

C - 8 BASIN DEVELOPMENT ANALYSIS

Abra River Basin

Abulog River Basin

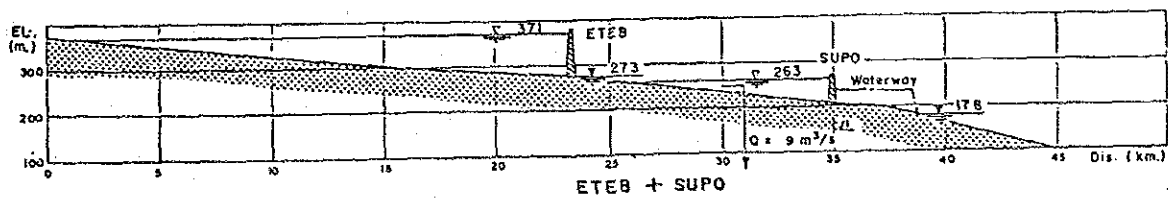
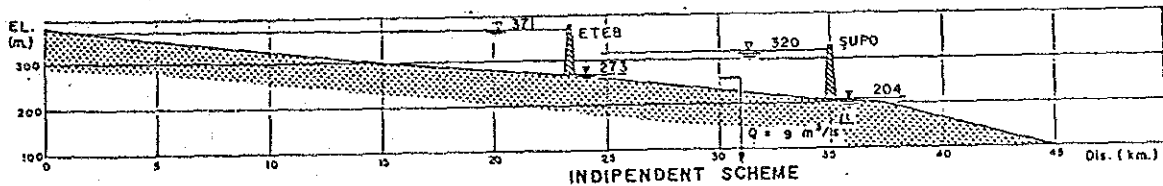
Chico River Basin

Agno River Basin

Agos River Basin

ABRA RIVER BASIN

Case No.	Scheme	ID No.	FSL(m)	TWL(m)
1-3	- Eteb	1-022-00-06-0-1	371.0	273.0
	- Supo	1-022-00-05-3-1	263.0	204.0
1-4	- Eteb	1-022-00-06-0-1	371.0	273.0
	- Supo (D+W Alt.)	1-022-00-05-4-1	263.0	178.0



FSL (Full Supply Level)
 TWL (Tail Water Level)

 **1-3-3 ABRA

REGION NO. : 1 BASIN NO. : 22

NUMBER OF PROJECTS : 2

LIST OF PROJECTS

NO.	PROJECT ID	PROJECT NAME	CA (SQ.KM)	RAIN (MM)	STREAM GAGE ID
1	1-022-00-06-0-1	ETEB	911.0	2750.0	4-1-008
2	1-022-00-05-3-1	SUPO	1293.0	2750.0	4-1-008

CONNECTION MATRIX

1	2
1	0
2	1

1/ C(I,J)=1 : PROJECT-J IS DIRECTLY UPSTREAM OF PROJECT-I
 - C(I,J)=0 : " IS NOT "

SEQ NO.	PROJECT ID	NUP	ID(S) OF U/S PROJECT(S)
1	1-022-00-06-0-1	0	
2	1-022-00-05-3-1	1	1-022-00-06-0-1

PROJECT NAME : ETEB
 PROJECT ID : 1-22-0-6-0-1
 TYPE : RESERVOIR

BASIN NAME : ABRA
 RIVER NAME : ABRA

 * SUMMARY TABLE OF OUTPUTS *

RESERVOIR

 ITEMS 1 2 3 4 5 6 7 8 9 10

 CASE

RESERVOIR DEVELOP. COEF : 0.60 0.55 0.55 0.55 0.50 0.50 0.50 0.45 0.45 0.45
 FULL SUPPLY LEVEL (M) : 371.0 349.9 359.6 371.0 346.2 357.7 371.0 342.6 355.8 371.0
 MIN. OPERATING LEVEL (M) : 331.4 303.9 319.5 335.1 303.7 321.3 338.9 303.5 323.0 342.5

POWER

FIRM DISCHARGE (M3/S) : 39.4 38.2 38.1 38.0 36.7 36.6 36.5 35.3 35.2 35.1
 PLANT PEAK DIS. (M3/S) : 157.8 152.6 152.3 152.0 146.9 146.6 146.2 141.2 140.8 140.4
 AVERAGE NET HEAD (M) : 82.5 59.5 71.1 83.7 57.1 70.4 84.9 54.6 69.7 86.1
 INSTALLED CAPACITY (MW) : 107.1 74.8 89.1 104.7 69.0 84.9 102.2 63.5 80.8 99.5
 GUARANTEED POWER (MW) : 69.3 34.6 52.9 71.2 33.0 53.0 72.8 31.5 52.7 73.8
 AVERAGE FIRM POWER (MW) : 26.8 18.7 22.3 26.2 17.3 21.2 25.5 15.9 20.2 24.9
 FIRM ENERGY (MIL KWH/Y) : 235. 164. 195. 229. 151. 186. 224. 139. 177. 218.
 SECONDARY ENERGY (") : 62. 54. 61. 69. 57. 66. 77. 59. 71. 84.
 ANNUAL AVERAGE E-GY (") : 296. 217. 256. 299. 208. 252. 301. 198. 247. 302.

D A M

DAM HEIGHT (M) : 104.0 82.9 92.6 104.0 79.2 90.7 104.0 75.6 88.8 104.0
 EMBANKMENT VOL. (MIL M3) : 6.063 3.461 4.550 6.063 3.111 4.320 6.063 2.777 4.097 6.063

EVALUATION INDECES

CH/V : 19627. 26031. 22294. 18899. 26530. 22081. 18171. 27123. 21846. 17444.
 C/V : 205. 348. 264. 198. 372. 267. 401. 401. 271. 183.
 P/(20VT+VD) : 8.5 8.7 9.2 9.3 8.4 9.0 9.1 8.0 8.8 8.9
 E(FIRM)/(20VT+VD) : 20.9 19.0 20.1 20.4 18.3 19.7 20.0 17.6 19.2 19.5
 E(F+SEC*0.3)/(20VT+VD) : 22.5 20.9 22.0 22.3 20.4 21.6 22.0 19.9 21.5 21.7

PROJECT NAME : ETEB
 PROJECT ID : 1-022-00-06-0
 TYPE : RESERVOIR

 * SUMMARY TABLE OF COST ESTIMATE *

(UNIT : MILLION USD)

I T E M	C A S E									
	1	2	3	4	5	6	7	8	9	10
POWER DEVELOPMENT (INST.CAP.(MW))	< 107.1	< 74.8	< 89.1	< 104.7	< 69.0	< 84.9	< 102.2	< 63.5	< 80.8	< 99.5
STORAGE DAM	58.77	36.01	45.73	58.77	32.81	43.70	58.77	29.71	41.73	58.77
SPILLWAY	18.74	15.51	17.01	18.74	14.96	16.71	18.74	14.41	16.42	18.74
DIVERSION TUNNEL	33.28	33.28	33.28	33.28	33.28	33.28	33.28	33.28	33.28	33.28
INTAKE (PRESSURE TYPE)	4.18	4.23	4.07	3.94	4.00	3.83	3.70	3.78	3.60	3.47
HEADRAGE TUNNEL (PRESSURE)	4.44	4.34	4.33	4.32	4.22	4.21	4.21	4.10	4.09	4.09
SURGE TANK	2.87	2.79	2.78	2.76	2.69	2.67	2.60	2.58	2.57	2.55
PENSTOCK	4.93	3.94	4.38	4.87	3.77	4.26	4.81	3.61	4.14	4.73
(PRESSURE SHAFT)	< 1.55	< 1.47	< 1.51	< 1.55	< 1.45	< 1.50	< 1.54	< 1.44	< 1.49	< 1.53
(STEEL LINER)	< 3.38	< 2.47	< 2.87	< 3.33	< 2.32	< 2.76	< 3.27	< 2.17	< 2.65	< 3.20
POWERHOUSE BUILDING	8.48	6.61	7.42	8.25	6.18	7.09	8.01	5.77	6.77	7.77
(SUPER STRUCTURE)	< 3.77	< 2.94	< 3.30	< 3.67	< 2.75	< 3.15	< 3.56	< 2.56	< 3.01	< 3.45
(SUB STRUCTURE)	< 4.71	< 3.67	< 4.12	< 4.58	< 3.43	< 3.94	< 4.45	< 3.20	< 3.76	< 4.32
MISCELLANEOUS CIVIL WORK	6.78	5.34	5.95	6.75	5.10	5.79	6.71	4.85	5.83	6.67
CONSTRUCTION FACILITIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
POWER EQUIPMENT	30.02	25.17	27.20	29.22	23.86	26.16	28.40	22.57	25.12	27.55
ENGINEERING/ADMINISTRATION	21.56	17.15	19.02	21.36	16.36	18.47	21.16	15.58	17.92	20.95
CONTINGENCIES	38.81	30.87	34.23	38.45	29.45	33.24	38.09	28.05	32.25	37.71
S U B T O T A L	232.88	185.24	205.40	230.73	176.68	199.43	228.53	168.31	193.53	226.28

ACCESS ROAD (ROAD LENGTH 0.2 KM)

CONSTRUCTION COST	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
ENGINEERING ADMINISTRATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CONTINGENCIES	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
S U B T O T A L	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07

TRANSMISSION LINE SYSTEM (T/L LENGTH 36.5 KM)

TRANSMISSION LINE	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.05
SWITCHYARD AND SUBSTATION	0.96	0.96	0.96	0.96	0.62	0.96	0.96	0.62	0.96	0.96
ENGINEERING/ADMINISTRATION	0.63	0.63	0.63	0.63	0.39	0.63	0.63	0.39	0.63	0.63
CONTINGENCIES	0.85	0.85	0.85	0.85	0.52	0.85	0.85	0.52	0.85	0.85
S U B T O T A L	6.48	6.48	6.48	6.48	4.01	6.48	6.48	4.01	6.48	6.48

T O T A L : 239.43 191.79 211.95 237.28 180.76 205.98 235.09 172.39 200.08 232.84

EVALUATION INDICES

U S D / K W	2235.6	2563.5	2377.8	2266.5	2618.7	2425.1	2301.0	2715.2	2477.4	2341.1
U S D / K W H	0.946	1.066	0.993	0.949	1.075	1.001	0.953	1.100	1.010	0.958

PROJECT NAME : SUPO
 PROJECT ID : 1- 22- 0- 5-3-1
 TYPE : RESERVOIR

BASIN NAME : ABRA
 RIVER NAME : ABRA

 * SUMMARY TABLE OF OUTPUTS *

CASE

RESERVOIR	1	2	3	4	5	6	7	8	9	10
RESERVOIR DEVELOP. COEF :	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01
FULL SUPPLY LEVEL (M) :	263.0	258.5	260.7	263.0	254.4	258.2	263.0	250.0	255.9	263.0
MIN. OPERATING LEVEL (M) :	246.5	244.2	248.0	251.8	244.1	250.0	255.9	243.7	251.8	260.0
POWER										
FIRM DISCHARGE (M ³ /S) :	39.5	38.8	38.8	38.8	37.9	37.9	37.9	35.2	35.1	35.1
PLANT PEAK DIS. (M ³ /S) :	158.0	155.3	155.2	155.1	151.7	151.6	151.4	140.6	140.4	140.2
AVERAGE NET HEAD (M) :	51.6	48.0	50.6	53.4	45.2	49.6	54.7	42.1	48.7	56.0
INSTALLED CAPACITY (MW) :	67.2	61.3	64.7	68.2	56.4	61.9	68.2	48.7	56.3	64.7
GUARANTEED POWER (MW) :	50.3	46.8	51.3	55.9	45.5	52.5	59.3	41.8	50.6	59.4
AVERAGE FIRM POWER (MW) :	16.8	15.3	16.2	17.0	14.1	15.5	17.0	12.2	14.1	16.2
FIRM ENERGY (MIL KWH/Y) :	147.	134.	142.	149.	123.	136.	149.	107.	123.	142.
SECONDARY ENERGY (") :	76.	72.	75.	78.	68.	74.	81.	69.	78.	89.
ANNUAL AVERAGE E-GY (") :	223.	206.	216.	227.	192.	209.	230.	176.	201.	231.

D A M

DAM HEIGHT (M) :	65.0
EMBANKMENT VOL. (MIL M ³) :	1.145
DAM HEIGHT (M) :	65.0
EMBANKMENT VOL. (MIL M ³) :	1.145

EVALUATION INDECES

CH/V :	62197.	67037.	63831.	61021.	71301.	65940.	59520.	72712.	63763.	55070.
C/V :	1088.	1271.	1163.	1068.	1488.	1260.	1043.	1644.	1275.	966.
P/(20VT+VD) :	11.0	10.4	10.8	11.2	9.8	10.5	11.2	8.8	9.8	10.7
E(FIRM)/(20VT+VD) :	24.1	22.7	23.6	24.5	21.5	23.0	24.5	19.2	21.4	23.4
E(F+SEC*0.3)/(20VT+VD) :	27.8	26.3	27.3	28.3	25.0	26.8	28.5	22.9	25.4	27.9

PROJECT NAME : SUPO
 PROJECT ID : 1-022-00-05-3
 TYPE : RESERVOIR

 * SUMMARY TABLE OF COST ESTIMATE *

(UNIT : MILLION USD)

I T E M	C A S E									
	1	2	3	4	5	6	7	8	9	10
POWER DEVELOPMENT (INST. CAP.(MW))	(67.2)	(61.3)	(64.7)	(68.2)	(56.4)	(61.9)	(68.2)	(48.7)	(56.3)	(64.7)
STORAGE DAM	13.70	11.78	12.79	13.70	10.18	11.62	13.70	8.63	10.77	13.70
SPILLWAY	14.56	13.80	14.17	14.56	13.09	13.74	14.56	12.35	13.35	14.56
DIVERSION TUNNEL	31.67	31.67	31.67	31.67	31.67	31.67	31.67	31.67	31.67	31.67
INTAKE (PRESSURE TYPE)	3.43	3.25	3.21	3.14	3.03	2.93	2.87	2.64	2.51	2.44
HEADRACE TUNNEL (PRESSURE)	4.83	4.77	4.77	4.77	4.69	4.69	4.69	4.45	4.44	4.44
SURGE TANK	2.90	2.85	2.84	2.84	2.78	2.77	2.77	2.58	2.57	2.57
PENSTOCK	3.57	3.42	3.52	3.62	3.29	3.45	3.62	3.06	3.27	3.51
(PRESSURE SHAFT)	(1.40)	(1.39)	(1.40)	(1.41)	(1.38)	(1.40)	(1.41)	(1.35)	(1.37)	(1.39)
(STEEL LINER)	(2.17)	(2.03)	(2.12)	(2.21)	(1.91)	(2.05)	(2.21)	(1.71)	(1.90)	(2.11)
POWERHOUSE BUILDING	6.22	5.82	6.03	6.24	5.46	5.81	6.19	4.83	5.31	5.83
(SUPER STRUCTURE)	(2.76)	(2.59)	(2.68)	(2.77)	(2.43)	(2.58)	(2.75)	(2.15)	(2.36)	(2.59)
(SUB STRUCTURE)	(3.46)	(3.23)	(3.35)	(3.47)	(3.03)	(3.23)	(3.44)	(2.68)	(2.95)	(3.24)
MISCELLANEOUS CIVIL WORK	4.04	3.87	3.95	4.03	3.71	3.83	4.00	3.51	3.70	3.94
CONSTRUCTION FACILITIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
POWER EQUIPMENT	24.35	23.19	23.75	24.31	22.10	23.03	24.05	20.00	21.33	22.69
ENGINEERING/ADMINISTRATION	13.66	13.06	13.33	13.61	12.50	12.94	13.52	11.72	12.37	13.17
CONTINGENCIES	24.59	23.50	23.99	24.50	22.50	23.30	24.33	21.09	22.25	23.70
S U B T O T A L	147.52	141.01	143.97	146.99	135.02	139.78	145.98	126.53	133.55	142.20

ACCESS ROAD (ROAD LENGTH 3.1 KM)

CONSTRUCTION COST	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68
ENGINEERING ADMINISTRATION	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
CONTINGENCIES	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
S U B T O T A L	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88

TRANSMISSION LINE SYSTEM (T/L LENGTH 31.7 KM)

TRANSMISSION LINE	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16
SWITCHYARD AND SUBSTATION	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62
ENGINEERING/ADMINISTRATION	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
CONTINGENCIES	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
S U B T O T A L	3.59	3.59	3.59	3.59	3.59	3.59	3.59	3.59	3.59	3.59

T O T A L : 152.00 145.48 148.44 151.48 139.49 144.26 150.45 131.00 138.02 146.67

EVALUATION INDICES

U S D / K W	2262.6	2373.0	2294.0	2221.6	2473.9	2331.4	2206.2	2687.5	2452.7	2268.1
U S D / K W H	0.895	0.934	0.905	0.877	0.969	0.915	0.867	1.028	0.941	0.871

**1-4-3 ABRA

REGION NO. : 1 BASIN NO. : 22

NUMBER OF PROJECTS : 2

LIST OF PROJECTS

NO.	PROJECT ID	PROJECT NAME	CA (SQ.KM)	RAIN (MM)	STREAM GAGE ID
1	1-022-00-06-0-1	ETEB	911.0	2750.0	4-1-008
2	1-022-00-05-4-1	SUPO (D+W ALT.)	1293.0	2750.0	4-1-008

CONNECTION MATRIX

1	2
1	0
2	1

1/ C(I,J)=1 : PROJECT-J IS DIRECTLY UPSTREAM OF PROJECT-I
- C(I,J)=0 : IS NOT

SEQ NO.	PROJECT ID	NUP	ID(S) OF U/S PROJECT(S)
1	1-022-00-05-0-1	0	
2	1-022-00-05-4-1	1	1-022-00-06-0-1

PROJECT NAME : ETES
 PROJECT ID : 1-22-0-6-0-1
 TYPE : RESERVOIR

BASIN NAME : ABRA
 RIVER NAME : ABRA

 * SUMMARY TABLE OF OUTPUTS *

RESERVOIR	CASE									
	1	2	3	4	5	6	7	8	9	10
RESERVOIR DEVELOP. COEF :	0.60	0.55	0.55	0.55	0.50	0.50	0.50	0.45	0.45	0.45
FULL SUPPLY LEVEL (M) :	371.0	349.9	359.6	371.0	346.2	357.7	371.0	342.6	355.8	371.0
MIN. OPERATING LEVEL (M) :	331.4	303.9	319.5	335.1	303.7	321.3	338.9	303.5	323.0	342.5
POWER										
FIRM DISCHARGE (M3/S) :	39.4	38.2	38.1	38.0	36.7	36.6	36.5	35.3	35.2	35.1
PLANT PEAK DIS. (M3/S) :	157.8	152.6	152.3	152.0	146.9	146.6	146.2	141.2	140.8	140.4
AVERAGE NET HEAD (M) :	82.5	59.5	71.1	83.7	57.1	70.4	84.9	54.6	69.7	86.1
INSTALLED CAPACITY (MW) :	107.1	74.8	89.1	104.7	69.0	84.9	102.2	63.5	80.8	99.5
GUARANTEED POWER (MW) :	69.3	34.6	52.9	71.2	33.0	53.0	72.8	31.5	52.7	73.8
AVERAGE FIRM POWER (MW) :	26.8	18.7	22.3	26.2	17.3	21.2	25.5	15.9	20.2	24.9
FIRM ENERGY (MIL KWH/Y) :	235.	164.	195.	229.	151.	186.	224.	139.	177.	218.
SECONDARY ENERGY (") :	62.	54.	61.	69.	57.	66.	77.	59.	71.	84.
ANNUAL AVERAGE E-GY (") :	296.	217.	256.	299.	208.	252.	301.	198.	247.	302.

D A M	1	2	3	4	5	6	7	8	9	10
DAM HEIGHT (M) :	104.0	82.9	92.6	104.0	79.2	90.7	104.0	75.6	88.6	104.0
EMBANKMENT VOL. (MIL M3) :	6.063	3.461	4.550	6.063	3.111	4.320	6.063	2.777	4.097	6.063

EVALUATION INDECES	1	2	3	4	5	6	7	8	9	10
CH/V :	19627.	26031.	22294.	18899.	26530.	22081.	18171.	27123.	21846.	17444.
C/V :	205.	348.	264.	198.	372.	267.	190.	401.	271.	183.
P/(20VT+VD) :	9.5	8.7	9.2	9.3	8.4	9.0	9.1	8.0	8.8	8.9
E(FIRM)/(20VT+VD) :	20.9	19.0	20.1	20.4	18.3	19.7	20.0	17.6	19.2	19.5
E(F+SEC*0.3)/(20VT+VD) :	22.5	20.9	22.0	22.3	20.4	21.8.	22.0	19.9	21.5	21.7

PROJECT NAME : ETEB
 PROJECT ID : 1-022-00-06-0
 TYPE : RESERVOIR

 * SUMMARY TABLE OF COST ESTIMATE *

(UNIT : MILLION USD)

I T E M	C A S E									
	1	2	3	4	5	6	7	8	9	10
POWER DEVELOPMENT (INST. CAP (MW))	(107.1)	(74.8)	(89.1)	(104.7)	(69.0)	(84.9)	(102.2)	(63.5)	(60.3)	(99.5)
STORAGE DAM	58.77	36.01	45.73	58.77	32.81	43.70	58.77	29.71	41.73	58.77
SPILLWAY	18.74	15.51	17.01	18.74	14.96	16.71	18.74	14.41	16.42	18.74
DIVERSION TUNNEL	33.28	33.28	33.28	33.28	33.28	33.28	33.28	33.28	33.28	33.28
INTAKE (PRESSURE TYPE)	4.18	4.23	4.07	3.94	4.00	3.83	3.70	3.78	3.60	3.47
HEADRACE TUNNEL (PRESSURE)	4.44	4.34	4.33	4.32	4.22	4.21	4.21	4.10	4.05	4.09
SURGE TANK	2.87	2.79	2.78	2.76	2.69	2.67	2.66	2.58	2.57	2.55
PENSTOCK	4.93	3.94	4.38	4.87	3.77	4.26	4.81	3.61	4.14	4.73
(PRESSURE SHAFT)	(1.55)	(1.47)	(1.51)	(1.55)	(1.45)	(1.50)	(1.54)	(1.44)	(1.49)	(1.53)
(STEEL LINER)	(3.38)	(2.47)	(2.87)	(3.33)	(2.32)	(2.76)	(3.27)	(2.17)	(2.65)	(3.20)
POWERHOUSE BUILDING	8.48	6.61	7.42	8.25	6.18	7.09	8.01	5.77	6.77	7.77
(SUPER STRUCTURE)	(3.77)	(2.94)	(3.30)	(3.67)	(2.75)	(3.15)	(3.56)	(2.56)	(3.01)	(3.45)
(SUB STRUCTURE)	(4.71)	(3.67)	(4.12)	(4.58)	(3.43)	(3.94)	(4.45)	(3.20)	(3.76)	(4.32)
MISCELLANEOUS CIVIL WORK	6.78	5.34	5.95	6.75	5.10	5.79	6.71	4.86	5.63	6.67
CONSTRUCTION FACILITIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
POWER EQUIPMENT	30.02	25.17	27.20	29.22	23.86	26.16	28.40	22.57	25.12	27.55
ENGINEERING/ADMINISTRATION	21.56	17.15	19.02	21.36	16.36	18.47	21.16	15.98	17.92	20.95
CONTINGENCIES	38.31	30.87	34.23	38.45	29.45	33.24	38.00	28.05	32.25	37.71
S U B T O T A L	232.88	185.24	205.40	230.73	176.68	199.43	223.53	168.31	193.53	226.28

ACCESS ROAD (ROAD LENGTH 0.2 KM)

CONSTRUCTION COST	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
ENGINEERING ADMINISTRATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CONTINGENCIES	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
S U B T O T A L	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07

TRANSMISSION LINE SYSTEM (T/L LENGTH 36.5 KM)

TRANSMISSION LINE	4.05	4.05	4.05	4.05	2.48	4.05	4.05	2.48	4.05	4.05
SWITCHYARD AND SUBSTATION	0.96	0.96	0.96	0.96	0.62	0.96	0.96	0.62	0.96	0.96
ENGINEERING/ADMINISTRATION	0.63	0.63	0.63	0.63	0.39	0.63	0.63	0.39	0.63	0.63
CONTINGENCIES	0.85	0.85	0.85	0.85	0.52	0.85	0.85	0.52	0.85	0.85
S U B T O T A L	6.48	6.48	6.48	6.48	4.01	6.48	6.48	4.01	6.48	6.48

T O T A L : 239.43 191.79 211.95 237.28 180.76 205.98 235.09 172.39 200.08 232.84

EVALUATION INDICES

U S D / K W	2235.5	2563.5	2377.8	2266.5	2518.7	2425.1	2301.0	2716.2	2477.4	2341.1
U S D / K W H	0.946	1.066	0.993	0.949	1.075	1.001	0.953	1.100	1.010	0.958

PROJECT NAME : SUPO (D+W ALT.)
 PROJECT ID : 1-22-0-5-4-1
 TYPE : RESERVOIR

BASIN NAME : ABRA
 RIVER NAME : ABRA

 * SUMMARY TABLE OF OUTPUTS *

RESERVOIR	CASE									
	1	2	3	4	5	6	7	8	9	10
RESERVOIR DEVELOP. COEF :	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01
FULL SUPPLY LEVEL (M) :	263.0	254.5	260.7	263.0	254.4	258.2	263.0	250.0	255.9	263.0
MIN. OPERATING LEVEL(M) :	246.5	244.2	243.0	251.8	244.1	250.0	255.9	243.7	251.8	260.0
POWER										
FIRM DISCHARGE (M3/S) :	39.5	38.8	38.8	38.8	37.9	37.9	37.9	35.2	35.1	35.1
PLANT PEAK DIS. (M3/S) :	158.0	155.3	155.2	155.1	151.7	151.6	151.4	140.6	140.4	140.2
AVERAGE NET HEAD (M) :	76.3	72.6	75.3	78.1	69.8	74.3	79.4	66.7	73.3	80.6
INSTALLED CAPACITY (MW) :	99.3	92.8	96.2	99.7	87.2	92.6	98.9	77.3	84.7	93.1
GUARANTEED POWER (MW) :	80.9	76.8	81.3	85.9	74.9	81.7	88.6	68.9	77.7	86.4
AVERAGE FIRM POWER (MW) :	24.8	23.2	24.1	24.9	21.8	23.2	24.7	19.3	21.2	23.3
FIRM ENERGY (MIL KWH/Y) :	217.	203.	211.	218.	191.	203.	217.	169.	185.	204.
SECONDARY ENERGY (") :	108.	105.	108.	111.	103.	108.	115.	107.	115.	128.
ANNUAL AVERAGE E-GY (") :	325.	308.	319.	330.	294.	311.	332.	276.	302.	331.

