8.3.8 RE-REGULATION FACILITIES

The maximum discharge of the powerhouse will be about 220m³/s for both schemes. According to the plant operation scenario required by EGAT, power generation will be interrupted daily for several hours and entirely on every Sunday and Thai national holidays.

To mitigate prospective impacts, which will be given to the downstream river course due to an intermittent operation, the following two (2) economic measures are conceivable:

(i) installation of a river alarm system, and

(ii) riparian protection works

However, in the light of a huge discharge variation, it was judged indispensable to provide a direct countermeasure, which enables to minimize water level fluctuation by regulating discharges from the powerhouse.

In response to the above judgement, re-regulation facilities were planned to be provided at about 5km downstream of the main dam site and a tentative operation rule for the facilities was established to fulfill the role of minimization of water level fluctuation as shown in Figure 8.3.6.

On the said operation rule, the capacity of the re-regulation pond will require about 4.7 million m³ of which maximum water level will reach EL.173m and pond area will go within the natural river course.

The re-regulation facilities will be designed as a combined structure of a narrow gated section and a broad crest overflow weir section as shown in Figure 8.3.7.

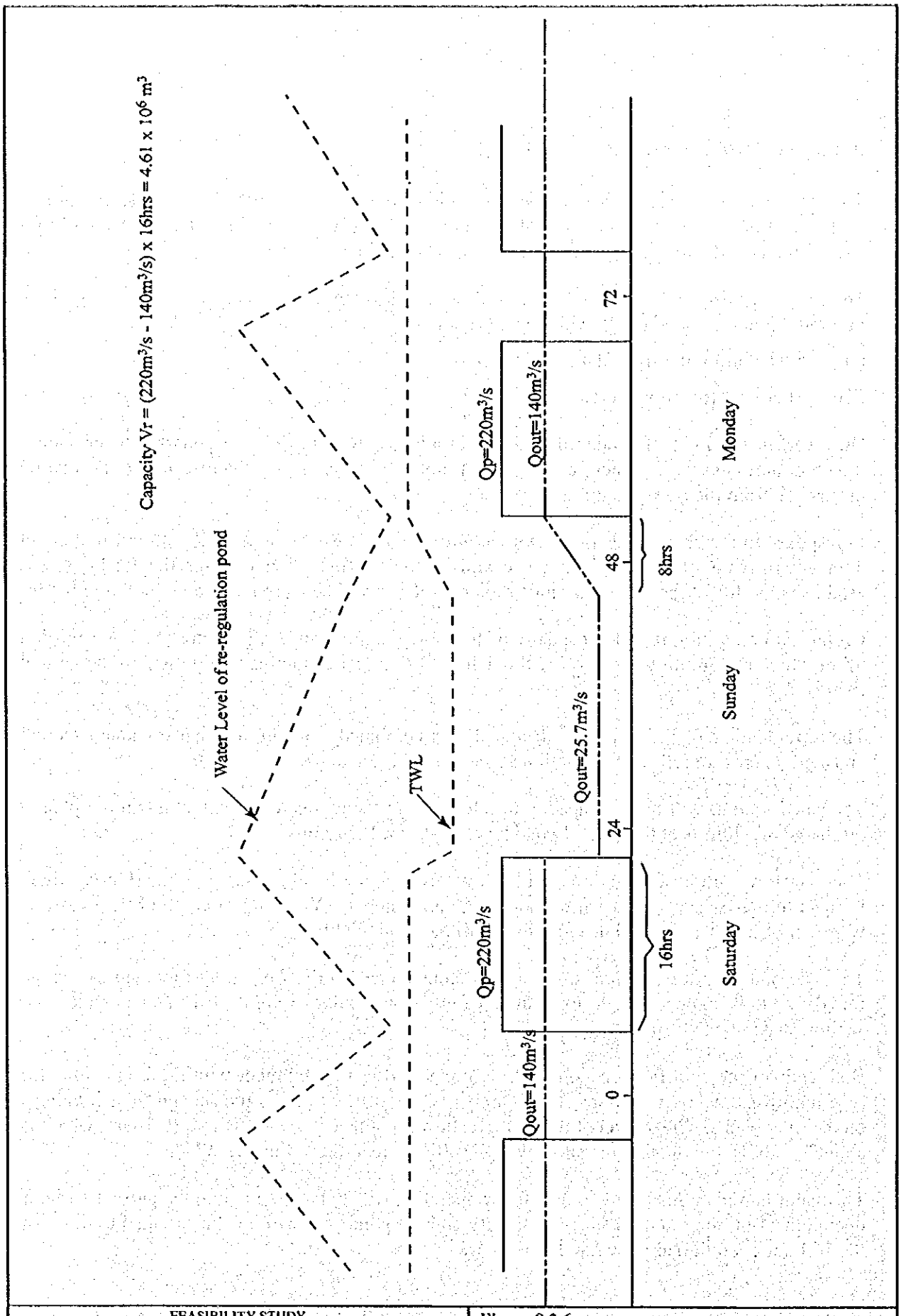
The gated section will have a capacity to release from the two gated bays the maximum plant a discharge of 220m³/s at the normal pond level (NPL) of EL.173m.

The overflow section will be designed to flow down with a flood discharge of 4,519m³/s, which is equal to the 100-year recurrence flood at the provisional FWL.180m. Length of the overflow weir will be about 120m and its crest level will be equal to NPL.

The gate and overflow weir sections will be constructed on the fresh mudstone and sandstone foundation to be exposed by the excavation of less than 2m thick river deposits and an under-laid shallow decomposed zone.

Both ends of the said flow sections will be connected to the abutment with the impervious fill type non-overflow weir sections, which are to be constructed across the several branch valleys on the river banks. Crest level of the non-overflow sections will be located at EL.183m, which is about 3m above the maximum water level of 100-year recurrence flood (FWL).

The maximum plant discharge in the 8-hour operation will be twice of that in the present 16-hour operation. But, the required storage capacity and the pond area will be almost equal to those of the 16-hour operation as shown in Figure 8.3.8.



FEASIBILITY STUDY
ON THE NAM NGIEP-1 HYDROELECTRIC POWER PROJECT
IN THE LAO PEOPLE'S DEMOCRATIC REPUBLIC
JAPAN INTERNATIONAL COOPERATION AGENCY

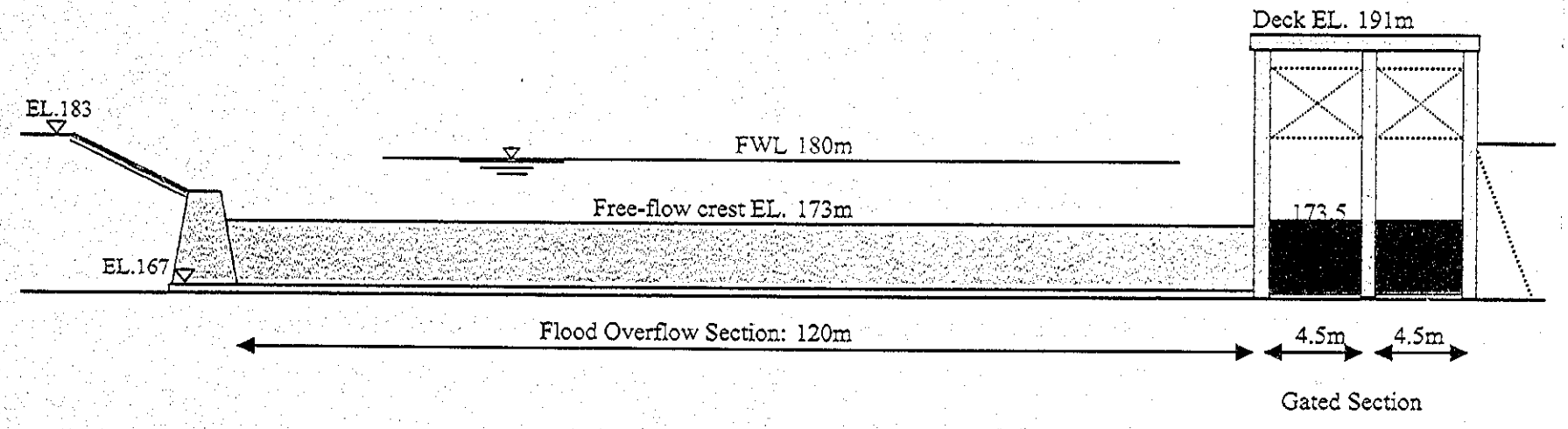
Figure 8.3.6
Tentative Operation Rule of Re-regulation Pond

Flood discharge capacity

Design flood (100-year flood), Qf_{100}	4,519 m^3/s
Free-flow crest EL.	173 m
Total flow width, Bf	129 m
Flood overflow depth, Hf	7.2 m
FWL	180 m
Minimum hoist deck EL.	191 m

Capacity of sluice gates

Target discharge, Qp	220 m^3/s
Sluice gate bottom EL.	167 m
Total gate width, Bg	9.0 m
Flow depth, Hs	5.9 m
Gate height, Hg	6.5 m
Gate top EL.	173.5 m



Preliminary Design for Re-Regulation Facilities, Nam Ngiep-1 HEPP

No to scale

Figure 8.3.7 Re-regulation Dam

Area-Storage Data of Re-regulation Pond for The Nam Ngiep-1 HEPP

EL.	Area	Sectional Vol.	Cumul. Vol.
m	km^2	m^3	m^3
160	0	0	0
170	0.619	3,095,000	3,095,000
175	1.056	4,187,500	7,282,500
180	2.424	8,700,000	12,887,500

Operation	Qmax	Net Storage	Gross Storage	HWL
hr	m^3/s	m^3	m^3	EL.m
16	224	4,300,800	4,730,880	173
8	443	4,252,800	4,678,080	173

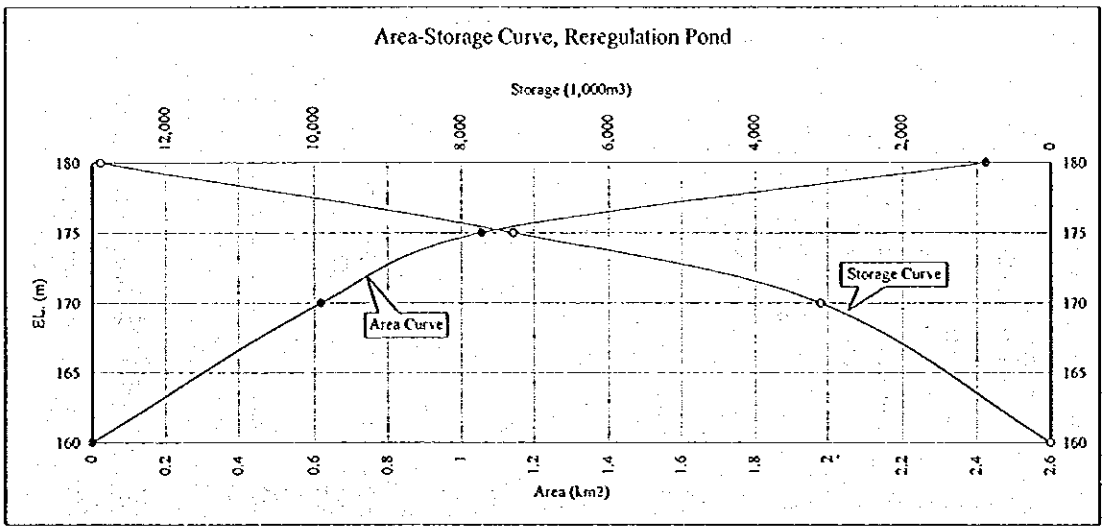


Figure 8.3.8 Area and Storage Curves of Re-regulation Pond

9. GENERAL PROJECT EVALUATION

9.1 GENERAL

"The United Nations Conference on Environment and Development", having met at Rio de Janeiro in June 1992, proclaims that:

"Principle 4: In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and can not be considered in isolation from it."

It shows the principle that development and environmental protection are inseparably related to each other. Today's world has been continuously trying to cope with them. The modern civilization, which applied to natural science, was developed with the technology to control nature. However, in the society of high technological principles, which is ruled by this civilization, nature philosophy contrary to human is only resulted. Therefore, as an environmental destruction of present society is led by this nature philosophy, a doubt and a regret against to this nature philosophy have led an effort to create a symbiotic relationship between human and nature. These recent tendencies require us to show various evaluation criteria for a dam project implementation.

