Technical Assistance Report

Project Number: 51329-002
Transaction Technical Assistance (TRTA)
November 2017

Lao People's Democratic Republic: Preparing the Northern Cross-Border Power Trade and Distribution Project

CURRENCY EQUIVALENTS

(as of 15 November 2017)

Currency unit	–	kip (LAK)
KN1.00	=	$0.00012
$1.00	=	KN8,311.50

ABBREVIATIONS

ADB	–	Asian Development Bank
EDL	–	Electricite du Laos
GMS	–	Greater Mekong Subregion
Lao PDR	–	Lao People's Democratic Republic
SHS	–	solar home system
TRTA	–	transaction technical assistance

NOTE

In this report, "$" refers to United States dollars.

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CONTENTS

TRANSACTION TECHNICAL ASSISTANCE AT A GLANCE

1. Basic Data — **Project Number:** 51329-002

Project Name	Northern Cross-Border Power Trade and Distribution Project	**Department /Division**	SERD/SEEN
Nature of Activity	Project Preparation	**Executing Agency**	Electricite du Laos
Modality	Regular		
Country	LAO		

2. Sector	**Subsector(s)**	**ADB Financing ($ million)**
✓ Energy	Electricity transmission and distribution	0.80
	Total	**0.80**

3. Strategic Agenda	**Subcomponents**	**Climate Change Information**	
Inclusive economic growth (IEG)	Pillar 2: Access to economic opportunities, including jobs, made more inclusive	Climate Change impact on the Project	Medium
Environmentally sustainable growth (ESG)	Global and regional transboundary environmental concerns		
Regional integration (RCI)	Pillar 1: Cross-border infrastructure		

4. Drivers of Change	**Components**	**Gender Equity and Mainstreaming**	
Governance and capacity development (GCD)	Client relations, network, and partnership development to partnership driver of change	Some gender elements (SGE)	✓
Partnerships (PAR)	Implementation Regional organizations South-South partner		
Private sector development (PSD)	Public sector goods and services essential for private sector development		

5. Poverty and SDG Targeting		**Location Impact**	
Geographic Targeting	No	Nation-wide	High
Household Targeting	Yes		
SDG Targeting	Yes		
SDG Goals	SDG7		

6. Risk Categorization Low

7. Safeguard Categorization Safeguard Policy Statement does not apply

8. Financing

Modality and Sources	Amount ($ million)
ADB	**0.80**
Transaction technical assistance: Technical Assistance Special Fund	0.80
Cofinancing	**0.00**
None	0.00
Counterpart	**0.00**
None	0.00
Total	**0.80**

I. THE ENSUING PROJECT

1. The proposed Northern Cross-Border Power Trade and Distribution Project aims to promote regional power exchange in the Greater Mekong Subregion (GMS) and expand access to energy in several northern provinces in the Lao People's Democratic Republic (Lao PDR). The project will help address Lao PDR's need to: (i) expand access to low-cost, reliable power in rural areas; and (ii) develop power interconnections between Lao PDR and Thailand and Myanmar to increase power trade. The project will support the national electric utility, Electricite du Laos (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; and (ii) cross-border transmission line(s) connecting Lao PDR with Thailand and/or Myanmar constructed. The outcome will be domestic electricity consumption and cross-border electricity trade increased. The impact will be Lao PDR graduated from least developed country status, as stated in the Vision 2030 and National Ten-Year Socio-Economic Development Strategy, 2016–2025.[1] The indicative amounts of the proposed project are (i) $24.4 million in concessional ordinary capital resources lending funds, (ii) $3.0 million in grant resources from the Asian Development Fund,[2] and (iii) $10.0 million from the Government of Lao PDR. The project and this transaction technical assistance (TRTA) are included in the country operations business plan, 2018–2020 for Lao PDR.

II. THE TECHNICAL ASSISTANCE

A. Justification

2. In recent years, Lao PDR has seen tremendous growth in economic development, averaging 7.6% from 2010–2016. Poverty has been reduced from 46% in 1992/93 to 23% in 2013. The energy sector has been a major contributor to the country's development. As the "battery of Southeast Asia," Lao PDR's hydropower development and electricity exports have been a critical source of revenue for the country. In 2016, electricity accounted for 21% of the country's exports.[3] At the same time, the government's effort to expand access to electricity within its borders has led to the early achievement of its target of 90% electrification by 2020. Currently, 92% of households have access to electricity through an on-grid connection, off-grid system or solar home system (SHS).[4] The government has since reset its objective to 95% electrification by 2020.

