



Technical Assistance Report

Project Number: 42320
Project Preparatory Technical Assistance (PPTA)
January 2009

Lao People's Democratic Republic: Preparing the Small and Mini Hydroelectric Development Project

(Financed by the Government of Finland)

CURRENCY EQUIVALENTS

(as of 30 October 2008)

Currency Unit	–	kip (KN)
KN1.00	=	\$0.00116
\$1.00	=	KN8,600

ABBREVIATIONS

ADB	–	Asian Development Bank
CDM	–	Clean Development Mechanism
CO ₂	–	Carbon dioxide
EdL	–	Electricité du Laos
GMS	–	Greater Mekong Subregion
Inh.	–	Inhabitants
MEM	–	Ministry of Energy and Mines
PDD	–	Project design document
PRC	–	People's Republic of China
TA	–	technical assistance
WREA	–	Water Resources and Environment Administration

WEIGHTS AND MEASURES

kWh	–	kilowatt hour
GWh	-	gigawatt hours = 1 thousand kWh
TWh	–	terawatt hours = 1 million kWh
kW	-	kilowatt = 1 thousand watt
MW	-	megawatt = 1 thousand kW
km ²	-	square kilometers
t CO ₂	-	tons of CO ₂

TECHNICAL ASSISTANCE CLASSIFICATION

Targeting Classification	–	General intervention
Sector	–	Energy
Subsector	–	Hydropower generation, mini hydroelectric
Themes	–	Sustainable economic growth, environmental sustainability
Subtheme	–	Cleaner production and eco-efficiency

NOTE

The fiscal year (FY) of the Government ends on 30 September. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY2008 ends on 30 September 2008. The fiscal year of the EdL ends on 31 December.

Vice-President	C. L. Greenwood, Jr., Operations 2
Director General	A. Thapan, South East Asia Regional Department
Director	A. Jude, Director, Southeast Asia Infrastructure Division (SEID)
Team leader	E. Baardsen, Senior Infrastructure Specialist, SEID
Team member	S. Ekelund, Senior Portfolio Management Specialist, Lao Resident Mission

I. INTRODUCTION

1. During the 2008 Country Program Confirmation Mission of the Asian Development Bank (ADB), the Government of the Lao People's Democratic Republic (Lao PDR) requested technical assistance (TA) for preparing the Small to Mini Hydroelectric Development Project.¹ The ADB Fact-Finding Mission visited Lao PDR from 4 to 12 September 2008 and reached an understanding with the Ministry of Energy and Mines (MEM) on the purpose, scope, implementation arrangements, cost estimates, financing arrangements, and terms of reference for consultants. The TA design and monitoring framework is in Appendix 1.

II. ISSUES

2. Lao PDR is among the poorest countries in Asia with a per capita income of \$810 in FY2007. With domestic sales of 1.30 terawatt-hours (TWh) in 2007, the per capita consumption of electricity was about 223 kWh/year. The country has abundant natural resources, including hydropower. Large hydropower development projects are being implemented to export electricity that will allow Lao PDR to earn much-needed foreign exchange. To date, about 672 MW of hydropower exist for export and domestic consumption,² and 2,100 MW are under construction mainly for export. Electricité du Laos (EdL) has developed a 115 kV transmission backbone system linking three hydropower plants in central Laos totaling 255 MW with population centers in northern and central Laos. In 2006, the length of this backbone was 1,498 km. The system is now being extended to include also central and southern Laos. ADB has long supported the expansion of this transmission system, currently through the ongoing Loan 2005-LAO: Northern Area Rural Power Distribution Project, and is preparing a follow-up project for 2009 approval (GMS Northern Power Transmission Project). These transmission lines link the main population centers, and provide power to communities within a certain distance to either side of the line.³ Expansion to more remote areas is slow due to high cost in difficult terrain and availability of funds within EdL.

3. Only 56% of the country's households were electrified in 2006,⁴ and only 38% are connected to the main grid operated by EdL. About 99 villages that were not connected to the EdL grid were connected to small and mini hydropower plants with an installed capacity totaling about 7.6 MW. In 2006, there were still 5,289 villages (about 50% of the national total) with more than 2.6 million people without access to electricity. Assuming the provincial average household consumption in 2006, the demand in those villages not yet electrified would correspond to about 375 GWh (equivalent to an installation of about 110 MW). These villages are generally in remote mountainous locations with difficult access, and provision of electricity from local renewable energy sources (especially hydropower and solar) may be the only viable option. Laos is well endowed with streams and the country's topography is conducive to hydropower development.

4. Lack of a reliable, affordable and safe access to electricity affect poor rural communities by among others: (i) causing social and economic poverty, including lack of education opportunities and worsening health standards; (ii) degrading water supplies and causing flash floods and erosion as forests are degraded when villagers use firewood for their energy needs;

¹ The TA first appeared in *ADB Business Opportunities* on 24 September 2008

² In addition there are about 42 diesel-fuelled generating power plants with a total installed capacity exceeding 9 MW, and 237 villages with solar photovoltaic power systems with installed capacity of 296 kW.

³ With about 6.5 million inhabitants and an area of about 236,000 km², the average population density is about 25 inhabitants/km². Mountainous provinces have low population densities with as low as 9.8 inh/km² in Phongsaly.

⁴ The electrification of households varies from 96% in Vientiane Capital to 9% in Phongsaly Province. Eight of 140 districts in Laos remain completely unelectrified in Phongsaly, Bokeo, Bolikhamxay and Attapeu.

and (iii) maintaining a stagnant rural economy since value-added industry cannot be supported. Access to energy is a prerequisite for sustainable development and for fighting poverty. Providing affordable and sustainable renewable energy in rural areas would: (i) allow for income generating productive activities in farms by freeing time otherwise spent for fuel and water gathering, and food grinding; (ii) improve education by allowing more time for studying, powering information and communication technologies, including distance learning; (iii) improve health by reducing indoor pollution and by improving refrigeration and powering of modern health equipment; and (iv) reduce CO₂ emission caused by use of fossil fuel for power generation, deforestation, land degradation and pollution. Appendix 2 shows the Initial Poverty and Social Analysis.

