

表 5.1 既設、建設中および建設予定の発電所（カビット系統）

No.	Type	Installed Cap.,kW	Unit	Inst. Year	Designated Retirement	Annual Max. Operation Rate,%
1.	Diesel	75	1	-	1987	60
2.	"	144	1	1977	1988	"
3.	"	144	1	1977	1988	"
4.	"	200	1	1979	-	"
5.	"	200	1	1980	-	"
6.	"	200	1	1981	-	"
7.	"	200	1	1982	-	"
8.	"	600	1	1985	-	"
9.	"	600	1	1985	-	"
10.	"	300	1	1988	-	"
11.	"	400	1	1990	-	"

表 5.2 ディーゼル発電所の建設費と運転維持費

Class, kw	Annual Max. Operation Rate, %	Lead Time year	Construction Time period, year	Life Time, year	Construction Cost, M\$/kw	O & M		Fuel Cost M\$/kWh
						Fixed, %	Variable, M\$/kWh	
500 to 1,000	60	0	1	15	2,700	3	0.02/0.032/	0.18/0.123/
1,000 to 2,000	"	"	"	"	2,200	"	"	"
2,000 to 3,000	"	"	"	"	1,900	"	"	"

Notes: 1/ Annual fixed O & M cost is expressed by percentage of construction cost.

2/ Variable O & M cost of M\$0.02/kWh is for the Kapit system, whilst M\$0.03/kWh for Limbang.

3/ Fuel cost of M\$0.18/kWh is for the diesel plant of Kapit used diesel, whilst M\$0.12/kWh is for the diesel plant of Limbang used light fuel oil.

The increase rates of future fuel costs to the price in 1987 are assumed on the basis of the projection of World Bank as follows:

Year	1987	1988	1989	1990	1995	2000	2010
Ratio to 1987 price	1.00	1.00	1.00	1.06	1.31	1.81	1.811/

4/ Fuel price is assumed to be constant after 2000 onward, since no projection is given for the crude oil price after that time.

表 5.3 主要工事単価

Unit: M\$		
Work Item	Unit	Price
1. Civil Works		
a. Excavation in common	m ³	5.0
b. Excavation in rock	"	18.0
c. Concrete in dam	"	210.0
d. Concrete in structure	"	290.0
e. Concrete in powerhouse	"	350.0
f. Reinforcement	ton	1,900.0
g. Access road, new	km	160,000.0
h. Access road, improvement	"	65,000.0
2. Metal Works		
a. Gates	ton	12,000.0
b. Penstock	"	6,800.0

表5.4 経済的プロジェクト評価 (ムコ計画)

Case	FSL (El./m)	Plant Discharge (cms)	Installed Capacity (MW)	Construction Cost (million M\$)	B/C	Net Benefit (million M\$)	EIRR (%)
Alt-1							
ROR-1	88.900	12.1	1.44	21.278	1.026	0.982	10.885
ROR-2	89.500	18.5	2.25	23.521	1.040	1.464	11.156
ROR-3	89.800	25.0	3.06	25.126	1.039	1.445	11.022
4	90.000	25.1	3.10	25.838	1.030	1.111	10.790
5	90.000	18.8	2.32	23.825	1.048	1.738	11.345
6	90.000	12.5	1.55	21.789	1.034	1.245	11.077
7	100.000	29.0	4.77	33.851	0.981	-0.727	9.655
8	100.000	21.7	3.57	31.231	1.033	1.216	10.712
9	100.000	14.5	2.38	28.504	1.039	1.424	10.910
10	100.000	9.7	1.59	26.361	1.014	0.538	10.414
11	110.000	16.9	3.47	43.352	0.937	-2.565	8.910
12	110.000	11.2	2.31	40.804	0.940	-2.416	8.885
Alt-2							
1	90.000	25.1	5.62	41.364	0.939	-2.471	8.949
2	90.000	18.8	4.19	35.958	1.015	0.547	10.293
3	90.000	12.5	2.77	33.582	1.032	1.182	10.655
4	90.000	8.4	1.83	30.272	1.020	0.743	10.482
5	100.000	21.7	5.75	45.769	0.949	-2.044	9.228
6	100.000	14.5	3.81	40.435	1.010	0.390	10.189
7	100.000	9.7	2.52	37.922	1.009	0.336	10.179
Alt-3							
1	90.000	25.1	6.38	47.210	0.895	-4.487	8.330
2	90.000	18.8	4.75	41.971	0.959	-1.646	9.346
3	90.000	12.5	3.13	36.339	1.029	1.066	10.550
4	90.000	8.4	2.05	32.648	1.025	0.931	10.553
5	100.000	21.7	6.40	51.008	0.905	-4.027	8.634
6	100.000	14.5	4.23	44.424	0.990	-0.402	9.862
7	100.000	9.7	2.78	40.770	1.013	0.486	10.238

表 5.5 経済的費用のキャッシュフロー (1/2) ALT.1-5

Description	Unit	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Demand, peak power	MW	1.40	1.48	1.57	1.65	1.75	1.86	1.98	2.09	2.20	2.32	2.42	2.53	2.64	2.76
, energy	GWh	5.76	6.23	6.70	7.17	7.66	8.16	8.65	9.15	9.65	10.19	10.77	11.35	11.93	12.51
Annual load factor		.47	.48	.49	.50	.50	.50	.50	.50	.50	.50	.51	.51	.51	.52
Reserve capacity	MW	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60
Required total capacity	MW	2.00	2.08	2.17	2.25	2.35	2.46	2.58	2.69	2.80	2.91	3.03	3.13	3.24	3.36
Diesel retirement	MW	.00	-.08	-.29	.00	.00	.00	.00	.00	-.20	-.20	-.20	-.20	.00	.00
Diesel transferred	MW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Power addition, hydro	MW	.00	.00	.00	.00	.00	.00	.00	.00	2.32	.00	.00	.00	.00	.00
, diesel	MW	.00	.00	.30	.00	.40	.00	.00	.50	.00	.00	.00	.00	.00	.00
System capacity, installed	MW	2.36	2.28	2.30	2.30	2.70	2.70	2.70	3.20	5.32	5.12	4.92	4.72	4.72	4.72
, guaranteed	MW	2.36	2.28	2.30	2.30	2.70	2.70	2.70	3.20	3.87	3.75	3.62	3.45	3.50	3.52
(hydro, guaranteed)	MW	.00	.00	.00	.00	.00	.00	.00	.00	.88	.96	1.02	1.05	1.11	1.12
(diesel, H.S.D.unit)	MW	2.36	2.28	2.30	2.30	2.70	2.70	2.70	3.20	3.00	2.80	2.60	2.40	2.40	2.40
(diesel, cold reserve)	MW	.00	.00	.00	.00	.00	.00	.00	.00	1.09	.79	.55	.28	.21	.12
Installation cost, hydro	m.M\$	.00	.00	.00	.00	.00	2.67	12.48	8.67	.00	.00	.00	.00	.00	.00
, diesel	m.M\$	.23	.69	.31	.92	.00	.38	1.15	.00	.00	.00	.00	.00	1.15	3.44
Power generation, hydro	GWh	.00	.00	.00	.00	.00	.00	.00	.00	7.83	8.04	8.26	8.46	8.64	8.79
, diesel	GWh	5.76	6.23	6.70	7.17	7.66	8.16	8.65	9.15	1.82	2.15	2.51	2.89	3.29	3.72
Hydro OM cost	m.M\$	.00	.00	.00	.00	.00	.00	.00	.00	.19	.19	.19	.19	.19	.19
Diesel OM cost, fixed	m.M\$	.19	.18	.18	.18	.21	.21	.21	.25	.15	.16	.16	.17	.17	.18
, variable	m.M\$	.12	.12	.13	.14	.15	.16	.17	.18	.04	.04	.05	.06	.07	.07
, fuel(HSD)	m.M\$	.92	.99	1.07	1.21	1.36	1.51	1.67	1.84	.38	.48	.60	.74	.90	1.07
, fuel (LO)	m.M\$	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Total cost	m.M\$	1.45	1.99	1.69	2.45	1.72	4.93	15.69	10.95	.76	.87	1.00	1.15	2.47	4.96

表 5.5 経済的費用のキャッシュフロー (2/2) ALT.1-5

Description	Unit	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Demand, peak power	MW	2.87	3.00	3.13	3.26	3.39	3.53	3.69	3.86	4.02	4.18
, energy	GWh	13.09	13.68	14.26	14.85	15.44	16.10	16.83	17.57	18.31	19.04
Annual load factor		.52	.52	.52	.52	.52	.52	.52	.52	.52	.52
Reserve capacity	MW	.60	.60	.63	.65	.68	.71	.74	.77	.80	.84
Required total capacity	MW	3.47	3.60	3.76	3.91	4.06	4.24	4.43	4.63	4.82	5.01
Diesel retirement	MW	-1.20	.00	.00	-.30	.00	-.40	.00	.00	-.50	.00
Diesel transferred	MW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Power addition, hydro	MW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
, diesel	MW	1.50	.00	.00	.50	.00	.50	.00	.50	.00	.50
System capacity, installed	MW	5.02	5.02	5.02	5.22	5.22	5.32	5.32	5.82	5.32	5.82
, guaranteed	MW	3.90	3.89	4.00	4.22	4.28	4.48	4.53	5.10	4.84	5.16
(hydro, guaranteed)	MW	1.20	1.19	1.30	1.33	1.39	1.49	1.53	1.60	1.84	1.67
(diesel, H.S.D.unit)	MW	2.70	2.70	2.70	2.90	2.90	3.00	3.00	3.50	3.00	3.50
(diesel, cold reserve)	MW	.39	.34	.18	.28	.16	.21	.06	.41	.03	.17
Installation cost, hydro	m.M\$	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
, diesel	m.M\$	.00	.38	-1.15	.38	1.15	.38	1.15	.38	1.15	.00
Power generation, hydro	GWh	8.92	9.01	9.09	9.15	9.21	9.27	9.33	9.39	9.44	9.50
, diesel	GWh	4.17	4.67	5.18	5.70	6.23	6.83	7.50	8.18	8.86	9.55
Hydro OM cost	m.M\$	.19	.19	.19	.19	.19	.19	.19	.19	.19	.19
Diesel OM cost, fixed	m.M\$	.18	.18	.20	.21	.21	.22	.23	.24	.23	.26
, variable	m.M\$	.08	.09	.10	.11	.12	.14	.15	.16	.18	.19
, fuel(HSD)	m.M\$	1.20	1.35	1.49	1.64	1.80	1.97	2.17	2.36	2.56	2.75
, fuel (LO)	m.M\$	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Total cost	m.M\$	1.66	2.20	3.13	2.53	3.47	2.90	3.88	3.34	4.30	3.40

表 5.6 ディーゼル発電によるキャッシュフロー表 (カピット系統) (1/2)

Description	Unit	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Demand, peak power	MW	1.40	1.48	1.57	1.65	1.75	1.86	1.98	2.09	2.20	2.32	2.42	2.53	2.64	2.76
, energy	GWh	5.76	6.23	6.70	7.17	7.66	8.16	8.65	9.15	9.65	10.19	10.77	11.35	11.93	12.51
Annual load factor		.47	.48	.49	.50	.50	.50	.50	.50	.50	.50	.51	.51	.51	.52
Reserve capacity	MW	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60
Required total capacity	MW	2.00	2.08	2.17	2.25	2.35	2.46	2.58	2.69	2.80	2.91	3.03	3.13	3.24	3.36
Diesel retirement	MW	.00	-.08	-.29	.00	.00	.00	.00	.00	-.20	-.20	-.20	-.20	.00	.00
Diesel transferred	MW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Power addition, hydro	MW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
, diesel	MW	.00	.00	.30	.00	.40	.00	.00	.50	.00	.50	.50	.00	.00	.00
System capacity, installed	MW	2.36	2.28	2.30	2.30	2.70	2.70	2.70	3.20	3.00	3.30	3.60	3.40	3.40	3.40
, guaranteed	MW	2.36	2.28	2.30	2.30	2.70	2.70	2.70	3.20	3.00	3.30	3.60	3.40	3.40	3.40
(hydro, guaranteed)	MW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(diesel, H.S.D.unit)	MW	2.36	2.28	2.30	2.30	2.70	2.70	2.70	3.20	3.00	3.30	3.60	3.40	3.40	3.40
(diesel, cold reserve)	MW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Installation cost, hydro	m.M\$	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
, diesel	m.M\$	.23	.69	.31	.92	.00	.38	1.15	.38	1.53	1.15	.00	.00	1.15	3.44
Power generation, hydro	GWh	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
, diesel	GWh	5.76	6.23	6.70	7.17	7.66	8.16	8.65	9.15	9.65	10.19	10.77	11.35	11.93	12.51
Hydro OM cost	m.M\$	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Diesel OM cost, fixed	m.M\$	.19	.18	.18	.18	.21	.21	.21	.25	.24	.26	.28	.27	.27	.27
, variable	m.M\$	.12	.12	.13	.14	.15	.16	.17	.18	.19	.20	.22	.23	.24	.25
, fuel(HSD)	m.M\$	.92	.99	1.07	1.21	1.36	1.51	1.67	1.84	2.02	2.29	2.59	2.91	3.25	3.61
, fuel (LO)	m.M\$	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Total cost	m.M\$	1.45	1.99	1.69	2.45	1.72	2.27	3.20	2.66	3.97	3.90	3.09	3.41	4.91	7.57

表 5.6 ディーゼル発電によるキャッシュフロー表 (カビット系統) (2/2)

Description	Unit	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Demand, peak power	MW	2.87	3.00	3.13	3.26	3.39	3.53	3.69	3.86	4.02	4.18
, energy	GWh	13.09	13.68	14.26	14.85	15.44	16.10	16.83	17.57	18.31	19.04
Annual load factor		.52	.52	.52	.52	.52	.52	.52	.52	.52	.52
Reserve capacity	MW	.60	.60	.63	.65	.68	.71	.74	.77	.80	.84
Required total capacity	MW	3.47	3.60	3.76	3.91	4.06	4.24	4.43	4.63	4.82	5.01
Diesel retirement	MW	-1.20	.00	.00	-.30	.00	-.40	.00	.00	-.50	.00
Diesel transferred	MW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Power addition, hydro	MW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
, diesel	MW	1.50	.00	.50	.50	.00	.50	.50	.00	.50	.50
System capacity, installed	MW	3.70	3.70	4.20	4.40	4.40	4.50	5.00	5.00	5.00	5.50
, guaranteed	MW	3.70	3.70	4.20	4.40	4.40	4.50	5.00	5.00	5.00	5.50
(hydro, guaranteed)	MW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(diesel, H.S.D.unit)	MW	3.70	3.70	4.20	4.40	4.40	4.50	5.00	5.00	5.00	5.50
(diesel, cold reserve)	MW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Installation cost, hydro	m.M\$	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
, diesel	m.M\$	.38	1.53	1.15	.38	1.53	1.15	.38	1.53	1.49	1.38
Power generation, hydro	GWh	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
, diesel	GWh	13.09	13.68	14.26	14.85	15.44	16.10	16.83	17.57	18.31	19.04
Hydro OM cost	m.M\$	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Diesel OM cost, fixed	m.M\$	.29	.29	.33	.35	.35	.35	.39	.39	.39	.43
, variable	m.M\$	.26	.27	.29	.30	.31	.32	.34	.35	.37	.38
, fuel(HSD)	m.M\$	3.78	3.95	4.12	4.29	4.46	4.65	4.86	5.07	5.28	5.50
, fuel (LO)	m.M\$	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Total cost	m.M\$	4.71	6.04	5.88	5.31	6.64	6.47	5.97	7.34	7.19	6.31

表 7.1 建設費の算定

(Unit:M\$)

Description	Foreign Currency	Local Currency	Total
1. PREPARATORY WORKS			
1.1 Access road	594,500	741,000	1,335,500
1.2 Field investigation	7,000	133,000	140,000
1.3 Camp facilities	84,000	336,000	420,000
Sub-total	685,500	1,210,000	1,895,500
2. CIVIL WORKS			
2.1 River diversion	208,639	259,291	467,930
2.2 Intake dam	2,588,024	2,247,006	4,835,030
2.3 Penstock line	121,829	98,681	220,510
2.4 Powerhouse	894,528	752,322	1,646,850
2.5 Tailrace	295,819	226,721	522,540
2.6 Drainage channel	52,528	41,072	93,600
Sub-total	4,161,367	3,625,093	7,786,460
3. METAL WORKS	2,598,000	650,200	3,248,200
4. GENERATING EQUIPMENT	4,708,000	721,000	5,429,000
5. TRANSMISSION LINE AND SUBSTATION	1,643,740	704,460	2,348,200
6. LAND COMPENSATION	0	70,000	70,000
7. DIRECT CONSTRUCTION COST	13,796,607	6,980,753	20,777,360
8. ENGINEERING SERVICES	2,077,740	0	2,077,740
9. ADMINISTRATIVE COST	0	1,038,870	1,038,870
10. PHYSICAL CONTINGENCY	2,381,150	1,202,940	3,584,090
11. TOTAL CONSTRUCTION COST	18,255,497	9,222,563	27,478,060

