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Technical Cooperation by Government of Japan

Application

By the Government of the Lao PDR
For a Development Study of
The Study on Power Network System Plan in the Mekong Region of Lao PDR
To the Government of Japan

1. Project Digest

(1) Project Title:

Study on Power System Network Plan in the Mekong Region of Lao PDR

(2) Location:

Whole country of Lao PDR

(3) Responsible Agency:

Department of Electricity (DOE), Ministry of Energy and Mines (MEM)

Executing Agency:

Department of Electricity (DOE)
Electricité du Laos (EDL)

(4) Justification of the Project

The Government of Lao PDR set twin goals in the power sector, one is to maintain and expand an affordable, reliable and sustainable electricity supply, and the other is to promote power generation for export to provide revenues. The electricity has played one of the key roles for promoting economic and social development. Based on this policy, the Government of Lao PDR aims to increase the electrification rate up-to 90% of the whole households by the year 2020, which is 54% at present. It is one of the principal means of achieving the goals to improve system optimization and strengthen network security in the Main Grids through interconnections, as well as to expand Off-Grid supplies. However the network system comprises four independent major grids with serving electricity and interconnecting system has not been completed yet "The Master Plan Study on

Transmission lines and Substations in Lao PDR" was executed from 2001 to 2002, supported by Japanese International Cooperation Agency (JICA). As a result of this study, a trunk transmission line between the central and the southern area is now in progress, as the first step for improvement of the national grid. The both areas have many potentials of power generation and also include load centers, and so the interconnection will improve flexibility of power interchanging, and release from the situation that Lao PDR is forced to purchase electricity from neighboring countries by higher price than the exporting tariff. It means to enable Lao PDR to manage system operation by itself and to strengthen the national energy security and facilitate rural electrification.

From these points of view, it needs to review the system planning which is getting complicated, and to support the basic design of trunk line as soon as possible in order to complete optimal and stable power supply network.

(5) Desirable or Scheduled Time of Commencement the Project:

It is preferable that the study commences as soon as possible.

(6) Prospective Funding Source and/or Assistance:

Technical Cooperation Fund of Japan International Cooperation Agency

(7) Other Relevant Projects, if any:

There are no other relevant projects.

2. Term of Reference of the Proposed Study

(1) Necessity/Justification of the Study

Since the electric power system is on the way of development in Lao PDR as mentioned above, only the people who live in Vientiane Capital, and major provincial capitals are supplied electricity by transmission/distribution grid system. People living in outside of the grid system have obtained electricity by either developing independent power plants with isolated distribution system or importing electricity from neighboring countries such as Thailand and Vietnam.

Currently four major transmission/distribution grid systems are independently installed in the four areas, that are Northern, Central-1, Central-2, and Southern. Gradually this isolated situation has been dissolved with grid expansion, but the interconnection system has not yet completed through the whole country In order to increase electrification rate and provide equal opportunity for accessing electricity to whole the nation, extension of the transmission/distribution system and buildup of

national grid, especially trunk line interconnected, are essential.

After JICA's master plan study in 2002, a part of interconnection line (Paksan-Pakbo) started to be implemented by Japan Bank for International Cooperation (JBIC) Loan. This interconnection has a key role to be a power source for rural distribution expansion as well as to decrease energy import from neighboring countries. On the other hand, domestic interconnection will make the bi-lateral international connection multi-lateral, so network planning and operation should be paid carefully attention to. Furthermore some of IPP projects, such as Nam Thuen 2 project, proceed to an implementation stage in quick succession mainly in Nam Ngum Basin (Central) and Bolaven Plateau (Southern) areas. IPPs should supply a part of their power products to domestic grid.

In these situations, the improvement of national grid becomes more urgent matter and it is necessary to review and to revise system planning in correspondence with the complicated grid system taking international connections into account and to assist to accelerate extension/development of the power supply network economically and efficiently.

(2) **Necessity/Justification of the Japanese Technical Cooperation:**

The Government of Lao PDR has been given various technical as well as financial supports in many sectors by the Government of Japan, which have remarkably contributed to develop the country. In power sector the Government of Japan has also conducted the technical assistant projects such as "The Study on Master Plan of Transmission Line and Substation System in Lao PDR" (2001-2002) by JICA development study scheme. The study showed a master plan for domestic power supply system up to the year 2020.

After this study, various implementation projects have started (and some of them completed), so Power Development Plan (PDP) has been revised periodically by Lao side. However, according to the expansion grid and increasing power sources, system becomes more complicated. Furthermore, international connection points will be physically connected each other within the Lao Grid and also IPP transmission lines, especially after central-southern connection. So reviewing study needs further analysis skills with taking system operation into account and basic design needs to support for facilitate implementation. At the same time, development of such capacity in power sector should be also conducted. It is the Japanese Technical Cooperation that such activities be executed effectively because of succession by following the Master Plan Study and National Grid Interconnection Project.

(3) Objectives of the Study

The objectives of this study are;

1) to improve an optimal long-term national power grid expansion plan of in Lao PDR,
2) to upgrade the system planning capabilities in correspondence with complicated network,
3) to develop a basic design of selected national grid, and
4) to transfer the design skills with IT technology such as GIS and electronic map data by previous JICA project.

(4) Area to be covered by the Study

Whole country in Lao PDR

(5) Scope of the Study

Stage-1: Reviewing Grid Expansion Plan Stage

(a) Collection and review of existing data and information, such as;
- Social data (latest Census etc.),
- Energy consumption and power product data,
- Demand forecast data, including the Industrial, Commercial and Regional Development Plan,
- Power Development Plan,
- Data and Information on electricity interconnection between Lao PDR and Thailand/Vietnam/China,
- Availability and cost of construction materials, machinery, equipment, and construction works.

(b) Review and improve a demand forecast data

(c) Transmission System Survey
- Study existing transmission lines and substations and identify exiting and/or future issues
- Review the current grid expansion plan
- Review the planning criterion and reliability standard

(d) Field survey, if necessary

(e) Detail Studies and formulate a national power grid expansion plan
- Power flow analysis
- Fault current analysis
- System voltage analysis
- Reliability analysis, etc

Stage-2: Making Basic Design of a Selected Project Stage

The following studies will be executed on a selected project;

- Implementation of field surveys, such as geological/topological survey, to collect necessary data for the design at basic design level, by using GIS if necessary
- Basic design on necessary facilities
- Preparation of specification of necessary equipment
- Preparatory study on the environmental impact study
- Environmental protection/preservation measures, if necessary
- Preparation of implementation plan including construction method and schedule
- Project cost estimation
- Economical and financial evaluation

(6) Study Schedule:

The study consists of two stages as follows and total period is one (1) year

- *Stage-1*: 6 months
- *Stage-2*: 6 months

(7) Expected Major Output of the Study

It is envisaged that the Study Team will submit the following reports in English.

- Inception Report: Ten (10) copies
- Interim Report: Ten (10) copies
- Draft Final Report: Ten (10) copies
- Final Report: Thirty (30) copies

(8) Possibility to be implemented / Expected funding resources:

Japanese Loan is expected

(9) Environmental and Social Considerations

*please fill in the attached screening format

(10) Request of the Study to other donor agencies, if any:

No specific request has been made to other donor agencies

(11) Other relevant information

None

3. Facilities and information for the Study

(1) Assignment of counterpart personnel of the implementing agency for the Study:

(number, academic background, etc.)

- Chief Counterpart
- System Planning Engineer
- Transmission Line Engineer
- Substation Engineer
- Environmental Engineer
- Economic and Finance Analysis Engineer

(2) Available data, information, documents, maps, etc. related to the Study:

(Please attach the list.)

- Power Development Plan
- Master Plan Study
- Power Sector Strategy Study
- Hydropower Development Study
- Projects Study concerned
- Statistics data on socio-economical matters
- Meteorological data
- Electricity Law, Lao Electric Technical Standard, and Environmental Law
- Others

(3) Information on the security conditions in the Study Area:

There is not special security problem in the study area

4. Global Issues (Gender, Poverty, etc.)

(1) Women as main beneficiaries or not.

This Study itself is not direct connection with the beneficiaries to women, but it leads to greatly improve the lifestyle of women in rural area as well as men, because the Study will contribute to strongly facilitate rural electrification.

(2) Project components which require special considerations for women (such as gender difference, women specific role, women's participation), if any.

None

(3) Anticipated impacts on women caused by the Project, if any.

The Study has not special impact in women

(4) Poverty alleviation components of the Project, if any.

The result of the Study will promote the development of national grid which is the basement of rural electrification, and it will become poverty alleviation.

(5) Any constraints against the low-income people caused by the Project.

The Study will not cause any special constraints against the low-income people

5. Undertaking of (the recipient country)

(1) To facilitate the smooth conduct of the Study; the Government of Lao PDR shall take necessary measures:

1) To permit the members of the Team to enter, leave and sojourn in Lao PDR for the duration of their assignments therein and exempt them from foreign registration requirements and consular fees;
2) To exempt the members of the Team from taxes, duties and any other charges on equipment, machinery and other material brought into Lao PDR for the implementation of the Study;
3) To exempt the members of the Team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the team for their services in connection with the implementation of the Study;
4) To provide necessary facilities to the Team for the remittance as well as utilization of the funds introduced into Lao PDR from Japan in connection with the implementation of the Study;

(2) The Government of Lao PDR shall bear claims, if any arises, against the members of the Team resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the team.

(3) DOE and EDL shall act as counterpart agency to the Japanese Study Team and also as coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.

(4) DOE and EDL shall, at its own expense, provide the Team with the following, in cooperation with other organizations concerned:

1) Security-related information on as well as measures to ensure the safety of the Team;
2) Information on as well as support in obtaining medical service;
3) Available data and information related to the Study;
4) Counterpart personnel;

5) Suitable office space with necessary office equipment and furniture;
6) Credentials or identification cards; and
7) Vehicles with drivers.

(5) DOE and EDL will, as the executing agency of the project, take responsibilities that may arise from the products of the Study.

*In the case that Detail Design Study is requested.

The Government of Lao PDR assures that the matters referred to in this form will be ensured for the smooth conduct of the Development Study by the Japanese Study Team.

Signed _____

Title: _____

On behalf of the Government of _____ Houmphone BULYAPHOL

Date: 16/07/17

Screening Format

Question 1 Outline of the project

1-1 Does the project come under following sectors?

