



# Completion Report

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Project Number: 31341  
Loan Number: 2005-LAO(SF)  
June 2011

## Lao People's Democratic Republic: Northern Area Rural Power Distribution Project

## CURRENCY EQUIVALENTS

Currency Unit – kip (KN)

		<b>At Appraisal</b>	<b>At Project Completion</b>
		31 July 2003	23 June 2010
KN1.00	=	\$0.000095	\$0.00012
\$1.00	=	KN10,570	KN8,262

## ABBREVIATIONS

ADB	–	Asian Development Bank
E&SMO	–	Environmental and Social Management Office
EDL	–	Electricite du Laos
EIRR	–	economic internal rate of return
EMP	–	environmental management plan
FIRR	–	financial internal rate of return
IEE	–	initial environmental examination
IPP	–	independent power producer
Lao PDR	–	Lao People's Democratic Republic
NDF	–	Nordic Development Fund
O&M	–	operation and maintenance
PCR	–	project completion report
PMU	–	project management unit
RRP	–	report and recommendation of the President
SDR	–	special drawing right
TA	–	technical assistance
WACC	–	weighted average cost of capital

## WEIGHTS AND MEASURES

ha (hectare)	–	10,000 square meters
km (kilometer)	–	1,000 meters
kV (kilovolt)	–	1,000 volts
kWh (kilowatt-hour)	–	1,000 watt-hours

## NOTES

- (i) The fiscal year (FY) of the Government of the Lao People's Democratic Republic ends on 30 September. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY2010 ends on 30 September2010.
- (ii) In this report, "\$" refers to US dollars.

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## CONTENTS

	<b>Page</b>
BASIC DATA	I
PROJECT MAP	V
I. PROJECT DESCRIPTION	1
II. EVALUATION OF DESIGN AND IMPLEMENTATION	1
A. Relevance of Design and Formulation	1
B. Project Outputs	2
C. Project Costs	3
D. Disbursements	4
E. Project Schedule	4
F. Implementation Arrangements	5
G. Conditions and Covenants	6
H. Related Technical Assistance	6
I. Consultant Recruitment and Procurement	7
J. Performance of Consultants, Contractors, and Suppliers	8
K. Performance of the Borrower and the Executing Agency	9
L. Performance of the Asian Development Bank	9
III. EVALUATION OF PERFORMANCE	10
A. Relevance	10
B. Effectiveness in Achieving Outcome	11
C. Efficiency in Achieving Outcome and Outputs	11
D. Preliminary Assessment of Sustainability	12
E. Impact	13
IV. OVERALL ASSESSMENT AND RECOMMENDATIONS	14
A. Overall Assessment	14
B. Lessons	15
C. Recommendations	15
APPENDIXES	
1. Project Framework	16
2. Summary Report of Impact Mitigation for Nam Song and Nam Leuk	19
3. Estimated and Actual Project Costs	25
4. Summary of Annual Projection and Actual Disbursement	26
5. Actual Implementaion versus Original Schedule	27
6. Project Management Unit - Organizational Chart	28
7. Status of Compliance with Loan Covenants	29
8. Summary of Contracts	35
9. Chronology of Key Events	36
10. Electrification and Energy Consumption Statistics	40
11. Recalculation of Financial and Economic Viability	43
12. Summary Report of the Safeguard Policies Implementation	50
13. Overall Project Assessment	56

## BASIC DATA

### A. Loan Identification

1.	Country	Lao People's Democratic Republic (Lao PDR)
2.	Loan Number	2005-LAO(SF)
3.	Project Title	Northern Area Rural Power Distribution Project
4.	Borrower	Lao PDR
5.	Executing Agency	Electricite du Laos (EDL)
6.	Amount of Loan	
	- Original Loan Amount	SDR21,491,000 (\$30,000,000 equivalent)
	- Net Loan Amount	SDR20,903,365 (\$31,571,662 equivalent)
7.	Project Completion Report Number	PCR: LAO 1242

### B. Loan Data

1.	Appraisal	
	– Date Started	24 February 2003
	– Date Completed	7 March 2003
2.	Loan Negotiations	
	– Date Started	16 July 2003
	– Date Completed	17 July 2003
3.	Date of Board Approval	18 September 2003
4.	Date of Loan Agreement	9 December 2003
5.	Date of Loan Effectiveness	
	– In Loan Agreement	8 March 2004
	– Actual	8 March 2004
	– Number of Extensions	0
6.	Closing Date	
	– In Loan Agreement	30 September 2008
	– Actual	23 June 2010
	– Number of Extensions	3
7.	Terms of Loan	
	– Interest Rate	1.0% during grace period and 1.5% during principal amortization
	– Maturity	32 years
	– Grace Period	8 years
8.	Terms of Relending	
	– Interest Rate	3% during 2004–2005, 6% in 2006 and thereafter
	– Maturity	20 years
	– Grace Period	5 years
	– Second-Step Borrower	EDL

## 9. Disbursements

## a. Dates

<b>Initial Disbursement</b>	<b>Final Disbursement</b>	<b>Time Interval</b>
5 April 2005	14 May 2010	61 months
<b>Effective Date</b>	<b>Original Closing Date</b>	<b>Time Interval</b>
8 March 2004	30 September 2008	55 months

## b. Amount SDR20,903,365 (\$31,571,662 equivalent)

<b>Cat. No.</b>	<b>Category or Subloan</b>	<b>Original Allocation</b>	<b>Partial Cancellation</b>	<b>Last Revised Allocation</b>	<b>Amount Disbursed</b>	<b>Undisbursed Balance</b>
(1)	(2)	(3)	(4=3-5)	(5)	(6)	(7=5-6)
01A	Equip and install 115 kV transmission lines	11,737,000	1,272,446	10,464,554	10,464,554	0
01B	Supply materials and equipment	6,744,000	(3,014,919)	9,758,919	9,758,919	0
01C	Clear unexploded ordnance	1,592,000	1,592,000	0	0	0
02	Consulting services	258,000	(25,528)	283,528	283,528	0
03	Interest charge	486,000	89,636	396,364	396,364	0
04	Unallocated	674,000	674,000	0	0	0
<b>Total (SDR)</b>		<b>21,491,000</b>	<b>587,635</b>	<b>20,903,365</b>	<b>20,903,365</b>	<b>0</b>
<b>Total (\$ equivalent)</b>		<b>30,000,000</b>	<b>867,326</b>	<b>31,571,662</b>	<b>31,571,662</b>	<b>0</b>

(-) = negative, kV = kilovolt, SDR = special drawing right

## 10. Local costs (financed by the Asian Development Bank)

- Amount (\$ million)	8.80
- Percent of local costs	35%
- Percent of total cost	14%

## C. Project Data

## 1. Project Cost (\$ million)

<b>Cost</b>	<b>Appraisal Estimate</b>	<b>Actual</b>
Foreign exchange cost	35.90	38.26
Local currency cost	15.61	25.13
<b>Total</b>	<b>51.51</b>	<b>63.39</b>

## 2. Financing Plan (\$ million)

<b>Cost</b>	<b>Appraisal Estimate</b>	<b>Actual</b>
<b>Implementation Cost</b>		
Borrower financed	11.51	15.25
ADB financed (including IDC)	30.00	31.57
NDF financed	10.00	16.57
<b>Total</b>	<b>51.51</b>	<b>63.39</b>
<b>Interest during construction</b>		
Borrower financed	3.39	6.07
ADB financed	0.68	0.61
<b>Total</b>	<b>4.07</b>	<b>6.68</b>

ADB = Asian Development Bank, IDC = interest during construction, NDF = Nordic Development Fund.

## 3. Cost Breakdown by Project Component (\$ million)

Component	Appraisal Estimate	Actual
<b>A. Base Cost</b>		
1. Civil works <sup>a</sup>	23.04	35.41
2. Materials and equipment <sup>b</sup>	10.80	14.15
3. Miscellaneous works <sup>c</sup>	0.26	2.45
4. Consulting services for project implementation	3.10	3.48
5. Other consulting services <sup>d</sup>	0.40	0.36
<b>Subtotal</b>	<b>37.60</b>	<b>55.85</b>
<b>B. Contingencies</b>		
1. Physical	3.47	0
2. Price contingencies	5.39	0
<b>Subtotal</b>	<b>8.86</b>	<b>0</b>
<b>C. Interest During Construction</b>	4.07	6.68
<b>D. Taxes and Duties</b>	0.98	0.85
<b>Total</b>	<b>51.51</b>	<b>63.39</b>

<sup>a</sup> Civil works included turnkey contracts and installation contracts (transmission lines, substations, construction of medium- and low-voltage systems, unexploded ordnance clearance, and mitigation works for the Nam Song and Nam Leuk hydropower projects).

<sup>b</sup> Including purchasing of vehicles.

<sup>c</sup> Including compensation, administration, and construction of service center offices.

<sup>d</sup> Consulting services for independent power producer development.

## 4. Project Schedule

Item	Appraisal Estimate <sup>a</sup>	Actual
Date of contract with implementing consultants	October 2003	March 2004
Date of contract with IPP consultants		January 2005
Completion of engineering designs	September 2004	July 2004
Civil works contract – transmission (including UXO)		
Date of award	August 2005	December 2005
Completion of work	March 2008	December 2009
Civil works contract – substations (including UXO)		
Date of award	August 2005	July 2005
Completion of work <sup>b</sup>	March 2008	April 2008
Medium- and low-voltage distribution systems		
Date of award—various dates (8 lots)	January 2006	August 2005
Completion of equipment installation	March 2008	December 2008
Start of operations		
Completion of tests and commissioning	June 2007	December 2009
Beginning of start-up	March 2008	December 2009
Other milestones		
1. Additional materials and equipment for medium- and low-voltage distribution systems procured under loan savings		
Date of award		November 2009
Delivery of materials and equipment		March 2010
2. Environmental and social impact mitigation work for Nam Song and Nam Leuk hydropower projects		
Date of award		June 2007
Completion of work		February 2010

IPP = independent power producer, UXO = unexploded ordnance.

<sup>a</sup> Dates are as indicated in the report and recommendation of the President (Northern Area Rural Power Distribution Project, August 2003) and project administration manual.

<sup>b</sup> The substation works were substantially completed but final commissioning was delayed until December 2009 due to late completion of transmission works.

## 5. Project Performance Report Ratings

Implementation Period	Ratings	
	Development Objectives	Implementation Progress
From 8 March 2004 to 31 December 2004	Satisfactory	Satisfactory
From 1 January 2005 to 31 December 2005	Satisfactory	Satisfactory
From 1 January 2006 to 31 December 2006	Satisfactory	Satisfactory
From 1 January 2007 to 31 December 2007	Satisfactory	Satisfactory
From 1 January 2008 to 31 December 2008	Satisfactory	Satisfactory
From 1 January 2009 to 31 December 2009	Satisfactory	Satisfactory
From 1 January 2010 to 23 June 2010	Satisfactory	Satisfactory

**D. Data on Asian Development Bank Missions**

Name of Mission	Date	No. of Persons	No. of Person-Days <sup>b</sup>	Specialization of Members <sup>a</sup>
Appraisal mission	24 Feb–7 Mar 03	5	65	a, b, c, d, e
Inception mission	22–26 Mar 04	4	20	a, e, f, g
Review mission	11–21 Sep 04	4	44	a, g, i
Review mission	17–19 May 05	5	15	a, b, e, g
Review mission	18–21 Nov 05	2	8	a, f
Review and handover mission	3–10 May 06	5	40	a, f, g, i, j
Review mission	21 Nov–1 Dec 06	4	44	e, g, i, j
Review mission	22 Jun–5 Jul 07	3	45	e, g, j
Joint review mission ADB–NDF	19–21 Sep 07	4	12	e, g, h, j
Joint review mission ADB–NDF	24–27 Jun 08	3	12	e, h, k
Review mission	11–19 Dec 08	2	18	e, k
Joint review mission ADB–NDF	18–26 Mar 09	4	36	e, h, k
Review mission	9–20 Nov 09	3	36	e, i, k
Review mission	22 Mar–1 Apr 10	6	66	e, g, i, k, l
Project completion review mission <sup>c</sup>	7–21 Oct 10	3	45	e, g, k

ADB = Asian Development Bank, NDF = Nordic Development Fund.

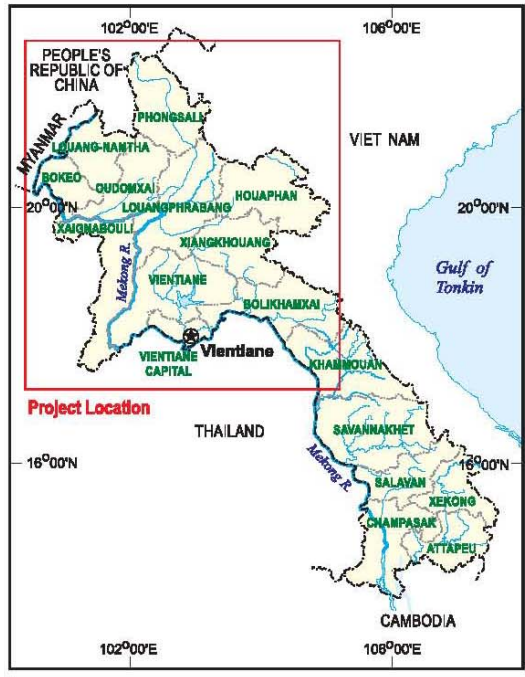
<sup>a</sup> a = energy sector specialist or economist, b = financial analyst, c = poverty reduction specialist, d = counsel, e = project implementation officer, f = associate project analyst, g = assistant project analyst, h = NDF officer, i = resettlement specialist, j = project specialist, k = portfolio management specialist, l = environmental consultant.

<sup>b</sup> Mission person-days estimated from aide-mémoire.

<sup>c</sup> The project completion report was prepared by Phoxay Phommachanh, project officer (energy) and mission leader; and Thipphasone Donekhamyoy, associate project analyst; assisted by consultant (an energy economist).



# Project Map



- Project Electrification Area
  - National Capital
  - Provincial Capital
  - City/Town
  - 115 kV Substation (existing/under construction)
  - 115 kV Project Substation
  - Hydropower Station (existing)
  - 115 kV Transmission Line (existing/under construction)
  - 115 kV Project Transmission Line
  - Road
  - River
  - Provincial Boundary
  - International Boundary
- Boundaries are not necessarily authoritative.

This map was produced by the cartography unit of the Asian Development Bank. The boundaries, colors, denominations, and any other information shown on this map do not imply, on the part of the Asian Development Bank, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries, colors, denominations, or information.

## **I. PROJECT DESCRIPTION**

1. The Government of the Lao People's Democratic Republic (Lao PDR) aimed to raise the electrification ratio from 34% in 2003 to 70% by 2010. To help the government in achieving this target, Electricite du Laos (EDL), the project executing agency, planned to supply electricity to 270,000 households in all regions of the country. The northern region of the country has the poorest provinces with only basic infrastructure and had not benefited from economic growth as much as the other regions. The objectives of the Northern Area Rural Power Distribution Project therefore were to (i) extend the electricity transmission and distribution system in the northern rural areas to provide electricity to rural low-income communities so as to improve their living standards and economic condition, and (ii) help the government restructure the power sector while also strengthening EDL's project management capacity and operational efficiency.<sup>1</sup>

2. The project scope included (i) reinforcing and extending the high-voltage (115 kilovolt [kV]) transmission systems; (ii) constructing associated medium-voltage (34.5 kV/22.0 kV) and low-voltage (400 volt [V]) distribution systems; and (iii) providing consulting services to help EDL in detailed project design, implementation, supervision, and other capacity building activities. The project impact area, as shown in the project map, includes the northern provinces of Louang Namtha, Louang Phrabang, Oudomxai, Vientiane, Xaignabouli, and Xiang Khouang.

## **II. EVALUATION OF DESIGN AND IMPLEMENTATION**

### **A. Relevance of Design and Formulation**

3. The project design was highly relevant to the government's objective and the Lao PDR country strategy and program<sup>2</sup> of the Asian Development Bank (ADB) that aimed to promote sustainable economic growth and development in the Lao PDR through infrastructure investments. Since most poor people live in rural areas and depend on agriculture, rural development is critical to sustaining economic growth and reducing poverty. Rural electrification development throughout the country is intended to increase consumer productivity, and economic opportunities focused on infrastructure improvements (such as roads and irrigation systems) will also be available or developed simultaneously. The government agreed that ADB assistance should focus on the poorest northern provinces using an integrated approach to reinforce its other infrastructure projects, thereby maximizing efforts to reduce poverty and foster economic development.

4. By the time of appraisal, ADB had already provided more than \$230 million in loans and technical assistance (TA) for power development, and planned to continue to help the power sector, emphasizing rural electrification development. The project provided not only rural electrification development but also consulting services to assist the government in promoting independent power producer (IPP) development, and institutional support to EDL to help in establishing a socioeconomic survey unit within EDL's existing socio-environmental division.

5. The project was formulated based on the National Power System Master Plan<sup>3</sup> and the project preparatory TA.<sup>4</sup> The lessons from the previous ADB-financed project<sup>5</sup> implemented in

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<sup>1</sup> ADB. 2003. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the Lao People's Democratic Republic for the Northern Area Rural Power Distribution Project*. Manila.

<sup>2</sup> ADB. 2002. *Country Strategy and Program (updated annually from 2003 to 2005)*. Manila

<sup>3</sup> Government of Lao PDR, Ministry of Energy and Mines, Department of Electricity. *National Power System Master Plan (prepared in 1999 by Nippon Koei - Japan)*. Vientiane

<sup>4</sup> ADB. 2002. *Northern Area Rural Power Distribution Project Preparatory TA*. Consultant's report. Manila.

the adjacent northern provinces—such as use of advance recruitment of project implementing consultants prior to loan effectiveness and establishing financial covenants (assuming that the government and/or EDL would be able to comply with them over the duration of the project)—were taken into account.

6. The project formulation proved to be sufficiently flexible to address changing circumstances. At the time of project commencement, many project villages had already been electrified or were in the process of being electrified by the private sector. Accordingly, a supplementary socioeconomic survey for the 193 new villages was performed by the project implementing consultants to identify villages for electrification.

## **B. Project Outputs**

7. The expected outputs at appraisal were substantially achieved. The major outputs are described below. A matrix of the project framework compares expected versus actual outputs (Appendix 1).

8. **Extension of 115 kV transmission lines.** The project completed 268.3 kilometers (km) of 115 kV transmission lines. This consisted of (i) 5.1 km from Nam Ngum to Thalat, (ii) 40.8 km from Hin-Heup to Vang Vieng, (iii) 86.9 km from Louang Phrabang to Pak Mong, (iv) 51.8 km from Pak Mong to Oudomxai, (v) 41.0 km from Oudomxai to Nam, and (vi) 42.7 km from Nam to Louang Namtha. The length of transmission line completed is 34.7 km shorter than estimated because a shorter route from Louang Phrabang to Oudomxai was used.

9. **Construction of 115 kV, 34.5 kV, and 22 kV substations.** The component included three new substations (Hin-Heup, Louang Namtha, and Oudomxai) and four substation extensions (Louang Phrabang, Nam Ngum 1, Thalat, and Vang Vieng), which was fully achieved. The scope was extended—by completing one additional new substation (Pak Mong substation), and purchasing additional equipment to reinforce the Louang Phrabang and Vang Vieng substations—by way of variation order using an additional loan from the Nordic Development Fund (NDF). Upgrading and extending the Vang Vieng substation was also partly financed by ADB loan savings (\$640,000).

