	Total
US$ million	2.45	3	0.57	6.02
Percentage	40.7%	49.8%	9.5%	100.0%

(a) Off-grid Investment Program (US$ 2.37 million)

The off-grid program under the Phase 1 project will provide electrification to about 10,000 households spread over 1109 villages in 17 provinces through off-grid technologies. The cost is estimated at $2.37 million, out of which US$ 2.0 million will be funded by IDA and the rest by MIH and consumer contributions.

Of the 10,000 households, 9000 are expected to be electrified by Solar Home Systems (SHSs) and 1000 by VH and Generating Sets (GS) as shown in the table below. It should be noted that these numbers are approximate since the off-grid program is very much market-driven. The Phase 2 program will be prepared in the later stage of the Phase 1 project.

Table Scope of Phase 1 Off-grid Component

Province		Total No. of Villages	Total No. of Households	No. of ESCO	No. of Households to be Electrified		
					SHS	VH/GS	Total
1	Vientiane	55	1,850	1	500		500
2	Oudomxai	65	3,250	1	500	50	550

3	Luangnamtha	101	5,120	1	600	50	650
4	Champasak	279	17,550	1	600	50	650
5	Luangpabang	19	901	1	500	50	550
6	Xaiyabuly	111	7,491	2	700	50	750
7	Xiengkuang	40	2,644	1	550	500	1,050
8	Houaphanh	52	2,917	1	500	250	750
9	Bolikhamxai	44	2,158	1	500		500
10	Khamuane	54	3,224	1	500		500
11	Savannakhet	56	2,364	1	500		500
12	Salavan	42	2,794	1	500		500
13	Sekong	31	754	1	500		500
14	Attapeu	36	4,337	1	500		500
15	Phongsaly	32	3,493	1	500		500
16	Bokeo	76	4,858	1	500		500
17	Xaisomboon SR	16	970	1	550		550
	Total	1109	66,675		9,000	1,000	10,000

Technical Assistance supporting the investment activities under this component is included in Sub-Components (b), (c), (d) and (f) below.

(b) Institutional Strengthening (US$ 1.0 million)

GEF-financed technical assistance to off-grid implementation will support continued steady improvements in operations and management of the existing off-grid electrification model alongside the development of new models. In the first year the technical assistance will support the transformation of the existing off-grid PMU within MIH into an expanded operation capable of undertaking the targeted geographic expansion from seven to seventeen provincial operations as well as a renewed emphasis on adding pico-hydro, VH and hybrid renewable/gen set schemes to the mix of off-grid electrification solutions. The pace of household installations will also increase, from an average of 100-200 per month in SPRE to as many as 500 per month in SPRE II.

The existing program has established a structure for electrification and prepared the detailed documentation required to operate it. However, current systems and staff are already reaching the limits of their existing capacity. 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 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. This will provide a focus for IDA support to the off-grid program as well as a mechanism through which additional funding can be attracted and administrated. The REF will be established by a Prime Ministerial Decree, initially as an Off-Grid Fund which will subsequently be converted to support all forms of rural electrification following the commencement of SPRE II Phase 2.

Although the exact modalities of this transformation in the structure of the management of the off-grid program are still in the course of development, the requirements for technical assistance are expected to remain the same. MIH will certainly 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.**16**

The cost of the planned activities is estimated US$ 1.0 million, to be financed by GEF.

(c) Alternative RE Delivery Models (US$ 0.9 million)

Both on-grid and off-grid rural electrification efforts in Lao PDR have so far 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 17; (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 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

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

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

developing the legal and regulatory mechanisms for oversight of funds management and disbursement and setting overall policy and priorities for rural electrification.

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.

A particular delivery model of interest in Northern Laos in 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.

(d) Rural Electrification Master Plan and Database (US$ 0.7 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 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 $700,000 in funding ($500,000 from GEF and $200,000 from ESMAP), or about $300,000 per year, is requested 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 under way for preparation of the proposed 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) A 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 workshops ("road show") in central and provincial areas of the country.

(e) Sector Financing Strategy (US$ 0.3 million)

This sub-component will develop a sector financing strategy including models for solicitation for new generation; prepare a small hydropower IPP project (policy, legal, regulatory, solicitation documents), assumes technical feasibility study carried out by JICA.

Financing of system expansion has traditionally been provided by multilateral and bilateral agencies through soft loans and grants. However, given the ambitious electrification objectives and with annual growth rates coming off a higher base, capital requirements are increasing at a time when competition for concessionary financing is becoming increasingly fierce. Instead, non-traditional lenders from nearby countries are playing an increasing role either through direct private financing or by means of export/mixed credits for projects where goods and construction services are sourced through their respective countries.

A study financed by PHRD identifies a financing strategy for the sector appropriate for the changing financial context. Model contracts and agreements are also becoming available through a joint effort involving UNIDO, ADB and the Bank. Technical assistance will build on the regulatory framework to prepare projects for solicitation in a competitive context and on the basis of private or combined private-public financing, this includes:

(a) Pre-feasibility study of transmission line expansion and substations with a view to attract concessionary financing from bilateral donors and solicit contracts through competitive bidding. This approach will combine access to financing at relaxed terms with principles of least-cost system development following the national Power Development Plan. (estimated cost $100,000)

(b) Pre-feasibility studies of small-scale (less than 5 MW) generation sites (expectedly hydro) either in the form of rehabilitation or greenfield development. The latter will be based on existing studies and the on-going JICA-sponsored Master Plan for Mini-Hydro Systems in Lao PDR. The pre-feasibility studies will include collection of hydrological data, geological survey, basic design and Initial Environmental Examination as required by national legislation. (estimated cost $60,000)

(c) A similar pre-feasibility study can be considered for a medium-sized hydro site (50-100 MW) based on least-cost selection principles and with the objective to solicit the project for competitive bidding under the expectation that concessionary financing can be obtained. (estimated cost $140,000)

(f) Organizational Strengthening of MIH (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, 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. Potential applications for solar PV water pumping (for irrigation and/or water supply purposes) will be demonstrated in two locations.

The cost of the proposed activities, US$ 0.75 million estimated, will be financed by GEF.

Attachment 1

Village Screening Process

Selection of villages to be electrified through grid extension under Phase 1 and 2 in sequence has gone through the following village screening process.

(i) Based on expected amounts of funds available and initial discussions with EdL Headquarters, the EdL BOs made proposals to the Headquarters of sub-projects selected based on the following factors: (i) proximity to existing major roads; (ii) priority to villages with larger number of households; (iii) priority to villages with greater economic and social activities, measured by the numbers of clinic, hospital, saw mill, rice mill, school, temple, irrigation and other small industries; (iv) priority to villages specially identified for promoting economic growth or achieving other social objectives (e.g. development for minority people) by provincial governments; and (v) priority to villages with lower cost per household of electrification, which is calculated with the total cost of each subproject excluding the main MV lines divided by the number of households served by the subproject, and institutions with economic and social activities such as schools and saw mills were not included in this calculation as consumers;

(ii) Based on expected IDA credits and EdL self-financing available for the on-grid component, EdL Headquarters then applied cut-off rates, which are different from province to province to allow balance of funds distribution among the seven provinces, based on cost-per-household and defined the scopes for Phase 1 and 2 in sequence, and sent the revised scopes back to BOs for comments;

(iii) BOs generally agreed with the Headquarters' choices of scopes for Phase 1 and 2, with some adjustment of shifting a limited number of villages between the two Phases. BOs provided justifications of the adjustment, which is mainly to allow the local Governments to achieve their social objectives;

(iv) Following recommendation of the IDA mission in May 2004, the cut-off rates were changed from cost per household to cost per weighted connection (see table 1 below). Calculation of the latter takes into consideration of the cost of MV lines, and the economic activities and government social objectives, which were converted into weighted connections through assigning appropriate weights to these activities either according to revenues, e.g. a saw mill could be 20 connections if the revenue from it is about 20 times of the revenue from a household, and/or importance in achieving Governments' social objectives, e.g. more weights than estimation of times of revenues may be given to schools or clinics. The revised cost per weighted connection for a village was obtained through the total cost of a subproject and its shared cost of associated MV lines divided by total numbers of weighted connections severed by the subproject (see table 1 below for the weight allocation).

Table 1 Actual Cut-off Cost Per Weighted Connection

No.	Province	No. of Sub-projects	Cut-off cost per weighted connection	Remarks on actual cost per weighted connection
1	Bolikhamxay	12	$ 250	one exception at $442 for government social objectives
2	Khammouane	14	$ 250	one exception at $352 for government social objectives
3	Savannakhet	16	$ 328	two exception at $344 & $388 respectively for government social objectives
4	Saravan	8	$ 258	
5	Xekong	3	$ 250	
6	Champasak	10	$ 266	one exception at $341 for government social objectives
7	Attapeu	5	$ 346	one exception at $475 for government social objectives
	Total	**68**		

Table 2 Weighted Connection of One Sample Sub-project of Phase 1

Economic Activities	Total No.	Weight	Weighted Connections	2. REMARKS
Household	419	1	419	HH revenue considered as the base revenue
Church	0	15	0	10 points for estimated revenue, 5 points for religion importance
School	4	25	100	20 points for estimated revenue, 5 points for social importance
Irrigation	2	35	70	30 points for estimated revenue, 5 points for social importance
Rice Mill	16	25	400	weighted according to estimated revenue
Clinic	0	7	0	4 points for estimated revenue, 3 points for social importance
Saw Mill	0	20	0	20 points for estimated revenue
Total			**989**	

Annex 5: Project Costs

LAO PDR: Second Southern Provinces Rural Electrification Project

A. Cost Estimation of Phase 1

Cost Estimation by Category

Cost by Category	Local	Foreign	Total	Local	Foreign	Total
	US$ Millions			Kip Billions		
1.Goods	7.69	14.55	22.25	86.18	163.09	249.27
2.Works	4.41	-	4.41	49.42	0.00	49.42
3.Services	-	6.15	6.15	0.00	68.89	68.89
Total Base Cost	**12.10**	**20.70**	**32.81**	**86.18**	**163.09**	**249.27**
Physical Contingencies	0.39	0.38	0.77	4.41	4.28	8.68
Price Contingencies	1.06	1.54	2.60	11.86	17.31	29.17
Total Cost	**13.55**	**22.63**	**36.18**	**151.87**	**253.56**	**405.44**
Total Financing Required	**13.55**	**22.63**	**36.18**	**151.87**	**253.56**	**405.44**

Note: 1US$ = 11,205 Kip

Cost Estimation by Component

Cost by Component	Local	Foreign	Total	Local	Foreign	Total
	US$ Millions			Kip Billions		
1.EdL Component	10.59	16.45	27.04	118.65	184.30	302.95
2.MIH Component	1.51	4.26	5.77	16.95	47.68	64.63
Total Base Cost	**12.10**	**20.70**	**32.81**	**118.65**	**184.30**	**302.95**
Physical Contingencies	0.39	0.38	0.77	4.41	4.28	8.68
Price Contingencies	1.06	1.54	2.60	11.86	17.31	29.17
Total Cost	**13.55**	**22.63**	**36.18**	**151.87**	**253.56**	**405.44**
Total Financing Required	**13.55**	**22.63**	**36.18**	**151.87**	**253.56**	**405.44**

Note: 1US$ = 11,205 Kip

The total cost of the Phase 1 project is estimated Kip 409.92 billion or US$ 36.58 million equivalent. Including US$ 30.24 million for EdL component and US$ 6.35 for MIH component. The cost estimation was based on the actual unit prices of the on-going SPRE project. For the EdL physical investment, 2% of physical contingencies and 10% price contingencies were included. With the experience of the on-going SPRE project and in view of the detailed and optimized design of individual sub-projects, 2% physical contingency is reasonable. For the MIH physical investment component, 12% of physical contingencies were included for changes of quantities and sizes of SHS and VH and GS to be chosen by the consumers. Since the market price for SHS is going down the trended will maintain as projected, 0% of price contingency is put down. Services would be covered with lump-sum contacts

B. Financing Arrangement by Component and Source for Phase 1

Component	Source						
	IDA	GEF	Unidentified	EDL	MIH	Consumer	Sub-total
1 **EdL Component**							
a) Grid extension	15.30			6.64		4.22	26.16
b) Loss Reduction	1.00			1.00			2.00
c) B & A System	1.00			0.00			1.00
d) DSM		0.75		0.00			0.750
e) Tariff Reform	0.25						0.25
Sub-total	**17.55**	**0.75**		**7.64**		**4.22**	**30.16**
2 **MIH Component**							
a) Off-grid Investment	2.00				0.24	0.13	2.37
b) Institutional Strengthening		1.00					1.00
c) Alternative RE Devilry Models	0.25	0.75					0.90
d) RE Master Plan and Database	0.20	0.50					0.70
e) Sector Financing Strategy			0.20				0.30
f) MIH Organizational Strengthening		0.75					0.75
Sub-total	**2.45**	**3.00**			**0.24**	**0.13**	**6.02**
Total	20.00	3.75	0.20	7.64	0.24	4.35	**36.18**
Percentage	55.0%	10.4%	0.55	21.1%	0.7%	12.0%	100.0%

Note

1) Physical contingency included: 2% for on-grid & loss reduction and 12% for off-grid physical investments;

2) Price contingency included: 10% for on-grid & loss reduction and 0% for off-grid physical investments;

3) Tax: no tax will be levied according to relevant GoL's policies.

C. EdL Component - Detailed Cost estimation of Phase 1

Cost by Category	Local	Foreign	Total	Local	Foreign	Total
	US$ Millions			Kip Billions		
EdL Component						
Goods	6.18	14.33	20.51	69.23	160.59	229.82
Works	4.41	-	4.41	49.42	0.00	49.42
Services	-	2.12	2.12	0.00	23.71	23.71
Total Base Cost	**10.59**	**16.45**	**27.04**	**69.23**	**160.59**	**229.82**
Physical Contingencies(2%)	0.21	0.31	0.52	2.37	3.46	5.83
Price Contingencies (10%)	1.06	1.54	2.60	11.86	17.31	29.17
Total Cost	**11.86**	**18.30**	**30.16**	**132.89**	**205.07**	**337.96**
Total Financing Required	**11.86**	**18.30**	**30.16**	**132.89**	**205.07**	**337.96**

Note: 1US$ = 11,205 Kip

D. MIH Component - Detailed Cost Estimation of Phase 1

Cost by Category	Local	Foreign	Total	Local	Foreign	Total
	US$ Millions			Kip Billions		
MIH Component						
Goods	1.51	0.22	1.74	16.95	2.50	19.45
Works				0.00	0.00	
Services	-	4.03	4.03	0.00	45.18	45.18
Total Base Cost	**1.51**	**4.26**	**5.77**	**16.95**	**2.50**	**19.45**
Physical Contingency (12%) /a	0.18	0.07	0.25	2.03	0.81	2.85
Price Contingency (0%) /b	-	-	0.00	0.00	0.00	0.00
Total Cost	**1.69**	**4.33**	**6.02**	**18.99**	**48.49**	**67.48**
Total Financing Required	**1.69**	**4.33**	**6.02**	**18.99**	**48.49**	**67.48**

Note: 1US$ = 11,205 Kip

Annex 6: Implementation arrangements
LAO PDR: Second Southern Provinces Rural Electrification Project

The proposed IDA credit will follow the APL approach. Rather than the SPRE approach of a single credit to be implemented over five years, the SPRE II credit will be provided in two phases each covering a 2 ½ year implementation period. Under the procedures for allocating IDA funds to individual countries, this should enable sufficient funds be channeled to finance entire proposals of MIH and EdL, albeit in two phases. The approach will also avoid the usual difficulty of getting agreement on specific sector reform measures to be undertaken under the project prior to credit negotiations. While the overall reform strategy is agreed at negotiations, specific measures are designed in the first Phase and the Government has ample time to consider, discuss and finally agree on these measures. There are, however, "triggers" required to be achieved before the second Phase will be released. For the physical investment components these are physical achievements, but for the sector reform component, they represent evidence of Government commitment to sector reform. A preliminary decision framework is shown in the Attachment 1. It is intended that this is refined as results of consultants studies come in. It is therefore vitally important that consultants are awarded as soon as possible and they are pressed to maintain schedules so that results will be available to inform the various steps in credit processing.

