3.4 DJATILUHUR PROJECT

3.4.1 Introduction

Cost allocation is to allocate justly and appropriately the costs of the construction of the common facilities in the comprehensive development of river basins in accordance with each separate objective of the whole plan. (See Appendix 3-15.)

Multi-purpose dams and common canals are, in general, common facilities, but the major common facilities are the multi-purpose dam in the comprehensive development of river basin.

In Japan, an act was legislated in 1952 to establish an uniform standard for the methodology of cost allocation, and was modified later in 1967 to eliminate some contradictions found in it. Therefore, we basically apply the "Japanese Cost Allocation Method", which has been used in Japan as a standard method and is thought to be the most reasonable at present, to the cost allocation of Djatiluhur project.

3.4.2 Cost Allocation

(1) The Estimation of the adjusted construction costs

The content of the data obtained from P N Djatiluhur is roughly as follows.

Table – 3.4.1 The Content of Construction Costs

Unit: US$

	Foreign Currency		Local Currency
	Amount	Adjusted Amount *	Amount
I. C.F.E. (Civil Engineering Contractor)	81,344,321	103,639,000	
II. C.O.B. (Overall Consulting Engineer)	24,414,465	28,865,000	
III. Soletanche (Boring and Grouting Contractor)	11,395,615	13,983,000	80,000,000 **
IV. Sogreah (Laboratory Test)	38,000	49,000	
V. Cogelex/G.I.E. (Electric and Mechanical Contractor)	19,096,283	21,400,000	
T o t a l	136,288,684	167,936,000	

Note: * *Adjusted amount in 1967, considering the year for payment and the annual interest rate of 5 per cent.*

** *The detailed items are not known.*

By assuming the following items for the construction costs, we estimated the adjusted amount for each item of the construction costs, based on the data of the adjusted foreign currency portion (shown in the previous page) and the adjusted local currency portion. Our estimation is as follows. As to the local currency portion of us $80 x 10^6, adjustments are made based on the estimated amounts of Rupiah for the annual expenditures, which are assumed to be proportionate to the foreign currency expenditures.

Table – 3.4.2 Estimation of the Breakdown of Construction Costs

Unit: US.$10^6

Item	Foreign Currency	Local Currency	Total	Construction Costs*	Facilities
A. Preparatory Works	7	8.4	15.4		
B. Dam Works	55	8	63	131.6	Common
C. Intake Tower Works	10	4.5	14.5	30.3	Common
D. Tailrace and Control Building	4.3	2.1	6.4	13.4	Common
E. Powerhouse, Switchyard, Penstock, Power Generating Equipments	15		15	26.7	Exclusive for Power Generation
F. Construction Machinery	16.1		16.1		
G. Construction Plants	10		10		
H. Consulting Engineering	28.9		28.9		
I. Compensation		7	7		
J. General Expenses	8.7	1	9.7		
K. Contingency	13	3	16		
T o t a l	168	34	202	202	

Note: * *We calculated the construction costs for common facilities and exclusive facilities by examining the items except for B, C, D and E, and eventually included them in the items B, C, D and E.*

The result of our calculation are as follows.

Construction costs for common facilities: $175.3 x 10^6

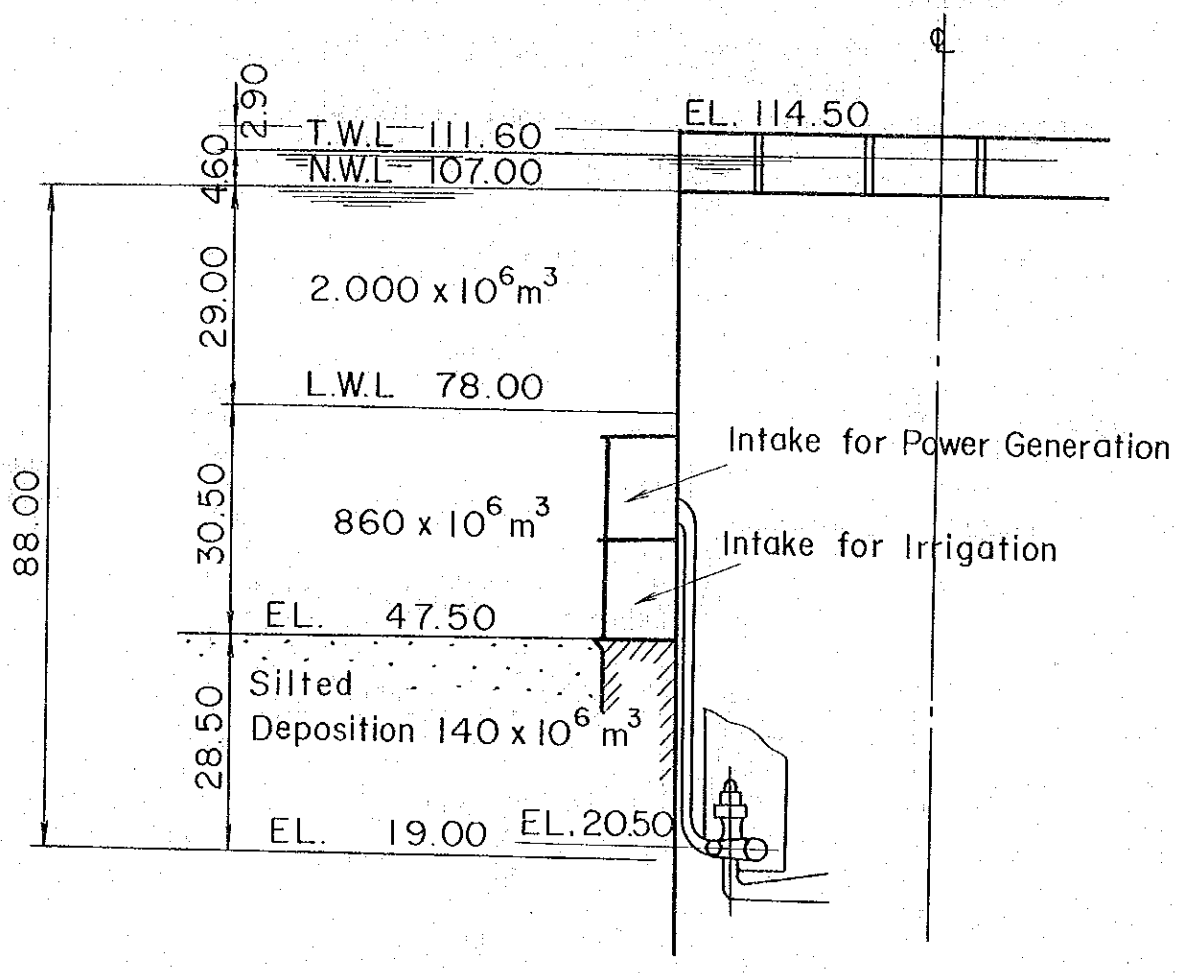
Construction costs exclusively for power generating facility: $26.7 x 10^6

Other construction costs are estimated as follows.

For transmission lines and substations: $8 x 10^6

For irrigation works: $30 x 10^6

Fig. 3.4.1 Capacity of Reservoir



(2) Allocation of reservoir capacity (See Fig. 3.4.1 and 3.4.2)

a. Assumptions

(a) Assumed that during the wet season (from November to May, considering the normal water level in the master plan) the reservoir is to be filled, and that during the dry season (from June to October) water is totally discharged from the reservoir.

(b) Calculated the required quantities of water for each purpose (irrigation, power generation, and water supply) based on the data in the master plan and others, and allocated the effective reservoir capacity of 2,000 x $10^6 m^3$ in accordance with the ratio of the above-calculated required quantities of water.

(c) Assumptions in the calculation of the alternative expenditure and the separable cost.

(i) Alternative expenditure

For the flood control, we considered the flood control volume of the natural overflow type (392 x $10^6 m^3$, which corresponds to the depth of 4.60 m in the master plan), and the volume of silted deposition.

For irrigation and water supply, we considered the allocated capacity in the dry season, the volume of silted deposition and the overflow depth which corresponds to the overflow discharge of 3,000 m^3/s.

(ii) Separable cost

For flood control, we assumed that there is no separable cost, because the reservoir is the overflow type and the exclusive volume for flood control is not included in the effective capacity of 2,000 x $10^6 m^3$.

For purposes other than the flood control, the calculations were made based on the allocated capacities in the dry season. However, in the case of power generation, dead water was taken into consideration.

b. Capacity allocation

(a) Irrigation

According to the master plan, the required volume for irrigation is as follows.

