No.

The Lao People's Democratic Republic

THE MASTER PLAN STUDY ON SMALL-HYDRO IN NORTHERN LAOS

Final Report : Volume 4

SMALL-HYDRO VISUAL GUIDE

December 2005

Japan International Cooperation Agency

Economic Development Department

ED
JR
05-113-2





Ministry of Industry and Handicrafts of Lao PDR

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Preface

In response to a request from Lao People's Democratic Republic, the Government of Japan decided to conduct The Master Plan Study on Small Hydropower in Northern Laos and entrusted the study to Japan International Cooperation Agency (JICA).

JICA sent a study team led by Mr. Ichiro Araki, Nippon Koei Co., Ltd. and KRI International Corp., to Laos six times from February 2004 to November 2005.

The study team held discussions with the officials concerned of the government of Laos and conducted a series of field surveys. After returning to Japan, the study team carried out further studies and compiled the final results in this report.

I hope this report will be utilized for contributing to develop the small hydropower in Northern Laos and to the promotion of amity between our two countries.

I also express my sincere appreciation to the officials concerned of the government of Laos for their close cooperation throughout the study.

December 2005

Tadashi IZAWA Vice President Japan International Cooperation Agency

December 2005



Consulting Engineers

NIPPON KOEI CO., LTD.

Mr. Tadashi IZAWA

Vice President Japan International Cooperation Agency Tokyo, Japan

Dear Sir,

LETTER OF TRANSMITTAL

We are pleased to submit herewith the Final Report of Master Plan Study on Small-Hydro in Northern Laos. We, Nippon Koei Co., Ltd. and KRI International Corp. had studied it for about two years from January 2004 to December 2005 under contract with your Agency.

The Final Report proposes the Government of Laos to utilize it for supporting tools with a master plan to achieve the Lao golden goal with 90% electrification until 2020. In addition, it comprehends the pre-feasibility study results for small-hydro potential sites executed by our Study Team supported by the Lao counterparts through comprehensive capacity building during whole study periods. We believe that the implementation of our proposed projects in the Study would contribute both to a rural development and a poverty reduction by electrification at the least-less developed area of remote villages in northern Laos. And, the Study had been carried out with three mottoes, Free access to information, Public involvement and Environmental friendly in line with JICA's own principles. Precisely, in consideration of the recent worldwide criticism on hydropower development, we have tried to investigate carefully for the negative impacts to the social/natural environments through a village socio-economic study and a public involvement at workshops showing our study results to the maximum extent.

Once again, we believe the Final Report would contribute both the smooth implementation of the Rural Electrification through the small-hydro projects and the good foot prints for future similar studies in other developing countries.

The Final Report consists of four volumes; Main Report, Executive Summary, Small-Hydro Manual and Small-Hydro Visual Guide. The main report covers all the study results including mainly the process of master plan study and Pre-F/S results on some small-hydro potential sites. The manual is expected for the Lao engineers to give a good valuable guidance for studying and designing of a small-hydro project. Especially, as the visual guide is translated into Lao language completely with full visual texts, it results in a unique beginner's book for the Lao local staff.

We wish to take this opportunity to express sincere gratitude to your Agency. We also wish to express our deep gratitude to the Ministry of Industry & Handicrafts of GOL, Electricite du Laos, Provincial Department of Industry & Handicrafts in northern eight provinces, the Embassy of Japan in Laos, the JICA Laos Office for close cooperation and assistance extended to our Study Team during field investigations and studies in Lao PDR.

