

APPENDICES

Appendix 1 Member List of the Study Team (1/2)

< Site Survey >

- | | | | |
|----|--|-------------------|--|
| 1. | Leader | Kazuo NAKAGAWA | Managing Director,
Office of Technical Coordination and Examination,
Grant Aid Management Department, JICA |
| 2. | Grand Aid
Cooperation | Atsushi OKAMOTO | Assistant Director,
Grant Aid Division, Economic Cooperation Bureau,
Ministry of Foreign Affairs |
| 3. | Coordinator | Shigeru SUGIYAMA | Third Project Management Division,
Grant Aid Management Department, JICA |
| 4. | Chief Consultant/
Operation and
Maintenance
Planner/Power
System Planner | Naoji NAKATO | Nippon Koei Co., Ltd. |
| 5. | Electrical
Equipment
Specialist | Kazuhiko YASUYUKI | Nippon Koei Co., Ltd. |
| 6. | Mechanical
Equipment
Specialist | Kenji SETO | Nippon Koei Co., Ltd. |
| 7. | Procurement
Planner/Cost
Estimator | Masaaki KAMEDA | Nippon Koei Co., Ltd. |

Appendix 1 Member List of the Study Team (2/2)

<Explanation on Draft Report>

- | | | | |
|----|--|-------------------|--|
| 1. | Leader | Motoyuki UEGAKI | Deputy Director,
Office of Technical Coordination and Examination,
Grant Aid Management Department, JICA |
| 2. | Coordinator | Shigeru SUGIYAMA | Third Project Management Division,
Grant Aid Management Department, JICA |
| 3. | Chief Consultant/
Operation and
Maintenance
Planner/Power
System Planner | Naoji NAKATO | Nippon Koei Co., Ltd. |
| 4. | Electrical
Equipment
Specialist | Kazuhiko YASUYUKI | Nippon Koei Co., Ltd. |
| 5. | Mechanical
Equipment
Specialist | Kenji SETO | Nippon Koei Co., Ltd. |

Appendix 2 Study Schedule (1/2)

<Site Survey>

	Date	Day of the week	Place	Official	Consultant
1	1/22	Mon	Bangkok	Departure for Bangkok by TG641	
2	1/23	Tue	Vientiane	Departure for Vientiane by TG690, Courtesy call and explanation on the Project to Japanese Embassy and JICA Office	
3	1/24	Wed	Vientiane	Courtesy call on Ministry of Industry and Handicrafts Lao PDR, explanation and discussion with EDL	
4	1/25	Thu	Vientiane	Inspection of Nam Ngum I hydropower station	
5	1/26	Fri	Vientiane	Discussion with EDL	
6	1/27	Sat	Vientiane	Inspection of Nam Leuk hydropower station	
7	1/28	Sun	Vientiane	Inspection of Nam Ngum I hydropower station	
8	1/29	Mon	Vientiane	Discussion with EDL about the minutes of discussion	
9	1/30	Tue	Vientiane	Discussion with Ministry of Industry and Handicrafts and EDL	
10	1/31	Wed	Vientiane	Signing on the Minutes of Discussion and reporting to Japanese Embassy and JICA Office	
11	2/1	Thu	Nam Ngum	Departure for Bangkok by TG691	Moving to Nam Ngum I hydropower station
12	2/2	Fri	Nam Ngum	Departure for Tokyo by TG772/JL719	Study on time schedule of inspection
13	2/3	Sat	Nam Ngum		Discussion on time schedule and procedure for inspection
14	2/4	Sun	Nam Ngum		Preparation of recording form, etc.
15	2/5	Mon	Nam Ngum		Inspection of interior Unit No. 1, operation condition of Unit No. 2
16	2/6	Tue	Nam Ngum		Inspection of interior Unit No. 1
17	2/7	Wed	Nam Ngum		Inspection of equipment for Unit No. 1
18	2/8	Thu	Nam Ngum		Inspection of equipment for Unit No. 1
19	2/9	Fri	Nam Ngum		Inspection of power house common equipment
20	2/10	Sat	Nam Ngum		Inspection of power house common equipment
21	2/11	Sun	Nam Ngum		Compilation of inspection results
22	2/12	Mon	Nam Ngum		Inspection of interior Unit No. 2, operation condition of Unit No. 1
23	2/13	Tue	Nam Ngum		Inspection of interior Unit No. 2
24	2/14	Wed	Nam Ngum		Inspection of equipment for Unit No. 2
25	2/15	Thu	Nam Ngum		Inspection of equipment for Unit No. 2
26	2/16	Fri	Nam Ngum		Data collection for cost estimate and power generation
27	2/17	Sat	Nam Ngum		Data collection for cost estimate and O/M operation
28	2/18	Sun	Nam Ngum		Compilation of inspection results
29	2/19	Mon	Nam Ngum		Data collection for rehabilitation plan
30	2/20	Tue	Nam Ngum		Compilation of inspection results
31	2/21	Wed	Nam Ngum		Compilation of inspection results
32	2/22	Thu	Vientiane		Final confirmation of inspection results / Moving to Vientiane
33	2/23	Fri	Vientiane		Reporting to Japanese Embassy and JICA Office
34	2/24	Sat	Bangkok		Departure for Bangkok by TG691
35	2/25	Sun			Departure for Tokyo by TG772