■Yes □No

If yes, please mark corresponding items.

□Mining development
□Industrial development
□Thermal power (including geothermal power)
□Hydropower, dams and reservoirs
□River/erosion control
■Power transmission and distribution lines
□Roads, railways and bridges
□Airports
□Ports and harbors
□Water supply, sewage and waste treatment
□Waste management and disposal
□Agriculture involving large-scale land-clearing or irrigation
□Forestry
□Fishery
□Tourism

1-2 Does the project include the following items?

□Yes ■No

If yes, please mark following items.

□Involuntary resettlement (scale: households persons)
□Groundwater pumping (scale: m3/year)
□Land reclamation, land development and land-clearing (scale: hectors)
□Logging (scale: hectors)

1-3 Did the proponent consider alternatives before request?

□Yes: Please describe outline of the alternatives
(　　)
■No

1-4 Did the proponent have meetings with the related stakeholders before request?

□Yes ■No

If yes, please mark the corresponding stakeholders.

□Administrative body

□Local residents

□NGO

□Others (　　)

Question 2

Is the project a new one or an on-going one? In the case of an on-going one, have you received strong complaints etc. from local residents?

☐New ☐On-going(there are complaints) ☐On-going (there are no complaints)

■Others (The project is mainly to revise the previous master plan)

Question 3 Name of the law or guidelines:

Is Environmental Impact Assessment (EIA) including Initial Environmental Examination (IEE) required for the project according to a law or guidelines in the host country?

☐Yes ■No

If yes, please mark the corresponding items.

□Required only IEE (□Implemented, □on going, □planning)

□Required both IEE and EIA (□Implemented, □on going, □planning)

□Required only EIA (□Implemented, □on going, □planning)

□Others: (　　)

Question 4

In case of that EIA was taken steps, was EIA approved by relevant laws in the host country?

If yes, please mark date of approval and the competent authority.

☐Approved: without a supplementary condition	☐Approved: with a supplementary condition	☐Under appraisal

(Date of approval: Competent authority:)

☐Not yet started an appraisal process

☐Others:( )

Question 5

If a certificate regarding the environment and society other than EIA is required, please

indicate the title of certificate.

☐Already certified ☐Required a certificate but not yet done

Title of the certificate :( )

☐Not required

☐Others [ ]

Question 6

Are following areas located inside or around the project site?

☐Yes ■No ☐Not identified

If yes, please mark corresponding items.

☐National parks, protected areas designated by the government (coast line, wetlands, reserved area for ethnic or indigenous people, cultural heritage) and areas being considered for national parks or protected areas

☐Virgin forests, tropical forests

☐Ecological important habitat area s (coral reef, mangrove wetland, tidal flats)

☐Habitat of valuable species protected by domestic law s or international treaties

☐Likely salts cumulus or soil erosion areas on a massive scale

☐Remarkable desertification trend areas

☐Archaeological, historical or cultural valuable areas

☐Living areas of ethnic, indigenous people or nomads who have a traditional lifestyle, or special socially valuable area

Question 7

Does the project have adverse impacts on the environment and local communities?

☐Yes ■No ☐Not identified

Reason: [ ]

Question 8

Please mark related environmental and social impacts, and describe their outlines.

☐Air pollution
☐Water pollution
☐Soil pollution
☐Waste
☐Noise and vibration
☐Ground subsidence
☐Offensive odors
☐Geographical features
☐Bottom sediment
☐Biota and ecosystem
☐Water usage
☐Accidents
☐Global warming
☐Involuntary resettlement
☐Local economy such as employment and livelihood etc.
☐Land use and utilization of local resources
☐Social institutions such as social infrastructure and local decision-making institutions
☐Existing social infrastructures and services
☐The poor, indigenous of ethnic people
☐Maldistribution of benefit and damage
☐Local conflict of interests
☐Gender
☐Children's rights
☐Cultural heritage
☐Infectious diseases such as HIV/AIDS etc.
☐Others (　　)

Outline of related impacts:

(　　)

Question 9

Information disclosure and meetings with stakeholders

9-1 If the environmental and social considerations are required, does the proponent agree on information disclosure and meetings with stakeholders in accordance with JICA Guidelines for Environmental and Social Considerations?

■Yes　　□No

9-2 If no, please describe reasons below.

[　　]

MINUTES OF MEETING
FOR
THE PREPARATORY STUDY
FOR
THE STUDY ON POWER NETWORK SYSTEM PLAN
IN
LAO PEOPLE'S DEMOCRATIC REPUBLIC

AGREED UPON BETWEEN
DEPARTMENT OF ELECTRICITY AND ELECTRICITE DU LAOS
OF
MINISTRY OF ENERGY AND MINES
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

Vientiane, 4th July, 2008

Mr. Viraphonh Viravong
Director General
Department of Electricity
Ministry of Energy and Mines

Mr. Kaoru Suzuki
Team Leader
Preparatory Study Team
Japan International Cooperation Agency

Mr. Khammany Inthirath
Managing Director
Electricite du Laos
Ministry of Energy and Mines

The Government of Lao People's Democratic Republic (hereinafter referred to as "Lao P.D.R.) officially requested the Government of Japan to implement the Study on Power Network System in the Mekong Region of Lao P.D.R.(hereinafter referred to as "the Study") in August 2007. In response to the request, the Preparatory Study Team (hereinafter referred to as "the Team") organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA") was dispatched and had a series of discussions with the authorities concerned of the Government of Laos from June 23rd to July 4th, 2008 (List of Main Attendants is shown in Attachment I.).

The discussions were conducted in a cordial atmosphere and both parties agreed to record the following points as summarized conclusions of the discussions between Lao side, Department of Electricity (hereinafter referred to as "DOE") and Electricite du Laos (hereinafter referred to as "EDL") of the Ministry of Energy and Mines (hereinafter referred to as "MEM"), and the Team.

1. Basic Mutual Understandings

Lao P.D.R. set twin goals in the power sector, one is to maintain and expand an affordable, reliable and sustainable electricity supply, and the other is to promote power generation for export to provide revenues. The electricity has one of the key roles for promoting economic and social development. Based on this policy, Lao P.D.R. aims to increase the electrification rate up-to 90% of the whole households by the year 2020, which is 58.3% at 2007. It is one of the principle means of achieving the goals to improve system optimization and strengthen network security in the Main Grid supplies. However, the network system comprises four independent major grids with serving electricity and interconnecting system has not been completed yet. "The Master Plan Study on Transmission lines and Substations in the Lao. P.D.R" was executed from 2001 to 2002, supported by JICA. As a result of this study, a trunk transmission line between the central and the southern areas is now in progress, as the first step for improvement of the national grid. The both areas have many potentials of power generation and also include load centers, and so the interconnection will improve flexibility of power interchanging. It means to enable Lao P.D.R. to manage system operation by itself and to strengthen the national energy security and facilitate rural electrification.

From these points of view, DOE and EDL need JICA's support to review the system planning which is getting complex, and to conduct the basic design of trunk line as soon as possible in order to complete optimal and stable power supply network.

2. Agreement of draft Scope of Work

Based on the above mutual understandings, both parties discussed detailed contents of the Study and reached an agreement on the draft Scope of Work as Attachment II.

3. Title of the Study

Both parties agreed that the title of the Study shall be changed from "The Study on Power Network System Plan in the Mekong Region of Lao P.D.R" to "The Study on Power Network System Plan in Lao P.D.R".

4.Understanding of the Draft Scope of Work

(1) The Scope of the Study covers the facilities of 115kV – 230kV transmission line and related substation.

(2) The Lao side strongly requested JICA that network system planning should be conducted in consideration from many aspects not only technical analyses but also wide area coordination with neighboring countries, long term economic and financial evaluation and environmental and social impact. JICA agreed to accept this request as much as possible.

(3) The Lao side requested JICA to transfer technology regarding power network system planning to utilize their own software such as PSSE. Both side agreed to conduct on-the-job training and technology transfer seminar during the Study.

(4) The Lao side requested JICA to renew the existing geographical map in the Study and to utilize this map for GIS software at basic design of a selected project, and JICA suggested that there is not necessary to use detail map at basic design level. Both side agreed that existing map data is enough for basic design level.

(5) The Lao side requested JICA to review not only network system but also IPP development plan. However, as IPP developers tend not to disclose their information to others, JICA suggested that DOE should obtain necessary information from IPP developers and provide them to JICA.

5. Institutional Framework for the Study

DOE and EDL shall act as the coordinating body for the authorities concerned, such as Department of Energy Promotion and Development (hereinafter referred to as "DEPD") within MEM and Water Resources and Environmental Authority (hereinafter referred to as "WREA") to conduct smooth implementation of the Study.

Both parties reached an agreement to organize a steering committee and a counterpart team which shall be established by DOE before implementing the Study.

(1) Steering Committee

To ensure smooth collaboration between relevant organizations of the Lao side and the JICA study team and to monitor the progress of the Study, the steering committee shall be held by DOE in a timely manner. The steering committee shall be composed of representatives from DOE, EDL, DEPD, WREA and the JICA study team and it will be chaired by DOE.

(2) Counterpart Team

To conduct the Study smoothly and efficiently, and to realize technology transfer to staff of related

institutions in the course of the Study, the counterpart team shall be organized by DOE. The counterpart team shall be composed of DOE and EDL counterpart persons including their provincial offices not only to facilitate and provide data and information but also to actively contribute and participate in the Study activities. The expected areas of counterpart team will be as follows.

1) Power Development Plan/Demand Forecast
2) Network System Planning
3) Transmission Line
4) Substation
5) Environmental and Social Consideration
6) Economic and Financial Analysis

6. Technology Transfer

Technology transfer during the study will be basically conducted on-the-job training basis from the JICA study team to the counterpart team personnel. Besides, the following measures will be considered.

(1) Workshop

Both parties agreed that workshops shall be held twice during the Study in order to confirm the progress of the Study among stakeholders. First workshop will be held in Vientiane at the time of submission of interim report. Second workshop will be held in Vientiane at time of submission of draft final report. All the arrangement of workshops shall be made by DOE in cooperation with EDL. JICA will closely cooperate with DOE and EDL by preparing the necessary documents and presentation, and by providing necessary expenses for venue.

(2) Technology Transfer Seminar

Both parties agreed that technology transfer seminar shall be held one time in Vientiane. The contents of the technology transfer seminar will include power network system planning.

