

TABLES

CHAPTER 6

FORMULATION OF DEFINITIVE PLAN

LIST OF TABLES

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Table 6.2.1 SEDIMENT CAPACITY OF JATIBARANG MULTIPURPOSE DAM

Item		Value	Unit	Method or Data used in Estimation
Wash Load				
Sediment Yield				
Sheet Erosion	(1)	131,100	m ³ /year	Universal Soil Loss Equation
Bank Erosion	(2)	4,900	m ³ /year	Valley Order and Bank Erosion Rate
Sediment Discharge	(3)	33,500	m ³ /year	(3) = (1)*(Delivery Ratio) +(2)
Bed Load				
Sediment Discharge	(4)	22,800	m ³ /year	Ashida and Michiue's Formula
Total Sediment Discharge	(5)	56,300	m ³ /year	(5) = (3) + (4)
Specific Sediment Discharge	(6)	1,062	m ³ /year/km ²	(6) = (5) / 53 km ²
Trap Efficiency	(7)	0.96		
Porosity	(8)	0.60		
Specific Sediment Yield	(9)	2,550	m ³ /year/km ²	(9) = (6)*(7)/(1-(8))
Project Life	(10)	50	year	
Sediment Capacity of Dam	(11)	6,800,000	m ³	(11) = (9)*(10)*53 km ²

Table 6.2.2 DISCHARGE HYDROGRAPH DATA FOR DAM DESIGN

Time (hour)	Flood Discharge (m ³ /s)					
	PMF	1,000-year	100-year	25-year	10-year	Once/year
1	2.7	2.7	2.7	2.7	2.7	2.7
2	2.7	2.7	2.7	2.7	2.7	2.7
3	57.6	22.4	17.6	14.7	12.7	8.7
4	93.2	24.4	19.1	15.9	13.7	9.3
5	116.9	15.6	12.4	10.5	9.2	6.6
6	134.2	10.2	8.4	7.3	6.5	5.0
7	148.2	7.1	6.0	5.4	4.9	4.0
8	161.3	5.3	4.6	4.3	4.0	3.5
9	175.3	33.8	26.2	21.6	18.5	12.1
10	191.6	41.1	31.7	26.0	22.2	14.4
11	212.7	45.2	34.8	28.5	24.3	15.6
12	242.8	57.4	44.1	36.0	30.5	19.3
13	459.6	104.2	79.5	64.4	54.2	33.5
14	1,599.3	446.9	338.7	272.6	228.2	137.5
15	1,355.1	357.7	271.2	218.4	182.9	110.4
16	1,099.0	280.5	212.8	171.5	143.7	87.0
17	894.1	275.9	178.4	143.9	120.6	73.2
18	741.1	232.9	128.6	103.8	87.2	53.2
19	629.0	184.2	91.5	74.0	62.3	38.3
20	546.9	178.2	77.1	62.5	52.7	32.6
21	486.0	152.2	61.5	49.9	42.1	26.3
22	440.0	113.7	44.7	36.5	30.9	19.6
23	404.6	113.8	42.3	34.5	29.3	18.6
24	376.5	137.1	48.4	39.4	33.4	21.0
1	354.0	105.4	37.3	30.5	25.9	16.6
2	335.3	83.8	29.8	24.4	20.9	13.6
3	199.2	50.4	18.6	15.5	13.4	9.1
4	117.3	30.5	12.0	10.2	8.9	6.4
5	69.6	18.9	8.1	7.1	6.3	4.9
6	41.7	12.2	5.9	5.2	4.8	4.0
Peak	1,599.3 = 1,600 m ³ /s	446.9 = 450 m ³ /s	338.7 = 340 m ³ /s	272.6 = 280 m ³ /s	228.2 = 230 m ³ /s	137.5 = 140 m ³ /s

Note : Control Point of Design Storm = Dam Site

Table 6.2.3 ESTIMATE OF SEISMIC COEFFICIENT

Items	Symbol	Unit	Rock Foundation (Concrete Dam)	Diluvium (Rockfill Dam)
Coefficient of zone	Z		0.80	0.80
Earthquake base acceleration	Ac	cm/sec ²	215.81	215.81
Correction factor	V		0.90	1.00
Gravity acceleration	g	cm/sec ²	980	980
Seismic coefficient(Z*Ac*V/g)	K		0.16	0.18

Classification of Water Resources Structures

No.	Dam Scale	Reservoir Capacity (1,000,000m ³)	Height (m)	Potential Damage in the Case of Failure	Category
1	Large	> 60	> 20	Sacrifice of human lives and serious property damage	1
	Medium	1 - 60	10 - 30	Not many sacrifice of human lives	2
	Small	< 1	< 15	No sacrifice of human lives	3

Standard Earthquake Load

Category	Life Time (years)	No Damage Condition			Small Damage and No Failure Condition	
		Design Earthquake Acceleration (cm/sec ²)	Return Period (years)	Method of Analysis	Return Period (years)	Method of Analysis
1	50 - 100	Ad.min=0.1g Ad.min=0.4g	100 - 200	Seismic Coefficient	10,000 (MCE)	Dynamic Analysis
2	20 - 50	Ad.min=0.1g Ad.min=0.4g	50 - 100	Seismic Coefficient	1,000 - 5,000 (MCE)	Dynamic Analysis
3	20	Ad.min=0.1g Ad.min=0.4g	20 - 50	Seismic Coefficient		

Note : MCE stands for Maximum Credible Earthquake

Coefficient of Zone

Zone	Coefficient Z	Remarks
A	1.90 - 2.00	
B	1.60 - 1.90	
C	1.20 - 1.60	
D	0.80 - 1.20	
E	0.40 - 0.80	Semarang
F	0.20 - 0.40	

Earthquake Base Acceleration

Unit : (cm/sec ²)	
Return Period T (years)	Earthquake Base Acceleration Ac
10	98.42
20	119.62
50	151.72
100	181.21
200	215.81
500	271.35
1,000	322.35
5,000	482.80
10,000	564.54

Correction Factor

Rock Type	Factor V
Rock Foundation	0.9
Diluvium	1.0
Alluvium	1.1
Soft Alluvium	1.2

Source : "Peta zona gempa dan cara penggunaannya sebagai usulan dalam perencanaan bangunan pengairan tahan gempa" by Najoan and others

Table 6.2.4 ESTIMATED WET AND SATURATED DENSITIES IN ZONES

Zone	Dam Type	Sample Size	Item	Symbol	Value	Unit	Remarks
Impervious Zone	Zoned Rockfill	smaller than 19.0mm	D Value 95% Dry Density	$\gamma d'$	1.739	tf/m ³	from Test Results
			Optimum Moisture Content	w'	15.5%		from Test Results
			Apparent Specific Gravity	Gs	2.716		from Test Results
			Void Ratio	e'	0.560		Gs/ $\gamma d'-1$
			Wet Density	$\gamma t'$	2.010	tf/m ³	$(1+w')x \gamma d'$
		Saturated Density	$\gamma sat'$	2.100	tf/m ³	$(Gs+e')/(1+e')$	
		larger than 19.0mm	Apparent Specific Gravity	Gs2	2.750		from Test Results
			Natural Moisture Content	w	1.0%		from Test Results
		Full Size	Estimated Bulk Specific Gravity	pd2	2.676		Gs2/(1+wxGs2)
			Gravel Content Ratio	P	20.0%		Assumed Value
Average Specific Gravity	Gbf		2.720		$(1-P)xGs2+PxGb$		
Average Moisture Content	wf		12.6%		$(1-P)xw'+Pxw$		
Average Void Ratio	ef		0.450		Gbf/ $\gamma df-1$		
Estimated Dry Density	γdf	1.870	tf/m ³	$\gamma dxpd2/(Px \gamma d'+(1-P)xd2)$			
Estimated Wet Density	γtf	2.110	tf/m ³	$(1+wf) \gamma df$			
Estimated Saturated Density	$\gamma satf$	2.190	tf/m ³	$(Gbf+ef)/(1+ef)$			
Semi-pervious Zone	Zoned Rockfill	smaller than 19.0mm	Bulk Specific Gravity	Gb'	2.580		from Test Results
			Void Ratio	e'	0.390		from Test Results
			Natural Moisture Content	w'	2.0%		from Test Results
			Dry Density	$\gamma d'$	1.860	tf/m ³	Gb'/(1+e')
			Wet Density	$\gamma t'$	1.900	tf/m ³	$(1+w')x \gamma d'$
		Saturated Density	$\gamma sat'$	2.140	tf/m ³	$(Gb'+e')/(1+e')$	
		larger than 19.0mm	Bulk Specific Gravity	Gb	2.540		from Test Results
			Natural Moisture Content	w	1.0%		from Test Results
		Full Size	Gravel Content Ratio	P	40.0%		Assumed Value
			Average Specific Gravity	Gbf	2.560		$(1-P)xGb'+PxGb$
Average Moisture Content	wf		1.6%		$(1-P)xw'+Pxw$		
Average Void Ratio	ef		0.230		Gbf/ $\gamma df-1$		
Estimated Dry Density	γdf		2.080	tf/m ³	$1/((1-P)/ \gamma d'+P/Gb)$		
Estimated Wet Density	γtf	2.110	tf/m ³	$(1+wf)x \gamma df$			
Estimated Saturated Density	$\gamma satf$	2.270	tf/m ³	$(Gbf+ef)/(1+ef)$			
Semi-pervious Zone	Concrete Face Rockfill	smaller than 19.0mm	Bulk Specific Gravity	Gb'	2.580		from Test Results
			Void Ratio	e'	0.390		from Test Results
			Natural Moisture Content	w'	2.0%		from Test Results
			Dry Density	$\gamma d'$	1.860	tf/m ³	Gb'/(1+e')
			Wet Density	$\gamma t'$	1.900	tf/m ³	$(1+w')x \gamma d'$
		Saturated Density	$\gamma sat'$	2.140	tf/m ³	$(Gb'+e')/(1+e')$	
		larger than 19.0mm	Bulk Specific Gravity	Gb	2.540		from Test Results
			Natural Moisture Content	w	1.0%		from Test Results
		Full Size	Gravel Content Ratio	P	20.0%		Assumed Value
			Average Specific Gravity	Gbf	2.570		$(1-P)xGb'+PxGb$
Average Moisture Content	wf		1.8%		$(1-P)xw'+Pxw$		
Average Void Ratio	ef		0.300		Gbf/ $\gamma df-1$		
Estimated Dry Density	γdf		1.970	tf/m ³	$1/((1-P)/ \gamma d'+P/Gb)$		
Estimated Wet Density	γtf	2.010	tf/m ³	$(1+wf)x \gamma df$			
Estimated Saturated Density	$\gamma satf$	2.210	tf/m ³	$(Gbf+ef)/(1+ef)$			
Pervious Zone	Zoned Rockfill and Concrete Face Rockfill	Full Size	Bulk Specific Gravity	Gb	2.540		from Test Results
			Void Ratio	e	0.325		from Test Results
			Natural Moisture Content	w	1.0%		from Test Results
	Estimated Dry Density	γd	1.920	tf/m ³	Gb/(1+e)		
	Estimated Wet Density	γt	1.940	tf/m ³	$(1+w)x \gamma d$		
	Estimated Saturated Density	γsat	2.160	tf/m ³	$(Gb+e)/(1+e)$		

Table 6.2.5 CONSTRUCTION SCHEDULE OF CENTER CORE ROCKFILL DAM FOR DAM TYPE COMPARISON

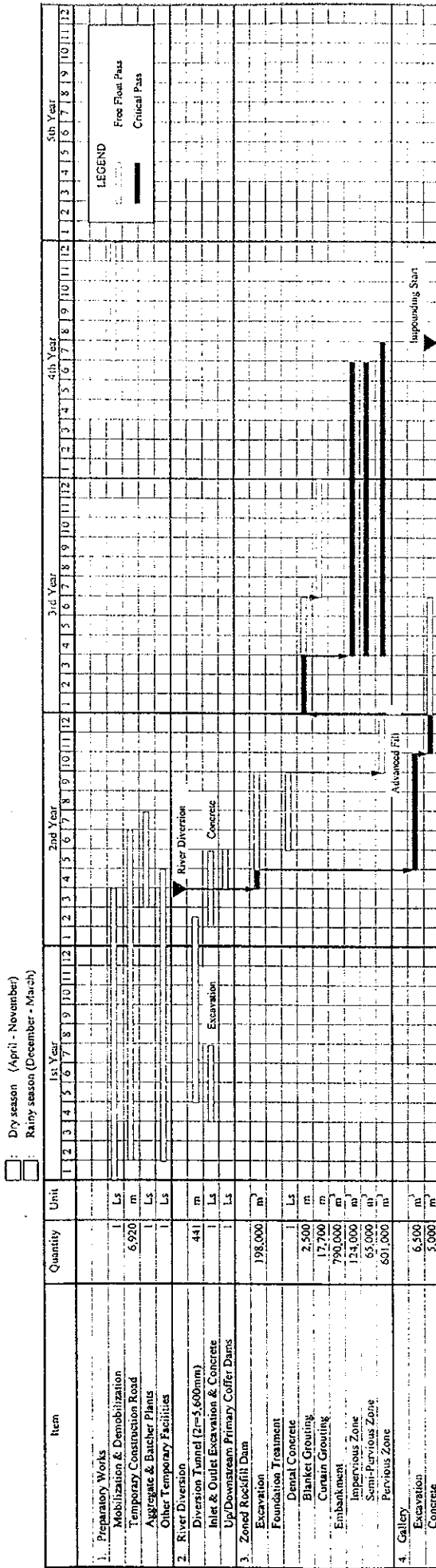
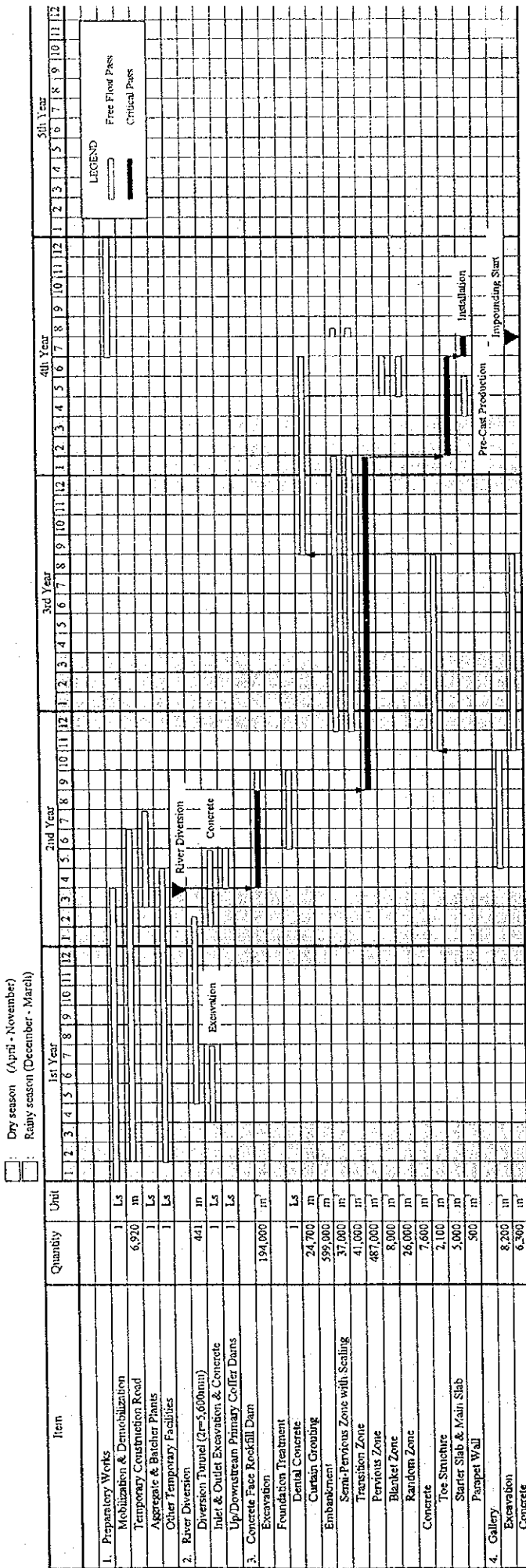


Table 6.2.6 CONSTRUCTION SCHEDULE OF CONCRETE FACE ROCKFILL DAM FOR DAM TYPE COMPARISON



Key dates of events, and construction period and progress required for main activities

1. Execution of River Diversion at the end of March in the 2nd year
2. Dam Excavation
 - Duration : 6 months from April to September in the 2nd year
 - Required Days : 135 days
 - Daily Progress : 194,000 m³ / 135 days = 1,500 m³/day
3. Embankment of Semi-impervious Zone
 - Duration : 14 months from December in the 2nd year to January in the 4th year
 - Required Days : 248 days
 - Daily Progress : 37,000 m³ / 248 days = 200 m³/day
4. Embankment of Pervious Zone and Transition Zone
 - Duration : 17 months from October in the 2nd year to January in the 4th year
 - Required Days : 319 days
 - Daily Progress : (487,000 + 41,000) m³ / 319 days = 1,700 m³/day
5. Concrete Facing
 - Duration : 5 months from February to June in the 4th year
6. Parapet Construction
 - Duration : 1 month in July in the 4th year
7. Commencement of Impounding in Early August in the 4th year
8. Appurtenant structures such as spillway and outlet facilities are not considered in the schedule, which are not on the critical pass.