表 7.2 建設費の内訳 (1 / 3)

(Unit: \$)

Description	Unit	Q'ty	Foreign currency		Local currency		Equivalent cost	
			Unit	Amount	Unit	Amount	Unit	Amount
1. PREPARATORY WORKS								
1.1 ACCESS ROAD								
New road	m	7,000	70	490,000	90	630,000	160	1,120,000
Improved road	m	1,500	29	43,500	36	54,000	65	97,500
New bridge	L.S.			61,000		57,000		118,000
1.2 FIELD INVESTIGATION								
	L.S.			7,000		133,000		140,000
1.3 CAMP FACILITIES								
	L.S.			84,000		336,000		420,000
Total of 1				685,500		1,210,000		1,895,500
2. CIVIL WORKS								
2.1 RIVER DIVERSION								
Earth embankment	cub.m	9,470	1.6	15,152	2.4	22,728	4	37,880
Concrete wall	cub.m	378	151.0	57,078	139.0	52,542	290	109,620
Reinforcement	ton	12	1,463.0	17,556	437.0	5,244	1,900	22,800
Gabion protection	sq.m	2,280	35.0	79,800	65.0	148,200	100	228,000
Removal of embankment	cub.m	9,470	2.9	27,463	2.1	19,887	5	47,350
Others	L.S.			11,590		10,690		22,280
Sub total of 2.1				208,639		259,291		467,930
2.2 INTAKE DAM AND INTAKE								
Excavation in common	cub.m	11,910	2.9	34,539	2.1	25,011	5	59,550
" weathered rock	cub.m	14,960	5.4	80,784	5.6	83,776	11	164,560
" rock	cub.m	3,040	9.5	28,880	8.5	25,840	18	54,720
Concrete in dam body	cub.m	13,944	109.0	1,519,896	101.0	1,408,344	210	2,928,240
" pier and intake	cub.m	3,210	151.0	484,710	139.0	446,190	290	930,900
Reinforcement	ton	163	1,463.0	238,469	437.0	71,231	1,900	309,700
Drilling grout hole	m	792	40.0	31,680	50.0	39,600	90	71,280
Cement in grouting	ton	79	590.0	46,610	410.0	32,390	1,000	79,000
Backfill, random material	cub.m	1,710	1.6	2,736	2.4	4,104	4	6,840
Others	L.S.			119,720		110,520		230,240
Sub total of 2.2				2,588,024		2,247,006		4,835,030

表 7.2 建設費の内訳 (2/3)

(Unit: M\$)

Description	Unit	Q'ty	Foreign currency		Local currency		Equivalent cost	
			Unit	Amount	Unit	Amount	Unit	Amount
2.3 PENSTOCK LINE								
Excavation in common	cub.m	1,840	2.9	5,336	2.1	3,864	5	9,200
" weathered rock	cub.m	1,150	5.4	6,210	5.6	6,440	11	12,650
" rock	cub.m	1,650	9.5	15,675	8.5	14,025	18	29,700
Concrete	cub.m	476	151.0	71,876	139.0	65,164	290	138,040
Reinforcement	ton	14	1,463.0	20,482	437.0	6,118	1,900	26,500
Others	L.S.			2,250		2,070		4,320
Sub total of 2.3				121,829		98,681		220,510
2.4 POWERHOUSE								
Excavation in common	cub.m	1,440	2.9	4,176	2.1	3,024	5	7,200
" weathered rock	cub.m	1,390	5.4	7,506	5.6	7,784	11	15,290
" rock	cub.m	3,710	9.5	35,245	8.5	31,535	18	66,780
Concrete above generator floor	cub.m	1,038	182.0	188,916	168.0	174,384	350	363,300
below generator floor	cub.m	1,141	151.0	172,291	139.0	158,599	290	330,890
in switchyard	cub.m	285	182.0	51,870	168.0	47,880	350	99,750
Reinforcement	ton	86	1,463.0	125,818	437.0	37,582	1,900	163,400
Superstructure	cub.m	1,438	151.0	217,138	139.0	199,882	290	417,020
Backfill, random material	cub.m	7,730	1.6	12,368	2.4	18,552	4	30,920
Others	L.S.			79,200		73,100		152,300
Sub total of 2.4				894,528		752,322		1,646,850
2.5 TAILRACE								
Excavation in common	cub.m	770	2.9	2,233	2.1	1,617	5	3,850
" weathered rock	cub.m	2,870	5.4	15,498	5.6	16,072	11	31,570
" rock	cub.m	2,340	9.5	22,230	8.5	19,890	18	42,120
Concrete	cub.m	1,165	151.0	175,915	139.0	161,935	290	337,850
Reinforcement	ton	51	1,463.0	74,613	437.0	22,287	1,900	96,900
Others	L.S.			5,330		4,920		10,250
Sub total of 2.5				295,819		226,721		522,540
2.6 DRAINAGE CHANNEL								
Concrete	cub.m	264	151.0	39,864	139.0	36,696	290	76,560
Reinforcement	ton	8	1,463.0	11,704	437.0	3,496	1,900	15,200
Others	L.S.			960		880		1,840
Sub total of 2.6				52,528		41,072		93,600
Total of 2				4,161,367		3,625,093		7,786,460

表 7.2 建設費の内訳 (3/3)

(Unit: M\$)

Description	Unit	Q'ty	Foreign currency		Local currency		Equivalent cost	
			Unit	Amount	Unit	Amount	Unit	Amount
3. METAL WORK								
Spillway gate	ton	150	9,600	1,440,000	2,400	360,000	12,000	1,800,000
Sand flushing gate	ton	55	9,600	528,000	2,400	132,000	12,000	660,000
Intake gate	ton	9	9,600	86,400	2,400	21,600	12,000	108,000
Draft gate	ton	10	9,600	96,000	2,400	24,000	12,000	120,000
Intake trashrack	ton	18	4,600	82,800	1,100	19,800	5,700	102,600
Raking equipment	ton	12	16,000	192,000	4,000	48,000	20,000	240,000
Steel penstock	ton	32	5,400	172,800	1,400	44,800	6,800	217,600
Total of 3				2,598,000		650,200		3,248,200
4. GENERATING EQUIPMENT								
L.S.								
5. TRANSMISSION LINE AND SUBSTATION								
Transmission line	L.S.			1,302,840		558,360		1,861,200
Substation	L.S.			340,900		146,100		487,000
Total of 5				1,643,740		704,460		2,348,200
6. LAND COMPENSATION								
L.S.								
7. DIRECT CONSTRUCTION COST								
6,990,753								
8. ENGINEERING SERVICES								
2,077,740								
9. ADMINISTRATION COST								
1,038,870								
10. PHYSICAL CONTINGENCY								
1,202,940								
11. TOTAL CONSTRUCTION COST								
18,255,497								
9,222,563								
27,478,060								

表 7.3 建設費の支出スケジュール (1/3)

(Unit: \$)

Description	1992			1993			1994		
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	
1. PREPARATORY WORKS									
1.1 ACCESS ROAD									
New road	490,000	630,000	490,000	630,000					
Improved road	43,500	54,000	43,500	54,000					
New bridge	61,000	57,000	61,000	57,000					
1.2 FIELD INVESTIGATION	7,000	133,000	7,000	133,000					
1.3 CAMP FACILITIES	84,000	336,000	84,000	336,000					
Total of 1	685,500	1,210,000	685,500	1,210,000					
2. CIVIL WORKS									
2.1 RIVER DIVERSION									
Earth embankment	15,152	22,728	1,515	2,273	13,637	20,455			
Concrete wall	57,078	52,542	5,708	5,254	51,370	47,288			
Reinforcement	17,556	5,244	1,756	524	15,800	4,720			
Gabion protection	79,800	148,200	7,980	14,820	71,820	133,380			
Removal of embankment	27,463	19,887	2,746	1,989	4,119	2,983	20,597	14,915	
Others	11,590	10,690	1,159	1,069	8,693	8,018	1,739	1,604	
Sub total of 2.1	208,639	259,291	20,864	25,929	165,439	216,843	22,336	16,519	
2.2 INTAKE DAM									
Excavation in common	34,539	25,011	24,177	17,508	10,362	7,503			
" weathered rock	80,784	83,776	56,549	58,643	24,235	25,133			
" rock	28,880	25,840	20,216	18,088	8,664	7,752			
Concrete in dam body	1,519,896	1,408,344	151,990	140,834	835,943	774,589	531,964	492,920	
" pier and intake	484,710	446,190	48,471	44,619	266,591	245,405	169,649	156,167	
Reinforcement	238,469	71,231	23,847	7,123	131,158	39,177	83,464	24,931	
Drilling grout hole	31,680	39,600	3,168	3,960	17,424	21,780	11,088	13,860	
Cement in grouting	46,610	32,390	4,661	3,239	25,636	17,815	16,313	11,337	
Backfill, random material	2,736	4,104	547	821	1,094	1,642	1,094	1,642	
Others	119,720	110,520	29,930	27,630	65,846	60,786	23,944	22,104	
Sub total of 2.2	2,588,024	2,247,006	363,556	322,465	1,386,952	1,201,581	837,516	722,960	

表 7.3 建設費の支出スケジュール (2/3)

(Unit: M\$)

Description	TOTAL		1992		1993		1994	
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
2.3 PENSTOCK LINE								
Excavation in common weathered rock	5336.0	3,864	2,668	1,932	2,668	1,932	1,932	
"	6210.0	6,440	3,105	3,220	3,105	3,220	3,220	
"	15675.0	14,025	7,838	7,013	7,838	7,013	7,013	
Concrete	71876.0	66,164	7,188	6,616	64,688	59,548	59,548	
Reinforcement	20,482.0	5,118	2,048	612	16,434	5,506	5,506	
Others	2,250	2,070	788	725	1,463	1,346	1,346	
Sub total of 2.3	121,829	98,681	23,634	20,117	98,195	78,564	78,564	
2.4 POWERHOUSE								
Excavation in common weathered rock	4,176	3,024	2,088	1,512	2,088	1,512	1,512	
"	7,506	7,784	3,753	3,892	3,753	3,892	3,892	
"	35,245	31,535	17,623	15,768	17,623	15,768	15,768	
Concrete above generator floor	188,916	174,384	18,892	17,438	151,133	139,507	139,507	17,438
below generator floor	172,291	158,599	17,229	15,860	137,833	126,879	126,879	17,229
in switchyard	51,870	47,880	5,187	4,788				46,683
Reinforcement	125,818	37,582	12,582	3,758	88,073	26,307	26,307	25,164
Superstructure	217,138	199,882	21,714	19,988	21,714	19,988	173,710	159,906
Backfill, random material	12,368	18,552	1,237	1,855	9,894	14,842	1,237	1,855
Others	79,200	73,100	15,840	14,620	47,520	43,860	15,840	14,620
Sub total of 2.4	894,528	752,322	116,144	99,479	479,630	392,555	298,755	260,288
2.5 TAILRACE								
Excavation in common weathered rock	2,233	1,617	1,117	809	1,117	809	809	
"	15,498	16,072	7,749	8,036	7,749	8,036	8,036	
"	22,230	19,890	11,115	9,945	11,115	9,945	9,945	
Concrete	175,915	161,935	17,592	16,194	158,324	145,742	145,742	
Reinforcement	74,613	22,287	7,461	2,229	67,152	20,058	20,058	
Others	5,330	4,920	1,865	1,722	3,465	3,198	3,198	
Sub total of 2.5	295,819	226,721	46,899	38,934	248,920	187,787	187,787	
2.6 DRAINAGE CHANNEL								
Concrete	39,864	36,696	3,986	3,670	35,878	33,026	33,026	
Reinforcement	11,704	3,496	1,170	350	10,534	3,146	3,146	
Others	960	880	96	88	864	792	792	
Sub total of 2.6	52,528	41,072	5,253	4,107	47,275	36,965	36,965	
Total of 2	4,161,367	3,625,093	576,349	511,032	2,426,412	2,114,295	1,158,606	999,766

表 7.3 建設費の支出スケジュール (3/3)

(Unit: \$)

Description	1992			1993			1994		
	F.C.	L.C.	TOTAL	F.C.	L.C.	TOTAL	F.C.	L.C.	TOTAL
3. METAL WORK									
Spillway gate	1,440,000	360,000	1,800,000	144,000	36,000	180,000	576,000	144,000	720,000
Sand flushing gate	528,000	132,000	660,000	52,800	13,200	66,000	475,200	118,800	594,000
Intake gate	86,400	21,600	108,000	8,640	2,160	10,800	77,760	19,440	97,200
Draft gate	96,000	24,000	120,000	9,600	2,400	12,000	74,520	17,820	92,340
Intake trashrack	82,800	19,800	102,600	8,280	1,980	10,260	172,800	43,200	216,000
Raking equipment	192,000	48,000	240,000	19,200	4,800	24,000	155,520	40,320	195,840
Steel penstock	172,800	44,800	217,600	17,280	4,480	21,760	1,531,800	383,580	1,915,380
Total of 3	2,598,000	650,200	3,248,200	259,800	65,020	324,820	1,883,200	268,400	2,151,600
4. GENERATING EQUIPMENT	4,708,000	721,000	5,429,000						
5. TRANSMISSION LINE AND SUBSTATION									
Transmission line	1,302,840	558,360	1,861,200	1,042,272	446,688	1,488,960	260,568.0	111,672.0	1,600,632.0
Substation	340,900	146,100	487,000	272,720	116,880	389,600	681,600.0	292,200.0	973,800.0
Total of 5	1,643,740	704,460	2,348,200	1,314,992	563,568	1,878,560	328,748	140,892	1,719,452
6. LAND COMPENSATION									
Total of 6		70,000	70,000						
7. DIRECT CONSTRUCTION COST	13,796,607	6,980,753	20,777,360	1,521,649	1,856,052	3,377,701	7,156,404	3,349,843	10,506,247
8. ENGINEERING SERVICES	2,077,740		2,077,740	415,548		415,548	831,096		1,246,644
9. ADMINISTRATION COST		1,038,870	1,038,870		259,718	259,718		363,605	619,323
10. PHYSICAL CONTINGENCY	2,381,150	1,202,940	3,584,090	290,580	317,370	607,950	1,198,120	557,020	1,755,140
11. TOTAL CONSTRUCTION COST	18,255,497	9,222,563	27,478,060	2,227,777	2,433,139	4,660,916	9,185,620	4,270,468	13,456,084

表 8.1 経済費用への変換係数

Type of goods	Conversion Factor		
	Imports	Exports	Combined
Tradeable goods			
1. Petroleum (refined)	0.47	1.13	0.67
2. Petroleum (crude oil)	0.84	1.13	0.86
3. Construction material	0.82	1.12	0.88
4. Investment goods	0.82	1.12	0.85
Non-tradeable goods/ service			
5. Construction	-	-	0.77
6. Government services	-	-	0.88

Source : National Parameters for Project Appraisal
Malaysian Data (EPU) 1977

表 8.2 経済的建設費の算定 (ムコ計画)

Unit: M\$			
Work Item	Financial cost	Economic cost	Ratio of E/F (%)
1. Preparatory Works	1,895,500	1,384,970	73
2. Civil Works			
2.1 River diversion	467,930	350,960	75
2.2 Intake dam	4,835,030	3,734,920	77
2.3 Penstock line	220,510	171,790	78
2.4 Powerhouse	1,646,850	1,286,740	78
2.5 Tailrace	522,540	404,290	77
2.6 Drainage channel	93,600	72,480	77
Total of 2	7,786,460	6,021,180	77
3. Metal Works	3,248,200	2,871,630	88
4. Generating Equipment	5,429,000	5,297,050	98
5. Transmission Line and Substation	2,348,200	2,234,000	95
6. Land Acquisition	70,000	-	-
Direct Cost	20,777,360	17,808,830	86
7. Engineering Service	2,077,740	2,077,740	100
8. Administration	1,038,870	831,100	80
9. Physical Contingency	3,584,090	3,107,650	87
Total cost	27,478,060	23,825,320	87