(3) Counterpart training in Japan

The Lao side requested that short training course should be held to strengthen DOE and EDL capacity during the Study. In order to establish the short training course on network system planning in Lao P.D.R., the Lao side has requested the counterpart personnel to be trained in Japan. The Team replied that the request would be conveyed to the officials concerned in the Government of Japan.

8. Environmental and Social Considerations

The Team explained that JICA had introduced the Guideline for Environmental and Social

Considerations for all projects, and consequently, the guideline would be also applied to the Study. As a study on power network system planning, the Study will be classified as Category B and therefore, surveys on environmental and social aspects are required to foresee environmental and social impacts of each development project. The Lao side understood the necessity of such surveys and agreed to take into account these impacts and mitigation measures in the Study.

9. Undertakings of Lao Side

(1) Budget allocation

The budget for counterpart personnel related to the Study will be borne by DOE and EDL.

The Lao side has requested that the transportation costs of the JICA Study Team would be covered by JICA for the smooth implementation of the study. The Team replied that the request would be conveyed to the officials concerned in the Government of Japan.

(2) Office space

Office space with enough furnishing for the JICA study team to implement the Study shall be provided by DOE or EDL.

Attachment I: List of Main Attendants

Attachment II: Draft Scope of Work

Attachment I

List of Main Attendants

(Lao Side)

Department of Electricity, Ministry of Energy and Mines

Mr. Viraphonh Viravong, Director General

Mr. Khamso Kouphokham, Chief of Administration Division

Ms. Sengdeuan Vong-inh, Deputy Chief of Administration Division

Mr. Bouathep Malaykham, Chief of Electric Power Management Division

Mr. Houmphan Vongphachan, Deputy Chief of Electric Power Management Division

Mr. Chanto Milattanapheng, Chief of Social and Environment Division

Mr. Sanhya Somvichith, Deputy Chief of Power Sector Planning Division

Mr. Anousak Phongsavath, Head of Rural Electrification Division

Mr. Khanthara Sisamouth, Deputy Head of Rural Electrification Division

Electricite du Laos, Ministry of Energy and Mines

Mr. Boun Oum Syvanpheng, Deputy Managing Director

Mr. Boungnong Bouttavong, Manager of System Planning

Mr. Kham Mingboubpha, Chief of Distribution Study Office

(Japanese Side)

JICA Preparatory Study Team

Mr. Kaoru Suzuki, Team Leader

Mr. Hitoshi Sawano, Electric Power Administration

Mr. Takanori Tanaka, Electric Power Technical Standards

Ms. Chiyoko Miyata, Study Planning

Mr. Yoshiyuki Kaneko, Electric Power Development Planning

Mr. Kenichi Kuwahara, Power System Network Planning

Ms. Mitsue Mishima, Environmental and Social Considerations

JICA Laos Office

Mr. Sota Sekine, Assistant Resident Representative

Mr. Kayasith Sadettan, Assistant Program Officer

JICA Expert

Mr. Keiichi Sato

Attachment II

DRAFT
SCOPE OF WORK
FOR
THE STUDY
ON
POWER NETWORK SYSTEM PLAN
IN
LAO PEOPLE'S DEMOCRATIC REPUBLIC

Agreed upon between
Department of Electricity and Electricite du Laos
of
Ministry of Energy and Mines
and
Japan International Cooperation Agency

Vientiane, , 2008

Mr. Viraphonh Viravong
Director General
Department of Electricity
Ministry of Energy and Mines

Mr. Hiroaki Takashima
Resident Representative
Laos Office
Japan International Cooperation Agency

Mr. Khammany Inthirath
Managing Director
Electricite du Laos
Ministry of Energy and Mines

I. INTRODUCTION

In response to the request of the Government of Lao People' s Democratic Republic (hereinafter referred to as "Lao P.D.R."), the Government of Japan decided to conduct the Study on Power Network System Plan in Lao P.D.R. (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

Accordingly, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of technical cooperation programs of the Government of Japan, will undertake the Study in close cooperation with the authorities concerned in Lao P.D.R.

The present document sets forth the scope of work with regard to the Study.

II. OBJECTIVES OF THE STUDY

The objectives of the Study are:

1. To formulate the power network system plan in Lao P.D.R. for twenty (20) years from 2011 to 2030;
2. To develop basic design of a selected project ; and
3. To transfer relevant skills and technologies regarding the power network system planning to counterpart personnel

III. THE STUDY AREA

The Study will cover whole country of Lao P.D.R.

IV. SCOPE OF THE STUDY

The study will be carried out in two Stages, "Power Network System Plan" stage and "Basic Design of a Selected Project" stage. The details at the respective stages are itemized as follows:

Stage I-Power Network System Plan

1) Collection and review of existing and planned data and information related power sector

The following data and information will be collected and analyzed.

- Socio-economic and environment information/data,
- Energy consumption and power production data,
- Demand forecast data including the Industrial, Commercial and Regional Development Plan,
- Power Development Plan,

- Data and information of interconnection line among Lao P.D.R., Thailand, Vietnam and China,
- Availability and cost of construction materials, machinery, equipment, and construction works,
- Environmental clearance system,

2) Review and improvement of a demand forecast

3) Transmission system survey

- Study existing transmission lines and substations and identify existing and/or future issues
- Review the current grid expansion plan
- Review the planning criterion and reliability standard
- Field survey

4) Detail studies on Power Network System

- Power flow analysis
- Fault current analysis
- System voltage and frequency analysis
- Reliability and stability analysis, etc.

5) Formulation of Power Network System Plan for 20 years

- Cost estimation for Power Network System Plan for 20 years
- Evaluation and prioritization of power network projects

Stage 2- Basic Design of a Selected Project

The following studies will be executed on a selected project.

1) Field survey on a selected project

- Implementation of field surveys, such as geological/topological survey, to collect necessary data for the design at basic design level.

2) Basic design on a selected project

- Basic design on necessary facilities
- Preparation of specification of necessary equipment
- Preparation of implementation plan including construction method and schedule
- Project cost estimation
- Economic and financial evaluation

3) Institutional arrangement

- Organization analysis for the project implementation and coordination
- Funding plan

4) Environmental impact study

- Scoping for environment assessment
- Preliminary study on environmental and social impacts

V. WORK SCHEDULE

The Study will be carried out in accordance with the tentative work schedule shown in the Appendix I.

VI. REPORTS

JICA shall prepare and submit the following reports in English to the Government of Lao P.D.R.:

- Inception Report (Ic/R) Ten (10) copies in English
- Interim Report (It/R) Ten (10) copies in English
- Draft Final Report (Df/R) Ten (10) copies in English (main reports and summaries)

The Government of Lao P.D.R. shall provide its comments on the draft final report within one month after its reception.

- Final Report (F/R) Thirty (30) copies in English (main reports and summaries)

JICA will submit these reports within six (6) weeks after receiving the comments of the Government of Lao P.D.R. on the Draft Final Report.

VII. DIVISION OF TECHNICAL UNDERTAKINGS

The division of technical undertakings by Department of Electricity (hereinafter referred to as "DOE") and Electricite du Laos (hereinafter referred to as "EDL") of Ministry of Energy and Mines (hereinafter referred to as "MEM"), and JICA of the Study detailed in the Appendix II.

VIII. UNDERTAKINGS OF THE GOVERNMENT OF LAO P.D.R.

(1) To facilitate the smooth conduct of the Study, the Government of Lao P.D.R. shall take necessary measures:

1) To permit the members of the JICA Study Team to enter, leave and sojourn in Lao P.D.R. for the duration of their assignment therein, and exempt them from foreign registration requirements and consular fees;

2) To exempt the members of the JICA Study Team from taxes, duties, fees and other charges on equipment, machinery and other materials brought into, and out of, Lao P.D.R. for the conduct of the Study;

3) To exempt the members of the JICA Study Team from income taxes and charges of any kind imposed on, or in connection with, any emoluments or allowances paid to them for their services for the implementation of the Study; and

4) To provide necessary facilities to the JICA Study Team for remittance as well as utilization of the funds introduced into Lao P.D.R from Japan in connection with the implementation of the Study,

(2) The Government of Lao P.D.R. shall bear claims, if any arises, against members of the JICA Study Team resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Study; except when such claims arise from gross negligence or willful misconduct on the part of the members of the JICA Study Team.

(3) DOE and EDL shall act as counterpart agency to the JICA Study Team and also as coordinating body in relation with the other governmental and non-governmental organizations concerned for the smooth implementation of the Study.

(4) DOE and EDL shall, at their own expenses, provide the JICA Study Team with the following, in cooperation with other organizations concerned:

1) Security-related information on as well as measures to ensure the safety of the JICA Study Team;

2) Information on as well as support in obtaining medical services;

3) Available data and information related to the Study;

4) Counterpart personnel;

5) Suitable office space with necessary equipment and facilities in Lao P.D.R.;

6) Credentials or identification cards;

7) Vehicles with drivers; and

8) Communication facilities such as telephone and facsimile etc. if necessary.

(5) DOE and EDL will, as the executing agency of the project, take responsibilities that may arise from the product of the Study.

IX. UNDERTAKING OF JICA

For the implementation of the Study, JICA shall take the following measures:

(1) To dispatch, at its own expense, study teams to Lao P.D.R., and

(2) To pursue technology transfer to the Laos counterpart personnel in the course of the Study.

X. OTHERS

JICA, DOE and EDL shall consult with each other in respect of any matter that may arise from or in connection with the Study.

