

L7. HYDROPOWER PROJECT ENVISAGED TOWARDS 2010

Separately from the Update NPDP study referred to in Chapter L6, the following three studies have been completed by KPC recently:

- (a) Detailed Design of Sondu/Miriu Hydropower Project, Nippon Koei, October 1991
- (b) Sondu/Miriu Hydropower Project, Feasibility Study on Additional Power Station (No.2 Power Station), Nippon Koei, April 1992
- (c) Feasibility Study on Magwagwa Hydroelectric Power Development Project, JICA, October 1991.

Of the above three schemes, the latter two were not taken up in the NPDP. However, the recent studies have revealed that the two schemes would have favourable economic return in terms of EIRR; 18.2% and 13.5% for Sondu/Miriu No.2 and Magwagwa, respectively. This Study assumes that, on top of schemes taken up in the NPDP, these two schemes would be worthy of listing in the proposed implementation programme towards the year 2010.

Therefore, candidate hydropower projects proposed for implementation will be the following six projects comprising seven schemes:

Table 4.5 Hydropower Projects to be Implemented by 2010

Project	River	Capacity (MW)	Commissioning Year	Cost (US\$ million)	
				NPDP*1	Studies*2
Sondu/Miriu	Sondu(No.1)	60	1997	119	133
	Sondu(No.2)	20.6	1998	-	36
Low Grand Falls*3	Tana	120	2000	291	-
Oldorko	Ewaso N'giro	72	2002	71	-
Magwagwa	Sondu	120	2003	340	329
Gitaru #3 (Extention)	Tana	72.5	2004	25	-
Mutonga*3	Tana	60	2005	149	-
Total		525.1			

Note : Cost does not include price escalation.

*1 Updated NPDP Study (Draft Final), April 1991

*2 Studies recently completed; (a) to (c) referred above.

*3 High Grand Falls project is an alternative to the Low Grand Falls/Mutonga, which should be examined further.

TABLES

Table L2.1 Existing and Committed Hydropower Plans

Plant	Owner	River	No. of Unit	Year Installed	Type of Turbine	Installed Capacity (MW)	Effective Output (MW)	Firm Output (MW)
Selbe Falls	KPLC	Sosiani	2	1952	Pelton	0.40	0.36	
Mesco	KPLC	Maragua	1	1933	Francis	0.38	0.38	
Ndula	KPLC	Thika	2	1925	Francis	2.00	1.70	4.30
Sagana Falls	KPLC	Tana	3	1954/55/61	Francis	1.50	1.50	
Gogo Falls	KPLC	Kuja	2	1958	Kaplan	2.00	1.50	
Wanjji	KPC	Maragua	4	1952/54	Francis	7.40	7.40	6.30
Tana I	KPC	Maragua	3	1932/52	Francis	6.40	5.30	1.10
Tana II		Tana	2	1954/55	Francis	8.00	6.70	4.10
Masinga	TARDA	Tana	2	1981	Kaplan	40.00	40.00	12.90
Kamburu	TRDC	Tana	3	1974/76	Francis	94.20	84.00	64.00
Gitaru	TRDC	Tana	2	1978	Francis	145.00	145.00	145.00
Kindaruma	TRDC	Tana	2	1968	Kaplan	44.00	44.00	44.00
Kiambere	TARDA	Tana	2	1988	Francis	144.00	140.00	92.00
Subtotal(1988)						495.28	477.84	373.70
Turkwel (under construction)	KVDA	Turkwel	2	1991	Francis	106.00	106.00	85.70
Total						601.28	583.84	459.40

Sources : Kenyan National Power Development Plan 1986-2006 and KPLC's Information

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Table L.2.2

Existing and Committed Power Plans

Plant	Region	No. of Unit	Year Installed	Installed Capacity (MW)	Effect Output (MW)
<u>Interconnected System</u>					
(1) Thermal Power Station					
Kipevu(Steam) *1	Coast	6	1954-76	98.0	69.0
Kipevu C.T *2	Coast	1	1987	30.0	30.0
Nairobi South C.T	Nairobi	3	1973	17.9	13.8
Subtotal				145.9	112.8
(2) Interconnected Diesel					
Ruitu	Nairobi	2	1948/49	3.0	
Mbaraki	Nairobi	2	1947/49	1.7	8.0
Nairobi South	Nairobi	8	1954-57	13.6	
Subtotal				18.3	8.0
(3) Geothermal					
Olkaria	Nairobi	3	1981-85	45.0	43.0
(4) Committed Geothermal Plant					
N.E Olkaria	Nairobi	2		60.0	60.0
Total of Interconnected System				269.2	223.8
<u>Isolated Power Plants</u>					
Wajir	Central	3	9182	0.640	0.280
Mandera	N. East	3	1979-84	0.340	0.333
Garissa	N. East	4	1972-82	0.904	0.775
Lodwar	N. East	3	1976-81	0.380	0.254
Moyale	East	2	1986	0.400	0.198
Marsabit	East	3	1978-84	0.340	0.330
Lamu	Coast	4	1977-84	0.934	0.720
Total of Isolated System				3.938	2.890

Sources : KPLC's Information

Remarks : *1 - Effective output by unit is as follow:

	(Installed)	(Effective)
#4	12.5 MW	8.0 MW
#5	12.5 MW	6.0 MW
#6	30.0 MW	30.0 MW
#7	33.0 MW	25.0 MW

*2 - Combution thermal.

KNY-10 Table L2.3 Existing Transmission Lines

Region	As of:	220kV	132kV	132kV	66kV	40kV	33kV (km)				
		1cct (km)	1cct (km)	2cct (km)	1cct (km)	1cct (km)	1cct	2-wire	SWER	U.G	
Nairobi	Dec.1976			582.96	215.80	107.78	17.99		72.92		
	Dec.1983	300.00		584.65	250.58	113.28	151.12		75.22		
	Jun.1988	302.00		589.85	254.18	113.28	229.05	0.82	75.22		
Rift Valley	Dec.1976						302.49	0.47			
	Dec.1983						566.24	1.74			
	Jun.1988						624.35	11.54			
Western	Dec.1976						533.96				
	Dec.1983			157.26			888.25	1.16			
	Jun.1988			157.26		8.00	1147.65	9.31			
Coast	Dec.1976	128.00					226.15	8.58		0.57	
	Dec.1983	128.00		78.04			379.29	9.67		1.26	
	Jun.1988			78.04			486.06	9.67		1.40	
Mt. Kenya	Dec.1976						235.83				
	Dec.1983			137.60			281.25				
	Jun.1988			137.60			358.07	2.95			
KPC	Dec.1976		405.23		134.89						
	Dec.1983		405.23	23.11	134.89						
	Jun.1988		405.23	23.11	134.89						
TRDC	Dec.1976	101.88		16.84							
	Dec.1983	216.96	7.70	18.38							
	Jun.1988	216.96	7.70	18.38							
Whole System	Dec.1976	101.88	405.23	599.80	350.69	107.78	1316.42	10.15	72.92	0.57	
	Dec.1977	101.88	405.23	600.93	365.79	107.78	1354.52	10.80	72.92	0.76	
	Dec.1978	209.65	412.93	603.03	365.79	107.78	1417.62	10.95	72.92	0.76	
	Dec.1979	209.65	412.93	603.03	365.79	107.78	1444.08	22.09	72.92	0.76	
	Dec.1980	216.96	412.93	608.83	367.27	113.28	1723.25	11.20	72.92	1.26	
	Dec.1981	216.96	412.93	608.83	367.27	113.28	1954.57	11.20	75.22	1.26	
	Dec.1982	216.96	412.93	661.03	367.27	113.28	2128.27	11.20	75.22	1.26	
	Dec.1983	644.96	412.93	681.43	385.47	113.28	2366.15	12.57	75.22	1.26	
	Dec.1984	644.96	412.93	681.43	385.47	113.28	2284.17	12.57	75.22	1.26	
	Dec.1985	644.96	412.93	681.43	n.a	113.28	n.a	12.57	75.22	1.26	
	Jun.1986	644.96	412.93	681.43	386.90	113.28	2526.47	12.57	75.22	1.26	
	Jun.1987	646.96	412.93	683.43	387.07	113.28	2606.20	32.87	75.22	1.26	
	Jun.1988	646.96	412.93	686.63	389.07	121.28	2845.18	34.29	75.22	1.40	
	Increase Rate(%)		17.43	0.16	1.18	0.91	1.03	6.93	11.17	0.27	8.13

220kV Lines under Construction

- 1) Turkwel to Lessos over 225km with a single circuit
- 2) Dandora to Embakasi over 12km with double circuit

Source : Information from KPLC

Remark : Increase Rate - Averaged Annual Growth Rate over 11.5 Years.

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Table L2.4 Existing Distribution Systems

Region	As of:	11kV(km)					L.V.(km)		Total			
		6-wire	3-wire	2-wire	SWER	U.G. Cable	Aerial Cable	Over-head		U.G. Cable		
Nairobi	Dec.1976	3.5	1901.2	133.3	66.7	114.9	0.2	941.4	61.8	1003.2		
	Dec.1983	3.5	2424.5	163.3	49.4	138.7	1.9	1213.3	156.8	1370.1		
	Jun.1988	3.5	2713.2	220.1	49.4	169.1	2.5	1456.0	183.1	1639.1		
Rift Valley	Dec.1976	0.2	484.4	30.0		4.5		149.7	2.8	152.5		
	Dec.1983	0.2	625.6	50.2		6.6		220.3	5.7	226.0		
	Jun.1988	0.2	733.4	68.9		7.9		369.3	6.4	375.7		
Western	Dec.1976		859.3	51.8		2.8		287.1	7.5	294.6		
	Dec.1983		1091.6	66.3		6.1		399.9	26.7	426.6		
	Jun.1988		1187.8	134.2		7.3		683.2	39.5	722.7		
Coast	Dec.1976	4.0	382.7	53.8		30.8	0.4	329.1	6.4	335.4		
	Dec.1983	4.0	496.8	49.0		42.8	0.4	400.5	12.1	412.5		
	Jun.1988	4.0	535.9	65.5		49.1	0.7	466.6	15.5	482.1		
Mt. Kenya	Dec.1976		594.8	29.6		2.9		194.6	1.8	196.4		
	Dec.1983		1001.0	70.4		3.9		357.0	15.8	372.8		
	Jun.1988		1111.0	112.3		4.9		580.2	18.9	599.2		
Whole Kenya	Dec.1976	7.7	4222.3	298.4	66.7	155.9	0.6	4751.6	1901.9	1982.1		
	Dec.1977	7.7	4398.3	304.8	67.5	159.5	0.6	4938.4	1959.0	2041.2		
	Dec.1978	7.7	4531.5	317.1	74.4	164.4	0.6	5095.7	2007.6	2093.6		
	Dec.1979	7.7	4705.3	334.8	74.4	169.0	0.6	5291.7	2091.4	2190.1		
	Dec.1980	7.7	4849.1	358.3	74.4	172.8	1.3	5463.6	2160.1	2263.8		
	Dec.1981	7.7	5096.2	367.8	49.4	183.3	1.6	5706.0	2306.8	2431.7		
	Dec.1982	7.7	5388.2	392.0	49.4	188.1	1.6	6026.9	2451.8	2580.2		
	Dec.1983	7.7	5639.5	401.2	49.4	198.1	2.3	6298.2	2590.9	2808.0		
	Dec.1984	7.7	5794.1	423.5	49.4	217.4	2.7	6494.8	2756.5	2985.6		
	Dec.1985	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	
	Jun.1986	7.7	6047.0	489.7	49.6	228.9	3.2	6826.2	3268.8	3515.1		
	Jun.1987	7.7	6146.3	547.0	49.6	231.9	3.2	6985.8	3321.8	3575.8		
	Jun.1988	7.7	6281.2	601.0	49.6	238.3	3.2	7181.0	3555.3	3816.8		
	Increase											
	Rate(%)		0.0	3.5	6.3	-2.5	3.8	15.9	3.7	5.6	10.9	5.9

Source : Information from KPLC.

Remark : Increase rate - Averaged annual growth rate over 11.5 years.

KNY-09 Table L2.5 Transformers in Service Their Installed Capacity (MVA)

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	
	(as at 31st December)											
	(as at 30th June)											
I. Generation Step-up Substation												
11/220kV												170.0
11/132kV	331.0	331.0	397.0	397.0	397.0	397.0	417.0	417.0	417.0	417.0	417.0	417.0
11/66kV	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
11/33kV	137.0	137.0	137.0	137.0	137.0	137.0	137.0	137.0	178.0	217.0	217.0	217.0
11/40kV	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
3.3/11/40kV	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
3.3/33kV	2.3	2.3	2.3	2.3	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
3.3/40kV	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
132/220kV					270.0	540.0	540.0	540.0	540.0	540.0	540.0	540.0
Total	517.3	512.3	583.3	583.3	854.0	1124.0	1145.0	1145.0	1186.0	1395.0	1395.0	1395.0
	(Average Annual Growth Rate: 1.01%)											
II. Distribution Substation												
220/132kV					180.0	580.0	580.0	580.0	580.0	580.0	580.0	580.0
132/66kV	195.0	195.0	195.0	195.0	195.0	195.0	195.0	195.0	210.0	210.0	210.0	270.0
132/33kV	180.0	180.0	180.0	180.0	239.0	239.0	285.0	285.0	285.0	285.0	285.0	308.0
66/11kV	323.0	323.0	323.0	323.0	323.0	346.0	369.0	369.0	369.0	395.0	395.0	441.0
66/40kV	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
40/11kV	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	19.0	19.0	19.0
33/11kV	223.0	237.0	262.0	270.0	286.0	294.0	302.0	325.0	333.0	358.0	356.0	356.0
Total	951.5	965.5	990.5	998.5	1253.5	1684.5	1761.5	1784.5	1807.5	1862.0	1862.0	1989.0
	(Average Annual Growth Rate: 8.07%)											
III. Distribution Transformers												
11/0.415kV												
33/0.415kV	649.0	726.0	789.0	871.0	931.0	1005.0	1056.0	1092.0	1173.0	1300.0	1376.0	1376.0
	(Average Annual Growth Rate: 8.23%)											
IV. 220kV Transformers under Construction												
Turkweil Project:												
Step-up Transformers at Turkweil												11/231kV, 2 units of 59MVA
Step-down Transformers at Lessos												220/132kV, 2 units of 75MVA

Source : Annual Reports of KPLC and KPLC's Information

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Table L3.1 Historical Power and Energy Balance

Description	Capacity(MW)		1979	1980	1981	1982	1983	1984	1985	1986	86/87	87/88	88/89	89/90
	Instal	Effect.												
(GWh)														
(1-6)														
I. Capacity and Energy Supply														
1.1 Hydropower	497.28	476.34	1,288	1,040	1,362	1,377	1,458	1,471	1,660	828	1,792	2,038	2,449	2,503
(Incl. Import)	527.28	496.17	1,448	1,355	1,556	1,589	1,637	1,686	1,875	941	2,003	2,192	2,561	2,682
a) Tana (KPC)	14.40	12.00	78	48	83	75	65	59	67	33	77	82	77	95
b) Warjii (KPC)	7.40	7.40	32	48	47	59	32	34	39	18	54	46	57	55
c) Kindaruna (TRDC)	44.00	44.00	188	129	174	174	187	172	202	102	191	223	214	216
d) Kamburu (TRDC)	94.20	84.00	315	278	335	336	357	337	398	184	415	432	400	372
e) Gitaru (TRDC)	147.00	145.00	656	513	644	658	723	687	776	400	836	841	779	762
f) Masinga (TARDA)	40.00	40.00			59	50	70	166	161	85	199	182	103	124
g) Kiambere (TARDA)	144.00	140.00										211	794	863
h) Small Hydro (KPLC)	6.28	3.94	19	24	20	25	24	16	17	6	20	21	25	21
i) Import from UEB	30.00	19.83	160	315	194	212	179	215	215	113	211	154	112	174
1.2 Thermal (KPLC)	98.00	69.00	205	333	283	260	114	174	83	59	168	208	25	97
a) Kipevu	98.00	69.00	205	333	283	260	114	174	83	59	168	208	25	97
1.3 Gas Turbine (KPLC)	47.90	43.80	1	25	0	0	0	0	4	3	44	65	21	10
a) Kipevu	30.00	30.00			0	0	0	0	0	0	27	52	20	10
b) Nairobi South	17.90	13.80			0	0	0	0	4	3	17	13	1	0
1.4 Diesel (KPLC)	18.28	8.00	1	22	1	1	0	1	2	1	5	3	2	2
1.5 Geothermal (KPC)	45.00	43.00			39	96	262	233	336	179	374	348	322	336
1.6 Adjustment														9
1.7 Total (Incl. Import)	706.46	640.14	1,495	1,420	1,685	1,734	1,834	1,879	2,085	1,070	2,383	2,662	2,819	2,962
	736.46	659.97	1,655	1,735	1,879	1,946	2,013	2,094	2,300	1,183	2,594	2,816	2,931	3,136
1.7 Isolated System	3.94	2.89	2	3	3	4	5	5	7	4	9	10	11	11
1.8 GROSS (INCL. IMPORT)	740.40	662.86	1,657	1,738	1,882	1,950	2,018	2,099	2,307	1,187	2,603	2,826	2,942	3,147
II. Losses(GWh)														
2.1 Station Use			22	29	29	31	29	28	27	16	28	43	27	33
2.2 System Losses			220	234	250	275	295	276	310	127	347	411	455	456
III. Sold Energy - KPLC System(GWh)			1,409	1,468	1,593	1,631	1,676	1,775	1,944	1,035	2,205	2,337	2,412	2,592
-REF System					7	9	13	15	19	11	25	36	49	61
-Total			1,409	1,468	1,600	1,640	1,689	1,790	1,963	1,046	2,230	2,373	2,461	2,653
IV. System Peak Demand (MW)			269	290	313	317	334	349	387	400	430	461	480	520
Nairobi			151	165	182	180	191	192	206	223	223	231	238	284
Coast Region			62	66	66	69	69	74	78	81	89	107	98	110
Western Kenya			32	35	38	39	41	49	60	61	60	79	78	57
Central Rift Valley			15	17	18	18	19	20	23	24	26	30	35	53
Mount Kenya			9	10	12	14	16	16	18	18	21	22	25	26
North Rift Valley														30

Sources : Annual reports of KPLC and KPLC's information.

KNY-05(1/3) Table L3.3 Sold Energy by Tariff Categories and Regions, 1979-1989/90

Description	(MWh)												
	1979	1980	1981	1982	1983	1984	1985	1986	1986/87	1987/88	1988/89	1989/90	
Tariff-A (<7000kWh/m)	385685	399331	434938	431711	479662	510247	541310	290495	629247	672366	723327	773336	
Nairobi	243715	252619	273876	282853	304090	322350	331631	180812	396782	421420	445654	477896	
Coast Region	67410	70777	79372	77909	82979	86695	96486	52719	110656	114371	124514	132908	
Central Rift Valley	22977	24535	27581	32781	31100	32863	35679	15285	36601	39609	45380	47831	
Western Kenya	35056	33140	35389	38217	39512	44061	49161	27367	54174	63235	70023	50040	
Mount Kenya	16527	18460	18720	19951	21981	24278	28353	14312	31034	33731	37756	41485	
North Rift Valley												23176	
A0: Domestic	355685	399531	434938	431711	479662	510247	432472	181785	391317	411810	452190	480671	
Nairobi	243715	252619	273876	282853	304090	322350	271113	120135	265638	276604	303047	323475	
Coast Region	67410	70777	79372	77909	82979	86695	82605	35182	71927	73740	79587	83264	
Central Rift Valley	22977	24535	27581	32781	31100	32863	24672	7247	17801	19282	22241	23851	
Western Kenya	35056	33140	35389	38217	39512	44061	34915	13453	23090	28980	31312	21794	
Mount Kenya	16527	18460	18720	19951	21981	24278	19167	5768	12861	13204	16003	17449	
North Rift Valley												10838	
A1: Commercial							108838	108710	237930	260556	271137	292665	
Nairobi							60518	60677	131144	144316	142607	154421	
Coast Region							13881	17537	38729	40631	44927	49644	
Central Rift Valley							11007	8038	18800	20327	23139	23980	
Western Kenya							14246	13914	31084	34255	38711	28246	
Mount Kenya							9186	8544	18173	20527	21753	24036	
North Rift Valley												12338	
Tariff-B (7000-10000kWh/m)	425179	437140	410596	406461	414752	455219	471714	252050	535545	554534	514993	553791	
Nairobi	221042	217974	220273	215781	216811	243778	250516	127889	287538	291322	277492	292986	
Coast Region	79438	89429	94717	88687	83224	80414	79652	51250	87811	94206	85945	103952	
Central Rift Valley	26805	26857	26009	27305	30476	37003	34304	22017	44712	47153	56658	57083	
Western Kenya	82650	85684	51649	54810	58861	63477	76951	35031	80404	83435	61999	40975	
Mount Kenya	15244	17196	17948	19878	25380	30547	30291	15863	35080	38418	32899	30274	
North Rift Valley												28521	
B0: Irrigation, 240V or 415V					20622	51322	37987	0	50294	50128	35472	26612	
Nairobi					15853	38235	25676		35648	34410	18985	13536	
Coast Region					178	206	298		287	180	227	275	
Central Rift Valley					2463	8693	7962		9892	10869	12529	9283	
Western Kenya					1717	3104	3473		3347	3310	2999	1527	
Mount Kenya					411	1084	578		1120	1359	732	717	
North Rift Valley												1274	
B1: Commercial, 240V or 415V	320804	328368	344707	364463	361905	374379	403862	0	456466	481625	465569	506357	
Nairobi	164396	174891	180322	185762	174588	181670	201923		229470	238835	248558	267041	
Coast Region	75752	72839	77766	82023	82448	79633	78806		87000	92904	84378	102451	
Central Rift Valley	26805	26857	26009	27305	28013	28310	26342		34820	36203	42930	44288	
Western Kenya	38962	38555	43341	50100	52328	57086	68566		72354	76624	57536	37406	
Mount Kenya	14889	15316	17269	19273	24528	27680	28225		32822	37059	32167	29557	
North Rift Valley												25614	
B2: Commercial, 11kV or 33kV	96876	100825	57980	41998	32161	29518	29865	0	28785	22781	13952	20822	
Nairobi	50259	37503	34457	30019	26306	23873	22917		22420	18077	9949	12409	
Coast Region	2574	14313	14536	6664	598	575	548		524	1122	1340	1226	
Central Rift Valley										81	1199	3512	
Western Kenya	43688	47129	8308	4710	4816	3287	4912		4703	3501	1464	2042	
Mount Kenya	355	1880	679	605	441	1783	1483		1138				
North Rift Valley												1633	
B3: Commercial, 66kV or 32kV	7499	7947	7909		64								
Nairobi	6387	5670	5494		64								
Coast Region	1112	2277	2415										
Central Rift Valley													
Western Kenya													
Mount Kenya													
North Rift Valley													
Tariff-C (>10000kWh/m)	462891	506838	614946	644534	659310	680576	812520	433805	915509	981776	1041112	1127448	
Nairobi	207267	248607	290523	299021	304735	306615	363396	194585	394291	417388	429290	468195	
Coast Region	190582	189944	209605	219091	226743	237407	257669	137827	294832	321620	347876	370074	
Central Rift Valley	18030	18072	22289	23425	20389	19091	27738	14565	32987	36524	32865	32665	
Western Kenya	44749	48155	87655	97117	102416	108454	137975	73536	166911	186460	203390	146887	
Mount Kenya	2263	2060	4874	5880	5027	9009	25742	13292	26488	19784	27691	35043	
North Rift Valley												74584	

