

TERMS OF REFERENCE FOR CONSULTANTS

A. Background

1. The Asian Development Bank (ADB) is interested in procuring the services of a qualified team of multi-disciplinary expert consultants comprising international and national consultants to assist in project preparation activities for a proposed Northern Cross-Border Power Trade and Distribution Project, including completion of the project feasibility study, least-cost electrification analysis, front-end engineering design, and preparation of bid documents for the engineering, procurement, and construction contract for the transmission and distribution systems recommended. The firm will work closely with Electricite du Laos (EDL), the executing agency, and directly support ADB.

2. The project will support the national electric utility, EDL, with the following outputs (i) electricity distribution expanded in the provinces of Luang Namtha, Bokeo, and Phongsaly, including provision of at least 8,000 household electricity meters;¹ and (ii) cross-border transmission line(s) connecting Lao PDR with Thailand and/or Myanmar constructed.

3. The provincial distribution systems will include expansion of medium- and low-voltage [22/0.4 kilovolt (kV)] transmission lines, transformers, poles, and associated civil works, and may also include off-grid alternatives, such as solar home systems, renewable mini-grids, and battery storage, subject to results of least-cost electrification analysis.

4. The three potential transmission line crossings proposed by EDL are as follows:

- (i) from Ban Tonpheng (Lao PDR) to Mea Chan (Thailand),
- (ii) from Ban Tonpheng (Lao PDR) to Shan State (Myanmar), and
- (iii) from Meung Long (Lao PDR) to Shan State (Myanmar).

5. The cross-border transmission system from Ban Tonpheng to Mea Chan and Shan State will require construction of 12–14 kilometer of 115 kV or 230 kV transmission lines, 2 high transmission towers for the crossing over the Mekong river, 4 substation feeder bays with switchgears at the connection point, controls, and associated civil works and structures. The cross-border transmission system from Mueng Long to Shan State is still under consideration and the required equipment has not yet been identified. During project preparation, the firm will study the technical, economic, and environmental feasibility of all three options and advise EDL on recommendations for moving forward.

6. The consultants will have extensive experience in the design and implementation of transmission lines, substations, and distribution systems (including on-grid and off-grid options such as renewable-based mini-grids); the development of feasibility studies for similar projects; and least-cost electrification planning. It is estimated that a total of 54.5 person-months of consulting services are required to undertake this work. Of these inputs, 42.5 person-months are to be engaged through a firm. In addition, an energy analyst (international, 12 months) will be hired through an individual contract and be based in ADB's Thailand Resident Mission. The transaction technical assistance (TA) will be administered over a period of 24 months from January 2018–December 2019. ADB will engage consulting firms and individual consultants in accordance with ADB Procurement Policy (2017, as amended from time to time) and the associated Project Administration Instructions/TA Staff Instructions.

¹ The project aims to reach approximately 31% of the unserved households in the three provinces.

B. Consulting Services

7. **Project scope.** TA activities will include, but not be limited to the following:

- (i) reviewing all studies relating to power system development in the Northern Provinces of Lao PDR, and interconnections to Thailand and Myanmar: the later if memorandum of understanding/agreement signed between the governments of Lao PDR and Myanmar;
- (ii) assessing electricity demand in Northern Lao PDR;
- (iii) conducting an electrification expansion simulation, applying least-cost life-cycle methods using tools including geographic information system (GIS), Network Planner, Homer, and DIgSILENT;
- (iv) carrying out engineering line surveys (GIS-based supported by field validation) and undertaking load flow studies in the Lao PDR, Thailand and if approved Myanmar;
- (v) preparing design and technical specifications for bid documentation;
- (vi) preparation of draft bid documents for transmission and distribution components;
- (vii) conducting economic and financial analyses under ADB policies and guidelines;
- (viii) reviewing and updating EDL's financial management capacity;
- (ix) capacity support in safeguards, procurement and distribution planning through workshops and on-the-job training; and
- (x) ensuring safeguard compliance with relevant ADB environment, involuntary resettlement, and indigenous peoples policies and guidelines.

8. The estimated budget for the firm is \$720,000, to include, but not limited to: remuneration, international and local travel, equipment, surveys, reports and consultations. The qualifications and outline terms of reference for the key consultants, with a minimum level of effort, are outlined below. Key personnel listed below are required to spend at least 50% of their time in Lao PDR.