Appendix - I

Tentative Work Schedule

Project period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Year	2009												2010		
Month	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Stage I - Power Network System Plan															
1) Collection and review of existing data and information related power sector		■													
2) Review and improvment of a demand forecast		■													
3) Transmission system survey		■													
4) Detail studies on Power Network System					■										
5) Formulation of Power Network System Plan for 20 years					■										
Stage 2- Basic Design of a Selected Project															
1) Field survey on a selected project							■	■			■				
2) Basic design on a selected project							■	■			■				
3) Institutional arrangement							■	■			■				
4) Environmental impact study							■	■			■				
Reports		▲ Ic/R				▲ It/R					▲ Df/R		▲ F/R		
Workshop						▲					▲				
Technology Transfer Seminar								▲							

□ works in Japan ■ works in Laos

Reports: Ic/R: Inception Report
It/R: Interim Report
Df/R: Draft Final Report
F/R: Final Report

Appendix-II

Technical Undertakings

	JICA Undertaking	DOE and EDL of MEM Undertaking
(1) Power Network System Plan Stage		
1) Collection and review of existing and planned data and information related power sector	Works by manmonth provision	Data, advise and counterpart provision and discussion
2) Review and improvement of a demand forecast	Works by manmonth provision	Data, advise and counterpart provision and discussion
3) Transmission system survey	Works by manmonth provision	Data, advise and counterpart provision and discussion
4) Detail studies on Power Network System	Works by manmonth provision	Data, advise and counterpart provision and discussion
5) Formulation of Power Network System Plan for 20 years	Works by manmonth provision	Data, advise and counterpart provision and discussion
(2) Basic Design of a Selected project Stage	Works by manmonth provision	Data, advise and counterpart provision and discussion
1) Field survey on a selected project	Works by manmonth provision	Data, advise and counterpart provision and discussion
2) Basic design on a selected project	Works by manmonth provision	Data, advise and counterpart provision and discussion
3) Institutional arrangement	Works by manmonth provision	Data, advise and counterpart provision and discussion
4) Environmental impact study	Works by manmonth provision	Data, advise and counterpart provision and discussion

３．事業事前評価表

事業事前評価表（開発調査）

作成日：平成 20 年 8 月 27 日

担当課：産業開発部　資源・エネルギーG

電力・エネルギー課

１．案件名
ラオス国　電力系統計画調査
２．協力概要
（１）事業の目的 ラオス国全土を対象に、2011 年から 2030 年までの 20 年間を対象とした電力系統計画を策定するとともに、その計画において選定される優先プロジェクトに関し、基本設計を行うことを目的とする。さらに、カウンターパート機関に対し、調査を通じ電力系統計画に係る技術移転を行う。 （２）調査期間 2008 年 12 月～2009 年 12 月 （３）総調査費用　1.5 億円 （４）協力相手先機関 エネルギー鉱業省（Ministry of Energy and Mines：MEM） 電力局（Department of Electricity：DOE） ラオス電力公社（Electricite du Laos：EDL） ＊：DOE、EDL ともに MEM の下部機関である。 （５）計画の対象（対象分野、対象規模等） 対象分野：電力系統計画 対象地域：ラオス国全土
３．協力の必要性・位置付け
（１）現状及び問題点 ラオス国で電力行政を主管する、エネルギー鉱業省（Ministry of Energy and Mines : MEM）電力局（Department of Electricity：DOE）は、電力セクターの開発目標として民生向上に資する電化率の向上、及び国家財政に寄与する外貨獲得のための電力輸出の促進を掲げており、ラオス電力公社（Electricite du Laos：EDL）とともに４地域（北部、中部１、中部２、南部）の基幹電力網を相互接続することによる各基幹電力網の最適化と安定性向上に取り組んでいる。その一環として JICA の協力により「送変電設備マスタープラン」（2001-2002）が策定され、現在は円借款により同マスタープランに基づく中部１と中部２との間（Borikhamxay-Savannakhet 間）の送変電施設整備が進められている。この施設が完成すれば、中部２地域は乾期の間、国内料金より高い電力を周辺国から輸入しているという現状から脱却することが可能となる。 包蔵水力に恵まれた中部１と南部それぞれにおける基幹電力網を、中部２を介して相互接続させれば、両地域間の電力融通を通じた電気事業経営の改善がはかれるため、現在整備中の送電線をさらに南部 Champasak 県の Pakse まで延伸させ、ナショナルグリッドを完成させることが望まれている。

（2）相手国政府国家政策上の位置づけ

ラオス国の電力政策の具体的展開として、４項目があげられており、そのうちの２項目は以下のとおりである。

1）2020 年時点での国内電化率 90%、このための国内グリッドの拡張、オフグリッド電源の整備、エネルギー自給率・安全性の向上、長期持続的な電力プロジェクトの実施

2）大メコン圏（GMS）での電力融通の促進、IPP（Independent Power Producer）プロジェクト選択・実施手順の確立、IPP によるラオスへの利益最大化、電力融通に資する送電網の開発

電力系統を全国に拡張することは、上記具体的展開のうち、国内グリッドの整備、エネルギー自給率・安全の向上、電力融通に資する送電網の開発を達成するものである。

（3）他国機関の関連事業との整合性

本件に関連し、世界銀行（WB)、アジア開発銀行（ADB）が支援するプロジェクトは下記のとおりであり、我が国が支援する中南部の国内基幹系統の整備とうまく棲み分けができている。また、世銀が中央給電指令所や変電所の制御監視に関わる情報管理システムの整備を近い将来計画していることも本プロジェクトと深い関連があり、それぞれの相乗効果が期待できる。

世界銀行	115kV 送電線　Ban Hat SS – カンボジア国境
	115kV 送電線　Xeset SS – Saravan
	中央給電指令所の設置
	変電所での情報管理システム支援
アジア開発銀行	北部送変電拡張（115kV）

（4）我が国援助政策との関連、JICA 国別事業実施計画上の位置づけ

日本国政府は 1970 年代以降、資金協力、技術協力両面でラオス国の電力分野に多くの協力を行ってきており、近年ではラオス国電力セクターにかかる総合的な政策支援として、電力政策アドバイザーの派遣及び電力技術基準整備プロジェクトを実施してきている。

我が国の対ラオス国別援助計画（2006 年 9 月）における援助目標の一つは、「自立的・持続的成長の原動力となる経済成長を促進すべく、その基盤造りを支援する」ものであり、重点分野として「社会経済インフラ整備及び既存インフラの有効活用」が上げられている。JICA 国別事業実施計画（2007 年 2 月）はこれを踏襲しており、本件は主要都市への安定した電力供給及び未電化地域の電化促進を通じた民生向上及び貧困削減のために、電源開発及び送配電の計画的かつ効率的な実施のための電力行政能力の強化、電力事業体の能力向上を目的とする電力整備プログラムに位置づけられる。

４．協力の枠組み

（1）調査項目

Stage l　電力系統計画

1）電力セクターに係る関連データ・情報の収集及びレビュー

ア.社会経済及び環境関連情報

イ.エネルギー消費及び発電電力量

ウ.需要予測（工業・商業・地域開発計画を含む）

エ.電力開発計画

オ.国際系統連系の情報（ラオス、タイ、ベトナム、中国間）

カ.工事用資材、機材及び工事用労働力の調達及び費用情報

キ.環境クリアランス制度に係わる承認手続の情報

2）電力需要予測のレビュー

3）送電系統調査

ア.既存送変電設備の調査及び課題の特定

イ.系統延伸計画のレビュー

ウ.送変電計画基準と信頼度基準のレビュー

エ.現地踏査

4）電力系統の解析

ア.電力潮流解析

イ.短絡電流解析

ウ.系統電圧及び周波数解析

エ.信頼度及び安定度解析、等

5）20 年間の電力系統計画の策定

ア.20 年間の電力系統計画の費用積算

イ.電力系統プロジェクトの評価及び優先順位検討（最優先プロジェクトの選定）

Stage 2　選定された電力系統プロジェクトの基本設計

1）選定された電力系統プロジェクトに関する現地踏査

ア.基本設計に必要とされる地形・地質情報収集のための現地踏査の実施

2）選定された電力系統プロジェクトの基本設計

ア.必要とされる設備の基本設計

イ.必要とされる設備仕様に係る準備作業

ウ.工事工法やスケジュールを含む施工計画の準備作業

エ.プロジェクト費用積算

オ.経済及び財務評価

3）制度及び実施体制の検討

ア.プロジェクト実施・調整のための体制検討

イ.資金計画

4）環境影響評価

ア.環境影響のためのスコーピング

イ.環境社会インパクトに係る初期調査

上記一連の調査や業務をカウンターパートと共同で実施することにより、カウンターパートに対して必要な技術移転を行う。また、調査期間中に実施する技術移転セミナーにおいて送変電系統計画等の分野でカウンターパートへの技術移転を実施する。

（2）アウトプット（成果）

1）20 年間のラオス国内電力系統計画の策定(2011-2030)

2）選定された電力系統プロジェクトの基本設計実施

3）電力系統計画に係る技術移転

（3）インプット（投入）：以下のコンサルタントの投入による調査の実施

ア．総括/電力系統計画／1

イ．需給計画／1

ウ．系統解析／1

エ．送電設備設計／1

オ．変電設備設計／1

カ．経済財務分析／1

キ．環境社会配慮／1

合計 7 名

5．協力終了後に達成が期待される目標

（1）提案計画の活用目標

・策定された系統計画に基づき、優先プロジェクトが実施される。

・系統計画に基づき、カウンターパートにより国際系統及び IPP との連携や調整が推進される。

（2）活用による達成目標

・系統計画の実施により、系統信頼性の向上と国内電力供給増を図り、地方電化の推進と電力公社の収入増へ貢献する。

・状況変化に対応した系統計画の見直しがカウンターパートにより行われる。

6．外部要因

（1）協力相手国内の事情

・IPP 新設や鉱山開発という大規模な計画があるものの、不確実性が高く、需給計画が大きく変動する可能性がある

（2）関連プロジェクトの遅れ

特になし

7．貧困・ジェンダー・環境等への配慮（注）

JICA 環境社会配慮ガイドラインにおる本調査のカテゴリ分類は B である。本調査対象となる

候補プロジェクトの近隣には国立保護区もあることから、送電ルートの選定の際には慎重な検討を要する。また、送電線建設に伴い、住民移転が生じて住民移転対象に貧困層（特に女性世帯主の低所得者層等）が含まれる場合については留意する。

８．過去の類似案件からの教訓の活用（注）

本件では、2011-2030 年を対象とした 20 年間の電力系統計画（マスタープラン）を策定するが、電力系統計画は電源開発、需要想定の内容に大きく影響を受けることから、IPP 数の増大、鉱山需要、国際連系などを十分に考慮するとともに、考えうる複数のケース（シナリオ）を示すなど柔軟な対応が必要となる。そのため、技術移転に関しては「ラオス国送変電設備マスタープラン調査（2001-02 年）」の経験を踏まえ、先方関係機関が現在も活用している系統計画・解析ソフト（PSS/E）を用いて、より現状に適した計画・解析手法についての技術移転が求められている。