Implementing agencies. The Project will be implemented by EdL and MIH jointly.

EdL will be responsible for the implementation of activities associated with EdL under (i) the investment components, including on-grid investment activities and associated EMPs and RAPs, as well as the loss reduction activities; (ii) the sector reform component; and (iii) the demand side management component.

The project organization is generally divided into two functions, i.e. project office in headquarters and construction team at each of the five BOs. 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 BOs will be responsible for implementation of individual physical sub-projects in the seven southern provinces.

1) Project Office in Headquarters

Project Manager for SPRE II. An project manager is appointed and shall have the overall responsibility in execution of the Project.

Deputy Project Manager. Two deputy project managers are assigned to assist the project manager. The deputy project manager shall be responsible for planning, design, procurement, and supervision of construction works to be carried out by the provincial offices. One deputy project manager will take charge of the construction works in Bolikhamxay, Khammouane and Savannakheth provinces and the other deputy project manager for Saravan, Sekong, Champasak and Attapeu provinces. (EdL has one

provincial office in Saravan to manage both Saravan and Sekong provinces and also one office in Champasak for Champasak and Attapeu provinces.

Construction and Installation Team - 1 and 2. Under each deputy project manager, the construction and installation team is deployed for control and management of construction and installation works. Construction and Installation Team – 1 is responsible for three provinces, i.e. Bolikhamxay, Khammouane and Savannakheth, and Construction and Installation Team – 2 for four provinces, i.e. Saravan, Sekong, Champasak and Attapeu provinces. Each team has one team leader and deputy team leader, who are well experienced distribution engineers, and are in charge of planning, design and any modifications where required,, procurement of materials, supervision and monitoring of construction works, etc. for the respective provinces.

Assistant Engineers. Five assistant engineers shall be assigned under the construction and installation teams, one engineer for each construction team of provincial office, for coordination and communication between provincial office and the project office in head quarter to collect all the necessary information from the provincial office and forward proper instructions to the provincial office.

Administration Officers. The administration officer shall be responsible for all the administrative works regarding the execution of the project. Two administration officers are to be assigned during the construction period.

Accounting Officer. The accounting officer shall be responsible for all the accounting works regarding the project execution.

2) Construction Team in each Provincial Office

Each provincial office will organize his own construction team for construction of 22kV, 12.7kV and low voltage distribution system under the SPRE-II project. To manage this construction team, each provincial office shall have the following personnel:

Team Leader. The team leader shall be responsible for management and construction of distribution system in the respective province(s). He is also responsible for coordination with the head office in reporting the progress of works, issues, procurement requirement, etc.

Distribution Engineers. Two distribution engineers will be assigned for each construction team, who are responsible for planning, design and construction supervision of 22kV and low voltage distribution system in technical aspect. During the execution of the project, the planned distribution system may be required to be modified due to the change of site conditions after the detail design. The distribution engineers will be responsible for modification work of the original design of the system in consultation with the head office and the consultant.

Social/environmental Officer. The social/environmental officer shall have the responsibility to minimize the social and environmental impact of the project during the construction and after completion of the Project. He will monitor the action plan to prevent or minimize the social and environmental impact to be taken according to the resettlement policy flamework and environmental management Plan (EMP).

Warehouse Officer. The warehouse officer will be responsible for handling, control and management of materials and equipment delivered by the contractors. They shall maintain all the records of deliveries by the Contractors and quantities of materials and equipment handed over to the construction team. As the management and control of materials and equipment in warehouses is one of the important task in the execution of the Project, two nos. of warehouse officers shall be stationed at each warehouse to maintain the proper records of receiving and delivery of materials.

Accounting Officer. The accounting officer will be responsible for accounting of the construction team.

Construction team. Each provincial office has his own construction team for construction of 22kV and low voltage distribution system. Each construction team is consisting of 30 to 50 members, i.e. supervisors, technician, linesmen, operators, drivers, skilled and unskilled laborers, etc.

3) Consultant Team

The Consultant team will comprise the following personnel: (i) Team Leader; (ii) Distribution Design Specialist; (iii) Procurement specialist; (iv) Safeguard specialist; (v) Resident Engineer

The Team Leader will be responsible for all the consulting services comprising of designing, assisting, supervising, monitoring to ensure smooth execution of the Project.

The distribution design specialist is responsible for planning, design, preparation of technical specifications, supervising the site erection works, etc.

Procurement specialist is responsible for preparation of bid documents for supply materials and equipment, monitoring of deliveries by the contractor and storing of materials at site depots.

The safeguard specialist will be responsible for assisting the EdL's social/ environmental officers in monitoring the action plan for social and environmental impact due to the project throughout the implementation period.

One resident engineer (a national consultant) will be assigned, who will be stationed in head office in Vientiane throughout the implementation period to ensure the consultant's continuous services for monitoring the progress of the Project and to maintain close coordination between EdL's project manager and counterpart personnel and the

consultant's international engineers/specialists even no international consultant is available at site.

MIH will be responsible for the implementation of activities associated with MIH under (i) the investment component, including off-grid investment activities and associated environmental and social management, for the first 6 to 12 months as an interim arrangement; (ii) the sector reform component; and (iii) the demand side management component . Due to limited procurement and financial management capacities of the off-grid unit of MIH and its position as a government function unit which leads to delays in its operations and difficulties in performing its work, the implementation of the off-grid investment activities and associated social and environment management will be handed over to a third party, a local private company or joint-venture through a management contract, for which a TOR will be finalized by the end of the Project appraisal as scheduled in July 2004. After the transition, MIH will oversee the off-grid program while continues to implemented activities associated with MIH under the sector reform and DSM components.

In order to expedite this transition early in Phase 1, a significant portion of the PDF B preparation grant mobilized for the GEF-financed off-grid component is being directed towards development of Terms of Reference (TORs) and a procurement strategy for outside contracting of the implementation functions currently performed by the OPS (including central procurement, establishment and capacity building of ESCOs, provision of marketing materials and village preparation procedures, and provision of technical support).

The emphasis on outsourcing off-grid implementation was a direct results of lessons learned from the predecessor project. The IDA undertook a formal interim evaluation of the SPRE 1 GEF MSP off-grid project as part of its responsibilities as the Implementing Agency. The interim evaluation was conducted by an independent Consultant in accordance with a TOR of Reference based on the GEF's *Guidelines for Implementing Agencies to Conduct Terminal Evaluations.*[18] Although the Consultant rated the SPRE 1 GEF MSP as "Satisfactory" with regard to both Outcome/Achievement of Objectives and Sustainability, the Consultant also identified several specific concerns that have been addressed in the design of the SPRE II successor project. In particular, it was noted that program experience thus far has shown that the constraints associated with off-grid project management unit's position as a government office leads to delays in its operations and difficulties in performing its work. The Consultant recommended that the management of an expanded off-grid program undertaken by the SPRE II program be transitioned to a private or joint venture company, allowing for "more efficient operations and increased flexibility in design, a greater focus and transparency in its work and stronger incentives through the linking of payments to the company to its performance. The company would need to have the authority to take procurement and other decisions, where delays currently often occur, and would be accountable to MIH and the World IDA."

[18] Revised and Final Edition, April 24, 2003

Implementation Schedule. The Project will be implemented in two phases over a five-year period with two tranches of IDA credit allocations. Phase 1 will be implemented from January 2005 to June 2007, and Phase 2 from July 2007 to December 2009. Trigger conditions are designed for initiation of Phase 2 and will be evaluated by the end of Phase 1. Project preparation work for Phase 2 will be completed by the end of Phase 1. See Attachment 1 for the decision framework for the proposed APL. The proposed implementation schedule for execution of the SPRE II project is shown in the Figure-2.

1) Preparatory Stage

Bidding for supply of materials and equipment will be executed from the beginning of June 2004. Supply of materials and equipment is divided into 13 lots. Bids for all 13 lots will be invited during three months from June to August. Evaluation on the bids for all lots will be carried out by the consultant and the EdL's project office for one month after closing the bids for recommendation of the highest evaluated bidders to be awarded.

The evaluation reports for all lots shall be approved by the Committee of EdL and the IDA during the following two months. After obtaining their approval, the contract negotiation with the selected bidders will be carried out for awarding the Contracts. All these works will be completed before the end of the year 2004 and all the contracts will be ready for signing of the Contract.

2) Implementation Stage

Immediately after the effectiveness of IDA credit for SPREII Phase-1, all the contracts will be signed and enter into the contract in January 2005. All the contractors are able to commence their works immediately after the signing.

Delivery of the materials and equipment by the contractors will be made in stage-wise as shown in the Figure-2, which shows time of deliveries with blue coloured triangle marks. Concrete poles will be procured in following two ways, one is manufacturing and supply by the EdL's factories and the other is supply by the Contractors. EdL's factories will commence the manufacturing of concrete poles after receiving the first delivery of cement and reinforcing steel in March 2005 and the delivery to the site will be started in May 2005. The first delivery of concrete poles by the contractor is expected in April 2005. Thus, the erection of concrete poles will be possible to start in July 2005 in every province.

Construction period of all the works is estimated as 24 months after commencement of concrete pole erection in July 2005.

The completion of construction works is expected in June 2007.

3) Preparation for Phase-2

The 2nd tranche of SPRE II credit is expected in July 2007. Project preparation work for Phase-2 shall be completed by this time.

Selection of subprojects for Phase-2 will be initially made by each provincial office, starting from July 2006. After collecting all the data and information of selected subprojects by the provincial offices, the EdL's head office will conduct the technical examination on the selected subprojects with assistance of the consultant for screening the subprojects for implementation.

Bid documents for supply of materials and equipment will be prepared following detailed design and continued to bid processing for the selection of successful contractors.

By the time of June 2007, contractors for all lots will be finally selected and wait for signing of contracts upon the effectiveness of IDA credit.

The manufacturing and site erection works will be commenced in July 2007 for 2.5 years construction period.

Monitoring and Evaluation. The key indicators in Annex 1 will be monitored and evaluated by EdL and MIH as the implementing agencies. These two agencies will be responsible to obtain GOL statistics for economic and social development to provide the basis to evaluate progress made towards the CAS related goals. Statistics collected from the Project by EdL and MIH will provide the basis for the annual progress report, on which monitoring will be based during the project implementation. Environment and resettlement monitoring reports by specialists will supplement the progress reports.

During the Project implementation period, the task team of IDA will supervise the Project implementation in full due diligence. After Project completion, the Borrower will prepare a completion report to evaluate achievement of Project objectives, and Project outputs and impacts. Within 6 months after Project completion, the task team of IDA will prepare an Implementation Completion Report to assess the Project in full aspects according to the IDA Policy.

EdL Project Management Unit Organization Chart

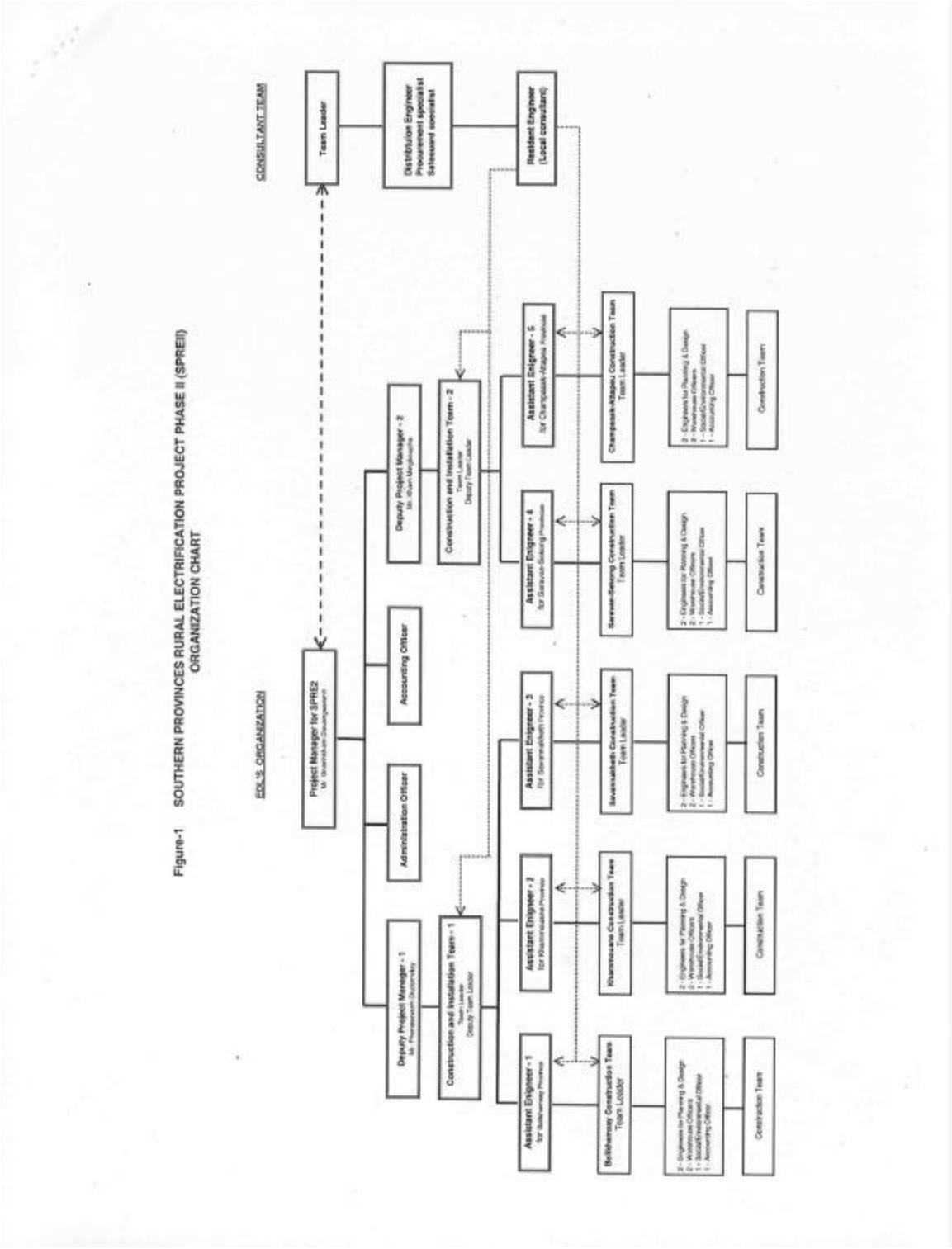
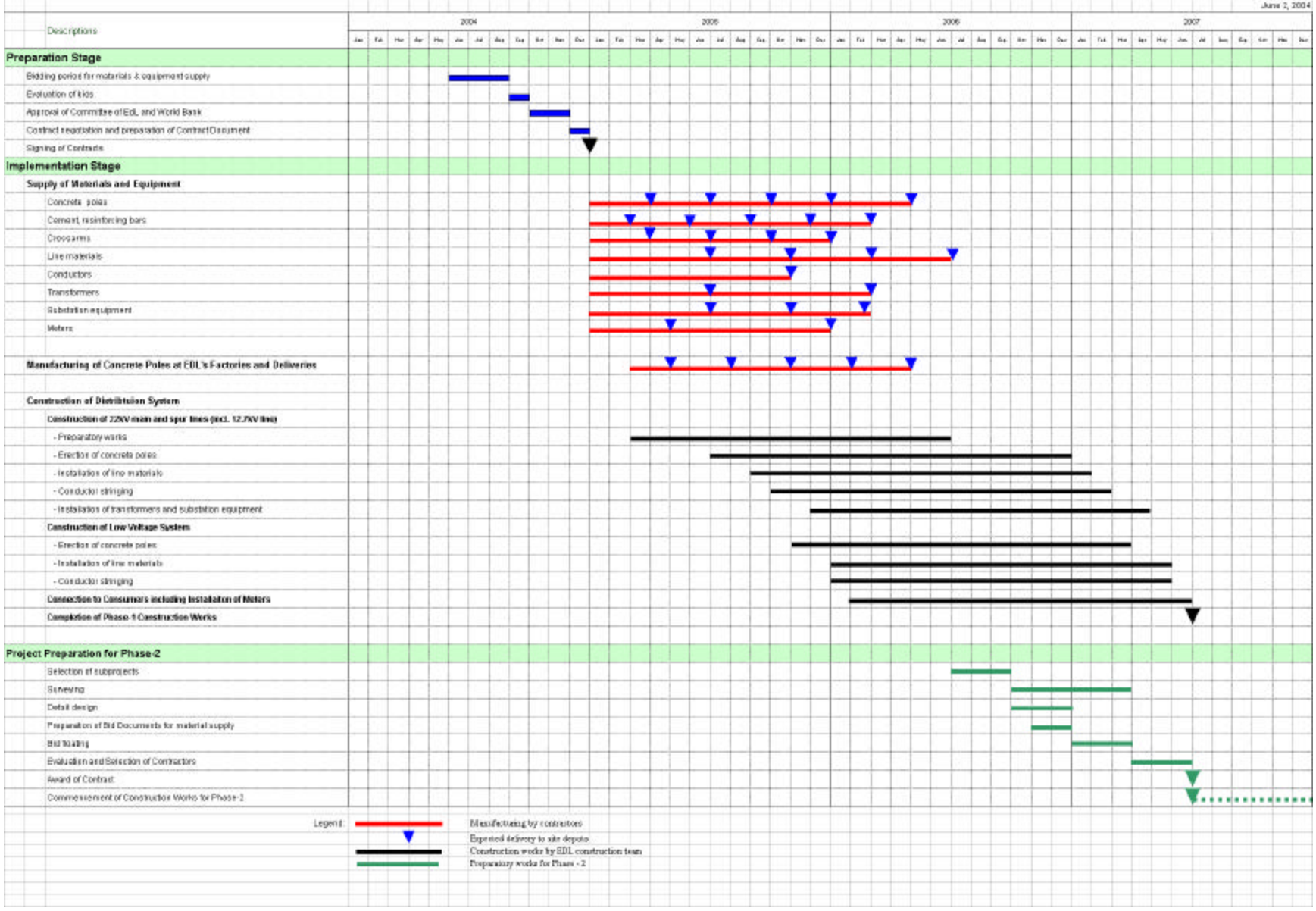


