Table VIII-9 ENERGY SALES: UTHAI THANI

FISCAL YEAR 1974 ∿ 1983

(kwh)

Year	Street Lighting	Residential	Small Business	Large Business	Small Industry	Large Industry	Government Hospital, Health Service and Institute of Education	Agriculture Pumping	Temporary	Total
1974	91,328	1,908,115	178,702	35,635	122,189				41,187	2,377,126
1975	99,769	2,538,865	568,994	113,463	388,960				34,896	3,744,947
1976	154,903	3,162,510	596,913	119,030	408,046				26,710	4,468,112
1977	157,712	3,728,627	950,725	189,584	649,909				24,746	5,701,303
1978	197,651	4,214,120	1,161,038	231,522	793,677				20,290	6,618,298
1979	222,033	5,649,311	1,371,943	273,579	937,850				34,334	8,489,050
1980	240,169	7,029,157	1,608,632	698,494	693,064				19,533	10,289,049
1981	184,885	7,586,829	1,660,798	331,179	1,135,309				24,820	10,923,820
1982	210,873	9,493,706	1,889,774	430,079	1,349,173				23,236	13,396,841
1983	226,513	11,755,574	1,763,794	151,046	1,470,064		563,026	51,760	22,979	16,004,756

Table VIII-10 NO. OF CUSTOMERS: NAKHON SAWAN

FISCAL YEAR 1974 ∿ 1983

Year	Street Lighting	Residential	Small Business	Large Business	Small Industry	Large Industry	Government Hospital, Health Service and Institute of Education	Agriculture Pumping	Temporary	Total
1974	23	16,504	149	3	5			1	11	16,696
1975	24	18,532	144	3	4			2	26	18,735
1976	26	22,409	166	4	5			1	1	22,612
1977	25	36,126	982	21	30			1	20	37,205
1978	28	41,346	1,011	21	31			1	48	42,486
1979	27	44,560	1,068	23	32			5	50	45,765
1980	29	55,524	1,220	23	24			1	80	56,901
1981	30	57,272	1,313	28	40			1	94	58,778
1982	30	67,019	1,384	37	44			2	123	68,639
1983	37	75,234	1,502	33	46	1	30	1	153	77,037

Table VIII-11 NO. OF CUSTOMERS: CHAI-NAT

FISCAL YEAR 1974 ∿ 1983

Year	Street Lighting	Residential	Small Business	Large Business	Small Industry	Large Industry	Government Hospital, Health Service and Institute of Education	Agriculture Pumping	Temporary	Total
1974	10	8,198	60	2	2	1		4	4	8,281
1975	14	9,856	79	3	2	1		4	6	9,965
1976	15	12,411	94	3	3	1		4	11	12,542
1977	18	14,698	115	4	4	1		4	14	14,858
1978	18	17,628	124	4	4	1		5	17	17,801
1979	17	18,113	112	4	3	1		5	10	18,265
1980	17	20,446	143	8	4	1		5	6	20,630
1981	20	22,487	148	5	5	1		5	15	22,686
1982	21	23,875	156	6	6	1		5	15	24,085
1983	21	26,378	154	9	6	1	9	5	27	26,610

Table VIII-12 NO. OF CUSTOMERS: UTHAI THANI

FISCAL YEAR 1974 ∿ 1983

Year	Street Lighting	Residential	Small Business	Large Business	Small Industry	Large Industry	Government Hospital, Health Service and Institute of Education	Agriculture Pumping	Temporary	Total
1974	12	3,589	21	1	1				21	3,645
1975	14	4,144	24	2	1				19	4,204
1976	14	4,884	26	2	1				14	4,941
1977	14	6,057	36	2	2				13	6,124
1978	14	6,540	47	3	2				1	6,607
1979	18	8,891	62	3	1				31	9,006
1980	20	10,174	76	3	2				12	10,287
1981	20	12,246	79	5	3				25	12,378
1982	21	16,123	90	5	4				20	16,263
1983	24	18,850	97	1	4		10	1	20	19,007

Table VIII-13 MONTHLY AVERAGE OF RELEASE WATER FROM RESERVOIR IN CM^3/SEC
UPPER MAE WONG PROJECT (1/3)

YEAR	APR.	MAY	JUN.	JUL.	AUG.	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	ANNIAL	AVG.
1954	0.016	0	12.656	17.261	8.436	18.784	28.821	18.889	1.368		1.202	0.339	107.772	8.981
1955	0	0	0	3.605	5.249	20.074	26.412	7.547	1.254		0.611	1.451	66.203	5.517
1956	0	0	3.402	19.884	7.516	0	13.721	15.079	1.079		0.527	0.358	61.566	5.131
1957	0	0		28.352	0	3.802	18.859	20.195	1.279		0.428	2.071	74.986	6.249
1958	0.009	0		17.421	15.240	1.546	17.008	19.636	1.474		0.904	1.826	75.064	6.255
1959	0.349	0		20.448	17.004	0.151	9.398	18.005	1.861		1.553	2.407	71.176	5.931
1960	0.152	0		9.106	4.758	6.413	7.120	10.211	0.566		0.663	0.223	39.212	3.268
1961	0.040	0		22.550	7.006	0.098	0	12.258	1.431		1.210	2.343	46.936	3.911
1962	0.541	0		39.099	7.026	0	0	17.398	1.691		1.510	2.586	69.851	5.821
1963	0.144	0		27.772	13.721	7.524	1.455	1.407	1.648		1.249	2.178	57.098	4.758
1964	0.079	0		9.190	19.419	0.847	0	15.682	0.836		0.681	0.895	47.629	3.969
1965	0.010	0		35.155	7.485	0.030	7.997	13.305	1.212		0.595	1.361	67.150	5.596
1966	0	0		23.743	0.971	4.583	14.192	10.374	1.005		0.797	1.960	57.625	4.802
1967	0	0		20.577	20.486	0	11.853	13.474	1.218		0.956	1.044	69.608	5.801
1968	0.004	0		20.287	11.533	12.274	21.698	20.737	1.577		1.261	1.970	91.341	7.612
1969	0	0		8.634	5.190	0	16.428	8.301	0.185		1.353	1.055	41.146	3.429
1970	0	0		24.663	7.088	7.474	0	8.967	0		0.108	1.711	50.011	4.167
1971	0	0		18.165	6.933	1.276	8.060	17.069	0.013		1.134	2.248	54.898	4.575
1972	0	0.805		23.317	11.758	1.305	8.723	20.084	10.218	2.900	1.016	0.822	80.948	6.746
1973	0.951	2.382	7.434	27.720	18.497	4.714	8.377	5.796	4.004	1.953	0.838	1.253	83.919	6.993
1974	0	2.681	1.697	23.540	14.486	10.092	50.459	23.098	4.054	3.423	1.320	0.723	135.573	11.298
1975	0 025	2.631	5.024	22.758	15.677	1.483	14.313	13.575	4.172	1.971	0.828	0.177	82.634	6.886
1976	0	0	0.610	29.354	6.405	1.365	10.330	26.526	0.528	0.691	1.422	2.538	79.769	6.647
1977	0	0	0	32.161	10.560	8.584	29.397	17.304	0.804	0	0.743	0.310	99.863	8.322
1978	0	0	0	5.373	12.355	1.911	5.800	16.630	0.423	0	1.024	2.591	46.107	3.842
1979	0.084	0	0	24.739	15.750	6.372	33.006	4.571	0.901	0	0.789	0.169	86.381	7.198
1980	0	0	0	17.377	8.396	3.084	1.952	2.721	0.332	0	0.247	1.661	35.770	2.981
1981	0	0	32.604	15.639	15.062	6.843	7.684	13.554	5.108	0.887	1.142	2.323	100.846	8.404
AVERAGE	0.086	0.304	2.265	20.996	10.500	4.665	13.343	14.014	1.794	0.422	0.933	1.450	70.753	5.896

Table VIII-13 MONTHLY AVERAGE OF RELEASE WATER FROM RESERVOIR IN CM^3/SEC
LOWER MAE WANG PROJECT (2/3)