Under the viewpoint mentioned above, the general evaluation to be carried out by all persons at any positions under various evaluation criteria is indispensable for the dam development alternatives with priority on the environmental study. Therefore, the Study Team recommended the most attractive alternative as a conclusion of evaluation results by proposing seven (7) items of design criteria as shown below, which are expected to raise various discussions among GOL, JICA, village people and NGOs.

9.2 GENERAL PROJECT EVALUATION RESULTS

9.2.1 DEFINITION OF EVALUATION CRITERIA

The purpose of the Study is to present the all materials to make a judgement on a necessity of the further study to be continued as the next stage. With the above understanding, the evaluation criteria on various view points were prepared so as to make judgement for people in various position. The respective evaluation criteria is shown in the table below:

Table 9.2.1 Definition of Evaluation Criteria

No.	Evaluation Category	Evaluation Criteria	Evaluation Results
1.	Natural Environment Evaluation	E.C. on the assumption that the existing natural, developed-natural and artificial environments should be preserved or improved.	Impacts on Natural Environment will become large as increasing dam scale, until a failure of the environmental preservation
2.	Social Environment Evaluation	E.C. on the assumption that people and social system surround them should be preserved and improved.	Impacts on Social Environment will become large as increasing dam scale, but, Social system can be kept safety by changing slowly.
3.	Economic Evaluation	E.C. on the assumption that the economic feasibility shall be judged by avoid cost of thermal generation.	Mathematical evaluation can be done with economical index: B/C, B-C, and EIRR; however, only a validity of hydropower can be evaluated.
4.	Financial Evaluation	E.C. on the assumption that the benefit by electricity sales shall cover all investment, under a good enterprise as IPP.	Same as Item No.3, however, evaluation is based on several assumptions such as BOOT composition, fund procure, electricity sale cost, and commencement day of commercial operation.
5.	Technical Evaluation (Dam Construction)	Technical evaluation criteria for a high dam construction.	A Large-scale dam is technically restricted to construct. The highest record of dam construction is 180m, that of project design is 220m.
6.	Evaluation on EAC & Workshops	E.C. judged from opinion, suggestion and questionnaire results at EAC/Workshop.	Evaluation is based on individual extent of interest and understanding on participants, and on their positions.
7.	Evaluation on Japan's Mekong River Develop.Plan	E.C. judged from the viewpoint of stance in official development aid of Japan	Aid policy in peace, development, environment preservation is essential for evaluation.

Note: E.C means Environmental Criteria.

9.2.2 GENERAL PROJECT EVALUATION BY STUDY TEAM

The Study Team recommended the most attractive alternative, the medium-scale dam development withFSL.320m, as a conclusion of evaluation results by proposing seven (7) items of design criteria as shown below:

Table 9.2.2 General Evaluation Results by Study Team

No.	Evaluation Category	General Evaluation Results	
		Medium-Scale (FSL.320m)	Large-Scale (FSL.360m)
1.	Natural Environment Evaluation	O	Δ
2.	Social Environment Evaluation	O	Δ
3.	Economic Evaluation	Δ	O
4.	Financial Evaluation	Δ	O
5.	Technical Evaluation(Dam Construction)	O	O
6.	Evaluation on EAC & Workshops	O	Δ
7.	Evaluation on Japan's Mekong River Basin Development Plan	O	O
8.	General Evaluation Results	O	Δ

Note: O : Recommended alternative to develop.
Δ : Recommended alternative not to develop compared with other one.

The various reasons that the medium-scale dam alternative have been selected as the most recommendable one by the Study Team were epitomized by the following four (4) reasons:

(i) Evaluation results of the social environmental aspects: This alternative will save the Thaviang Sub-District, where is expected of the future development due to not only a geographic advantage but also the recent regional development projects for extension of both a national highway and a rural electrification.

(ii) Evaluation results of the preliminary resettlement plan: This alternative will save the population being resettled forcibly as less as possible due to avoiding inundation of the Thaviang Sub-District.

(iii) Evaluation results of economic and financial analysis: This alternative will clear the critical economic index for IPP projects, even the Study Team's evaluation criteria thinks a great deal of evaluation results both on the social and natural environmental aspects.

(iv) Evaluation results of General and Site Workshops: This alternative was selected under deep consideration of the evaluation results by local peoples and local governments through both General and Site Workshops during the field investigations.

Accordingly, at the following two points, the Nam Ngiep-I HEPP is expected to set as a high valuation on dam developments in the world not only by peoples in Lao PDR but also by both local and international NGOs, as well as international financing agencies being willing to invest in positively based on the comprehensive development intention:

(i) The project might become a pathfinder of the advanced development procedure selecting a project scheme based on the EIA results at the preliminary F/S stage of hydroelectric power project, and

(ii) The Project will save the reservoir area of 74km^2, the dam height of 40m, the construction cost of US$118mil., and resettlement population of 3,000, instead of lost values at the install capacity of 94MW, the annual energy of 556GWh, and B-C(current value) of US$80mil.

9.2.3 NATURAL ENVIRONMENT EVALUATION RESULTS

Both the proposed FSL alternatives EL.360m and EL.320m have the same dam site. Consequently, the environmental impacts in the downstream area are very similar and do not provide a significant basis for differentiating the two (2) alternatives from the environmental point of view. Impacts on land at downstream will be limited to land acquisition for only 10km of access road and 110km of transmission line. Compensation for the loss of land will be provided to the concerned population. Impact is the same for both alternatives.

The large-scale dam alternative (FSL.360m) will inundate exactly not only twice more land (14,820ha) than the medium-scale alternative (FSL.320m, 7,390ha), but also three (3) times more cultivated land (950ha compared to 310ha). Almost 10,000ha of forest, representing a potential timber volume of 290,000m^3 are also flooded by FSL.360m, against only half of these values for FSL.320m.

With the flooding of the forest, Laos will lost a potential for sequestering the carbon, resulting eventually in a higher contribution to global warming. It represents a loss for a potential selling

of carbon credits to any industrialized nations. Based on a forest growth of 2 to 3 m^3/ha/year, the loss may be estimated at US$180,000-270,000/year for FSL.360m and at US$88,000-130,000/year for FSL.320m.

During operation, the water level of the reservoir will fluctuate, exposing draw-down areas which may be developed for agriculture or grazing. For rice production, the land must be exposed around 5 months. FSL.320m offers almost twice more areas for rice cultivation than FSL.360m: almost 2,000ha against 1,000ha. Only a part of this area is suitable for rice culture when considering soil quality and local topography.

The residence time of water into the reservoir is about 13 months for FSL.360m and only 3.6 months for FSL.320m. This short residence time combined with a limited inflow of Phosphorus from the watershed leads to the conclusion that there should be no problem of water quality in the medium and long term. After the impoundment, as the intense decay of organic matter in the water consume all the dissolved oxygen, it is anticipated that the water will recover a reasonable level of oxygen after only 5 to 6 years for FSL.360m and after only 2 years for FSL.320m.

As mentioned above, the reservoirs of both alternatives include no vulnerable species, there are no reasons to stop the dam construction, if the environmental management and monitoring will be continued at each implementation stage. Moreover, the medium-scale dam alternative (FSL.320m) has more advantage than the large-scale one (FSL.360m), since the proposed reservoir area for FSL.360m is twice of FSL.320m, even the impacts to the downstream area are the same degree for the both alternatives.

9.2.4 SOCIAL ENVIRONMENT EVALUATION RESULTS

According to the socioeconomic surveys of the Project area conducted December 1998 through March 1999, overall, including both Upstream and Downstream areas of the proposed dam site, nearly 2,000 households and 12,000 persons may be affected to one degree or another by the Project. About 660 households and 5,000 persons in 14 villages are in the Upper Reservoir and another 200 households and 1,200 persons in 4 villages the Lower Reservoir could potentially be affected by involuntary resettlement. For Downstream area about 1,300 households and 6,800 people in 15 villages would be affected through changes in the Nam Ngiep River flow and water.

While not all villages within the proposed reservoir area would be submerged even by FSL.360m, their rice lands are all situated along the Nam Ngiep River and its territories at low levels. So it can be assumed that virtually all the villages would require resettlement, if FSL.360m is chosen for implementation. Generally speaking, mitigation includes minimizing resettlement to the extent possible, carrying out an international standard of resettlement planning and implementation if unavoidable, and fair compensation for the displaced population.

The recommended design mitigation at this time is to consider the medium-scale dam alternative. The initial thinking was that lowering the FSL to EL 320m would reduce the number of affected villages down to 5 villages. There is not enough information at this time, however, to determine what the amount of backwater effect would be, i.e., how much higher the water at the back of the reservoir will be than at the front end. Two (2) meters would be assumed, including a safety margin. Therefore, consideration of the backwater effect indicates that EL.318m might be necessary to protect the majority of irrigated paddy land belonging to the Upper Reservoir

villages, nearly 300ha of the total reservoir paddy land. This FSL.318m dam would more surely reduce the affected population down to 260 households and about 1,600 people.

As mentioned the populations affected by the dam construction above, it is recommendable to select the medium-scale alternative for mitigation of the impacts on the social environmental, as there are no populations to protect as a rare ethnic group and to refuse themselves a resettlement plan due to dam construction.

9.2.5 ECONOMIC EVALUATION RESULTS

Economical evaluation has been already described in Chapter 6.6. The cost includes not only construction costs including temporary facilities cost, but also environmental mitigation costs such as resettlement cost and environmental maintenance work cost for number of houses and population. Also as the project benefit, construction cost and fuel cost in the case that the same scale of thermal power plants as Thailand are being established is considered. Indirect benefits such as the reduction of CO^2 discharge amount, etc. are not included. The results at the 2nd stage economic evaluation are shown in the next figures. The large-scale dam plan as represented by FSL.360m is the alternative plan with the maximum value of B/C and EIRR.

Table 9.2.3 Economic Comparison of Alternative Dam Type Schemes

No.	FSLs	Inst.Capacity (MW)	Total Energy (GWh)	Const. Cost (Mil.US$)	B/C	B-C (Mil.US$)	EIRR (%)
1.	EL.310m	214	1,192	316.3	1.55	129.83	16.39%
2.	EL.320m	240	1,349	339.6	1.64	163.21	17.52%
3.	EL.330m	263	1,508	367.5	1.68	186.44	17.85%
4.	EL.340m	280	1,626	392.1	1.69	202.60	17.97%
5.	EL.350m	314	1,777	420.4	1.73	230.85	18.52%
6.	EL.360m	334	1,905	445.6	1.76	252.46	18.81%
7.	EL.370m	356	2,030	476.1	1.75	265.83	18.65%
8.	EL.380m	377	2,148	505.0	1.75	282.37	18.69%
9.	EL.390m	401	2,282	538.4	1.74	299.29	18.65%

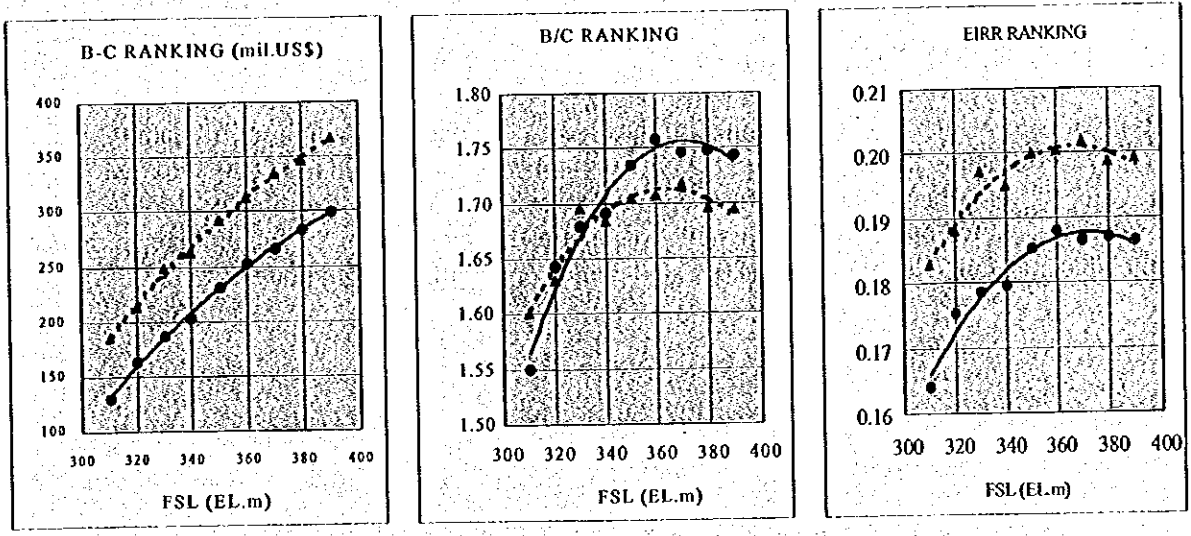


Figure 9.2.1 Results of Economic Comparison

9.2.6 FINANCIAL EVALUATION RESULTS

Financial evaluation has been already described in Section 6.7. The financial evaluation items for each alternative are calculated as shown below, however, evaluation is based on several assumptions such as BOOT composition, fund procure, electricity sale cost, and commencement day of commercial operation. Therefore, it is almost inevitable that the values of each item will change to both up and down based on the further studies, even these values for both alternatives showed financial validity in FIRRs on project and equity.