5. Ownership of private or communal pico hydropower-generating sets reflects the importance of electricity in village life. In a 2006 census, provincial authorities reported existence of pico hydropower plants in their province, indicating on average about 22% of villages had installed such devices. Easily available pico-hydro generating sets for about \$50-\$100 each provide poor quality electric power, and are generally dangerous to operate. There is therefore a need to continue developing environmentally friendly, affordable, safe and sustainable generating facilities to provide electricity to those in remote areas without electric power and relying on fire wood for their energy needs; or are provided with electricity generated by local diesel generators⁵ and use kerosene for lighting; or are supplied with electricity imported from neighboring countries⁶ produced using fossil fuels.⁷ EdL and private developers have identified about 95-100 small and mini⁸ environmentally benign hydropower projects totaling about 120 MW to 140 MW in 13 of Lao PDR's 18 provinces.⁹ Promoting small-scale hydropower development is a priority to the Government of Lao PDR as (i) solar panels are expensive and more suitable for lighting of houses; (ii) use of biomass is less known in Lao PDR and the technology is not developed locally; (iii) unsuitability of wind power due to absence of all year winds; and (iv) the ability of small and mini hydropower plants to provide electricity also to small industries and enterprises.

6. Small and mini hydroelectric power plants generally have higher generation costs than large scale hydro, which benefits from economies of scale. Present tariff regulations in Lao PDR now hinder the development of small hydro. The MEM has prepared an amendment to the Electricity Law to, among other things, encourage small to mini hydropower development for domestic power supply. The amended Energy Law is expected to be discussed and approved by the National Assembly in December 2008. There will thereafter be a need for a policy dealing with development of small hydropower, and identification of what measures need to be taken to encourage interested public and private developers of small hydropower plants. There will also be a need to prepare the necessary implementing guidelines that will allow EdL to purchase electricity at higher cost from such small developers.

⁵ Reduction greenhouse gas emissions can go up to 12,800-28,000 tCO₂/year if mini-hydro projects totally displace diesel power plants.

⁶ In 2006, Lao PDR imported about 340 GWh to 11 provinces from PRC (4.9 GWh), Thailand (317 GWh), and Viet Nam (18 GWh).

⁷ The greenhouse emission factor for Thailand has averaged 0.515 for its CDM projects. If Lao PDR can reduce its annual electricity import from Thailand by 16-35 GWh, then some 8,200-18,000 tCO₂/year can be avoided.

⁸ Hydropower projects are classified in Lao PDR as small for sizes between 5 MW and 50 MW, mini (100 to 5,000 kW), micro (5 to 100 kW) and pico (<5 kW). Provincial authorities can approve projects when the installed capacity is less than 2 MW; and district authorities when capacity is less than 100 kW. The National Assembly approves projects larger than 50 MW, and the remaining by the Government.

⁹ Two private sector developers are in the advanced stage of developing small hydropower: Nam Sim (8 MW) in Houaphan Province, Nam Nhone (2.4 MW) in Bokeo Province; and five developers (for projects totaling 12.2 MW in installed capacity) are conducting feasibility studies.

7. Small hydropower plants have a potential to displace carbon emissions from other carbon-based energy sources as mentioned in paragraph 5. Due to the relatively high transaction cost of registering projects under the Clean Development Mechanism, there is a need to standardize the documentation, methodologies, greenhouse emission factors, and procedures within Lao PDR, so that developers of small hydropower plants of similar characteristics prepare similar documentation for submission to the United Nation Framework on Climate Change (UNFCCC). This would reduce transaction costs, would make it easier for UNFCCC to evaluate proposals coming from Lao PDR, and would reduce transaction costs.

III. THE TECHNICAL ASSISTANCE

8. The Project proposes to assist the MEM in (i) preparing a policy for implementing sections of the amended Electricity Law related to tariff setting, to encourage development of medium to mini hydroelectric power projects to provide electricity from a clean and renewable source of energy for domestic use, and to allow the Government to approve such development proposals; (ii) after screening and ranking identified projects, prepare a feasibility study of one or two small or mini hydropower (with an installed capacity of up to 5 MW each) projects that would benefit from the work under (i); and (iii) preparing the necessary documentation for Clean Development Mechanism (CDM) registration that would serve as a model for replication by other small-scale hydroelectric power project developments. This is in line with ADB's Strategy 2020 and the country strategy and program for Lao PDR, which encourages the development of environmentally friendly generating facilities to tackle climate change and promote clean energy, and is also consistent with the Government's energy sector plan to provide electricity to 90% of the population by 2020, and EdL's energy strategy and road map on power generation.

A. Impact and Outcome

9. The impact of the project will be for private and public sector to provide clean and renewable electricity generated at medium, small, and mini hydroelectric power plants to rural communities in remote areas. The outcome of the project will be a project design, with CDM registration, of the hydroelectric power plants that the Government of Lao PDR and ADB will agree upon to be used as model for further replication at other small-scale hydropower projects.

B. Methodology and Key Activities

10. The TA project will have three outputs:

- Output (i): **Policy Paper**: to assist the MEM prepare a policy to encourage development of medium to mini public and private sector hydroelectric power projects to provide electricity from a clean and renewable source of energy for domestic use, and to allow the Government to approve such development proposals;
- Output (ii): **Feasibility Study**: that will, subsequent to a screening and ranking process of identified projects, prepare a feasibility study of one or two off-grid or grid-connected small or mini hydropower (with an installed capacity of up to 5 MW each) projects that would benefit from the work under Output 1; and
- Output (iii): **Model CDM Project Design Document (PDD)**: will assist the Government prepare the necessary documentation for CDM registration that would serve as a model for replication by other medium, small and mini-scale hydroelectric power project development.

