APPENDIX

APPENDIX

Table A - 1 - (1) Load Forecast for Entire Ecuador

Unit : GWh

	(Estimated) 1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	Increase (%) 1974-1980	1980-1984	1974-1984
Energy demand at customer end (GWh)		(22.9)	(23.0)	(34.1)	(21.9)	(12.4)	(13.8)	(9.6)	(10.3)	(10.3)	(11.0)	21.1	10.3	16.7
Industry	341.23	419.38	515.66	691.37	842.54	946.85	1,077.78	1,181.58	1,303.33	1,438.20	1,595.86			
		(12.5)	(13.1)	(13.1)	(13.3)	(13.5)	(13.6)	(12.2)	(11.9)	(11.7)	(11.5)	13.2	11.8	12.6
Residential	412.72	464.19	524.86	593.52	672.48	763.60	867.40	973.58	1,089.77	1,217.05	1,356.66			
		(13.1)	(13.1)	(13.3)	(13.6)	(13.4)	(13.4)	(11.5)	(11.0)	(11.1)	(10.6)	13.3	11.1	12.4
Commercial	175.20	198.12	224.09	253.84	288.35	326.99	370.88	413.51	459.14	510.25	564.29			
		(7.3)	(7.3)	(7.5)	(7.2)	(7.4)	(7.4)	(6.7)	(6.6)	(6.6)	(6.6)	7.3	6.6	7.0
Others	112.34	120.51	129.26	138.89	148.87	159.90	171.74	183.21	195.23	208.06	221.79			
		(15.4)	(15.9)	(20.4)	(16.4)	(12.6)	(13.2)	(10.6)	(10.7)	(10.7)	(10.8)	15.6	10.7	13.6
Subtotal	1,041.49	1,202.20	1,393.87	1,677.62	1,952.24	2,197.34	2,487.80	2,751.88	3,047.47	3,373.56	3,738.60			
Energy requirement at sending end (GWh)	1,247.64	(15.0) 1,435.07	(15.6) 1,659.02	(20.3) 1,995.67	(16.0) 2,314.25	(12.2) 2,597.25	(13.0) 2,933.87	(10.4) 3,237.73	(10.5) 3,576.95	(10.4) 3,950.41	(10.5) 4,366.36	15.3	10.5	13.3
Loss factor (%)	16.5	16.2	16.0	15.9	15.6	15.4	15.2	15.0	14.8	14.6	14.4			
Load factor (%)	48	48	48	49	49	49	49	49	49	49	49			
Max. demand at sending end (MW)	299.76	(14.4) 342.78	(15.3) 395.10	(18.0) 466.67	(15.2) 537.10	(12.6) 604.95	(12.9) 682.91	(10.5) 754.63	(10.6) 834.44	(10.5) 922.11	(10.5) 1,018.70	14.7	10.5	13.0

Note: Figures in parenthesis indicate growth rate of the demand.