Table 9.2.4 Results of Financial Evaluation

No.	FIRR Evaluation Cases	FSL.320m	FSL.360m
1.	Base Case	12.8%	13.7%
2.	10% Increase in Investment Cost	11.6%	12.5%
3.	10% Decrease in Total Energy Sales	11.4%	12.3%

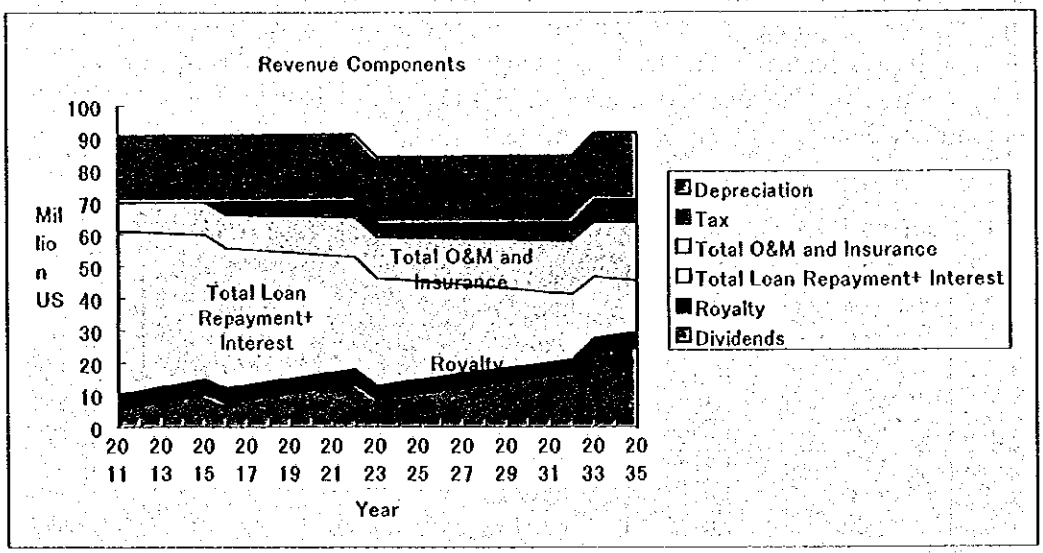


Figure 9.2.2 Financial Evaluation(FSL.320m, unit:Mill.US$)

9.2.7 TECHNICAL EVALUATION

The type of dam, which has been planned in the study, is a concrete facing rockfill dam (CFRD) as already examined in the chapter 8. This type of dam was first built in the 1850's in the U.S.A. From then, the dam height has grown according to tending to gigantic from the 1960's. The major dams as shown on the following table to support this fact. From the table, there are many completed dams with a height under 180m, and planed dam with a height under 220m.

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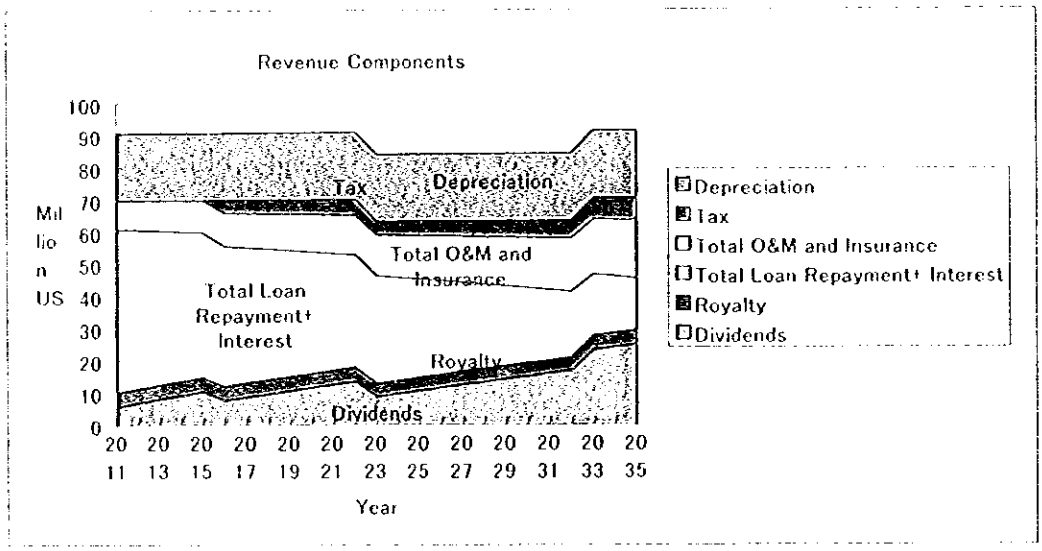

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Table 9.2.5 Typical Dam Project of CFRD

No.	Height	Completion	Name of Dam	Country
1.	110 m	1971	Cethana	Australia
2.	140 m	1974	Anchicaya	Colombia
3.	161 m	1980	Areia	Brazil
4.	187 m	1993	Aguamilpa	Mexico
5.	187 m	U/Const.	Tianshenqiao	China
6.	205 m	U/Const.	Bakun	Malaysia
7.	182 m	U/Plan	Guizhou Hongjiadu	China
8.	187 m	U/Plan	Xekaman	Lao PDR
9.	190 m	U/Plan	Sogamoso	Colombia
10.	210 m	U/Plan	Abdula	Philippines
11.	220 m	U/Plan	Nam Ngum 3	Lao PDR
12.	220 m	U/Plan	West Seti	Nepal
13.	237 m	U/Plan	Shui	China

Source: International Water Power & Dam Construction, 1997 Year Book

The details of the dam in each alternative plan, which is being proposed in the study, are shown in Table 9.2.3. As the difference between these alternative plans is the level of FSL, its crest length becomes wider and the dam volume increases remarkably even on similar abutments slopes. Since the dam height is approximately 200m even in a large-scale dam plan, it is not technically impossible to construct it. Although, there are no cases constructed at this height, there are many cases already planned.

Table 9.2.6 Major Dam Features

No.	Items	Medium-Scale Dam FSL.EL.320m	Large-Scale Dam FSL.EL.360m	Difference
1.	Height	157m	197m	40m (Exc. depth: 5m)
2.	Length	524m	662m	138m
3.	Volume	6,896,000m^3	12,744,000m^3	5,848,000m^3
4.	Slope	U/S1.4, D/S.3	U/S:1.4, D/S:1.3	Same

The difference in dam volume affects the foundation geology and period of construction. The following table shows the items to study technically and evaluations of its effect. In both alternative cases, no technical problems can be found as the following table supports:

Table 9.2.7 Technical Comparison among Alternatives

No.	Items	Middle-scale Dam	Large-scale Dam	Evaluation Results
1.	Dam foundation excavation	Foundation excavation depth is determined with consideration of waterstop and foundation bearing strength.	Foundation excavation depth is deeper comparing to mid-scale dam plan.	Foundation excavation depth increases.
2.	Rock materials	There are many construction cases with this amount of embankment.	Embankment will be twice as much as mid-scale dam plan.	Area of quarries will increase but it is possible to supply within the reservoir.
3.	Geological investigation	Study of dam axis and steep slope area inside the reservoir.	Need to study saddle point in detail.	Study items increase; however, impossible conditions such as an active fault do not exist.
4.	Construction period	Need five years of period to finish construction.	Period needs to be longer with same construction plan as mid-scale dam plan.	It can be solved by increasing number of machines.

9.2.8 EVALUATION RESULTS ON EAC AND GENERAL/SITE WORKSHOPS

The EAC was established and Workshop took places in city and villages as will be described in chapter 11. Important opinions from EAC/WS are summarized in the following table:

Table 9.2.8 Major Opinion at EAC and General/Site Workshops

No.	EAC/Workshop	Date	Major Opinions
	EAC Meeting		
1.	1st at Vientiane	November 21-25, 1998	(i) Approval of the large-scale, the medium-scale and the small-scale dam schemes, as alternative studies. (ii) Importance of resettlement plan and impacts & remedy of the downstream reach. (iii) Necessity to verify the accuracy of hydrological measuring record.
2.	2nd at Vientiane	June 4-8, 1999	(i) Doubt about economical and hydrological data. (ii) Necessity to set up the possible resettlement area. (iii) Reviewing of environment mitigation cost.
3.	3rd at Vientiane	December 3-8, 1999	(i) Appreciation of gender issues study. (ii) UXO problems at the possible resettlement area. (iii) Economic assumptions for financial analysis. (iv) Necessity of further economic survey in Thailand and Vietnam (v) Execution plan for the next stage F/S.
	General Workshop		
4.	1st at Vientiane	November 26-27, 1998	(i) Doubt about economy of the Project. (ii) Expecting on economical effect. What to gain is greater than what to lose. (iii) Expecting the stable life on the basis of agriculture. (iv) Fear to results of slash-and-burn shifting farming.
5.	2nd at Pakxan	June 9-11, 1999	(i) Medium-scale dam scheme being encouraged for development of the Thaviang Sub-District. (ii) Necessity to fulfill incomplete hydrological data. (iii) Justification of personal & paddy-field compensation. (iv) Expecting the increase of employment opportunity. (v) Necessity of regional development with the hydropower project.
6.	3rd at Vientiane	December 8-10, 1999	(i) Execution plan for the next stage F/S. (ii) Reliability and accuracy of EIA survey. (iii) Problems on cultivation in draw-down reservoir area. (iv) Importance of governmental decision. (v) Damage comparison against other hydropower projects.
	Site Workshop		
7.	1st at B.Dong (Thaviang)	March 16, 1999	(i) No objection to the Project, because of well understanding of its needs as a national development plan. (ii) Everyone encouraging medium-scale dam scheme as a result of questionnaire.
8.	1st at B.Sopyouk (Hom)	March 17, 1999	(i) Clear the condition of resettlement action plan. (ii) Wishes to visit prospective resettlement area.
9.	2nd at B.Soemkham D/S of Dam	June 24, 1999	(i) Detailed explanation of impacts & mitigation measures to downstream reach of the proposed dam. (ii) Care on quality & quantity of drinking & agricultural water to be getting worse and lack. (iii) Altitude relations between prospective inundation area for villages and farm.

No.	EAC/Workshop	Date	Major Opinions
10.	3rd at B.Dong (Thaviang)	December 13, 1999	(i) No objection for both alternatives, if it will make Thaviang better than without. (ii) Strong request for rural development (road, bridge). (iii) Keep as it is, as women's representative.
11.	3rd at B.Sopyouk (Hom)	December 14, 1999	(i) No objection, if we had enough compensation. (ii) Clear the condition of resettlement action plan. (iii) Wishes to visit prospective resettlement area.
12.	3rd at B.Soemkham (D/S of Dam)	December 15, 1999	(i) Care on quality & quantity of potable water and haul of fisheries to be getting worse and lack. (ii) Care on social problems to be getting worse by resettlers .

Opposing opinions of the Project itself have not been heard. People from the central government gave their opinions to verify the presupposed condition such as the accuracy of the economic and hydrological data of the Project. Officials of the local government and representatives of local residents were hoping to implement the Project harmonizing with the regional development.

There were many opinions for the selection of the alternative plan as above, but no opposing opinions were heard. This results because of the explanations made to the policy of the study and the middle and final reports of study under the inspection of EAC and open hearing of information.

9.2.9 EVALUATION RESULTS ON THE MEKONG RIVER BASIN DEVELOPMENT PLANS IN JAPAN

In February 1995, the "Cabinet Council of the Indochina General Development Forum" was held in Tokyo, Japan. Also, taking opportunity of the re-organization of the Mekong River Committee in April of the same year, many research reports have been submitted as the high understanding of the general development over national level to actualize the Mekong River basin development cooperation to grow efficiently and balanced with the regional countries.

In this section, the related subjects to promote this Study as one of the projects of the Mekong River basin development is extracted from three (3) research reports from the Ministry of Foreign Affairs and JICA. Many of these researches have pointed out (1) sustainable development, which considers environmental conservation as a basic principle, (2) impartial development aid of the whole region, and (3) promotion of a power generation plan by non-government corporations.