Sources: KPLC's information, National Power Development Plan (1987) and Interim Update of NPDP (1991)

KNY-05(2/3) Table L3.3 Sold Energy by Tariff Categories and Regions, 1979-1989/90

Description	(MWh)											
	1979	1980	1981	1982	1983	1984	1985	1986 (1-6)	1986/87	1987/88	1988/89	1989/90
C1: Commercial, 415V	151250	139445	148386	146162	145000	149972	169328	0	207346	232279	296485	339739
Nairobi	85221	79426	86720	82423	78898	84249	91430		106255	117974	132642	148120
Coast Region	32075	28155	25936	24463	27085	32519	44395		56058	62252	78127	89173
Central Rift Valley	14799	14693	17919	18266	17102	15723	12789		16209	17980	18890	19553
Western Kenya	16892	15437	15790	18657	20057	14805	17009		25074	29466	50487	43341
Mount Kenya	2263	1734	2021	2353	1858	2676	3705		3750	4607	16339	23397
North Rift Valley												16155
C2: Commercial, 11kV or 33kV	287969	341881	427781	462194	470636	465256	515947	0	582115	621247	615872	640637
Nairobi	58374	143669	166837	185018	196535	188723	211999		243748	260079	254870	270248
Coast Region	158507	161789	181856	190030	185286	191310	195328		213043	230445	241839	247159
Central Rift Valley	3231	3379	4370	5159	3287	3368	14949		16778	18544	13975	13112
Western Kenya	27857	32718	71865	78460	82359	75522	71634		85808	97002	93836	40043
Mount Kenya		326	2853	3527	3169	6333	22037		22738	15177	11352	11646
North Rift Valley												58429
C3: Commercial, 66kV or 132kV	23672	25512	38779	36178	43674	65348	127245	0	126048	128250	128755	147072
Nairobi	23672	25512	36966	31580	29302	33643	59967		44288	39335	41778	49827
Coast Region			1813	4598	14372	13578	17946		25731	28923	27910	33742
Central Rift Valley												
Western Kenya						18127	49332		56029	59992	59067	63503
Mount Kenya												
North Rift Valley												
Tariff-D (Off-peak)	122619	111353	117791	114102	108602	116186	105624	52893	110878	110211	113035	116700
Nairobi	110007	99163	105650	101767	96562	103959	95536	47050	100754	100317	103032	106642
Coast Region	4537	4742	4504	4301	4378	4298	3848	1921	3566	3149	3003	2733
Central Rift Valley	2475	1908	1912	2177	1866	2595	907	979	1931	1778	1862	1876
Western Kenya	3888	3680	3839	3742	3923	3267	3448	1477	2977	2926	3061	1768
Mount Kenya	1712	1860	1886	2115	1873	2067	1885	1466	1650	2041	2077	2248
North Rift Valley												1433
Tariff-E (Street Lighting)	10021	10716	11099	11092	10376	9275	8858	4169	9021	12431	14152	13624
Nairobi	6518	6950	7235	6849	5738	6258	5410	2529	5310	7842	9033	9385
Coast Region	1598	1802	1827	2106	2134	1709	1584	716	1695	2055	2330	1658
Central Rift Valley	466	509	593	652	1021	-9	509	242	578	652	1019	715
Western Kenya	1129	1092	1125	1154	1097	1022	1024	525	1120	1402	1306	880
Mount Kenya	310	363	319	331	386	295	331	157	318	480	464	536
North Rift Valley												450
Tariff-F (KPLC Staff)	2989	2913	3232	3410	3788	3176	3977	1981	4735	5268	5980	6859
Nairobi	2300	2197	2337	2493	2446	2428	2544	1269	2937	3376	4021	4284
Coast Region	304	325	358	341	613	257	471	268	599	734	816	768
Central Rift Valley	72	74	163	206	217	259	235	141	504	277	566	665
Western Kenya	209	195	193	206	338	113	272	173	363	424	191	386
Mount Kenya	104	122	131	164	174	119	455	130	332	457	386	528
North Rift Valley												228
National Total by Region	1409384	1468491	1592602	1631310	1676490	1774679	1944003	1035393	2204935	2336586	2412599	2591758
Nairobi	790849	827510	899944	908764	930382	985388	1049033	554134	1187612	1241665	1268522	1359388
Coast Region	343869	357019	390383	392435	400071	410780	439710	244701	499159	536135	564484	612093
Central Rift Valley	70825	71955	78547	86546	85069	91802	99372	53229	117313	125993	138350	140835
Western Kenya	167681	171946	179850	195246	206147	220394	268831	138109	305949	337882	339970	240936
Mount Kenya	36160	40061	43878	48319	54821	66315	87057	45220	94902	94911	101273	110114
North Rift Valley												128392
National Total by Tariff	1409384	1468491	1592602	1631310	1676490	1774679	1944003	1035393	2204935	2336586	2412599	2591758
Tariff-A	385685	399531	434938	451711	479662	510247	541310	290495	629247	672366	723327	773336
Tariff-B	425129	437140	410596	406461	414752	455219	471714	252050	535545	554534	514993	553791
Tariff-C	462891	506838	614946	644534	659310	680576	812520	433805	915509	981776	1041112	1127448
Tariff-D	122619	111353	117791	114102	108602	116186	105624	52893	110878	110211	113035	116700
Tariff-E	10021	10716	11099	11092	10376	9275	8858	4169	9021	12431	14152	13624
Tariff-F	2989	2913	3232	3410	3788	3176	3977	1981	4735	5268	5980	6859

Sources: KPLC's information, National Power Development Plan (1987) and Interim Update of NPDP (1991)

KNY-05(3/3) Table L3.3 Sold Energy by Tariff Categories and Regions, 1979-1989/90

Description	1979	1980	1981	1982	1983	1984	1985	1986	(MWh)			
									1986/87 (1-6)	1987/88	1988/89	1989/90
National Total by Group	1409384	1468491	1592602	1631310	1676490	1774679	1944003	1035393	2204935	2336586	2412599	2591758
Domestic (A+E+F)	398695	413160	449269	466213	493826	522698	554145	296645	643003	690065	743459	793819
Comm. & Indust. (B+C)	888070	943978	1025542	1050995	1074062	1135795	1284234	685855	1451054	1536310	1556105	1681239
Off-peak (D)	122619	111353	117791	114102	108602	116186	105624	52893	110878	110211	113035	116700
Nairobi												
Domestic (A+E+F)	252533	261766	283498	292195	312274	331036	339585	184610	405029	432638	458708	491565
Comm. & Indust. (B+C)	428309	466581	510796	514802	521546	550393	613912	322474	681829	708710	706782	761181
Off-peak (D)	110007	99163	105650	101767	96562	103959	95536	47050	100754	100317	103032	106542
Total	790849	827510	899944	908764	930382	985388	1049033	554134	1187612	1241665	1268522	1359388
Coast Region												
Domestic (A+E+F)	69312	72904	81557	80356	85726	88661	98541	53703	112950	117160	127660	135334
Comm. & Indust. (B+C)	270020	279373	304322	307778	309967	317821	337321	189077	382643	415826	433821	474026
Off-peak (D)	4537	4742	4504	4301	4378	4298	3848	1921	3566	3149	3003	2733
Total	343869	357019	390383	392435	400071	410780	439710	244701	499159	536135	564484	612093
Central Rift Valley												
Domestic (A+E+F)	23515	25118	28337	33639	32338	33113	36423	15668	37683	40538	46965	49211
Comm. & Indust. (B+C)	44835	44929	48298	50730	50865	56094	62042	36582	77699	83677	89523	89748
Off-peak (D)	2475	1968	1912	2177	1866	2595	907	979	1931	1778	1862	1876
Total	70825	71955	78547	86546	85069	91802	99372	53229	117313	125993	138350	140835
Western Region												
Domestic (A+E+F)	36394	34427	36707	39577	40947	45196	50457	28065	55657	65061	71520	51306
Comm. & Indust. (B+C)	127399	133839	139304	151927	161277	171931	214926	108567	247315	269895	265389	187862
Off-peak (D)	3888	3680	3839	3742	3923	3267	3448	1477	2977	2926	3061	1768
Total	167681	171946	179850	195246	206147	220394	268831	138109	305949	337882	339970	240936
Mt. Kenya												
Domestic (A+E+F)	16941	18945	19170	20446	22541	24692	29139	14599	31684	34668	38606	42549
Comm. & Indust. (B+C)	17507	19256	22822	25758	30407	39556	56033	29155	61568	58202	60590	65317
Off-peak (D)	1712	1860	1886	2115	1873	2067	1885	1466	1650	2041	2077	2248
Total	36160	40061	43878	48319	54821	66315	87057	45220	94902	94911	101273	110114
North Rift Valley												
Domestic (A+E+F)												23854
Comm. & Indust. (B+C)												103105
Off-peak (D)												1433
Total												128392

Sources : KPLC's information, National Power Development Plan(1987) and Interim Update of NPDP(1991)

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Table L3.4 Energy Sales of REF System

Region	1982	1983	1984	1985	1986 (1-6)	1986/87	1987/88	1988/89	Growth Rate
Nairobi	1,294.2	1,162.9	2,962.3	5,451.0	3,601.5	5,993.2	8,373.0	11,748.3	40.40 %
Interconnected	327.6	857.3	1,142.9	2,615.9	2,247.3	2,933.9	4,759.6	7,213.1	60.91 %
Isolated	966.6	305.7	1,819.4	2,835.1	1,354.2	3,059.3	3,613.4	4,535.1	26.85 %
Coast	289.0	510.8	897.5	772.5	502.4	915.0	965.6	1,395.0	27.41 %
Rift Valley	1,012.7	1,535.2	1,852.1	2,261.4	847.7	2,291.1	3,072.4	3,699.5	22.06 %
Western	4,145.7	5,069.2	6,390.7	9,667.4	5,391.4	11,837.9	17,694.7	22,108.0	29.37 %
Interconnected	3,810.7	5,069.2	5,318.3	8,425.2	4,917.0	10,973.7	16,545.7	20,820.9	29.86 %
Isolated	335.0	0.0	1,072.4	1,242.1	474.3	864.1	1,149.0	1,287.1	23.01 %
Mr. Kenya	1,760.3	2,455.7	2,904.4	3,120.6	1,705.4	3,968.8	5,676.5	9,785.2	30.20 %
Subtotal	7,200.2	10,428.2	12,115.2	17,195.7	10,219.8	21,082.5	31,019.6	42,913.6	31.60 %
Interconnected	1,301.6	305.7	2,891.8	4,077.3	1,828.6	3,923.5	4,762.4	5,822.2	25.92 %
Isolated	8,501.8	10,733.9	15,007.0	21,272.9	12,048.4	25,006.0	35,782.1	48,735.8	30.82 %
TOTAL OF REF SAJ	8,501.8	10,733.9	15,007.0	21,272.9	12,048.4	25,006.0	35,782.1	48,735.8	30.82 %

Source : KPLC's information

Note : Growth Rate = Average growth rate for 6.5 years from 1982 to 1988/89

Table L3.5 Monthly Energy Production and Averaged Loads

Year	Description	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1980	Generation (GWh)	147.75	131.65	126.21	127.34	144.18	143.45	158.39	154.64	150.87	153.16	150.41	147.58	1735.63
	Ave. Load (MW)	198.59	189.15	169.64	176.86	193.79	199.24	212.89	207.85	209.54	205.86	208.90	198.36	197.59
1981	Generation (GWh)	158.36	146.52	152.75	144.72	152.20	151.75	163.52	161.72	161.87	164.61	161.73	159.25	1879.00
	Ave. Load (MW)	212.85	218.04	205.31	201.00	204.57	210.76	219.78	217.37	224.82	221.25	224.63	214.05	214.50
1982	Generation (GWh)	169.06	153.03	168.98	154.02	162.75	161.03	168.16	157.13	159.53	166.14	165.20	160.50	1945.53
	Ave. Load (MW)	227.23	227.72	227.12	213.92	218.75	223.65	226.02	211.20	221.57	223.31	229.44	215.73	222.09
1983	Generation (GWh)	172.18	156.61	175.85	163.11	165.97	165.80	168.95	171.80	169.00	171.04	170.86	161.40	2012.57
	Ave. Load (MW)	231.42	233.05	236.36	226.54	223.08	230.28	227.08	230.91	234.72	229.89	237.31	216.94	229.75
1984	Generation (GWh)	171.10	163.93	179.77	161.74	179.84	172.15	177.68	181.70	172.36	182.09	178.14	174.09	2094.59
	Ave. Load (MW)	229.97	235.53	241.63	224.64	241.72	239.10	238.82	244.22	239.39	244.74	247.42	233.99	238.46
1985	Generation (GWh)	184.91	168.21	190.84	174.61	188.76	185.73	204.41	202.28	196.13	206.61	201.29	197.89	2301.67
	Ave. Load (MW)	248.53	250.31	256.51	242.51	253.71	257.96	274.74	271.88	272.40	277.70	279.57	265.98	262.75
1986	Generation (GWh)	209.90	188.83	197.90	195.56	195.74	186.53	217.53	211.46	212.50	219.95	214.41	210.96	2461.27
	Ave. Load (MW)	282.12	281.00	265.99	271.61	263.09	259.07	292.38	284.22	295.14	295.63	297.79	283.55	280.97
1987	Generation (GWh)	223.75	208.38	224.91	212.68	218.67	220.84	234.93	235.56	231.37	239.85	236.58	236.18	2723.70
	Ave. Load (MW)	300.74	310.09	302.30	295.39	293.91	306.72	315.77	316.61	321.35	322.38	328.58	317.45	310.92
1988	Generation (GWh)	241.05	229.95	244.25	222.14	231.02	232.64	244.69	248.94	241.26	241.78	250.50	246.79	2875.01
	Ave. Load (MW)	323.99	330.39	328.29	308.53	310.51	323.11	328.88	334.60	335.08	324.97	347.92	331.71	327.30
1989	Generation (GWh)	242.97	223.62	247.60	239.60	246.66	242.67	253.63	251.79	236.50	249.78	255.57		2690.39
	Ave. Load (MW)	326.57	332.77	332.80	332.78	331.53	337.04	340.90	338.43	328.47	335.73	354.96		335.63

Reference : Figure No. L.3.5

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Table L3.6

Electricity Tariffs in 1990

Tariff Category	Description	Fixed Charge (Sh/mon)	Capacity Charge (Sh/KVA)	Energy Charge (Sh/kWh)
A	Less than 7,000 kWh/month			
A0	Domestic	30	-	
	- 0 to 50 kWh/month			0.50
	- 50 50 100 kWh/month			1.00
	- 100 to 200 kWh/month			1.25
	- Over 200 kWh/month			1.66
A1	Small non-domestic	45	-	1.46
B	From 7,000 kWh to 100,000 kWh/month			
B0	Irrigation pumping	120	-	1.17
B1	Supply at 240V or 415V	120	50	1.28
B2	Supply at 11kV or 33kV	720	45	1.23
B3	Supply at 66kV or 132kV	3,280	40	1.19
C	Over 100,000 kWh/month			
C1	Supply at 415V	120	50	1.19
C2	Supply at 11kV or 33kV	720	45	1.15
C3	Supply at 66kV or 132kV	3,280	40	1.10
D0	Off-peak supply	50 *1	-	1.16
E	Street lighting	65	-	1.46

Remarks:

* If Method D0 is used in conjunction with Method A0 at the same supply terminals, then the combined fixed charge for both Methods of Charge will be Shs. 75.00.

* Government tax of 1 cents/kWh is also applied.

* Fuel oil cost adjustment surcharge may be applied to all kilowatt hour sales.

* Effect from 1st June, 1990

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Table L3.7

Gross Domestic Product, 1979-1989
(In Millions Kenya Pounds)

Year	Current Prices			Constant 82 Prices			Deflators(1982=100)			Growth Rate		
	Total GDP	Agri GDP	Non-agr GDP	Total GDP	Agri GDP	Non-agr GDP	Total GDP	Agri GDP	Non-agr GDP	Total GDP	Agri GDP	Non-agr GDP
1979	2033.2	703.4	1329.8	2661.5	885.0	1776.5	76.4	79.5	74.9			
1980	2298.4	749.1	1549.3	2768.2	894.5	1873.7	83.0	83.7	82.7	4.01 %	1.07 %	5.47 %
1981	2659.5	864.3	1795.2	2933.5	947.5	1986.0	90.7	91.2	90.5	5.97 %	5.93 %	5.99 %
1982	3049.3	1017.3	2032.0	3049.3	1017.3	2032.0	100.0	100.0	100.0	3.95 %	7.37 %	2.32 %
1983	3473.6	1188.6	2285.0	3124.9	1036.2	2088.7	111.2	114.7	109.5	2.48 %	1.86 %	2.79 %
1984	3872.9	1313.5	2559.4	3151.7	1000.2	2151.5	122.9	131.3	119.0	0.86 %	-3.47 %	3.01 %
1985	4418.7	1436.7	2982.0	3313.3	1040.3	2273.0	133.4	138.1	131.2	5.13 %	4.01 %	5.65 %
1986	5115.0	1690.1	3424.9	3498.2	1091.5	2406.7	146.2	154.8	142.3	5.58 %	4.92 %	5.88 %
1987	5612.5	1781.9	3830.6	3668.4	1137.3	2531.1	153.0	156.7	151.3	4.87 %	4.20 %	5.17 %
1988	6391.1	2039.1	4352.0	3858.6	1190.7	2667.9	165.6	171.2	163.1	5.18 %	4.70 %	5.40 %
1989	7330.5	2271.3	5059.2	4050.0	1238.0	2812.0	181.0	183.5	179.9	4.96 %	3.97 %	5.40 %

Average 1979-84

Average 1984-89

Average 1979-89

3.44 %

2.48 %

3.90 %

5.14 %

4.36 %

5.50 %

4.29 %

3.41 %

4.70 %

Sources: Kenya

Stabilization and Adjustment: Toward Accelerated Growth

October 17, 1990, World Bank

Remarks: 1) Deflators of non-agr GDP are calculated from that of total GDP and agr. GDP.

2) (Non-agr GDP)/(Total GDP) - (Agr GDP)

Table L3.8 Average Tariffs by Tariff Categories (1979-1988/89)

Description	1979	1980	1981	1982	1983	1984	1985	1986	1987/88	1988/89	1989/90	
Total Sales (MWh) *1	1409383	1468491	1592603	1631310	1676490	1774681	1944003	1035393	2204935	2336586	2412599	2591758
Domestic (A+E+F)	398695	413160	449269	466213	493826	522698	554145	296645	643003	690065	743459	793819
Comm.&Indust. (B+C)	888069	943978	1025542	1050995	1074062	1135797	1284234	683855	1451054	1536310	1556105	1681239
Off-peak (D)	122619	111353	117792	114102	108602	116186	105624	52893	110878	110211	113035	116700
Total Revenue (M.KSh) *2	573780	701483	920078	1020384	1132093	1242953	1481511	843286	2005753	2434600	2629657	2936501
Domestic (A+E+F)	211197	220771	238960	248963	350796	428521	488032	270857	652477	788105	878694	980342
Comm.&Indust. (B+C)	334961	355844	381170	396831	584878	747202	922197	533520	1263440	1541419	1635794	1837416
Off-peak (D)	25878	24602	25596	25562	46553	65922	69855	37556	89351	104178	112500	116764
Others *3	1744	100266	274352	349028	149866	1308	1427	1353	485	898	2669	1979
Inflation Indexes (1982=100) *4												
Gross Domestic Product	75.4	83.0	90.7	100.0	111.2	122.9	133.4	146.2	153.0	165.6	181.0	
Total	79.5	83.7	91.2	100.0	114.7	131.3	138.1	154.8	156.7	171.2	183.5	
Agriculture	74.9	82.7	90.5	100.0	109.5	119.0	131.2	142.3	151.3	163.1	179.9	
Non-agriculture	64.4	72.7	81.8	100.0	114.5	124.9	138.2	146.0	156.4	173.2	191.5	
Consumer Price Indexes (Average)												
Average Tariff (Current Price, Sh/kWh)	0.0012	0.0683	0.1723	0.2140	0.0894	0.0007	0.0007	0.0013	0.0002	0.0004	0.0011	0.0008
Others	0.5310	0.6026	0.7042	0.7480	0.7998	0.8206	0.8814	0.9144	1.0150	1.1425	1.1830	1.2357
Domestic (A+E+F)	0.3784	0.4452	0.5439	0.5915	0.6339	0.6586	0.7188	0.7792	0.8709	1.0037	1.0523	1.0937
Comm.&Indust. (B+C)	0.2123	0.2892	0.3896	0.4380	0.5180	0.5681	0.6621	0.7113	0.8061	0.9456	0.9964	1.0013
Off-peak (D)	0.4071	0.4777	0.5777	0.6255	0.6753	0.7004	0.7621	0.8145	0.9097	1.0419	1.0900	1.1330
Total	0.8245	0.8289	0.8608	0.7480	0.6985	0.6570	0.6378	0.6263	0.6489	0.6596	0.6178	
Domestic (A+E+F) *5	0.5052	0.5384	0.6010	0.5915	0.5789	0.5534	0.5479	0.5476	0.5756	0.6154	0.5849	
Comm.&Indust. (B+C) *6	0.3296	0.3978	0.4762	0.4380	0.4524	0.4549	0.4791	0.4872	0.5154	0.5460	0.5203	
Off-peak (D) *5	0.5435	0.5776	0.6384	0.6255	0.6167	0.5886	0.5809	0.5724	0.6012	0.6388	0.6059	
Total *6												

Remarks:

*1 Source : KPLC

*2 Source : KPLC and National Power Development Plan 1986-2006

*3 Others include study items such as fuel oil surcharge, KPLC board meter rent, etc.