YEAR	APR.	MAY	JUN.	JUL.	AUG.	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	ANNIAL	AVG.
1954	1.292		18.395	22.649	15.165	28.129	43.320	20.191	1.938	0.358	5.911	2.928	160.276	13.356
1955	0.373			8.577	5.986	20.382	36.905	9.222	1.874	0.326	4.901	6.908	95.454	7.595
1956	0.852			21.716	11.153	5.806	15.442	17.595	1.776	0.276	4.790	3.335	82.741	6.895
1957	1.424			31.413	6.984	4.023	21.963	21.193	1.888	0.154	4.208	8.325	101.575	8.465
1958	1.108			19.116	18.871	7.446	24.182	20.879	1.998	0.389	5.101	7.294	106.384	8.865
1959	0			20.970	26.474	5.443	18.864	18.743	2.215	0.530	5.805	4.849	103,893	8.658
1960	0.254			8.721	6.567	10.456	13.945	11.126	0.861	0.485	0.485	0.338	53.238	4.437
1961	0.938			25.142	15.392	11.179	8.688	16.826	1.974	0.370	5.915	8.477	94.901	7.908
1962	2.041			41.270	12.092	5.094	9.176	19.621	2.120	0.454	6.083	8.613	106.564	8.880
1963	1.134			29.066	15.808	9.650	12.305	3.668	2,095	0.437	5.601	7.829	87.593	7.299
1964	1.608			11.484	22.398	6.132	6.932	11.725	1.453	0.364	4.699	5.158	71.953	5.996
1965	1.082			38.031	11.091	6.239	17.696	16.577	1.764	0	4.683	6.422	103.585	8.632
1966	0.394			28.006	5.273	11.476	14.756	13.233	1.705	0.270	5.897	8.262	89.272	7.439
1967	0.959			22.586	23.062	5.719	21.543	15.618	1.854	0.314	1.649	5.856	99.160	8.263
1968	0.303			22.272	18.094	17.677	23.301	1.861	1.401	0.318	1.592	0.747	87.566	7.297
1969	0.633			3.451	7.887	5.702	22.905	13.019	1.228	0.352	4.277	4.251	63.705	5.309
1970	0.536			26.028	12.557	13.983	10.773	12.404	0.013	0	5.871	7.786	89.951	7.496
1971	0.315			20.442	9.097	8.310	14.234	15.446	1.113	0.169	5.198	8.363	82.687	6.891
1972	1.438			23.820	12.451	5.693	6.057	7.449	14.662	3.435	5.018	6.663	86.686	7.224
1973	0.394			30.118	20.723	7.159	22.438	12.416	5.219	1.996	5.500	7.651	113.614	9.468
1974	1.060			24.596	18.277	21.914	76.202	34.336	5.295	4.230	6.063	4.916	196.889	16.407
1975	1.258			24.423	17.478	11.273	26.156	19.864	5.475	2.023	4.569	3.272	115.791	9.649
1976	0.717			29.976	8.741	6.588	16.318	39.111	1.203	0.238	5.854	8.555	117.301	9.775
1977	0.480			32.574	11.253	12.012	32.547	20.990	1.868	0.557	4.569	8.464	125.314	10.443
1978	0.713			9.641	19.476	6.240	14.425	19.190	1.406	0.328	4.754	8.616	84.789	7.066
1979	0.470			25.594	16.688	7.883	39.601	20.834	1.369	0.517	0.404	0.256	113.616	9.468
1980	0.174			20.137	11.581	6.779	37.162	5.446	1.366	0.243	3.716	7.424	64.028	5.336
1981	1.285			17.866	18.365	10.865	14.659	8.050	6.897	0.512	5.692	8.433	92.624	7.719
AVERAGE	0.829	0	0.657	22.846	14.249	9.973	21.161	15.951	2.643	0.702	4.600	6.071	99.684	8.307

Table VIII-13 MONTHLY AVERAGE OF RELEASE WATER FROM RESERVOIR IN CM^3/SEC
KHLONG PHO PROJECT (3/3)

YEAR	APR.	MAY	JUN.	JUL.	AUG.	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	ANNIAL	AVG.
1954	0.828		2.626	4.008	4.736	6.885	7.587	4.048	0.140	0.108	4.070	1.407	36,443	3.037
1955	0.191			0.895	0.218	7.583	9.838	3.285	0.126	0.094	2,901	4.602	29,733	2.478
1956	0.485			1.646	0.929	2.563	7.496	3.976	0.119	0.089	2.832	2.010	22.145	1.845
1957	1.236			10.096	1.067	0.577	0.871	2.717	0.152	0.087	2.634	6.235	25.672	2.139
1958	0.718			1.548	1.601	0.841	2.061	4.142	0.173	0.179	3.826	5.611	20.700	1.725
1959	0			3.663	2.316	0.739	1.495	2.192	0.164	0.147	4.135	0.442	15.293	1.274
1960	0.736			0.987	0.431	0.600	1.045	0.703	0.143	0.110	3.003	4.988	12.746	1.062
1961	0.594			3.382	2.451	1.637	1.165	2.172	0.145	0.113	4.141	6.431	22.231	1.853
1962	1.595			3.251	1.199	0.418	0.419	2.734	0.159	0.130	4.418	6.554	20.877	1.740
1963	0			4.091	0.911	1.014	1.461	0.138	0.164	0.125	3.923	5.837	17.664	1.472
1964	0.860			0.910	1.515	0.438	0.347	0.975	0.075	0.091	2.623	2.775	10,609	0.884
1965	0.656			9.873	1.385	0.618	1.580	1.233	0.131	0	2.836	4.356	22.668	1.889
1966	0.317			2.432	0.580	1.122	1.098	0.822	0.116	0.088	3.592	5.968	16.135	1.345
1967	0.822			4.188	2.826	0.681	1.834	1.022	0.142	0.111	4.104	3.961	19.691	1.641
1968	0.477			3.352	1.807	1.611	2.123	4.046	0.178	0.122	4.347	5.780	23.843	1.987
1969	0.393			1.487	5.561	0.590	1.202	1.502	0.146	0.112	3.539	2.540	17.072	1.423
1970	0.203			1.532	0.855	0.508	3.426	4.868	0.472	0.384	2.278	5.086	19.612	1.634
1971	0.162			2.730	0.852	0.399	4.541	4.466	0.123	0.093	3.630	5.933	22.929	1.911
1972	0.980			3.566	0.905	0.569	0.731	5.554	1.462	0.088	3.427	4.739	22.021	1.835
1973	0.691			2.108	1.637	0.804	4.450	2.872	0.141	0.109	3.247	5.930	21.989	1.832
1974	0.573			3.085	1.632	0.446	12.716	7.398	0.799	0	2.673	2.538	31.860	2.655
1975	0.978			4,690	2.317	0.972	11.249	7.353	0.265	0.112	4.226	1.993	34.155	2.846
1976	0.476			9.023	1.891	0.283	1.254	1.159	0.400	0.464	4.577	6.537	26.064	2.172
1977	0			9.988	1.904	1.360	0.413	0.259	0.076	0.006	0	0	14.006	1.167
1978	0.507			0.818	4.254	1.519	0.817	3.045	0.154	0.151	3.390	6.556	21.211	1.768
1979	0.808			7.548	3.988	9.922	11.257	4.921	0.156	0.123	4.022	4.784	47.529	3.961
1980	0.180			2.054	0.964	4.202	33.322	5.143	1.039	0.242	0.969	3.614	51.729	4.311
1981	0.923			1.762	2.514	0.873	9.135	17.299	3.019	1.053	1.224	3.423	41.225	3.435
AVERAGE	0.585	0	0.094	3.740	1.902	1.778	4.819	3.573	0.371	0.162	3.235	4.308	24.566	2.047

Table VIII-14 PRINCIPAL FEATURE OF PROPOSED DAM SCHEMES

Name of Dam		Upper Mae Wong	Lower Mae Wong	Khlong Pho	Lower Huai Rang	Upper Khun Kaew	Lower Khun Kaew
River System		Mae Wong	Mae Wong	Khlong Pho	Huai Rang	Khun Kaew	Khun Kaew
1. Hydrology							
Catchment area	km^2	612	930	394	76	162	219
Annual in flow	10^6m^3	193	294	80	18	38	51
2. Reservoir							
Flood water surface	El.m						
High water surface	El.m	216	136	100	150	177.5	130.5
Low water surface	El.m	189	124	95	141	147	119
Drawdown	m	27	12	5	9	30.5	11.5
Gross storage	10^6m^3	250	380	110	21	44	59
Dead storage	10^6m^3	20	30	14	3	6	8
Active storage	10^6m^3	230	350	96	18	38	51
Surface area	km^2						
3. Dam							
Type		RF	ZEF	EF	ZEF	RF	EF
Crest elevation	El.m	222	143.1	103.9	153.5	181.5	135
Height	m	62	38.1	19.9	30.5	49.5	29
Crest length	m	780	262	1,580	1,470	570	2,500
Volume	10^6m^3	3.4	0.43	0.71	0.83	1.32	2.06
Design flood	m^3/s	1,770	2,600	1,190	260	530	690
4. Power Facilities							
Maximum discharge	m^3/s	14.2	17.6	3.9	0.8	1.6	2.2
Rated net head	m	43.1	12.4	6.1	20.9	31.8	17.7
Installed capacity	kW	5,000	1,500	170	120	360	270
Energy production	MWH	13,718	5,289	571	357	1,072	804
5.* Construction Cost	10^6฿	173	109	60	40	49	44
6.* Annual Benefit	10^6฿	13.7	5.3	0.6	0.4	1.07	0.8
7.* Annual Cost	10^6฿	3.5	2.2	1.2	0.8	1	0.9
8.* B/C Ratio		3.9	2.4	0.5	0.5	1.07	0.9

The items indicated with * are related only to "Power".

RF: Rock fill type
ZEF: Zone type earth fill type
EF: Earth type

Table VIII-15 COMPARISON OF MAXIMUM DISCHARGE

UPPER MAE WONG PROJECT

Item \ Case	Case 1	* Case 2	Case 3	Case 4
Maximum Discharge (m^3/s)	20.4	14.2	6.6	2.4
Maximum Output (MW)	7	5	2.3	0.8
Annual Energy (MWh)	16.3	13.7	8.6	3.4
Construction Cost (M฿)	225	173	121	75
Annual Benefit (M฿)	16.3	13.7	8.6	3.4
Annual Cost (M฿)	4.5	3.5	2.4	1.5
Benefit Cost Ratio	3.62	3.95	3.57	2.26
Unit Price (฿/kWh)	13.8	12.6	14.1	21.8

LOWER MAE WONG PROJECT

Item \ Case	Case 1	* Case 2	Case 3	Case 4
Maximum Discharge (m^3/s)	23.2	17.6	10.9	7.2
Maximum Output (MW)	1.9	1.5	1	0.72
Annual Energy (MWh)	5.5	5.3	4.5	3.6
Construction Cost (M฿)	131	109	98	84
Annual Benefit (M฿)	5.5	5.3	4.5	3.6
Annual Cost (M฿)	2.6	2.2	2	1.7
Benefit Cost Ratio	2.12	2.41	2.25	2.12
Unit Price (฿/kWh)	23.9	20.6	21.7	23.5

KHLONG PHO PROJECT

Item \ Case	Case 1	* Case 2	Case 3	Case 4
Maximum Discharge (m^3/s)	5.8	3.9	2.7	1.5
Maximum Output (MW)	230	170	120	70
Annual Energy (MWh)	0.598	0.571	0.488	0.348
Construction Cost (M฿)	67	60	55	50
Annual Benefit (M฿)	0.6	0.6	0.5	0.3
Annual Cost (M฿)	1.3	1.2	1.1	1.0
Benefit Cost Ratio	0.45	0.5	0.45	0.3
Unit Price (฿/kWh)	112	105.1	112.7	143.5