Figure-2 SOUTHERN PROVINCES RURAL ELCTRIFICATION II (SPREII) PROJECT

IMPLEMENTATION SCHEDULE

June 2, 2004



Annex 7: Financial Management and Disbursement Arrangements

LAO PDR: Second Southern Provinces Rural Electrification Project

1. Summary of the Financial Management Assessment

The Country Financial Accountability Assessment (CFAA) carried out for Lao PDR in late 2001 found the overall fiduciary risk is considered to be high despite the fact that there are elaborate built-in controls within the government financial management system. There is insufficient transparency related to public finances and the general attitude towards fiscal discipline is not strong. A general permissive environment and lack of incentives in complying with rules and regulations are compounded by an inadequate awareness of modern practices of internal controls in the public sector. The budget process is not transparent and public access to government financial information is limited. While an elaborate control system is in place, involving extensive pre-approval and checking processes, it is not effective or efficient. The government has introduce a decentralization initiative without putting in place a sufficiently robust institution framework that clearly defines the new responsibilities at lower levels. Technical capacity of staff at these levels needs to be strengthened. The oversight functions and the National Auditor Office's independence need to be strengthened. The accounting and auditing profession and institutions remain undeveloped. To address these challenges, the Government is implementing several recommendations of the PER and CFAA. The proposed Financial Management Capacity Building Project as well as government initiatives supported by ADB are expected to bring the fiduciary risk to an acceptable level.

To assess the existing capacity at the implementing agencies, an assessment of the adequacy of the project financial management system of the following implementing agencies was carried out during project preparation and confirmed at appraisal: (a) EdL, the electricity utility, a separate legal entity, is revenue generating; and (b) MIH, whose accounting personnel is expected to be involved in the proposed project; maintaining its own books and accounts. The FM assessment confirmed that both EdL and MIH have adequate financial management capacity to manage the proposed project. The FM assessment is in the project files.

2. Audit Arrangements

Auditor will be required to audit: (a) EdL's annual Corporate Financial Statements; and (b) the consolidated Project Financial Statements of all components implemented by both EdL and MIH, in accordance with International Standards on Auditing, under terms of reference satisfactory to IDA. In addition, the respective audits will be required to determine: (i) whether the activities of the Special Accounts associated with the respective project funds have been correctly accounted for and used in accordance with the IDA Credit and GEF Grant Agreements; and (ii) the adequacy of supporting documents and controls surrounding the use of the Statement of Expenditures (SOEs) as a basis for disbursement. A separate Management Letter will also be submitted which will: (a) identify any material weakness in accounting and internal control; (b) report on

the degree of compliance of financial covenants of the Credit and Project Agreements; and (c) communicate matters that have come to the attention of the auditors which might have a significant impact on the implementation of the Project. The audit will be financed from the proceeds of the Credit. The audited financial statements will be submitted to IDA within six months after the end of each fiscal year.

EdL has engaged PriceWaterhouseCoopers (PWC) as its external auditor. The annual audits are conducted in accordance with international standards on auditing and includes both the corporate financial statements of EdL; and the project financial statements of existing SPRE project. The audit reports were acceptable to IDA for purposes of EdL's full compliance with the audit report requirements of the Credit and Project Agreements.

The table below summarizes the audit reporting requirements for the Project.

henting Agency	Required Audit Report
	(1) EdL Corporate Financial Statements **(2) Consolidated Project Financial Statements of all components**
	Audited under Consolidated Project Financial Statements of all components

3. Disbursement Arrangements

The proceeds of the Credit/Grant will be disbursed on the traditional system: (a) from the SAs, with reimbursements made based on full documentation or against SOEs; and (b) direct payments from the Credit/Grant accounts. Two Special Accounts will be established for EdL and MIH as follows:

Implementing Agency	Disbursement Arrangements
	IDA Special Account
	GEF Special Account

Allocation of Credit/Grant Proceeds (Table C)

Disbursement of the proceeds of the Credit/Grant would be made against expenditure categories as shown in Table C.

TABLE C: ALLOCATION OF CREDIT/GRANT PROCEEDS

Expenditure Category	IDA Credit	GEF Grant	Financing Percentage
1. Goods			100% of foreign expenditures, 100% of local expenditures (ex-factory cost), and 85% of local expenditures for other items procured locally.
Under EdL	16,420,000		
Under MIH	2,000,000		

2. Consultants' Services			88%
Under EdL	1,250,000	500,000	
Under MIH		1,950,000	
3. Technical Assistance			100%
Under EdL			
Under MIH		1,300,000	
4. Unallocated			
Total	**19,670,000**	**3,750,000**	

Use of Statement of Expenditures (SOEs)

Some of the proceeds of the Credit/Grant are expected to be disbursed on the basis of SOEs as indicated in the table below.

3. EXPENDITURES CATEGORY	**Contracts less than US$ Equivalent**	
	Credit	**Grant**
Goods	200,000	
Consulting firms	100,000	
Individual consultants	50,000	
Incremental operational cost	All through SOE	All through SOE

Expenditures exceeding the above limits will be made in accordance with respective procurement guidelines and provisions in the Credit/Grant Agreements against submission of full documentation and signed contracts.

The PMUs will retain documentation supporting SOE disbursements during the life of the project and for one year after the receipt of the audit report for the year in which the last disbursement is made. These documents will be made available for review by the auditor and IDA supervision missions. Should the auditors or IDA supervision missions find that any disbursements made are not justified by supporting documentation, or are ineligible, IDA may withhold further deposits to the SA until the Borrower has: (a) either refunded the amount involved; or (b) submitted evidence of other eligible expenditures that offset the ineligible amounts.

Special Accounts:

To facilitate disbursements from the Credit/Grant, EdL and MIH shall each maintain a separate US dollar Special Account (SA) at the IDA of Lao, on terms and conditions satisfactory to IDA including appropriate protection against set off, seizure and attachments.

The EdL IDA-SA, which will cover the IDA share of eligible expenditures in all disbursement categories, will have an authorized allocation of US$x million with an initial deposit of US$x million. When the amount withdrawn from the Credit account

totals SDR x million equivalent, the initial allocation will be increased to the authorized allocation. While the MIH GEF-SA, will have an authorized allocation of US$x million. The SAs should be replenished regularly, preferably monthly (but not less than quarterly) or when the amounts withdrawn equal 20% of the initial deposit, whichever comes first. All replenishment applications will be accompanied by reconciled IDA statements from the depository IDA showing all transactions in the SAs. The SAs will be audited annually by independent auditors acceptable to IDA.

Financial Management and Reporting Arrangements

Implementing Entity. To ensure successful implementation of the proposed project, the institutional arrangements established under the on-going SPRE project will continue under the proposed SPRE II project. There will be two implementing agencies:

1. the EdL will be responsible for the implementation of activities associated with EdL under: (i) the investment component, including on-grid investment activities and associated EMPs and RAPs, as well as the loss reduction activities; (ii) the sector reform component; and (iii) the demand side management component.

2. the Off-grid Promotion and Support Office (OPS) established under the Department of Electricity (DoE) within MIH will be responsible for the implementation of activities associated with MIH under (i) the off-grid investment activities and associated EMPs and RAPs for the initial period (about first 6 months) as an interim arrangement; (ii) the sector reform component; and (iii) the demand side management component. After the initial period, implementation of the off-grid investment activities and associated social and environmental management will eventually be transferred to a third party, a private or joint venture company.

Funds Flow. IDA funds would be made available to Government at standard terms. The Government would on lend the Credit proceeds to EdL under a Subsidiary Loan Agreement.

IDA funds will be channeled either through the SAs to the EdL and MIH or through direct payment. EdL counterpart funds will be channeled through normal EdL payment procedures. Government counterpart funds will be channeled through the Counterpart Fund Account to be maintained by MIH. The Government counterpart fund requirements are estimated at a total of US$240,000 equivalent for the duration of the project. For the purposes of financing its contribution to expenditures under the project, the Government would open an account in the IDA of Lao and deposit into the account an initial amount equivalent to US$ 30,000 and thereafter replenish the account by depositing therein the balance of the Borrower's counterpart contribution in quarterly installments consistent with the financing requirements of the Project, subject to maintaining a minimum balance of US$10,000 in the counterpart account, or in such other installments as may be acceptable to IDA

Accounting Organization and Staffing. The financial management arrangement for the proposed project will be handled as follows:

(a) EdL – the Project Accountant appointed under PMU will be responsible for project accounts of components implemented by EdL, including accounting and reporting, preparation of SOEs and WAs, supplier records and processing and filing of disbursement vouchers and supporting documents. The accounting system will be computerized using the recently installed BAS (Accounting and Financial Management System) by EdL. In addition, the EdL Project Accountant will be responsible for: (i) ensuring that the accounting transactions of the proposed project will be consolidated with the corporate accounting transactions to produce the consolidated corporate financial statements at the end of the year; and (ii) preparation of the consolidated Project Financial Statements of all project components at the end of the year to be audited by an independent auditor.

(b) MIH – the Project Accountant appointed under OPS will be responsible for project accounts of components implemented by MIH. As the experiences in procurement, disbursement and accounting are low within MIH, the extensive training will be provided to MIH Project Accountant in: (i) preparation of SOEs and WAs; (ii) maintaining of the accounting books; and (iii) preparation of FMRs. Even though, it is not required by the existing project that MIH has to maintain its own accounting records, but the Project Accountant develop the simple accounting program by using ACCESS software and use to maintain the project accounts for his own internal control purpose. The mission reviewed the functions of the in-house developed accounting program, with some minor modifications needed, it should be able to produce annual financial statements and quarterly FMRs acceptable to IDA.

Internal Audit. With only two internal audit staff and without strongly support by the management, the internal audit function can not carried out efficiently. The two staff have extensive experiences in operations, but not enough background in financial audit. The technical assistance will be provided for on-the-job training in EGAT for the period of 3-6 months. During the period, the staff will also attend the relevant training or seminar courses conducted by Institution of Certified Auditors and Accountants in Thailand (ICAAT) or associated organizations in Thailand.

Monitoring and Reporting. Each PMU will provide IDA with financial monitoring reports (FMRs) in accordance with the Guideline to Borrowers issued on November 30, 2002. The FMRs shall include: (a) Discussion of Project Progress; (b) Project Balance Sheet; (c) Statement of Sources and Uses of Funds by Disbursement Categories; (d) Statement of Uses of Funds by Project Activities; (e) Output Monitoring Report; and (f) Procurement Status Report. The reports shall emphasize linkages between expenditures and physical progress. The FMR formats will be designed and agreed with EdL and MIH PMU before negotiation.

EdL and the MIH will be responsible for submitting the FMRs to IDA on a quarterly basis within 45 days of the quarter end starting the first quarter following Project's first

disbursement. Additional output monitoring report and key performance indicators will be identified and developed to suit project needs during implementation as appropriate.

Financial Management Action Plan. The implementing agencies have agreed to carry out a time-bound action plan to strengthen the financial management system, as per table below.

Actions	***Responsibility***	***Completion by Date***
Financial Management System and Reporting		
Fine tune the existing computerized billing accounting system (BAS at EdL and in-house developed accounting program at MIH) to support the project accounting system to capable of producing the FMRs and annual financial statements.	EdL/MIH	Credit Effectiveness
Internal Audit Function Training		
EdL internal audit staff to receive on-the-job training at EGAT for the period of 3-6 months and attend relevant training and seminar courses to be conducted during that period.	EdL	September 30, 2005
Audit		
Appoint an independent auditor to audit the Project Financial Statements and EdL Corporate Financial Statements.	EdL	September 30, 2005

Annex 8: Procurement Arrangements

LAO PDR: Second Southern Provinces Rural Electrification Project

A. General

1. Procurement for the proposed project would be carried out in accordance with the World IDA's "Guidelines: Procurement Under IBRD Loans and IDA Credits" dated May 2004; and "Guidelines: Selection and Employment of Consultants by World IDA Borrowers" dated May 2004, and the provisions stipulated in the Legal Agreement. The various items under different expenditure categories are described in general below. For each contract to be financed by the Credit, the different procurement methods or consultant selection methods, the need for pre-qualification, estimated costs, prior review requirements, and time frame are agreed between the Borrower and the IDA in the Procurement Plan. The Procurement Plan will be updated at least annually or as required to reflect the actual project implementation needs and improvements in institutional capacity.

2. **Procurement of Works**: The installation & erection works will be performed by EdL's own construction force (or subcontracted by EdL to qualified local contractors). No works are expected to be financed by the Credit.

3. **Procurement of Goods**: Goods procured under this project would include: (a) power distribution equipment and materials such as overhead conductors, transformers meters, poles and associated fittings and accessories; (b) field work vehicles and construction equipment, special installation tools; (c) IT hardware and software, office equipment; (d) loss-reduction-needed equipment such as meters, calibration & testing equipment, mentoring instrument, substation spot metering equipment; (e) solar home system units including their installations; (f) VH and GS including their installations.

4. All packages will be procured through ICB procedures with the following exceptions: (a) concrete poles and cross arms will be procured through NCB procedures since a number of local suppliers are available and these items are unlikely to attract any foreign suppliers; (b) small contracts (less than $100,000) for tools, loss-reduction equipment and office equipment may be procured following Shopping procedures. All the ICB procurement will be done using the IDA's latest SBD for Procurement of Goods.

5. **Procurement of non-consulting services**: Not expected.

6. **Selection of Consultants:** Consultant services will be required for the following TA activities: establishing a Rural Electrification Fund (REF) and engaging a management consultant; technical support to MIH's Off-grid Promotion and Support Office (OPS); developing legal, regulatory and institutional mechanism for extending the REF to other participants; developing a RE Master Plan; establishing a RE Data Base; technical support to various aspects of village and pico hydro development; support to Demand Side Management (DSM)/energy efficiency policy & regulation development; technical assistance in implementation of loss reduction measures; tariff and subsidy design, institutional upgrading for EdL.

7. The above services will be provided by consulting firms or individuals. No short lists of consultants (firms) are expected to compose entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines. All consultants will be selected through QCBS, QBS, or CQ depending on the specific situation; single-source selection procedures will be followed if justified in line with the World IDA guidelines. Individuals will be selected competitively or through single-sourcing if justified.