表 8.3 ムコを含む電力投入計画

Unit : MW

Year	Installation year of the Mukoh							
	1995 (First)		1996 (second)		1997 (Third)		1998 (Fourth)	
	Diesel	Hydro	Diesel	Hydro	Diesel	Hydro	Diesel	Hydro
1989	0.30		0.30		0.30		0.30	
1990								
1991	0.40		0.40		0.40		0.40	
1992								
1993								
1994	0.50		0.50		0.50		0.50	
1995		2.32						
1996				2.32	0.50		0.50	
1997						2.32	0.50	
1998								2.32
1999								
2000								
2001	1.50		1.50		1.00		0.50	
2002								
2003								
2004	0.50		0.50		0.50		0.50	
2005								
2006	0.50		0.50		0.50		0.50	
2007								
2008	0.50		0.50		0.50		0.50	
2009								
2010	0.50		0.50		0.50		0.50	

表 8.4 経済的費用便益のキャッシュフロー (1/2)

Unit : Million M\$

Year	Benefit streams				Costs streams			
	Capital	Fuel	O&M	Total	Capital	Fuel	O&M	Total
1987	0.230	0.919	0.301	1.449	0.230	0.919	0.301	1.449
1988	0.689	0.994	0.304	1.987	0.689	0.994	0.304	1.987
1989	0.306	1.069	0.315	1.690	0.306	1.069	0.315	1.690
1990	0.918	1.213	0.324	2.455	0.918	1.213	0.324	2.455
1991	-	1.356	0.365	1.721	-	1.356	0.365	1.721
1992	0.382	1.509	0.375	2.266	2.990	1.509	0.375	4.874
1993	1.148	1.670	0.385	3.202	12.839	1.670	0.385	14.893
1994	0.382	1.839	0.434	2.656	7.509	1.839	0.434	9.782
1995	1.530	2.016	0.428	3.974	-	0.381	0.359	0.740
1996	1.148	2.291	0.463	3.901	-	0.483	0.373	0.856
1997	-	2.593	0.498	3.091	-	0.603	0.384	0.987
1998	-	2.914	0.494	3.408	-	0.742	0.397	1.139
1999	1.147	3.253	0.506	4.906	1.147	0.898	0.410	2.456
2000	3.443	3.610	0.517	7.570	3.443	1.072	0.426	4.940
2001	0.382	3.779	0.552	4.713	-	1.205	0.437	1.642
2002	1.530	3.948	0.564	6.042	0.382	1.348	0.451	2.181
2003	1.148	4.117	0.615	5.879	1.148	1.494	0.474	3.115
2004	0.382	4.286	0.642	5.311	0.382	1.644	0.492	2.518
2005	1.530	4.455	0.654	6.639	1.148	1.797	0.512	3.456
2006	1.148	4.646	0.675	6.469	0.382	1.971	0.528	2.881
2007	0.382	4.858	0.729	5.970	1.148	2.165	0.553	3.866
2008	1.530	5.071	0.744	7.345	0.382	2.361	0.579	3.322
2009	1.492	5.283	0.759	7.189	1.148	2.558	0.583	4.288
2010	1.377	5.495	0.813	6.308	-	2.755	0.624	3.379
2011	1.033	5.495	0.813	7.341	-	2.755	0.624	3.379
2012	-	5.495	0.813	6.308	-	2.755	0.624	3.379
2013	-	5.495	0.813	6.308	-	2.755	0.624	3.379
2014	1.033	5.495	0.813	7.341	1.033	2.755	0.624	4.412
2015	3.098	5.495	0.813	9.406	3.098	2.755	0.624	6.478

表 8.4 経済的費用便益のキャッシュフロー (2/2)

Unit : Million M\$

Year	Benefit streams				Costs streams			
	Capital	Fuel	O&M	Total	Capital	Fuel	O&M	Total
2016	0.344	5.494	0.813	6.652	-	2.755	0.624	3.379
2017	1.377	5.495	0.813	7.685	0.344	2.755	0.624	3.724
2018	1.033	5.495	0.813	7.341	1.033	2.755	0.624	4.412
2019	0.344	5.495	0.813	6.652	0.344	2.755	0.624	3.724
2020	1.377	5.495	0.813	7.685	1.033	2.755	0.624	4.412
2021	1.033	5.495	0.813	7.341	0.344	2.755	0.624	3.724
2022	0.344	5.495	0.813	6.652	1.033	2.755	0.624	4.412
2023	1.377	5.495	0.813	7.685	0.344	2.755	0.624	3.724
2024	1.377	5.495	0.813	7.685	1.033	2.755	0.624	4.412
2025	1.377	5.495	0.813	7.685	-	2.755	0.624	3.379
2026	1.033	5.495	0.813	7.341	-	2.755	0.624	3.379
2027	-	5.495	0.813	6.308	-	2.755	0.624	3.379
2028	-	5.495	0.813	6.308	-	2.755	0.624	3.379
2029	1.033	5.495	0.813	7.341	1.033	2.755	0.624	4.412
2030	3.098	5.495	0.813	9.406	3.098	2.755	0.624	6.478
2031	0.344	5.495	0.813	6.652	-	2.755	0.624	3.379
2032	1.377	5.495	0.813	7.685	0.344	2.755	0.624	3.724
2033	1.033	5.495	0.813	7.341	1.033	2.755	0.624	4.412
2034	0.344	5.495	0.813	6.652	0.344	2.755	0.624	3.724
2035	1.033	5.495	0.813	7.341	1.033	2.755	0.624	4.412
2036	-	5.495	0.813	6.308	-	2.755	0.624	3.379

表 8.5 過去及び1995年におけるSESCOの財務状況

Item	1978	1979	1980	1981	1982	1983	1984	1985	1986	1995
Energy sales (GWh)	223	275	305	344	383	445	474	535	569	1,342
Revenue (M\$10 ⁶)	47	57	71	101	112	132	140	159	161	375
Tariff (M\$/kWh)	0.20	0.21	0.23	0.29	0.29	0.29	0.29	0.30	0.28	0.28
Expenses (M\$10 ⁶)	33	38	55	79	89	97	103	108	92	220
Net income (M\$10 ⁶)	14	19	16	22	23	35	37	51	69	155
Fixed assets (M\$10 ⁶)	168	176	191	210	239	305	326	825	867	2,294
Acc. Depreciation (M\$10 ⁶)	50	58	66	76	86	100	117	144	173	693
Net assets (M\$10 ⁶)	118	118	125	134	153	205	209	681	694	1,601
ROR (%)	12	16	13	16	15	17	18	7	10	9.7
Peak demand (MW)	61	69	74	84	101	107	116	133	141	331

Note: Acc. Depreciation means accumulated depreciation
 Net fixed assets is equal to fixed assets minus accumulated depreciation.

ROR is expressed by the ratio of net income to net fixed assets on annual basis.

表8.6 ムコ計画の財務的キャッシュフロー

Unit:M\$

No Year	Cost		Revenue
	Foreign	Local	
1 1987			
2 1988			
3 1989			
4 1990			
5 1991			
6 1992	2,458,770	2,519,460	2,204,800
7 1993	10,492,850	4,466,200	2,264,000
8 1994	8,089,370	2,660,770	2,326,020
9 1995		221,690	2,382,340
10 1996		221,690	2,433,020
11 1997		221,690	2,475,260
12 1998		221,690	2,511,870
13 1999		221,690	2,537,220
14 2000		221,690	2,559,740
15 2001		221,690	2,576,640
16 2002		221,690	2,593,540
17 2003		221,690	2,610,430
18 2004		221,690	2,627,330
19 2005		221,690	2,644,220
20 2006		221,690	2,658,300
21 2007		221,690	2,675,200
22 2008		221,690	
23 2009		221,690	
24 2010		221,690	
50 2036		221,690	2,675,200

表 8.7 財 務 表

(Unit : M\$)

No Year	Local Currency Portion	Foreign Portion	Revenue	Balance	Accumulated Balance
	O&M Interest Repayment	Interest Repayment			
1 1992	188,960	98,350		-283,310	-287,310
2 1993	523,960	518,060		-1,042,202	-1,329,330
3 1994	723,480	841,640		-1,565,120	-2,894,450
4 1995	221,690	841,640	2,204,800	417,990	-2,476,460
5 1996	221,690	841,640	2,264,000	477,190	-1,999,270
6 1997	221,690	841,640	2,326,020	316,180	-1,683,090
7 1998	221,690	841,640	2,382,340	372,500	-1,310,590
8 1999	221,690		2,433,020	-397,210	-1,707,800
9 2000	221,690		2,475,260	-354,970	-2,062,770
10 2001	221,690		2,511,870	-318,360	-2,381,130
11 2002	221,690		2,537,220	-293,010	-2,674,140
12 2003	221,690		2,559,740	-270,490	-2,944,630
13 2004	221,690		2,576,640	-253,590	-3,198,220
14 2005	221,690		2,593,540	-236,690	-3,434,910
15 2006	221,690		2,610,430	-219,800	-3,654,710
16 2007	221,690		2,627,330	-202,900	-3,857,610
17 2008	221,690		2,644,220	-186,010	-4,043,620
18 2009	221,690		2,658,300	-171,930	-4,215,550
19 2010	221,690		2,675,200	-155,030	-4,370,580
20 2011	221,690		2,675,200	-155,030	-4,525,610
21 2012	221,690		2,675,200	-155,030	-4,680,640
22 2013	221,690		2,675,200	-155,030	-4,835,670
23 2014	221,690		2,675,200	-155,030	-4,990,700
24 2015	221,690		2,675,200	-155,030	-5,145,730
25 2016	221,690		2,675,200	-155,030	-5,300,760

表 8.8 財 務 表

No	Year	Cost	Interest	Repayment	Revenue	Balance	Accumulation
1	1992	2,519,460	98,350			-2,617,810	-2,617,810
2	1993	4,466,220	518,060			-4,984,260	-7,602,070
3	1994	2,660,770	841,640			-3,502,410	-11,104,480
4	1995	221,690	841,640		2,204,800	1,141,470	-9,963,010
5	1996	221,690	841,640		2,264,000	1,200,670	-8,762,340
6	1997	221,690	841,640		2,326,020	1,262,690	-7,499,650
7	1998	221,690	841,640		2,382,340	1,319,010	-6,180,640
8	1999	221,690		1,662,030	2,433,020	549,300	-5,631,340
9	2000	221,690		1,662,030	2,475,260	591,540	-5,039,800
10	2001	221,690		1,662,030	2,511,870	628,150	-4,411,650
11	2002	221,690		1,662,030	2,537,220	653,500	-3,758,150
12	2003	221,690		1,662,030	2,559,740	676,020	-3,082,130
13	2004	221,690		1,662,030	2,576,640	692,920	-2,389,210
14	2005	221,690		1,662,030	2,593,540	709,820	-1,679,390
15	2006	221,690		1,662,030	2,610,430	726,710	-952,680
16	2007	221,690		1,662,030	2,627,330	743,610	-209,070
17	2008	221,690		1,662,030	2,644,220	760,500	551,430
18	2009	221,690		1,662,030	2,658,300	774,580	1,326,010
19	2010	221,690		1,662,030	2,675,200	791,480	2,117,490
20	2011	221,690		1,662,030	2,675,200	791,480	2,908,970
21	2012	221,690		1,662,030	2,675,200	791,480	3,700,450
22	2013	221,690		1,662,030	2,675,200	791,480	4,491,930
23	2014	221,690		1,662,030	2,675,200	791,480	5,283,410
24	2015	221,690		1,662,030	2,675,200	791,480	6,074,890
25	2016	221,690		1,662,030	2,675,200	791,480	6,866,370

表 8.9 財 務 表

No	Year	Cost	Interest	Repayment	Revenue	Balance	Accumulation
1	1992	2,519,460	196,700			-2,716,160	-2,716,160
2	1993	4,466,200	1,036,130			-5,502,330	-8,218,490
3	1994	2,660,760	1,683,280			-4,344,040	-12,562,530
4	1995	221,690	1,683,280		2,204,800	299,830	-12,262,700
5	1996	221,690	1,683,280		2,264,000	359,030	-11,903,670
6	1997	221,690		2,458,220	2,326,020	-353,890	-12,257,560
7	1998	221,690		2,458,220	2,382,340	-297,570	-12,555,130
8	1999	221,690		2,458,220	2,433,020	-246,890	-12,802,020
9	2000	221,690		2,458,220	2,475,260	-204,650	-13,006,670
10	2001	221,690		2,458,220	2,511,870	-168,040	-13,174,710
11	2002	221,690		2,458,220	2,537,220	-142,690	-13,317,400
12	2003	221,690		2,458,220	2,559,740	-120,170	-13,437,570
13	2004	221,690		2,458,220	2,576,640	-103,270	-13,540,840
14	2005	221,690		2,458,220	2,593,540	-86,370	-13,627,210
15	2006	221,690		2,458,220	2,610,430	-69,480	-13,696,690
16	2007	221,690		2,458,220	2,627,330	-52,580	-13,749,270
17	2008	221,690		2,458,220	2,644,220	-35,690	-13,784,960
18	2009	221,690		2,458,220	2,658,300	-21,610	-13,806,570
19	2010	221,690		2,458,220	2,675,200	-4,710	-13,811,280
20	2011	211,690		2,458,220	2,675,200	-4,710	-13,815,990

表 8.10 カピット・系統の財務表 (ダイーゼル発電)

Unit: Million M\$

Year	Fuel	O&M	Depre- ciation	Expense		Revenue		Balance		Accumula- tion	
				I	II	I	II	I	II		
1987	1.07	0.32	0.02	1.41	1.62	1.62	0.21	0.21	0.21	0.21	
1988	1.29	0.31	0.07	1.67	1.75	1.75	0.08	0.08	0.29	0.29	
1989	1.40	0.32	0.09	1.81	1.88	1.88	0.07	0.07	0.36	0.36	
1990	1.59	0.34	0.16	2.09	2.02	2.02	-0.07	-0.07	0.29	0.29	
1991	1.78	0.38	0.16	2.32	2.16	2.16	-0.16	-0.16	0.13	0.13	
1992	1.98	0.40	0.19	2.57	2.30	2.30	-0.27	-0.27	-0.14	-0.14	
1993	2.18	0.41	0.29	2.88	2.44	2.44	-0.44	-0.44	-0.58	-0.58	
1994	2.41	0.47	0.32	3.20	2.58	2.58	-0.62	-0.62	-1.20	-1.20	
1995	3.67	0.47	0.46	4.60	2.72	2.72	-1.88	-1.88	-3.08	-3.08	
1996	4.16	0.51	0.57	5.24	2.87	2.87	-2.37	-2.37	-5.27	-5.27	
1997	4.70	0.56	0.57	5.83	3.04	3.22	-2.79	-2.61	-8.24	-7.88	
1998	5.28	0.56	0.57	6.41	3.19	3.40	-3.22	-3.01	-11.46	-10.89	
1999	5.91	0.57	0.68	7.16	3.36	3.57	-3.80	-3.59	-15.26	-14.48	
2000	10.50	0.58	1.00	12.08	3.52	3.74	-8.56	-8.34	-23.82	-22.82	
2001	11.00	0.62	1.02	12.64	3.69	3.92	-8.95	-8.72	-32.77	-31.54	
2002	11.48	0.63	1.16	13.27	3.85	4.09	-9.42	-9.18	-42.19	-40.72	
2003	11.98	0.69	1.22	13.89	4.01	4.27	-9.88	-9.62	-52.07	-50.34	
2004	12.48	0.72	1.24	14.44	4.18	4.44	-10.26	-10.00	-62.33	-60.34	
2005	12.98	0.73	1.28	14.99	4.35	4.62	-10.64	-10.37	-72.97	-70.71	
2006	13.53	0.75	1.39	15.67	4.53	4.82	-11.14	-10.85	-84.11	-81.56	
2007	14.13	0.81	1.40	16.34	4.74	5.04	-11.60	-11.30	-95.71	-92.86	
2008	14.75	0.82	1.44	17.01	4.95	5.26	-12.06	-11.75	-107.77	-104.61	
2009	15.35	0.84	1.55	17.74	5.16	5.48	-12.58	-12.26	-120.35	-116.87	
2010	16.00	0.91	1.54	18.45	5.36	5.70	-13.09	-12.75	-133.44	-129.62	

Remarks: Revenue I is calculated based on present tariff (M\$0.31/kWh).
Revenue II is calculated based on the tariff of M\$0.33/kWh.