Table A - 1 - (2) Load Forecast for the Sistema Norte

Unit : GWh

	(Estimated) 1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	Increase (%) 1974-1980	1980-1984	1974-1984
Energy demand at customers end (GWh)		(13.1)	(13.4)	(2,208.9)	(3.3)	(1.2)	(1.3)	(1.4)	(1.5)	(1.7)	(1.8)	77.6	1.6	42.0
Industry	1.98	2.24	2.54	58.61	60.52	61.28	62.09	62.98	63.94	65.02	66.19			
		(13.9)	(14.5)	(14.7)	(15.4)	(15.3)	(15.3)	(12.8)	(12.4)	(12.5)	(12.4)	14.9	12.5	13.9
Residential	8.57	9.77	11.18	12.82	14.80	17.07	19.69	22.20	24.97	28.09	31.58			
		(14.2)	(14.4)	(13.8)	(14.5)	(14.7)	(14.4)	(13.4)	(13.5)	(13.5)	(13.5)	14.3	13.5	14.0
Commercial	4.17	4.76	5.45	6.20	7.10	8.14	9.32	10.56	11.99	13.60	15.43			
		(5.0)	(6.0)	(5.4)	(5.6)	(5.9)	(6.1)	(4.0)	(3.8)	(3.6)	(3.6)	5.7	3.8	4.9
Others	4.53	4.75	5.04	5.31	5.61	5.94	6.30	6.56	6.81	7.05	7.31			
		(11.6)	(12.5)	(242.6)	(6.1)	(5.0)	(5.4)	(5.0)	(5.3)	(5.6)	(5.9)	31.0	5.5	20.1
Subtotal	19.25	21.52	24.21	82.94	88.03	92.42	97.40	102.30	107.71	113.76	120.51			
Energy requirement at sending end (GWh)		(11.5)	(12.1)	(244.1)	(5.7)	(4.6)	(5.0)	(4.7)	(4.9)	(5.3)	(5.6)	30.7	5.1	19.8
	23.65	26.36	29.56	101.68	107.51	112.48	118.13	123.67	129.77	136.63	144.31			
Loss factor (%)	18.6	18.3	18.1	18.4	18.1	17.8	17.5	17.2	16.9	16.7	16.4			
Load factor (%)	37	37	37	59	57	56	54	53	52	51	50			
Max. demand at sending end (MW)		(11.2)	(11.9)	(415.5)	(8.6)	(7.5)	(8.0)	(7.0)	(7.3)	(7.5)	(7.7)	22.5	7.4	16.2
	7.34	8.16	9.13	19.68	21.38	23.00	24.84	26.58	28.51	30.65	33.01			

Note : Figures in parenthesis indicate growth rate of the demand.

Table A - 1 - (3) Load Forecast for the Sistema Pichincha

Unit : Gwh

	(Estimated) 1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	Increase (%) 1974-1980	1980-1984	1974-1984
Energy demand at customers end (GWh)														
Industry	99.34	(8.9) 108.19	(14.9) 124.29	(13.9) 141.61	(13.5) 160.74	(12.9) 181.45	(13.0) 205.02	(13.1) 231.84	(13.6) 263.32	(12.8) 296.98	(13.3) 336.36	12.8	13.2	13.0
Residential	140.62	(10.5) 155.38	(10.3) 171.47	(11.1) 190.53	(10.7) 210.86	(10.9) 233.83	(11.0) 259.63	(11.1) 288.52	(11.1) 320.47	(10.9) 355.47	(10.9) 394.08	10.8	11.0	10.9
Commercial	49.22	(13.1) 55.65	(12.1) 62.40	(13.4) 70.75	(13.2) 80.09	(12.9) 90.45	(13.2) 102.35	(13.1) 115.73	(12.0) 129.62	(13.0) 146.44	(11.6) 163.43	13.0	12.4	12.8
Others	33.11	(7.4) 35.57	(7.0) 38.08	(8.3) 41.25	(7.4) 44.31	(7.5) 47.62	(7.4) 51.12	(7.3) 54.83	(7.1) 58.75	(7.3) 63.06	(7.5) 67.78	7.5	7.3	7.4
Subtotal	322.29	(10.1) 354.79	(11.7) 396.24	(12.1) 444.14	(11.7) 496.00	(11.6) 553.35	(11.7) 618.12	(11.8) 690.92	(11.8) 772.16	(11.6) 861.95	(11.6) 961.65	11.5	11.7	11.6
Energy requirement at sending end (GWh)	402.51	(9.8) 442.01	(11.5) 492.79	(11.9) 551.66	(11.4) 614.79	(11.3) 684.14	(11.4) 762.32	(11.5) 849.92	(11.3) 946.24	(11.2) 1,052.66	(11.0) 1,168.71	11.2	11.3	11.2
Loss factor (%)	19.9	19.7	19.5	19.4	19.3	19.1	18.9	18.7	18.3	18.1	17.8			
Load factor (%)	51	51	51	51	51	51	51	51	51	51	51			
Max. demand at sending end (MW)	89.24	(9.7) 97.86	(11.1) 108.77	(11.9) 121.71	(11.4) 135.60	(11.7) 151.41	(11.9) 169.35	(11.8) 189.27	(11.6) 211.31	(11.5) 235.71	(11.4) 262.68	11.3	11.6	11.4

Note : Figures in parenthesis indicate growth rate of the demand.