11. The TA will: (i) Review the revised Electricity Law and then prepare a policy document that allows the MEM to give incentives to developers of medium to mini hydroelectric power plants; (ii) Review existing master plans and feasibility reports for small hydroelectric power plants in Lao PDR, and prepare a ranking list of grid-connected and off-grid hydropower projects using criteria proposed by the consultants in the Interim Report and to be agreed upon at a subsequent tripartite meeting; (iii) Based on the ranking list, prepare the technical design to feasibility level for up to two small and mini hydroelectric power plants (including MV transmission line, if grid connected), cost estimates, procurement plan and implementation schedule, and operation and maintenance arrangements for the power facilities; (iv) Assess sales tariff to the grid based on the investment, depreciation and amount of energy to be transmit; (v) Carry out an economic and financial analysis of the Project; (vi) Carry out the environmental and social assessment of the Project and safeguard planning for involuntary resettlement, ethnic minorities and environment as appropriate in accordance with ADB policies and guidelines on environmental assessments and resettlement; and (vii) Based on the results of the feasibility study, prepare the PDD required for CDM registration.

12. Since the location of a good hydropower plant may be located at a distance from a demand center that could consume its potential generation, the study will also consider financing a medium voltage transmission line to the nearest large demand center or the EdL grid. The TA will undertake a financial analysis from EdL's point of view and will recommend the overall level of sales tariff to EdL. The PPTA will update EdL financial projections.

13. The registration of CDM of the chosen hydroelectric power project will only be requested after feasibility has been carried out and subject to loan approval. However, the procedures for preparing the necessary documents (e.g. PDD) will be done at the completion of the feasibility study, and in coordination with Water Resources and Environment Administration (WREA). The PDD, with CDM registration, of the hydroelectric power plants will be used as model for further replication at other small-scale hydropower projects. As part of this outcome, CDM capacity building will be given to EdL and MEM.

14. Change in land use within catchments area represents a risk to the sustainability of hydroelectric projects. The TA will develop if required a community based catchments management model appropriate for the selected power plant for implementation during construction and operation to mitigate this risk, and in close cooperation with the ADB-financed Nam Ngum River Basin Development Project, if the selected project is in that river basin.

C. Cost and Financing

15. The total cost of the TA is estimated at \$1,175,000 equivalent. The Government of Finland¹⁰ will provide a grant of \$1,000,000 to be administered by the Asian Development Bank. The Government will finance, in kind, the remaining local currency cost of \$175,000 equivalent in the form of office accommodation, site transportation, and counterpart staff. The detailed cost estimates are presented in Appendix 3. The Government has been advised that approval of the TA does not commit ADB to finance any ensuing investment project.

¹⁰ Financed through the Channel Financing Agreement (Technical Assistance Program) between the Government of Finland and the Asian Development Bank.

D. Implementation Arrangements

16. MEM will be the Executing Agency. A senior MEM staff member will be appointed as TA director. The Department of Electricity will be the implementing agency for Outputs (i) and (iii), while EdL will be the implementing agency for Output (ii). EdL will also facilitate the processing of the ensuing loan. The TA will be implemented over 12 months, from March 2009 to February 2010.

17. International consultants will be engaged for 26 person-months and national consultants for 13 person-months. The consultants will be engaged by ADB in accordance with the *Guidelines on the Use of Consultants by Asian Development Bank and Its Borrowers* (2007, as amended from time to time). The simplified technical proposal format and quality- and cost-based selection will be used to select the consulting firm for Output (ii). International consultants will procure equipment¹¹ to be financed under the TA in accordance with ADB's *Procurement Guidelines* (2007, as amended from time to time). Disbursements under the TA will be done in accordance with the *ADB's Technical Assistance Disbursement Handbook* (January 2008, as amended from time to time).

18. The consulting team for Output (ii) will comprise international specialists (22 person-months) with expertise in (a) hydropower engineering; (b) hydrology; (c) civil engineering design; (d) electrical and mechanical engineering; (e) environmental assessment; (f) resettlement, gender and social assessment; (g) financial analysis; and (h) power economics. The national consultants (ten person-months) will include specialists with expertise in (a) geology, (b) hydrology, (c) civil engineering design, and (d) social aspects. The hydropower engineer will be the team leader. The outline terms of reference for the consultants are in Appendix 4. The team leader will submit an inception report within four weeks after the commencement of services. An interim report and a draft final report will be submitted after four and 11 months of TA commencement, respectively. The Government and ADB will provide their comments within two weeks of receiving the reports. The draft final report, incorporating Government and ADB comments, will be finalized 12 months after TA commencement.

19. ADB will recruit one Institutional Specialist and one national Institutional Specialist as individual consultants for Output (i) for three and two person-months input respectively. One international and one national CDM Specialist for Output (iii) will be recruited for one month input each. The individual consultants for Output (i) and the firm for Output (ii) will begin their services when the recruitment has been completed after TA signing, while consultants for Output (iii) will start once the draft feasibility report issued under Output (ii) has been completed.

IV. THE PRESIDENT'S DECISION

20. The President, acting under the authority delegated by the Board, has approved ADB administering technical assistance not exceeding the equivalent of \$1,000,000 to the Lao People's Democratic Republic to be financed on a grant basis by the Government of Finland for preparing the Small and Mini Hydroelectric Development Project, and hereby reports this action to the Board.

¹¹ Equipment to be procured includes: hydro-meteorological measuring equipment (e.g. automatic rain gauges and water level recorders, current meter, software) and office equipment (laser printer and WIFI Router). The consultant will turn over the equipment to EdL at the completion of the TA.