9. **Power distribution expert (and team leader) (international, 3 person-months).** The international expert should preferably have a master's degree in electrical engineering with a minimum 20 years' professional experience, of which 15 years should be in senior positions in a power utility and/or as a senior professional consultant expert. The expert shall have completed 3 or more project preparatory TA assignments as team leader and/or key team member. Experience in Southeast Asia including Thailand, Cambodia or Lao PDR is highly desirable. As team leader, this expert will be responsible for all TA outputs and will serve as liaison with the Ministry of Energy and Mines (MEM), EDL, and the ADB Project Officer. The expert will seek and coordinate the inputs of all team members and ensure the quality and timely submission of technical, financial, procurement, social safeguards and implementation arrangements-related documents. Specifically, the expert will:

- (i) coordinate with the Economist/Financial experts to confirm that the proposed projects are least-cost life-cycle electrification options for the Northern provinces of Lao PDR and align with MEM/EDL planning outcomes;
- (ii) coordinate with the System Planning Expert to define the configuration (3-ph, 1-ph, SWER) of the proposed on-grid extensions and off-grid projects;
- (iii) coordinate with the Solar Power Expert to optimize least-cost life-cycle off-grid generation options;
- (iv) review MEM/EDL distribution standards for cost optimization using latest design, material and construction techniques;

- (v) add inputs to and review the grid reinforcement feasibility study for Luang Namtha, Bokeo, and Phongsaly Provinces;
- (vi) estimate proposed projects costs, including physical and price contingencies, and financing charges during implementation;
- (vii) prepare detailed project-implementation schedules clearly indicating the tasks on the critical path;
- (viii) review EDL's technical capacity in supervising and managing projects of similar magnitude and identify the need for capacity strengthening and implementation advisory services;
- (ix) review of the procurement capacity assessment of EDL;
- (x) prepare bid document technical specifications for distribution and review the specifications for transmission, solar equipment and solar home system (SHS);
- (xi) review procurement specialists' standard bidding documents;
- (xii) review the safeguard documents produced by specialists on the team and ensure that such meet ADB's Safeguard Policy Statement (SPS) requirements; and
- (xiii) support the ADB Project Officer to prepare the report and recommendation of the President.

10. **Transmission and substations engineer (international, 1.5 person-months).** The international expert should preferably have a master's degree, minimum bachelor's degree, in electrical or civil engineering, with a minimum 15 years' professional experience and a minimum 8 years in transmission and substations design with global experience, preferably including Southeast Asia. Experience in project implementation is preferable. The expert will:

- (i) review EDL's/Electricity Generating Authority of Thailand's proposed 115-kV interconnections to/from Tonpheung Substation to Thailand (Mae Chan) and the proposed 115/132 kV Myanmar interconnection;
- (ii) prepare concept single line diagram (SLD) design for the upgrade of the Tonpheung Substation, line routing and transmission tower requirements for Mekong River spans (up to 920 meters depending on tower locations);
- (iii) evaluate the possibility of using high-temperature low-sag conductors for the interconnection(s);
- (iv) liaise through EDL with Electricity Generating Authority of Thailand and Myanmar authorities to determine responsibilities for the cross-border high tower construction and conductor stringing;
- (v) prepare technical specifications for bidding documents including bill of quantities, route profiles, SLD's, etc.;
- (vi) provide costs to the Team Leader to consolidate for the financial evaluation including right of way and other compensation costs;
- (vii) prepare high level concept options for 115-kV transmission reinforcement in Luang Namtha, Bokeo, and Phongsaly provinces, SLD's, GIS-based transmission line routing (field checked), project costs and least-cost life-cycle assessments liaising with the System Planning Expert, Environmental and Social/Resettlement specialists for compliance with safeguards and compensation costs; and
- (viii) inputs to a feasibility report on grid reinforcement in Luang Namtha, Bokeo, and Phongsaly.