8. **Operational Costs:** [*Describe the operating costs which would be financed by the project and procured using the implementing agency's administrative procedures which were reviewed and found acceptable to the IDA*.] No operational costs will be financed by the IDA credit.

9. **Others**: [*Describe if any special arrangements for scholarships, grants etc.*] Efforts will be made during project implementation to obtain ASTAE or other suitable trust funds to support some of the technical assistance activities such as resource inventory studies (especially renewable resources) associated with the RE Master Plan development.

B. Assessment of the Agency's Capacity to Implement Procurement

10. Procurement activities will be carried out by EdL (a wholly stated owned enterprise) for the on-going and loss reduction components, and by MIH (a central government ministry) for the off-grid component. EdL and MIH will also be responsible for selection of consultants for their respective TA activities.

11. EdL has proposed an institutional arrangement to implement the on-grid component, including a Project Management Unit (PMU) at its head office and PMUs at the five southern provincial BOs. The PMU includes three staff who have gained practical procurement experience through the previous IDA projects. This arrangement is being reviewed by the consultants and would be strengthened if the consultants so recommend. For the off-grid component, MIH OPS, the unit responsible for the off-grid component under the on-going SPRE project, will continue to assume the primary responsibility for implementation with the support of expatriate and local consultants.

12. An assessment of the capacity of the Implementing Agency to implement procurement actions for the project has been carried out by IDA procurement staff in accordance with relevant instructions & guidelines and based on findings of the preparation mission in December 2003 and preappraisal mission in May 2004. The assessment report is available in the project files.

13. The main risks associated with procurement for this project are identified as follows: (a) corruption and collusive practices – though no specific cases have been reported under EdL/MIH sponsored procurement, given the perceived risk and general weak procurement environment in the country, the issue still warrants particular attention during the implementation of this project; and (b) procurement delays – to mitigate such a risk, bidding documents have been prepared for most of the on-grid packages and an

international consulting firm has been hired under the on-going SPRE project to help handling the bidding process and preparation of bidding documents for other packages. For the off-gird component, an individual procurement consultant will be hired to review the technical specifications and to prepare bidding documents.

14. The overall project risk for procurement is rated as "average", taking into account the following assessments: (a) EdL has extensive experience with international procurement financed by the IDA and ADB. It will be responsible for the majority of procurement under the proposed project; (b) an international consulting firm (including at least one senior procurement specialist) has been appointed to assist EdL in all stages of procurement; (c) MIH, while has no ICB experience, has done reasonably well in handling the consultant selection process (QCBS) for three preparation studies funded by PHRD grant. As such, an individual procurement consultant (who knows the IDA procurement guidelines and procedures) will be hired to provide training to MIH staff on ICB procedures and assistance in preparation of ICB bidding documents; and (d) the procurement under the previous IDA financed projects was conducted successfully without major problems.

C. Procurement Plan

15. The Borrower, at appraisal, developed a Procurement Plan for project implementation which provides the basis for the procurement methods. This plan has been agreed between the Borrower and the Project Team on [*date*….] and is available at EdL PMU and MIH OPS as well as the IDA Team/project file. It will also be available in the Project's database and in the IDA's external website. The Procurement Plan will be updated in agreement with the Project Team annually or as required to reflect the actual project implementation needs and improvements in institutional capacity.

D. Frequency of Procurement Supervision

16. In addition to the prior review supervision to be carried out from World IDA offices, the capacity assessment of the Implementing Agency has recommended twice a year supervision missions to visit the field for post review of procurement actions and discussion/solutions of procurement related issues.

E. Details of the Procurement Arrangement involving International Competition

17. **Goods and Works and non consulting services**.

(a) List of contract Packages which will be procured following ICB, NCB, Shoping and Direct contracting:

1	2	3	4	5	6	7	8	9
Ref. No.	**Contract (Description)**	**Estimated Cost ($'m)**	**Procure-ment Method**	**P-Q**	**Domestic Preference (yes/no)**	**Review by IDA (Prior/ Post)**	**Expected Bid-Opening Date**	**Comments**

On-grid component (EdL)								
01	Tools	0.49	ICB	No	Yes	Prior	08/26/04	
02	Overhead conductors	4.95	ICB	No	Yes	Prior	08/26/04	
03	Distribution transformers	1.07	ICB	No	Yes	Prior	08/26/04	
04	Watt hour meters & meter boxes	0.96	ICB	No	Yes	Prior	08/18/04	
05a	Concrete poles	1.50	NCB	No	No	Prior	07/28/04	
05b	Concrete poles supplied by EdL pole factory	1.41	-	-	-	-	-	100% EdL financing
06	Transformer fitting materials	0.56	ICB	No	Yes	Prior	08/17/04	
07	Distribution line materials	3.31	ICB	No	Yes	Prior	08/17/04	
08	Cement for EdL pole factory	0.25	-	-	-	-	-	100% EdL financing
09	Steel reinforcement wire for EdL pole factory	0.61	-	-	-	-	-	100% EdL financing
10	Computer and office equipment	0.18	ICB	No	Yes	Post	08/05/04	
11	IT hardware and software	1.00	ICB	No	Yes	Prior	08/26/04	
12	Field work vehicles and construction equipment	1.55	ICB	No	Yes	Prior	08/18/04	
13	Concrete cross arms	0.29	NCB	No	No	Prior	07/28/04	
Loss reduction component (EdL)								
01	Domestic & commercial revenue meters	0.46	ICB	No	Yes	Prior	12/15/04	
02	Calibration & testing equipment	0.045	Shopping	No	No	Post	12/15/04	
03	Substation and spot metering equipment	0.045	Shopping			Post	12/15/04	
Off-grid component (MIH)								
01	SHS units	1.80	ICB	No	Yes	Prior	02/28/05	3 rounds of ICB in equal quantity.
02	VH/GS	0.20	ICB	No	Yes	Prior	05/31/05	

(b) ICB Contracts estimated to cost at or above $200,000 per contract and all Direct contracting will be subject to IDA prior review.

18. **Consulting Services**.

(a) List of Consulting Assignments with short-list of international firms.

1	2	3	4	5	6	7
Ref. No.	**Description of Assignment**	**Estimated Cost ($'m)**	**Selection Method**	**Review by IDA (Prior/ Post)**	**Expected Proposals Submission Date**	**Comments**
EdL component						
01	Project implementation consultant	0.50	QCBS	Prior	-	Consultant already selected under SPRE financing.
02	Loss reduction implementation consultant	0.20	QCBS	Prior	???	
03	Tariff and subsidy design	0.25	QCBS	Prior		
04	Institutional upgrading	0.25				
05	Other studies	0.25				To be defined.
MIH component						
01	REF management consultant	0.25	QCBS	Prior	???	
02	Technical support to MIH OPS for off-grid implementation					
03	Development of legal, regulatory and institutional mechanism for REF extension					
04	Technical support to village and pico hydro development					
05	Development of a RE Master Plan					
06	Development of a RE Data Base					
07	DSM/energy efficiency policy development					

(b) Consultancy services estimated to cost at or above $100,000 per contract and all Single Source selection of consultants (firms), and $50,000 for individuals will be subject to prior review by the IDA.

(c) **Short lists composed entirely of national consultants**: No short lists of consultants are expected to compose entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines.

F. IDA Prior Review Thresholds

Expenditure Category	Contract Value Threshold (US$'000)	Procurement Method	Contracts Subject to Prior Review (US$'000)
Goods	>=100	ICB **	>=200
	<100	Shopping	
Consultant services	>=100	QCBS, QBS	>=100 for firms
	<100	CQ	All SSS
	NA	IC	>=50 for individuals

** With exceptions of two procurement packages (concrete poles and concrete cross arms) for which NCB is the most appropriate method though their estimated costs are above $100,000.

ICB: International Competitive Bidding
NCB: National Competitive Bidding
QCBS: Quality and Cost Based Selection
QBS: Quality Based Selection
CQ: Selection Based on Consultant's Qualifications
IC: Individual Consultants
SSS: Single Source Selection

Annex 9: Economic and Financial Analysis

LAO PDR: Second Southern Provinces Rural Electrification Project

DETERMINING ECONOMIC PRICE OF SHS
DETERMINATION OF CONSUMER SURPLUS

TOTAL # of Households Buying PV Systems under SPRE II, Phase 1 **9,000**

Exchange Rate (Kips/US$) **11,205**

20 Watt-Systems

Initial Number of Hholds (as 45% under SPRE I)	0.45	**4050Hh.**		
Initial Cost of System (solar+house kit)	1360000Kips	**121$**		
Watts Provided by System		**20Watts**		
Cost of Controller Replacement	163200Kips	15$	Repl Cost	
Cost of Battery Replacement	185500	17$	0.26	
Yearly System Maintenance (2 % of Capital Costs)		2.4274877$		

Assuming Full Utilization of PV System

	Year	SHS Capital Cost	Battery& Contr. Replace-ment Cost	Annual O&M Cost	Electricity Available	Village Installed	Village Utilized
					kWh	kW	kW
1724899.6	1	491566.3		9831.3	144180	81	81
	2			9831.3	144180	81	81
	3			9831.3	144180	81	81
	4			9831.3	144180	81	81
	5		126036	9831.3	144180	81	81
	6			9831.3	144180	81	81
	7			9831.3	144180	81	81
	8			9831.3	144180	81	81
	9			9831.3	144180	81	81
	10		126036	9831.3	144180	81	81
	11			9831.3	144180	81	81
	12			9831.3	144180	81	81
	13			9831.3	144180	81	81
	14			9831.3	144180	81	81
	15		126036	9831.3	144180	81	81
	16			9831.3	144180	81	81
	17			9831.3	144180	81	81
	18			9831.3	144180	81	81

19			9831.3	144180	81	81
20	491566.265	126036	9831.3	144180	81	81
21			9831.3	144180	81	81
22			9831.3	144180	81	81
23			9831.3	144180	81	81
24			9831.3	144180	81	81
25		126036	9831.3	144180	81	81
26			9831.3	144180	81	81
27			9831.3	144180	81	81
28			9831.3	144180	81	81
29			9831.3	144180	81	81
30			9831.3	144180	81	81

Discount Rate

12%	830772	454332	79193	1161396	652.47	652.47
0%	983132.53	630180.7	294939.8	4325400	2430.00	2430.00

Net Present Cost per kWh	**1.17**
NPV of Total Cost per kW**h** (30 Years)	16843
Annual Cost of Total Installed PV System (kW)	1684
Annual Cost of *Fully Utilized PV System* (kW)	1684

LUMEN PRICE OF PV SYSTEM UTILIZATION (20 W)

Lamps	2
Watts	5
Lamp Use (hrs)	3
Light/Hour/Lamp	200
Total Lumens	400
Watts/hr	10.00
Price/kWh	**1.17**
Lumens/Watt-hr	40
Price/kLumen	**0.0294**
Lumens/Mo	**36,000**

subscription to the size of SHS from SPRE I Status Report, Dec 03

20W	Phase 1	45%	0.48	4152
30W	Phase 1	20%	0.10	
40W			0.04	
50W	Phase 1	35%	0.37	

20 W System

Calculation of Consumer Surplus for Lighting

Exchange Rate	Kips/US$	**11,205**
Slope of the Linear Demand Curve		**0.5**

Average # of Lamps		**2**
Type of Lamps		**5W**

			Wick Lamp	Hurricane Lamp	CFL 5W Lamp
No. of Hrs. each Lamp is on		**3**			
Total Lamp Use (All Lamps)	Hours/Day		3	3	6
Light Output	Lumens/Hr		11	32	230
Light Output	**Lumens/ M**		**990**	**2,880**	**41,400**
Diesel Consumption	Liters/Hr		0.01	0.02	
Diesel Consumption	Liters/M		0.90	1.80	
Energy Equivalent	kWh/M		0.81	1.62	0.90
Total Cost	Month		4,500	9,000	296
Fuel Cost in kWh	**Cost/kWh**		**5,556**	**5,556**	**329**
Fuel Cost in Lumen hr.	**Cost/Lumen hour**		**4.545**	**3.125**	**0.00715**
Daily cost to reach equiv. Lumens	**Kips/Day**		**3,136**	**2,156**	**10**
Monthly Cost to reach equiv Output	**Kips/Month**		**94,091**	**64,688**	**296**
CS Gain-*WicktoElec* - Kips/Lumen	Kips/Month		96,189	69,029	
Per kWh Electricity Use			118,752	42,611	
In Step Gain-*WicktoElec* - Kips/Lumen	Kips/Month		2,749	69,029	
Per kWh Electricity Use			3,393	42,611	
TOTAL CS Gain	Kips/Month				**71,778**
Converted to kWh Electricity Use					46,004
Consumer Surplus per kWh Elect Use/Month			106,877	76,699	

Comparison of Cost of PV with Diesel/Kerosene

Electricity Cost/kWh	B. Kips	329	$0.029	USD
Kerosene/diesel Cost/liter	B. Kips	5000	$0.446	US$

Gain in Gross Benefits (Defined as Gain in CS + Expenditure):

Monthly Benefits						
Lumen Expenditure for Electric Lighting					**296**	
Gross Benefit from **Wick-Hurricane-Electricity** =				72,074	**$6.43**	Broken DD curve result
Gross Benefit **Wick to Electricity =**				**96,485**	**$8.61**	
Yearly Benefits						
Gross Benefit from **Wick-Hurricane-Electricity** =				**864,886**	**$77**	Broken DD curve result

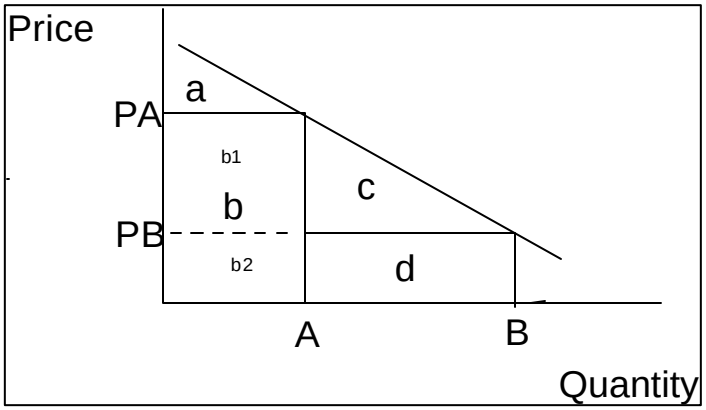
Illustration of Consumer Surplus (not for a kink DD curve)

Gain Due To Shift From Kerosene Wick Lantern to Electric Light

	4.5454	
PA =	5	=Lumen price using Wick Lantern
	0.0071	
PB =	5	=Lumen price using Electricity
A =	990	=Lumen consumption using Wick Lantern
B =	41,400	=Lumen consumption using Electricity
a =	Unknown but Not Necessary to Calculate **Gain** in Surplus	
b1 =	4493	=Surplus gain due to lower cost for original lumen consumption
c =	91,696	=Surplus gain due to substition effect

b1 + c =	**96,189**	**=Total Gain in Consumer Surplus**
b2 + d =	296	=Consumer Expenditure- Higher Lumen Consumption
b1 + b2 + c + d =	**96,485**	=Gain in Gross Benefit

Price = Price per lumen hour
Quantity = Lumen hours
Note: Not drawn according to scale or example data.