D A M

DAM HEIGHT (M) :	65.0
EMBANKMENT VOL.(MIL M3) :	1.145
EVALUATION INDECS	
CH/V :	89049.
C/V :	1086.
P/(20VT+VD) :	14.4
E(FIRM)/(20VT+VD) :	31.4
E(F+SEC*0.3)/(20VT+VD) :	36.1

CH/V :	89049.	87371.	107493.	97012.	85221.	113209.	95156.	78829.
C/V :	1086.	1163.	1068.	1260.	1043.	1644.	1275.	966.
P/(20VT+VD) :	14.4	14.2	14.5	13.9	14.4	12.3	13.1	13.8
E(FIRM)/(20VT+VD) :	31.4	31.0	31.7	30.5	31.6	26.9	28.6	30.2
E(F+SEC*0.3)/(20VT+VD) :	36.1	35.8	36.5	35.3	36.6	32.0	34.0	35.8

PROJECT NAME : SUPO (D+W ALT.)
 PROJECT ID : I-022-00-05-4
 TYPE : RESERVOIR

 * SUMMARY TABLE OF COST ESTIMATE *

(UNIT : MILLION USD)

I T E M	C A S E									
	1	2	3	4	5	6	7	8	9	10
POWER DEVELOPMENT (INST. CAP (MW))	(99.3)	(92.8)	(96.2)	(99.7)	(87.2)	(92.6)	(98.9)	(77.3)	(84.7)	(99.1)
STORAGE DAM	13.70	11.78	12.73	13.70	10.18	11.62	13.70	8.63	10.77	13.70
SPILLWAY	14.56	13.80	14.17	14.56	13.09	13.74	14.56	12.35	13.35	14.56
DIVERSION TUNNEL	31.67	31.67	31.67	31.67	31.67	31.67	31.67	31.67	31.67	31.67
INTAKE (PRESSURE TYPE)	3.43	3.26	3.21	3.14	3.03	2.93	2.87	2.64	2.51	2.44
HEADRAGE TUNNEL (PRESSURE)	11.99	11.84	11.84	11.63	11.64	11.63	11.63	11.03	11.02	11.00
SURGE TANK	3.59	3.53	3.53	3.52	3.45	3.44	3.44	3.20	3.20	3.19
PENSTOCK	5.23	5.02	5.14	5.26	4.85	5.04	5.25	4.51	4.77	5.05
(PRESSURE SHAFT)	(1.71)	(1.70)	(1.71)	(1.72)	(1.69)	(1.71)	(1.72)	(1.66)	(1.68)	(1.70)
(STEEL LINER)	(3.51)	(3.32)	(3.43)	(3.54)	(3.16)	(3.33)	(3.53)	(2.86)	(3.09)	(3.35)
POWERHOUSE BUILDING	8.07	7.67	7.86	8.04	7.30	7.60	7.94	6.57	6.98	7.43
(SUPER STRUCTURE)	(3.59)	(3.41)	(3.49)	(3.57)	(3.24)	(3.38)	(3.53)	(2.92)	(3.10)	(3.30)
(SUB STRUCTURE)	(4.48)	(4.28)	(4.36)	(4.47)	(4.06)	(4.22)	(4.41)	(3.65)	(3.88)	(4.13)
MISCELLANEOUS CIVIL WORK	4.51	4.43	4.51	4.59	4.26	4.38	4.55	4.03	4.21	4.45
CONSTRUCTION FACILITIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
POWER EQUIPMENT	29.03	27.95	28.40	28.84	26.88	27.62	28.43	24.61	25.64	26.73
ENGINEERING/ADMINISTRATION	15.73	15.12	15.30	15.85	14.55	14.96	15.50	13.66	14.26	15.03
CONTINGENCIES	28.32	27.22	27.69	28.16	26.18	26.93	27.91	24.58	25.88	27.05
S U B T O T A L	169.93	163.32	166.11	168.97	157.09	161.56	167.45	147.48	154.05	162.30
ACCESS ROAD (ROAD LENGTH 3.1 KM)										
CONSTRUCTION COST	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68
ENGINEERING ADMINISTRATION	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
CONTINGENCIES	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
S U B T O T A L	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
TRANSMISSION LINE SYSTEM (T/L LENGTH 31.7 KM)										
TRANSMISSION LINE	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52
SWITCHYARD AND SUBSTATION	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
ENGINEERING/ADMINISTRATION	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
CONTINGENCIES	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
S U B T O T A L	5.79	5.79	5.79	5.79	5.79	5.79	5.79	5.79	5.79	5.79
T O T A L	175.61	170.00	172.79	175.65	163.77	168.24	174.13	154.16	160.73	168.97
EVALUATION INDICES										
U S D / K W	1779.0	1831.0	1795.7	1762.2	1875.6	1816.2	1760.4	1995.3	1897.0	1815.6
U S D / K W H	0.707	0.724	0.711	0.698	0.738	0.715	0.693	0.765	0.729	0.698

I N V E N T O R Y O F H Y D R O P O W E R S I T E S

SCHEME : ETEB
 RIVER SYSTEM : ABRA
 STREAM : ABRA
 WATER RESOURCES REGION : ILOCOS SUR PROVINCE
 COORDINATES : N17-10-42 E120-40-22
 STUDY LEVEL : UNSCALED (PRE-F/S-RECONNAISSANCE)
 SCHEME ID : 1-022-00-06-0-1

HYDRO/TOPO. INFORMATION
 CATCHMENT AREA (KM2) : 911.0 (MAIN : 911.0 INTER TRANSFER TOTAL : 0.)
 AVER. BASIN RAINFALL (MM/YR) : 2750. DENUDATION RATE (MM/YR) : 1.4 GAGE CATCHMENT (KM2) : 2575.
 AVERAGE DISCHARGE (M3/S) : 51.4 EVAPORATION RATE (MM/DAY) : 3.5 GAGE AVER. DISCHARGE (M3/S) : 134.6

SELECTED PLAN

 TYPE OF DEVELOPMENT : RESERVOIR RESERVOIR DEVELOPMENT RATIO : 0.60

RESERVOIR
 FULL SUPPLY LEVEL (EL.M) : 371.0 GROSS STORAGE VOL. (MIL M3) : 1526.2
 AVERAGE OPERATING LEVEL (EL.M) : 357.8 ACTIVE STORAGE VOL. (MIL M3) : 972.5
 MINIMUM OPERATING LEVEL (EL.M) : 331.4 DEAD STORAGE VOL. (MIL M3) : 653.7
 DRAWDOWN DEPTH (M) : 39.6 SEDIMENT VOL. (MIL M3) : 63.8

MAIN DAM
 CREST ELEVATION (EL.M) : 377.0 CREST LENGTH (M) : 451.8
 DAM HEIGHT (M) : 104.0 EMBANKMENT VOL. (MIL M3) : 6.06

WATERWAY
 HEADRACE : LENGTH (M) : 460.0 DIAMETER (WIDTH) (M) : 5.8
 PENSTOCK : HORIZONTAL (M) : 220.0 DIAMETER (M) : 4.5
 DIVERSION : LENGTH (M) : 970.0 DIAMETER (M) : 8.6
 EXCAVATION VOL TOTAL (1000 M3) : 259.0

DISCHARGE
 PLANT MAX. DISCHARGE (M3/S) : 157.8 AVERAGE NET HEAD (M) : 82.5
 FIRM DISCHARGE (M3/S) : 39.4 TAILWATER LEVEL (EL.M) : 279.0

POWER
 INSTALLED CAPACITY (MW) : 107.1 ANNUAL TOTAL ENERGY (GWH) : 256.4
 FIRM POWER (MW) : 26.8 FIRM ENERGY (GWH) : 234.6
 MIN. GUARANTEED POWER (MW) : 69.3 SECONDARY ENERGY (GWH) : 61.9

TRANSMISSION
 LINE LENGTH (KM) : 36.5 TO : SAN ESTEBAN 230 K V DOUBLE CIRCUIT NOS. OF CIRCUIT : 1
 ACCESS ROAD LENGTH (KM) : 0.2 FROM : NEAREST PROVINCIAL ROAD

CONSTRUCTION COST

 TOTAL COST (MIL USD) : 239.4 POWER COST (MIL USD) : 232.9
 TOTAL COST/KW (USD/KW) : 2235.6 TRANSMISSION COST (MIL USD) : 6.5
 TOTAL COST/KWH (USD/KWH) : 0.946 ACCESS ROAD COST (MIL USD) : 0.1

OTHER INFORMATION

 LAND USE IN RESERVOIR AREA :
 SUBMERGED ROAD :
 MAP USED (1:50,000 SCALE) : 3171-IV
 TECHNICAL COMMENT :

INVENTORY OF HYDROPOWER SITES

SCHEME : SUPO
 RIVER SYSTEM : ABRA
 STREAM : ABRA
 WATER RESOURCES REGION : I
 PROVINCE : ILOCOS SUR
 COORDINATES : N17-14-42 E120-40-36
 STUDY LEVEL : UNSCALED
 (PRE-F/S, RECONNAISSANCE)
 SCHEME ID : 1-022-00-05-3-1

HYDRO/TOPO. INFORMATION
 CATCHMENT AREA (KM2) : 1293.0 (MAIN : 1293., INTER TRANSFER TOTAL : 0.)
 AVER. BASIN RAINFALL (MM/YR) : 2750. DENUDATION RATE (MM/YR) : 1.4
 AVERAGE DISCHARGE (M3/S) : 69.9 EVAPORATION RATE (MM/DAY) : 3.5
 STREAM GAGE ID : 4-1-008-NW-106
 GAGE CATCHMENT (KM2) : 2575.
 GAGE AVER. DISCHARGE (M3/S) : 134.6

SELECTED PLAN

TYPE OF DEVELOPMENT : RESERVOIR RESERVOIR DEVELOPMENT RATIO : 0.02

RESERVOIR	FULL SUPPLY LEVEL (EL.M) : 263.0	GROSS STORAGE VOL. (MIL M3) : 142.6
	AVERAGE OPERATING LEVEL (EL.M) : 260.6	ACTIVE STORAGE VOL. (MIL M3) : 40.3
	MINIMUM OPERATING LEVEL (EL.M) : 255.9	DEAD STORAGE VOL. (MIL M3) : 102.3
	DRAWDOWN DEPTH (M) : 7.1	SEDIMENT VOL. (MIL M3) : 26.7
MAIN DAM (WEIR)	CREST ELEVATION (EL.M) : 269.0	CREST LENGTH (M) : 212.8
	DAM HEIGHT (M) : 65.0	EMBANKMENT VOL. (MIL M3) : 1.14
WATERWAY	HEADRACE : LENGTH (M) : 500.0	DIAMETER (WIDTH) (M) : 5.7
	PENSTOCK : HORIZONT. L (M) : 200.0	DIAMETER (M) : 4.5
	DIVERSION : LENGTH (M) : 750.0	DIAMETER (M) : 8.5
	EXCAVATION VOL TOTAL (1000 M3) : 247.0	
DISCHARGE /HEAD	PLANT. MAX. DISCHARGE (M3/S) : 151.4	AVERAGE NET HEAD (M) : 54.7
	FIRM DISCHARGE (M3/S) : 37.9	TAILWATER LEVEL (EL.M) : 204.0
POWER /ENERGY	INSATLLED CAPACITY (MW) : 68.2	ANNUAL TOTAL ENERGY (GWH) : 229.9
	FIRM POWER (MW) : 17.0	FIRM ENERGY (GWH) : 149.3
	MIN. GUARANTEED POWER (MW) : 59.3	SECONDARY ENERGY (GWH) : 80.6

TRANSMISSION LINE LENGTH (KM) : 31.7 TO : SAN ESTEBAN FROM : NEAREST PROVINCIAL ROAD
 ACCESS ROAD LENGTH (KM) : 3.1 FROM : NEAREST PROVINCIAL ROAD

CONSTRUCTION COST

TOTAL COST (MIL USD) : 150.5	POWER COST (MIL USD) : 145.0
TOTAL COST/KW (USD/KW) : 2206.2	TRANSMISSION COST (MIL USD) : 3.6
TOTAL COST/KWH (USD/KWH) : 0.867	ACCESS ROAD COST (MIL USD) : 0.9

OTHER INFORMATION

LAND USE IN RESERVOIR AREA :
 SUBMERGED ROAD :
 MAP USED (1:50,000 SCALE) : 3171-IV
 TECHNICAL COMMENT :

I N V E N T O R Y O F H Y D R O P O W E R S I T E S

SCHEME ID : 1-022-00-05-4-1

SCHEME : SUPO (D+W ALT.)

RIVER SYSTEM : ABRA
 STREAM : ABRA
 WATER RESOURCES REGION : I
 PROVINCE : ILOCOS SUR
 COORDINATES : N17-14-42 E120-40-36
 STUDY LEVEL : UNSCALED
 (PRE-F/S.RECONNAISSANCE)

HYDRO/TOPO. INFORMATION

CATCHMENT AREA (KM2) : 1293.0 (MAIN : 1293., INTER TRANSFER TOTAL : 0.) STREAM GAGE ID : 4-1-008-NW-108
 AVER. BASIN RAINFALL (MM/YR) : 2750. DENUDATION RATE (MM/YR) : 1.4 GAGE CATCHMENT (KM2) : 2575.
 AVERAGE DISCHARGE (M3/S) : 63.9 EVAPORATION RATE (MM/DAY) : 3.5 GAGE AVER. DISCHARGE (M3/S) : 134.6

SELECTED PLAN

TYPE OF DEVELOPMENT : RESERVOIR RESERVOIR DEVELOPMENT RATIO : 0.03

RESERVOIR FULL SUPPLY LEVEL (EL.M) : 269.0 GROSS STORAGE VOL. (MIL M3) : 142.6
 AVERAGE OPERATING LEVEL (EL.M) : 259.3 ACTIVE STORAGE VOL. (MIL M3) : 60.5
 MINIMUM OPERATING LEVEL (EL.M) : 251.8 DEAD STORAGE VOL. (MIL M3) : 82.1
 DRAWDOWN DEPTH (M) : 11.2 SEDIMENT VOL. (MIL M3) : 26.7

MAIN DAM CREST ELEVATION (EL.M) : 269.0 CREST LENGTH (M) : 212.8
 (WEIR) DAM HEIGHT (M) : 65.0 EMBANKMENT VOL. (MIL M3) : 1.14

WATERWAY HEADRAGE : LENGTH (M) : 1240.0 DIAMETER (WIDTH) (M) : 5.7 NOS. : 2
 PENSTOCK : HORIZONTAL L (M) : 240.0 DIAMETER (M) : 4.5 NOS. : 2
 DIVERSION : LENGTH (M) : 750.0 DIAMETER (M) : 8.5 NOS. : 5
 EXCAVATION VOL TOTAL (1000 M3) : 287.3

DISCHARGE PLANT MAX. DISCHARGE (M3/S) : 155.1 AVERAGE NET HEAD (M) : 78.1
 /HEAD FIRM DISCHARGE (M3/S) : 38.8 TAILWATER LEVEL (EL.M) : 178.0

POWER INSATLLED CAPACITY (MW) : 99.7 ANNUAL TOTAL ENERGY (GWH) : 329.6
 /ENERGY FIRM POWER (MW) : 24.9 FIRM ENERGY (GWH) : 218.3
 MIN. GUARANTEED POWER (MW) : 35.9 SECONDARY ENERGY (GWH) : 111.3

TRANSMISSION LINE LENGTH (KM) : 31.7 TO : SAN ESTEBAN 230 K V DOUBLE CIRCUIT NOS. OF CIRCUIT : 1
 ACCESS ROAD LENGTH (KM) : 3.1 FROM : NEAREST PROVINCIAL ROAD

CONSTRUCTION COST

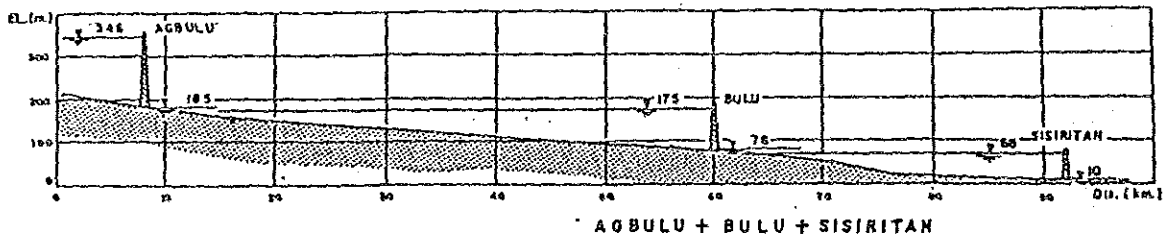
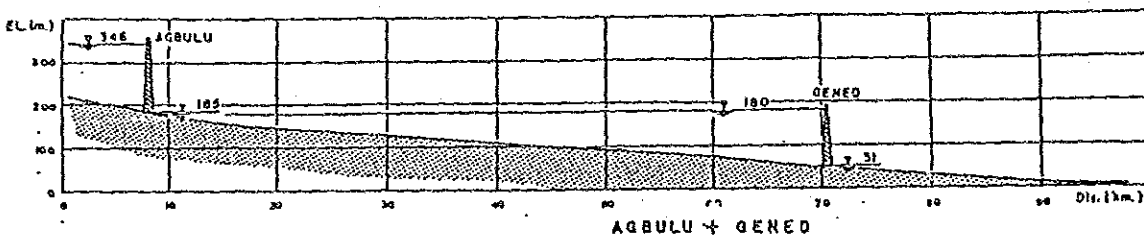
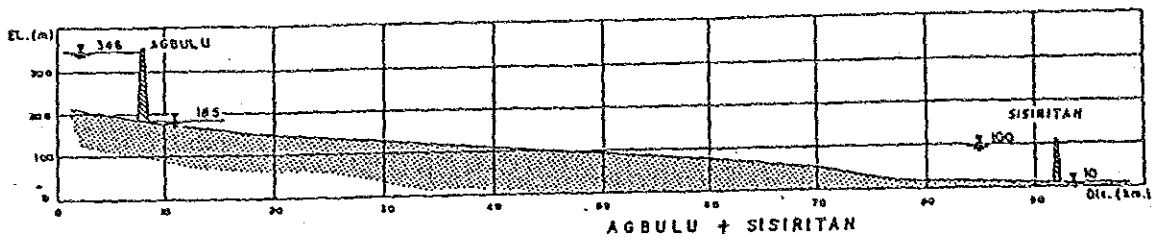
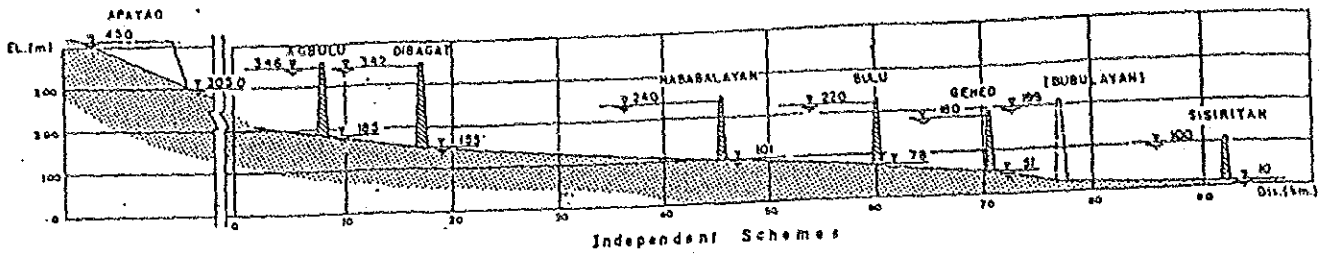
TOTAL COST (MIL USD) : 175.6 POWER COST (MIL USD) : 169.0
 TOTAL COST/KW (USD/KWH) : 1762.2 TRANSMISSION COST (MIL USD) : 5.8
 TOTAL COST/KWH (USD/KWH) : 0.898 ACCESS ROAD COST (MIL USD) : 0.9

OTHER INFORMATION

LAND USE IN RESERVOIR AREA : FOREST - SCARCE POPULATION
 SUBMERGED ROAD : NONE
 MAP USED (1:50,000 SCALE) : 3171-IV 1979
 TECHNICAL COMMENT :
 - REGULATING EFFECT BY ETEB PLAN IS EXAMINED
 - CONSTRAINED FSL (MAXIMUM=EL 269.0M) DUE TO TWL OF ETEB
 - DIVERSION FOR IRRIGATION REQUIREMENT (9.0 CMS) IS CONSIDERED

ABULOG RIVER BASIN

Case No.	Scheme	ID No.	FSL(m)	TWL(m)
2-2	- Agubulu	2-006-01-06-0-1	346.0	185.0
	- Sisiritan	2-006-00-01-1-1	100.0	10.0
2-3	- Agbulu	2-006-01-06-0-1	346.0	185.0
	- Gened	2-006-00-81-0-1	180.0	50.7
2-4	- Agbulu	2-006-01-06-0-1	346.0	185.0
	- Bulu	2-006-00-03-1-1	175.0	78.3
	- Sisiritan	2-006-00-01-2-1	68.3	10.0



FSL (Full supply level)
 TWL (Tail water level)

 **2-2-3 ABULOG

PAGE : 1

REGION NO. : 2 BASIN NO. : 6

NUMBER OF PROJECTS : 2

LIST OF PROJECTS

NO.	PROJECT ID	PROJECT NAME	CA (SQ.KM)	RAIN (MM)	STREAM GAGE ID
1	2-006-01-06-0-1	AGBUJU	706.0	3977.0	4-2-005
2	2-006-00-01-1-1	SISIRITAN	1370.0	4004.0	4-2-005

CONNECTION MATRIX

1 2
 1 0 0
 2 1 0

1/ C(I,J)=1 : PROJECT-J IS DIRECTLY UPSTREAM OF PROJECT-I
 - C(I,J)=0 : " IS NOT "

SEQ ID(S) OF
 NO. PROJECT ID NUP U/S PROJECT(S)
 1 2-006-01-06-0-1 0
 2 2-006-00-01-1-1 1 2-006-01-06-0-1

PROJECT NAME : A3BULU
 PROJECT ID : 2- 6- 1- 6-0-1
 TYPE : RESERVOIR

BASIN NAME : ABULOG
 RIVER NAME : APAYAO

 * SUMMARY TABLE OF OUTPUTS *

RESERVOIR	CASE									
	1	2	3	4	5	6	7	8	9	10
RESERVOIR DEVELOP. COEF :	0.75	0.40	0.40	0.40	0.30	0.30	0.30	0.20	0.20	0.20
FULL SUPPLY LEVEL (M) :	346.0	300.8	316.4	346.0	289.4	310.0	346.0	275.9	301.9	346.0
MIN. OPERATING LEVEL(M) :	278.1	226.3	271.2	316.0	225.4	275.0	324.5	224.2	278.1	332.0
FIRM DISCHARGE (M3/S) :	64.6	49.9	49.6	49.1	42.1	41.7	41.2	38.1	32.6	32.1
PLANT PEAK DIS. (M3/S) :	194.1	149.9	148.9	147.6	126.5	125.3	123.7	99.4	98.0	96.3
AVERAGE NET HEAD (M) :	135.6	88.6	113.6	147.8	80.7	110.5	150.5	71.7	106.5	153.2
INSTALLED CAPACITY (MW) :	216.6	109.4	139.3	179.5	84.0	114.0	153.3	58.6	86.0	121.4
GUARANTEED POWER (MW) :	137.4	45.8	97.4	147.8	37.7	85.6	132.1	28.0	69.7	108.6
AVERAGE FIRM POWER (MW) :	72.1	35.4	46.4	59.8	28.0	38.0	51.0	19.5	28.6	40.4
FIRM ENERGY (MIL KWH/Y) :	632.	319.	406.	524.	245.	332.	447.	171.	251.	354.
SECONDARY ENERGY (") :	81.	138.	159.	198.	163.	197.	258.	180.	234.	328.
ANNUAL AVERAGE E-GY (") :	713.	457.	565.	722.	408.	529.	705.	351.	485.	632.

D A M

DAM HEIGHT (M) :	167.0	121.8	137.4	167.0	110.4	131.0	167.0	96.9	122.9	167.0
EMBANKMENT VOL.(MIL M3) :	10.090	4.462	6.052	10.090	3.497	5.357	10.090	2.535	4.560	10.090

EVALUATION INDECS

CH/V :	31953.	40037.	33253.	24232.	38758.	30007.	20299.	36593.	25839.	15821.
C/V :	202.	353.	258.	154.	380.	246.	129.	412.	226.	100.
P/(20VT+VD) :	16.3	14.7	15.5	13.8	13.3	13.9	11.9	11.3	11.9	9.5
E(FIRM)/(20VT+VD) :	47.5	43.0	45.1	40.1	38.8	40.6	34.6	32.9	34.7	27.8
E(F+SEC*0.3)/(20VT+VD) :	49.3	48.6	50.4	44.7	46.5	47.8	40.6	43.3	44.4	35.5

PROJECT NAME : AGBULU
 PROJECT ID : 2-006-01-06-0
 TYPE : RESERVOIR

 * SUMMARY TABLE OF COST ESTIMATE *

(UNIT : MILLION USD)

I T E M	C A S E									
	1	2	3	4	5	6	7	8	9	10
POWER DEVELOPMENT (INST. CAP.(MW))	(216.6)	(109.4)	(139.3)	(179.5)	(84.0)	(114.0)	(153.3)	(58.6)	(86.0)	(121.4)
STORAGE DAM	91.68	44.96	58.67	91.68	36.34	52.74	91.68	27.44	45.82	91.68
SPILLWAY	24.99	18.85	20.97	24.99	17.30	20.10	24.99	15.45	18.99	24.99
DIVERSION TUNNEL	16.37	16.37	16.37	16.37	16.37	16.37	16.37	16.37	16.37	16.37
INTAKE (PRESSURE TYPE)	5.31	4.81	4.12	3.67	3.97	3.31	2.90	3.06	2.46	2.16
HEADRACE TUNNEL (PRESSURE)	8.74	7.26	7.23	7.18	6.43	6.39	6.33	4.44	4.40	4.34
SURGE TANK	3.98	3.11	3.06	3.02	2.63	2.59	2.55	2.03	1.98	1.94
PENSTOCK	4.88	2.71	3.57	4.72	2.29	3.13	4.26	1.48	2.17	3.12
(PRESSURE SHAFT)	(1.05)	(0.84)	(0.96)	(1.08)	(0.80)	(0.93)	(1.05)	(0.45)	(0.53)	(0.61)
(STEEL LINER)	(3.93)	(1.87)	(2.61)	(3.64)	(1.49)	(2.20)	(3.20)	(1.03)	(1.63)	(2.51)
POWERHOUSE BUILDING	14.54	8.46	9.91	11.71	6.70	8.19	9.94	3.44	4.42	5.53
(SUPER STRUCTURE)	(6.46)	(3.76)	(4.41)	(5.20)	(2.98)	(3.64)	(4.42)	(1.53)	(1.96)	(2.46)
(SUB STRUCTURE)	(8.08)	(4.70)	(5.51)	(6.50)	(3.72)	(4.55)	(5.52)	(1.91)	(2.46)	(3.07)
MISCELLANEOUS CIVIL WORK	8.55	5.33	6.20	8.17	4.60	5.64	7.95	3.69	4.83	7.51
CONSTRUCTION FACILITIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
POWER EQUIPMENT	45.24	29.62	32.92	36.75	24.36	27.83	31.62	18.59	21.95	25.43
ENGINEERING/ADMINISTRATION	26.14	17.68	20.38	25.10	15.13	18.28	24.47	12.00	15.42	22.89
CONTINGENCIES	50.21	31.83	36.68	46.67	27.23	32.91	44.61	21.60	27.76	41.20
S U B T O T A L	301.23	190.97	220.07	280.03	163.36	197.48	267.67	129.59	166.58	247.17

ACCESS ROAD (ROAD LENGTH 6.5 KM)

CONSTRUCTION COST	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43
ENGINEERING ADMINISTRATION	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
CONTINGENCIES	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
S U B T O T A L	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85

TRANSMISSION LINE SYSTEM (T/L LENGTH 78.6 KM)

TRANSMISSION LINE	8.72	8.72	8.72	8.72	8.72	8.72	8.72	8.72	8.72	8.72
SWITCHYARD AND SUBSTATION	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.62	0.96	0.96
ENGINEERING/ADMINISTRATION	1.21	1.21	1.21	1.21	1.21	1.21	1.21	0.75	1.21	1.21
CONTINGENCIES	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.01	1.63	1.63
S U B T O T A L	12.53	12.53	12.53	12.53	12.53	12.53	12.53	7.72	12.53	12.53

T O T A L : 315.62 205.36 234.45 294.41 177.74 211.86 282.05 139.16 180.97 261.55

EVALUATION INDICES

U S D / K W	1457.3	1877.4	1683.6	1640.1	2115.3	1858.9	1840.3	2373.6	2105.5	2154.1
U S D / K W H	0.481	0.570	0.517	0.505	0.605	0.541	0.538	0.618	0.564	0.578

PROJECT NAME : SISIRITAN
 PROJECT ID : 2- 6- 0- 1-1-1
 TYPE : RESERVOIR

BASIN NAME : ABULOG
 RIVER NAME : ABULOG

 * SUMMARY TABLE OF OUTPUTS *

RESERVOIR	CASE									
	1	2	3	4	5	6	7	8	9	10
RESERVOIR DEVELOP. COEF :	0.35	0.30	0.30	0.30	0.25	0.25	0.25	0.20	0.20	0.20
FULL SUPPLY LEVEL (M) :	100.0	80.0	89.3	100.0	73.9	86.1	100.0	67.0	82.6	100.0
MIN. OPERATING LEVEL (M) :	58.0	32.4	48.8	65.2	33.1	52.6	72.1	32.7	55.6	78.5
POWER										
FIRM DISCHARGE (M ³ /S) :	162.2	156.4	156.1	155.8	147.6	147.3	146.9	138.8	138.4	137.9
PLANT PEAK DIS. (M ³ /S) :	648.7	625.4	624.4	623.3	590.4	589.2	587.6	555.2	553.6	551.7
AVERAGE NET HEAD (M) :	73.6	52.0	63.5	76.0	48.3	62.7	78.3	43.6	61.4	80.3
INSTALLED CAPACITY (MW) :	393.1	267.9	326.5	389.8	234.8	304.3	378.5	199.3	279.7	364.8
GUARANTEED POWER (MW) :	231.9	99.8	179.1	258.0	97.6	186.5	274.8	90.2	188.2	285.3
AVERAGE FIRM POWER (MW) :	98.3	67.0	81.6	97.4	58.7	76.1	94.6	49.8	69.9	91.2
FIRM ENERGY (MIL KWH/Y) :	861.	587.	715.	854.	514.	666.	829.	436.	613.	799.
SECONDARY ENERGY (") :	183.	164.	187.	213.	179.	214.	256.	189.	238.	298.
ANNUAL AVERAGE E-GY (") :	1044.	750.	902.	1067.	693.	881.	1085.	621.	851.	1097.

D A M	1	2	3	4	5	6	7	8	9	10
DAM HEIGHT (M) :	96.0	76.0	85.3	96.0	69.9	82.1	96.0	63.0	78.6	96.0
EMBANKMENT VOL. (MIL M ³) :	11.449	6.794	8.728	11.449	5.567	8.007	11.449	4.472	7.245	11.449

EVALUATION INDECEES	1	2	3	4	5	6	7	8	9	10
CH/V	39137.	49694.	43429.	37577.	51772.	42889.	35433.	53693.	42404.	33239.
C/V	447.	732.	564.	429.	836.	580.	405.	579.	602.	380.
P/(20VT+VD)	22.4	21.1	22.2	22.3	20.7	22.0	21.9	19.7	21.7	21.4
E(FIRM)/(20VT+VD)	49.0	46.1	48.6	48.9	45.3	48.3	48.0	43.2	47.6	46.8
E(F-SEC*0.3)/(20VT+VD)	52.2	50.0	52.4	52.6	50.0	52.9	52.5	48.7	53.1	52.0

PROJECT NAME : SISIRITAN
 PROJECT ID : 2-006-00-01-1
 TYPE : RESERVOIR

(UNIT : MILLION USD)

 * SUMMARY TABLE OF COST ESTIMATE *

I T E M	C A S E									
	1	2	3	4	5	6	7	8	9	10
POWER DEVELOPMENT (INST.CAP(MW))	(393.1)	(267.9)	(326.5)	(369.6)	(234.8)	(304.3)	(378.5)	(199.3)	(279.7)	(364.8)
STORAGE DAM	102.38	64.40	60.78	102.38	54.54	74.92	102.38	45.04	68.65	102.38
SPILLWAY	19.91	16.50	19.08	19.91	15.46	17.55	19.91	14.29	16.95	19.91
DIVERSION TUNNEL	21.44	21.44	21.44	21.44	21.44	21.44	21.44	21.44	21.44	21.44
INTAKE (PRESSURE TYPE)	14.68	14.59	14.08	13.60	13.43	12.86	12.38	12.24	11.64	11.12
HEADRACE TUNNEL (PRESSURE)	23.52	22.91	22.88	22.85	21.04	21.01	20.97	20.14	20.10	20.04
SURGE TANK	12.56	12.15	12.10	12.05	11.40	11.34	11.29	10.72	10.66	10.60
PENSTOCK	20.26	16.17	15.11	20.24	14.40	16.65	19.12	13.29	15.86	18.70
(PRESSURE SHAFT)	(6.30)	(6.01)	(6.16)	(6.31)	(5.31)	(5.47)	(5.63)	(5.23)	(5.41)	(5.59)
(STEEL LINER)	(13.96)	(10.16)	(11.95)	(13.93)	(9.09)	(11.17)	(13.50)	(8.05)	(10.44)	(13.11)
POWERHOUSE BUILDING	60.50	46.28	52.79	59.36	38.50	45.73	52.85	33.82	42.35	50.49
(SUPER STRUCTURE)	(26.89)	(20.57)	(23.46)	(26.38)	(17.11)	(20.33)	(23.49)	(15.03)	(18.82)	(22.44)
(SUB STRUCTURE)	(33.61)	(25.71)	(29.33)	(32.98)	(21.39)	(25.41)	(29.36)	(19.79)	(23.53)	(28.05)
MISCELLANEOUS CIVIL WORK	13.76	10.72	12.01	13.59	9.51	11.08	13.02	8.55	10.38	12.73
CONSTRUCTION FACILITIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
POWER EQUIPMENT	101.82	84.28	92.07	99.62	77.39	86.89	95.75	69.93	81.35	91.53
ENGINEERING/ADMINISTRATION	35.02	30.95	32.75	34.74	29.19	31.47	33.87	27.61	30.41	33.48
CONTINGENCIES	85.17	68.08	75.41	83.96	61.26	70.19	80.62	55.41	65.96	78.49
S U B T O T A L	511.02	408.48	452.40	503.77	367.57	421.14	483.71	332.47	395.75	470.91

ACCESS ROAD (ROAD LENGTH 10.5 KM)

CONSTRUCTION COST	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31
ENGINEERING ADMINISTRATION	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
CONTINGENCIES	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
S U B T O T A L	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99

TRANSMISSION LINE SYSTEM (T/L LENGTH 48.0 KM)

TRANSMISSION LINE	10.56	10.56	10.56	10.56	10.56	10.56	10.56	10.56	10.56	10.56
SWITCHYARD AND SUBSTATION	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
ENGINEERING/ADMINISTRATION	1.44	1.44	1.44	1.44	1.44	1.44	1.44	1.44	1.44	1.44
CONTINGENCIES	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94
S U B T O T A L	14.90	14.90	14.90	14.90	14.90	14.90	14.90	14.90	14.90	14.90

T O T A L : 528.92 426.37 470.38 521.67 365.47 439.03 501.60 343.60 413.64 488.81

EVALUATION INDICES

U S D / K W	1345.6	1591.7	1440.6	1338.4	1641.9	1442.8	1325.1	1723.9	1478.7	1340.1
U S D / K W H	0.578	0.671	0.610	0.569	0.679	0.601	0.554	0.698	0.605	0.550

 #2-3-2 ASULOG

PAGE : 1

REGION NO. : 2 BASIN NO. : 6

NUMBER OF PROJECTS : 2

LIST OF PROJECTS

NO.	PROJECT ID	PROJECT NAME	CA (SQ.KM)	RAIN (MM)	STREAM GAGE ID
1	2-006-01-06-0-1	AGBULU	706.0	3977.0	4-2-005
2	2-006-00-81-0-1	GENED	1583.1	4000.0	4-2-005

CONNECTION MATRIX

1	2
1	0
2	1

1/ C(I,J)=1 : PROJECT-J IS DIRECTLY UPSTREAM OF PROJECT-I
 - C(I,J)=0 : " IS NOT "

SEQ NO.	PROJECT ID	NUP	ID(S) OF U/S PROJECT(S)
1	2-006-01-06-0-1	0	
2	2-006-00-81-0-1	1	2-006-01-06-0-1

PROJECT NAME : ASBULU
 PROJECT ID : 2- 6- 1- 6-0-1
 TYPE : RESERVOIR

BASIN NAME : ABULOG
 RIVER NAME : APAYAO

 * SUMMARY TABLE OF OUTPUTS *

RESERVOIR	CASE									
	1	2	3	4	5	6	7	8	9	10
RESERVOIR DEVELOP. COEF :	0.75	0.40	0.40	0.40	0.30	0.30	0.30	0.20	0.20	0.20
FULL SUPPLY LEVEL (M) :	346.0	300.8	316.4	346.0	289.4	310.0	346.0	275.9	301.9	346.0
MIN. OPERATING LEVEL(M) :	278.1	226.3	271.2	316.0	225.4	275.0	324.5	224.2	278.1	332.0
POWER										
FIRM DISCHARGE (M ³ /S) :	64.6	49.9	49.6	49.1	42.1	41.7	41.2	33.1	32.6	32.1
PLANT PEAK DIS. (M ³ /S) :	194.1	149.9	148.9	147.6	126.5	125.3	123.7	99.4	98.0	96.3
AVERAGE NET HEAD (M) :	135.6	88.6	113.6	147.8	80.7	110.5	150.5	71.7	106.5	153.2
INSTALLED CAPACITY (MW) :	216.6	109.4	139.3	179.5	34.0	114.0	153.3	58.6	86.0	121.4
GUARANTEED POWER (MW) :	137.4	45.8	97.4	147.8	37.7	85.6	132.1	29.0	69.7	108.6
AVERAGE FIRM POWER (MW) :	72.1	36.4	46.4	59.8	23.0	38.0	51.0	19.5	28.6	40.4
FIRM ENERGY (MIL KWH/Y) :	632.	319.	406.	524.	245.	332.	447.	171.	251.	354.
SECONDARY ENERGY (") :	81.	138.	159.	198.	163.	197.	258.	180.	234.	328.
ANNUAL AVERAGE E-GY (") :	713.	457.	565.	722.	408.	529.	705.	351.	485.	682.