Table 6.2.7 COST COMPARISON BETWEEN ALTERNATIVE DAM TYPES

1. CENTER CORE ROCKFILL DAM

Description	Quantity	Unit	Unit Cost		Amount		Total (Rp.x10 ³)
			F.C. (Rp.)	L.C. (Rp.)	F.C. (Rp.x10 ³)	L.C. (Rp.x10 ³)	
1. Excavation					981,999	655,413	1,637,412
1) Common Excavation	87,950	m3	3,543	2,423	311,607	213,103	524,710
2) Unsound Rock Excavation	100,000	m3	4,825	3,418	482,500	341,800	824,300
3) Sound Rock Excavation	10,000	m3	14,113	6,930	141,130	69,300	210,430
4) Others; 5 % of 1.1) to 1.3)					46,762	31,210	77,972
2. Grouting					3,203,663	915,985	4,119,648
1) Core Foundation Rock Treatment	5,500	m2	2,550	6,470	14,025	35,585	49,610
2) Boring for Blanket	2,500	m	67,491	6,442	168,728	16,105	184,833
3) Grouting for Blanket	2,500	m	27,350	26,700	68,375	66,750	135,125
4) Boring for Curtain	22,000	m	96,920	9,280	2,132,240	204,160	2,336,400
5) Grouting for Curtain	17,700	m	29,890	28,820	529,053	510,114	1,039,167
4) Others; 10 % of 1.1) to 1.3)					291,242	83,271	374,513
3. Internal Gallery					699,054	1,778,381	2,477,435
1) Excavation for Gallery	6,500	m3	34,487	16,050	224,166	104,325	328,491
2) Concrete for Gallery	5,000	m3	74,009	132,309	370,045	661,545	1,031,590
3) Deformed Bar for Gallery	250,000	kg	57	2,586	14,250	646,500	660,750
4) Form Work for Gallery	4,300	m2	6,289	47,521	27,043	204,340	231,383
5) Others; 10 % of 1.1) to 1.4)					63,550	161,671	225,221
4. Main Dam Embankment					16,019,569	11,486,813	27,506,382
1) Impervious Zone	124,000	m3	19,770	20,390	2,451,480	2,528,360	4,979,840
2) Semi-pervious Zone	65,000	m3	30,970	31,190	2,013,050	2,027,350	4,040,400
3) Inner Rock Embankment	105,000	m3	15,410	9,180	1,618,050	963,900	2,581,950
4) Outer Rock Embankment	486,600	m3	18,400	10,860	8,953,440	5,284,476	14,237,916
5) Upstream Riprap	9,400	m3	23,480	14,440	220,712	135,736	356,448
6) Others; 5 % of 1.1) to 1.5)					762,837	546,991	1,309,828
Total					20,904,285	14,836,592	35,740,877

2. CONCRETE FACE ROCKFILL DAM

Description	Quantity	Unit	Unit Cost		Amount		Total (Rp.x10 ³)
			F.C. (Rp.)	L.C. (Rp.)	F.C. (Rp.x10 ³)	L.C. (Rp.x10 ³)	
1. Main Dam Excavation					1,213,043	820,583	2,033,626
1) Common Excavation	88,400	m3	3,618	2,481	319,831	219,320	539,151
2) Unsound Rock Excavation	85,000	m3	4,810	3,407	408,850	289,595	698,445
3) Sound Rock Excavation	20,000	m3	14,121	6,936	282,420	138,720	421,140
4) Excavated Slope Surface Treatment	9,300	m2	1,311	2,231	12,192	20,748	32,940
5) Shotcrete (=5cm for Excavated Slope	9,300	m2	14,192	12,164	131,986	113,125	245,111
6) Others; 5 % of 1.1) to 1.5)					57,764	39,075	96,839
2. Grouting					4,202,373	1,107,654	5,310,027
1) Boring for Curtain	31,800	m	96,920	9,280	3,082,056	295,104	3,377,160
2) Grouting for Curtain	24,700	m	29,890	28,820	738,283	711,854	1,450,137
3) Others; 10 % of 1.1) to 1.2)					382,034	100,696	482,730
3. Internal Gallery					881,063	2,239,996	3,121,059
1) Excavation for Gallery	8,200	m3	34,487	16,050	282,793	131,610	429,565
2) Concrete for Gallery	6,300	m3	74,009	132,309	466,257	833,547	1,341,068
3) Deformed Bar for Gallery	315,000	kg	57	2,586	17,955	814,590	858,975
4) Form Work for Gallery	5,400	m2	6,289	47,521	33,961	256,613	295,956
5) Others; 10 % of 1.1) to 1.4)					80,097	203,636	283,733
4. Main Dam Embankment					11,584,020	7,587,930	19,171,950
1) Semi-pervious Zone	37,000	m3	27,010	31,860	999,370	1,178,820	2,178,190
2) Transition Zone	41,000	m3	26,460	16,660	1,084,860	683,060	1,767,920
3) Inner Pervious Zone	120,000	m3	15,180	9,060	1,821,600	1,087,200	2,908,800
4) Outer Pervious Zone	367,000	m3	18,450	10,900	6,771,150	4,000,300	10,771,450
5) Blanket Zone	8,000	m3	6,370	11,350	50,960	90,800	141,760
6) Random Zone	26,000	m3	11,710	7,170	304,460	186,420	405,080
7) Others; 5 % of 1.1) to 1.6)					551,620	361,330	912,950
5. Impervious Membrane					1,946,548	4,737,113	6,683,661
1) Upstream Face Concrete Slab	5,000	m3	112,841	189,696	564,205	948,480	1,215,910
2) Parapet Wall	500	m3	62,623	111,954	31,312	55,977	121,591
3) Toe Structure	2,100	m3	74,009	132,309	155,419	277,849	510,682
4) Deformed Bar	490,000	kg	503	3,430	246,470	1,680,700	1,583,780
5) Form Work	15,000	m2	8,385	71,296	125,775	1,069,440	1,115,534
6) Water Stops and Perimeter Joints	2,100	m	211,304	10,772	443,738	22,621	226,405
7) Compaction of Upstream Face	13,000	m2	16,970	20,040	220,610	260,520	407,640
8) Application of Bitumen	13,000	m2	5,102	15,073	66,326	195,949	184,764
9) Others; 5 % of 1.1) to 1.8)					92,693	225,577	318,270
Total					19,827,047	16,493,276	36,320,323

Table 6.2.8 COMPARISON OF TYPE FOR BRIDGE TO GOA KREO

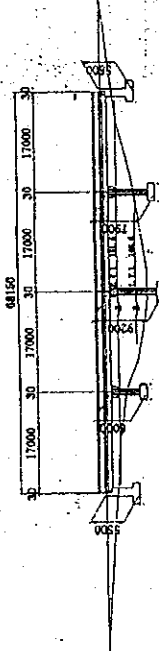
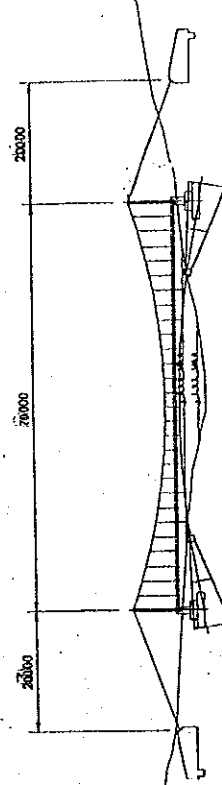
	CASE 1 RC BRIDGE	CASE 2 SUSPENSION BRIDGE
SIDE VIEW		
TOTAL COST	\$164,000	\$545,000
COMMENT	Construction work is simple.	Construction work is comparatively complex.
EVALUATION	ADOPTED	NOT ADOPTED

Table 6.3.4 CHARACTERISTIC OF ALTERNATIVE PLANT SIZE

	alt.1	alt.1-6	alt.1-2	alt.1-3	alt.2	alt.3	alt.4	alt.5	alt.101	alt.1-5
Capacity(total)	1,377	1,411	1,651	1,892	2,132	2,372	2,612	2,851	1,890	1,410
#1 unit	923	947	1,092	1,286	1,431	1,575	1,769	1,913	944	705
#2 unit	454	463	559	606	701	796	843	938	946	705
Energy(present stage)	6,367	6,437	6,905	7,319	7,652	7,906	8,118	8,229	7,152	6,408
Energy(future stage)	8,108	8,212	8,861	9,366	9,727	9,999	10,254	10,472	9,309	8,183
Discharge(total)	2.93	3.00	3.50	4.00	4.50	5.00	5.50	6.00	4.00	3.00
#1 unit	1.95	2.00	2.30	2.70	3.00	3.30	3.70	4.00	2.00	1.50
#2 unit	0.98	1.00	1.20	1.30	1.50	1.70	1.80	2.00	2.00	1.50
Ratio of Plant Size	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	1:1	1:1
Plant factor(present stage)	53	52	48	44	41	38	35	33	43	52
Plant factor(future stage)	67	66	61	57	52	48	45	42	56	66

	alt.102	alt.107	alt.103	alt.12	alt.104	alt.105	alt.106	alt.108	alt.109	alt.110
Capacity(total)	951	1,097	1,292	1,438	1,585	1,781	1,927	2,074	2,270	2,416
#1 unit	951	1,097	1,292	1,438	1,585	1,781	1,927	2,074	2,270	2,416
#2 unit	-	-	-	-	-	-	-	-	-	-
Energy(present stage)	5,121	5,372	5,637	5,790	5,850	5,895	5,877	5,843	5,823	5,796
Energy(future stage)	6,357	7,041	2,825	8,307	8,671	8,821	8,866	8,865	8,875	8,715
Discharge(total)	2.00	2.30	2.70	3.00	3.30	3.70	4.00	4.30	4.70	5.00
#1 unit	2.00	2.30	2.70	3.00	3.30	3.70	4.00	4.30	4.70	5.00
#2 unit	-	-	-	-	-	-	-	-	-	-
Ratio of Plant Size	1:0	1:0	1:0	1:0	1:0	1:0	1:0	1:0	1:0	1:0
Plant factor(present stage)	61	56	50	46	42	38	35	32	29	27
Plant factor(future stage)	76	73	25	66	62	57	53	49	45	41

Table 6.3.5 FLUCTUATION OF RESERVOIR WATER LEVEL

year	No. of Days			
	H=148.62 m	148.62 ≥ H >148.00	148.00 ≥ H>138.00	138.00>H ≥135.7
1967	245	15	105	0
1968	365	0	0	0
1969	365	0	0	0
1970	365	0	0	0
1971	365	0	0	0
1972	255	20	90	0
1973	360	5	0	0
1974	365	0	0	0
1975	365	0	0	0
1976	280	25	60	0
1977	240	15	110	0
1978	365	0	0	0
1979	365	0	0	0
1980	335	25	5	0
1981	240	25	100	0
1982	210	15	140	65
1983	205	30	130	0
1984	235	40	90	0
1985	145	20	200	30
1986	310	45	10	0
1987	215	20	130	0
1988	220	15	130	0
1989	300	15	50	0
1990	255	25	85	0
1991	205	10	150	30
1992	360	5	0	0
1993	305	25	35	0
1994	245	20	100	0
1995	240	25	100	0
1996	360	5	0	0
Total	8685	445	1820	125
ratio(%)	79.3	4.1	16.6	1.0

H : Reservoir Water Level (EL:m)

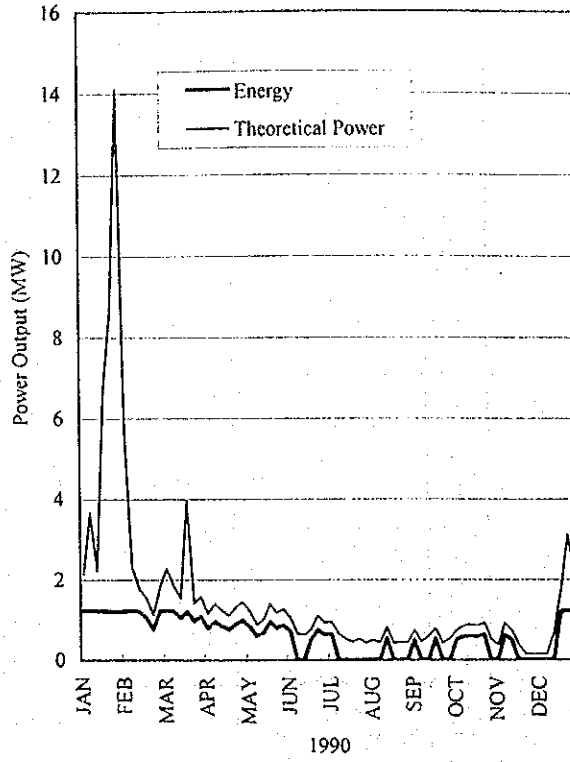
Table 6.3.6 ANNUAL ENERGY PRODUCTION

(MWh)

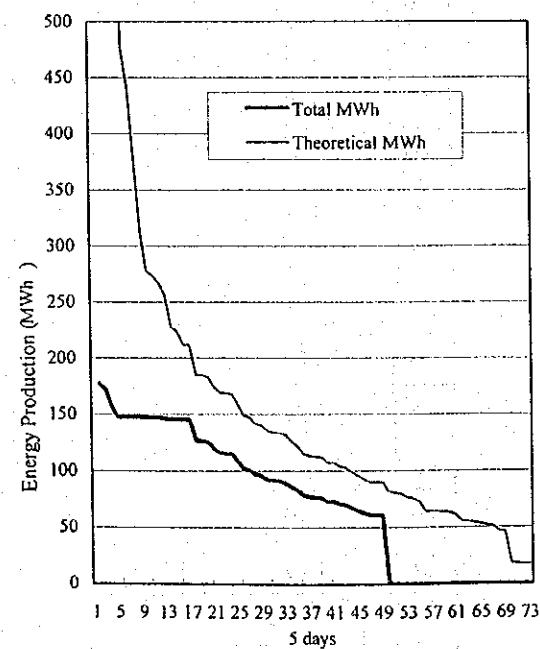
No.		Present stage development	Future stage development
1	1967	5,535	8,201
2	1968	7,496	8,182
3	1969	7,051	8,465
4	1970	8,002	8,954
5	1971	8,779	8,877
6	1972	5,275	7,943
7	1973	6,051	8,332
8	1974	6,875	8,323
9	1975	7,682	8,404
10	1976	5,387	8,235
11	1977	5,286	8,208
12	1978	5,542	7,682
13	1979	6,719	8,457
14	1980	6,960	8,777
15	1981	4,803	7,743
16	1982	4,517	7,118
17	1983	4,305	7,558
18	1984	3,958	8,514
19	1985	2,640	6,898
20	1986	4,787	8,143
21	1987	4,931	8,489
22	1988	5,238	8,751
23	1989	6,595	9,188
24	1990	5,247	8,594
25	1991	4,996	7,664
26	1992	7,646	7,967
27	1993	4,061	8,863
28	1994	4,804	8,898
29	1995	6,287	8,673
30	1996	6,251	9,117
	average	5,790	8,307