(1) Report on "Greater Mekong Regional Development Plan"

"The Greater Mekong Regional Development Plan" was established in the Economic Cooperation Department in the Ministry of Foreign Affairs of Japan in March 1996 and the task force of seven specialists with experience in the infrastructure field have prepared the plan as material for a development scenario of the basin.

From the description indicated the summary in the first chapter, the related subject of this study is extracted as follows:

(i) Promotion of General Development with Consideration of Benefit for Whole Region / Priority Support to Lao PDR and Cambodia

For the necessity of stable and balanced growth of the economy in the Greater Mekong Region, the aggressive support is needed for the development of an infrastructure of domestic and national border between Lao PDR and Cambodia. To give an actual plan, the build-up of infrastructures, which contributes to the promotion of processing industries by use of water resources of the Mekong River basin, high potential of energy generation and agriculture and cheap electricity, is needed to be done among other things.

(ii) Promotion of Infrastructure with both Government and Non-government as One Unit

The fund from non-government corporations, as well as the fund from the government, is indispensable to respond to the enormous demand of infrastructure in the future. Japan needs to contribute information of policy, which leads non-government funds to be the incentive in infrastructure and draw the vitality of non-government.

Also, in chapter 5 "development policy to Year 2020" of the report, the following definite policies are proposed:

(i) Development by Non-Government / Development by ODA

In order to develop the hydropower project with a total of 5,000MW in branches of the Mekong River by 2020, US$5 to 6 billion in funds is needed. It is impossible to cover the whole cost by government funds such as ODA. It will also slow down the development while ODA is the only dependable fund.

Energy generation is usually highly profitable; therefore, the development fund from the non-government corporation as well as ODA will be rightfully encouraged. A country like Lao PDR has a small demand of domestic electricity even in the future. Thus, an aggressive fund for development tends to be excessive for domestic demand. However, appropriate actions are needed to correspond with the regional demand and on various conditions.

As mentioned above, hydropower developments are in many cases done as a part of multi-purpose development of water resource. In fact, it is difficult for non-government corporations to promote all of the facilities needed for multi-purpose development such as a dam and related facilities. Thus, government of developing countries need to take responsibility in resettlement, and highly public facilities are mainly funded from foreign sources such as ODA. The part of energy generation should be considered as cooperated development by both government and non-government funds.

(ii) Preferred Development of Hydropower Project

Rich hydropower resources of the Mekong River are fully developed and used. Compared with a thermal power generation, a hydropower generation needs high initial cost; however, it has an advantage of saving foreign currency for fuel purchasing in the long run. In hydropower generation, the development project needs to consider the relationship with water resources multi-purpose development (including flood control, irrigation, transportation, fishery) and implementation of harmonious development as a part of general development.

(iii) Adjustment of Project Development Mutuality

In Lao PDR, having a policy to accept funds from non-government developers aggressively trying to actualize the project with the BOT system, the government and non-government corporations have already exchanged 23 Memorandum of Understanding. They are already moving to implement the project. Even though the general development plan of each river basin is included in the work program of the Mekong Committee, the project has not yet been drawn up. In fact, each project has no mutual relationship and a project is planned and promoted independently. From the point of view of effectively use of water resource, an adjustment between the projects is needed and also a quick draw up of the development plan with the consideration of environmental problems and resettlement is needed.

(iv) Establishment of Impartial Electricity Sales Price

When exporting electricity to the country which possesses power generation, an impartial and appropriate electricity sales price needs to be established. A country which supplies electricity may draw back the price negotiation because of one concentration of the demand as a result of only two countries, an exporting country and an importing country, having a negotiation. In order to pass electricity smoothly and to promote electricity in each country in the Greater Mekong Region, a third country or international system may need to participate in the establishment of an impartial and appropriate price.

(2) Report on "Research of a Present State and a Prospect of the Mekong Committee"

This research has been done from October 1995 to May 1996 by the study group organized by JICA. This study group is formed from eight specialists with experience and knowledge in the Mekong River basin development and the Mekong River Committee activities. The related subject of this study is extracted from "Chapter 6 Suggestion: Establishment of Unity System of the Government and Non-Government".

There is a strong hope to establish the system with the aggressive non-government cooperation as well as cooperation of the government. For example, non-government corporations have studied many field in development and investment; however, they have restriction in their funds. Thus, strengthening of fund support from organizations such as JICA and OECF should be considered. Import and export of electricity from hydropower plants are realized because of an abundant supply of water resource of this region. The development by BOT system is also progressed. Applying public investment such as BOT system and contriving a system to quicken the progress of technology transferring are effective techniques to promote regional development. In order to promote BOT system smoothly, trust needs to be increased and risks should be decreased by having a nature of ODA such as expansion of exporting insurance and investing insurance and investment from official organizations such as Japan Export and Import Bank and OECF. Other development projects, which may consider adopting BOT system in the future, need to cooperate with official organizations in F/S level.

(3) Report on "Research of Mekong River Regional Development and Environmental Study"

This research has been reported in June 1998. This study has been done by the JICA study team, organized in February 1997, that has been formed by eight specialists. From the summary of the report, the section on suggestion to environmental regarding support is extracted.

"Pursuit of economic from scale" is justified for a long time in this world; however, short-term exploit of sources caused by large-scale development needs to be avoided when aiming for sustainable development. The sources should be thought at as borrowed from next generations, not as handed over from ancestors.

Today, when supporting developing countries, many people deny the large-scale development, especially dam development, because of the bad effect to the natural environment and influence to social environment of the local residents which may be caused by the development. In addition, when the long future is prospected, development is intended as change of social economic situation of the concerned area, the enforcement of development may be hesitated as the risk of decline in expected effectiveness of social economic. In fact, there are many cases to support this idea. Thus, the opinion to oppose development of large-scale project cannot be turn down as an unfounded idea. On the other hand, (when development is completely unrestricted) proceeding small-scale development is as absurd as receiving large effects from large-scale development and proceeding the development in the project site by overcoming all the environmental issues. This issue is difficult to come to a conclusion.

The important point is to make sure to recognize the needs of this development to the region and country from the local residents and government, and to make people understand that there is no better alternative plan than this development plan. When the effect from this development is sustainable, the progress to society is high for a long time after development. If the benefit of this development is higher than the consumption of resources, and there is no better way to receive benefit, then this development can be approved with green signal with no matter the scale of project. This conclusion will be derived after several discussions; therefore, collection of enough judging materials and giving complete information to the public are needed.

For the planning and progress of large-scale development projects, the following subjects should be emphasized:

(i) Every person concerned approves the national needs and regional needs of this development from accurate and wide study materials. Also, more than 70% of persons concerned should approve this plan as the best as a result of consideration of all other alternative plans

(ii) An evaluation of plus and minus effects of the development needs to be done before and after the development.

(iii) Development is enforced in each step as demand changes, discussion is made over the propriety of necessary changes of project details and the result is given to the public.

(iv) To receive evaluation as a valuable infrastructure from every people, the project should be implemented with a thorough study on harmony with the surrounding landscape and regional culture at both the development stage and final stage.

10. PROJECT IMPLEMENTATION

10.1 FEASIBILITY STUDY FOR NEXT STAGE

10.1.1 GENERAL

At the 2nd survey stage of F/S, the alternative plan proposed at the 1st stage will be optimized. Accordingly, geophysical survey and geological survey will be carried out focusing an aero-photo survey and boring survey, which had not been carried out at the previous stage, in order to analyze both an economic and financial evaluation using the precise data required for IPP projects.

And, a tentative work schedule for the 2nd survey stage is prepared on the assumption of its implementation during 2 fiscal years as shown in Figure 10.1, separating the detailed survey stage and the F/S grade design stage. Attentions will be paid at the commencement of the field surveys at the beginning of dry season.

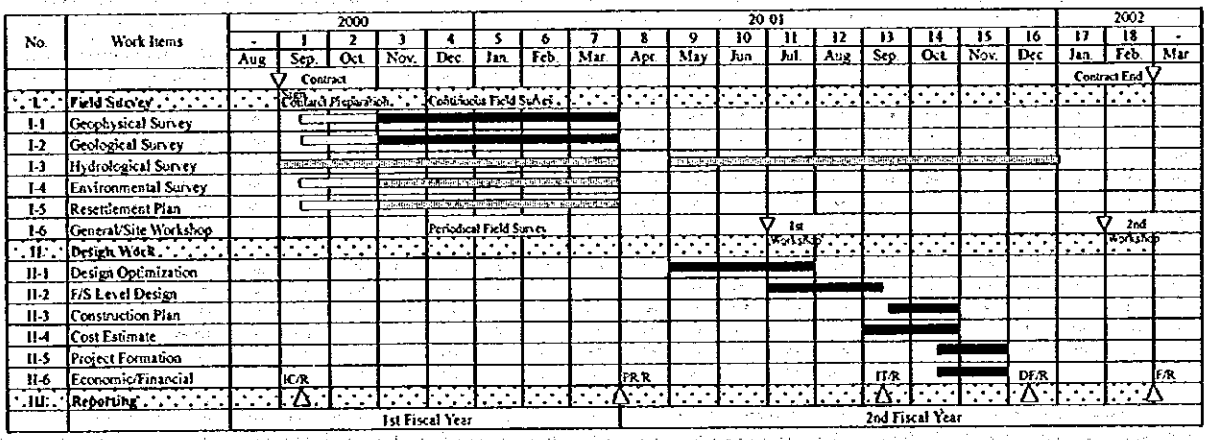


Figure 10.1 Tentative Work Schedule for 2nd Survey Stage

10.1.2 FIELD INVESTIGATION

(i) Geographic Survey

A topographic maps (Scale 1:10,000) will be prepared by an aero-photo survey for all of the proposed catchment area. The ground survey (Scale 1:1,000) also will be carried out both at the proposed main dam site and the proposed re-regulation dam site for the F/S revel structure

design.

(ii) Geological & Material Survey

Geological survey will be carried out both at proposed main dam and re-regulation dam sites; boring works, permeability test, region test, penetration test, in-situ loading test at bore holes, etc. And, physical tests for embankment and concrete materials will be carried out after core sampling works at quarry sites.

(iii) Hydrological Survey

Data collection will be continued for that not obtained during the survey at the previous stage. And also continued the hydrological observation at the stations installed during the previous survey stage. Both water level gauge and rainfall gauge stations will be installed newly in the catchment area.

The run-off discharge will be studied based on the data obtained from the gauge stations installed during the previous study stage.

The detailed back-water analysis will be carried out by a cross section survey between B.Muangmai and the confluence of the Mekong River. And also, a cross section survey for downstream of the proposed dam site will be carried out for preparation of the rating curves both at the main dam and re-regulation dam site.

(iv) Environmental Survey

The environmental survey will be continued for the items proposed at the previous study stage. The mitigation measures will be proposed in details based on the survey results.

(v) Resettlement Action Plan & Rural Development Plan

The review work of the preliminary resettlement plan conducted at the previous study stage will be carried out. And, a rural development plan will be prepared through a method able to put the local peoples' desires in it, being helped by a local consultant and a domestic NGOs.

10.1.3 F/S GRADE DESIGN WORKS

(i) Layout & Optimum Design

An optimum design work of major structures will be carried out for the alternative selected at the previous F/S stage. A layout design also will be done.

(ii) F/S Level Design

A design work at a F/S level will be carried out for the major structures. The drawings will be prepared and the work volume calculation will be carried out.

(iii) Construction Plan

A construction plan for the major structures will be prepared including preparatory works and

temporary works.

(iv) Cost Estimate

Project cost evaluation will be carried out based on unit prices for each work item.

(v) Project Formation

A project formation will be studied including review of the previous stage. And also, possible project financing schemes will be studied.

(vi) Economic & Financial Analysis

An economic analysis will be carried out for the alternative proposed at the previous stage. A financial analysis will be carried out for the proposed project formation.

10.2 PROJECT IMPLEMENTATION SCHEDULE

10.2.1 IMPLEMENTATION PROCEDURE

(i) Overall Implementation Schedule

The Nam Ngiep-1 HEPP will be implemented in four stages: Phase-1 to Phase-4 of the following events to be accomplished after the feasibility study of the Project.