D A M

DAM HEIGHT (M) :	167.0	121.8	137.4	167.0	110.4	131.0	167.0	96.9	122.9	167.0
EMBANKMENT VOL.(MIL M ³) :	10.090	4.462	6.052	10.090	3.497	5.357	10.090	2.536	4.560	10.090

EVALUATION INDECS

CH/V :	31953.	40037.	33253.	24232.	38758.	30007.	20299.	36593.	25839.	15821.
C/V :	202.	353.	258.	154.	380.	246.	129.	412.	226.	100.
P/(20VT+VD) :	16.3	14.7	15.5	13.8	13.3	13.9	11.9	11.3	11.9	9.5
E(FIRM)/(20VT+VD) :	47.5	43.0	45.1	40.1	38.8	40.6	34.6	32.9	34.7	27.8
E(F+SEC*0.3)/(20VT+VD) :	49.3	48.6	50.4	44.7	46.5	47.8	40.6	43.3	44.4	35.5

PROJECT NAME : AGBULU
 PROJECT ID : 2-008-01-06-0
 TYPE : RESERVOIR

 * SUMMARY TABLE OF COST ESTIMATE *

(UNIT : MILLION USD)

I T E M	C A S E									
	1	2	3	4	5	6	7	8	9	10
POWER DEVELOPMENT (INST. CAP.(MW))	(216.6)	(109.4)	(139.3)	(179.5)	(84.0)	(114.0)	(153.3)	(58.6)	(86.0)	(121.4)
STORAGE DAM	91.68	44.96	58.67	91.68	36.34	52.74	91.68	27.44	45.82	91.68
SPILLWAY	24.99	16.65	20.97	24.99	17.30	20.10	24.99	15.45	16.99	24.99
DIVERSION TUNNEL	16.37	16.37	16.37	16.37	16.37	16.37	16.37	16.37	16.37	16.37
INTAKE (PRESSURE TYPE)	5.81	4.81	4.12	3.67	3.97	3.31	2.90	3.06	2.46	2.16
HEADRACE TUNNEL (PRESSURE)	8.74	7.26	7.23	7.13	6.43	6.39	6.33	4.44	4.40	4.34
SURGE TANK	3.98	3.11	3.05	3.02	2.63	2.59	2.55	2.03	1.98	1.94
PENSTOCK	4.98	2.71	3.57	4.72	2.29	3.13	4.26	1.48	2.17	3.12
(PRESSURE SHAFT)	(1.05)	(0.84)	(0.96)	(1.08)	(0.80)	(0.93)	(1.05)	(0.45)	(0.53)	(0.61)
(STEEL LINER)	(3.93)	(1.87)	(2.61)	(3.64)	(1.49)	(2.20)	(3.20)	(1.03)	(1.63)	(2.51)
POWERHOUSE BUILDING	14.54	8.46	9.91	11.71	6.70	8.19	9.94	3.44	4.42	5.53
(SUPER STRUCTURE)	(6.46)	(3.76)	(4.41)	(5.20)	(2.98)	(3.64)	(4.42)	(1.53)	(1.96)	(2.46)
(SUB STRUCTURE)	(8.08)	(4.70)	(5.51)	(6.50)	(3.72)	(4.55)	(5.52)	(1.91)	(2.40)	(3.07)
MISCELLANEOUS CIVIL WORK	8.55	5.33	6.20	8.17	4.60	5.64	7.95	3.69	4.83	7.51
CONSTRUCTION FACILITIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
POWER EQUIPMENT	45.24	29.62	32.92	36.75	24.36	27.83	31.62	18.59	21.95	25.43
ENGINEERING/ADMINISTRATION	26.14	17.68	20.38	25.10	15.13	18.28	24.47	12.00	15.42	22.89
CONTINGENCIES	50.21	31.83	36.68	46.67	27.23	32.91	44.61	21.60	27.76	41.20
S U B T O T A L	301.23	190.97	220.07	290.03	163.36	197.48	267.67	129.59	165.58	247.17

ACCESS ROAD (ROAD LENGTH 6.5 KM)

CONSTRUCTION COST	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43
ENGINEERING ADMINISTRATION	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
CONTINGENCIES	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
S U B T O T A L	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85

TRANSMISSION LINE SYSTEM (T/L LENGTH 73.6 KM)

TRANSMISSION LINE	8.72	8.72	8.72	8.72	8.72	8.72	8.72	8.72	8.72	8.72
SWITCHYARD AND SUBSTATION	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
ENGINEERING/ADMINISTRATION	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21
CONTINGENCIES	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63
S U B T O T A L	12.53	12.53	12.53	12.53	12.53	12.53	12.53	12.53	12.53	12.53

T O T A L : 315.62 205.36 234.45 294.41 177.74 211.86 282.05 139.16 130.97 261.56

EVALUATION INDICES

U S D / K W	1457.3	1877.4	1683.6	1640.1	2115.3	1858.9	1640.3	2373.6	2105.5	2154.1
U S D / K W H	0.481	0.570	0.517	0.505	0.605	0.541	0.533	0.613	0.564	0.578

PROJECT NAME : GENED
 PROJECT ID : 2- 6- 0-81-0-1
 TYPE : RESERVOIR

BASIN NAME : ABULOG
 RIVER NAME : ABULOG

 * SUMMARY TABLE OF OUTPUTS *

RESERVOIR	CASE									
	1	2	3	4	5	6	7	8	9	10
RESERVOIR DEVELOP. COEF :	0.50	0.37	0.37	0.37	0.37	0.37	0.27	0.27	0.27	0.27
FULL SUPPLY LEVEL (M) :	180.0	167.7	169.3	171.8	175.2	180.0	157.1	159.8	171.2	180.0
MIN. OPERATING LEVEL(M) :	96.3	96.0	106.3	116.7	127.0	137.3	95.6	109.8	138.2	152.5
POWER										
FIRM DISCHARGE (M3/S) :	149.9	143.3	143.1	142.9	142.7	142.5	134.0	133.8	133.2	132.8
PLANT PEAK DIS. (M3/S) :	450.3	430.3	429.8	429.2	428.6	427.8	402.6	401.8	400.1	398.9
AVERAGE NET HEAD (M) :	97.9	89.7	94.1	93.1	104.8	111.3	82.5	89.0	105.8	116.4
INSTALLED CAPACITY (MW) :	362.9	317.7	333.0	350.3	369.7	392.1	273.3	294.2	348.3	382.4
GUARANTEED POWER (MW) :	148.6	141.2	175.7	210.0	244.1	278.0	130.9	175.2	262.8	308.7
AVERAGE FIRM POWER (MW) :	120.8	105.8	110.9	116.6	123.1	130.6	91.0	98.0	116.0	127.3
FIRM ENERGY (MIL KWH/Y) :	1059.	927.	971.	1022.	1078.	1144.	797.	858.	1016.	1115.
SECONDARY ENERGY (%) :	121.	145.	148.	152.	158.	166.	177.	183.	206.	224.
ANNUAL AVERAGE E-GY (%) :	1179.	1072.	1120.	1174.	1236.	1309.	975.	1042.	1222.	1339.

D A M

DAM HEIGHT (M) :	179.0	166.7	168.3	170.8	174.2	179.0	156.1	158.8	170.2	179.0
EMBANKMENT VOL. (MIL M3) :	12.711	10.401	10.686	11.124	11.756	12.711	8.639	9.078	11.019	12.711

EVALUATION INDECES

CH/V :	46802.	49351.	48626.	47617.	46267.	44374.	50381.	49103.	44509.	41399.
C/V :	372.	434.	422.	405.	383.	353.	489.	465.	381.	330.
P/(20VT+VD) :	18.6	18.7	19.3	19.8	20.2	20.3	18.3	19.1	20.1	20.1
E(FIRM)/(20VT+VD) :	54.4	54.6	56.3	57.8	58.6	59.3	53.4	55.8	58.7	58.7
E(F+SECK0.3)/(20VT+VD) :	56.2	57.2	58.9	60.3	61.4	61.9	56.9	59.4	62.2	62.3

PROJECT NAME : GENED
 PROJECT ID : 2-006-00-81-0
 TYPE : RESERVOIR

 * SUMMARY TABLE OF COST ESTIMATE *

(UNIT : MILLION USD)

I T E M	C A S E									
	1	2	3	4	5	6	7	8	9	10
POWER DEVELOPMENT (INST. CAP(MW))	(362.9)	(317.7)	(333.0)	(350.3)	(369.7)	(392.1)	(273.3)	(294.2)	(348.3)	(382.4)
STORAGE DAM	112.17	94.15	96.40	99.84	104.77	112.17	80.06	83.60	99.02	112.17
SPILLWAY	32.63	30.62	30.89	31.29	31.85	32.63	28.87	29.33	31.19	32.63
DIVERSION TUNNEL	18.28	18.28	18.28	18.28	18.28	18.28	18.28	18.28	18.28	18.28
INTAKE (PRESSURE TYPE)	12.62	11.62	11.22	10.83	10.47	10.16	10.53	9.97	9.02	8.71
HEADRACE TUNNEL (PRESSURE)	35.30	34.17	34.14	34.11	34.08	34.03	32.53	32.54	32.44	30.38
SURGE TANK	10.47	10.00	9.98	9.95	9.93	9.90	9.37	9.33	9.26	9.15
PENSTOCK	16.72	15.40	16.08	16.82	17.63	18.54	14.03	14.93	17.13	17.61
(PRESSURE SHAFT)	(4.49)	(4.44)	(4.52)	(4.60)	(4.67)	(4.74)	(4.37)	(4.47)	(4.67)	(4.06)
(STEEL LINER)	(12.23)	(10.95)	(11.56)	(12.22)	(12.96)	(13.80)	(9.66)	(10.46)	(12.47)	(13.55)
POWERHOUSE BUILDING	42.92	38.69	39.91	41.26	42.75	44.43	34.23	35.94	40.15	38.18
(SUPER STRUCTURE)	(19.08)	(17.20)	(17.74)	(18.34)	(19.00)	(19.75)	(15.21)	(15.97)	(17.84)	(16.97)
(SUB STRUCTURE)	(23.85)	(21.49)	(22.17)	(22.92)	(23.75)	(24.68)	(19.02)	(19.96)	(22.31)	(21.21)
MISCELLANEOUS CIVIL WORK	14.05	12.65	12.84	13.12	13.49	14.01	11.40	11.70	12.82	13.36
CONSTRUCTION FACILITIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
POWER EQUIPMENT	83.34	76.91	78.52	80.28	82.19	84.33	69.75	72.05	77.58	80.80
ENGINEERING/ADMINISTRATION	34.43	32.65	32.94	33.32	33.79	34.43	30.93	31.38	32.88	32.59
CONTINGENCIES	82.59	75.03	76.24	77.82	79.85	82.58	68.00	69.81	75.95	78.97
S U B T O T A L	495.53	450.17	457.42	466.91	479.07	495.50	408.02	418.85	455.72	473.83

ACCESS ROAD (ROAD LENGTH 46.1 KM)

CONSTRUCTION COST	10.14	10.14	10.14	10.14	10.14	10.14	10.14	10.14	10.14	10.14
ENGINEERING ADMINISTRATION	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
CONTINGENCIES	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19
S U B T O T A L	13.14	13.14	13.14	13.14	13.14	13.14	13.14	13.14	13.14	13.14

TRANSMISSION LINE SYSTEM (T/L LENGTH 36.0 KM)

TRANSMISSION LINE	7.92	7.92	7.92	7.92	7.92	7.92	7.92	7.92	7.92	7.92
SWITCHYARD AND SUBSTATION	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
ENGINEERING/ADMINISTRATION	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
CONTINGENCIES	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
S U B T O T A L	11.49	11.49	11.49	11.49	11.49	11.49	11.49	11.49	11.49	11.49

T O T A L

	520.15	474.80	482.06	491.54	503.71	520.13	432.65	443.48	480.36	498.47
EVALUATION INDICES										
U S D / K W	1433.4	1494.6	1447.5	1403.2	1362.6	1326.6	1583.2	1507.2	1379.2	1303.7
U S D / K W H	0.475	0.489	0.475	0.460	0.447	0.436	0.509	0.486	0.446	0.422

 **2-4-3 ABULOG

PAGE : 1

REGION NO. : 2 BASIN NO. : 6

NUMBER OF PROJECTS : 3

LIST OF PROJECTS

NO.	PROJECT ID	PROJECT NAME	CA (SQ.KM)	RAIN (MM)	STREAM GAGE ID
1	2-006-01-06-0-1	AGBULU	706.0	3977.0	4-2-005
2	2-006-00-03-1-1	BULU	1540.0	4020.0	4-2-005
3	2-006-00-01-2-1	SISIRITAN	1870.0	4004.0	4-2-005

1/
 - CONNECTION MATRIX -

1 2 3
 1 0 0 0
 2 1 0 0
 3 0 1 0

1/ C(I,J)=1 : PROJECT-J IS DIRECTLY UPSTREAM OF PROJECT-I
 - C(I,J)=0 : IS NOT

SEQ NO.	PROJECT ID	NUP	ID(S) OF U/S PROJECT(S)
1	2-006-01-06-0-1	0	
2	2-006-00-03-1-1	1	2-006-01-06-0-1
3	2-006-00-01-2-1	1	2-006-00-03-1-1

PROJECT NAME : ASBULU
 PROJECT ID : 2- 6- 1- 6-0-1
 TYPE : RESERVOIR

BASIN NAME : ABULOG
 RIVER NAME : APAYAO

 * SUMMARY TABLE OF OUTPUTS *

RESERVOIR ITEMS CASE

RESERVOIR DEVELOP. COEF : 0.75 0.40 0.40 0.40 0.30 0.30 0.30 0.30 0.20 0.20
 FULL SUPPLY LEVEL (M) : 346.0 300.8 316.4 316.0 346.0 289.4 310.0 345.0 275.9 346.0
 MIN. OPERATING LEVEL (M) : 278.1 226.3 271.2 316.0 225.4 225.4 275.0 324.5 224.2 278.1 332.0

POWER
 FIRM DISCHARGE (M3/S) : 64.6 49.9 49.5 49.5 49.1 42.1 41.7 41.2 33.1 32.6 32.1
 PLANT PEAK DIS. (M3/S) : 194.1 149.9 148.9 147.6 147.6 126.5 125.3 123.7 99.4 98.0 96.3
 AVERAGE NET HEAD (M) : 135.6 88.6 113.6 147.8 147.8 80.7 110.5 150.5 71.7 106.5 153.2
 INSTALLED CAPACITY (MW) : 216.6 109.4 139.3 179.5 179.5 84.0 114.0 153.3 58.6 86.0 121.4
 GUARANTEED POWER (MW) : 137.4 45.8 97.4 147.8 147.8 37.7 85.6 132.1 29.0 69.7 108.6
 AVERAGE FIRM POWER (MW) : 72.1 36.4 46.4 46.4 59.8 28.0 38.0 51.0 19.5 28.6 40.4
 FIRM ENERGY (MIL KWH/Y) : 632. 319. 406. 524. 332. 245. 332. 447. 171. 251. 354.
 SECONDARY ENERGY (") : 81. 138. 159. 198. 163. 197. 197. 258. 180. 234. 328.
 ANNUAL AVERAGE E-GY (") : 713. 457. 565. 722. 408. 529. 705. 485. 351. 485. 682.

D A M
 DAM HEIGHT (M) : 167.0 121.8 137.4 167.0 167.0 110.4 131.0 167.0 96.9 122.9 167.0
 EMBANKMENT VOL. (MIL M3) : 10.090 4.452 6.052 10.090 10.090 3.497 5.357 10.090 2.535 4.560 10.090

EVALUATION INDECS
 CH/V : 31953. 40037. 33253. 24232. 38758. 30007. 20299. 25839. 15821.
 C/V : 202. 353. 258. 154. 129. 246. 412. 226. 100.
 P/(20VT+VD) : 16.3 14.7 15.5 13.8 13.9 11.9 11.9 11.9 9.5
 E(FIRM)/(20VT+VD) : 47.5 43.0 45.1 40.1 40.1 38.8 40.6 34.6 34.7 27.8
 E(F+SEC*0.3)/(20VT+VD) : 49.3 48.6 50.4 44.7 46.5 47.8 40.5 43.3 44.4 35.5

PROJECT NAME : AGBULU
 PROJECT ID : 2-006-01-06-0
 TYPE : RESERVOIR

 * SUMMARY TABLE OF COST ESTIMATE *

(UNIT : MILLION USD)

I T E M	C A S E									
	1	2	3	4	5	6	7	8	9	10
POWER DEVELOPMENT (INST.CAP(MW))	(216.6)	(109.4)	(139.3)	(175.5)	(84.0)	(114.0)	(153.3)	(58.6)	(86.0)	(121.4)
STORAGE DAM	91.68	44.96	56.67	91.68	36.34	52.74	91.68	27.44	45.82	91.68
SPILLWAY	24.99	18.85	20.97	24.99	17.30	20.10	24.99	15.45	18.99	24.99
DIVERSION TUNNEL	16.37	16.37	16.37	16.37	16.37	16.37	16.37	16.37	16.37	16.37
INTAKE (PRESSURE TYPE)	5.81	4.81	4.12	3.67	3.97	3.31	2.90	3.06	2.46	2.16
HEADRACE TUNNEL (PRESSURE)	8.74	7.26	7.23	7.18	6.43	6.39	6.33	4.44	4.40	4.34
SURGE TANK	3.98	3.11	3.05	3.02	2.63	2.59	2.55	2.03	1.98	1.94
PENSTOCK	4.98	2.71	3.57	4.72	2.29	3.13	4.26	1.48	2.17	3.12
(PRESSURE SHAFT)	(1.05)	(0.84)	(0.96)	(1.08)	(0.60)	(0.93)	(1.05)	(0.45)	(0.53)	(0.51)
(STEEL LINER)	(3.93)	(1.87)	(2.61)	(3.64)	(1.49)	(2.20)	(3.20)	(1.03)	(1.63)	(2.51)
POWERHOUSE BUILDING	14.54	8.46	9.91	11.71	6.70	8.19	9.94	3.44	4.42	5.53
(SUPER STRUCTURE)	(6.46)	(3.76)	(4.41)	(5.20)	(2.98)	(3.64)	(4.42)	(1.53)	(1.96)	(2.46)
(SUB STRUCTURE)	(8.08)	(4.70)	(5.51)	(6.51)	(3.72)	(4.55)	(5.52)	(1.91)	(2.46)	(3.07)
MISCELLANEOUS CIVIL WORK	0.55	5.33	6.20	8.17	4.60	5.64	7.95	3.69	4.83	7.51
CONSTRUCTION FACILITIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
POWER EQUIPMENT	45.24	29.62	32.92	36.75	24.36	27.83	31.62	18.59	21.95	25.43
ENGINEERING/ADMINISTRATION	26.14	17.68	20.38	25.10	15.13	18.28	24.47	12.00	15.42	22.89
CONTINGENCIES	50.21	31.83	35.68	46.67	27.23	32.91	44.61	21.60	27.76	41.20
S U B T O T A L	301.23	190.97	220.07	280.03	163.36	197.48	267.67	129.59	166.58	247.17

ACCESS ROAD (ROAD LENGTH 6.5 KM)

CONSTRUCTION COST	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43
ENGINEERING ADMINISTRATION	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
CONTINGENCIES	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
S U B T O T A L	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85

TRANSMISSION LINE SYSTEM (T/L LENGTH 78.6 KM)

TRANSMISSION LINE	8.72	8.72	8.72	8.72	8.72	8.72	8.72	8.72	8.72	8.72
SWITCHYARD AND SUBSTATION	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
ENGINEERING/ADMINISTRATION	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21
CONTINGENCIES	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63
S U B T O T A L	12.53	12.53	12.53	12.53	12.53	12.53	12.53	12.53	12.53	12.53

T O T A L : 315.62 295.36 234.45 294.41 177.74 211.86 282.05 139.16 160.97 261.56

EVALUATION INDICES

U S D / K W	1457.3	1877.4	1683.6	1640.1	2115.3	1858.9	1840.3	2373.6	2105.5	2154.1
U S D / K W H	0.461	0.570	0.517	0.505	0.605	0.541	0.538	0.618	0.564	0.578

PROJECT NAME : BULU
 PROJECT ID : 2- 6- 0- 3-1-1
 TYPE : RESERVOIR

BASIN NAME : ABULOG
 RIVER NAME : ABULOG

 * SUMMARY TABLE OF OUTPUTS *

RESERVOIR	CASE									
	1	2	3	4	5	6	7	8	9	10
RESERVOIR DEVELOP. COEF :	0.39	0.36	0.36	0.26	0.26	0.26	0.26	0.26	0.16	0.16
FULL SUPPLY LEVEL (M) :	175.0	172.9	175.0	161.5	164.1	167.3	171.1	175.0	147.6	175.0
MIN. OPERATING LEVEL (M) :	107.3	108.2	115.9	107.8	115.9	124.0	132.2	140.3	108.1	155.9
FIRM DISCHARGE (M3/S) :	141.4	140.2	140.1	131.2	131.1	131.0	130.8	130.6	115.5	114.5
PLANT PEAK DIS. (M3/S) :	565.5	560.9	560.4	524.9	524.5	523.8	523.2	522.5	452.0	458.1
AVERAGE NET HEAD (M) :	72.1	71.0	74.9	63.4	67.7	72.5	77.6	82.9	54.3	88.1
INSTALLED CAPACITY (MW) :	335.7	327.9	345.6	273.8	292.4	312.7	334.4	356.5	206.7	332.1
GUARANTEED POWER (MW) :	119.7	122.7	156.1	113.4	146.4	179.3	212.1	244.8	101.5	270.7
AVERAGE FIRM POWER (MW) :	83.9	82.0	86.4	68.5	73.1	78.2	83.6	89.1	51.7	83.0
FIRM ENERGY (MIL KWH/Y) :	735.	718.	757.	600.	640.	695.	732.	781.	453.	727.
SECONDARY ENERGY (") :	127.	130.	134.	154.	159.	166.	174.	182.	185.	264.
ANNUAL AVERAGE E-GY (") :	863.	848.	891.	754.	800.	851.	908.	963.	638.	991.

D A M

DAM HEIGHT (M) :	102.7	100.6	102.7	89.2	91.8	95.0	98.8	102.7	75.3	102.7
EMBANKMENT VOL. (MIL M3) :	6.863	6.554	6.863	4.979	5.296	5.760	6.295	6.883	3.394	6.883

EVALUATION INDECES

CH/Y :	61331.	62450.	60745.	67556.	65415.	62344.	59368.	56540.	72430.	49549.
C/Y :	648.	675.	642.	831.	781.	717.	655.	598.	1073.	525.
P/(20VT+VD) :	28.7	26.8	27.5	26.1	27.0	27.7	28.3	28.7	24.0	27.4
E(FIRM)/(20VT+VD) :	58.4	58.7	60.2	57.1	59.1	60.6	61.9	62.8	52.5	60.0
E(F+SEC*0.3)/(20VT+VD) :	61.4	61.8	63.4	61.5	63.5	65.0	66.3	67.2	58.9	66.5

PROJECT NAME : BULU
 PROJECT ID : 2-006-00-03-1
 TYPE : RESERVOIR

 * SUMMARY TABLE OF COST ESTIMATE *

(UNIT : MILLION USD)

I T E M	C A S E									
	1	2	3	4	5	6	7	8	9	10
POWER DEVELOPMENT (INST. CAP (MW))	(335.7)	(327.9)	(345.6)	(273.8)	(292.4)	(312.7)	(334.4)	(356.5)	(206.7)	(332.1)
STORAGE DAM	65.64	62.90	65.64	49.47	52.22	56.19	60.72	65.64	35.40	65.64
SPILLWAY	19.98	19.63	19.98	17.78	18.20	18.73	19.34	19.98	15.52	19.98
DIVERSION TUNNEL	24.37	24.37	24.37	24.37	24.37	24.37	24.37	24.37	24.37	24.37
INTAKE (PRESSURE TYPE)	14.54	14.27	13.95	12.85	12.52	12.20	11.90	11.60	10.70	9.19
HEADRACE TUNNEL (PRESSURE)	19.75	19.63	19.62	18.72	18.71	18.69	18.67	18.68	16.22	16.13
SURGE TANK	10.96	10.86	10.83	10.15	10.12	10.09	10.06	10.03	8.87	8.73
PENSTOCK	11.56	11.43	11.97	10.34	10.89	11.47	12.03	12.74	8.40	11.82
(PRESSURE SHAFT)	(3.60)	(3.60)	(3.67)	(3.55)	(3.62)	(3.69)	(3.76)	(3.83)	(3.02)	(3.36)
(STEEL LINER)	(7.96)	(7.83)	(8.30)	(6.80)	(7.27)	(7.78)	(8.33)	(8.91)	(5.37)	(8.45)
POWERHOUSE BUILDING	48.17	47.28	48.96	41.01	42.84	44.78	46.81	48.83	29.74	40.70
(SUPER STRUCTURE)	(21.41)	(21.02)	(21.76)	(18.23)	(19.04)	(19.90)	(20.80)	(21.70)	(13.22)	(18.09)
(SUB STRUCTURE)	(26.76)	(26.27)	(27.20)	(22.79)	(23.80)	(24.88)	(26.00)	(27.13)	(16.52)	(22.61)
MISCELLANEOUS CIVIL WORK	10.75	10.52	10.77	9.24	9.49	9.83	10.20	10.59	7.46	9.83
CONSTRUCTION FACILITIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
POWER EQUIPMENT	29.16	27.89	29.97	28.66	31.00	33.43	35.94	38.40	65.44	80.71
ENGINEERING/ADMINISTRATION	31.23	30.91	31.30	28.94	29.37	29.89	30.45	31.02	25.97	29.74
CONTINGENCIES	69.22	67.84	69.47	60.31	61.95	63.94	66.11	68.37	49.62	63.37
S U B T O T A L	415.32	407.66	416.82	361.86	371.67	383.61	396.65	410.25	297.70	380.20

ACCESS ROAD (ROAD LENGTH 4.0 KM)

CONSTRUCTION COST	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
ENGINEERING ADMINISTRATION	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
CONTINGENCIES	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
S U B T O T A L	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14

TRANSMISSION LINE SYSTEM (T/L LENGTH 69.0 KM)

TRANSMISSION LINE	15.18	15.18	15.18	15.18	15.18	15.18	15.18	15.18	7.68	15.18
SWITCHYARD AND SUBSTATION	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
ENGINEERING/ADMINISTRATION	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02	1.08	2.02
CONTINGENCIES	2.72	2.72	2.72	2.72	2.72	2.72	2.72	2.72	1.45	2.72
S U S T O T A L	20.88	20.88	20.88	20.88	20.88	20.88	20.88	20.88	11.15	20.88

T O T A L

T O T A L	437.35	429.68	438.84	383.88	393.69	405.69	418.67	432.27	309.99	402.22
EVALUATION INDICES										
U S D / K W	1302.7	1310.5	1269.6	1402.0	1346.4	1297.1	1252.1	1212.4	1500.0	1211.1
U S D / K W H	0.565	0.568	0.551	0.594	0.572	0.552	0.534	0.517	0.610	0.499