表 8.11 カピット・系統の財務表 (ディーゼル発電)

Unit: Million M\$

Year	Fuel	O&M	Depre- ciation	Expense	Revenue		Balance		Accumula- tion	
					I	II	I	II	I	II
1987	1.07	0.32	0.02	1.41	1.62	1.62	0.21	0.21	0.21	0.21
1988	1.29	0.31	0.07	1.67	1.75	1.75	0.08	0.08	0.29	0.29
1989	1.40	0.32	0.09	1.81	1.88	1.88	0.07	0.07	0.36	0.36
1990	1.59	0.34	0.16	2.09	2.02	2.02	-0.07	-0.07	0.29	0.29
1991	1.78	0.38	0.16	2.32	2.16	2.16	-0.16	-0.16	0.13	0.13
1992	1.98	0.40	0.19	2.57	2.30	2.30	-0.27	-0.27	-0.14	-0.14
1993	2.18	0.41	0.29	2.88	2.44	2.44	-0.44	-0.44	-0.58	-0.58
1994	2.41	0.47	0.32	3.20	2.58	2.58	-0.62	-0.62	-1.20	-1.20
1995	2.64	0.47	0.46	3.57	2.72	2.72	-0.85	-0.85	-2.05	-2.05
1996	2.99	0.51	0.57	4.07	2.87	3.05	-1.20	-1.02	-3.07	-3.07
1997	3.39	0.56	0.57	4.52	3.04	3.22	-1.48	-1.30	-4.37	-4.37
1998	3.80	0.56	0.57	4.93	3.19	3.40	-1.74	-1.53	-5.90	-5.90
1999	4.25	0.57	0.68	5.50	3.36	3.57	-2.14	-1.93	-7.83	-7.83
2000	4.73	0.58	1.00	6.31	3.52	3.74	-2.79	-2.57	-10.40	-10.40
2001	4.95	0.62	1.02	6.59	3.69	3.92	-2.90	-2.67	-13.07	-13.07
2002	5.16	0.63	1.16	6.95	3.85	4.09	-3.10	-2.86	-15.93	-15.93
2003	5.39	0.69	1.22	7.30	4.01	4.27	-3.29	-3.03	-18.96	-18.96
2004	5.61	0.72	1.24	7.57	4.18	4.44	-3.39	-3.13	-22.09	-22.09
2005	5.84	0.73	1.28	7.85	4.35	4.62	-3.50	-3.23	-25.32	-25.32
2006	6.09	0.75	1.39	8.23	4.53	4.82	-3.70	-3.41	-28.73	-28.73
2007	6.36	0.81	1.40	8.57	4.74	5.04	-3.83	-3.53	-32.26	-32.26
2008	6.64	0.82	1.44	8.90	4.95	5.26	-3.95	-3.64	-35.90	-35.90
2009	6.91	0.84	1.55	9.30	5.16	5.48	-4.14	-3.82	-39.72	-39.72
2010	7.20	0.91	1.54	9.65	5.36	5.70	-4.29	-3.95	-43.67	-43.67

表 8.12 カピット・系統の財務表 (小水力 + ディーゼル発電)

Unit: Million M\$

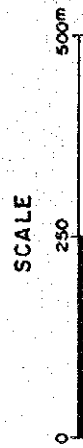
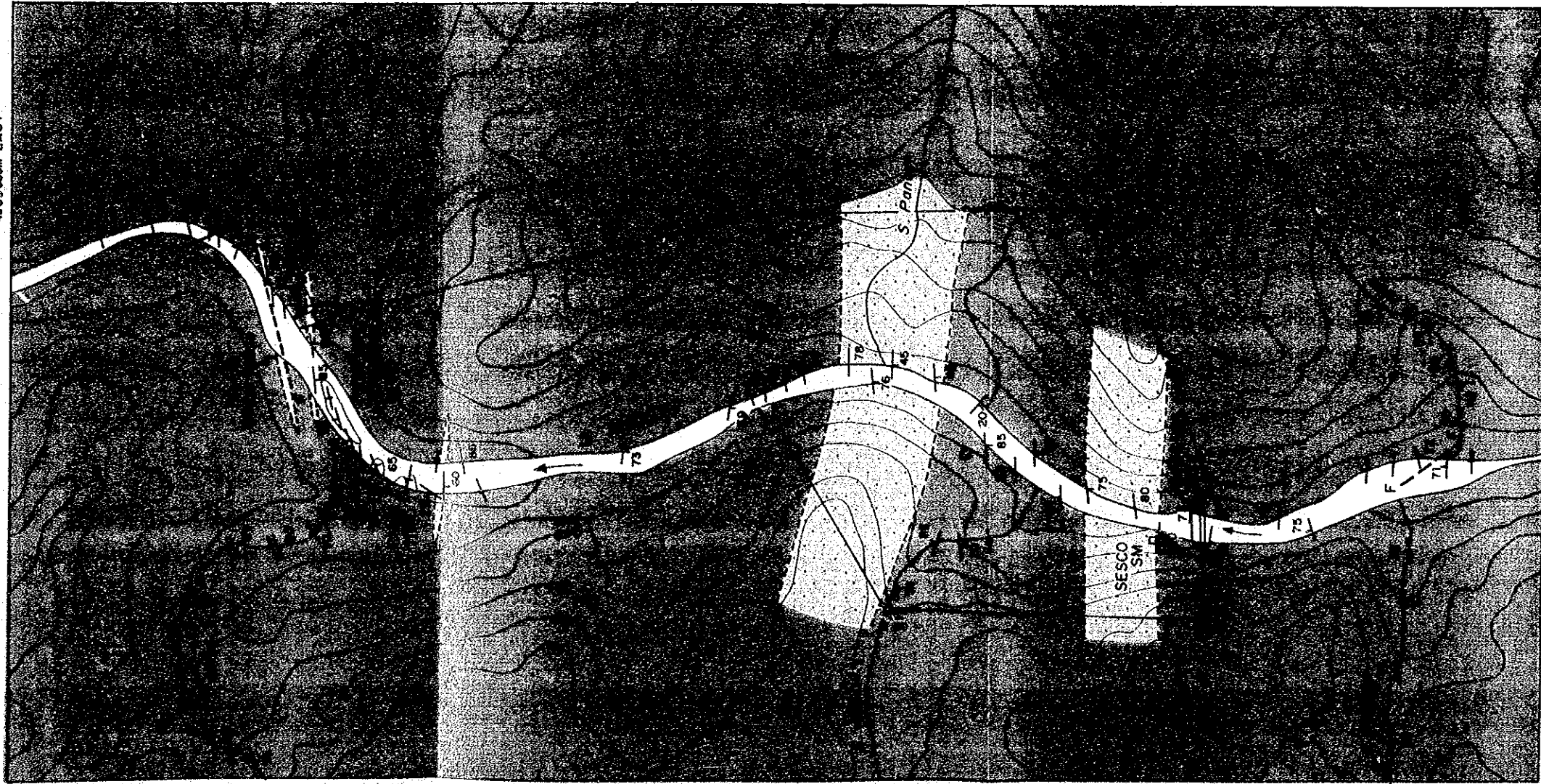
Year	Fuel	O&M	Depreciation Payment	Expense	Revenue		Balance		Accumula- tion I		Accumula- tion II	
					I	II	I	II	I	II	I	II
1987	1.07	0.31	0.02	1.40	1.62	1.62	0.22	0.22	0.22	0.22	0.22	0.22
1988	1.29	0.31	0.07	1.67	1.75	1.75	0.08	0.08	0.08	0.30	0.30	0.30
1989	1.40	0.32	0.09	1.81	1.88	1.88	0.07	0.07	0.07	0.37	0.37	0.37
1990	1.59	0.34	0.16	2.09	2.02	2.02	-0.07	-0.07	-0.07	0.30	0.30	0.30
1991	1.78	0.38	0.16	2.32	2.16	2.16	-0.16	-0.16	-0.16	0.14	0.14	0.14
1992	1.97	0.40	0.34	2.71	2.30	2.30	-0.41	-0.41	-0.41	-0.27	-0.27	-0.27
1993	2.18	0.41	0.95	3.54	2.44	2.44	-1.10	-1.10	-1.10	-1.37	-1.37	-1.37
1994	2.41	0.47	1.32	4.20	2.58	2.58	-1.62	-1.62	-1.62	-2.99	-2.99	-2.99
1995	0.69	0.44	1.32	2.45	2.72	2.72	0.27	0.27	0.27	-2.72	-2.72	-2.72
1996	0.88	0.45	1.32	2.65	2.87	2.87	0.22	0.22	0.40	-2.50	-2.50	-2.50
1997	1.09	0.46	1.32	2.87	3.04	3.04	0.17	0.17	0.35	-2.33	-2.33	-2.33
1998	1.34	0.49	1.32	3.15	3.19	3.19	0.04	0.04	0.25	-2.29	-2.29	-2.29
1999	1.63	0.50	2.25	4.38	3.36	3.36	-1.02	-1.02	-0.81	-3.31	-3.31	-3.31
2000	3.13	0.52	2.57	6.22	3.52	3.52	-2.70	-2.70	-2.48	-6.01	-6.01	-6.01
2001	3.50	0.53	2.57	6.60	3.69	3.69	-2.91	-2.91	-2.68	-8.92	-8.92	-8.92
2002	3.93	0.54	2.59	7.06	3.85	3.85	-3.21	-3.21	-2.97	-12.13	-12.13	-12.13
2003	4.35	0.56	2.65	7.56	4.01	4.01	-3.55	-3.55	-3.29	-15.68	-15.68	-15.68
2004	4.78	0.58	2.67	8.03	4.18	4.18	-3.85	-3.85	-3.59	-19.53	-19.53	-19.53
2005	5.23	0.60	2.71	8.54	4.35	4.35	-4.19	-4.19	-3.92	-23.72	-23.72	-23.72
2006	5.73	0.63	2.75	9.11	4.53	4.53	-4.58	-4.58	-4.29	-28.30	-28.30	-28.30
2007	6.30	0.66	2.83	9.79	4.74	4.74	-5.05	-5.05	-4.75	-33.35	-33.35	-33.35
2008	6.88	0.68	2.77	10.33	4.95	4.95	-5.38	-5.38	-5.07	-38.73	-38.73	-38.73
2009	7.43	0.69	2.88	11.00	5.16	5.16	-5.84	-5.84	-5.52	-44.57	-44.57	-44.57
2010	8.00	0.73	2.88	11.61	5.36	5.36	-6.25	-6.25	-5.91	-50.82	-50.82	-50.82

表 8.13 カピット・系統の財務表 (小水力+ディーゼル発電)

Unit: Million M\$

Year	Fuel	O&M	Depreciation	Expense	Revenue		Balance		Accumula-		Accumula-
					I	II	I	II	tion I	tion II	
1967	1.07	0.31	0.02	1.40	1.62	1.62	0.22	0.22	0.22	0.22	0.22
1968	1.29	0.31	0.07	1.67	1.75	1.75	0.08	0.08	0.30	0.30	0.30
1969	1.40	0.32	0.09	1.81	1.88	1.88	0.07	0.07	0.37	0.37	0.37
1990	1.59	0.34	0.16	2.09	2.02	2.02	-0.07	-0.07	0.30	0.30	0.30
1991	1.78	0.38	0.16	2.32	2.16	2.16	-0.16	-0.16	0.14	0.14	0.14
1992	1.97	0.40	0.34	2.71	2.30	2.30	-0.41	-0.41	-0.27	-0.27	-0.27
1993	2.18	0.41	0.95	3.54	2.44	2.44	-1.10	-1.10	-1.37	-1.37	-1.37
1994	2.41	0.47	1.32	4.20	2.58	2.58	-1.62	-1.62	-2.99	-2.99	-2.99
1995	0.50	0.44	1.32	2.26	2.72	2.72	0.46	0.46	-2.53	-2.53	-2.53
1996	0.63	0.45	1.32	2.40	2.87	3.05	0.47	0.65	-2.06	-2.06	-1.88
1997	0.79	0.46	1.32	2.57	3.04	3.22	0.47	0.65	-1.59	-1.59	-1.23
1998	0.97	0.49	1.32	2.78	3.19	3.40	0.41	0.62	-1.18	-1.18	-0.61
1999	1.17	0.50	2.25	3.92	3.36	3.57	-0.56	-0.35	-1.74	-1.74	-0.96
2000	1.41	0.52	2.57	4.50	3.52	3.74	-0.98	-0.76	-2.72	-2.72	-1.72
2001	1.58	0.53	2.57	4.68	3.69	3.92	-0.99	-0.76	-3.71	-3.71	-2.48
2002	1.77	0.54	2.59	4.90	3.85	4.09	-1.05	-0.81	-4.76	-4.76	-3.29
2003	1.96	0.56	2.65	5.17	4.01	4.27	-1.16	-0.90	-5.92	-5.92	-4.19
2004	2.15	0.58	2.67	5.40	4.18	4.44	-1.22	-0.96	-7.14	-7.14	-5.15
2005	2.35	0.60	2.71	5.66	4.35	4.62	-1.31	-1.04	-8.45	-8.45	-6.19
2006	2.58	0.63	2.75	5.96	4.53	4.82	-1.43	-1.14	-9.88	-9.88	-7.33
2007	2.84	0.66	2.83	6.33	4.74	5.04	-1.59	-1.29	-11.47	-11.47	-8.62
2008	3.09	0.68	2.77	6.54	4.95	5.26	-1.59	-1.28	-13.06	-13.06	-9.90
2009	3.24	0.69	2.88	6.91	5.16	5.48	-1.75	-1.43	-14.81	-14.81	-11.33
2010	3.60	0.73	2.88	7.21	5.36	5.70	-1.85	-1.51	-16.66	-16.66	-12.84

付 図



Shale: Hard, fresh, slightly metamorphosed, thinly and steeply bedded with a minor amount of thin sandstone intercalations. Tightly folded, faulted and fractured.

Sandstone: Hard, fresh fine grained, slightly metamorphosed, thickly bedded, faulted and fractured.

75 Attitude of beds in degrees

+ Vertical beds

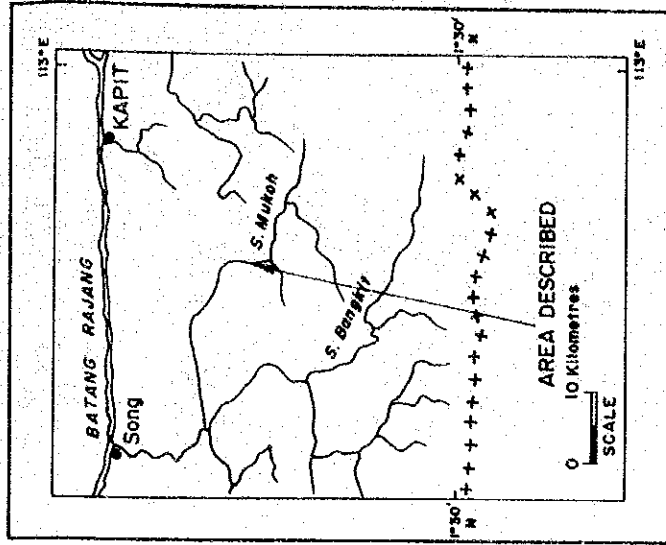
⊖ Landslide

Contour at 100 feet interval

F Fault

→ River flow direction

LOCALITY MAP



[Base Map (scale 1:10,000) is an enlargement of Topographic map sheet 1/112/4 (scale 1:50,000) published by the Director of Survey, Ministry of Defence, United Kingdom, 1968]