Table 10.1 Implementation Schedule in Four Stages

Phase	Items	Contents
Phase-1	Financial arrangement for the construction and selection of a consulting firm for the engineering services	Financial arrangement for the implementation of the Project in the Phase-1 will complete by the end of 2001, and start the field investigations and appoint a consulting firm for making a definite plan of the Project with detailed designing.
Phase-2	Field Investigations and detailed design of the Project with review of the feasibility studies	The Phase-2 for the filed investigations will start from the beginning of the dry season: the late 2002, and the review of the previous studies and detailed design will start from the end of 2002 and complete by the middle of 2004.
Phase-3	Selection of the contractor with the tendering for construction	The Phase-3 the pre-qualification and tendering for selection of the constructor will start immediately after approval of the project design, and the notice to proceed will be issued to the selected contractor by the end of 2005.
Phase-4	Construction works	The construction works in the Phase-4 is scheduled to start early 2006 and complete by the end of 2011.

(ii) Organization of Executing Body

The Project may be implemented by an independent BOT (Build-Operate-Transfer) power development company (hereinafter referred to as "the Nam Ngiep-1 power-company" or " the power-company"), which is organized by the private sector and international financing institutions. The Nam Ngiep-1 power-company makes independently financial arrangement for

implementation of the Project.

(iii) BOT System

The project implementation costs may be shared by the respective partner of the power-company; the dam components by the international financing institutions and power generating components by the private sector.

The Lao PDR Government will grant the power-company his renewable license to build and operate the Nam Ngiep-1 power plant for an initial 25 years from the start of commercial operation. If the license is not renewed, all plant facilities will be transferred to the Lao PDR Government once the license has expired.

The power-company will consign the Electricite Du Lao (EDL) who is one of the financing partners to conduct operation and maintenance of the power plant for the initial 25 years.

(iv) Financial Arrangement and Selection of Consulting Firm

The power-company makes arrangement of the project budget allocation including loans, etc. The external loan arrangement including appraisal by the financing agencies, pledge of loans or exchange of note, and signing of the loan agreement, is scheduled to complete by the end of 2001.

Immediately after the loan agreement, the power-company will start field investigations to increase accuracy of the site topographic and geological conditions, environmental aspects, etc. and consign a consulting firm for reviewing the previous studies, detailed designing and supervising construction works of all facilities of the Project.

(v) Pre-construction Activities

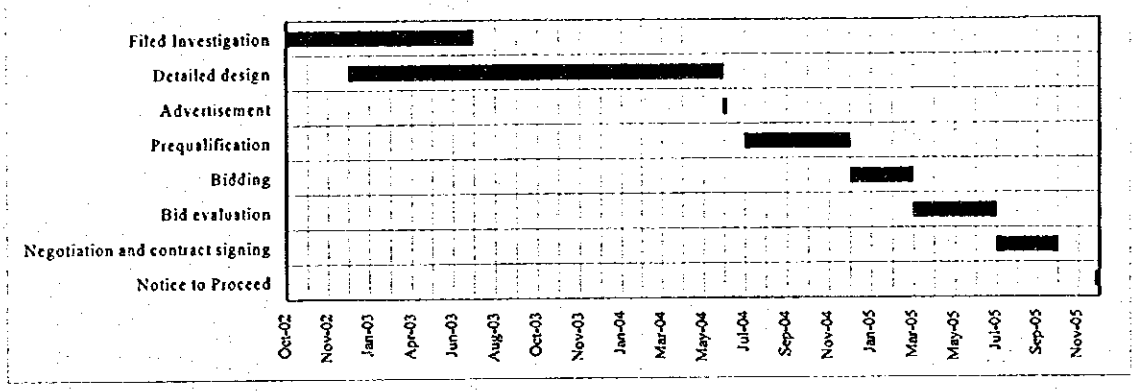
The pre-construction activities may trace the following time schedule:

Table 10.2 Time Schedule for Pre-Construction Activities

No.	Activities	Period	Start	End
1.	Field Investigations	9 months	Oct. 2002	Jun. 2003
2.	Detailed Design			
2-1	Review of previous studies	6 months	Dec. 2002	May 2003
2-2	Detailed design	6 months	Jan. 2003	Jun. 2004
3.	Pre- qualification			
3-1	Advertisement	-	Jul. 2004	-
3-2	Pre-qualification	5 months	Aug. 2004	Dec. 2004
4.	Tendering			
4-1	Bidding	3 months	Jan. 2005	Mar. 2005
4-2	Bid Evaluation	4 months	Apr. 2005	Jul. 2005
4-3	Negotiation and contract	3 months	Aug. 2005	Oct. 2005
5.	Notice to Proceed	-	Dec. 2005	-

Tentative time schedule for the stage of pre-construction is as shown in Figure 10.2 below:

Figure 10.2 Time Schedule for Pre-construction Stage



(vi) Construction Works

After conclusion of the contract between the power-company and the contractor, the notice to proceed (NTP) will be issued to the contractor to start the construction works at the beginning of 2006. The construction time schedule is tentatively planned as follows:

Table 10.3 Construction Time Schedule for Major Works

No.	Structures	Construction Period
1.	Diversion tunnels	Early 2006 to Mid. 2007
2.	Main dam	Mid. 2006 to Late 2009
3.	Spillway	Early 2006 to Mid. 2009
4.	Power waterway	Mid. 2006 to Late 2008
5.	Powerhouse	Mid. 2006 to End of 2011

The construction works will take about 5 years from the NTP, and commissioning will be at the beginning of 2012. Tentative construction time schedule in shown in Figure 10.3.

10.2.2 PROCUREMENT PLAN

(i) General

Figure 10.2 and Figure 10.3 show the time allowed for the implementation being only 108 months; 30 months for project design, 18 months for pre-construction procedures and 60 months for construction.

The schedule is very tight taking into consideration the scale of the development and the works/procedures in implementation. Therefore, the detailed design for the Project should be started as early as possible and the contract for engineering services should cover full period from the design stage to the construction stage to reduce risks of delaying the scheduled power commissioning date.

(ii) Field Investigations

Prior to the commencement of the detailed design of the Project, the field investigations will start for the following:

Table 10.4 Contents of Field Survey before Detailed Design

No.	Survey	Surveyed Contents	Remarks
1.	Topographic Survey		
1-1		Topographic mapping; main dam site, power intake site, diversion tunnel inlets and outlets, up and downstream portals for power waterway, penstock line route, powerhouse site, re-regulation weir site, resettlement sites	
1-2		Longitudinal section surveys along the tunnel routes	
1-3		Cross sectional survey for the Nam Ngiep River downstream of main dam	
1-4		Longitudinal and cross section surveys for material borrowing and quarrying sites	
2.	Geological Investigation		
2-1		Core boring	
2-2		Packer Lugeon test in rock	
2-3		Electrical resistivity prospecting along the tunnels and powerhouse site	
2-4		Seismic refraction survey along dam site and tunnel routes	
2-5		Test pitting and auger boring	
2-6		Property test on embankment materials	
2-7		Test on concrete materials	
3.	Environmental Investigation		
3-1		National policy and legal context developed by GOL.	Through an overall review and examination of the results of the previous EIA, the final environmental investigation for the Project will be performed.
3-2		Present natural and social conditions in and around the Project area	
3-3		Natural and social impacts of the Project	
3-4		Prospective impact mitigation measures	
3-5		Compensation and resettlement plan	
3-6		Environmental management plan including public consultation and participation programs	

(iii) Selection of Consulting Firm

The power-company will procure an international consulting firm in accordance with the guideline of financing institutions for engineering services during the implementation of the Project.

The scope of the engineering services will be divided into three categories; (a) detailed design and preparation of tender documents, (b) assistance to the power-company in tendering procedures, and (c) construction management.

(iv) Detailed Design and Preparation of Tender Documents

a. Preparation of definitive plan with detailed design

The definite plan aims at reviewing and justifying or modifying the proposed development features of the Project including the development layout plan, locations of the project structures, routes of the tunnels, progress of the resettlement plan, the environmental management plan, etc. The study includes:

- Review of existing data, information, previous studies, reports, etc. related to the Project

- Review and analyses of the results of topographic survey and geological investigation
- Hydrological analysis
- Final layout of the Project
- Dimensioning and stability/stress analyses of the Project major structures
- Construction planning on the procedure/methodology and the time schedule
- Detailed project cost estimate

b. Preparation of tender documents

The tender documents will be prepared based on the outcome of the definitive plan study. The preparation of the tender documents includes:

- Preparation of tender design for all project facilities, and preparation of deign report
- Preparation of pre-qualification documents with evaluation criteria for international competitive bidding (ICB)
- Preparation of tender documents with evaluation criteria for ICB, including the following:
- Instructions to Bidders
- Conditions of Contract
- Employer's (power-company's) requirements, including scope of works, standards, specifications, design criteria, program of works, etc.
- Bill of Quantities
- Letter of Acceptance
- Forms of Tender and Agreement
- Tender Drawings

(v) Assistance in Tendering Procedures

The assistance to the power-company in the tender procedures includes:

a. Assistance in pre-qualification for selection of bidders:
- prequalification calling
- pre-qualification evaluation and
- selection of the qualified bidders

b. Assistance in tendering for selection of a contractor:
- issuance of tender notice
- answers to bidders' questionnaires during the tender period
- pre-bid conference and site visit with bidders
- opening of tenders, tender evaluation, and selection of the lowest evaluated bidder for contract award
- contract negotiation with the successful bidder and

- contract signing

(vi) Construction Management

The consulting firm will act as the Employer's Representative for the following:

- Pre-construction review and approval/disapproval of design and construction documents including all drawings, calculations, computer software, samples, patterns, models, operation and maintenance manuals, and other manuals and information of a similar nature, to be submitted by the contractor
- Quality control of the contractor's construction works
- Progress control of the contractor's construction works including issuance of the notice to proceed, taking-over certificate and performance certificate
- Payment control to the contractor including issuance of interim payment certificate and final payment certificate
- Variation order
- Evaluation of results of test on completion
- Assessment of contractor's claims for extension of completion time and contract price adjustment (especially, evaluation on unforeseeable sub-surface conditions)
- Preparation of monthly project status report and project completion report
- Environmental impact monitoring
- Resettlement progress monitoring

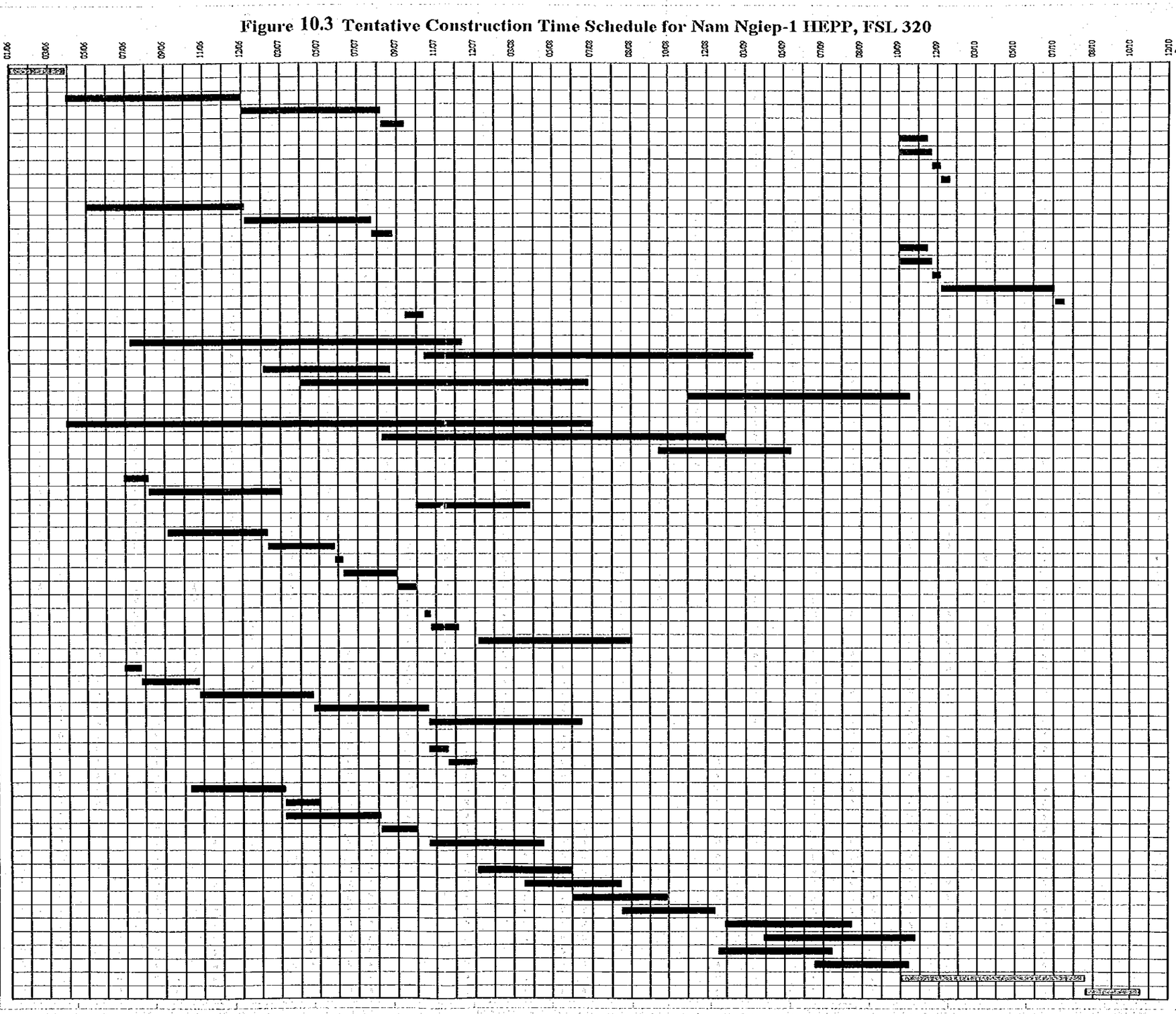
10.2.3 CONTRACT PACKAGE

The construction may be conducted under one-package contract system to execute the entire construction works by one general contractor, for which a reputable contractor will be selected through an ICB in compliance with the guidelines of financing institutions. This would also help to reduce risks of delaying the project commissioning in the tight implementation schedule.