Note: "Optimum" is marked with "*"

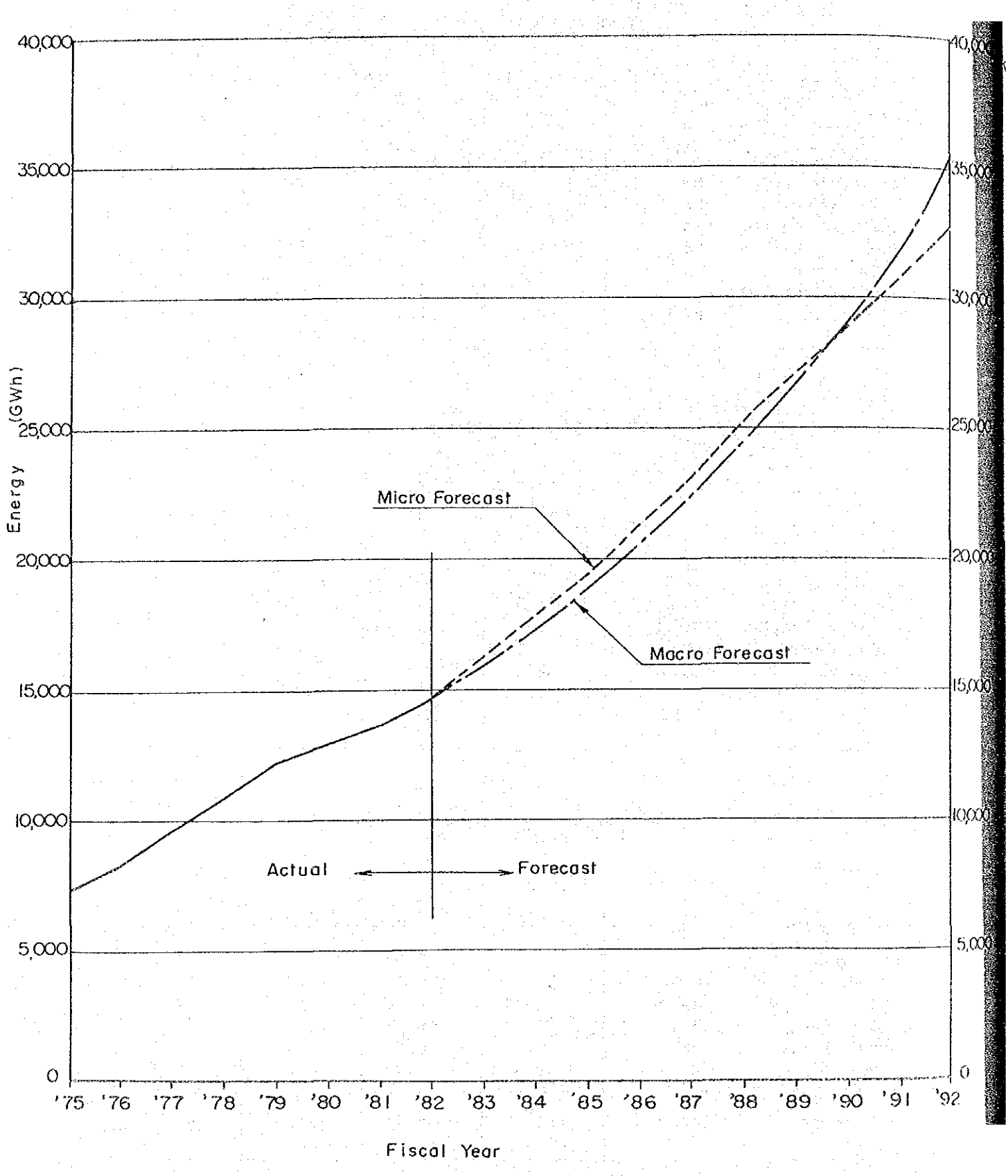


Fig.VIII-1 Comparison of Micro and Macro Forecast

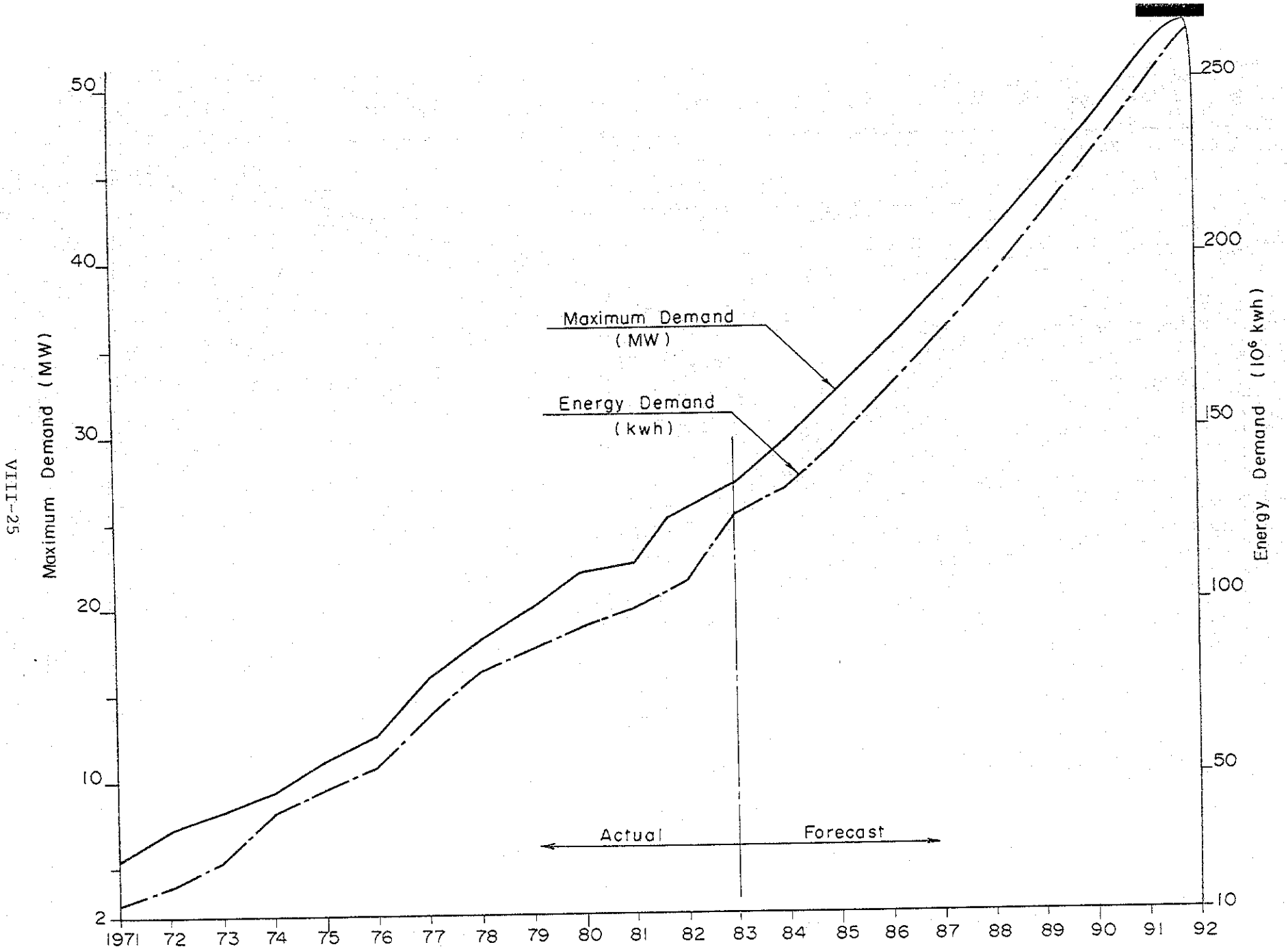