Appendix 2 Study Schedule (2/2)

<Explanation on Draft Report>

	Date	Day of the week	Place	Official	Consultant
1	5/9	Wed	Bangkok		Departure for Bangkok by TG641
2	5/10	Thu	Vientiane		Departure for Vientiane by TG690, Courtesy call to Japanese Embassy and JICA Office
3	5/11	Fri	Vientiane		Discussion with EDL about basic design
4	5/12	Sat	Vientiane		Inspection of Nam Ngum I hydropower station
5	5/13	Sun	Vientiane		Inspection of Nam Ngum I hydropower station
6	5/14	Mon	Vientiane		Discussion with EDL about basic design
7	5/15	Tue	Vientiane		Discussion with EDL about basic design
8	5/16	Wed	Vientiane	Departure for Bangkok by TG641	Discussion with EDL about specifications of major items
9	5/17	Thu	Vientiane	Departure for Vientiane by TG690	Discussion with EDL about specifications of major items
10	5/18	Fri	Vientiane	Discussion with EDL about basic design	
11	5/19	Sat	Vientiane	Inspection of Nam Ngum I and Nam Leuk hydropower stations	
12	5/20	Sun	Vientiane	Internal meeting	
13	5/21	Mon	Vientiane	Discussion with EDL about basic design	
14	5/22	Tue	Vientiane	Discussion about the minutes of meeting	Explanation for stuff of Nam Ngum I hydropower station
15	5/23	Wed	Vientiane	Signing on the Minutes of Discussion and reporting to Japanese Embassy and JICA Office	
16	5/24	Thu	Bangkok	Departure for Bangkok by TG691	
17	5/24	Fri		Departure for Tokyo by TG772	

Appendix 3 List of Parties Concerned in the Recipient Country (1/2)

< Site Survey >

1. Ministry of Industry and Handicraft

	Interviewer	Managerial Position, Charge	Remarks
1	Mr. Soulivong Daravong	Minister	
2	Mr. Somboun Rasasombath	Vice Minister	
3	Mr. Houmphone Bulyaphol	Director of Electricity Department	

2. Electricité du Laos

	Interviewer	Managerial Position, Charge	Remarks
1	Mr. Viraphonh Viravong	General Manager	
2	Mr. Khamphone Saignasane	Deputy General Manager	
3	Ms. Sisouda	Manager of Generation Office	
4	Mr. Phummy Nettibanedith	Deputy Manager Nam Ngum I Power Station	
5	Mr. Phet Sychaleune	Chief of Electrical Department Nam Ngum I Power Station	
6	Mr. Boun Ome Philavanh	Chief of Operation and Control Dept. Nam Ngum I Power Station	
7	Mr. Khamvene Thongphanith	Chief of Mechanical Department Nam Ngum I Power Station	
8	Mr. Kham Phuoi Keorasvang	Deputy Chief of Mechanical Department Nam Ngum I Power Station	
9	Mr. Bouavanh Chansavath	Deputy Manager Nam Leuk Power Station	

Appendix 3 List of Parties Concerned in the Recipient Country (2/2)

<Explanation on Draft Report>

1. Ministry of Industry and Handicraft

	Interviewer	Managerial Position, Charge	Remarks
1	Mr. Houmphone Bulyaphol	Director of Electricity Department	

2. Committee for Investment and Cooperation

	Interviewer	Managerial Position, Charge	Remarks
1	Ms. Khempheng Pholsena	Vice Minister	

3. Electricité du Laos

	Interviewer	Managerial Position, Charge	Remarks
1	Mr. Viraphonh Viravong	General Manager	
2	Mr. Khamphone Saignasane	Deputy General Manager	
3	Mr. Phummy Nettibanedith	Deputy Manager Nam Ngum I Power Station	
4	Mr. Phet Sychaleune	Chief of Electrical Department Nam Ngum I Power Station	
5	Mr. Boun Ome Philavanh	Chief of Operation and Control Dept. Nam Ngum I Power Station	
6	Mr. Khamvene Thongphanith	Chief of Mechanical Department Nam Ngum I Power Station	
7	Mr. Kham Phuoi Keorasvang	Deputy Chief of Mechanical Department Nam Ngum I Power Station	

MINUTES OF DISCUSSIONS
ON
THE BASIC DESIGN STUDY ON THE PROJECT FOR
THE NAM NGUM NO. 1 HYDROPOWER STATION REHABILITATION
IN THE LAO PEOPLE'S DEMOCRATIC REPUBLIC

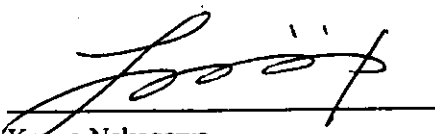
In response to a request from the Government of the Lao People's Democratic Republic (hereinafter referred to as "the Lao P.D.R."), the Government of Japan decided to conduct a Basic Design Study on the Project for the Nam Ngum No. 1 Hydropower Station Rehabilitation (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

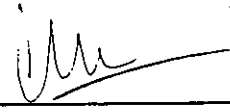
JICA sent to the Lao P.D.R. the Basic Design Study Team (hereinafter referred to as "the Team"), which is headed by Mr. Kazuo Nakagawa, Managing Director, Office of Technical Coordination and Examination, Grant Aid Managing Department, JICA, and is scheduled to stay in the country from January 23 to February 24, 2001.