Dry season (from June to October) :	2,064 x $10^6 m^3$
Wet season (from November to May) :	1,784 x $10^6 m^3$
Total	3,848 x $10^6 m^3$

(b) Power generation

In the master plan, the increment of the volume of water discharge for power generation, which supplements the shortage of power generation caused by the lowered water level, is taken into consideration.

If we consider the dry season only, the required volume in September and October is 257 x 10^6 m^3. And the dead water of the reservoir is 860 x 10^6 m^3.

(c) Water supply (including water for sewage treatment)

For Djakarta and its harbour, 3 m^3/s are supplied from Djatiluhur as clean water. In the dry season, the following volume of water is required.

3 m^3/s x 3,600 x 24 x 153 days = 40 x 10^6 m^3

For Djakarta, 10 m^3/s of water for sewage treatment is required.

10 m^3/s x 3,600 x 24 x 153 days = 132 x 10^6 m^3

The total volume of water required for the purpose of water supply is 172 x 10^6 m^3. 40 x 10^6 m^3 + 132 x 10^6 m^3 = 172 x 10^6 m^3.

The following table shows the allocated capacities in the dry season.

	Required Volume		Allocated Capacity
Irrigation	2,064 x 10^6 m^3	⟶	1,655 x 10^6 m^3
Power Generation	257 x 10^6 m^3	⟶	207 x 10^6 m^3
Water Supply	172 x 10^6 m^3	⟶	138 x 10^6 m^3
T o t a l	2,493 x 10^6 m^3		2,000 x 10^6 m^3

(3) Alternative expenditure

a. Flood control

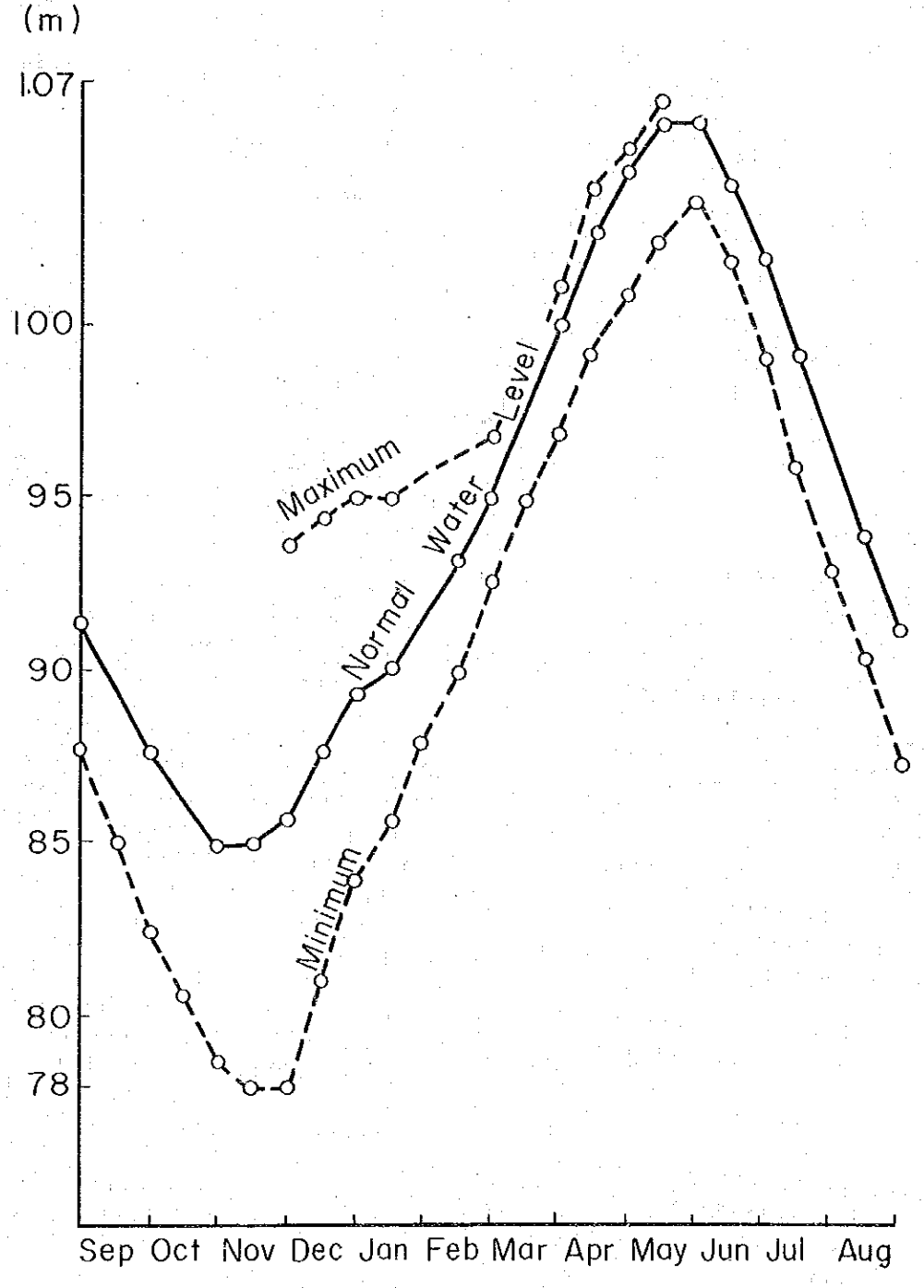
V = 392 x 10^6 m^3 + 140 x 10^6 m^3 (volume of silted deposition) = 532 x 10^6 m^3

WL : 65 m,

Height of Crest : 65 m + 2.90 m = 67.90 m

Volume of Dam: 1.05 x 10^6 m^3 ..... (by Fig. 3-4-3)

Fig. 3. 4. 2 Normal Water Level of Reservoir



Dam: $11.43 \times 1.05 \times 10^6 = US\$12 \times 10^6$
EL of Intake Tower : 47.50 m
Volume of Intake Tower: 201×10^3 m^3..... (by Fig. 3-4-4)

Intake Tower: $84.1 \times 201 \times 10^3 = US\$16.9 \times 10^6$

Tailrace and Control Building: $US\$13.4 \times 10^6$
Total $US\$42.3 \times 10^6$

b. Irrigation

$V = 1,655 \times 10^6 + 140 \times 10^6 = 1,795 \times 10^6$ m^3

WL : 91.5 m,
Height of Crest : 91.5 m + 7.50 = 99 m
Volume of Dam: 6.45×10^6 m^3 ..... (by Fig.3-4-3)

Dam: $11.43 \times 6.45 \times 10^6 = US\$73.6 \times 10^6$
EL of Intake Tower: 91.5 m
Volume of Intake Tower: 290×10^3 m^3 ..... (by Fig.3-4-4)

Intake Tower: $84.1 \times 290 \times 10^3 = US\$24.4 \times 10^6$

Tailrace and Control Building: $US\$13.4 \times 10^6$
Sub-total $US\$111.4 \times 10^6$

Construction cost for Exclusive Facility : $US\$30 \times 10^6$
Total $US\$141.4 \times 10^6$

c. Water supply

$V = 138 \times 10^6 + 140 \times 10^6 = 278 \times 10^6$ m^3

WL : 55.5 m,
Height of Crest : 55.5 m + 7.5 m = 63 m
Volume of Dam: 0.8×10^6 m^3 ..... (by Fig. 3-4-3)

Dam: $11.43 \times 0.8 \times 10^6 = US\$9.1 \times 10^6$
EL of Intake Tower : 55.5 m
Volume of Intake Tower : 210×10^3 m^3 .....(by Fig. 3-4-4)

Intake Tower : $84.1 \times 210 \times 10^3 = US\$17.6 \times 10^6$

Tailrace and Control Building : $US\$13.4 \times 10^6$
Total $US\$40.1 \times 10^6$