Fig. VIII-2 Load Forecast of Nakhon Sawan

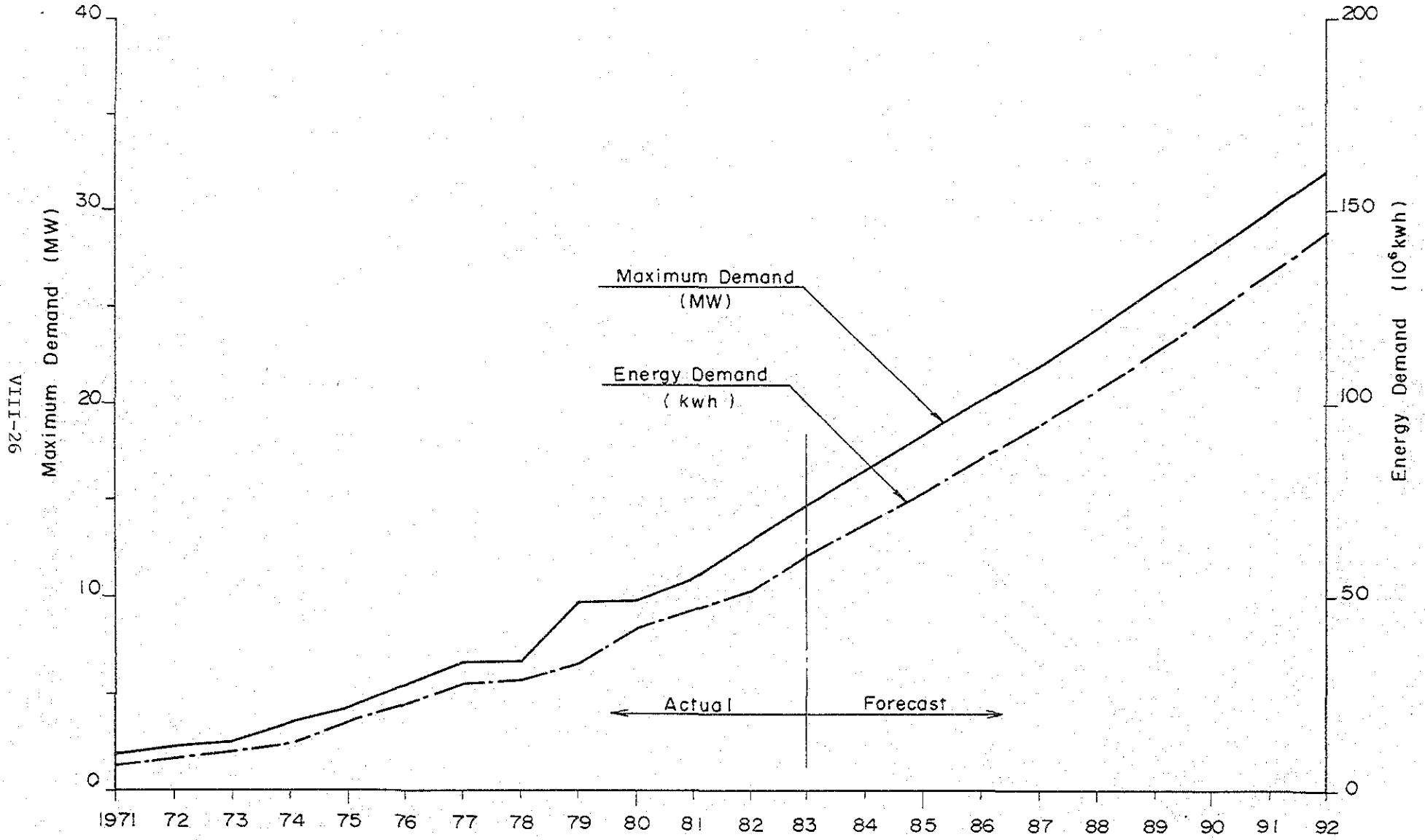
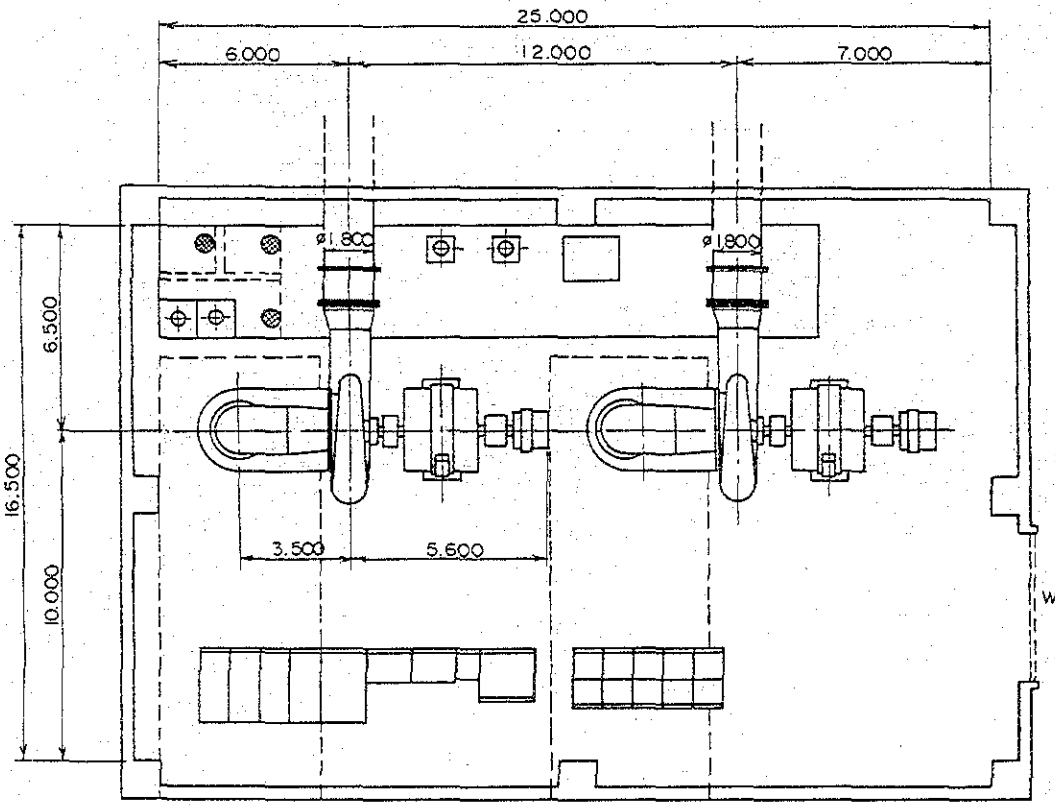
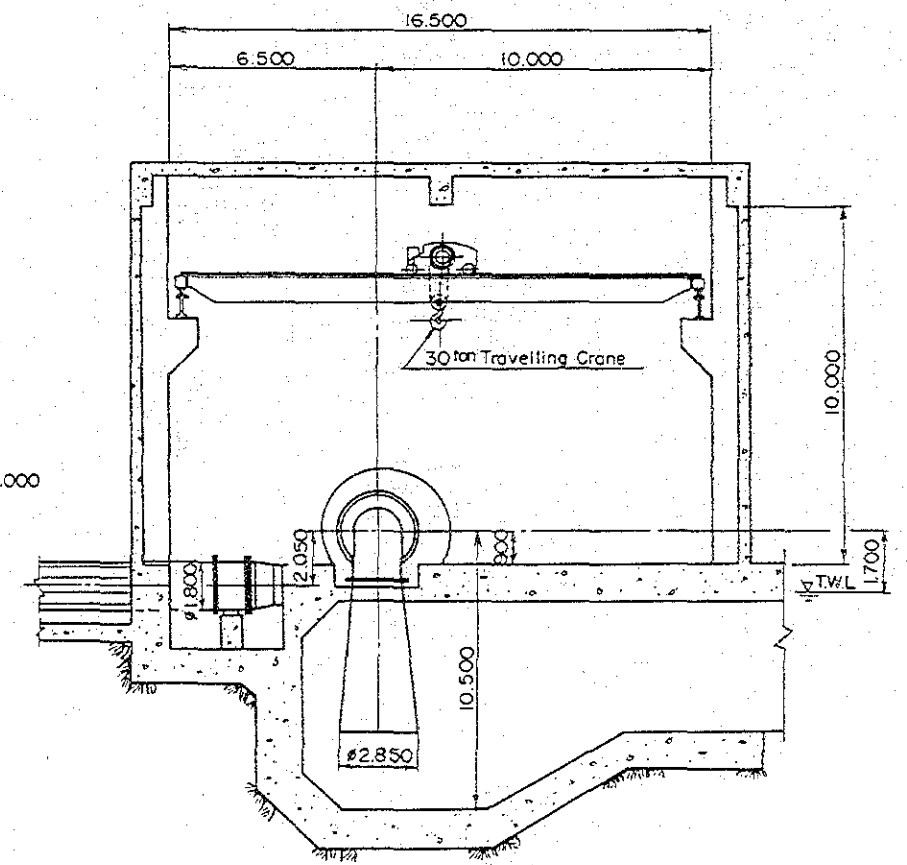