Table 6.3.7 (1/4) FIVE-DAYS ENERGY PRODUCTION (PRESENT STAGE DEVELOPMENT, MEAN YEAR(1990))

1990	day	WL	Q _{out}	Energy		Theoretical Power	
		(El. m)	(m ³ /s)	(MW)	(MWh)	(MW)	(MWh)
JAN	5	148.62	3.568	1.229	147	2.133	256
	5	148.62	6.153	1.223	147	3.662	439
	5	148.62	3.720	1.228	147	2.223	267
	5	148.62	11.371	1.213	146	6.717	806
	5	148.62	14.629	1.207	145	8.606	1033
	6	148.62	24.257	1.194	172	14.119	2033
FEB	5	148.62	9.626	1.216	146	5.699	684
	5	148.62	3.875	1.228	147	2.315	278
	5	148.62	2.954	1.211	145	1.768	212
	5	148.62	2.578	1.057	127	1.544	185
	5	148.62	1.876	0.766	92	1.125	135
	3	148.62	3.055	1.230	89	1.828	132
MA	5	148.62	3.817	1.228	147	2.280	274
	5	148.62	3.107	1.230	148	1.859	223
	5	148.62	2.571	1.054	126	1.540	185
	5	148.62	6.667	1.222	147	3.964	476
	5	148.62	2.356	0.965	116	1.412	169
	6	148.62	2.645	1.084	156	1.584	228
APR	5	148.62	1.942	0.793	95	1.165	140
	5	148.62	2.345	0.960	115	1.405	169
	5	148.62	2.070	0.846	102	1.241	149
	5	148.62	1.853	0.756	91	1.112	133
	5	148.62	2.201	0.901	108	1.319	158
	5	148.62	2.419	0.991	119	1.449	174
MA	5	148.62	2.043	0.835	100	1.225	147
	5	148.62	1.484	0.604	72	0.891	107
	5	148.62	1.682	0.686	82	1.009	121
	5	148.62	2.335	0.956	115	1.399	168
	5	148.62	1.967	0.804	96	1.180	142
	6	148.62	2.120	0.867	125	1.271	183
JUN	5	148.62	1.745	0.712	85	1.047	126
	5	148.62	1.113	0.000	0	0.669	80
	5	148.62	1.058	0.000	0	0.636	76
	5	148.62	1.279	0.519	62	0.768	92
	5	148.62	1.859	0.759	91	1.115	134
	5	148.62	1.566	0.638	77	0.940	113
JUL	5	148.62	1.589	0.647	78	0.954	114
	5	148.62	1.100	0.000	0	0.661	79
	5	148.62	0.886	0.000	0	0.533	64
	5	148.62	0.765	0.000	0	0.460	55
	5	148.62	0.884	0.000	0	0.532	64
	6	148.60	0.730	0.000	0	0.439	63
AUG	5	148.62	0.837	0.000	0	0.503	60
	5	148.62	0.734	0.000	0	0.442	53
	5	148.62	1.364	0.554	66	0.819	98
	5	148.62	0.711	0.000	0	0.428	51
	5	148.59	0.750	0.000	0	0.451	54
	6	148.56	0.730	0.000	0	0.439	63
SEP	5	148.23	1.251	0.504	60	0.747	90
	5	148.19	0.772	0.000	0	0.461	55
	5	148.00	1.015	0.000	0	0.604	72
	5	147.61	1.342	0.536	64	0.793	95
	5	147.59	0.730	0.000	0	0.432	52
	5	147.47	0.906	0.000	0	0.535	64
OCT	5	147.12	1.276	0.505	61	0.748	90
	5	146.66	1.467	0.577	69	0.853	102
	5	146.15	1.545	0.602	72	0.890	107
	5	145.66	1.508	0.583	70	0.862	103
	5	145.09	1.655	0.634	76	0.936	112
	6	144.91	0.926	0.000	0	0.523	75
NOV	5	144.92	0.678	0.000	0	0.383	46
	5	144.23	1.671	0.630	76	0.931	112
	5	143.76	1.351	0.504	60	0.747	90
	5	143.76	0.700	0.000	0	0.388	47
	5	144.10	0.260	0.000	0	0.145	17
	5	144.60	0.260	0.000	0	0.146	18
DEC	5	146.30	0.260	0.000	0	0.151	18
	5	147.47	0.260	0.000	0	0.154	18
	5	148.62	1.127	0.000	0	0.677	81
	5	148.62	2.948	1.209	145	1.764	212
	5	148.62	5.234	1.225	147	3.119	374
	6	148.62	3.632	1.228	177	2.171	313
			Total		5247		13610



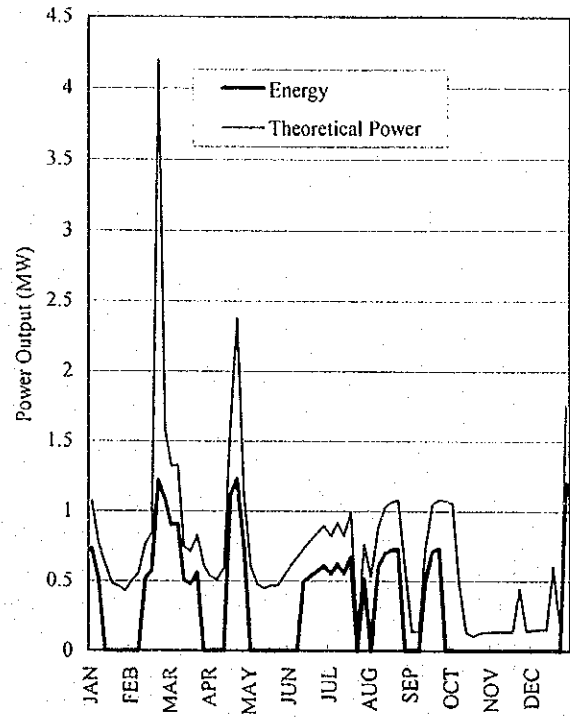
Note : Theoretical Power = 9.8Qout H_{max}/1000



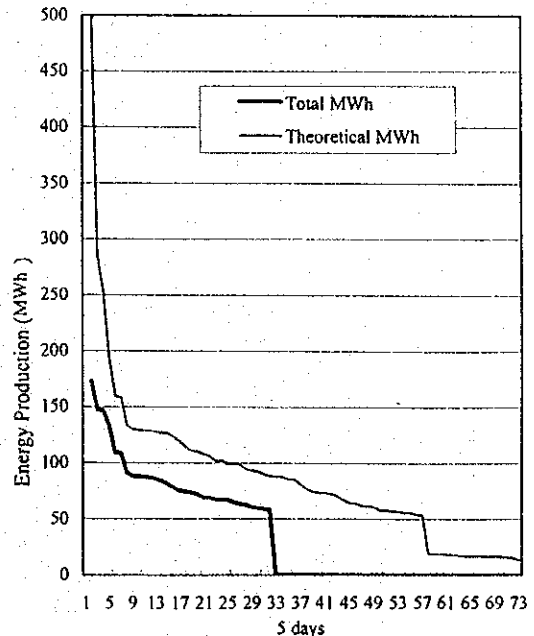
ANNUAL DURATION CURVE OF MWh

Table 6.3.7 (2/4) FIVE-DAYS ENERGY PRODUCTION (PRESENT STAGE DEVELOPMENT, DRY YEAR(1985))

1985	day	WL	Q _{OUT}	Energy		Theoretical Power	
		(EL. m)	(m ³ /s)	(MW)	(MWh)	(MW)	(MWh)
JAN	5	148.62	1.789	0.730	88	1.073	129
	5	148.62	1.291	0.524	63	0.776	93
	5	148.62	1.028	0.000	0	0.618	74
	5	148.62	0.798	0.000	0	0.480	58
	5	148.62	0.771	0.000	0	0.464	56
FEB	6	148.60	0.717	0.000	0	0.431	62
	5	148.52	0.843	0.000	0	0.506	61
	5	148.38	0.931	0.000	0	0.558	67
	5	148.62	1.277	0.518	62	0.767	92
	5	148.62	1.408	0.572	69	0.846	101
MAR	5	148.62	7.071	1.221	146	4.202	504
	3	148.62	2.640	1.082	78	1.581	114
	5	148.62	2.199	0.900	108	1.318	158
	5	148.62	2.219	0.908	109	1.330	160
	5	148.62	1.243	0.504	60	0.747	90
APR	5	148.62	1.184	0.480	58	0.711	85
	5	148.62	1.375	0.559	67	0.826	99
	6	148.62	1.020	0.000	0	0.613	88
	5	148.62	0.889	0.000	0	0.535	64
	5	148.62	0.849	0.000	0	0.511	61
MAY	5	148.62	0.979	0.000	0	0.589	71
	5	148.62	2.705	1.109	133	1.620	194
	5	148.62	3.985	1.227	147	2.380	286
	5	148.62	1.847	0.754	90	1.108	133
	5	148.62	1.014	0.000	0	0.610	73
JUN	5	148.62	0.794	0.000	0	0.478	57
	5	148.62	0.742	0.000	0	0.446	54
	5	148.62	0.778	0.000	0	0.468	56
	5	148.57	0.772	0.000	0	0.464	56
	6	148.43	0.896	0.000	0	0.537	77
JUL	5	148.24	1.019	0.000	0	0.609	73
	5	147.98	1.131	0.000	0	0.673	81
	5	147.65	1.240	0.495	59	0.733	88
	5	147.26	1.346	0.534	64	0.790	95
	5	146.81	1.450	0.571	69	0.845	101
AUG	5	146.30	1.552	0.607	73	0.896	108
	5	145.86	1.429	0.554	66	0.819	98
	5	145.31	1.620	0.623	75	0.920	110
	5	144.82	1.461	0.556	67	0.823	99
	5	144.04	1.789	0.673	81	0.993	119
SEP	5	144.63	0.260	0.000	0	0.147	18
	6	144.05	1.371	0.514	74	0.762	110
	5	143.87	0.960	0.000	0	0.533	64
	5	143.22	1.609	0.595	71	0.881	106
	5	142.35	1.908	0.695	83	1.027	123
OCT	5	141.41	2.012	0.720	86	1.064	128
	5	140.43	2.075	0.729	87	1.078	129
	6	140.04	1.144	0.000	0	0.591	85
	5	140.87	0.260	0.000	0	0.137	16
	5	141.51	0.260	0.000	0	0.139	17
NOV	5	141.02	1.388	0.492	59	0.730	88
	5	140.06	2.040	0.711	85	1.052	126
	5	138.82	2.152	0.732	88	1.083	130
	5	137.53	2.188	0.000	0	1.074	129
	5	136.23	2.209	0.000	0	1.056	127
DEC	5	135.70	0.998	0.000	0	0.474	57
	5	135.70	0.279	0.000	0	0.133	16
	5	135.70	0.226	0.000	0	0.108	13
	5	137.24	0.260	0.000	0	0.128	15
	6	138.99	0.260	0.000	0	0.132	19
TOTAL	5	140.22	0.260	0.000	0	0.135	16
	5	140.66	0.260	0.000	0	0.136	16
	5	141.15	0.260	0.000	0	0.138	17
	5	141.66	0.260	0.000	0	0.139	17
	5	141.55	0.841	0.000	0	0.448	54
TOTAL	5	142.87	0.260	0.000	0	0.142	17
	5	146.54	0.260	0.000	0	0.151	18
	5	147.42	0.260	0.000	0	0.154	18
	5	147.76	0.260	0.000	0	0.155	19
	5	147.57	1.019	0.000	0	0.602	72
TOTAL	5	148.04	0.260	0.000	0	0.155	19
	6	148.62	2.931	1.202	173	1.754	253
		Total			2640		6295



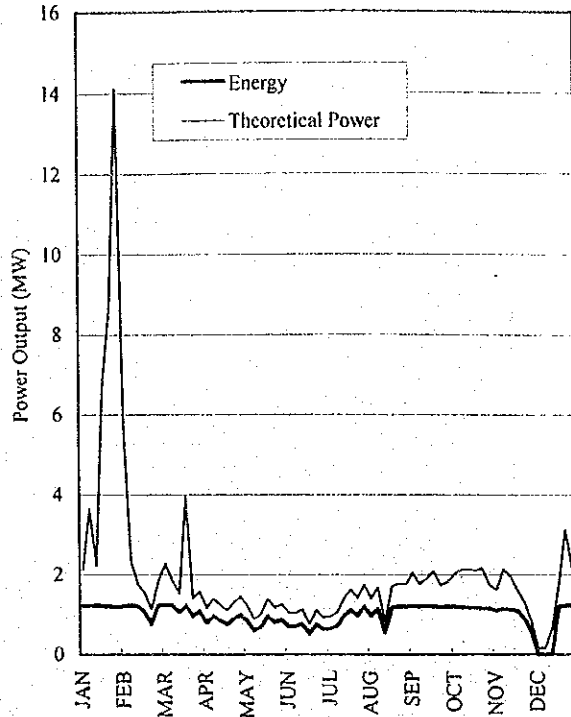
Note : Theoretical Power = $9.8Q_{out} H_{max}/1000$



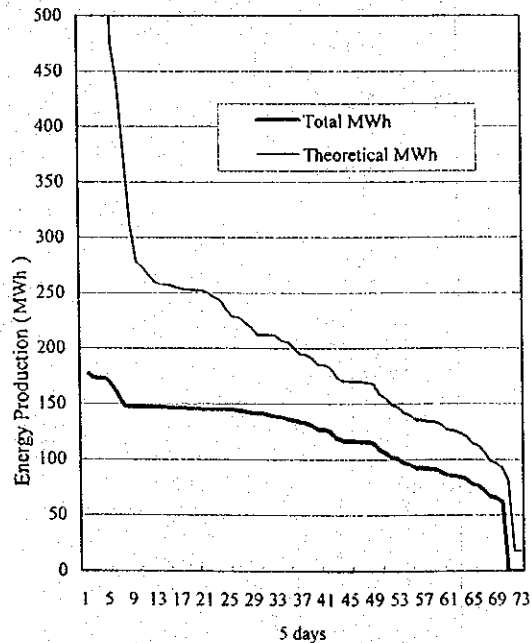
ANNUAL DURATION CURVE OF MWh

Table 6.3.7 (3/4) FIVE-DAYS ENERGY PRODUCTION (FUTURE STAGE DEVELOPMENT, MEAN YEAR(1990))