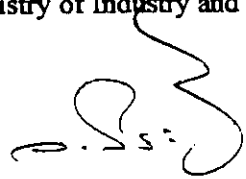
The Team held discussions with the officials concerned of the Government of the Lao P.D.R. and conducted a field survey at the study area.

In the course of discussions and field survey, both parties have confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Basic Design Study Report.

Vientiane, January 31, 2001


Kazuo Nakagawa
Leader
Basic Design Study Team
Japan International Cooperation Agency


Houmphone Bulyaphol
Director
Electricity Department
Ministry of Industry and Handicrafts


Viraphonh Viravong
General Manager
Electricité du Laos

ATTACHMENT

1. Objective

The objective of the Project is to rehabilitate the existing plant, which have been deteriorated seriously and/or have lost their proper performances and functions on the existing Units No. 1 and No. 2 and their associated common equipment at the Nam Ngum No. 1 Hydropower Station.

2. Project Site

The site of the Project is the Nam Ngum No. 1 Hydropower Station located at about 90 km north from Vientiane, the capital of the Lao P.D.R., as shown in Annex - 1.

3. Responsible and Implementing Agency

The Responsible Agency is the Ministry of Industry and Handicrafts.

The Implementing Agency is Electricité du Laos.

4. Items Requested by the Government of the Lao P.D.R.

After discussion with the Team, the equipment, the facilities and the systems described in Annex - 2 were finally requested by the Lao side. JICA will assess the appropriateness of the request and will recommend to the Government of Japan for approval.

5. Japan's Grant Aid Scheme

The Lao side understands the Japan's Grant Aid Scheme explained by the Team, as described in Annex - 3.

6. Undertakings by the Lao Side

The Lao side will take all the necessary measures, as described in Annex - 4, for smooth implementation of the Project, as a condition for the Japan's Grant Aid to be implemented. Especially important items are described as follows;

- (1) The Lao side shall exempt Japanese juridical and physical nationals engaged in the Project from custom duties, internal taxes including VAT, and other fiscal levies which may be imposed in the Lao P.D.R. regarding the Project under the verified contracts (according to the standard practice of the Japan's Grant Aid).
- (2) The Lao side shall shut down the Units No. 1 and No. 2 at the Nam Ngum No.1 Hydropower Station in accordance with the Project implementation schedule.
- (3) The Lao side shall make necessary coordination with EGAT for shutdown of the Units for execution of the Project at predetermined times and for an agreed period.
- (4) The Lao side shall allocate the necessary budget and personnel for the implementation of the Project.
- (5) The Lao side shall provide information related to the Project in timely manner, which may be raised after completion of the Basic Design Study.



- (6) The Lao side shall secure the spaces necessary for the execution of the Project and storage of the equipment and the materials required.
- (7) The Lao side shall provide necessary permissions, licenses and other authorizations for smooth and convenient implementation of the Project, if necessary.
- (8) The Lao side shall assign exclusive counterpart engineers and technicians for the Project.
- (9) The Lao side shall execute all the necessary operation of the Units, the switchgear and the powerhouse crane during implementation of the Project.
- (10) The Lao side shall take a share in site rehabilitation works of the turbines and the generators. The details of the works to be shared by the Lao side will be suggested in the draft final report and will be discussed at the meeting on the draft final report.
- (11) The Lao side shall undertake necessary modification works of the civil and building structures.
- (12) The Lao side shall be responsible for suitable treatment and disposal of the unnecessary existing equipment and/or materials that will be removed.

7. Schedule of the Study

- (1) The consultants will proceed to further field studies in the Lao P.D.R. until February 24, 2001.
- (2) JICA will prepare the draft final report in English and dispatch a mission in order to explain its contents around the middle of May, 2001.
- (3) In case that the contents of the draft final report is accepted in principle by the Government of the Lao P.D.R., JICA will complete the final report and send it to the Government of the Lao P.D.R. by August, 2001.