Table A - 1 - (4) Load Forecast for the Sistema Centro-Norte

Unit : (GWh)

	(Estimated) 1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	Increase (%) 1974-1980	1980-1984	1974-1984
Energy demand at customers end (GWh)		(25.3)	(20.8)	(12.5)	(62.4)	(7.3)	(11.1)	(7.6)	(9.6)	(7.8)	(7.9)	22.0	8.2	16.3
Industry	31.38	39.32	47.52	53.47	86.83	93.22	103.53	111.39	122.08	131.54	141.93			
		(17.8)	(18.5)	(17.5)	(17.4)	(16.7)	(16.4)	(13.6)	(13.2)	(13.5)	(13.6)	17.4	13.5	15.8
Residential	24.20	28.50	33.78	39.70	46.62	54.40	63.34	71.98	81.46	92.45	104.99			
		(10.0)	(10.2)	(10.4)	(10.8)	(10.1)	(10.7)	(9.9)	(9.9)	(10.2)	(10.5)	10.4	10.1	10.3
Commercial	13.77	15.15	16.69	18.44	20.42	22.48	24.88	27.43	30.05	33.13	36.62			
		(5.9)	(6.4)	(6.7)	(6.8)	(7.1)	(7.4)	(6.4)	(5.8)	(5.6)	(5.5)	6.7	5.8	6.4
Others	8.88	9.41	10.01	10.68	11.40	12.21	13.11	13.94	14.76	15.58	16.44			
		(18.1)	(16.9)	(13.2)	(35.1)	(10.3)	(12.4)	(9.7)	(10.6)	(9.8)	(10.0)	17.4	10.0	14.4
Subtotal	78.23	92.38	108.00	122.29	165.27	182.31	204.86	224.65	248.35	272.70	299.98			
Energy requirement at sending end (GWh)	98.73	(17.3) 115.77	(16.1) 134.36	(12.8) 151.50	(33.6) 202.34	(9.8) 222.26	(11.9) 248.77	(9.3) 271.89	(10.2) 299.68	(9.4) 327.96	(9.6) 359.61	16.7	9.6	13.8
Loss factor (%)	20.8	20.2	19.6	19.3	18.3	18.0	17.7	17.4	17.1	16.8	16.6			
Load factor (%)	42	42	43	44	46	46	46	46	46	45	45			
Max. demand at sending end (MW)	26.95	(15.6) 31.16	(13.9) 35.47	(11.8) 39.65	(25.9) 49.92	(10.8) 55.31	(12.4) 62.15	(9.8) 68.25	(10.6) 75.47	(10.1) 83.09	(10.4) 91.69	14.9	10.2	13.0

Note : Figures in parenthesis indicate growth rate of the demand.