图 3-1 ムコ地点周辺の地質図

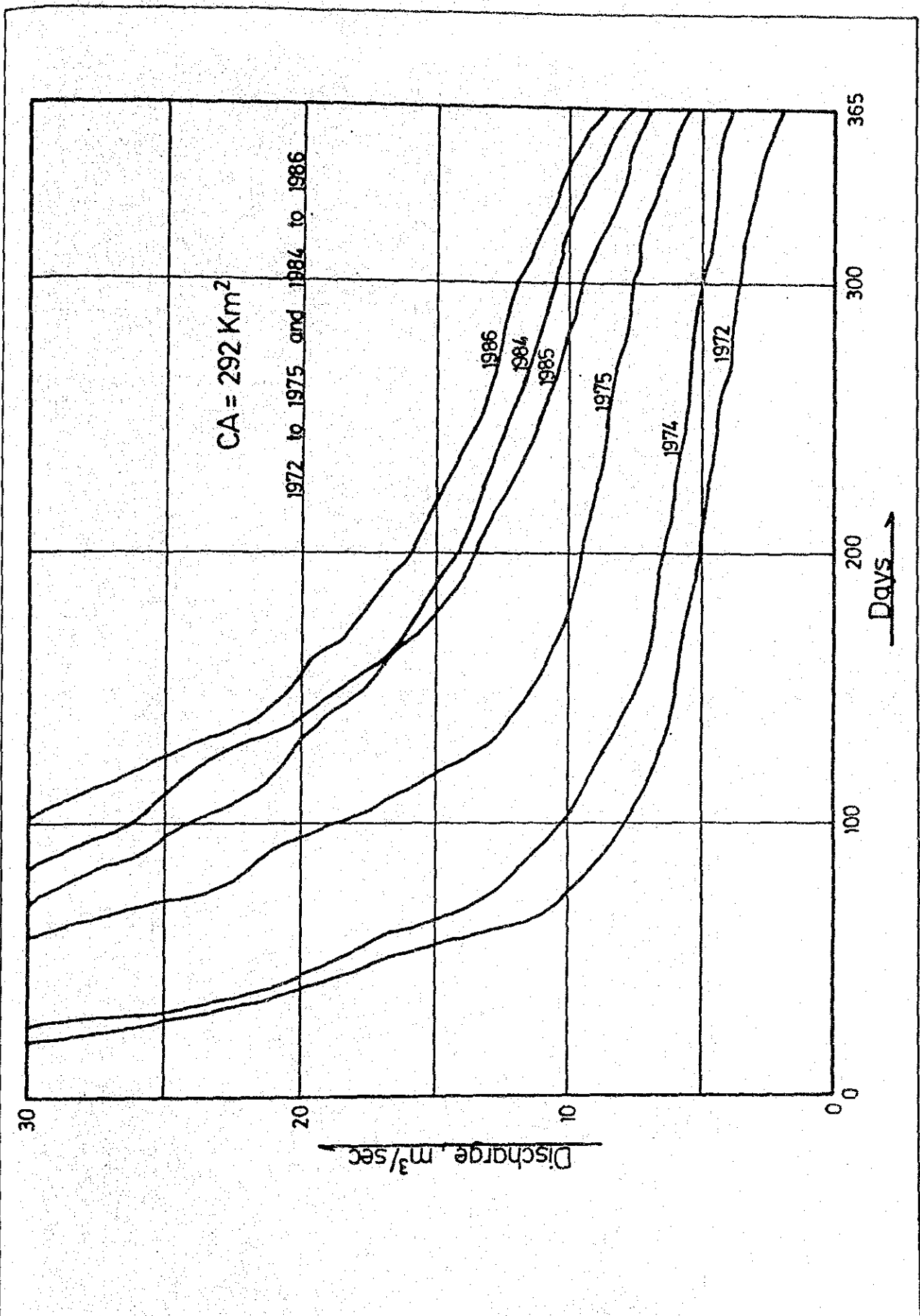
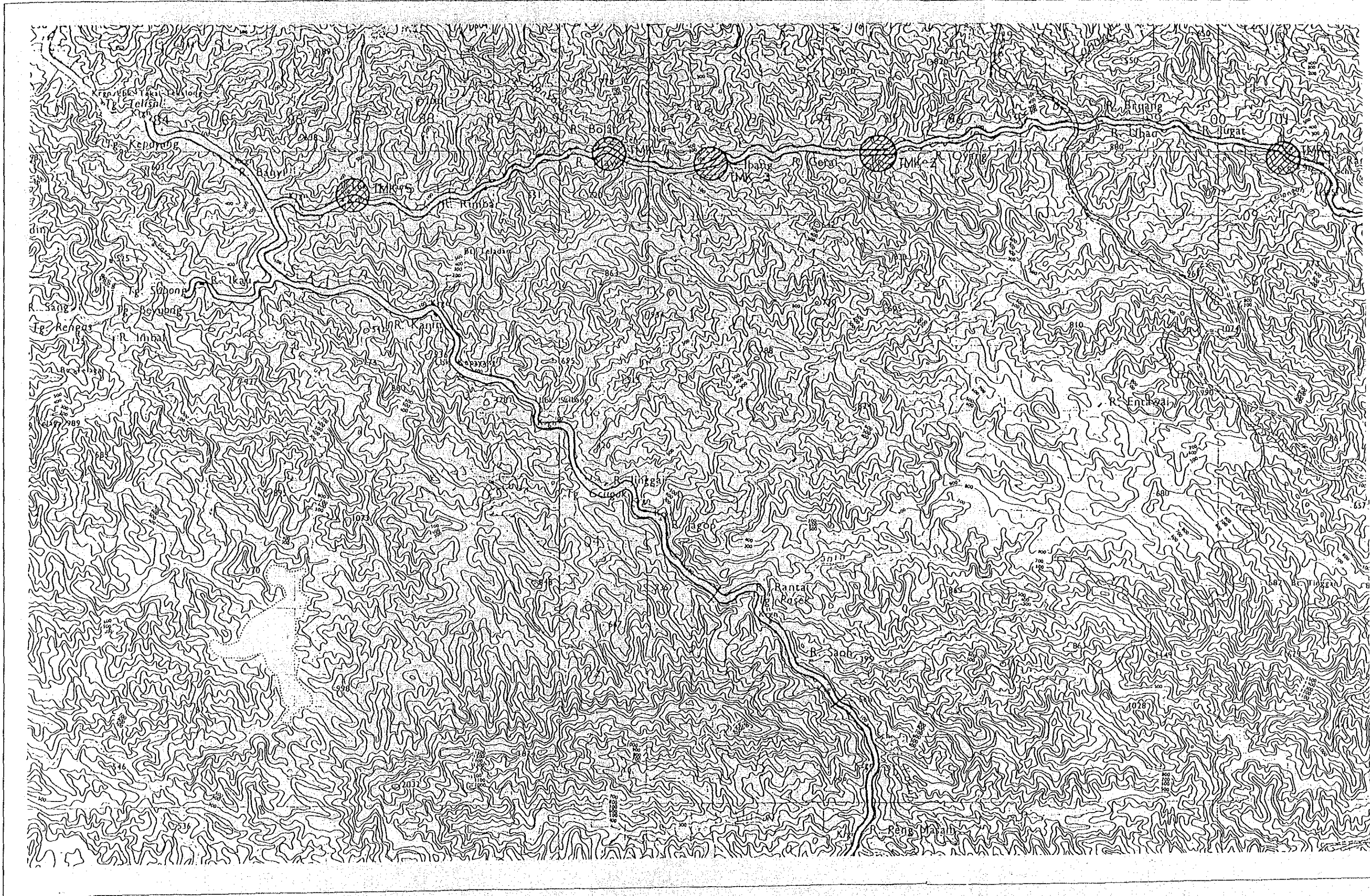


図 3. 2 取水口予定地点での流況曲線 (ムコ計画)

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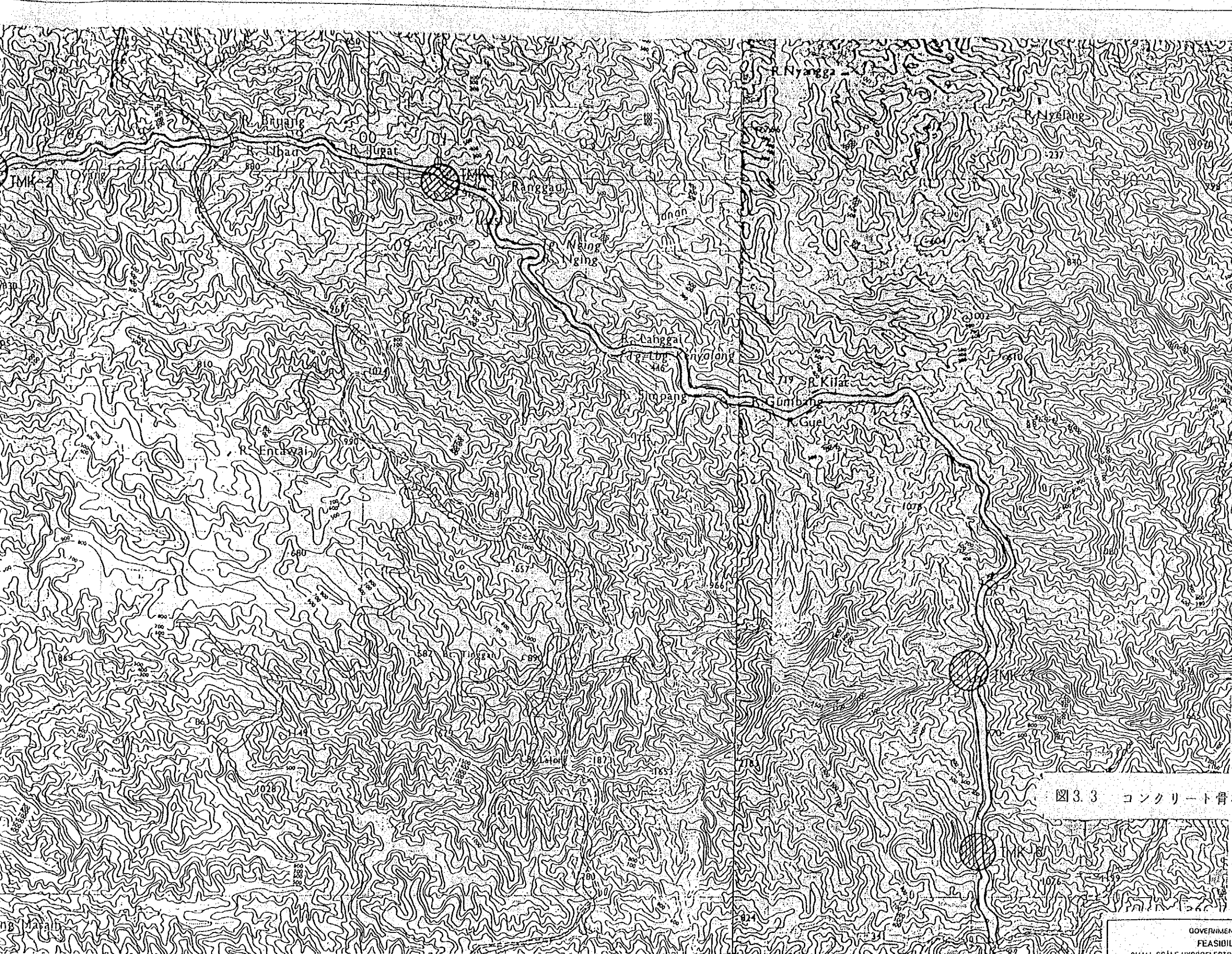
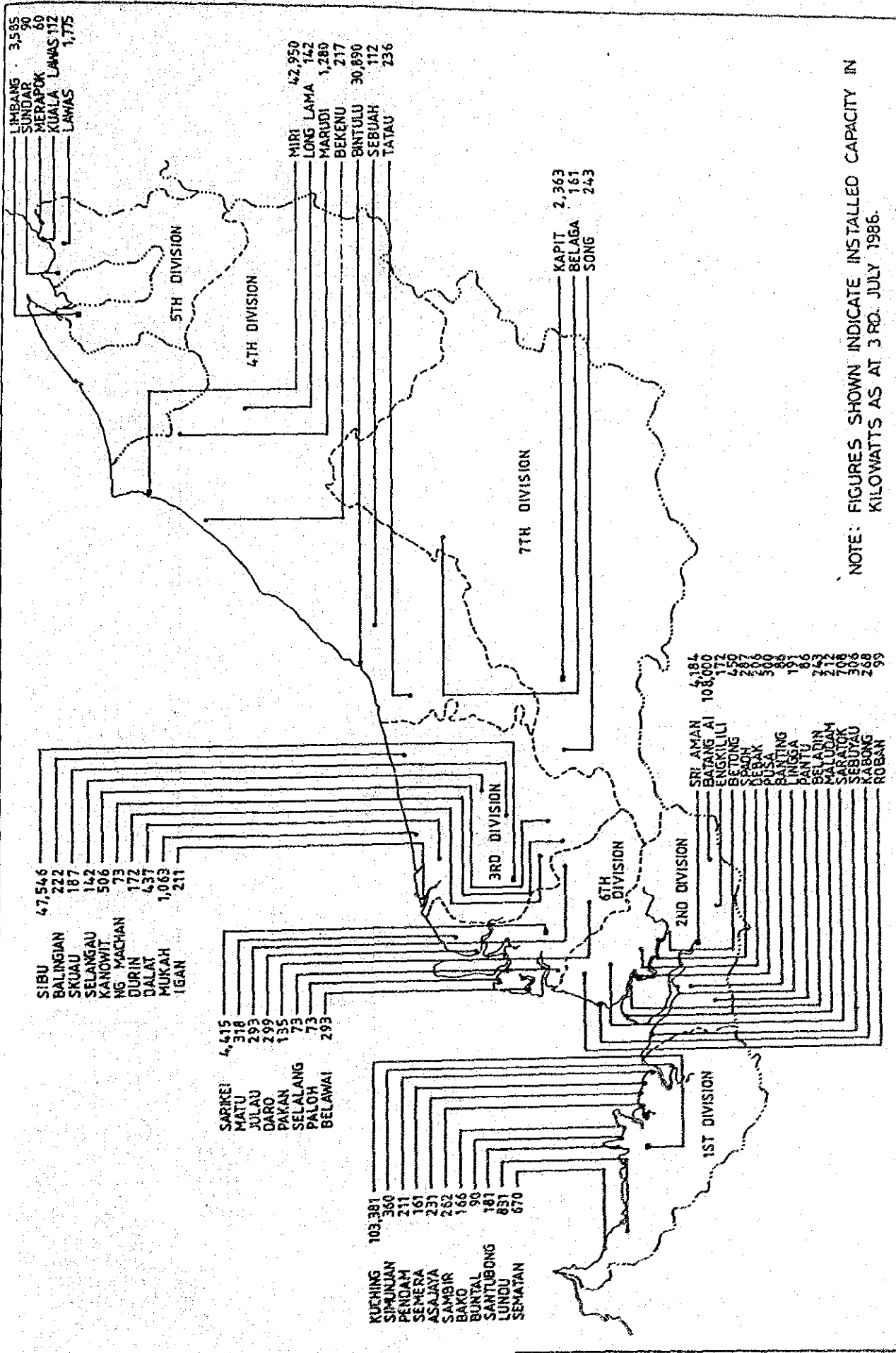


図 3.3 コンクリート骨材採取可能位置

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NOTE: FIGURES SHOWN INDICATE INSTALLED CAPACITY IN KILOWATTS AS AT 3RD. JULY 1986.

図 4.1 SESCOの管轄区および発電所

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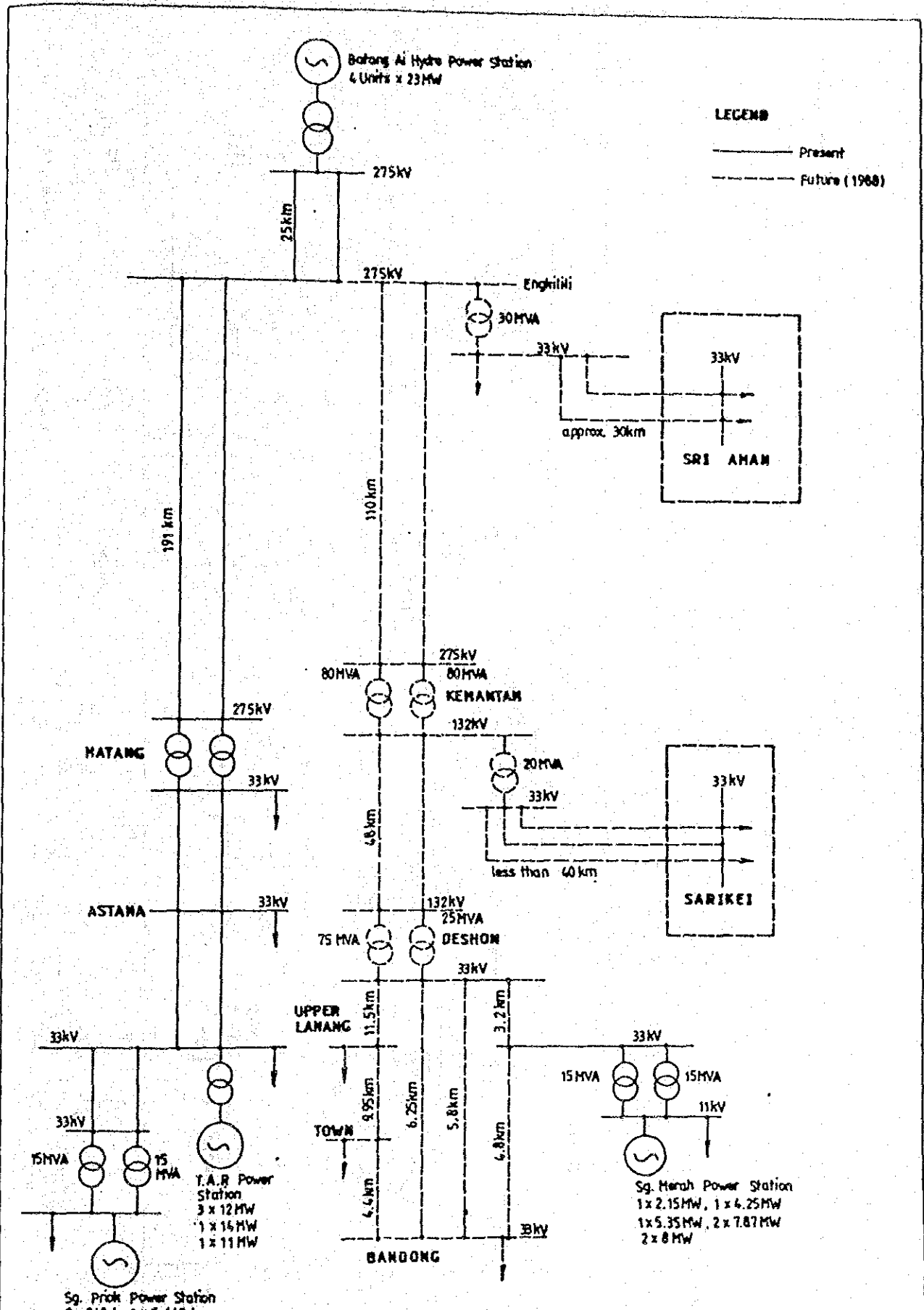