Fig 3.4.3 Elevation and Volume of Dam

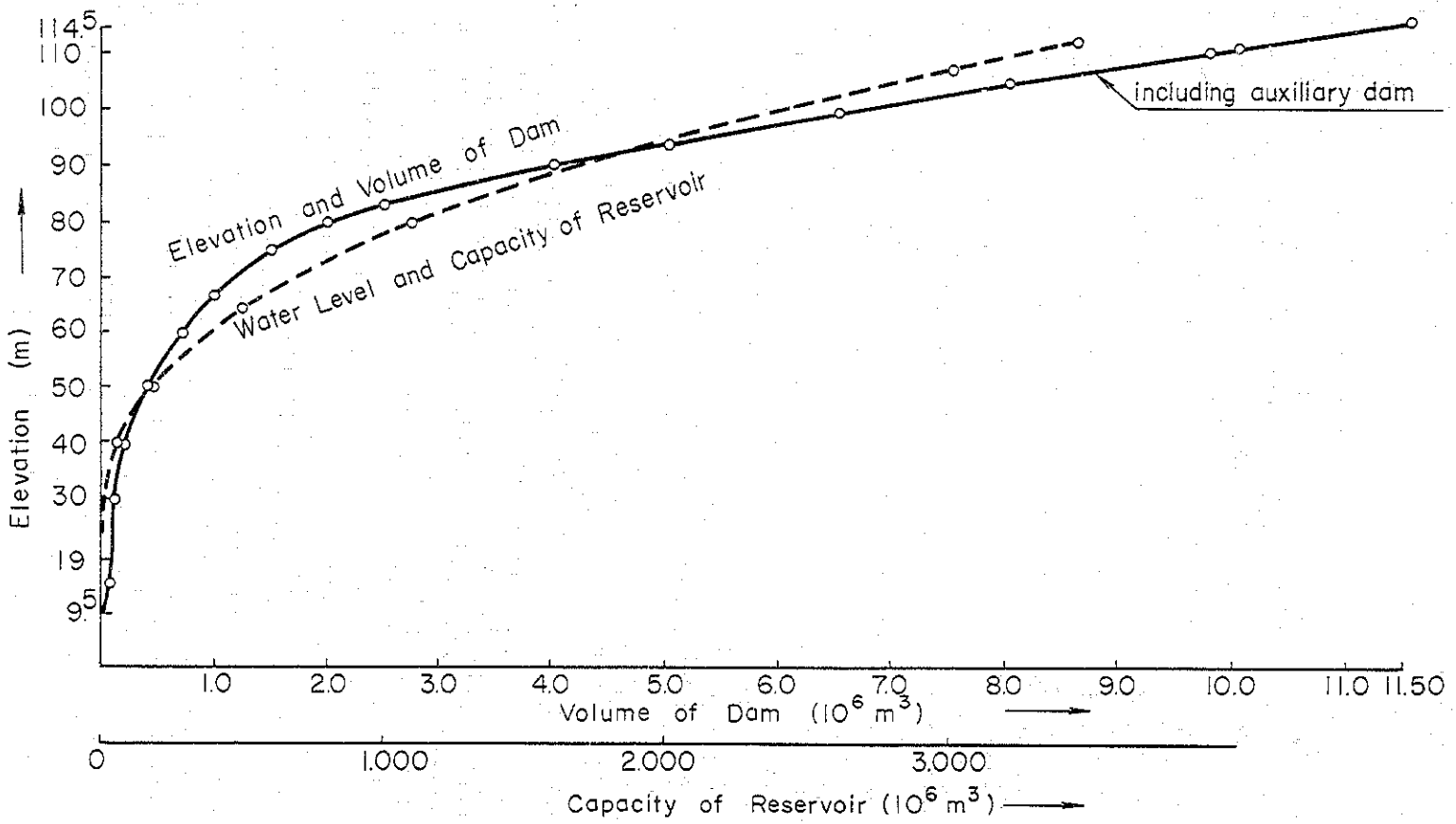
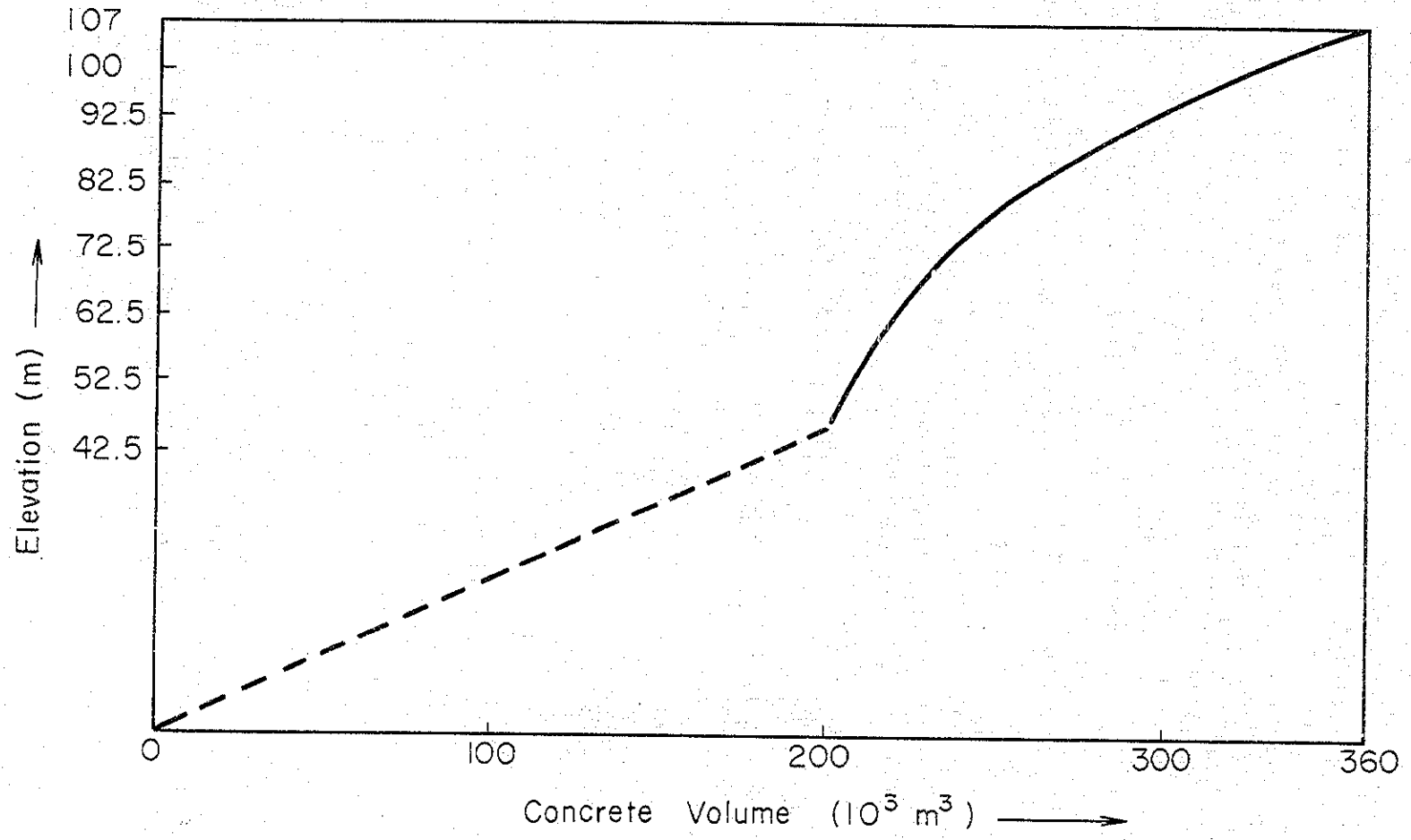


Fig. 3.4.4 Concrete Volume of Intake Tower



d. Power generation

(a) Assumptions

(i) The calculation of the alternative expenditure is based on the annual expenditure of the standard steam power plant. The unit capacity of the standard steam power plant is assumed to be 50 MW.

(ii) The reservoir is planned to be operated based on the normal water level of 80% dry year, determined mainly by the required quantity of water for irrigation. Thus, the operation of power station is also assumed to be based on the above-planned level of water.

(iii) As we can expect the gradual transition of the operation of the generators from three units at present to five units in the future during the life time, we take the four unit operation as the average operation during the life time.

(iv) The yearly average of monthly peak outputs (the peak period is for ten hours) at the Djatiluhur Power Station is considered to be the effective power (92 MW) at the power station, assuming the operation of four units with one stand-by unit. (See Appendix 3-16)

(v) For the effective energy at the power station, we take 658 x 10^6 KWH/Year of the master plan as the average value during the life time.