1990	day	Wl.	Qout	Energy		Theoretical Power	
		(EL. m)	(m ³ /s)	(MW)	(MWh)	(MW)	(MWh)
JAN	5	148.62	3.568	1.229	147	2.133	256
	5	148.62	6.153	1.223	147	3.662	439
	5	148.62	3.720	1.228	147	2.223	267
	5	148.62	11.371	1.213	146	6.717	806
	5	148.62	14.629	1.207	145	8.606	1033
	6	148.62	24.257	1.194	172	14.119	2033
FEB	5	148.62	9.626	1.216	146	5.699	684
	5	148.62	3.875	1.228	147	2.315	278
	5	148.62	2.954	1.211	145	1.768	212
	5	148.62	2.578	1.057	127	1.544	185
	5	148.62	1.876	0.766	92	1.125	135
	3	148.62	3.055	1.230	89	1.828	132
MA	5	148.62	3.817	1.228	147	2.280	274
	5	148.62	3.107	1.230	148	1.859	223
	5	148.62	2.571	1.054	126	1.540	185
	5	148.62	6.667	1.222	147	3.964	476
	5	148.62	2.356	0.965	116	1.412	169
	6	148.62	2.645	1.084	156	1.584	228
APR	5	148.62	1.942	0.793	95	1.165	140
	5	148.62	2.345	0.960	115	1.405	169
	5	148.62	2.070	0.846	102	1.241	149
	5	148.62	1.853	0.756	91	1.112	133
	5	148.62	2.201	0.901	108	1.319	158
	5	148.62	2.419	0.991	119	1.449	174
MA	5	148.62	2.043	0.835	100	1.225	147
	5	148.62	1.484	0.604	72	0.891	107
	5	148.62	1.682	0.686	82	1.009	121
	5	148.62	2.335	0.956	115	1.399	168
	5	148.62	1.967	0.804	96	1.180	142
	6	148.62	2.120	0.867	125	1.271	183
JUN	5	148.62	1.745	0.712	85	1.047	126
	5	148.62	1.719	0.701	84	1.032	124
	5	148.62	1.875	0.766	92	1.125	135
	5	148.62	1.279	0.519	62	0.768	92
	5	148.62	1.859	0.759	91	1.115	134
	5	148.62	1.566	0.638	77	0.940	113
JUL	5	148.62	1.589	0.647	78	0.954	114
	5	148.62	1.756	0.716	86	1.054	126
	5	148.62	2.365	0.969	116	1.417	170
	5	148.62	2.710	1.111	133	1.623	195
	5	148.62	2.370	0.971	116	1.420	170
	6	148.60	2.930	1.201	173	1.753	252
AUG	5	148.62	2.362	0.967	116	1.415	170
	5	148.62	2.798	1.147	138	1.675	201
	5	148.62	1.364	0.554	66	0.819	98
	5	148.62	2.864	1.174	141	1.714	206
	5	148.59	2.950	1.209	145	1.765	212
	6	148.56	2.930	1.200	173	1.752	252
SEP	5	148.23	3.451	1.220	146	2.050	246
	5	148.19	2.972	1.209	145	1.766	212
	5	148.00	3.215	1.216	146	1.903	228
	5	147.61	3.542	1.206	145	2.082	250
	5	147.59	2.930	1.179	142	1.724	207
	5	147.47	3.106	1.205	145	1.823	219
OCT	5	147.12	3.476	1.196	144	2.027	243
	5	146.66	3.667	1.185	142	2.121	255
	5	146.15	3.745	1.174	141	2.147	258
	5	145.66	3.708	1.163	140	2.108	253
	5	145.09	3.855	1.151	138	2.170	260
	6	144.91	3.126	1.149	165	1.756	253
NOV	5	144.92	2.878	1.103	132	1.618	194
	5	144.23	3.871	1.132	136	2.146	258
	5	143.76	3.551	1.122	135	1.953	234
	5	143.76	2.900	1.087	130	1.598	192
	5	144.10	2.331	0.880	106	1.294	155
	5	144.60	1.437	0.544	65	0.806	97
DEC	5	146.30	0.260	0.000	0	0.151	18
	5	147.47	0.260	0.000	0	0.154	18
	5	148.62	1.127	0.000	0	0.677	81
	5	148.62	2.948	1.209	145	1.764	212
	5	148.62	5.234	1.225	147	3.119	374
	6	148.62	3.632	1.228	177	2.171	313
			Total		8594		17725



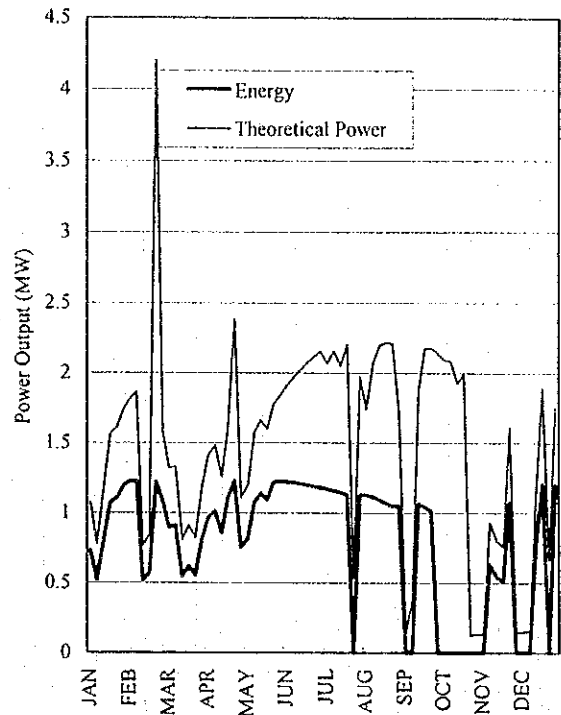
Note: Theoretical Power = $9.8Q_{out} H_{max}/1000$



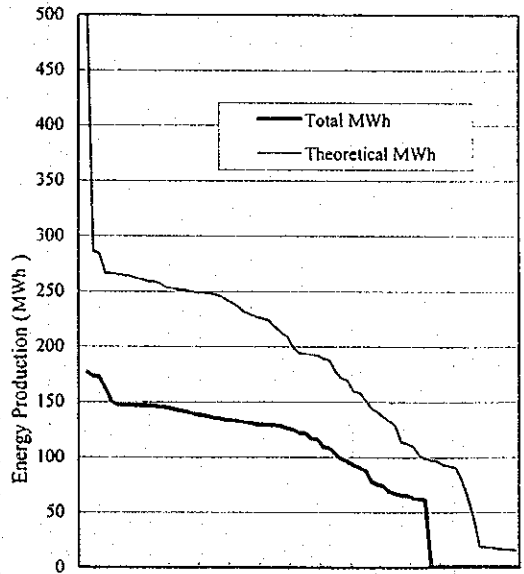
ANNUAL DURATION CURVE OF MWh

Table 6.3.7 (4/4) FIVE-DAYS ENERGY PRODUCTION (FUTURE STAGE DEVELOPMENT, DRY YEAR (1985))

1985	day	WL	Q _{out}	Energy		Theoretical Power	
		(EL m)	(m ³ /s)	(MW)	(MWh)	(MW)	(MWh)
JAN	5	148.62	1.789	0.730	88	1.073	129
	5	148.62	1.291	0.524	63	0.776	93
	5	148.62	1.960	0.801	96	1.175	141
	5	148.62	2.617	1.073	129	1.567	188
	5	148.62	2.695	1.105	133	1.614	194
FEB	6	148.60	2.917	1.196	172	1.745	251
	5	148.52	3.043	1.228	147	1.818	218
	5	148.38	3.131	1.224	147	1.866	224
	5	148.62	1.277	0.518	62	0.767	92
	5	148.62	1.408	0.572	69	0.846	101
MA	5	148.62	7.071	1.221	146	4.202	504
	3	148.62	2.640	1.082	78	1.581	114
	5	148.62	2.199	0.900	108	1.318	158
	5	148.62	2.219	0.908	109	1.330	160
	5	148.62	1.348	0.547	66	0.810	97
APR	5	148.62	1.518	0.618	74	0.911	109
	5	148.62	1.375	0.559	67	0.826	99
	6	148.62	1.984	0.811	117	1.190	171
	5	148.62	2.358	0.966	116	1.413	170
	5	148.62	2.470	1.012	121	1.480	178
MAY	5	148.62	2.100	0.859	103	1.259	151
	5	148.62	2.705	1.109	133	1.620	194
	5	148.62	3.985	1.227	147	2.380	286
	5	148.62	1.847	0.754	90	1.108	133
	5	148.62	2.002	0.818	98	1.201	144
JUN	5	148.62	2.628	1.077	129	1.574	189
	5	148.62	2.775	1.138	137	1.661	199
	5	148.62	2.673	1.096	131	1.601	192
	5	148.57	2.972	1.217	146	1.777	213
	6	148.43	3.096	1.226	176	1.846	266
JUL	5	148.24	3.219	1.221	147	1.913	230
	5	147.98	3.331	1.215	146	1.971	237
	5	147.65	3.440	1.208	145	2.024	243
	5	147.26	3.546	1.199	144	2.072	249
	5	146.81	3.650	1.189	143	2.117	254
AUG	5	146.30	3.752	1.177	141	2.157	259
	5	145.86	3.629	1.168	140	2.071	248
	5	145.31	3.820	1.156	139	2.158	259
	5	144.82	3.661	1.145	137	2.052	246
	5	144.04	3.989	1.127	135	2.203	264
SEP	5	144.63	0.949	0.000	0	0.534	64
	6	144.05	3.571	1.129	163	1.975	284
	5	143.87	3.160	1.126	135	1.743	209
	5	143.22	3.809	1.110	133	2.074	249
	5	142.35	4.108	1.090	131	2.201	264
OCT	5	141.41	4.212	1.070	128	2.217	266
	5	140.43	4.275	1.048	126	2.209	265
	6	140.04	3.344	1.042	150	1.718	247
	5	140.87	0.260	0.000	0	0.137	16
	5	141.51	0.705	0.000	0	0.375	45
NOV	5	141.02	3.588	1.063	128	1.877	225
	5	140.06	4.240	1.041	125	2.176	261
	5	138.82	4.352	1.014	122	2.180	262
	5	137.53	4.388	0.000	0	2.142	257
	5	136.23	4.409	0.000	0	2.096	252
DEC	5	135.70	4.428	0.000	0	2.082	250
	5	135.70	4.096	0.000	0	1.927	231
	5	135.70	4.246	0.000	0	1.997	240
	5	137.24	0.260	0.000	0	0.128	15
	6	138.99	0.260	0.000	0	0.132	19
NOV	5	140.22	0.260	0.000	0	0.135	16
	5	140.66	1.790	0.631	76	0.934	112
	5	141.15	1.525	0.542	65	0.804	96
	5	141.66	1.422	0.510	61	0.757	91
	5	141.55	3.041	1.076	129	1.609	193
DEC	5	142.87	0.260	0.000	0	0.142	17
	5	146.54	0.260	0.000	0	0.151	18
	5	147.42	0.260	0.000	0	0.154	18
	5	147.76	1.922	0.773	93	1.137	136
	5	147.57	3.219	1.206	145	1.892	227
DEC	5	148.04	1.123	0.000	0	0.669	80
	6	148.62	2.931	1.202	173	1.754	253
		Total			6898		13028



Note : Theoretical Power = $9.8Q_{out} H_{max}/1000$



1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73

5 days

ANNUAL DURATION CURVE OF MWh

Table 6.3.8(1/2) ECONOMIC EVALUATION OF ALTERNATIVES

Alternative NO.	Alt.1	Alt.1-6	Alt.1-2	Alt.1-3	Alt.2	Alt.3	Alt.4	Alt.5	Alt.101	Alt.1-5
Install Capacity P(KW)	1,380	1,411	1,650	1,890	2,130	2,370	2,610	2,850	1,890	1,410
Annual Energy Production										
Present Stage E1(MWh)	6,367	6,437	6,905	7,319	7,652	7,906	8,118	8,229	7,152	6,408
Future Stage E2(MWh)	8,108	8,212	8,861	9,366	9,727	9,999	10,254	10,472	9,309	8,183
Construction Cost ((Construction Base Cost)+(Compensation Cost)+(Administration Cost)+(Engineering Service)+(Physical Contingency))										
Case B2 & Case A ;	11,748	11,802	12,304	12,740	13,227	14,154	14,580	14,992	13,055	11,343
Case A ;	12,577	12,416	13,135	13,569	14,057	14,985	15,407	15,819	13,884	11,969
Economic Evaluation										
Case A B/C	0.753	0.820	0.810	0.810	0.818	0.791	0.794	0.793	0.840	0.860
NPV(Rpx10 ⁶)	-2,123	-1,524	-	-1,760	-1,751	-2,147	-2,175	-2,246	-1,492	-1,130
EIRR(%)	7.21	7.90	7.88	7.88	7.95	7.62	7.64	7.62	8.12	8.36
Case B2 B/C	0.778	0.784	0.810	0.828	0.831	0.800	0.798	0.790	0.800	0.812
NPV(Rpx10 ⁶)	-1,958	-1,915	-1,749	-1,639	-1,676	-2,115	-2,208	-2,351	-1,958	-1,602
EIRR(%)	7.53	7.59	7.91	8.11	8.13	7.77	7.74	7.65	7.78	7.93
Case C B/C	-	-	-	-	-	-	-	-	-	-
NPV(Rpx10 ⁶)	-	-	-	-	-	-	-	-	-	-
EIRR(%)	-	-	-	-	-	-	-	-	-	-
Case D B/C	0.666	5.970	0.690	0.706	0.712	0.688	0.686	0.676	0.674	0.693
NPV(Rpx10 ⁶)	-2,949	-2,925	-2,862	-2,804	-2,857	-3,306	-3,424	-3,627	-3,186	-2,612
EIRR(%)	5.92	5.97	6.23	6.45	6.51	6.19	6.17	6.04	6.02	6.29

Table 6.3.8(2/2) ECONOMIC EVALUATION OF ALTERNATIVES

Alternative NO.	Alt.102	Alt.107	Alt.103	Alt.12	Alt.104	Alt.105	Alt.106	Alt.108	Alt.109	Alt.110
Install Capacity P(KW)	950	1,100	1,290	1,440	1,590	1,780	1,930	2,070	2,270	2,420
Annual Energy Production										
Present Stage E1(GWh)	5,121	5,372	5,637	5,790	5,850	5,895	5,877	5,843	5,823	5,796
Future Stage E2(GWh)	6,357	7,041	7,825	8,307	8,671	8,821	8,866	8,865	8,815	8,715
Construction Cost C(Rpx10 ⁶)	8,772	9,003	9,352	9,574	10,321	10,672	10,897	11,158	11,976	12,222
Economic Evaluation										
Case A	B/C									
	NPV(Rpx10 ⁶)	-	-	-	-	-	-	-	-	-
	EIRR(%)									
Case B1	B/C	0.818	0.867	0.912	0.937	0.900	0.868	0.847	0.786	0.763
	NPV(Rpx10 ⁶)	-1,208	-901	-619	-454	-776	-934	-1,286	-1,924	-2,173
	EIRR(%)	8.00	8.58	9.08	9.35	8.96	8.79	8.39	7.71	7.45
Case C	B/C	0.712	0.728	0.736	0.739	0.694	0.661	0.642	0.597	0.582
	NPV(Rpx10 ⁶)	-1,912	-1,851	-1,864	-1,887	-2,382	-2,781	-3,006	-3,627	-3,834
	EIRR(%)	6.57	6.77	6.87	6.9	6.31	5.87	5.61	4.97	4.76
Case D	B/C									
	NPV(Rpx10 ⁶)	-	-	-	-	-	-	-	-	-
	EIRR(%)									

Table 6.3.9 (1/2) ANNUAL COST AND BENEFIT FLOW
(PRESENT STAGE DEVELOPMENT)

Year	Economic Cost (million Rp.)						Total	Benefit	Balance
	Const.	Comp.	Admin.	E/S	Phy. Conti	OMR			
1995							0	0	0
1996							0	0	0
1997							0	0	0
1998							0	0	0
-8 1999							0	0	0
-7 2000							0	0	0
-6 2001	0	0	0	0	0	0	0	0	0
-5 2002	0	0	0	400	40	40	440	0	-440
-4 2003	13	5	1	403	42	42	464	0	-464
-3 2004	991	5	70	212	121	121	1,398	0	-1,398
-2 2005	3583	0	251	213	379	379	4,426	0	-4,426
-1 2006	2365	0	166	280	265	265	3,076	0	-3,076
1 2007						222	222	992	770
2 2008						222	222	992	770
3 2009						222	222	992	770
4 2010						222	222	992	770
5 2011						222	222	992	770
6 2012						222	222	992	770
7 2013						222	222	992	770
8 2014						222	222	992	770
9 2015						222	222	992	770
10 2016						222	222	992	770
11 2017						222	222	992	770
12 2018						222	222	992	770
13 2019						222	222	992	770
14 2020						222	222	992	770
15 2021						222	222	992	770
16 2022						222	222	992	770
17 2023						222	222	992	770
18 2024						222	222	992	770
19 2025						222	222	992	770
20 2026						222	222	992	770
21 2027						222	222	992	770
22 2028						222	222	992	770
23 2029						222	222	992	770
24 2030						222	222	992	770
25 2031						222	222	992	770
26 2032						222	222	992	770
27 2033						222	222	992	770
28 2034						222	222	992	770
29 2035						222	222	992	770
30 2036						222	222	992	770
31 2037						222	222	992	770
32 2038						222	222	992	770
33 2039						222	222	992	770
34 2040						222	222	992	770
35 2041						222	222	992	770
36 2042						222	222	992	770
37 2043						222	222	992	770
38 2044						222	222	992	770
39 2045						222	222	992	770
40 2046						222	222	992	770
41 2047						222	222	992	770
42 2048						222	222	992	770
43 2049						222	222	992	770
44 2050						222	222	992	770
45 2051						222	222	992	770
46 2052						222	222	992	770
47 2053						222	222	992	770
48 2054						222	222	992	770
49 2055						222	222	992	770
50 2056						222	222	992	770
TOTAL	6,952	10	487	1,508	847	11,100			

Case	P1(MW)	P2(MW)	Annual Energy(MWh)
Present Stage:	1.560	0.000	6,022
(Future Stage:			6,022)

EIRR=	7.04%
(Discount rate 10%)	
B/C=	0.751
NPV=	-1,845 million Rp.