Cost Benefit Analysis of Phase 1 for SHS

Calculation of Assumptions

Totl.SHS		9000	
Total Cost of Off-grid		2,000,000	US$
95% for SHS		1900000	US$
		211	

(See ProjectionPhase1SPREII.xls)

Physical Contingencies are note included as the cost of SHS may be declining

			Yr. 1	Yr.2	Yr.3	
SHS Installation	Cumm		2460	8330	9000	
SHS Installation	Annual		2460	5870	670	
Distribution of Capital Cost			0.27	0.65	0.07	
% of Replacement Cost (Controller+Battery)				0.2		
Assumption from SPRE 1		**20W**	**30&40W**	**50W**	for Consumer Surplus for Lighting	
% of SHS		0.45	0.2	0.35		
Per Hhld. Cost		121	178	290	192	Avg. Cost
O&M Cost		0.02				

Benefits distributed with respect to installation %

			US$	2005	2006	2007	2005	2006	2007
Gross Benefit by 20 W Hhld			79	1107	2642	302	88	210	24
Gross Benefit by 30 W& 40 W Hhld			117	492	1174	134	57	137	16
Gross Benefit by 50 W Hhld			207	861	2055	235	178	425	48
				2460	5870	670			

ECONOMIC ANALYSIS OF SHS
LIGHTING BENEFITS QUANTIFIED ONLY

						Benefits of Lighting					@ 10%	@ 12%	@ 36%	@ 10%	@ 12%	@ 36%	@ 10%	@ 12%	@ 36%
	Year	SHS Capital Cost	Replace-ment Cost	O&M Cost	Total Cost	20 W	30 W	50 W	Total Benefit	Net Benefit	Total Cost			Total Benefit			NET BENEFIT		
		US Dollar ('000)				US Dollar ('000)				US$ ('000)	US$ ('000)			US$ ('000)			US$ ('000)		
		(1)	(2)	(3)	(4)	b1	b2	b3	(5)	(6)	(4)-a	(4)-b	(4)-c	(5)-a	(5)-b	(5)-c	(6)-a	(6)-b	(6)-c
0	2005	519		10	530	0.088	0.210	0.024	0.322	-529	529.7	529.7	529.7	0.3	0.3	0.3	-529.4	-529.4	-529.4
1	2006	1239		35	1274	0.057	0.135	0.015	0.207	-1274	1158.5	1137.9	937.1	0.2	0.2	0.2	-1158.4	-1137.7	-936.9
2	2007	141		38	179	0.171	0.409	0.047	0.627	-179	148.3	143.1	97.0	0.5	0.5	0.3	-147.8	-142.6	-96.7
3	2008			38	38	322	210	651	1183	1145	28.5	27.0	15.1	888.6	841.9	470.2	860.1	814.8	455.1
4	2009		380	38	418	322	210	651	1183	765	285.5	265.6	122.2	807.8	751.7	345.7	522.3	486.0	223.5
5	2010			38	38	322	210	651	1183	1145	23.6	21.6	8.2	734.4	671.1	254.2	710.8	649.6	246.0
6	2011			38	38	322	210	651	1183	1145	21.5	19.3	6.0	667.6	599.2	186.9	646.2	580.0	180.9
7	2012			38	38	322	210	651	1183	1145	19.5	17.2	4.4	606.9	535.0	137.4	587.4	517.8	133.0
8	2013			38	38	322	210	651	1183	1145	17.7	15.3	3.2	551.8	477.7	101.1	534.0	462.3	97.8
9	2014		380	38	418	322	210	651	1183	765	177.3	150.7	26.3	501.6	426.5	74.3	324.3	275.8	48.0
10	2015			38	38	322	210	651	1183	1145	14.7	12.2	1.8	456.0	380.8	54.6	441.4	368.6	52.9
11	2016			38	38	322	210	651	1183	1145	13.3	10.9	1.3	414.5	340.0	40.2	401.2	329.1	38.9
12	2017			38	38	322	210	651	1183	1145	12.1	9.8	0.9	376.9	303.6	29.5	364.8	293.8	28.6
13	2018			38	38	322	210	651	1183	1145	11.0	8.7	0.7	342.6	271.1	21.7	331.6	262.3	21.0
14	2019		380	38	418	322	210	651	1183	765	110.1	85.5	5.6	311.5	242.0	16.0	201.4	156.5	10.3
15	2020			38	38	322	210	651	1183	1145	9.1	6.9	0.4	283.1	216.1	11.7	274.0	209.1	11.4
16	2021			38	38	322	210	651	1183	1145	8.3	6.2	0.3	257.4	192.9	8.6	249.1	186.7	8.4
17	2022			38	38	322	210	651	1183	1145	7.5	5.5	0.2	234.0	172.3	6.3	226.5	166.7	6.1
18	2023			38	38	322	210	651	1183	1145	6.8	4.9	0.1	212.7	153.8	4.7	205.9	148.9	4.5
19	2024	1900	380	38	2318	322	210	651	1183	-1135	379.0	269.1	6.7	193.4	137.3	3.4	-185.6	-131.8	-3.3
20	2025			38	38	322	210	651	1183	1145	5.6	3.9	0.1	175.8	122.6	2.5	170.2	118.7	2.4
21	2026			38	38	322	210	651	1183	1145	5.1	3.5	0.1	159.8	109.5	1.9	154.7	106.0	1.8
22	2027			38	38	322	210	651	1183	1145	4.7	3.1	0.0	145.3	97.7	1.4	140.6	94.6	1.3
23	2028			38	38	322	210	651	1183	1145	4.2	2.8	0.0	132.1	87.3	1.0	127.8	84.5	1.0

24	2029		380	38	418	322	210	651	1183	765	42.4	27.5	0.3	120.1	77.9	0.7	77.6	50.4	0.5
25	2030			38	38	322	210	651	1183	1145	3.5	2.2	0.0	109.2	69.6	0.5	105.7	67.3	0.5
26	2031			38	38	322	210	651	1183	1145	3.2	2.0	0.0	99.2	62.1	0.4	96.1	60.1	0.4
27	2032			38	38	322	210	651	1183	1145	2.9	1.8	0.0	90.2	55.5	0.3	87.3	53.7	0.3
28	2033			38	38	322	210	651	1183	1145	2.6	1.6	0.0	82.0	49.5	0.2	79.4	47.9	0.2
29	2034			38	38	322	210	651	1183	1145	2.4	1.4	0.0	74.6	44.2	0.2	72.2	42.8	0.2
											3059	2797	1768	9030	7490	1777	5971	4693	9

B/C@10%= 3.0
B/C@12%= 2.7
B/C@28%= 1.0

	@10%	@12%	@36%
IRR=	24%	22%	0%

TOTAL # of Households Buying PV Systems under SPRE II, Phase 1 **9,000**

Exchange Rate (Kips/US$) **11,205**

30 Watt-Systems

Initial Number of Hhlds.(as 20% under SPRE I)		0.2	1800	Hh.
Initial Cost of System (solar + house kit)	1990000	Kips	**178**	$
Watts Provided by System			**30**	Watts
Cost of Controller Replacement	199000	Kips	18	$
Cost of Battery Replacement	222600		20	$
Yearly System Maintenance (2 % of Capital Costs)			3.551986	$

						Repl Cost
						0.21

Assuming Full Utilization of PV System

Year	SHS Capital Cost	Battery& Contr. Replace-ment Cost	Annual O&M Cost	Electricity Available	Village Installed	Village Utilized
				kWh	kW	kW
1	319679		6394	96120	54	54
2			6394	96120	54	54
3			6394	96120	54	54
4			6394	96120	54	54
5		67727	6394	96120	54	54
6			6394	96120	54	54
7			6394	96120	54	54
8			6394	96120	54	54
9			6394	96120	54	54
10		67727	6394	96120	54	54
11			6394	96120	54	54
12			6394	96120	54	54
13			6394	96120	54	54
14			6394	96120	54	54
15		67727	6394	96120	54	54
16			6394	96120	54	54
17			6394	96120	54	54
18			6394	96120	54	54
19			6394	96120	54	54
20	319679	67727	6394	96120	54	54
21			6394	96120	54	54
22			6394	96120	54	54
23			6394	96120	54	54
24			6394	96120	54	54
25		67727	6394	96120	54	54
26			6394	96120	54	54
27			6394	96120	54	54
28			6394	96120	54	54
29			6394	96120	54	54
30			6394	96120	54	54

Discount Rate						
12%	540273	244140	51501	774264	434.98	434.98
0%	639357.4297	338634.5	191807.2	2883600	1620.00	1620.00

Net Present Cost per kWh	1.08
NPV of Total Cost per kW (30 Years)	15480
Annual Cost of Total Installed PV System (kW)	1548
Annual Cost of *Fully Utilized PV System* (kW)	1548

LUMEN PRICE OF PV SYSTEM UTILIZATION (30 W)

Lamps	3
Watts	5
Lamp Use (hrs)	3
Light/Hour/Lamp	200
Total Lumens	600
Watts/hr	15.00
Price/kWh	**1.08**
Lumens/Watt-hr	40
Price/kLumen	**0.0270**
Lumens/Mo	**54,000**

DETERMINATION OF CONSUMER SURPLUSE FROM GRID ELECTRIFICATION

Cosnsumer Categories are not defined in the first stage of analysis

Assumptions

Total # of Households 42186
Diesel instead of Kerosene is used for one Wick lamp and one Hurricane lamp
Comparison of Lamps with 6 hours of lighting/day

Calculation of Consumer Surplus for Lighting

Exchange Rate	Kips/US$			**11,205**	
Slope of Linear Demand Curve				0.5	
		Without Electricity			**With Electricity**
		Wick Lamp	Hurricane Lamp		Electric 60W Lamp
Lamp usage per day (All Lamps)	Hours/Day	6	6		6
Light Output	Lumens/Hr	11	32		720
Light Output	**Lumens/M**	**1,980**	**5,760**		**129,600**
Monthly Lumen Consumption		**7,740**			**129,600**
Diesel Consumption	Liters/Hr	0.01	0.02		
Diesel Consumption	Liters/M	1.80	3.60		
Conversion into Monthly kWh Cons	**kWh/M**	**1.62**	**3.24**		**10.80**
Total Cost in Kips	Month	9,000	18,000		1,815
Fuel Cost in kWh	**Cost/kWh**	**5,556**	**5,556**		**168**
Fuel Cost in Lumen hr.	**Cost/Lumen hour**	**4.545**	**3.125**		**0.01401**
Daily cost to reach equiv. Lumens	**Kips/Day**	**19,636**	**13,500**		**61**
Monthly Cost to reach equiv Output	**Kips/Month**	**589,091**	**405,000**		**1,815**
CS Gain-*WicktoElec* - Kips/Lumen	Kips/Month	298,124	210,552		
Per kWh Electricity Use		184,027	64,985		
In Step Gain-*WicktoElec* - Kips/Lumen	Kips/Month	5,497	210,552		
Per kWh Electricity Use		3,393	64,985		
TOTAL CS Gain	Kips/Month				**216,049**
Converted to kWh Electricity Use					68,379
Consumer Surplus per kWh Elect Use/Month		27,604	19,496		

Comparison of 60W with Kerosene Lamp

Electricity Cost/kWh	B. Kips	168	$0.015	US$
Diesel Cost/ liter	B. Kips	5000	$0.446	US$

Gain in Gross Benefits (Defined as Gain in CS + Expenditure): Area under the Demand Curve

Monthly Benefits					
Lumen Expenditure for Electric Lighting				**1815**	
Gross Benefit from **Wick-Hurricane-Electricity** =			217,864	$19.44	Broken DD curve result
Gross Benefit **Hurricane to Electricity** =			212,367	$18.95	
Yearly Benefits					
Gross Benefit from **Wick-Hurricane-Electricity** =			2,614,373	**$233**	Broken DD curve result

Total CS for Lighting

Year	HH Connections	Yearly Benefit from Lighting	US$ (m)
2005	16187	$3,776,783.36	3.78
2006	22074	$8,927,133.39	8.93
2007	3925	$9,842,922.28	9.84

30 W System

Calculation of Consumer Surplus for Lighting

Exchange Rate	Kips/US$	**11,205**
Slope of the Linear Demand Curve		**0.5**
Average # of Lamps	**3**	
Type of Lamps	**5W**	
No. of Hrs. each Lamp is on	**3**	

		Wick Lamp	Hurricane Lamp	CFL 5W Lamp
Total Lamp Use (All Lamps)	Hours/Day	3	3	9
Light Output	Lumens/Hr	11	32	230
Light Output	**Lumens/M**	**990**	**2,880**	**62,100**
Diesel Consumption	Liters/Hr	0.01	0.02	
Diesel Consumption	Liters/M	0.90	1.80	
Energy Equivalent	kWh/M	0.81	1.62	1.35
Total Cost	Month	4,500	9,000	408
Fuel Cost in kWh	**Cost/kWh**	**5,556**	**5,556**	**302**
Fuel Cost in Lumen hr.	**Cost/Lumen hour**	**4.545**	**3.125**	**0.00657**
Daily cost to reach equiv. Lumens	**Kips/Day**	**3,136**	**2,156**	**14**
Monthly Cost to reach equiv Output	**Kips/Month**	**94,091**	**64,688**	**408**

CS Gain-*WicktoElec* - Kips/Lumen	Kips/Month	143,179	101,318
Per kWh Electricity Use		176,764	62,542
In Step Gain-*WicktoElec* - Kips/Lumen	Kips/Month	2,749	101,318
Per kWh Electricity Use		3,393	62,542

TOTAL CS Gain	Kips/Month			**104,066**
Converted to kWh Electricity Use				65,935
Consumer Surplus per kWh Elect Use/Month		106,058	75,050	

Comparison of Cost of PV with Diesel/Kerosene

Electricity Cost/kWh	B. Kips	302	$0.027USD
Kerosene/diesel Cost/liter	B. Kips	5000	$0.446US$

Gain in Gross Benefits (Defined as Gain in CS + Expenditure):

Monthly Benefits				
Lumen Expenditure for Electric Lighting			**408**	
Gross Benefit from **Wick-Hurricane-Electricity** =	104,475	$9.32	Broken DD curve result	
Gross Benefit **Wick to Electricity =**	**143,587**	$12.81		
Yearly Benefits				
Gross Benefit from **Wick-Hurricane-Electricity** =	**1,253,694**	**$112**	Broken DD curve result	

TOTAL # of Households Buying PV Systems under SPRE II, Phase 1 **9,000**

Exchange Rate (Kips/US$) **11,205**

50 Watt-Systems

Initial Number of Hholds (as 35% under SPRE I)		0.35	3150	Hh.
Initial Cost of System (solar kit+house kit)	3250000	Kips	**290**	$
Watts Provided by System			**50**	Watts
Cost of Controller Replacement	300000	Kips	27	$
Cost of Battery Replacement	397500	Kips	35	$
Yearly System Maintenance (2 % of Capital Costs)			5.8009817	%

	Repl Cost
	0.21

Assuming Full Utilization of PV System

Year	SHS Capital Cost	Battery& Contr. Replace-ment Cost	Annual O&M Cost	Electricity Available	Village Installed	Village Utilized
				kWh	kW	kW
1	913655		9831	144180	81	81
2			7647	144180	81	81
3			9831	144180	81	81
4			9831	144180	81	81
5		112048	9831	144180	81	81
6			9831	144180	81	81
7			9831	144180	81	81
8			9831	144180	81	81
9			9831	144180	81	81
10		112048	9831	144180	81	81
11			9831	144180	81	81
12			9831	144180	81	81
13			9831	144180	81	81
14			9831	144180	81	81
15		112048	9831	144180	81	81
16			9831	144180	81	81
17			9831	144180	81	81
18			9831	144180	81	81
19			9831	144180	81	81
20	913655	112048	9831	144180	81	81
21			9831	144180	81	81
22			9831	144180	81	81
23			9831	144180	81	81
24			9831	144180	81	81
25		112048	9831	144180	81	81
26			9831	144180	81	81
27			9831	144180	81	81
28			9831	144180	81	81
29			9831	144180	81	81
30			9831	144180	81	81

Discount Rate						
12%	1544123	403909	77451	1161396	652.47	652.47
0%	1827309	560241	292755.02	4325400	2430.00	2430.00

Net Present Cost per kWh	**1.74**
NPV of Total Cost per kW**h** (30 Years)	25006
Annual Cost of Total Installed PV System (kW)	2501
Annual Cost of *Fully Utilized PV System* (kW)	2501

LUMEN PRICE OF PV SYSTEM UTILIZATION (50 W)

Lamps	2
Watts	5
Lamp Use (hrs)	3
Light/Hour/Lamp	200
Total Lumens	400
Watts/hr	10.00
Price/kWh	**1.74**
Lumens/Watt-hr	40
Price/kLumen	**0.0436**
Lumens/Mo	**36,000**

2. Financial Analysis.

A. Financial Assessment of EDL

Past Performance and Present Financial Position.