*4 Source : Kenya Stabilization and Adjustment toward Accelerated Growth

Oct 17, 1990, World Bank

*5 CPI price deflator was used.

*6 Non-agriculture GDP price deflator was used.

River	Reach under Study			Elevation(m)	Location	(To)	Elevation(m)	Length (km)	Upper Bound Potential	
	Location	Elevation(m)	(From)						Energy (GWh/yr)	Power (MW)
DRAINAGE AREA NO.1										
Nzoia	Koitcut	5290	34:00'E	1130			271	1,970	225	
Sondu	West Mau	2060	L. Victoria	1140			120	1,503	172	
Yala	Source	2480	Equator	1130			181	946	108	
Gucha	Source	2073	Migori R.	1152			176	705	81	
Migori	Source	1771	L. Victoria	1140			187	449	52	
Mara	Source	2860	Border	1510			258	603	69	
							Sub-total	6,176	707	
DRAINAGE AREA NO.2										
Turkwell	Mt. Elgon	4190	2:30'N	590			233	1,684	172	
Ewaso Ng'iro S.	Source	2800	1:45'S	700			196	824	94	
Kerio	Source	2440	1:15'N	930			140	327	37	
							Sub-total	2,835	303	
DRAINAGE AREA NO.3										
Athi/Sabaki	Source	2100	Baricho	46			612	2,462	281	
DRAINAGE AREA NO.4										
Tana	Source	4600	Garissa	160			546	10,790	1,232	
Thika	0:45'S	2420	Tana R.	1030			160	652	74	
Chania	Sasumua	2460	Thika R.	1463			66	395	45	
							Sub-total	11,837	1,351	
DRAINAGE AREA NO.5										
Ewaso Ng'iro N.	Lesatima	3960	Archer's Post	840			250	1,133	130	
							TOTALS	24,443	2,772	

Note : Upper bound potentials were estimated using 10-kilometer reaches.

Sources : National Master Water Plan, Stage I, Volume II, Natural Resources and Potential Projects

Table L4.2 Principal Features of Potential Hydropower Schemes

Name of Project	River	Catchment Area (km ²)	Crest EL (m)	Dam Height (m)	Volume (mcm)	Area (km ²)	Inflow (m ³ /s) Average	Reservoir		Storage Cap (mcm) Gross	Effect	Power		Annual Average Energy (GWh)		
								Firm	Install.			Average Head (m)	Capacity (MW) Firm			
1) DRAINAGE AREA NO.1 - LAKE VICTORIA																
1.1 Nzoia River Basin																
Hemsted's Bridge	Nzoia	3,825	1,784	53	4.6	32.0	18.0	12.0	433	310	44	12	4.2	37		
Rongai	Nzoia	4,916	1,680	65	7.5	38.0	22.0	16.0	745	500	53	15	6.8	60		
Lugari	Nzoia	8,300	1,615	100	16.9	54.0	41.0	30.0	1,290	800	79	45	19.0	166		
Webyeye Falls	Nzoia	8,380					42.0	30.0	*1 (run-of-river)		55	30	13.2	116		
Mumias	Nzoia	10,200		45	5.5	60.0	60.0	45.0	700	450	35	30	n.a	110		
Rawpula	Nzoia	11,849	1,245	47		60.0	80.0	60.0	790	600	37	33	17.7	155		
*1: Subject to completion of upstream storage projects.																
1.2 Yala River Basin																
Nandi Forest	Yala	1,560	1,814	58		8.4	14.8	7.7	127	100	44	4.0	1.7	15		
Mushangumbo	Yala	2,000	1,438	48	2.0	29.0	23.0	17.0	450	285	36	15.0	4.9	43		
Yala Falls - Congo	Yala	2,390	1,400			21.0	25.0	19.0		525	109	40.0	16.6	125		
1.3 Nyando River Basin																
Tinderet Forest	Kipkurere							0.6		20		6.0	2.1	18		
Twin Bridge	Ainoggetui							2.0		60		4.0	1.3	11		
Koru	Nyando							4.0		50		4.0	1.2	11		
Awasi	Nyando							5.0								
1.4 Sendu River Basin																
Orodet	Kipsonoi	800	1,745	55	0.9	13.0	12.0	7.0	165	130	42	8.0	2.3	20		
Magwagwa	Sondu	3,250	1,700	140	13.2	50.0	40.0	30.0	1,730	1,200	118	75.0	28.3	248		
Sondu	Sondu						40.0	30.0			370	90.0		692		
Minu	Sondu	3,360	1,468	108	11.9	27.0	40.0	26.0	935	700	220	75.0	45.8	498		
1.5 Gucha Migori River Basin																
Gogo Falls	Kuja	3,022	1,265			20.0	37.0	20.0	230	200			3.7	24		
Oi Ngobor	Migori	3,050				3.0			130	115						
1.6 Mara River Basin																
Tenwek	Nvangores	635	2,044	91	4.4	15.0	10.0	8.0	405	300	79	10.0	5	44		
												Total of Drainage Area No.1		496.0	174.4	2,393

KNY-31(2/2) Table L4.2 Principal Features of Potential Hydropower Schemes

Name of Project	River	Catchment Area (km ²)	Crest EL (m)	Dam Height (m)	Volume (mm)	Area (km ²)	Reservoir		Power		Annual Average Energy (GWh)		
							Inflow (m ³ /s)	Storage Cap (mm)	Average Head (m)	Capacity (MW)			
2) DRAINAGE AREA NO.2 - RIFT VALLEY													
2.1 Turkwel River Basin	Turkwel	5,870	1,120	65	0.1	30.0	26.8	765	495	314	100.0	67.2	589
2.2 Melawa River / Lake Naivasha	Melawa	1,430	1,992	75	2.4	15.0	4.5	320	295	64	6.0	2.3	20
Naivasha-Kedong		3,140				6.3					12.6		59
2.3 Kerio River Basin													
Moiben-Arros-Kerio		2,416	1,040	36		52.0	2.5	465	275	750		15.0	131
Kerio A							10.0						
2.4 Ewaso Ng'iro River Basin	Ewaso Ng'iro	5,300	1,304	94	1.9	50.0	12.0	970	400	469	60.0	19.0	166
Ewaso Ng'iro		5,500									75.0	45.0	394
Ng'iro													1,359
Total of Drainage Area No.3													
253.6													
148.5													
38.2													
335.0													
3) DRAINAGE AREA NO.3 - ATHI RIVER BASIN													
Munya	Athi	5,600	1,467	52	2.7	55.0	13.5	920	700	189	33.0	20.4	179
Thwake	Athi	10,200	930	84	10.7	49.0	18.0	1,280	840	69	20.0	9.9	87
Baricho	Sabald	35,200	95	48	1.7	88.0	30.0	1,300	840	33	14.0	7.9	69
Total of Drainage Area No.3													
67.0													
38.2													
335.0													
4) DRAINAGE AREA NO.4 - TANA RIVER BASIN													
Karura	Tana	11,802	715	31	0.8	8.2	91.9	74	12		65.0		193
Kiambere	Tana	15,329	681	87	5.8	13.0	91.9	315	305		110.0		377
Muronga	Tana	17,459	595	97	7.8	46.0	132.1	1,580	1,450		90.0		339
Grand Falls	Tana	18,690	539	97	10.7	119.0	146.2	3,600	3,528		150.0		701
Uwani	Tana	21,462	428	41	2.6	26.0		330	286		60.0		321
Adamson's Falls	Tana	25,551	369	53	3.0	102.0	175.2	1,730	1,640		80.0		429
Kora Hills	Tana	26,500	324	73	8.0	190.0	175.2	3,800	3,657		110.0		376
Total of Drainage Area No.4													
665.0													
1,481.6													
6,823													

Source: National Master Water Plan (1980)

Name of Project	River	Average Inflow (m ³ /s)	Firm Inflow (m ³ /s)	Live Storage (mcm)	Gross Head (m)	Install Capacity (MW)	Firm Energy (GWh)	Average Energy (GWh)	Status of Study
D) DRAINAGE AREA NO.1: LAKE VICTORIA									
1.1) Nzoia River Basin									
Hemsted Bridge	Nzoia		8.5	226	553	60	297	307	Rec
Rongai	Nzoia		13.0	441 *	50 *	12 *	52 *	72 *	Rec
Lugari	Nzoia		17.8	234 *	55 *	15 *	62 *	86 *	Rec
Webuye Falls	Nzoia		17.3	200 *	105 *	30 *	115 *	170 *	Rec
Anyika	Nzoia		42.5	756 *	40 *	25 *	95 *	125 *	Rec
Subtotal						60	297	307	
1.2) Yala River Basin									
Nandi Forest - KPT	Yala	7.0	6.6	275	552	50	249	255	Rec
Nandi Forest - Tindinyo	Yala	7.0	6.8	275 *	312 *	33 *	139 *	142 *	Rec
Mushangumbo	Yala	13.4	7.8	337 *	35 *	8 *	25 *	29 *	Rec
Yala Falls	Yala	13.8	7.8	0 *	70 *	12 *	63 *	69 *	Rec
Gongo	Yala	13.8	0 *	0 *	55 *	12 *	53 *	65 *	Rec
Subtotal						50	249	255	
1.3) Nyando River Basin									
Koru	Nyando		5.5	204	63.5	5	18.2	n.a	Rec
Tinderet	Nyando		5.5	20	43.0	4	17.9	n.a	Rec
Subtotal						9	36.1	n.a	
1.4) Sondu River Basin									
Oreket	Kipsonoi	9.0	5.9	577	67	6	27.1	30.3	Rec
Yurith	Yurith		8.7	203	73	8	37.3	53.8	Rec
Magwagwa (Low)	Sondu		18.7	594 *	95 *	28 *	102 *	163 *	Rec
Magwagwa (High)	Sondu		18.7 *	536	185	95	276	334	Rec
Sondu Village	Sondu		18.7 *	0 *	230 *	70 *	414.4 *	562.4 *	Rec
Low Miriu	Sondu		18.7 *	1.1 *	163 *	49 *	269 *	252 *	F/S
High Miriu	Sondu		20.0 *	693	315	100	450.5	528	Rec
Fotobiro	Sondu		8.3	155 *	154 *	80 *	66.7 *	355.1 *	Rec
Subtotal						209	763	946	
1.5) Gucha Migori River Basin									
Namba Kodiro	Migori		4.3	139	49	4	12.4	24.0	Pre-rec
Ol Ngebor	Migori		5.0	450	54	5	14.7	23.1	Pre-rec
Gogo Falls	Kuja		20.1	1027	53	18	73.8	88.4	Rec
Subtotal						27	101	135	
TOTAL OF DRAINAGE AREA NO.1						355	1450	1680	
D) DRAINAGE AREA NO.2: RIFT VALLEY									
Aror	Serewa			50	1100	60		150	Pre-rec
Embobut	Embobut			n.a	n.a	20		85 *	Ident
Wei Wei	Wei Wei			n.a	n.a	5		20 *	Ident
Kimwacer	Kimwacer			n.a	n.a	2		10 *	Ident
Damsite A	Kerio			n.a	n.a	12		50	Pre-rec
Damsite B	Kerio			n.a	n.a	14		60	Pre-rec
Damsite C	Kerio			n.a	n.a	14		60	Pre-rec
Leshou	Ewaso Ng'iro South			360	265	42		111	Rec
Oldorko	Ewaso Ng'iro South			785	480	76		193	Rec
TOTAL OF DRAINAGE AREA NO.2						245		739	
III) DRAINAGE AREA NO.3: ATHI RIVER BASIN									
Manyu	Athi	23.2		625	42	8	27	40	Rec
Fourteen Falls HM2	Athi	23.2		0	60	10	37	56	Rec
Fourteen Falls HM3	Athi	23.2		0	120	20	73	111	Rec
Site A13	Athi				50	10	25	45	Pre-rec
Twake Confluence	Athi				75	20	75	120	Pre-rec
Yatta	Athi			500	65	15	57	91	Rec
TOTAL OF DRAINAGE AREA NO.3						84	290	463	
IV) DRAINAGE AREA NO.4: TANA RIVER BASIN									
Karura	Tana	91.9		0	42	50	170	216	Pre-rec
Mutonga	Tana	122.0		63	37	60	210	262	Pre-F/S
Low Grand Falls	Tana	133.2		701	68	120	421	525	Pre-F/S
High Grand Falls	Tana	130.7		1925 *	105 *	180 *	692 *	802 *	Pre-F/S
Usucui	Tana	n.a		n.a	40	70	248	309	Pre-rec
Adamson's Falls	Tana	158.1		379	40	80	307	358	Rec
Kora	Tana	154.2		384	46	92	342	401	Rec
Ndola	Thiba	18.0		n.a	90	25	n.a	120	Pre-rec
Mavokoni	Thiba	20.0		n.a	125	40	n.a	190	Pre-rec
Kianyoga	Mutonga	n.a		n.a	90	30	n.a	120	Pre-rec
Gachuriri	Thiba	26.0		200	36	16	n.a	70	Pre-rec
TOTAL OF DRAINAGE AREA NO.4						583	1700	2560	
V) DRAINAGE AREA NO.5: EWASO NGIRO NORTH RIVER BASIN									
Crocodile Jaws	Ewaso Ng'iro North			n.a	115	40	n.a	175	Pre-rec
Muridojo	Ewaso Ng'iro North			0	70	25	n.a	100	Pre-rec
Kirimun	Ewaso Ng'iro North			0	260	90	n.a	400	Pre-rec
TOTAL OF DRAINAGE AREA NO.5						155		675	

Sources: National Power Development Study 1986-2006

Remarks: *1 - Mutually exclusive with others.

*2 - Status of study:

Ident : identification only

Pre-rec : pre-reconnaissance study

Rec : reconnaissance study

Pre-F/S : prefeasibility study

F/S : feasibility study

*3 - Value depending on previous development of Magwagwa.

*4 - Rough estimate.

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Table L4.4 Principal Features of Promising Hydroelectric Schemes

Name of Project	Drainage Area No.	Name of River	Crest Elev. (m)	Dam Height (m)	Length (m)	Volum (mcm)	Average Inflow (m ³ /s)	FSL (m)	Min Level (m)	Reservoir		Tailwater Level (Aver) (m)	Head Gross (m)	Net (m)	Power Output Install (MW)	Annual Energy Firm (GWh)	Annual Energy Aver (GWh)	Const. Cost (Equiv. US\$) (mUS\$)		
										Area (km ²)	Storage Gross (mcm)									
Nandi Forest - KPT	No.1	Yala	1,837.7	88.0	n.a	3.10	9.8	1,832.5	1,800.0	12.5	305.0	275	1,280.0	552.5	542.0	50.0	46.0	249	255	189.3
Magevaya (High)	No.1	Sondu	1,667.9	106.9		11.00	40.8	1,662.9	1,620.0	21.5	694.0	596	1,478.3	184.6	157.1	94.6	72.9	333	438	352.6
Low Miriu	No.1	Sondu	1,368.0			0.04	40.9	1,368.0	1,355.5			1.1	1,205.0	163.0	143.1	48.6	48.6	140	261	100.2
High Miriu	No.1	Sondu	1,460.0	104.0	2,000	10.90	40.9	1,458.0	1,400.0			693	1,143.0	315/258		72.0	450	675	329.5	
Mid-Miriu	No.1	Sondu	1,425.0	69.0	650	2.20	40.9	1,423.0	1,396.0			230		280/223		131.0	n.a	670	213.5	
Lesboza	No.2	E.Ngilo S	1,570.0	110.0	2,100	8.43	8.0	1,565.0	1,538.0	18.4	521.8	940	1,300.0	265.0	251.8	42.0	35.7	86	111	195.7
Oldorto	No.2	E.Ngilo S	1,305.0	55.0	1,500	4.48	8.0	1,300.0	1,272.0	51.2	904.2	785	820.0	480.0	456.0	76.0	69.4	149	236	206.3
Muoniga	No.4	Tana	554.0	42.0	540	0.87	132.1	550.0	542.0	10.9	122.2	62.6	513.0	37.0	35.2	60.0	40.8	202	234	153.8
Low Grand Falls	No.4	Tana	516.0	79.0	850	5.82	146.2	512.0	500.0	67.2	1,399.0	701	443.8	68.2	64.8	120.0	88.3	482	594	290.8
High Grand Falls	No.4	Tana	555.0	117.0	2,150	22.00	146.2	550.0	535.0	161.4	5,325.0	1,925	443.8	106.2	101.0	180.0	141.4	692	802	589.3
Adamsori's Falls	No.4	Tana	360.0	50.0	1,700	2.23	175.2	356.0	350.0	67.9	1,009.0	379	316.2	39.8	38.4	80.0	62.8	307	358	225.2
Kera	No.4	Tana	302.0	55.0	780	3.04	175.2	298.0	292.0	66.3	1,172.0	392	252.0	45.8	44.3	92.0	68.3	342	401	250.8

Sources : National Power Development Plan 1986 - 2006

KNY-18 Table L5.1 Summary of Load Forecasts - Calendar Year

Fiscal Year (Jun/Jul)	Low Forecast		Median Forecast		High Forecast	
	Peak Load (MW)	Net Gene. (GWh)	Peak Load (MW)	Net Gene. (GWh)	Peak Load (MW)	Net Gene. (GWh)
1985	381	2,273	381	2,273	381	2,273
1986	409	2,437	410	2,440	410	2,441
1987	434	2,572	436	2,582	438	2,593
1988	459	2,710	462	2,729	467	2,758
1989	483	2,848	489	2,879	499	2,935
1990	509	2,995	517	3,041	533	3,128
1991	533	3,133	546	3,203	570	3,341
1992	557	3,271	574	3,368	608	3,561
1993	582	3,416	605	3,542	649	3,796
1994	609	3,570	637	3,727	694	4,049
1995	636	3,727	670	3,919	741	4,319
1996	665	3,893	706	4,123	791	4,608
1997	696	4,070	743	4,340	846	4,920
1998	727	4,250	783	4,564	903	5,248
1999	762	4,451	826	4,813	967	5,614
2000	798	4,662	871	5,076	1,035	6,006
2001	837	4,883	919	5,353	1,109	6,425
2002	876	5,112	970	5,643	1,187	6,870
2003	917	5,347	1,022	5,943	1,269	7,341
2004	959	5,585	1,076	6,250	1,356	7,834
2005	1,003	5,837	1,133	6,576	1,449	8,363
Average Annual Growth Rate						
1985-1990	6.0%	5.7%	6.3%	6.0%	6.9%	6.6%
1990-2000	4.6%	4.5%	5.4%	5.3%	6.9%	6.7%

Source : National Power Development Plan, Table 4.6

Remark : Base year = 1985

KNY-17 Table L5.2 Summary of Load Forecasts - Fiscal Year

Fiscal Year (Jun/Jul)	Low Forecast		Median Forecast		High Forecast	
	Peak Load (MW)	Net Gene. (GWh)	Peak Load (MW)	Net Gene. (GWh)	Peak Load (MW)	Net Gene. (GWh)
1986/87	416	2,509	417	2,515	418	2,520
1987/88	440	2,641	443	2,655	446	2,674
1988/89	464	2,779	469	2,804	476	2,845
1989/90	489	2,920	496	2,958	509	3,029
1990/91	514	3,065	524	3,122	544	3,232
1991/92	537	3,202	552	3,285	581	3,450
1992/93	562	3,343	581	3,454	620	3,677
1993/94	587	3,492	612	3,633	662	3,920
1994/95	614	3,648	644	3,822	707	4,181
1995/96	642	3,809	678	4,019	756	4,460
1996/97	671	3,980	714	4,229	807	4,760
1997/98	701	4,159	752	4,451	863	5,081
1998/99	734	4,348	793	4,685	923	5,425
1999/00	769	4,555	837	4,943	988	5,806
2000/01	806	4,771	883	5,213	1,058	6,211
2001/02	844	4,996	932	5,496	1,132	6,643
2002/03	884	5,228	982	5,791	1,211	7,102
2003/04	925	5,466	1,035	6,095	1,295	7,584
2004/05	967	5,709	1,089	6,410	1,383	8,093
2005/06	1,011	5,967	1,147	6,744	1,478	8,640
Average Annual Growth Rate						
1986/87-1990/91	5.4%	5.1%	5.9%	5.6%	6.8%	6.4%
1990/91-2000/01	4.6%	4.5%	5.4%	5.3%	6.9%	6.8%

Source : National Power Development Plan, Table 4.7

Remark : Base year = 1985

Table LS.3 Median Forecast : National and Regional Future Electric Power Demands for Kenya