Note: Water Supply Plan Provide P1 & P2 in Pres. Stage Provide P1 in Present Stage
 Present Stage & Future Stage Case B Case A
 Only Present Stage Case D Case C

Table 6.3.9 (2/2) ANNUAL COST AND BENEFIT FLOW
(FUTURE STAGE DEVELOPMENT)

Year	Economic Cost (million Rp.)						Total	Benefit	Balance
	Const.	Comp.	Admin.	E/S	Phy. Conti	OMR			
1995							0	0	0
1996							0	0	0
1997							0	0	0
1998							0	0	0
-8 1999							0	0	0
-7 2000							0	0	0
-8 2001	0	0	0	0	0		0	0	0
-5 2002	0	0	0	400	40		440	0	-440
-4 2003	13	5	1	403	42		464	0	-464
-3 2004	991	5	70	212	121		1,398	0	-1,398
-2 2005	3,583	0	251	213	379		4,426	0	-4,426
-1 2006	2,365	0	166	280	265		3,076	0	-3,076
1 2007						222	222	992	770
2 2008						222	222	992	770
3 2009						222	222	992	770
4 2010						222	222	992	770
5 2011						222	222	992	770
6 2012						222	222	1,423	1,201
7 2013						222	222	1,423	1,201
8 2014						222	222	1,423	1,201
9 2015						222	222	1,423	1,201
10 2016						222	222	1,423	1,201
11 2017						222	222	1,423	1,201
12 2018						222	222	1,423	1,201
13 2019						222	222	1,423	1,201
14 2020						222	222	1,423	1,201
15 2021						222	222	1,423	1,201
16 2022						222	222	1,423	1,201
17 2023						222	222	1,423	1,201
18 2024						222	222	1,423	1,201
19 2025						222	222	1,423	1,201
20 2026						222	222	1,423	1,201
21 2027						222	222	1,423	1,201
22 2028						222	222	1,423	1,201
23 2029						222	222	1,423	1,201
24 2030						222	222	1,423	1,201
25 2031						222	222	1,423	1,201
26 2032						222	222	1,423	1,201
27 2033						222	222	1,423	1,201
28 2034						222	222	1,423	1,201
29 2035						222	222	1,423	1,201
30 2036						222	222	1,423	1,201
31 2037						222	222	1,423	1,201
32 2038						222	222	1,423	1,201
33 2039						222	222	1,423	1,201
34 2040						222	222	1,423	1,201
35 2041						222	222	1,423	1,201
36 2042						222	222	1,423	1,201
37 2043						222	222	1,423	1,201
38 2044						222	222	1,423	1,201
39 2045						222	222	1,423	1,201
40 2046						222	222	1,423	1,201
41 2047						222	222	1,423	1,201
42 2048						222	222	1,423	1,201
43 2049						222	222	1,423	1,201
44 2050						222	222	1,423	1,201
45 2051						222	222	1,423	1,201
46 2052						222	222	1,423	1,201
47 2053						222	222	1,423	1,201
48 2054						222	222	1,423	1,201
49 2055						222	222	1,423	1,201
50 2056						222	222	1,423	1,201
TOTAL	6,952	10	487	1,508	847	11,100			

Case

	P1(MW)	P2(MW)	Annual Energy(MWh)
Present Stage:	1,560	0,000	6,022
(Future Stage:			8,639)

EIRR=	9.51%
(Discount rate 10%)	
B/C=	0.952
NPV=	-355 million Rp.

Note :	Water Supply Plan	Provide P1 & P2 in Pres. Stage	Provide P1 in Present Stage
	Present Stage & Future Stage	Case B	Case A
	Only Present Stage	Case D	Case C

Table 6.3.10 (1/2) BREAKDOWN OF COST DISBURSEMENT (FINANCIAL)

Description	2001/2002		2002/2003		2003/2004		2004/2005		2005/2006		2006/2007		2007/2008		2008/2009		2009/2010		2010/2011		2011/2012		
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	
I. Construction Base Cost	5,416	1,536	0	0	0	0	7	5	619	372	2713	871	2077	288	0	0	0	0	0	0	0	0	0
1. Jatbarang Dam	41	37	0	0	0	0	7	5	12	11	14	14	8	7	0	0	0	0	0	0	0	0	0
2. Exclusive Hydro	5375	1499	0	0	0	0	0	0	607	361	2699	857	2069	281	0	0	0	0	0	0	0	0	0
II. Compensation Cost	0	10	0	0	0	0	0	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0
III. Administration Cost	0	487	0	0	0	0	0	1	0	70	0	251	0	166	0	0	0	0	0	0	0	0	0
IV. Engineering Service	982	526	1508	0	260	140	262	141	139	73	139	74	182	98	0	0	0	0	0	0	0	0	0
1. Detailed Design	520	280	800	0	260	140	260	140	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2. Construction Supervision	462	246	708	0	0	0	2	1	139	73	139	74	182	98	0	0	0	0	0	0	0	0	0
V. Physical Contingency	640	207	847	0	26	14	27	15	76	45	285	94	226	39	0	0	0	0	0	0	0	0	0
VI. Total (I+II+III+IV+V)	7,038	2,767	9,805	0	236	154	296	168	834	565	3,137	1,289	2,485	591	0	0	0	0	0	0	0	0	0
VII. Value added Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VIII. Grand Total	7,038	2,767	9,805	0	236	154	296	168	834	565	3,137	1,289	2,485	591	0	0	0	0	0	0	0	0	0

Notes: *1 Price Level in July, 1992
 *2 Conversion Rate US\$ 1.00 = Rp.2,633. 1 Yen = Rp.16.20

Table 6.3.10 (2/2) BREAKDOWN OF COST DISBURSEMENT (FINANCIAL)

Description	2001/2002		2002/2003		2003/2004		2004/2005		2005/2006		2006/2007		2007/2008		2008/2009		2009/2010		2010/2011		2011/2012	
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
I																						
Construction Base Cost	8,820	4,582	13,403	0	0	0	11	14	971	1030	4382	2605	3456	934	0	0	0	0	0	0	0	0
1. Jabbaring Dam	45	41	86	0	0	0	8	6	13	12	15	15	9	8	0	0	0	0	0	0	0	0
2. Exclusive Hydro	5,913	1,849	7,562	0	0	0	0	0	668	397	2969	943	2276	310	0	0	0	0	0	0	0	0
3. Price Contingency	2,862	2,892	5,755	0	0	0	3	8	290	621	1398	1647	1171	616	0	0	0	0	0	0	0	0
II																						
Compensation Cost	0	27	27	0	0	0	0	13	0	14	0	0	0	0	0	0	0	0	0	0	0	0
1. Compensation	0	11	11	0	0	0	0	6	0	6	0	0	0	0	0	0	0	0	0	0	0	0
2. Price Contingency	0	16	16	0	0	0	0	7	0	8	0	0	0	0	0	0	0	0	0	0	0	0
III																						
Administration Cost	0	1482	1482	0	0	0	0	3	0	193	0	750	0	535	0	0	0	0	0	0	0	0
1. Administration	0	536	536	0	0	0	0	1	0	77	0	276	0	182	0	0	0	0	0	0	0	0
2. Price Contingency	0	946	946	0	0	0	0	2	0	116	0	475	0	353	0	0	0	0	0	0	0	0
IV																						
Engineering Service	1390	1304	2694	0	0	262	141	139	73	139	74	182	98	0	0	0	0	0	0	0	0	0
1. Detailed Design	520	280	800	0	0	260	140	140	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2. Construction Supervision	462	246	708	0	0	0	2	1	139	73	139	74	182	98	0	0	0	0	0	0	0	0
3. Price Contingency	408	778	1186	0	0	89	162	101	188	59	111	65	127	93	190	0	0	0	0	0	0	0
V																						
Physical Contingency	1021	591	1612	0	0	26	14	27	17	111	112	452	268	364	103	0	0	0	0	0	0	0
VI																						
Total (I+II+III+IV+V)	11,231	7,986	19,218	0	0	286	154	300	188	1,422	4,973	3,698	4,002	1,670	0	0	0	0	0	0	0	0
VII																						
Value added Tax	1,123	799	1,922	0	0	29	15	30	19	122	142	497	370	400	187	0	0	0	0	0	0	0
VIII																						
Grand Total	12,354	8,785	21,140	0	0	315	169	330	207	1,564	5,470	4,068	4,402	1,837	0	0	0	0	0	0	0	0

Notes: #1 Price Level in July, 1992
 #2 Conversion Rate US\$ 1.00 = Rp.2,033.1 Yen = Rp.16.20

Table 6.3.11 SUMMARY OF PROJECT COST (FINANCIAL)

Description	Amount			Total (1,000 US\$)	Total (Mill.Yen)
	F.C.	L.C.	Total		
	(Mill. Rp.)	(Mill. Rp.)	(Mill. Rp.)		
Construction Base Cost	8,820	4,582	13,403	6,593	827
1.1 Jatbarang Dam	45	41	86		
1.2 Exclusive Hydro					
1. Preparatory Works	534	146	680	334	42
2. Penstock	66	69	135	66	8
3. Powerhouse	795	774	1,569	772	97
4. Tailrace	27	28	55	27	3
5. Tailrace Outlet	44	47	91	45	6
6. Electrical & Mechanical Equipment	3,926	435	4,361	2,145	269
7. Distribution Line	35	15	50	25	3
8. Miscellaneous Works	486	135	621	305	38
Sub-total	5,958	1,690	7,648	3,762	472
1.3 Price Contingency; F.C.3% & L.C.8%	2,862	2,892	5,755	2,831	355
Compensation Cost	0	27	27	13	2
1. Compensation	0	11	11	5	1
2. Price Contingency; F.C.3% & L.C.8%	0	16	16	8	1
Administration Cost	0	1,482	1,482	729	91
1. Administration	0	536	536	264	33
2. Price Contingency; F.C.3% & L.C.8%	0	946	946	465	58
Engineering Service	1,390	1,304	2,694	1,325	166
1. Detailed Design	520	280	800	394	49
2. Construction Supervision	462	246	708	348	44
3. Price Contingency; F.C.3% & L.C.8%	408	778	1,186	583	73
Physical Contingency; 10% of I + II + IV	1,021	591	1,612	793	100
Total (I + II + III + IV + V)	11,231	7,986	19,217	9,453	1,186
Value Added Tax ;10% of VI	1,123	799	1,922	945	119
Grand Total	12,354	8,785	21,139	10,398	1,305
Grand Total(1,000 US\$)	6,077	4,321	10,398		
Grand Total (Mill.¥)	763	542	1,305		

Notes;

*1 Price Level July,1992

*2 Conversion Rate US\$1.00=Rp.2033 1 yen=Rp.16.20

Table 6.3.12 BREAKDOWN OF CONSTRUCTION BASE COST (FINANCIAL)

ALT-12 QT=3m3/s Q1=3m3/s Q2=0m3/s

Item	Quantity	Unit Price (1,000 Rp.)		Amount (Mill. Rp.)		Total (Mill. Rp.)
		F.C.	L.C.	F.C.	L.C.	
I. Construction Cost (exclusive to Hydro)				5,913	1,649	7,562
1. Preparatory Works	L.S.			534	146	680
2. Penstock				66	69	135
- Excavation	536 m3	7.5	5.5	4	3	7
- Common Concrete	0 m3	52.0	63.0	0	0	0
- Reinforced Concrete	492 m3	125.0	135.0	62	66	128
3. Powerhouse				795	774	1,569
- Excavation	13028 m3	7.5	5.5	98	72	170
- Common Concrete	0 m3	52.0	63.0	0	0	0
- Reinforced Concrete	618 m3	125.0	135.0	77	83	160
- Powerhouse Building	1 L.S.	620,000.0	619,000.0	620	619	1,239
4. Tailrace				27	28	55
- Excavation	272 m3	7.5	5.5	2	1	3
- Common Concrete	0 m3	52.0	63.0	0	0	0
- Reinforced Concrete	199 m3	125.0	135.0	25	27	52
5. Tailrace OutLet				44	47	91
- Excavation	112 m3	7.5	5.5	1	1	2
- Common Concrete	0 m3	52.0	63.0	0	0	0
- Reinforced Concrete	342 m3	125.0	135.0	43	46	89
6. Electrical & Mechanical Equipment				3,926	435	4,361
- Turbine-Inlet valve	1 set	1,480,000.0	164,000.0	1,480	164	1,644
- Generator	1 set	1,092,000.0	121,000.0	1,092	121	1,213
- Transformer	1 set	84,000.0	9,000.0	84	9	93
- Overhead crane	1 set	122,000.0	13,000.0	122	13	135
- Control & Switchyard Equipment	1 set	556,000.0	62,000.0	556	62	618
- Outlet Gate	1 set	154,000.0	17,000.0	154	17	171
- Penstock	1 set	50,000.0	6,000.0	50	6	56
- TL Bay	1 set	289,000.0	32,000.0	289	32	321
- TR Bay	1 set	99,000.0	11,000.0	99	11	110
7. Distribution Line; 20kV	L.S.	35,000.0	15,000.0	35	15	50
8. Miscellaneous Works	L.S.			486	135	621

Table 6.4.1 CONSUMERS' PRICE INDEX IN INDONESIA AND IN SEMARANG CITY

(Fiscal year 1988/89 = 100)

Group/Sub group	Composite consumer price indexes of 27 municipalities in whole Indonesia at the end of each calendar year					Consumer price indexes of Semarang Municipality at the end of each calendar year					Average annual increasing ratio(%)**	
	1993 ¹⁾	1994 ²⁾	1995 ²⁾	1996 ²⁾	1996 ²⁾	1992 ³⁾	1993 ³⁾	1994 ³⁾	1995 ³⁾	1996 ³⁾		1997 ³⁾
	Average annual increasing ratio(%)*					Average annual increasing ratio(%)**						
General	145.07	157.42	172.27	185.92	8.62%	134.46	147.52	157.38	171.21	178.82	194.12	7.62%
Food	136.27	151.08	171.06	187.38	11.20%	139.08	147.40	164.52	183.93	188.42	218.58	9.46%
Cereals, cassava and their products	120.56	139.97	167.89	179.67	14.22%	125.73	132.28				214.13	11.24%
Meat and its products	161.56	180.34	205.96	225.92	11.83%	169.60	174.07				250.21	8.09%
Fresh fish	142.35	159.99	173.97	202.09	12.39%	140.74	158.71				280.41	14.78%
Preserved fish	134.12	148.80	162.10	188.63	12.04%	129.14	141.63				177.17	6.53%
Eggs, milk and their products	148.56	154.01	161.12	178.56	6.32%	148.40	151.20				196.16	5.74%
Vegetables	137.20	165.16	179.34	204.91	14.31%	122.26	151.53				302.99	19.90%
Beans and nuts	135.26	147.51	155.27	173.20	8.59%	157.02	177.38				197.76	4.72%
Fruits	146.14	160.47	192.67	211.17	13.05%	154.25	186.26				308.16	14.84%
Spices	141.97	150.05	158.25	191.41	10.47%	125.53	125.22				214.11	11.27%
Fats and oils	126.61	140.41	179.49	187.04	13.89%	116.49	120.72				166.16	7.36%
Soft drinks	144.12	154.64	176.53	182.01	8.09%	150.21	157.55				229.90	8.88%
Prepared food and other food items	131.93	141.17	157.03	167.49	8.28%	140.08	142.68				188.06	6.07%
Housing	154.88	170.09	185.12	194.81	7.95%	133.19	147.91	154.93	162.98	171.04	181.40	6.37%
Costs for housing	165.58	188.30	208.59	220.75	10.06%	131.91	151.03				182.79	6.74%
Fuel, electricity and water	152.80	160.14	169.21	175.01	4.63%	134.17	153.24				174.29	5.37%
Household equipment	131.33	136.41	143.29	148.17	4.10%	122.48	124.49				170.39	6.83%
Household operation	131.04	136.64	145.96	154.86	5.73%	137.52	143.47				190.12	6.69%
Clothing	135.74	144.53	153.81	164.04	6.52%	124.41	133.57	139.99	148.26	152.02	157.13	4.78%
Clothing for men	139.24	147.89	156.05	167.09	6.27%	138.09	145.33				167.72	3.96%
Clothing for women	136.46	143.41	151.51	159.12	5.25%	122.40	131.09				149.19	4.04%
Clothing for children	151.52	163.31	179.21	193.95	8.58%	122.80	134.62				157.63	5.12%
Personal effects	111.61	120.45	126.38	134.52	6.42%	107.59	116.87				152.60	7.24%
Miscellaneous	150.71	158.31	168.40	184.60	6.99%	133.81	152.19	157.45	171.90	183.99	190.20	7.29%
Medical care	137.59	157.28	173.67	191.02	11.56%	127.43	142.64				189.60	8.27%
Personal care and cosmetics	136.60	145.86	156.43	165.43	6.59%	133.96	138.20				164.78	4.23%
Education	144.95	159.65	177.49	196.25	10.63%	125.76	143.74				180.93	7.55%
Recreation and sports	137.27	142.88	158.29	169.72	7.33%	129.96	147.61				185.11	7.33%
Transportation	160.20	162.02	165.66	182.64	4.47%	139.13	163.58				200.18	7.55%
Tobacco and alcoholic drinks	171.74	174.91	184.00	202.70	5.68%	149.78	157.99				203.59	6.33%

Source:

1) Statistical Year Book of Indonesia 1995, Biro Pusat Statistik Indonesia.