(b) The calculation of the annual expenditure for a standard steam power plant

(i) Standard steam power plant

Table 3-4-3 Standard Steam Power Plant

Item	
Unit Capacity	50 MW x 2 units
Type	Residual Oil
Unit Construction Cost	US$250/KW (Priok #3, #4, US$230)
Station Use	6%
Life Time	15 years
Interest Rate	5%
KW Adjustment	1.1
Construction Cost for Transmission Lines	US$9/KW (77KV, 100MW, standard distance of 40 KM, US$22,200/KM x 40 = US$888,000)
Transmission Loss	5%

(ii) Annual expenditures (Fixed costs) of the standard steam power plant

Table 3-4-4 Annual Expenditures (Fixed Costs) of the Standard Steam Power Plant

I t e m	
Interest and Depreciation	2,275 US¢/KW (residual 10% 0.096 x 0.9 + 0.05 x 0.1 = 0.091)
Labour Cost	36 US¢/KW (120 staff members, $300/staff member per year)
Repairing Cost	250 US¢/KW (1% of Construction Cost)
Others	125 US¢/KW (0.5% of Construction Cost)
T o t a l	2,686 US¢/KW

(iii) Annual expenditures of the standard steam power plant used in our calculation

Table 3-4-5 Annual Expenditures of the Standard Steam Power Plant Used in Our Calculation

I t e m	
Fixed Costs for Steam Power Plant	2,686 US¢/KW
Variable Costs for Steam Power Plant	0.5 US¢/KWH (Perak 0.53, Priok #1 and #2, 0.56)
Fixed Costs after KW Adjustment	2,955 US¢/KW (2,686 x 1.1 = 2,955)
Expenditure for Transmission	90 US¢/KW (9 x 0.1 = 0.9)
Sub-total	3,045 US¢/KW
Total Expenditure at the Entrance of the 77KV Substation	3,420 US¢/KW : 3,045 ÷ (1−0.06−0.05)
Calculation Cost	3,400 US¢/KW 0.56 US¢/KWH : 0.5 ÷ (1−0.06−0.05)

(c) The calculation of alternative expenditure

The KW value and KWH value (the limit amount of annual expenditure) of the Djatiluhur Hydro Power Station at the load center are as follows.

KW Value : US$34/KW x 92 x 10^3 (1 – 0.02 – 0.005)
= US$3,050,000
Transmission loss ——— 0.02
Substation loss ——— 0.005

KWH Value : US¢ 0.56/KWH x 658 x 10^6 (1 – 0.014 – 0.005)
= US¢ 361 x 10^6 = US$3,610,000
Sub-total : US$6,660,000/Year

The annual expenditure for transmission lines and substations is as follows.

US$8,000,000 x 0.1 = US$800,000
Construction costs for transmission lines : US$3.5 x 10^6
Construction costs for substations : US$4.5 x 10^6

Thus, the limit amount of annual expenditure is,

US$6,660,000 -- US$800,000 = US$5,860,000

If we capitalize the above amount, we can get the limit amount of profitable investment for the Djatiluhur hydro power station.

The limit amount of profitable investment

$$= \frac{5,860,000 - 482,540}{0.057}$$

= US$94,400,000

where i = 0.05, n = 40,
residual value rate : 0.1
the operation and maintenance cost at the Djatiluhur Hydro Power Station : US$482,540

(4) Justifiable investment

a. Irrigation

(a) Assumptions

(i) We assumed the irrigable areas in the dry season as follows.

25,000 ha. before 1962
90,000 ha. in 1967
240,000 ha. in 1977 ..... (See Appendix 3–17)

(ii) We assumed the crop per hectare, 2.5 tons of paddy up to 1965 and 2.8 tons of paddy after 1966. Though it is expected to be 4 tons of paddy after 1969 with the improved variety of rice, we assumed 2.8 tons of paddy, for our purpose is to evaluate the effect of the construction of the dam. ..... (See Appendix 3–17)

(iii) We assume that there would be no change in the crop in the wet season after the construction of the dam.

(b) The calculation of the average crop during the life time

..... (See Appendix 3–18 and 3–19)

The present worth of the total crops during the life time after 1968, with the base year of 1967, is 10,856,000 tons of paddy.

If we average the above amount during the life time, 10,856,000 x 0,058 = 630,000 tons of paddy/year = 315,000 tons of rice/year.

If we deduct the crop before the construction of the dam, the increased production, 315,000 – 31,000 = 284,000 tons of rice/year.

(c) The calculation of justifiable investment

We assume the standard unit price of rice of US$100/ton and the net profit ratio of 60%, the net profit is US$100 x 284,000 x 0.6 = US$ 17,000,000/year, where the net profit ratio is,

$$\frac{\text{Price of Produce} - \text{Production Cost}}{\text{Price of Produce}}$$

The standard unit price of $100/ton of rice is determined by considering the market price, the price determined by the government in 1967 and 1968, and the recent price trend. The net profit ratio is assumed to be 60%, considering the condition in the past.

Justifiable Investment

$$= \frac{\text{Annual Utility} - \text{Annual Expenditure}}{\text{Capital Recovery Rate}}$$

Capital recovery rate : 0.058 (i = 5%, n = 40)

Justifiable Investment

$$= \frac{17{,}000{,}000 - 806{,}000}{0.058} = \text{US\$}280{,}000{,}000$$

The construction cost of the exclusive facilities for irrigation (Jurug dam,

pump and gate facilities, main canals, secondary canals, etc.) is assumed to be US$30 x 10^6, in anticipation of the completion of the total irrigation works for 240,000 ha.

b. Water supply

The alternative expenditure is regarded as the justifiable investment for water works.

(5) Separable cost

a. Flood control

None (See the assumptions in the allocation of the reservoir capacity)

b. Irrigation

The capacity of reservoir for other purposes

$3,000 \times 10^6\ m^3 - 1,655 \times 10^6\ m^3 = 1,345 \times 10^6\ m^3$

Construction Cost

W.L. : 85 m, Crest of Dam : 92.5 m

Volume of Dam : $4.7 \times 10^6\ m^3$ ..... (by Fig. 3-4-3)

Dam: $11.43 \times 4.7 \times 10^6 =$ US$53.7 x 10^6

E L of Intake Tower : 85 m

Volume of Intake Tower : $268 \times 10^3\ m^3$.....(by Fig. 3-4-4)

Intake Tower : $84.1 \times 268 \times 10^3 =$ US$22.5 x 10^6

Tailrace and Control Building : US$13.4 x 10^6

Sub-total US$89.6 x 10^6

Separable Cost

$175.3 \times 10^6 - 89.6 \times 10^6 =$ US$85.7 x 10^6

The construction cost for common facilities : 175.3×10^6

c. Water supply

The capacity of reservoir for other purposes

$3,000 \times 10^6 - 138 \times 10^6 = 2,862 \times 10^6\ m^3$

Construction Cost

W.L. : 105 m, Crest of Dam: 112.5 m

Volume of Dam : $10.6 \times 10^6\ m^3$ ..... (by Fig. 3-4-3)

Dam : $11.43 \times 10.6 \times 10^6 =$ US$121 x 10^6

E L of Intake Tower : 105 m

Volume of Intake Tower : $350 \times 10^3\ m^3$ .... (by Fig. 3-4-4)

Intake Tower : $84.1 \times 350 \times 10^3 = US\$29.4 \times 10^6$

Tailrace and Control Building : $US\$13.4 \times 10^6$

Sub-total $US\$163.8 \times 10^6$

Separable Cost

$175.3 \times 10^6 - 163.8 \times 10^6 = US\$11.5 \times 10^6$

d. Power generation

The capacity of the reservoir for other purposes

$3{,}000 \times 10^6 - (860 \times 10^6 + 207 \times 10^6)$

$= 1.933 \times 10^6 \ m^3$

Dead Water : $860 \times 10^6 \ m^3$

For power generation : $207 \times 10^6 \ m^3$

W.L. : 93 m, Crest of Dam : 100.5 m

Volume of Dam : $6.85 \times 10^6 \ m^3$ .....(by Fig. 3-4-3)

Dam : $11.43 \times 6.85 \times 10^6 = US\$78.4 \times 10^6$

E L of Intake Tower : 93 m

Volume of Intake Tower : $296 \times 10^3 \ m^3$ .....(by Fig. 3-4-4)

Intake Tower : $84.1 \times 296 \times 10^3 = US\$24.9 \times 10^6$

Tailrace and Control Building : $US\$13.4 \times 10^6$

Sub-total $US\$116.7 \times 10^6$

Separable Cost

$175.3 \times 10^6 - 116.7 \times 10^6 = \$58.6 \times 10^6$

(6) Cost allocation

Table – 3-4-6 Result of Cost Allocation

Unit: $US\$10^6$

	Flood Control	Irrigation	Water Supply	Power Generation	Total	Remarks
a. Alternative Expenditure	42.3	141.4	40.1	94.4		
b. Justifiable Investment	-	280	40.1	-		
c. a or b, whichever is smaller	42.3	141.4	40.1	94.4		
d. Cost for Exclusive Facility	-	30	-	26.7		
e. c - d	42.3	111.4	40.1	67.7		
f. Separable Cost	-	85.7	11.5	58.6	155.8	
g. Residual Benefit (e-f)	42.3	25.7	28.6	9.1	105.7	
h. Residual (%)	40.2	24.2	27.0	8.6	100	
i. Allocation of the Residual Common Cost	7.8	4.7	5.3	1.7	19.5	175.3 - 155.8
j. Share (f + i)	7.8	90.4	16.8	60.3	175.3	The Construction Cost of Common Facilities
k. Percentage of Share (%)	4.5	51.5	9.6	34.4	100	

3-4-3 Power Cost

(1) Construction cost

The allocated share :	US$60.3 x 10^6
Construction cost for the exclusive facilities :	US$26.7 x 10^6
T o t a l	US$87 x 10^6

(2) Cost calculation (US$ 1 = Rp.326 in 1968)

a. Interest and Depreciation

Life time -------- n = 40 (years)
Interest rate ---- i = 0.05
Residual value rate = 0.1

US$87 x 10^6 x 0.057 = US$4.96 x 10^6 = US$4,960,000

b. Labour cost

The calculation is made based on the actual record of 1968, Rp.83,000 per person per year and the number of staff members involved. (See Appendix 3–20)

Rp.83,000 x 150 persons = Rp.12,450,000 = US$38,200

c. Repairing cost

We assume 0.5% as the ratio of the repairing cost to the construction cost.