1. EDL's current financial situation and status of compliance with financial covenants for FY02-03 had been satisfactory in large part due to the implementation of financial strengthening measures under the Financial Recovery Plan (FRP) and other extra-ordinary events, particularly: (a) the revaluation of fixed assets which raised total equity by K 3.1 trillion, K 127 billion of which was transferred to retained earnings; (b) the application of proceeds from the refinancing of Theun Hinboun amounting to US$33 million for retirement of several outstanding EDL long term debts; (c) reduction in tax payments due to increased depreciation expense arising from the revaluation; (d) monthly tariff increase of 2% effective May 2002 for a period of 36 months up to FY05; and (d) dividends received from THPC of Kip 124 billion in FY02. These favorable results allowed EDL for the first time ever, to comply with financial covenants in FY02-03: Self Financing Ratio (SFR) at 38% and 56%, Debt Service Coverage Ratio (DSCR) at 2.1x and 2.7x and Debt Equity Ratio at 34:66 and 35:65, exceeding the requirement set out of 30%, 1.5x and 60:40, respectively.

2. Prior to the implementation of the package of measures under the FRP in FY01, EDL's financial situation had deteriorated to the point were it became technically bankrupt. This highly precarious position was primarily brought on by the unstable macroeconomic condition and the rapid devaluation of the Kip to the US$, as the country descended into hyperinflation. Despite monthly tariff increases in February 1999, this was insufficient to fully offset the average monthly devaluation of the Kip. The severe impact of the foreign exchange devaluation on EDL's operating performance is evident in the FY98 profit and loss accounts. Although EDL reported a 24% increase in operating profit for the year, this was wiped out by a 178% increase in interest expenses on foreign debts (from K 13.1 billion to K 36.5 billion) and a drastic loss ensuing from its foreign exchange obligations (from a gain of K 2.1 billion in FY97 to a loss of K 13.5 billion in FY98). EDL concluded that year with a net loss of K 6.6 billion, reversing the net profit posted in FY97 of K 2.6 billion. These audited figures could have been far worse had EDL used IAS reporting .

B. FINANCIAL RECOVERY PLAN (FRP)

3. The objective of the FRP is to develop a comprehensive set of actions to restore EDL's financial health over the period FY99-02. Overall, the FRP was successfully completed; but for one element that could not be implemented and another which was only partly completed. The major components of the Plan and its significant milestones were:

- Conversion of Debt to Equity - completed in FY01, with Government's conversion of US$77 million of EDL long term debts to equity;
- Relaxation of on-lending terms of remaining loans - completed in FY01, with the Government and various creditors agreeing to the following: (a) interest reduction to 2% from FY00-04 and to 6% from FY05-07 for IDA, ADB and NDF social loans; (b) interest reduction by 50% of all interest rates of non-social loans; and (c) extension of maturity period of all loans by 5 years.
- Maintain adequate levels of electricity tariffs - effective May 2002, a new tariff structure increasing tariff rates by an average of 2.3% per month over a period of 36 months (up to FY05) was put in place.
- Revaluation of Fixed Assets - completed in November 2002: (a) August 2001, the Government approved the revaluation of fixed assets and established a Revaluation Committee in MOF with the assistance of an independent appraisal firm; (b) April 2002, revaluation of power generation and transmission assets commenced; (c) September 2002, the draft revaluation report was presented and discussed among MOF, MIH, EDL, ADB, IDA and PWC.
- Variable remittances to the Government of THPC dividends - not implemented.
- Review of EDL's Capital Expenditure Program - completed, the Lahmayer-Meritech Report was finalized and submitted to the Government and EDL for comment and review in March 2004.
- Settlement of overdue Government Accounts - partly completed but major steps undertaken in settling overdue arrears and ageing of accounts receivable (para. xx).

C. Key Financial Issues

4. Commercialization of EDL. The commercialization of EDL has been underway since FY87. This gained momentum with EdL's incorporation as a public company in FY97. Its Board of Directors approves annually a corporate plan for the next 3 years, which covers EDL's annual budget, new investment, operations and maintenance plans, and proposed borrowings and tariffs. EDL currently submits all requests for tariff increases to the MIH, but tariff approvals are, in practice obtained from the prime minister. In FY98, a new organizational structure establishing profit and cost responsibility centers was adopted, followed, FY99, by the establishment of a new budgeting and control system designed around the cost/profit centers, and the creation of the Corporate Planning Department, responsible for coordinating budget preparation, consolidation and reporting.

5. While commercialization has been underway, there is still strong interrelationship between the Government and EDL's finances. In particular, there is confusion among government's various roles as: owner of EDL, regulator, onlender of loans to the Government, tax collector and electricity consumer. While considerable progress has been made in straightening out the interrelationships under the FRP, it is important that there be a complete separation of Government and EDL's finances and that the interrelationship between them be made more transparent and predictable. IDA and ADB have played a leading role in achievements to date and will continue to stress financial separation. ADB is currently engaged in a dialogue with the Government on commercialization as part of negotiations for their new loan.

6. Electricity Tariffs. EDL is expected to be commercially operating, autonomous, and self financing. In recognition of its commitments under the Contract Plan, the Government undertook the set of measures to strengthen the financial position and long-term viability of EDL. These measures include among others, the periodic review of the tariff structure to maintain electricity tariffs at levels that will enable EDL to meet its financial and social objectives, keep pace with fluctuations in foreign exchange, maintain a sustainable level of tariffs aligned to actual costs, and comply with loan covenants of major creditors. The periodic setting of tariffs, as embodied in the Power Sector Reform Policy Statement[19], is one of the significant measures recognized by the Government to strengthen the commercial functions of EDL. The policy also acknowledges the social dimension of electricity pricing and adopts specific guidelines and tariff setting principles aimed at full cost recovery over a period of time.

7. A study of EDL tariffs, financed under the SPRE project provided the basis for the current agreement on tariffs: increase (in kip terms) by 2.3 % per month for 36 months (May 2002 to May 2005). However, some reservations were expressed with this study. First, it was considered that EDL's financial requirements were overestimated in that they required rural grid expansion to be financed on a fully commercial basis whereas current trends are for a capital subsidy for such extensions (and even operating cost subsidies for

[19] issued by the Government in March 2001 which sets out the main elements of the power sector policy and establishes priorities and objectives of the GOL for the development of the power sector.

the very poor). Second, EDL's use of dividends from its IPP investments to subsidize domestic tariffs, was criticised. Third, the study suffered from some shortcomings concerning tariff structure and its lack of differentiation among cost categories. Finally, the study lacks guidance with regard to seasonal and time of day pricing, an important aspect as in many cases, EDL imports power from Thailand where premiums for peak load power are becoming substantial. Current export tariffs are also an outstanding issue as these have fallen in recent years as a consequence of surplus generation capacity in Thailand arising from the East Asia financial crisis, and also from the inability of EDL to guarantee firm energy (as defined by EGAT). Re-negotiation of power exchange tariffs with Thailand is due to be carried out shortly and it is necessary to establish the principles that should govern an equitable power exchange agreement.

8. To ensure consistency with Government policy on the power sector, future tariff reviews should therefore take into consideration these issues. The Government and EDL requested that studies relating to domestic tariffs, socio-economic impact of electrification and various tariff levels and power exchange tariffs be carried out as part of the preparation of the proposed Project. With this in mind, a new tariff study, financed through a PHRD grant, is underway to provide guidelines for the forthcoming and future tariff revisions that would take into account: (a) a detailed analysis of the actual cost of electricity supply to different classes of consumers at different points in the system; (b) formulation of an appropriate subsidy policy and of a tariff structure reflecting the cost of supply; (c) new electricity tariff rates and a suitable implementation plan; and (d) identification and differentiation of subsidy flows, i.e. subsidies provided to EDL in various forms and the subsidies passed on to the different classes of consumers. *Agreement would be reached with EDL during negotiations to implement by FY05, the recommendations of the FY04 EDL Tariff Study.*

9. Government's Overdue Receivables. EDL continues to struggle with compliance with existing collection covenant, i.e. that EDL accounts receivable be no more than two months average of its electricity sales. This is the only other pending matter towards full completion of the FRP. EDL's growing accounts receivable, particularly past due arrears of various Government ministries and agencies, had grown from K22 billion in FY01 to K44 billion in FY02. While the Government has had financial difficulties, EDL could not function as a true commercial enterprise under conditions of repeated non-payment without the permission to terminate electricity service.

10. EDL had not met the collection covenant in years, however, it had taken some measures to address this issue: (a) the Government deducted K9 billion from THPC dividend tax representing current unpaid Government arrears for January to April 2003; (b) from the FY02 declared dividends of K33 billion, the Government accepted 50% in cash (K17 billion) in October 2003 and 50% as offset (K16 billion) against overdue receivables for electricity consumption during FY03; (c) the Government approved the offset against taxes and duties for the remaining overdue receivables from government offices for FY03; and (d) for the overdue receivables

11. from government offices amounting to about K44 billion as of end FY02, the Government agreed to settle this through the Government's national budget: K22 billion in FY03/04 and the balance in FY04/05. *The Government and EDL agreed that: (a) all past due Government arrears would be settled to complete project appraisal; and (b) a plan of action would be in place to ensure timely payment of future Government electricity bills.* Power Development Plan and Financing. Financing EDL's system expansion has traditionally been provided by multilateral and bilateral agencies through soft loans and grants. With annual growth rates now coming off a higher base, capital requirements are increasing at a time when the power sector's traditional lenders are re-focusing their programs on other sectors. Non-traditional lenders, China and India are playing an increasing role through provision of export credits (with significant grant element) for projects where goods and construction services are sourced through their respective countries). Lao's earlier successes with export generation projects demonstrates that the international private sector (particularly the Thai private sector) can play a role and the nascent local private sector and domestic banks should not be ruled out as a source of capital for smaller projects.

12. A power sector policy workshop identified power development issues and recommended that the Government: (a) investigate the infrastructure investment finance market (local, regional and international); (b) conduct local and regional power market analysis; (c) examine financing modalities (traditional, BOT, public-private and leveraging of bilateral and multilateral funds through credit enhancement rather than direct lending); (d) develop solicitation strategies for supplier financed public projects and privately developed projects; (e) prepare projects (particularly hydropower projects) for solicitation to improve risk profile. The workshop also provided specific measures for strategies in relation to IPPs. *Agreement would be reached that EDL would prepare and furnish to IDA for its review and comment: (a) its proposed Power Development Plan (PDP); and (b) a report on the progress in the program for the succeeding 5 year*.

13. EDL Non-Operating Income. The Government is the owner of EDL, the nominee shareholder in its IPP investment projects. EDL currently holds for the Government 25% shares of the NT2 project and xx% and xx% in THPC and HHPC, respectively. As such, it is entitled to a share of the total dividends declared proportional to its shareholding. The dividends from these investments, in particular anticipated dividends from NT2 which would begin to flow around about the year 2009, represent significant amounts of EDL's non-operating income and their treatment presents major issues. The Government is concerned that the efficient and effective allocation and treatment of these dividends should be in the context of the overall country revenue management policy and in the narrower context of the corporate finances of EDL. As such, the lenders have taken the position that future NT2 revenues should be segregated from EDL's financial accounts and be made available for the Government's poverty alleviation activities. Consequently, a review of the current and possible future arrangements was undertaken to analyze the revenues retained by EDL and transferred to the Government, the mechanisms that have been set up, and government directives that have been issued to enable the government transfers. The focus of the study was to suggest possible alternatives to treat and account for these future dividends.

14. ADB, IMF and IDA have reviewed the available options and recommended that the Government consider establishing a special vehicle company, an independent entity that would receive and manage NT2 revenues. The company could be maintained as a purely passive investment vehicle, doing nothing more than hold shares for the Government (i.e. an asset management company to invest and raise financing for the power sector). The special company option was deemed to provide the most transparent separation of financial and accounting relationships between EDL and NT2, in the process, avoiding the distortionary effects that may be created on EDL's balance sheet and income statement. It would also give greater flexibility to the Government to achieve its objective of maximizing NT2 benefits for its poverty alleviation goals and meet the criteria set out by the lenders for: (a) a clear separation of NT2 dividends from EDL's accounts; (b) maximize the non-financial advantages to EDL; (c) be simple and easy to implement, i.e. not require special legislation nor an overly artificial structure to be put it place; (d) be relatively inexpensive to maintain; (e) comply with Lao tax and company laws; and (f) maintain EDL's ability to comply with its existing legal covenants with lenders. It was recommended that this option be applied to all other future investments of the Government in the power sector. ADB is also conducting a study for IPP development and institutional restructuring to, among other tasks, identify and structure an appropriate government agency to own and manage the Government's future IPP equity investments, including NTPC, the company that would manage and operate the NT2 project. Further to this, EDL raised concerns regarding the treatment of current dividends in THPC and HHPC. EDL argued that while tariff adjustments assist in maintaining its financial viability and supported its financial recovery, the tariffs will not fully cover the cost of electricity service. Retention of THPC dividends will allow EDL to continue to pursue the Government's electrification program without Government equity injections in the future. In view of the substantial impact of these dividends as a major source of cash revenues and a critical assumption of EDL's future financial viability, *agreement would be reached with the Government, ADB and IDA at negotiations, that the current arrangement for these dividends would not be revisited in the development of options for dividends of NT2 and other future projects.*

D. Financial Prospects of EDL

15. Assumptions. A base case scenario for the projected period, FY04-13, was developed for EDL's financial projections with the following major assumptions: (a) annual average load growth of 12% based on EDL's FY04-13 power development plan; (b) local and foreign inflation at 7% and 2.4%, respectively; (c) an ambitious investment program in the 3 years, 2004-06; and (d) the existing tariff regime to remain in place until FY05 with tariffs to remain at the same level after that period except for inflation adjustments. Other assumption parameters include: (a) accumulated dividends from THPC investments of about US$167.8 during the projected period, to be retained by EDL; (b) no cash nor equity injections from the Government; (c) financing plan for new investments consisting of 80% borrowings and 20% self generation; (d) an investment program in generation (US$xx million), transmission (US$xx million), substation/distribution (US$xx billion), overhaul (US$xx million) and rural electrification

(US$xx million); (e) interest support for existing social and non-social loans under the FRP will cease, as scheduled; and (f) receivables at 2 months of sales.

16. Financial Forecast and Future Covenant Compliance. On the basis of these forecasts, EDL concluded that future performance would be greatly impacted by the level of capital expenditures in generation and transmission in FY04-06. From an initial base of US$29.7 million in FY03, the Government's PDP 2004-13 called for an ambitious capital expenditure program of US$93.5 million, US$153 million, and US$88.1 million, respectively in FY04-06 for generation (US$180 million, largely accounted for by expenditures in Nam Mang 3 and Xeset 2) and transmission (US$63.4 million). *To complete appraisal, the Government and EDL would agree on the critical capital expenditures, particularly for Xeset and related transmission network and propose investment options taking into account optimal allocation of public resources in the long term, the projects that should and could be developed by the private sector, the available financing from external sources, and the direct support that could be provided by the Government in order to achieve the required financial ratios.*

17. EDL's projected financial ratios and covenant compliance for FY03-09 is provided below:

	Required	2003	2004	2005	2006	2007	2008	2009
SFR (%)	>30%	56	31	16	23	29	91	25
Debt Service Coverage Ratio (x)	>1.5x	2.7	2.3	2.1	1.8	1.5	1.5	1.1
Debt Equity Ratio	<60:40	35:65	43:57	53:47	57:43	58:42	57:43	57:43
Domestic Accounts Receivable (months)	<2 months	4.1	1.5	1.6	2	2	2	2

18. Beyond 2006, EDL assumed that with the completion of Nam Mang and Xeset and no other generation projects earmarked until FY11, its cash position would be at more manageable levels. However, with the heavy debt drawdowns for these projects and the commencement of normal debt servicing (with no FRP interest rate support), the DSCR would begin to show strain and non-compliance from FY09-12. A sensitivity analysis to test for financial covenant compliance should (a) the capital investment for Xeset be spread out to more reasonable levels; and (b) the current tariff regime (which runs until May 2005) be extended up to the end of FY06, was prepared and concluded that either scenarios would result in only slight improvements in the SFR in FY05. Clearly, these investments represent a heavy drain on EDL's cash generating abilities and would need to be addressed in the context of the energy sector's power development strategy. At negotiations, *agreement would be reached that the Government would take all necessary measures including but not limited to raising electricity tariffs, to ensure that EDL meet the financial covenants as follows: (a) maintain a self-financing ratio of no less than 30% of three-year average planned capital expenditures; (b) maintain net revenues of no less than 1.5 times annual projected debt service payments; (c) maintain the ratio of its long-term debt to no more than 1.5 times its equity; and (d) reduce its domestic accounts receivable to no more than 2 months average electricity sales.*

Annex 10: Safeguard Policy Issues

LAO PDR: Second Southern Provinces Rural Electrification Project

Resettlement Policy Framework

Project Description

The proposed on-grid component for SPRE II Project will provide access to electricity to more than 46,000 households in some 600 villages in 7 southern provinces. Based on consultation in the project areas, the scope of the grid connection component has been identified, which include construction of 1.6 million meters of 22 kV and 12.7 kV lines, and 1.2 million meters of 0.4 kV spur lines, and installation of 711 transformers. The total cost of the component will amount to $24 million with IDA financing $16 million.