Fig.VIII-3 Load Forecast of Chainat & Uthai Thani



PLAN



POWER HOUSE CROSS SECTION

Fig. VIII-4 UPPER MAE WONG PROJECT

S = 1/100

POWER HOUSE PLAN AND CROSS SECTION

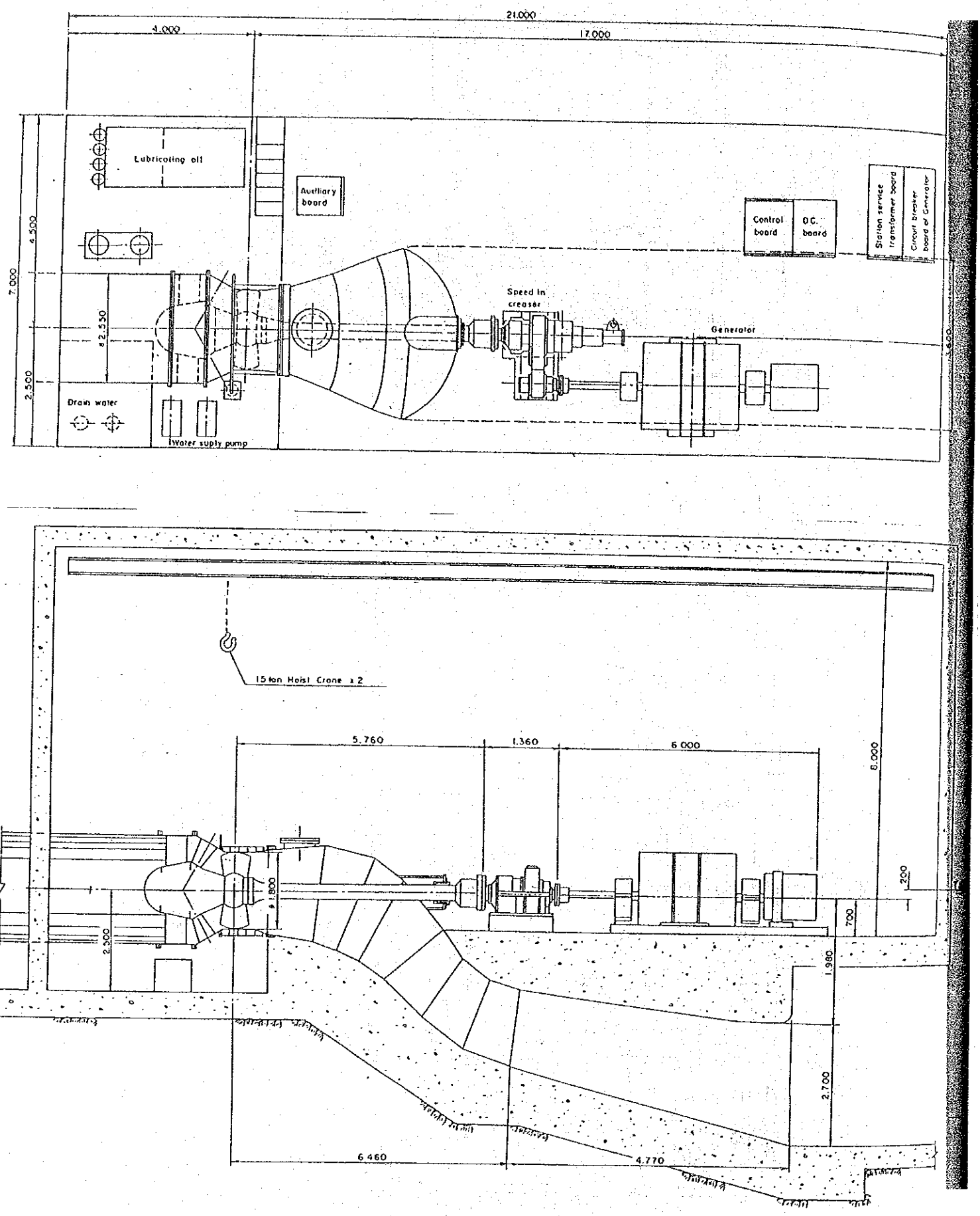


Fig.VIII-5 LOWER MAE WONG PROJECT
POWER HOUSE PLAN

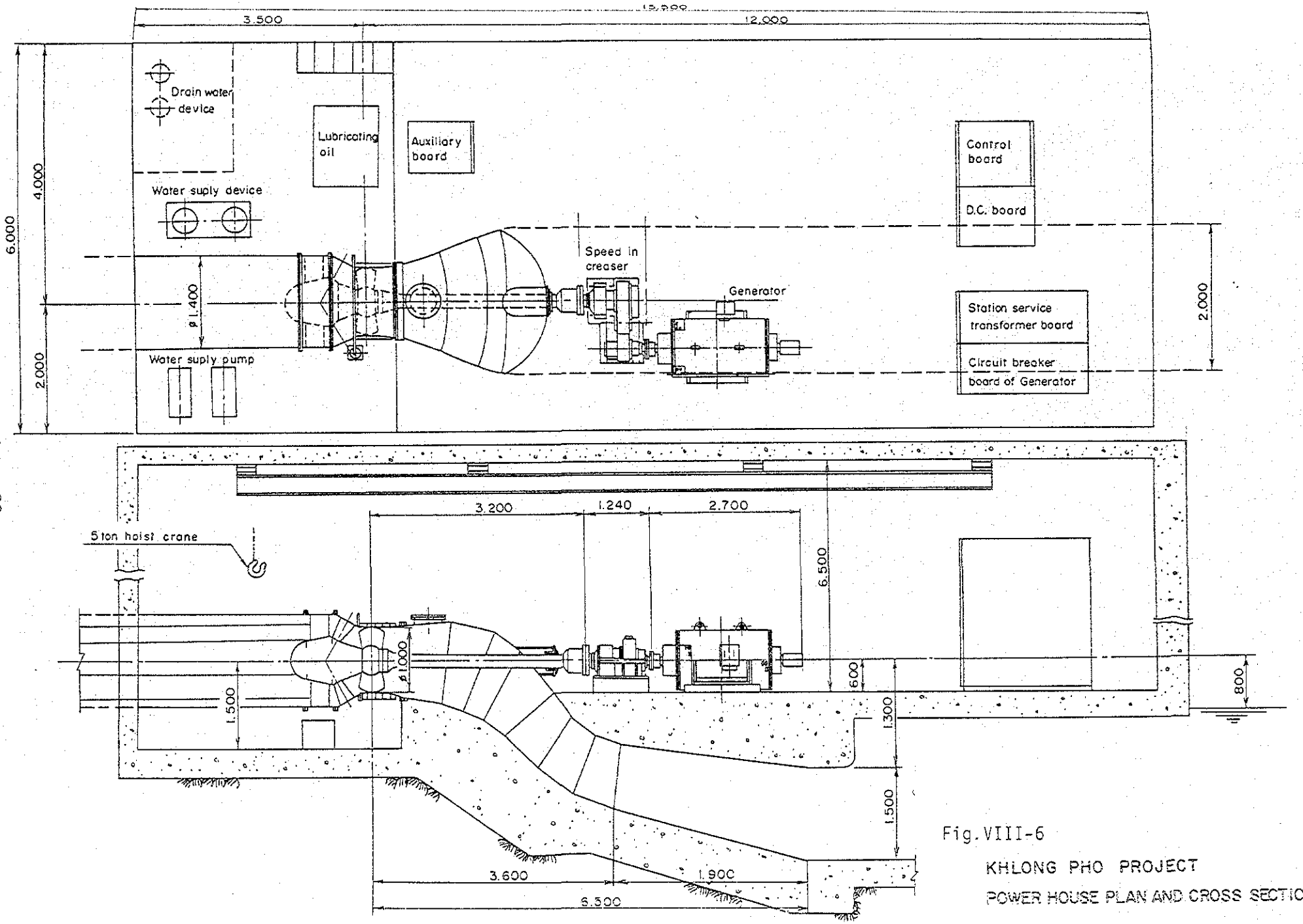


Fig. VIII-6

KHLONG PHO PROJECT

POWER HOUSE PLAN AND CROSS SECTION

ANNEX IX
CONSTRUCTION PLAN AND COST ESTIMATE

ANNEX IX

CONSTRUCTION PLAN AND COST ESTIMATE

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ANNEX IX

CONSTRUCTION PLAN AND COST ESTIMATE

1. CONSTRUCTION PLAN

1.1 Basic Assumption of Construction Planning

1.1.1 Workable days

Suspension of construction works for dam is usually caused by heavy rainfall which affects on the embankment of impervious materials. In the construction planning for pre-feasibility level, the embankment works were allocated, taking conservative measurements, during dry season from November to May as much as possible. As for the normal works such as concrete works, foundation treatment works, construction works for irrigation facilities, etc., 25 days per month are applied from the standard construction workable days stipulated by RID.

1.1.2 Conversion rate of earth materials

Earth volume should be counted according to their status. Earth materials naturally placed as they are, increase in volume after excavation and decrease after compaction. These changes in volume should be counted for the estimation of earth work capacity by construction equipment. The conversion rate of earth volume is assumed as follows.

Earth Materials	Status of Material		
	in-place	excavated	compacted
Sand	1.00	1.25	0.95
Normal soil	1.00	1.30	0.90
Clayey soil	1.00	1.35	0.90
Gravel & weathered rock	1.00	1.30	1.00
Rock	1.00	1.60	1.30

1.2 Dam Construction

1.2.1 Upper Mae Wong Dam

(1) Rock and earth moving plan

Rock zone of the dam embankment is to be obtained from the quarry site proposed at left side upstream hill in the distance about 1.5 km from the dam site. Hard rocks excavated by dynamite blasting will be applied for rock zone embankment. Estimated construction equipments are 3.2 m^3 tactor shovel and 32 t dump track assisted by 21 t bulldozers at quarry site and embankment yard.

Core material is to be obtained from the borrow area proposed at downstream right side terrace about 1.5 km from the dam site. It is assumed that about 70% of excavation will be adoptable for core zone embankment. Materials for transition zone will be obtained mainly from service spillway excavation, river diversion channel excavation and from quarry site. For the embankment of transition zone, excavated materials except from quarry will be once stockpiled for adjustment of embankment schedule with the progress of other zones such as rock and core zones. Weathered rock and smaller size rocks obtained from quarry site will be directly transported to the transition zone. The expected diversion rate of excavated materials suitable for transition zone will be 20% of quarry excavation, 80% of river diversion channel excavation and also 80% of spillway excavation. Filter zone materials will be obtained from river sand excavation but about 50% suitable for proposed sand grading.

(2) Construction schedule

After the preparatory works such as access roads, office yards, etc., the dam construction works will be commenced from the beginning of dry season. As the dam site construction yard is wide as much as 400 m and the river width is very small about 20 - 30 m during dry season, the excavation works of dam foundation, river diversion channel and diversion tunnel can be progressed in parallel. Foundation grouting works will follow after the foundation excavation.

Spillway excavation will be started from second year when the materials supply for transition zone from the river diversion excavation approaches to the end. After the completion of diversion tunnel construction on the second year, the river will be diverted through the tunnel. Dam body embankment will require four dry seasons and some additional period during wet season. After the concrete works for spillway in third and fourth year, intake structures and miscellaneous works will be completed in fifth year.

Total construction period is assumed at five years.

1.2.2 Lower Mae Wong Dam

(1) Earth moving plan

The design of the dam body for Lower Mae Wong dam is so made that the most of excavated materials from the service spillway should be utilized for the embankment of the dam. The earth moving plan is made according to this design concept. The diversion rate is estimated from the site investigations on the soil mechanical and geological conditions that 70% of spillway excavation can be used for the random zone, semi-pervious zone and back fill of structures. And about 10% can be used for rock zone. Out of total excavation volume of 800,000 m^3 from service spillway, all embankment volumes for rock zone, random zone and semi-pervious zone are supplied but about 310,000 m^3 will be disposed. Core materials are obtained from borrow area located at downstream of dam. Filter material will be produced from river sand. All materials for embankment from spillway excavation should be once stockpiled in order to adjust the embankment speeds of different zones. Dynamite plasting for excavation will be limited only for hard rock with small quantity.