US$26.7 x 10^6 x 0.005 = US$133,500

d. Fuel and lubrication oil

The estimation is made based on the actual record of 1968. (See Appendix 3–20)

Rp.23 x 10^6 = US$70,500

e. Supplies and miscellaneous expenses

The calculation is made based on the actual record of 1968, Rp.19,000 per person per year. (See Appendix 3–20)

Rp.19,000 x 150 staff members = Rp.2,850,000 = US$8,700

f. Others

The calculation is made based on the proportion of staff members directly engaged in power generation to the total member of personnel, (excepting tourism). (See Appendix 3–20)

$$\text{Rp.14} \times 10^6 \times \frac{150}{1768} = \text{Rp.1,185,000} = \text{US\$3,640}$$

g. Share for the maintenance and operation cost of the common facilities

The calculation of the share for the maintenance and operation costs of the common facilities is based on the ratio of cost allocation for power generation.

Common facilities : Rp.300 x 10^6 (US$920,000)(See Appendix 3–20)

Exclusively for power generation, Total of b, c, d, e, and f : US$254,540

(920,000 – 254,540) x 0.344 = US$228,000

h. Total : US$5,442,540

i. Energy production : 658 x 10^6 KWH

j. Power cost

US$5,442,540 ÷ 658 x 10^6 KWH = US¢ 0.83/KWH

Note: *(1) It is necessary to pay attention to the fact that the percentage of capital costs (interest and depreciation) in the power cost of US ¢ 0.83/KWH is as high as, about 90%; and that the percentage of the operation and maintenance costs is only 10%.*

(2) In general, the electric tariff of the power sales from a hydro power station is determined by dividing the tariff into the demand charge and the energy charge. In deciding on the proportion of this division, considerations must be made so that the energy charge per KWH is well below the fuel cost per KWH. In this way, the efficient use of the Djatiluhur power station can be promoted.

4. PROVISIONAL REVISION OF PRESENT TARIFFS

4. PROVISIONAL REVISION OF PRESENT TARIFFS

4-1 INTRODUCTION

(1) Electric power is closely related to the life of the people, and the supply of electric power is the indispensable service for industrial activities as a basic input for production.

Thus, electricity rates should be reasonable and fair, and equitable for every sort of demand. The principle of electric tariff formulation to meet the above requirements is the principle of cost basis.

(2) If we study the existing electricity rates in Indonesia from the above-mentioned point of view, although with the revision of rates in 1968 the approach to the principle of cost basis was attempted, the existing tariff level and structure still contain the elements of policy.

a. The whole level of electricity rates is suppressed considerably below the proper cost level, and the deficit cannot but be compensated by the subsidy from the national government.

b. The structure of electricity rates is rather based on the ability to pay principle. For example, the level of rate for the demand of small houses is half the average rate level. On the other hand, the rate level for the commercial demand is twice as high as the average rate level.

If we consider some political and economic factors which existed in the past, it seems that the establishment of such a policy-tinged tariff system has been unavoidable.

But we are afraid that the inclusion of policy elements in the electricity tariff system, which must be basically excluded from the tariffs of public utilities enterprises, will raise the cost level of electric power through ineffective management and lead to the inefficient allocation of resources, and eventually obstruct the economic and social development of Indonesia.

(3) If we aim at the economic and social stability and development by the successful implementation of the Five Year Development Plan, the revision of electricity rates must be carried out according to the principle of cost basis as much as possible, which is the principle on which the tariff of any public utilities enterprise must be based.

With such a revision, it is possible to expect in the electricity tariff,

a. the function of attracting outside capital,

b. the function of promoting the effective management, and

c. the function of allocating the resources in the most efficient way.

In this way the harmonization of the sound development of the electric power industry and the protection of the interest of consumers can be promoted.

We feel that the policy elements in the existing electricity tariff system can be transferred to other systems such as the taxation system and the social security system.

(4) In revising the electricity tariffs which are closely related to every facet of economic and social life, we carefully considered the factors which affect the present and future consumers, the economic and social environments in which Indonesia is placed at present, and the role of the electric power industry in the total development of Indonesia.

Needless to say, it is expected that the revised tariff system will contribute to the economic and social development of Indonesia.

(5) Recommendations concerning the provisional revision of electricity tariffs are made by assuming that efforts are going to be made in order to make the management of electric power industry most efficient, and that the tariff system based on the proper allocation of cost is going to be established.

Recommendations are the results of the careful examination of economic and social factors which exist at present, and are to indicate one step forward toward the vision of the future.

4-2 FUNDAMENTAL PRINCIPLES OF ELECTRICITY TARIFF FORMULATION AND THE GENERAL METHOD OF CALCULATION

4-2-1 Fundamental Principles of Electricity Tariff Formulation

(1) Self-supporting system

The electric power industry is a representative facility industry which has a large amount of fixed assets, and is also a basic industry of the nation. Its economic efficiency affects the whole national economy to a large extent.

Accordingly, whether it is a national enterprise or a private enterprise, the rational and efficient management is the top priority for the electric power enterprise.

It is a historical fact that the system of subsidy for the electric power enterprise

has been apt to suppress the desire for autonomous management and to obstruct the efficient management. Especially, the system of subsidy to compensate for the deficit in the current transaction has some very detrimental influences.

From the above-mentioned point of view, even if it is a national enterprise, the fundamental principle of the management of electric power enterprise in Indonesia should be the principle of self-support, which promotes the efficient and autonomous management. This self-supporting system can be established based on the sound system of electricity tariffs.

(2) Principle of cost basis

The electric power enterprise is a public enterprise and an enterprise which supplies electric power in a monopolistic fashion. Tariffs must, therefore, be so structured as both to promote the sound development of the electric power industry and to protect the interest of consumers, and the tariff system must also have objective adequacy.

The principle of cost basis should be applied in order to meet the above-mentioned requirements and is a fundamental principle which can be universally applicable not only to the electric power enterprise, but also to any monopolistic public enterprises.

The principle of cost basis consists of two components, the principle of total cost and the principle of allocated cost.

a. Principle of total cost

Needless to say, electricity tariffs should not bring about excessive profits for the electric power enterprise, but also should not be such as to make it impossible for the electric power enterprise to manage the enterprise properly. Thus the total revenue from the electricity tariffs must be to compensate for all the required costs to provide the good service to the consumers under the efficient management of the electric power enterprise. Such a principle is called the principle of of total cost.

b. Principle of allocated cost

Electricity tariffs should not be inequitable among the categories of demand and consumers. We must definitely refrain from the practice of establishing policy tariffs by making differentiation among the categories of demand and consumers according to the consumers' ability to pay. Electricity tariffs must be fairly and properly formulated based on the allocation of costs, considering the characteristics of load for each category of demand and the differences in the costs caused by the differences in the supply voltage, the method of use, and so on. That is the

principle of allocated cost.

By insisting on the principle of allocated cost, we can accomplish the following objectives.

(a) Efficient use of electric power according to the economic principle

(b) Strengthening of the supply capability in correspondence to the demand

(c) Raising funds for the strengthening of the facilities

(d) Consistent implementation of the principle of equity which is indispensable for a public enterprise

(3) The principle of equity

Because of the public and monopolistic nature of the electric power enterprise, tariffs must be equitable for every sort of demand.

If the application of discriminatory electricity tariff for a certain category of demand or a certain consumer is allowed in order to carry out a policy, the principle of protecting the interest of all the consumers cannot be maintained by the electric power enterprise. In this respect, the principle of equity for the consumers is the fundamental principle of the formulation of electricity tariffs.