National Forecast	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2002	2003	2004	2005
Domestic Sales (A+B+C), GWh	554.1	588.7	622.2	655.0	687.6	720.8	754.8	791.4	830.1	871.3	915.2	961.7	1011.5	1065.0	1119.7	1180.3	1311.8	1381.9	1454.0	1530.1
Comm. & Indust. Sales (B+C), GWh	1204.2	1384.8	1471.7	1559.9	1649.6	1746.6	1854.0	1928.6	2029.4	2137.1	2251.5	2372.8	2501.8	2636.1	2782.5	2938.0	3273.5	3451.9	3635.2	3828.3
Off-peak sales (D), GWh	105.6	107.8	103.4	101.9	101.0	101.0	102.6	104.9	106.8	109.2	111.7	114.2	117.2	120.4	124.0	127.8	134.3	136.8	138.2	141.4
Total KPLC Sales, GWh	1943.9	2081.4	2197.3	2316.8	2438.2	2568.5	2691.4	2824.8	2966.3	3117.6	3278.4	3448.7	3630.3	3818.0	4026.2	4246.2	4719.6	4970.7	5227.4	5499.8
RES Sales	190	264	343	429	523	625	726	821	911	996	1088	1183	1282	1383	1486	1591	151.5	1596	1679	1767
Total Sales, GWh	1962.9	2107.8	2231.6	2359.7	2490.5	2631.0	2783.9	2960.9	3057.4	3217.2	3383.2	3559.0	3746.5	3940.2	4155.2	4382.5	4871.0	5130.3	5395.3	5678.6
Total Integrated System Sales, GWh	1956.3	2099.8	2221.1	2348.7	2477.9	2618.6	2768.7	2948.7	3048.3	3207.8	3372.7	3549.9	3738.9	3938.0	4162.3	4398.0	4865.9	5114.3	5378.6	5658.9
Net Generation Requirement, GWh	2273.2	2139.9	2382.1	2729.2	2879.3	3040.5	3203.3	3368.7	3542.1	3726.8	3919.0	4122.7	4339.9	4568.0	4813.4	5076.4	5353.3	5642.6	5949.9	6275.6
Total Generation Requirement, GWh	2300.2	2474.1	2618.3	2767.4	2919.7	3083.1	3248.1	3415.4	3591.7	3779.0	3973.9	4180.4	4400.7	4628.2	4875.5	5147.5	5428.2	5721.5	6026.1	6347.4
Net Peak Annual Load, MW	380.9	407.7	435.9	462.1	488.8	517.2	545.6	574.3	604.6	636.7	670.2	705.6	743.4	782.6	823.6	871.3	909.9	962.5	1026.4	1102.7
Gross Peak Annual Load, MW	307.3	416.8	443.2	469.9	497.0	525.9	554.8	583.9	614.7	647.4	681.4	717.5	755.9	795.8	836.9	885.9	949.2	1039.6	1094.4	1152.3
Growth in Energy Generation, %		7.6	5.8	5.7	5.5	5.6	5.4	5.2	5.2	5.2	5.2	5.2	5.3	5.2	5.3	5.5	5.4	5.3	5.2	5.2
Growth in Peak Annual Load, %		7.6	6.3	6.0	5.8	5.8	5.5	5.3	5.3	5.3	5.3	5.3	5.4	5.3	5.5	5.5	5.5	5.4	5.3	5.3
REGIONAL FORECAST																				
NAIROBI REGION																				
Domestic Sales, GWh	339.6	357.9	373.4	392.4	409.1	426.0	443.1	461.3	480.4	500.5	521.7	544.0	567.5	591.7	617.9	645.7	704.6	735.5	766.9	799.5
Commercial Sales, GWh	613.9	632.8	690.5	729.3	767.0	807.6	845.4	886.0	923.0	974.5	1022.4	1072.7	1125.6	1180.2	1239.1	1300.9	1365.3	1431.9	1500.2	1561.6
Off-peak Sales, GWh	95.5	97.5	93.5	92.1	91.4	91.4	92.8	94.8	96.6	98.8	101.0	103.3	106.0	107.6	112.1	115.6	118.7	121.5	123.7	125.0
Total KPLC Sales, GWh	1049.0	1100.2	1159.4	1213.8	1267.4	1325.0	1381.3	1442.2	1506.0	1573.8	1645.1	1719.9	1799.1	1879.4	1969.1	2062.2	2158.7	2258.0	2359.5	2461.4
Peak Load, MW	206.0	222.0	234.0	246.0	258.0	271.0	283.0	296.0	309.0	324.0	339.0	355.0	372.0	389.0	408.0	427.0	448.0	469.0	491.0	513.0
COAST REGION																				
Domestic Sales, GWh	98.5	104.8	110.9	116.8	122.7	128.6	134.7	141.3	148.2	155.6	163.4	171.6	180.4	189.5	199.5	210.1	221.3	233.0	245.2	257.6
Commercial Sales, GWh	337.5	368.3	398.2	425.6	449.4	475.1	492.5	511.1	530.5	550.9	572.1	594.1	617.0	640.3	665.2	691.0	717.5	744.7	772.2	799.7
Off-peak Sales, GWh	3.8	3.9	3.8	3.7	3.7	3.7	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.3	4.5	4.7	4.8	4.9	5.0	5.2
Total KPLC Sales, GWh	439.7	477.0	512.8	546.1	575.4	607.4	631.0	656.2	682.6	710.4	729.5	769.8	801.6	834.1	869.2	905.8	943.6	982.6	1022.3	1062.1
Peak Load, MW	78.0	84.0	91.0	97.0	102.0	108.0	112.0	116.0	121.0	126.0	131.0	137.0	142.0	148.0	154.0	161.0	167.0	174.0	181.0	187.0
RIFT VALLEY REGION																				
Domestic Sales, GWh	36.4	39.4	42.3	45.1	48.0	51.0	54.1	57.4	61.0	64.9	69.0	73.5	78.3	83.3	89.0	95.0	101.5	108.4	115.6	123.1
Commercial Sales, GWh	62.0	66.0	71.7	79.0	85.9	89.8	95.5	97.5	101.7	106.2	110.8	115.7	120.8	126.0	131.6	137.4	143.5	149.7	156.0	162.4
Off-peak Sales, GWh	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.2	1.2	1.2
Total KPLC Sales, GWh	99.1	106.3	114.9	125.0	134.7	141.6	148.5	155.9	163.7	172.0	180.8	190.2	200.1	210.4	221.6	233.5	246.1	259.2	272.8	286.7
Peak Load, MW	23.0	24.0	26.0	28.0	31.0	32.0	34.0	35.0	37.0	39.0	41.0	43.0	45.0	48.0	50.0	53.0	56.0	59.0	62.0	65.0
WESTERN REGION																				
Domestic Sales, GWh	50.5	54.6	58.6	62.7	66.8	70.9	75.3	80.0	85.1	90.6	96.4	102.7	109.5	116.7	124.7	133.3	142.5	152.3	162.6	173.3
Commercial Sales, GWh	214.9	237.5	255.1	273.2	291.0	311.9	334.1	358.5	385.0	413.7	444.7	478.1	514.2	552.4	596.7	640.3	689.1	741.0	795.7	852.6
Off-peak Sales, GWh	3.4	3.5	3.4	3.3	3.3	3.3	3.3	3.4	3.5	3.6	3.6	3.7	3.8	3.9	4.0	4.2	4.3	4.4	4.5	4.6
Total KPLC Sales, GWh	268.8	295.4	317.1	339.2	361.1	386.2	412.8	442.0	473.5	507.8	544.8	584.6	627.6	673.0	723.1	777.8	835.9	897.6	962.7	1030.4
Peak Load, MW	60.0	64.0	69.0	74.0	79.0	84.0	90.0	96.0	103.0	111.0	119.0	128.0	137.0	147.0	158.0	170.0	183.0	196.0	210.0	225.0
MT. KENYA REGION																				
Domestic Sales, GWh	29.1	32.1	35.0	38.0	41.1	44.3	47.6	51.3	55.4	59.8	64.6	69.8	75.6	81.7	88.6	96.3	104.5	113.5	123.0	133.1
Commercial Sales, GWh	56.0	60.5	64.3	68.3	72.4	76.4	80.4	84.4	88.4	92.4	96.4	100.4	104.4	108.4	112.4	116.4	120.4	124.4	128.4	132.4
Off-peak Sales, GWh	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	2.0	2.0	2.1	2.1	2.1	2.2	2.3	2.4	2.4	2.5
Total KPLC Sales, GWh	87.1	94.5	99.1	102.7	105.3	108.5	111.9	115.6	119.2	123.6	128.6	134.2	140.1	146.1	152.1	158.1	164.1	170.1	176.1	182.1
Peak Load, MW	18.0	20.0	21.0	22.0	23.0	24.0	25.0	26.0	27.0	28.0	29.0	30.0	31.0	32.0	33.0	34.0	35.0	36.0	37.0	38.0

Source : National Power Development Plan, Table 4.3

KNY-19

Table L5.4

Summary of Revised Load Forecasts

Fiscal Year (Jun/Jul)	Low Forecast		Median Forecast		High Forecast	
	Peak Load (MW)	Gross Gene. (GWh)	Peak Load (MW)	Gross Gene. (GWh)	Peak Load (MW)	Gross Gene. (GWh)
1988/89	490	2,916	490	2,916	490	2,916
1989/90	514	3,047	527	3,127	524	3,111
1990/91	537	3,184	558	3,306	560	3,320
1991/92	563	3,328	589	3,483	599	3,542
1992/93	589	3,477	620	3,662	640	3,780
1993/94	616	3,634	653	3,852	684	4,033
1994/95	644	3,797	687	4,051	730	4,303
1995/96	674	3,968	724	4,261	780	4,591
1996/97	705	4,147	762	4,484	833	4,899
1997/98	738	4,333	803	4,718	890	5,227
1998/99	771	4,528	846	4,970	949	5,577
1999/00	806	4,732	893	5,242	1,014	5,951
2000/01	843	4,945	942	5,528	1,082	6,350
2001/02	881	5,168	994	5,829	1,155	6,775
2002/03	922	5,400	1,049	6,142	1,235	7,229
2003/04	965	5,643	1,105	6,464	1,319	7,714
2004/05	1,008	5,897	1,163	6,801	1,407	8,230
2005/06	1,055	6,163	1,225	7,157	1,503	8,782
Average Annual Growth Rate						
1986/87- 1990/91	4.5%	4.9%	6.5%	6.7%	6.7%	6.9%
1990/91- 2000/01	4.5%	4.6%	5.3%	5.4%	6.7%	6.8%

Source : Feasibility Study for Geothermal Power Station
at North East Olkaria, Dec. 1989

Remark : (Gross Gen.)=(Net Gen.)+(Gen. Station Use)

Table L5.5 Revised Median Load Forecast - Regional Forecast

	Estimate Forecast																					
	85-86	86-87	87-89	88-89	89-90	90-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-00	00-01	01-02	02-03	03-04	04-05	05-06	
Nairobi Region																						
Domestic Sales, GWh	368.6	405.9	449.9	465.2	489.9	510.9	532.0	554.2	577.7	602.4	628.4	655.8	684.4	714.6	747.0	781.1	816.5	853.2	890.6	929.2	969.5	
Commercial Sales, GWh	635.4	679.8	691.3	721.7	775.2	818.1	857.0	898.3	942.1	988.3	1036.9	1088.1	1141.3	1197.4	1257.2	1319.6	1384.4	1451.2	1519.3	1589.2	1662.2	
Off-peak Sales, GWh	98.1	100.8	101.1	99.4	99.3	100.1	102.0	104.1	106.2	108.6	111.0	113.8	116.1	119.5	123.8	127.4	130.6	133.3	135.2	137.5	140.6	
Total KPLC Sales, GWh	1102.1	1186.5	1242.3	1286.2	1364.4	1429.3	1490.9	1536.7	1626.0	1699.4	1776.4	1857.6	1941.7	2031.5	2128.0	2228.1	2331.5	2437.6	2545.1	2655.9	2772.3	
Regional Load Factor	0.575	0.607	0.614	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	
Peak Load, MW	218.9	223.0	231.0	245.3	260.1	272.5	284.3	296.8	310.0	324.0	338.7	354.2	370.2	387.4	405.8	424.8	444.6	464.8	485.3	506.4	528.6	
Coast Region																						
Domestic Sales, GWh	102.0	112.9	98.8	113.1	114.6	120.4	126.3	132.5	139.1	146.2	153.6	161.5	169.9	178.8	188.3	198.5	209.2	220.3	231.8	243.7	256.2	
Commercial Sales, GWh	356.9	382.6	434.7	446.8	486.0	510.8	529.8	549.9	570.9	592.8	615.6	639.3	663.7	689.2	715.9	743.6	771.9	800.8	829.8	859.3	889.8	
Off-peak Sales, GWh	3.9	3.6	2.8	2.8	2.8	2.8	2.9	2.9	3.0	3.0	3.1	3.2	3.2	3.3	3.5	3.6	3.7	3.7	3.8	3.8	3.9	
Total KPLC Sales, GWh	462.8	499.2	536.3	562.7	603.4	634.0	659.0	683.3	713.0	742.0	772.4	804.1	836.8	871.3	907.7	943.7	984.8	1024.8	1065.4	1106.9	1149.9	
Regional Load Factor	0.644	0.64	0.572	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	
Peak Load, MW	82.0	89.0	107.0	107.1	114.8	120.6	125.4	130.4	135.7	141.2	146.9	153.0	159.2	165.8	172.7	179.9	187.4	195.0	202.7	210.6	219.9	
Rift Valley Region																						
Domestic Sales, GWh	35.5	37.8	40.5	44.6	47.1	50.1	53.2	56.5	60.1	64.0	68.1	72.6	77.4	82.5	88.2	94.3	100.8	107.6	114.8	122.3	130.4	
Commercial Sales, GWh	69.2	77.7	83.7	92.5	99.2	104.1	108.5	113.1	118.1	123.2	128.6	134.3	140.1	146.2	152.7	159.5	166.4	173.6	180.8	188.1	195.8	
Off-peak Sales, GWh	1.5	1.9	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	2.0	2.0	2.1	2.1	2.2	2.3	2.3	2.4	2.4	2.5	2.5	
Total KPLC Sales, GWh	106.2	117.4	126.0	138.9	148.1	155.9	163.5	171.5	180.1	189.2	198.7	208.3	219.6	230.9	243.1	256.0	269.5	293.5	298.0	312.9	328.7	
Regional Load Factor	0.501	0.516	0.479	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Peak Load, MW	24.2	26.0	30.0	31.8	33.9	35.7	37.4	39.3	41.2	43.3	45.5	47.8	50.3	52.9	55.7	58.6	61.7	64.9	68.2	71.6	75.2	
Western Region																						
Domestic Sales, GWh	53.1	56.6	65.4	71.5	75.8	80.7	85.8	91.2	97.1	103.4	110.2	117.6	125.4	133.9	143.2	153.2	163.8	175.1	187.0	199.4	212.7	
Commercial Sales, GWh	225.6	247.7	269.9	281.6	311.6	336.5	360.8	387.3	416.1	447.2	480.8	517.0	555.7	597.6	642.4	692.6	745.0	800.5	858.6	919.9	985.5	
Off-peak Sales, GWh	3.5	3.1	2.9	3.0	2.9	2.9	3.0	3.1	3.1	3.2	3.3	3.4	3.4	3.5	3.6	3.8	3.8	3.9	4.0	4.1	4.1	
Total KPLC Sales, GWh	282.1	307.3	338.2	356.1	390.4	420.2	449.6	481.6	516.3	553.8	594.3	637.9	684.5	735.0	790.3	849.6	912.7	979.6	1049.6	1123.4	1202.4	
Regional Load Factor	0.519	0.456	0.489	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	
Peak Load, MW	62.0	77.0	79.0	83.3	91.3	98.3	105.2	112.7	120.8	129.6	139.0	149.2	160.1	172.0	184.9	198.8	213.5	229.2	245.5	262.8	281.3	
Mt. Kenya Region																						
Domestic Sales, GWh	30.3	31.7	34.7	37.8	41.1	44.4	47.8	51.6	55.7	60.2	65.1	70.4	76.3	82.6	89.8	97.5	106.0	115.0	124.7	135.0	146.2	
Commercial Sales, GWh	58.5	61.6	58.2	58.7	65.7	73.0	80.3	88.6	97.8	108.1	119.5	132.2	146.1	161.6	179.1	198.4	219.6	242.7	267.6	294.6	324.4	
Off-peak Sales, GWh	1.9	1.7	2.0	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.3	2.4	2.4	2.5	2.6	2.6	2.7	2.8	2.8	2.8	2.9	
Total KPLC Sales, GWh	90.7	94.9	94.9	98.6	108.9	119.4	130.3	142.3	155.7	170.5	186.9	205.0	224.7	246.7	271.4	298.5	328.2	360.5	395.1	432.5	473.5	
Regional Load Factor	0.552	0.516	0.492	0.48	0.46	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	
Peak Load, MW	18.8	21.0	22.0	23.4	27.0	30.3	33.0	36.1	39.5	43.3	47.4	52.0	57.0	62.6	68.8	75.7	83.3	91.4	100.2	109.7	120.1	

Source: Feasibility Study for A Geothermal Power Station at North East Oltarna, Dec. 1989

Table L5.6 Revised Median Load Forecast - National Forecast

	Estimate Forecast																				
	85-86	86-87	87-89	88-89	89-90	90-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-00	00-01	01-02	02-03	03-04	04-05	05-06
Domestic Sales (A+E+F), GWh	589	645	689	752	768	807	845	886	930	976	1,026	1,078	1,133	1,192	1,257	1,325	1,396	1,471	1,549	1,630	1,715
Comm. & Indust. Sales (B+C), GWh	1,346	1,449	1,538	1,601	1,738	1,843	1,936	2,037	2,145	2,260	2,381	2,511	2,647	2,792	2,948	3,114	3,287	3,469	3,656	3,851	4,058
Off-peak Sales (D), GWh	309	311	311	309	309	310	312	314	316	319	322	325	327	331	336	340	343	346	348	351	354
Total XPLC Sales, GWh	2,044	2,205	2,338	2,443	2,615	2,759	2,895	3,037	3,191	3,355	3,529	3,713	3,907	4,116	4,341	4,578	4,827	5,086	5,353	5,632	5,927
REF Sales	22	25	35	43	52	61	70	78	86	92	97	102	108	114	120	127	133	141	148	156	165
Total Sales, GWh	2,066	2,230	2,373	2,486	2,667	2,820	2,963	3,116	3,277	3,447	3,626	3,816	4,015	4,229	4,461	4,704	4,960	5,227	5,501	5,788	6,091
Proportion of XPLC Integrated	0.998	0.998	0.998	0.998	0.998	0.998	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Proportion of REF Integrated	0.853	0.853	0.853	0.853	0.853	0.853	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900
Total Integrated System Sales, GWh	2,058	2,222	2,363	2,475	2,654	2,805	2,956	3,108	3,269	3,438	3,610	3,806	4,004	4,218	4,449	4,692	4,947	5,213	5,486	5,772	6,075
Average Losses, % of Sales	16.2	15.6	17.4	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2
Total Trans. & Distr. Losses, GWh	333	347	412	401	430	454	479	504	530	557	586	617	649	683	721	760	801	844	889	935	984
Net Generation Requirement, GWh	2,392	2,569	2,775	2,875	3,084	3,260	3,435	3,612	3,798	3,995	4,202	4,422	4,653	4,901	5,169	5,452	5,748	6,057	6,375	6,707	7,059
Generation Station Use, GWh	27	28	43	40	43	46	48	51	53	56	59	62	65	69	72	76	80	85	89	94	99
Gross Generation Requirement, GWh	2,419	2,597	2,818	2,916	3,127	3,306	3,483	3,662	3,852	4,051	4,261	4,484	4,718	4,970	5,242	5,528	5,829	6,142	6,464	6,801	7,157
Net Peak Annual Load, MW	411	423	453	482	519	549	579	610	642	676	712	750	789	832	878	927	978	1031	1087	1144	1205
System Peak Demand, MW	418	430	461	490	527	558	589	620	653	687	724	762	803	846	893	942	994	1049	1105	1163	1225
Growth in Energy Generation, %	7.4	8.5	8.5	3.5	7.3	5.7	5.4	5.1	5.2	5.2	5.2	5.2	5.2	5.3	5.5	5.5	5.4	5.4	5.3	5.2	5.2
Growth in Peak Annual Load, %	2.9	7.2	7.2	6.3	7.6	5.9	5.5	5.2	5.3	5.3	5.3	5.3	5.3	5.4	5.5	5.5	5.5	5.5	5.4	5.3	5.3
Annual Load Factor, %	66.1	69.0	69.8	67.9	67.7	67.7	67.5	67.4	67.3	67.3	67.2	67.2	67.1	67.1	67.0	67.0	66.9	66.9	66.8	66.7	66.7

Source: Feasibility Study for A. Geothermal Power Station at North East Okama, Dec. 1989

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Table L5.7 Least Cost Generation Expansion Plan

On-line (mid)	Project	Installed Capacity (MW)	System Capacity (MW)	Critical LOLE (d/yr)	Weighted LOLE (d/yr)	Plant Addition				
						Hydro (MW)	Geo. (MW)	C.T. (MW)		
									Coal (MW)	
1986	Mombasa C.T. #1	1x30	488							
1987	Kipevu Rehabil.	42	518							
1988	Kiambere	2x72	704	1.4	0.1	144	*2			30
1989	Retire Kipevu #2,#3	-9	725	1.4	0.2					30
	Mombasa C.T.	1x30								
1990			725	6.3	0.5					
1991	Turkweel	2x55	831	8.6	0.3	106	*4			
1992	Mombasa C.T.	1x30	861	8.4	0.3					30
1993	Retire Nairobi C.T.	-12	909	4.6	0.1					60
	Mombasa C.T.	2x30								
1994	Retire Kipevu #4,#5	-24	914	7.8	0.3		30			
	Olkaria E. Geothermal	1x28.8								
1995	Olkaria E. Geothermal	1x28.8	973	1.4	0.1		30			30
	Mombasa C.T.	1x30								
1996	Low Miriu	2x24.3	1022	5.7	0.2	49	*5			
1997			1022	6.9	0.3					
1998	Olkaria W. Geothermal	1x52.8	1074	6.4	0.2		55			60
1999	Mombasa Coal	1x60	1134	1.5	0.1					60
2000	Mombasa Coal	1x60	1194	10.7	0.4					60
2001	Olkaria W. Geothermal	1x52.8	1247	1.3	0.1		55			60
2002	Retire Kipevu #6	-50	1277	10.9	0.5					
	Mombasa Coal	1x60								
2003	Olkaria W. Geothermal	1x52.8	1330	10.0	0.5		55			60
2004	Mombasa Coal	1x60	1390	10.0	0.5					
2005	Olkaria W. Geothermal	1x52.8	1443	9.3	0.6		55			
	Total					299	280	180		240

Sources : National Power Development Plan 1986-2006 (1987)

Executive Summary and Main Report Table 9.1

Remarks : *1 - Combustion thermal.

*2 - Completed as scheduled.

*3 - Unit was not required, because of UEB energy supply.

*4 - Under construction, and will be completed in early 1990.

*5 - Subject to review in F/S.