(2) Construction schedule

After the preparatory works, the dam construction starts from the beginning of dry season. As the dam site valley is narrow, the river diversion tunnel should be completed before the commencement of earth moving works. Spillway excavation can be started from early stage even before the river diversion at it is located on the hill side. Foundation grout works will be started from the river bed portion and the grout works proceed to both abutments. Foundation grout should always go ahead of embankment progress. Total construction period is estimated at five years.

1.2.3 Khlong Pho dam

(1) Earth moving plan

In case of the Khlong Pho dam, available materials near the dam site is expected only applicable for random zone. Core materials should be borrowed in far distance about 5 km from dam site near the foot hill of the Khao Chonkan mountains. Filter zone will be supplied from the river sand but grade adjustment will be required. As for the riprap material, it is planned to find the suitable quarry site around the dam site. In this design, the quarry site was assumed to exist within 5 km distance. If there is no quarry site available, the rock material for riprap should be purchaced.

(2) Construction schedule

In case of the Khlong Pho dam, the construction site is very wide about 1,500 m, the dam height is relatively low about 21 m and the river flowing width is small except for flood time.

The embankment works can be proceeded for most of the dam site width without river diversion tunnel. River diversion will be required only for the final enclosure of dam embankment. Therefore, the diversion tunnel is designed to be utilized for intake tunnel and to have flow capacity design intake discharge. In the construction schedule, it is proposed to excavate the diversion tunnel first and to utilize it except flood time in order to keep the site dry. Final enclosure is planned at the last dry season. Critical pass for the Khlong Pho dam will not created from the earth work but from foundation grouting and concrete placing for service spillway. Total construction period is estimated at about five years.

1.3 Construction of Irrigation Facilities

1.3.1 Excavation and filling

Stripping and surface excavation of the main cananls would be mainly made by bull-dozer, and sub-surface and deep excavation, by back-hoe shovel depending on the soil condition at the working site. Weathered rock, which are hard and beyond capacity of back-hoe shovel, would be excavated by pick-hummer. Manpower would contribute to the lateral canals construction, face smoothing, compacting of canal invert and other lateral works.

The excavated materials excessive of filling requirement would be transported to a spoil area. In case of lacking the materials for filling, the materials would be supplemented from borrow area selected near the working site. Spreading of filling materials would be mainly made by bull-dozer and supplementally by manpower. Materials for laterite pavement would be transported from a borrow area, spreaded by bull-dozer, and compacted by compactor.

1.3.2 Concrete lining

Main canals and laterals would be lined with 10-cm thick concrete. After completion of earth works, concrete lining works would be started. Concrete would be produced by portable concrete mixer, and placed by manpower. Simple sliding concrete form removed by manpower would be used for the lining. Three or four sets of the slide forms would be required for making continuous lining works every day.

1.3.3 Related structures

Earth works for canal related structures would be done by manpower. The structures are mainly made by reinforced concrete. The concrete would be mixed by portable mixer and placed by manpower. The structures are not so simple compared with canal lining that wooden forms would be used for these structures.

1.4 Implementation Schedule

(1) Detailed design works

Prior to the construction works, the detailed design for the project will be carried out for about two eyars. Loan arrangement will also be included in this period.

(2) Preparatory works

The construction office and quarters will be constructed prior to the major construction works. The access road for construction of dam and temporary access road for canal construction will be provided for smooth construction works. The land acquisition for the dam and canal system will be completed before start of the construction works. Resettlement and compensation also include in the preparatory works.

These works will be started from mid-2nd year and completed by mid-3rd year.

(3) Construction works for dam and irrigation facilities

The construction works for dam will be started from the 3rd year and completed within five years. Since the existing irrigation areas have the intake weir and intake facilities, the rehabilitation or improvement works should be started as early as possible in order to gain the benefits in possiblely early stage. The construction works for irrigation facilities will be commenced from to 4th year and completed with four years, at the same time of completion of dam construction.

The implementation schedule is shown in Fig. IX-1.

2. COST ESTIMATE

2.1 Conditions

The construction cost is estimated based on the following conditions.

(1) The exchange rate used in the estimate is shown as follows:

US$1.0 = ฿ 27 = ¥ 240 (end-1984 level)

(2) Civil works are to be carried out on the international contract basis using contractor's own heavy construction machinery and equipment.

(3) Taxes on the construction materials, machinery and equipment to be imported from abroad are excluded in the cost estimate.

(4) The construction cost comprises foreign and local currency portions. The cost estimate is made based on the price level in November, 1984. The classification of foreign and local portions is shown below:

Foreign currency portion:

- large gates for dam and intake weir,
- depreciation costs for heavy construction machinery and equipment,
- engineering services cost of foreign consultant, and
- contractor's general expenses and profit.

Local currency portion:

- labor forces,
- sand, gravel and wooden materials,
- cement,
- reinforcement bar and other structural steel,
- fuel, oil, etc.,
- inland transportation costs,
- resettlement and compensation costs,
- administration costs,
- engineering services costs of local consultant, and
- contractor's general expenses and profit.

(5) The physical contingency, 15% of direct construction cost is included in the construction cost in view of the preliminary nature of the estimate.

(6) The price contingency is also taken into account at an annual escalation rate of 5% for foreign currency portion and 7% for local currency portion.

2.2 Construction Cost

Construction cost for the high priority projects comprises direct construction cost, resettlement and compensation cost, administration cost, engineering services fee, physical contingency and price contingency. The direct construction cost consists of construction costs of dam, irrigation facilities and office and quarters, including contractor's profit, overhead and taxes.

The construction cost of dam is estimated on the basis of work quantities worked out based on the preliminary design of dam and related structures. As for the construction cost of irrigation facilities, the cost estimate is made based on the construction cost of model area shown in Table IX-1 and Table IX-2.

The following alternative plans for high priority projects are made for selection of first priority project among high priority projects (Refer to ANNEX V).

(1) Alternative plan for optimization of dam scale

Alternative D-1: supplemental irrigation to the existing irrigation area for wet season paddy

Alternative D-2: supplemental irrigation to the possible maximum irrigable area in each basin for wet season paddy

Alternative D-3: supplemental irrigation to the possible maximum irrigable area in each basin for wet season paddy and dry season crop

(2) Alternative plan for optimization of irrigable area and cropping intensity

Alternative I-1: supplemental irrigation to the existing irrigation area

Alternative I-2: supplemental irrigation to the possible maximum irrigable area in each basin

Through the optimization study, the Alternative I-2 is selected as the most optimal development plan for high priority projects (see ANNEX X). Total construction cost of the Alternative I-2 is shown as follows:

(Unit: 10^6 ฿)

High Priority Project	Foreign Currency	Local Currency	Total
Upper Mae Wong	1,812.4	2,100.2	3,912.6
Lower Mae Wong	1,085.8	2,009.0	3,094.8
Khlong Pho	727.4	1,267.4	1,994.8

The summaries of cost estimate for Alternative I-2 are shown in Table IX-3 to Tablx IX-5. The breakdowns of direct construction cost for Alternative I-2 are shown in Table IX-6 to Table IX-8. The resettlement and compensation cost is estimated below based on the unit cost by EGAT.

(Unit: 10^6 ฿)

Item	Unit Cost	Upper Mae Wong		Lower Mae Wong		Khlong Pho	
	(10^6฿)	Q'ty	Amount	Q'ty	Amount	Q'ty	Amount
House	0.2	40	8.0	520	104.0	365	73.0
Land	0.6	19.5	11.7	68.0	40.8	32.0	19.2
Total			19.7		144.8		92.2

The construction cost for each alternative plan other than the construction cost of Alternative I-2 is shown in Table IX-9.

2.3 Annual Disbursement Schedule

The annual disbursement schedule is worked out based on the implementation schedule. The annual disbursement schedule for Alternative I-2 is shown in Tables IX-10 to IX-12.

2.4 Annual Operation and Maintenance Costs

The annual operation and maintenance costs include the salaries of the operation and maintenance office staff, the materials and labor costs reparing and maintenance of project facilities and running cost of project facilities. The operation and maintenance costs are estimated based on the following assumptions:

Dam : 0.5% of direct construction cost

Irrigation facilities : 2.5% of direct construction cost

The annual operation and maintenance costs for Alternative I-2 are estimated as follows:

Upper Mae Wong	27.6×10^6 ฿
Lower Mae Wong	30.2×10^6 ฿
Khlong Pho	13.9×10^6 ฿

Table IX-1 CONSTRUCTION COST OF INTAKE WEIR FOR MODEL AREA

(Unit: 10^3 ₱)

	Work Item	Unit	Q'ty	F.C	L.C	Total
1.	Preparatory workd	-	LS	104	753	857
2.	Excavation	m^3	7,140	88	35	123
3.	Backfill	m^3	2,300	18	8	26
4.	Embankment	m^3	14,000	112	49	161
5.	Smoothing of face	m^3	8,950	-	11	11
6.	Sod facing	m^3	8,950	-	289	289
7.	Reinforced concrete	m^3	4,850	575	5,805	6,380
8.	Reinforcement bar	ton	64	-	634	634
9.	Metal form	m^3	3,400	244	159	403
10.	Scat folding	m^3	1,450	-	180	180
11.	Gabionade	m^3	390	-	118	118
12.	Gravel pavement	m^3	20	-	5	5
13.	Slide gate (2.0 x 1.8)	nos	2	-	104	104
	Slide gate (2.0 x 1.5)	nos	3	-	129	129
	Total			1,141	8,299	9,420

Table IX-2 CONSTRUCTION COST OF CANAL SYSTEM FOR MODEL AREA

(10^3 ฿)

Work Item	F.C.	L.C.	Total
1. Preparatory Works	3,264	7,023	10,287
2. Main Canal	12,266	28,291	40,557
- Canal	8,770	20,195	28,965
- Related Structures	2,587	6,000	8,587
- Miscellaneous	909	2,096	3,005
3. Lateral and Sub-Lateral	52,205	110,583	162,788
- Canal	40,976	86,961	127,937
- Related Structures	7,362	15,431	22,793
- Miscellaneous	3,867	8,191	12,058
4. Drainage Canal	799	1,591	2,390
- Canal	673	1,339	2,012
- Related Structure	67	134	201
- Miscellaneous	59	118	177
Total	68,534	147,488	216,022