This principle of equity can be maintained mainly by insisting on the principle of allocated cost which is already mentioned. It must be applied not only for the formulation of tariffs, but also for the application of the general supply rules and the rules concerning the share system for construction works.

4-2-2 The General Method of Calculation for Tariff Formulation

The explanation of the general method of calculation for tariff formulation based on the principles described in the preceding Section 4-2-1 is as follows.

(1) Calculation of total cost

The total cost is defined as the sum-total of the depreciation cost for the electric power facilities, the operating expenses, and the financial expenses. The calculation of the total cost must be based on the demand and supply program, the construction program and the financial program which are formulated by considering the actual records of the past and estimating reasonably for the future. For the purpose of this report, the cost calculation is made for the period of two years. In estimating the possible generated energy production from hydro-power stations, the conditions of the facilities and their rational operations must be considered.

a. Assumptions in calculation

(a) Demand and supply program

The demand and supply program consists of the estimation of the future demand for each category and the planning of the measures to supply electric power for the demand. Here the fuel program for power generation is also included. The demand and supply program can provide the basic data concerning the fuel cost and the purchasing cost of electric power, and can be the basis on which the calculation of revenues from the tariffs of each category of demand can be made.

(b) Construction program

The construction program is the program of construction works based on the demand and supply program, in order to supply adequate electric power while maintaining a proper level of service.

This program shows the condition of assets on which the calculation of depreciation costs can be based.

(c) Financial program

The financial program is a program for raising the necessary funds to implement the construction program smoothly. This program provides the basic data for the calculation of the financial expenses as the elements of total cost.

(d) Other programs

For the calculation of total cost, the personnel program on which the calculation of personnel expenditures are based, the business modernization program and other programs must be properly formulated.

(e) Period of cost calculation

In calculating the total cost, the period for the calculation must be determined. As the electric power enterprise is a public enterprise and the electric power industry is a basic industry, it is hoped that the electricity tariffs are stable for a long period of time. Thus, it is desirable to set the period of cost calculation as long as possible and include factors which affect the cost in the long run. But, on the other hand, it becomes more difficult to formulate the programs accurately as the period of cost calculation becomes longer. Considering the above-mentioned factors, the period of cost calculation is settled for two fiscal years.

b. Depreciation

The depreciation cost must be calculated by using a proper method, based on the acquisition costs of the fixed assets of the electric power enterprise and on the increment of fixed assets during the period of cost calculation considering the period of time in operation. Here the life time and the scrap value are determined in accordance with the law.

c. Business expenses

The business expenses are the residuals obtained by subtracting the expenses related to constructions and the miscellaneous business revenues from the sum of the personnel expenses, the fuel expenses, the expenses for purchasing electric power and other expenses, and are the expenses necessary for the sound and efficient management of electric power enterprise.

e. Financial expenses

The financial expenses are the residuals obtained by subtracting the interests during construction from all the interest charges for the period of cost calculation, based on the properly formulated plan of raising funds.

(2) Allocation of total cost

After the calculation of total cost which is the basis of the formulation of electricity tariffs is made, it is necessary to allocate the total cost for each category of demand, such as residential demand and industrial demand, in accordance with the principle of cost basis and the principle of equity.

Due to the differences in the conditions of using electric power including the differences in the voltage, loss, load factor, diversity factor, etc., the costs of electric power sold to the various kinds of consumers are different.

Thus, electricity tariffs for each category of demand must reflect fairly the differences in the conditions of using electric power. The allocation of total cost for each category of demand considering the differences in the conditions of using electric power has a very significant role in the process of formulating electricity tariffs. It is an ideal method faithful to the principle of cost basis that the supply cost of electric power is calculated separately for each consumer. But, as the electric power enterprise must supply power to a very large number of consumers, it is not realistic and not economically practicable to calculate the cost for every consumer.

Thus, in the actual allocation of total cost, the grouping of consumers based on the similarities in the load situation and supply cost must be carried out, and for each group of consumers, that is, for each category of demand, the allocation of total cost must be made.

Electricity tariffs must be established based on the allocated cost for each category of demand and by considering the characteristics of supply condition. The following is a summary of the allocation of total cost.

a. Departmental allocation of total cost

The allocation of total cost is made for the departments of power generation (hydro-power and thermal power), transmission, substation, distribution and sales; and the allocated costs are subdivided into fixed costs, variable costs and consumers' costs.

b. Allocation of total cost in accordance with the category of demand.

(a) Allocation of fixed cost

The allocation of fixed cost is made based on the load curve during the period of cost calculation and on the proportion obtained by compounding properly the coefficient calculated by the maximum demand method and the coefficient calculated by the peak responsibility method.

(b) Allocation of variable cost

The allocation of variable cost is made based on the proportion of energy used for each category of demand during the period of cost calculation. In the case that the component ratio of electric energy produced by hydro power stations and thermal power stations varies substantially according to the time and the season, this ratio must be taken into consideration for the allocation of variable cost for each category of demand.

(c) Allocation of consumers' cost

The allocation of consumers' cost is based on the ratio calculated by considering the number of consumers, the volume of works required and so on during the period of cost calculation.

(d) Others

In the allocation of total cost, the differences in the costs caused by the differences in supply voltage must be taken into consideration. We are to allocate the costs for power generation, power transmission and substation (which is required) for the extra-high voltage demand, the costs for generation, transmission, substation and distribution (which is required) for the high voltage demand and the costs for generation, transmission, substation and distribution for the low voltage demand.

(3) Determination of rates

Electricity rates are determined based on the allocation of total costs for each

category of demand, which is already explained. Rates are established for each kind of contract which is formulated by subdividing each category of demand, while considering the differences in the costs caused by the differences in the supply voltage, the method of measurement, the time and period of the use of power and so on. The former electricity rates are also taken into consideration. In this case, the total expected revenue calculated from the revised rates must be equal to the total cost which was reasonably estimated.

(4) Share system for construction work

It is a general rule that, in supplying power to the consumers, the electric power enterprise installs the power supply facilities on its own account, and the costs for installation are recovered through electricity tariffs. But in the case that a consumer demands a special supply facility or an excessively large amount of investment is required, a share for construction work must be burdened on the consumer according to the principle of burden on the beneficiary and the principle of equity. Thus, the share system for construction work is closely related to the tariff system narrowly defined, and must be of limited nature, set within the framework of the principle of equity.

4-3 DRAFT OF PROPOSAL FOR REVISION OF ELECTRICITY RATES

4-3-1 Fundamental Direction and Main Points of Tariff Revision

We calculated the proper cost of electric energy under the condition of efficient management, based on the principles and the general method of calculation discussed in the Section 4-2, while considering carefully the general circumstances of Indonesia at present and in the near future.

Based on the data included in this section, it would appear that the general cost of electric energy is about Rp.882/KWH and on this basis a balance between income and expenditure should be achieved. This cost level is a little higher than the international standard. But, considering the existing condition of the electric power industry in Indonesia, this cost level is not unreasonable and not feared to obstruct the economic and social development of Indonesia. Rather, the revision of electricity rates up to this level at this moment is thought to promote the structural modernization of the electric power industry and to the stabilization and minimization of the electricity rates in the long run.

In view of promoting the autonomous and efficient management of the electric power enterprise, the existing system of subsidy should be abolished, and the rigid implementation of the principle of total cost must be attempted. But, as to the principle of allocated cost, its complete implementation is thought to be too early, considering the influences to the

consumers. Accordingly, efforts are made to make rates in accordance with the principle of allocated cost as much as possible, while emphasis is placed on the correction of the unbalance between the rate for residential demand and the rate for industrial demand.

The main points of the revision of electricity rates along the direction of revision discussed above are as follows.

(1) Normalization of depreciation

The proportion of fixed assets in the total assets of the electric power enterprise is extremely high. In this sense, the electric power industry is a typical facility industry. Consequently depreciation is a crucial element in the calculation of electricity rates. Looking at the reality of the electric power industry of Indonesia, we found that proper depreciation costs are not taken into consideration owing to the lack of the compilation of financial data on which the calculation of depreciation costs can be based. This situation allows only a small room for internal reserve and is bound to bring about the deterioration of the balance of accounts.

This time, we adopt a straight-line method for the calculation of depreciation costs considering the whole level of electricity rates. (We did not consider the revaluation of assets in this case.)