PROJECT NAME : SISIRITAN
 PROJECT ID : 2- 6- 0- 1-2-1
 TYPE : RESERVOIR

BASIN NAME : ABULOG
 RIVER NAME : ABULOG

 * SUMMARY TABLE OF OUTPUTS *

RESERVOIR	CASE									
	1	2	3	4	5	6	7	8	9	10
RESERVOIR DEVELOP. COEF :	0.11	0.11	0.11	0.11	0.08	0.08	0.08	0.05	0.05	0.05
FULL SUPPLY LEVEL (M) :	68.3	53.8	60.7	68.3	48.7	58.0	68.3	43.0	55.2	68.3
MIN. OPERATING LEVEL (M) :	51.9	32.9	42.4	51.9	32.6	44.7	56.7	32.4	46.8	61.3
POWER										
FIRM DISCHARGE (M3/S) :	159.1	159.4	159.2	159.1	153.8	153.6	153.4	148.2	147.9	147.6
PLANT PEAK DIS. (M3/S) :	477.6	478.8	478.2	477.6	462.0	461.3	460.6	445.1	444.2	443.3
AVERAGE NET HEAD (M) :	50.8	35.0	42.7	50.8	31.5	41.6	52.3	27.7	40.5	53.8
INSTALLED CAPACITY (MW) :	199.8	137.9	168.1	199.8	120.0	153.1	198.5	101.5	147.9	196.4
GUARANTEED POWER (MW) :	149.4	79.0	114.3	149.4	75.5	118.4	161.0	72.0	121.5	170.8
AVERAGE FIRM POWER (MW) :	66.5	45.9	56.0	66.5	39.9	52.7	66.1	33.8	49.2	65.4
FIRM ENERGY (MIL KWH/Y) :	583.	402.	490.	583.	350.	461.	579.	296.	431.	573.
SECONDARY ENERGY (") :	113.	84.	98.	113.	84.	105.	129.	79.	110.	144.
ANNUAL AVERAGE E-GY (") :	696.	486.	588.	696.	433.	565.	707.	375.	542.	717.
D A M										
DAM HEIGHT (M) :	64.3	49.8	56.7	64.3	44.7	54.0	64.3	39.0	51.2	64.3
EMBANKMENT VOL. (MIL MG) :	4.677	2.697	3.578	4.677	2.199	3.233	4.677	1.654	2.858	4.577
EVALUATION INDECES										
CR/V :	60334.	78218.	68521.	60334.	81628.	69074.	58131.	88284.	70301.	55907.
C/V :	1072.	1864.	1404.	1072.	2212.	1498.	1034.	2826.	1626.	995.
P/(20VT+VD) :	20.1	17.4	19.1	20.1	16.3	18.9	20.2	15.1	18.6	20.1
E(FIRM)/(20VT+VD) :	58.8	50.7	55.6	58.8	47.7	56.0	58.9	44.1	54.3	58.8
E(F+SEC*0.37)/(20VT+VD) :	62.2	53.9	59.0	62.2	51.1	58.7	62.8	47.6	58.5	63.2

PROJECT NAME : SISIRITAN
 PROJECT ID : 2-006-00-01-2
 TYPE : RESERVOIR

 * SUMMARY TABLE OF COST ESTIMATE *

(UNIT : MILLION USD)

I T E M	C A S E									
	1	2	3	4	5	6	7	8	9	10
POWER DEVELOPMENT (INST. CAP.(MW))	(199.8)	(137.9)	(168.1)	(199.8)	(120.0)	(158.1)	(198.5)	(101.5)	(147.9)	(196.4)
STORAGE DAM	46.85	28.96	37.07	45.85	24.17	33.93	46.85	18.89	30.56	46.85
SPILLWAY	14.51	12.04	13.22	14.51	11.17	12.76	14.51	10.21	12.27	14.51
DIVERSION TUNNEL	21.44	21.44	21.44	21.44	21.44	21.44	21.44	21.44	21.44	21.44
INTAKE (PRESSURE TYPE)	9.32	9.74	9.51	9.32	9.01	8.74	8.56	8.18	7.92	7.75
HEADRACE TUNNEL (PRESSURE)	17.17	17.20	17.18	17.17	16.76	16.74	16.73	16.32	16.30	16.27
SURGE TANK	9.15	9.18	9.16	9.15	8.86	8.84	8.82	8.53	8.50	8.48
PENSTOCK	12.43	10.51	11.45	12.43	9.94	11.12	12.33	9.36	10.78	12.29
(PRESSURE SHAFT)	(4.56)	(4.42)	(4.49)	(4.56)	(4.37)	(4.47)	(4.55)	(4.32)	(4.44)	(4.53)
(STEEL LINER)	(7.88)	(6.09)	(6.95)	(7.88)	(5.57)	(6.65)	(7.83)	(5.03)	(6.34)	(7.76)
POWERHOUSE BUILDING	29.40	22.98	26.22	29.40	20.70	24.87	28.92	18.29	23.49	28.36
(SUPER STRUCTURE)	(13.07)	(10.22)	(11.65)	(13.07)	(9.20)	(11.05)	(12.85)	(8.13)	(10.44)	(12.61)
(SUB STRUCTURE)	(16.34)	(12.77)	(14.57)	(16.34)	(11.50)	(13.82)	(15.07)	(10.16)	(13.05)	(15.76)
MISCELLANEOUS CIVIL WORK	8.01	6.60	7.26	8.01	6.10	6.92	7.91	5.56	6.56	7.80
CONSTRUCTION FACILITIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
POWER EQUIPMENT	65.42	55.43	60.57	65.42	51.23	57.97	64.17	46.73	55.90	62.78
ENGINEERING/ADMINISTRATION	26.68	24.18	25.40	26.68	22.42	24.78	26.47	20.44	24.11	26.24
CONTINGENCIES	52.08	43.65	47.70	52.08	40.36	45.63	51.35	36.79	43.45	50.56
S U B T O T A L	312.46	261.92	286.19	312.46	242.18	273.76	308.00	220.74	260.59	303.34

ACCESS ROAD (ROAD LENGTH 10.5 KM)

CONSTRUCTION COST	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31
ENGINEERING ADMINISTRATION	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
CONTINGENCIES	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
S U B T O T A L	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99

TRANSMISSION LINE SYSTEM (T/L LENGTH 48.0 KM)

TRANSMISSION LINE	5.33	5.33	5.33	5.33	5.33	5.33	5.33	5.33	5.33	5.33
SWITCHYARD AND SUBSTATION	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
ENGINEERING/ADMINISTRATION	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
CONTINGENCIES	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
S U B T O T A L	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14

T O T A L : 323.59 273.05 297.32 323.59 253.31 284.89 319.22 231.87 271.82 314.47

EVALUATION INDICES

U S D / K W	1619.9	1980.2	1768.6	1619.9	2111.6	1801.5	1608.6	2284.7	1837.9	1601.0
U S D / K W H	0.525	0.639	0.572	0.525	0.676	0.578	0.517	0.725	0.585	0.510

I N V E N T O R Y O F H Y D R O P O W E R S I T E S

SCHEME ID : 2-006-00-01-1-1

SCHEME : SISIRITAN

RIVER SYSTEM : ABULOG
STREAM : ABULOG

WATER RESOURCES REGION : 11
PROVINCE : KAL-APAYAO

COORDINATES : N18-09-42 E121-21-00
STUDY LEVEL : UNSCALED
(PRE-F/S, RECONNAISSANCE)

HYDRO/TOPO. INFORMATION

CATCHMENT AREA (KM2) : 1870.0 (MAIN : 1870.0 INTER TRANSFER TOTAL : 0.0) STREAM GAGE ID : 4-2-005-NW-203
AVER. BASIN RAINFALL (MM/YR) : 4004. DENUDATION RATE (MM/YR) : 1.4 GAGE CATCHMENT (KM2) : 2066.
AVERAGE DISCHARGE (M3/S) : 200.9 EVAPORATION RATE (MM/DAY) : 3.5 GAGE AVER. DISCHARGE (M3/S) : 227.2

SELECTED PLAN

TYPE OF DEVELOPMENT : RESERVOIR RESERVOIR DEVELOPMENT RATIO : 0.30

RESERVOIR FULL SUPPLY LEVEL (EL.M) : 100.0 GROSS STORAGE VOL. (MIL M3) : 3443.0
AVERAGE OPERATING LEVEL (EL.M) : 88.4 ACTIVE STORAGE VOL. (MIL M3) : 1900.8
MINIMUM OPERATING LEVEL (EL.M) : 65.2 DEAD STORAGE VOL. (MIL M3) : 1942.2
DRAWDOWN DEPTH (M) : 34.8 SEDIMENT VOL. (MIL M3) : 81.5

MAIN DAM CREST ELEVATION (EL.M) : 105.0 CREST LENGTH (M) : 890.5
(WEIR) DAM HEIGHT (M) : 96.0 EMBANKMENT VOL. (MIL M3) : 11.45

WATERWAY HEADRACE : LENGTH (M) : 620.0 DIAMETER (WIDTH) (M) : 6.1
PENSTOCK : HORIZONT. L (M) : 250.0 DIAMETER (M) : 4.8
DIVERSION : LENGTH (M) : 970.0 DIAMETER (M) : 7.8
EXCAVATION VOL TOTAL (1000 M3) : 299.8

DISCHARGE PLANT MAX. DISCHARGE (M3/S) : 623.3 AVERAGE NET HEAD (M) : 76.0
/HEAD FIRM DISCHARGE (M3/S) : 155.8 TAILWATER LEVEL (EL.M) : 10.0

POWER INSATLLED CAPACITY (MW) : 389.8 ANNUAL TOTAL ENERGY (GWH) : 1067.0
/ENERGY FIRM POWER (MW) : 97.4 FIRM ENERGY (GWH) : 853.6
MIN. GUARANTEED POWER (MW) : 258.0 SECONDARY ENERGY (GWH) : 213.4

TRANSMISSION LINE LENGTH (KW) : 48.0 TO : CAMALANIUGAN 230 K V DOUBLE CIRCUIT NOS. OF CIRCUIT : 1
ACCESS ROAD LENGTH (KW) : 10.5 FROM : PUOTOL

CONSTRUCTION COST

TOTAL COST (MIL USD) : 521.7 POWER COST (MIL USD) : 503.8
TOTAL COST/KW (USD/KW) : 1338.4 TRANSMISSION COST (MIL USD) : 14.9
TOTAL COST/KWH (USD/KWH) : 0.969 ACCESS ROAD COST (MIL USD) : 3.0

OTHER INFORMATION

LAND USE IN RESERVOIR AREA : FOREST - SCARCE POPULATION
SUBMERGED ROAD : PROVINCIAL ROAD 8.0 KMS.
MAP USED (1:50,000 SCALE) : 3274-II 1979
TECHNICAL COMMENT : - SERIES DEVELOPMENT PLAN WITH AGBULU
- REGULATION EFFECT BY AGBULU RESERVOIR IS CONSIDERED

INVENTORY OF HYDROPOWER SITES

SCHEME ID : 2-006-00-01-2-1

SCHEME : SISIRITAN

RIVER SYSTEM : ABULOG
 STREAM : ABULOG
 WATER RESOURCES REGION : II
 PROVINCE : KAL-APAYAO
 COORDINATES : N18-09-42 E121-21-00
 STUDY LEVEL : UNSCALED
 (PRE-F/S-RECONNAISSANCE)

HYDRO/TOPO. INFORMATION

CATCHMENT AREA (KM2) : 1870.0 (MAIN : 1870.0 INTER TRANSFER TOTAL : 0.0) STREAM GAGE ID : 4-2-005-NW-203
 AVER. BASIN RAINFALL (MM/YR) : 4004. DENUDATION RATE (MM/YR) : 1.4 GAGE CATCHMENT (KM2) : 2066.
 AVERAGE DISCHARGE (M3/S) : 200.9 EVAPORATION RATE (MM/DAY) : 3.5 GAGE AVER. DISCHARGE (M3/S) : 227.2

SELECTED PLAN

TYPE OF DEVELOPMENT : RESERVOIR RESERVOIR DEVELOPMENT RATIO : 0.11

RESERVOIR FULL SUPPLY LEVEL (EL.M) : 68.3 GROSS STORAGE VOL. (MIL M3) : 1679.7
 AVERAGE OPERATING LEVEL (EL.M) : 62.3 ACTIVE STORAGE VOL. (MIL M3) : 696.9
 MINIMUM OPERATING LEVEL (EL.M) : 51.9 DEAD STORAGE VOL. (MIL M3) : 982.8
 DRAWDOWN DEPTH (M) : 16.4 SEDIMENT VOL. (MIL M3) : 81.5

MAIN DAM CREST ELEVATION (EL.M) : 74.3 CREST LENGTH (M) : 675.5
 (WEIR) DAM HEIGHT (M) : 64.3 EMBANKMENT VOL. (MIL M3) : 4.68

WATERWAY HEADRACE : LENGTH (M) : 620.0 DIAMETER (WIDTH) (M) : 6.4 NOS. : 5
 PENSTOCK : HORIZONT. L (M) : 250.0 DIAMETER (M) : 5.0 NOS. : 5
 DIVERSION : LENGTH (M) : 970.0 DIAMETER (M) : 7.8 NOS. : 3
 EXCAVATION VOL TOTAL (1000 M3) : 261.9

DISCHARGE PLANT MAX. DISCHARGE (M3/S) : 477.6 AVERAGE NET HEAD (M) : 50.8
 /HEAD FIRM DISCHARGE (M3/S) : 159.1 TAILWATER LEVEL (EL.M) : 10.0

POWER INSATLLED CAPACITY (MW) : 199.8 ANNUAL TOTAL ENERGY (GWH) : 696.0
 /ENERGY FIRM POWER (MW) : 65.5 FIRM ENERGY (GWH) : 582.7
 MIN. GUARANTEED POWER (MW) : 149.4 SECONDARY ENERGY (GWH) : 113.3

TRANSMISSION LINE LENGTH (KM) : 48.0 TO : CAMALANJUGAN 230 K V DOUBLE CIRCUIT NOS. OF CIRCUIT : 1
 ACCESS ROAD LENGTH (KM) : 10.5 FROM : PUOTOL

CONSTRUCTION COST

TOTAL COST (MIL USD) : 323.6 POWER COST (MIL USD) : 312.5
 TOTAL COST/KW (USD/KW) : 1619.9 TRANSMISSION COST (MIL USD) : 8.1
 TOTAL COST/KWH (USD/KWH) : 0.525 ACCESS ROAD COST (MIL USD) : 3.0

OTHER INFORMATION

LAND USE IN RESERVOIR AREA : FOREST - SCARGE POPULATION
 SUBMERGED ROAD : PROVINCIAL ROAD 8.0 KMS.
 MAP USED (1:50,000 SCALE) : 3274-11 1977
 TECHNICAL COMMENT : - SERIES DEVELOPMENT PLAN WITH BULU AND AGBULU
 - CONSTRAINED FSL (MAX 68.3 M) DUE TO TWL OF BULU
 - REGULATION EFFECTS BY BULU AND AGBULU ARE CONSIDERED

I N V E N T O R Y O F H Y D R O P O W E R S I T E S

SCHEME ID : 2-006-00-03-1-1
 COORDINATES : N18-02-30 E121-13-00
 STUDY LEVEL : UNSCALED
 (PRE-F/S.RECONNAISSANCE)

SCHEME : BULU

RIVER SYSTEM : ABULOG
 STREAM : ABULOG

WATER RESOURCES REGION : 11
 PROVINCE : KAL-APAYAO

HYDRO/TOPO. INFORMATION

CATCHMENT AREA (KM2) : 1540.0 (MAIN : 1540., INTER TRANSFER TOTAL : 0.) STREAM GAGE ID : 4-2-005-NW-203
 AVER. BASIN RAINFALL (MM/YR) : 4020. DEMONSTRATION RATE (MM/YR) : 1.4 GAGE CATCHMENT (KM2) : 2056.
 AVERAGE DISCHARGE (M3/S) : 166.2 EVAPORATION RATE (MM/DAY) : 3.5 GAGE AVER.DISCHARGE (M3/S) : 227.2

SELECTED PLAN

TYPE OF DEVELOPMENT : RESERVOIR : RESERVOIR DEVELOPMENT RATIO : 0.25

RESERVOIR FULL SUPPLY LEVEL (EL.M) : 175.0 GROSS STORAGE VOL. (MIL M3) : 2198.5
 AVERAGE OPERATING LEVEL (EL.M) : 163.4 ACTIVE STORAGE VOL. (MIL M3) : 1364.8
 MINIMUM OPERATING LEVEL (EL.M) : 140.3 DEAD STORAGE VOL. (MIL M3) : 813.8
 DRAWDOWN DEPTH (M) : 34.7 SEDIMENT VOL. (MIL M3) : 58.4
 MAIN DAM CREST ELEVATION (EL.M) : 161.0 CREST LENGTH (M) : 473.5
 (WEIR) DAM HEIGHT (M) : 102.7 ENKANKMENT VOL. (MIL M3) : 6.88
 WATERWAY HEADRACE : LENGTH (M) : 600.0 DIAMETER (WIDTH) (M) : 6.1 NOS. : 6
 PENSTOCK : HORIZONT. L (M) : 170.0 DIAMETER (M) : 4.7 NOS. : 6
 DIVERSION : LENGTH (M) : 1170.0 DIAMETER (M) : 7.5 NOS. : 3
 EXCAVATION VOL TOTAL (1000 M3) : 277.2

DISCHARGE PLANT MAX. DISCHARGE (M3/S) : 522.5 AVERAGE NET HEAD (M) : 82.9
 /HEAD FIRM DISCHARGE (M3/S) : 130.6 TAILWATER LEVEL (EL.M) : 76.3
 POWER UNSATLLED CAPACITY (MW) : 356.5 ANNUAL TOTAL ENERGY (GWH) : 962.8
 /ENERGY FIRM POWER (MW) : 89.1 FIRM ENERGY (GWH) : 780.8
 MIN. GUARANTEED POWER (MW) : 244.6 SECONDARY ENERGY (GWH) : 182.0

TRANSMISSION LINE LENGTH (KM) : 69.0 TO : CAMALANLUGAN 230 K V DOUBLE CIRCUIT NOS. OF CIRCUIT : 1
 ACCESS ROAD LENGTH (KM) : 4.0 FROM : KABUGAO

CONSTRUCTION COST

TOTAL COST (MIL USD) : 432.3 POWER COST (MIL USD) : 410.2
 TOTAL COST/KW (USD/KW) : 1212.4 TRANSMISSION COST (MIL USD) : 20.9
 TOTAL COST/KWH (USD/KWH) : 0.517 ACCESS ROAD COST (MIL USD) : 1.1

OTHER INFORMATION

LAND USE IN RESERVOIR AREA : MIXED - DENSED POPULATION
 SUBMERGED ROAD : PROVINCIAL ROAD 10.0 KMS.
 MAP USED (1:50,000 SCALE) : 3274-III 1975
 TECHNICAL COMMENT :
 - SERIES DEVELOPMENT PLAN WITH SISIRITAN AND AGBULU
 - CONSTRAINED FSL (MAX=175 M) DUE TO TWL OF AGBULU
 - REGULATION EFFECT BY AGBULU IS CONSIDERED

INVENTORY OF HYDROPOWER SITES

SCHEME ID : 2-006-00-81-0-1

SCHEME : GENVED

RIVER SYSTEM : ABULOG
STREAM : ABULOG

WATER RESOURCES REGION : 11
PROVINCE : KAL-APAYAO

COORDINATES : N18-05-18 E121-16-38
STUDY LEVEL : SCALED
(FEASIBILITY STUDY)

HYDRO/TOPO. INFORMATION

CATCHMENT AREA (KM2) : 1593.1 (MAIN : 1583.0 INTER TRANSFER TOTAL : 0.0) STREAM GAGE ID : 4-2-005-NW-203
AVER. BASIN RAINFALL (MM/YR) : 4000.0 DENUDATION RATE (MM/YR) : 1.4 GAGE CATCHMENT (KM2) : 2066.
AVERAGE DISCHARGE (M3/S) : 159.9 EVAPORATION RATE (MM/DAY) : 3.5 GAGE AVER. DISCHARGE (M3/S) : 227.2

SELECTED PLAN

TYPE OF DEVELOPMENT : RESERVOIR RESERVOIR DEVELOPMENT RATIO : 0.37

RESERVOIR FULL SUPPLY LEVEL (EL.M) : 180.0 GROSS STORAGE VOL. (MIL M3) : 2809.6
AVERAGE OPERATING LEVEL (EL.M) : 165.8 ACTIVE STORAGE VOL. (MIL M3) : 1976.1
MINIMUM OPERATING LEVEL (EL.M) : 137.3 DEAD STORAGE VOL. (MIL M3) : 833.5
DRAWDOWN DEPTH (M) : 42.7 SEDIMENT VOL. (MIL M3) : 61.4
MAIN DAM CREST ELEVATION (EL.M) : 166.0 CREST LENGTH (M) : 459.0
(WEIR) DAM HEIGHT (M) : 179.0 EMBANKMENT VOL. (MIL M3) : 12.71
WATERWAY HEADRAGE : LENGTH (M) : 1330.0 DIAMETER (WIDTH) (M) : 6.0 NOS. : 5
PENSTOCK : HORIZONT. L (M) : 257.1 DIAMETER (M) : 4.6 NOS. : 5
DIVERSION : LENGTH (M) : 870.0 DIAMETER (M) : 7.5 NOS. : 3
EXCAVATION VOL TOTAL (1000 M3) : 328.5

DISCHARGE PLANT MAX. DISCHARGE (M3/S) : 427.8 AVERAGE NET HEAD (M) : 111.3
/HEAD FIRM DISCHARGE (M3/S) : 142.5 TAILWATER LEVEL (EL.M) : 50.7
POWER INSATLLED CAPACITY (MW) : 392.1 ANNUAL TOTAL ENERGY (GWH) : 1309.2
/ENERGY FIRM POWER (MW) : 130.6 FIRM ENERGY (GWH) : 1143.7
MIN. GUARANTEED POWER (MW) : 278.0 SECONDARY ENERGY (GWH) : 165.5

TRANSMISSION LINE LENGTH (KV) : 36.0 TO : ST MAROGLA 230 K V DOUBLE CIRCUIT NOS. OF CIRCUIT : 1
ACCESS ROAD LENGTH (KV) : 46.1 FROM :

CONSTRUCTION COST

TOTAL COST (MIL USD) : 520.1 POWER COST (MIL USD) : 455.5
TOTAL COST/KW (USD/KW) : 1326.6 TRANSMISSION COST (MIL USD) : 11.5
TOTAL COST/KWH (USD/KWH) : 0.436 ACCESS ROAD COST (MIL USD) : 13.1

OTHER INFORMATION

LAND USE IN RESERVOIR AREA :
SUBMERGED ROAD :
MAP USED (1:50,000 SCALE) :
TECHNICAL COMMENT :

I N V E N T O R Y O F H Y D R O P O W E R S I T E S

SCHEME ID : 2-006-01-06-0-1

SCHEME : AGBULU

RIVER SYSTEM : ABULOG
 STREAM : APAYAO
 WATER RESOURCES REGION : 11
 PROVINCE : KAL-APAYAO
 COORDINATES : N18-08-20 E121-05-00
 STUDY LEVEL : UNSCALED
 (PRE-F/S.RECONNAISSANCE)

HYDRO/TOPO. INFORMATION

CATCHMENT AREA (KM2) : 706.0 (MAIN : 706.0, INTER TRANSFER TOTAL : 0.) STREAM GAGE ID : 4-2-005-NW-203
 AVER. BASIN RAINFALL (MM/YR) : 3977. DENUDATION RATE (MM/YR) : 1.4 GAGE CATCHMENT (KM2) : 2056.
 AVERAGE DISCHARGE (M3/S) : 75.2 EVAPORATION RATE (MM/DAY) : 3.5 GAGE AVER. DISCHARGE (M3/S) : 227.2

SELECTED PLAN

TYPE OF DEVELOPMENT : RESERVOIR RESERVOIR DEVELOPMENT RATIO : 0.75

RESERVOIR FULL SUPPLY LEVEL (EL.M) : 346.0 GROSS STORAGE VOL. (MIL M3) : 2370.0
 AVERAGE OPERATING LEVEL (EL.M) : 323.4 ACTIVE STORAGE VOL. (MIL M3) : 1779.7
 MINIMUM OPERATING LEVEL (EL.M) : 278.1 DEAD STORAGE VOL. (MIL M3) : 590.3
 DRAWDOWN DEPTH (M) : 67.9 SEDIMENT VOL. (MIL M3) : 49.4

MAIN DAM CREST ELEVATION (EL.M) : 352.0 CREST LENGTH (M) : 380.0
 (WEIR) DAM HEIGHT (M) : 167.0 EMBANKMENT VOL. (MIL M3) : 10.09

WATERWAY HEADRAGE : LENGTH (M) : 780.0 DIAMETER (WIDTH) (M) : 6.4 NOS. : 2
 PENSTOCK : HORIZONT. L (M) : 120.0 DIAMETER (M) : 4.8 NOS. : 2
 DIVERSION : LENGTH (M) : 1120.0 DIAMETER (M) : 7.7 NOS. : 2
 EXCAVATION VOL TOTAL (1000 M3) : 160.8

DISCHARGE PLANT MAX. DISCHARGE (M3/S) : 194.1 AVERAGE NET HEAD (M) : 135.5
 /HEAD FIRM DISCHARGE (M3/S) : 64.6 TAILWATER LEVEL (EL.M) : 185.0

POWER INSATLLED CAPACITY (MW) : 216.6 ANNUAL TOTAL ENERGY (GWH) : 712.6
 /ENERGY FIRM POWER (MW) : 72.1 FIRM ENERGY (GWH) : 631.8
 MIN. GUARANTEED POWER (MW) : 137.4 SECONDARY ENERGY (GWH) : 80.8

TRANSMISSION LINE LENGTH (KM) : 78.6 TO : CAMALANJUGAN 230 K V DOUBLE CIRCUIT NOS. OF CIRCUIT : 1
 ACCESS ROAD LENGTH (KM) : 6.5 FROM : NEAREST NATIONAL ROAD

CONSTRUCTION COST

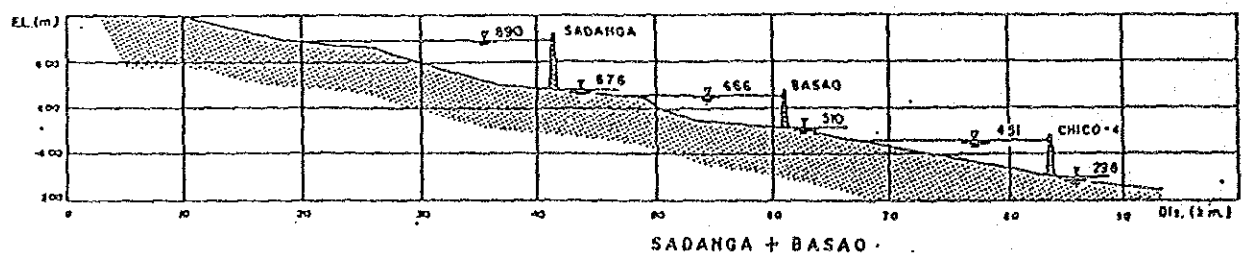
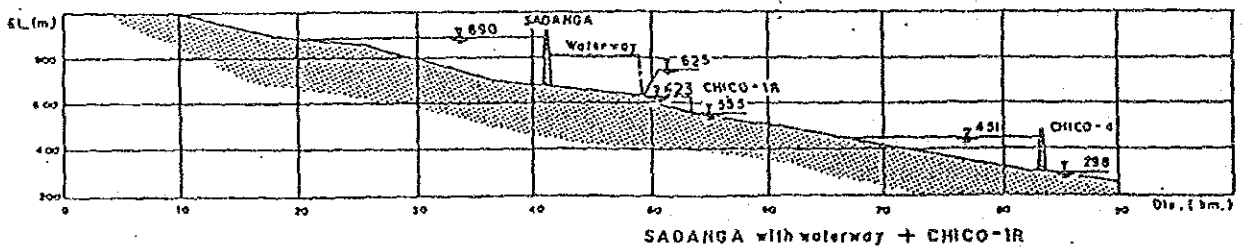
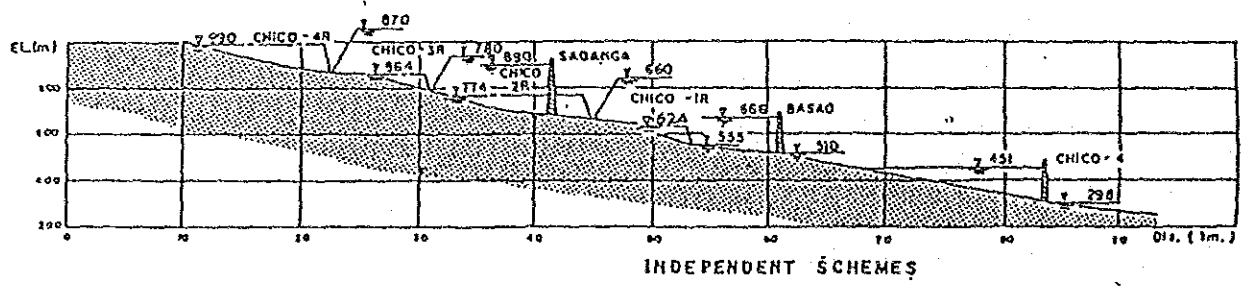
TOTAL COST (MIL USD) : 315.6 POWER COST (MIL USD) : 301.2
 TOTAL COST/KW (USD/KW) : 1457.3 TRANSMISSION COST (MIL USD) : 12.5
 TOTAL COST/KWH (USD/KWH) : 0.481 ACCESS ROAD COST (MIL USD) : 1.9

OTHER INFORMATION

LAND USE IN RESERVOIR AREA : FOREST - SCARCE POPULATION
 SUBMERGED ROAD : NONE
 MAP USED (1:50,000 SCALE) : 3274-1111 1977
 TECHNICAL COMMENT : - SERIES DEVELOPMENT PLAN WITH SISIRITAN AND AGBULU

CHICO RIVER BASIN

Case No.	Scheme	ID No.	FSL(m)	TWL(m)
3-1	- Sadanga	2-008-03-05-0-1	890.0	676.0
	- Chico 1R	2-008-03-04-0-2	623.0	555.0
3-2	- Sadanga (D+W)	2-008-03-05-1-1	890.0	625.0
	- Chico 1R	2-008-03-04-1-2	623.0	555.0
3-3	- Sadanga	2-008-03-05-0-1	890.0	676.0
	- Basao	2-008-03-03-1-1	666.0	510.0



FSL (Full supply level)
 TWL (Tall water level)

 **3-1-1 CHICO

 **

REGION NO. : 2 BASIN NO. : 8

NUMBER OF PROJECTS : 2

LIST OF PROJECTS

NO.	PROJECT ID	PROJECT NAME	CA (SQ.KM)	RAIN (MM)	STREAM GAGE ID
1	2-008-03-05-0-1	SADANGA	725.0	3413.0	4-2-063
2	2-008-03-04-0-2	CHICO-1R	806.8	3372.0	4-2-063

- CONNECTION MATRIX -
 1/

1 2
 1 0 0
 2 1 0

1/ C(I,J)=1 : PROJECT-J IS DIRECTLY UPSTREAM OF PROJECT-I
 " C(I,J)=0 : " IS NOT "

SEQ NO.	PROJECT ID	NUP	ID(S) OF U/S PROJECT(S)
1	2-008-03-05-0-1	0	
2	2-008-03-04-0-2	1	2-008-03-05-0-1

PROJECT NAME : SADANCA
 PROJECT ID : 2- 8- 3- 5-0-1
 TYPE : RESERVOIR

BASIN NAME : CAGAYAN
 RIVER NAME : CHICO

 * SUMMARY TABLE OF OUTPUTS *

ITEMS	CASE					
	1	2	3	4	5	6
RESERVOIR DEVELOP. COEF :	0.95	0.85	0.80	0.75	0.70	0.65
FULL SUPPLY LEVEL (M) :	890.0	890.0	890.0	890.0	890.0	890.0
MIN. OPERATING LEVEL (M) :	738.7	780.2	792.6	802.8	811.6	820.2
POWER						
FIRM DISCHARGE (M3/S) :	41.4	40.6	40.2	39.8	39.5	38.9
PLANT PEAK DIS. (M3/S) :	165.4	162.4	160.8	159.3	157.8	155.5
AVERAGE NET HEAD (M) :	159.5	173.1	177.1	180.5	183.3	186.1
INSTALLED CAPACITY (MW) :	217.2	231.4	234.6	236.7	238.2	238.2
GUARANTEED POWER (MW) :	76.1	127.2	141.5	152.9	162.2	170.2
AVERAGE FIRM POWER (MW) :	54.3	57.6	58.6	59.2	59.5	59.6
FIRM ENERGY (MIL KWH/Y) :	476.	507.	514.	518.	522.	522.
SECONDARY ENERGY (") :	62.	70.	74.	79.	83.	90.
ANNUAL AVERAGE E-GY (") :	537.	577.	588.	597.	605.	611.