Table L5.8 Preliminary Screening Results of Hydroelectric Projects

Projects	Capacity		Annual Energy		Capital Cost		Cost of Capacity		Long Term Energy Cost		
	Installed (MW)	Firm (MW)	Firm (GWh)	Average (GWh)	Generat. (MUSS)	Transm. Total (MUSS)	Installed (\$/kW)	Firm (\$/kW)	Firm (\$/kWh)	Average (\$/kWh)	
Muronga (2)	2 x 30	40.8	202	234	153.8	5.3	159	2,677	3,898	0.099	0.085
Low Grand Falls (2)	2 x 60	88.3	482	594	290.8	14.7	306	2,572	3,460	0.085	0.073
High Grand Falls (2)	3 x 60	141.4	692	802	589.3	9.0	598	3,357	4,231	0.129	0.123
Adamson's Falls (2)	2 x 40	62.8	307	358	225.2	9.2	234	2,959	3,732	0.100	0.086
Kora (2)	2 x 46	68.2	342	401	250.8	20.9	272	2,983	3,984	0.101	0.088
Magwagwa (3)	2 x 47.3	48.9	333	438	352.6	16.3	369	3,939	7,544	0.145	0.113
Low Miriu (4)	2 x 24.3	48.6	140	261	100.2	5.0	105	2,186	2,164	0.101	0.054
Mid Miriu	2 x 33 + 2 x 8	131.0	175	670	213.5	19.6	213	1,575	1,780	0.179	0.048
High Moru (3)	2 x 42 + 2 x 8	72.0	342	675	329.5	9.7	339	3,392	4,711	0.130	0.071
Low Miriu+Magwagwa (3)	143.2	97.5	473	699	452.8	21.3	474	3,310	4,862	0.122	0.089
Nandi Forest	2 x 25	46.0	249	255	189.3	3.9	193	3,903	4,200	0.101	0.099
Leshora	2 x 21	55.7	86	111	195.7	0.0	196	4,707	5,482	0.278	0.215
Oldoriko (1)	2 x 38	69.4	149	236	206.3	0.0	206	2,742	2,973	0.153	0.131
Sererwa	2 x 30	60.0	161	161	82.0	0.0	82	1,367	1,367	0.065	0.065

- 1 - Not including transmission costs.
- 2 - Not including additional transmission from Tana to Nairobi.
- 3 - Not including additional transmission from Lessos to Nairobi.
- 4 - Not including benefits of irrigation water supply.

Sources : National Power Development Plan (1987), Main Report Table 8.2

1)	Catchment Area	3,345 km ²
2)	Annual Mean Discharge	41.0 m ³ /sec
3)	Intake Weir	
	Type	Gated concrete weir of gravity type
	Dimension	70 m in width and 18 m height
	Full supply level	EL. 1,402.5 m
	Minimum operation level	EL. 1,400.0 m
4)	Waterway	
	Headrace	
	Length	6,290 m
	Diameter	4.2 m
	Penstock	
	Length	1,216 m
	Diameter	2.2 m - 1.65 m
5)	Power House	
	Type	Surface type
	Dimension	24.4m x 40m x 32.1m
6)	Generating Equipment	
	Turbine - Type	Vertical shaft Francis type
	- Capacity	2 x 31.2 MW
	Generator - Voltage	11 kV
	- Capacity	2 x 33.7 MVA
	Transformer - Voltage ratio	11/132 kV
	- Capacity	2 x 33.7 MVA
7)	Transmission Line	To Kisumu : 49 km (132kV single circuit)
8)	Power Generation	
	Maximum Plant Discharge	39.9 m ³ /sec
	Tailwater Level	
	High	EL. 1,205.6 m
	Low	EL. 1,205.0 m
	Head - Gross	196.9 m
	- Net	178.4 m
	Installed Capacity	60 MW
	Annual Energy Production	336.7 GWh/year
9)	Construction Cost (J-A Plan)	
	Direct Construction Cost	93.41 MUS\$
	Civil work	(52.04 MUS\$)
	Metal work	(13.68 MUS\$)
	Generating Equipment	(25.06 MUS\$)
	Transmission Line	(2.63 MUS\$)
	Engineering & Management	12.54 MUS\$
	Physical Contingency	15.89 MUS\$
	Total	121.84 MUS\$
10)	Capacity and Energy Cost	
	Cost of Capacity	2,031 US\$/kW
	Long Term Energy Cost	0.039 US\$/kWh

Sources : Preliminary Design Report for Sondu/Miriu Hydropower Project
(January 1991, Nippon Koei)

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Table L6.1

Summary of Updated Load Forecasts
(Updated of NPDP)

Fiscal Year (Jun/Jul)	Low Forecast		Reference Forecast		High Forecast	
	Peak Load (MW)	Genera. Energy (GWh)	Peak Load (MW)	Genera. Energy (GWh)	Peak Load (MW)	Genera. Energy (GWh)
1988/89	480	2,904	480	2,904	480	2,904
1989/90	520	3,103	520	3,103	520	3,103
1990/91	566	3,187	566	3,187	566	3,187
1991/92	586	3,289	591	3,313	593	3,327
1992/93	615	3,446	629	3,520	737	3,566
1993/94	644	3,607	668	3,735	683	3,817
1994/95	675	3,775	710	3,963	733	4,084
1995/96	708	3,952	754	4,204	785	4,369
1996/97	741	4,137	801	4,459	841	4,672
1997/98	777	4,332	851	4,729	900	4,998
1998/99	815	4,538	903	5,017	964	5,346
1999/00	854	4,753	959	5,321	1,033	5,717
2000/01	895	4,980	1,018	5,643	1,106	6,115
2001/02	939	5,217	1,081	5,984	1,183	6,538
2002/03	984	5,465	1,147	6,344	1,267	6,990
2003/04	1,031	5,724	1,217	6,725	1,355	7,472
2004/05	1,081	5,996	1,291	7,127	1,450	7,986
2005/06	1,133	6,280	1,369	7,551	1,551	8,533
2006/07	1,187	6,576	1,451	8,000	1,658	9,117
2007/08	1,244	6,887	1,538	8,473	1,773	9,740
2008/09	1,303	7,211	1,630	8,973	1,895	10,404
2009/10	1,365	7,550	1,727	9,501	2,025	11,111
Average Annual Growth Rate						
1989/99- 1999/00	5.08%	4.36%	6.31%	5.54%	7.10%	6.30%
1999/00 2009/10	4.81%	4.74%	6.06%	5.97%	6.97%	6.87%

Source : 1990 Interim Update of National Development Plan 1991 to 2010,
Draft Final Report, Table 4.11, April 1991, Acres

KNY-45 Table L6.2 Hydroelectric Power Projects : Main Features, Adjusted Cost Estimate and Unit Cost

		Miriu	Magwagwa	Leshota	Oldorko	Arror	Low Grand Falls	Mutonga	High Grand Falls
Reference River		R-1 Sondu	R-2 Sondu	R-3 E. Ngiro South	R-3 E. Ngiro South	R-4 Arror	R-5 Tana	R-5 Tana	R-5 Tana
River Flow									
Average	(m ³ /s)	41.0	40.5	8.2	8.2	2.0	133.9	120.0	
Firm	(m ³ /s)		24.1	6.4	6.5				
Reservoir Characteristics									
Surface area	(km ²)		32.4			2.8			
Live storage	(m.m ³)	3.0	692.0	365.0	20.0	49.0	701.0	62.6	
FSL	(m)	1,402.5	1,665.0	1,565.0	1,255.0	2,264.0	512.0	550.0	
LWL	(m)	1,400.0	1,609.0	1,532.0	1,248.0	2,235.0	500.0	542.0	
Tailwater Level									
High	(m)	1,205.9	1,458.0			Axis of Pelton			
Low	(m)	1,205.0		1,285.0	840.0	1,120.0	443.0	511.7	
Average	(m)					1,116.0	443.8	513.0	
Head									
Gross	(m)	196.6	186.0	280.0	420.0	1,144.0	68.2	37.0	
Net	(m)	178.6	170.4	265.0	404.0	1,075.6	64.8	35.2	
Power Facilities									
Turbines	(MW)	2x31.2	2x61.5	2x23	2x36	2x35.2	2x60	2x30	
Design flow	(m ³ /s)	39.9	82.0	21.2	21.7	8.0	212.0	195.5	
Generator	(MW)	60.0	120.0	46.0	72.0	70.0			177.0
Output									
Firm output at LWL	(MW)	58.8	51.5	37.7	70.1	67.6	88.3	40.8	
Firm energy	(GWh)	188.0	243.9	139.0	77.0	157.0	535.0	219.0	692.0
Average energy	(GWh)	330.6	457.0	144.0	200.0	157.0	620.0	285.0	485.0
Construction Cost									
Total	(\$10 ³)	122,434	306,808	203,247	64,193	111,765	290,815	153,766	589,300
Contingency	(\$10 ³)	15,892	34,793	15,850	4,138	9,970	50,248	26,232	105,328
Transmission	(\$10 ³)	2,624	5,940	3,871	9,198	11,235	0	0	0
Engineering	(\$10 ³)	11,677	21,087	18,681	5,629	8,412	32,313	17,085	53,568
Construction Camp	(\$10 ³)	5,820	6,000	7,839	1,159	4,706	28,698	17,060	47,283
Total cost w/o above	(\$10 ³)	86,421	238,988	157,006	44,069	77,442	179,556	93,389	383,121
Revised Direct Cost									
Escalation adjust.	(\$10 ³)	0	0	0	0	0	17,956	9,339	38,312
Revised cost	(\$10 ³)	86,421	238,988	157,006	44,069	77,442	197,512	102,728	421,433
Revised Indirect Cost									
Contingency	(\$10 ³)	12,963	47,798	31,401	8,814	15,488	39,502	20,546	84,287
Engineering	(\$10 ³)	12,423	35,848	23,551	6,610	11,616	29,627	15,409	63,215
Camp	(\$10 ³)	3,975	11,471	7,536	2,115	3,717	9,481	4,931	20,229
Total Cost									
W/o Transmission	(\$10 ³)	115,783	334,105	219,494	61,608	108,264	276,121	143,614	589,163
Transmission	(\$10 ³)	2,624	5,940	3,871	9,198	11,235	14,700	5,300	9,000
Total	(\$10 ³)	118,407	340,045	223,365	70,806	119,499	290,821	148,914	598,163
Unit Cost of Energy									
Average	(mills/kWh)	39.9	72.2	176.5	53.4	90.2	50.3	57.2	98.7
Firm	(mills/kWh)	76.0	69.9	182.9	138.8	82.6	58.3	74.7	114.4
Unit Cost w/Irrigation Benefit				(Leshota + Oldorko)					
Average	(mills/kWh)	27.2	56.1	59.3					
Firm	(mills/kWh)	51.9	54.3	90.5					
Sources :	Draft Final Report, 1990 Interim Update of National Power Development Plan 1990 to 2010 Table 5.1 to 5.10 and 7.2, April 1991, Acres International								
Remarks :	a) R-1 : Detailed Design and Preparation of Tender Documents for Sondu/Miriu Hydropower Project October 1991, Nippon Koei b) R-2 : Feasibility Study on Magwagwa Hydroelectric Power Development Project, Progress Report March 1990, JICA c) R-3 : Prefeasibility Study on Ewaso Ngiro Multipurpose Project, Second Draft, August 1990 Knight Peisold & Partners in association with Ewbank Preece Ltd. d) R-4 : Feasibility Study on the Integrated Development of Arror River Basin, Jan. 1990, beb ingg s.p.a. e) R-5 : National Power Development Plan 1986-2006, June 1987, Acres International								

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Table L6.3 Thermal Generation Unit Cost (Crude Oil Price US\$ 22/bbl)

	Steam						Gas Turbine						Combined Cycle						Diesel						
	Coal		Oil		Oil		(Momb)		(Nair)		(Momb)		(Nair)		(Momb)		(Nair)		Low		Medium		Medium		
	2x60	2x100	2x60	2x100	2x60	2x100	2x30	2x60	2x30	2x60	2x30	2x60	2x30	2x60	2x30	2x60	2x30	2x60	4x30	3x10	2x20	4x20	3x20		
Total Capacity	120	200	120	200	60	120	60	120	60	120	90	180	90	180	120	180	180	180	120	30	30	40	40	60	
Capital Cost																									
First unit	90.3	139.6	65.2	97.8	19.0	27.6	19.0	27.6	21.6	31.3	74.7	120.0	79.3	127.0	65.8	22.5	33.8	48.3							
Second unit	65.9	98.8	49.1	73.6	15.0	23.4	15.0	23.4	17.4	26.6	0.0	0.0	0.0	0.0	55.1	0.0	0.0	0.0							
Transmission	3.2	5.4	3.2	5.4	1.6	3.2	1.6	3.2	1.6	3.2	2.4	4.9	2.4	4.9	3.2	0.8	1.1	1.6							
Total	159.4	243.8	117.5	176.8	35.6	54.2	35.6	54.2	40.6	61.1	77.1	124.9	81.7	131.9	124.1	23.3	34.9	49.9							
Unit Cost (\$/kW)	1328	12319	979	884	593	452	593	452	677	509	857	694	908	733	1034	777	873	832							
Fixed Cost																									
Capital	174.3	160.0	128.5	116.0	81.3	61.9	81.3	61.9	92.7	69.8	121.0	68.0	128.2	103.5	139.1	116.6	130.9	124.8							
O & M	35.0	35.0	23.0	23.0	16.0	16.0	16.0	16.0	16.0	16.0	18.0	18.0	18.0	18.0	16.0	16.0	16.0	16.0							
Total	209.3	195.0	151.5	139.0	97.3	77.9	97.3	77.9	108.7	85.8	139.0	116.0	146.2	121.5	155.1	132.6	146.9	140.8							
Adjusted	262.9	244.9	176.5	161.9	126.7	101.4	126.7	101.4	135.8	107.1	180.9	151.0	190.3	158.2	176.3	152.8	169.4	162.3							
Variable Cost																									
Fuel price	1.839	1.839	2.486	2.486	5.444	5.444	5.444	5.444	2.804	2.804	5.444	5.444	2.804	2.804	2.486	2.804	2.804	2.804							
Hear rate	12050	10300	11900	10160	15380	15080	15380	15080	15080	15080	9180	9000	9200	9000	8300	8800	8800	8800							
Fuel cost	0.0222	0.0189	0.0296	0.0253	0.0837	0.0821	0.0837	0.0821	0.0423	0.0423	0.0500	0.0490	0.0258	0.0252	0.0206	0.0247	0.0247	0.0247							
Variable O&M	0.0030	0.0030	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0058	0.0058	0.0025	0.0025	0.0042	0.0042	0.0045	0.0090	0.0090	0.0090							
Total	0.0252	0.0219	0.0321	0.0278	0.0862	0.0846	0.0862	0.0846	0.0481	0.0481	0.0525	0.0515	0.0300	0.0294	0.0251	0.0337	0.0337	0.0337							

source : 1990 Internam Update National Power Development Plan 1991 to 2010
Draft Final Report, April 1991, Acres International

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Table L6.4

Generation Expansion Plan

Fiscal Year	Generation Addition				
	Hydro	Geothermal	Low Speed Diesel	Medium Sp. Diesel	Gas Turbine
1990/91					
1991/92	Turkwel (106)				
1992/93					
1993/94				90	
1994/95		2x32			
1995/96					1x60
1996/97		1x55			
1997/98	Miriu (60)				
1998/99		1x55			
1999/00			50		
2000/01	LG Falls (120)				
2001/02		1x55			
2002/03	Oldorko (72)		50		
2003/04	Gitaru #3 (72.5)	1x55			
2004/05			100		
2005/06	Mutonga (60)				
2006/07		1x55			
2007/08			100		
2008/09		1x55			
2009/10			100		
Total	490MW	394MW	400MW	90MW	60MW

FIGURES

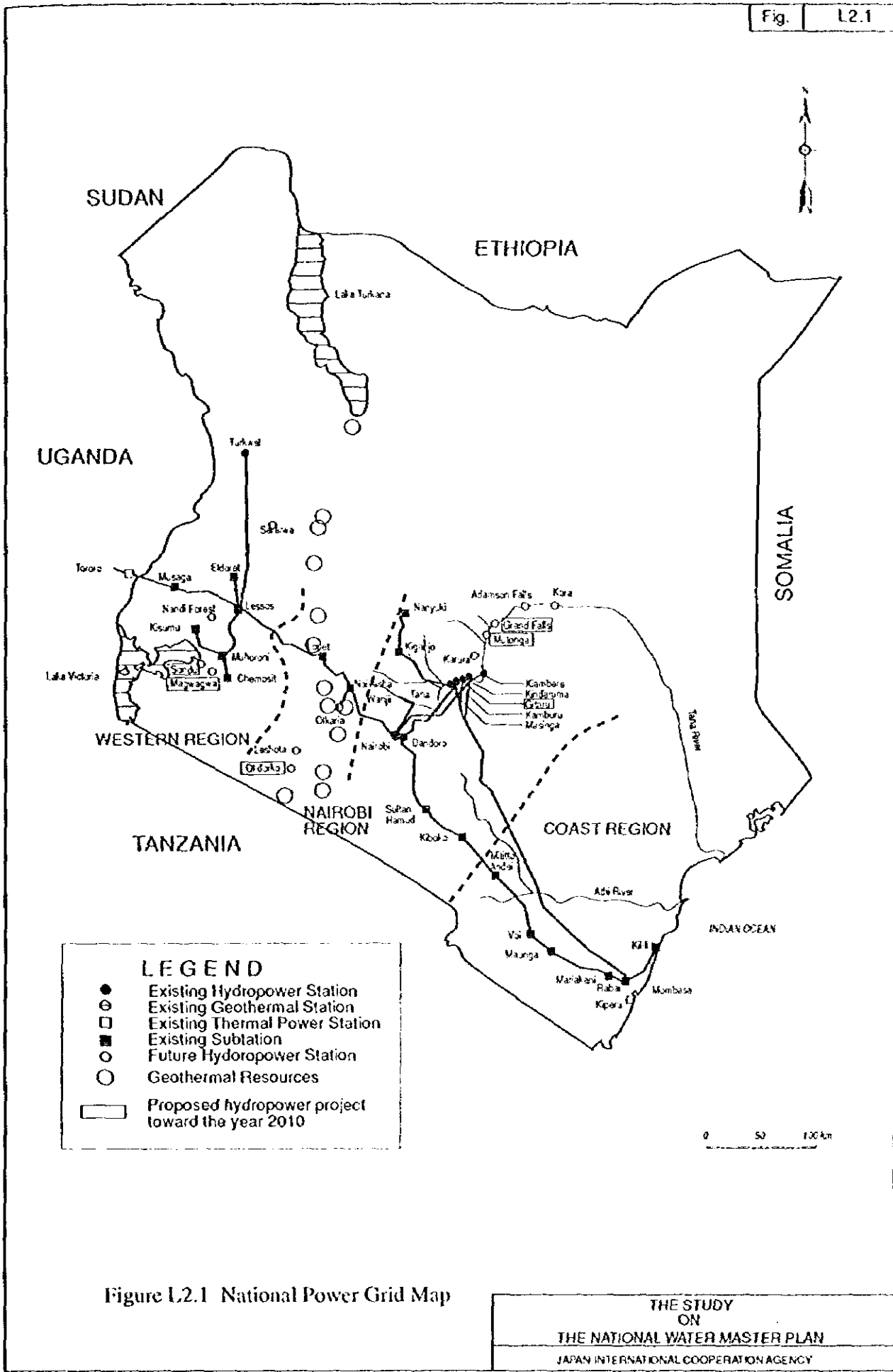


Figure L2.1 National Power Grid Map

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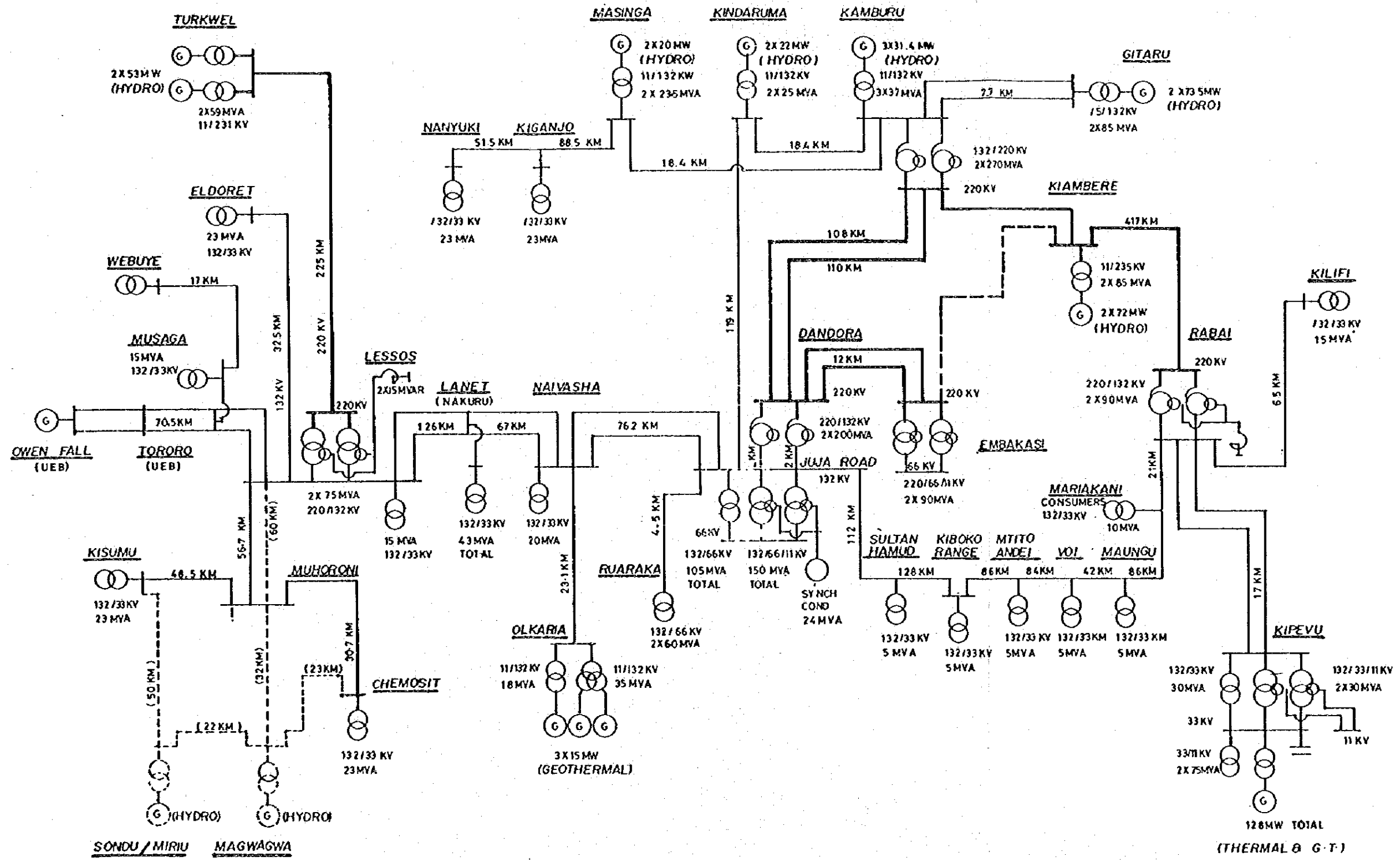