10. **Erection of new medium- and low-voltage distribution facilities and household connections.** The target was fully achieved and exceeded. This included (i) 1,150 km of medium-voltage distribution lines and 544 sets of distribution transformers (originally 796 km and 237 sets), (ii) 662 km of low-voltage distribution lines (originally 609 km), and (iii) connection of 32,830 households in 570 villages (originally 33,800 households in 342 villages). Most of the targets were exceeded mainly because (i) three additional supply contracts for materials and equipment for distribution systems were procured under the ADB loan savings; (ii) there was a major change in project scope, which also covered the cost of upgrading and extending the Vang Vieng substation; and (iii) there were additional costs for mobilization and demobilization of the substation contractor.

11. **Unexploded ordnance.** Unexploded ordnance was cleared and incorporated within the respective transmission and substation contracts.

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<sup>5</sup> ADB. 2005. *Completion Report: Power Transmission and Distribution Project in the Lao People's Democratic Republic*. Manila (Loan 1558-LAO).

12. **Consulting services.** The project implementing consultants funded by the NDF loan were engaged in March 2004. The consultants assisted EDL in detailed project design, implementation, and supervision, and strengthened the capacity of EDL staff through regular training seminars and dissemination of technical standards. Using a portion of ADB loan savings by way of reallocation, consultants were engaged in September 2006 to support the mitigation works related to the Nam Song and Nam Leuk hydropower projects. The consultants prepared (i) an environmental impact mitigation plan, (ii) a midterm review of the implementation of the plan, and (iii) a completion report in June 2010. Consulting services provided to enhance the IPP development program were engaged in January 2005. The consultants provided the policy recommendations and an action plan for developing a framework for IPP selection and development. To disseminate the information, the Department of Energy Promotion and Development under the Ministry of Energy and Mines conducted the consultation workshop in November 2009 with representatives from the government and international financial institutions. A final report summarizing the findings of the workshop was issued in December 2009. Ministry officials indicated they were very happy with the report and used the recommendations in their ongoing negotiations with the IPP and its various financing agencies.

13. **Miscellaneous works.** Several international nongovernment organizations (including the International River Network) expressed concerns about the outstanding social and environmental issues following completion of the Nam Song and Nam Leuk hydropower projects.<sup>6</sup> To mitigate these issues, minor changes were made to the scope of the Northern Area Rural Power Distribution Project, using a portion of loan savings to (i) cover the cost of providing village-improved water supply, village solid-waste facilities, small demonstration fishponds for household use, and excavated rain-fed village fishponds and stream-blocked village fishponds (in June 2006); (ii) cover the cost of additional water supply for Vang Song village and local consultants for site supervision (in December 2008); and (iii) cover the cost of additional mitigation works due to works that had not been satisfactorily completed (in November 2009). This resulted in the need to extend the loan by 3 months, from 31 December 2009 to 31 March 2010, to complete the works satisfactorily. A summary report for this mitigation is given in Appendix 2. The socioeconomic baseline survey for the project was done in 2005, and the second survey will be carried out by March 2013.

### C. Project Costs

14. The ADB loan of SDR21.491 million (\$30 million equivalent at appraisal) to the government was relented to EDL (the project executing agency) under a separate project agreement,<sup>7</sup> and was intended to finance about 58% of the total project costs of \$51.51 million. The ADB loan financed the foreign and local currency costs of the transmission lines, the supply of medium- and low-voltage equipment, and unexploded ordnance clearance to facilitate construction. The NDF provided parallel cofinancing of €10 million (\$10 million equivalent at appraisal), or about 20% of the project cost. The NDF financed new substations and extensions to existing substations along with consulting services for project implementation. EDL provided \$11.5 million, or about 22% of project costs, to finance medium- and low-voltage distribution line

<sup>6</sup> ADB. 1992. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the Lao People's Democratic Republic for the Nam Song Hydropower Development Project*. Manila (Loan 1214-LAO[SF]); ADB. 1996. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the Lao People's Democratic Republic for the Nam Leuk Hydropower Project*. Manila (Loan 1456-LAO[SF]). ADB's involuntary resettlement and indigenous peoples policies were not applied.

<sup>7</sup> The relending terms for both the ADB and NDF agreements require EDL to pay 3% interest during 2004–2005 and 6% in 2006 and thereafter for 20 years. A grace period of 5 years is allowed on repayment of interest charges, during which time the interest and other charges are accrued and capitalized.

construction, land acquisition and resettlement, household connections,<sup>8</sup> taxes, duties, and interest during construction.

15. The project cost was increased from \$51.51 million to \$63.39 million. The major reasons for the increase in project costs are described in paras. 16-17 below. A breakdown of the estimated and actual project cost is given in Appendix 3.

16. The substantial increase in project costs was in the substations component, which was almost twice the estimated cost. This was because (i) the actual cost for substations was higher than estimated; (ii) the contract was signed in euros, which appreciated against the US dollar during implementation; and (iii) an additional loan of €2.50 million was needed to cover the additional scope in the substation component (para. 9).

17. In June 2008, ADB loan savings were estimated at about \$4.60 million due to (i) the devaluation of the US dollar against the special drawing right (SDR); and (ii) the savings gained from the lower cost of the transmission line contract, uncommitted costs for unexploded ordnance clearance, and contingency. A major change in scope (\$4.16 million) was approved in August 2008 to use this savings for purchasing additional materials and equipment for distribution systems, upgrading and extending the Vang Vieng substation, and covering additional costs for mobilization and demobilization of the substation contractor (para. 10). Using a portion of these and previous savings, the reallocation of loan proceeds and three minor changes in scope (\$0.47 million) were approved to cover the costs of consulting services and mitigation works related to the Nam Song and Nam Leuk hydropower projects (paras. 12–13).

#### **D. Disbursements**

18. A summary of annual projection and actual disbursement is given in Appendix 4. The disbursement records show that, for the first 2 years, the actual disbursement was initially very slow, largely due to the delays in implementation of the transmission component. The initial disbursement from the ADB loan was made on 5 April 2005 and the final payment was made on 14 May 2010. The loan was closed on 23 June 2010 upon cancellation of SDR587,635 (\$867,326 equivalent). The cancelled amount was mainly from (i) the undisbursed amount for taxes and duties, which was not eligible for ADB funding, and was incidentally included in the total amount of the transmission line contract; and (ii) the uncommitted amounts from the components of materials and equipment, consulting services, interest during construction, and contingencies. The NDF loan was fully disbursed by March 2010.

#### **E. Project Schedule**

19. The actual implementation versus original schedule is shown in Appendix 5. Project completion was expected within 4.5 years, about 2 years of which were taken up by consultant recruitment, preparation of bidding documents, bidding, and contract award. In retrospect it appears that the project designers underestimated the time required to deal with the physical and institutional difficulties of project implementation. Although the contractor was slow to start, it was apparent that (i) insufficient time was allocated to the difficult task of surveying and constructing transmission lines over extremely rugged jungle-covered terrain, and (ii) an inadequate period of 4 weeks was allocated for completing resettlement compensation payment. As planned, the project implementing consultants were recruited in advance of NDF loan

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<sup>8</sup> The cost of household connections was recouped from direct payments by consumers or through amortized charges.

effectiveness, enabling them to quickly initiate a socioeconomic survey of new villages eligible for electrification. The consultants prepared the bidding documents for the contracts for transmission lines, substations, and materials and equipment for distribution systems before the socioeconomic survey of new villages eligible for electrification was finalized. With the exception of the transmission line contract, early action by the project implementing consultants enabled most of the contracts to be signed by mid-2005, generally in accordance with the original schedule.

20. Although the transmission line contract was awarded in December 2005, the contractor was slow to mobilize and slow to complete the survey and tower spotting exercise,<sup>9</sup> thereby delaying implementation of the resettlement planning process. In June 2006, after it became apparent that the transmission line contract could not be completed by March 2008, the loan was extended to January 2009. As delays built up during construction, the loan was extended initially to December 2009 and subsequently to March 2010 to enable final payments to the transmission contractor to be made, along with payments to distribution suppliers for the additional conductors and transformers that had been procured using loan savings.

21. The substations contract was awarded in July 2005. The contractor completed the works with high quality in April 2008 (1 month behind the original schedule). However, the delay in the completion of the transmission line contract did not allow final commissioning of the substations until December 2009.

22. Delivery of the bulk of the distribution items—poles, conductors, insulators, transformers, etc.—commenced in August 2005, in line with the original schedule. This enabled the first household connections to be completed in 2006, with power supplies sourced from the existing 33 kV line. The materials and equipment installation was completed in December 2008, 9 months behind the original schedule, as a result of re-erection of several poles which had not been placed deep enough in the ground to provide safe line construction, discovered during joint inspection by the project implementing consultants, contractor, and EDL. The delivery of additional materials and equipment for distribution systems procured under the loan savings was completed by March 2010, within the contract schedule. Installation was completed in April 2011 (about 8 months behind schedule) because access roads to rural villages in the raining season were impassable; work resumed in November 2010.

## **F. Implementation Arrangements**

23. Overall, the project was implemented satisfactorily by EDL's project management unit (PMU) supported by its project implementing consultants. The PMU structure is in Appendix 6. The organization was adequately effective in delivering project outputs and achieving its purpose. However, contrary to their terms of reference, the project implementing consultants were discouraged by EDL from having any significant involvement in the planning and construction management or monitoring of the medium- and low-voltage distribution systems and rural electrification connections. EDL considered that its own project engineers had adequate skills in designing and constructing distribution networks, and the contractor (the government-owned Electricity Construction and Installation Company) was very experienced and had done works of this nature for both EDL and private developers for many years. As a consequence, there was limited information of progress of electrification of the new villages, and

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<sup>9</sup> The contractor underbid to get the contract and was seriously considering walking away once they realized that they were in a loss-making situation. However, ADB persuaded the contractor to complete the work.



inadequate financial reporting that would otherwise have helped predict cost overrun or underutilization.

24. The PMU coordinated with local authorities to identify villages targeted for electrification and, in consultation with the village heads, to prioritize household connections. The PMU also had responsibility for, and made every effort to minimize the need for, land acquisition and resettlement among affected persons in this project. The independent post-audit of the resettlement process indicated that EDL handled this aspect well with few complaints about the level of compensation paid.<sup>10</sup> Transmission line alignments were sited to avoid crossing villages or other areas of settlement, and to avoid agricultural land and trees wherever possible. Although every attempt was made to minimize the effects on villagers, land acquisition and resettlement issues could not be wholly mitigated. In total, 1,626 households were affected in 87 villages across the six sections of the transmission line and substations.

## **G. Conditions and Covenants**

25. Loan and project agreement covenants were applied to ensure EDL met its commitments with regard to electricity loss reduction and financial viability—key factors that were identified as important to the success of the project. The status of compliance with 30 loan covenants (1 environmental, 10 social, 11 financial, and 8 others) is given in Appendix 7; many of the covenants were complied with at an early stage of implementation. Notably, however, the government was slow in settling its outstanding debts (equivalent to 22 months of billing in 2005) to EDL and, contrary to its agreement to steadily increase electricity tariffs, it froze tariffs in 2005. This situation exacerbated EDL's inability to reduce its high level of accounts receivable from 5.6 months of sales to the agreed 2.0 months. Under some pressure from the international financing agencies (ADB and the World Bank), the government agreed to offset taxes against its power bills and to take steps to increase tariffs. Following a World Bank study in June 2009 of EDL's tariff requirements,<sup>11</sup> in May 2010 EDL requested the government to allow it to increase tariffs by 18% in 2010 and 4% annually thereafter until 2016. This was approved in January 2011, with revision to the proposal, to increase tariffs by 18% in 2011, 2% in 2012, and annually thereafter until 2016.

26. A minor change in implementation arrangement—an amendment to loan covenants (loan agreement, Schedule 4, para. 7 [a] and [b])—was approved in August 2005 to facilitate the signing of the transmission line contract, thereby enabling the contractor's survey team to establish the transmission line alignment so that the resettlement plan could be completed. The original covenants in the loan agreement were anomalous in that they did not allow the transmission contract to be signed before all the land acquisition and resettlement plan compensation activities were complete.

## **H. Related Technical Assistance**

27. TA for preparing the Northern Area Rural Power Distribution Project was approved by ADB in October 1998. The total cost of the TA was \$580,000; ADB financed \$510,000 and the government financed the remaining cost of \$70,000 in kind. The TA (i) assessed the electricity demand in the candidate project areas, (ii) identified the best option to meet the assessed

<sup>10</sup> Sustainable Rural Livelihood Consultants, External Auditors. 2009. *Audit Report of Resettlement Plan of Northern Area Rural Power Distribution Project*. Vientiane

<sup>11</sup> The study by SNC Lavalin recommended EDL restructure and substantially increase its tariff (by about 20% per year during 2010–2013 and 6% annually thereafter).

electricity demand, (iii) prepared feasibility designs for the best options, (iv) carried out economic and financial evaluations of the subprojects, (v) assessed the environmental and social impacts of the subprojects and formulated suitable mitigation measures, and (vi) proposed suitable institutional improvements to ensure efficient implementation of the ensuing project. Subsequently, the TA output was incorporated in the design and formulation of the project.

## **I. Consultant Recruitment and Procurement**

28. Details of the various contract packages for consulting services, goods, and works summarized in Appendix 8 describe the procurement method and cost along with contractors' names. Overall, recruitment and procurement were in line with the implementation plan, as most of the contracts were in place by the beginning of 2006, with the exception of the additional contracts that were procured using loan savings. Technical specifications for goods and works contracts were prepared by the implementing consultants on the basis of a comprehensive design report in June 2004. This provided the basis of technical designs in the bid documents that were prepared with due consideration to procurement conditions specified in Schedule 4 of the loan agreement, including provision for domestic preference.<sup>12</sup> The documents were submitted by EDL to ADB in October 2004 and subsequently advertised internationally in December 2004 (transmission and substations) and January 2005 (distribution).

29. **Consultant recruitment.** The terms of reference for both the project implementing consultants (110 person-months of international and 20 person-months of national consulting services) and the IPP consultants (13 person-months) were provided in the report and recommendation of the President (RRP) and were used as a basis for issuing requests for proposals. The project implementing consultants were recruited in advance of loan effectiveness in accordance with NDF's general procurement guidelines based on Nordic competitive bidding. No significant issues in the recruiting process resulted from the selection of the project implementing consultants. The consultants for the IPP development program were recruited using the quality- and cost-based selection method, which reported no concerns relating to the recruitment process. The consultants to support the social and environmental impact mitigation related to the Nam Song and Nam Leuk hydropower projects were recruited using the single source selection method.

30. **Procurement of goods.** Procurement of nine contract packages for goods, including the three additional contract packages for supplying materials and equipment for distribution systems, followed international competitive bidding procedures, while the other four contracts were procured following national competitive bidding procedures. Most of the contract packages were awarded by August 2005 with no issues related to the procurement processes, except that the successful contractor for the supply of conductors, cables, and wires refused to execute the signed contract without being compensated for the big increase in commodity prices that occurred. The contract was cancelled and re-bid successfully a second time. Since the installation of conductors on distribution lines is usually done at the last stage of construction, and the delay was only a few months, this did not adversely affect the work program. To make use of loan savings, bidding for the three additional contract packages for supplying (i) line equipment and transformers; (ii) concrete poles and cross-arms; and (iii) conductors, cables,

<sup>12</sup> For distribution tenders where imported goods had the lowest Cost, Insurance and Freight (CIF) prices, the domestic preference clause allowed EDL to compare the imported goods prices with qualified local bids by adding the lower of 15% of the CIF price or the import taxes and duties. For works contracts, the domestic preference clause also allowed similar treatment of the cost of the imported goods content of the tender for the transmission line.



and wires was undertaken in August 2009 using national competitive bidding. Contracts were awarded without difficulties in November 2009.

31. **Procurement of works.** Procurement of works for the transmission line (procured in accordance with ADB international competitive bidding procedures) and the substation (procured in accordance with Nordic competitive bidding procedures, which was open to bidders from eligible source countries of the Nordic Development Fund) was carried out expeditiously by EDL, ably supported by its project consultants. A delay in the procurement process of the transmission line contract due to poor response by some bidders and the incomplete nature of some of the transmission line bids required further clarification (6 out of 12 offers were rejected at the initial evaluation stage). ADB intervention was required to clarify issues relating to the permissibility of price adjustments after receipt of bids and thereby enable the evaluation to proceed. To finalize the contract with the successful bidder before all affected persons had been compensated, the loan agreement had to be amended (as explained in para. 26). There were no problems with the award of the substations contract.

## **J. Performance of Consultants, Contractors, and Suppliers**

32. **Performance of consultants.** The performance of the project implementing consultant was *partly satisfactory* in fulfilling most aspects of the terms of reference. EDL considered that the consultant performed his responsibilities expeditiously on time and within budget. However, after the various procurement activities were completed, EDL requested the consultant to concentrate his activities on the supervision of the transmission and substations works, considering its own project engineers had adequate skills in designing and constructing distribution networks. In retrospect, this decision by EDL did not result in a fully satisfactory outcome given the poor service reliability that some of the villages are apparently experiencing.<sup>13</sup> This is largely a consequence of building very long 22 kV lines (some in excess of 70 km), inadequately provisioned for voltage regulation—an aspect of distribution planning where the consultants should have been more involved. Although the consultants did a good job of redefining the scope of the rural electrification component, they inexplicably did not consider expanding the 34.5 kV shield wire system to serve new customers along the transmission line route. Moreover, once the rural electrification program was implemented by EDL, the consultants did little to ensure adequate records were kept to assess the economic outcome of the program.

33. **Performance of contractors.** The performance of the transmission line contractor was *partly satisfactorily*, mainly because the contract was completed 21 months late. The contractor apparently underestimated the difficulty of the task and took 8 months to get the initial survey started. Reportedly because its subcontracted surveyors (from Bangladesh) were inexperienced in this type of terrain, the initial survey was inadequate, with route changes made several times during the course of the construction work. Although many of the other design, manufacture, and construction activities took place concurrently, it was apparent that, as a result of the initial delay (measured against the contractor's own schedule), tower and foundations construction also took longer than expected. Nevertheless, due recognition should be given to the contractor completing the project, despite apparently making a significant financial loss. Inspection of various tower sites during the project completion review mission showed the construction was of a high standard and would last for many years.

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<sup>13</sup> During the project completion review mission, a number of village heads complained to the mission about the poor reliability of the distribution service. Apparently they were experiencing regular blackouts and given little notice of impending shutdown for construction and operational work by EDL.

34. The performance of the substations contractor was *satisfactory*. The substations contract was awarded to the contractor for a fixed price turnkey contract to construct four new substations (originally three, but extended to four by way of variation order) and to extend four existing substations. The contractor completed the works on time and to a high quality, with the exception of the 115/22 kV 20 megavolt-ampere transformer in Oudomxai that had to be returned to ABB's factory in Viet Nam due to leakages in the oil tank. The transformer was redelivered in November 2008 and was the subject of an extended warranty until June 2010; it is currently reported to be operating without any problems.

35. **Performance of suppliers.** Suppliers delivered goods on time (with one exception mentioned in para. 30). Construction of the distribution works comprising more than 1,812 km of medium- and low-voltage lines along with the associated 544 distribution transformers and 32,830 new connections was carried out by the government-owned Electricity Construction and Installation Company. These works were completed, albeit late (para. 22), but well within budget (under force account). The project completion review mission noted that the work done was of good standard and should operate satisfactorily for more than 20 years.

#### **K. Performance of the Borrower and the Executing Agency**

36. The performance of the borrower and EDL were *partly satisfactory*. This rating takes into account the initial reluctance of the government to provide the necessary financial support to EDL as agreed in the loan agreement. It was only after intervention by ADB that the government subsequently provided the approvals necessary to increase electricity tariffs and offset its debt against taxes to EDL. This enabled EDL to be successful in implementing its financial covenants and completing a difficult transmission line system and connecting new consumers in the project area. In particular, it was a considerable achievement of EDL to manage the construction of a transmission project in very difficult terrain with a contractor who had underestimated the difficulties that would be faced in implementation. On the other hand, the PMU reports (albeit prepared by the implementing consultants) were barely adequate and did not provide up-to-date financial forecasting that might, for example, have anticipated potential loan savings earlier in the project.