D A M

DAM HEIGHT (M) :	220.0	220.0	220.0	220.0	220.0	220.0
EMBANKMENT VOL. (MIL M3) :	23.099	23.099	23.099	23.099	23.099	23.099

EVALUATION INDICES

CH/V :	11854.	11620.	11507.	11395.	11284.	11111.
C/V :	55.	55.	55.	54.	54.	53.
P/(20VT+VD) :	7.9	8.4	8.5	8.6	8.6	8.6
E(FIRM)/(20VT+VD) :	17.2	18.3	18.6	18.8	18.9	18.9
E(F+SEC*0.3)/(20VT+VD) :	17.9	19.1	19.4	19.6	19.8	19.9

PROJECT NAME : SADANGA
 PROJECT ID : 2-003-03-05-0
 TYPE : RESERVOIR

 * SUMMARY TABLE OF COST ESTIMATE *

(UNIT : MILLION USD)

I T E M	C A S E					
	1	2	3	4	5	6
POWER DEVELOPMENT (INST. CAP.(MW))	(217.2)	(231.4)	(234.6)	(236.7)	(238.2)	(238.2)
STORAGE DAM	189.00	189.00	189.00	189.00	189.00	189.00
SPILLWAY	32.42	32.42	32.42	32.42	32.42	32.42
DIVERSION TUNNEL	23.58	23.58	23.58	23.58	23.58	23.58
INTAKE (PRESSURE TYPE)	6.64	5.84	5.56	5.32	5.10	4.85
HEADRACE TUNNEL (PRESSURE)	12.69	12.52	12.43	12.35	12.27	12.13
SURGE TANK	3.86	3.77	3.73	3.69	3.65	3.59
PENSTOCK	6.57	7.47	7.72	7.92	8.08	8.20
(PRESSURE SHAFT)	(1.34)	(1.45)	(1.48)	(1.51)	(1.53)	(1.55)
(STEEL LINER)	(5.24)	(6.02)	(6.24)	(6.41)	(6.55)	(6.65)
POWERHOUSE BUILDING	13.81	14.31	14.40	14.44	14.46	14.39
(SUPER STRUCTURE)	(6.14)	(6.36)	(6.40)	(6.42)	(6.43)	(6.39)
(SUB STRUCTURE)	(7.67)	(7.95)	(8.00)	(8.02)	(8.03)	(7.99)
MISCELLANEOUS CIVIL WORK	14.43	14.45	14.44	14.44	14.43	14.41
CONSTRUCTION FACILITIES	0.	0.	0.	0.	0.	0.
POWER EQUIPMENT	42.16	43.01	43.09	43.09	43.02	42.73
ENGINEERING/ADMINISTRATION	32.79	32.85	32.85	32.84	32.83	32.80
CONTINGENCIES	75.59	75.84	75.84	75.82	75.77	75.62
S U B T O T A L	453.54	455.05	455.07	454.90	454.60	453.71

ACCESS ROAD (ROAD LENGTH 0. KM)

CONSTRUCTION COST	0.	0.	0.	0.	0.	0.
ENGINEERING ADMINISTRATION	0.	0.	0.	0.	0.	0.
CONTINGENCIES	0.	0.	0.	0.	0.	0.
S U B T O T A L	0.	0.	0.	0.	0.	0.

TRANSMISSION LINE SYSTEM (T/L LENGTH 28.1 KM)

TRANSMISSION LINE	3.12	6.18	6.18	6.18	6.18	6.18
SWITCHYARD AND SUBSTATION	0.96	0.96	0.96	0.96	0.95	0.96
ENGINEERING/ADMINISTRATION	0.51	0.89	0.89	0.89	0.89	0.89
CONTINGENCIES	0.69	1.21	1.21	1.21	1.21	1.21
S U B T O T A L	5.28	9.24	9.24	9.24	9.24	9.24

T O T A L : 458.81 464.29 464.31 464.14 463.84 462.95

EVALUATION INDICES

U S D / K W	2112.1	2006.9	1979.6	1960.7	1947.9	1943.4
U S D / K W H	0.928	0.880	0.866	0.855	0.849	0.844

PROJECT NAME : CHICO-1R
 PROJECT ID : 2- 8- 3- 4-0-2
 TYPE : RUN-OF-RIVER

 * SUMMARY TABLE OF OUTPUTS *

ITEMS CASE
 ----- 1 2 3
 HEAD PONDAGE

OUTPUT FACTOR	:	1.000	0.900	0.857
FULL SUPPLY LEVEL (M)	:	622.4	622.9	623.0
NORMAL OPERATING LEVEL (M)	:	622.4	622.9	623.0
MINIMUM OPERATING LEVEL (M)	:	622.4	622.9	623.0
DIVERSION WEIR HEIGHT INC. 3M F-B:	:	8.4	8.9	9.0
WATER DEPTH AT TRASHRACK (M)	:	5.4	5.9	6.0
CHANNEL WIDTH AT TRASHRACK (M)	:	17.7	19.6	20.2
PONDAGE STORAGE VOLUME (1000 M3)	:	271.5	300.6	332.5

WATERWAY

NUMBER OF WATERWAY	:	1	1	1
INSIDE DIAMETER OF HEADRACE (M)	:	4.3	4.6	4.7
HEADRACE TUNNEL LENGTH (M)	:	2950.0	2950.0	2950.0
INSIDE DIAMETER OF PENSTOCK (M)	:	3.5	3.8	3.8
PENSTOCK LENGTH (HORIZONTAL) (M)	:	135.0	135.0	135.0
EXCAVATION VOLUME (1000 M3)	:	44.2	51.3	53.8

POWER

FIRM DISCHARGE (M3/S)	:	39.4	39.4	39.4
DEPENDABLE DISCHARGE (M3/S)	:	39.4	39.4	39.4
PLANT PEAK DISCHARGE (M3/S)	:	39.3	47.8	51.0
TAIL WATER LEVEL (M)	:	555.0	555.0	555.0
NET HEAD (M)	:	62.2	62.7	62.9
INSTALLED CAPACITY (MW)	:	20.1	24.7	26.4
DEPENDABLE PEAK POWER (MW)	:	20.2	20.3	20.4
FIRM POWER (MW)	:	20.2	20.3	20.4
GUARANTEED POWER OUTPUT (MW)	:	18.2	18.3	18.3
FIRM ENERGY/YEAR (10**6 KWH)	:	176.7	178.0	178.5
SECONDARY ENERGY/YEAR (10**6 KWH)	:	0.	15.0	17.7
ANNUAL ENERGY (MIL KWH/YR)	:	176.7	193.0	196.2

PARAMETERS

P (INSTALLED)/(20VT) (W/M3)	:	22.8	24.1	24.5
P (DEPENDABLE)/(20VT) (W/M3)	:	22.8	19.8	18.9
E (FIRM)/(20VT) (KWH/M3)	:	200.0	173.7	165.9
E (F+0.3*SECONDARY)/(20VT) (")	:	200.0	176.1	170.9

PROJECT NAME : CHICO-1R
 PROJECT ID : 2-008-03-04-0
 TYPE : RUN-OF-RIVER

(UNIT : MILLION USD)

 * SUMMARY TABLE OF COST ESTIMATE *

I T E M C A S E

	1	2	3
POWER DEVELOPMENT (INST. CAP (MW))	(20.1)	(24.7)	(26.4)
DIVERSION DAM/WEIR	1.03	1.15	1.19
INTAKE (NON-PRESSURE TYPE)	0.94	1.08	1.13
HEADRACE TUNNEL (NON-PRES.)	7.01	7.88	8.20
HEAD TANK	0.67	0.76	0.79
PENSTOCK	0.91	1.03	1.07
(PRESSURE SHAFT)	(0.42)	(0.45)	(0.46)
(STEEL LINER)	(0.49)	(0.58)	(0.62)
POWERHOUSE BUILDING	1.24	1.52	1.62
(SUPER STRUCTURE)	(0.55)	(0.67)	(0.72)
(SUB STRUCTURE)	(0.69)	(0.84)	(0.90)
MISCELLANEOUS CIVIL WORK	0.59	0.67	0.70
CONSTRUCTION FACILITIES	0.	0.	0.
POWER EQUIPMENT	7.56	9.07	9.62
ENGINEERING/ADMINISTRATION	2.49	2.89	3.04
CONTINGENCIES	4.49	5.21	5.47
S U B T O T A L	26.92	31.26	32.82

ACCESS ROAD (ROAD LENGTH 0. KM)

CONSTRUCTION COST	0.	0.	0.
ENGINEERING ADMINISTRATION	0.	0.	0.
CONTINGENCIES	0.	0.	0.
S U B T O T A L	0.	0.	0.

TRANSMISSION LINE SYSTEM (T/L LENGTH 20.5 KM)

TRANSMISSION LINE	0.47	0.47	0.47
SWITCHYARD AND SUBSTATION	0.27	0.27	0.27
ENGINEERING/ADMINISTRATION	0.09	0.09	0.09
CONTINGENCIES	0.13	0.13	0.13
S U B T O T A L	0.96	0.96	0.96

T O T A L	27.88	32.22	33.78
-----------	-------	-------	-------

EVALUATION INDICES

U S D / K W	1385.9	1304.9	1279.9
U S D / K W H	0.158	0.177	0.184

 **3-2-1 CHICO

REGION NO. : 2 BASIN NO. : 8

NUMBER OF PROJECTS : 2

LIST OF PROJECTS

NO.	PROJECT ID	PROJECT NAME	CA (SQ.KM)	RAIN (MM)	STREAM GAGE ID
1	2-008-03-05-1-1	SADANGA	725.0	3413.0	4-2-063
2	2-008-03-04-1-2	CHICO-1R	806.8	3372.0	4-2-063

CONNECTION MATRIX

1	2
1	0
2	1

1/ C(I,J)=1 : PROJECT-J IS DIRECTLY UPSTREAM OF PROJECT-I
 - C(I,J)=0 : IS NOT

SEQ NO.	PROJECT ID	NUP	ID(S) OF U/S PROJECT(S)
1	2-008-03-05-1-1	0	
2	2-008-03-04-1-2	1	2-008-03-05-1-1

PROJECT NAME : SADANGA
 PROJECT ID : 2- 8- 3- 5-1-1
 TYPE : RESERVOIR

BASIN NAME : CAGAYAN
 RIVER NAME : CHICO

 * SUMMARY TABLE OF OUTPUTS *

ITEMS	CASE					
	1	2	3	4	5	6
RESERVOIR						
RESERVOIR DEVELOP. COEF :	0.95	0.85	0.80	0.75	0.70	0.65
FULL SUPPLY LEVEL (M) :	890.0	890.0	890.0	890.0	890.0	890.0
MIN. OPERATING LEVEL (M) :	738.7	780.2	792.6	802.8	811.6	820.2
POWER						
FIRM DISCHARGE (M3/S) :	41.4	40.6	40.2	39.8	39.5	38.9
PLANT PEAK DIS. (M3/S) :	165.4	162.4	160.8	159.3	157.8	155.5
AVERAGE NET HEAD (M) :	208.2	221.8	225.8	229.1	232.0	234.8
INSTALLED CAPACITY (MW) :	283.5	296.4	299.0	300.5	301.4	300.4
GUARANTEED POWER (MW) :	139.2	139.1	202.9	213.6	222.3	229.5
AVERAGE FIRM POWER (MW) :	70.9	74.1	74.7	75.1	75.3	75.1
FIRM ENERGY (MIL KWH/Y) :	621.	649.	655.	658.	660.	658.
SECONDARY ENERGY (") :	76.	86.	92.	97.	102.	110.
ANNUAL AVERAGE E-GY (") :	897.	736.	746.	755.	762.	768.

D A M

DAM HEIGHT (M) :	220.0	220.0	220.0	220.0	220.0	220.0
EMBANKMENT VOL. (MIL M3) :	23.099	23.099	23.099	23.099	23.099	23.099

EVALUATION INDECS

CH/V :	14604.	14317.	14178.	14040.	13904.	13691.
C/V :	56.	55.	55.	54.	54.	53.
P/(20VT+VD) :	9.9	10.3	10.4	10.5	10.5	10.5
E(FIRM)/(20VT+VD) :	21.6	22.6	22.8	23.0	23.0	23.0
E(F+SEC#0.3)/(20VT+VD) :	22.4	23.5	23.8	24.0	24.1	24.2

PROJECT NAME : SADANGA
 PROJECT ID : 2-008-03-05-1
 TYPE : RESERVOIR

(UNIT : MILLION USD)

 * SUMMARY TABLE OF COST ESTIMATE *

I T E M	C A S E					
	1	2	3	4	5	6
POWER DEVELOPMENT (INST. CAP (MW))	(283.5)	(286.4)	(299.0)	(300.5)	(301.4)	(300.4)
STORAGE DAM	169.00	169.00	189.00	189.00	189.00	189.00
SPILLWAY	32.42	32.42	32.42	32.42	32.42	32.42
DIVERSION TUNNEL	23.58	23.58	23.58	23.58	23.58	23.58
INTAKE (PRESSURE TYPE)	5.64	5.84	5.56	5.32	5.10	4.85
HEADRACE TUNNEL (PRESSURE)	21.98	21.69	21.54	21.40	21.25	21.02
SURGE TANK	4.36	4.27	4.22	4.16	4.14	4.07
PENSTOCK	12.11	13.23	13.53	13.75	13.92	14.03
(PRESSURE SHAFT)	(2.01)	(2.12)	(2.15)	(2.18)	(2.20)	(2.21)
(STEEL LINER)	(10.00)	(11.11)	(11.37)	(11.57)	(11.73)	(11.81)
POWERHOUSE BUILDING	16.50	16.88	16.93	16.91	16.91	16.79
(SUPER STRUCTURE)	(7.33)	(7.50)	(7.52)	(7.53)	(7.52)	(7.46)
(SUB STRUCTURE)	(9.16)	(9.38)	(9.40)	(9.41)	(9.40)	(9.33)
MISCELLANEOUS CIVIL WORK	15.33	15.34	15.34	15.33	15.32	15.29
CONSTRUCTION FACILITIES	0.	0.	0.	0.	0.	0.
POWER EQUIPMENT	47.53	48.08	48.06	47.97	47.83	47.44
ENGINEERING/ADMINISTRATION	33.99	34.03	34.03	34.01	33.99	33.94
CONTINGENCIES	80.69	80.87	80.84	80.78	80.69	80.49
S U B T O T A L	484.11	485.23	485.04	484.66	484.15	482.92

ACCESS ROAD (ROAD LENGTH 0. KM)	CONSTRUCTION COST	ENGINEERING ADMINISTRATION	CONTINGENCIES	S U B T O T A L
	0.	0.	0.	0.
	0.	0.	0.	0.
	0.	0.	0.	0.
	0.	0.	0.	0.

TRANSMISSION LINE SYSTEM (T/L LENGTH 28.1 KM)	TRANSMISSION LINE	SWITCHYARD AND SUBSTATION	ENGINEERING/ADMINISTRATION	CONTINGENCIES	S U B T O T A L
	6.18	6.18	6.18	6.18	6.18
	0.96	0.96	0.96	0.96	0.96
	0.89	0.89	0.89	0.89	0.89
	1.21	1.21	1.21	1.21	1.21
	9.24	9.24	9.24	9.24	9.24

T O T A L	493.35	494.47	494.28	493.90	493.39	492.16
-----------	--------	--------	--------	--------	--------	--------

EVALUATION INDICES

U S D / K W	1739.9	1668.2	1653.3	1643.5	1637.1	1638.1
U S D / K W H	0.766	0.753	0.724	0.719	0.714	0.712

PROJECT NAME : CHICO-1R
 PROJECT ID : 2- 3- 3- 4-1-2
 TYPE : RUN-OF-RIVER

 * SUMMARY TABLE OF OUTPUTS *

 CASE

ITEMS	1	2	3
HEAD PONDAGE			
OUTPUT FACTOR	1.000	0.900	0.864
FULL SUPPLY LEVEL (M)	622.5	622.9	623.0
NORMAL OPERATING LEVEL (M)	622.5	622.9	623.0
MINIMUM OPERATING LEVEL (M)	622.5	622.9	623.0
DIVERSION WEIR HEIGHT INC. 3M F-B	8.5	8.9	9.0
WATER DEPTH AT TRASHRACK (M)	5.5	5.9	6.0
CHANNEL WIDTH AT TRASHRACK (M)	17.9	19.7	20.2
PONDAGE STORAGE VOLUME (1000 M3)	273.2	313.1	332.2

 WATERWAY

NUMBER OF WATERWAY	1	1	1
INSIDE DIAMETER OF HEADRACE (M)	4.3	4.6	4.7
HEADRACE TUNNEL LENGTH (M)	2950.0	2950.0	2950.0
INSIDE DIAMETER OF PENSTOCK (M)	3.5	3.8	3.8
PENSTOCK LENGTH (HORIZONTAL) (M)	135.0	135.0	135.0
EXCAVATION VOLUME (1000 M3)	44.7	51.7	53.8

 POWER

FIRM DISCHARGE (M3/S)	40.0	40.0	40.0
DEPENDABLE DISCHARGE (M3/S)	40.0	40.0	40.0
PLANT PEAK DISCHARGE (M3/S)	39.8	48.4	51.0
TAIL WATER LEVEL (M)	555.0	555.0	555.0
NET HEAD (M)	62.3	62.7	62.9
INSTALLED CAPACITY (MW)	20.4	25.0	26.4
DEPENDABLE PEAK POWER (MW)	20.5	20.6	20.7
FIRM POWER (MW)	20.5	20.6	20.7
GUARANTEED POWER OUTPUT (MW)	18.4	18.6	18.6
FIRM ENERGY/YEAR (10**6 KWH)	179.5	180.8	181.2
SECONDARY ENERGY/YEAR (10**6 KWH)	0.	14.8	16.8
ANNUAL ENERGY (MIL KWH/YR)	179.5	195.6	198.0

 PARAMETERS

P (INSTALLED)/(20VT) (W/M3)	22.9	24.2	24.5
P (DEPENDABLE)/(20VT) (W/M3)	22.9	19.9	19.2
E (FIRM)/(20VT) (KWH/M3)	200.8	174.8	168.5
E (F+0.3*SECONDARY)/(20VT) (")	200.8	179.0	173.2

PROJECT NAME : CHICO-IR
 PROJECT ID : 2-008-03-04-1
 TYPE : RUN-OF-RIVER

(UNIT : MILLION USD)

 * SUMMARY TABLE OF COST ESTIMATE *

I T E M C A S E

	1	2	3
POWER DEVELOPMENT (INST. CAP. (MW))	(20.4)	(25.0)	(26.4)
DIVERSION DAM/WEIR	1.04	1.15	1.19
INTAKE (NON-PRESSURE TYPE)	0.95	1.09	1.13
HEADRACE TUNNEL (NON-PRES.)	7.07	7.95	8.19
HEAD TANK	0.68	0.75	0.79
PENSTOCK	0.92	1.04	1.07
(PRESSURE SHAFT)	(0.42)	(0.45)	(0.46)
(STEEL LINER)	(0.50)	(0.59)	(0.62)
POWERHOUSE BUILDING	1.26	1.53	1.62
(SUPER STRUCTURE)	(0.56)	(0.68)	(0.72)
(SUB STRUCTURE)	(0.70)	(0.85)	(0.90)
MISCELLANEOUS CIVIL WORK	0.60	0.68	0.70
CONSTRUCTION FACILITIES	0.	0.	0.
POWER EQUIPMENT	7.67	9.17	9.61
ENGINEERING/ADMINISTRATION	2.52	2.92	3.04
CONTINGENCIES	4.54	5.26	5.47
S U B T O T A L	27.23	31.55	32.80

ACCESS ROAD (ROAD LENGTH 0. KM)

CONSTRUCTION COST	0.	0.	0.
ENGINEERING ADMINISTRATION	0.	0.	0.
CONTINGENCIES	0.	0.	0.
S U B T O T A L	0.	0.	0.

TRANSMISSION LINE SYSTEM (T/L LENGTH 20.5 KM)

TRANSMISSION LINE	0.47	0.47	0.47
SWITCHYARD AND SUBSTATION	0.27	0.27	0.27
ENGINEERING/ADMINISTRATION	0.09	0.09	0.09
CONTINGENCIES	0.13	0.13	0.13
S U B T O T A L	0.96	0.96	0.96

T O T A L	28.19	32.51	33.76
-----------	-------	-------	-------

EVALUATION INDICES

U S D / K W	1380.4	1300.0	1280.2
U S D / K W H	0.157	0.176	0.181

 **3-3-2 CHICO

PAGE : 1

REGION NO. : 2 BASIN NO. : 8

NUMBER OF PROJECTS : 2

LIST OF PROJECTS

NO.	PROJECT ID	PROJECT NAME	CA (SQ.KM)	RAIN (MM)	STREAM GAGE ID
1	2-008-03-05-0-1	SADANGA	725.0	3413.0	4-2-063
2	2-008-03-03-1-1	BASAO	897.0	3344.0	4-2-063

1 2
 1 0 0
 2 1 0

CONNECTION MATRIX

1/ C(I,J)=1 : PROJECT-J IS DIRECTLY UPSTREAM OF PROJECT-I
 - C(I,J)=0 : " IS NOT "

SEQ NO.	PROJECT ID	NUP	ID(S) OF U/S PROJECT(S)
1	2-008-03-05-0-1	0	
2	2-008-03-03-1-1	1	2-008-03-05-0-1

PROJECT NAME : SADANGA
 PROJECT ID : 2- 8- 3- 5-0-1
 TYPE : RESERVOIR

BASIN NAME : CAGAYAN
 RIVER NAME : CHICO

 * SUMMARY TABLE OF OUTPUTS *

RESERVOIR ITEMS	CASE					
	1	2	3	4	5	6
RESERVOIR DEVELOP. COEF :	0.95	0.85	0.80	0.75	0.70	0.65
FULL SUPPLY LEVEL (M) :	890.0	890.0	890.0	890.0	890.0	890.0
MIN. OPERATING LEVEL (M) :	730.7	780.2	792.6	802.0	811.6	820.2
POWER						
FIRM DISCHARGE (M3/S) :	41.4	40.6	40.2	39.8	39.5	38.9
PLANT PEAK DIS. (M3/S) :	165.4	162.4	160.8	159.3	157.8	155.5
AVERAGE NET HEAD (M) :	159.5	173.1	177.1	180.5	183.3	186.1
INSTALLED CAPACITY (MW) :	217.2	231.4	234.6	236.7	238.2	238.2
GUARANTEED POWER (MW) :	76.1	127.2	141.5	152.9	162.2	170.2
AVERAGE FIRM POWER (MW) :	54.3	57.8	58.6	59.2	59.5	59.6
FIRM ENERGY (MIL KWH/Y) :	476.	507.	514.	518.	522.	522.
SECONDARY ENERGY (") :	61.	70.	74.	79.	83.	90.
ANNUAL AVERAGE E-GY (") :	537.	577.	588.	597.	605.	611.

D A M

DAM HEIGHT (M) :	220.0	220.0	220.0	220.0	220.0	220.0
EMBANKMENT VOL. (MIL M3) :	23.099	23.099	23.099	23.099	23.099	23.099

EVALUATION INDECES

CH/V :	11855.	11620.	11507.	11395.	11284.	11111.
C/V :	56.	55.	55.	54.	54.	53.
P/(20VT+VD) :	7.9	8.4	8.5	8.6	8.6	8.6
E(FIRM)/(20VT+VD) :	17.2	18.3	18.6	18.8	18.9	18.9
E(F+SEC*0.3)/(20VT+VD) :	17.9	19.1	19.4	19.6	19.8	19.9

PROJECT NAME : SADANGA
 PROJECT ID : 2-008-03-05-0
 TYPE : RESERVOIR

 * SUMMARY TABLE OF COST ESTIMATE *

(UNIT : MILLION USD)

I T E M	C A S E					
	1	2	3	4	5	6
POWER DEVELOPMENT (INST. CAP.(MW))	(217.2)	(231.4)	(234.6)	(236.7)	(236.2)	(236.2)
STORAGE DAM	189.00	189.00	189.00	189.00	189.00	189.00
SPILLWAY	32.42	32.42	32.42	32.42	32.42	32.42
DIVERSION TUNNEL	23.58	23.58	23.58	23.58	23.58	23.58
INTAKE (PRESSURE TYPE)	6.64	5.84	5.56	5.32	5.10	4.85
HEADRAGE TUNNEL (PRESSURE)	12.69	12.52	12.43	12.35	12.27	12.13
SURGE TANK	3.86	3.77	3.73	3.69	3.65	3.59
PENSTOCK	6.57	7.47	7.72	7.92	8.08	8.20
(PRESSURE SHAFT)	(1.34)	(1.45)	(1.48)	(1.51)	(1.53)	(1.55)
(STEEL LINER)	(5.24)	(6.02)	(6.24)	(6.41)	(6.55)	(6.65)
POWERHOUSE BUILDING	13.81	14.31	14.40	14.44	14.46	14.39
(SUPER STRUCTURE)	(6.14)	(6.36)	(6.40)	(6.42)	(6.43)	(6.39)
(SUB STRUCTURE)	(7.67)	(7.95)	(8.00)	(8.02)	(8.03)	(7.99)
MISCELLANEOUS CIVIL WORK	14.43	14.45	14.44	14.44	14.43	14.41
CONSTRUCTION FACILITIES	0.	0.	0.	0.	0.	0.
POWER EQUIPMENT	42.16	43.01	43.09	43.09	43.02	42.73
ENGINEERING/ADMINISTRATION	32.79	32.85	32.85	32.84	32.83	32.80
CONTINGENCIES	75.59	75.84	75.84	75.82	75.77	75.62
S U B T O T A L	453.54	455.05	455.07	454.90	454.60	453.71

ACCESS ROAD (ROAD LENGTH 0. KM)	CONSTRUCTION COST	ENGINEERING ADMINISTRATION	CONTINGENCIES	S U B T O T A L
	0.	0.	0.	0.
	0.	0.	0.	0.
	0.	0.	0.	0.
	0.	0.	0.	0.

TRANSMISSION LINE SYSTEM (T/L LENGTH 28.1 KM)	CONSTRUCTION COST	ENGINEERING ADMINISTRATION	CONTINGENCIES	S U B T O T A L
	3.12	6.18	6.18	6.18
	0.96	0.96	0.96	0.96
	0.51	0.89	0.89	0.89
	0.69	1.21	1.21	1.21
	5.28	9.24	9.24	9.24

T O T A L	458.82	464.25	464.31	464.14	463.84	462.95
EVALUATION INDICES						
U S D / K W	2112.1	2006.9	1979.6	1960.7	1947.3	1943.4
U S D / K W H	0.928	0.880	0.866	0.856	0.849	0.844

PROJECT NAME : BASAO
 PROJECT ID : 2- 8- 3- 3-1-1
 TYPE : RESERVOIR

BASIN NAME : CAGAYAN
 RIVER NAME : CHICO

 * SUMMARY TABLE OF OUTPUTS *

RESERVOIR	CASE										
	1	2	3	4	5	6	7	8	9	10	
RESERVOIR DEVELOP. COEF :	0.21	0.09	0.09	0.09	0.03	0.03	0.03	0.03	0.03	0.02	0.02
FULL SUPPLY LEVEL (M) :	666.0	623.9	666.0	588.0	602.9	622.6	643.9	666.0	583.8	666.0	666.0
MIN. OPERATING LEVEL (M) :	556.6	556.4	637.7	556.3	581.8	607.3	632.8	658.3	556.2	659.8	659.8
POWER											
FIRM DISCHARGE (M3/S) :	47.6	45.7	45.6	44.7	44.6	44.6	44.6	44.5	43.8	43.6	43.6
PLANT PEAK DIS. (M3/S) :	142.9	137.4	137.0	134.2	134.1	134.0	133.9	133.7	131.5	131.0	131.0
AVERAGE NET HEAD (M) :	114.9	87.2	141.4	63.6	81.7	103.0	125.3	148.1	60.8	148.6	148.6
INSTALLED CAPACITY (MW) :	135.2	98.6	159.5	70.2	90.2	113.5	138.1	163.0	65.8	160.3	160.3
GUARANTEED POWER (MW) :	47.1	49.4	131.7	44.6	71.1	97.4	123.7	149.8	43.7	148.4	148.4
AVERAGE FIRM POWER (MW) :	45.0	32.8	53.1	23.4	30.0	37.8	45.0	54.3	21.9	53.4	53.4
FIRM ENERGY (MIL KWH/Y) :	394.	287.	465.	205.	263.	331.	403.	476.	192.	467.	467.
SECONDARY ENERGY (") :	61.	54.	75.	40.	48.	59.	70.	83.	41.	89.	89.
ANNUAL AVERAGE E-GY (") :	455.	341.	540.	245.	311.	390.	473.	558.	233.	557.	557.