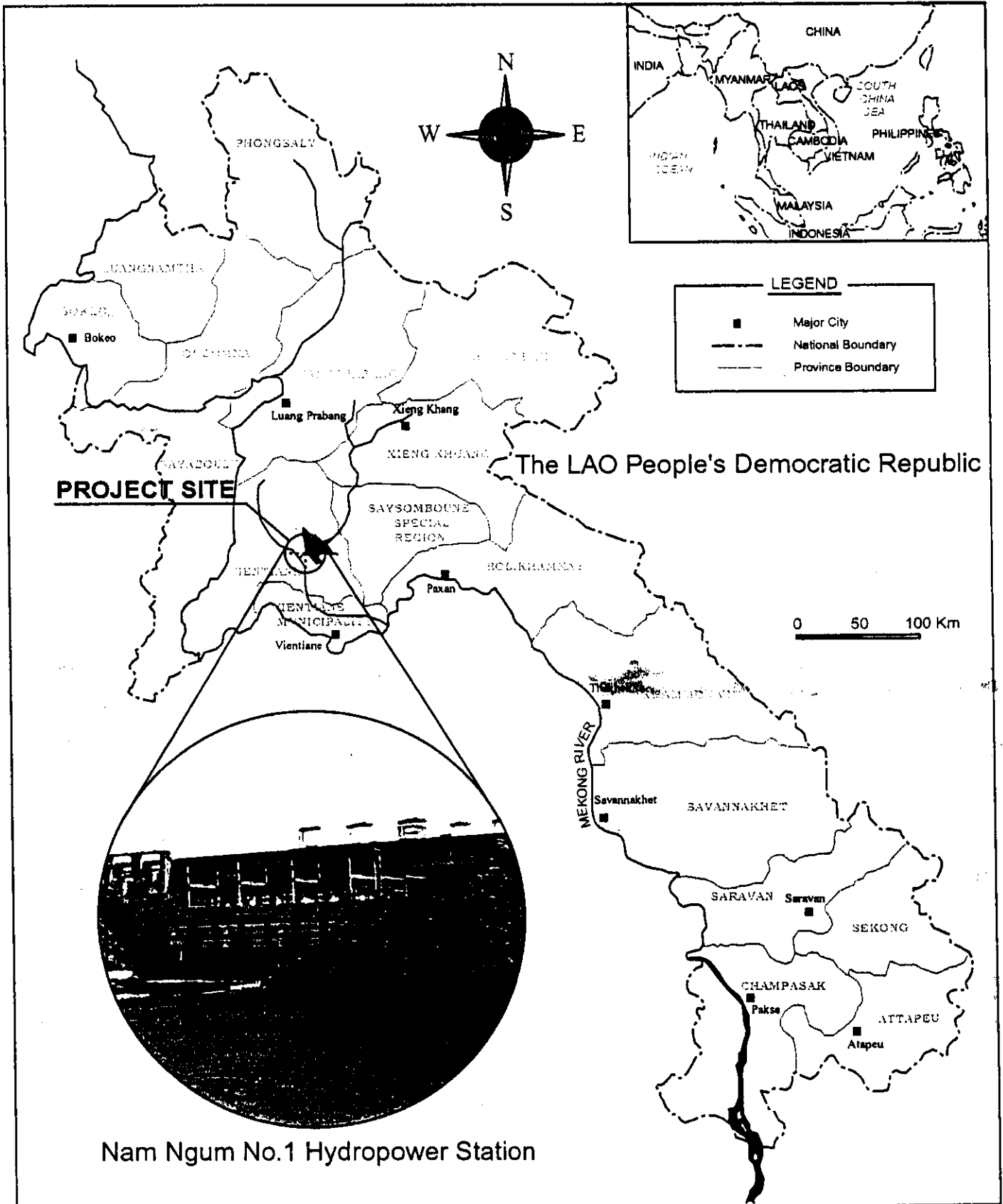
8. Other Relevant Issues

- (1) The Lao side has agreed to provide necessary number of counterpart personnel to the Team during the period of their field studies.
- (2) It was confirmed by the Lao side that there is no plan to privatize Electricité du Laos.
- (3) The Lao side shall submit answers to the questionnaire, which the Team had sent to the Lao side, by February 15, 2001.
- (4) The Lao side has agreed to shut down the existing Units No. 1 and No. 2 at the Nam Ngum No. 1 Hydropower Station according to the request by the Team for the interior inspection during the Basic Design Study.
- (5) The Lao side has agreed that defect liability by the Japan side shall be applied only to the equipment, materials and/or their parts that will be supplied and worked under the Project. The Lao side has also agreed that total performance of the Units No. 1 and No. 2 shall not be guaranteed by the Japan Side.
- (6) Both sides agreed that the Project Title shall be changed to "the Nam Ngum I Hydropower Station Rehabilitation".

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Annex - 1: Location Map



LOCATION MAP

ANNEX - 2

ITEMS REQUESTED BY THE GOVERNMENT OF THE LAO P.D.R.

No.	Description	Extent of Rehabilitation
1	Water turbines	Units No. 1 and No. 2
2	AC generators	Units No. 1 and No. 2
3	Intake gates and control panels	Units No. 1 and No. 2
4	Electrical protective relays	Units No. 1 and No. 2 and Common
5	Governor and oil pressure systems	Units No. 1 and No. 2
6	Compressed air systems	Units No. 1 and No. 2
7	Water supply and drainage systems	Units No. 1 and No. 2 and Common
8	Overhead travelling crane	Units No. 1 and No. 2
9	Main transformers	Units No. 1 and No. 2
10	Fire fighting equipment for main transformer	Units No. 1 and No. 2
11	11kV switchgear cubicles	Units No. 1 and No. 2
12	110 V batteries, battery chargers and DC distribution panels	Units No. 1 and No. 2
13	115 kV switchyard equipment and busbars	Units No. 1 and No. 2
14	Permanent magnetic generators (PMG)	Units No. 1 and No. 2
15	Station-service transformers	Common
16	Local-service transformer	Common
17	Control boards	Units No. 1 and No. 2 and Common
18	Gantry crane for intake gate stop logs	Common
19	Gantry crane for draft tube gate	Common
20	Emergency diesel engine generator set	Common
21	Telephone system for internal communication	Common

NOTE : "Common" means the station common equipment that is essential to operation of the Units No.1 and No. 2.