#### **L. Performance of the Asian Development Bank**

37. The overall performance of ADB can be rated *partly satisfactory*. The supervision work was exemplary but the overall rating is marred by the inadequacy of the project cost estimates and project planning. It was recognized in 2002 that when the project preparation work was done there were serious security concerns and poor transport facilities in northern Lao PDR that could have prevented a credible review of the scope of work defined by the project preparation consultants. It was also apparent that the appraisal mission may not have been informed by EDL about the complementary construction work that was being done by the provincial authorities in electrifying the designated villages (using private sector funding). Notably, much of the analysis in the RRP (e.g., power sector analysis, EDL financial performance) is based on information available up to 2001. As a consequence, the project costs given in the RRP had not been updated before it went to the Board in 2003; had that not been the case, the cost overrun would not have appeared to be so high.

38. During implementation, regular ADB supervision missions ensured that there was an understanding of the issues relating to the noncompliance with financial covenants and the need for changes in the scope of work as new information came to hand. The chronology of key

events given in Appendix 9 shows that ADB gave a high degree of attention to ensuring the project maintained steady progress. In particular, the early difficulties with the government over its failure to meet its obligations were handled by the ADB review missions with a good outcome. It is apparent from PMU reporting that EDL was focused primarily on project construction objectives and probably did not keep in mind the ADB development objectives to ensure they had a good understanding of the mission's interest in the project. These organizational weaknesses could also have been assessed more thoroughly during appraisal and the deficiencies in reporting probably should have been addressed during ADB supervision missions.

39. ADB is credited by EDL with persuading the transmission line contractor to meet his obligations when it was evident at an early stage that he had grossly underestimated the cost of building a line in difficult mountainous terrain. Although there was only one significant procurement issue (resulting in a 6-month delay in the award of the transmission line contract), ADB dealt with the deviation in procurement procedures expeditiously. In May 2006, and after all contracts were awarded, the project administration was transferred from headquarters to the Lao PDR Resident Mission.

40. Altogether there were some 20 ADB staff involved in review missions over 6 years of the project administration period. Most officers were experts in economics, finance, project management, or socioeconomics. There was little evidence the mission teams included an experienced power utility engineer who could have focused on technical issues such as the inadequate operational reliability facilities provided for in the distribution networks. Surprisingly, while the ADB mission identified the opportunity for cost savings at the midterm review, EDL was not encouraged to accelerate procurement of additional distribution equipment nor to continuously update project budgets in its quarterly reports.

### III. EVALUATION OF PERFORMANCE

#### A. Relevance

41. The project is rated *highly relevant*. The project when designed in 2003 was in line with ADB's country strategy and program (2003–2006) in support of the government's rural electrification target of electrifying 70% of total households by 2010 (paras. 3–6). It is also consistent with ADB's country strategy and program (2007–2011) for the Lao PDR and aligned with the government's sixth socioeconomic development plan (2006–2010), which prioritizes development of the agriculture and natural resource, education, health, and infrastructure sectors. All of the project objectives envisaged at appraisal were achieved upon completion. The project design proved to have sufficient flexibility to enable EDL to quickly recertify the selection of new villages, while the detailed technical design work was able to be done in accordance with the schedule. The project design was also capable of being adapted to much larger than expected growth in region demand fostered by significant investments by investors from the People's Republic of China in roads and agricultural, industrial, transmission, and rural electrification development. Demonstrably during the project implementation period, electricity demand in the northern regional provinces grew dramatically (Appendix 10, Table A10.2), while current projections anticipating growth rates in the northern region are well above the average of other provinces (Appendix 11, Table A11.3).

## **B. Effectiveness in Achieving Outcome**

42. The project is rated *effective*. The outcome envisaged at appraisal has been substantially achieved, including (i) strengthening and expanding the power grid and supplying electricity to the selected northern area, and (ii) improving EDL's technical and financial performance.

43. EDL's power grid systems have been strengthened by the completion of 268 km of 115 kV lines (using a shorter route from Louang Phrabang to Oudomxai), four new substations (originally three, but extended by one by way of variation order), extension of four existing substations, and medium- and low-voltage systems. EDL was very successful in meeting its obligation under the project agreement to reduce energy losses throughout the country; the figure was 12% in 2010 (Appendix 10, Table A10.3) compared to the agreed 15%. The actual achievement of the electrification ratio in the northern region was in excess of 68% compared to the original target at appraisal, which aimed to increase the rate from 18% to 30% by project completion. Appendix 10 provides data relating to the connections achieved under the project and the resultant electricity use. These show that, although rural electrification connection rates in the northernmost regions are currently behind the rest of the country, they are likely to catch up quickly. This is because the new transmission lines will provide additional power sources to support growth of the now well-established domestic and commercial consumers.

44. EDL's technical and financial performance has significantly improved. The financial statements were audited, and the financial targets generally complied with the agreed loan covenants (Appendix 7). Recent tariff studies by SNC-Lavalin (June 2009), funded by the World Bank, demonstrate the company should be in a much stronger financial position today than it was in 2003. EDL's capacity has been built throughout with consultant services, including (i) training for EDL staff in bid evaluation, contract awarding, supervision of construction work, and system testing and commissioning; (ii) strengthening the capacity of staff in main field offices through regular training seminars, dissemination of technical standards, and implementation of the computerized management information system; and (iii) helping improve social and environmental assessment, management, and monitoring of the projects. The project also provided capacity building for EDL staff in consumer services through a consumer awareness program, which included information on safe use of electricity, connection cost policy, tariffs, billing statements and timing of bills, and due payment and disconnection policy.

## **C. Efficiency in Achieving Outcome and Outputs**

45. The project is rated *efficient* in achieving its outcome and outputs despite a 21-month delay in commissioning the transmission and substation components. The transmission system has been operating very well since commissioning. Since the northern region's load demand has grown rapidly (met by using imported power), the new transmission lines supplying power from the nation's resources were built in time to provide the vital reinforcement and interconnection facilities necessary to sustain continuing growth over the next few years.

46. The project was approved by ADB in 2003 and was justified in terms of an economic internal rate of return (EIRR) of 23.3% that was demonstrated to be robust under extensive sensitivity testing of the basic assumptions. This was based on the evaluation of the project's sensitivity to changes in capital costs (plus and minus 20%), energy costs, seven willingness-to-pay values, delays (up to 2 years), and exchange rate variations. On the other hand, the appraised financial internal rate of return (FIRR) of the project was shown to be 2.71%; a figure

lower than the weighted average cost of capital (then assessed at 4.77%) that indicated that EDL would need to increase its tariff by at least 9% per year for the project to be viable.

47. Since the loan was approved, there have been significant changes to the appraised assumptions; specifically these are in terms of the higher project cost, the scope of villages electrified, EDL's tariffs, and load demand growth projections (Appendix 11, Tables A11.2 and A11.3). Appendix 11 provides details of the recalculation of the financial and economic viability using current data and methodology similar to that used in the RRP. The main difference in methodology relates to the treatment applied in the RRP of crediting both the transmission line and the distribution line with electricity growth only within the newly electrified villages. The revised methodology credits the transmission line investment with supporting growth in both ADB and private sector investments in roads and agricultural, industrial, and rural electrification developments in areas covered by the transmission lines constructed under the Project. Credit for the distribution investment is based only on growth under the ADB-funded rural electrification project. Surprisingly, despite the changes in assumptions, the values for the recalculated FIRR (3.5%) and EIRR (24%) are not significantly different to those in the RRP. It is also concluded that a higher FIRR can only be achieved if EDL increases its tariffs up to 2016 as currently proposed by the Ministry of Energy and Mines and continues to increase them by similar amounts thereafter.

#### **D. Preliminary Assessment of Sustainability**

48. The project's sustainability is rated *likely* as demonstrated by significant growth in demand, as shown in Appendix 10. The equipment supplied under the project is expected to have a long life (typically 40–60 years) and require little maintenance. Since 2005, EDL investments in distribution (financed by various sources including ADB loans) have given rise to dramatic increases in electricity growth in the northern region. The average electricity growth during project implementation period was about 53% annually (Appendix 10). The electricity demand in the northern region is expected to grow at 36% annually to 2016 (from a low base of 5% of overall Lao PDR sales in 2008).<sup>14</sup> To date, power generation to the region has been provided through links with the People's Republic of China and Thailand and from EDL's own generation from the Nam Ngum 1 power plant. As shown in EDL's Power Development Plan 2010–2020, it is apparent that, to sustain this demand growth in electricity, transmission links in the north will need to be reinforced, such as with the ADB-financed Northern Power Transmission Project approved in December 2009.<sup>15</sup>

49. Overall, despite some initial difficulties with the government in implementing agreed tax and dividend offsets against overdue electricity payments, EDL substantially met most of the requirements of the loan covenants (environmental, social, financial, and other). At the time of loan closing, the government agreed to offset taxes against all of its outstanding electricity debts up to December 2009, resulting in the reduction of EDL's accounts receivable for domestic electricity sales to 2.6 months of average sales of the previous fiscal year. Since the government approved in January 2011 EDL's request to raise its tariffs over the next 5 years, according to the 2009 tariff study, it is apparent that the company should be in a much stronger financial position today than it was in 2003.

<sup>14</sup> Government of Lao PDR, Ministry of Energy and Mines, Electricite du Laos. 2009. *Tariff Study*. Vientiane

<sup>15</sup> 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 Greater Mekong Sugregion Northern Power Transmission Project*. Manila.

## E. Impact

50. **Institutional arrangement.** To implement the resettlement plan and environmental mitigation measures, EDL (i) strengthened its existing Environmental and Social Management Office (E&SMO) by provision of training and engaging more staff, (ii) established compensation committees chaired by vice-governors of the affected provinces and subcompensation committees chaired by district governors, and (iii) assigned a deputy project manager and four staff members from the PMU to work full time with E&SMO compensation committees and subcommittees (Appendix 12).

51. **Environmental impact.** The project is classified as environment category B. An initial environmental examination (IEE) identified the possibility of environmental impacts, including adverse effects on natural vegetation and wildlife. The impacts were deemed to be minor, even after taking into account land use and resettlement issues, potential concerns about health and safety during construction, and any potential issues related to encroachment on historical and cultural sites. The E&SMO verified that the contractor had met their obligations under the environmental management plan (EMP). The contract documents required the transmission line contractor to avoid environmentally sensitive areas and ensure that temporary access roads were reinstated after the work was completed. In the quarterly reports submitted to ADB, EDL confirmed that the 115kV line routes were checked on site to verify the actual situation. Line alignments were found to be as required to avoid mature forest, religious and cultural and/or heritage sites, and environmentally sensitive areas. Where applicable, despite rerouting, the environmental impact did not change since the lines passed through environmental areas that were very similar to the original ones. Access to the towers by the contractor during construction did not have any adverse effect on the environment since he used existing pathways, and used animals and people for transportation. However, the delay in construction progress necessitated some work in rice fields during rainy seasons. This caused some inconvenience to the farmers as the excavations and access roads to the sites destroyed dikes separating field sections. However, the contractor fixed all dikes after construction was completed. Damage that could not be avoided was compensated for in accordance with the rates determined by the compensation committees. At the Hin-Heup substation, rains partially eroded excess soil piled next to the switchgear area and soil ran into a neighboring field. Compensation was awarded and the contractor stabilized the soil by building a retaining wall.

52. The performance of EDL in implementing the EMP is considered *partly satisfactory*. Although all environmental impacts were adequately mitigated and/or compensated for, EDL did not keep detailed records of its monitoring visits or minutes of meetings regularly held between the contractor, EDL, and the government to ensure that ADB guidelines were fully complied with, as specified in the IEE. No environmental monitoring report was submitted to ADB; the only information related to environmental issues was in the quarterly and completion reports.

53. **Resettlement impact.** At appraisal, the resettlement and compensation requirements were not expected to be significant: (i) the 115 kV transmission systems were expected to be sited to avoid, wherever possible, interfering with villages, agricultural land, and trees; and (ii) the distribution lines were expected to follow the existing roads. After the transmission and distribution line alignments were finalized in 2004, it was confirmed that resettlement and compensation activities were only necessary in association with the construction of 115 kV transmission systems. Resettlement plans for six sections of the transmission lines based on preliminary design were prepared and approved by ADB on various dates from June 2007 to February 2008. In total, 1,209 households were estimated to be affected. All resettlement and compensation was completed by May 2008. The total compensation paid out to persons

affected by the project was \$292,325 against the initial budget of \$250,000 due to an increase in the number of affected persons, after detailed design, as indicated in the updated resettlement plans (in October 2009 for section 1 and in March 2010 for sections 2–6). In total, 1,626 households in 87 villages across the six sections were compensated; only one household was required to relocate and was compensated in cash in accordance with the rates determined by the compensation committees (Appendix 12).

54. **Socioeconomic impact.** The project has had a significant positive impact on village life. Villages electrified under the project have increased their use of domestic appliances (which, according the village heads, frees up time for villagers to increase their agricultural activities) and there was demonstrable evidence of increased use of electricity for productive uses that increased economic opportunities. There is, however, scope for EDL to expand the program of awareness of electricity benefits (instituted under this project) so it focuses more on increasing productive use of electricity.

55. Electricity supplies in the Lao PDR are largely sourced from renewable hydropower, in effect reducing the dependence of rural villages on using imported kerosene for lighting and wood for cooking. All the benefits identified in the socioeconomic baseline surveys as justification for the project appear to be giving rise to the expected improvement in the standard of living. During field visits, the project completion review mission observed that electric lighting and satellite television are demonstrably increasing the capacity of villagers to learn about new technologies that will enhance their productive efficiencies. In this respect, village heads reported that electricity is relieving villagers of routine tasks (e.g., rice milling, water carrying, home repairs) that would be otherwise done manually, thus enabling them to increase productivity in their largely agricultural activities. These factors are expected to be quantified in more detail when EDL updates the socioeconomic survey of the project area as agreed with ADB, within 3 years after project completion, i.e., by March 2013.

#### IV. OVERALL ASSESSMENT AND RECOMMENDATIONS

##### A. Overall Assessment

56. The overall assessment of the project (Appendix 13) is *successful* in that the project achieved its principle objective of electrifying 32,830 households in 570 villages and extending the transmission network to supply the northern region as part of the government's greater plan to achieve the target of 70% electrification by 2010, while simultaneously managing a large number of projects by the private sector. On this basis EDL certainly deserves further support by ADB as planned for the rural electrification development under the Greater Mekong Subregion Northern Power Transmission Project in trying to achieve the government's much more difficult new target of 90% electrification by 2020.

57. The project's objective of strengthening EDL's institutional capability to manage and monitor its projects has been met (para. 44). There was, however, room for EDL to improve its project reporting capacity by providing adequate information on the implementation of the rural electrification program. EDL should also direct the project consultants to fulfill their obligation as specified in the terms of reference rather than to focus solely on implementation of the technical aspects related to transmission and substation construction. If there had been better overall cost forecasting procedures in place, EDL may have avoided the cancellation of a significant amount from the loan.

## B. Lessons

58. Key lessons from the project include the following:

- (i) transmission lines that traverse populated rural areas in the Lao PDR should continue to use the shield wire system and/or single-wire-earth-return system to minimize objections by affected persons and enhance the socioeconomic impact of the transmission component;
- (ii) the design of distribution networks should be improved by giving due attention to ensuring reliability and operational maintenance objectives rather than focusing solely on meeting connection targets;
- (iii) consultants should be required to fulfill their obligations under the terms of reference and to ensure adequate reporting on implementation that will anticipate cost savings or overrun situations in time to take appropriate action;
- (iv) in the climate of international commodity volatility, contracts for supply materials and equipment for distribution systems should have provision for changes in aluminum, copper, and steel prices that might occur during the bid evaluation process; and
- (v) the financial loan covenants for EDL should be accompanied by an agreed plan to achieve compliance over a prescribed period.

## C. Recommendations

### 1. Project Related

59. **Future monitoring.** EDL shall carry out the second round socioeconomic surveys, which shall cover both electrified and unelectrified areas, by March 2013.

60. **Covenants.** Many of the loan covenants, especially those dealing with implementation matters, are readily achieved. Covenants relating to EDL compliance with financial issues, especially those that are largely out of EDL's control, may need more analysis to quantify the issues of concern. Rather than wait for visiting missions to identify problems, it would be appropriate for the consultant to employ financial experts as part of their team so as to take the initiative and report back to ADB with recommendations when it is apparent that transgressions in covenant compliance may be impeding progress in meeting project objectives.

61. **Additional assistance.** EDL could benefit from more focused consulting effort that will (i) introduce modern project management reporting systems with forward-looking budget planning capability, and (ii) provide institutional support to enhance EDL's activities in promoting the greater productive use of electricity in villages.

62. **Project performance evaluation report.** In view of the time needed for economic growth in electrified villages and for EDL to complete the second round socioeconomic surveys, (para. 59) by that time the project will have been fully operational for more than 3 years and a project performance evaluation report should be prepared sometime after the second quarter of 2013.



## PROJECT FRAMEWORK

Design Summary	Performance Indicators/Targets	Achievements	Remarks
<b>Goal</b> Extend electricity to poor rural areas that have potential for socioeconomic development to improve rural living standards and economic conditions. Strengthen Electricite du Laos (EDL) institutional capacity and improve its operational efficiency on a commercial basis.	Improved quality of rural electricity supply. Improved quality of rural life and reduced cost of energy consumption. Improved EDL financial performance, operational efficiency, and project implementation capability.	Electrification of target villages was achieved (32,830 new households in 570 villages). The improvement of quality of rural life and reduction of energy consumption cost will become more apparent when EDL carries out the second round socioeconomic surveys, by March 2013. EDL's financial targets as specified in the loan covenants were met; capacity was built through consulting services, including (i) training for EDL staff in bid evaluation, contract awarding, supervision of construction work, and system testing and commissioning; (ii) strengthening the capacity of staff in main field offices through regular training seminars, dissemination of technical standards, and implementation of the computerized management information system; and (iii) helping improve social and environmental assessment, management, and monitoring of the projects.	The macroeconomic and political environment was stable and the government is committed to poverty reduction. This resulted in achievement of the project targets. The government has used private sector resources to undertake complementary infrastructure projects or cross-sector interventions in the northern region, resulting in dramatic increases in electricity growth in the northern region, i.e., about 53% annually on average during project implementation period.
<b>Purpose</b> Strengthen and expand the power grid and supply electricity to the selected northern rural areas. Improve EDL's technical and financial performance.	Power grid extended to Louang Namtha, Louang Phrabang, Oudomxai, Vientiane, Xaignabouli, and Xiang Khouang provinces. Electrification ratio by population in the northern region increased from 18% to 30% by project completion. EDL's compliance with technical and financial targets as set	The scope of the project was fully implemented. Due to concurrent investments in rural electrification in the project provinces, the electrification rate, by the time of this PCR, was in excess of 69%, about 10% of which was electrified by the project, and is growing. EDL's financial statements were audited. Technical and financial targets were met. Tariff study, June 2009 (prepared by SNC-Lavalin	Rural consumers have demonstrated they can pay for connections and energy consumption. Consumers with 3-ampere meter connections are allowed to amortize payments. EDL failed to meet some of its financial covenants for reasons largely outside its control (i.e., high government receivables, low allowable tariff).