2) Statistical Year Book of Indonesia 1996, Biro Pusat Statistik Indonesia.

3) Economic Indicator of Semarang City (Indikator Ekonomi Kotamadya Semarang) 1992, Kantor Statistik Kotamadya Semarang.

4) Economic Indicator (Indikator Ekonomi) November 1993, Kantor Statistik Kotamadya Semarang.

4) Economic Indicator (Indikator Ekonomi) November 1997, Kantor Statistik Kotamadya Semarang.

(Note)

* : Annual average increasing ratio from 1993 to 1996.

** : Annual average increasing ratio from the end of 1992 to November 1997.

Table 6.4.2 ESTIMATION OF DAMAGES INCREASING RATE FOR FLOOD CONTROL WORKS BASED ON 10-YEAR FLOOD

No.	X	Y	Land Use		Damageable Value (Rp.10 ⁶)				Damage Rate				Damaged Value (Rp.10 ⁶)				Remarks																				
			RS	ID	Inund.	Buildings	Indoor movables	Buildings	Indoor movables	Buildings	Indoor movables	Buildings	Indoor movables	Buildings	Indoor movables																						
			RS	ID	BZ	RS	ID	BZ	RS	ID	BZ	RS	ID	BZ	RS	ID	BZ	RS	ID	BZ	RS	ID	BZ	RS	ID	BZ											
28	10	8	0	4	0	10,094	0	8,378	0	0,530	0,530	0,530	0,4070	0,4110	0,2510	0	535	0	3,443	0	3,978	1. Damage Rates by inundation depth															
36	10	9	0	4	0	0,07	0	8,378	0	0,530	0,530	0,530	0,4070	0,4110	0,2510	0	535	0	3,443	0	3,978	Inundatio															
45	10	10	0	4	0	0,06	0	8,378	0	0,530	0,530	0,530	0,4070	0,4110	0,2510	0	535	0	3,443	0	3,978	Damage rates															
54	10	11	0	4	0	0,06	0	8,378	0	0,530	0,530	0,530	0,4070	0,4110	0,2510	0	535	0	3,443	0	3,978	Buildings															
61	8	12	0	4	0	0,04	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	Indoor movables															
62	9	12	0	4	0	0,09	0	8,378	0	0,530	0,530	0,530	0,4070	0,4110	0,2510	0	535	0	3,443	0	3,978	RS															
63	10	12	0	4	0	0,09	0	8,378	0	0,530	0,530	0,530	0,4070	0,4110	0,2510	0	535	0	3,443	0	3,978	ID															
68	6	13	0	4	0	0,01	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	BZ															
69	7	13	0	4	0	0,02	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	RSI															
70	8	13	0	4	0	0,07	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	ID															
71	9	13	0	4	0	0,15	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	BZ															
76	5	14	0	4	0	0,02	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	RSI															
77	6	14	0	4	0	0,02	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	ID															
78	7	14	0	4	0	0,06	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	BZ															
79	8	14	0	4	0	0,11	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	RSI															
80	9	14	0	4	0	0,21	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	ID															
81	10	14	0	4	0	0,24	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	BZ															
87	7	15	0	4	0	0,02	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	RSI															
88	8	15	0	4	0	0,06	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	ID															
89	9	15	0	4	0	0,14	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	BZ															
90	10	15	0	4	0	0,10	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	RSI															
96	7	16	0	4	0	0,04	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	ID															
97	8	16	0	4	0	0,07	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	BZ															
98	9	16	0	4	0	0,04	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	RSI															
105	7	17	0	4	0	0,01	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	ID															
106	8	17	0	4	0	0,01	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	BZ															
114	7	18	0	4	0	0,05	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	RSI															
208	4	36	0	4	0	0,03	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	ID															
209	5	36	0	4	0	0,12	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	BZ															
214	5	37	0	4	0	0,04	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	RSI															
216	2	38	0	4	0	0,06	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	ID															
217	3	38	0	4	0	0,03	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	BZ															
218	4	38	0	4	0	0,02	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	RSI															
221	2	39	0	4	0	0,24	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	ID															
222	3	39	0	4	0	0,06	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	BZ															
223	4	39	0	4	0	0,01	0	10,951	0	15,058	0,530	0,530	0,4070	0,4110	0,2510	0	580	0	3,779	0	4,360	RSI															
Total																							3,922	3,210	9,287	18,070	20,660	60,472	115,619								

(Note) 1. Standard construction price of building (in 1992) 2. Share rate
 Residence: 0.48
 Permanent - Rp. 300 (thousand/m²)
 Semi P. - Rp. 225 (thousand/m²)
 Temporary - Rp. 120 (thousand/m²)
 Industry - Rp. 548 (thousand/m²)
 Commercial - Rp. 594 (thousand/m²)
 Public - Rp. 594 (thousand/m²)
 Annual increase (%) 6.74%

3. Area value (Rp.10⁶/ha)
 Residence: 1,088
 Permanent - Rp. 664
 Semi P. - Rp. 293
 Temporary - Rp. 131
 Industry - Rp. 2,523
 Commercial - Rp. 2,738
 Public: Rp. 2,758

4. Depreciation: 56%
 5. Tax: 10%
 6. Building densi 66%
 7. Indoor movables to buildings (%):
 Residence - 60.0%
 Industry - 83.0%
 Commercial - 137.5%

8. Abbreviation:
 RS: Residence
 ID: Industry
 BZ: Business (commercial)
 RSim: Residence - indoor movables
 IDim: Industry - indoor movables
 BZim: Business - indoor movables

1. Calculation of Damages Increasing Rate:
 - Damages as of 1992 for residence, industry and business areas: Rp. 10⁶ 77
 - Damages as of 1997 taking price index for housings into account: Rp. 10⁶ 116
 - Damages increasing rate: 1.495
 by JICA in 1993.

Table 6.4.3 PROBABLE FLOOD DAMAGES BY FLOOD SCALE

(Rp.10 ⁶)					
Flood scale (return perio	5-year	10-year	25-year	50-year	100-year
Building					
Residence*	0	3,922	11,217	17,146	30,413
Industrial*	0	3,210	8,025	14,445	21,824
Business*	0	9,287	15,091	20,894	25,252
Inddor movable					
Residence*	0	18,070	51,527	75,804	132,527
Industrial*	0	20,660	51,652	92,974	141,167
Business*	0	60,472	98,263	136,055	175,716
Sub-total (damages to general assets	115,621	235,775	357,318	526,899	
Public facilities**	0	54,111	110,343	167,225	246,589
Business suspension***	0	6,937	14,146	21,439	31,614
Total probable damage	0	176,669	360,264	545,983	805,102

(Note) * : For 10-year flood damages, refer to Table 6.4.2.

For 25-, 50- and 100-year flood damages, estimated based on the flood damages used in the Feasibility Study in 1993 multiplying an damages increase rate of 1.495 calculated in the said table.

** : Estimated by a rate of 46.8 % of damages to public facilities to the total of general assets above as same manner in the said Feasibility Study.

*** : Estimated by a rate of 6.0 % of damages to business suspension to the total of general assets.

Table 6.4.4 ANNUAL AVERAGE PROBABLE FLOOD DAMAGES

(Rp.10 ⁶)						
Return period	Annual average probability of exceedance	Probability of occurrence	Flood damages by return period	Average amount of assumed damages	Average annual amount of probable damages	Accumulated amount of probable damages
5-year	0.2000	0.0000	0	0	0	0
10-year	0.1000	0.1000	176,669	88,334	8,833	8,833
25-year	0.0400	0.0600	360,264	268,467	16,108	24,941
50-year	0.0200	0.0200	545,983	453,123	9,062	34,004
100-year	0.0100	0.0100	805,102	675,542	6,755	40,759

Table 6.4.5 ESTIMATION OF STANDARD CONVERSION FACTOR

(Note)
Equation for calculation of standard conversion factor (SCF):

$$SCF = \frac{\text{Import amount} + \text{Export amount}}{(\text{Import amount} + \text{Import customs}) + (\text{Export amount} - \text{Export tax} + \text{Excise duties})}$$

Year	Import amount	Export amount	Import customs	Export taxes	Excise duties	
1992/93	36,016	33,967	3,223	9	2,242	
1993/94	37,961	36,823	3,555	14	2,626	
1994/95	46,129	40,053	3,218	120	3,001	
1995/96	55,360	45,418	3,248	201	3,668	
Total	175,466	156,261	13,244	344	11,537	
					SCF=	0.93139

(Note) Refer to Tables 2.4.12 in Chapter II.

**Table 6.4.6 ANNUAL DISBURSEMENT OF CONSTRUCTION COST AND ESTIMATION OF ITS ECONOMIC COST
(Flood Control Works)**

Cost item	Distribution												Total					
	2006/01			2001/02			2002/03			2003/04			2004/05			F.C.	L.C.	Total
	FC	L.C.	ub-total	FC	L.C.	ub-total	FC	L.C.	ub-total	FC	L.C.	ub-total	FC	L.C.	ub-total			
Construction works	2,582	2,789	5,371	15,738	15,559	31,297	12,893	22,320	35,213	16,112	10,871	26,983	0	0	0	47,325	51,139	98,464
Preparatory works	0	0	0	430	465	895	430	465	895	860	930	1,790	0	0	0	4,302	4,649	8,951
West Floodway improvement	0	0	0	11,009	6,786	17,795	4,626	8,879	13,505	0	0	0	0	0	0	15,635	15,665	31,300
Reconstruction of Simongan	0	0	0	4,299	8,308	12,607	5,418	8,898	14,316	12,450	4,926	17,376	0	0	0	22,167	22,132	44,299
Garang river improvement	0	0	0	0	0	0	2,419	4,078	6,497	2,802	4,615	7,417	0	0	0	5,221	8,693	13,914
Engineering cost for supervision	316	181	517	1,569	845	2,414	1,457	785	2,242	897	483	1,380	0	0	0	4,259	2,294	6,553
Tax	0	589	589	0	3,371	3,371	0	3,746	3,746	0	2,796	2,796	0	0	0	4,000	10,502	10,502
Sub total	2,918	3,721	6,639	17,307	19,775	37,082	14,350	26,851	41,201	17,009	13,750	30,759	0	0	0	51,584	64,097	115,681
Administration	0	387	387	0	2,191	2,191	0	2,465	2,465	0	1,861	1,861	0	0	0	0	6,904	6,904
Sub-total	2,918	4,108	7,026	17,307	21,966	39,273	14,350	29,316	43,666	17,009	15,611	32,620	0	0	0	51,584	71,001	122,585
Physical contingency	292	372	664	1,731	1,978	3,709	1,435	2,685	4,120	1,701	1,375	3,076	0	0	0	5,159	6,410	11,569
Sub-total	3,210	4,480	7,690	19,038	23,944	42,982	15,785	32,001	47,786	18,710	16,986	35,696	0	0	0	56,743	77,411	134,154
Price contingency	298	1,164	1,462	2,389	8,632	11,021	2,514	15,019	17,533	3,631	9,969	13,600	0	0	0	8,832	34,784	43,616
Total	3,508	5,644	9,152	21,427	32,576	54,003	18,299	47,020	65,319	22,341	26,955	49,296	0	0	0	65,575	112,195	177,770
Financial cost (Total-Price cont.)	3,210	4,480	7,690	19,038	23,944	42,982	15,785	32,001	47,786	18,710	16,986	35,696	0	0	0	56,743	77,411	134,154
Economic cost	2,889	3,422	6,311	17,134	17,984	35,118	14,207	24,576	38,783	16,839	12,457	29,296	0	0	0	51,069	58,440	109,508

Remarks:	1. Price share rates of construction:	2. Tax : 10 % for construction and engineering services:	3. Contractor's overhead & profit:	4. Standard conversion factor:	5. Shadow wage rate (economic wage rat. 10%):	6. Price : As of October 1997.	7. Conversion rate : US\$ 1.00 = Rp.2.971 and Yen100 = Rp.2.437.
	- Labour 0% 15%	100% 85%	0.0314 (Refer to Table 2.8.5)	0.9314	90%		
	- Equipment and Material 100% 85%						

Remarks:	8. Operation/maintenance and replacement cost:	9. Share rate of cost for engineering services, tax, compensation and administration of dam to total dam construction cost:	10. Share rate of cost for compensation for dam to total dam construction cost:
	Annualized work item: Power consumption: 0 25 25	0.0% 13.2%	0.0% 13.2%
	Periodical inspection: 0 5 5	100.0% 86.8%	100.0% 86.4%
	Pump replacement cost: 60 15 75		
	Maintenance for civil: 0 295 295		
	Administration: 0 80 80		
	Financial cost: 60 420 480		
	Economic cost: 60 397 457		

Remarks:	11. Operation/maintenance and replacement cost:	12. Share rate of cost for engineering services, tax, compensation and administration of dam to total dam construction cost:	13. Share rate of cost for compensation for dam to total dam construction cost:
	Annualized work item: Power consumption: 0 25 25	0.0% 11.2%	0.0% 11.2%
	Periodical inspection: 0 5 5	100.0% 88.8%	100.0% 88.8%
	Replacement cost per: 70 20 90		
	Maintenance for civil: 0 270 270		
	Administration: 0 180 180		
	Financial cost: 70 500 570		
	Economic cost: 70 478 548		
	Allocated economic c: 25 151 176		