D A M

DAM HEIGHT (M) :	162.0	119.9	162.0	84.0	98.9	118.6	139.9	162.0	79.8	162.0	162.0
EMBANKMENT VOL. (MIL M3) :	14.251	6.270	14.251	2.526	3.773	6.085	9.476	14.251	2.245	14.251	14.251

EVALUATION INDECS

CH/V :	15941.	25222.	15235.	41367.	33129.	24982.	19136.	14847.	43063.	14545.	14545.
C/V :	105.	230.	101.	558.	373.	231.	148.	99.	615.	97.	97.
P/(20VT+VD) :	6.9	8.6	8.2	9.1	10.1	10.1	9.4	8.4	8.9	8.9	8.9
E(FIRM)/(20VT+VD) :	20.2	25.1	23.9	26.6	29.4	29.4	27.5	24.5	26.0	24.1	24.1
E(F+SEC*0.3)/(20VT+VD) :	21.2	26.5	25.1	28.2	31.0	31.0	28.9	25.8	27.6	25.5	25.5

PROJECT NAME : BASAO
 PROJECT ID : 2-008-03-03-1
 TYPE : RESERVOIR

 * SUMMARY TABLE OF COST ESTIMATE *

(UNIT : MILLION USD)

I T E M	C A S E									
	1	2	3	4	5	6	7	8	9	10
POWER DEVELOPMENT (INST. CAP.(MW))	(135.2)	(98.6)	(159.5)	(70.2)	(90.2)	(113.5)	(138.1)	(163.0)	(65.6)	(160.3)
STORAGE DAM	123.95	60.51	123.95	27.35	38.83	58.95	86.79	123.95	24.67	123.95
SPILLWAY	25.83	19.77	25.83	14.61	16.76	19.58	22.65	25.83	14.01	25.83
DIVERSION TUNNEL	29.10	29.10	29.10	29.10	29.10	29.10	29.10	29.10	29.10	29.10
INTAKE (PRESSURE TYPE)	5.25	4.33	3.39	3.42	3.10	2.90	2.73	2.58	3.25	2.45
HEADRACE TUNNEL (PRESSURE)	10.88	10.58	10.56	10.40	10.40	10.39	10.39	10.38	10.25	10.23
SURGE TANK	3.30	3.15	3.12	3.05	3.05	3.04	3.04	3.03	3.00	2.97
PENSTOCK	9.83	8.25	11.72	7.05	8.09	9.32	10.66	12.07	6.84	11.92
(PRESSURE SHAFT)	(2.67)	(2.67)	(2.87)	(2.87)	(2.75)	(2.80)	(2.86)	(2.91)	(2.68)	(2.90)
(STEEL LINER)	(7.16)	(5.58)	(8.85)	(4.36)	(5.35)	(6.52)	(7.80)	(9.16)	(4.16)	(9.02)
POWERHOUSE BUILDING	9.59	7.66	10.56	6.07	7.17	8.35	9.51	10.62	5.77	10.43
(SUPER STRUCTURE)	(4.26)	(3.41)	(4.69)	(2.70)	(3.19)	(3.71)	(4.23)	(4.72)	(2.56)	(4.64)
(SUB STRUCTURE)	(5.33)	(4.26)	(5.87)	(3.37)	(3.98)	(4.64)	(5.28)	(5.90)	(3.21)	(5.80)
MISCELLANEOUS CIVIL WORK	10.89	7.17	10.91	5.05	5.83	7.08	8.74	10.88	4.84	10.84
CONSTRUCTION FACILITIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
POWER EQUIPMENT	31.89	21.17	33.71	23.08	25.82	28.63	31.25	33.66	22.21	33.10
ENGINEERING/ADMINISTRATION	28.25	22.21	28.39	16.15	18.52	22.17	25.51	28.34	15.49	28.27
CONTINGENCIES	57.75	39.98	58.25	29.07	33.33	39.91	48.08	58.09	27.89	57.82
S U B T O T A L	346.51	239.90	349.48	174.42	200.01	239.44	288.45	348.53	157.33	346.92

ACCESS ROAD (ROAD LENGTH 2.5 KM)

CONSTRUCTION COST	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
ENGINEERING ADMINISTRATION	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
CONTINGENCIES	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
S U B T O T A L	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71

TRANSMISSION LINE SYSTEM (T/L LENGTH 15.6 KM)

TRANSMISSION LINE	1.73	1.73	1.73	1.73	1.73	1.73	1.73	1.73	1.06	1.73
SWITCHYARD AND SUBSTATION	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.62	0.96
ENGINEERING/ADMINISTRATION	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.21	0.34
CONTINGENCIES	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.28	0.45
S U B T O T A L	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	2.17	3.48

T O T A L : 350.71 244.09 353.68 178.62 204.20 243.63 292.65 352.73 170.22 351.12

EVALUATION INDICES

U S D / K W	2594.1	2476.7	2216.8	2543.5	2264.0	2145.8	2119.9	2163.8	2586.8	2190.9
U S D / K W H	0.850	0.804	0.725	0.824	0.736	0.698	0.691	0.705	0.834	0.710

I N V E N T O R Y O F H Y D R O P O W E R S I T E S

SCHEME ID : 2-008-03-03-1-1

SCHEME : BASAO

RIVER SYSTEM : CAGAYAN
 STREAM : CHICO

WATER RESOURCES REGION : II
 PROVINCE : KAL-APAYAO

COORDINATES : N17-14-32 E121-07-30
 STUDY LEVEL : UNSCALED
 (PRE-F/S.RECONNAISSANCE)

HYDRO/TOPO. INFORMATION

CATCHMENT AREA (KM2) : 897.0 (MAIN : 897.0 INTER TRANSFER TOTAL : 0.) STREAM GAGE ID : 4-2-063-NP-
 AVER. BASIN RAINFALL (MM/YR) : 3344. DENUDATION RATE (MM/YR) : 1.4 GAGE CATCHMENT (KM2) : 874.
 AVERAGE DISCHARGE (M3/S) : 55.9 EVAPORATION RATE (MM/DAY) : 3.0 GAGE AVER. DISCHARGE (M3/S) : 54.8

SELECTED PLAN

TYPE OF DEVELOPMENT : RESERVOIR RESERVOIR DEVELOPMENT RATIO : 0.03

RESERVOIR FULL SUPPLY LEVEL (EL.M) : 666.0 GROSS STORAGE VOL. (MIL M3) : 391.7
 AVERAGE OPERATING LEVEL (EL.M) : 563.4 ACTIVE STORAGE VOL. (MIL M3) : 50.2
 MINIMUM OPERATING LEVEL (EL.M) : 553.3 DEAD STORAGE VOL. (MIL M3) : 341.5
 DRAWDOWN DEPTH (M) : 7.7 SEDIMENT VOL. (MIL M3) : 12.0

MAIN DAM CREST ELEVATION (EL.M) : 672.0 CREST LENGTH (M) : 609.6
 (WEIR) DAM HEIGHT (M) : 162.0 EMBANKMENT VOL. (MIL M3) : 14.25

WATERWAY HEADRACE : LENGTH (M) : 1210.0 DIAMETER (WIDTH) (M) : 5.3 NOS. : 2
 PENSTOCK : HORIZONT. L (M) : 420.0 DIAMETER (M) : 4.1 NCS. : 2
 DIVERSION : LENGTH (M) : 1850.0 DIAMETER (M) : 8.1 NCS. : 2-
 EXCAVATION VOL TOTAL (1000 M3) : 258.6

DISCHARGE PLANT MAX. DISCHARGE (M3/S) : 133.7 AVERAGE NET HEAD (M) : 148.1
 /HEAD FIRM DISCHARGE (M3/S) : 44.5 TAILWATER LEVEL (EL.M) : 510.0

POWER UNSATLLED CAPACITY (MW) : 163.0 ANNUAL TOTAL ENERGY (GWH) : 558.2
 /ENERGY FIRM POWER (MW) : 54.3 FIRM ENERGY (GWH) : 475.5
 MIN. GUARANTEED POWER (MW) : 149.8 SECONDARY ENERGY (GWH) : 32.6

TRANSMISSION LINE LENGTH (KW) : 15.6 TO : BATONG BUHAY 230 K V DOUBLE CIRCUIT NOS. OF CIRCUIT : 1
 ACCESS ROAD LENGTH (KM) : 2.5 FROM : LUPLUPA

CONSTRUCTION COST

TOTAL COST (MIL USD) : 352.7 POWER COST (MIL USD) : 348.5
 TOTAL COST/KW (USD/KW) : 2163.8 TRANSMISSION COST (MIL USD) : 3.5
 TOTAL COST/KWH (USD/KWH) : 0.705 ACCESS ROAD COST (MIL USD) : 0.7

OTHER INFORMATION

LAND USE IN RESERVOIR AREA : MIXED - SCARCE POPULATION
 SUBMERGED ROAD : PROVINCIAL ROAD 4.5 KMS.
 MAP USED (1:50,000 SCALE) : 3271-11 1979
 TECHNICAL COMMENT :
 - DEVELOPMENT PLAN WITH SADANGA (2-008-03-05-0-1)
 - CONSTRAINED FSL (MAX=666 M) DUE TO TWL OF SADANGA
 - REGULATION EFFECT BY DADANGA IS CONSIDERED

INVENTORY OF HYDROPOWER SITES

SCHEME ID : 2-008-03-04-0-2

SCHEME : CHICO-1R

RIVER SYSTEM : CAGAYAN
STREAM : CHICO

WATER RESOURCES REGION : II
PROVINCE : MT. PROVINCE

COORDINATES : N17-11-10 E121-03-53
STUDY LEVEL : NEWLY IDENTIFIED
THROUGH LRPPS

HYDRO/TOPO. INFORMATION

CATCHMENT AREA (KM2) : 806.8 (MAIN : 807.0 INTER TRANSFER TOTAL : 0.0) STREAM GAGE ID : 4-2-063-NP-
AVER. BASIN RAINFALL (MM/YR) : 3372.0 DENUDATION RATE (MM/YR) : 1.4 GAGE CATCHMENT (KM2) : 874.
AVERAGE DISCHARGE (M3/S) : 51.0 EVAPORATION RATE (MM/DAY) : 3.0 GAGE AVER. DISCHARGE (M3/S) : 54.8

SELECTED PLAN

TYPE OF DEVELOPMENT : RUN-OF-RIVER OUTPUT FACTOR : 0.86
PONDAGE FULL SUPPLY LEVEL (EL.M) : 623.0 PONDAGE STORAGE VOL. (1000M3) : 332.5
AVERAGE OPERATING LEVEL (EL.M) : 623.0 ACTIVE STORAGE VOL. (1000M3) : 0.
MINIMUM OPERATING LEVEL (EL.M) : 623.0
DRAWDOWN DEPTH (M) : 0.

MAIN DAM CREST ELEVATION (EL.M) : 623.0 CREST LENGTH (M) : 110.0
(WEIR) WEIR HEIGHT (M) : 9.0 WEIR CONCRETE VOL. (1000 M3) : 18.4

WATERWAY HEADRACE : LENGTH (M) : 2950.0 DIAMETER (WIDTH) (M) : 4.7 NOS. : 1
PENSTOCK : HORIZONT. L (M) : 135.0 DIAMETER (M) : 3.9 NOS. : 1
EXCAVATION VOL TOTAL (1000 M3) : 53.8

DISCHARGE PLANT MAX. DISCHARGE (M3/S) : 51.0 AVERAGE NET HEAD (M) : 62.9
/HEAD FIRM DISCHARGE (M3/S) : 39.4 TAILWATER LEVEL (EL.M) : 555.0

POWER UNSATLLED CAPACITY (MW) : 26.4 ANNUAL TOTAL ENERGY (GWH) : 196.2
/ENERGY FIRM POWER (MW) : 20.4 FIRM ENERGY (GWH) : 178.5
MIN. GUARANTEED POWER (MW) : 18.3 SECONDARY ENERGY (GWH) : 17.7

TRANSMISSION LINE LENGTH (KV) : 20.5 TO : BATONG BUHAY 69 K V SINGLE CIRCUIT NOS. OF CIRCUIT : 1
ACCESS ROAD LENGTH (KV) : 0. FROM : NATIONAL ROAD BESIDE DAMSITE

CONSTRUCTION COST

TOTAL COST (MIL USD) : 33.8 POWER COST (MIL USD) : 32.8
TOTAL COST/KW (USD/KW) : 1279.9 TRANSMISSION COST (MIL USD) : 1.0
TOTAL COST/KWH (USD/KWH) : 0.134 ACCESS ROAD COST (MIL USD) : 0.

OTHER INFORMATION

LAND USE IN RESERVOIR AREA : FOREST - SCARCE POPULATION
SUBMERGED ROAD : NONE
MAP USED (1:50,000 SCALE) : 3271-IV 1979
TECHNICAL COMMENT : - SERIES DEVELOPMENT PLAN WITH SADANGA (2-008-03-05-01)
- REGULATION EFFECT BY SADANGA IS CONSIDERED

I N V E N T O R Y O F H Y D R O P O W E R S I T E S

SCHEME ID : 2-008-03-04-1-2

SCHEME : CHICO-1R

RIVER SYSTEM : CAGAYAN
STREAM : CHICO

WATER RESOURCES REGION : II
PROVINCE : MT. PROVINCE

COORDINATES : N17-11-10 E121-03-53
STUDY LEVEL : NEWLY IDENTIFIED
THROUGH LHPPS

HYDRO/TOPO. INFORMATION

CATCHMENT AREA (KM2) : 806.8 (MAIN : 807. INTER TRANSFER TOTAL : 0.) STREAM GAGE ID : 4-2-063-NP-
AVER. BASIN RAINFALL (MM/YR) : 3372. DENUDATION RATE (MM/YR) : 1.4 GAGE CATCHMENT (KM2) : 874.
AVERAGE DISCHARGE (M3/S) : 51.0 EVAPORATION RATE (MM/DAY) : 3.0 GAGE AVER. DISCHARGE (M3/S) : 54.6

SELECTED PLAN

TYPE OF DEVELOPMENT : RUN-OF-RIVER OUTPUT FACTOR : 0.86

PONDAGE FULL SUPPLY LEVEL (EL.M) : 623.0 PONDAGE STORAGE VOL. (1000M3) : 332.2
AVERAGE OPERATING LEVEL (EL.M) : 623.0 ACTIVE STORAGE VOL. (1000M3) : 0.
MINIMUM OPERATING LEVEL (EL.M) : 623.0
DRAWDOWN DEPTH (M) : 0.

MAIN DAM CREST ELEVATION (EL.M) : 623.0 CREST LENGTH (M) : 110.0
(WEIR) WEIR HEIGHT (M) : 9.0 WEIR CONCRETE VOL. (1000 M3) : 18.4

WATERWAY HEADRACE : LENGTH (M) : 2950.0 DIAMETER (WIDTH) (M) : 4.7 NOS. : 1
PENSTOCK : HORIZONTAL L (M) : 135.0 DIAMETER (M) : 3.8 NOS. : 1
EXCAVATION VOL TOTAL (1000 M3) : 53.8

DISCHARGE PLANT MAX. DISCHARGE (M3/S) : 51.0 AVERAGE NET HEAD (M) : 62.9
/HEAD FIRM DISCHARGE (M3/S) : 40.0 TAILWATER LEVEL (EL.M) : 555.0

POWER UNSATLLED CAPACITY (MW) : 26.4 ANNUAL TOTAL ENERGY (GWH) : 198.0
/ENERGY FIRM POWER (MW) : 20.7 FIRM ENERGY (GWH) : 181.2
MIN. GUARANTEED POWER (MW) : 18.6 SECONDARY ENERGY (GWH) : 16.8

TRANSMISSION LINE LENGTH (KM) : 20.5 TO : BATONG BUHAY 69 K V SINGLE CIRCUIT NOS. OF CIRCUIT : 1
ACCESS ROAD LENGTH (KM) : 0. FROM : NATIONAL ROAD BESIDE DAMSITE

CONSTRUCTION COST

TOTAL COST (MIL USD) : 33.8 POWER COST (MIL USD) : 32.8
TOTAL COST/KW (USD/KW) : 1280.2 TRANSMISSION COST (MIL USD) : 1.0
TOTAL COST/KWH (USD/KWH) : 0.181 ACCESS ROAD COST (MIL USD) : 0.

OTHER INFORMATION

LAND USE IN RESERVOIR AREA : FOREST - SCARCE POPULATION
SUBMERGED ROAD : NONE
MAP USED (1:50,000 SCALE) : 3271-1V 1979
TECHNICAL COMMENT : SERIES DEVELOPMENT PLAN WITH SADANGA (2-008-03-05-1-1)
REGULATION EFFECT BY SADANGA IS CONSIDERED

I N V E N T O R Y O F H Y D R O P O W E R S I T E S

SCHEME : SADANGA
 RIVER SYSTEM : CAGAYAN
 STREAM : CHICO
 WATER RESOURCES REGION : II
 PROVINCE : MT. PROVINCE
 COORDINATES : N17-08-53 E121-03-08
 STUDY LEVEL : UNSCALED
 (PRE-F/S, RECONNAISSANCE)
 SCHEME ID : 2-008-03-05-0-1

HYDRO/TOPO. INFORMATION

CATCHMENT AREA (KM2) : 725.0 (MAIN : 725., INTER TRANSFER TOTAL : 0.) STREAM GAGE ID : 4-2-063-NP-
 AVER. BASIN RAINFALL (MM/YR) : 3413. DENUDATION RATE (MM/YR) : 1.4 GAGE CATCHMENT (KM2) : 874.
 AVERAGE DISCHARGE (M3/S) : 46.8 EVAPORATION RATE (MM/DAY) : 3.0 GAGE AVER. DISCHARGE (M3/S) : 54.8

SELECTED PLAN

TYPE OF DEVELOPMENT : RESERVOIR RESERVOIR DEVELOPMENT RATIO : 0.65

RESERVOIR FULL SUPPLY LEVEL (EL.M) : 890.0 GROSS STORAGE VOL. (MIL M3) : 1471.7
 AVERAGE OPERATING LEVEL (EL.M) : 865.7 ACTIVE STORAGE VOL. (MIL M3) : 958.8
 MINIMUM OPERATING LEVEL (EL.M) : 820.2 DEAD STORAGE VOL. (MIL M3) : 512.9
 DRAWDOWN DEPTH (M) : 69.8 SEDIMENT VOL. (MIL M3) : 50.7

MAIN DAM CREST ELEVATION (EL.M) : 896.0 CREST LENGTH (M) : 615.6
 (WEIR) DAM HEIGHT (M) : 220.0 EMBANKMENT VOL. (MIL M3) : 23.10

WATERWAY HEADRACE : LENGTH (M) : 1270.0 DIAMETER (WIDTH) (M) : 5.7 NOS. : 2
 PENSTOCK : HORIZONT. L (M) : 190.0 DIAMETER (M) : 4.3 NOS. : 2
 DIVERSION : LENGTH (M) : 1500.0 DIAMETER (M) : 7.8 NOS. : 2
 EXCAVATION VOL TOTAL (1000 M3) : 224.4

DISCHARGE PLANT MAX. DISCHARGE (M3/S) : 155.5 AVERAGE NET HEAD (M) : 186.1
 /HEAD FIRM DISCHARGE (M3/S) : 38.9 TAILWATER LEVEL (EL.M) : 676.0

POWER INSATLLED CAPACITY (MW) : 238.2 ANNUAL TOTAL ENERGY (GWH) : 611.3
 /ENERGY FIRM POWER (MW) : 59.6 FIRM ENERGY (GWH) : 521.7
 MIN. GUARANTEED POWER (MW) : 170.2 SECONDARY ENERGY (GWH) : 89.6

TRANSMISSION LINE LENGTH (KW) : 28.1 TO : BATONG BURAY 230 K V DOUBLE CIRCUIT NOS. OF CIRCUIT : 1
 ACCESS ROAD LENGTH (KM) : 0. FROM : NATIONAL ROAD BESIDE DAMSITE

CONSTRUCTION COST

TOTAL COST (MIL USD) : 463.0 POWER COST (MIL USD) : 453.7
 TOTAL COST/KW (USD/KW) : 1943.4 TRANSMISSION COST (MIL USD) : 9.2
 TOTAL COST/KWH (USD/KWH) : 0.844 ACCESS ROAD COST (MIL USD) : 0.

OTHER INFORMATION

LAND USE IN RESERVOIR AREA : FOREST - SCARCE POPULATION
 SUBMERGED ROAD : PROVINCIAL ROAD 8.5 KMS.
 MAP USED (1:50,000 SCALE) : 3271-111 1979
 TECHNICAL COMMENT : - SERIES DEVELOPMENT PLAN WITH EITHER BASAO OR CHICO-1R

I N V E N T O R Y O F H Y D R O P O W E R S I T E S

SCHEME : SADANGA
 RIVER SYSTEM : CAGAYAN
 STREAM : CHICO
 WATER RESOURCES REGION : 11
 PROVINCE : MT. PROVINCE
 COORDINATES : N17-08-53 E121-03-08
 STUDY LEVEL : UNSCALED
 (PRE-F/S, RECONNAISSANCE)
 SCHEME ID : 2-008-03-05-1-1

HYDRO/TOPO. INFORMATION
 CATCHMENT AREA (KM2) : 725.0 (MAIN : 725., INTER TRANSFER TOTAL : 0.)
 AVER. BASIN RAINFALL (MM/YR) : 3413. DENUDATION RATE (MM/YR) : 1.4
 AVERAGE DISCHARGE (M3/S) : 46.8 EVAPORATION RATE (MM/DAY) : 3.0
 STREAM GAGE ID : 4-2-063-NP-
 GAGE CATCHMENT (KM2) : 874.
 GAGE AVER. DISCHARGE (M3/S) : 54.8

SELECTED PLAN
 TYPE OF DEVELOPMENT : RESERVOIR
 RESERVOIR DEVELOPMENT RATIO : 0.70

RESERVOIR FULL SUPPLY LEVEL (EL.M) : 890.0
 AVERAGE OPERATING LEVEL (EL.M) : 863.9
 MINIMUM OPERATING LEVEL (EL.M) : 811.6
 DRAWDOWN DEPTH (M) : 78.4
 GROSS STORAGE VOL. (MIL M3) : 1471.7
 ACTIVE STORAGE VOL. (MIL M3) : 1032.6
 DEAD STORAGE VOL. (MIL M3) : 439.1
 SEDIMENT VOL. (MIL M3) : 50.7
 CREST ELEVATION (EL.M) : 896.0
 DAM HEIGHT (M) : 220.0
 HEADRACE : LENGTH (M) : 2200.0
 PENSTOCK : HORIZONTAL L (M) : 230.0
 DIVERSION : LENGTH (M) : 1600.0
 EXCAVATION VOL TOTAL (1000 M3) : 277.0

DISCHARGE PLANT MAX. DISCHARGE (M3/S) : 157.8
 FIRM DISCHARGE (M3/S) : 39.5
 POWER INSTALLED CAPACITY (MW) : 301.4
 FIRM POWER (MW) : 75.3
 MIN. GUARANTEED POWER (MW) : 222.3
 AVERAGE NET HEAD (M) : 232.0
 TAILWATER LEVEL (EL.M) : 625.0
 ANNUAL TOTAL ENERGY (GWH) : 762.2
 FIRM ENERGY (GWH) : 660.0
 SECONDARY ENERGY (GWH) : 102.1

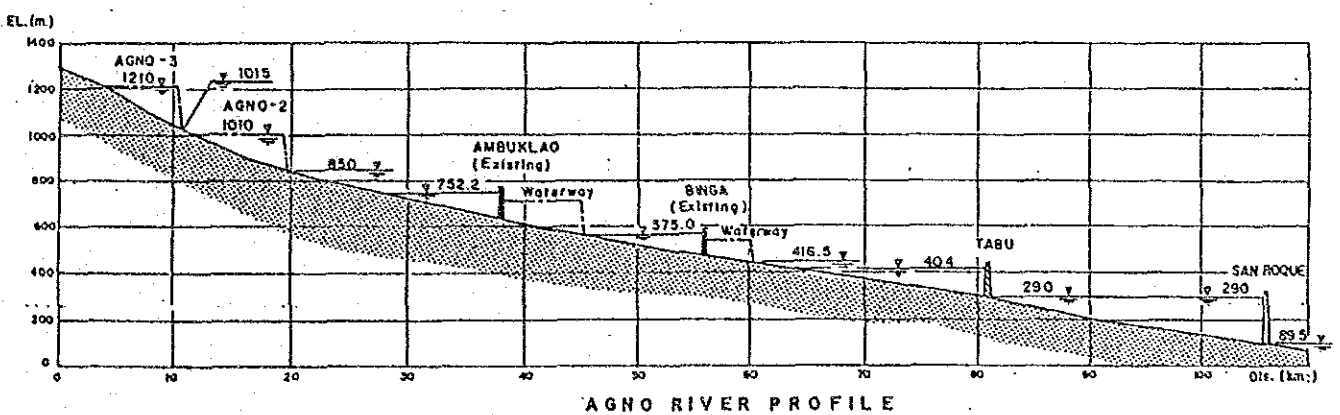
TRANSMISSION LINE LENGTH (KM) : 28.1 TO : BATONG BUHAY
 ACCESS ROAD LENGTH (KM) : 0. FROM : NATIONAL ROAD BESIDE DAMSITE
 230 K V DOUBLE CIRCUIT NOS. OF CIRCUIT : 1

CONSTRUCTION COST
 TOTAL COST (MIL USD) : 493.4
 TOTAL COST/KW (USD/KW) : 1637.1
 TOTAL COST/KWH (USD/KWH) : 0.714
 POWER COST (MIL USD) : 484.1
 TRANSMISSION COST (MIL USD) : 9.2
 ACCESS ROAD COST (MIL USD) : 0.

OTHER INFORMATION
 LAND USE IN RESERVOIR AREA : FOREST - SCARCE POPULATION
 SUBMERGED ROAD : PROVINCIAL ROAD 8.5 KMS.
 MAP USED (1:50,000 SCALE) : 3271-111 1979
 TECHNICAL COMMENT : - SERIES DEVELOPMENT PLAN WITH CHICO-1R

AGNO RIVER BASIN

Case No.	Scheme	ID No.	FSL(m)	TWL(m)
5-1	- Binga (existing)	3-077-00-81-0-1	575.0	416.5
	- Tabu	3-077-00-04-1-1	404.0	290.0
5-2	- Binga (existing)	3-077-00-81-0-1	575.0	416.5
	- Tabu (low dam Alt.)	3-077-00-04-2-1	348.5	290.0



∇ FSL (Full supply level)
 \triangle TWL (Tall water level)

 **5-1-4 AGNO

PAGE : 1

REGION NO. : 3 BASIN NO. : 77

NUMBER OF PROJECTS : 2

LIST OF PROJECTS

NO.	PROJECT ID	PROJECT NAME	CA (SQ.KM)	RAIN (MM)	STREAM GAGE ID
1	3-077-00-81-0-1	BINGA	936.0	2825.0	4-3-093
2	3-077-00-04-1-1	TABU	1070.0	2838.0	4-3-093

CONNECTION MATRIX

1 2
 1 0 0
 2 1 0

1/ C(I,J)=1 : PROJECT-J IS DIRECTLY UPSTREAM OF PROJECT-I
 - C(I,J)=0 : " IS NOT "

SEQ NO.	PROJECT ID	NUP	ID(S) OF U/S PROJECT(S)
1	3-077-00-81-0-1	0	
2	3-077-00-04-1-1	1	3-077-00-81-0-1

PROJECT NAME : SINGA
 PROJECT ID : 3-77-0-81-0-1
 TYPE : RESERVOIR

BASIN NAME : AGNO
 RIVER NAME : AGNO

 * SUMMARY TABLE OF OUTPUTS *

ITEMS	CASE									
	1	2	3	4	5	6	7	8	9	10
RESERVOIR										
RESERVOIR DEVELOP. COEF :	0.24	0.16	0.16	0.16	0.12	0.12	0.12	0.08	0.08	0.08
FULL SUPPLY LEVEL (M) :	575.0	562.3	568.5	575.0	558.4	566.3	575.0	553.7	564.1	575.0
MIN. OPERATING LEVEL (M) :	556.7	545.9	554.8	563.7	545.2	556.0	556.8	544.4	557.2	570.0
POWER										
FIRM DISCHARGE (M ³ /S) :	23.2	18.3	18.1	18.0	15.0	14.8	14.6	11.8	11.6	11.3
PLANT PEAK DIS. (M ³ /S) :	46.4	36.5	36.3	35.9	30.0	29.7	29.3	23.5	23.1	22.6
AVERAGE NET HEAD (M) :	151.9	139.7	146.7	153.9	136.7	145.5	154.7	133.1	144.1	155.4
INSTALLED CAPACITY (MW) :	58.0	42.0	43.8	45.5	33.8	35.6	37.3	25.7	27.4	28.9
GUARANTEED POWER (MW) :	50.8	26.9	29.1	41.2	30.1	32.3	34.2	23.4	25.3	26.9
AVERAGE FIRM POWER (MW) :	29.0	21.0	21.9	22.8	16.9	17.8	18.6	12.9	13.7	14.4
FIRM ENERGY (MIL KWH/Y) :	254.	184.	192.	199.	148.	156.	163.	113.	120.	127.
SECONDARY ENERGY (") :	181.	194.	192.	199.	148.	156.	163.	113.	120.	127.
ANNUAL AVERAGE E-GY (") :	435.	368.	384.	399.	296.	312.	326.	226.	240.	253.
D A M										
DAM HEIGHT (M) :	92.4	79.7	85.9	92.4	75.8	83.7	92.4	71.1	81.5	92.4
EMBANKMENT VOL. (MIL M3) :	2.011	1.384	1.668	2.011	1.224	1.566	2.011	1.050	1.464	2.011
EVALUATION INDECES										
CH/V :	57475.	60447.	51907.	44418.	54539.	44518.	36112.	48042.	36457.	27813.
C/V :	364.	416.	343.	282.	387.	299.	229.	353.	249.	177.
P/(20VT+VD) :	18.9	17.6	16.4	15.1	15.4	14.0	12.5	13.0	11.4	9.8
E(FIRM)/(20VT+VD) :	82.9	77.1	71.9	66.2	67.5	61.5	54.8	56.8	50.1	43.0
E(F*SEC*0.3)/(20VT+VD) :	100.6	100.3	93.5	86.1	87.7	79.9	71.3	73.9	65.2	55.9

PROJECT NAME : BINGA
 PROJECT ID : 3-077-00-81-0
 TYPE : RESERVOIR

 * SUMMARY TABLE OF COST ESTIMATE *

(UNIT : MILLION USD)

I T E M	C A S E									
	1	2	3	4	5	6	7	8	9	10
POWER DEVELOPMENT (INST. CAP (MW))	(58.0)	(42.0)	(43.8)	(45.5)	(33.8)	(35.6)	(37.3)	(25.7)	(27.4)	(28.9)
STORAGE DAM	22.42	16.17	19.03	22.42	14.53	18.02	22.42	12.71	16.98	22.42
SPILLWAY	16.65	14.74	15.67	16.65	14.15	15.34	16.65	13.45	15.01	16.65
DIVERSION TUNNEL	6.45	6.45	6.45	6.45	6.45	6.45	6.45	6.45	6.45	6.45
INTAKE (PRESSURE TYPE)	1.19	0.94	0.89	0.85	0.75	0.70	0.65	0.55	0.51	0.47
HEADRACE TUNNEL (PRESSURE)	2.51	2.11	2.10	2.09	1.84	1.82	1.80	1.54	1.52	1.50
SURGE TANK	0.96	0.76	0.76	0.75	0.63	0.62	0.61	0.50	0.49	0.48
PENSTOCK	0.60	0.44	0.49	0.53	0.38	0.43	0.47	0.32	0.37	0.41
(PRESSURE SHAFT)	(0.17)	(0.15)	(0.16)	(0.17)	(0.14)	(0.15)	(0.16)	(0.13)	(0.14)	(0.15)
(STEEL LINER)	(0.43)	(0.30)	(0.33)	(0.36)	(0.25)	(0.28)	(0.31)	(0.19)	(0.23)	(0.26)
POWERHOUSE BUILDING	2.65	1.98	2.03	2.07	1.60	1.65	1.69	1.23	1.28	1.31
(SUPER STRUCTURE)	(1.18)	(0.88)	(0.90)	(0.92)	(0.71)	(0.73)	(0.75)	(0.55)	(0.57)	(0.58)
(SUB STRUCTURE)	(1.47)	(1.10)	(1.13)	(1.15)	(0.89)	(0.92)	(0.94)	(0.68)	(0.71)	(0.73)
MISCELLANEOUS CIVIL WORK	2.67	2.18	2.37	2.59	2.02	2.25	2.54	1.84	2.13	2.48
CONSTRUCTION FACILITIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
POWER EQUIPMENT	13.14	10.20	10.36	10.50	8.46	8.62	8.75	6.71	6.85	6.94
ENGINEERING/ADMINISTRATION	8.65	7.00	7.52	8.11	6.35	6.99	7.75	5.66	6.45	7.39
CONTINGENCIES	15.58	12.60	13.53	14.60	11.43	12.58	13.96	10.19	11.61	13.30
S U B T O T A L	93.46	75.58	81.21	87.59	68.58	75.47	83.74	61.16	69.64	79.79