DESIGN AND MONITORING FRAMWORK
Lao PDR: Small and Mini-Hydroelectric Development Project

Design Summary	Performance Targets/Indicators	Data Sources/ Reporting Mechanisms	Assumptions and Risk
<p>Impact Access of rural villages to clean electricity generated at medium, small and mini hydroelectric power plants is improved</p>	<p>Increased number of rural households with access to clean electricity from 245,300 in 2006 by [tbd]% by 2014 (target tbd during PPTA)</p>	<p>MEM Documents, incl. Electricity (DoE/MEM) EdL Documents</p> <p>Reports of other appropriate Ministries and Government agencies.</p>	<p>Assumptions Amendment to Electricity Law is passed as proposed and policy for implementation of the amended law is approved timely.</p> <p>Project developers find incentives acceptable to make positive investment decisions in clean energy technologies</p> <p>Risk Change in land use within catchments area if not community based catchments management is implemented</p>
<p>Outcome Project design, with CDM registration, of one or two small or mini hydroelectric power plants to be used as demonstration project agreed upon by ADB and the Government/borrower.</p>	<p>MOU attesting to GOL-ADB agreement by Q2 2009 of plans to provide about 5-10 MW of installed hydroelectric capacity.</p>	<p>EdL, MEM, WREA agreements</p>	<p>Assumption</p>
<p>Outputs 1. Policy proposal for implementation of amended Electricity Law.</p> <p>2. Draft Prime Ministerial Decree to implement policy proposal (Output 1).</p> <p>3. Feasibility study of up to two small or mini hydroelectric plants.</p> <p>4. Model CDM PDD for up to two hydroelectric</p>	<p>1. Policy proposal endorsed by the MEM by November 2009.</p> <p>2. Decree issued by Prime Minister by Q2 2010.</p> <p>3. Proposed technical design and financing plan for hydroelectric plants endorsed by the Government by Q2 2010.</p> <p>4. PDD ready for Designated Operational</p>	<p>1. and 2. MEM document confirming acceptance of policy proposal and signed decree</p> <p>3. Feasibility study reports</p> <p>4. PDD</p>	<p>Assumptions Data and information to assess projects is readily available</p> <p>Hydrological data adequate to determine project's generation potential of spillway design.</p> <p>Social and environmental impacts of the small and mini hydroelectric power plants acceptable and mitigated and community supportive</p> <p>Risk The registration of CDM of</p>

Design Summary	Performance Targets/Indicators	Data Sources/ Reporting Mechanisms	Assumptions and Risk
power plants	Entities evaluation of the plants for CDM Registration by Q2 2010.		the chosen hydroelectric power project will only be known after feasibility has been carried out

Activities with Milestones	Inputs
<ol style="list-style-type: none"> 1. Prepare Policy Proposal that allows the MEM to give incentives to developers of medium to mini hydroelectric power plants <ol style="list-style-type: none"> 1.1 Complete the first draft of the policy proposal by July 2009 1.2 Submit the final proposal to Minister Energy and Mines by October 2009 2. Draft Prime Ministerial Decree to implement the policy proposal <ol style="list-style-type: none"> 2.1 Complete the draft for the Decree by November 2009 2.2 MEM to submit to the Prime Minister's Office by Q1 2010 3. Feasibility studies of up to two hydroelectric power plants <ol style="list-style-type: none"> 3.1 Prepare Inception Report proposing projects to be studied to Feasibility by June 2009. 3.2 Prepare draft final feasibility study report by January 2010 3.3 Prepare Final Report by February 2010 4. Model CDM Project Design Documents <ol style="list-style-type: none"> 4.1 Prepare CDM Project Design Document by February 2010 	<p>Government of Finland: \$1,000,000</p> <ul style="list-style-type: none"> • Consulting services 26 PMs – \$784,000 • Surveys – \$25,000 • Equipment – \$35,000 • Misc. admin and others – \$27,000 • Contingencies – \$130,000 <p>Government: \$175,000</p> <ul style="list-style-type: none"> • Office accommodation – \$40,000 • Transport – \$50,000 • Personnel – \$60,000 • Others – \$25,000

ADB = Asian Development Bank; CDM = Clean Development Mechanism; GWh = giga watt hour; MEM = Ministry of Energy and Mines; EdL = Electricité du Lao; MW = mega watt; PDD = project design document; PPTA = project preparatory technical assistance; TA = technical assistance; tbd = to be decided; WREA = Water Resources and Environment Agency; p-m = person-months.

INITIAL POVERTY AND SOCIAL ANALYSIS

Country/Project Title: Lao PDR/Small and Mini Hydroelectric Development Project

Lending/Financing Modality: Loan Department/Division: SERD/ SEID

I. POVERTY ISSUES

A. Linkages to the National Poverty Reduction Strategy and Country Partnership Strategy

ADB's Country Strategy and Program (CSP) for Lao PDR (2007-2011) focus on supporting pro-poor economic growth, social equity and balanced development, and sustainable environment management. One of the key challenges for poverty reduction in Lao PDR's Socio-economic Development Program, 2006-2010 (SEDP) is to provide the basic services and infrastructure needed to ensure the access to markets needed to attract private investment and create jobs. ADB country strategy is aimed at reducing the poverty through promoting pro-poor, business-led economic growth. Provision of basic infrastructure is one of the prerequisites for such development. In 2006, 56% of households in Lao PDR had access to electricity. The government is extending the grid system but this is proving to be slow in mountainous provinces due to difficult access resulting in high costs. Those remaining to be connected are districts in remote mountains, often inhabited by indigenous people with 18% of the population below the national poverty line (against 22% for the whole country). The Project will contribute to achieving this objective of ensuring 90% electrification of villages and households by 2020. The proposed project will help in achieving this goal, and thus, contributes to the government goal of promoting pro-poor and balanced economic development of remote and isolated mountainous districts through sustainable use of renewable energy.

In remote mountainous poor districts when electricity is available, it is mainly used for household purposes such as lighting. There is little scope for the productive use of energy; however the Project will promote a special feature to support such productive use of energy. The Project will provide reliable and affordable supply of electricity to remote poor districts by implementing a small or mini hydroelectric power plant and associated transmission and distribution facilities. The Project will thus contribute to inclusive social development and to a lesser extent to pro-poor growth (through some additional potential for income generation of poor remote communities through productive use of electricity) as well as to environmental sustainability (through promoting renewable energy sources).