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ANNEX-3

JAPAN'S GRANT AID SCHEME

1. Grant Aid Procedures

1) The Japan's Grant Aid Program is executed through the following procedures.

- Application (Request made by the recipient country)
- Study (Basic Design Study conducted by Japan International Cooperation Agency (JICA))
- Appraisal & Approval (Appraisal by the Government of Japan and Approval by the Cabinet)
- Determination of the Implementation (The Note exchanged between the Governments of Japan and recipient country)

2) Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study) using (a) Japanese consulting firm(s).

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for the Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Governments of Japan and the recipient country.

Finally, for the implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

2. Basic Design Study

1) Contents of the study

The aim of the Basic Design Study (hereafter referred to as "the Study") conducted by JICA on a requested project (hereafter referred to as "the Project") is to provide a basic document necessary for the appraisal of the Project by the Government of Japan. The contents of the Study are as follows :

- a) Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation.
- b) Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, social and economic point of view.
- c) Confirmation of items agreed on by both parties concerning the basic concept of the Project.
- d) Preparation of a basic design of the Project.

e) Estimation of costs of the Project.

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of the Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

2) Selection of Consultants

For smooth implementation of the Study, JICA uses (a) registered consultant firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms. The selected firm(s) carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference set by JICA. The consultant firm(s) used for the Study is(are) recommended by JICA to the recipient country to also work on the Project's implementation after the Exchange of Notes, in order to maintain technical consistency.

3. Japan's Grant Aid Scheme

1) Japan's Grant Aid

The Grant Aid Program provides a recipient country with non-reimbursable funds to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. Grant Aid is not supplied through the donation of materials as such.

2) Exchange of Notes (E/N)

The Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the Project, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

3) "The period of the Grant Aid" means the one fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) and final payment to them must be completed. However, in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

4) Under the Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.

However, the prime contractors, namely, consulting, constructing and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

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5) Necessity of "Verification"

The Government of recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

6) Undertakings required of the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as the following:

- (1) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction.
- (2) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.
- (3) To secure buildings prior to the procurement in case the installation of the equipment.
- (4) To ensure all the expenses and prompt excursion for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid.
- (5) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.

7) "Proper Use"

The recipient country is required to maintain and use the facilities constructed and the equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

8) "Re-export"

The products purchased under the Grant Aid should not be re-exported from the recipient country.

9) Banking Arrangements (B/A)

- a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.
- b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an authorization to pay issued by the Government of the recipient country or its designated authority.

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ANNEX - 4

MAJOR UNDERTAKINGS TO BE TAKEN BY EACH GOVERNMENT

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To bear the following commissions to a bank of Japan for the banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
2	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country		
	1) Marine (Air) transportation of the products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	●	
3	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
4	To exempt Japanese nationals from customs duties, internal taxes including VAT and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract		●
5	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		●
6	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for the transportation and installation of the equipment		●

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Appendix 4-2 Minutes of Discussions

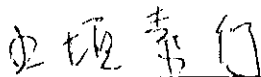
MINUTES OF DISCUSSIONS
ON THE BASIC DESIGN STUDY
ON THE PROJECT FOR
THE NAM NGUM I HYDROPOWER STATION REHABILITATION
IN THE LAO PEOPLE'S DEMOCRATIC REPUBLIC
(EXPLANATION ON DRAFT REPORT)

In January 2001, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a Basic Design Study Team on the Project for Nam Ngum I Hydropower Station Rehabilitation (hereinafter referred to as "the Project") to the Lao People's Democratic Republic (hereinafter referred to as "the Lao P.D.R."), and through discussion, field survey, and technical examination of the results in Japan, JICA prepared a draft report of the Study.

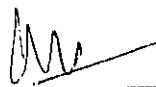
In order to explain and to consult the Government of the Lao P.D.R. on the components of the draft report, JICA sent to the Lao P.D.R. the Draft Report Explanation Team (hereinafter referred to as "the Team"), which is headed by Mr. Uegaki, Deputy Director, Office of Technical Coordination and Examination, Grant Aid Management Department, JICA, from May 10th to May 24th, 2001.

As a result of discussions, both sides confirmed and mutually agreed the main items described on the attached sheets.

Vientiane, May 23, 2001



Motoyuki Uegaki
Leader
Draft Report Explanation Team
Japan International Cooperation Agency



Houmphone Bulyaphol
Director
Electricity Department
Ministry of Industry and Handicrafts



Viraphonh Viravong
General Manager
Electricite Du Laos

ATTACHMENT

1. Components of the Draft Report

The Government of the Lao P.D.R. agreed and accepted in principle the components of the draft report explained by the Team.

2. Japan's Grant Aid Scheme

The Lao side understands the Japan's Grant Aid scheme and the necessary measures to be taken by the Government of the Lao P.D.R. as explained by the Basic Design Study Team and described in Annex-3 and Annex-4 of the Minutes of Discussions signed by both sides on January 31st, 2001.