図 4.2 クチン—シブ間送電線系統図

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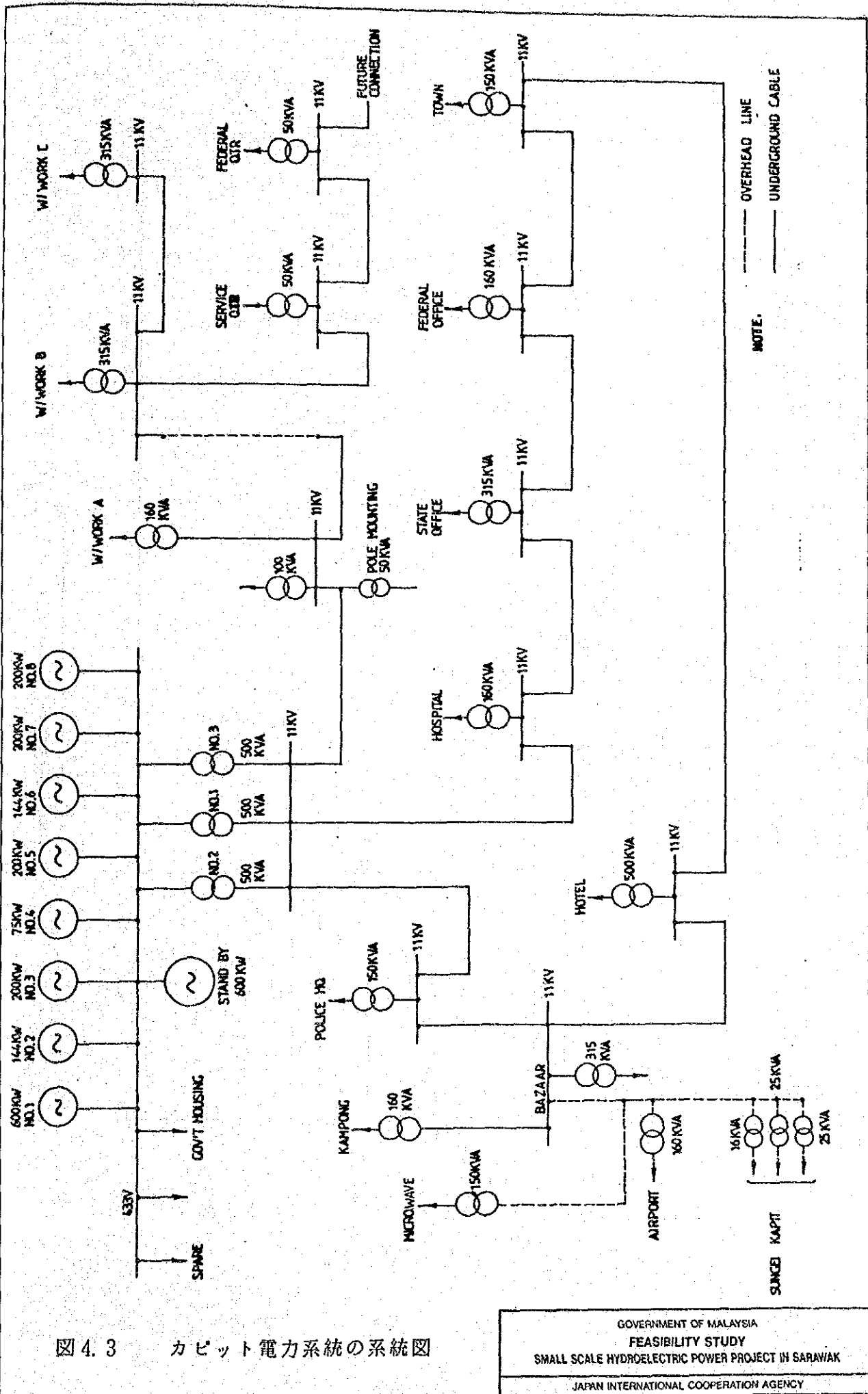


図 4.3 カピット電力系統の系統図

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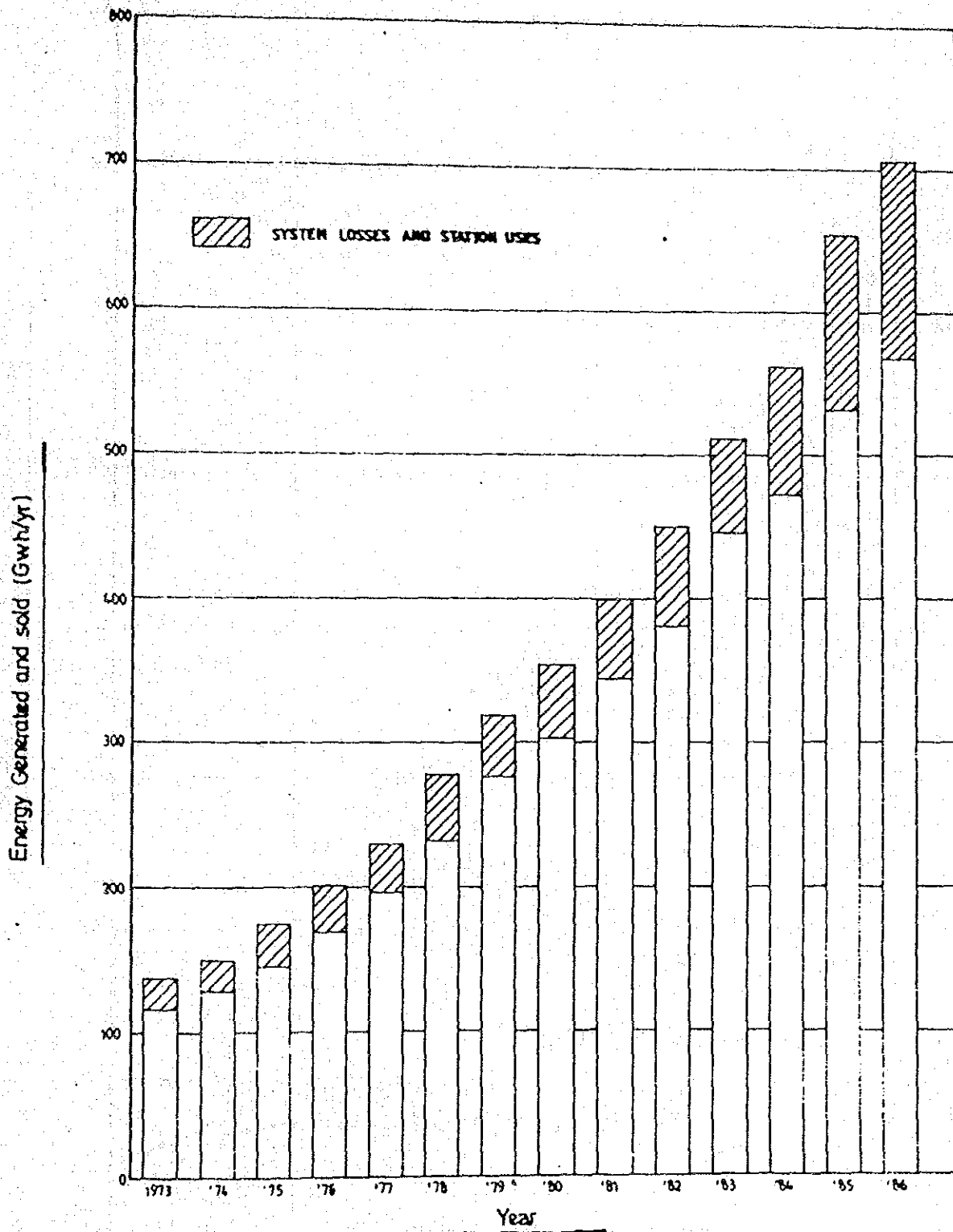


図 4.4 サラワク州における発電電力量と売電量

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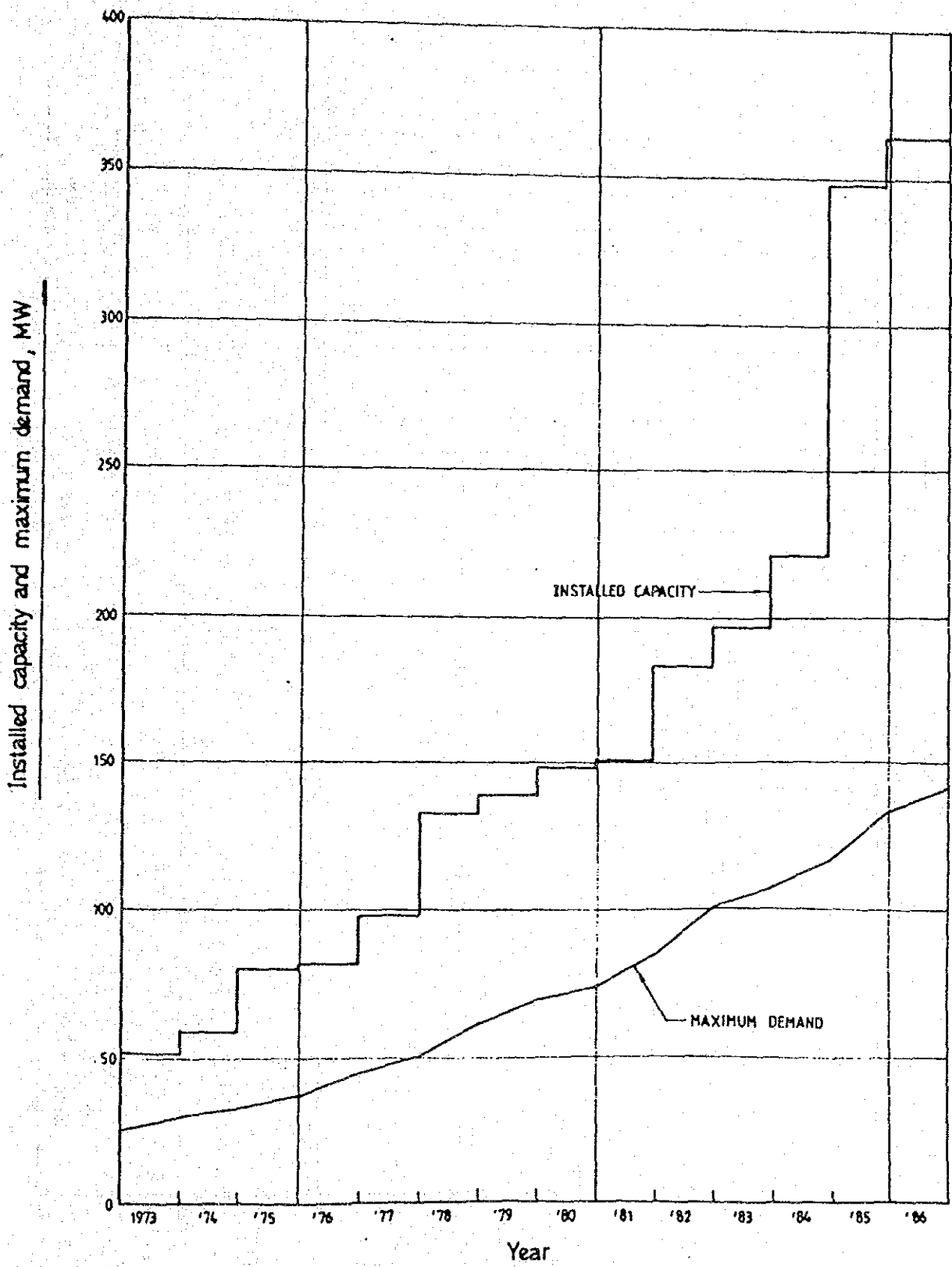


図 4.5 サラワク州における設備容量と最大電力需要

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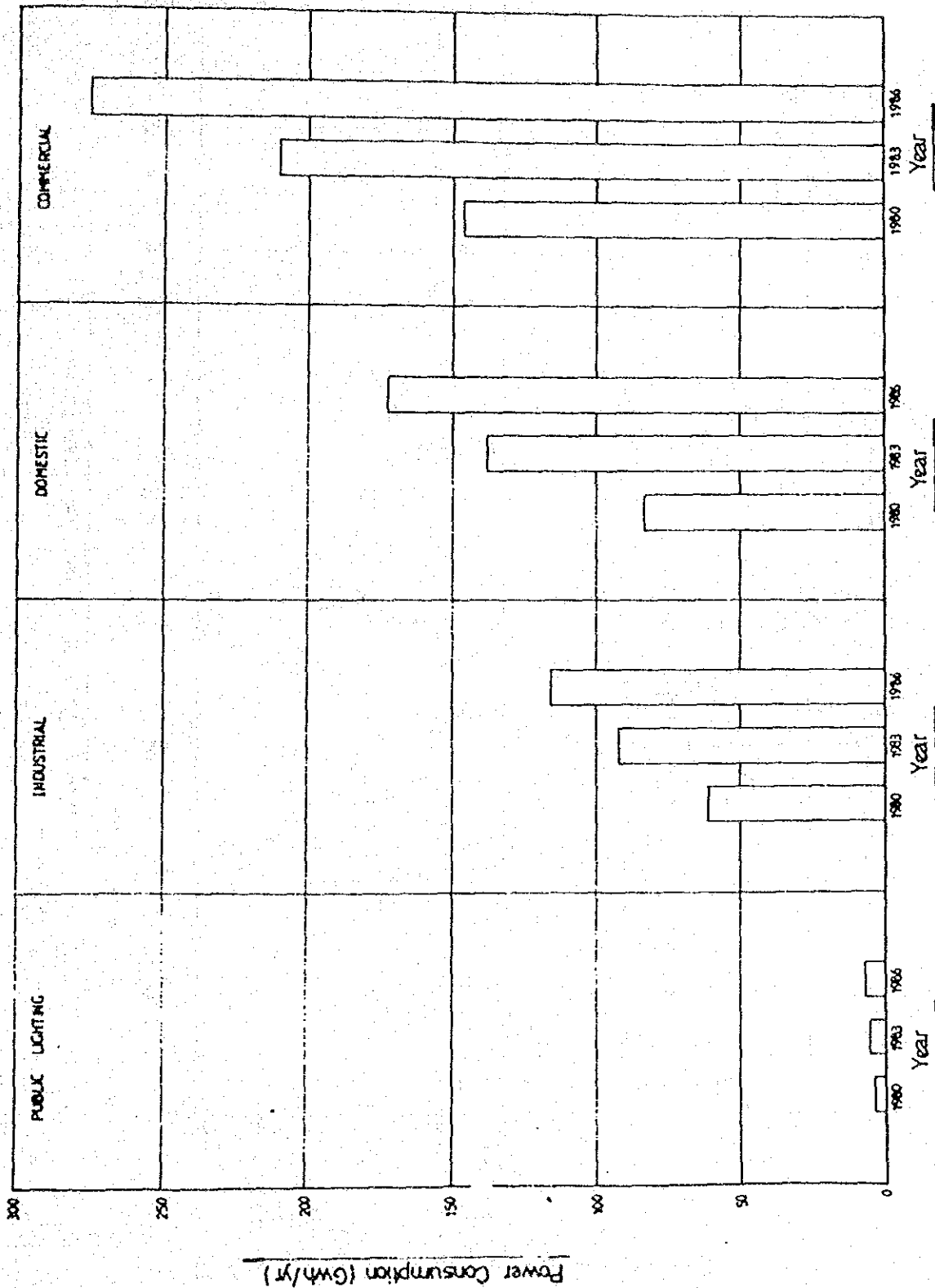