(2) Inclusion of interest

Up to now, new investments in the electric power facilities are largely financed by the national government, and the government is also burdened with the interest charges. In this system of investment, the principle of cost basis cannot be established, and the existing system is feared to obstruct the development of the effective pattern of investment which is the most important matter of concern for the electric power industry as a facility industry. As we judged that the inclusion of interest is possible considering the general level of cost, we included the sum of expected interest expenses in the calculation of cost for electric energy, assuming that funds will be raised by the electric power enterprise on its own responsibility.

(3) Rationalization of contract categories

The existing categories of demand contain strong elements of social policies. But, the categories of demand must be established in accordance with the conditions of power use and load. Thus, in this revision, we established new categories of demand, as well as new categories of contracts, in view of the necessity for the execution of the principle of cost basis, and systematized the electricity rates. We abolished the existing categories of demand, which consist of social, residential, commercial, public and industrial demand. In accordance with the type of load, we established four categories of demand, consisting of residential, street lighting, commercial, and industrial demands, and in accordance with the quantity of demand and other factors,

we established several kinds of contracts for each category of demand.

(4) Rationalization of two-stage energy charge

The system of two-stage energy charge was established for the absorption of increased costs and for the suppression of load, and is considered to be a provisional system. Thus, the two-stage energy charge must be abolished in the future, and one consistent system of rates should be established. Nevertheless, considering that the marginal cost is expected to increase for a while, that existing supply capacity is short, and that the influences of the abolition of two-stage energy charge on the consumers are expected to be substantial, we think it is necessary to continue the system of two-stage charge for the time being. Thus, we rationalize the system of two-stage energy charge with the following objectives.

a. The minimization of the excessive discrepancy between the first stage and the second stage considering the future abolition of this system

b. The revision of the range of operating hours for the first stage considering the efficient allocation of electric energy

(5) Establishment of high voltage rate

At present, there exists a certain quantity of high voltage power supply for industrial use, which is expected to increase with the industrial development of Indonesia. Due to the differences in the required supply facilities and the load condition, the cost of power supply for the high voltage demand is inevitably different from the cost of low voltage supply. Thus, in accordance with the principle of cost basis, we establish a high voltage rate for industrial use.

(6) Rationalization of the share system for construction work

The BP-VA category of share for construction work which sets a flat charge of Rp.30/VA for new and additional installations is not directly related to the facilities for consumers, and generally to be included in the tariffs. Nevertheless, realizing the low percentage of electrification and the shortage of supply capacity, such a system of share is thought to be required for the promotion of the raising of funds for constructions for the time being. Accordingly, the existing system of share for the construction work will be continued. But, as the charge of Rp.30/VA for the category of BP-VA is too high, it is revised to be Rp.20/VA. For industrial consumers, from the standpoint of the national economy, BP-VA is not to be applied, and the cost is to be recovered through electricity tariffs.

4-3-2 Provisional Tariffs after Revision

(1) Revised table of rates

Categories		Revised Rates		Existing Rates
By Demand	By Contract	Range of Application	Rates	
Residential	Residential Fixed Payment Tariff (A_1)	For Small Houses (60VA-250VA)	60VA (one month) Rp. 174 70 218 100 290 125 363 150 435 175 508 200 580 225 653 250 725	Rp. 67 108 144 180 216 252 288
	Residential Meter Rate Charge (A_2)	For Large Houses (More than 250 VA)	Demand Charge 100 VA (one month) Rp. 50 Energy Charge 1. Up to 150 h. per month Rp. 6.80/KWH 2. More than 150 h. per month Rp. 13.60/KWH	(R_1) 250VA-2500VA D.C. Rp. 42 E.C. 1. 250 h. Rp.5.00 2. Rp.15.00 (R_2) (More than 2.500VA) D.C. Rp.44 E.C. 1. 200 h. Rp.5.5 2. Rp.16.5
Street Lighting	Street Lighting (B)	For Street Lights	Rp. 7.50 per KWH	(U_1) 2.50

Categories		Revised Rates		Existing Rates
By Demand	By Contract	Range of Application	Rates	
Commercial	Commercial I (C_1)	Temples, Schools, etc. (More than 250VA)	D.C. 100 VA (one month) Rp. 50 E.C. 1. Up to 150h. per month Rp. 3.50/KWH 2. More than 150h. per month Rp. 7.00/KWH	(S_2) DC Rp. 17 EC 1. 200h. Rp. 1.70 2. Rp. 5.00
	Commercial II (C_2)	Commercial More than 250VA (less than 2500VA)	D.C. 100 VA (one month) Rp. 60 E.C. 1. Up to 150h. per month Rp. 8.50/KWH 2. More than 150h. per month Rp. 17.00/KWH	(K_1) DC EC Rp. 88 1. 150h. Rp. 6.50 2. Rp. 20.00
	Commercial III (C_3)	Commercial (More than 2500 VA)	D.C. 100 VA (one month) Rp. 80 E.C. 1. Up to 150h. per month Rp. 8.50/KWH 2. More than 150h. per month Rp. 17.00/KWH	(K_2) DC Rp. 112 EC 1. 150h. Rp. 9.00 2. Rp. 20.00
	Commercial IV (C_4)	National Agencies Embassies, Consulates, etc. (More than 250 VA)	D.C. 100 VA (one month) Rp. 60 E.C. 1. Up to 150h. per month Rp. 5.50/KWH 2. More than 150h. per month Rp. 11.00/KWH	(U_2) D.C. Rp. 48 E.C. 1. Rp.4.00 (150h.) 2. Rp.12.00 (U_3) D.C. Rp. 52 E.C. 1.Rp. 4.25 (150h.) 2.Rp.13.00

Categories		Revised Rates		Existing Rates
By Demand	By Contract	Range of Application	Rates	
Industrial	Industrial Low Voltage (D_1)	Industrial Use (More than 1 KVA)	D.C. 1 KVA one month Rp.400 E.C. off peak 1 KWH Rp. 3.50 peak 1 KWH Rp. 7.00 (18:00 – 22:00)	DC (P) Rp.270 EC op Rp. 5.50 p Rp.20.00
	Industrial High Voltage (D_2)	Industrial Use (More than 50 KVA)	D.C. 1 KVA one month Rp. 380 E.C. off peak 1 KWH Rp. 3.30 peak 1 KWH Rp. 6.60 (18:00 – 22:00)	DC (P) Rp. 270 EC op Rp. 5.50 p Rp.20.00
Temporary		Temporary Use	15% increase for three months based on the rates revised above	(K_3) 1 KWH Rp.20.00

NOTE : Comparison of the levels of existing and revised electricity rates

Unit : Rp/KWH

Categories		Level of Revised Rates A	Level of Existing Rates B	A/B %
By Demand	By Contract			
Residential	$A_1(S_1)$	5.80	2.88 (*3.60)	201.4 (*161.1)
	$A_2(R_1)$	11.53	8.33	138.4
	(R_2)	13.23	11.59	114.1
Sub-total	*	7.73	4.78	161.8
Street Lighting	$B(U_1)$	7.50	2.50	300.0
Commercial	$C_1(S_2)$	7.28	3.56	204.5
	$C_2(K_1)$	13.84	14.56	95.1
	$C_3(K_2)$	16.52	20.14	82.0
	(K_3)	17.62	20.00	88.1
	$C_4(U_2)$	10.45	9.76	107.1
	(U_3)	9.76	8.74	119.6
Sub-total		11.74	11.61	101.2
Industrial	$D_1(P)$ $D_2(P)$	7.74	8.61	90.0
Total		8.82	7.21	122.3

*Note: * unit cost calculated for 400 h. as in the use of the formulation of the existing rates.*

(2) Revision of the share system for construction work

The BP-VA category (at present a flat charge of Rp.30/VA) in the share system for construction work is revised to have a flat charge of Rp.20/VA. The existing rates of share are retained for the categories BP-DU and BP-SR.

(3) Consolidation of supply rules

In order to insure the indiscriminative service for the consumers and to protect the interests of consumers in accordance with the principle of equity, it is urgently necessary to consolidate the rules of electric power supply, which cover all the fundamental areas including not only the rules concerning electricity tariffs, but also the regulations concerning the share system for the construction work.

The following items should be included in the rules of electric power supply:

a. Classification of power supply

b. Supply voltage and frequency

c. Tariffs

d. Method of sharing the construction costs and the costs for machinery, equipment and other articles, (including the amounts or the method for determination of the amounts for the share of consumers)

e. In the case that there exist shares for consumers other than the items mentioned above, their amounts or the method of determination

f. The method of measurement for electric power and energy, and the method of calculation

g. The line of demarcation in the responsibility for the transmission of power

h. The regulations concerning the method of power use and the use of machinery, equipment and other articles, if some restrictions are necessary

i. Items other than those mentioned above, concerning the condition of power supply, and the responsibility of the electric power enterprise and of the consumers

j. The term of validity if it is to be specified

k. The area and range to be applied

1. The time of enforcement

(4) Application of supply rules

Because of the character of the electric power enterprise being a monopolistic and public enterprise, there should not be any discriminatory practices in any respect in the application of the supply rules. Especially, the strict enforcement of the rules is required for the collection of electricity charges, and the specified description of charge collection should be the basic component of the contracts. Without the assurance of the revenues from tariffs, the integrity of the electric power enterprise can not be maintained. Only with the strict and fair enforcement of the supply rules, the sound development of the electric power enterprise and the protection of the interest of the consumers can be expected.