Figure 10.3 Tentative Construction Time Schedule for Nam Ngiep-1 HEPP, FSL 320

Notice to Proceed: January 1, 2006
Power Commissioning Date: November 17, 2010

Work Item	Work Quantity	Start Date	Period (day)	End Date
Mobilization		2006/1/1	90	2006/4/1
Diversion Tunnel No.1				
Tunnel excavation	1,100 m	2006/4/1	275	2007/1/1
Lining concrete	1,100 m	2007/1/1	220	2007/8/5
Backfill grout	1,100 m	2007/8/9	37	2007/9/14
Plug works	9 lift	2009/11/1	45	2009/12/16
Pipe cooling		2009/11/2	50	2009/12/22
Contact grout	20 m	2009/12/22	15	2010/1/6
Portal closure		2010/1/6	15	2010/1/21
Diversion Tunnel No.2				
Tunnel excavation	1,000 m	2006/5/1	250	2007/1/6
Lining concrete	1,000 m	2007/1/6	200	2007/7/25
Backfill grout	1,000 m	2007/7/25	33	2007/8/27
Plug works	9 lift	2009/11/1	45	2009/12/16
Pipe cooling		2009/11/2	50	2009/12/22
Contact grout	20 m	2009/12/22	15	2010/1/6
Valve installation		2010/1/6	180	2010/7/5
Portal closure		2010/7/5	15	2010/7/20
Cofferdams		2007/9/14	30	2007/10/14
Main Dam				
Foundation excavation	658,000 m^3	2006/7/10	522	2007/12/13
Rockfilling	6,896,000 m^3	2007/10/14	517	2009/3/14
Toe slab concrete	20,000 m^3	2007/2/3	200	2007/8/22
Foundation grouting		2007/4/4	450	2008/6/27
Facing concrete	46,800 m^3	2008/12/1	351	2009/11/17
Spillway				
Excavation	4,949,000 m^3	2006/4/1	825	2008/7/3
Concrete	361,000 m^3	2007/8/8	542	2009/1/31
Gate installation		2008/10/15	210	2009/5/13
Power Intake				
Excavation	79,000 m^3	2006/6/30	40	2006/8/8
Concrete	28,000 m^3	2006/8/8	210	2007/3/6
Gate installation		2007/10/1	180	2008/3/29
Headrace Tunnel				
Tunnel excavation	420 m	2006/9/7	158	2007/2/12
Lining concrete	420 m	2007/2/12	105	2007/5/28
Backfill grout	420 m	2007/5/28	14	2007/6/11
Invert concrete	420 m	2007/6/11	84	2007/9/3
Consolidation grouting	420 m	2007/9/3	28	2007/10/1
Penstock Line				
Open excavation	10,000 m^3	2007/10/14	10	2007/10/24
Concrete work	2,200 m^3	2007/10/24	44	2007/12/7
Pipe installation		2008/1/6	240	2008/9/2
Powerhouse, Civil and Architetural Works				
Open excavation	28,000 m^3	2006/6/30	28	2006/7/28
Sub-mass concrete	12,000 m^3	2006/7/28	90	2006/10/26
Sub-struct. concrete	6,000 m^3	2006/10/26	180	2007/4/24
Superstructures	3,000 m^3	2007/4/24	180	2007/10/21
Utility works		2007/10/21	240	2008/6/17
OHT Crane				
Rail installation		2007/10/21	30	2007/11/20
Crane installation		2007/11/20	45	2008/1/4
Draft Tubes				
Unit-1,2 setting		2006/10/11	150	2007/3/10
2nd stage concrete		2007/3/10	55	2007/5/4
Unit-3,4 setting		2007/3/10	150	2007/8/7
2nd stage concrete		2007/8/7	55	2007/10/1
Gate installation		2007/10/21	180	2008/4/18
Spiral Casings				
Unit-1,2 installation		2008/1/4	150	2008/6/2
2nd stage concrete		2008/3/19	150	2008/8/16
Unit-3,4 installation		2008/6/2	150	2008/10/30
2nd stage concrete		2008/8/16	150	2009/1/13
Stators / Rotors		2009/1/28	200	2009/8/16
Plant Equipment		2009/3/29	240	2009/11/24
Main Transformers		2009/1/18	180	2009/7/17
G.I.S.		2009/6/17	150	2009/11/14
Impounding to RWL		2009/11/1	291	2010/8/19
Wet Test		2010/8/19	90	2010/11/17
Total construction period : 4.9 years				



11. RECORDS ON WORK PROCESS

Particulars, which are not included in common reports, such as holding of Environmental Assessment Committees, General Workshops and Site Workshops, execution of natural-social environmental survey works under the local contract, on-the-job training for HPO staff, etc. are compiled here together with the photographs taken during the past 6-time field investigations. The table contents of the totally 5-volume of Supporting Reports and the scope of works for the respective team staff with a man-month table are also compiled here.

11.1 ENVIRONMENTAL ASSESSMENT COMMITTEE (EAC)

11.1.1 BACKGROUND AND AIM OF EAC

In usual JICA studies, JICA entrusts all the works of environmental assessments to a study team including formulating methodologies, implementation of surveys and analyses, and drawing conclusions. There has been strong social needs to review the technical validity of survey and evaluation methods for environmental assessment studies by a third party. JICA organized an Environmental Assessment Committee (EAC), which is independent from the activities of the Study Team and positioned as a technical advisory group for the Study Team. JICA was responsible for providing necessary costs and appointing committee members.

In organizing EAC and starting its activities, JICA has defined that the position of EAC is limited to the JICA's advisory body as shown in the Supporting Report (V) 2.1. The above definition has been fully understood by all members of EAC. For the technical support to EAC, JICA nominated, as one of the members of EAC, a technical advisor specializing in hydropower planning. He also has a duty of supervising the Study Team and its works. The members of EAC consist of both experts in this country and experts in foreign countries. The technical advisor chaired EAC so that each member can exchange opinions at neutral positions. The technical advisor was also responsible for compiling the committee report. EAC discussed the study policy and process from a technical point of view and prepared the reports, results of which were reflected in the Study.

JICA made clear that each Committee member including the technical advisor should maintain the following three (3) characteristics: (i) Committee has no authority for the implementation of the Study and no responsibility for the results of the Study, (ii) all comments from the Committee are not to be referred directly to the Study Team, and (iii) formal opinion of the Committee is principally limited to the contents of the Committee report and technical advice made at each Workshop, and all others are regarded to be private opinions.

The nominated members of the Committee are as listed in Table 11.1.1:

Table 11.1.1 List of EAC Members and An Advisor

1.	Member (1st-3rd)	Specialized Subject	:	Geology
		Name (Nationality/Age/Sex)	:	Daiei INOUE (Japanese, 52, Male)
		Firm/Position	:	Director, General Research Institute of Electric Power Industry
2.	Member (1st-3rd)	Specialized Subject	:	Natural Environment
		Name (Nationality/Age/Sex)	:	Donald L Graybill (USA, 55, Male)
		Firm/Position	:	President, GCP International Inc.
3.	Member (1st)	Specialized Subject	:	Social Environment
		Name (Nationality/Age/Sex)	:	Khamphaeng Ketavong (Lao PDR, 59, Male)
		Firm/Position	:	Deputy Director, Institute for Cultural Researches
4.	Member (2nd-3rd)	Specialized Subject	:	Social Environment
		Name (Nationality/Age/Sex)	:	Thongsy Bounthipangno (Lao PDR, 40, Female)
		Firm/Position	:	Lao Front for National Construction
5.	Member (1st)	Specialized Subject	:	Natural Environment
		Name (Nationality/Age/Sex)	:	Bounthong Xaysida (Lao PDR, 47, Male)
		Firm/Position	:	Deputy Director, Department of Forestry
6.	Member (2nd-3rd)	Specialized Subject	:	Natural Environment
		Name (Nationality/Age/Sex)	:	Vean Vongphet (Lao PDR, 42, Male)
		Firm/Position	:	(NBCA & Water Resource)
7.	Member (2nd-3rd)	Specialized Subject	:	Resettlement Planner
		Name (Nationality/Age/Sex)	:	Songhoua Vangvonxay (Lao PDR, 53, Male)
		Firm/Position	:	Prime Minister Office, Rural Development
8.	Adviser (1st-3rd)	Specialized Subject	:	Hydropower Plan
		Name (Nationality/Age/Sex)	:	Hayao ADACHI (Japanese, 62, Male)
		Firm/Position	:	Japan International Cooperation Agency

11.1.2 EXECUTION OF 1ST EAC MEETING

(1) General

The first Environmental Assessment Committee meeting was held in Vientiane from November 23 to 25, 1998 for three (3) days, prior to the first General Workshop. The main topics of the meeting were general discussion on the plan of Environmental Impact Assessment (EIA) survey to be carried out for ten (10) months and discussions on the report of Initial Environmental Examination (IEE) performed in August 1998. The following reports and information were presented: an inception report prepared in August 1998, a progress report / an EIA plan / an IEE report submitted in October 1998, OHP sheets and panels for the first General Workshop. Observers including the Study Team, the embassy of Japan, MIH as the counterpart, JICA Lao PDR office, and JICA experts participated in the meeting.

EAC members inspected the planned reservoir area using a helicopter with explanation from the Study Team prior to the meeting. The members attended to the 1st General Workshop after the Committee meeting to collect directly opinions exchanged at the Workshop with the peoples concerned, which would be helpful for appropriate advice to the Study Team.

Attendance of the Committee meeting and execution program of the meeting are given in Table

11.1.2 and Table 11.1.3 respectively.

Table 11.1.2 Attendance List of 1st Environmental Assessment Committee

No.	Position	No. of Attendance	Name (without title)
1.	Counterpart (MIH)	2	Sombone, Chansaveng
2.	EAC	5	Inoue, Graybill, Khamphaeng, Bounthong, Adachi
3.	JICA (Tokyo)	3	Nagata, Fujiwara, Kobayashi
4.	JICA (Lao PDR)	2	Masaki, Murashige, Sophonh
5.	Embassy	1	Nagano (Secretary)
6.	Study Team	4	Araki, Ikeda, Yon, Ragsdale
	Total	17	

Table 11.1.3 Execution Programs of 1st Environmental Assessment Committee

Date	Start		Finish	Subject	In-Charge
Nov. 21 (Sat)	08:00	-	13:00	General inspection for reservoir area by helicopter	Jointly
Nov. 23 (Mon) (1st Day)	09:00	-	09:20	Opening speech (Introduction, Opening address)	JICA
	09:20	-	09:30	Committee's steering policy	JICA
	09:40	-	14:00	Inception, Progress, IEE reports & Further schedule	Study Team
	14:00	-	15:30	Plan and schedule of General Workshop	Team, HPO
Nov. 24 (Tue) (2nd Day)	09:00	-	13:30	Advice from Committee members	Committee
	13:30	-	14:30	Discussion	Committee
	14:30	-	17:00	Report preparation by Committee	Committee
Nov. 25 (Wed) (3rd Day)	09:00	-	16:00	Report preparation by Committee	Committee
	16:00	-	16:30	Presentation by Committee	Committee
	16:30	-	16:45	Discussion on further schedule	Study Team
	16:45	-	17:00	Closing speech	JICA
Nov. 26 (Thu)	08:30	-	16:30	1st General Workshop (1st Day)	Team, HPO
Nov. 27 (Fri)	08:30	-	20:30	1st General Workshop (2nd Day)	Team, HPO

(2) Minutes of 1st EAC Meeting

The main programs of the EAC meeting were the general explanation by the Study Team by using OHP and questions and answers on the 1st day, comments from Committee to the Study Team on the 2nd day, and the explanation by Committee on his report on the 3rd day. At the meeting, a lot of useful opinions and advice with expertise were given.