11. **Least-cost electrification expert (international, 1.5 person-months).** The expert should preferably have a master's degree, minimum 4-year bachelor's degree, in electrical engineering, with a minimum 10 years' professional experience and a minimum 5 years in power distribution and sub-transmission system planning. Experience in grid transmission planning also

desirable. Working knowledge of DlgSILENT is required with experience in use of GIS tools and Network Planner preferable. The expert will:

- (i) identify household and villages by GIS techniques and validate MEM/EDL data;
- (ii) prepare distribution load forecasts for the Provinces of Phongsaly, Luang Namtha, and Bokeo and adjacent bordering districts as required;
- (iii) conduct necessary load flows and power system analysis for distribution systems;
- (iv) with the power distribution expert conduct “Network Planner” optimization modelling for on-grid and off-grid electrification options; and
- (v) conduct power system studies reviewing options for network reinforcement from Long and/or Luang Namtha Substations including:
 - a. 22 kV primary reinforcement,
 - b. 115 kV transmission reinforcement to Maung Sing, and
 - c. consider impacts of existing 35/22 kV interconnection with China to Sing District; and
- (vi) prepare feasibility level report in collaboration with team members on the recommended strengthening approach including costs of various options.

12. **Solar power specialist (international, 1.5 person-months)** (Off-grid and solar home systems). The expert will preferably have a post-graduate degree in engineering or other relevant field, and at least 10 years of experience in solar photovoltaic engineering with the design, specification and installation of off-grid connected solar photovoltaic systems, and in power electric engineering with the design, specification, and implementation of middle and low voltage systems, including battery storage and SHS systems. The expert will:

- (i) review Lao PDR’s previous experiences with solar off-grid and SHS systems;
- (ii) prepare least-cost life-cycle generation options and analysis using Homer of solar/battery/hybrid off-grid options including SHS 20W–50W systems, pico 200 W to 5 kW and micro up to 200 kW typically including back up diesel, and hydro generation for micro and pico systems if viable;
- (iii) prepare cost estimates of options that may be adopted for single or multiple village application, for isolated communities of 2 or more households and for SHS;
- (iv) coordinate with the System Planning Expert and Power Distribution expert in “Network Planner” studies to optimize least-cost life-cycle selection of on-grid and on-grid solutions providing inputs to reports;
- (v) analyze existing solar off-grid systems that may be relocated, if in good condition, due to proposed upgrade to on-grid at the existing village location;
- (vi) work with the Procurement Specialist to prepare bidding documents for design, supply, installation and ongoing O&M of solar systems contracts for all subprojects; and
- (vii) provide skilled input to the design and documentation including assessment of tenders and selection of equipment.

13. **Energy economist (international, 1.5 person-months)**. The expert should preferably have a master’s degree in economics, or business administration with a minimum 10 years’ professional experience during which at least 3 power system economic analyses have been conducted based on ADB (or other multilateral development bank) guidelines for infrastructure projects. The expert will have experience in least-cost life-cycle distribution expansion plans. The expert will:

- (i) assess the economic benefits of the project including the impacts of energy imports/exports, current account deficit, and balance of payments;
- (ii) identify the risks, and undertake appropriate economic analysis of the project, following the ten key areas of economic analysis as provided for under the 2017 ADB Guidelines on the Economic Analysis of Projects (<https://www.adb.org/documents/guidelines-economic-analysis-projects>); and
- (iii) prepare a project framework that clearly identifies the proposed project's impact and outcomes.

14. **Financial analyst (international, 1.5 person-months).** The expert should preferably have a master's degree in finance or business administration, chartered accountant/certified public accountant or equivalent and a minimum of 15 years of professional experience, including in financial due diligence (FDD) and with power sector infrastructure projects. The expert will conduct FDD in accordance with ADB's requirements. Relevant guidance is available at <https://www.adb.org/about/financial-management-resources>. The FDD will include:

- (i) conducting a financial management assessment of the executing and implementing agencies, including:
 - a. assessing previous financial management assessments conducted by ADB or other agencies and, reviewing the results and ascertaining whether these can be used as input, (see the following guidance materials):
 - i. Technical guidance note (TGN) for Financial Management Assessment (2015),
 - ii. TGN (2015) for project financial reporting, and
 - iii. TGN (2014) for preparation of cost estimates, and eLearn module for cost estimates preparation and presentation;
 - b. assessing capacity for planning and budgeting, management and financial accounting, reporting, auditing, internal controls, and information systems
 - c. reviewing proposed disbursement and funds-flow arrangements, and
 - d. concluding on the financial management risk rating and identifying and confirming measures for addressing identified deficiencies;
- (ii) supporting the preparation and agreement of cost estimates and a financing plan, which are based on verifiable data and are sufficient to support project implementation;
- (iii) preparing financial projections and conducting financial analyses of the executing and implementing agencies, and incremental recurrent costs, to determine financial sustainability, and reviewing proposed cost-recovery and tariff policies, including affordability;
- (iv) conducting financial evaluations (financial cost-benefit analyses) including sensitivity analyses of project components that have a cost-recovery objective;
- (v) where significant risks are identified to project financial sustainability or viability, proposing relevant financial performance indicators to be incorporated in financial covenants; and
- (vi) assessing and reaching agreement on financial reporting, auditing and public disclosure arrangements for the project, and, as appropriate, identifying and

agreeing arrangements for receiving financial statements from executing and/or implementing agencies.

15. **Environmental safeguards specialist (international, 1.5 person-months).** The expert should preferably have a master's degree in environment science or engineering and at least 8 years of prior experience conducting environmental safeguards documentation. The specialist will:

- (i) assist the executing agency to carry out further investigations and analysis, as required, to prepare the: (a) Environmental Impact Assessment; and (b) Environmental Management Plan; in accordance with the guidance in ADB SPS 2009 and the requirements of the government of Lao PDR;
- (ii) co-ordinate with other TA consultants to optimize the alignment, design, construction, operation and maintenance proposals to minimize environmental impacts;
- (iii) ensure the project will meet the measures and standards set out in the EHS Guidelines on Electricity Power Transmission and Distribution (http://www.ifc.org/wps/wcm/connect/66b56e00488657eeb36af36a6515bb18/Fin_al+-+Electric+Transmission+and+Distribution.pdf?MOD=AJPERES);
- (iv) review identified potential climate and disaster risks and carry out a more detailed analyses of climate and disaster risk to identify project components that are vulnerable to climate change and disaster impacts and identify measures to ensure resilience in accordance with the *Guidelines for Climate Proofing Investment in the Energy Sector* (ADB, 2013) <https://www.adb.org/sites/default/files/institutional-document/33896/files/guidelines-climate-proofing-investment-energy-sector.pdf>; and
- (v) provide calculations of the 'incremental cost' (the cost over and above business as usual practice) of climate adaptation and climate mitigation measures.

16. **Biodiversity specialist (international, 1.5 person-months).** The expert should preferably have a master's degree in environment science or engineering, natural resources management, or related subjects. and at least 8 years of prior experience conducting environmental safeguards documentation. The specialist will:

- (i) undertake detailed biodiversity assessment of key habitats and species of project area of influence, taking account of seasonal variation;
- (ii) undertake consultation with key biodiversity stakeholders and experts (government, non-government, academic, local communities);
- (iii) assess potential impacts of the project on critical and natural habitats and associated species;
- (iv) ensure the project will meet the measures and standards set out in the EHS Guidelines on Electricity Power Transmission and Distribution (http://www.ifc.org/wps/wcm/connect/66b56e00488657eeb36af36a6515bb18/Fin_al+-+Electric+Transmission+and+Distribution.pdf?MOD=AJPERES);
- (v) provide a biodiversity chapter for the environmental impact assessment confirming if the criteria for project activities in areas of critical and natural habitats and legally protected areas are satisfied; and
- (vi) consult with the TA team, government and project stakeholders to agree on appropriate mitigation, monitoring and enhancement measures in accordance with ADB SPS 2009 with the overall aim of achieving a net gain in the biodiversity

values associated with the critical or natural habitat affected by the project activities.