In the case of the payments of tariffs by the governmental agencies whose consumptions of electric energy are quite large, the deferred lump-sum payments at the settlement center are done in some cases. This situation has created some serious problems for the management of the electric power enterprise.

In order to establish a self-supporting system for the management of the electric power enterprise and to promote the autonomous management of Exploitasi offices, it is necessary to establish a principle that the payments by the governmental agencies should be made, where electric energy is consumed, on the specified date just as the general consumers. This would encourage the rational use of electric power on the part of consumers.

4-4 FUTURE PROBLEMS

4-4-1 Future Cost Trend and New Measures to Stabilize the Cost Level

As we have not done the revaluation of the assets of the electric power enterprise in this provisional revision, the ratio of the fund internally reserved to the total funds available for constructions during the period of cost calculation is only 7 per cent. It is apparently difficult to replace the existing facilities by this internal reserve. Therefore, it is very important for the management of the electric power enterprise to revalue the assets in the near future, increase the ratio of the fund internally reserved, and improve the quality of the management of the enterprise.

If we have a general look at the future cost trend, based on the above-mentioned premises, we can anticipate a substantial increase in the general cost level caused largely by the following factors.

- The rising cost for new constructions

- The rise in the cost level caused by the revaluation of the existing assets

In order to cope with such a substantial rise in the general cost level, it is essential to rationalize every aspect of the management of the electric power enterprise, including the execution of the efficient pattern of investments in electric power facilities and the minimization of the costs of operation.

If the general cost level will rise greatly beyond the present cost level, a new national policy will be required for the stabilization of electricity tariffs from the standpoint of the national economy. But, such a policy must not include the establishment of the system of subsidy to compensate for the deficit in the current transactions as practised now. It is necessary to examine some new measures which have limited objectives such as to compensate for the interests for the development of power sources and which would not obstruct the autonomous management of the electric power enterprise.

4-4-2 Approach to Principle of Allocated Cost and Rate Revision

This recommendation concerning the revision of electricity tariffs was made based on our careful examination of the present economic and social circumstances of Indonesia. Even though efforts are made to make rates in accordance with the principle of cost basis as much as possible, the proposed rates are still provisional in nature and can not completely eliminate the unbalances among the categories of demand.

Nevertheless, it must be emphasized that the implementation of the principle of allocated cost for the efficient allocation of resources is a very important task. Thus, it is necessary to make gradual approach to the principle of allocated cost in accordance with the rising level of income and with the future changes in the economic and social circumstances.

4-4-3 Relation with Other Systems

The revision of tariffs must be based on the fundamental programs such as the demand and supply programs and the program of facilities as already described. Needless to say, the consolidation of the whole planning system is essential as mentioned in our recommendation on the organization.

Also, as the revision of tariffs is closely related to the management system and specially to the accounting system, the early consolidation of the accounting system is desired. In the consolidation of the accounting system, considerations must be given concerning the inclusion of interest in the cost calculation presupposing the raising of fund by the electric power enterprise.

It is also an urgent task to consolidate the statistical data required for the effective

management along with the improvements of other systems.

4-4-4 Purchasing Price of Electric Energy Generated at Djatiluhur Hydro Power Station

We made the cost allocation of the Djatiluhur hydro-power project and came to the conclusion that the average unit cost of electric energy generated during the life time is US ¢ 0.83/KWH.

Considering the existing price of energy from the Djatiluhur hydro-power station which is Rp. 1.05/KWH, the implementation of the purchasing price of US ¢ 0.83/KWH would have great influences on the administration of P.L.N. Therefore, as we think it appropriate to increase the price gradually from now on and normalize the price during the approximate period of five years, we used, in our calculation of total cost for 1970, the unit price of Rp.1.35/KWH which is increased by Rp.0.30/KWH from the existing price.

5. REQUIRED ADVISORY SERVICES AND THEIR EXPENDITURES FOR REALIZATION OF RECOMMENDATIONS

5. REQUIRED ADVISORY SERVICES AND THEIR EXPENDITURES FOR REALIZATION OF RECOMMENDATIONS

5-1 INTRODUCTION

(1) The greater part of the recommendations given in Section 1 through 4 of Volume II is intended to indicate the targets of and fundamental approaches to various measures which should be taken for the future development of the electric power industry of Indonesia. It is therefore urged that concrete and detailed plans be drawn up on the basis of these recommendations and put into execution as soon as possible.

(2) The recommendations extend over a wide field of the electric power industry of Indonesia, and provide the contents for an substantial improvement on the present status of the industry. The most effective way leading to their successful realization will be to forward the progress with the technical assistance of a developed country.

(3) This section describes the fundamental approach to achieve the desired improvement under the foreign assistance, and estimates the expenditures required for obtaining foreign assistance.

5-2 APPROACH TO BE TAKEN

5-2-1 Principal Notion

(1) Recommendations given in Section 1 through 4 cover all aspects of the electric power industry of Indonesia as abovementioned, and are based on the consistent philosophy and approach for improving its management. Accordingly, all recommendations are closely interrelated.

It is therefore desirable that all items of recommendation be brought in together for technical assistance from a developed country.

(2) Needless to say that it is the electric power industry itself to make improvement on its management. Improvements through the materialization of the recommendations would never be truly achieved unless all of Plan-Do-See process which involves mapping out of concrete plans as well as their execution and following-up is wholly undertaken by the electric power industry of Indonesia itself.

It is therefore proposed that the electric power industry get technical assistance by inviting an advisory team and that the formulation and execution of plans be

carried out by the hands of the electric power industry of Indonesia with the advice of the team.

The advisory team is to give advices, guidances and alternative plans so as to make the progress in each stage most efficient and rational.

5-2-2 Items

(1) All items involved in the recommendations should be brought for the technical assistance and guidance of the advisory team. Particularly, the formulation of the long-range study including the long-term investment program and the improvement of management are important. Moreover, from the viewpoint of our finding, the improvement of the accounting system which is one of the basis supporting the management of the industry is also one of the most essential subject.

(2) Following items should be covered by the advisory team:

a. Formulation of the long-term investment plan

(a) Establishment of a fundamental design for the formation of facilities (inclusive of voltage classification to be adopted and others) based on a long-range viewpoint covering 10 to 20 years

(b) Formulation of a 10-year investment program including the expansion of major power sources and transmission systems

(c) Formulation of a concrete and detailed 5-year investment program

b. Formulation of a financial plan

c. Formulation of a concrete and detailed plan for the improvement of organization and management of the entire industry

d. Settlement of accounting and auditing system

e. Rearrangement and application of rules and regulations concerning electric power sales

f. Establishment and application of a control of master schedule for project

g. Rearrangement and execution of management respecting procurement and contract

h. Rearrangement of the system operation for power dispatching

i. Rearrangement of regulations and standards concerning the maintenance and operation of power facilities

j. Formulation of a plan for investigation of potential hydro energy

(a) Office study based on the existing data

(b) Formulation of a field investigation plan based on the office study of item (a)

5-2-3 Formation of Advisory Team and Period of Service

(1) Since each of the above-listed items demands a wide range of specialized knowledge, it is recommended that the advisory team be composed of the following 12 experts specialized in their respective fields.

Kind of experts	Number	Main engaged subjects
Leader	1	Overall guidance
Organization and management	2	c and g
Accounting	1	d
Rate making and power sales	1	b and e
Load estimation	1	a
Power sources	2	a, f and i
Transmission and substations	1	a and i
Distribution	1	a and i
Dispatching	1	h
Hydro power survey	1	j
T o t a l :	12	

Note : Alphabetical denotions correspond to those in paragraph (2) of the previous section 5-2-2.

(2) The actual management and its execution based on the respective plans are far more important than formulating such plans judging from the condition of Indonesia. A period of about two years is therefore considered necessary for the advisory team to complete its task.

5-3 REQUIRED EXPENDITURE

It is estimated that an amount of approximately 1.9 million U.S. dollars will be

required to invite the advisory team and obtain its technical assistance on the foregoing items.