Design Summary	Performance Indicators/Targets	Achievements	Remarks
	in the loan covenants.	International, funded by the World Bank), demonstrates the company is much stronger than it was in 2003.	
<b>Outputs</b> Extension of 115 kV transmission lines and construction of 115 kV substations. Erection of medium- and low-voltage distribution facilities and household connections. Unexploded ordnance clearances, miscellaneous works, and consulting services.	303 km of 115 kV lines and three 115 kV substations. 796 km of 34.5 kV and 22 kV distribution lines, and 237 sets of distribution transformers. 609 km of 380 V distribution lines. Electrification of 33,800 households in 342 villages.	268 km of 115 kV line built using shorter route from Louang Phrabang to Oudomxai. Construction of 1,150 km of medium-voltage and 662 km of low-voltage line, and installation of 544 sets of distribution transformers were completed. All substations (including one additional new substation) were completed. 32,830 new households in 570 villages were electrified under the project. Clearance of unexploded ordnance was incorporated within the respective transmission and substation contracts and financed from that budget item. The socioeconomic baseline survey was done in 2005, and the second round socioeconomic survey will be carried out by March 2013. Consulting services for IPP development and for Nam Song and Nam Leuk mitigation plan were satisfactorily completed. Performance of project implementing consultants was partly satisfactory.	No significant delays in procurement of civil (i.e., transmission and substation) works. On-time implementation of mitigation measures. Counterpart funds were available on time. Unexploded ordnance cleared.
<b>Activities</b> Engagement of consultants. Conduct of detailed project design and survey. Update, approval, and implementation of resettlement plan. Procurement of equipment and materials. Physical construction.	Consultants engaged by January 2004. Detailed project design completed by June 2004. Bid evaluation and contract awards completed by August 2005. Physical works completed by March 2008.	Consultants were in place early enough to react to changes in scope of villages to be electrified. Detailed project design completed by June 2004. Bid evaluation and contract awards largely completed by 2006. Physical works for substations and distribution completed within reasonable time, but 21 month delay in	Consultants and contractors are competent but too focused on engineering issues related to transmission lines and substation construction. They should fulfill their terms of reference, which included designing and constructing distribution networks, and ensure

<b>Design Summary</b>	<b>Performance Indicators/Targets</b>	<b>Achievements</b>	<b>Remarks</b>
Conduct of consulting services. Project performance monitoring and evaluation. Capacity building for socioeconomic assessment. Consumer awareness program. Implementation of EDL's financial recovery program and sector reform.		transmission and therefore in project completion. Capacity building in socioeconomic assessment and/or consumer awareness is a low priority for EDL and it has limited resources.	there are adequate records to assess the economic outcome of the program. Construction supervision and quality control are effective but limited attention is given to distribution reliability issues. Resettlement planning and implementation were slow to get started but proved to be effective. PCR is unsatisfactory. EDL should be able to do this work when consultant leaves site.
<b>Inputs</b>			
Civil works	\$23.0 million	Financing for substations was much larger than estimated in RRP. NDF loan of €10.0 million at appraisal had to be increased to €12.5 million to cover the cost of additional substation work.	Supervision and quality control were effective. Counterpart resources and other funding agency contribution was committed and allocated.
Equipment and materials	\$10.8 million		
Land acquisition resettlement, and benefit monitoring program	\$300,000		
Consulting services	\$3.5 million		

EDL = Electricite du Laos, IPP = independent power producer, km = kilometer, kV = kilovolt, NDF = Nordic Development Fund, PCR = project completion report, RRP = Report and Recommendation of the President to the Board of Directors, V = volt.

## SUMMARY REPORT OF IMPACT MITIGATION FOR NAM SONG AND NAM LEUK

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### A. Background

1. The Nam Song Hydropower Development Project was approved for \$31.5 million equivalent in 1994 and closed in 1998. The project consisted mainly of the construction of a diversion weir on the Nam Song River to divert water along a canal to the Nam Ngum 1 reservoir to increase the energy output of the Nam Ngum 1 power plant. The project did not include any power plant construction. The Nam Leuk Hydropower Project was approved for \$52.0 million equivalent in 1996 and closed in 2003. This transbasin project also financed construction for diversion of water into the Nam Ngum 1 reservoir. With the additional water in the Nam Ngum 1 reservoir, the Nam Ngum 1 power plant could increase generation.<sup>1</sup>

### B. Nongovernment Organization Concerns

2. Several international nongovernment organizations, including the International Rivers Network, expressed concerns about outstanding social issues following completion of the two projects. These concerns were related to the environmental and social mitigations undertaken by the project's executing agency, mainly (i) insufficient reliable year-round water supply to the affected villages; (ii) delays in implementing fisheries compensation; and (iii) viability of the mitigation efforts, including (a) implementation of mitigation plans in a timely manner, (b) development of recourse mechanisms for affected villagers, (c) regular monitoring of mitigation activities, and (d) compensation for past fisheries losses and additional fishponds.

### C. Asian Development Bank Response

3. At the time of project agreement, the Asian Development Bank (ADB) had neither resettlement nor indigenous peoples safeguard policies or operational guidelines in place. Nonetheless, it subsequently responded to concerns and conducted studies on outstanding issues following representation by nongovernment organizations after loan closing date. Discussions by ADB with Electricite du Laos (EDL, the executing agency) led to agreement that uncommitted loan funds under the Northern Area Rural Power Distribution Project could be redirected toward meeting the cost of some mitigation measures.<sup>2</sup> In 2006 a minor change of scope was made to address mitigation recommendations made by EDL's international rural development specialist<sup>3</sup> in 24 villages<sup>4</sup> in the Nam Song and Nam Leuk areas. With ADB approval, EDL awarded two civil work contracts—for water supply systems and environmental mitigation, and fishponds and livelihood development—on 15 June 2007 for \$252,082. The contracts required the works to be completed by December 2007.

4. ADB conducted a field review mission in August 2007 to assess progress of the

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<sup>1</sup> ADB. 1992. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the Lao People's Democratic Republic for the Nam Song Hydropower Development Project*. Manila (Loan 1214-LAO); ADB. 1996. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the Lao People's Democratic Republic for the Nam Leuk Hydropower Project*. Manila (Loan 1456-LAO).

<sup>2</sup> ADB. 2003. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the Lao People's Democratic Republic for the Northern Area Rural Power Distribution Project*. Manila (Loan 2005-LAO).

<sup>3</sup> Outlined in the environmental and social impact mitigation plan.

<sup>4</sup> Nam Leuk Areas: Donhom, Gnangkheua, Hatkai, Houay Leuk, Namkui, Palai, Phon Ngam, Poupaman, Thabok, Thaheua, and Thamdin; Nam Song Areas: Hin Tit, Houay Dokmai, Houay Pamom, Khanmark, Nam Pat, Pak Vang, Phon Thong, Pongsong, Sivilay, Somsanouk, Tao Tan, Van Khy, and Vangsong.

mitigation works against plans. The mission concluded that implementation was progressing somewhat satisfactorily. However, the quality of civil works—especially earth dams, fishponds, and water supply systems—needed close monitoring to ensure completed works were satisfactory to villagers. Civil works encountered geographical problems as villages are located in areas with semi-limestone and limestone-bed at 15–20 meters underground. This created obstacles for construction of deep-water wells, boreholes for water hand pumps, and for getting sufficient water for fishponds. Significant leakage was experienced in many fishponds. EDL recruited three national consultants (one civil engineer, one water supply specialist, and one fisheries expert) on 10 December 2007 to conduct monitoring and supervision.

5. An ADB review mission in March 2008 found that project implementation was delayed. Water supply systems were incomplete and fishponds were not sufficiently filled with water. The mission held discussions with officers from EDL and village representatives (village headpersons and villagers) and advised EDL to take the following actions:

- (i) review design of flood levels and determine correct design levels for all stream-blocked village fishponds;
- (ii) recruit an earth dam specialist to inspect all stream-blocked village fishpond dams to determine any corrective measures necessary to dams already built;
- (iii) request contractors to bring dams up to contracted standards;
- (iv) protect water supply distribution pipes according to the Lao People's Democratic Republic (Lao PDR) water supply system standards to avoid unnecessary damage and leaks and repair all currently leaking pipes;
- (v) install an adequate water supply system for Vangsong village with reliable water source;
- (vi) find a solution to the hydrogen sulfide contaminated water issue in Somsanouk village;
- (vii) estimate current water consumption per person/day and compare this with the national water consumption standard of 65 liters/person/day for the rural areas; where gaps occur, the project should fill the gap with additional water supply systems; information should be reflected in the final report of environmental and/or social and rural development specialists;
- (viii) provide training and user guidelines for solid-waste pit management;
- (ix) provide training and user guidelines for the various types of fishponds (plastic lined, stream-blocked, and excavated); and
- (x) recruit a local community development specialist to (a) mobilize communities to establish operation and maintenance (O&M) committees and procedures for sustainable use of the various infrastructure and village funds; (b) oversee training and demonstrations; (c) determine if all villagers have year-round domestic water supply; (d) ensure that all villages are organized to operate and maintain the village infrastructure and funds for channeling fishpond incomes; (e) ensure that village fishponds and gardens are operating in a sustainable way; (f) ensure that the fishponds and gardens are used for the common benefit of all villagers; and (g) ensure that all villagers have been informed and trained in the importance of—and method of collecting, sorting, and disposing of—solid wastes, and that links have been made with traders so that traders collect the sorted waste materials and remove them from the villages.

6. As a follow-up to the March 2008 mission, representatives of EDL, ADB, contractors, and consultants implementing the Nam Song and Nam Leuk environmental mitigation implementation plan met at ADB's office in Vientiane on 15 May 2008 and agreement was reached on how to address outstanding issues of the plan.

7. An ADB mission reviewed implementation progress on 5–10 September 2008. The mission held discussions with officers from EDL and village representatives. Delays continued to be experienced due to lack of adequate water supply for targeted villages and fishponds. An earth-dam specialist with an adequate geology background and a social development specialist were not yet identified and recruited by EDL. Additionally, the natural flood due to high rainfall in July–August 2008 damaged many of the stream-blocked fishponds already constructed. The mission found that there was a need to not only repair or rehabilitate these fishponds but also to improve the quality of earth-dam work and provide better water supply systems to the targeted villages. ADB advised EDL that the following actions needed to be carried out urgently:

- (i) EDL to identify and recruit an earth-dam specialist to advise on how to rehabilitate stream-blocked fishponds;
- (ii) repair water leaking from the rain-fed fishpond in Vangsong village and reseal the demonstration fishponds in other villages;
- (iii) recruit a community development specialist to follow up on the agreed activities at village level;
- (iv) provide fingerlings to the fishponds when it starts to rain so that the fishponds would have sufficient water to raise fish;
- (v) follow up on the proper use of solid-waste facilities provided;
- (vi) estimate additional funds required from the uncommitted loan amount under the Northern Area Rural Power Distribution Project for consultants recruitment and additional repair and water provisions, discuss this with ADB, and seek Ministry of Finance approval for use of the funds; and
- (vii) provide an update on the situation by February 2009.

8. By mid-January 2009 EDL requested (and ADB approved) an additional \$42,500 of the uncommitted loan amount under the Northern Area Rural Power Distribution Project for installing gravity-fed water systems in Vangsong village and Nam Song area, and to cover the cost of earth-dam, fisheries, and community development specialists.

9. In March 2009 ADB met with EDL to follow up agreed actions. EDL confirmed recruitments had taken place and, with their guidance, works were progressing. The specialists had visited and studied all 24 affected villages, submitting inception reports and work plans to EDL in February 2009. ADB reviewed all reports and work plans and recommended that

- (i) the earth-dam specialist should draft a step-by-step procedure on how to rehabilitate stream-blocked fishponds, solve leakage problems of ponds, and demonstrate how to seal rain-fed fishponds and how to build an individual family fishpond;
- (ii) the fishery specialist should work closely with other specialists to (a) give advice on fishpond rehabilitation, (b) facilitate and assist the community development specialist in fishpond management training, and (c) produce a simple step-by-step user manual on how to raise fish and frogs at the village level;
- (iii) the community development specialist should follow up proposed activities at village level, including (a) set up and train village organizations; (b) provide operation and maintenance training on hand pump and gravity fed water supply systems, solid-waste management, and fishponds management; and (c) prepare user manuals with simple step-by-step procedures and conduct training on these;
- (iv) the contractor for water supply systems and environmental mitigation should submit a water supply design and implementation schedule for Vangsong village;
- (v) EDL should follow up on the proper use of solid-waste facilities provided; and
- (vi) EDL should promptly estimate additional funds needed and seek ADB and

Ministry of Finance approval.

10. ADB missions to project villages in both Nam Song and Nam Leuk in April and May 2009 concluded that progress was made on outstanding works but some social issues persisted because the mitigation measures were planned and carried out without proper consultation with the affected communities. EDL was advised to identify the technical measures to bring this to satisfactory completion. ADB declared its commitment to continue monitoring and to assist EDL to achieve agreed objectives. ADB recommended that EDL develop key performance indicators to ensure general village-level satisfaction and sustainable outcomes.

11. In June 2009 EDL submitted the indicators and the international specialist's draft project completion report (PCR) for review. ADB did not approve the PCR, considering that measures were not yet satisfactorily achieved, and advised EDL to provide sufficient water supply as recommended in the environmental mitigation implementation plan. Other ADB comments on the PCR were as follows:

- (i) A PCR should be prepared at the end of implementation period, i.e., after all mitigation measures have been properly implemented and proven to have satisfactory results according to the original plan and ADB. This had not yet been achieved.
- (ii) As mitigation measures were recommended village by village, the PCR should verify results per village, comparing with original targets.
- (iii) Where the achievement outcomes had not been met in accordance with the mitigation proposals, the PCR should give justifications and explanations as to why they have not been implemented.
- (iv) The PCR should include a summary of effective results and where implementation of the mitigation measures was less successful. Overall satisfactory results must be achieved before project closure.

12. In July and August 2009, EDL conducted further surveys and consulted with all affected villages. Community priorities had changed, and many villages proposed to have year-round water supply instead of fishponds and waste disposal sites. EDL informed ADB that all affected villages had received technical training in waste disposal management, fishery and poultry management, and O&M of water supply systems. O&M committees in each village had been established and trained. Additionally, EDL had prepared a list of 14 villages<sup>5</sup> that needed additional funds and further assistance for mitigation work. After a detailed survey, a design was made by the contracted construction company, and the additional cost for mitigation measures estimated at \$127,953.37. Furthermore, consultation with villagers resulted in willingness for labor contributions. On 18 November 2009 ADB approved the use of the additional amount from uncommitted loan amounts under the Northern Area Rural Power Distribution Project.

13. ADB closely monitored progress and activities to enable mitigation measures to be properly implemented by EDL and to arrive at closure to the satisfaction of affected villagers. Confidence levels of some villages were low with respect to contractors' performance and in some cases they were unwilling to cooperate with the construction company. This caused delays in project implementation and required ADB to increase its monitoring inputs to assist EDL and the contractor to properly communicate with the villagers and their authorities. This support by ADB to affected villages involved intensive communication with the villagers and village authority, resulting in

<sup>5</sup> Nam Leuk Areas: Gngangkheua, Hatkai, Palai, Phon Ngam, and Thamdin; Nam Song Areas: Hin Tit, Houay Dokmai, Khanmark, Nam Pat, Pak Vang, Phon Thong, Pongsong, Tao Tan, and Van Khy.

- (i) improved community knowledge about activities;
- (ii) community participation in the process of water supply construction;
- (iii) community ownership of water supply systems;
- (iv) communities providing labor for water supply construction to gain a sense of ownership;
- (v) the ability of the communities (water management committees) assessed on O&M of water supply systems; and
- (vi) ensured quality of all remaining works in the remaining villages to the satisfaction of communities.

14. An ADB mission in November 2009 concluded that, while ADB can assist in enhancing harmonious relationships between villagers, the contractor, and EDL, and in facilitating community support, technical supervision needs to be done by the contractor. The contractor failed to continuously provide site supervisors with technical understanding to guide affected communities in implementing mitigation measures. On the other hand, ADB missions witnessed admirable efforts from communities in providing labor inputs for all construction activities and in sourcing materials locally such as wood, sand, gravel stones, and some funding to support their workers at sites.

15. By December 2009, technical supervision by the contractor continued to present a major constraint. ADB provided two of its own technical engineering staff to work full time with EDL and the contractor to finalize the work in a timely manner. ADB conducted continuous special missions from 24 December 2009 until 11 February 2010, until all work was confirmed as completed. ADB concluded that

- (i) some waste disposal pits were not welcomed by the rural affected villages;
- (ii) all community stream-blocked fishponds are functional when streams are filled with water in the rainy season;
- (iii) all community rain-fed fishponds function well during the rainy season;
- (iv) all demonstration fishponds are currently nonfunctional, but they served their purpose as ponds for training purposes and demonstrations on how to raise fingerlings; and
- (v) water supply systems function well with sufficient water, except in Taotan village where the existing water source is too small to provide for the entire village and there is no alternative source.

16. Lessons are as follows:

- (i) community consultation, communication, and direct involvement in project planning is essential for effective implementation of mitigation measures; and
- (ii) planning and implementation must be in place well before impacts are experienced, rather than several years after project closure, to ensure the full cooperation of the executing agency.

17. A project completion mission, with participation of the country director from the ADB Lao PDR Resident Mission and the managing director of EDL (the executing agency), was conducted on 1–4 March 2010. ADB and EDL confirmed all work was satisfactorily completed. Communities expressed sincere thanks to ADB for its support. Since O&M committees were formed in all villages and committee members trained by EDL, ADB requested continued monitoring and assistance by EDL to ensure maximum benefit. EDL agreed to assign one person each for Nam Song and Nam Leuk areas for this purpose.

18. A mitigation measures completion report was submitted by EDL to ADB on 11 March



2010. This was revised, based on feedback from ADB, and a final version was submitted in June 2010. EDL confirmed all affected villages were satisfied with project outcomes as they now have year-round water supply as requested. All 24 affected village authorities signed off project activity completion for waste disposal pits and waste management, community fishponds, water supply systems, and technical trainings on how to maintain those facilities in a sustainable manner. The village O&M committees agreed that operations, maintenance, and ownership of facilities provided are now their responsibility.

### ESTIMATED AND ACTUAL PROJECT COSTS

Components	Estimated costs (\$'000)			Actual Costs (\$'000)		
	FC	LC	Total	FC	LC	Total
A. 115 KV Transmission Lines	10,619	2,655	13,274	11,669	4,789	16,458
B. 115 kV Substations	5,234	438	5,672	12,100	988	13,088
C. Medium Voltage Distribution System	6,354	3,226	9,579	10,770	3,376	14,146
D. Low Voltage Distribution System <sup>a</sup>	1,451	1,235	2,686	0	5,868	5,868
E. UXO Clearance <sup>b</sup>	1,842	790	2,632	0	0	0
F. Other Costs						
Compensation, administration, and construction of service center	0	260	260	0	2,449	2,449
Consulting Service for Implementation	2,790	310	3,100	3,358	123	3,481
Other Consulting service	360	40	400	357	6	363
<b>Cost Summary</b>						
Base Costs	28,650	8,953	37,603	38,254	17,599	55,853
Physical Contingencies	2,628	839	3,467	0	0	0
Price Contingencies	3,942	1,447	5,389	0	0	0
Taxes & Duties	0	979	979	0	852	852
IDC <sup>c</sup>	679	3,394	4,073	0	6,681	6,680
<b>Total Costs</b>	<b>35,899</b>	<b>15,612</b>	<b>51,511</b>	<b>38,254</b>	<b>25,132</b>	<b>63,385</b>

IDC = interest during construction, FC = foreign currency, LC = local currency, UXO = unexploded ordnance

<sup>a</sup> Low-voltage distribution system costs include additional items procured under ADB loan savings.

<sup>b</sup> The actual cost of unexploded ordnance clearance was incorporated within the respective transmission and substation contracts and financed from that budget item.