3. Schedule of the Study

JICA will complete the final report in accordance with the items confirmed by both sides and send it to the Government of the Lao P.D.R. by August, 2001.

4. Other Relevant Issues

- (1) The Lao side shall undertake the works which are described in the Minutes of Discussions signed by both sides on January 31st, 2001. As a result of detailed discussion on this issue, Chapter 3 "Obligations of Recipient Country" of the draft report was revised as shown in Annex-1.
- (2) In accordance with the practice of the Japan's Grant Aid, the Lao side shall ensure the tax exemption including VAT, referring to Annex-4 of the Minutes of Discussion on January 31st, 2001.
- (3) The Lao side shall shut down the No.1 and No.2 Units according to the Project implementation schedule. The Lao side shall make necessary coordination with Electricity Generating Authority of Thailand (EGAT) for the shutdown related to the Project.
- (4) The Lao side shall allocate the budget, which is estimated by the Team, to cover the Lao side's undertakings, according to the Project implementation schedule.
- (5) The Lao side shall complete the necessary preparation work of the storage area, for the waste equipment/materials, by the time that new equipment/materials arrive at the Project site.
- (6) The Lao side pointed out the necessity of replacing the air compressor of the diesel engine generator because of deterioration. The Team suggested that this item should be undertaken by the Lao side as soon as possible prior to the implementation of the Project.
- (7) The Team handed one copy of the draft detailed specifications of the equipment to the Lao side. Both sides agreed that these draft specifications are confidential and should not be duplicated nor released to any outside party.
- (8) All the goods procured under the Project shall be maintained as state property by the Lao side, and shall be neither leased nor transferred to other sites.

- (9) For the sake of the technology transfer on sustainable operation and maintenance, the Lao side pointed out the need for technical training of the EDL's staff(s) in Japan. They also understood that another official request on technical cooperation should be submitted through diplomatic channel such as the JICA Laos Office.

CHAPTER 3 OBLIGATIONS OF RECIPIENT COUNTRY

3.1 Works to be Executed by Lao Side

In the implementation of this Project, the Lao side is requested to execute the following works in addition to the services and works listed in Annex-3 and Annex-4 of the Minutes of Discussions on January 31, 2001 as the obligations of the recipient country.

(1) Participation in Rehabilitation Works of Turbines and Generators

The site rehabilitation works of the turbines and generators shall be carried out in active collaboration with the Lao side.

The Lao side shall provide at least ten (10) personnel of the maintenance crews of the Nam Ngum I Power Station to participate directly in the site rehabilitation works of the turbines and the generators during the period of the site rehabilitation works. These personnel is requested not only to be actively engaged in the rehabilitation works but also to improve and master a practical technique for dismantling and re-assembling the turbines and the generators in close collaboration with Japanese technicians.

(2) Proper Storage and Disposal of Unnecessary and Waste Equipment/Materials

The Lao side shall be responsible for proper storage and disposal of all unnecessary and waste equipment/materials including removal of them to the outside of the power station.

However, removal of the existing main transformers will be included in the scope of work for a Japanese contractor on condition that the existing main transformer should be relocated to the EDL's stockyard, which is about 600 m distant from the powerhouse.

The following works shall also be borne by the Lao side.

(a) Emptying and re-filling work for insulating oil of the existing main transformers

(b) Foundation work for the relocated existing main transformers

Appropriate foundations are required to place the existing main transformers at the EDL's stockyard. The design and preparation of these foundations shall be carried out by the Lao side.

The foundation works shall be completed one month before the new main transformers arrive at the site.

(c) Storage of old oils

This Project is planning to change all lubricating oils (4,800 liters) and pressure oils (7,600 liters) for the Units No. 1 and No. 2. In case the old oils are to be stored in oil drums, necessary number of the oil drums shall be arranged by the Lao side in close coordination with the contractor.

Re-conditioning of these oils shall also be made by the Lao side, if necessary.

(d) Disposal of existing lead acid batteries

The waste lead acid batteries consisting of 104 cells shall be carefully disposed at a factory of car battery in Laos.

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(e) Safekeeping of harmful electrical equipment

It is found that the existing excitation transformers, 11 kV voltage transformers and 11 kV capacitors use the insulating oils containing toxic chemicals. These items are requested to be removed from the 11 kV switchgear cubicles and stored securely at a specially designated place in the powerhouse for safekeeping.

The required space for safekeeping of these items are 2 m x 6 m and it shall be surrounded by a suitable oil fence with a height of at least 20 cm.

The preparation of this place for safekeeping of such harmful electrical equipment shall be completed prior to the commencement of the replacement work of the 11 kV switchgear cubicles.

(3) Floor Finishing Work

In relation to the removal of the existing equipment, floor finishing work will be required to repair the floor surfaces. Such finishing works shall be carried out by the Lao side as well as supply of necessary mortar cement and floor tiles.

(4) Cable Re-Connection Work for DC Supply to Units Nos. 3 to 5

When the DC distribution panels are rehabilitated, the DC power supply to the Units Nos. 3 to 5 needs to be secured by changing the cable connections so that the DC power can be supplied directly from the battery charger.