As for the resettlement plan, which was one of major subjects, the necessity of participation of Laotian specialists related to the ethnic problems was also discussed. The Committee's report is compiled in the Supporting Report (V)2.2 with answers from the Study Team. Main points discussed in the meeting were as follows:

General

(i) The members have generally observed that the Study Team has made necessary efforts to fulfill its tasks and duties mentioned in the TOR and minutes. The discussion was concentrated on the scheduled field survey and hydropower planning.

Definition of Alternative

(ii) The Study Team reported that the further Study would be proceeded based on three (3) conceivable alternatives; high-dam (HWL.360m), middle-dam (HWL.320m) and low-dam (HWL.240) alternatives. The Study Team explained the number of people to be resettled for each alternative: about 5,000 by the high-dam, 2,000 by the middle-dam, but no resettlement by the low-dam. The Committee principally agreed with the above plans,

but suggested necessities of care for the middle-dam alternative whether it is economically feasible or not. The Study Team explained that even the middle-dam would secure a viable IRR though there still be no sufficient data for definite evaluation.

Sedimentation

(iii) The Committee pointed out that a study on sediment issues is not enough. But, the Committee also explained that the effect of sediment might be smaller than the other Asian countries like China and Indonesia at the impression obtained by the inspection for the existing Nam Ngum reservoir area by helicopter. The Committee added that sediment flushing to the downstream of the dam may be difficult due to the seasonal storage regulation in reservoir.

(iv) It is concerned that sand transfer to the downstream will be interrupted and the downstream riverbed will be scoured, which may adversely affect for a long time facilities along the river and agricultural lands developed around the river mouth. It is generally observed that a flood intensively deposits sand at the upstream end of reservoir due to sudden decrease of flow velocity. This is called back-sand phenomena which may cause water level rise in the river. Detailed studies and analyses should be made based on the observed data on sedimentation in the field investigation. For the downstream areas, costs of sufficient counter-measures such as banking, slope protection, etc. along the river should be included in the project cost.

Resettlement

(v) Discussion was also concentrated regarding resettlement of people in the inundated areas. The decision whether inundation of the Thaviang Sub-District is avoided or not, is subject to the result of an economic analysis for the scale alternatives and intention of local people. It is necessary to grasp precisely such local opinions through a questionnaire survey. When the resettlement plan is drawn up, various alternatives should be provided and direct conversation with the people is indispensable. Although certain financial support is required for environmental mitigation measures including resettlement, the most essential point is to establish sustainable plans meeting the people's real requirement. To facilitate preparation of proper plans, it is important to mobilize specialists of agricultural sector and reinforce the Committee with Laotian specialists for resettlement plan.

Peak Operation Hours

(vi) Discussion was made for environmental issues in the downstream area of the dam including the necessity of a re-regulating pond. MIH pointed out the following regarding operation hours which was related with discharge to the downstream area: it was necessary to review proposed an 8-hour peak operation since a 16-hour operation was requested from EGAT in power purchase negotiations for Nam Theun 2 HEPP to cope with the medium peak load in Thailand. However, the Committee expressed a different opinion that an 8-hour peak would be advantageous from a long-term view, taking into consideration future change of power market with economic development in Thailand, as the same trend had been experienced in Japan in the course of economic development.

Fishery

(vii) Matters on fishery and fishes were discussed. The Committee suggested that addition of a fish specialist is necessary, as survey of rare fishes is important. The Study Team

explained that specialists would be employed as required on a short-term basis during the field environmental survey. Necessity of the following studies was also pointed out: shortage of downstream water during initial impounding, function of re-regulating pond, management of riparian water supply for the downstream, rural electrification by using re-regulating facilities, etc.

Backwater from the Mekong River

(viii) The problem on backwater from the Mekong River to the Nam Ngiep River was brought up. The water of the Mekong River often inundates Vientiane City developed on EL.180m. Therefore, it is possible that backward flow from the Mekong River goes up to the Nam Ngiep River, even if the Nam Ngiep river basin has no rain. If timing of discharge from the Nam Ngiep powerhouse coincides with the backward flow, it is concerned that the backwater inundates the villages along the Nam Ngiep River. Moreover, it is required to check the hydrological data since there is a possibility that the water level gauge record at the station downstream of the main dam has been influenced by the said backward flow.

(3) EAC Report and Study Team's Comments

The Committee's report, in which the comments and advice of the respective member were summarized, was submitted to JICA and JICA handed it to the Study Team. The answer and countermeasure in response to the recommendations made by the Committee were compiled in Supporting Report (V)2.2. It was distributed to each Committee member after getting concurrence of JICA and GOL. These report and comments were distributed to the Embassy of Japan in Lao PDR, JICA/Laos office, and MIH.

The Committee's report and Team's comments were treated as open documents and were opened to the public in the 2nd General Workshop in June 1999.

11.1.3 EXECUTION OF 2ND EAC MEETING

(1) General

The 2nd Environmental Assessment Committee meeting was held in Vientiane from June 4 to 8, 1999 for three (3) days prior to the 2nd General Workshop. The main topics of the meeting were explanations and discussions on the Interim Report submitted in March 1999, and comments from the Study Team on the 1st EAC Report. Except the said reports the following reports and information were presented: the Supporting Report on the Interim EIA Report by the Study Team and the EIA Interim Report by the sub-contractor. The latest data which was obtained after submitting the EIA Interim Report was also presented. Explanations were performed with OHP sheets for the 2nd General Workshop.

Observers including the Study Team, MIH as the counterpart, JICA headquarters, JICA/Laos office, and three Laotian facilitator and interpreters for the Workshop participated in the meeting. Two Laotian committee members were replaced and a Laotian resettlement plan specialist joined.

Attendance to the Committee meeting and execution program of the meeting are given in Table

11.1.4 and Table 11.1.5 respectively.

Table 11.1.4 Attendance List of 2nd Environmental Assessment Committee

No.	Position	No. of Attendance	Name (without title)
1.	Counterpart (MIH)	4	Somboune, Voradeth, Chansaveng, Sisoukham
2.	EAC	6	Inoue, Graybill, Thongsy, Vean, Chanty, Adachi
3.	JICA (Tokyo)	1	Kobayashi
4.	JICA (Laos)	2	Masaki, Murashige, Sophonh
5.	Study Team	4	Araki, Ikeda, Yon, Ragsdale
6.	Others (Observer)	2	Facilitator & Interpreter for Workshop
	Total	19	

Table 11.1.5 Execution Programs of 2nd Environmental Assessment Committee

Date	Start		Finish	Subject	In-Charge
Jun. 04 (Fri.) (1st Day)	09:00	-	09:30	Opening speech (Introduction, Opening address)	JICA
	09:30	-	10:15	General explanation of the Interim Report	Study Team
	10:15	-	10:35	Discussion	Committee
	10:35	-	15:40	Presentation of the Interim Report	Study Team
	15:40	-	16:00	Discussion	Committee
Jun. 07 (Mon.) (2nd Day)	09:00	-	09:10	Discussion	Committee
	09:10	-	11:30	Advice from Committee members	Committee
	14:00	-	16:00	Report Preparation by Committee	Committee
Jun. 08 (Tue.) (3rd Day)	09:00	-	09:40	Report Presentation by Committee	Committee
	09:40	-	09:45	Comments by HPO	HPO
	09:45	-	10:30	Discussion on further schedule	Study Team

(2) Minutes of 2nd EAC Meeting

The 2nd Committee meeting was held in Vientiane by the five (5) committee members, the four (4) Study Team experts chaired by the technical adviser. The main programs of the EAC meeting were the general explanation by the Study Team in the 1st day, comments from Committee to the Study Team in the 2nd day, and the explanation by Committee on his report in the 3rd day. Main points discussed in the meeting were as follows:

General

(i) After presentations by the Study Team, the Committee generally recognized that field surveys and data collections by the sub-contractor were carried out properly. The committee members expressed their expectation that the further analysis based on survey results and collected data would be made and incorporated in the Final Report to be submitted in January 2000.

Population subject to Resettlement

(ii) Discussions in the Committee were made based on newly obtained detailed elevations in the reservoir area and survey data of required number of people for resettlement. The survey results showed 1,207 people in 4 villages below EL.315m, 2,417 people in 7 villages in the densely populated range of EL.319m~EL.335m, 851 people in 3 villages in the range of EL.335m~EL.360m, and 729 people in 3 villages above EL.360m (the highest point at EL.368). Total population related to resettlement is 5,204 people in 17 villages.

(iii) However, the following question arose: whether such classifications by elevation for 4,997 people living above EL.315m were meaningful, in other words, whether it was

meaningful to leave a part of the Thaviang Sub-District. This idea lead to only two alternatives: to keep water level below EL.320m or to inundate the Thaviang Sub-District.

Economic Evaluation

(iv) The Study Team carried out preliminary studies on project scale optimization and economic evaluations. The study results showed power of 377MW, annual energy of 1,983GWh, and net benefit (B-C) of US$151.2 million for the case of water level at EL.360m, and power of 245MW, annual energy of 1,375GWh, and net benefit (B-C) of US$85.1 million for the case of water level at EL.320m. The net benefit increases at about US$66.0 million by rise of water level. From an economical point of view, it was concluded to set the water level at EL.360m or above. As resettlement of about 4,000 people is required in this case, intention of the affected people would be the important decisive factor.

(v) However, both cases indicated economic internal rate of return of less than 15%, which implied a doubt of project feasibility. Since the economic evaluation was based on several conditions including assumptions, further detailed studies were necessary. It is noted that benefits applied to the economic evaluation were obtained from construction and operation cost of thermal power plants (gas turbine and combined cycle) in Thailand.

Hydrological Data

(vi) Discussions were made regarding hydrological conditions, which were the basis of the above economic evaluation. Especially, the most concerned issue was that an inflow to the dam was decreased at 78% from 208m^3/s in the Pre-F/S report to 162m^3/s this time. As a result annual energy also decreased from 2,900kWh to 1,983kWh. Such modifications were made, because an estimate of annual average rainfall in the Nam Ngiep River catchment was changed from about 2,900mm to 2,200mm based on rainfall estimate in the vicinity of Lao PDR studied for the Nam Theun 2 HEPP.

(vii) Though the Committee member expressed a question that the inflow estimate seemed too pessimistic, the Study Team replied that sufficient data was not available to change the results of Nam Theun 2 study, which took a comparatively long study period. The Study Team also commented that the rainfall estimate in the Nam Theun 2 study may be somewhat conservative for the Nam Ngiep project, because no rainfall data was available in the upstream reaches of the Nam Ngiep River. Further study would be executed after the new flow measurement records for 365 days were available in September 1999. Even though the new flow records would be ready, hydrological data would be still insufficient. It might be necessary to proceed to the next stage with two conceivable cases: a pessimistic case and an optimistic case.

Peak Operation Hours

(viii) The technical adviser specialized in hydropower planning raised an opinion that economic feasibility would be considerably improved, if peak operation hours would be changed from the proposed 16 hours to 8 hours. The proposed peak hours were determined, because the present daily load curve in Thailand has a daytime peak and evening peak with almost the same level and EGAT intended to purchase power with 16 hours peak. The adviser explained that the shortage of an 8-hour peak power would occur in a few years in Thailand considering the power demand trend in Thailand for the recent 10 years. He suggested studying an 8-hour peak operation, which was normally

advantageous for hydropower plants. MIH commented that the idea seemed difficult to be applied, since the planned Nam Theun 2 plant (installed capacity: 900MW) aimed at a 16-hour medium-peak operation.