図 4.6 サラワク州における電力消費の内訳

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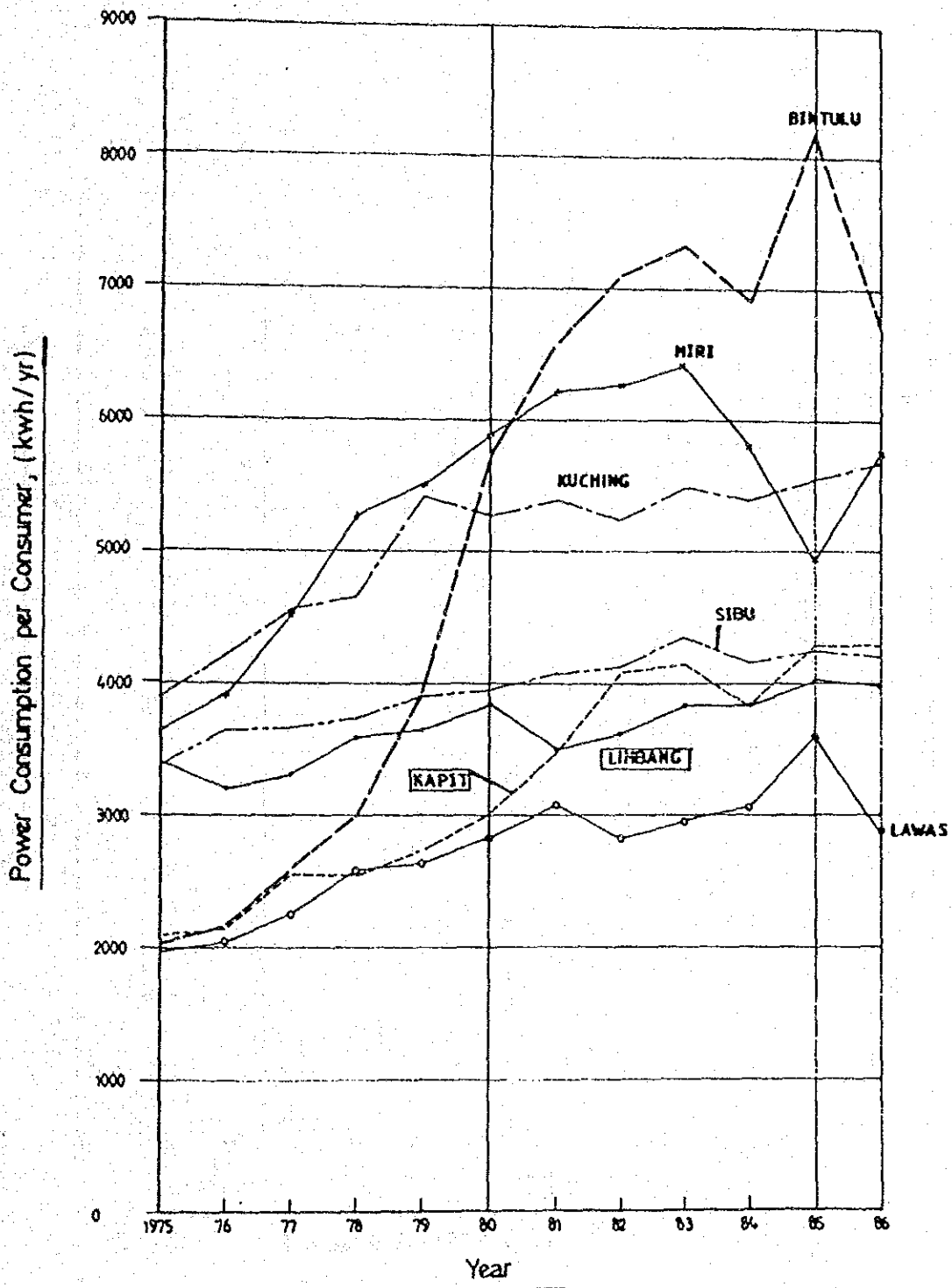


図 4.7 サラワク州における消費者あたりの年間電力消費量

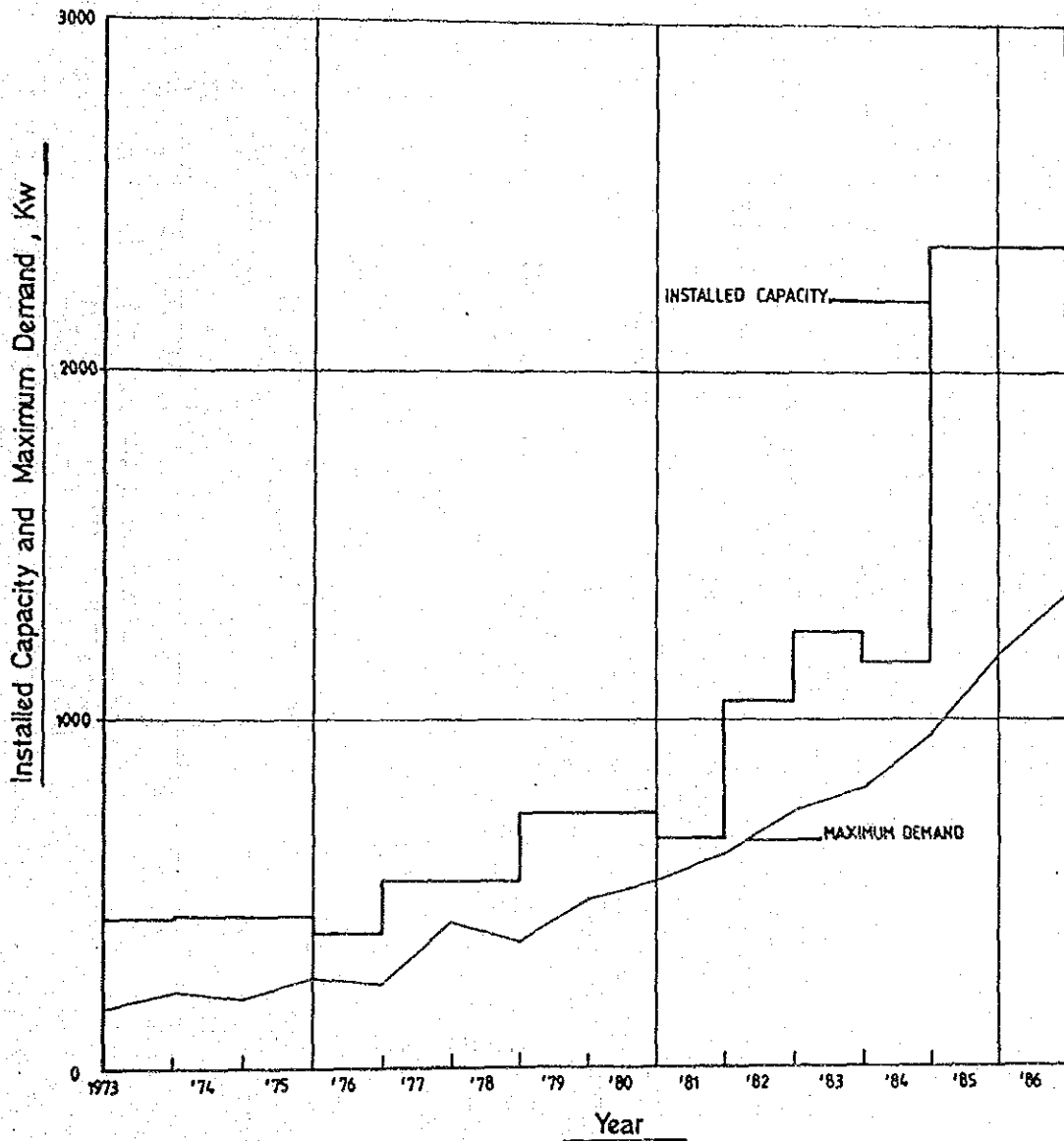


図 4.8 設備容量および最大電力需要 (カピット地区)

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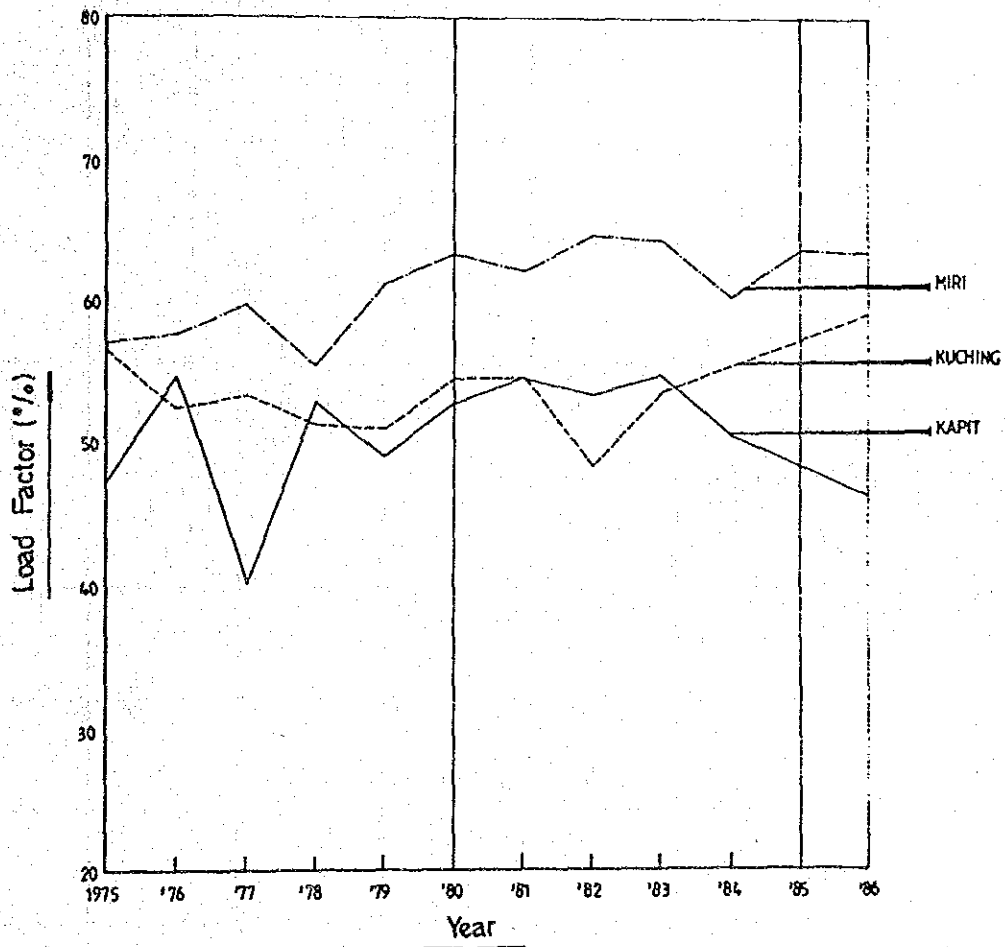


図 4.9 年負荷率の変化 (カピット地区)

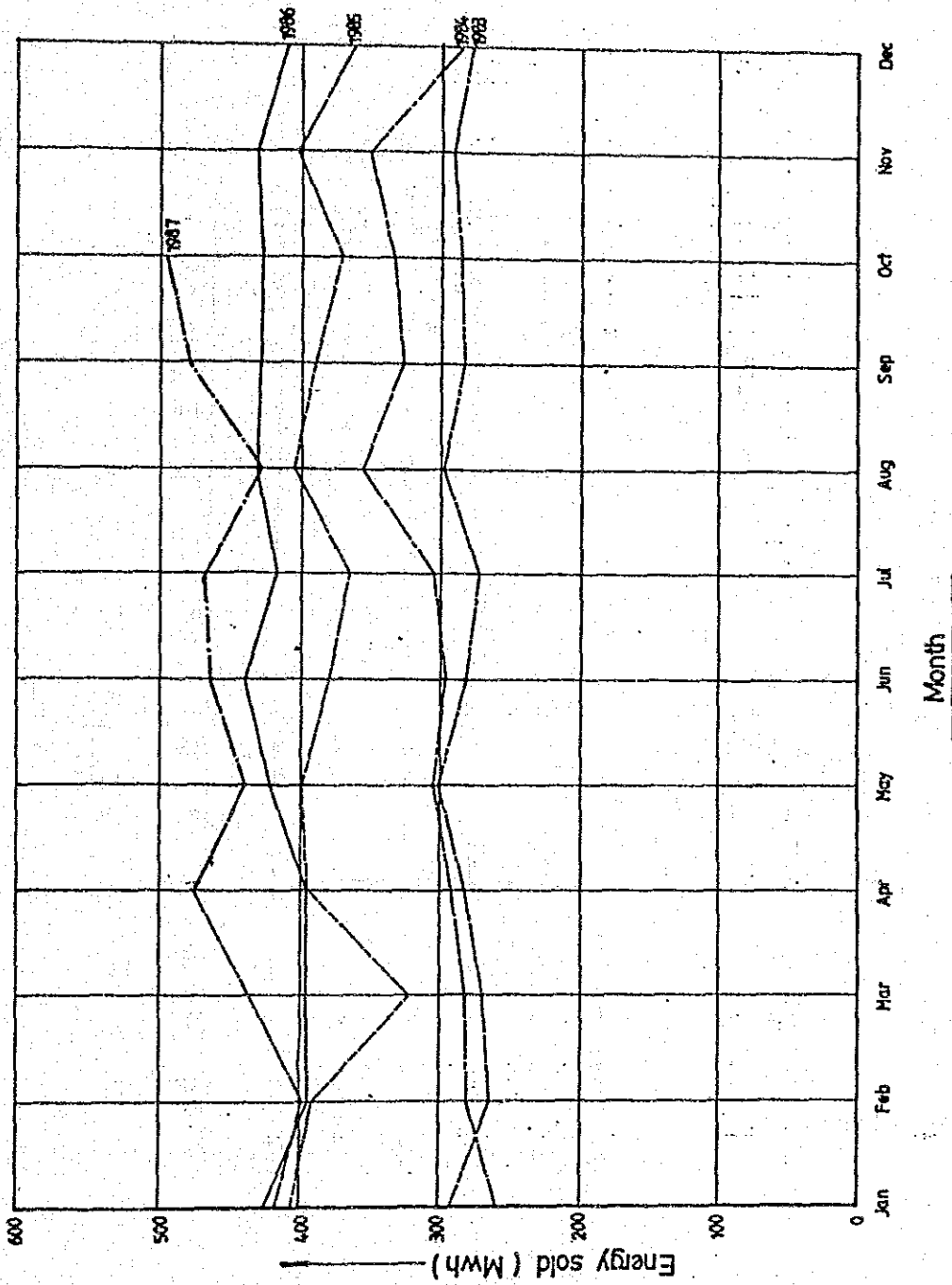


図 4.10
月別電力消費量の変化 (カピット地区)

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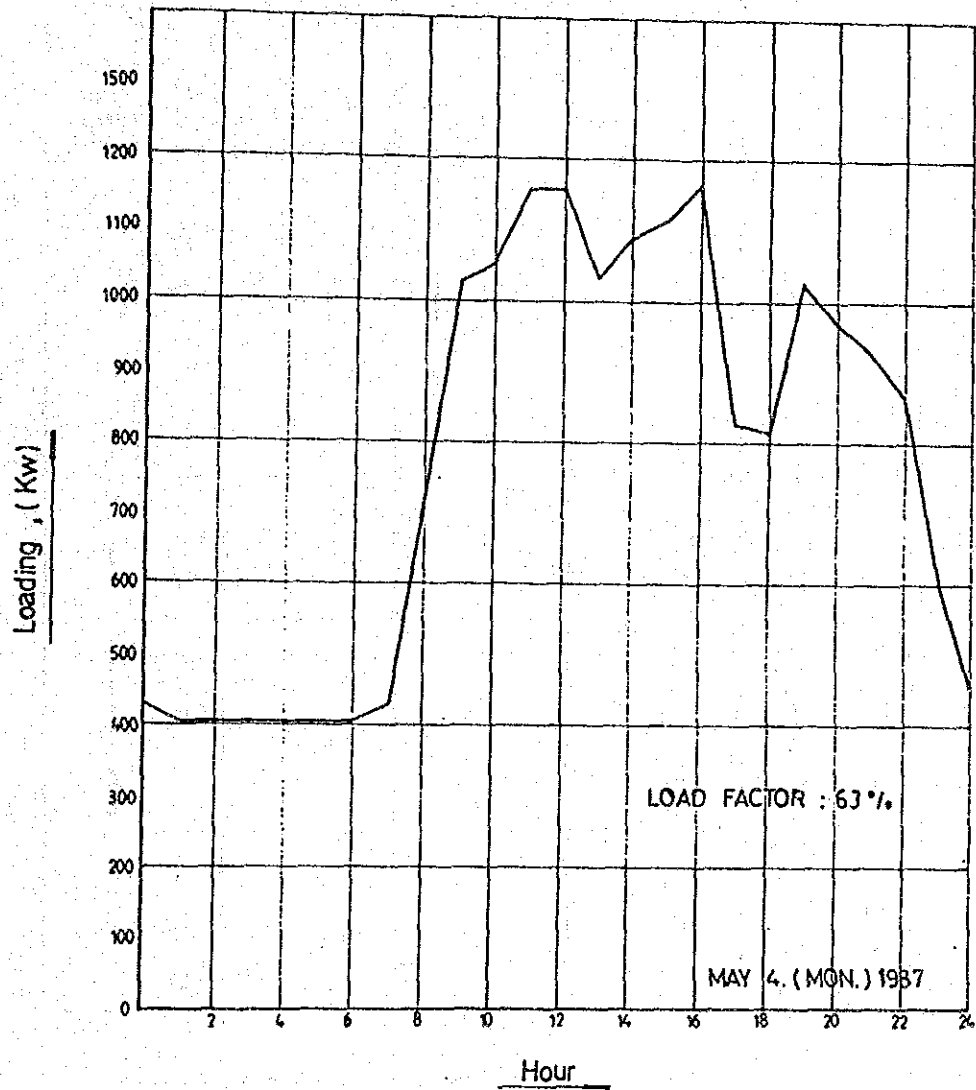