B. Targeting Classification

1. Select the targeting classification of the project:

General Intervention Individual or Household (TI-H); Geographic (TI-G); Non-Income MDGs (TI-M1, M2, etc.)

The Project will be in areas with poverty incidence substantially above the national average. While it is not specifically targeted to individual poor households, as it will provide access to electricity to all the households in the remote communes within the 47 poorest districts identified by the Government. Besides making indirect impact on income poverty, the project's major feature is improving livings standards of poor households. It is therefore classified as an intervention that targets geographical dimensions of poverty (TI-G).

C. Poverty Analysis

1. If the project is classified as TI-H, or if it is policy-based, what type of poverty impact analysis is needed?

The Project will not specifically address income-poverty at the household level. While it will have a small component of promoting the productive use of energy, thereby contributing to perhaps increased income potential for some poor families, the main feature will be improving the livings standard of all in a geographical area where majority of the population are poor.

During Project preparation, a social and poverty impact analysis study will be done, including assessment of impact on ethnic minorities.

2. What resources are allocated in the PPTA/due diligence?

A social and poverty expert team will prepare a socio-economic analysis in remote mountainous districts divided

into following sub tasks:

- Socio-economic profile of the households in the pilot sub projects.
- People's income and ability to pay, affordability analysis and recommendations for targeted subsidies to ensure poor households benefiting from the Project.
- Estimate on use of electricity and recommendations for enhancing productive use of electricity.
- Impact of electricity on changing life, analysis of potential positive and negative effects.
- Ethnic minority assessment; Ethnic Minority Framework for the sector project and Ethnic Minority Development Plan for the sub projects in ethnic minority dominated areas.
- HIV/AIDS and human trafficking risk assessment and recommendations for risk reduction.
- Gender assessment and gender strategy.
- Stakeholder analysis, participation and consultation strategy.

Methodology used will include statistical reports, household surveys, and interviews with different stakeholder categories individually and in groups such as men and women, people earning income from different type of production activities, small business owners, education and healthcare providers, local administration, and regional development authorities.

2. If GI, is there any opportunity for pro-poor design (e.g., social inclusion subcomponents, cross subsidy, pro-poor governance, and pro-poor growth)?

The Project is classified as a TI-G. It has pro-poor design features and supported an affordability analysis, leading to recommended targeted subsidies to enhance poor households' access and long-term use of electricity.

II. SOCIAL DEVELOPMENT ISSUES

A. Initial Social Analysis

Based on existing information:

1. Who are the potential primary beneficiaries of the project? How do the poor and the socially excluded benefit from the project?

- Primary beneficiaries will be households (majority of which being poor), small enterprises and public service providers in poor and remote communities. Project guidelines and recommendations will be targeted to enhance poor households' access to and long-term use of electricity. The project will provide awareness raising campaign on safe use and conservation of electricity, and the Project will prepare a program for electricity use for income generation activities through appropriate micro-credit facilities.

2. What are the potential needs of beneficiaries in relation to the proposed project?

To get sustainable access to electricity at an affordable price in the long term for household use and for development of income generation activities. Subsidized prices for connection and electricity consumption may be needed, as well as special features (one of them could be micro-credit) for income generation development.

3. What are the potential constraints in accessing the proposed benefits and services, and how will the project address them?

Electricity prices may in the long run constitute an obstacle for poor households' electricity use. Affordability analysis of households' ability to pay for electricity and recommendations for targeted subsidies are expected to mitigate the risk of poor households not benefiting from the electrification potential. The analysis will help rationalizing the subsidy component for the off-grid connection.

B. Consultation and Participation

1. Indicate the potential initial stakeholders.

Local households, local small entrepreneurs, local government offices, local public service providers (primarily education and healthcare sectors, and agricultural extension centre), district and province authorities responsible for the sub-sector and for regional development.

2. What type of consultation and participation (C&P) is required during the PPTA or project processing (e.g., workshops, community mobilization, involvement of non-government organizations and community-based organizations, etc.)?

Interviews and focus group meetings with households – men and women – from different wealth categories and income generation activity sectors, interviews and focus group meetings with local entrepreneurs, service providers, government officials, representatives for mass organizations, interviews with regional (province and district) authorities.

3. What level of participation is envisaged for project design?

Information sharing **Consultation** Collaborative decision making Empowerment

4. Will a C&P plan be prepared? **Yes** No Please explain.

C. Gender and Development

1. What are the key gender issues in the sector/subsector that are likely to be relevant to this project/program?

Equal access of men and women to the benefits of electrification and the improved income generation prerequisites; risk of loss of manual labor opportunities; some (minor) risk of sexual exploitation and spread of STDs and HIV during the construction period.

2. Does the proposed project/program have the potential to promote gender equality and/or women's empowerment by improving women's access to and use of opportunities, services, resources, assets, and participation in decision making?

Yes No Please explain

Energy will be provided to households not to individual people. As such both men and women will benefit. The use of electricity in public places will enhance comfort and security in the area which will particularly benefit women. The electricity will particularly be used for living room and kitchen lights. Especially the later will reduce exposure of women to fume from candle light (some health and comfort impact). The Project will have however little impact on income potential because of the limited productive use of electricity and the use of electricity in areas where women may not find major employment opportunities. Further information on the benefits for men and women and how such project could impact on gender relations will be prepared during the Project preparation.

3. Could the proposed project have an adverse impact on women and/or girls or to widen gender inequality?

Yes No Please explain

Gender strategy prepared during the Project preparation will include recommendations and measures to mitigate the potential adverse impacts of loss of work opportunities of women and potential (relatively minor) gender-related risks of sexual exploitation during the construction period.