ACCESS ROAD (ROAD LENGTH 0. KM)

CONSTRUCTION COST	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENGINEERING ADMINISTRATION	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CONTINGENCIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S U B T O T A L	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TRANSMISSION LINE SYSTEM (T/L LENGTH 35.0 KM)

TRANSMISSION LINE	2.38	2.38	2.38	2.38	1.61	1.61	1.61	0.80	0.80	0.80
SWITCHYARD AND SUBSTATION	0.62	0.62	0.62	0.62	0.54	0.54	0.54	0.27	0.27	0.27
ENGINEERING/ADMINISTRATION	0.37	0.37	0.37	0.37	0.27	0.27	0.27	0.13	0.13	0.13
CONTINGENCIES	0.51	0.51	0.51	0.51	0.36	0.36	0.36	0.18	0.18	0.18
S U B T O T A L	3.88	3.88	3.88	3.88	2.78	2.78	2.78	1.39	1.39	1.39

T O T A L : 97.34 79.46 85.09 91.47 71.37 78.25 86.53 93.74 62.55 71.03 81.18

EVALUATION INDICES

U S D / K W	1677.8	1890.2	1941.6	2009.3	2112.9	2200.3	2322.0	2429.6	2590.5	2809.6
U S D / K W H	0.316	0.332	0.341	0.353	0.371	0.386	0.408	0.427	0.455	0.493

PROJECT NAME : TABU
 PROJECT ID : 3-77-0-4-1-1
 TYPE : RESERVOIR

BASIN NAME : AGNO
 RIVER NAME : AGNO

 * SUMMARY TABLE OF OUTPUTS *

RESERVOIR	CASE									
	1	2	3	4	5	6	7	8	9	10
RESERVOIR DEVELOP. COEF :	0.07	0.05	0.05	0.05	0.04	0.04	0.04	0.03	0.03	0.03
FULL SUPPLY LEVEL (M) :	404.0	392.7	397.8	404.0	387.1	394.6	404.0	380.6	391.1	404.0
MIN. OPERATING LEVEL (M) :	349.9	349.6	363.0	376.4	349.5	366.6	383.7	349.4	369.7	390.1
POWER										
FIRM DISCHARGE (M3/S) :	28.8	27.5	27.5	27.5	27.0	27.0	27.0	26.5	26.5	26.4
PLANT PEAK DIS. (M3/S) :	172.4	164.9	164.8	164.6	161.9	161.8	161.5	158.9	158.7	158.4
AVERAGE NET HEAD (M) :	91.2	83.6	91.3	99.8	79.8	90.3	102.1	75.4	89.1	104.2
INSTALLED CAPACITY (MW) :	129.4	113.5	123.9	135.2	106.3	120.3	135.8	98.7	116.4	135.8
GUARANTEED POWER (MW) :	74.4	70.9	88.0	105.0	69.5	90.9	112.1	68.1	93.1	117.8
AVERAGE FIRM POWER (MW) :	21.6	18.9	20.7	22.6	17.8	20.1	22.7	16.5	19.4	22.7
FIRM ENERGY (MIL KWH/Y) :	189.	166.	181.	198.	156.	176.	199.	144.	170.	199.
SECONDARY ENERGY (%) :	226.	210.	221.	234.	201.	217.	237.	189.	212.	241.
ANNUAL AVERAGE E-GY (%) :	416.	376.	402.	432.	356.	393.	436.	334.	383.	439.
D A M										
DAM HEIGHT (M) :	98.0	86.7	91.8	98.0	81.1	88.6	98.0	74.8	85.1	98.0
EMBANKMENT VOL. (MIL MS) :	2.414	1.780	2.051	2.414	1.509	1.875	2.414	1.238	1.705	2.414
EVALUATION INDECES										
CH/V :	41071.	47806.	43568.	39137.	52159.	45295.	38363.	58030.	47173.	37594.
C/V :	376.	488.	423.	359.	565.	455.	352.	676.	490.	345.
P/(20VT+VD) :	15.6	15.2	16.0	16.7	14.9	16.0	16.9	14.5	16.0	17.0
E(FIRM)/(20VT+VD) :	22.9	22.2	23.4	24.4	21.7	23.4	24.7	21.2	23.4	24.9
E(F+SEC*0.3)/(20VT+VD) :	31.1	30.6	31.9	33.0	30.2	32.1	33.5	29.5	32.1	33.9

PROJECT NAME : TABU
 PROJECT ID : 3-077-00-04-1
 TYPE : RESERVOIR

 * SUMMARY TABLE OF COST ESTIMATE *

(UNIT : MILLION USD)

I T E M	C A S E									
	1	2	3	4	5	6	7	8	9	10
POWER DEVELOPMENT (INST. CAP(MW))	(129.4)	(113.5)	(123.9)	(135.2)	(106.3)	(120.3)	(135.6)	(98.7)	(116.4)	(135.8)
STORAGE DAM	26.29	20.14	22.60	26.29	17.44	21.08	26.29	14.67	19.40	26.29
SPILLWAY	18.18	16.42	17.21	18.18	15.54	16.71	18.18	14.54	16.18	18.18
DIVERSION TUNNEL	18.01	18.01	18.01	18.01	18.01	18.01	18.01	18.01	18.01	18.01
INTAKE (PRESSURE TYPE)	4.92	4.44	4.20	3.97	4.22	3.92	3.64	3.96	3.63	3.32
HEADRACE TUNNEL (PRESSURE)	30.87	29.91	29.89	29.86	29.52	29.50	29.45	29.12	29.10	29.05
SURGE TANK	4.83	4.63	4.62	4.61	4.54	4.54	4.50	4.46	4.45	4.44
PENSTOCK	4.11	3.80	4.12	4.46	3.66	4.08	4.54	3.52	4.02	4.59
(PRESSURE SHAFT)	(1.17)	(1.16)	(1.20)	(1.24)	(1.16)	(1.21)	(1.26)	(1.16)	(1.21)	(1.27)
(STEEL LINER)	(2.93)	(2.64)	(2.91)	(3.22)	(2.50)	(2.87)	(3.26)	(2.36)	(2.81)	(3.32)
POWERHOUSE BUILDING	9.91	8.95	9.49	10.05	8.52	9.24	10.01	8.05	8.99	9.95
(SUPER STRUCTURE)	(4.40)	(3.98)	(4.22)	(4.47)	(3.79)	(4.11)	(4.45)	(3.58)	(3.99)	(4.42)
(SUB STRUCTURE)	(5.51)	(4.97)	(5.27)	(5.58)	(4.73)	(5.14)	(5.53)	(4.47)	(4.99)	(5.53)
MISCELLANEOUS CIVIL WORK	5.86	5.32	5.52	5.77	5.07	5.35	5.73	4.82	5.19	5.69
CONSTRUCTION FACILITIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
POWER EQUIPMENT	34.01	31.43	32.69	33.98	30.28	31.99	33.75	29.03	31.25	33.48
ENGINEERING/ADMINISTRATION	19.62	17.88	18.57	19.40	17.10	18.05	19.27	16.27	17.53	19.12
CONTINGENCIES	39.32	32.19	33.42	34.92	30.78	32.49	34.68	29.29	31.55	34.42
S U B T O T A L	211.93	193.12	200.55	209.51	184.69	194.97	208.05	175.74	189.29	206.53

ACCESS ROAD (ROAD LENGTH 12.0 KM)

CONSTRUCTION COST	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64
ENGINEERING ADMINISTRATION	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
CONTINGENCIES	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57
S U B T O T A L	3.42	3.42	3.42	3.42	3.42	3.42	3.42	3.42	3.42	3.42

TRANSMISSION LINE SYSTEM (T/L LENGTH 24.0 KM)

TRANSMISSION LINE	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66
SWITCHYARD AND SUBSTATION	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
ENGINEERING/ADMINISTRATION	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
CONTINGENCIES	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61
S U B T O T A L	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69

T O T A L : 220.04 201.23 208.66 217.62 192.80 203.08 216.20 183.85 197.40 214.64

EVALUATION INDICES

U S D / K W	1700.7	1773.6	1684.1	1609.5	1813.1	1688.2	1592.5	1863.2	1656.3	1580.3
U S D / K W H	0.856	0.879	0.843	0.812	0.893	0.842	0.801	0.914	0.844	0.792

 **5-2-1 AGNO

PAGE : 1

REGION NO. : 3 BASIN NO. : 77

NUMBER OF PROJECTS : 2

LIST OF PROJECTS

NO.	PROJECT ID	PROJECT NAME	CA (SQ.KM)	RAIN (MM)	STREAM GAGE ID
1	3-077-00-81-0-1	BINCA	935.0	2825.0	4-3-093
2	3-077-00-04-2-1	TABU (LOW DAM ALT.)	1070.0	2838.0	4-3-093

CONNECTION MATRIX

1	2
1	0 0
2	1 0

1/ C(I,J)=1 : PROJECT-J IS DIRECTLY UPSTREAM OF PROJECT-I
 - C(I,J)=0 : " IS NOT "

SEQ NO.	PROJECT ID	NUP	ID(S) OF U/S PROJECT(S)
1	3-077-00-81-0-1	0	
2	3-077-00-04-2-1	1	3-077-00-81-0-1

PROJECT NAME : BINGA
 PROJECT ID : 3-77-0-81-0-1
 TYPE : RESERVOIR

BASIN NAME : AGNO
 RIVER NAME : AGNO

 * SUMMARY TABLE OF OUTPUTS *

RESERVOIR	CASE									
	1	2	3	4	5	6	7	8	9	10
RESERVOIR DEVELOP. COEF :	0.24	0.16	0.16	0.16	0.12	0.12	0.12	0.08	0.08	0.08
FULL SUPPLY LEVEL (M) :	575.0	562.3	568.5	575.0	558.4	566.3	575.0	553.7	564.1	575.0
MIN. OPERATING LEVEL(M) :	556.7	545.9	554.8	563.7	545.2	556.0	566.8	544.4	557.2	570.0
POWER										
FIRM DISCHARGE (M3/S) :	23.2	18.3	18.1	18.0	15.0	14.8	14.6	11.8	11.6	11.3
PLANT PEAK DIS. (M3/S) :	46.4	36.5	36.3	35.9	30.0	29.7	29.3	23.5	23.1	22.6
AVERAGE NET HEAD (M) :	151.9	139.7	146.7	153.9	136.7	145.5	154.7	133.1	144.1	155.4
INSTALLED CAPACITY (MW) :	58.0	42.0	43.8	45.5	33.8	35.6	37.3	25.7	27.4	28.9
GUARANTEED POWER (MW) :	50.8	36.9	39.1	41.2	30.1	32.3	34.2	23.4	25.3	26.9
AVERAGE FIRM POWER (MW) :	29.0	21.0	21.9	22.8	16.9	17.8	18.6	12.9	13.7	14.4
FIRM ENERGY (MIL KWH/Y) :	254.	184.	192.	199.	148.	156.	163.	113.	120.	127.
SECONDARY ENERGY (") :	181.	184.	192.	199.	148.	156.	163.	113.	120.	127.
ANNUAL AVERAGE E-GY (") :	435.	368.	384.	399.	296.	312.	326.	226.	240.	253.

D A M

DAM HEIGHT (M) :	92.4	79.7	85.9	92.4	75.8	83.7	92.4	71.1	81.5	92.4
EMBANKMENT VOL.(MIL M3) :	2.011	1.384	1.668	2.011	1.224	1.566	2.011	1.050	1.464	2.011

EVALUATION INDECS

CH/V :	57475.	60447.	51907.	44418.	54539.	44518.	36112.	48042.	36457.	27813.
C/V :	364.	416.	343.	282.	387.	299.	229.	353.	249.	177.
P/(20VT+VD) :	18.9	17.6	16.4	15.1	15.4	14.0	12.5	13.0	11.4	9.8
E(FIRM)/(20VT+VD) :	82.9	77.1	71.9	66.2	67.5	61.5	54.8	56.8	50.1	43.0
E(F+SECK0.3)/(20VT+VD) :	100.6	100.3	93.5	86.1	87.7	79.9	71.3	73.9	65.2	55.9

PROJECT NAME : BINGA
 PROJECT ID : 3-077-00-81-0
 TYPE : RESERVOIR

 * SUMMARY TABLE OF COST ESTIMATE *

(UNIT : MILLION USD)

I T E M	C A S E									
	1	2	3	4	5	6	7	8	9	10
POWER DEVELOPMENT (INST. CAP.(MW))	(58.0)	(42.0)	(43.8)	(45.5)	(33.8)	(35.6)	(37.3)	(25.7)	(27.4)	(28.9)
STORAGE DAM	22.42	16.17	19.03	22.42	14.53	18.02	22.42	12.71	16.93	22.42
SPILLWAY	16.65	14.74	15.67	16.65	14.15	15.34	16.65	13.45	15.01	16.65
DIVERSION TUNNEL	6.45	6.45	6.45	6.45	6.45	6.45	6.45	6.45	6.45	6.45
INTAKE (PRESSURE TYPE)	1.19	0.94	0.89	0.85	0.75	0.70	0.65	0.55	0.51	0.47
HEADRACE TUNNEL (PRESSURE)	2.51	2.11	2.10	2.09	1.84	1.82	1.80	1.54	1.52	1.50
SURGE TANK	0.96	0.76	0.76	0.75	0.63	0.62	0.61	0.50	0.49	0.48
PENSTOCK	0.60	0.44	0.49	0.53	0.38	0.43	0.47	0.32	0.37	0.41
(PRESSURE SHAFT)	(0.17)	(0.15)	(0.16)	(0.17)	(0.14)	(0.15)	(0.16)	(0.13)	(0.14)	(0.15)
(STEEL LINER)	(0.43)	(0.30)	(0.33)	(0.36)	(0.25)	(0.28)	(0.31)	(0.19)	(0.23)	(0.26)
POWERHOUSE BUILDING	2.55	1.98	2.03	2.07	1.60	1.65	1.69	1.23	1.28	1.31
(SUPER STRUCTURE)	(1.18)	(0.88)	(0.90)	(0.92)	(0.71)	(0.73)	(0.75)	(0.55)	(0.57)	(0.58)
(SUB STRUCTURE)	(1.47)	(1.10)	(1.13)	(1.15)	(0.89)	(0.92)	(0.94)	(0.68)	(0.71)	(0.73)
MISCELLANEOUS CIVIL WORK	2.67	2.18	2.37	2.59	2.02	2.25	2.54	1.84	2.13	2.48
CONSTRUCTION FACILITIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
POWER EQUIPMENT	13.14	10.20	10.36	10.50	8.46	8.62	8.75	6.71	6.85	6.94
ENGINEERING/ADMINISTRATION	8.65	7.00	7.52	8.11	5.35	6.99	7.75	5.66	6.45	7.39
CONTINGENCIES	15.58	12.60	13.53	14.60	11.43	12.58	13.90	10.19	11.61	13.30
S U B T O T A L	93.46	75.58	81.21	87.59	68.58	75.47	83.74	61.16	69.64	79.79

ACCESS ROAD (ROAD LENGTH 0. KM)

CONSTRUCTION COST	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENGINEERING ADMINISTRATION	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CONTINGENCIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S U B T O T A L	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TRANSMISSION LINE SYSTEM (T/L LENGTH 35.0 KM)

TRANSMISSION LINE	2.38	2.38	2.38	2.38	1.61	1.61	1.61	0.60	0.60	0.60
SWITCHYARD AND SUBSTATION	0.62	0.62	0.62	0.62	0.54	0.54	0.54	0.27	0.27	0.27
ENGINEERING/ADMINISTRATION	0.37	0.37	0.37	0.37	0.27	0.27	0.27	0.13	0.13	0.13
CONTINGENCIES	0.51	0.51	0.51	0.51	0.36	0.36	0.36	0.18	0.18	0.18
S U B T O T A L	3.88	3.88	3.88	3.88	2.78	2.78	2.78	1.39	1.39	1.39

T O T A L : 97.34 79.46 85.09 91.47 71.37 78.25 86.53 62.55 71.03 81.18

EVALUATION INDICES

U S D / K W	1677.8	1890.2	1941.6	2009.3	2112.9	2200.3	2322.0	2429.6	2590.5	2809.6
U S D / K W H	0.316	0.332	0.341	0.353	0.371	0.386	0.408	0.427	0.455	0.493

PROJECT NAME : TABU (LOW DAM ALT.)
 PROJECT ID : 3-77-0-4-2-1
 TYPE : RESERVOIR

BASIN NAME : AGNO
 RIVER NAME : AGNO

 * SUMMARY TABLE OF OUTPUTS *

RESERVOIR

ITEMS	1	2	3	4	5	6
RESERVOIR DEVELOP. COEF :	0.00	0.00	0.00	0.00	0.00	0.00
FULL SUPPLY LEVEL (M) :	348.5	348.5	348.5	348.5	348.5	348.5
MIN. OPERATING LEVEL(M) :	346.7	346.8	347.0	347.1	347.2	347.3

POWER

FIRM DISCHARGE (M3/S) :	23.7	23.7	23.7	23.7	23.7	23.6
PLANT PEAK DIS. (M3/S) :	47.4	47.5	47.4	47.4	47.3	47.3
AVERAGE NET HEAD (M) :	52.1	52.1	52.1	52.2	52.2	52.2
INSTALLED CAPACITY (MW) :	20.3	20.4	20.4	20.3	20.3	20.3
GUARANTEED POWER (MW) :	18.9	19.0	19.0	19.0	19.0	19.1
AVERAGE FIRM POWER (MW) :	10.1	10.2	10.2	10.2	10.2	10.2
FIRM ENERGY (MIL KWH/Y) :	89.	89.	89.	89.	89.	89.
SECONDARY ENERGY (") :	75.	75.	75.	75.	75.	75.
ANNUAL AVERAGE E-GY (") :	164.	164.	164.	164.	164.	164.

D A M

DAM HEIGHT (M) :	42.5	42.5	42.5	42.5	42.5	42.5
EMBANKMENT VOL.(MIL M3) :	0.362	0.362	0.362	0.362	0.362	0.362

EVALUATION INDECES

CH/V :	108571.	108820.	108686.	108552.	108419.	108285.
C/V :	2062.	2066.	2064.	2062.	2059.	2057.
P/(20VT+VD) :	5.6	5.6	5.6	5.6	5.6	5.6
E(FIRM)/(20VT+VD) :	24.4	24.5	24.5	24.5	24.5	24.5
E(F+SEC*0.3)/(20VT+VD) :	30.6	30.7	30.7	30.7	30.7	30.7

PROJECT NAME : TABU (LOW DAM ALT.)
 PROJECT ID : 9-077-00-04-2
 TYPE : RESERVOIR

 * SUMMARY TABLE OF COST ESTIMATE *

(UNIT : MILLION USD)

I T E M	C A S E					
	1	2	3	4	5	6
POWER DEVELOPMENT (INST. CAP. (MW))	(20.3)	(20.4)	(20.4)	(20.3)	(20.3)	(20.3)
STORAGE DAM	5.02	5.02	5.02	5.02	5.02	5.02
SPILLWAY	9.56	9.56	9.56	9.56	9.56	9.56
DIVERSION TUNNEL	18.01	18.01	18.01	18.01	18.01	18.01
INTAKE (PRESSURE TYPE)	0.85	0.84	0.84	0.84	0.83	0.83
HEADRACE TUNNEL (PRESSURE)	10.05	10.07	10.06	10.05	10.04	10.03
SURGE TANK	1.35	1.36	1.35	1.35	1.35	1.35
PENSTOCK	1.08	1.08	1.08	1.08	1.08	1.08
(PRESSURE SHAFT)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)
(STEEL LINER)	(0.58)	(0.58)	(0.58)	(0.58)	(0.58)	(0.58)
POWEROUSE BUILDING	1.33	1.33	1.33	1.33	1.33	1.33
(SUPER STRUCTURE)	(0.59)	(0.59)	(0.59)	(0.59)	(0.59)	(0.59)
(SUB STRUCTURE)	(0.74)	(0.74)	(0.74)	(0.74)	(0.74)	(0.74)
MISCELLANEOUS CIVIL WORK	2.36	2.36	2.36	2.36	2.36	2.36
CONSTRUCTION FACILITIES	0.	0.	0.	0.	0.	0.
POWER EQUIPMENT	8.26	8.28	8.28	8.27	8.27	8.26
ENGINEERING/ADMINISTRATION	7.23	7.24	7.24	7.23	7.23	7.23
CONTINGENCIES	13.02	13.03	13.03	13.02	13.02	13.01
S U B T O T A L	78.12	78.18	78.15	78.12	78.09	78.06

ACCESS ROAD (ROAD LENGTH 6.0 KM)	
CONSTRUCTION COST	1.32
ENGINEERING ADMINISTRATION	0.11
CONTINGENCIES	0.29
S U B T O T A L	1.71

TRANSMISSION LINE SYSTEM (T/L LENGTH 27.0 KM)	
TRANSMISSION LINE	0.62
SWITCHYARD AND SUBSTATION	0.27
ENGINEERING/ADMINISTRATION	0.11
CONTINGENCIES	0.15
S U B T O T A L	1.15

T O T A L	80.99	81.05	81.02	80.98	80.95	80.92
EVALUATION INDICES						
U S D / K W	3990.0	3980.5	3980.9	3981.2	3981.6	3982.0
U S D / K W H	0.727	0.726	0.725	0.725	0.725	0.725

I N V E N T O R Y O F H Y D R O P O W E R S I T E S

SCHEME : TABU
 RIVER SYSTEM : AGNO
 STREAM : AGNO
 WATER RESOURCES REGION : III
 PROVINCE : BENGUET
 COORDINATES : N16-16-43 E120-44-33
 STUDY LEVEL : UNSCALED
 (PRE-F/S, RECONNAISSANCE)

SCHEME ID : 3-077-00-04-1-1

HYDRO/TOPO. INFORMATION
 CATCHMENT AREA (KM2) : 1070.0 (MAIN) : 1070.0 INTER TRANSFER TOTAL : 0.0 STREAM GAGE ID : 4-3-093-NP-
 AVER. BASIN RAINFALL (MM/YR) : 2835. DENUDATION RATE (MM/YR) : 1.4 GAGE CATCHMENT (KM2) : 690.
 AVERAGE DISCHARGE (M3/S) : 63.3 EVAPORATION RATE (MM/DAY) : 3.5 GAGE AVER. DISCHARGE (M3/S) : 42.7

SELECTED PLAN

TYPE OF DEVELOPMENT : RESERVOIR RESERVOIR DEVELOPMENT RATIO : 0.03
 RESERVOIR FULL SUPPLY LEVEL (EL.M) : 404.0 GROSS STORAGE VOL. (MIL M3) : 168.6
 AVERAGE OPERATING LEVEL (EL.M) : 399.4 ACTIVE STORAGE VOL. (MIL M3) : 59.9
 MINIMUM OPERATING LEVEL (EL.M) : 390.1 DEAD STORAGE VOL. (MIL M3) : 109.7
 DRAWDOWN DEPTH (M) : 13.9 SEDIMENT VOL. (MIL M3) : 9.4
 MAIN DAM CREST ELEVATION (EL.M) : 410.0 CREST LENGTH (M) : 226.4
 (WEIR) DAM HEIGHT (M) : 98.0 EMBANKMENT VOL. (MIL M3) : 2.41
 WATERWAY HEADRACE : LENGTH (M) : 3000.0 DIAMETER (WIDTH) (M) : 5.8 NOS. : 2
 PENSTOCK : HORIZONT. L (M) : 160.0 DIAMETER (M) : 4.5 NOS. : 2
 DIVERSION : LENGTH (M) : 1250.0 DIAMETER (M) : 7.5 NOS. : 2
 EXCAVATION VOL TOTAL (1000 M3) : 279.0

DISCHARGE PLANT MAX. DISCHARGE (M3/S) : 158.4 AVERAGE NET HEAD (M) : 104.2
 /HEAD FIRM DISCHARGE (M3/S) : 26.4 TAILWATER LEVEL (EL.M) : 290.0
 POWER UNSATLLED CAPACITY (MW) : 135.8 ANNUAL TOTAL ENERGY (GWH) : 439.4
 FIRM POWER (MW) : 22.7 FIRM ENERGY (GWH) : 198.7
 MIN. GUARANTEED POWER (MW) : 177.8 SECONDARY ENERGY (GWH) : 240.7

TRANSMISSION LINE LENGTH (KW) : 24.0 TO : SAN MANUEL 230 K V DOUBLE CIRCUIT NOS. OF CIRCUIT : 1
 ACCESS ROAD LENGTH (KW) : 12.0 FROM : NEARES PROVINCIAL ROAD

CONSTRUCTION COST

TOTAL COST (MIL USD) : 214.6 POWER COST (MIL USD) : 205.5
 TOTAL COST/KW (USD/KW) : 1580.3 TRANSMISSION COST (MIL USD) : 4.7
 TOTAL COST/KWH (USD/KWH) : 0.792 ACCESS ROAD COST (MIL USD) : 3.4

OTHER INFORMATION

LAND USE IN RESERVOIR AREA : MIXED - DENSE POPULATION
 SUBMERGED ROAD : NONE
 MAP USED (1:50,000 SCALE) : 3168-1V 1978
 TECHNICAL COMMENT : - REGULATION EFFECT BY EXISTING BINGA RESERVOIR IS CONSIDERED
 - CONSTRAINED FSL (MAX=404 M) DUE TO TWL OF BINGA

I N V E N T O R Y O F H Y D R O P O W E R S I T E S

SCHEME ID : 3-077-00-04-2-1

SCHEME : TABU (LOW DAM ALT.)

COORDINATES : N16-16-43 E120-44-33
 STUDY LEVEL : UNSCALED
 (PRE-F/S. RECONNAISSANCE)

WATER RESOURCES REGION : III
 PROVINCE : BENGUET

HYDRO/TOPO. INFORMATION

CATCHMENT AREA (KM2) : 1070.0 (MAIN : 1070., INTER TRANSFER TOTAL : 0.) STREAM GAGE ID : 4-3-093-NP-
 AVER. BASIN RAINFALL (MM/YR) : 2838. DENUDATION RATE (MM/YR) : 1.4 GAGE CATCHMENT (KM2) : 690.
 AVERAGE DISCHARGE (M3/S) : 63.3 EVAPORATION RATE (MM/DAY) : 3.5 GAGE AVER. DISCHARGE (M3/S) : 42.7

SELECTED PLAN

TYPE OF DEVELOPMENT : RESERVOIR RESERVOIR DEVELOPMENT RATIO : 0.00

RESERVOIR FULL SUPPLY LEVEL (EL.M) : 348.5 GROSS STORAGE VOL. (MIL M3) : 19.5
 AVERAGE OPERATING LEVEL (EL.M) : 347.9 ACTIVE STORAGE VOL. (MIL M3) : 1.7
 MINIMUM OPERATING LEVEL (EL.M) : 346.8 DEAD STORAGE VOL. (MIL M3) : 17.8
 DRAWDOWN DEPTH (M) : 1.7 SEDIMENT VOL. (MIL M3) : 9.4

MAIN DAM CREST ELEVATION (EL.M) : 354.5 CREST LENGTH (M) : 104.9
 (WEIR) DAM HEIGHT (M) : 42.5 EMBANKMENT VOL. (MIL M3) : 0.36

WATERWAY HEADRACE : LENGTH (M) : 3000.0 DIAMETER (WIDTH) (M) : 4.5 NOS. : 1
 PENSTOCK : HORIZONTAL L (M) : 160.0 DIAMETER (M) : 3.8 NOS. : 1
 DIVERSION : LENGTH (M) : 1250.0 DIAMETER (M) : 7.6 NOS. : 2
 EXCAVATION VOL TOTAL (1000 M3) : 164.1

DISCHARGE PLANT MAX. DISCHARGE (M3/S) : 47.5 AVERAGE NET HEAD (M) : 52.1
 /HEAD FIRM DISCHARGE (M3/S) : 23.7 TAILWATER LEVEL (EL.M) : 290.0

POWER INSATLLED CAPACITY (MW) : 20.4 ANNUAL TOTAL ENERGY (GWH) : 164.2
 /ENERGY FIRM POWER (MW) : 10.2 FIRM ENERGY (GWH) : 89.2
 MIN. GUARANTEED POWER (MW) : 19.0 SECONDARY ENERGY (GWH) : 75.1

TRANSMISSION LINE LENGTH (KM) : 27.0 TO : SAN MANUEL 69 K V SINGLE CIRCUIT NOS. OF CIRCUIT : 1
 ACCESS ROAD LENGTH (KM) : 6.0 FROM : DALUPIRIP

CONSTRUCTION COST

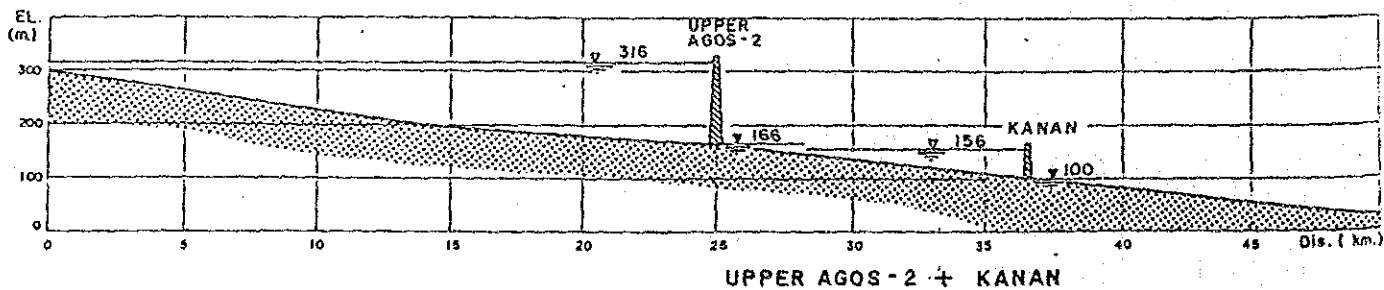
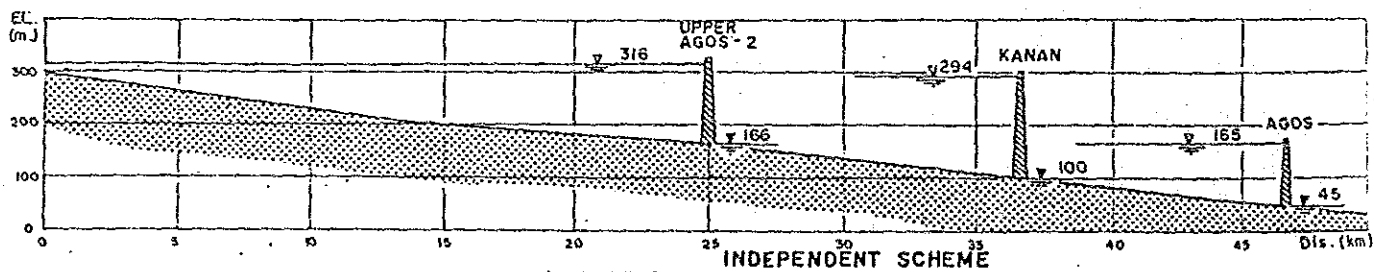
TOTAL COST (MIL USD) : 81.0 POWER COST (MIL USD) : 78.2
 TOTAL COST/KW (USD/KWH) : 3980.5 TRANSMISSION COST (MIL USD) : 1.2
 TOTAL COST/KWH (USD/KWH) : 0.726 ACCESS ROAD COST (MIL USD) : 1.7

OTHER INFORMATION

LAND USE IN RESERVOIR AREA :
 SUBMERGED ROAD :
 MAP USED (1:50,000 SCALE) : 3168-IV
 TECHNICAL COMMENT :

AGOS RIVER BASIN

Case No.	Scheme	ID No.	FSL(m)	TWL(m)
6-1	- Upper Agos 2	4-007-00-05-0-1	316.0	166.0
	- Kanan	4-007-00-01-0-1	156.0	100.0



FSL (Full supply level) or Inlet Elev.
 TWL (Tail water level)

 **5-1-3 AGOS

PAGE : 1

REGION NO. : 4 BASIN NO. : 7

NUMBER OF PROJECTS : 2

LIST OF PROJECTS

NO.	PROJECT ID	PROJECT NAME	CA (SQ. KM)	RAIN (MM)	STREAM GAGE ID
1	4-007-00-05-0-1	UPPER AGOS-2	286.4	5798.0	4-4-003
2	4-007-00-01-1-1	KANAN	364.3	5569.0	4-4-003

1/
 - CONNECTION MATRIX -

1 2
 1 0 0
 2 1 0

1/ C(I,J)=1 : PROJECT-J IS DIRECTLY UPSTREAM OF PROJECT-I
 - C(I,J)=0 : " IS NOT "

SEQ NO.	PROJECT ID	NUP	ID(S) OF U/S PROJECT(S)
1	4-007-00-05-0-1	0	
2	4-007-00-01-1-1	1	4-007-00-05-0-1

PROJECT NAME : UPPER AGOS-2
 PROJECT ID : 4-7-0-5-0-1
 TYPE : RESERVOIR

BASIN NAME : AGOS
 RIVER NAME : KANAN

 * SUMMARY TABLE OF OUTPUTS *

ITEMS	CASE									
	1	2	3	4	5	6	7	8	9	10
RESERVOIR										
RESERVOIR DEVELOP. COEF :	0.98	0.85	0.85	0.85	0.80	0.80	0.80	0.75	0.75	0.75
FULL SUPPLY LEVEL (M) :	316.0	310.5	312.5	316.0	308.1	311.0	316.0	305.6	309.2	316.0
MIN. OPERATING LEVEL (M) :	205.7	205.0	227.9	250.7	205.0	232.6	260.2	204.9	236.1	267.3
POWER										
FIRM DISCHARGE (M3/S) :	44.1	43.3	43.2	42.9	43.0	42.8	42.5	42.4	42.2	41.8
PLANT PEAK DIS. (M3/S) :	132.5	130.1	129.6	128.9	129.2	128.6	127.6	127.4	126.7	125.6
AVERAGE NET HEAD (M) :	110.8	106.9	115.7	125.5	105.3	116.2	128.6	103.6	116.2	130.9
INSTALLED CAPACITY (MW) :	120.8	114.5	123.4	133.2	111.9	123.0	135.1	108.7	121.3	135.3
GUARANTEED POWER (MW) :	38.7	37.3	60.2	82.8	37.0	64.5	91.4	36.4	67.1	96.9
AVERAGE FIRM POWER (MW) :	40.2	38.1	41.1	44.3	37.3	41.0	45.0	36.2	40.4	45.1
FIRM ENERGY (MIL KWH/Y) :	352.	334.	360.	388.	327.	359.	394.	317.	354.	395.
SECONDARY ENERGY (%) :	28.	33.	34.	37.	34.	36.	40.	37.	40.	44.
ANNUAL AVERAGE E-GY (%) :	381.	366.	394.	425.	361.	395.	434.	354.	394.	438.