3. Despite the government's achievements, challenges remain in the energy sector. EDL's fragmented transmission and distribution system does not yet cover the entire country. As a result, there is great disparity in electrification rates between urban and rural areas. For example, regional data from 2015 shows that northern provinces of Bokeo, Luang Namtha, and Phongsaly had a combined electrification rate of 73% of households, with Phongsaly province alone at 46%, while Vientiane had reached over 99%.[5] Poverty remains high in these provinces, with an estimated 24% of households classified as poor in 2013, compared with 5.9% in Vientiane.[6] Unconnected rural households must choose between expensive off-grid electricity (primarily diesel) or none at all. However, the government realizes that expanding access to the few

[1] Government of the Lao People's Democratic Republic, Ministry of Planning and Investment. 2016. *Vision 2030 and National Ten-Year Socio-Economic Development Strategy, 2016–2025*. Vientiane.
[2] The ADF grant resources will be funded from Disaster Risk Reduction grant financing.
[3] ADB. 2017. *Country Partnership Strategy, Lao People's Democratic Republic, 2017–2020: More Inclusive and Sustainable Economic Growth*. Manila.
[4] EDL. 2017. *Electricity Statistics 2016*. Vientiane.
[5] Ministry of Energy and Mines (2014).
[6] Government of the Lao People's Democratic Republic, Ministry of Planning and Investment. 2014. *Poverty Profile in Lao PDR: Poverty Report for the Lao Consumption and Expenditure Survey, 2012–2013*. Vientiane.

remaining unconnected households via grid connection may not be economically feasible. Therefore, the Asian Development Bank (ADB) recommends a least-cost electrification approach, whereby alternative options, such as renewable-based mini grids, battery storage, and SHS will be evaluated along with grid extension.

4. The lack of a unified national electricity grid also contributes to increased system losses and affects reliability of supply. The current grid capacity is insufficient to meet peak demand in urban centers or keep up with growing demand. In addition, Lao PDR's reliance on hydropower leads to seasonal imbalances: during the wet season, hydropower is abundant and EDL has excess capacity; during the dry season, EDL experiences shortages of supply and must import power. Regional power trade can solve these imbalances and support expanded access in neighboring countries, benefiting the GMS as a whole.

5. The government's objectives are to further reduce poverty and alleviate fiscal sensitivities. In its Vision 2030 and National Ten-Year Socio-Economic Development Strategy, 2016–2025 (footnote 1), operationalized in the Eighth National Socio-Economic Development Plan, 2016–2020[7], the government targets Lao PDR's graduation from least-developed country status by 2025 through sustainable and inclusive development. Thus, improving electrification to households in rural areas and adding to the hydropower export capacity are two critical governmental objectives.

6. ADB has provided extensive support to the development of Lao PDR's electricity infrastructure since 1992 through several projects focused on generation and transmission and distribution. ADB's ongoing GMS Northern Power Transmission Project,[8] nearing completion, is extending 115-kilovolt transmission lines and distribution systems in Xaiyabuli, Phongsaly, and Vientiane provinces, and supporting an interconnection with the Electricity Generating Authority of Thailand–Provincial Electricity Authority system.

7. Building on this experience, the proposed Northern Cross-Border Power Trade and Distribution Project will support 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 to reach approximately 31% of the unserved households in the three provinces; and (ii) cross-border transmission line(s) connecting Lao PDR with Thailand and/or Myanmar constructed. Support for the project was requested by the government of Lao PDR in 2016. A scoping mission carried out in February–March 2017 reviewed the government's request and reached an understanding with the government, EDL and the Ministry of Energy and Mines on the scope of the proposed TRTA to prepare the project.

8. The proposed TRTA will help the government to identify all project components and prepare the project through 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.[9]

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[7] Government of the Lao People's Democratic Republic, Ministry of Planning and Investment. 2016. *Eighth Five-Year National Socio-Economic Development Plan, 2016–2020*. Vientiane.

[8] ADB. 2009. *Report and Recommendation of the President to the Board of Directors: Proposed Asian Development Fund Grant to the Lao People's Democratic Republic for the Greater Mekong Subregion Northern Power Transmission Project*. Manila.

[9] The TRTA first appeared in the business opportunities section of ADB's website on 25 October 2017.

9. Project due diligence will (i) evaluate the feasibility of one or more high-voltage cross-border connections between Lao PDR and Thailand and/or Myanmar, consisting of the following options:

(a) from Ban Tonpheng (Bokeo Province, Lao PDR) to Mea Chan (Thailand),
(b) from Ban Tonpheng (Bokeo Province, Lao PDR) to Shan State (Myanmar), and
(c) from Meung Long (Luang Namtha, Lao PDR) to Shan State (Myanmar);

(ii) conduct a system study of cross-border interconnector options of 115/230/500 kilovolt as may be determined and evaluate the feasibility of using high-temperature low-sag conductors; (iii) determine the optimal combination of on-grid and/or off-grid solutions for rural electrification in three northern provinces (Luang Namtha, Bokeo, and Phongsaly) through a least-cost electrification planning approach; and (iv) develop an investment plan for the various electrification options.