III. SOCIAL SAFEGUARD ISSUES AND OTHER SOCIAL RISKS

Issue	Nature of Social Issue	Significant/Limited/ No Impact/Not Known	Plan or Other Action Required
<u>Involuntary Resettlement</u>	Households may lose land, non-land assets, and source of income	Not known as it depends on project setting. A Resettlement Plan will be prepared.	<input type="checkbox"/> Full Plan <input type="checkbox"/> Short Plan <input type="checkbox"/> Resettlement Framework <input type="checkbox"/> No Action <input checked="" type="checkbox"/> Uncertain Full or short plan
<u>Indigenous Peoples</u>	The Project is located in areas typically inhabited by ethnic minority people and they are the major	Significant. An Ethnic Minority Development Plan will be prepared as required.	<input checked="" type="checkbox"/> Plan <input type="checkbox"/> Other Action <input checked="" type="checkbox"/> Indigenous Peoples

	beneficiaries.		Framework <input type="checkbox"/> No Action <input type="checkbox"/> Uncertain
Labor <input type="checkbox"/> Employment Opportunities <input type="checkbox"/> Labor Retrenchment <input type="checkbox"/> Core Labor Standards	Electrification is expected to lead to new business and labor opportunities; some opportunities of manual labor might be lost.	Not known	<input type="checkbox"/> Plan <input checked="" type="checkbox"/> Other Action <input type="checkbox"/> No Action <input type="checkbox"/> Uncertain
Affordability	Households' and local enterprises' ability to pay for electricity and benefit from electrification	Significant core issue for development.	<input checked="" type="checkbox"/> Action <input type="checkbox"/> No Action <input type="checkbox"/> Uncertain An affordable tariff mechanism will be designed taking into account the affordability of the people.
IV. PPTA/DUE DILIGENCE RESOURCE REQUIREMENT			
1. Do the TOR for the PPTA (or other due diligence) include poverty, social and gender analysis and the relevant specialist/s? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If no, please explain why.			
2. Are resources (consultants, survey budget, and workshop) allocated for conducting poverty, social and/or gender analysis, and C&P during the PPTA/due diligence? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If no, please explain why.			

COST ESTIMATES AND FINANCING PLAN
(\$'000)

Item	Total Cost
A. Government of Finland ^a	
1. Consultants	
a. Remuneration and Per Diem	
i. International Consultants	638
ii. National Consultants	39
b. International and Local Travel	96
d. Reports and Communications	10
2. Surveys	25
3. Equipment ^b	35
4. Miscellaneous Administration and Support Costs	22
5. Representative for contract negotiations	5
6. Contingencies	130
Subtotal (A)	1,000
B. Government Financing	
1. Office Accommodation ^c	40
2. Transport ^d	50
3. Remuneration and Per Diem of Counterpart Staff	60
4. Others	25
Subtotal (B)	175
Total	1,175

Notes:

^a Financed through the Channel Financing Agreement (Technical Assistance Program) between the Government of Finland and Asian Development Bank.

^b Hydro meteorological equipment, office equipment

^c DOE/MEM and EdL will provide furnished office space for the consultants incl. telephone line and internet connection

^d EdL will provide vehicles for site surveys

Source: ADB staff estimates

INDICATIVE TERMS OF REFERENCE FOR CONSULTANTS

A. Output 1 – Policy Paper on Incentives for Small and Mini Hydropower Development

1. Scope of Work

1. Individual consultants will be engaged to provide technical services for five person-months of consulting services (three person-months of international consulting inputs and two person-months of national consulting inputs). The consultants will report to the Department of Electricity (DoE) of the Ministry of Energy and Mines (MEM), and the Asian Development Bank (ADB).

2. Terms of Reference

2. The consultant shall ensure that all works and outputs under the TA are fully compliant with all relevant ADB and Government policies and guidelines. The consultant's work should include, but not be limited to, the following:

3. Institutional Expert

3. The consultant will: (i) review all legal documentation in Lao PDR relating to the development of power projects; (ii) assess the sustainability of small and mini hydropower plants currently operational in Lao PDR. Identify barriers to investments of mini to medium-sized hydropower plants by both private and public investors, strategy to remove these barriers, and incentive package consisting of fiscal and policy incentives; (iii) present similar policies adopted in other countries comparable to Lao PDR; (iv) Prepare (a) a proposal to serve as Policy for the Government to give incentives to developers (public and private) of mini to medium-sized hydropower projects less than 50 MW; (b) an implementation strategy for the Policy; and (c) an outline of its implementation regulations. The policy incentives could consist of model concession, power purchase agreements, transparent mechanism for off-take prices and end user tariffs if the mini- to medium-sized hydropower plants are to directly supply the consumers; (v) assist Government in conducting consultation on the Policy with relevant stakeholders; and (vi) prepare a Decree to be approved by the Prime Minister.

4. Implementation Arrangements

4. MEM/DoE will act as the Executing Agency and Implementing Agency. DOE will provide counterpart staff, office space, and office furniture without cost to the consultant.

5. Reporting

5. The consultants will prepare the following reports for MEM and ADB: (i) an inception report within two weeks after the commencement of services; (ii) an interim report containing first proposal for the Policy six weeks after the commencement of services; (iii) a draft final report containing Draft Decree four months after the commencement of services; and (iv) a final report five months after the commencement of services.

6. Tripartite meetings will be held after submission of the inception, interim, and draft final reports in Vientiane.

B. Output 2 – Feasibility Study

1. Scope of Work

7. A consulting firm will be engaged to provide technical services for 32 person-months of consulting services (22 person-months of international consulting inputs and 10 person-months of national consulting inputs). The consultants will report to the Electricité du Laos and to the Asian Development Bank (ADB).