図 4.11 日負荷曲線 (カピット地区)

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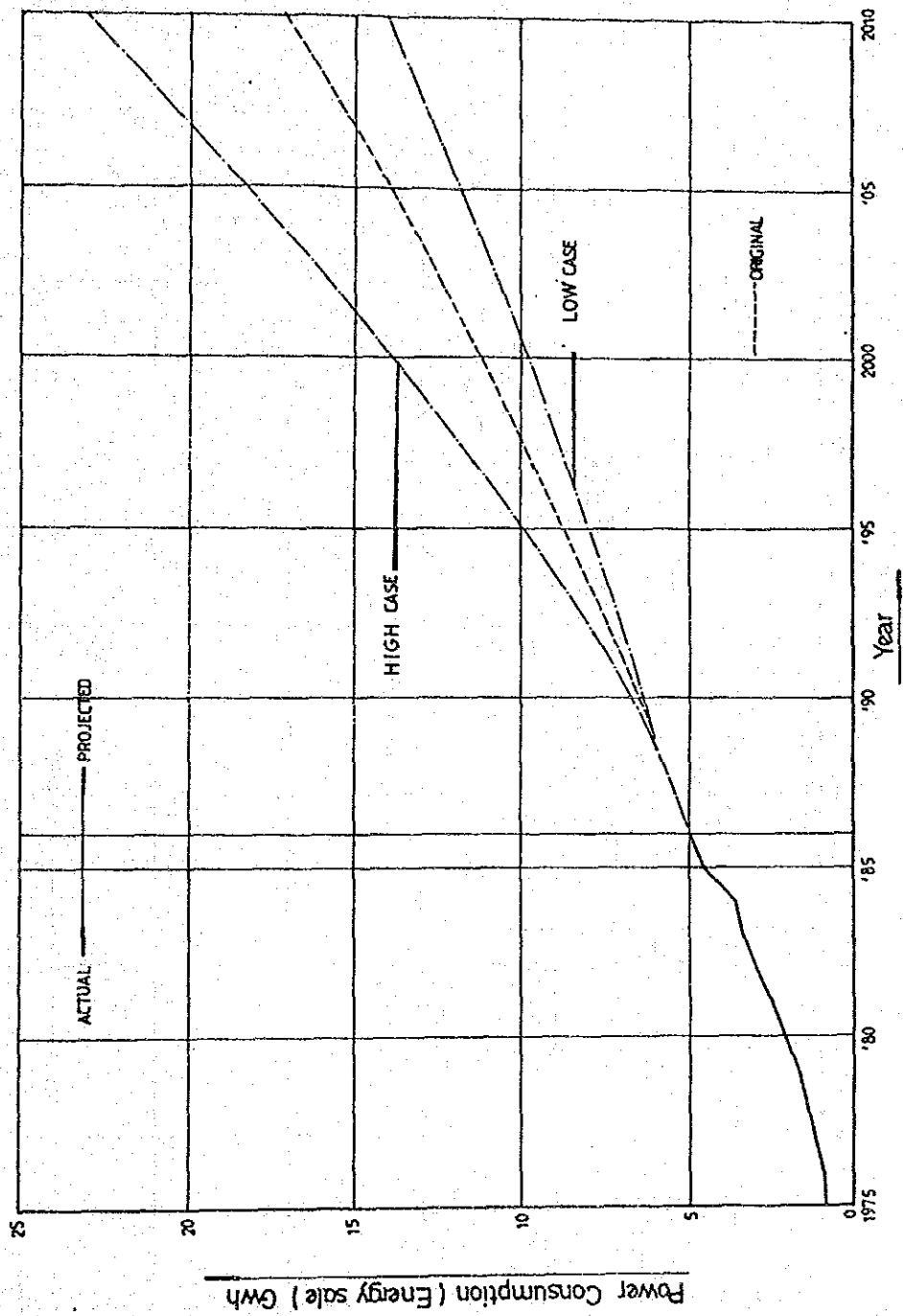


図 4.12 電力消費量予測とその上下限值

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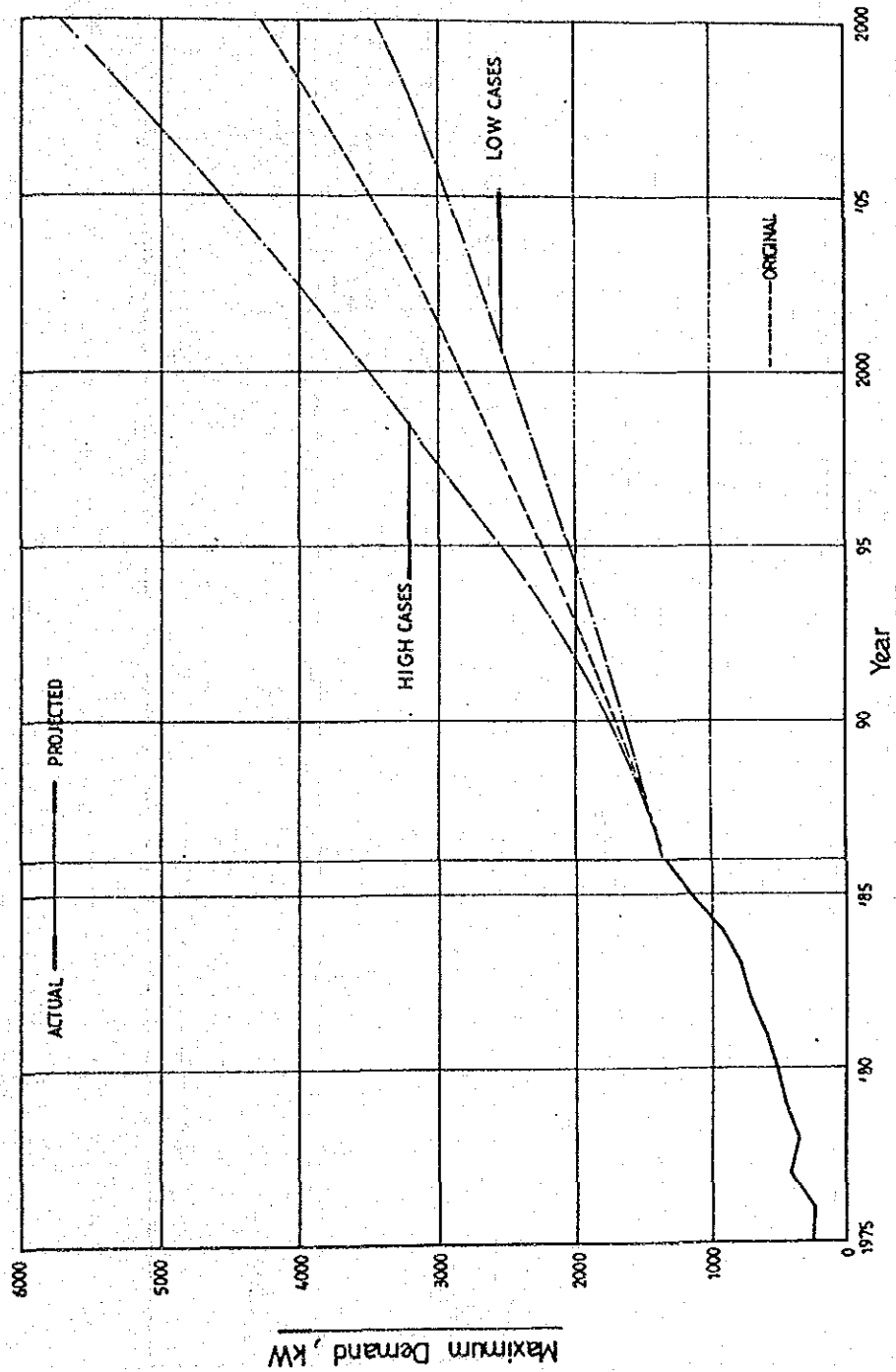


図 4.13 ピーク負荷予測とその上下限值

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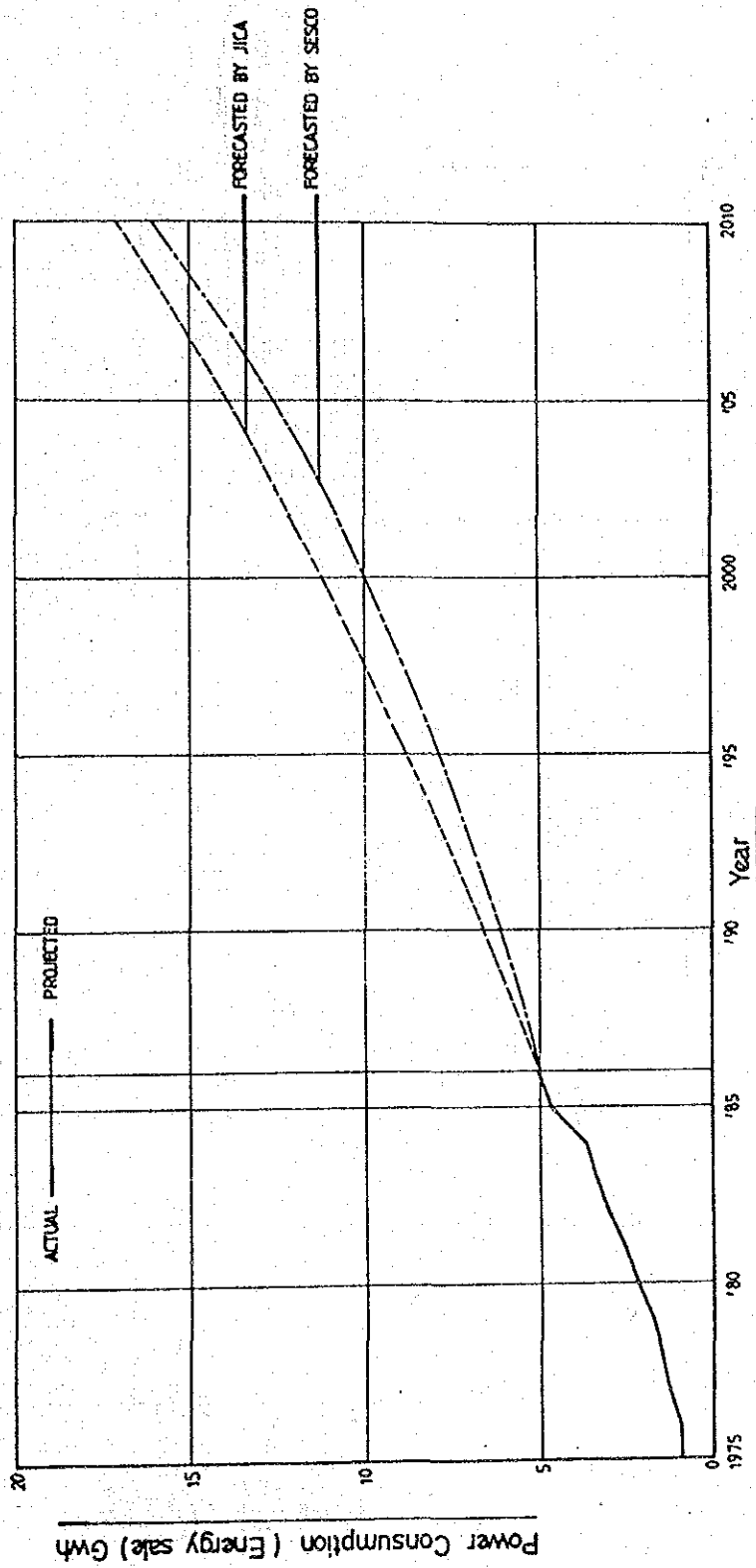


図 4.14 電力消費量予測値の比較

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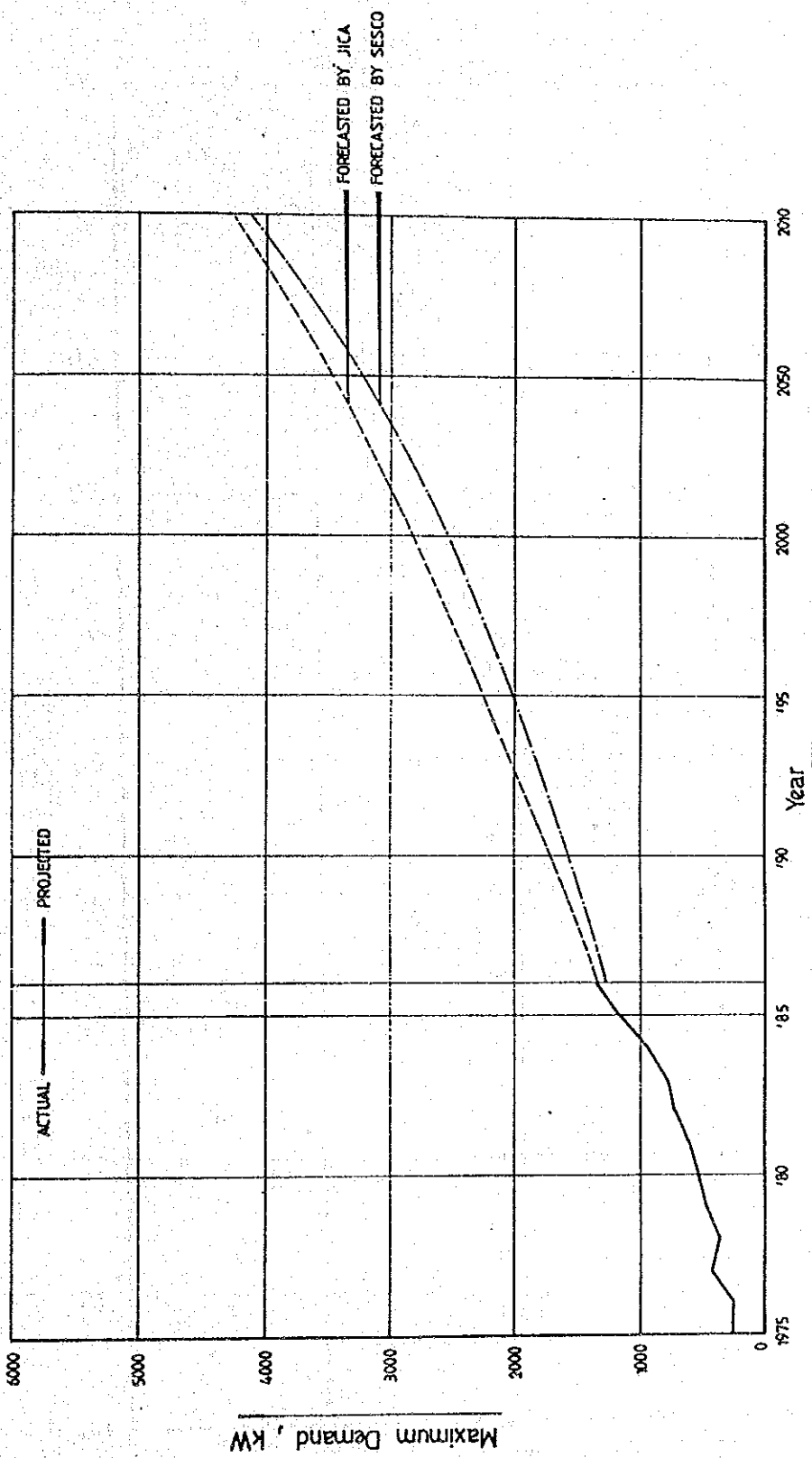


図 4.15 ピーク負荷予測値の比較

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