Table A - 1 - (5) Load Forecast for the Sistema Centro-Sur

Unit : GWh

	(Estimated) 1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	Increase (%) 1974-1980	1980-1984	1974-1984
Energy demand at customers end (GWh)		(10.9)	(11.9)	(153.1)	(13.3)	(6.3)	(29.8)	(7.2)	(7.9)	(8.3)	(8.6)	30.4	8.0	20.9
Industry	11.16	12.38	13.85	35.04	39.72	42.21	54.78	58.72	63.36	68.62	74.50			
Residential	19.18	(12.6) 21.60	(13.5) 24.49	(14.1) 27.96	(14.9) 32.13	(15.9) 31.25	(17.7) 43.84	(12.3) 49.22	(12.1) 55.20	(12.4) 62.03	(12.5) 69.77	14.8	12.3	13.8
Commercial	3.60	(17.5) 4.23	(18.8) 5.03	(19.9) 6.03	(21.2) 7.31	(23.2) 9.00	(25.2) 11.27	(14.7) 12.92	(14.6) 14.81	(14.7) 16.99	(14.7) 19.48	20.9	14.7	18.4
Others	3.42	(9.9) 3.75	(10.6) 4.15	(11.6) 4.63	(12.1) 5.19	(16.8) 6.06	(17.3) 7.11	(5.6) 7.51	(5.7) 7.93	(5.7) 8.38	(5.7) 8.87	13.0	5.7	10.0
Subtotal	37.36	(12.3) 41.96	(13.3) 47.52	(55.0) 73.66	(14.5) 84.35	(12.1) 94.52	(23.8) 117.00	(9.7) 128.37	(10.1) 141.30	(10.4) 156.02	(10.6) 172.62	21.0	10.2	16.5
Energy requirement at sending end (GWh)	47.87	(11.5) 53.38	(12.5) 60.04	(54.2) 92.59	(13.8) 105.34	(11.3) 117.27	(22.7) 143.83	(9.2) 157.07	(9.6) 172.13	(9.9) 189.20	(10.1) 208.37	20.1	9.7	15.8
Loss factor (%)	21.9	21.4	20.8	20.4	19.9	19.3	18.6	18.2	17.9	17.5	17.1			
Load factor (%)	43	43	43	44	44	43	43	43	43	43	43			
Max. demand at sending end (MW)	12.57	(12.3) 14.11	(13.4) 16.01	(49.9) 24.01	(14.8) 27.57	(13.2) 31.21	(23.5) 38.56	(9.0) 42.04	(9.3) 45.96	(9.8) 50.45	(10.1) 55.54	20.5	9.6	16.0

Note : Figures in parenthesis indicate growth rate of the demand.

Table A - 1 - (6) Load Forecast for the Sistema Sur

Unit : GWh

	(Estimated) 1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	Increase (%) 1974-1980	1980-1984	1974-1984
Energy demand at customers end (GWh)		(118.0)	(29.8)	(13.5)	(17.7)	(56.8)	(29.4)	(10.9)	(10.9)	(9.4)	(10.2)	40.4	10.2	27.5
Industry	1.86	4.05	5.26	5.96	7.02	11.01	14.24	15.79	17.51	19.16	21.01			
		(15.9)	(18.4)	(21.2)	(23.2)	(24.6)	(27.1)	(29.8)	(29.3)	(23.9)	(20.7)	21.7	25.9	23.3
Residential	3.63	4.21	4.98	6.04	7.44	9.27	11.78	15.29	19.78	24.50	29.57			
		(11.1)	(13.0)	(14.8)	(16.1)	(16.4)	(18.6)	(22.0)	(22.2)	(18.0)	(15.6)	15.0	19.4	16.7
Commercial	2.86	3.17	3.58	4.12	4.78	5.56	6.60	8.05	9.83	11.60	13.40			
		(4.3)	(4.0)	(5.1)	(5.0)	(5.4)	(6.2)	(6.6)	(6.7)	(6.5)	(6.3)	5.0	6.5	5.6
Others	3.16	3.30	3.43	3.60	3.78	3.99	4.23	4.51	4.81	5.13	5.45			
		(28.0)	(17.1)	(14.3)	(16.7)	(29.6)	(23.5)	(18.4)	(19.0)	(16.3)	(15.0)	21.4	17.2	19.7
Subtotal	11.51	14.73	17.25	19.72	23.02	29.83	36.85	43.64	51.93	60.39	69.43			
Energy requirement at sending end (GWh)		(27.3)	(17.0)	(14.1)	(16.6)	(29.0)	(23.2)	(18.2)	(18.8)	(16.1)	(14.7)	21.1	16.9	19.4
	14.04	17.88	20.91	23.86	27.82	35.90	44.23	52.30	62.12	72.10	82.71			
Loss factor (%)	18.0	17.6	17.4	17.3	17.2	16.9	16.6	16.5	16.4	16.2	1.60			
Load factor (%)	36	37	37	38	38	39	40	40	41	41	42			
Max. demand at sending end (MW)		(24.9)	(16.6)	(12.7)	(15.2)	(27.2)	(20.5)	(16.8)	(17.4)	(14.1)	(12.9)	19.4	15.3	17.7
	4.41	5.50	6.42	7.23	8.33	10.60	12.78	14.92	17.51	19.97	22.55			