Irrigation Service Area: 7,360 ha

฿29,351/ha = $1,087/ha

Development Area: $1,100/ha → ฿29,700/ha

Existing Area: $500/ha → ฿13,500/ha

Table IX-3 SUMMARY OF CONSTRUCTION COST
UPPER MAE WONG PROJECT
(ALTERNATIVE I-2)

(10^6 ฿)

Work Item	Total	Foreign Currency	Local Currency
1. Direct Construction Cost	2,173.2	1,056.6	1,116.6
1.1 Dam Construction	1,147.8	752.9	394.9
1.2 Irrigation Facilities	978.4	303.7	674.7
1.3 Office & Quarters	47.0	-	47.0
2. Resettlement & Compensation	19.7	-	19.7
3. Administration	108.6	-	108.6
4. Engineering Services	257.0	190.0	67.0
Total	2,558.5	1,246.6	1,311.9
5. Physical Contingency	326.0	158.5	167.5
Total	2,884.5	1,405.1	1,479.4
6. Price Contingency	1,028.1	407.3	620.8
Grand Total	3,912.6	1,812.4	2,100.2

Table IX-4 SUMMARY OF CONSTRUCTION COST
LOWER MAE WONG PROJECT
(ALTERNATIVE I-2)

(10^6 ฿)

Work Item	Total	Foreign Currency	Local Currency
1. Direct Construction Cost	1,644.9	624.5	1,020.4
1.1 Dam Construction	619.5	320.8	298.7
1.2 Irrigation Facilities	978.4	303.7	674.7
1.3 Office & Quarters	47.0	-	47.0
2. Resettlement & Compensation	144.8	-	144.8
3. Administration	82.2	-	82.2
4. Engineering Services	189.0	138.0	51.0
Total	2,060.9	762.5	1,298.4
5. Physical Contingency	246.8	93.7	153.1
Total	2,307.7	856.2	1,451.5
6. Price Contingency	787.1	229.6	557.5
Grand Total	3,094.8	1,085.8	2,009.0

Table IX-5 SUMMARY OF CONSTRUCTION COST
KHLONG PHO PROJECT
(ALTERNATIVE I-2)

(10^6 ฿)

Work Item	Total	Foreign Currency	Local Currency
1. Direct Construction Cost	1,055.5	414.2	641.3
1.1 Dam Construction	567.3	279.6	287.7
1.2 Irrigation Facilities	441.2	134.6	306.6
1.3 Office & Quarters	47.0	-	47.0
2. Resettlement & Compensation	92.2	-	92.2
3. Administration	52.8	-	52.8
4. Engineering Services	123.2	91.1	32.1
Total	1,323.7	505.3	818.4
5. Physical Contingency	158.3	62.1	96.2
Total	1,482.0	567.4	914.6
6. Price Contingency	512.8	160.0	352.8
Grand Total	1,994.8	727.4	1,267.4

Table IX-6 BREAKDOWN OF DIRECT CONSTRUCTION COST
UPPER MAE WONG PROJECT
(ALTERNATIVE I-2)

(10^6 ฿)

	Work Item	Foreign Currency	Local Currency	Total
I.	Dam Construction			
	1. Preparatory Works	31.5	16.5	48.0
	2. River Diversion	24.0	14.6	38.6
	3. Earth Works	513.6	197.3	710.9
	4. Foundation Treatment	16.6	8.1	24.7
	5. Spillway	26.8	98.6	125.4
	6. Intake	50.4	12.6	63.0
	Sub-total	662.9	347.7	1,010.6
	7. Overhead	23.2	12.1	35.3
	8. Profit	43.0	22.6	65.6
	9. Tax	23.8	12.5	36.3
	Total	752.9	394.9	1,147.8
II.	Irrigation Facilities			
	1. Intake Weir	4.8	33.2	38.0
	2. Existing Area	158.2	338.7	496.9
	3. Development Area	104.5	222.2	326.7
	Sub-total	267.5	594.1	861.6
	4. Overhead	9.3	20.7	30.0
	5. Profit	17.3	38.6	55.9
	6. Tax	9.6	21.3	30.9
	Total	303.7	674.7	978.4

Table IX-7 BREAKDOWN OF DIRECT CONSTRUCTION COST
LOWER MAE WONG PROJECT
(ALTERNATIVE I-2)

(10^6 ฿)

Work Item	Foreign Currency	Local Currency	Total
I. Dam Construction			
1. Preparatory Works	13.4	12.5	25.9
2. River Diversion	102.0	54.9	156.9
3. Earth Works	46.5	19.1	65.6
4. Foundation Treatment	8.0	3.9	11.9
5. Spillway	61.5	159.8	221.3
6. Intake	51.2	12.8	64.0
Sub-total	282.6	263.0	545.6
7. Overhead	9.8	9.2	19.0
8. Profit	18.3	17.1	35.4
9. Tax	10.1	9.4	19.4
Total	320.8	298.7	619.5
II. Irrigation Facilities			
1. Intake Weir	4.8	33.2	38.0
2. Existing Area	158.2	338.7	496.9
3. Development Area	104.5	222.2	326.7
Sub-total	267.5	594.1	861.6
4. Overhead	9.3	20.7	30.0
5. Profit	17.3	38.6	55.9
6. Tax	9.6	21.3	30.9
Total	303.7	674.7	978.4

Table IX-8 BREAKDOWN OF DIRECT CONSTRUCTION COST
KHLONG PHO PROJECT
(ALTERNATIVE I-2)

(10^6 ฿)

Work Item	Foreign Currency	Local Currency	Total
I. Dam Construction			
1. Preparatory Works	11.7	12.0	23.7
2. River Diversion	22.4	10.5	32.9
3. Earth Works	109.4	70.5	179.9
4. Foundation Treatment	39.6	22.9	62.5
5. Spillway	30.4	121.8	152.2
6. Intake	28.0	7.0	35.0
7. Road	4.7	8.7	13.4
Sub-total	246.2	253.4	499.6
8. Overhead	8.6	8.8	17.4
9. Profit	16.0	16.4	32.4
10. Tax	8.8	9.1	17.9
Total	279.6	287.7	567.3
II. Irrigation Facilities			
1. Existing Area	45.6	97.6	143.2
Sub-total	45.6	97.6	143.2
2. Overhead	1.6	3.4	5.0
3. Profit	2.9	6.3	9.2
4. Tax	1.6	3.5	5.1
Total	51.7	110.8	162.5

Table IX-9 SUMMARY OF CONSTRUCTION COST FOR EACH ALTERNATIVE PLAN

(Unit: 10^6 ฿)

Work Item	Upper Mae Wong					Lower Mae Wong						Khlong Pho			
	Alt. D-1	Alt. D-2	Alt. D-3	Alt. I-1	A.t. I-2	Alt. D-1	Alt. D-2	Alt. D-3	Alt. I-1	Alt. I-2	Alt. D-1	Alt. D-2	Alt. D-3	Alt. I-1	Alt. I-2
1. Direct Construction Cost	1,577.6	2,100.4	2,173.2	1,791.5	2,173.2	1,235.7	1,637.9	1,644.9	1,263.2	1,644.9	691.7	1,031.3	1,055.5	776.8	1,055.5
1.1 Dam Construction	933.9	1,075.0	1,147.8	1.147.8	1,147.8	592.0	612.5	619.5	619.5	619.5	482.2	543.1	567.3	567.3	567.3
1.2 Irrigation Facilities	596.7	978.4	978.4	596.7	978.4	596.7	978.4	978.4	596.7	978.4	162.5	441.2	441.2	162.5	441.2
1.3 Office & Quarters	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0
2. Resettlement & Compesnation	14.6	17.3	19.7	19.7	19.7	122.0	131.6	144.8	144.8	144.8	85.0	86.8	92.2	92.2	92.2
3. Administration	78.9	105.0	108.6	89.5	108.6	61.8	81.9	82.2	63.1	82.2	34.6	51.6	52.8	38.8	52.8
4. Engineering Services	189.3	252.0	257.0	212.0	257.0	148.3	196.5	189.0	149.0	189.0	83.0	123.8	123.2	95.0	123.2
Sub-total	1,860.4	2,474.7	2,558.5	2,112.7	2,558.5	1,567.8	2,047.9	2,060.9	1,620.1	2,060.9	894.3	1,293.5	1,323.7	1,002.8	1,323.7
5. Physical Contingency	236.6	315.1	326.0	268.7	326.0	185.4	245.7	246.8	189.5	246.8	103.8	154.7	158.3	116.5	158.3
Total	2,097.0	2,789.8	2,884.5	2,381.4	2,884.5	1,753.2	2,293.6	2,307.7	1,809.6	2,307.7	998.1	1,448.2	1,482.0	1,119.3	1,482.0

Table IX-10 ANNUAL DISBURSEMENT SCHEDULE, UPPER MAE WONG

(Alternative I-2)

(Unit: 10^6 ฿)