D A M

DAM HEIGHT (M) : 156.0
 EMBANKMENT VOL. (MIL M3) : 10.708

EVALUATION INDICES

CH/V : 19170.
 C/V : 130.
 P/(20VT+VD) : 9.6
 E(FIRM)/(20VT+VD) : 28.0
 E(F+SEC*0.3)/(20VT+VD) : 28.7

152.5 156.0 148.1 151.0 156.0 145.6 149.2 156.0
 10.119 10.708 9.416 9.878 10.708 9.022 9.601 10.708

19353. 18614. 20116. 19458. 18419. 20344. 19491. 18119.
 134. 126. 144. 137. 125. 148. 139. 123.
 10.3 10.6 9.9 10.5 10.7 10.0 10.6 10.8
 30.1 30.9 29.0 30.6 31.4 31.7 30.9 31.4
 30.9 31.8 29.9 31.5 32.3 30.2 31.9 32.5

PROJECT NAME : UPPER AGOS-2
 PROJECT ID : 4-007-00-05-0
 TYPE : RESERVOIR

 * SUMMARY TABLE OF COST ESTIMATE *

(UNIT : MILLION USD)

I T E M	C A S E									
	1	2	3	4	5	6	7	8	9	10
POWER DEVELOPMENT (INST. CAP.(MW))	(120.8)	(114.5)	(123.4)	(133.2)	(111.9)	(123.0)	(135.1)	(108.7)	(121.3)	(135.3)
STORAGE DAM	96.57	89.35	91.92	96.57	86.31	90.00	96.57	83.15	87.00	96.57
SPILLWAY	18.11	17.51	17.73	18.11	17.26	17.57	18.11	16.99	17.38	18.11
DIVERSION TUNNEL	11.28	11.28	11.28	11.28	11.28	11.28	11.28	11.28	11.28	11.28
INTAKE (PRESSURE TYPE)	4.95	4.40	4.44	4.06	4.73	4.30	3.83	4.54	4.15	3.83
HEADRACE TUNNEL (PRESSURE)	3.24	3.20	3.19	3.17	3.18	3.17	3.15	3.15	3.14	3.12
SURGE TANK	2.42	2.37	2.34	2.30	2.35	2.31	2.27	2.32	2.27	2.22
PENSTOCK	4.03	3.90	4.29	4.71	3.85	4.32	4.84	3.78	4.31	4.90
(PRESSURE SHAFT)	(1.16)	(1.16)	(1.22)	(1.28)	(1.15)	(1.23)	(1.30)	(1.15)	(1.23)	(1.32)
(STEEL LINER)	(2.87)	(2.74)	(3.07)	(3.43)	(2.69)	(3.09)	(3.54)	(2.63)	(3.08)	(3.59)
POWERHOUSE BUILDING	8.67	8.52	8.73	9.17	8.17	8.69	9.23	7.98	8.57	9.19
(SUPER STRUCTURE)	(3.86)	(3.70)	(3.88)	(4.08)	(3.63)	(3.86)	(4.10)	(3.55)	(3.81)	(4.08)
(SUB STRUCTURE)	(4.82)	(4.82)	(4.85)	(5.09)	(4.54)	(4.83)	(5.13)	(4.43)	(4.76)	(5.11)
MISCELLANEOUS CIVIL WORK	7.46	7.04	7.20	7.47	6.86	7.08	7.45	6.66	6.94	7.45
CONSTRUCTION FACILITIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
POWER EQUIPMENT	29.30	28.36	29.29	30.23	27.99	29.14	30.29	27.45	28.77	30.10
ENGINEERING/ADMINISTRATION	23.25	22.02	22.55	23.38	21.50	22.23	23.38	20.92	21.83	23.32
CONTINGENCIES	41.86	39.63	40.59	42.09	38.70	40.02	42.08	37.66	39.29	41.98
S U B T O T A L	251.15	237.77	243.53	252.55	232.17	240.11	252.49	225.98	235.72	251.87

ACCESS ROAD (ROAD LENGTH 18.6 KM)

CONSTRUCTION COST	4.09	4.09	4.09	4.09	4.09	4.09	4.09	4.09	4.09	4.09
ENGINEERING ADMINISTRATION	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
CONTINGENCIES	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
S U B T O T A L	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30

TRANSMISSION LINE SYSTEM (T/L LENGTH 21.0 KM)

TRANSMISSION LINE	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33
SWITCHYARD AND SUBSTATION	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
ENGINEERING/ADMINISTRATION	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
CONTINGENCIES	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
S U B T O T A L	4.26	4.26	4.26	4.26	4.26	4.26	4.26	4.26	4.26	4.26

T O T A L : 260.71 247.33 253.09 262.11 241.73 249.67 262.05 235.54 245.28 261.43

EVALUATION INDICES

U S D / K W	2157.9	2160.9	2050.6	1968.4	2159.5	2029.6	1940.0	2167.4	2022.6	1931.9
U S D / K W H	0.722	0.720	0.684	0.656	0.718	0.675	0.646	0.718	0.671	0.641

PROJECT NAME : KANAN
 PROJECT ID : 4- 7- 0- 1-1-1
 TYPE : RESERVOIR

BASIN NAME : AGOS
 RIVER NAME : KANAN

 * SUMMARY TABLE OF OUTPUTS *

RESERVOIR	CASE									
	1	2	3	4	5	6	7	8	9	10
RESERVOIR DEVELOP. COEF :	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
FULL SUPPLY LEVEL (M) :	156.0	150.2	156.0	145.5	148.0	150.8	153.4	156.0	147.9	156.0
MIN. OPERATING LEVEL (M) :	132.0	134.3	144.5	134.1	137.9	141.7	145.5	149.3	134.2	146.9
FIRM DISCHARGE (M ³ /S) :	47.1	46.8	46.8	45.5	45.5	45.5	45.5	45.5	46.1	46.1
PLANT PEAK DIS. (M ³ /S) :	188.5	187.1	187.0	182.0	182.0	181.9	181.9	181.9	184.5	184.5
AVERAGE NET HEAD (M) :	45.9	42.8	50.0	39.6	42.6	45.6	48.6	51.5	41.3	50.8
INSTALLED CAPACITY (MW) :	71.2	66.0	77.0	59.4	63.7	68.3	72.7	77.1	62.7	77.1
GUARANTEED POWER (MW) :	44.2	47.2	62.1	45.7	51.1	56.4	61.7	67.1	46.5	64.8
AVERAGE FIRM POWER (MW) :	17.8	16.5	19.2	14.8	15.9	17.1	18.2	19.3	15.7	19.3
FIRM ENERGY (MIL KWH/Y) :	156.	144.	169.	130.	140.	150.	159.	169.	137.	169.
SECONDARY ENERGY (%) :	33.	31.	34.	31.	32.	34.	35.	38.	31.	35.
ANNUAL AVERAGE E-GY (%) :	189.	175.	203.	161.	172.	184.	195.	207.	168.	205.

D A M

DAM HEIGHT (M) :	62.0	56.2	62.0	51.5	54.0	56.8	59.4	62.0	53.9	62.0
EMBANKMENT VOL. (MIL M ³) :	1.110	0.888	1.110	0.706	0.804	0.910	1.010	1.110	0.799	1.110

EVALUATION INDECES

CH/V :	72117.	79947.	71466.	88240.	81933.	76677.	72706.	69450.	83453.	70458.
C/V :	1338.	1661.	1328.	2033.	1784.	1576.	1420.	1292.	1822.	1210.
P/(20VT+VD) :	14.1	13.7	15.2	12.9	13.5	14.2	14.8	15.4	13.3	15.3
E(FIRM)/(20VT+VD) :	30.8	29.9	33.4	28.2	29.6	31.0	32.4	33.7	29.1	33.5
E(F+SEC*0.31)/(20VT+VD) :	32.8	31.8	35.4	30.2	31.7	33.2	34.6	35.9	31.0	35.7

PROJECT NAME : KARAN
 PROJECT ID : 4-007-00-01-1
 TYPE : RESERVOIR

 * SUMMARY TABLE OF COST ESTIMATE *

(UNIT : MILLION USD)

I T E M	C A S E									
	1	2	3	4	5	6	7	8	9	10
POWER DEVELOPMENT (INST.CAP(MW))	(71.2)	(66.0)	(77.0)	(59.4)	(63.7)	(69.3)	(72.7)	(77.1)	(62.7)	(77.1)
STORAGE DAM	13.34	10.98	13.34	8.98	10.07	11.21	12.28	13.34	10.01	13.34
SPILLWAY	8.77	8.11	8.77	7.56	7.66	8.17	8.47	8.77	7.94	8.77
DIVERSION TUNNEL	20.12	20.12	20.12	20.12	20.12	20.12	20.12	20.12	20.12	20.12
INTAKE (PRESSURE TYPE)	4.34	3.98	3.76	3.66	3.59	3.54	3.47	3.40	3.82	3.59
HEADRACE TUNNEL (PRESSURE)	9.65	9.60	9.60	9.41	9.41	9.41	9.41	9.41	9.51	9.50
SURGE TANK	3.93	3.89	3.89	3.79	3.78	3.78	3.78	3.78	3.84	3.83
PENSTOCK	4.10	4.00	4.33	3.82	3.95	4.08	4.21	4.34	3.91	4.33
(PRESSURE SHAFT)	(1.57)	(1.58)	(1.61)	(1.57)	(1.58)	(1.59)	(1.60)	(1.61)	(1.58)	(1.61)
(STEEL LINER)	(2.53)	(2.42)	(2.72)	(2.25)	(2.36)	(2.49)	(2.60)	(2.73)	(2.33)	(2.72)
POWERHOUSE BUILDING	6.26	6.50	7.20	6.00	6.30	6.59	6.87	7.15	6.25	7.18
(SUPER STRUCTURE)	(3.05)	(2.89)	(3.20)	(2.67)	(2.80)	(2.93)	(3.05)	(3.18)	(2.78)	(3.19)
(SUB STRUCTURE)	(3.81)	(3.61)	(4.00)	(3.34)	(3.50)	(3.66)	(3.82)	(3.97)	(3.47)	(3.99)
MISCELLANEOUS CIVIL WORK	3.56	3.36	3.55	3.17	3.25	3.35	3.43	3.52	3.26	3.53
CONSTRUCTION FACILITIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
POWER EQUIPMENT	27.06	26.06	27.93	24.55	25.34	26.14	26.89	27.61	25.31	27.77
ENGINEERING/ADMINISTRATION	12.72	12.07	12.81	11.38	11.71	12.05	12.37	12.68	11.73	12.75
CONTINGENCIES	22.89	21.73	23.06	20.43	21.08	21.69	22.26	22.82	21.12	22.94
S U B T O T A L	137.34	130.39	138.36	122.92	126.45	130.14	133.57	136.94	126.73	137.66

ACCESS ROAD (ROAD LENGTH 29.0 KM)

CONSTRUCTION COST	6.38	6.38	6.38	6.38	6.38	6.38	6.38	6.38	6.38	6.38
ENGINEERING ADMINISTRATION	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
CONTINGENCIES	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38
S U B T O T A L	8.27	8.27	8.27	8.27	8.27	8.27	8.27	8.27	8.27	8.27

TRANSMISSION LINE SYSTEM (T/L LENGTH 9.0 KM)

TRANSMISSION LINE	1.00	0.61	1.00	0.61	0.61	0.61	1.00	1.00	0.61	1.00
SWITCHYARD AND SUBSTATION	0.96	0.62	0.96	0.62	0.62	0.62	0.96	0.96	0.62	0.96
ENGINEERING/ADMINISTRATION	0.24	0.15	0.24	0.15	0.15	0.15	0.24	0.24	0.15	0.24
CONTINGENCIES	0.33	0.21	0.33	0.21	0.21	0.21	0.33	0.33	0.21	0.33
S U B T O T A L	2.53	1.59	2.53	1.59	1.59	1.59	2.53	2.53	1.59	2.53

T O T A L : 148.14 140.26 149.16 132.78 136.32 140.00 144.37 147.75 136.59 148.47

EVALUATION INDICES

U S D / K W	2080.7	2126.6	1938.1	2237.1	2138.6	2049.4	1985.1	1915.1	2179.5	1926.4
U S D / K W H	0.893	0.913	0.824	0.954	0.913	0.876	0.849	0.819	0.933	0.827

I N V E N T O R Y O F H Y D R O P O W E R S I T E S

SCHEME ID : 4-007-00-01-1-1
 COORDINATES : N14-44-30 E121-31-54
 STUDY LEVEL : UNSCALED
 (PRE-F/S, RECONNAISSANCE)

WATER RESOURCES REGION : IV
 PROVINCE : QUEZON

RIVER SYSTEM : AGOS
 STREAM : KANAN

HYDRO/TOPS INFORMATION

CATCHMENT AREA (KM2) : 364.3 (MAIN : 364.3 INTER TRANSFER TOTAL : 0.) STREAM GAGE ID : 4-4-003-NW-430
 AVER. BASIN RAINFALL (MM/YR) : 5569 DENUDATION RATE (MM/YR) : 1.4 GAGE CATCHMENT (KM2) : 879
 AVERAGE DISCHARGE (M3/S) : 58.5 EVAPORATION RATE (MM/DAY) : 3.5 GAGE AVER. DISCHARGE (M3/S) : 116.1

SELECTED PLAN

TYPE OF DEVELOPMENT : RESERVOIR RESERVOIR DEVELOPMENT RATIO : 0.01

RESERVOIR FULL SUPPLY LEVEL (EL.M) : 156.0 GROSS STORAGE VOL. (MIL M3) : 39.7
 AVERAGE OPERATING LEVEL (EL.M) : 153.8 ACTIVE STORAGE VOL. (MIL M3) : 11.0
 MINIMUM OPERATING LEVEL (EL.M) : 149.3 DEAD STORAGE VOL. (MIL M3) : 28.8
 DRAWDOWN DEPTH (M) : 6.7 SEDIMENT VOL. (MIL M3) : 5.5

MAIN DAM CREST ELEVATION (EL.M) : 162.0 CREST LENGTH (M) : 243.2
 (WEIR) DAM HEIGHT (M) : 62.0 ENBANKMENT VOL. (MIL M3) : 1.11

WATERWAY HEADRAGE : LENGTH (M) : 880.0 DIAMETER (WIDTH) (M) : 6.2 NOS. : 2
 PENSTOCK : HORIZONT. L (M) : 220.0 DIAMETER (M) : 4.0 NOS. : 2
 DIVERSION : LENGTH (M) : 1260.0 DIAMETER (M) : 8.2 NOS. : 2
 EXCAVATION VOL TOTAL (1000 M3) : 195.5

DISCHARGE PLANT MAX. DISCHARGE (M3/S) : 181.9 AVERAGE NET HEAD (M) : 51.5
 /HEAD FIRM DISCHARGE (M3/S) : 45.5 TAILWATER LEVEL (EL.M) : 100.0

POWER UNSATLLED CAPACITY (MW) : 77.1 ANNUAL TOTAL ENERGY (GWH) : 206.9
 /ENERGY FIRM POWER (MW) : 19.3 FIRM ENERGY (GWH) : 168.9
 MIN. GUARANTEED POWER (MW) : 67.1 SECONDARY ENERGY (GWH) : 37.9

TRANSMISSION LINE LENGTH (KM) : 9.0 TO : KANAN 230 K V DOUBLE CIRCUIT NOS. OF CIRCUIT : 1
 ACCESS ROAD LENGTH (KM) : 29.0 FROM : INFANTA

CONSTRUCTION COST

TOTAL COST (MIL USD) : 147.7 POWER COST (MIL USD) : 136.9
 TOTAL COST/KW (USD/KW) : 1915.1 TRANSMISSION COST (MIL USD) : 2.5
 TOTAL COST/KWH (USD/KWH) : 0.819 ACCESS ROAD COST (MIL USD) : 8.3

OTHER INFORMATION

LAND USE IN RESERVOIR AREA : FOREST - SCARCE POPULATION
 SUBMERGED ROAD : NONE
 MAP USED (1:50,000 SCALE) : 3364-111 1970
 TECHNICAL COMMENT :
 - SERIES DEVELOPMENT PLAN WITH UPPER AGOS-2
 - CONSTRAINED FSL (MAX=156 M) DUE TO TWL OF UPPER AGOS-2
 - REGULATION EFFECT BY UPPER AGOS-2 IS CONSIDERED

I N V E N T O R Y O F H Y D R O P O W E R S I T E S

SCHEME ID : 4-007-00-05-0-1

SCHEME : UPPER AGOS-2

RIVER SYSTEM : AGOS
 STREAM : KANAN
 WATER RESOURCES REGION : IV
 PROVINCE : QUEZON
 COORDINATES : N14-48-40 E121-30-42
 STUDY LEVEL : NEWLY IDENTIFIED THROUGH LHPPS

HYDRO/TOPO. INFORMATION

CATCHMENT AREA (KM2) : 286.4
 AVER. BASIN RAINFALL (MM/YR) : 5798.
 AVERAGE DISCHARGE (M3/S) : 48.1
 MAIN : 286.4
 DENUDATION RATE (MM/YR) : 1.4
 EVAPORATION RATE (MM/DAY) : 3.5
 INTER TRANSFER TOTAL : 0.
 STREAM GAGE ID : 4-4-003-NW-430
 GAGE CATCHMENT (KM2) : 879.
 GAGE AVER. DISCHARGE (M3/S) : 116.1

SELECTED PLAN

TYPE OF DEVELOPMENT : RESERVOIR
 RESERVOIR DEVELOPMENT RATIO : 0.75

RESERVOIR FULL SUPPLY LEVEL (EL.M) : 316.0
 AVERAGE OPERATING LEVEL (EL.M) : 299.8
 MINIMUM OPERATING LEVEL (EL.M) : 267.3
 DRAWDOWN DEPTH (M) : 48.7
 GROSS STORAGE VOL. (MIL M3) : 1526.3
 ACTIVE STORAGE VOL. (MIL M3) : 1137.3
 DEAD STORAGE VOL. (MIL M3) : 389.1
 SEDIMENT VOL. (MIL M3) : 20.0

MAIN DAM (WEIR) CREST ELEVATION (EL.M) : 322.0
 DAM HEIGHT (M) : 156.0
 WATERWAY HEADRACE : LENGTH (M) : 380.0
 PENSTOCK : HORIZONT. L (M) : 180.0
 DIVERSION : LENGTH (M) : 800.0
 EXCAVATION VOL TOTAL (1000 M3) : 92.8
 CREST LENGTH (M) : 430.0
 EMBANKMENT VOL. (MIL M3) : 10.71
 DIAMETER (WIDTH) (M) : 5.2
 DIAMETER (M) : 4.0
 DIAMETER (M) : 7.5
 NOS. : 2
 NOS. : 2
 NOS. : 2

DISCHARGE /HEAD PLANT MAX. DISCHARGE (M3/S) : 125.6
 FIRM DISCHARGE (M3/S) : 41.8
 POWER /ENERGY INSTALLED CAPACITY (MW) : 135.3
 FIRM POWER (MW) : 45.1
 MIN. GUARANTEED POWER (MW) : 96.9
 AVERAGE NET HEAD (M) : 130.9
 TAILWATER LEVEL (EL.M) : 166.0
 ANNUAL TOTAL ENERGY (GWH) : 439.1
 FIRM ENERGY (GWH) : 394.8
 SECONDARY ENERGY (GWH) : 44.4.

TRANSMISSION LINE LENGTH (KM) : 21.0 TO : INFANTA
 ACCESS ROAD LENGTH (KM) : 18.6 FROM : NEAREST PROVINCIAL ROAD
 230 K V DOUBLE CIRCUIT NOS. OF CIRCUIT : 1

CONSTRUCTION COST

TOTAL COST (MIL USD) : 261.4
 TOTAL COST/KW (USD/KW) : 1931.9
 TOTAL COST/KWH (USD/KWH) : 0.641
 POWER COST (MIL USD) : 251.9
 TRANSMISSION COST (MIL USD) : 4.3
 ACCESS ROAD COST (MIL USD) : 5.3

OTHER INFORMATION

LAND USE IN RESERVOIR AREA : FOREST - SCARCE POPULATION
 SUBMERGED ROAD : NONE
 MAP USED (1:50,000 SCALE) : 3364-III 1970
 TECHNICAL COMMENT : SERIES DEVELOPMENT PLAN WITH KANAN

C - 9 UNIT PRICE APPLIED FOR SECOND
CONSTRUCTION COST ESTIMATE

STANDARD UNIT PRICES (US \$)

PRICE LEVEL : LATE 1985

WORK ITEM UNIT OF Q-TY UNIT PRICE

GENERAL

REINFORCEMENT STEEL	TON	1100.0
GATES	TON	7500.0
TRASHRACKS	TON	3600.0
STORAGE DAM		
DAM EMBANKMENT		
- ROCKFILL DAM	M3	12.0
- EARTHFILL DAM	M3	8.0
EXCAVATION		
- FILL DAM	M3	6.0
- TRENCH	M3	12.0
- CONCRETE DAM	M3	8.0
CONCRETE		
- INSPECTION GALLERY	M3	100.0
- CONCRETE DAM	M3	-1.0
CURTAIN GROUTING	M	75.0
BLANKET/CONSOLI. GROUTING	M	75.0
DRAINAGE HOLE	M	75.0
MISCELLANEOUS (FILL TYPE)	%	5.
- DO - (CONCRETE TYPE)	%	5.

SPILLWAY

EXCAVATION		
- CHUTEWAY	M3	6.0
- ENERGY DISSIPATOR	M3	8.0
CONCRETE		
- CHUTEWAY	M3	90.0
- ENERGY DISSIPATOR	M3	100.0
GROUTING		
MISCELLANEOUS (FILL TYPE DAM)	%	5.
- DO - (INTEGRATED)	%	5.

W O R K I T E M UNIT OF Q-TY UNIT PRICE

RIVER DIVERSION WORKS

TUNNEL EXCAVATION	M3	-1.0
COFFERDAM EMBANKMENT	M3	3.0
LINING CONCRETE	M3	-1.0
SLOPE PROTECTION	M3	90.0
PLUG CONCRETE	M3	90.0
FILL GROUTING	M3	-1.0
COURTAIN GROUTING	M	75.0
DRAINAGE HOLE	M	75.0
CONDUIT PIPE	M	3000.0
MISCELLANEOUS (DIV. TUNNEL)	%	5.
- DO - (COFF. DAM)	%	5.
- DO - (GROUTING)	%	5.
- DO - (RIV. OUTLET)	%	5.
- DO - (PLUG. GATE)	%	5.

DIVERSION DAM/WEIR

FOUNDATION EXCAVATION	M3	6.0
DIVERSION WEIR CONCRETE	M3	80.0
SHEET-PILE WALLING	M2	300.0
FOUNDATION PILING	M	200.0
MISCELLANEOUS (NON GATED WEIR)	%	5.
- DO - (GATED WEIR)	%	5.
DIVERSION WORKS	%	20.

INTAKE

EXCAVATION IN INTAKE	M3	6.0
EXCAVATION IN SAND TRAP	M3	6.0
CONCRETE	M3	100.0
MISCELLANEOUS (PRESSURE TYPE)	%	5.
- DO - (NON-PRESSURE)	%	5.
- DO - (SAND TRAP BASIN)	%	5.

HEADRACE

TUNNEL EXCAVATION	M3	-1.0
OPEN CHANNEL EXCAVATION	M3	6.0
TUNNEL LINING CONCRETE	M3	-1.0
CHANNEL LINING CONCRETE	M3	90.0
FILL GROUTING	M	-1.0
CURTAIN GROUTING	M	75.0
MISCELLANEOUS (PRESSURE TUNNEL)	%	5.
- DO - (NON-PRESS. T.)	%	5.
- DO - (CHANNEL)	%	5.

W O R K I T E M U N I T O F Q - T Y U N I T P R I C E

SURGE/HEAD TANK

SHAFT EXCAVATION	M3	70.0
EXCAVATION IN HEAD TANK	M3	6.0
SHAFT LINING CONCRETE	M3	90.0
CONCRETE IN HEAD TANK	M3	90.0
STEEL CONDUIT PIPE	TON	3000.0
MISCELLANEOUS (SURGE TANK)	%	5.
- DO - (HEAD TANK)	%	5.
- DO - (SPILLOUT COND.)	%	5.

PENSTOCK

PRESSURE SHAFT EXCAVATION	M3	-1.0
OPEN EXCAVATION	M3	6.0
BACKFILL CONCRETE	M3	75.0
CONC. IN OPEN-AIR PENSTOCK	M3	90.0
STEEL LINERS	TON	4000.0
MISCELLANEOUS (PRESSURE)	%	5.
- DO - (OPEN-AIR)	%	5.

POWERHOUSE BUILDING

BUILDING SUPER STRUCTURE	M3	180.0
EXCAVATION	M3	12.0
CONCRETE	M3	-1.0
MISCELLANEOUS (SUB-STRUCTURE)	%	5.
SWITCH YARD CIVIL WORK (OPEN)	%	30.
(OF SWITCHYARD EQUIP. COST)		

TAILRACE

TUNNEL EXCAVATION	M3	-1.0
OPEN EXCAVATION	M3	6.0
CONCRETE (TUNNEL)	M3	-1.0
CONCRETE (OPEN)	M3	160.0
FILL GROUTING	M	-1.0
SURGE TANK EXCAVATION	M3	60.0
SURGE TANK CONCRETE	M3	180.0
MISCELLANEOUS (NO-PRESS. TUNNEL)	%	5.
- DO - (CONDUIT)	%	5.
- DO - (TAILRACE BAY)	%	5.
- DO - (PRESS. TUNNEL)	%	5.
- DO - (SURGE TANK)	%	5.

TAILRACE OUTLET

EXCAVATION	M3	6.0
CONCRETE	M3	160.0
MISCELLANEOUS	%	5.

W O R K I T E M	U N I T O F Q - T Y	U N I T P R I C E
WATER TRANSFER FACILITIES		
INCLINED SHAFT EXCAVATION	M3	-1.0
SHAFT LINING CONCRETE	M3	-1.0
FILL GROUTING	M	400.0
CONSOLIDATION GROUTING	M	800.0
MISCELLANEOUS	%	5.
MISCELLANEOUS CIVIL WORKS		
FOR TOTAL COST OF CIVIL WORK	%	5.
WITHOUT ACCESS ROAD		
POWER EQUIPMENT		
EQUIPMENT COST	-	6500.0
ACCESS ROAD		
FLAT LAND	KM	220000.0
SWAMPY LAND	KM	220000.0
ROLLING TERRAIN	KM	200000.0
HILLY LAND	KM	250000.0
INPROV. OF EXISTING ROAD	KM	90000.0
BRIDGE	M	5000.0
TRANSMISSION LINE		
69KV SINGLE	KM	23000.0
115KV SINGLE	KM	34000.0
230KV DOUBLE	KM	111000.0
230KV DOUBLE	KM	220000.0
230KV DOUBLE	KM	459000.0
500KV DOUBLE	KM	678000.0
SWITCHYARD AND SUBSTATION		
69KV	LINE	270000.0
115KV	LINE	310000.0
230KV	LINE	480000.0
500KV	LINE	1880000.0
LAND PROCUREMENT AND RESETTLEMENT		
CULTIVATED LAND (INCL. PADDY F)	HA	700.0
SWAMP	HA	500.0
BUSHES AND SHRUBS	HA	150.0
FOREST	HA	50.0
RESETTLEMENT (HOUSING)	HA	0.
RESETTLEMENT (PUBLIC FACILITY)	%	0.
OF HOUSING		
TRANSMISSION LINE (69 KV)	KM	0.
TRANSMISSION LINE (115 KV)	KM	0.
TRANSMISSION LINE (230 KV)	KM	0.
TRANSMISSION LINE (500 KV)	KM	0.