また、近隣諸国との国際電力系統連系の将来的な方向性を見据えて計画を策定するために、「インドシナ地域電力セクター域内協力に係るプロジェクト研究（2007-8）」の結果を踏まえ、それらの国々との意見交換を本格調査で行うこととする。

９．今後の評価計画

（１）事後評価に用いる指標

（ａ）活用の進捗度

・策定された系統計画に基づいて実施されたプロジェクト

・策定された系統計画に基づいた国際系統及び IPP との連携・調整の実績

（ｂ）活用による達成目標の指標

・策定された系統計画の実施による国内への電力供給増

・策定された系統計画の実施による系統信頼性向上への貢献度

・策定された系統計画の実施による地方電化の推進と電力公社の収入増への貢献度

・カウンターパートにより更新された系統計画

（２）上記（ａ）及び（ｂ）を評価する方法及び時期

フォローアップ調査等によるモニタリング（2011 年度以降）

（注）調査にあたっての配慮事項

SCOPE OF WORK
FOR
THE STUDY
ON
POWER NETWORK SYSTEM PLAN
IN
LAO PEOPLE'S DEMOCRATIC REPUBLIC

Agreed upon between
Department of Electricity and Electricite du Laos
of
Ministry of Energy and Mines
and
Japan International Cooperation Agency

Vientiane, 28th August, 2008

Mr. Viraphonh Viravong
Director General
Department of Electricity
Ministry of Energy and Mines

Mr. Hiroaki Takashima
Resident Representative
Laos Office
Japan International Cooperation Agency

Mr. Khammany Inthirath
Managing Director
Electricite du Laos
Ministry of Energy and Mines

I. INTRODUCTION

In response to the request of the Government of Lao People' s Democratic Republic (hereinafter referred to as "Lao P.D.R."), the Government of Japan decided to conduct the Study on Power Network System Plan in Lao P.D.R. (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

Accordingly, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of technical cooperation programs of the Government of Japan, will undertake the Study in close cooperation with the authorities concerned in Lao P.D.R.

The present document sets forth the scope of work with regard to the Study.

II. OBJECTIVES OF THE STUDY

The objectives of the Study are:

1. To formulate the power network system plan in Lao P.D.R. for twenty (20) years from 2011 to 2030;
2. To develop basic design of a selected project ; and
3. To transfer relevant skills and technologies regarding the power network system planning to counterpart personnel

III. THE STUDY AREA

The Study will cover whole country of Lao P.D.R.

IV. SCOPE OF THE STUDY

The study will be carried out in two Stages, "Power Network System Plan" stage and "Basic Design of a Selected Project" stage. The details at the respective stages are itemized as follows:

Stage l-Power Network System Plan

1) Collection and review of existing and planned data and information related power sector

The following data and information will be collected and analyzed.

- Socio-economic and environment information/data,
- Energy consumption and power production data,
- Demand forecast data including the Industrial, Commercial and Regional Development Plan,
- Power Development Plan,

- Data and information of interconnection line among Lao P.D.R., Thailand, Vietnam and China,
- Availability and cost of construction materials, machinery, equipment, and construction works,
- Environmental clearance system,

2) Review and improvement of a demand forecast

3) Transmission system survey

- Study on existing transmission lines and substations and identification of existing and/or future issues
- Review of the current grid expansion plan
- Review of the planning criterion and reliability standard
- Field survey

4) Detail studies on Power Network System

- Power flow analysis
- Fault current analysis
- System voltage and frequency analysis
- Reliability and stability analysis, etc.

5) Formulation of Power Network System Plan for 20 years

- Cost estimation for Power Network System Plan for 20 years
- Evaluation and prioritization of power network projects

Stage 2- Basic Design of a Selected Project

The following studies will be executed on a selected project.

1) Field survey on a selected project

- Implementation of field surveys, such as geological/topological survey, to collect necessary data for the design at basic design level.

2) Basic design on a selected project

- Basic design on necessary facilities
- Preparation of specification of necessary equipment
- Preparation of implementation plan including construction method and schedule
- Project cost estimation
- Economic and financial evaluation

3) Institutional arrangement

- Organization analysis for the project implementation and coordination
- Funding plan

4) **Environmental impact study**

- Scoping for environment assessment
- Preliminary study on environmental and social impacts

V. WORK SCHEDULE

The Study will be carried out in accordance with the tentative work schedule shown in the Appendix I.

VI. REPORTS

JICA shall prepare and submit the following reports in English to the Government of Lao P.D.R.:

- Inception Report (Ic/R) Ten (10) copies in English
- Interim Report (It/R) Ten (10) copies in English
- Draft Final Report (Df/R) Ten (10) copies in English (main reports and summaries)

The Government of Lao P.D.R. shall provide its comments on the draft final report within one month after its reception.

- Final Report (F/R) Thirty (30) copies in English (main reports and summaries)

JICA will submit these reports within six (6) weeks after receiving the comments of the Government of Lao P.D.R. on the Draft Final Report.

VII. DIVISION OF TECHNICAL UNDERTAKINGS

The division of technical undertakings by Department of Electricity (hereinafter referred to as "DOE") and Electricite du Laos (hereinafter referred to as "EDL") of Ministry of Energy and Mines (hereinafter referred to as "MEM"), and JICA of the Study detailed in the Appendix II.

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(1) To facilitate the smooth conduct of the Study, the Government of Lao P.D.R. shall take necessary measures:

1) To permit the members of the JICA Study Team to enter, leave and sojourn in Lao P.D.R. for the duration of their assignment therein, and exempt them from foreign registration requirements and consular fees;

2) To exempt the members of the JICA Study Team from taxes, duties, fees and other charges on equipment, machinery and other materials brought into, and out of, Lao P.D.R. for the conduct of the Study;

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1) Security-related information on as well as measures to ensure the safety of the JICA Study Team;

2) Information on as well as support in obtaining medical services;

3) Available data and information related to the Study;

4) Counterpart personnel;

5) Suitable office space with necessary equipment and facilities in Lao P.D.R.;

6) Credentials or identification cards;

7) Vehicles with drivers; and

8) Communication facilities such as telephone and facsimile etc. if necessary.

(5) DOE and EDL will, as the executing agency of the project, take responsibilities that may arise from the product of the Study.

IX. UNDERTAKING OF JICA

For the implementation of the Study, JICA shall take the following measures:

(1) To dispatch, at its own expense, study teams to Lao P.D.R., and

(2) To pursue technology transfer to the Laos counterpart personnel in the course of the Study.

X. OTHERS

JICA, DOE and EDL shall consult with each other in respect of any matter that may arise from or in connection with the Study.

Appendix - I

Tentative Work Schedule

Project period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Year	2009												2010		
Month	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Stage 1 - Power Network System Plan															
1) Collection and review of existing and planned data and information related power sector															
2) Review and improvement of a demand forecast															
3) Transmission system survey															
4) Detail studies on Power Network System															
5) Formulation of Power Network System Plan for 20 years															
Stage 2- Basic Design of a Selected Project															
1) Field survey on a selected project															
2) Basic design on a selected project															
3) Institutional arrangement															
4) Environmental impact study															
Reports		▲ Ic/R				▲ It/R					▲ Df/R		▲ F/R		
Workshop						▲					▲				
Technology Transfer Seminar								▲							

works in Japan works in Laos

Reports: Ic/R: Inception Report
It/R: Interim Report
Df/R: Draft Final Report
F/R: Final Report

Appendix-II

Technical Undertakings

	JICA Undertaking	DOE and EDL of MEM Undertaking
(1) Power Network System Plan Stage		
1) Collection and review of existing and planned data and information related power sector	Works by manmonth provision	Data, advise and counterpart provision and discussion
2) Review and improvement of a demand forecast	Works by manmonth provision	Data, advise and counterpart provision and discussion
3) Transmission system survey	Works by manmonth provision	Data, advise and counterpart provision and discussion
4) Detail studies on Power Network System	Works by manmonth provision	Data, advise and counterpart provision and discussion
5) Formulation of Power Network System Plan for 20 years	Works by manmonth provision	Data, advise and counterpart provision and discussion
(2) Basic Design of a Selected project Stage	Works by manmonth provision	Data, advise and counterpart provision and discussion
1) Field survey on a selected project	Works by manmonth provision	Data, advise and counterpart provision and discussion
2) Basic design on a selected project	Works by manmonth provision	Data, advise and counterpart provision and discussion
3) Institutional arrangement	Works by manmonth provision	Data, advise and counterpart provision and discussion
4) Environmental impact study	Works by manmonth provision	Data, advise and counterpart provision and discussion

５．環境社会配慮サマリー（英文）

Summary of Preparatory Study on the Environmental and Social Consideration

1. Project Title

The Study on Power Network System Plan in Lao PDR

2. Type of the Study

Development Study

3. Environmental Category and Reason for Categorization

Category: B

Reason: It is envisaged that the Study does not cause any serious negative environment and social impacts since environmental and social considerations are incorporated into all components: reviewing the current national power system network plan, selecting a prioritized project, and conducting basic design for the selected project. Upon planning the specific project, no other serious impacts are predicted if the transmission line routes are selected to mitigate or minimize the negative impacts.

In Lao PDR, at each phase of project planning, implementation, and operation & maintenance for power network system construction, environmental and social issues were examined to mitigate or alleviate negative impacts according to stipulations in existing laws, regulations, and standards. To the present, in the projects composed of only transmission lines, those routes were practically planned diverting from environmentally and/or socially critical locations such as national protected area (National Biodiversity Conservation Area: NBCA) as much as possible. Therefore, those projects were required to conduct only Initial Environmental Examination (IEE) to obtain environmental certificate.