17. **Social and resettlement specialist (international, 1.5 person-months).** The expert should preferably have a master's degree in social science or related subjects. The expert shall have a minimum 10 years of experience in social safeguard assessments of projects with extensive experience preparing resettlement and other social development plans in accordance with ADB/ World Bank/ International Finance Corporation guidelines. The expert will guide the preparation of and ensure quality assurance for the following:

- (i) social and poverty impacts assessment;
- (ii) community participation, land acquisition and resettlement plan, with community development and safety education plans for new areas to be electrified as required;
- (iii) Indigenous Peoples Plan if relevant and other documents to meet the social safeguards requirements of SPS 2009 and ADB good practice guidelines;
- (iv) ensure the consultants team is conversant on mobilization of cultural sensitivities and appropriate formalities in Lao society generally but also different hill tribes;
- (v) with the Environmental Safeguards Specialist undertake a capacity building workshop with the EDL Environmental Office; and
- (vi) supervise the work of a national specialist who will coordinate with Provincial Governments and implement the community consultation requirements in compliance with Lao PDR law and decrees.

18. The expert should ensure the executing agency/ implementing agency carry out meaningful consultation with affected people and assist as needed. The consultation processes will be appropriately documented in the safeguards documents (resettlement plan, Indigenous Peoples Plan, etc.). The expert should pay special attention to ensure that vulnerable groups, in particular ethnic hill tribes, have sufficient opportunities to participate in consultations.

19. **Gender specialist (international, 1 person-month).** The expert should preferably have a master's degree in social sciences or public administration (an additional degree in engineering will be an advantage) at least 8 years of prior experience conducting gender analysis. The expert should have formal training in gender analysis and gender planning and demonstrated experience, skills, and expertise in mainstreaming gender in infrastructure, especially in the energy sector, including in renewable energy systems. The expert should be familiar with the energy sector in the Asia and Pacific region, especially on issues of "vulnerability," "accessibility," and "affordability" related to energy resources and services. Experience in conducting primary gender research is needed. The expert should also be familiar with gender analysis tools and methodologies in the energy sector. The expert should have consulted for international or nongovernment organizations supporting gender and development work in the energy sector. She/he will be responsible for the following key tasks:

- (i) review ADB documents on the requirements for gender mainstreaming such as Policy on Gender and Development (1998), Operations Manual C2 on Gender and Development in ADB Operations (2010), and Guidelines for Gender Mainstreaming Categories of ADB Projects (2012);
- (ii) at the outset, agree with ADB and the executing agency on the intended gender category;
- (iii) as part of the poverty and social analysis, conduct a detailed gender analysis as guided by ADB's Gender and Energy Tool Kit, particularly emphasizing access to

- energy services and use of energy services and gender division of labor, control of energy sources and technologies, women's and men's energy needs and preferences, and opportunities for and constraints on women's participation;
- (iv) identify the socioeconomic profile of key stakeholder groups in the target population and disaggregate data by sex. Analyze the link between poverty and gender;
 - (v) assess and identify potential gender-differentiated measures and impacts of the project. Possible entry points may include: inclusion of user education programs (with targets for women's participation); connection costs for the households and affordability for poor and female-headed households; opportunities for women's employment as part of jobs generated through the project as well as opportunities to provide support to women in energy based income generating opportunities; and women's involvement in renewable energy solutions (e.g. in community operated and managed renewable based mini grids) as part of the assessment of various on-grid and off-grid options for ensuring a least-cost electrification planning approach;
 - (vi) collect sex-disaggregated baseline data that could be used to monitor potential project gender benefits and impacts;
 - (vii) assess and recommend key gender elements in mitigation measures (e.g., resettlement, HIV, trafficking in women);
 - (viii) identify government agencies, nongovernment and community-based organizations, and women's groups that can be utilized during project preparatory TA and project implementation. Assess their capacity.
 - (ix) review the related policy and legal framework, as necessary;
 - (x) based on gender analysis, develop a gender action plan (GAP) that mirrors the design and monitoring framework outputs and includes gender-inclusive design features, gender targets and indicators, time lines, assigned responsibilities, and implementation arrangements;
 - (xi) provide cost estimates for GAP implementation;
 - (xii) integrate GAP or gender design features in the project design and relevant project documents;
 - (xiii) prepare terms of reference for gender specialist services to implement GAP or project gender features, including for any nongovernment organizations to be recruited for implementation; and
 - (xiv) prepare other documentations related to gender required in the report and recommendation of the President (e.g., design and monitoring framework gender targets, implementation arrangements of the project administration memorandum, summary poverty reduction, and social strategy).