Note : Figures in parenthesis indicate growth rate of the demand.

Table A - 1 - (7) Load Forecast for the Sistema Esmeraldas

Unit : GWh

	(Estimated) 1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	Increase (%) 1974-1980	1980-1984	1974-1984
Energy demand at customers end (GWh)		(54.6)	(28.1)	(26.9)	(42.6)	(15.0)	(75.1)	(6.8)	(7.0)	(7.4)	(22.0)	39.0	10.6	26.9
Industry	4.24	6.56	8.40	10.66	15.20	17.48	30.61	32.70	35.00	37.59	45.86			
		(17.6)	(18.5)	(20.0)	(21.7)	(24.0)	(26.4)	(28.3)	(25.0)	(21.5)	(19.3)	21.3	23.5	22.2
Residential	4.26	5.00	5.93	7.12	8.66	10.74	13.58	17.43	21.79	26.47	31.58			
		(18.4)	(19.8)	(21.1)	(22.7)	(24.5)	(26.8)	(27.3)	(25.3)	(21.4)	(18.2)	22.2	23.0	22.5
Commercial	2.13	2.52	3.02	3.66	4.49	5.59	7.09	9.02	11.30	13.72	16.22			
		(17.5)	(14.2)	(14.2)	(13.0)	(13.2)	(12.4)	(11.0)	(10.0)	(10.0)	(9.9)	14.1	10.2	12.5
Others	1.45	1.71	1.95	2.23	2.52	2.85	3.20	3.55	3.91	4.30	4.73			
		(30.7)	(22.2)	(22.6)	(30.4)	(18.8)	(48.6)	(15.1)	(14.8)	(14.0)	(19.9)	28.5	15.9	23.3
Subtotal	12.08	15.79	19.30	23.67	30.87	36.66	54.48	62.70	72.00	82.08	98.39			
Energy requirement at sending end (GWh)		(30.0)	(21.5)	(22.0)	(29.8)	(18.2)	(47.8)	(14.5)	(14.2)	(13.4)	(19.3)	27.9	15.3	22.7
	15.28	19.86	24.13	29.44	38.21	45.16	66.74	76.41	87.27	98.99	118.09			
Loss factor (%)	20.9	20.4	20.0	19.6	19.2	18.8	18.3	17.9	17.5	17.0	16.6			
Load factor (%)	38	41	42	44	48	48	53	52	51	51	51			
Max. demand at sending end (MW)		(19.9)	(16.8)	(16.9)	(19.5)	(17.4)	(34.2)	(17.8)	(16.2)	(13.6)	(18.2)	20.6	16.4	18.9
	4.64	5.56	6.49	7.59	9.06	10.64	14.27	16.81	19.54	22.19	26.23			

Note: Figures in parenthesis indicate growth rate of the demand.