**Table 6.4.7 CALCULATION OF ECONOMIC INTERNAL RATE OF RETURN
(Flood Control Works)**

Year in order	Year	Flood control works			Cost allocated from dam				Cost grand total	Benefit	Cash Balance	
		Construction cost		Cost for L/C M & R	Total	Construction co		Cost for O/M & R				Total
		F/C	L/C			F/C	L/C					
1	1998/99	0	0	0	0	0	0	0	0	0	0	
2	1999/00	0	0	0	0	0	0	0	0	0	0	
3	2000/01	2,889	3,422	0	6,311	644	702	0	1,346	7,657	-7,657	
4	2001/02	17,134	17,984	0	35,118	3,156	4,182	0	7,338	42,456	-42,456	
5	2002/03	14,207	24,576	0	38,783	4,395	5,362	0	9,757	48,540	-48,540	
6	2003/04	16,839	12,457	0	29,296	10,062	9,039	0	19,101	48,397	-48,397	
7	2004/05			457	457	6,816	4,353	0	11,169	11,626	24,941	
8	2005/06			457	457	0	0	176	176	633	40,759	
9	2006/07			457	457	0	0	176	176	633	40,759	
10	2007/08			457	457			176	176	633	40,759	
11	2008/09			457	457			176	176	633	40,759	
12	2009/10			457	457			176	176	633	40,759	
13	2010/11			457	457			176	176	633	40,759	
14	2011/12			457	457			176	176	633	40,759	
15	2012/13			457	457			176	176	633	40,759	
16	2013/14			457	457			176	176	633	40,759	
17	2014/15			457	457			176	176	633	40,759	
18	2015/16			457	457			176	176	633	40,759	
19	2016/17			457	457			176	176	633	40,759	
20	2017/18			457	457			176	176	633	40,759	
21	2018/19			457	457			176	176	633	40,759	
22	2019/20			457	457			176	176	633	40,759	
23	2020/21			457	457			176	176	633	40,759	
24	2021/22			457	457			176	176	633	40,759	
25	2022/23			457	457			176	176	633	40,759	
26	2023/24			457	457			176	176	633	40,759	
27	2024/25			457	457			176	176	633	40,759	
28	2025/26			457	457			176	176	633	40,759	
29	2026/27			457	457			176	176	633	40,759	
30	2027/28			457	457			176	176	633	40,759	
31	2028/29			457	457			176	176	633	40,759	
32	2029/30			457	457			176	176	633	40,759	
33	2030/31			457	457			176	176	633	40,759	
34	2031/32			457	457			176	176	633	40,759	
35	2032/33			457	457			176	176	633	40,759	
36	2033/34			457	457			176	176	633	40,759	
37	2034/35			457	457			176	176	633	40,759	
38	2035/36			457	457			176	176	633	40,759	
39	2036/37			457	457			176	176	633	40,759	
40	2037/38			457	457			176	176	633	40,759	
41	2038/39			457	457			176	176	633	40,759	
42	2039/40			457	457			176	176	633	40,759	
43	2040/41			457	457			176	176	633	40,759	
44	2041/42			457	457			176	176	633	40,759	
45	2042/43			457	457			176	176	633	40,759	
46	2043/44			457	457			176	176	633	40,759	
47	2044/45			457	457			176	176	633	40,759	
48	2045/46			457	457			176	176	633	40,759	
49	2046/47			457	457			176	176	633	40,759	
50	2047/48			457	457			176	176	633	40,759	
51	2048/49			457	457			176	176	633	40,759	
52	2049/50			457	457			176	176	633	40,759	
53	2050/51			457	457			176	176	633	40,759	
54	2051/52			457	457			176	176	633	40,759	
55	2053/54			457	457			176	176	633	40,759	
56	2054/55			457	457			176	176	633	40,759	
Total		51,069	58,439	22,850	132,358	25,073	23,638	8,624	57,335	189,693	2,022,132	1,832,439

In the condition of discount rate at 12 %:

Net Present value (NPV):	92,130	164,331	72,201
Internal rate of return (EIRR):			19.77%
B/C			1.78

**Table 6.4.8 FINANCIAL BACKGROUND OF REGIONAL STATE CORPORATION
OF POTABLE WATER (PDAM)**

(Rp. 10⁶)

Items	1992	1993	1994	1995	1996	1997	Remarks
Expenditure/Revenue							
Revenue	12,205	17,766	18,529	23,673	29,155	29,121	Annual average increasing rate
Water sales revenue	9,217	14,567	14,851	18,829	21,324	22,657	of raw water price: 7.81% (per annum)
Non-water sales revenue	2,286	2,119	2,765	4,025	6,483	4,567	Estimated raw water price in 2005/06: 580 (Rp./m ³)
Other revenue	703	1,080	913	819	1,348	1,897	Annual average benefit of of water supply: 26,700 (Rp. 10 ⁶)
Expenditure	13,691	18,226	16,957	21,832	26,088	25,645	1.46 (m ³ /s)
Direct expenditure for water production	8,452	8,548	9,838	12,113	16,110	15,909	
General and administration expenses	3,821	4,574	5,160	5,822	9,852	6,195	
Other expenditure	1,418	5,103	1,958	3,897	125	3,541	Designed water supply volume:
Balance	-1,485	-459	1,572	1,841	3,067	3,476	
Liability/assets							
Current assets	6,732	12,546	12,255	11,126	15,609	19,919	
Fixed assets	67,155	64,808	62,687	72,637	76,486	70,091	
Other assets	8,092	8,565	10,759	7,770	9,258	34,322	
Total of assets	81,979	85,918	85,701	91,533	101,352	124,331	
Current debt	8,024	2,950	3,574	7,093	6,976	8,131	
Long term debt	39,578	49,244	46,880	48,710	52,668	72,467	
Other obligation	4,606	4,406	218	2,217	4,262	2,263	
Capital and reserves	29,771	29,319	35,029	33,514	37,446	41,470	
Total liabilities	81,979	85,918	85,701	91,534	101,352	124,331	
Others							
Produced water volume (m ³)	38,740,200	40,250,845	39,918,833	41,155,117	46,784,721	50,066,667	
Distributed water volume (m ³)	22,621,714	23,740,957	24,490,204	25,532,633	29,179,813	31,838,458	
Water loss (m ³)	16,118,486	16,509,888	15,428,629	15,622,484	17,604,908	18,228,209	
Loss rate (%)	41.61%	41.02%	38.65%	37.96%	37.63%	36.41%	
Number of customers	61,486	65,802	71,106	82,444	97,775	105,168	
Raw Water Price (Rp./m ³)	218.17	212.38	246.46	294.33	344.35	317.75	

Source : Information from PDAM.

**Table 6.4.9 ANNUAL DISBURSEMENT OF CONSTRUCTION COST AND ESTIMATION OF ITS ECONOMIC COST
(Water Resources Development)**

Cost item	Distribution												Total					
	2000/01			2001/02			2002/03			2003/04			2004/05		Sub-total	Sub-total		
	FC	LC	Sub-total	FC	LC	Sub-total	FC	LC	Sub-total	FC	LC	Sub-total	FC	LC				
Jatibarang Dam Construction Works	1,834	1,625	3,459	8,942	10,684	19,626	12,232	13,381	25,613	28,642	22,800	51,442	19,165	11,143	30,308	70,815	59,633	130,448
64.4% allocated for river improvement:	1,182	1,047	2,229	5,762	6,885	12,647	7,882	8,623	16,505	18,457	14,692	33,149	12,350	7,181	19,530	45,633	38,428	84,061
Engineering cost for supervision	336	181	517	1,738	936	2,674	2,859	1,339	4,398	2,859	1,539	4,398	1,962	1,056	3,018	9,754	5,251	15,005
Tax	0	398	398	0	2,282	2,282	0	3,379	3,379	0	6,268	6,268	0	4,130	4,130	0	16,457	16,457
Compensation cost	0	1,350	1,350	0	2,700	2,700	0	4,050	4,050	0	5,400	5,400	0	0	0	0	13,500	13,500
Administration	0	337	337	0	1,599	1,599	0	2,341	2,341	0	4,458	4,458	0	2,679	2,679	0	11,414	11,414
Sub-total	336	2,266	2,602	1,738	7,517	9,255	2,859	11,309	14,168	2,859	17,665	20,524	1,962	7,865	9,827	9,754	46,622	56,376
Allocated for river improvement	20	176	196	102	637	739	168	950	1,118	168	1,576	1,744	115	777	893	573	4,117	4,690
Sub-total	1,202	1,223	2,425	5,864	7,522	13,386	8,050	9,573	17,623	18,625	16,269	34,894	12,465	7,958	20,423	46,206	42,544	88,751
Physical contingency	217	355	572	1,111	1,669	2,780	1,794	2,328	4,122	3,688	3,747	7,435	2,822	1,721	4,543	9,632	9,820	19,452
46.8% allocated for river improvement	102	166	268	520	781	1,301	840	1,089	1,929	1,726	1,754	3,480	1,321	805	2,126	4,508	4,596	9,103
Sub-total	1,303	1,390	2,693	6,384	8,303	14,687	8,890	10,662	19,552	20,351	18,022	38,373	13,786	8,763	22,549	50,714	47,140	97,854
Price contingency	221	1,103	1,324	1,534	7,196	8,730	3,143	13,116	16,259	7,872	26,807	34,679	7,135	15,426	22,561	19,905	63,648	83,555
46.8% allocated for river improvement	103	516	620	718	3,368	4,086	1,471	6,138	7,609	3,684	12,545	16,229	3,339	7,219	10,558	9,315	29,787	39,102
Total	1,407	1,906	3,312	7,102	11,670	18,772	10,361	16,801	27,161	24,035	30,568	54,602	17,125	15,982	33,107	60,029	76,927	136,956
Financial cost (Total-Price conti.)	1,303	1,390	2,693	6,384	8,303	14,687	8,890	10,662	19,552	20,351	18,022	38,373	13,786	8,763	22,549	50,714	47,140	97,854
Economic cost	1,173	1,278	2,450	5,746	7,613	13,359	8,001	9,761	17,762	18,316	16,454	34,770	12,407	7,924	20,331	45,643	43,029	88,672

11. Operation/maintenance and replacement cost:

Annualized work item:	F.C.	L.C.	Total
Power consumption:	0	25	25
Periodical inspection:	0	5	5
Replacement cost per y	70	20	90
Maintenance for civil:	0	270	270
Administration:	0	180	180
Financial cost	70	500	570
Economic cost	70	478	548
Allocated economic cos	45	275	321

- Remarks:
- Price share rates of construction:
 - Labour: 0.0% 13.2% 0.0% 11.2% 0.0% 10.2% 0.0% 13.6%
 - Equipment and Material: 100.0% 86.8% 100.0% 88.8% 100.0% 89.8% 100.0% 86.4%
 - Tax: 10% for construction and engineering services.
 - Contractor's overhead & profit: 10%
 - Standard conversion factor: 0.9314 (Refer to Table 2.8.5)
 - Shadow wage rate (economic wage rate): 90%
 - Price: As of October 1997.
 - Conversion rate: US\$ 1.00 = Rp.2,971 and Yen 100 = Rp.2,437.
 - Share rate of cost for engineering services, tax, compensation and administration of dam to total dam construction cost: 27.4%
 - Share rate of cost for engineering services of dam to total dam construction cost: 9.1%
 - Share rate of cost for compensation for dam to total dam construction cost: 9.5%

**Table 6.4.10 CALCULATION OF ECONOMIC INTERNAL
RATE OF RETURN
(Water Resources Develioment)**

Year in order	Year	Allocated cost from Jatibarang Dam			Total	Benefit	Cash Balance
		Construction cost		Cost for O/M & R			
		F/C	L/C				
1	1998/9	0	0	0	0	0	
2	1999/0	0	0	0	0	0	
3	2000/0	1,173	1,278	0	2,451	0	
4	2001/0	5,746	7,613	0	13,359	0	
5	2002/0	8,011	9,761	0	17,772	0	
6	2003/0	18,316	16,454	0	34,770	0	
7	2004/0	12,407	7,924	0	20,331	0	
8	2005/0	0	0	321	321	26,700	
9	2006/0	0	0	321	321	26,700	
10	2007/08			321	321	26,700	
11	2008/09			321	321	26,700	
12	2009/10			321	321	26,700	
13	2010/11			321	321	26,700	
14	2011/12			321	321	26,700	
15	2012/13			321	321	26,700	
16	2013/14			321	321	26,700	
17	2014/15			321	321	26,700	
18	2015/16			321	321	26,700	
19	2016/17			321	321	26,700	
20	2017/18			321	321	26,700	
21	2018/19			321	321	26,700	
22	2019/20			321	321	26,700	
23	2020/21			321	321	26,700	
24	2021/22			321	321	26,700	
25	2022/23			321	321	26,700	
26	2023/24			321	321	26,700	
27	2024/25			321	321	26,700	
28	2025/26			321	321	26,700	
29	2026/27			321	321	26,700	
30	2027/28			321	321	26,700	
31	2028/29			321	321	26,700	
32	2029/30			321	321	26,700	
33	2030/31			321	321	26,700	
34	2031/32			321	321	26,700	
35	2032/33			321	321	26,700	
36	2033/34			321	321	26,700	
37	2034/35			321	321	26,700	
38	2035/36			321	321	26,700	
39	2036/37			321	321	26,700	
40	2037/38			321	321	26,700	
41	2038/39			321	321	26,700	
42	2039/40			321	321	26,700	
43	2040/41			321	321	26,700	
44	2041/42			321	321	26,700	
45	2042/43			321	321	26,700	
46	2043/44			321	321	26,700	
47	2044/45			321	321	26,700	
48	2045/46			321	321	26,700	
49	2046/47			321	321	26,700	
50	2047/48			321	321	26,700	
51	2048/49			321	321	26,700	
52	2049/50			321	321	26,700	
53	2050/51			321	321	26,700	
54	2051/52			321	321	26,700	
55	2053/54			321	321	26,700	
56	2054/55			321	321	26,700	
57	2055/56			321	321	26,700	
Total		45,653	43,030	16,050	104,733	1,335,000	1,230,267

In the condition of discount rate at 12 %:

Net Present value (NPV):	48,337	100,299	51,963
Internal rate of return (EIRR):			22.14%
B/C			2.08

**Table 6.4.12 CALCULATION OF ECONOMIC INTERNAL RATE OF RETURN
(Hydropower Generation Works)**

(Note)

.Rate= 2,971 Rp./US\$ Annual increasing rate of fuel: 5.37% Unit benefit as of 1992(US\$/kWh): 0.098 (Rp.10⁶)