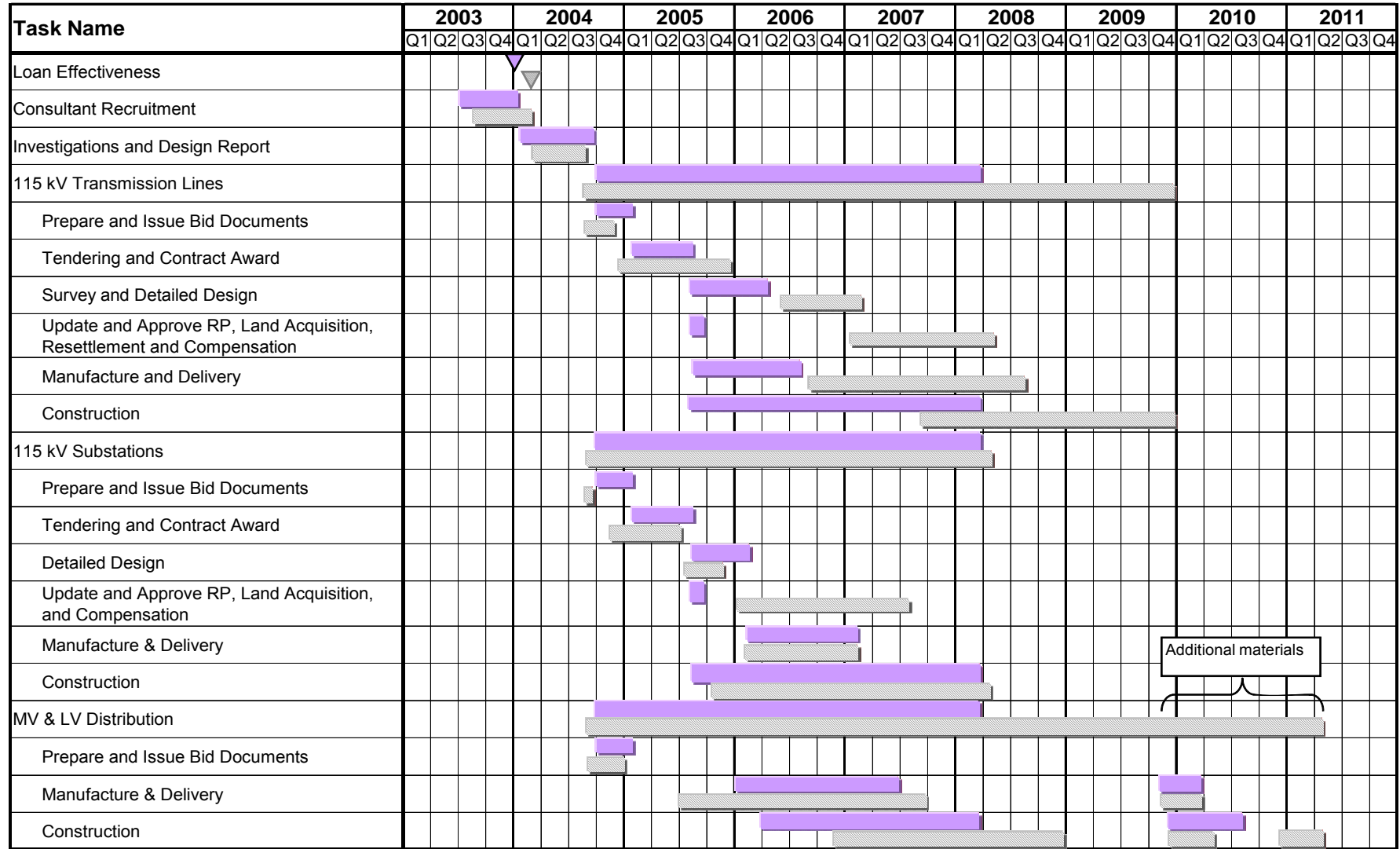
<sup>c</sup> It is presumed that although there was provision for part of the IDC to be disbursed from the Asian Development Bank (ADB) loan, this was credited directly to the government. Accordingly, the amount of IDC shown was paid by EDL directly to the government under the terms of its subsidiary loan agreement.

Source: Asian Development Bank - loan financial information system, Nordic Development Fund - loan disbursement record, and EDL's audited costs of the Northern Area Rural Power Distribution Project to December 2009 and updated to include unaudited data to June 2010 when the loan account closed.

SUMMARY OF ANNUAL PROJECTION AND ACTUAL DISBURSEMENT				
Calendar Year	Projection (\$ million)		Actual (\$ million)	
	Yearly	Cumulative	Yearly	Cumulative
2004	1.20	1.20	1.34	1.34
2005	14.80	16.00	3.09	4.42
2006	12.45	28.45	11.85	16.27
2007	10.35	38.80	18.49	34.76
2008	7.23	46.03	13.19	47.95
2009	4.10	50.13	7.90	55.85
2010	0.00	0.00	7.54	63.39

Source: Asian Development Bank - loan financial information system, Nordic Development Fund - loan disbursement record, and Project Quarterly Progress Reports.

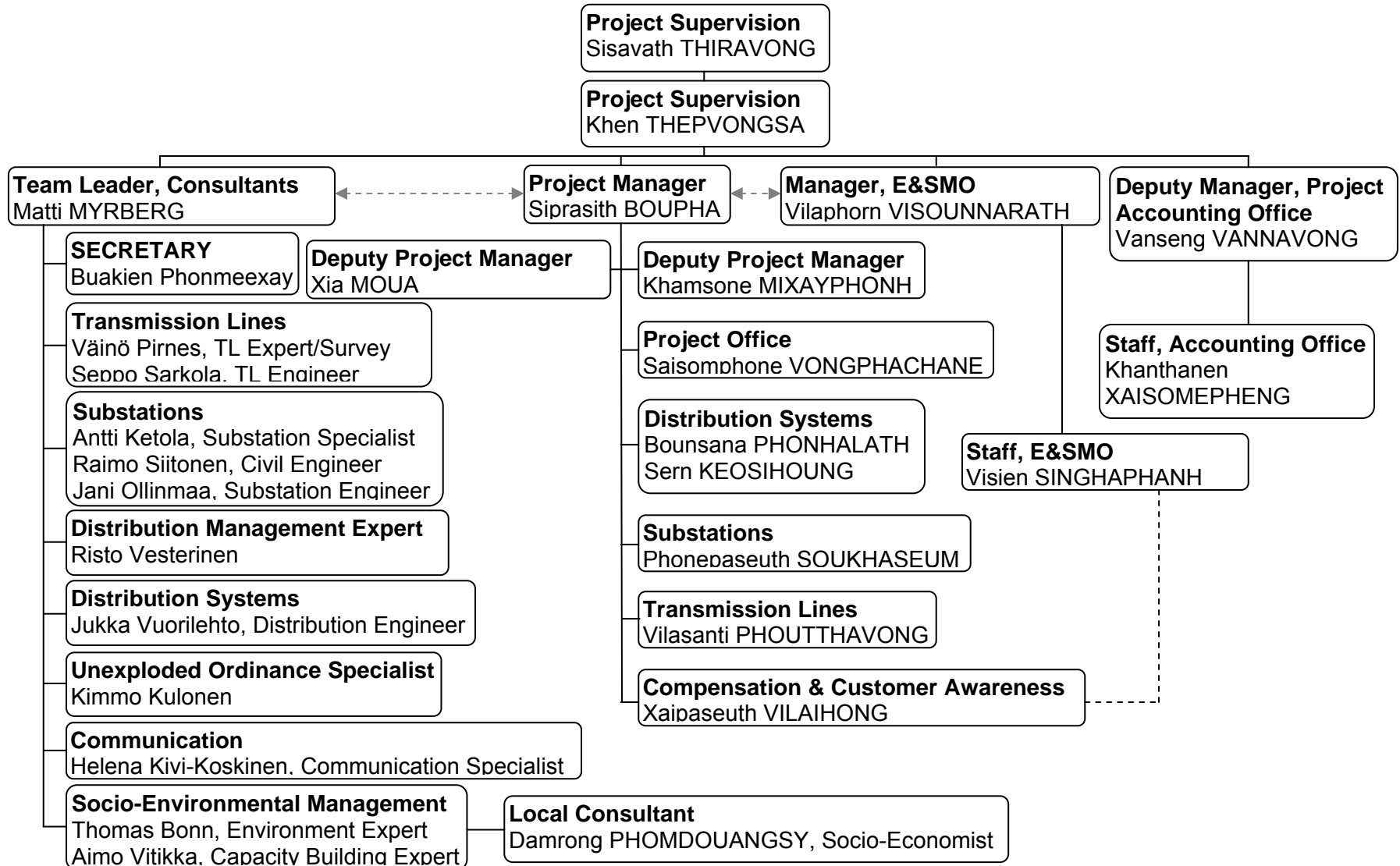
### ACTUAL IMPLEMENTATION VERSUS ORIGINAL SCHEDULE



kV = kilovolt, LV = low voltage, MV = medium voltage

Source: Report and Recommendation of the President to the Board of Directors, Project Administration Manual, EDL's Project Quarterly Progress Reports and Project Completion Report.

# PROJECT MANAGEMENT UNIT - ORGANIZATIONAL CHART



E&SMO. = Environmental and Social Management Office, TL = transmission line  
Source: EDL's Project Completion Report

**STATUS OF COMPLIANCE WITH LOAN COVENANTS**

<b>Covenants</b>	<b>Reference of the Covenants</b>	<b>Status of Compliance</b>
<b>Environmental</b>		
1. The EA shall comply with ADB's Environmental Assessment Guidelines and the Borrower's environmental regulations and shall meet the mitigation and monitoring requirements described in the initial environmental examination report to the satisfaction of ADB. The Borrower shall ensure or cause The EA to ensure that necessary Project budget is allocated for these purposes.	Loan agreement, Schedule 6, para. 3	Complied with.
<b>Social</b>		
1. No civil works contract shall be awarded for each Part of the Project until after: a) all people affected by that Part have been satisfactorily compensated and resettled, and rehabilitation measures have been in place, in accordance with the requirements of the updated Resettlement Plan, the Borrower's procedures, and the Bank's Policy on Involuntary Resettlement; and b) the area for the civil works contracts have become free of all encumbrance.	Loan agreement, Schedule 4, para. 7 (a) and (b)	Complied with.
2. The EA shall ensure that a comprehensive program for PPME acceptable to the Bank is carried out during the Project implementation period and subsequent operation. PPME shall include monitoring and evaluation of the physical progress, operations, benefits, and impacts of the Project. A set of PPME indicators shall be developed at the beginning of the Project with assistance of consultants and in consultation with local communities shall be responsible for carrying out the PPME activities, including initial baseline and socioeconomic surveys, data collection, and analysis. A baseline socio-economic survey shall be carried out before connections are made in the Project areas. A second round socio-economic survey shall be carried out within 3 years since the first connections are made. The surveys shall cover both electrified and un-electrified areas. A careful assessment of the new connection policy on the ability of connecting the poor shall be made continuously throughout connections under the Project. The EA shall submit a detailed implementation plan of PPME for the	Project agreement, Section 2.16	Partly complied with.  Benefit monitoring evaluation plan approved by ADB on 22 March 2005.  Completed socioeconomic baseline survey and report was sent to ADB on December 2005.  The executing agency proposed to carry out the second round socioeconomic surveys within 3 years after project completion, by March 2013.  An external monitoring audit engaged in November 2009 for reviewing the

Covenants	Reference of the Covenants	Status of Compliance
Bank's review and concurrence within six months of the Loan effective date and also submit annual PPME reports within one month of the end of each calendar year.		<p>implemented resettlement.</p> <p>The monitoring audit report was submitted to ADB and confirmed resettlement was in compliance with ADB safeguards.</p> <p>Annual PPME report not submitted to ADB.</p>
3. The EA will assign at least one staff at each provincial branch office by the end of 2003 to be responsible for social and environmental management.		Complied with.
4. The Borrower or The EA shall ensure that a full census and inventory of lost assets for people who are affected by the Project's resettlement impacts shall be undertaken following detailed design at the Project implementation stage. An updated resettlement plan shall be prepared and submitted to the Bank for approval, prior to commencing land acquisition activities for each part of the Project.	Loan agreement, Schedule 6, para. 4	Complied with.
5. By end 2003, The EA will establish as a permanent unit a socioeconomic cell within its Environment and Social Management Office.	Project agreement, Section 2.23 (i)	Complied with.
6. Assign appropriate counterpart staff there for the training of systematic data collection, benefit monitoring, and economic modeling.	Project agreement, Section 2.23 (ii)	Complied with.
7. Engage at least one social development specialist and one rural development specialist there.	Project agreement, Section 2.23 (iii)	Complied with.
8. Assign at least one staff to be responsible for social and environmental management at each provincial branch office.	Project agreement, Section 2.23 (iv)	Complied with.
9. The Borrower shall ensure or cause The EA to ensure that the updated Resettlement Plan approved by the Bank is implemented to the satisfaction of the Bank.	Loan agreement, Schedule 6, para. 5	Complied with.
10. The Borrower shall ensure or cause The EA to ensure that The EA does not make contracts with contractors to be engaged for the Project	Loan agreement, Schedule 6,	Complied with.

Covenants	Reference of the Covenants	Status of Compliance
that allow differentiation of wages between men and women for work of equal type or child labor in the Project's construction activities and camps.	para. 6	
<b>Financial</b>		
1. The EA shall continue to implement its Financial Recovery Plan as agreed between the Borrower and the Bank.	Project agreement, Section 2.17	Complied with
2.Except as ADB shall otherwise agree, for FY 2003 and thereafter, The EA shall not incur any debt unless a reasonable forecast of the revenues and expenditures of The EA shows that the estimate net revenues of The EA for each fiscal year during the term of the debt to be incurred shall be at least on one and one half (1.5) times the estimated debt service requirements of The EA in such year on all debt of The EA including the debt to be incurred.	Project agreement, Section 2.18	Complied with.
3. The EA shall produce cash from internal sources equivalent to not less than 30% of the three-year average of planned capital expenditures for FY 2003, the previous fiscal year and the year thereafter.	Project agreement, Section 2.19 (a)	<p>Was complied with but dropped due to major investments by the executing agency. Being reviewed with support of other development partners.</p> <p>FY2003 = 54% (complied with)  FY2004 = 93% (complied with)  FY2005 = 42% (complied with)  FY2006 = 60% (complied with)  FY2007 = 32% (complied with)  FY2008 = 30%  FY2009 = 25% (due to increase in capital investments for 2009/10 and 2010/11 and low energy production, mainly Nam Ngum 1 hydroelectric plant because of [i] low water level in reservoir; and [ii]</p>



Covenants	Reference of the Covenants	Status of Compliance
		<p>repair of a generator)</p> <p>On 12 May 2010, the executing agency wrote to the government requesting authority to raise the overall average tariff by 18.3% in 2010 and 4.2% every year thereafter until 2016. This was approved in January 2011 with revision to the proposal, to increase by 18.4 % in 2011, 2% in 2012, and annually thereafter until 2016.</p>
4. The EA shall maintain a debt–equity ratio of 1.5 or below.	Project agreement, Section 2.20	Complied with.
5. The EA shall reduce its accounts receivable for domestic electricity sales equivalent to 2 months' of average sales of the previous fiscal year by fiscal year 2005 and maintain level thereafter.	Project agreement, Section 2.21	<p>Nearly complied with.</p> <p>FY2010 = 2.6 months' of average sales of the previous fiscal year. That is nearly in compliance, as the new requirement of the Greater Mekong Subregion Northern Power Transmission Project (Grant 0195) is 3 months.</p>
6. The EA shall maintain levels of electricity tariffs for The EA to meet its financial loan covenants in FY2005 and thereafter;	Project agreement, Section 2.22	Complied with.
7. and maintain the lifeline tariff block for residential consumers at no more than 50 kWh/month	Project agreement, Section 2.22	Complied with.
8. The EA shall offset government, provincial, and municipal receivables (including arrears as of 31 Dec. 2002) above 2 months' average sales against The EA's tax and other financial liabilities with the Government every quarter in 2004 and 2005, and submit quarterly statements to ADB concerning these settlements.	Project agreement, Section 2.21 (b)	Complied with.
9. The EA shall use its own funds to	Project	Complied with.

<b>Covenants</b>	<b>Reference of the Covenants</b>	<b>Status of Compliance</b>
continuously carry out the loss reduction program and ensure that the rate of total domestic distribution loss is less than 17%, 16%, and 15% by the end of 2003, 2004 and 2005 respectively, and maintain less than 15% thereafter.	agreement, Section 2.24	
10. (iii) The Government and The EA will ensure that sufficient counterpart funds are available on time to meet all local-cost components of the Project.		Complied with.
11. The EA shall not declare any dividend or make any other distribution with respect to share capital, unless its obligations specified in Sections 2.18, 2.19 and 2.20 above are met based on the Bank's review of audited financial statement.	Project agreement, Section 2.29	Complied with.
<b>Others</b>		
1. Established, Staffed, and Operating PMU The EA shall carry out the Project and make available, promptly as needed the funds, facilities, services, equipment, land and other resources which are required, in addition to the proceeds of the Loan, for the carrying out of the Project.	Project agreement, Article 2, Section 2.01	Complied with.
2. Fielding of Consultants The consultants shall be selected in accordance with ADB guidelines in the recruitment of consultants.	Loan agreement, Schedule 5, para. 2	Complied with.
3. Consultants shall be selected and engaged as firm by MIH (now MEM) and the EA using QCBS method.	Loan agreement, Schedule 5, para 3	Complied with.
4. The EA will issue information on the amortization option for residential consumers with 3/9 ampere meter connections to all branch offices and consumers at least 2 months before connections are made. Amortization will apply to all The EA residential consumers with 3/9 ampere connections, including consumers in areas not supported by ADB, by end of 2003.	Project agreement, Section 2.26	Complied with.

Covenants	Reference of the Covenants	Status of Compliance
5. At least 2 months before connections are made, The EA will implement a consumer awareness campaign on the safe use of electricity, billing practices, and connection policy.	Project agreement, Section 2.27	Complied with.
6. By 31 March, The EA shall annually prepare and provide to the Bank for its review and comments, a draft Power Development Plan for all capital expenditures planned for the subsequent ten years, which shall include The EA's load forecast, its investment requirements for generation, transmission, and distribution, its indicative financing assumptions, and its financial projections over the same period.	Project agreement, Section 2.25	Complied with.
7. The EA will insure or cause to be insured the Project facilities or cause to be insure with responsible insurers, or make other arrangement satisfactory to the Bank consistent with sound business practices, the Project facilities and goods to be imported by the Project and to be financed out of the proceeds of the Loan against hazards incident to the acquisition, transportation and delivery to the place of use or installation, and for such insurance any indemnity shall be payable in a currency freely usable to replace or repair such goods.	Project agreement, Section 2.05	Complied with.
8. Execution of Contract - If any substantial amendment of the contract is proposed after its execution, the proposed changes shall be submitted to the Bank for prior approval.	Loan agreement, Schedule 5, para 3.e	Complied with.