The component will be directly linked to a number 115kV transmission lines to be constructed during project implementation. Three such 115kV transmission lines have been identified and prepared, which include Thakhek-Xepon Line (165 km), Pakse-Khonphapheng (164 km), and BanNa- Attapeu (123 km). Even though they are financed by the World IDA, since they are directly related with SPRE II grid component, EDL agrees to apply the same resettlement policy framework to these transmission projects, and separate RAPs have been prepared for these projects.

For off-grid component, it will provide access to electricity to about 10,000 households from 832 villages in 17 provinces in Lao PDR through off-grid technologies, using delivery models similar to the existing SPRE project which included SHS, VH and GS.

Potential Land Acquisition and Resettlement Impact

For 115kV transmission projects, certain amount of land acquisition and resettlement might be required. Based on experience in SPRE 1, and design requirements, each 115kV substation will require about 1 ha of land area, and each tower will require about 36 square meters. In addition, to ensure safe operation, all structures and trees underneath the transmission line will be removed within 25m right-of-way. During construction, certain amount of land areas will also be required temporarily for building access road, setting up towers, and storing construction materials.

For MV and LV lines, according to technical standards and construction practices, very limited amount of land acquisition might be required. They include land acquisition for the construction of poles (about 0.14 square meters per pole) and clearance of 4-8 meters right-of-way under the transmission lines. In addition, during construction, limited amount of temporary land occupation might be needed for erecting poles, storing materials, and constructing access roads.

Since transmission line often runs through countryside, and efforts will be made during design stage to avoid built-up areas, the number of families that need to be relocated and buildings to be removed will be relatively small. The amount of land areas required for

towers or poles will be very small. Most of farmland under the transmission line will be allowed to continue farming except for damages of some current crops during the construction. Various trees within the right of way will be removed. Following the compensation policies, all affected people will be provided with compensation at replacement values and rehabilitation measures if it is necessary, and the potential impact on their income and livelihood will be very limited.

For off-grid component, no land acquisition, tree clearance, or resettlement is required during installation of solar home system and gen-set schemes. For VH scheme, while most of them do not involve any land acquisition, some schemes might need small amount of land areas for building head-race channels (200m x 1m). The off-grid planning guidelines and technical standards ensure that the channel routing does not cause removing any productive trees or structures used by farmers for dwelling or working. They also ensure that all transmission lines do not interfere with existing building structures and trees.

Legal Framework for Land Acquisition and Resettlement

Even though there are no specific laws in Lao PDR concerning the details of resettlement and compensation, the current Electricity Law, Land Law, and Forestry Law have general provisions which require compensations to be paid for the land and building owners in case their trees, crops or buildings are damaged by the public projects. Based on these provisions, Ministry of Industry and Handcraft (MIH) issued Environmental Management Standard, providing details guidance on how to prepare power sector projects. In addition, a draft National Policy on Resettlement and Compensation, prepared by STEA with ADB support, is being approved by Lao PDR government, which is in general agreement with the World IDA resettlement policy.

Compensation Standards

Based on the laws, compensation principles, and SPRE experience, a set of compensation standards and valuation methods have been developed for the proposed SPRE II Project.

For permanent land acquisition, the basic compensation for productive farmland will be 10 times of annual output value. The detailed formula for unit compensation will be: *yields of the farmland (ton/ha/year) x market price of grain x (number of multiples).* For acquired scrub land and garden land, the compensation rate will be set at one third of the compensation rate for farmland. Based on SPRE 1 experience, such compensation was well received among affected people. With limited land loss and adequate compensation, no significant negative impacts are expected.

For temporary land occupation, compensation of lost crops and land reclamation will be paid by the project owner. The compensation will be based on average output value of lost crops and cost of restoring them into original conditions. Efforts will be made by the project owner to minimize the impacts of temporary land occupation by timing the construction after planting season.

For affected houses, compensation at replacement value will be paid to affected persons, which will include (1) cash for lost structures; (2) housing plot to build the replacement structure; and (3) allowance for moving and transfer. For transmission line project, since affected houses are only required to move short distance from the right of way, based on SPRE 1 experience, most traditional wood structure were simply moved by the villagers to nearby locations. In this case, the project owner will pay all related cost for such moving event after consultation with affected people and villages. The agreed total compensation will include new site preparation, payment for moving ceremony, and cost of additional materials for minor repairs. The project owner will ensure that all moved houses will have the same or better conditions after the move.

For the loss of various trees, the general compensation principle is to provide replacement value to the affected people. After consultation with provincial government and affected villages, the basic formula for estimating such compensation is developed. For industry trees: unit compensation = (cost of land cleaning + cost of seedling) + (cost of taking care x year of taking care). For fruit tree, the unit compensation = (cost of land clearing + cost of seedling) + (cost of taking care x year of taking care) + (cost of income x year of income). In order to ensure that the compensation rates for economic trees are adequate, each province will develop a detail list of compensation rates for various trees, based on agreed formula, current yield, and market prices, which will be consulted with local governments and affected people prior to project implementation.

Criteria and Eligibility for Compensation

The compensation and rehabilitation will be provided for all displaced persons if their land area or income source will be removed; their houses demolished and their other properties (crops, trees, and other facilities) removed or damaged due to land acquisition or construction of the project. All displaced persons, regardless of their legal status, will be provided compensation and rehabilitation based on the policies adopted for the project. Lack of legal paper of their customary rights of occupancy certificates shall not be an obstacle for obtaining compensation for them.

Institutional Arrangement

The project management offices from MIH and EDL will be jointly responsible for planning and implementation of the SPRE II Project. In terms of resettlement planning and implementation, for grid extension component, three levels of institutions will be involved. The first level is EdL headquarter office, which will be responsible for overall resettlement planning and implementation. The second level is EdL BOs in 7 provinces, which will be responsible for implementing actual grid extension activities and coordinating with local authorities. The third level of organization is the Resettlement Coordination Committees of 7 provinces with members from relevant provincial departments and districts. These three levels of organizations will form the institutional network to ensure smooth resettlement implementation in according to the resettlement policy framework.

Similar arrangement is also made for off-grid component. The first level is Off-grid Project Support Office (OPS) from MIH, which will be responsible for overall planning and implementation. The second level is individual ESCO, which will be responsible to actual implementation of individual cluster and village schemes. The third level will be Provincial Department of Industry and Handicraft (PDIH) and local district and villages, which will be responsible to assist the implementation of resettlement activities following the resettlement policy framework for the project.

Reporting and Approval

For most those subprojects with only minor impacts, only impact and compensation data sheet needs to be prepared, which are not required to submit to the WB for review. Instead, they will be reviewed and approved by both EdL and OPS to ensure that resettlement policy framework is followed. For the subprojects with serious resettlement impacts, EDL and OPS will prepare full RAPs and submit to WB for review prior to implementation.

Resettlement Cost Estimate

The cost of potential land acquisition and resettlement will be included in the total project cost for SPRE II Project. Both EdL and OPS will sure sufficient funding available to cover all resettlement related cost for grid and off-grid subprojects. For each subproject, the total resettlement budget submitted by EdL Branch and ESCO/PDIH will be reviewed and approved by EdL and OPS. After receiving the approval, EDL branch and ESCO will make funds available for implementation.

Consultations, participation, and disclosure in resettlement planning and implementation

In preparing each subproject, extensive consultation will be carried out in project areas by project implementation agencies and local government officials on potential resettlement impacts, compensation policies, and rehabilitation measures as well as grievance procedures. The affected people are invited to voice their opinion on the project and compensation policies. After consultation in each village a minutes of meeting with villages will be prepared by project implementation agencies to record all discussion and agreements made with villages.

After finalization of the RAP or datasheet with detailed compensation standards and rehabilitation measures, they will be disclosed to the affected villages and individuals. The public disclosure of RAP could be carried out by holding public meeting, putting up notice in the affected villages, or distributing resettlement information booklet to the affected people. The Resettlement Policy Framework will be translated in local languages and disclosed in both EDL BOs and ESCO/PDIH offices once it is approved by EDL, MIH and World IDA.

Grievance Redress Mechanism

In order to address complaints and disputes effectively and timely, a grievance redress mechanism will be set up, which will be disclosed to DPs before the resettlement implementation. If a person is not satisfied with his compensation, he could voice his complaint to the affected village or district resettlement committee. The village or district resettlement committee will give him an answer within two weeks. If he is not satisfied with the solution, he could appeal directly to EDL BO or ESCO/PDIH, who will give him a reply within two weeks. If he still does not agree with the decision, he could appeal to EDL or OPS, which will make a final decision within two weeks. If he still does not agree with the decision, he could go the court as a last option.

Resettlement Monitoring and Evaluation

Following the requirements of the World IDA, during the project implementation, both internal and external resettlement monitoring and evaluation exercises will be carried out in order to monitor resettlement implementation and ensure all affected people are compensated adequately and their income and livelihood are restored after resettlement and rehabilitation. The internal resettlement monitoring will be carried out by EDL and OPS, and staff from branch EDLs and ESCO. The main purpose is to have an overview of the resettlement progress for both components. Every quarter, branch EDL and ESCO will report resettlement implementation for each subproject to EDL and OPS to be compiled into resettlement progress reports for the two components. They will be submitted to the World IDA as part of quarterly report for the SPRE II Project.

For those subprojects with serious impact (more than 200 DPs), an external resettlement monitoring and evaluation agency will be selected to carry out external resettlement monitoring and evaluation. The main objective is by independently monitoring resettlement implementation to see whether the objective of resettlement is achieved, and to provide basic assessment on resettlement implementation and restoration of livelihood for the affected people.

Ethnic People Development Plan

For SPRE II Project, among total benefited villages and populations by grid and off-grid components, significant portion of them are ethnic villages and populations. For grid extension component, according to the survey by EDL, among total project villages, 37 percent of them will have more 50 percent of population as ethnic population, and about 31 percent of total project population being ethnic population. For off-grid component, since most project villages will be located in remote areas in 17 provinces, about 68 percent of project villages are ethnic minority villages. Following the World IDA policy requirements, an Ethnic People's Development Plan (EPDP) has been prepared for both components, under which, a consultative process will be set up and a range of measures will be adopted during the project implementation in order to ensure that affected ethnic populations will derive benefits under the project and adverse impacts are avoided or mitigated.

The Project by providing electricity connection through grid and off-grid components is anticipated to have positive impacts on ethnic groups living in the project villages, which include improving irrigation conditions, creating new income opportunities in handcraft, providing cheap lighting option, and reducing burdens for women and children in fetching water and rice de-husking.

The EPDP introduces the basic legal, cultural and socio-economic conditions for ethnic groups in Lao PDR, particularly pertaining to land tenure and natural resource use. In addition, specific consultation procedures and institutional arrangements are proposed to address the particular needs and circumstances of ethnic groups during project implementation. It aims to ensure that development progress fosters full respect for their dignity, human rights and cultural uniqueness.

The basic strategy for addressing the issues will be based on the informed participation of the ethnic groups themselves, which include identifying local preferences through direct consultation and incorporation of ethnic groups' knowledge into project planning and implementation process.

Environmental Safeguard

To be inputted by **BB.**

Annex 11: Project Preparation and Supervision

LAO PDR: Second Southern Provinces Rural Electrification Project

1. A timeline showing the dates (mm/yy) of:
   - PCN review 06/09/2003
   - Initial PID to PIC 08/24/2003
   - Initial ISDS to PIC 08/31/2003
   - Appraisal 07/05/2004
   - Negotiations 07/19/2004
   - Board/RVP approval 10/19/2004
   - Planned date of effectiveness (consistent with Cover Sheet)
   - Planned date of mid-term review (if applicable)
   - Planned closing date (consistent with Cover Sheet)

2. The World Bank was primarily responsible for the preparation of this project. A PDF B Grant from the GEF in the amount of $330,000 (GEF -PPG TF 053573) was approved by the GEF on March 30 2004; the purpose of the Grant is to assist the recipient in the preparation of the Renewable Off-Grid Electrification and Urban Energy Efficiency/DSM Project, and covers the following activities:

- Supporting preparation activities for the transition of the existing Off-Grid Promotion and Support Office (OPS) to the SPRE II GEF Project;

- Preparing the Rural Electrification Framework, including the development of a draft Rural Electrification Fund Decree, draft regulations, stakeholders consultations, and alternative models for organizing the operations of the Rural Electrification Fund.

- Designing electrification strategy and integration studies at the sub-provincial and district levels to support the development of a Rural Electrification Master Plan.

- Carrying out a study on the implications for sustainable financing strategy of the off-grid electrification, especially using alternative financing models such as household repayment schemes and village revolving funds.

- Carrying out a study on selected data related to DSM and energy efficiency, including considerations as to organizational placement of a DSM cell and estimating the size of the market for economical DSM.

- Carrying out a study on tariff levels and requirements for subsidy mechanisms for off-grid electrification and defining alternative delivery models and systems for the off-grid program in Phase 1 of SPRE II.

- Defining the capacity building needs and appropriate organizational design for the EdL and the Ministry of Industry and Handicrafts to fully absorb and apply the outputs of the key preparation studies described above.

- Designing a monitoring and evaluation plan on the Project objectives.

The Ministry of Industry and Handicrafts will implement as well as serve as the national executing agency for the PDF preparation activity. It shall ensure the delivery of the project outputs and the judicious use of the project resources. It shall also closely monitor the satisfactory performance of the various contractors for the project. The IDA will disburse directly in lieu of setting up a special account, which are prohibited at present for Lao PDR.

The PDF B activity is targeted to start in June 2004 and be complete by December 2004.

The total estimated budget for this PDF B proposal is $330,000, which is the requested amount of funding from the GEF. The breakdown of the budget is shown below.

Activities	***Cost of Services***	***Cost of Goods***	***Total Cost***
Prepare Physical Components – Off-Grid	$50,000		50,000
Prepare Rural Electrification Framework	70,000		70,000
Rural Electrification Master Plan	30,000	10,000	40,000
Sector Financing Strategy	50,000		50,000
DSM and Energy Efficiency	20,000	10,000	30,000
EdL Tariff Structure and Process	20,000		20,000
EdL and MIH Capacity Building	50,000		50,000
Monitoring and Evaluation	20,000		20,000
Total	***310,000***	***20,000***	***330,000***

Supplemental preparation funds were mobilized from the ASTAE trust fund totaling $150,000. These funds were used primarily to support two critical areas – DSM preparation and renewable resource assessment – that were insufficiently funded under the PDF B procurement plan. The table below summarizes the contribution of the requested PDF-B budget to the total project preparation activity for SPRE II. The PDF B grant amount requested is less than 20% of the total grant- and co-financed preparation budget.