Figure L2.2 Single-line Diagram of Power System in Kenya

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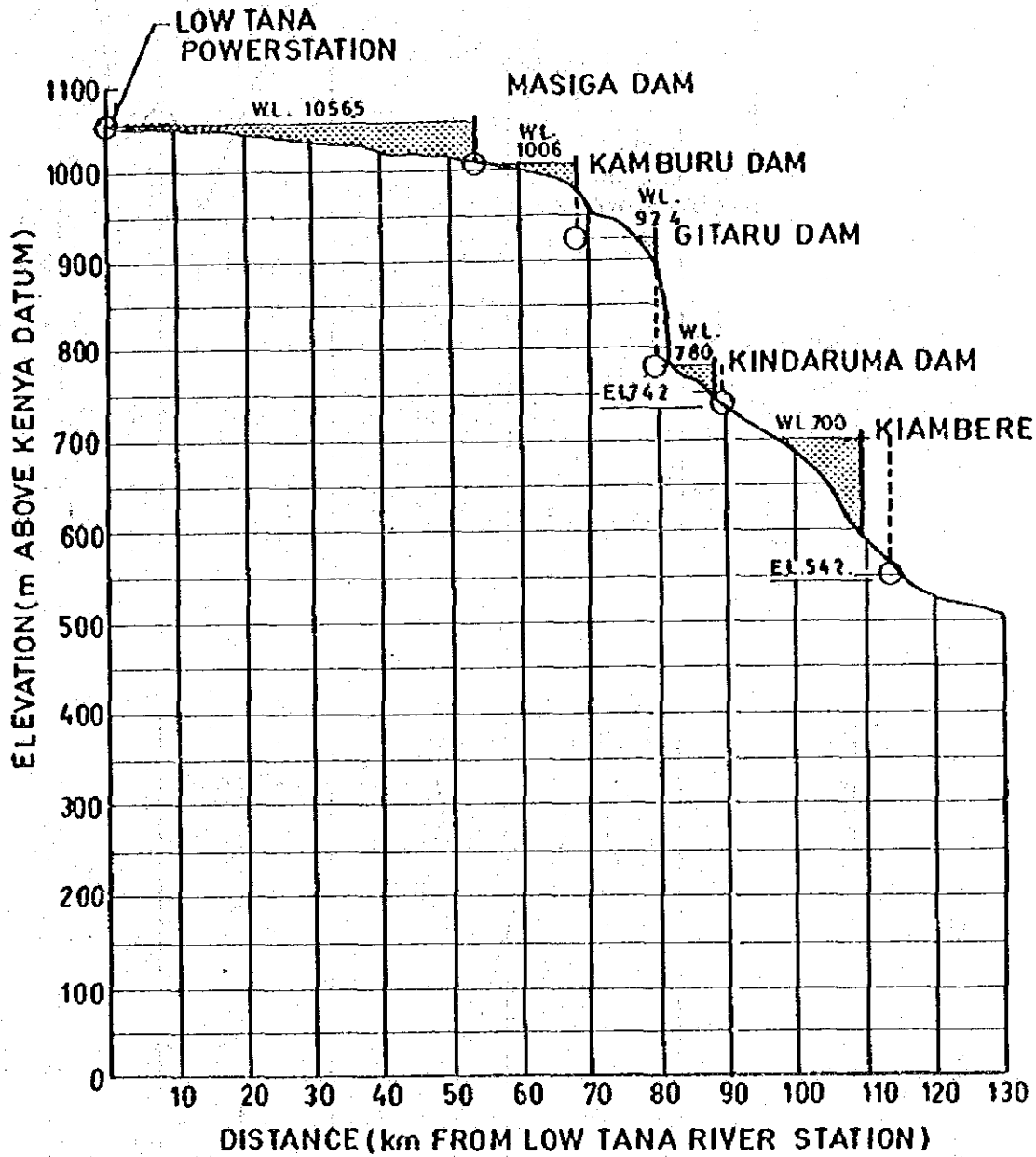


Figure L2.3

Hydroelectric Projects Developed on The Tana River

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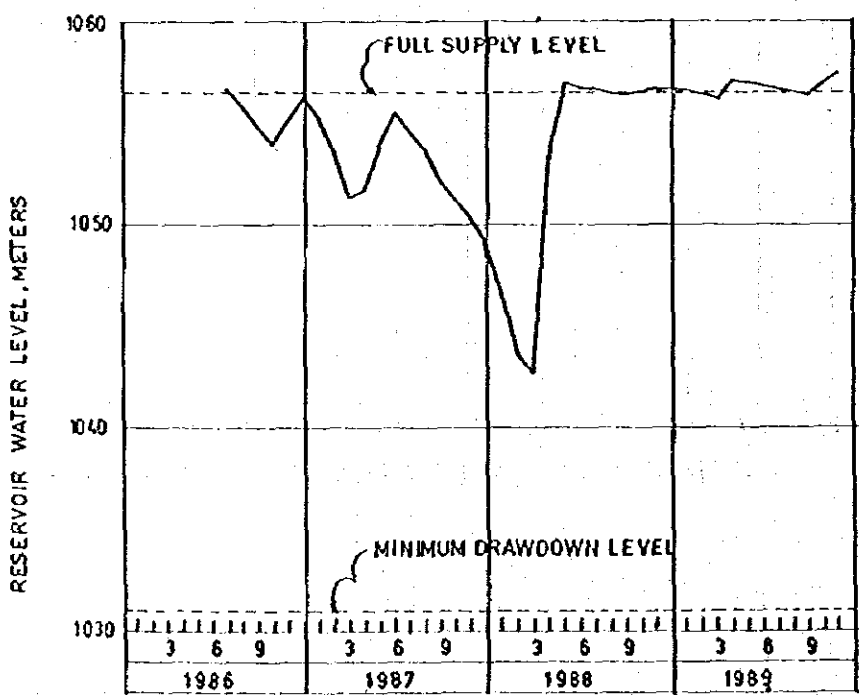
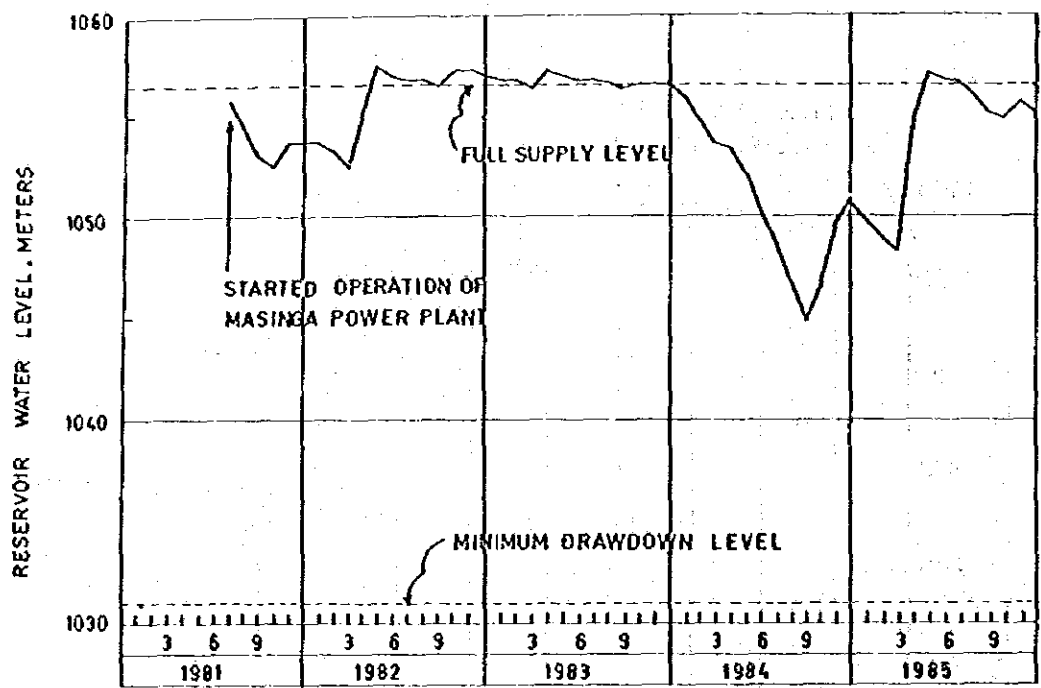


Figure L2.4
Water Level Fluctuation of Masinga Reservoir

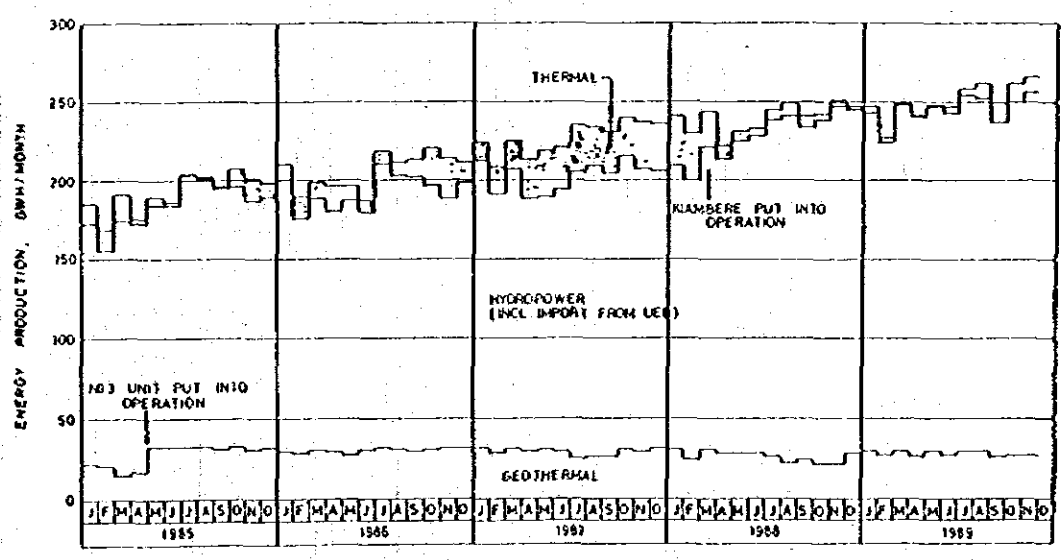
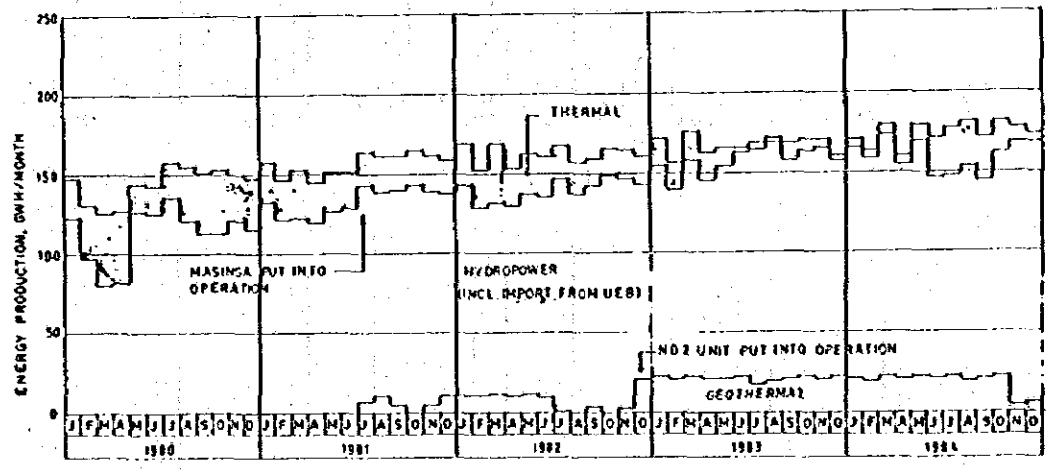


Figure L3.1 Energy Production by Type (1980 - 1989)

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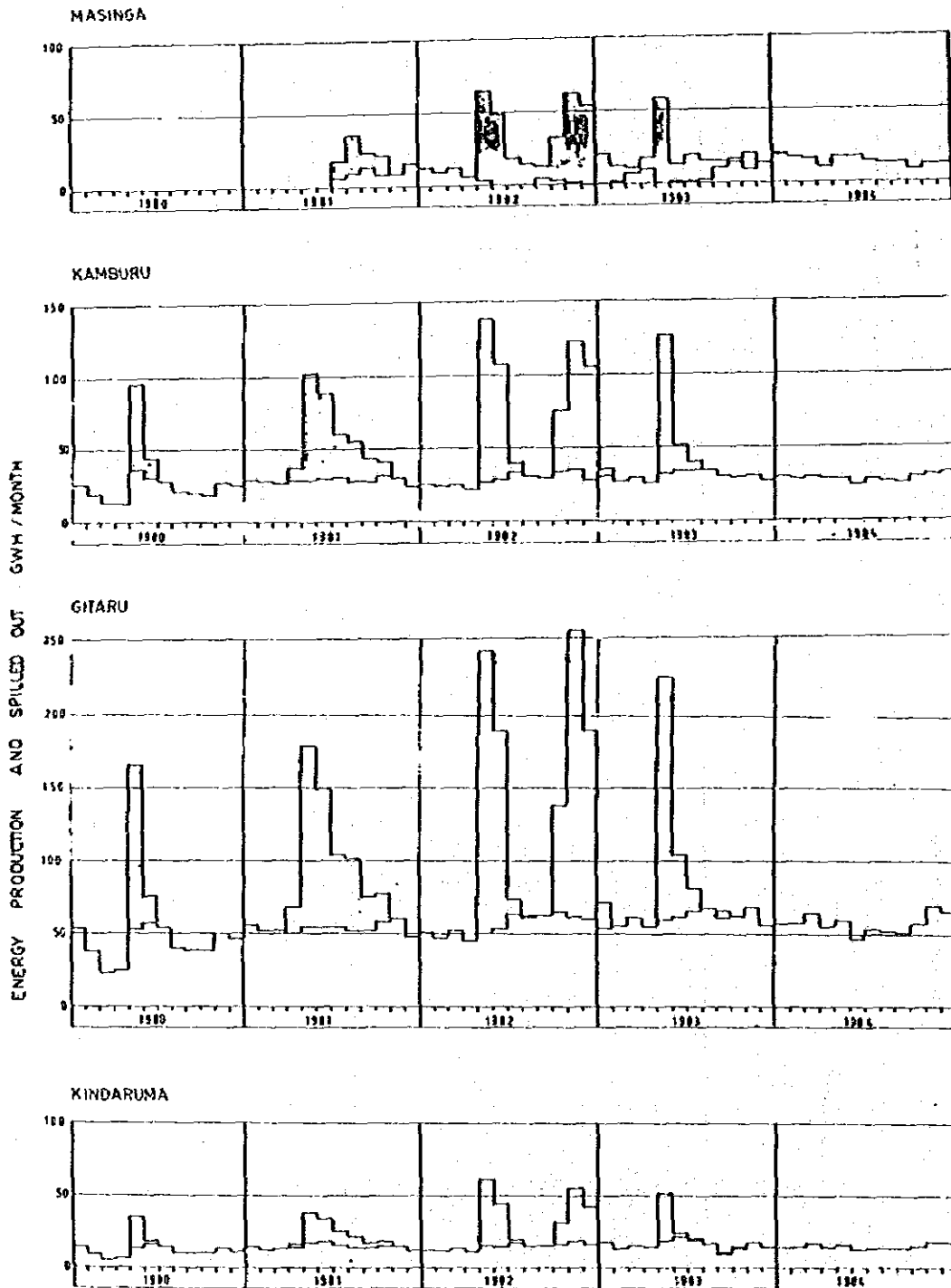


Figure L3.2 Monthly Energy Production and Spilled Water (1980 - 1984)

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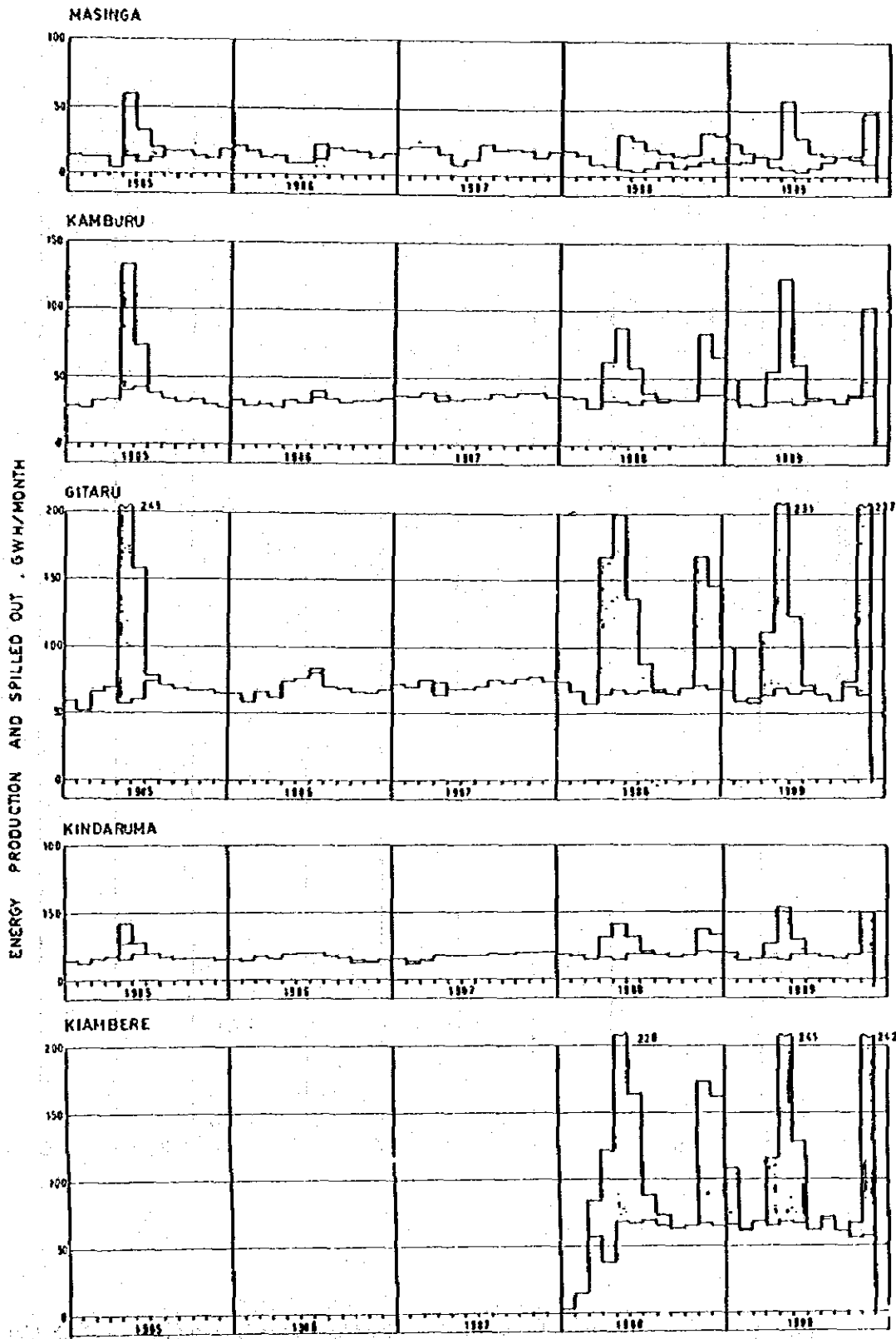


Figure L3.3

Monthly Energy Production
and Spilled Water (1985 - 1989)