## SUMMARY OF CONTRACTS

Item	Package Name	Procurement Mode	Date of Contract Award	Contract Prices (\$'000)	Contractors' Names
<b>I</b>	<b>Civil Works</b>			<b>29,547</b>	
NARPD 1	Transmission Lines	ICB	22 December 2005	16,459	China National Electric Wire and Cable Import & Export Corporation (CCC), PRC
NARPD 2	Substations	Nordic Competitive Bidding	6 July 2005	13,088	Jacobsen Elektro AS, Norway
<b>II</b>	<b>Material and Equipment</b>			<b>14,146</b>	
<b>NARPD 3</b>	<b>Distribution System</b>			<b>13,244</b>	
NARPD 3.1	Lines Equipment&Tools	ICB	7 July 2005	1,638	Guangzhou Economic and Technical Development District Construction Import & Export, PRC
NARPD 3.2	Concrete Poles&Cross-arms, Lot A,B	ICB	29 June 2005	2,089	DLPCP Group, Lao PDR
NARPD 3.2	Concrete Poles&Cross-arms, Lot C	ICB	8 July 2005	1,261	Phetlaiphone Concrete, Lao PDR
NARPD 3.3	Distribution Transformers	ICB	11 August 2005	763	Panmotor Electric Industry, Lao PDR
NARPD 3.4	Conductors,Cables&Wires	ICB	7 July 2005	5,000	Wuxi Jiangnan Cable, Lao PDR
NARPD 3.5	Energy Meters	IS	1 July 2005	210	Holley Metering Limited, Lao PDR
NARPD 3.6a Add.	Line Equipment & Transformers	ICB	23 November 2009	1,065	Gunkul Engin. Pub, Thailand
NARPD 3.6b Add.	Concrete Poles & Cross-arms	ICB	10 November 2009	896	Elect. Cons. & Inst. (ECI), Lao PDR
NARPD 3.6c Add.	Conductors, Cables & Wires	ICB	12 November 2009	322	Hanaka Group Joint Stock, Viet Nam
<b>NARPD 4</b>	<b>Vehicles</b>			<b>902</b>	
NARPD 4a	Vehicles, Pick-up trucks	NCB	01 September 2005	231	RM Asia (H.K.), Lao PDR
NARPD 4b	Vehicles, Trucks with crane	NCB	31 January 2006	671	Diethelm & Co, Lao PDR
<b>III</b>	<b>Construction and Installation of distribution systems</b>			<b>5,083</b>	
NARPD 5a	Construction and Installation of Medium&Low Voltage Sys	NCB	11 November 2005	4,657	Elect. Cons. & Inst. (ECI), Lao PDR
NARPD 5b	Construction of EdL Service Centers	NCB		426	Various
<b>IV</b>	<b>Consulting</b>			<b>3,844</b>	
	Implementation Services	QCBS	12 March 2004	3,481	Hifab/Electrowatt-Ekono, Finland
	IPP Development	QCBS	14 January 2005	363	Maunsell Limited, New Zealand
<b>V</b>	<b>Miss. Works (Nam Song and Nam Leuk Impact Mitigation)</b>			<b>474</b>	
	Fish Pool & Livelihood Development in Nam Song area	NCB	15 June 2007	58	AMMATA Construction, Lao PDR
	Fish Pool & Livelihood Development in Nam Leuk area	NCB	15 June 2007	69	PASOMXAY Construction, Lao PDR
	Water Supply System in Nam Song Area	NCB	15 June 2007	238	SPM, Lao PDR
	Water Supply System in Nam Leuk Area	NCB	26 December 2007	54	Douangthavixay Const, Lao PDR
	Preparation of the Mitigation Plan for Nam Song/Nam Leu	SSS	8 September 2006	29	Dr. Montri SUVANAMONTRI, Thai National
	Fishery and Water Suply, and Earth Dam Specialists	SSS	26 December 2007	15	Local Consultant, Lao National
	Community Development specialist	SSS	26 December 2007	11	SD&XP Consultant Group, Lao National

Lao PDR = Lao People's Democratic Republic, NARPD = Northern Area Rural Power Distribution

EDL = Electricite du Laos, ICB = International Competitive Bidding, IS = International Shopping, NCB = National Competitive Bidding, QCBS = Quality-and-Cost Based Selection, SSS = Single Source Selection, VO = Variation Order

Source: Asian Development Bank - loan financial information system, Nordic Development Fund - contract awards record, and EDL's Project Quarterly Progress Reports

**CHRONOLOGY OF KEY EVENTS**

<b>Date</b>	<b>Activity</b>	<b>ADB Mission Findings/Actions</b>
24 Feb–7 Mar 2003	Appraisal Mission	– Scope, financing, and implementing arrangements, NARDP Project finalized with NDF based on Project Preparatory TA prepared by Arcres International in September 2002.
18 Sept 2003		– Loan approval.
8 Mar 2004		– ADB loan effective, await effectiveness of NDF loan, consultants in place.
22–26 Mar 2004  26 Mar 2004 1 Apr 2004	Inception Mission  MOU BTOR	– Consultants, Hifab Oy (Finland), selected and contract signed 9 March 2004. – Review preparations, finalize project administration manual (PAM) and ADB reporting requirements, review covenants. – EDL proposed amendments to project scope to be considered after reconnaissance survey. – Clarification of ADB procurement issues, environmental monitoring and management (EMM), resettlement and compensation (R&C), project progress monitoring reporting and evaluation (PPM&E), accounting. – Request for Ministry of Energy and Mines (MEM) to recruit consultants for power sector policy statement and institutional restructuring.
11–21 Oct 2004  21 Oct 2004 2 Nov 2004	Review Mission  AM BTOR	– Project management unit established, engineering design report completed, socioeconomic work commenced September 2004, EMM, R&C, PPM&E, and consumer awareness in place. – 115 kV line length reduced from 303 km to 274 km; parts of 22 kV line already constructed under local financing, new lines 22 kV proposed; average houses per village at 50 (half of appraisal); increase number of villages. – Noncompliance with accounts receivable covenants. The government suspended tariff increase from June 2004.
17–19 May 2005  19 May 2005 26 May 2005	Review Mission  AM BTOR	– Resettlement action plan submitted to ADB 28 April 2005. – Bid evaluation report for 115 kV lines expected 27 May 2005, bid evaluation report for NDF-funded substations completed, expected cost overrun €1.3 million. – Bid evaluation report for distribution equipment by May 2005. Financial issues: high accounts receivable, ADB objects to EDL dividend to the government.
Jun–Oct 2005		– Contract for substations and various supply of distribution equipment placed during this period.
19 Aug 2005	Amend loan agreement	– Allow transmission line contract to be let prior to finalization of resettlement action plan (to enable contractor to finalize alignment).
18–21 Nov 2005  21 Nov 2005 7 Dec 2005	Review Mission  AM BTOR	– Socioeconomic findings to be submitted to ADB on 25 Nov 2005. – Bid evaluation report for 115 kV transmission lines submitted to ADB in November 2005 with 4.5 month projected delay. – Partial deliveries of medium- and low-voltage poles and trucks. – UXO clearance at substation done, compensation to affected people paid. – Non-complying financial covenants, increasing accounts receivable to 5.7 months, MOF planned to offset government's arrears by February 2006; government's action plan on financial sustainability; tariff action plan, losses increase from 17% to 20%. – Consultants (Maunsell) appointed for IPP development and MEM institutional strengthening.

Date	Activity	ADB Mission Findings/Actions
20 Feb 2006	Key Date	<ul style="list-style-type: none"> <li>– Contract for transmission lines signed.</li> </ul>
3–10 May 2006	Review Mission	<ul style="list-style-type: none"> <li>– All ADB contracts awarded by Feb 2006; rebidding of conductors contract due to contract default.</li> <li>– CCC (PRC) begins work on transmission lines February 2006, design by June 2006, survey by February 2007; projected delay 12 months holding up substations testing.</li> <li>– NDF credit increases to €12.5 million to cover substations costs, 12 March 2006.</li> <li>– New managing director of EDL appointed on 1 April 2006; new project manager appointed.</li> <li>– Delays in socio-environment and resettlement ongoing; noncompliance with financial covenants in accounts receivable, government offset (equal to 20 months sales), loss reduction, dividend to Ministry of Finance (MOF), tariff adjustments.</li> <li>– EDL requested extension to transmission line contract for 4 months, ongoing contraction of 22 kV lines by Engineering Construction and Installation Company.</li> <li>– EDL proposed reallocation of \$0.2 million from ADB loan to environment and social issues associated with Nam Song and Nam Leuk hydropower projects.</li> <li>– Maunsell report submitted to MEM on IPP development.</li> </ul>
15 May 2006	Transfer Project Administration	<ul style="list-style-type: none"> <li>– ADB project administration handed over to Lao PDR Resident Mission.</li> <li>– Change in ADB HQ project implementation officer (Peter Logan).</li> </ul>
5 June 2006	Loan Extension	<ul style="list-style-type: none"> <li>– First request for approval for 4 month loan extension to 31 January 2009 to enable transmission line contract to be funded to completion.</li> </ul>
23 June 2006	Loan Reallocation	<ul style="list-style-type: none"> <li>– \$250,000 approved to settle pending environmental and social issues on Nam Song and Nam Leuk hydropower projects.</li> </ul>
22 Jun–5 Jul 2007	Review Mission	<ul style="list-style-type: none"> <li>– Project cost estimated at \$54.8 million, progress 52% versus 69% in RRP.</li> <li>– NDF loan fully committed, ADB loan savings estimated at \$3 million.</li> <li>– Significant delays in transmission line survey, profiling, line design. UXO clearing at towers proceeding well.</li> <li>– Progress with financial covenants although serious delays with settlement of government debts; accounts receivable up to 5.4 months, government offset 25.6 months, energy loss reduction down to 17.8%.</li> </ul>
5 July 2007 11 July 2007	AM BTOR	
19–21 Sep 2007	Joint Mission ADB–NDF	<ul style="list-style-type: none"> <li>– Field visits to inspect substation and transmission clearing.</li> <li>– Overall project cost \$55 million due to appreciation of SDR against \$ and increase in NDF loan; progress assessed at 68% against 74% projected loan disbursements.</li> <li>– Substations contract expected to complete in February 2008; planned to demobilize and mobilize using ADB loan savings.</li> <li>– EDL identified more work and requested ADB reallocate \$0.65 million from \$3 million of loan savings.</li> <li>– Delays in delivery of towers line completion projected January 2009.</li> <li>– Delays in resettlement action plan (not critical).</li> <li>– Progress with Nam Song and Nam Leuk impact mitigation</li> </ul>
21 Sep 2007 29 Sep 2007	AM BTOR	

Date	Activity	ADB Mission Findings/Actions
		measures.
10 Dec 2007	Loan Reallocation	– Approval of EDL request, 1 November 2007, to allocate \$10,000 loan savings to fund consulting supervision of civil works contractors.
24–27 Jun 2008	Joint Mission ADB–NDF	– NDF funds fully committed, EDL requested extension to December 2009. – Noncompliance with three financial covenants. – Workshop planned for IPP presentation as per Maunsell report. – Contracts for mitigation measures signed and appointment of Nam Song and Nam Leuk hydropower projects. – Loan savings estimated \$4.55 million. – Concerns about delays in transmission line contract.
12 Aug 2008	Loan Reallocation	– Approval to use \$4.6 million loan savings for contract variations, extensions to 22 kV lines, upgrading and extensions to Vang Vieng substation, mobilization and demobilization of substation contractor.
11–19 Dec 2008	Review Mission	– Schedule of issues and actions to complete project. – Without transmission line work program ADB reluctant to commit loan savings in case of cost overruns.
23 Dec 2008	Loan Reallocation	– \$0.042 million approved to cover the cost of additional water supply for Vang Song village and local consultants for site supervision related to mitigation works impacted by Nam Song and Nam Leuk hydropower projects.
18–25 Mar 2009	Joint Mission ADB–NDF	– Resettlement plan fully implemented. – Nam Song and Nam Leuk measures require attention. – Further allocation to Nam Song and Nam Leuk impact mitigation measures. – Loan savings estimated at \$1.26 million; procurement documents for additional distribution materials ready for issue. – ADB propose extension of consultants' contract to completion of transmission line.
17 Sep 2009	Loan Extension	– Request for approval of second extension of loan by 11 months to 31 December 2009 to enable transmission line contract to be completed.
18 Nov 2009	Loan Reallocation	– Approval to use further savings of \$128,000 for additional mitigation works for Nam Song and Nam Leuk hydropower projects.
9–20 Nov 2009	Review Mission	– Still issues with financial loan covenants and mitigation measures for Nam Song, Nam Leuk and transmission line project delays.
8 Jan 2009	Loan Reallocation Extension	– Approval to use \$879,000 for variation order to the three additional supply contracts procured under the loan savings. – Request approval of loan extension by 3 months to 31 March 2010 to enable EDL to complete procurement using loan savings.
25 Dec 2009–11 Feb 2010	Review mission	– Review of social impact mitigation measures affected by Nam Song and Nam Leuk hydropower projects.
15 Feb 2010	BTOR	– All mitigation works for Nam Song and Nam Leuk satisfactorily completed, albeit late.
22 Mar–1 Apr 2010	Review Mission	– Final status review of project completion arrangements including disbursement of loan savings.
Jul 2010	IED Review Mission	– General comments of progress with NARPD project and issues with transmission line contractor. – Survey of selected village indicates probable inability to pay. – Confirmation of general acceptance of covenant defaults.

Date	Activity	ADB Mission Findings/Actions
		<ul style="list-style-type: none"> <li>– Need for economic internal rate of return and financial internal rate of return review.</li> </ul>
7–21 Oct 2010	PCR Mission	<ul style="list-style-type: none"> <li>– Assess the project impact and sustainability.</li> <li>– Discuss pending issues, mainly financial covenants.</li> <li>– Distribution system reliability issues.</li> <li>– Recommendations for enhancing supervision of future ADB projects.</li> </ul>

ADB = Asian Development Bank, AM = Aide Memore, RTOR = Back-to-Office Report, IED = Independent Evaluation Department, EDL = Electricite du Laos, IPP = independent power producer, NARPD = Northern Area Rural Power Distribution, NDF = Nordic Development Fund, SDR = special drawing right, UXO = unexploded ordnance, Source: Asian Development Bank, AMs, BTORs, and Memos



## ELECTRIFICATION AND ENERGY CONSUMPTION STATISTICS

Table A10.1: Electrification in the NARPD Project Area (HH)

Year	Vientiane		Xaignabouli		Louang Namtha		Oudomxai		Xiang Khouang		Louang Phrabang		Total	
	Other	NARPD	Other	NARPD	Other	NARPD	Other	NARPD	Other	NARPD	Other	NARPD	Other	NARPD
2006	54,367	0	27,211	0	8,294	67	4,930	0	8,357	0	24,439	0	127,598	67
2007	60,082	633	29,076	1,589	8,476	1,812	5,566	0	8,921	0	27,131	0	139,252	4,034
2008	64,868	1,530	34,797	5,010	8,994	2,240	5,594	1,054	10,186	2,068	32,855	1,067	157,294	12,969
2009	68,386	2,111	35,816	7,871	10,101	2,583	7,479	5,018	11,335	4,345	34,497	3,897	167,614	25,825
2010	74,462	2,417	40,783	6,908	13,063	3,279	9,149	9,079	13,055	5,881	48,170	5,266	198,682	32,830
<b>Total Elect. HHs</b>		<b>76,879</b>		<b>47,691</b>		<b>16,342</b>		<b>18,228</b>		<b>18,936</b>		<b>53,436</b>		<b>231,512</b>
<b>Total HHs</b>		<b>83,011</b>		<b>66,614</b>		<b>28,831</b>		<b>46,244</b>		<b>40,463</b>		<b>69,981</b>		<b>335,144</b>
<b>Elect. Ratio</b>		<b>93%</b>		<b>72%</b>		<b>57%</b>		<b>39%</b>		<b>47%</b>		<b>76%</b>		<b>69%</b>

Elect. = Electrified, HH = household, NARPD = Northern Area Rural Power Distribution

Source: Ministry of Energy and Mines - Electrification Statistic, EDL Annual Report 2009, and Project Completion Review Mission.

**Table A10.2: Energy Growth in Project Area During NARPD Project Implementation Period  
(Vientiane, Xaignabouli, Xiang Khouang, Louang Prabang, Oudomxai, and Louang Namtha)**

<b>Year</b>	<b>Energy Consume and Revenue</b>	<b>Residential</b>	<b>Embassy/ Organization</b>	<b>Commercial</b>	<b>Entertainment</b>	<b>Government Office</b>	<b>Agriculture</b>	<b>Industry</b>	<b>Total</b>
2006	Energy (kWh)	80,549,974	54,152	13,619,176	3,624,531	8,905,604	3,372,808	65,973,611	<b>176,099,856</b>
	Revenue (KN'000)	24,849,554	58,204	11,777,189	3,845,868	6,317,153	1,182,929	38,899,398	<b>86,930,296</b>
2007	Energy (kWh)	85,793,160	56,881	22,857,043	3,203,164	8,842,277	3,979,851	74,728,144	<b>199,460,520</b>
	Revenue (KN'000)	27,709,929	61,286	18,942,300	3,224,819	6,275,220	1,045,397	43,475,314	<b>100,734,265</b>
2008	Energy (kWh)	95,107,304	59,087	151,795,316	3,008,055	9,219,616	3,237,998	67,127,843	<b>329,555,219</b>
	Revenue (KN'000)	31,758,413	62,142	115,538,340	3,024,427	6,566,291	946,082	39,575,509	<b>197,471,204</b>
2009	Energy (kWh)	112,477,498	47,105	90,150,471	3,674,924	11,317,238	3,579,901	242,528,415	<b>463,775,552</b>
	Revenue (KN'000)	40,238,232	50,254	67,917,122	3,675,911	7,852,264	1,057,865	151,692,382	<b>272,484,029</b>
2010	Energy (kWh)	132,968,240	20,762	44,541,897	3,738,942	13,599,597	4,118,102	347,700,572	<b>546,688,112</b>
	Revenue (KN'000)	52,835,561	22,816	38,250,430	3,914,620	9,738,508	1,579,691	224,059,606	<b>330,401,233</b>

Note: average growth from 2007 to 2010 was about 53% annually for energy consumption, and 70% annually for revenue.

Source: Ministry of Energy and Mines - Electrification Statistic, EDL Annual Report 2009, and Project Completion Review Mission.

**Table A10.3: Annual Statistics of Electrification Rate, Tariffs and Energy**

Year	Total amount			Elect. rate	Average Tariff		Exchange rate	Energy Exported	Energy Imported	Energy Consumed	Energy losses
	Dist.	Village	HH	%	KN/kWh	US\$/kWh	KN/US\$	GWh	GWh	GWh	%
1997	141	11,456	754,265	26	52	0.043	1,220	710		483	22.8%
1998	141	11,456	754,265	30	52	0.016	3,235	405	142	513	19.0%
1999	141	11,058	768,142	33	113	0.016	7,044	598	172	565	20.0%
2000	142	11,263	818,668	36	169	0.021	7,911	862	181	639	18.8%
2001	142	11,231	866,277	35	240	0.027	8,948	796	182	710	17.7%
2002	142	11,168	875,774	39	370	0.036	10,171	771	200	766	18.7%
2003	142	10,866	883,355	43	402	0.038	10,625	434	229	883	16.4%
2004	141	10,781	930,982	47	492	0.046	10,646	507	277	902	19.0%
2005	139	10,473	1,000,350	48	510	0.048	10,646	727	325	1,011	19.3%
2006	140	10,583	943,810	54	517	0.048	10,706	547	325	1,112	17.8%
2007	140	9,630	959,094	59	523	0.054	9,607	267	467	1,298	15.5%
2008	141	9,528	972,419	63	542	0.062	8,720	391	515	1,577	13.7%
2009	141	9,063	1,026,027	70	547	0.064	8,533	229	818	1,901	11.9%

Source: Ministry of Energy and Mines - Electrification Statistic, EDL Annual Report 2009, and Project Completion Review Mission.

## RECALCULATION OF FINANCIAL AND ECONOMIC VIABILITY

1. The analysis of the financial internal rate of return (FIRR) and economic internal rate of return (EIRR) in the 2003 report and recommendation of the President (RRP)<sup>21</sup> concluded that the Northern Area Rural Power Distribution Project was financially unsustainable (FIRR of 2.77% compared to the Electricite du Laos [EDL] weighted average cost of capital [WACC] of 4.7%), but economically very attractive, with an EIRR of 24%. The FIRR computation was based on a project cost estimate that was 20% lower than actual and used an average tariff of US\$0.052 per kilowatt-hour (kWh) that was anticipated to apply in 2005. EDL's operation and maintenance (O&M) costs were determined from incremental financial costs of generation (KN95/kWh now over KN200/kWh) coupled with an O&M and administrative cost per consumer (KN307/kWh). The analysis concluded that, for the project to be financially viable, EDL tariffs would need to increase by 9% per year after 2005.