Sincerely yours,

Ichiro ARAKI, Team Leader

The Master Plan Study on Small-Hydro in Northern Laos

THE MASTER PLAN STUDY ON SMALL-HYDRO IN NORTHERN LAOS

DRAFT FINAL REPORT

COMPOSITION OF REPORTS

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Front Cover Photo



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PREFACE LETTER OF TRANSMITTAL ABBREVIATION

English Version	Part 1
Lao Version	

ABBREVIATIONS

ABBREVIATIONS		ABBREVIATIONS	
Lao PDR agencies		Others (continued)	
CDEP	Committee for Development of Electric Power	GHG	Green House Gas
CPI	Committee for Planning and Investment	GIS	Geographic Information System
DMH	Department of Meteorology and Hydrology	GMS	Greater Mekong Sub-region
DOE	Department of Electricity, MIH	GPS	Global Positioning System
EDL	Electricite du Laos	HPP	Hydropower Project
FIMC	Foreign Investment Management Committee	ICB	International Competitive Bidding
GOL	Government of Lao PDR	IEE	Initial Environmental Examination
LHSE	Lao Holding State Enterprise	IPDP	Indigenous Peoples Development Plan
LNCE	Lao National Committee for Energy	IPP	Independent Power Producer
LWU	Lao Women's Union	JI	Joint Implementation
MIH	Ministry of Industry and Handicrafts	LA	Loan Agreement
PDIH	Provincial Department of Industry & Handicrafts	LLDC	Least Less-Developed Countries
STEA	Science, Technology & Environment Agency	MOU	Memorandum of Understanding
Foreign	organizations	M/P	Master Plan Study
ADB	Asian Development Bank	NBCA	National Biodiversity Conservation Area
EGAT	Electricity Generation Authority of Thailand	NEM	New Economic Mechanism
EVN	Electricity of Vietnam	NGOs	Non Governmental Organizations
IMF	International Monetary Fund	O&M	Operation and Maintenance
IUCN	World Conservation Union (Switzerland)	ODA	Official Development Assistance
JBIC	Japan Bank for International Cooperation	OPS	Off-grid Promotion & Support Program
JICA	Japan International Cooperation Agency (Japan)	PDA	Project Development Agreement
MOI	Ministry of Industry	PDP	Power Development Plan
MPI	Ministry of Planning and Investment	PPA	Power Purchase Agreement
NEPO	National Energy Policy Office	PPP	Public-Private Partnership
NTEC	Nam Theun 2(NT2) Electricity Company	PRF	Poverty Reduction Fund
NTPC	Nam Theun 2(NT2) Power Company	PTD	Power Transmission & Distribution Project
PEA	Provincial Electricity Authority in Thailand	PVP	Public-Village Partnership
UNDP	United Nations Development Program	SHS	Solar Home System
WB	World Bank	SIA	Social Impact Assessment
WCD	World Commission on Dams	SPC	Special Purpose Company
Others		SPP	Small Power Producer
AAU	Assigned Amount Unit	SPRE	Southern Province Rural Electrification Project
ATP	Ability to Pay	S/W	Scope of Works
B.	"Ban" Village in Laotian language	TOR	Terms of Reference
BOO	Build-Operate-Own	WTP	Willingness to Pay
BOT	Build-Operate-Transfer	Unit and	Technical Terms
CA	Concession Agreement	B-C, B/C	B: Benefit and C: Cost
CDM	Clean Development Mecah	EIRR, FIRR	Economic/Financial Internal Rate of Return
CER	Certified Emission Reduction	EL.() m	Meters above Sea level
COD	Commercial Operation Date	FSL	Full Supply Level of Reservoir
ECA	Export Credit Agencies	GDP	Gross Domestic Product
EIA	Environmental Impact Assessment	GWh	Giga Watt Hour (one billion watt hour)
EMMP	Environmental Management & Monitoring Plan	HH	Household
EPC	Engineering, Procurement and Construction	IRR	Internal Rate of Return
EPMs	Environmental Protection Measures	MAP	Mean Annual Precipitation
ERU	Emission Reduction Unit	MAR	Mean Annual Runoff
ESCO	Electricity Supply Company	MOL	Minimum Operation Level of Reservoir
ET	Emission Trading	MW	Mega Watt (one million watt)
F/S	Feasibility Study	PMF	Probable Maximum Flood
FARD	Focal Area for Rural Development	PMP	Probable Maximum Precipitation
GEF	Global Environmental Fund	US\$	US Dollar





Ministry of Industry and Handicrafts of Lao PDR

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(ENGLISH VERSION)



THE MASTER PLAN STUDY ON SMALL-HYDRO IN NORTHERN LAOS

SMALL-HYDRO VISUAL GUIDE

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DEMAND FORECAST 1. Which is the Cheapest Lighting Source? 60W Pressurized Wick Kerosene Candle Incandescence Kerosene Lump Lump Shape **Brightness** 40 - 100 lumens 10 - 15 lumens ??? 700 lumens 0.11 - 0.17 0.04 - 0.06 **Fuel Efficiency** 60 Wh/hour 3 hours/candle liter/hour liter/hour **Fuel Expense** 150 Kip/kWh 6,000Kip/liter 330Kip/candle 240 - 360Kip **Cost per Hour** 9Kip 660 – 1,020Kip 110Kip Electricity **Fluorescent** Electric 15 W 400 W light x 2 Iron pieces **TV Set** Radio (Monochro 70 W 50 W 0 Cassette me) Rice Electric 400 W 25 W Cooker Fan (Example) How Much Electricity You Need in Future?



[1]



Electricity Demand					
Number of Households					
Total Number of Households (example)	Connection Ratio				
Village 1 155 Village 2 180 Village 3 121 Village 4 102 Village 5 71 Total 629 HH	Not all H/H will be electrified because: - Too far - Cannot pay for connection - Cannot pay monthly fee etc. - Assume 80% connection ratio				
	Number of Households to be electrified 629 x 80% = 503 HH				

[2]







