



Draft Final Report

**PROMOTION OF RENEWABLE ENERGY,
ENERGY EFFICIENCY AND GREENHOUSE GAS
ABATEMENT (PREGA)**

Lao PDR

Country and Policy Report

May 2006

Contents

List of Figures.....	4
List of Tables.....	5
List of Abbreviations.....	6
Executive Summary.....	8
1. COUNTRY BACKGROUND.....	11
1.1 Geography.....	11
1.2 Population.....	11
1.3 Economy.....	12
1.4 Natural Resource.....	13
1.5 National Poverty Eradication Program and Poverty Reduction Fund.....	14
2. ENERGY SECTOR REVIEW.....	15
2.1 Overview.....	15
2.2 Energy Resources in Lao PDR.....	15
2.3 Electricity generation / domestic use / export / and import Energy.....	16
2.4 Energy Consumption.....	17
2.5 Renewable Energy Resources in Lao PDR.....	18
2.6 Energy Tariff System.....	20
2.7 Lao PDR's Policy Framework on Energy.....	22
2.8 Institutional Arrangement for Lao PDR's Energy Sector.....	24
2.9 Organizations Chart of the Power Sector Agencies.....	25
3. TECHNICAL POTENTIAL FOR REGA TECHNOLOGIES.....	27
3.1 Renewable Energy Technologies.....	27
3.2 Energy Efficiency.....	34
3.3 Greenhouse Gas.....	35
4. REVIEW OF SKILLS AND INSTITUTIONAL CAPACITIES RELEVANT TO REGA TECHNOLOGIES.....	36
4.1 Technical Institutions.....	36
4.2 Financial Institutions.....	39
4.3 Non-Government Organizations.....	39
4.4 Donor Agencies.....	39
4.5 Private Sector Participation.....	40
4.6 Government Institutions.....	41
5. POLICY AND INSTITUTIONAL FEATURES IMPACTING REGA TECHNOLOGY.....	41
DISSEMINATION.....	41

5.1	National Poverty Eradication Programme (NPEP).....	41
5.2	Rural Electrification Master Plan.....	41
6.	REVIEW OF SUSTAINABLE DEVELOPMENT PRIORITIES.....	45
6.1	RE Sustainable Development Priorities in Lao PDR.....	49
6.2	RE Sustainable Development as Supplied by ADB Lao PREGA Project.....	49
6.3	Priorities for Mitigating Greenhouse Gas Emissions.....	50
6.4	Policy Support for Sustainable Development.....	52
7.	IDENTIFICATION AND PRIORITIZATION OF REGA TECHNOLOGIES.....	60
7.1.	GHG Emissions Inventory.....	60
7.2.	Technology Needs and Priorities for Mitigating Greenhouse Gas Emissions in the Energy Field.....	61
7.3.	Optional Ways of the Energy Utilization for Dwelling Sector	64
7.4.	Technological Options and Reduction of Greenhouse Gas..... Emissions in Transportation Field.....	67
7.5.	Technological Options and Reduction of Greenhouse Gas..... Emissions in Agriculture Field.....	68
7.6.	Technological Options and Reduction of Greenhouse Gas..... Emissions in Forestry Field.....	69
7.7.	Technological Options and Reduction of Greenhouse Gas..... Emissions in the Toxic Waste Field.....	71
8.	CONCLUSIONS AND RECOMMENDATIONS.....	73
8.1.	Conclusions.....	73
8.1.	Recommendations.....	74
	REFERENCES.....	76
	Attachment.....	78

List of Figures

Figure 1.1: General Map of Lao PDR.....	11
Figure 2.1: Exploitable Hydropower Potential of Lao PDR.....	16
Figure 2.2: Electricity Generation, Domestic Use, Export and Import up to 2004.....	17
Figure 2.3: Energy Consumption by Energy Type in Year 2002.....	18
Figure 2.4: Energy Consumption by Energy Sectors in Year 2002.....	19
Figure 2.5: Organizations Chart of the Power Sector Agencies.....	26
Figure 3.1: Distribution of Annual Solar Insolation, at the Earth's Surface.....	28
Figure 5.1: National Poverty Eradication Programme Process.....	42
Figure 5.2: Map of Lao PDR, 72 Districts Identified as Poor.....	44
Figure 5.3: Rural Electrification Master Plan Organization.....	48

List of Tables

Table 1-1: GDP Growth and Inflation Indicator in Lao PDR (2004).....	12
Table 1-2: GDP per Electric Consumption and Elasticity in Lao PDR	12
Table 1-3: Elements of the 2020 Development Vision.....	13
Table 2.1: Primary Energy Resources of Lao PDR.....	15
Table 2.2: Electricity Generation, Domestic Use, Export and Import.....	16
Table 2.3: Importing of Petroleum and City Gas in Year 2003-2004.....	17
Table 2.4: Energy Consumption Comparison by Energy Type.....	18
Table 2.5: Energy Consumption by Sectors.....	18
Table 2.6: Historical EDL's Power Tariff (by Dec. 2001).....	20
Table 2.7: New Power Tariff (Effective on May 2002).....	20
Table 2.8: Trading Tariffs for Export and Import.....	21
Table 2.9: Other Import Tariffs.....	21
Table 2.10: Theun Hinboun IPP Tariffs for Export to EGAT.....	21
Table 2.11: Theun Hinboun IPP Tariff for Export to EGAT and EDL.....	22
Table 2.12: Houy Ho IPP Tariffs for Export to EGAT and EDL.....	22
Table 3.1: Average Daily Radiation on Horizontal Surface (kWh/m ² /day, 10-year ave.).....	27
Table 3.2: Average Daily Wind Speed (m/s).....	29
Table 3.3: Production of Crops (Possible Biofuels) for Year 2003.....	30
Table 3.4: The Efficient Development of the Electric Light/Lamp.....	34
Table 3.5: General Summary of Assessment on the Utilization of the Energy for Lights.....	35
Table 3.6: Institutions and their Mandates in the Area of Environment.....	
Including CDM and Climate Change.....	36
Table 5.1: Elements of the 2020 Development Vision.....	45
Table 7.1: The National Inventory on the Greenhouse gases Emission.....	60
Table 7.2: General Summary Regarding the Assessment of the Cost	
of Electric Energy Production.....	51
Table 7.3: Biomass Technology Chart.....	52
Table 7.4: The Cost Benefit Analysis Regarding Various Cooking Stoves.....	54
Table 7.5: The Efficient Development of the Electric Light/Lamp.....	54
Table 7.6: General Summary of the Assessment on the Utilization of Energy for Lights.....	65
Table 7.7: General Summary of the Assessment on the Recycling Energy Utilization as the	
Lights.....	66
Table 7.8: General Summary of the Methane Gas Reduction (CH ₄) in Agricultural Field.....	69