Total SPRE II Project Preparation Budget

Activities	**Total**	**PHRD**	**ASTAE**	**EdL/MIH**	**GEF**
Prepare Physical Components – Grid-Connected and Off-Grid	110,000			50,000	50,000
Prepare Rural Electrification Framework	430,300	320,300		50,000	70,000
Rural Electrification Master Plan	277,100	217,100	75,000		40,000
Sector Financing Strategy	214,350	194,350			50,000

DSM and Energy Efficiency	100,000		75,000		30,000
EdL Tariff Structure and Process					$20,000
EdL and MIH Capacity Building					$50,000
Monitoring and Evaluation					$20,000

3. A list of IDA staff and consultant who worked on the project with their titles and units
IDA staff of various expertise and consultants worked on the preparation of the project include:

i. Barry Trembath, Task Team Leader, Lead Power engineer;
ii. Jie Tang, Co-Task Team Leader, Energy Specialist;
iii. Yuling Zhou, Senior Operation Officer, procurement accredit specialist;
iv. Chrisantha Ratnayake, Senior Distribution Engineer;
v. Rebecca C. Sekse, Financial Specialist;
vi. Kannathee Danaisawat, Financial Management Specialist;
vii. Esperanza Miranda, Operation Officer
viii. Teresita G. Velilla, Program Assistant
ix. Perry Lee Radford, Program Assistant
x. Lawyer

and

1) Morten Larsen, consultant, renewable energy specialist;
2) Somphone Simmalavong, consultant, procurement;
3) Grayson Heffner, consultant, renewable energy specialist;
4) Youxuan Zhu, consultant, social specialist;
5) Bernard Baratz, consultant, environment specialist;
6) Voravate Tuntivate, consultant, consultant, economist (social and statistics);
7) Shaheena Khan, consultant (rural energy);
8) William Derbyshire, consultant, economist;
9) Douglas Frenc Barnes, Consultant

4. A table summarizing the IDA funds expended to date on project preparation and the estimated costs of approval and supervision costs.

	Planned	Acutal
PCN review		
Initial PID to PIC		
Initial ISDS to PIC		
Appraisal		
Negotiations		
Board/RVP approval		
Planned date of effectiveness		
Planned date of mid-term review		
Planned closing date		

Key institutions responsible for preparation of the project:

IDA staff and consultants who worked on the project included:

Name	Title	Unit

IDA funds expended to date on project preparation:

1. IDA resources:
2. Trust funds:
3. Total:

Estimated Approval and Supervision costs:

1. Remaining costs to approval:
2. Estimated annual supervision cost:

Annex 12: Documents in the Project File

LAO PDR: Second Southern Provinces Rural Electrification Project

By Team

Annex 13: Statement of Loans and Credits

LAO PDR: Second Southern Provinces Rural Electrification Project

			Original Amount in US$ Millions						Difference between expected and actual disbursements	
Project ID	FY	Purpose	IBRD	IDA	SF	GEF	Cancel.	Undisb.	Orig.	Frm. Rev'd
P075006	2003	LA - Second Land Titling Project	0.00	14.82	0.00	0.00	0.00	15.87	2.51	0.00
P064886	2003	LA-SUSTAINABLE FORESTRY FOR RURAL DEV.	0.00	9.90	0.00	0.00	0.00	10.23	0.00	0.00
P077620	2002	LA-Fin. Management Capacity Building Cr.	0.00	8.50	0.00	0.00	0.00	9.22	0.34	0.00
P077326	2002	LA-Poverty Reduction Fund Project	0.00	19.34	0.00	0.00	0.00	20.81	0.74	0.00
P068069	2002	LA-Fin Mngt Adj Cr (FMAC)	0.00	17.00	0.00	0.00	0.00	11.74	14.41	10.00
P065973	2001	LA-Agricultural Development Project	0.00	16.69	0.00	0.00	0.00	17.91	-1.64	0.00
P064821	2001	LA-Road Maintenance	0.00	25.00	0.00	0.00	0.00	7.53	-1.31	0.00
P042237	1999	LA-Provin. Infrast.	0.00	27.80	0.00	0.00	0.00	10.59	5.33	0.00
P044973	1998	LA-SOUTHERN PROVINCE RE	0.00	34.70	0.00	0.70	0.00	3.91	1.91	0.00
P004208	1996	LA-LAND TITLING	0.00	20.73	0.00	0.00	0.00	7.63	8.76	6.03
P004200	1995	LA-HEALTH SYSTEM REFORM & M	0.00	19.20	0.00	0.00	0.00	3.91	5.17	5.20
		Total:	0.00	213.68	0.00	0.70	0.00	119.35	36.22	21.23

LAO PEOPLE'S DEMOCRATIC REPUBLIC
STATEMENT OF IFC's
Held and Disbursed Portfolio
In Millions of US Dollars

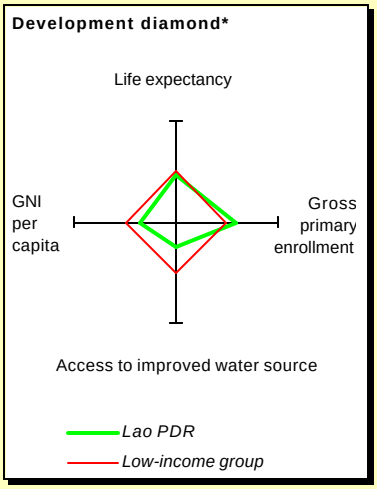
		Committed				**Disbursed**			
		IFC				**IFC**			
FY Approval	Company	Loan	Equity	Quasi	Partic.	Loan	Equity	Quasi	Partic.
1998	SEF BAFCO	0.77	0.00	0.00	0.00	0.77	0.00	0.00	0.00
1998	SEF Endeavor	0.15	0.00	0.00	0.00	0.15	0.00	0.00	0.00
1998/00	SEF Settha	0.18	0.00	0.00	0.00	0.18	0.00	0.00	0.00
2001	SEF Villa Santi	1.15	0.00	0.00	0.00	1.15	0.00	0.00	0.00
	Total portfilio:	2.25	0.00	0.00	0.00	2.25	0.00	0.00	0.00

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

Annex 14: Country at a Glance

LAO PDR: Second Southern Provinces Rural Electrification Project

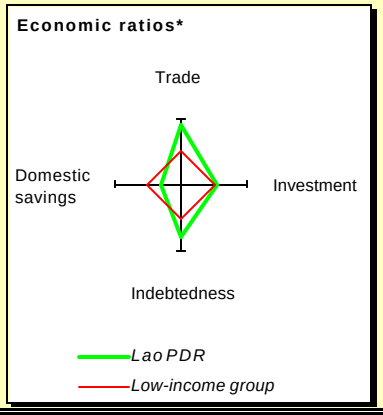
POVERTY and SOCIAL	Lao PDR	East Asia & Pacific	Low-income
2002			
Population, mid-year *(millions)*	5.5	1,838	2,495
GNI per capita *(Atlas method, US$)*	310	950	430
GNI *(Atlas method, US$ billions)*	1.7	1,740	1,072
Average annual growth, 1996-02			
Population *(%)*	2.4	1.0	1.9
Labor force *(%)*	2.2	1.2	2.3
Most recent estimate (latest year available, 1996-02)			
Poverty *(% of population below national poverty line)*	39	..	..
Urban population *(% of total population)*	20	38	30
Life expectancy at birth *(years)*	55	69	59
Infant mortality *(per 1,000 live births)*	88	33	81
Child malnutrition *(% of children under 5)*	40	15	..
Access to an improved water source *(% of population)*	37	76	76
Illiteracy *(% of population age 15+)*	34	13	37
Gross primary enrollment *(% of school-age population)*	113	106	95
Male	121	105	103
Female	104	106	87



KEY ECONOMIC RATIOS and LONG-TERM TRENDS

	1982	1992	2001	2002
GDP *(US$ billions)*	..	1.1	1.7	1.7
Gross domestic investment/GDP	..	..	22.1	..
Exports of goods and services/GDP	..	17.0	..	..
Gross domestic savings/GDP	..	..	..	..
Gross national savings/GDP	..	..	..	..
Current account balance/GDP	..	-4.3	-4.7	..
Interest payments/GDP	..	0.3	0.6	0.6
Total debt/GDP	..	170.0	142.6	158.6
Total debt service/exports	..	4.9	7.9	..
Present value of debt/GDP	..	..	74.0	..
Present value of debt/exports	..	..	235.5	..

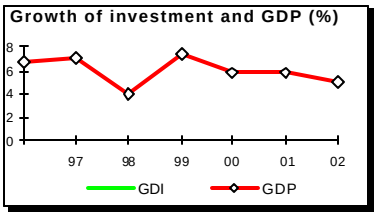
	1982-92	1992-02	2001	2002	2002-06
(average annual growth)					
GDP	4.5	6.3	5.7	5.0	..
GDP per capita	1.8	3.8	3.3	2.6	..



STRUCTURE of the ECONOMY

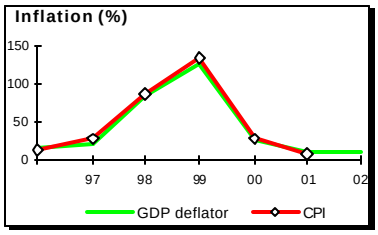
	1982	1992	2001	2002
(% of GDP)				
Agriculture	..	61.8	50.9	..
Industry	..	17.8	23.4	..
Manufacturing	..	13.4	17.7	..
Services	..	20.4	25.7	..
Private consumption	..	..	..	..
General government consumption	..	9.5	..	..
Imports of goods and services	..	27.1	..	..

	1982-92	1992-02	2001	2002
(average annual growth)				
Agriculture	3.6	5.1	3.8	..
Industry	9.3	10.6	9.7	..
Manufacturing	12.4	12.3	..	..
Services	3.7	7.0	5.7	..
Private consumption	..	..	..	..
General government consumption	..	..	..	..
Gross domestic investment	..	..	..	..
Imports of goods and services	..	..	..	..



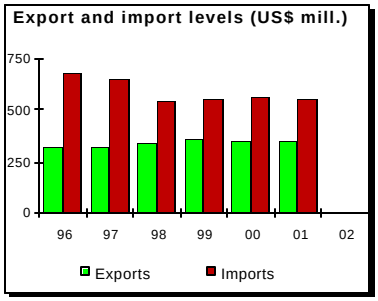
PRICES and GOVERNMENT FINANCE

	1982	1992	2001	2002
Domestic prices				
(% change)				
Consumer prices	..	..	8.0	..
Implicit GDP deflator	..	4.7	9.9	9.2
Government finance				
(% of GDP, includes current grants)				
Current revenue	..	..	18.3	..
Current budget balance	..	..	8.8	..
Overall surplus/deficit	..	..	-5.0	..



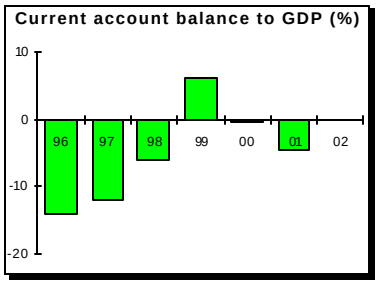
TRADE

	1982	1992	2001	2002
(US$ millions)				
Total exports (fob)	..	133	350	..
Wood products	..	43	..	..
Agriculture	..	7	..	..
Manufactures	..	57	..	..
Total imports (cif)	..	265	558	..
Food	..	..	..	..
Fuel and energy	..	18	..	..
Capital goods	..	61	..	..
Export price index *(1995=100)*	..	..	..	..
Import price index *(1995=100)*	..	..	..	..
Terms of trade *(1995=100)*	..	..	..	..



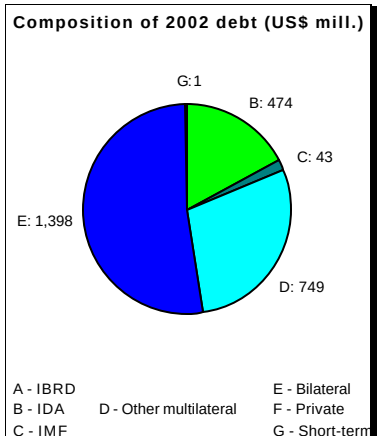
BALANCE of PAYMENTS

	1982	1992	2001	2002
(US$ millions)				
Exports of goods and services	..	193	536	..
Imports of goods and services	..	304	598	..
Resource balance	..	-111	-62	..
Net income	..	-1	-68	..
Net current transfers	..	30	..	..
Current account balance	..	-48	-82	..
Financing items (net)	..	53	80	..
Changes in net reserves	4	-5	2	..
Memo:				
Reserves including gold *(US$ millions)*	..	..	..	..
Conversion rate *(DEC, local/US$)*	35.0	716.0	8,954.6	10,700.0



EXTERNAL DEBT and RESOURCE FLOWS

	1982	1992	2001	2002
(US$ millions)				
Total debt outstanding and disbursed	429	1,917	2,495	2,665
IBRD	0	0	0	0
IDA	14	180	415	474
Total debt service	5	10	44	45
IBRD	0	0	0	0
IDA	0	2	7	9
Composition of net resource flows				
Official grants	19	59	90	..
Official creditors	54	49	77	60
Private creditors	0	0	0	0
Foreign direct investment	0	8	24	..
Portfolio equity	0	0	0	..
World Bank program				
Commitments	15	36	42	45
Disbursements	3	38	31	33
Principal repayments	0	1	4	6



Annex 15: Incremental Cost Analysis

LAO PDR: Second Southern Provinces Rural Electrification Project

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.[20]

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.

[20] 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.

- Other planned rural electrification activities, reflective of the particular rural conditions in Laos, including installation of isolated/mini distribution grid systems 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.[21]

- 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[22]; (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

[21] 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.

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

(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 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.[23] 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 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[24]	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:

[23] 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

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

- 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.

  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			
					No. of hh with techno.			
	Provinces	No. villages	No.hh	No. of ESCO	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

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

At present there are 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. These cross-border high-voltage transmission and medium-voltage distribution linkages result in a high degree of electrical interconnection, 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.[25]

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

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 3 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 3: 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
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. 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 bad 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. [26] 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 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.[27]

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[28], 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.[29]

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[26] 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.

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

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

[29] 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

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 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.[30]

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.

Rural Electrification (RE) Master Plan and Data Base (GEF US$ 0.5 million, ASTAE $75,000, ESMAP US$ 0.2 million, PHRD US $ 0.1 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. ESMAP funding will also be requested for some aspects of grid extension planning. 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

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

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, ESMAP $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[31]; (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 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. ESMAP 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

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

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

Table 5: 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).[32] 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 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

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

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 the electric light in the evenings to increase their production of woven scarves and skirts. On visiting the houses, it was found that the looms had been moved into the main rooms of each house, and one of the solar lamps placed near the work. The women and teenagers doing this work were clearly proud that they could contribute to family incomes by approximately 5$ per month from evening work net of costs, and were very 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.

It was found that villagers in Pakoup were routinely using their solar systems to charge portable 6V batteries commonly used by Lao villagers to power torches (flashlights). These lights are used to hunt fish and frogs during the night, both as an important protein source 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 the case of Tapen, where 58 houses are supplied by a 2.5 kW VH system, families are using electric light to work in the evenings to make baskets, adding about $20 extra income after costs per month. The Tapen villagers sell miniaturized baskets to tourists passing nearby. The tourists also consume cooled drinks. An ice maker was constructed by a local engineer and driven from the turbine by belt during daytime hours, producing enough ice to satisfy both the tourist demand and the demand from 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.[33]

- 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.[34] 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. Drawing on this comparison of the Baseline vs. GEF Alternative we 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. A 25% reduction in the maximum potential program-wide carbon benefits of 16,200 te CO_2 would take 4,050 te CO_2 off the table in the Baseline case that is recovered in the GEF Alternative.

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

[33] 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.

[34] 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.

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[35], 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.[36]

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.[37] 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.

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 6 below. The incremental costs and benefits are detailed in Table 7.

Table 6: Global Benefits of GEF Support to SPRE II

Component	Basis	Baseline	GEF Alternative	Carbon Benefits due to GEF Support

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

[36] 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.

[37] 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.

Off-grid Implementation (10,000 HHs)	Average per-HH lighting fuel use: 5 liters diesel per month = 13.5 kg CO_2[38] = 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	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

[38] 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 7: 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 16: World Bank Team Response To STAP Reviewer Comments
LAO PDR: Second Southern Provinces Rural Electrification Project

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.

Response by Task Team 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.