Year in order	Year	Cost for power generation works				Cost allocated from dam				Grand total of cost	Envisaged benefit in 2005/06			Cash balance
		Construction cost		OMR Cost	Total	Construction cost		OMR Cost	total		Unit value (Rp./kWh)	Annual E. output (mWh)	Benefit	
		F/C	L/C			F/C	L/C							
1	1998/9	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1999/0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	2000/0	0	0	0	0	3	3	0	6	6	0	0	0	-6
4	2001/0	503	140	0	643	14	19	0	33	676	0	0	0	-676
5	2002/0	3,356	1,319	0	4,675	20	24	0	44	4,719	0	0	0	-4,719
6	2003/0	5,770	2,065	0	7,835	45	41	0	86	7,921	0	0	0	-7,921
7	2004/0	7,542	1,495	0	9,037	31	20	0	51	9,088	0	0	0	-9,088
8	2005/0	0	0	426	426	0	0	1	1	427	575	5,790	3,328	2,901
9	2006/0	0	0	426	426	0	0	1	1	427	575	5,790	3,328	2,901
10	2007/08			426	426			1	1	427	575	5,790	3,328	2,901
11	2008/09			426	426			1	1	427	575	5,790	3,328	2,901
12	2009/10			426	426			1	1	427	575	5,790	3,328	2,901
13	2010/11			426	426			1	1	427	575	5,790	3,328	2,901
14	2011/12			426	426			1	1	427	575	5,790	3,328	2,901
15	2012/13			426	426			1	1	427	575	5,790	3,328	2,901
16	2013/14			426	426			1	1	427	575	5,790	3,328	2,901
17	2014/15			426	426			1	1	427	575	5,790	3,328	2,901
18	2015/16			426	426			1	1	427	575	5,790	3,328	2,901
19	2016/17			426	426			1	1	427	575	5,790	3,328	2,901
20	2017/18			426	426			1	1	427	575	5,790	3,328	2,901
21	2018/19			426	426			1	1	427	575	5,790	3,328	2,901
22	2019/20			426	426			1	1	427	575	5,790	3,328	2,901
23	2020/21			426	426			1	1	427	575	5,790	3,328	2,901
24	2021/22			426	426			1	1	427	575	5,790	3,328	2,901
25	2022/23			426	426			1	1	427	575	5,790	3,328	2,901
26	2023/24			426	426			1	1	427	575	5,790	3,328	2,901
27	2024/25			426	426			1	1	427	575	5,790	3,328	2,901
28	2025/26			426	426			1	1	427	575	5,790	3,328	2,901
29	2026/27			426	426			1	1	427	575	5,790	3,328	2,901
30	2027/28			426	426			1	1	427	575	5,790	3,328	2,901
31	2028/29			426	426			1	1	427	575	5,790	3,328	2,901
32	2029/30			426	426			1	1	427	575	5,790	3,328	2,901
33	2030/31			426	426			1	1	427	575	5,790	3,328	2,901
34	2031/32			426	426			1	1	427	575	5,790	3,328	2,901
35	2032/33			426	426			1	1	427	575	5,790	3,328	2,901
36	2033/34			426	426			1	1	427	575	5,790	3,328	2,901
37	2034/35			426	426			1	1	427	575	5,790	3,328	2,901
38	2035/36			426	426			1	1	427	575	5,790	3,328	2,901
39	2036/37			426	426			1	1	427	575	5,790	3,328	2,901
40	2037/38			426	426			1	1	427	575	5,790	3,328	2,901
41	2038/39			426	426			1	1	427	575	5,790	3,328	2,901
42	2039/40			426	426			1	1	427	575	5,790	3,328	2,901
43	2040/41			426	426			1	1	427	575	5,790	3,328	2,901
44	2041/42			426	426			1	1	427	575	5,790	3,328	2,901
45	2042/43			426	426			1	1	427	575	5,790	3,328	2,901
46	2043/44			426	426			1	1	427	575	5,790	3,328	2,901
47	2044/45			426	426			1	1	427	575	5,790	3,328	2,901
48	2045/46			426	426			1	1	427	575	5,790	3,328	2,901
49	2046/47			426	426			1	1	427	575	5,790	3,328	2,901
50	2047/48			426	426			1	1	427	575	5,790	3,328	2,901
51	2048/49			426	426			1	1	427	575	5,790	3,328	2,901
52	2049/50			426	426			1	1	427	575	5,790	3,328	2,901
53	2050/51			426	426			1	1	427	575	5,790	3,328	2,901
54	2051/52			426	426			1	1	427	575	5,790	3,328	2,901
55	2053/54			426	426			1	1	427	575	5,790	3,328	2,901
56	2054/55			426	426			1	1	427	575	5,790	3,328	2,901
57	2055/56			426	426			1	1	427	575	5,790	3,328	2,901
Total		17,171	5,019	21,300	43,490	113	107	50	270	43,760				

In the condition of discount rate at 12 %:

Net Present value (NPV):	12,840	12,500	-339
Internal rate of return (EIRR):			11.66%
B/C			0.97

Table 6.4.13 ANNUAL DISBURSEMENT OF CONSTRUCTION COST AND ESTIMATION OF ITS ECONOMIC COST
(Jatibarang Multipurpose Dam Construction Works)

Cost item	Distribution																	
	2000/01			2001/02			2002/03			2003/04			2004/05					
	FC	L.C	Sub-total	FC	L.C	Sub-total	FC	L.C	Sub-total	FC	L.C	Sub-total	FC	L.C	Sub-total			
Jatibarang Dam Construction Works	1,834	1,625	3,459	8,942	10,684	19,626	12,232	13,381	25,613	28,642	22,800	51,442	19,165	11,143	30,308	70,815	59,633	130,448
100% allocated for dam	1,834	1,625	3,459	8,942	10,684	19,626	12,232	13,381	25,613	28,642	22,800	51,442	19,165	11,143	30,308	70,815	59,633	130,448
Engineering cost for supervision	336	181	517	1,738	936	2,674	2,859	1,539	4,398	4,398	1,539	4,398	1,962	1,056	3,018	9,754	5,251	15,005
Tax	0	398	398	0	2,282	2,282	0	3,379	3,379	0	6,268	6,268	0	4,130	4,130	0	16,457	16,457
Compensation cost	0	1,350	1,350	0	2,700	2,700	0	4,050	4,050	0	5,400	5,400	0	0	0	0	13,500	13,500
Administration	0	337	337	0	1,599	1,599	0	2,341	2,341	0	4,458	4,458	0	2,679	2,679	0	11,414	11,414
Sub-total	336	2,266	2,602	1,738	7,517	9,255	2,859	11,309	14,168	2,859	17,665	20,524	1,962	7,865	9,827	9,754	46,622	56,376
Allocated for hydropower	0	0	0	0	2	2	1	3	4	0	4	4	0	2	2	1	11	12
Allocated for dam	336	2,266	2,602	1,738	7,515	9,253	2,858	11,306	14,164	2,859	17,661	20,520	1,962	7,863	9,825	9,753	46,611	56,364
Sub-total	2,170	3,891	6,061	10,680	18,199	28,879	15,090	24,687	39,777	31,501	40,461	71,962	21,127	19,006	40,133	80,568	106,244	186,812
Physical contingency	217	355	572	1,111	1,669	2,780	1,794	2,328	4,122	3,688	3,747	7,435	2,822	1,721	4,543	9,632	9,820	19,452
Allocated for hydropower	0	1	1	1	2	3	2	3	5	5	4	9	3	2	5	11	12	23
Allocated for dam	217	354	571	1,110	1,667	2,777	1,792	2,325	4,117	3,683	3,743	7,426	2,819	1,719	4,538	9,621	9,808	19,429
Sub-total	2,387	4,245	6,632	11,790	19,866	31,656	16,882	27,012	43,894	35,184	44,204	79,388	23,946	20,725	44,671	90,189	116,052	206,241
Price contingency	221	1,103	1,324	1,534	7,196	8,730	3,143	13,116	16,259	7,872	26,807	34,679	7,135	15,426	22,561	19,905	63,648	83,553
Allocated for hydropower	0	2	2	2	8	10	4	15	19	9	31	40	8	16	24	23	72	95
Allocated for dam	221	1,101	1,322	1,532	7,188	8,720	3,139	13,101	16,240	7,863	26,776	34,639	7,127	15,410	22,537	19,882	63,576	83,458
Total	2,608	5,346	7,954	13,322	27,054	40,376	20,021	40,113	60,134	43,047	70,980	114,027	31,073	36,135	67,208	110,071	179,628	289,699
Financial cost (Total-Price conti.)	2,387	4,245	6,632	11,790	19,866	31,656	16,882	27,012	43,894	35,184	44,204	79,388	23,946	20,725	44,671	90,189	116,052	206,241
Economic cost	2,148	2,464	4,612	10,611	14,160	24,771	15,194	18,690	33,884	31,666	30,971	62,637	21,551	15,537	37,089	81,170	81,823	162,993

Remarks:		11. Operation/maintenance and replacement cost:	
		Annualized work item	Total
1. Price share rates of construction:			
- Labour	0.0%	0.0%	13.6%
- Equipment and Material	100.0%	100.0%	86.4%
2. Tax : 10 % for construction and engineering services.			
3. Contractor's overhead & profit:	10%		
4. Standard conversion factor:	0.9314 (Refer to Table 2.8.5)		
5. Shadow wage rate (economic wage rate)	90%		
6. Price : As of October 1997.			
7. Conversion rate : US\$ 1.00 = Rp.2,971 and Yen 100 = Rp.2,437.			
8. Share rate of cost for engineering services, tax, compensation and administration of dam to total dam construction cost:		27.4%	
9. Share rate of cost for engineering services of dam to total dam construction cost:		9.1%	
10. Share rate of cost for compensation for dam to total dam construction cost:		9.5%	

**Table 6.4.14 CALCULATION OF ECONOMIC INTERNAL
RATE OF RETURN
(Jatibarang Multipurpose Dam Construction Works)**

		Jatibarang dam construction works				Envisaged benefit in 2005/06				(Rp.10 ⁶)
Year in	Year	Construction cos		OMR	Total	Flood	Water	Power	Total	Cash
order		F/C	L/C	cost	cost	control	resources	Generation	benefit	balance
1	1998/9	0	0	0	0	0	0	0	0	0
2	1999/0	0	0	0	0	0	0	0	0	0
3	2000/0	2,148	2,464	0	4,612	0	0	0	0	-4,612
4	2001/0	10,611	14,160	0	24,771	0	0	0	0	-24,771
5	2002/0	15,194	18,690	0	33,884	0	0	0	0	-33,884
6	2003/0	31,666	30,971	0	62,637	0	0	0	0	-62,637
7	2004/0	21,551	15,537	0	37,088	0	0	0	0	-37,088
8	2005/0	0	0	497	497	12,550	26,700	33	39,283	38,786
9	2006/0	0	0	497	497	12,550	26,700	33	39,283	38,786
10	2007/08			497	497	12,550	26,700	33	39,283	38,786
11	2008/09			497	497	12,550	26,700	33	39,283	38,786
12	2009/10			497	497	12,550	26,700	33	39,283	38,786
13	2010/11			497	497	12,550	26,700	33	39,283	38,786
14	2011/12			497	497	12,550	26,700	33	39,283	38,786
15	2012/13			497	497	12,550	26,700	33	39,283	38,786
16	2013/14			497	497	12,550	26,700	33	39,283	38,786
17	2014/15			497	497	12,550	26,700	33	39,283	38,786
18	2015/16			497	497	12,550	26,700	33	39,283	38,786
19	2016/17			497	497	12,550	26,700	33	39,283	38,786
20	2017/18			497	497	12,550	26,700	33	39,283	38,786
21	2018/19			497	497	12,550	26,700	33	39,283	38,786
22	2019/20			497	497	12,550	26,700	33	39,283	38,786
23	2020/21			497	497	12,550	26,700	33	39,283	38,786
24	2021/22			497	497	12,550	26,700	33	39,283	38,786
25	2022/23			497	497	12,550	26,700	33	39,283	38,786
26	2023/24			497	497	12,550	26,700	33	39,283	38,786
27	2024/25			497	497	12,550	26,700	33	39,283	38,786
28	2025/26			497	497	12,550	26,700	33	39,283	38,786
29	2026/27			497	497	12,550	26,700	33	39,283	38,786
30	2027/28			497	497	12,550	26,700	33	39,283	38,786
31	2028/29			497	497	12,550	26,700	33	39,283	38,786
32	2029/30			497	497	12,550	26,700	33	39,283	38,786
33	2030/31			497	497	12,550	26,700	33	39,283	38,786
34	2031/32			497	497	12,550	26,700	33	39,283	38,786
35	2032/33			497	497	12,550	26,700	33	39,283	38,786
36	2033/34			497	497	12,550	26,700	33	39,283	38,786
37	2034/35			497	497	12,550	26,700	33	39,283	38,786
38	2035/36			497	497	12,550	26,700	33	39,283	38,786
39	2036/37			497	497	12,550	26,700	33	39,283	38,786
40	2037/38			497	497	12,550	26,700	33	39,283	38,786
41	2038/39			497	497	12,550	26,700	33	39,283	38,786
42	2039/40			497	497	12,550	26,700	33	39,283	38,786
43	2040/41			497	497	12,550	26,700	33	39,283	38,786
44	2041/42			497	497	12,550	26,700	33	39,283	38,786
45	2042/43			497	497	12,550	26,700	33	39,283	38,786
46	2043/44			497	497	12,550	26,700	33	39,283	38,786
47	2044/45			497	497	12,550	26,700	33	39,283	38,786
48	2045/46			497	497	12,550	26,700	33	39,283	38,786
49	2046/47			497	497	12,550	26,700	33	39,283	38,786
50	2047/48			497	497	12,550	26,700	33	39,283	38,786
51	2048/49			497	497	12,550	26,700	33	39,283	38,786
52	2049/50			497	497	12,550	26,700	33	39,283	38,786
53	2050/51			497	497	12,550	26,700	33	39,283	38,786
54	2051/52			497	497	12,550	26,700	33	39,283	38,786
55	2053/54			497	497	12,550	26,700	33	39,283	38,786
56	2054/55			497	497	12,550	26,700	33	39,283	38,786
57	2055/56			497	497	12,550	26,700	33	39,283	38,786
Total		81,170	81,822	24,850	187,842	627,500	1,335,000	1,650	1,964,150	1,776,308

In the condition of discount rate at 12 %:

Net Present value (NPV):	88,629	147,568	58,938
Internal rate of return (EIRR):			18.53%
B/C			1.66

**Table 6.4.15 CALCULATION OF ECONOMIC INTERNAL
RATE OF RETURN
(OVERALL PROJECT)**

		Cost			Total	Benefit	Cash Balance
Year in order	Year	Construction cost		Cost for			
		F/C	L/C	O/M & R			
1	1998/9	0	0	0	0	0	0
2	1999/0	0	0	0	0	0	0
3	2000/0	6,578	9,484	0	16,062	0	-16,062
4	2001/0	38,473	50,098	0	88,571	0	-88,571
5	2002/0	44,603	61,886	0	106,489	0	-106,489
6	2003/0	52,821	47,119	0	99,940	0	-99,940
7	2004/0	26,796	13,792	1,216	41,804	41,042	-762
8	2005/06			2,140	2,140	86,888	84,748
9	2006/07			2,140	2,140	86,888	84,748
10	2007/08			2,140	2,140	86,888	84,748
11	2008/09			2,140	2,140	86,888	84,748
12	2009/10			2,140	2,140	86,888	84,748
13	2010/11			2,140	2,140	86,888	84,748
14	2011/12			2,140	2,140	86,888	84,748
15	2012/13			2,140	2,140	86,888	84,748
16	2013/14			2,140	2,140	86,888	84,748
17	2014/15			2,140	2,140	86,888	84,748
18	2015/16			2,140	2,140	86,888	84,748
19	2016/17			2,140	2,140	86,888	84,748
20	2017/18			2,140	2,140	86,888	84,748
21	2018/19			2,140	2,140	86,888	84,748
22	2019/20			2,140	2,140	86,888	84,748
23	2020/21			2,140	2,140	86,888	84,748
24	2021/22			2,140	2,140	86,888	84,748
25	2022/23			2,140	2,140	86,888	84,748
26	2023/24			2,140	2,140	86,888	84,748
27	2024/25			2,140	2,140	86,888	84,748
28	2025/26			2,140	2,140	86,888	84,748
29	2026/27			2,140	2,140	86,888	84,748
30	2027/28			2,140	2,140	86,888	84,748
31	2028/29			2,140	2,140	86,888	84,748
32	2029/30			2,140	2,140	86,888	84,748
33	2030/31			2,140	2,140	86,888	84,748
34	2031/32			2,140	2,140	86,888	84,748
35	2032/33			2,140	2,140	86,888	84,748
36	2033/34			2,140	2,140	86,888	84,748
37	2034/35			2,140	2,140	86,888	84,748
38	2035/36			2,140	2,140	86,888	84,748
39	2036/37			2,140	2,140	86,888	84,748
40	2037/38			2,140	2,140	86,888	84,748
41	2038/39			2,140	2,140	86,888	84,748
42	2039/40			2,140	2,140	86,888	84,748
43	2040/41			2,140	2,140	86,888	84,748
44	2041/42			2,140	2,140	86,888	84,748
45	2042/43			2,140	2,140	86,888	84,748
46	2043/44			2,140	2,140	86,888	84,748
47	2044/45			2,140	2,140	86,888	84,748
48	2045/46			2,140	2,140	86,888	84,748
49	2046/47			2,140	2,140	86,888	84,748
50	2047/48			2,140	2,140	86,888	84,748
51	2048/49			2,140	2,140	86,888	84,748
52	2049/50			2,140	2,140	86,888	84,748
53	2050/51			2,140	2,140	86,888	84,748
54	2051/52			2,140	2,140	86,888	84,748
55	2053/54			2,140	2,140	86,888	84,748
56	2054/55			2,140	2,140	86,888	84,748
57	2055/56			2,140	2,140	86,888	84,748
Total		169,271	182,379	106,076	457,726	4,298,554	3,840,828

In the condition of discount rate at 12 %:

Net Present value (NPV):	205,728	344,963	139,235
Internal rate of return (EIRR):			18.81%
B/C			1.68