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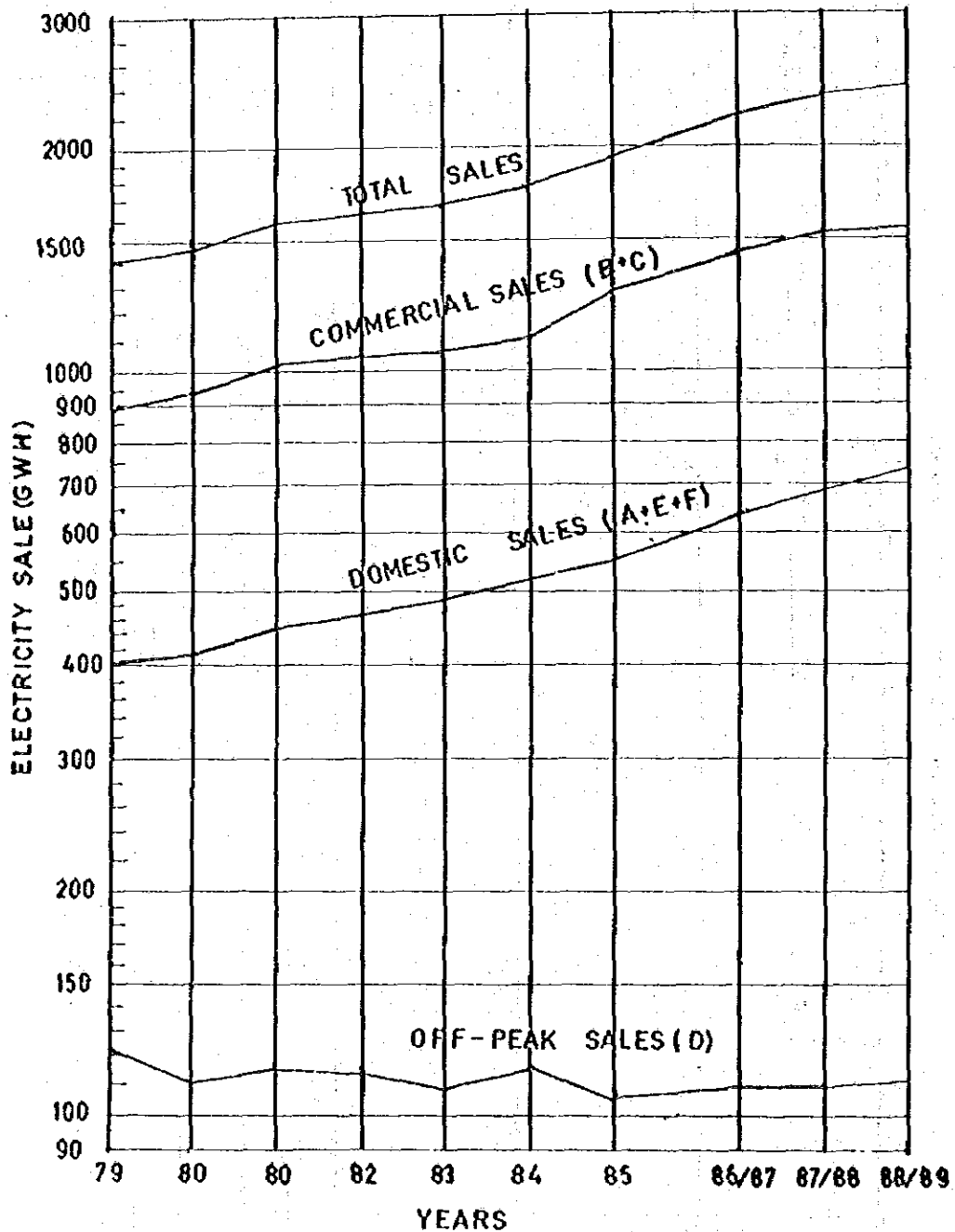
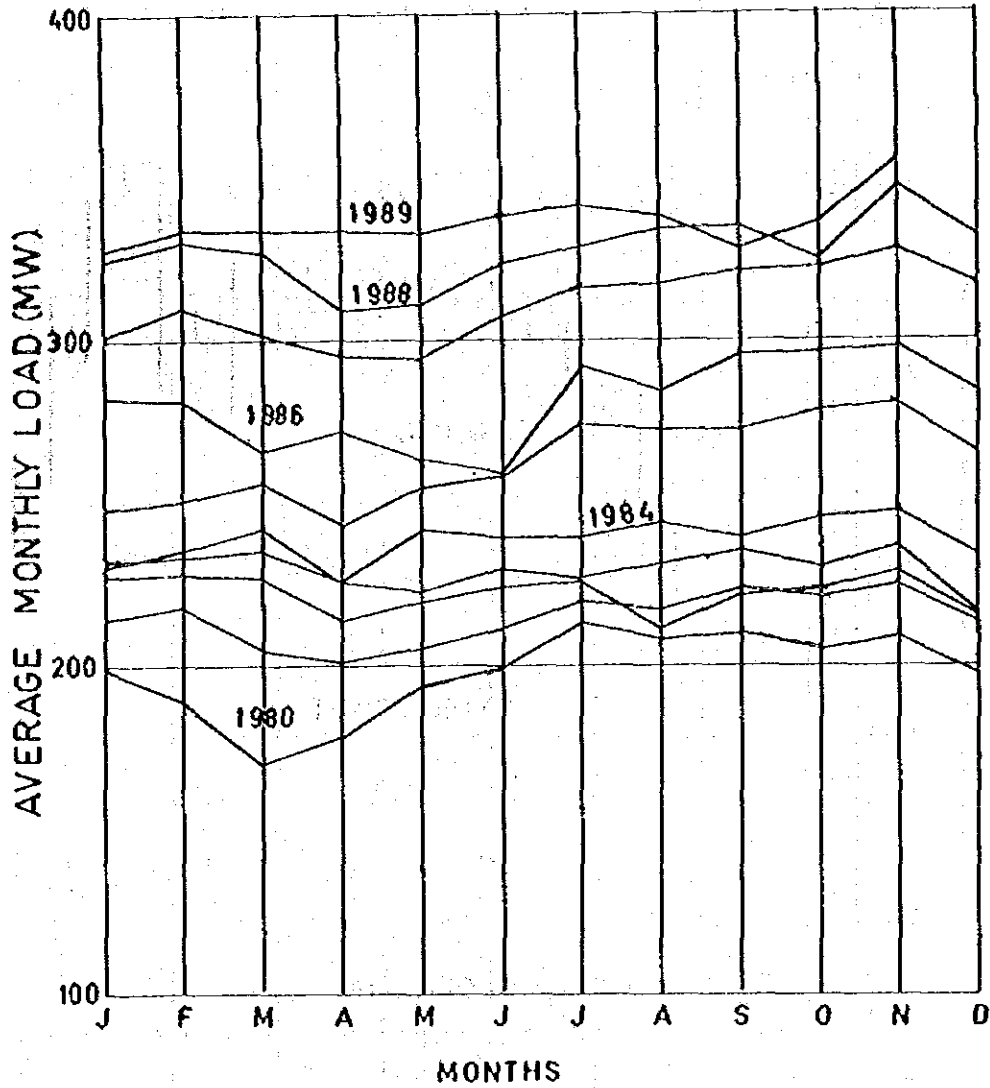


Figure L3.4

Annual Energy Sales by Customer Group (1979 - 1988/89)

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Note: Load suppression occurred from Feb. to April, 1980 and June to Sep. 1984

Figure L3.5 Averaged Loads (1980 - 1989)

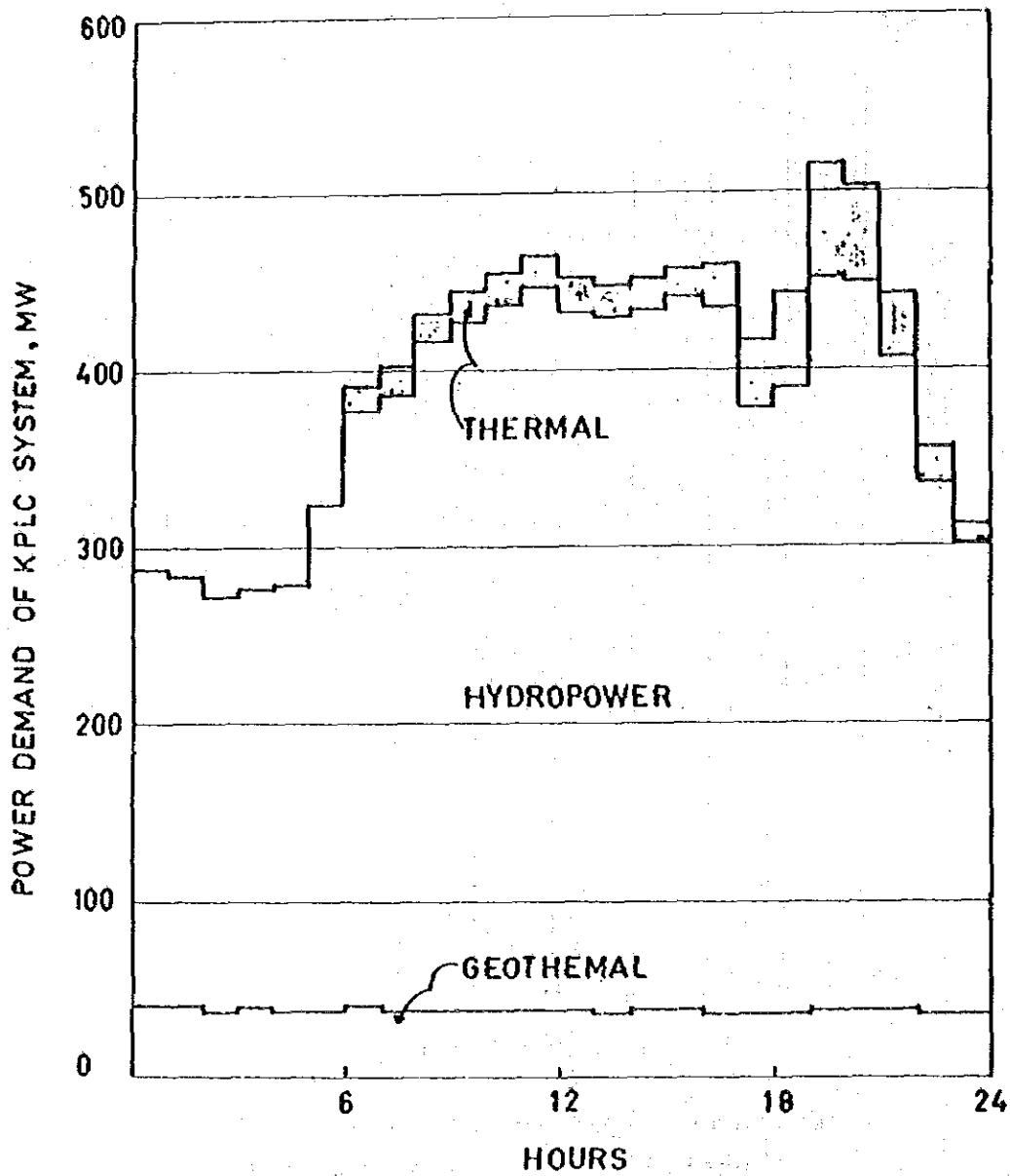


Figure L3.6 Typical Daily Load Curve March 20, 1990 (Tuesday)

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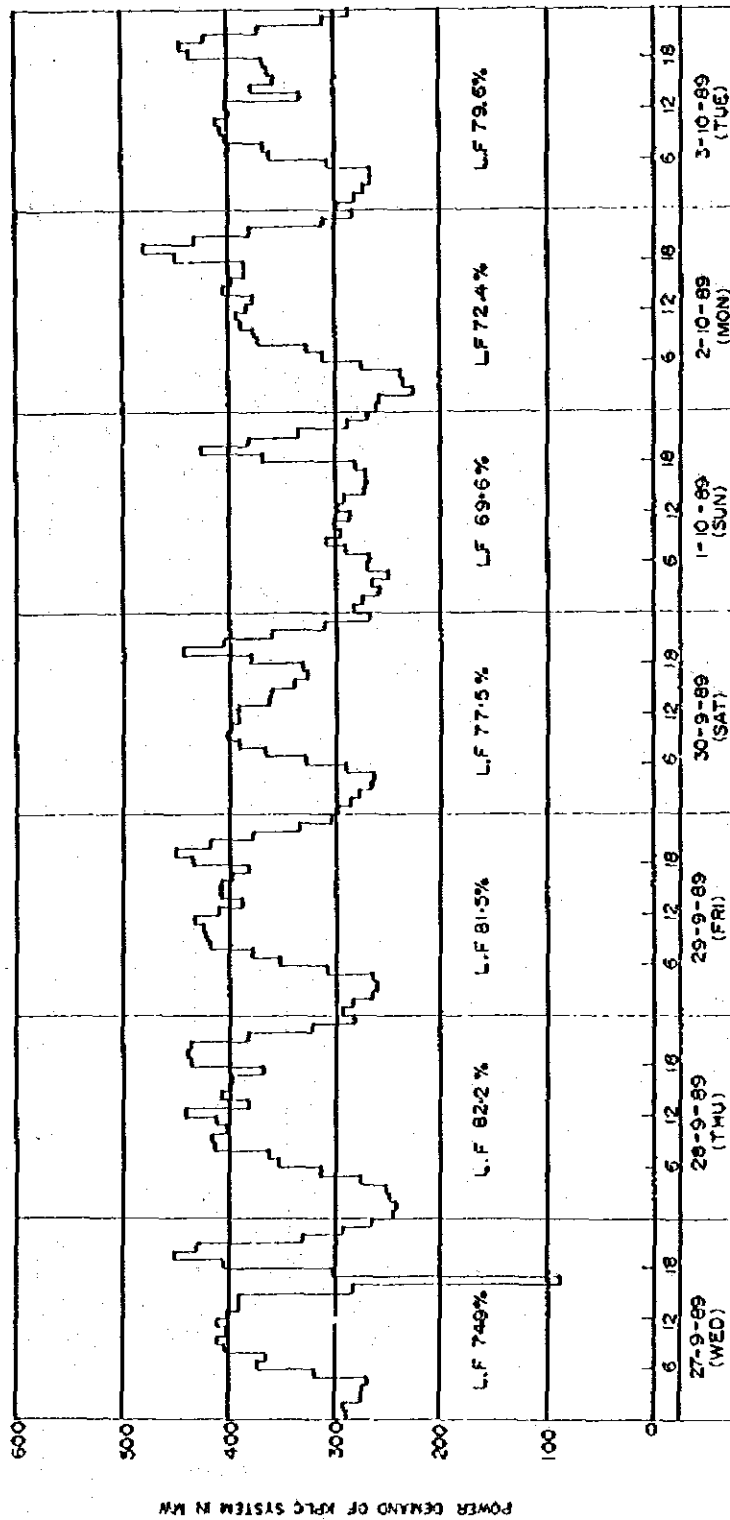


Figure L3.7

Daily Load Curves for One Week
(Sept. 27 to Oct. 3, 1989)

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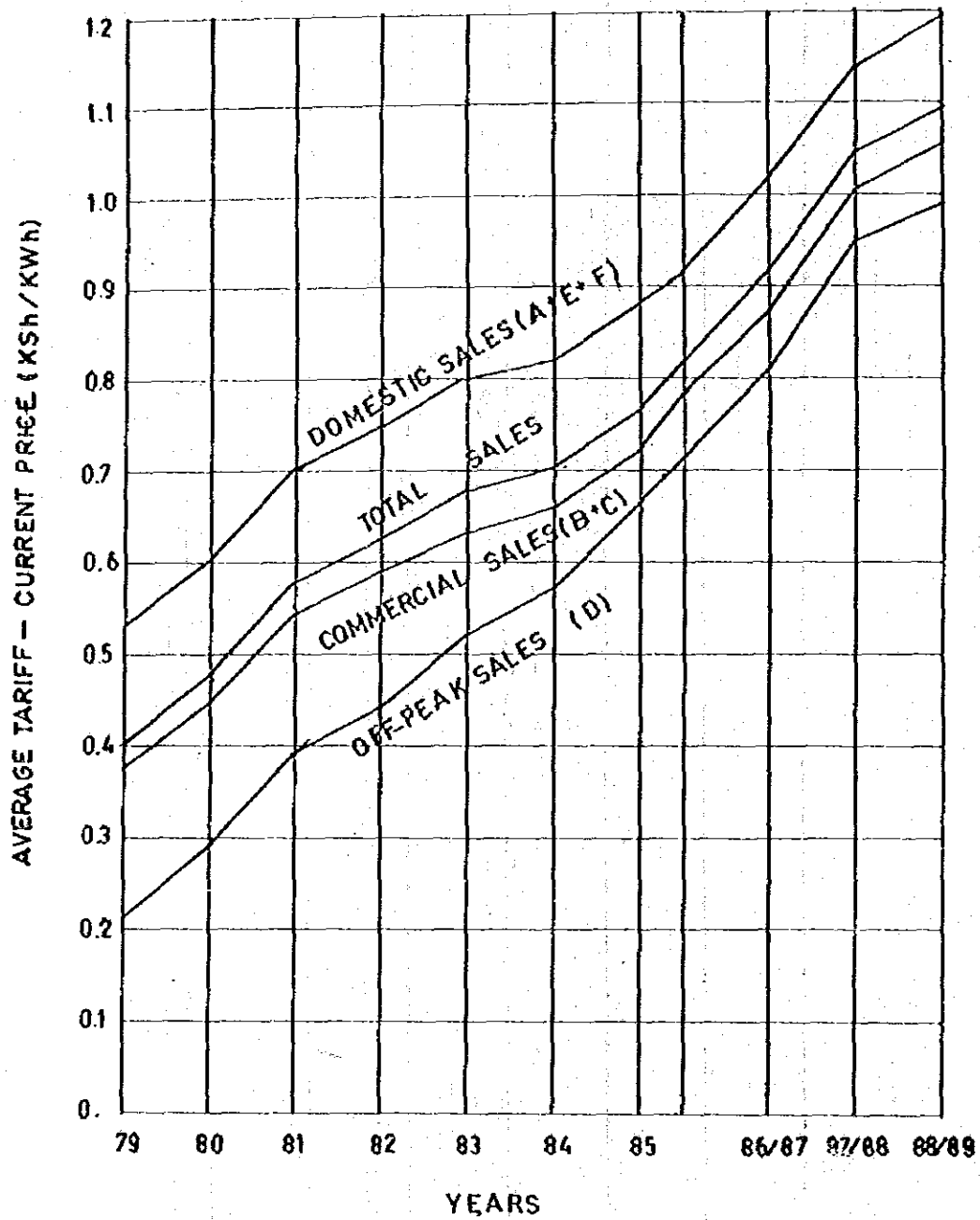
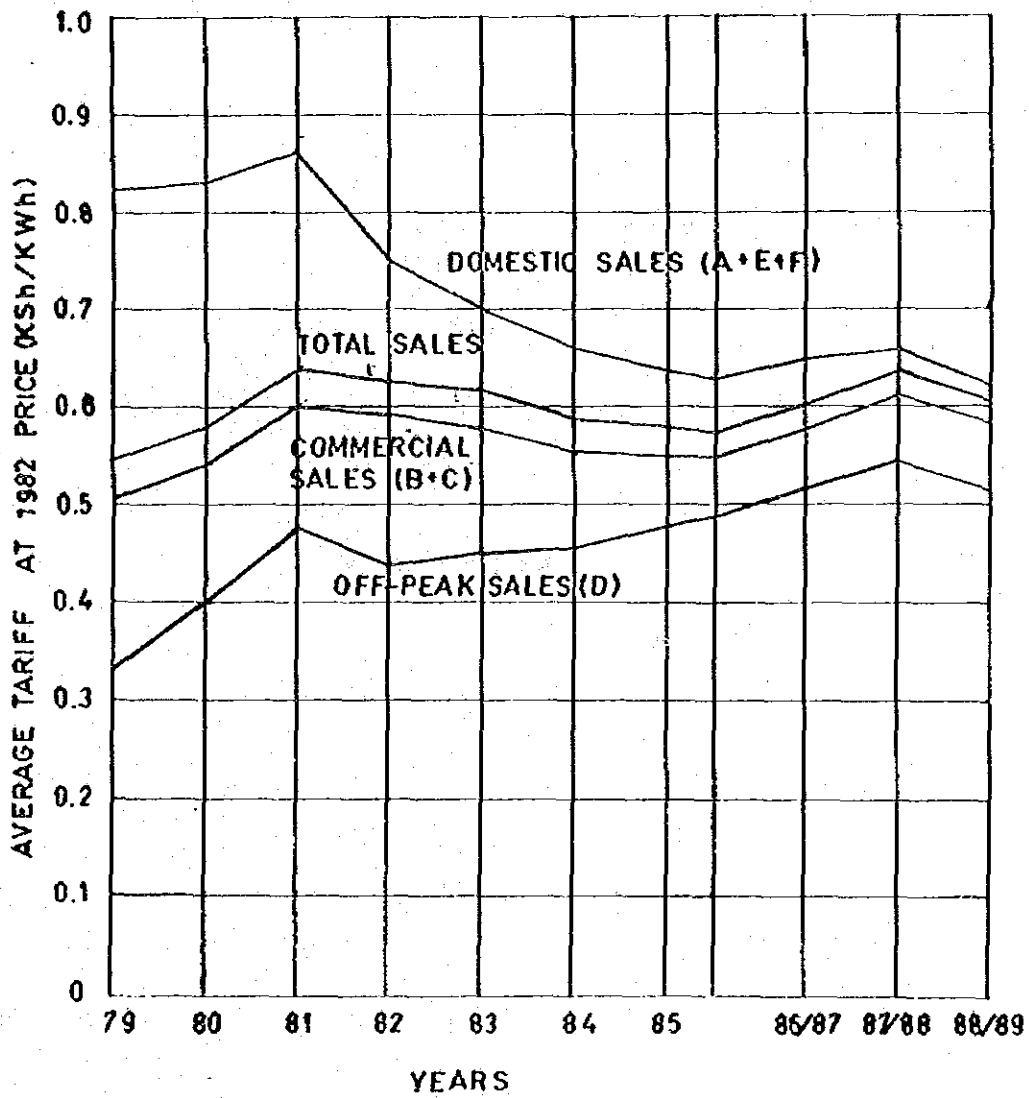


Figure L3.8

Averaged Tariffs of Current Price (1979 - 1988/89)

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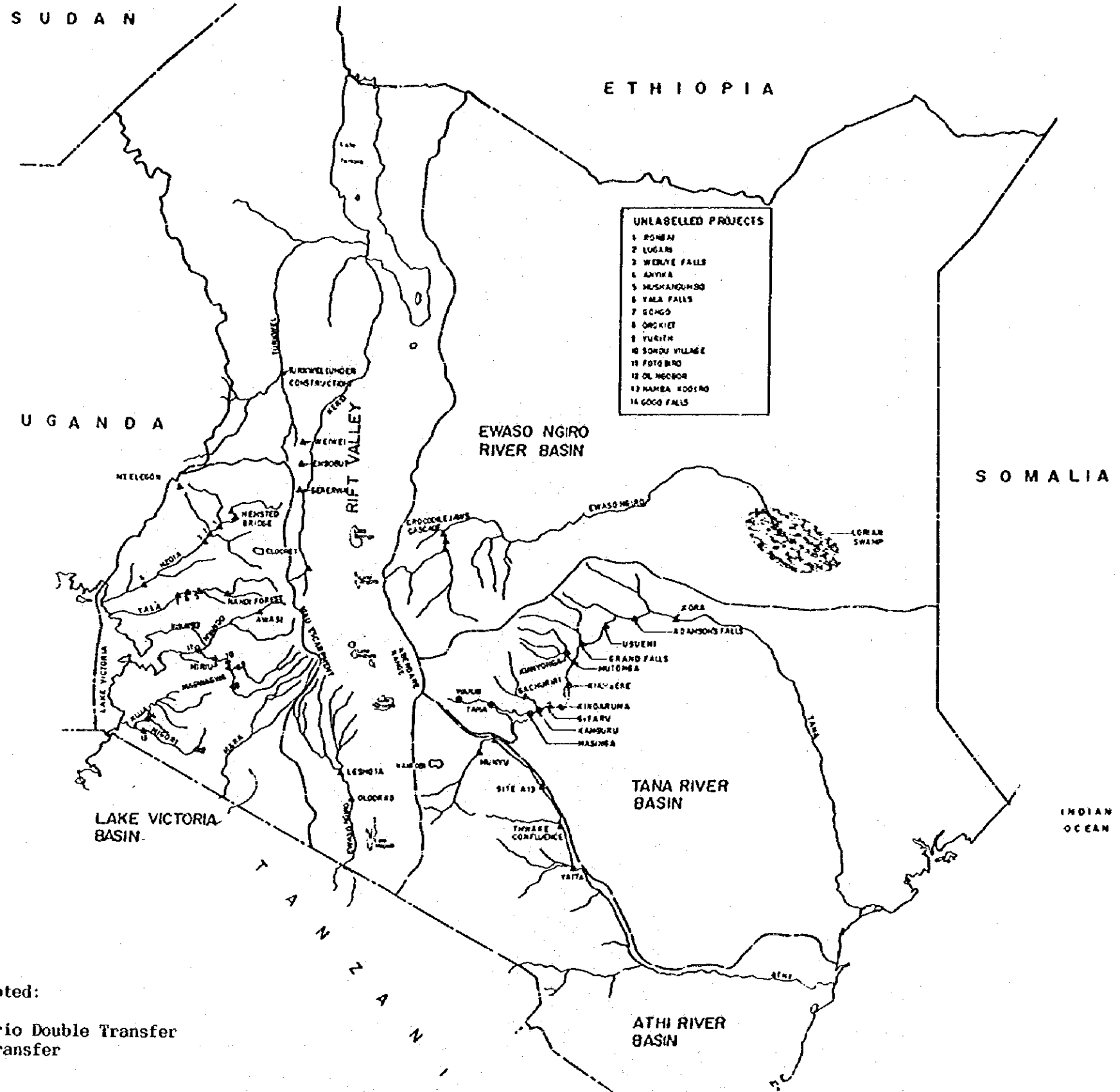