4. Agency or Institution Responsible for Implementation of the Project

Responsible Agency:

Department of Electricity (DOE), Ministry of Energy and Mines (MEM)

Executing Agency:

Department of Electricity (DOE) and Electricité du Laos (EDL)

5. Outline of the Project

5.1. Objectives

The objectives of the Study are:

1. To formulate the power network system plan in Lao P.D.R. for twenty (20) years from

2011 to 2030;

2. To develop basic design of a selected project; and
3. To transfer relevant skills and technologies regarding the power network system planning to counterpart personnel

5.2. Scope of the Study

(1) Stage 1- Power Network System Plan

i) Collection and review of existing and planned data and information related power sector
ii) Review and improvement of a demand forecast
iii) Transmission system survey
iv) Detail studies on Power Network System
v) Formulation of Power Network System Plan for 20 years

(2) Stage 2- Basic Design of a Selected Project

i) Field survey on a selected project,
ii) Basic design on a selected project,
iii) Institutional arrangement,
iv) Environmental impact study

6. Description of the Study Area

Lao People's Democratic Republic is a landlocked country, which is bordered by five countries of Vietnam, Cambodia, Thailand, Myanmar and China. The population of about 5.6 million inhabit in the total land area of 230,800 km^2. The population density is 23.7 persons per km^2, which is far blow the one on the average in Southeast Asia of 122 persons per km^2. Ethnic compositions are diverse and 49 ethnic groups are identified by Census survey 2005. The largest ethnic group is Lao, accounting for 55% of the total population. The majority of the population is engaged in agriculture and the country's economy depends on rich natural resources, including forest and water resources.

The topography of the country of the northern and eastern parts is dominated by mountains and plateaus. The largest river, the Mekong (Nam Khong), which runs throughout the country, provide fertile flood plain for rich and a variety of natural environment. Forest area occupies about 54% of the total area and forestry production contributed 2.9% of GDP (estimated for year 2006) and its share would be even higher if subsistence and other use are counted. Forest areas also have rich biodiversity. The country has, however, been encountering serious deforestation causing by illegal logging and slash-and burn shifting cultivation. The Government of Lao PDR established the national level of conservation area of 20 National Protected Area (NPA, it is also

Table 1 : Number and Area of Conservation and Protection Forestry

Forestry Category	Administrative Level	Number	Area :1,000 ha (% of total land)
Conservation	National	20 NPA 2 Corridor	3,391 (14.0%)
	Provincial	57	77 (0.3 %)
	District	144	504 (2.1%)
Protection	Provincial	23	461 (2.0%)
	District	52	56 (0.2%)

Source: “Forestry Strategy to the Year 2020 of the Lao PDR” (2005), P.11-12

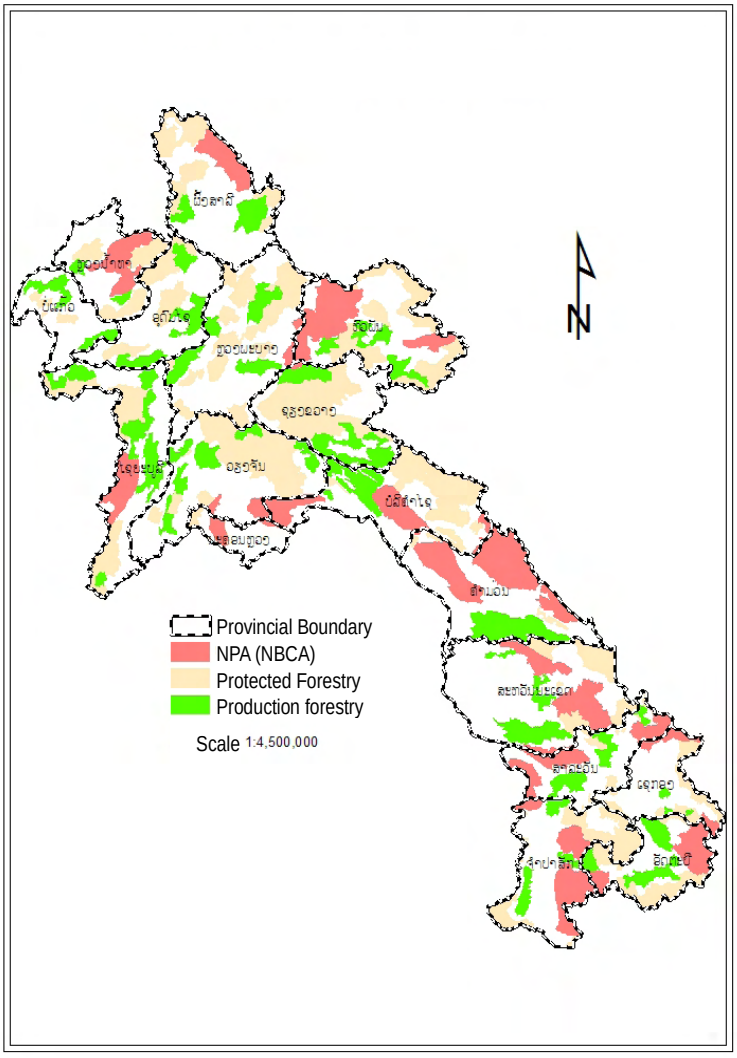

Figure 1: Location of National Conservation Forestry Area

Source: Forest Inventory & Planning Division, Department of Forestry, Ministry of Agriculture and Forestry

known as National Biodiversity Conservation Area: NBCA), 2 Corridors that is approximately total 3.4 million ha (14% of total land), and conservation and protection area at provincial and district level .(Refer to Table 1 and Figure 1 for the location)

Highlighting the southern part of the country where candidate projects for basic design of the study might be considered, population densities of three provinces, Savannakhet, Saravane, and Champasak are relatively higher than the national average, 37.9, 30.3 and 39.4 persons per square km respectively. 6 NPAs, total 1.06 million ha, encompass three provinces. Southern part of the country is characterized as having a high potential of Unexploded Ordnance (UXO) contaminated area as shown in Figure 2.

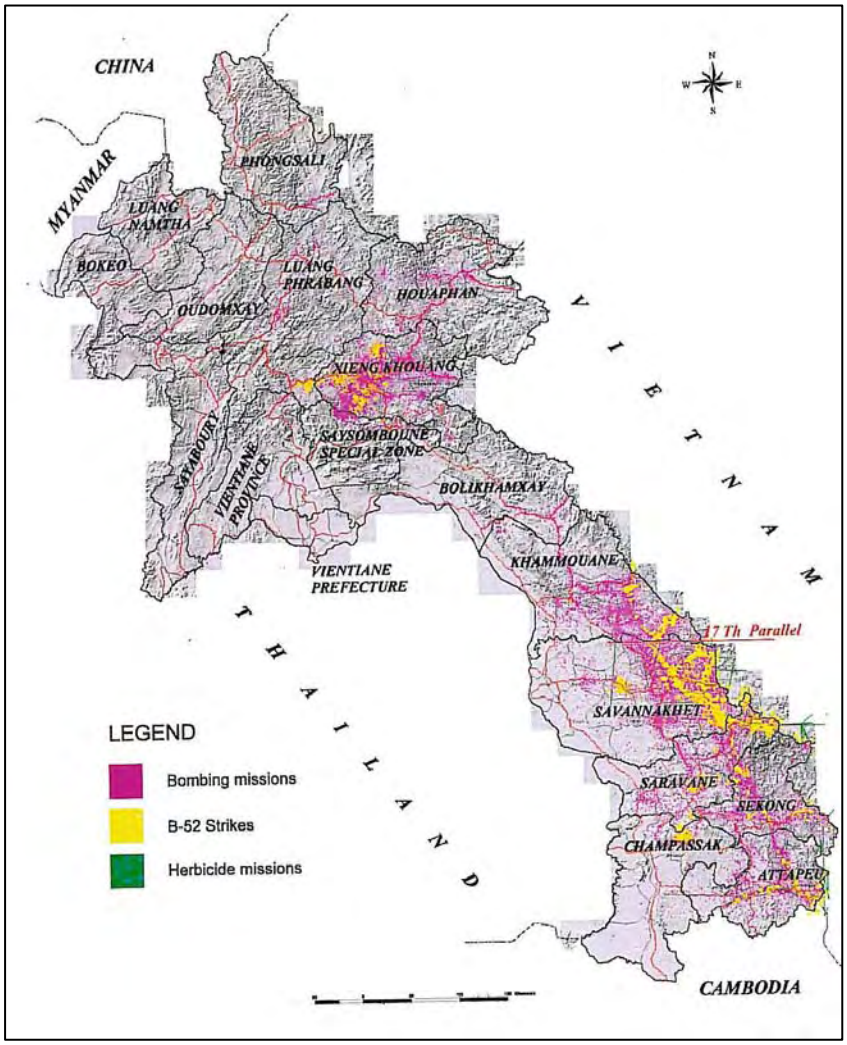

Figure 2: Location of Bombing Mission

Source: Forest Inventory & Planning Division, Department of Forestry, Ministry of Agriculture and Forestry

7. Legal Framework for Environmental and Social Considerations

(1) Laws, Regulations, and Standards related to environmental and social issues

The Article 8 of "Environment Protection Law (NO.02-99/NA, April 1999）" stipulates that development projects with potential environmental impact shall submit environmental assessment report in accordance with the regulations by the responsible agencies for those projects.

"Regulation on Environmental Assessment in the Lao PDR (No. 1770 / STEA, 10, 2000)" refers to specific procedures and requirements for IEE and Environmental Impact Assessment (EIA), including stakeholder consultation and information disclosure.

Ministry of Energy and Mines (MEM) is responsible for the law and regulation on power development projects and therefore established the regulations and standard of environmental and social considerations for power development projects. "Regulation on Implementing Environmental Assessment for Electricity Projects in Lao PDR (NO.447/MIH, November 2001）" refers to implement environmental assessment requirements and procedures. This regulation stipulates the procedure of IEE and EIA as in the chart below. All projects are subject to environmental screening and then proceed for IEE that examines whether or not it is necessary to conduct EIA. Public consultation is held 2 or 3 times during the preparation of IEE and EIA. "Environmental Standard Management for Electricity Project (NO.0366 MIH.DOE, June 2003）" refers to details of environmental Screening.

In July 2007, Water Resources and Environment Agency (WREA) was established as EIA approval entity, taking over the department which is responsible to environmental issues under Science and Technology and Environmental Agency. Accordingly, EIA related regulation established by STEA was under the process of revision as of June, 2008.