2. Terms of Reference

8. The consultant shall ensure that all works and outputs under the TA are fully compliant with all relevant ADB and Government policies and guidelines. The consultant's work should include, but not be limited to, the following:

(i) Hydropower Planner/Team Leader (eight person months – international)

9. The consultant will: (i) Review Government's policies on rural renewable energy and legal framework related to hydropower development, specifically related to small hydropower; (ii) Review, available documentation prepared by others (MEM, EdL, consultants) for on- and off-grid hydropower development including master plan study on small hydro in Northern Laos prepared under JICA financing; (iii) Prepare criteria, in coordination with MEM, EdL and ADB, for ranking proposed projects in to a shortlist-list of about 10-15 projects, and propose up to two projects with installed capacity not exceeding 5 MW each (both off-grid and on-grid projects would be eligible - if demand at a selected hydropower site is too low to justify the development of a small hydropower plant, implementation of a MV transmission line to the national grid can be considered) to be carried over to feasibility stage taking into consideration potential CO₂ reductions and that they should be prepared for CDM registration (the ensuing ADB loan would be for one project to be developed by EDL); (iv) Prepare general layouts and specify requirements for topographical mapping; procure topographical services within Laos for selected projects; (v) assess the needs for catchment management to assure the sustainability of the inflows to the reservoir and make recommendations on steps to be taken; (vi) assess potential safety hazard and extent, should the proposed dam breach, and make recommendations for further in-depth studies during the project implementation stage; (vii) Assess the realistic displacement of carbon/fossil fuel use due to the proposed power plant, and estimate reduction in CO₂ emissions; (viii) Prepare in cooperation with civil works designer, mechanical engineer, electrical engineer, social specialist and environmentalist the project base cost estimates (preferably using the software COSTAB), including unit costs and estimates of quantities for project components, identification of local and foreign cost components, and physical and price contingencies. (ix) Prepare the contract packages, determine the financing requirements of the Project and identify options for co-financing; (x) Prepare an outline bidding document following ADB's requirements, the project implementation schedule, a Gantt chart showing the schedule, and a procurement schedule, assess the Project's technical risks and carry out sensitivity analysis to check project viability under these risks; (xi) Assess EdL's operation and maintenance capability for small and mini hydropower plants and make recommendations for improvements, if necessary; (xii) Coordinate necessary consultation workshops to be done at provincial and national level; (xiii) Prepare terms of reference, expertise requirements, and person-month estimates for implementation consulting services; (xiv) Prepare final reports in the format of ADB's Report and Recommendations to the President (the RRP); and (xv) Coordinate the work of all members of the team, the individual consultants, and be liaison between the consulting team and MEM and EdL.

- (ii) **Engineering Hydrologist** (One person-month international, two person-months national)

10. The consultant will: (i) Review the hydrological studies, flood studies, and sediment studies of existing small hydropower project studies; (ii) Prepare program for data collection in cooperation with EdL, MEM and relevant government agencies for the projects to be studied to feasibility study; (iii) Propose equipment to be procured and install these (a working gauging station should be established close to selected sites before the onset of the 2009 wet season, if possible); (iv) Analyze hydro-meteorological data and determine energy potential at project site(s) (prepare flow duration curve as far as possible on the basis of daily flows and estimate firm power potential and average annual energy output for various levels of system demand); (v) Do flood analysis and advise civil works designer and mechanical engineer on suitable design floods for the various project components (dam, power house, etc.); (vi) Assess the impact of hydropower development on the availability of water for human consumption, irrigation, and other downstream uses in areas where water could be in short supply.

- (iii) **Geologist/Geotechnical Engineer** (one half person-month international, one person-months national)

11. The consultant will: (i) Assess the geological conditions in the reservoir and project component areas with special reference to reservoir water tightness, earthquakes, and major faults; (ii) Review the geo-technical conditions at the site with particular reference to the foundation of the dam, spillway, waterways and power plant; (iii) Assess the need for monitoring dam safety; and (iv) Propose necessary field investigations needed for detail design stage.

- (iv) **Civil Designer** (1.5 person-months international, two person-months national)

12. The consultants will for the civil works component: (i) prepare all the necessary layouts and designs to feasibility level for dam, water ways, powerhouse, tailrace in coordination with the mechanical and electrical engineers; (ii) prepare the bill of quantities and cost estimates.

- (v) **Mechanical Engineer** (one person-months international)

13. The consultant will (i) determine, in cooperation with the hydrologist and power economist the most appropriate type of turbine and installed capacity, (ii) estimate the cost of the required mechanical equipment (turbines, gates, valves, etc.), and (iii) provide the necessary information to the civil works designer.

- (vi) **Electrical Engineer** (one person-months international)

14. The consultant will: (i) determine all aspects of the electrical works of the project (generator, control equipment, transformers, MV and LV transmission lines and connections to consumes living close to power plant), (ii) estimate the costs of the equipment; and (iii) provide the necessary information to the civil works designer.

- (vii) **Power Economist** (1.5 person-months - international)

15. The consultant will: (i) During the ranking stage, assist the Team Leader in preparing the criteria for ranking the projects in terms of the demand side (the proposed Project will provide electricity to local communities also); (ii) Prepare demand forecast for each project selected for feasibility study; (iii) Identify the risks, and undertake appropriate risk and sensitivity analysis

with respect to the economic internal rate of return in accordance with ADB's Handbook for Integrating Poverty Impact Assessment in the Economic Analysis of Projects (2001); (iv) Identify stakeholders, and conduct a distributional analysis of the net project benefits in accordance with ADB's Handbook for Integrating Poverty Impact Assessment in the Economic Analysis of Projects (2001); (v) With other team members, prepare a project framework that clearly identifies the proposed project's impact, outcome, output and activities, targets or benchmarks, monitoring mechanisms, assumptions and potential risks in accordance with ADB standards.