NOTES

- (1) PCI PRICE DEFLATOR USED FOR DOMESTIC AND OFF-PEAK TARIFFS
- (2) NON AGRICULTURE GDP PRICE DEFLATOR USED FOR COMMERCIAL AND TOTAL TARIFFS

Figure L3.9

Averaged Tariffs at 1982 Price (1979 - 1988/89)



- UNLABELLED PROJECTS**
- 1 ROMEN
 - 2 LUGAN
 - 3 WERYE FALLS
 - 4 ANYWA
 - 5 MUSHAGUMBO
 - 6 YALA FALLS
 - 7 GONGO
 - 8 ORKRET
 - 9 YUKITH
 - 10 SONDU VILLAGE
 - 11 FOTO BHO
 - 12 OL MEBOR
 - 13 NAMBAL KOOIRO
 - 14 GOGO FALLS

Note: Other Schemes to be noted:
 1 Nzoia-Swam/Nzoia Kerio Double Transfer
 2 Amala-Narok Water Transfer

Figure L4.1 Location Map of Hydroelectric Potential

Source : National Power Development Plan 1986 - 2006

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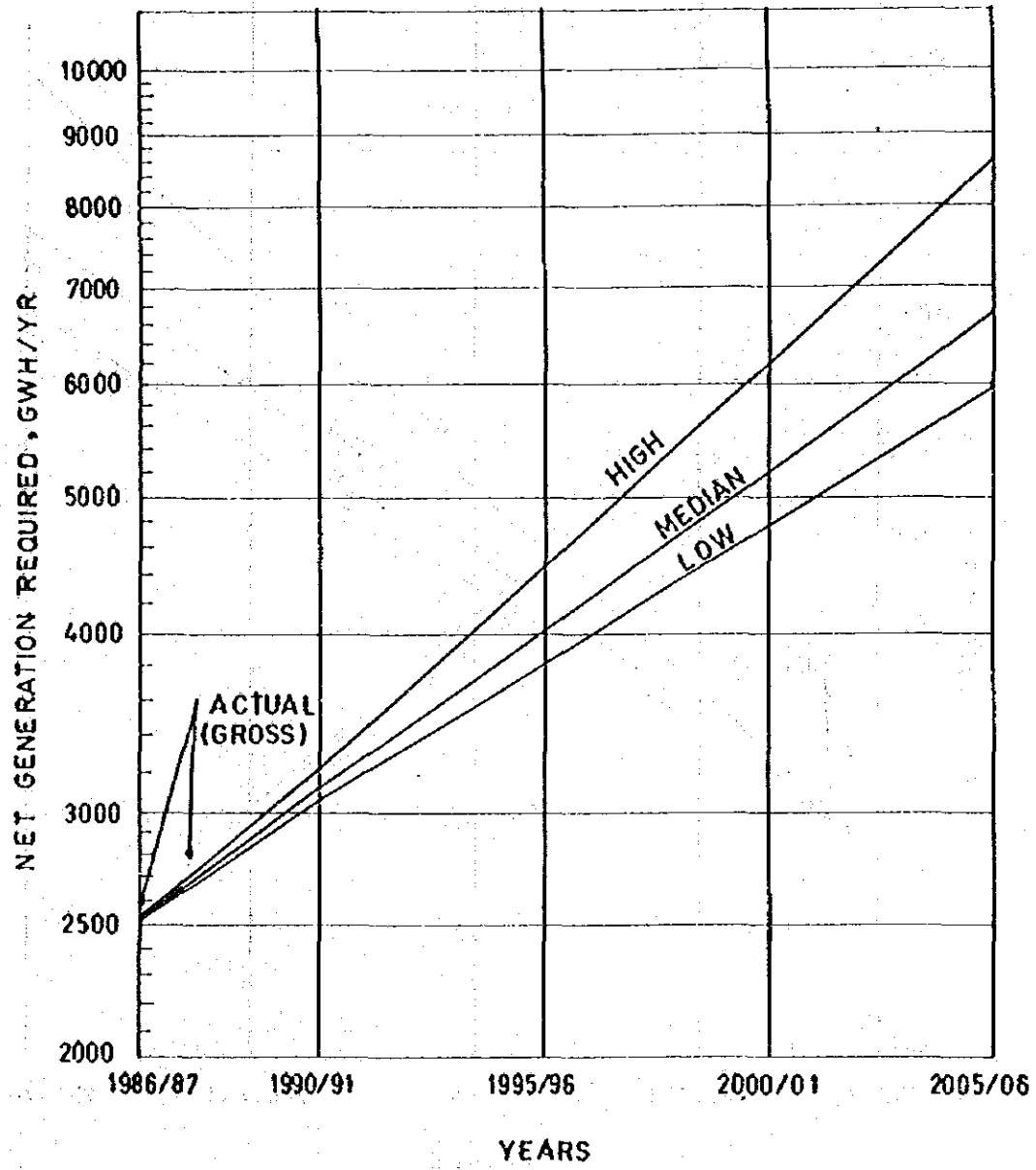


Figure L5.1 Generation Forecast

Source : National Power Development Plan 1986 - 2006

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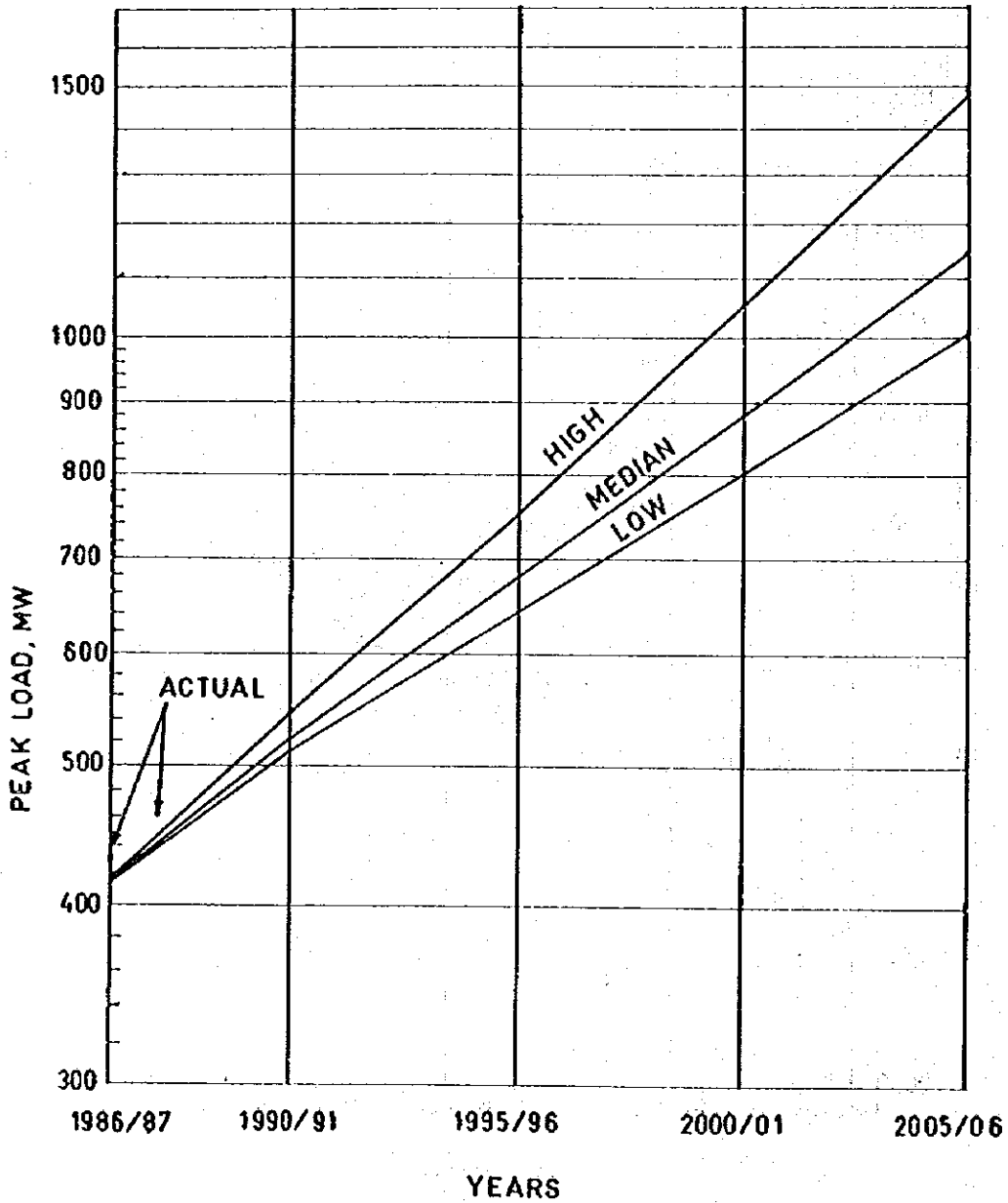


Figure L.5.2 Peak Demand Forecast

Source : National Power Development Plan 1986 - 2006

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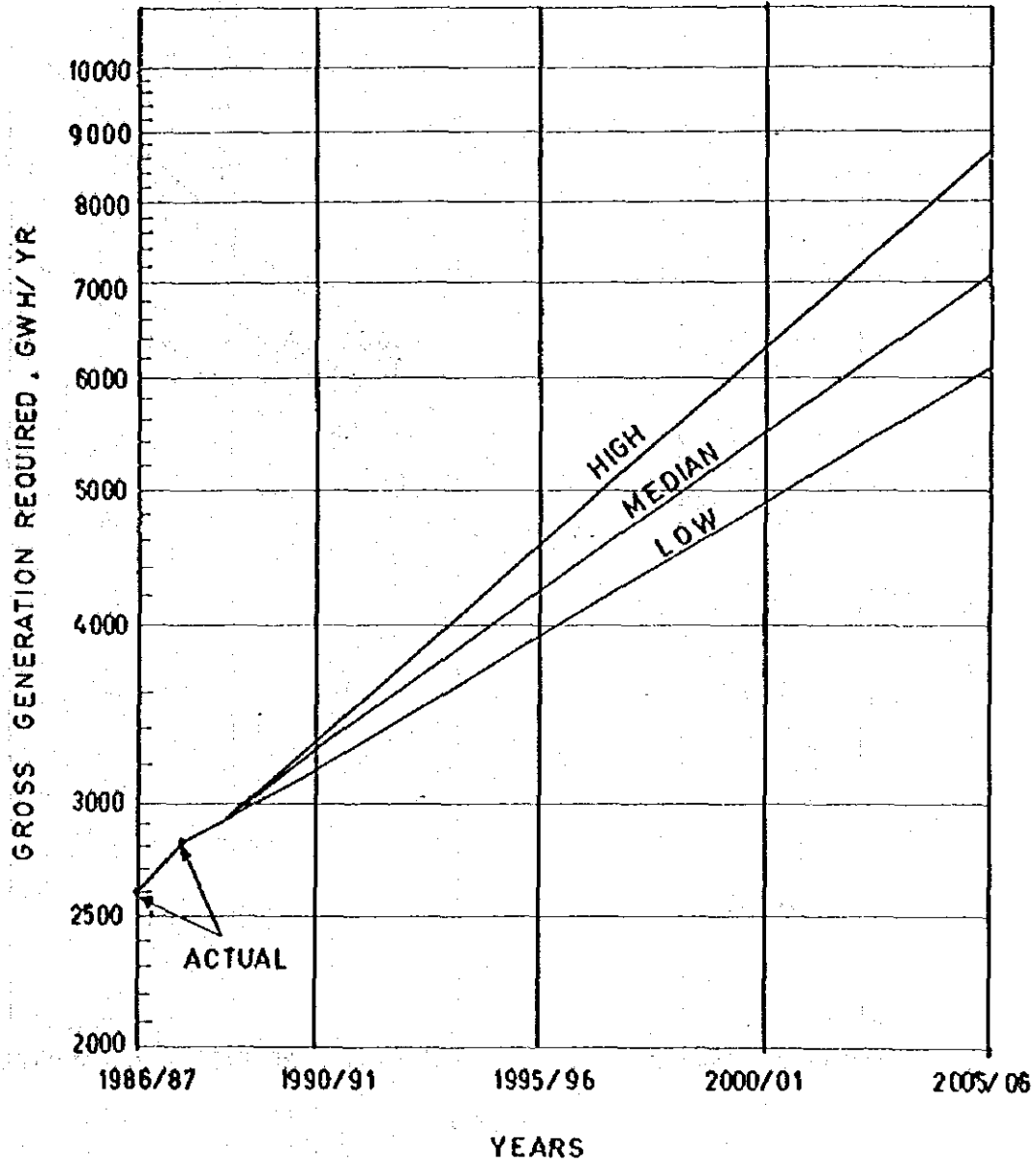


Figure L5.3 Revised Generation Forecast

Source : Feasibility Study for North East Olkaria Geothermal Plant (1989)

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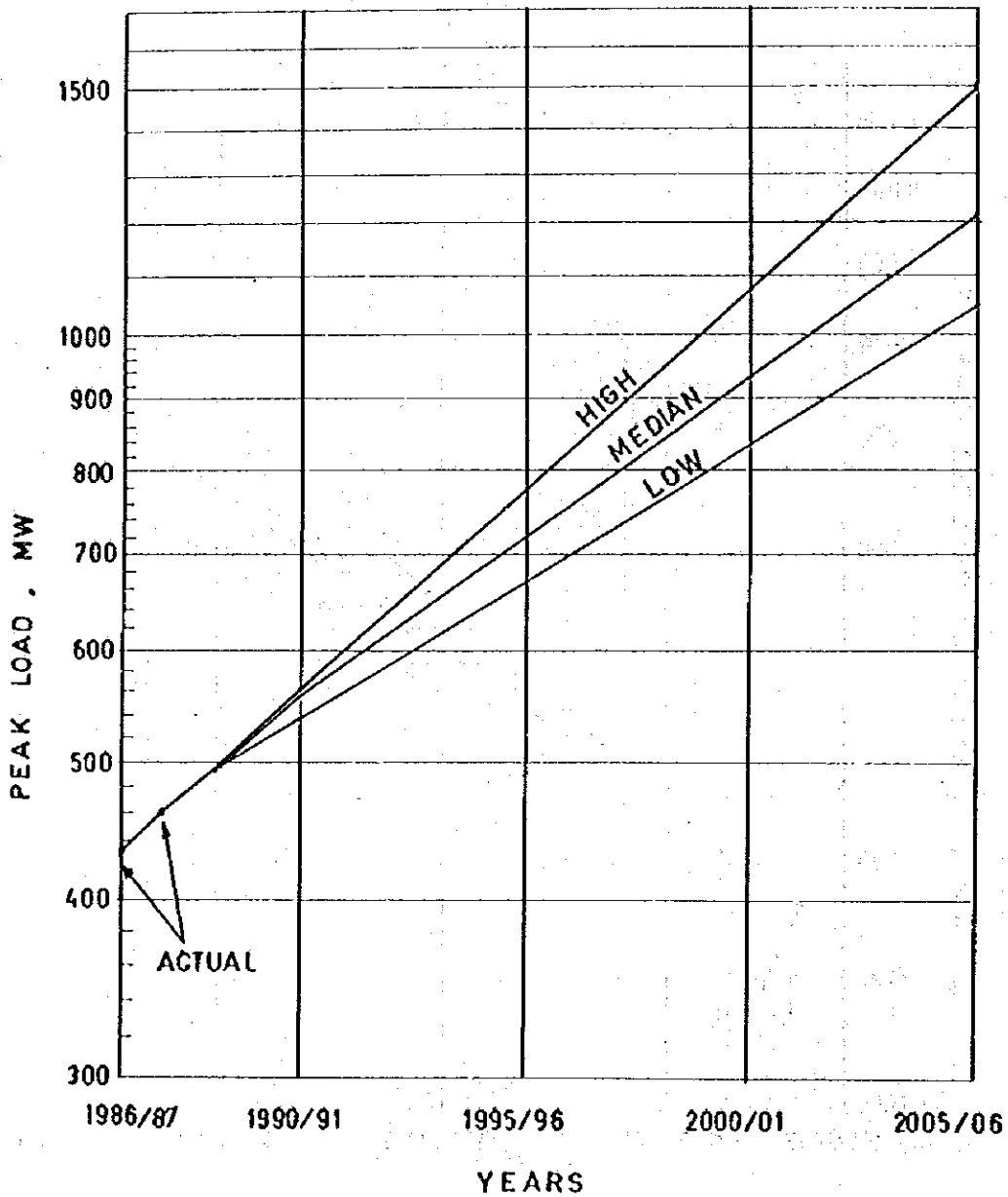


Figure L.5.4 Revised Peak Demand Forecast

Source : Feasibility Study for North East Olkaria Geothermal Plant (1989)

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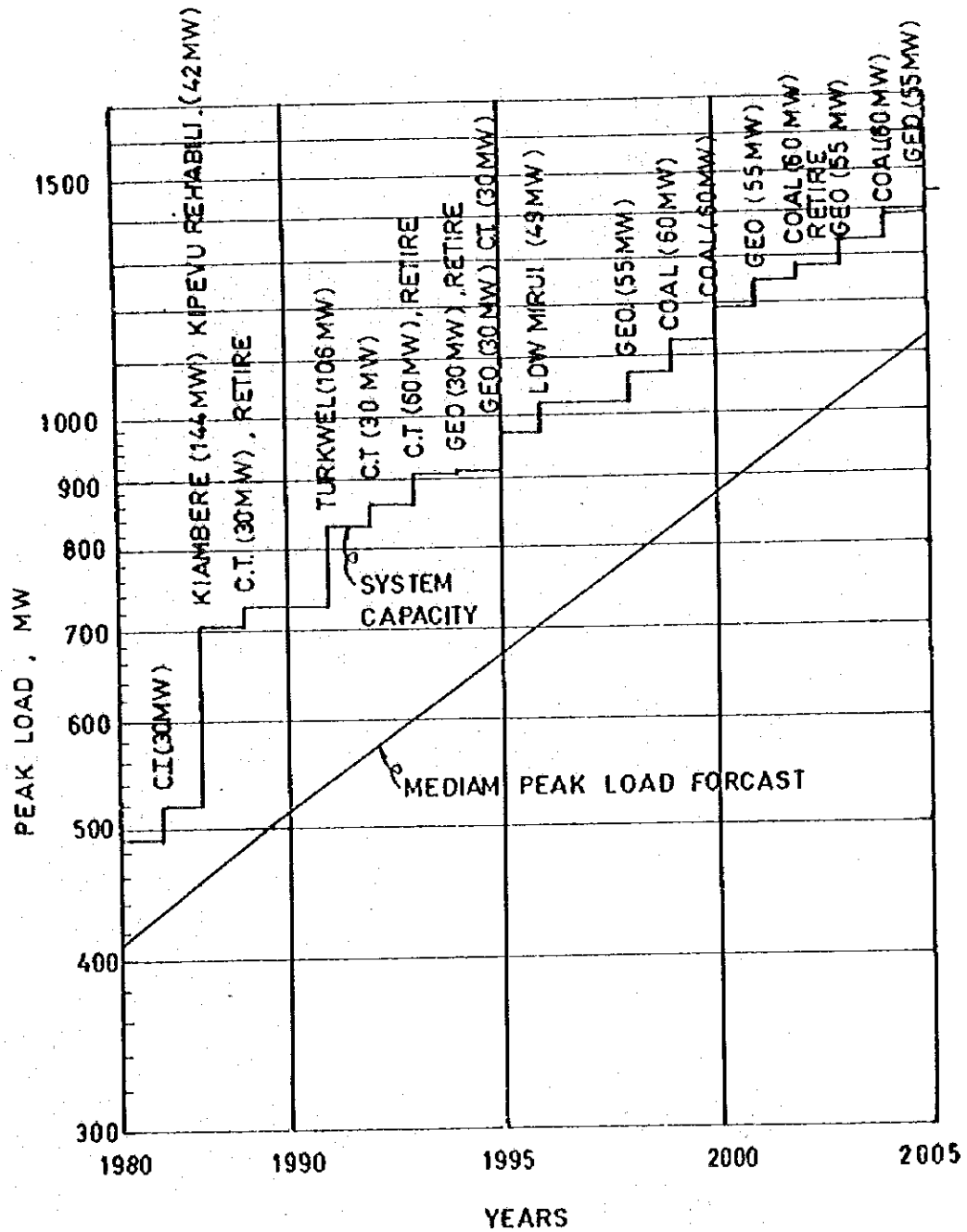


Figure L5.5 Least Cost Generation Expansion Plan

Source : National Power Development Plan 1986 - 2006

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