2. In the meantime, the financial and physical implementation assumptions that underlay the FIRR and EIRR estimates changed significantly since 2003, requiring a reassessment of project viability. There was a major change made to the scope of the villages to be electrified, based on a supplementary socioeconomic survey and review and update of socioeconomic assessment by Hifab Oy (Finland) in April 2005. This resulted in the reselection of 195 new villages that were generally smaller in size and poorer than those identified in the Project Preparatory TA prepared by Arcres International in September 2002. On the other hand, high growth has taken place in the northern region due to the significant investment by the private sector in roads, electricity networks, agriculture, and industry.

3. A comprehensive reevaluation of the financial and economic performance of the project would be difficult without specific detail of the villages connected, which is expected to be provided within 3 years after project completion. It is also difficult to assess the efficacy of the Northern Area Rural Power Distribution Project transmission investments in terms of the significant electricity growth occurring because of all the concurrent investments by others. Nevertheless, on the basis of simplified assumptions (explained in paras. 4-12 below) and using similar methodology as used in the RRP, the reevaluation shows that the project will still not meet the WACC unless EDL increases tariffs to the extent recommended by its consultants, but the economic viability is still robust under a variety of different sensitivities.

### Financial Analysis

4. Current data for EDL operations are taken from the June 2009 Tariff Study Update Report prepared by SNC-Lavalin and used as a basis for EDL's recommendation to the government for its new tariffs. Based on the forecast, the EDL balance sheet report also indicated significantly increased generation and O&M administrative cost data (Table A11.1).

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<sup>21</sup> ADB. 2003. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the Lao People's Democratic Republic for the Northern Area Rural Power Distribution Project*. Manila.

**Table A11.1: Financial Forecast for EDL Systems (KN million)**

<b>Operating Expense:</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>Incr/ year</b>
Energy Purchases	447,248	745,008	1,203,253	1,925,443	2,930,176	3,822,621	4,153,475	4,505,111	12%
Admin & General	240,700	338,725	530,813	801,350	1,130,337	1,478,980	1,644,224	1,795,961	12%
Other	394,459	452,126	538,532	623,413	714,791	984,087	1,076,456	1,143,027	9%
Total	1,082,407	1,535,859	2,272,598	3,350,206	4,775,304	6,285,688	6,874,155	7,444,099	12%
Total Consumption (kWh)	2,129	2,528	3,136	4,378	5,864	6,119	6,368	6,582	9%
Operating Profit	357,518	528,509	987,679	1,685,533	2,225,332	2,555,265	2,955,193	3,283,145	12%
Generation Cost KN/kWh	210	295	384	440	500	625	652	684	9%
Total Cost Less Profit KN/kWh	340	398	410	380	435	610	615	632	7%
Total Cost KN/kWh	508	608	725	765	814	1,027	1,079	1,131	7%
Total Cost US\$/kWh	0.064	0.076	0.091	0.096	0.102	0.128	0.135	0.141	7%
Customers (KN'000)	700	740	778	817	856	894	933	981	4%
Cost/Customer (KN million)	0	0	1	1	1	2	2	2	11%
Cost/Customer (\$)	43	57	85	123	165	207	220	229	11%

Source: EDL's Tariff Study 2009 and Power Development Plan 2010-2020

5. EDL tariffs have increased steadily (Table A11.2). EDL's current proposal to the Ministry of Energy and Mines would result in tariffs approaching the level that would have been achieved to meet the WACC if all its costs had remained constant. However, because of the high cost of generation, EDL's proposals for electricity tariffs in the country still fall short of what is recommended in the Tariff Study Update Report to meet its expected O&M costs until 2016. The Tariff Study Update Report also computed a long-run marginal cost of KN750/kWh at low voltage, KN608/kWh at medium voltage, and KN551/kWh for generation for 2007–2016.

**Table A11.2: Comparison of Tariffs Proposed by EDL with RRP and TSUP Recommendations (US\$/kWh)**

<b>EdL Recomendations to MEM</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>Incr/ year</b>
Residential	0.054	0.057	0.057	0.057	0.057	0.057	0.057	0.058	1%
Non Residential	0.085	0.103	0.104	0.105	0.106	0.108	0.109	0.110	2%
Medium Voltage	0.075	0.093	0.098	0.095	0.096	0.096	0.098	0.099	2%
High Voltage	0.081	0.081	0.081	0.082	0.082	0.083	0.083	0.083	0%
Overall Average	0.068	0.081	0.084	0.087	0.088	0.089	0.090	0.090	3%
RRP (9% per annual)	0.074	0.081	0.088	0.096	0.105	0.114	0.125	0.136	6%
TSUP Domestic	0.060	0.075	0.094	0.117	0.146	0.183	0.228	0.260	11%
<b>TSUP Average Cost of Supply</b>	<b>0.074</b>	<b>0.087</b>	<b>0.102</b>	<b>0.113</b>	<b>0.121</b>	<b>0.133</b>	<b>0.147</b>	<b>0.159</b>	<b>7%</b>

EDL = Electricite du Laos, kWh = kilowatt-hour, MEM = Ministry of Energy and Mines, RRP = Report and Recommendation of the President to the Board of Directors, TSUP = Tariff Study Update Project

Source: EDL's tariff increase proposal and TSUP, and RRP

6. Demand in the northern regional provinces has grown dramatically since 2003. Current projections (Table A11.3) taken from EDL's Power Development Plan 2010–2020 anticipate that growth rates in the northern region will be well above the average in other provinces. The justification for this optimism was evidenced by the project completion review mission<sup>22</sup> and appears to be largely fostered by significant investments by investors from the People's Republic of China in roads and agricultural, industrial, transmission, and rural electrification development.

<sup>22</sup> Project Completion Review Mission - aide-mémoire, 7–21 October 2010.

Table A11.3: Demand Forecast in Project Areas (MW)

Provinces	Actual	Forecast										
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Louang Namtha	5.3	5.7	6.6	16.6	63.8	83.6	36.1	16.9	17.2	17.6	17.9	18.2
Oudomxai	3.1	3.7	4.1	19.5	25.2	26.6	52.1	52.2	53.1	54.0	54.9	55.9
Xiangkhouang	5.2	24.1	24.6	7.2	13.8	111.4	126.2	55.0	55.9	56.9	57.8	58.8
Louang Phrabang	17.8	28.0	28.9	39.7	59.8	78.9	68.0	73.8	68.3	47.4	49.2	51.0
Xaignabouli	10.5	11.4	12.2	13.7	14.6	70.0	71.3	66.7	68.2	60.8	62.6	64.4
Vientiane Province	79.9	82.8	85.1	100.0	118.8	169.0	197.1	173.7	179.9	195.9	204.0	204.2
Total Demand in Project Areas for Residential and Commercial Loads	89.8	94.0	89.1	94.2	99.8	105.9	112.6	119.8	128.9	139.1	150.6	163.5
Total Demand in Project Areas for all Categories Loads	121.8	155.6	161.5	196.7	295.9	539.4	550.8	438.3	442.6	432.6	446.3	452.6
Total Demand for Whole Country for all Categories Loads	477.9	558.9	644.5	765.0	938.8	1,380.3	1,813.3	1,931.2	2,014.0	2,206.3	2,650.9	2,723.0

MW = Megawatt

Source: EDL Power Development Plan 2010-2020

7. The project was implemented after EDL had made a significant number of new rural electrification connections and continued to do so using mostly private sector financing. The coincident investment in transmission and distribution by others in fact resulted in a tenfold growth in EDL revenue by 2010, about 50% of which was from the industry sector. Growth in the domestic and commercial sectors was about three times higher than forecast in 2003.

8. Accordingly, a different approach is required to separately evaluate the project benefits of the respective transmission and distribution components. The transmission component is assumed to be adequate to support incremental total regional growth from 2009 to 2016, after which time additional transmission investment will be required. The financial benefits of transmission are therefore assumed to be derived from an applicable wheeling tariff based on the Tariff Study Update Report and long-run marginal cost assessment of 10% of generation cost. The benefits of the distribution and rural electrification component arise from the difference in the assumed cost of power delivered by the transmission systems at the 22 kV bus bars of the new 115/22 kV substations (i.e., 110% of generation costs predicted by the Tariff Study Update Report) and the sale price to mainly domestic and

commercial customers (i.e., excluding industry customers) that were connected under the project. Other costs assumed in the FIRR include the administrative cost of KN400,000/consumer plus EDL taxes.

9. The FIRR for the project is now shown to be 3.0% (i.e., only marginally improved from 2003). The calculation uses actual data from 2006–2010 collected by the project completion review mission together with projected data based on EDL's Power Development Plan 2010-2020 along with EDL's recommended tariffs from 2010 to 2016. Both costs and benefits are assumed to be held constant after 2016, after which time it is assumed that further reinforcement of transmission and distribution will be necessary to sustain growth. The project capital cost is about \$63 million.

10. Generation O&M costs as forecast in Table A11.1 are used to derive an appropriate transmission tariff as a proxy for the cost of energy delivered to the 22 kV lines. Transmission benefits are derived by estimating the incremental increase in power supplied to the area after 2009 and up to 2016 when the next transmission investments will be made. The distribution benefits are computed pro rata to the proportion of connections made under the project that contribute to the total domestic and commercial demand in the area. A check on the sensitivity shows that, in order to make the FIRR equal to the WACC, EDL would need to increase its tariff by 2.5% annually after 2016 while holding all other costs constant.

11. For the EIRR, the methodology of separating the benefits of the rural electrification and transmission components is similar to the FIRR. Modifications to the benefits of rural electrification consider the value of electricity only for the willingness-to-pay of domestic and commercial consumers. No credit is assigned to the rural electrification component of the project for large industry customers, which is only assigned the benefit of its wheeling tariff based on the long-run marginal cost factors derived in the Tariff Study Update Report. Table A11.4 gives a comparison of the basic economic data applied for the Greater Mekong Subregion Northern Power Transmission Project, showing how little the key economic values relating to willingness-to-pay have changed since 2003.

**Table A11.4: Comparison of Basic Economic Data used in RRP with Data Used in Recent Studies**

Economic Values used in RRP in Computing EIRR	Limit (kWh/year)	NARPD (KN/kWh)	GMSNPT (KN/kWh)	EIRR (KN/kWh)	Replacement
Non Incremental					
Poor Residential	44	7,200			Kerosene lamp
Residential	560	2,480	3,128	3,000	Small Diesel
Commercial		1,550	2,756	2,000	Diesel
Industrial		1,140			Diesel
Incremental					
Poor Residential		2,646			Willingness to pay
Residential		790	1,742		
Commercial		635	1,806		
Industrial		812	1,317	1,000	

GMSNPT = Greater Mekong Subregion Northern Power Transmission, NARPD = Northern Area Rural Power Distribution, RRP = Report and Recommendation of the President to the Board of Directors.

Source: Asian Development Bank, RRP's for Northern Area Rural Power Distribution and GMS-Northern Power Transmission Projects



12. The same assumptions as in the FIRR are made for the cost of generation and transmission based on long-run marginal cost data as computed in the Tariff Study Update Report. Similarly, the project cost is assumed to be the same in real terms without making any adjustment for the shadow price conversion factors used in the Greater Mekong Subregion Northern Power Transmission Project evaluation. Taxes are excluded from the economic costs of the operation. Recalculation of the FIRR and EIRR for the Northern Area Rural Power Distribution Project is shown in Table A11.5 and A11.6.

**Table A11.5: Characteristics of Project Area and Comparison with RRP**

Table A1.3: Characteristics of Project Area and Comparison with RRP																							
NARPD Provincial Demand @ LF= 30%							NARPD Provincial Revenue				NARPD Actual versus RRP												
GWh Actual & Forecast							KN million, \$1 =KN 8000				Retail Tariff (Usc/kWh)				0.0%				Actual & Projected Rev.			RRP Projected	
Year	Dom	Com	Ind	Total	Gwh	MW @ LF	Dom	Com	Ind	Total D&C	Dom	Com	Ind	HV	Total D&C	N/T	# RE	(KN million)	# RE	(KN million)			
Actual	2006	81	26	69	176	107	41	24,908	21,940	39,971	46,848	3.86	10.49	7.22		3.33	0%	67	25	9,502	12,318		
	2007	86	35	78	199	121	46	27,691	28,442	44,097	56,134	4.03	10.19	7.05		3.53	3%	4,034	1,465	19,004	24,480		
	2008	94	164	70	328	258	98	31,820	125,229	40,361	157,049	4.25	9.54	7.19		5.99	8%	12,969	11,963	21,140	24,587		
	2009	113	105	246	464	218	83	40,088	79,426	151,422	119,515	4.45	9.44	7.70		3.22	13%	25,825	15,956	23,277	25,897		
	2010	134	64	336	535	199	76	53,923	52,831	229,300	106,754	5.02	10.26	8.53		2.50	15%	31,760	15,977	25,413	31,320		
PDP 2010	2011	158	76	396	630	234	89	71,835	63,094	309,900	134,930	5.68	10.40	9.79	8.13	8.39	19%	35,000	25,637	27,061	30,628		
	2012	167	80	418	665	247	94	75,963	67,373	317,381	143,336	5.69	10.53	9.50	8.16	8.69	18%	35,000	27,234	28,709	34,205		
	2013	177	85	444	706	262	100	80,859	72,323	340,643	153,181	5.70	10.64	9.60	8.21	8.84	17%	35,000	29,104	30,357	35,894		
	2014	188	90	471	749	278	106	86,177	77,555	362,405	163,732	5.73	10.75	9.63	8.25	8.90	16%	35,000	31,109	32,005	37,918		
	2015	200	96	500	796	296	113	91,608	83,401	392,249	175,009	5.73	10.88	9.80	8.29	8.96	15%	35,000	33,252	33,654	44,070		
	2016	213	102	532	847	315	120	98,102	89,752	422,112	187,854	5.76	11.00	9.91	8.34	9.01	14%	35,000	35,692	34,599	46,194		
Projected based on constant Prices	2017	213	102	532	847	315	120	98,102	89,752	422,112	187,854	5.76	11.00	9.91	8.34	9.01	13%	35,000	35,692	35,544	48,580		
	2018	213	102	532	847	315	120	98,102	89,752	422,112	187,854	5.76	11.00	9.91	8.34	9.01	13%	35,000	35,692	36,489	51,132		
	2019	213	102	532	847	315	120	98,102	89,752	422,112	187,854	5.76	11.00	9.91	8.34	9.01	12%	35,000	35,692	37,384	53,860		
	2020	213	102	532	847	315	120	98,102	89,752	422,112	187,854	5.76	11.00	9.91	8.34	9.01	12%	35,000	35,692	38,380	60,691		
	2021	213	102	532	847	315	120	98,102	89,752	422,112	187,854	5.76	11.00	9.91	8.34	9.01	12%	35,000	35,692	38,380	60,549		
	2022	213	102	532	847	315	120	98,102	89,752	422,112	187,854	5.76	11.00	9.91	8.34	9.01	12%	35,000	35,692	38,380	60,549		
	2023	213	102	532	847	315	120	98,102	89,752	422,112	187,854	5.76	11.00	9.91	8.34	9.01	12%	35,000	35,692	38,380	60,549		
	2024	213	102	532	847	315	120	98,102	89,752	422,112	187,854	5.76	11.00	9.91	8.34	9.01	12%	35,000	35,692	38,380	60,549		
	2025	213	102	532	847	315	120	98,102	89,752	422,112	187,854	5.76	11.00	9.91	8.34	9.01	12%	35,000	35,692	38,380	60,549		
	2026	213	102	532	847	315	120	98,102	89,752	422,112	187,854	5.76	11.00	9.91	8.34	9.01	12%	35,000	35,692	38,380	60,549		
	2027	213	102	532	847	315	120	98,102	89,752	422,112	187,854	5.76	11.00	9.91	8.34	9.01	12%	35,000	35,692	38,380	60,549		
	2028	213	102	532	847	315	120	98,102	89,752	422,112	187,854	5.76	11.00	9.91	8.34	9.01	12%	35,000	35,692	38,380	60,549		
	2029	213	102	532	847	315	120	98,102	89,752	422,112	187,854	5.76	11.00	9.91	8.34	9.01	12%	35,000	35,692	38,380	60,549		
	2030	213	102	532	847	315	120	98,102	89,752	422,112	187,854	5.76	11.00	9.91	8.34	9.01	12%	35,000	35,692	38,380	60,549		
	2031	213	102	532	847	315	120	98,102	89,752	422,112	187,854	5.76	11.00	9.91	8.34	9.01	12%	35,000	35,692	38,380	60,549		
	2032	213	102	532	847	315	120	98,102	89,752	422,112	187,854	5.76	11.00	9.91	8.34	9.01	12%	35,000	35,692	38,380	60,549		
	2033	213	102	532	847	315	120	98,102	89,752	422,112	187,854	5.76	11.00	9.91	8.34	9.01	12%	35,000	35,692	38,380	60,549		
	2034	213	102	532	847	315	120	98,102	89,752	422,112	187,854	5.76	11.00	9.91	8.34	9.01	12%	35,000	35,692	38,380	60,549		
	2035	213	102	532	847	315	120	98,102	89,752	422,112	187,854	5.76	11.00	9.91	8.34	9.01	12%	35,000	35,692	38,380	60,549		
	2036	213	102	532	847	315	120	98,102	89,752	422,112	187,854	5.76	11.00	9.91	8.34	9.01	12%	35,000	35,692	38,380	60,549		
	2037	213	102	532	847	315	120	98,102	89,752	422,112	187,854	5.76	11.00	9.91	8.34	9.01	12%	35,000	35,692	38,380	60,549		
	2038	213	102	532	847	315	120	98,102	89,752	422,112	187,854	5.76	11.00	9.91	8.34	9.01	12%	35,000	35,692	38,380	60,549		
2039	213	102	532	847	315	120	98,102	89,752	422,112	187,854	5.76	11.00	9.91	8.34	9.01	12%	35,000	35,692	38,380	60,549			

#RE = number of rural electrification consumers, Com = commercial consumers, Dom = domestic consumers, D&C= domestic and commercial consumers, HV = high voltage consumers, Ind = industrial consumers, kWh = kilowatt-hour, LF = load factor, MW = megawatt, NARPD = Northern Area Rural Power Distribution, PDP 2010 = Power Development Plan 2010-2020, RRP = Report and Recommendation of the President to the Board of Directors, N/T = number of consumers in the project districts over total number of consumers in districts, Rev = Revenue, Usc = US cent