For this purpose, the existing power cables for the DC power supply to Units Nos. 3 to 5 is required to be disconnected from the existing DC distribution panel and to be re-connected to the battery charger.

This cable re-connection work shall be carried out by the Lao side.

(5) Temporary Connection for House-Service Power Supply

When the 115 kV busbars are rehabilitated, the house-service power supply needs to be secured by receiving power from the 22 kV distribution line. Necessary preparation and temporary connection works for this purpose shall be carried out by the Lao side.

(6) Removal and Re-Installation of Terminal Boxes in the AC/DC Distribution Panels

The existing terminal boxes, which were additionally installed in the existing AC/DC distribution panels, are required to be removed before the replacement of AC/DC distribution panels are carried out by the contractor and to be re-installed in the new AC/DC distribution panels after completion of the contractor's replacement work.

Such removal and re-installation works for the terminal boxes shall be carried out by the Lao side including their cable connections.

(7) Remake of Foundations for Fire Extinguishing System for Main Transformers

At the replacement of the main transformers, a part of the water pipes for the fire extinguishing system will be disassembled by the contractor including removal of the foundations for their supports.

The foundations removed are required to be remade after completion of the replacement of the main transformers.

Such remaking of the foundations shall be carried out by the Lao Side.

(8) Replacement of Air Compressor for Emergency Diesel Engine Generator

The existing air compressor, which is essential to starting-up of the diesel engine, has seriously deteriorated in its operating function. Therefore, the replacement of the air compressor is urgently required to ensure successful operation of the diesel engine generator at any time to secure the house-service power supply.

The replacement of the air compressor shall be undertaken by the Lao side as soon as possible prior to the implementation of the Project.

3.2 Project Cost Estimation

In order to execute all the above mentioned works as undertaking obligations by the Lao side, the cost to be borne by the Lao side is estimated as follows:

(a) Personnel expense	<u>Kip. 70,000,000</u>
(b) Civil and building works	<u>US\$ 2,000</u>
i) Temporary foundations for existing main transformers	US\$ 1,200
ii) Oil fence around storage area of harmful equipment	US\$ 50
iii) Floor finishing work	US\$ 300
iv) Remake of foundations for fire extinguishing system	US\$ 50
v) Others	US\$ 400
(c) Air compressor for diesel engine generator	<u>US\$ 6,250</u>

To smoothly implement this Project, the Lao side should have the necessary cost ready in advance.

Appendix 5 Cost Estimation Borne by the Recipient Country

No.	Description	Budget
1.	Personnel expense	Kip.70,000,000
2.	Civil and building works	
	(a) Temporary foundations for existing main transformer	US\$ 1,200
	(b) Oil fence around storage area of harmful equipment	US\$ 50
	(c) Floor finishing work	US\$ 300
	(d) Remake of foundations for fire extinguishing system	US\$ 50
	(e) Others	US\$ 400
3.	Air compressor for diesel engine generator	US\$ 6,250

Appendix 6 References

Examination on Effect of Change in Turbine Discharge on Turbine Characteristics

Basic Policy

The rated net head of the turbines No. 1 and No. 2 is changed from 32 m to 37 m, which is equal to that for the turbines Nos. 3 to 5, and the turbine discharge is recovered to the rated value originally designed for them.

1. Effect on Turbine Output

Available turbine discharge will be changed hydrologically corresponding to an operating net head of the turbine. Therefore, technical examination was carried out for the following cases.

- Basic Plan: To change the rated net head to 37 m and to recover the turbine discharge to 55.4 m³/s originally designed for the Units No. 1 and No. 2
- Alternative Plan: To change the rated net head to 37 m and to increase the turbine discharge up to 58.7 m³/s hydrologically available at a net head of 37 m.

Turbine output is determined by net head and turbine discharge. Therefore, the turbine output is changed when either net head or turbine discharge is changed. The following table shows a relationship among net head, turbine discharge and output.

	Net Head	Discharge	Turbine Output	Generator Output
Original Design	32 m	55.4 m ³ /s	15.5 MW	15.0 MW
Present Operating Condition	37 m	46.0 m ³ /s	15.5 MW	15.0 MW
Basic Plan	37 m	55.4 m ³ /s	18.3 MW	17.5 MW
Alternative Plan	37 m	58.7 m ³ /s	19.2 MW	18.6 MW

If the turbine discharge is recovered to 55.4 m³/s at the rated net head of 37 m, the turbine rated output will increase to 18.3 MW.

2. Effect of Change in Rated Net Head on Turbine Design

The existing turbines No. 1 and No. 2 were designed to operate safely and satisfactorily at any net heads between 32 m to 45.5 m and at any discharges up to the rated discharge of 55.4 m³/s. The turbines are therefore able to operate at a net head of 37 m and a discharge of 55.4 m³/s without any technical problem.