Item	Total		1st Year		2nd Year		3rd Year		4th Year		5th Year		6th Year		7th Year	
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
I. Direct Construction Cost																
1. Dam Construction	752.9	394.9	-	-	-	-	37.6	19.7	150.6	79.0	225.9	118.5	225.9	118.5	112.9	59.2
2. Irrigation System	303.7	674.7	-	-	-	-	-	-	45.6	101.3	106.3	236.1	106.3	236.1	45.5	101.2
3. Office & Quarters	-	47.0	-	-	-	47.0	-	-	-	-	-	-	-	-	-	-
Sub-Total	1,056.6	1,116.6	-	-	-	47.0	37.6	19.7	196.2	180.3	332.2	354.6	332.2	354.6	158.4	160.4
II. Resettlement & Compensation	-	19.7	-	-	-	9.9	-	9.8	-	-	-	-	-	-	-	-
III. Administration	-	108.6	-	10.9	-	10.9	-	17.4	-	17.4	-	17.4	-	17.3	-	17.3
IV. Engineering Services	190.0	67.0	33.3	11.7	33.3	11.7	4.4	1.0	22.9	7.3	38.8	14.5	38.8	14.5	18.5	6.3
V. Physical Contingency	158.5	167.5	-	-	-	7.1	5.6	3.0	29.4	27.0	49.8	53.2	49.8	53.2	23.9	24.0
Sub-Total	348.5	362.8	33.3	22.6	33.3	39.6	10.0	31.2	52.3	51.7	88.6	85.1	88.6	85.0	42.4	47.6
Total	1,405.1	1,479.4	33.3	22.6	33.3	86.6	47.6	50.9	248.5	232.0	420.8	439.7	420.8	439.6	200.8	208.0
VI. Price Contingency	407.3	620.8	1.7	1.6	3.4	12.5	7.5	11.5	53.6	72.1	116.3	177.0	143.1	220.1	81.7	126.0
Grand Total	1,812.4	2,100.2	35.0	24.2	36.7	99.1	55.1	62.4	302.1	304.1	537.1	616.7	563.9	659.7	282.5	334.0

Table IX-11 ANNUAL DISBURSEMENT SCHEDULE, LOWER MAE WONG

(Alternative I-2)

(Unit: 10^6 ฿)

	Item	Total		1st Year		2nd Year		3rd Year		4th Year		5th Year		6th Year		7th Year	
		F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
I.	Direct Construction Cost																
	1. Dam Construction	320.8	298.7	-	-	-	-	112.3	104.5	64.2	59.7	48.1	44.9	48.1	44.8	48.1	44.8
	2. Irrigation System	303.7	674.7	-	-	-	-	-	-	45.6	101.3	106.3	236.1	106.3	236.1	45.5	101.2
	3. Office & Quarters	-	47.0	-	-	-	47.0	-	-	-	-	-	-	-	-	-	-
	Sub-Total	624.5	1,020.4	-	-	-	47.0	112.3	104.5	109.8	161.0	154.4	281.0	154.4	280.9	93.6	146.0
II.	Resettlement & Compensation	-	144.8	-	-	-	72.4	-	72.4	-	-	-	-	-	-	-	-
III.	Administration	-	82.2	-	8.2	-	8.2	-	13.2	-	13.2	-	13.2	-	13.1	-	13.1
IV.	Engineering Services	138.0	51.0	24.2	8.9	24.2	8.9	16.1	3.6	15.8	5.5	22.2	9.6	22.2	9.6	13.3	4.9
V.	Physical Contingency	93.7	153.1	-	-	-	7.1	16.8	15.7	16.5	24.2	23.2	42.2	23.2	42.1	14.0	21.8
	Sub-Total	231.7	431.1	24.2	17.1	24.2	96.6	32.9	104.9	32.3	42.9	45.4	65.0	45.4	64.8	27.3	39.8
	Total	856.2	1,451.5	24.2	17.1	24.2	143.6	145.2	209.4	142.1	203.9	199.8	346.0	199.8	345.7	120.9	185.8
VI.	Price Contingency	229.6	557.5	1.2	1.2	2.5	20.8	22.9	47.1	30.6	63.4	55.2	139.3	68.0	173.1	49.2	112.6
	Grand Total	1,085.8	2,009.0	25.4	18.3	26.7	164.4	168.1	256.5	172.7	267.3	255.0	485.3	267.8	518.8	170.1	298.4

Table IX-12 ANNUAL DISBURSEMENT SCHEDULE, KHLONG PHO

(Alternative I-2)

(Unit: 10^6 ฿)

Item	Total		1st Year		2nd Year		3rd Year		4th Year		5th Year		6th Year		7th Year	
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
I. Direct Construction Cost																
1. Dam Construction	279.6	287.7	-	-	-	-	28.0	28.8	41.9	43.2	97.9	100.7	83.9	86.3	27.9	28.7
2. Irrigation System	134.6	306.6	-	-	-	-	-	-	20.2	46.0	47.1	107.3	47.1	107.3	20.2	46.0
3. Office & Quarters	-	47.0	-	-	-	47.0	-	-	-	-	-	-	-	-	-	-
Sub-Total	414.2	641.3	-	-	-	47.0	28.0	28.8	62.1	89.2	145.0	208.0	131.0	193.6	48.1	74.7
II. Resettlement & Compensation	-	92.2	-	-	-	46.1	-	46.1	-	-	-	-	-	-	-	-
III. Administration	-	52.8	-	5.3	-	5.3	-	8.4	-	8.4	-	8.4	-	8.5	-	8.5
IV. Engineering Services	91.1	32.1	15.9	5.6	15.9	5.6	4.0	1.0	8.9	3.1	20.8	7.3	18.8	6.8	6.8	2.7
V. Physical Contingency	62.1	96.2	-	-	-	7.1	4.2	4.3	9.3	13.4	21.8	31.2	19.7	29.0	7.1	11.2
Sub-Total	153.2	273.3	15.9	10.9	15.9	64.1	8.2	59.8	18.2	24.9	42.6	46.9	38.5	44.3	13.9	22.4
Total	567.4	914.6	15.9	10.9	15.9	111.1	36.2	88.6	80.3	114.1	187.6	254.9	169.5	237.9	62.0	97.1
VI. Price Contingency	160.0	352.8	0.8	0.8	1.6	16.1	5.7	19.9	17.3	35.5	51.8	102.6	57.6	119.1	25.2	58.8
Grand Total	727.4	1,267.4	16.7	11.7	17.5	127.2	41.9	108.5	97.6	149.6	239.4	357.5	227.1	357.0	87.2	155.9

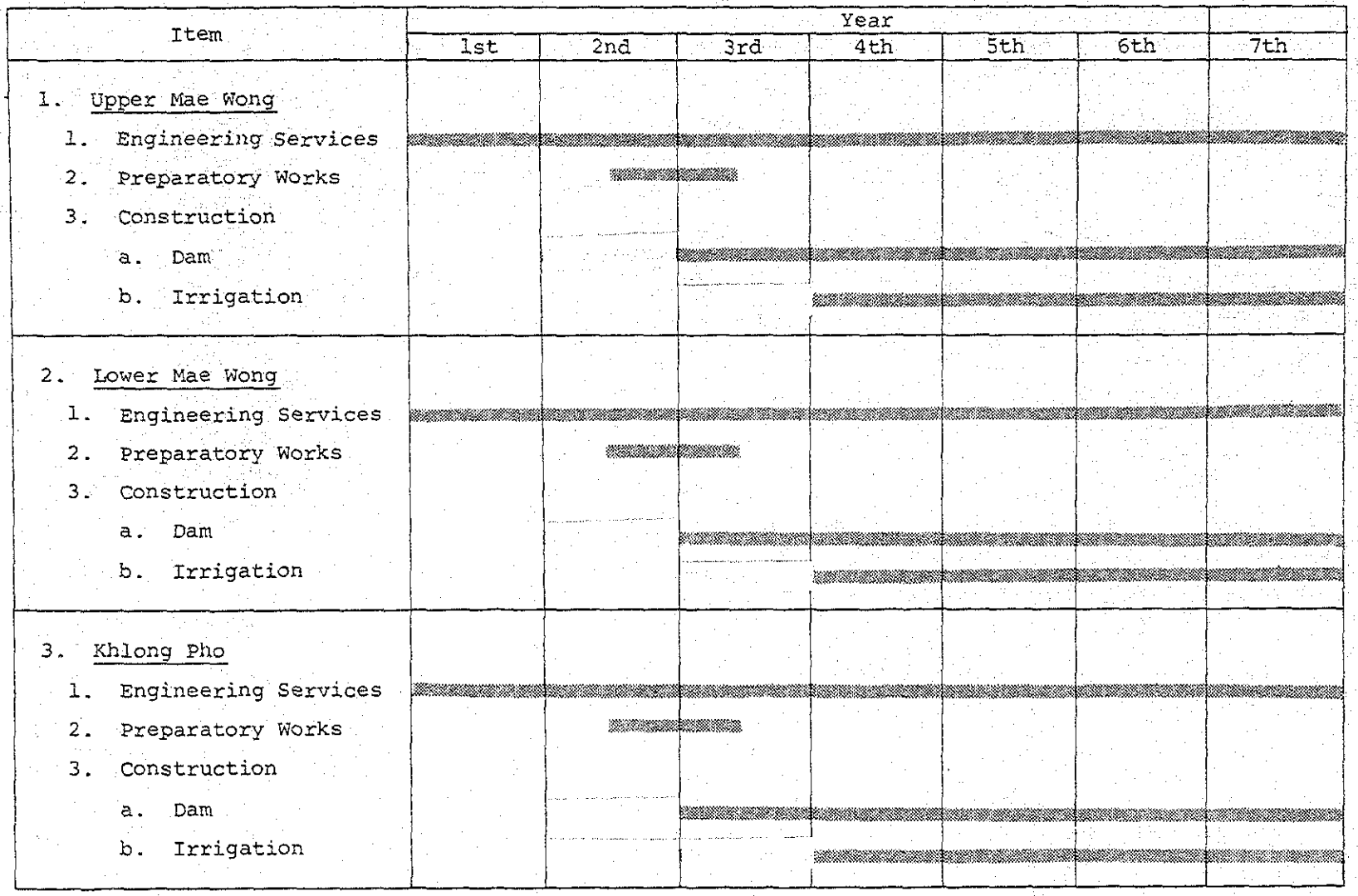

Fig. IX-1 Implementation Schedule of High Priority Projects