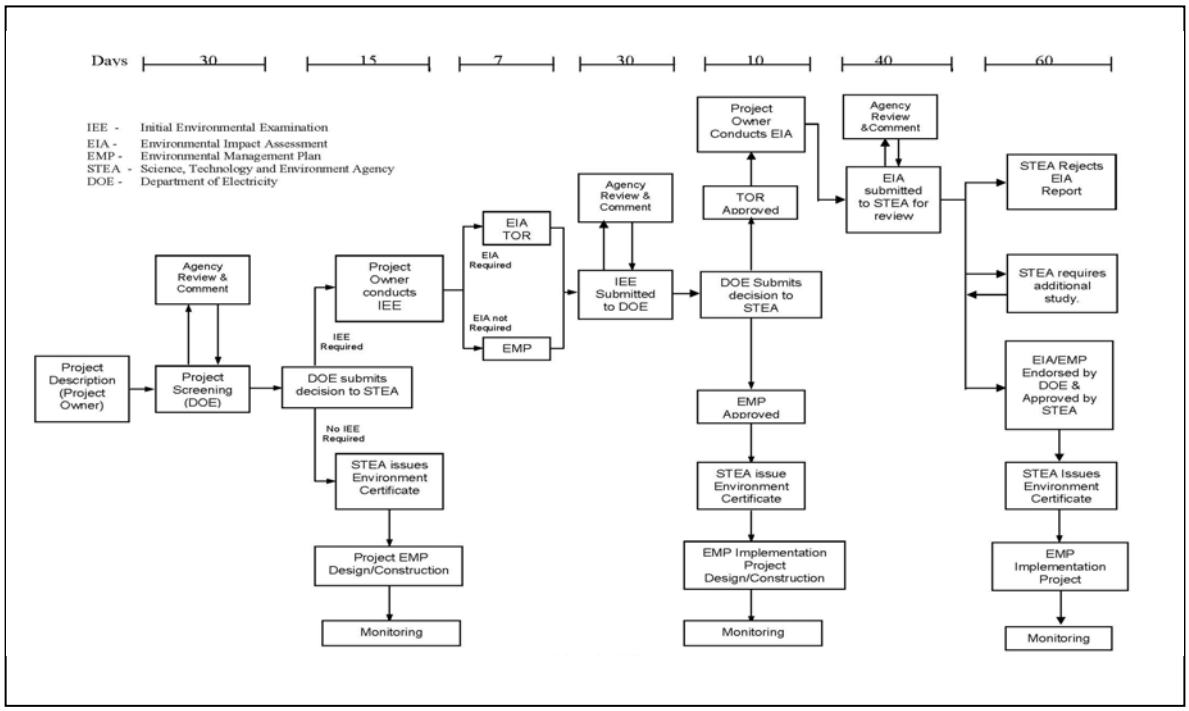

Chart: Environmental Assessment Process for Electricity Sector

Source： "Regulation on Implementing Environmental Assessment for Electricity Projects in Lao PDR" p5

Note: Water Resources and Environment Agency (WREA) was newly established in 2007 and STEA in this chart was replaced by WREA

(2) Relevant agencies and institutions of EIA

EIA Division in Department of Environment of WREA is in charge of issuing the license of environmental certificate. The responsible agency for Environmental Assessment process of all electricity projects is Department of Electricity of MEM. Relevant agencies for review on IEE and EIA of electricity projects are, for example in general, Ministry of Agriculture and Forestry, Ministry of Culture Information, Ministry of Transportation and Civil work, Ministry of Public Health, Local authorities and others.

8. Provisional Scoping of the Environmental and Social Impact Study

The Study reviews existing power system network and future plan in year in Figure 3. A candidate project for basic design is located from Savannakhet to Champasak province. Careful environmental and social consideration upon selecting transmission line route can mitigate negative impacts on local resources. For the candidate project for basic design, it is necessary to consider particularly the location of National Protected Area of Forestry (NBCA) and clearance of UXO.

The result of provisional scoping for the Study is in Table 2. At this time of the preparatory study,

there are no items with possibility of serious impacts; however, there are some items which may have some impacts.

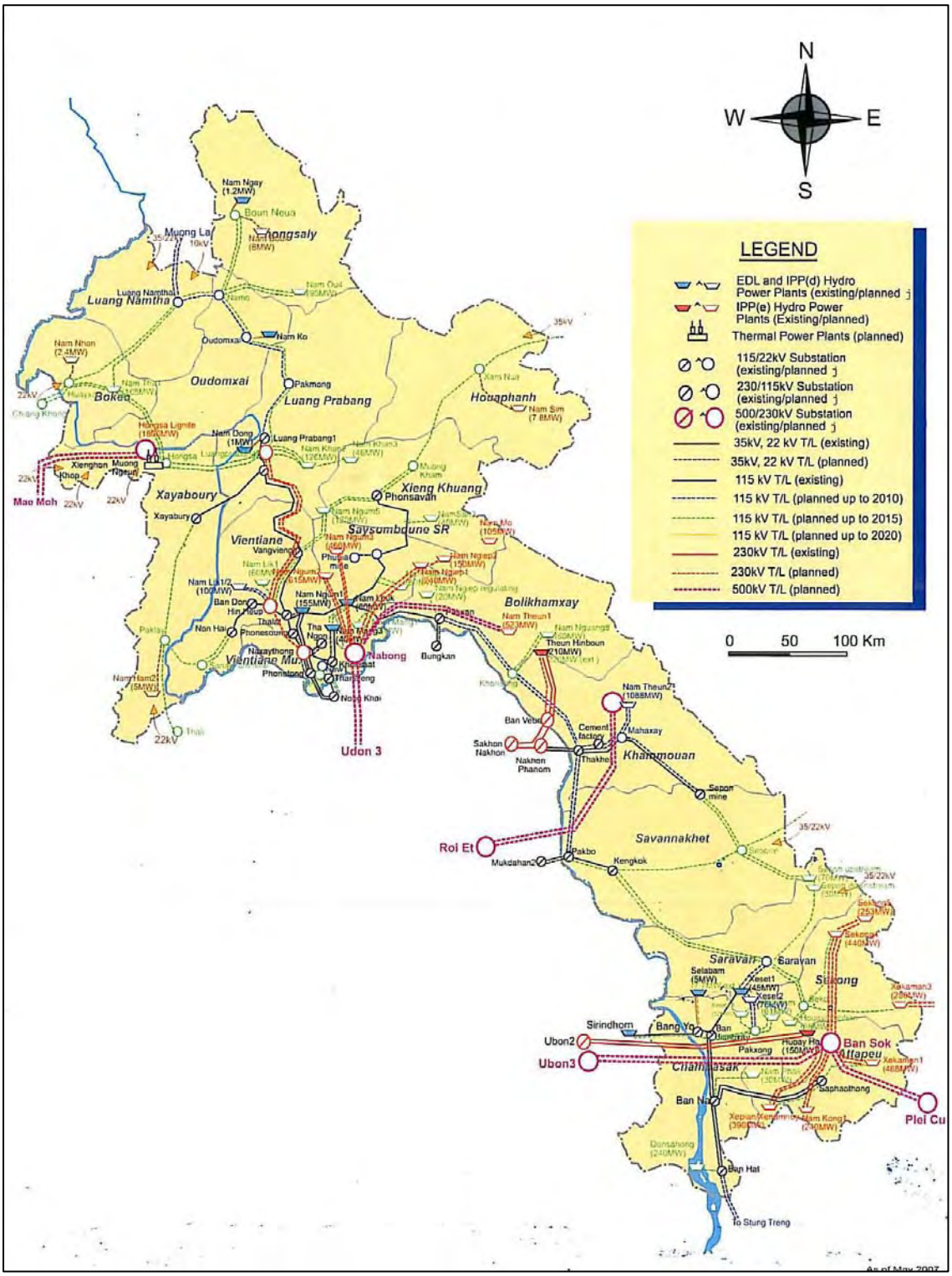

Figure 3: Long-term Power Development Plan (2007-2016)

Table 2: Provisional Scoping of Environmental and Social Impact Study

Name of Cooperation Name			
No.	Impacts	Rating	a Brief Description
Social Environment: *Regarding the impacts on “Gender” and “Children’s Right”, might be related to all criteria of Social Environment.			
1	Involuntary Resettlement	B	Depending on the transmission line route, some houses might be resettled although the number should be minimal.
2	Local economy such as employment and livelihood, etc.	B	Depending on the transmission line route some impacts on economic activities might be affected by resettlement, however, those may be minimal.
3	Land use and utilization of local resources	B	Depending on transmission line route, land acquisition around steel tower may be necessary and there might have some impacts. Also, around the transmission line, there might be some impacts on local resources such as cutting or relocating commercial trees, and so on..
4	Social institutions such as social infrastructure and local decision-making institutions	C	
5	Existing social infrastructures and services	B	Depending on the transmission line route, some infrastructure may be affected.
6	The poor, indigenous and ethnic people	C	
7	Misdistribution of benefit and damage	C	
8	Cultural heritage	B	Depending on the transmission line route, social institution such as small pagoda of the village may be affected.
9	Local conflict of interests	C	
10	Water Usage or Water Rights and Rights of Common	B	Depending on the transmission line route, some infrastructure may be affected.
11	Sanitation		
12	Hazards (Risk) Infectious diseases such as HIV/AIDS		
Natural Environment			
13	Topography and Geographical features	B	There is a possibility to have some impacts according to the transmission line route
14	Soil Erosion	B	There is a possibility to have some impacts according to the transmission line route
15	Groundwater	B	There is a possibility to have some impacts according to the transmission line route
16	Hydrological Situation		
17	Coastal Zone (Mangroves, Coral reefs, Tidal flats, etc.)		
18	Flora, Fauna and Biodiversity	B	There is a possibility to have some impacts according to the route
19	Meteorology		
20	Landscape	B	There is a possibility to have some impacts according to the route
21	Global Warming		
Pollution			
22	Air Pollution	B	Some impacts only during construction
23	Water Pollution	B	Some impacts only during construction
24	Soil Contamination		
25	Waste	B	Some impacts only during construction
26	Noise and Vibration	B	Some impacts only during construction
27	Ground Subsidence		
28	Offensive Odor		
29	Bottom sediment		
30	Accidents	B	There might be a possibility during construction and operation period

Rating:
A: Serious impact is expected.
B: Some impact is expected.
C: Extent of impact is unknown (Examination is needed. Impacts may become clear as study progresses.)
No Mark: No impact is expected. IEE/EIA is not necessary.

9. Alternatives

It is necessary that the Study examine the alternative of "without" project option and alternative project site options in light of environmental and social considerations. Upon analyzing alternatives, both positive and negative impact duration, scale, and significance in each case can be compared carefully among options. Feasibility of mitigation measures, in terms of cost and difficulties in implementation, will be also considered.