3. Effect of Increase in Turbine Discharge on Turbine Design and Hydraulic Losses

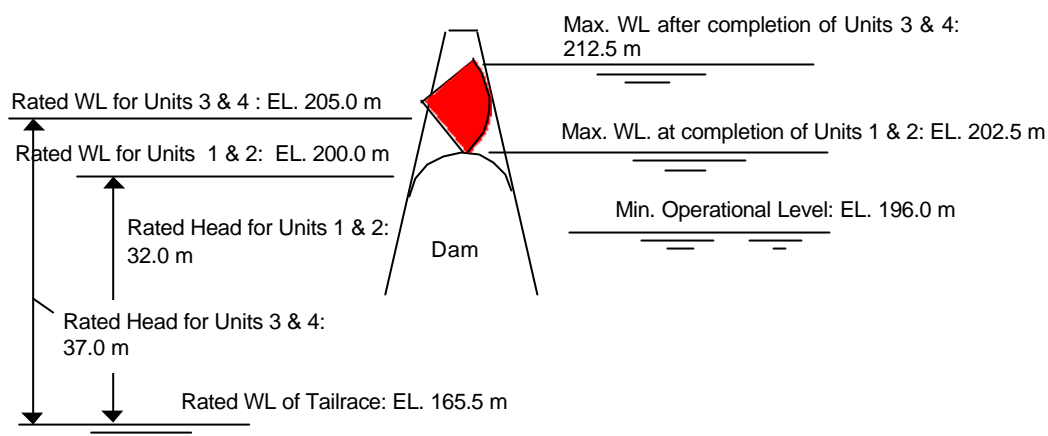
The existing turbines No. 1 and No. 2 were designed for the discharge of 55.4 m³/s at a net head of 32 m and 58.7 m³/s at a net head of 37 m.

On the other hand, the penstock was designed for the original discharge of 55.4 m³/s. When the penstock discharge exceeds 55.4 m³/s, hydraulic loss in the penstock is increased to more than the designed value accordingly.

Net head is the gross head minus hydraulic loss and is conveniently expressed by the following formula:

$$\text{Net Head} = \text{Reservoir Water Level} - \text{Tailrace Water Level} - \text{Hydraulic Loss}$$

The rated net head 37 m for the Units Nos. 3 to 5 is corresponding to the reservoir water level of EL. 205.0 m as shown in the figure blow. If the hydraulic losses for the Units No. 1 and No. 2 are increased more than the originally designed value, the reservoir water level referred to the rated net head of 37 m for the Units No. 1 and No. 2 is different from that for the Units Nos. 3 to 5 and needs to set at higher than EL. 205 m. This is contrary to the basic policy to coordinate the turbine operating conditions between the Units Nos. 1/2 and the Units Nos. 3/4/5. Therefore, an increase of the turbine discharge exceeding 55.4 m³/s is not acceptable.



4. Effect of Increase in Turbine Output on Turbine Performance

An increase of the turbine output will modify the turbine performance. The technical examination was carried out for the following three items of the typical turbine performance.

Item	Definition	Considerations and Criteria
Maximum pressure	Maximum momentary pressure developed in the turbine and penstock following a sudden load rejection of the generator.	<p>The maximum pressure should not exceed 65.4 m because it will directly affect the design condition of the existing turbine and penstock.</p> <p>(Criteria)</p> <p>Not exceeding 65.4 m equal to the guaranteed value for the existing turbines No. 1 and No. 2.</p>
Maximum speed rise	Maximum momentary speed rise caused by sudden full load rejection of the generator.	<p>The guaranteed value for the existing turbines No. 1 and No. 2 was 37 m.</p> <p>The rotational parts of the existing turbine and generator were designed to withstand the turbine runaway speed of 386 rpm (118 % rise of the rated speed) for one minute. Then, a little increase of the speed rise will have no problem on the design of the existing turbine and generator.</p> <p>In current practice, the maximum speed rise for Francis turbine is usually selected at 45 to 50 %.</p> <p>(Criteria)</p> <p>Not exceeding 50 %.</p>

Item	Definition	Considerations and Criteria
Suction head	<p>Static suction head is conveniently defined as a level difference between elevation of the turbine centerline and the tailrace water level.</p> <p>Since the existing turbine centerline cannot be changed, a suction head calculated for the new turbine output should have a sufficient safety margin on the actual suction head.</p>	<p>Suction head will directly affect the occurrence of cavitation on the turbine. Therefore, the calculated safety margin on the actual suction head should be not less than the original design.</p> <p>(Criteria)</p> <p>The calculated safety margin should be not less than +1.12 m equal to the original design.</p>

The results of the technical examination are summarized as tabulated below.

Item	Criteria	Basic Plan		Alternative Plan	
		Results	Judgement	Results	Judgement
Turbine output	-	18.3 MW	-	19.2 MW	-
Specific speed	-	259.5 m-kW	-	268.0 m-kW	-
Hydraulic losses	No increase	Not increased		Increased	x
Maximum pressure	65.4 m \geq	65.4 m		65.4 m	
Max. speed rise	50 % \geq	44 %		52 %	x
Safety margin on suction head	+ 1.12 m \leq	+ 1.93 m		+ 1.35 m	
Overall Results					x

5. Conclusion

As shown in the above table, the alternative plan to increase the turbine discharge is not technically acceptable because of an increase in hydraulic losses and higher speed rise.

On the other hand, the basic plan to recover the turbine discharge to the original designed value is achievable without any adverse effect on the turbine performance. Therefore, the basic plan is technically feasible.