20. **Procurement specialist (international, 1.5 person-months).** The expert should have a bachelor's degree, or higher, in a related field and a minimum of 10 years' experience in power sector projects with 3 or more years on ADB (or other multilateral development bank) funded projects in procurement roles with preferably at least 2 ADB funded projects. The expert will work closely with the other technical specialists to prepare:

- (i) undertake project procurement risk assessment;
- (ii) undertake procurement capacity assessments of EDL;
- (iii) prepare a detailed procurement plan specifying packages, schedule and mode of procurement, and source of financing;
- (iv) provide guidance to the implementing agency(ies) and other team members in preparing bidding documents and technical specifications for contracts to be

funded by ADB according to ADB's Procurement Guidelines, with the aim of meeting the advance procurement and retroactive financing requirements for a project implementation consultant, minor goods and services (< \$100,000) and two or more Goods only and/or turnkey packages (> \$1.0 million);

- (v) undertake a thorough review of the contract packages identified for advance contracting to ensure alignment with ADB Procurement Policy and Regulations, EDL and national guidelines; and
- (vi) conduct a workshop in ADB procurement processes for EDL's Project Management Unit (2 days).

21. **Additional (or non-Key) positions.** Following is a list of suggested additional positions whose services may be required to address the terms of reference, and related person months of inputs. However, these are indicative and the firms may employ their own interpretation of the type and number of positions, and related person months.

- (i) Power Distribution Specialist (national, 5 person-months),
- (ii) Transmission and Substations Engineer (national, 3 person-months),
- (iii) GIS Specialist (national, 3 person-months),
- (iv) Environmental Safeguards Specialist (national, 3 person-months),
- (v) Social and Resettlement Specialist (national, 3 person-months), and
- (vi) Translator/Administrator (national, 8 person-months).

22. **Energy analyst (international, 12 person-months).** An individual consultant will be engaged for this position. The analyst is meant to support all the other experts by conducting background research, undertaking analysis, developing and finalizing sections of reports, and maintaining a database of reference material. The candidate will preferably have (i) a master's degree in a related discipline, (ii) prior experience with energy sector programs and international development, and (iii) at least 3 years of relevant professional experience, preferably with experience in at least one Southeast Asian country. The analyst will report to the ADB Project Officer and be based in ADB's offices in Bangkok.

C. Reporting Requirements

23. The following reports will be delivered based on the schedule in Table 1. All deliverables will be in English language and should be attached with a draft summary report in Lao. All safeguard documents should also be translated to Lao.

Table: Summary of Major Outputs and Activities

Major Outputs	Delivery Dates	Key Activities with Milestones
1. Feasibility study on transmission and distribution projects prepared	July 2018	<p>1.1 Inception report detailing current state of transmission and distribution infrastructure in project areas, TA implementation schedule, review of safeguards compliance issues, and other issues that need resolution. February 2018 (6 weeks from mobilization).</p> <p>1.2 Draft FS report including: technical feasibility assessment, financial and economic analysis, social and environmental due diligence including gender analysis, project procurement risk</p>

Major Outputs	Delivery Dates	Key Activities with Milestones
		assessment, and project procurement plan. May 2018 (16 weeks from mobilization). 1.3 Final FS report including incorporation of feedback from ADB and EDL. July 2018 (24 weeks from mobilization).
2. Least-cost electrification analysis prepared	May 2018	2.1 Report on least-cost life-cycle geospatial analysis for electrification using on-grid and off-grid solutions (including renewables, mini-grids, battery storage, and SHS) with optimal solutions identified. May 2018 (16 weeks from mobilization). 2.2 Investment plan for electrification options, assessing contributions of P2P and output based aid grant funding. May 2018 (16 weeks from mobilization).
3. Front-end engineering design and bidding documents prepared	August 2018	3.1 Technical engineering concept design of transmission and distribution systems and cost estimates. May 2018 (16 weeks from mobilization). 3.2 Draft procurement documents. May 2018 (16 weeks from mobilization) 3.3 Final procurement documents including incorporation of feedback from ADB and EDL. August 2018. (28 weeks from mobilization).

ADB = Asian Development Bank, EDL = Electricite du Laos, FS = feasibility study, P2P = Power to the poor program, SHS = solar home system, TA = technical assistance