10. Terms of Reference (TOR) for Environmental and Social Considerations

Scope of work of TOR for IEE on the proposed project in the Study shall entail at least the following items:

(1) Description of the proposed project

(2) Review of Literatures, Laws, Regulations and Standards Concerned:
Particularly on the latest information of the EIA procedures and institutional frame work

(3) Description of the Environment:
Physical Resource -topography, affected area, soils, water resource, climate,
Biological Resources -vegetation, wild and aquatic animals, national protected areas,
Socio-economic and Cultural information -population, ethnic composition, economy, agricultural, commercial, industrial activities, health and education, infrastructures, UXO conditions

(4) Analysis of Potential Environmental Impacts:
Significance of positive and negative impacts on each item, from construction to operation & maintenance period

(5) Analysis of Alternatives and Mitigation Measures for Negative Impacts

(6) Preparation of Environmental Management and Monitoring Plan and Review and Recommendation on Institutional Capacity to Implement the Plan

６．視察記録

１．115kV 送電線、115 / 22kV 変電所（2008 年 6 月 26-29 日）

中央１地域の Pakxan S/S から、中央２地域 Pakbo S/S は JBIC ローンで 115kV 送電建設が予定されている。中央２と南部をつなぐ送電線建設が期待され、Kengkok S/S - Ban Jiangxai S/S が候補となっている。

Pakxan S/S 変電所（中央 C1 地域）
奥の鉄塔はメコン川横断鉄塔

Kengkok S/S 引込鉄塔とガントリー
左側に２回線の引き込みスペースあり

Ban Jiangxai S/S 多回線のスイッチ
ステーション将来 Kengkok から引込

右が 500kV 送電鉄塔（タイ輸出用）
左が 115kV 送電鉄塔（国内基幹用）

２．地方電化　太陽光設備（2008 年 6 月 28 日）

南部チャンパサック県の世銀太陽光 SHS プロジェクト視察、PESCO と呼ばれるサービス組織が運営しており、20W、30W、40W、50W の SHS が選択できる。それぞれにつき 150,000-250,000kip の初期投資と 13,000-30,000kip/month の使用料が徴収される。受益者はバッテリーチャージより安く電気を得られる。配電線の末端から約 13ｋｍ離れている。

40kW パネル、10 年間で世帯主の資産となる。
となる。蛍光灯は 70,000kip/個

50AH ドライバッテリーには鍵付
用途は蛍光灯、TV、扇風機、ステレオ

3．水力設備視察（2008 年 6 月 26 日 –7 月 2 日）

（1）Nam Theun2 建設サイトと住民移転村の視察

Nam Theun2 発電機建屋

Nam Theun2 建屋内ランナーの工事

ダムの建設に伴い、17 村が移転。補償対象住民は 1,200 世帯、約 6,000 人であり、補償内容は、移転先の土地、家屋、基礎インフラ（電気、水タンク、トイレ／各家庭、水ポンプは1台／5世帯、公共インフラは学校、保健センター、マーケット等）の供与である。さらに、以下の分野について、職業訓練コースを提供、村に常駐スタッフを配置して支援するなどの、職業補償を実施している。9年間で年間所得 1,200US ドル／世帯（自家消費用の作物の現金換算含む。現在は年間所得 200－300US ドル程度）を目標とし、達成できなかった場合は補償を延長。

・ 5種類の職業補償:
  1)農業（0.66h/世帯、灌漑施設の供与）
  2)村落林業（Village Forestry Association を形成、年間所得 300USドル/世帯をめざす）
  3)貯水池での漁業（ボート1隻/2家族）
  4)サービス業（店、修理工、手工芸品等）
  5)家畜飼育（豚、鶏、牛）

また、環境保全として、以下の活動を実施している。

- 貯水池の水源流域である Nakai-Nam Theun National Protected Area（NPA）、4,000km2 の保全活動
- 保全地域内に居住する少数民族 6,000 人を対象に社会開発も実施
- NPTC の資金支援（コンセッション期間中、毎年百万 US ドル）によって Watershed Management Protenction Authority を設立

Nam Theun2 発電所　環境社会調査

移転した Area1、Nakainoua 村（94 世帯）

（2）Selabam 水力発電所

ラオス国最初の水力発電所であり、運転開始時には国王も訪れた発電所であり、モニュメント的な要素がある。当該地域における EGAT-EDL の電力輸出入は EDL の輸入が多い。高い料金で電力を引き取らざるを得ない状況である。国内グリッドの確立が望まれる。

- 1～3号機：合計出力＝2MW、フランス製、1970 年運転開始、フランス無償プロジェクト
- 4号機：出力＝3MW、中国製、1994 年運転開始、中国無償プロジェクト

Selabam 水力1～3号機：出力＝2MW

Selabam 水力【フランス無償協力】
水車は磨耗が激しい

- 発電所保守スタッフは 32 人
- 取水路のメンテ頻度
  雨期：2～3回/月

乾期：1回/2～3ヶ月　（1回あたりの作業時間は数時間）

砂が水路内に堆積するため排砂作業が必要になる。

作業手順：開水路両側に砂が堆積するため、ポンプによる圧力水により、水路底部へ落とし、取水口横にある排砂ゲートを開けて砂を排出する。

- 1～3号機は古い。シール材の交換のため毎年水車を止めている。
- 中国製の水車は品質が悪く、磨耗が著しかったため 14 年で水車ランナーを交換した。

（3）Theun-Hinboun 水力発電所

ラオス国で最初の IPP 事業。出資割合は EDL=60%、Nordic Hydropower AB=20%、MDX Lao=20%であり、電力供給先は EGAT=95%、Domestic=5%。国内供給はタケック SS から供給される。

- 1、2号機：　出力＝105MW×2Units = 210MW
- 年間発生電力量：　1,561GWh
- 発電所保守スタッフは全部で 150 人（うち、エンジニアは 50 人）

Theun-Hinboun Power Company
発電所建屋及びトランスフォーマー

Theun-Hinboun Power Company
ダムの越流状況　出力 210MW

７．収集資料リスト

収集資料リスト

No.	TITLE	PUBLISHER	PUBLISHED YEAR	SOURCE	Remarks
1	Electricity Statics Year Book 2006 Lao PDR	DOE, MEM	2007	DOE	Book
2	Electricite du Laos Annual Report 2006	EDL	2006	EDL	Book
3	Implementation of LEPTS on IPP Development in Laos	DOE	2008	DOE	hard copy only
4	Fundament Requirements/Scope of Works on Feasibility Study	DOE	2008	DOE	hard copy only
5	Hydropower Projects (IPP List)	DOE	2008	DOE	hard copy only
6	Agreement from Minister for Ministry of Energy and Mines on Organization & Function of Department of Energy Promotion and Development	Ministry of Energy and Mines	2006	DEPD	hard copy only
7	Nam Theun 2 Hydroelectric Project	NTPC	2008	NTPC	hard copy only
8	Project Information Document Appraisal Stage	World Bank	2007	World Bank	hard copy only
9	Organization Chart of LHSE	LHSE	2008	LHSE	hard copy only
10	A Leader in IPP Hydropower Development in Lao PDR	THPC		THPC	hard copy only
11	Hydropower Site in Laos	DOE	2008	DOE	soft coppy
12	Hydropower Site and Mines in Laos	DOE	2008	DOE	soft coppy
13	Power System Planning	DOE	2008	DOE	soft coppy
14	Power Development Plan 2007-16 （not authorized yet)	EDL/DOE	2007	EDL	Soft copy
15	EDL Training Centrer	EDL	2007	EDL	Power Point
16	ATLAS of LAOS	Nordic Instituet of Asian Studies	2000	Book store	Book
17	Organization chartof Ministry of Energy and Mines (power sector)	DOE	2008	DOE	Paper
18	Summary report on the current extension transmission line projects to year 2010 in Oudomxay Province	PDEM Oudomxay	2008	PDEM Oudomxay	Hard copy
19	Budget Plan on 0.4 and 22kV Power Transmission Line Extension project and low voltage trasformer installation for candidate villages in Oudomxay province	PDEM Oudomxay	2008	PDEM Oudomxay	Hard copy
20	Commendation Report	PDEM Champasack	2008	PDEM Champasack	Soft copy
21	Laos Country Map	PERIPLUS		Book store	
22	Hydopower Site map 2008	DOE	2008	DOE	Hard copy
23	Regulation on Environmental Assessment in the Lao PDRNo. 1770/STEA	STEA	2000		Data
24	National Policy :Environmental and Social Sustainability of the Hydropower Sector in Lao PDR	MEM	2007		Hard Copy
25	Environmental Management Plans for Electricity Projects No.584/MIH.DOE	DOE/MIH	2001		Data
26	Environmental Impact Assessment for Electricity Projects No. 585/MIH.DOE	DOE/MIH	2001		Data
27	Regulation on Implementing Environmental Assessment for Electricity Projects in Lao PDR No. 447/MIH	DOE/MIH	2001		Data

28	Environmental Standard Management for Electricity Project No. 0366/MIH.DOE	DOE/MIH	2003		Data
29	Instruction Information on Compensation for Power Transmission Line Project	DOE	2006		Hard Copy
30	Forestry Law No. 06	DOF/MAF	2007		Hard Copy
31	Law on Aquatic and Wild Life No. 07	DOF/MAF	2007		Hard Copy
32	Results of the population and housing Census 2005	National Statistics Center	2006		Data
33	Statistical Yearbook 2006	National Statistics Center	2007		Data
34	Population by ethnicity in Savanakhet, Saravan, Champasack Province	National Statistics Center	2006		Hard copy
35	Map of the Three type Area of Forestry in Lao PDR			Forest Inventry & Planning Division, DOF	Data
36	Map: Location of the National Biodiversity Conservation and Production Forest Areas in Lao PDR			Forest Inventry & Planning Division, DOF	Hard Copy
37	Map: Location of the Watershed Protected Areas in Lao PDR			Forest Inventry & Planning Division, DOF	Hard Copy
38	Terms of Reference: IEE and RAP for Nam Ngum 5 Power Transmission Line Project			EDL	Hard Copy
39	Lao National Unexploded Ordnance (UXO) Programme Work Plan 2008	UXO LAO			Hard Copy
40	Claiming the Future: The Impact of UXO and Landmines in Lao PDR	Australian Network of the International Campaign to Ban Landmines			Hard Copy


JICA
ジャイカ