Source: Asian Development Bank, Project Completion Review Mission

Table A11.6: Result of FIRR and EIRR Recalculation

Year	Costs		Benefits (KN million)		Taxes (KN million)		FIRR Net	Economic Benefits (KN million)				Project Gen & O&M Costs Net of Taxes	EIRR Net Benefits (KN million)		
	Project Cost (\$ million)	Gen Unit Cost	RE Admin O&M (KN million)	Trans LRMC *Gen	RE sales less G&T Costs	Taxes per D&C	Profit Tax on T/O	Benefit (KN million)	WTP (KN/kWh)		Total WTP Domestic & Commerce			Benefits including Trans Charges	
									524	Resident					Com
	63	0%	400	10%		5%	1%	2.58%	3000	2000		21%			
Actual	2006	75,600	150	27	16	1	0	(75,762)	127	27	154	154	75,634	(75,479)	
	2007	100,800	160	1,614	961	73	15	(101,701)	6,722	1,822	8,544	8,544	102,830	(94,286)	
	2008	100,800	200	5,188	8,038	598	120	(98,867)	21,381	24,987	46,369	46,369	109,194	(62,825)	
	2009	100,800	210	10,330	9,851	798	160	(102,446)	45,068	28,074	73,142	73,142	116,277	(43,136)	
	2010	75,600	295	12,704	328	7,212	799	160	(82,017)	60,316	19,272	79,588	79,916	96,110	(16,194)
PDP 2010	2011		384	14,000	11,593	8,573	1,282	256	4,244	90,190	28,817	119,007	130,600	29,525	101,074
	2012		440	14,000	14,815	7,683	1,362	272	6,424	90,154	28,806	118,959	133,774	31,917	101,858
	2013		500	14,000	18,895	6,822	1,455	291	9,472	90,434	28,895	119,329	138,224	34,536	103,688
	2014		625	14,000	26,318	3,288	1,555	311	13,115	90,317	28,858	119,174	145,492	39,955	105,538
	2015		652	14,000	30,557	4,304	1,663	333	18,213	90,008	28,759	118,767	149,324	40,953	108,371
Projected based on constant prices	2016		684	14,000	35,550	5,527	1,785	357	24,251	89,377	28,557	117,935	153,484	42,023	111,461
	2017		684	14,000	35,550	7,682	1,785	357	26,406	82,993	26,518	109,511	145,060	39,869	105,192
	2018		684	14,000	35,550	7,682	1,785	357	26,406	82,993	26,518	109,511	145,060	39,869	105,192
	2019		684	14,000	35,550	9,837	1,785	357	28,560	76,609	24,478	101,087	136,636	37,714	98,922
	2020		684	14,000	35,550	9,837	1,785	357	28,560	76,609	24,478	101,087	136,636	37,714	98,922
	2021		684	14,000	35,550	9,837	1,785	357	28,560	76,609	24,478	101,087	136,636	37,714	98,922
	2022		684	14,000	35,550	9,837	1,785	357	28,560	76,609	24,478	101,087	136,636	37,714	98,922
	2023		684	14,000	35,550	9,837	1,785	357	28,560	76,609	24,478	101,087	136,636	37,714	98,922
	2024		684	14,000	35,550	9,837	1,785	357	28,560	76,609	24,478	101,087	136,636	37,714	98,922
	2025		684	14,000	35,550	9,837	1,785	357	28,560	76,609	24,478	101,087	136,636	37,714	98,922
	2026		684	14,000	35,550	9,837	1,785	357	28,560	76,609	24,478	101,087	136,636	37,714	98,922
	2027		684	14,000	35,550	9,837	1,785	357	28,560	76,609	24,478	101,087	136,636	37,714	98,922
	2028		684	14,000	35,550	9,837	1,785	357	28,560	76,609	24,478	101,087	136,636	37,714	98,922
	2029		684	14,000	35,550	9,837	1,785	357	28,560	76,609	24,478	101,087	136,636	37,714	98,922
	2030		684	14,000	35,550	9,837	1,785	357	28,560	76,609	24,478	101,087	136,636	37,714	98,922
	2031		684	14,000	35,550	9,837	1,785	357	28,560	76,609	24,478	101,087	136,636	37,714	98,922
	2032		684	14,000	35,550	9,837	1,785	357	28,560	76,609	24,478	101,087	136,636	37,714	98,922
	2033		684	14,000	35,550	9,837	1,785	357	28,560	76,609	24,478	101,087	136,636	37,714	98,922
	2034		684	14,000	35,550	9,837	1,785	357	28,560	76,609	24,478	101,087	136,636	37,714	98,922
	2035		684	14,000	35,550	9,837	1,785	357	28,560	76,609	24,478	101,087	136,636	37,714	98,922
	2036		684	14,000	35,550	9,837	1,785	357	28,560	76,609	24,478	101,087	136,636	37,714	98,922
	2037		684	14,000	35,550	9,837	1,785	357	28,560	76,609	24,478	101,087	136,636	37,714	98,922
	2038		684	14,000	35,550	9,837	1,785	357	28,560	76,609	24,478	101,087	136,636	37,714	98,922
	2039		684	14,000	35,550	9,837	1,785	357	28,560	76,609	24,478	101,087	136,636	37,714	98,922

(-) = negative, Com = commercial consumers, D&C= domestic and commercial consumers, EIRR = economic internal rate of return, FIRR = financial internal rate of return, Gen = generation, G&T = generation and transmission, LRMC = Long Run Marginal Cost, O&M = operation and maintenance, RE = Rural Electrification, T/O = turnover, Trans = transmission, WTP = willingness to pay.

Source: Asian Development Bank, Project Completion Review Mission

## **SUMMARY REPORT OF THE SAFEGUARD POLICIES IMPLEMENTATION**

1. An initial environmental examination (IEE) performed at appraisal identified the mitigation measures that would be required to minimize any adverse affects on natural vegetation and wildlife. The measures were deemed to be minor, even after taking into account land use and resettlement issues, potential concerns about health and safety during construction, and any possible issues related to encroachment on historical and cultural sites. Electricite du Laos (EDL) complied with the Environmental Assessment Guidelines (2003) of the Asian Development Bank (ADB) and the borrower's environmental regulations. The mitigation requirements described in the IEE were fully implemented.

2. A separate social analysis of the project area also concluded that the project would require minimal land acquisition and resettlement associated only with the transmission and substation development. Routing of medium- and low-voltage distribution lines was not expected to require any special environmental, land access, or compensation arrangements. The loan covenant, which required that during implementation the resettlement plan would be updated and subject to ADB approval before construction could commence, was fully complied with.

### **A. Institutional Arrangements**

3. To implement the resettlement plan and environmental mitigation measures, EDL strengthened its existing Environmental and Social Management Office (E&SMO) by provision of training to staff to ensure it was capable of implementing and/or monitoring the resettlement plan and environmental management plan (EMP) and managing the overall coordination of organizations involved in resettlement and environmental measures. The E&SMO was staffed by an experienced environmental specialist manager and three other environmental specialists and one social specialist, but needed more staff who were qualified in social and environmental expertise. During the course of the project the E&SMO was expanded into two sections covering environmental and social issues with a total of 11 staff, one of whom was made primarily responsible for resettlement planning. The E&SMO was responsible for (i) the implementation of the different resettlement plans; and (ii) overall coordination of organizations involved in resettlement and environment, including the preparation of resettlement plans, supervision and management of resettlement plan implementation, consultation and information dissemination, and reporting to the government the details of compliance with ADB's environmental assessment requirements and guidelines and the government's own regulations. The project management unit was responsible for overall control, management of the budget, and implementation of the resettlement plans and reporting to ADB. The project also established (i) compensation committees in the affected provinces, chaired by the vice-governors of the provinces and with related provincial department managers as committee members; and (ii) subcompensation committees in affected districts, chaired by district governors and with related district office managers and village heads as committee members. The compensation committees were responsible for ensuring consistent application of the approved resettlement plan in the province, and surveys and consultation with concerned departments, market vendors and/or suppliers, affected persons, and affected communities to determine rates for various losses. Table A12.1 gives an overall summary of the institutional arrangements used to implement the resettlement plans.

**Table A12.1: Institutional Arrangement for Resettlement Plan Implementation**

<b>Activity</b>	<b>Responsible Agency</b>	<b>Implementing Position</b>
Concession application	EDL	PMU
Physical survey	EDL	PMU and consultant
Information dissemination/ consultation	EDL	E&SMO and PMU
Loss assessment	Compensation Committee	PMU and provincial land office
Negotiation with owners on type of compensation	Joint EDL, Municipality, and Village head	PMU and provincial land office
Notification	Municipality	Provincial land office
Transfer of land ownership	Municipality	Provincial land office
Payment of compensation	Joint EDL, Municipality, and Village Head	PMU and provincial land office
Supervision visits	EDL	Deputy managing director, PMU, and E&SMO
Progress reports	EDL	E&SMO and PMU
Monitoring and evaluation	EDL	E&SMO and PMU

EDL = Electricite du Laos, E&SMO = Environmental and Social Management Office, PMU = Project Management Unit

Source: Updated Resettlement Plans.

4. Grievance committees were established for the project. They comprised the subcommittees, complemented with village elders, representatives of the affected persons, and, as applicable, representatives of local women's and youth organizations. If efforts to resolve disputes at the village and project level remained unsolved or unsatisfactory, affected persons had the right to directly contact ADB or complain to the courts.

## **B. Assessment and Implementation of Environmental Management**

5. The E&SMO verified that contractors had met their obligations under the EMP. The contract documents required the transmission line contractor to avoid environmentally sensitive areas and ensure that temporary access roads were reinstated after the work was completed. In addition, an environmental management and monitoring plan was developed at the design stage and used as a basis for route planning. Key aspects of the environmental management and monitoring plan submitted to ADB covered mitigation issues relating to the alignment survey and design stage, the construction stage, and subsequent maintenance stage.

6. In the quarterly reports submitted to ADB, EDL confirmed the 115 kilovolt (kV) line routes were checked on site to verify the actual situation. Line alignments were found to be as required to avoid mature forest, religious and cultural and/or heritage sites, and environmentally sensitive areas. Where applicable, despite rerouting, the environmental impact did not change since the lines passed through very similar environmental areas as the original ones. Access to the towers by the contractor during construction did not have any adverse effect on the environment since existing pathways were followed and animals and people were used for transportation.

7. The delay in construction progress necessitated some work in rice fields during rainy seasons. This caused some inconvenience to the farmers as the excavations and access roads to the sites destroyed dikes separating field sections. However, the contractor fixed all dikes after construction was completed. Damage that could not be avoided was compensated for in accordance, with the rates determined by the compensation committees. At the Hin-Heup substation, rains partially eroded excess soil piled next to the switchgear area and soil ran into a

neighboring field. Compensation was awarded and the contractor stabilized the soil by building a retaining wall.

### C. Assessment of Resettlement and Compensation Requirements

8. The initial survey of the project area in 2004 confirmed that the construction of the transmission and substations were the only components likely to affect the lives of people, with the compensation particulars listed in Tables A12.2 and A12.3.

**Table A12.2: Compensation Requirement under the Transmission Line Contract**

<b>115 kV Transmission Lines</b>	<b>Length (km)</b>	<b>Right of Way requirement (ha)<sup>a</sup></b>	<b>Compensation types for affected persons</b>	<b>Affected province</b>
Louang Phrabang to Oudomxai	138.7	433	Loss of arable land	Louang Phrabang Oudomxai
Oudomxai to Namo	41.0	90	Loss of residential land	Oudomxai
Namo to Louang Namtha	42.7	108	Loss of structure	Oudomxai Louang Namtha
Hin-Heup to Vang Vieng	40.8	115	Loss of standing crops	Vientiane Province
Nam Ngum 1 Power House to Thalut	5.1	16	Loss of trees	Vientiane Province <sup>b</sup>
<b>Total</b>	<b>268.3</b>	<b>762</b>		

ha = hectare, km = kilometer, kV = kilovolt.

<sup>a</sup> Possibly lattice tower bases 6 meters (m) x 6 m = 36 square meters (m<sup>2</sup>), dead end and angle lattice tower bases 10 m x 10 m = 100 m<sup>2</sup>.

<sup>b</sup> Two houses on 0.25 ha may be affected.

Source: Updated Resettlement Plans.

**Table A12.3: Compensation Requirement under the Substations Contract**

<b>115/34.5/22 kV Substations</b>	<b>Compensation types for affected persons</b>	<b>Affected province</b>
Louang Phrabang (extension)	No compensation	Louang Phrabang
Oudomxai (new)	Approximately 5 ha of land will be for permanent acquisition on scrubland belonging to the local government	Oudomxai
Louang Nam Tha (new)		Louang Namtha
Unattended "T" tap at Hin-Heup	Private scrubland (0.25 ha) will be acquired	Vientiane Province
22 kV "Interface" at Xaignabouli, existing	No compensation	Xaignabouli

ha = hectare, kV = kilovolt.

Source: Updated Resettlement plans.

9. The detailed design of the 115 kV transmission lines ensured that, wherever possible, the alignments were sited to avoid crossing villages and other settlement areas as well as agricultural land and trees. Plants or trees more than 3 meters (m) high were not permitted below the transmission lines or within 12.5 meters on each side of the transmission line (right of way). Wherever possible, towers were situated to avoid agricultural land with the number and location determined during detailed design. The project was not deemed to have a permanent adverse effect on livelihood or income. Farmers were, for the most part, able to continue growing their crops under the transmission lines. Approximately 5 hectares (ha) of land was required for permanent acquisition for two substations on scrubland belonging to the local government, and private scrubland of 0.25 ha was required for one "T" tap junction.

10. Although there was no permanent adverse effect on the livelihoods of the affected persons, the construction of the high-voltage transmission lines did in fact interfere with the livelihoods of a substantial number of households. To mitigate the impact of the transmission lines on these households, ADB required EDL to prepare and implement resettlement plans for each section of the 115 kV transmission network. The resettlement plan based on preliminary design was prepared and approved by ADB as a condition for contract awards, with the requirement that the resettlement plan would be updated during implementation. EDL was also required to conduct regularly monitoring and submit progress reports on the implementation of the resettlement plan.

11. All affected persons were adequately compensated. In total, 1,626 households in 87 villages across the six sections were compensated by May 2008; only one household was required to relocate and was compensated in cash in accordance with the rates determined by the compensation committees. The total compensation paid out to persons affected by the project was \$292,325 against the initial budget of \$250,000. The increase was due to an increase in the number of affected persons, after detailed design, as indicated in the updated resettlement plans (Table A12.4).

**Table A12.4: Details of Resettlement Plan Implementation**

Affected Villages		Affected Persons		Resettlement Plan Approval by ADB		Compensation	Compensation Amount	
Est	Act	Est	Act	Submitted	Approved	Paid	(KN)	(\$)
3	3	35	34	13 Jan 2007	21 Jun 2007	2 Nov 2007	44,869,000	4,487
18	15	133	179	13 Jan 2007	10 Aug 2007	22 Nov 2007	246,394,324	24,639
33	34	517	732	11 Oct 2007	4 Feb 2008	29 Mar 2008	1,614,448,800	161,445
17	13	206	217	25 Oct 2007	4 Feb 2008	5–8 May 2008	12,626,000	1,263
17	10	120	234	25 Oct 2007	4 Feb 2008	22 Feb 2008	242,208,500	24,221
13	12	198	230	31 Aug 2007	3 Oct 2007	22 Feb 2008	762,702,800	76,270
<b>101</b>	<b>87</b>	<b>1,209</b>	<b>1,626</b>				<b>2,923,249,424</b>	<b>292,325</b>

Act = actual, ADB = Asian Development Bank, Est = estimated.

Source: Approved Resettlement Plans and the Updated Resettlement Plans.

#### **D. Assessment of Executing Agency Capacity**

12. The performance of EDL in implementing the resettlement plan is considered *partly satisfactory*. Although all affected persons were adequately compensated, EDL did not keep detailed records of their monitoring visits; the information provided in the quarterly and completion reports was considered inadequate. The detailed information was provided in the updated resettlement plans, which were finalized only after all compensation was made. There were also delays in completing the work and in obtaining approval by ADB, but because the contractor was also behind in his works, these delays did not adversely affect the overall schedule of the project.

#### **E. Summary of the External Audit Report**

13. About 1,626 households were directly affected by the project. To verify that the work carried out by EDL was in compliance with the approved resettlement plan, the auditors<sup>1</sup> interviewed 200 households in 30 villages throughout the six sections of the 115 kV transmission lines. In their investigations, however, the auditors found that EDL had not

<sup>1</sup> Sustainable Rural Livelihood Consultants, External Auditors. 2009. *Audit Report of Resettlement Plan of Northern Area Rural Power Distribution Project*. Vientiane

recorded details of its monitoring visits so was unable to comment on the efficacy of the supervision work done by the E&SMO.

14. The auditors held meetings with five district compensation and grievance committees and held focus group discussions with village heads. A range of different ethnic groups were interviewed to establish whether or not there were ethnic differences in how affected persons experienced the project, and in nearly every village visited the consultant carried out semi-structured interviews with the village heads. Separate questionnaires were designed for all of these sources including households, village heads, women and ethnic groups, and the district compensation and grievance committees. The questionnaires were based on the indicators for monitoring and evaluation as requested by ADB. Each questionnaire had four main components: consultation, implementation, compensation, and grievance. The main findings of the audit of the resettlement plan were that

- (i) the number of impacted villages had decreased from 101 to 87,
- (ii) the number of affected persons had increased from 1,209 to 1,626, and
- (iii) there were significant delays (up to 1 year) in submission of resettlement plans by EDL in some sections and delays in the approval by ADB of up to 7 months.

15. The auditors found that there were minor differences between the compensation audit and EDL's update of the resettlement plan. Most households reported more trees cut and more land was affected permanently and temporarily than was reported in the updated resettlement plan. However, in some cases households were unable to recall exactly how many trees or how much land had been affected; in these case approximations were given. In other cases, affected persons might have exaggerated their loss to stress the fact that they had major losses to their livelihood. Furthermore, in their responses the affected persons did not always make a distinction between the right-of-way losses, which are compensated for by EDL, and the access road or unintended losses caused by the construction company. There were also some misunderstandings on temporarily and permanently affected lands; in some villages, affected persons were unclear about the nature of affected lands. Some affected persons insisted that land that had once, for example, grown teak and would no longer be able to sustain the same crop, was permanently affected. Some households cited land lost while construction was carried out or while the trees were felled as a temporary loss, while other households did not count it this way.

## **F. Auditors' Conclusions**

16. The audit found that EDL implemented the resettlement plan adequately. The resettlement plan objectives were reached and EDL was in compliance with ADB rules and regulations. All of the affected persons received their base compensation as signed upon. In some of the sections, mitigation measures have been introduced by EDL to reduce the impact on the livelihoods of the villagers. Affected persons have the opportunity, and have shown ability, to use the grievance committee in pursuing their rights. However, the audit considered that in the consultation sessions there was room for improvement in addressing the following points:

- (i) There was a lack of understanding of the project, especially among ethnic minorities and women.
- (ii) The establishment of unit prices was often unclear to affected persons, which gave them a feeling of being overruled.
- (iii) The time between initial assessment (2004/2005) and final implementation of construction works (2008/2009) was too long for many affected persons.
- (iv) There was confusion among affected persons about permanently and temporarily affected land.

- (v) It was unclear for the affected persons whether EDL or the construction company was responsible for which type of loss, and therefore who was responsible for which payment.
- (vi) Crop and tree management (3 m maximum growth of crops and trees) underneath the transmission lines in the right of way restricts the kinds of crops and trees affected persons can subsequently grow on this land.

#### **G. Auditors' Suggestion for Future Projects**

17. The auditor suggested EDL introduce new tools and techniques to increase the level of understanding and learning (such as slide shows, flip charts, short drama movies, posters, and card games) in their awareness raising sessions to make it easier for people to understand the electrification process better and increase the support of the affected persons. The audit team also suggested that translators or interpreters be used in future projects to inform the villagers in their own language during the different phases of implementation. To improve the correlation between effectiveness and time planning and timely deliverance of outputs, it was also suggested EDL make more effort to increase the adequacy of time planning and timely delivery of outputs of all involved stakeholders.



### OVERALL PROJECT ASSESSMENT

The overall rating of the Northern Area Rural Power Distribution Project is summarized in Table A13. This overall rating reflects weighted averages of the individual ratings for four criteria: relevance (20%), effectiveness (30%), efficiency (30%), and sustainability (20%). Individual criterion ratings are in whole numbers from 0 to 3, in increasing order of project performance.

**Table A13: Overall Project Assessment**

<b>Core Criteria</b>	<b>Weight (%)</b>	<b>Rating Description (Value)</b>	<b>Weighted Rating</b>
Relevance	20	Highly Relevant (3)	0.6
Effectiveness	30	Effective (2)	0.6
Efficiency	30	Efficient (2)	0.6
Sustainability	20	Likely (2)	0.4
<b>Overall Assessment</b>		<b>Successful</b>	<b>2.2</b>

Source: Asian Development Bank, Project Completion Review mission.