10. To optimize the financial and economic benefits of rural electrification requires a "least-cost" analysis approach in which all options are considered and the optimized solution provided to the subject remote community and households. Least-cost analysis includes (i) streamlining policy, management and implementation mechanisms; (ii) review of existing on-grid distribution practices to minimize distribution line costs; and (iii) review of off-grid solutions optimizing least-cost generation, power line distribution, and connections as required. Options to be reviewed include extension of the grid through 3-phase and 1-phase systems including single wire earth return, off-grid mini (>25 kilowatts) and micro (2 kilowatts–25 kilowatts) systems, and SHS (50–100 watts). According to the Ministry of Energy and Mines data, most villages requiring electrification by 2020 average less than 60 households and thus fall into the mini-grid range. Villages and households can be identified and aggregated through geographic information system techniques and software tools such as Homer can determine optimal off-grid generation options. Network Planner software uses the geographic information system data, load data, and optimized generation source data to determine the least-cost supply: be that on-grid or off-grid. This analysis is a financial approach to least-cost and must include asset life-cycle. Load flow studies using DIgSILENT will be used to optimize grid connected distribution.

11. A least-cost electrification plan supports effective communication with sources of funds enabling alignment of electrification projects to available funding, including public funding from the government via subsidies, EDL, international funding agencies, private investment, or public-private partnerships. For the project, government contributions through the Power to the Poor program of subsidies to low-income households and other potential sources of funding, such as ADB's output based aid grants, will be assessed during project preparation.

B. Outputs and Activities

12. The major outputs and activities are summarized in Table 1.

Table 1: 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	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

Major Outputs	Delivery Dates	Key Activities with Milestones
		resolution. February 2018 (6 weeks from mobilization) 1.2 Draft FS report including: technical feasibility assessment, financial and economic analysis, social and environmental due diligence including gender analysis, project procurement risk 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
Source: Asian Development Bank estimates.

C. Cost and Financing

13. The TRTA is estimated to cost $880,000, of which $800,000 will be financed on a grant basis by ADB's Technical Assistance Special Fund (TASF 6). The key expenditure items are listed in Appendix 1.

14. The government will provide counterpart support in the form of office space, communication facilities, and other in-kind contributions. The government was informed that approval of the TA does not commit ADB to finance any ensuing project.

D. Implementation Arrangements

15. ADB will administer the TRTA. The Energy Division of the Southeast Asia Department will select, supervise and evaluate consultants, and organize workshops.

Table 2: Implementation Arrangements

Aspects	Arrangements		
Indicative implementation period	January 2018–December 2019		
Executing agency	Electricite du Laos		
Implementing agencies	Electricite du Laos		
Consultants	To be selected and engaged by ADB		
	Quality- and cost-based selection (90:10)	42.5 person-months	$720,000
	Individual consultant selection	12 person-months	$80,000
Procurement	Survey, workshop, report and communication services are to be procured by consultants based on prior approval of the ADB TASU.		
Advance contracting	Advance contracting will be used for recruitment of consultants.		
Disbursement	The technical assistance resources will be disbursed following ADB's *Technical Assistance Disbursement Handbook* (2010, as amended from time to time).		
Asset turnover or disposal arrangement upon TRTA completion	All goods, if any, purchased under the TRTA will be turned over to the executing agency upon completion of the TRTA		

ADB = Asian Development Bank; TRTA = transaction technical assistance; TASU = technical assistance supervising unit.
Source: Asian Development Bank estimates.

16. **Consulting services.** 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 safeguards compliance documents; and least-cost electrification planning. One contract package for $720,000 will be used to recruit a firm through quality- and cost-based selection with a simplified technical proposal. The individual consultant will be recruited using individual consultant selection, for a contract package totaling $80,000. Each contract package will be a time-based contract. 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/Staff Instructions on Business Processes for TRTA.[10]

E. Governance

17. Capacities of the executing agency on financial management assessments, procurement capacity assessment, risk assessment and management, and integrity due diligence will be assessed.

[10] Terms of Reference for Consultants (accessible from the list of linked documents in Appendix 2).

APPENDIX 1: COST ESTIMATES AND FINANCING PLAN

($'000)

Item	Amount
A. **Asian Development Bank**[a]	
1. Consultants	
a. Remuneration and per diem	
i. International consultants	390.1
ii. National consultants	166.2
b. Out-of-pocket expenditures	
i. International and local travel	85.6
2. Surveys	20.0
3. Workshops and consultations	10.0
4. Reports and communications	5.0
5. Miscellaneous administration and support costs[b]	90.0
6. Contingencies	33.1
Total	**800.0**

Note: The technical assistance (TA) is estimated to cost $880,000, of which contributions from the Asian Development Bank are presented in the table above. The government will provide counterpart support in the form of counterpart staff, office space, and other in-kind contributions. The value of government contribution is estimated to account for 9% of the total TA cost.

[a] Financed by the Asian Development Bank's Technical Assistance Special Fund (TASF 6).

[b] To include provision of $80,000 for the direct hire of a consultant (Energy Analyst) to support the project.

Source: Asian Development Bank estimates.

APPENDIX 2: LIST OF LINKED DOCUMENTS

http://www.adb.org/Documents/LinkedDocs/?id=51329-002-TAReport

1. Terms of Reference for Consultants