(viii) **Financial Analyst** (1.5 person-month – international)

16. The consultant's activities will be guided by, and outputs prepared in accordance with, ADB's *Financial Management and Analysis of Projects* (2005). The consultant will undertake, but not be limited to, the following tasks: (i) Review the overall financial viability of the selected hydropower project(s); (ii) Carry out in-depth financial analysis of the proposed investment, including calculation of the financial internal rate of return and weighted average cost of capital, taking into account all the financial costs and revenues that can be attributed to the proposed project; (iii) With the hydropower planner, assess the remuneration of the project that will ensure cost recovery, reasonable return to the developer (although the developer in this instance may be EdL, it will be assumed that the hydropower plant is an independent entity); (iv) Identify all risks to the proposed project's revenue and costs, and conduct relevant sensitivity analyses on its financial rate of return; (v) Work with the Hydropower Planner to prepare detailed project cost estimates table for the proposed investment, taking into account all relevant financial costs that include physical and price contingencies, interest during construction, commitment fees, and up-front fees; (vi) Prepare a financing plan for the proposed project that includes proposed ADB lending, prospective cofinancing, if any, and appropriate counterpart funds for local currency expenditures, with price and physical contingencies and interest during construction; (vii) Update financial projections for EdL; (viii) Propose prudent financial covenants to ensure that EdL generate adequate cash flow to finance new investments and to repay their loans; and (ix) in the case of an off-grid mini hydropower plant not owned by EdL providing power to a local community, propose adequate billing arrangements.

(ix) **Environmental Specialist** (One person-month international)

17. In accordance with ADB's Environmental Policy (2002), Environmental Assessment Guidelines (2003), and Public Communications Policy (2005); the consultant will undertake the following tasks, including preparation of relevant appendixes and sections of the RRP: (i) Prepare an environmental impact assessment (EIA) and summary EIA (SEIA) or initial environmental examination (IEE) and summary IEE (SIEE) of the proposed hydropower projects, associated transmission lines, and substations, considering the likely impacts associated with pre-construction and construction activities, as well as the long-term impacts during operation; (ii) As part of the EIA/IEE, prepare an environmental management plan (EMP) detailing environmental mitigation measures to address each identified impact as well as an environmental monitoring program to be implemented during various project phases. The EMP shall identify specific costs, institutional responsibilities, schedule/timeframe, location, and monitoring parameters. The consultant shall also conduct an assessment of current institutional capability to implement the EMP and shall propose necessary capacity building program; (iii) Conduct consultations with groups to be affected (local residents, local officials, people's organizations, and other stakeholders) by the project and local NGOs. For category B projects, the public consultation shall be conducted at least once while for category A projects, consultations shall be carried out at least twice, i.e., once during the early stages of EIA field work; and once when the draft EIA report is available, and prior to loan appraisal by ADB.

Document the results of the consultation in the EIA/IEE; (iv) ensure that the cost for implementing mitigation measures, monitoring plan and environmental management capacity strengthening activities are included in the project cost; and (v) Prepare the terms of reference for any further detailed environmental assessments, if required, in consultation with all concerned.

- (x) **Resettlement, Social Development and Poverty Specialists** (five person-month international, five person-month national)

18. The consultant will: (i) Prepare a sample-based social impact assessment, including gender analysis, of the proposed project to provide adequate information, including any potential impacts on ethnic minorities; provide mitigation measures/affirmative activities to ensure that ethnic minorities are safeguarded during construction and the project implementation period; (ii) Prepare a resettlement plan for the Project if it will result in social impacts that will trigger ADB's *Involuntary Resettlement Policy* (1995); (iii) If necessary, prepare an ethnic minority-specific actions for inclusion in each resettlement plan or ethnic minority development plan in accordance with ADB's *Policy on Indigenous Peoples* (1998), and include a gender strategy in each resettlement plan; (iv) Review and assess the risk of spreading HIV/AIDS and other sexually transmitted diseases during the construction phase; (v) Prepare a plan for mitigating the risk to construction workers and communities; the plan will include the requirement for each contractor to prepare and implement an HIV/AIDS and sexually transmitted disease awareness program for its workers, for which the bidding documents will include a budget line item; (vi) For associated facilities, review and ensure that suitable and acceptable consultations have occurred and that the project resettlement plans and ethnic minority-specific action or development plans, if any, have been disclosed to affected people; (vii) For Project components, ensure that suitable and acceptable consultations have occurred and that the project resettlement plans and ethnic minority-specific action or development plans, if any, have been disclosed to affected people; (viii) for the project area, prepare socio-economic profiles of households likely to benefit from the project; (ix) determine the beneficiaries income and ability to pay; (x) determine the use of electricity at household level in villages that already have electricity close to the project area, and estimate the use of electricity by the project beneficiaries, including potential productive use of electricity; (xi) assess the positive and negative impact of electricity on the people receiving electricity for the first time, or for those that are already connected to non-grid and inadequate electricity source; and (xii) recommend and participate in necessary consultations with stakeholders.

C. Output 3 – Preparation of Sample Project Design Document for CDM Registration

1. Scope of Work

19. Individual consultants will be engaged to provide technical services for two person-months of consulting services (one person-month of international consulting inputs and one person-month of national consulting inputs). The consultants will report to the Department of Electricity (DOE) at the Ministry of Energy and Mines (MEM), and the Asian Development Bank (ADB).

2. Terms of Reference

20. The consultant shall ensure that all works and outputs under the TA are fully compliant with all relevant ADB and Government policies and guidelines. The consultant's work should include, but not be limited to, the following:

3. CDM Expert (One person months – international, one person month national)

21. The consultant will: (i) Review all legal documentation in Lao PDR relating to the registration of power projects for CDM; (ii) check the validity of CO₂ emission reductions estimated in Output 2; (iii) prepare model Project Design Document (PDD) document for mini hydropower projects in Laos; (iv) prepare a template for calculating the emission reduction compared to the baseline emissions; and (v) Prepare the PDD for up to two power projects after Consultant of Output 2 has submitted the Draft Final Report.

4. Implementation Arrangements

22. MEM/DoE will act as the Executing Agency and Implementing Agency. DOE will provide counterpart staff, office space, and office furniture without cost to the consultant. EdL will provide all necessary information and data for the PDD.

5. Reporting

23. The consultants will prepare the following reports for MEM and ADB: (i) an inception report within one week after the commencement of services and a final report one month after the commencement of services. Reports and computations will be submitted in electronic form.

24. Tripartite meetings will be held after submission of the final report in Vientiane.