(ix) The Committee proposed to formulate the Project as a stage-wise development and to study the economic evaluation for this stage development plan. The stage development would be as follows: 377MW (case of FSL.EL.360m) with a 16-hour medium-peak in the 1st stage, and 754MW with an 8-hour peak in the 2nd stage. This idea was based on the economic evaluation results. In financial evaluations to be executed in the next Study step, the unit power rate agreed with EGAT became the project benefit. For realistic financial evaluations, it would be necessary to assure peak power supply with 90% to 95% reliability so that EGAT could recognize peak power kW- value assumed in the Study. Therefore, the following issues would raise: increased reservoir capacity of re-regulating facilities and reliability of hydrological data.

Cost for Mitigation Measures for Environmental Impacts

(x) For the alternative of water level at EL.360m, the cost for environmental mitigation measures and compensation including re-regulating pond, relocation roads, and resettlement from reservoir area were estimated at about US$25 million (about US$14 million for resettlement cost), which was 5.1% of total construction cost of about US$577 million. The Committee was not willing to agree to the amount. Though the Study Team explained that compensation cost for resettlement is difficult to exceed significantly the amount shown in the Government regulations and other projects, the Committee felt the cost was under-estimated from a viewpoint of "profit return to local inhabitant". It was recommended to implement detailed countermeasures against issues raised from EIA considering contributions to rural development of vicinity of the river basin. Conceivable countermeasures were to establish a river basin conservation fund, to develop road networks, and to provide social infrastructures for surrounding villages (roads and transportation, irrigation and fishery facilities, electrification and telecommunications, and public facilities such as hospitals, movie theaters, sports grounds, libraries, and religious facilities), etc.

(xi) Many opinions regarding compensation for resettlement were presented mainly from the Committee's resettlement specialists. The resettlement plan should include arrangement of means for livelihood for resettled people such as agriculture with irrigation, fishery in new reservoir, and forestry near resettlement site. Dr. Graybill, one of the Committee members, introduced an example of fishery development in Indonesia.

(xii) Other ideas were presented from Laotian specialists. Considerations should be made to the relationship of respective families, people belonging to minor races, and people having land in the reservoir area and not settling permanently. Mr. Somboune of MIH suggested that the resettlement site should be selected near the reservoir. It was also discussed that some options of a resettlement site should be planned so that the people could select their favorite site. Further investigations for site selection and presentation of clearly understandable visions including an illustrated resettlement plan would be necessary.

Dam Geology

(xiii) Dr. Inoue, one of the members, commented on the importance of dam design and construction and necessity of careful considerations in geological investigation plan,

explaining the significant dam height, in case of higher FSL, which includes the excavation of river deposits. If the dam height exceed more than 200m, it may be one of the highest concrete faced rockfill dams in the world. He also gave his attention to the open cracks in the basement rock at the higher elevation of the left bank, which would cause increase in excavation volume and construction cost related to economic evaluation of the project.

(3) EAC Report and Study Team's Comments

The Committee's report, in which the comments and advice of the respective member were summarized, was submitted to JICA and JICA handed it to the Study Team. The answer and countermeasure in response to the recommendations made by the Committee were compiled in Supporting Report (V)2.3. It was distributed to each Committee member after getting concurrence of JICA and MIH/HPO. These reports and comments were distributed to the Embassy of Japan in Lao PDR, JICA Laos office, and MIH.

The Committee's report and Team's answer were treated as open documents and would be opened to the public in the 3rd General Workshop in December 1999.

11.1.4 THE 3RD EAC MEETING

(1) General

The 3rd Environmental Assessment Committee meeting was held in Vientiane, same as the 2nd General Workshop, from December 3 to 8, 1999 for four (4) days prior to the 3rd General Workshop. The main topics of the meeting were explanations and discussions on the Final Report (2nd Draft) submitted in mid-November 1999, and comments from the Study Team on the 2nd EAC Report. Out of the said reports and its summary report, the following reports and documents were also presented as the Supporting Reports on (i)First EIA Report, (ii)Preliminary Environmental Management Plan, (iii)Preliminary Resettlement Plan, (iv)Records during Field Investigations. Explanation on the above was made smoothly by a computer program using the LCD projector and screen for presentation.

Observers including 4-Study Team members, MIH as the counterpart, JICA headquarters, JICA/Laos office, a Laotian Gender expert appointed by the Study Team and a Canadian facilitator. The member of the Committee was six (6) persons same as the previous. Specially, the reporting on the result of field investigation was made for the Thaviang peoples by the Gender specialist. In addition, the facilitator of the workshop made suggestion for the method of presentation.

Attendance to the Committee meeting and execution program of the meeting are given in Table 11.1.6 and Table 11.1.7 respectively.

Table 11.1.6 Attendance List of 3rd Environmental Assessment Committee

No.	Position	No. of Attendance	Name (without title)
1.	Counterpart (MIH)	3	Somboune, Chansaveng, Sisoukham
2.	EAC	6	Inoue, Graybill, Thongsy, Vean, Songhoua, Adachi
3.	JICA (Tokyo)	1	Kobayashi
4.	JICA (Laos)	2	Abe, Hatsadong
5.	Study Team	5	Araki, Ikeda, Yon, Ragsdale, Kesone
6.	Others (Observer)	1	Facilitator at General Workshop
	Total	18	

Table 11.1.7 Execution Programs of 3rd Environmental Assessment Committee

Date	Start		Finish	Subject	In-Charge
Dec. 3 (Fri.) (1st Day)	14:00	-	14:30	Opening speech (Introduction, Opening address)	JICA
	14:30	-	15:30	Explanation of Final Report (Draft) General	Study Team
	16:00	-	17:30	Explanation of Final Report (Draft) Hydropower Plan	Study Team
Dec. 6 (Mon.) (2nd Day)	09:00	-	12:00	Explanation of Final Report (Draft) Natural Environm.	Study Team
	14:00	-	17:00	Explanation of Final Report (Draft) Social Environm.	Study Team
Dec. 7 (Tue.) (3rd Day)	09:00	-	12:00	Discussion	EAC
	14:00	-	17:00	Report Preparation by Committee	EAC
Dec. 08 (Wed.) (4th Day)	09:00	-	11:00	Report Preparation by Committee	EAC
	11:00	-	11:30	Reporting by Committee	EAC
	11:30	-	12:00	Comments by HPO	HPO
	12:00	-	14:00	Lunch party	EAC/Team

(2) Minutes of 3rd EAC Meeting

The 3rd Committee meeting was held in Vientiane by the five (5) committee members, the five (5) Study Team experts including a Gender specialist chaired by the technical adviser. The main programs of the EAC meeting were the general explanation by the Study Team in the 1st and 2nd days, comments from Committee to the Study Team in the 3rd day, and the explanation by Committee on his report in the 4th day. Main points discussed in the meeting were as follows:

General

(i) The EAC appreciated for the Study Team, who has performed without lack of the particulars for the theme: EIA, resettlement plan, and preliminary technical studies for the above and completed satisfactorily the presentation by using a modern technology. The EAC also appreciated for the study on Gender issue by Miss Kesone following the suggestions made by EAC at the last committee meeting.

Study on Backwater Effect and Sedimentation Problem at the Upstream end of the Reservoir

(ii) Dr. Graybill (Natural Environmentalist) commented that information concerning the natural environment of the reservoir does not appear to provide a strong basis for choosing or avoiding FSL cases EL.320m or EL.360m. However, he pointed out, if the team proposed FSL.320m, until detailed studies of the cumulative effects of backwater curves and sediment deposition prove otherwise, Mr. Adachi, advisor of EAC also expressed similar concern and proposed further detailed study for determination of FSL with adjustment taking into consideration these phenomena.

Prospective Resettlement Site

(iii) Dr. Graybill also recommended that detailed study for resettlement should be made including the affected peoples in the member showing the definite plan and candidate

sites. He pointed out for the selection of the site that the unexploded ordnance (UXO) problem should be taken carefully into consideration.

Back Sand Effect

(iv) Dr. Inoue (Engineering Geology) explained that the sedimentation in the Nam Ngiep basin is probably not serious problem assuming from the actual state observed in the Nam Ngum basin. This opinion will influence significantly on the judgment of back sand effect at the reservoir upstream area.

(v) Dr. Inoue gave significant recommendation on geologic investigation for the next stage in the light of current progress of the study. He emphasized that the EL.320m reservoir would be born from the 156m height dam, which was still classified into high-class dam, and suggested careful investigation on micro adjustment of dam axis, weathered depth, limestone existence and deep crack to be found at the dam foundation.

Resettlement Plan

(vi) Mr. Venvonphet (Natural Environmentalist) appreciated for the team's recommendation for the development of the medium scale (FSL.320m) from the viewpoint of the drastic reduction to 1,200 persons of resettlement. He pointed out the necessity of resettlement program to be cooperated with the development plan of provincial and regional levels. He also asked to give an attention to the UXO in the resettlement land.

(vii) Ms. Thongsy (Social Environmentalist) pointed out that the resettlement plan will be accepted with the effort of the frequent explanation to the peoples. She requested for the improvement of the regional living standard and rural electrification. In the preparation of the plan, she also advised to establish careful vocational training program to the villagers concerned and to involve several agencies concerned, such as Lao Front for National Construction, Youth Organizations and so on.

(viii) Mr. Songhoua (Resettlement Specialist) also made the similar request as Ms. Thongsy and added to the involvement of Lao Women's Union for the planning. He emphasized that the resettlement plan should consider not only the technical aspects but also the local religion of each group of people to be resettled.

Financial Analysis

(ix) Mr. Somboune Manolom (MIH) asked permission to speak for the selection of FSL and he expressed his concern about the result of financial analysis: 12.1% of the financial IRR worked out for the Nam Ngiep-1 on the condition of 6.42c/kWh of the power tariff, which was levelized for 25 years might be not feasible in view of the strong stand of Thai side in negotiation. Although the agreed tariff for Nam Ngum series projects was increase from 4.178c/kWh in April to 4.372c/kWh in October 1999, this tariff is of December 2006 including NG2 and NG3. On December 14, 1999, there scheduled to be held another tariff negotiation. In this negotiation, Lao PDR and NTEC will propose the tariff 4.74c/kWh, but it is probably difficult to be agreeable for Thai side due to the recent lack of electricity demand in Thailand. Therefore, hoping 5.78c/kWh for NG3 and 5.63c/kWh for NG4 are also difficult target in the negotiation.

(x) FIRR should be more than 15% or 18% if possible for safe when 25-year long concession period is taken into account. The Study Team planned to use 25% of soft loan, but the remaining portion was planned with very hard loan of 12.5% interest rate, that is not understandable. He explained that the ordinary interest rates of hard loan are not so high

likely: 6% of LIBOR, 8% of OCR, 8.5% of ECA, etc. and average ranges around 8%. Therefore, he advised that the large scale scheme FSL.360m should not be deleted in the future stage and various studies such as resettlement plan, hydrological analysis, financial analysis, UXO study, backwater analysis, so on are to be continued.

(xi) Mr. Adachi, after showing his respect for the appropriateness of the project evaluation by the economic analysis not by the financial analysis at this stage, pointed out the necessity of the review on hydrological aspect and power peak load duration of the Project, aiming at further improvement in financial viability of the Project. He explained that Thailand will meet in the near future a power crisis assuming from the recent changes: economic situation is rapidly being improved and peak load demand is coming into sharp. He also added that the new power plant requires 8c/kWh for construction, because the international market price of oil is now US$18 per barrel (US$15 used in this report). Accordingly the time will come soon that the tariff negotiation is made between the minimum 4.372c/kWh and the maximum 8c/kWh.

(xii) The Study Team strongly recommended the scheme of FSL.320m putting the weight on the reduction of inundation scale, because the drastic improvement of FIRR is not expected by the development of the scheme FSL.360m.

F/S at Next Stage

(xiii) The EAC meeting was closed without consensus, since the meeting's purpose was not the final judgement of the Project development scale. The execution plan for the next stage F/S will be discussed between JICA and GOL after consideration of EAC meeting results. Probably, therefore, the extent and scopes for the further investigation and study of F/S will be not limited only for the medium scale development.

(3) EAC Report and Study Team's Comments

It was requested that the Final Report shall be compiled after the execution of additional investigation on the economic situation in Thailand and Vietnam as well as alternative study on the project financing structure. Especially, economic situation survey in Thailand is very important for assessment of the implementation of the Project. Moreover, in addition to the investigations for the implementation, this time is to perform a positive promotion exchanging opinions among the various organizations.

The Committee's report, in which the comments and advice of the respective member were summarized, was submitted to JICA and JICA handed it to the Study Team. The answer and countermeasure in response to the recommendations made by the Committee were compiled in Supporting Report (V) 2.4.

The Committee's report and Team's answer were treated as open documents and would be compiled in the Final Report to be submitted in February 2000.