List of Abbreviations

ADB	Asian Development Bank
ASEAN	Association of South East Asian Nations
BCS	Battery Charging Station
BOOT	Build, Operate, Own and Transfer
BOT	Build, operate and transfer
BTF	Build, transfer and finance
CCEAP	Climate Change Enabling Activity Project
CDM	Clean Development Mechanism
CFL	Compact Fluorescent Lamp
CH ₄	Methane
CIDA:	Canadian International Development Agency
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CPC	Committee for Planning and Cooperation
CTTE	Canada-Thailand Tri-bilateral on Environment
NAPA	National Adoption Program of Action
DANIDA	Danish International Development Agency
DNA	Designated National Agency
DOE	Department of Electricity
ECS	Electric Cooking Stove
EDL	Electricité du Laos
EE	Energy Efficiency
EGAT	Electricity Generation Authority of Thailand
EIAs	Environmental Impact Assessments
EMP	Environmental Management Plan
EMMUs	Environmental Management and Monitoring Units
ESCOs	Energy Service Companies
FAO	Food and Agricultural Organization (of United Nations)
FIMC	Investment Management and Foreign Economic Co-operation
GDP	Gross Domestic Product
GEF	Global Environment Facility
GIS	Geography Information System
GHG	Greenhouse Gas
GMS	Greater Mekong Sub-region
GOL	Government of Lao PDR
HDR	Global Human Development Report
ICS	Improved Cook Stoves
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producer
JICA	Japan International Cooperation Agency
LDC	Least-Developed Country
LNCE	Lao National Committee for Energy
LNMC	Lao National Mekong Committee
LPG	Liquefied Petroleum Gas
LRMC	Long Run Marginal Cost
MAF	Ministry of Agriculture and Forestry
MAT	Multiple Aeration Technique
MCTPC	Ministry of Communication, Transport, Post and Construction
MHP	Micro-Hydropower
MIH	Ministry of Industry and Handicrafts
MLSW	Ministry of Labour and Social Welfare
MOC	Ministry of Commerce
MPH	Ministry of Public Health
MRC	Mekong River Commission

MSW	Municipal Solid Wastes
MUB	Multi-nutrient Urea Block
N ₂ O	Nitrous Oxide
NASA	National Aeronautical and Space Agency
NAFES	National Agriculture and Forestry Extension Service
NDF	National Long-Term Development Framework, of Lao PDR
NEDO	New Energy Development Organization (Japan)
NGO	Non-governmental Organization
NO _x	Nitrogen Oxide
NPEP	National Poverty Eradication Programme
NREL	US National Renewable Energy Laboratory
NSC	National Statistical Centre
NTFP	non-timber forest products
O&M	Operation and Maintenance
PAPs	Project Affected Persons
PDIH	Provincial Department(s) of Industry and Handicrafts
PEA	Provincial Electricity Authority of Thailand
PPA	Power Purchase Agreement
PPAg	Power Purchase Agreement
PPP	Purchasing Power Parity
PREGA	Promotion of Renewable Energy, Energy Efficiency and Greenhouse Gas Abatement
PRC	People's Republic of China
PV	Photovoltaic
R&D	Research and Development
RE	Renewable Energy
REGA	Renewable Energy, Energy Efficiency and Greenhouse Gas Abatement
RESDALAO	The Renewable Energy for Sustainable Development Association
RET	Renewable Energy Technology
RETC	Renewable Energy Technology Centre
SHP	Small Scale Hydropower Potential
SHS	Solar Home System
SIDA:	Swedish International Development Agency
SPRE	Southern Provinces Rural Electrification Project
STEA	Science, Technology and Environment Agency
SNV	The Netherlands Development Organization
SWH	Solar Water Heater
TCD	Tons of Crushing per Day
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
Vientiane Cpt.	Vientiane Capital
WB	The World Bank

Currency Unit

Unless otherwise specified, the term “dollar” refers to US\$

Currency	=	Kip (KN)
\$1	=	KN10,300
KN1	=	\$0.00009

Units

km	Kilometers
ha	Hectares
GJ	Giga Joule
GWh	Gigawatthour
ktoe	Kiloton of Oil Equivalent
kW	Kilowatt
kWh	Kilowatt hour
m ²	Square meter
m ³	Cubic Meter
MW	Megawatt
TgC/EJ	
toe	Ton of Oil Equivalent
kWh/m ²	kilowatt-hours per square meter
kWp	kilowatt-peak
m/s	Meter per second