Table A - 1 - (8) Load Forecast for the Sistema Manabi

Unit : GWh

	(Estimated) 1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	Increase (%) 1974-1980	1980-1984	1974-1984
Energy demand at customers end (GWh)		(36.1)	(61.3)	(39.4)	(7.9)	(8.2)	(22.6)	(7.7)	(7.9)	(8.0)	(8.2)	27.9	7.9	19.5
Industry	7.66	10.42	16.81	23.43	25.29	27.37	33.55	36.13	38.97	42.10	45.55			
		(22.4)	(23.8)	(22.2)	(22.7)	(20.8)	(18.1)	(16.6)	(14.0)	(13.0)	(12.2)	21.6	13.9	18.5
Residential	14.02	17.17	21.25	25.95	31.84	38.45	45.42	52.94	60.37	68.22	76.57			
		(15.8)	(18.6)	(16.9)	(18.3)	(17.0)	(15.1)	(14.5)	(12.8)	(11.6)	(11.0)	16.9	12.5	15.1
Commercial	7.07	8.18	9.70	11.34	13.42	15.70	18.07	20.68	23.34	26.05	28.92			
		(10.0)	(10.4)	(10.2)	(8.4)	(8.5)	(8.4)	(7.4)	(7.3)	(7.1)	(7.0)	9.3	7.2	8.5
Others	4.59	5.04	5.57	6.14	6.65	7.22	7.82	8.40	9.01	9.66	10.33			
		(22.4)	(30.6)	(25.4)	(15.5)	(15.0)	(18.2)	(12.7)	(11.5)	(10.9)	(10.5)	21.0	11.4	17.1
Subtotal	33.34	40.81	53.33	66.86	77.20	88.74	104.86	118.15	131.69	146.03	161.37			
Energy requirement at sending end (GWh)		(21.0)	(29.1)	(23.9)	(14.2)	(13.9)	(17.1)	(11.4)	(10.7)	(10.3)	(10.2)	19.7	10.6	16.0
	43.69	52.87	68.26	84.58	96.59	109.99	128.75	143.47	158.89	175.27	192.84			
Loss factor (%)	23.6	22.8	21.8	20.9	20.0	19.3	18.5	17.6	17.1	16.6	16.3			
Load factor (%)	43	44	45	46	46	47	48	48	48	47	47			
Max. demand at sending end (MW)		(17.8)	(26.2)	(20.9)	(13.2)	(13.0)	(14.7)	(11.5)	(11.2)	(10.7)	(10.4)	17.5	11.0	14.9
	11.66	13.74	17.33	20.96	23.72	26.80	30.74	34.29	38.14	42.22	46.59			

Note : Figures in parenthesis indicate growth rate of the demand.

Table A - 1 - (9) Load Forecast for the Sistema Guayas-Los Rios

Unit : GWh

	(Estimated) 1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	Increase (%) 1974-1980	1980-1984	1974-1984
Energy demand at customers end (GWh)		(28.3)	(24.8)	(21.8)	(23.5)	(14.9)	(12.0)	(10.1)	(10.6)	(11.2)	(11.3)	20.7	10.8	16.7
Industry	178.57	229.05	285.95	348.17	430.09	494.06	553.16	609.22	674.03	749.50	833.97			
Residencial	191.65	(12.1) 214.86	(12.9) 242.66	(12.4) 272.68	(12.7) 307.43	(13.1) 347.64	(13.0) 392.67	(10.8) 435.24	(10.5) 481.06	(10.3) 530.71	(10.1) 584.38	12.7	10.5	11.8
Commercial	87.32	(13.0) 98.71	(13.1) 111.66	(12.7) 125.88	(13.0) 142.30	(12.8) 160.52	(12.5) 180.65	(9.1) 197.15	(8.9) 214.77	(8.8) 233.65	(8.6) 253.79	12.9	8.9	11.3
Others	51.76	(6.7) 55.25	(6.7) 58.97	(6.3) 62.67	(6.4) 66.68	(6.4) 70.93	(6.3) 75.40	(6.1) 80.03	(6.1) 84.90	(6.1) 90.08	(6.1) 95.54	6.5	6.1	6.3
Subtotal	509.30	(17.4) 597.87	(17.0) 699.24	(15.8) 809.40	(16.9) 946.50	(13.4) 1,073.15	(12.0) 1,201.88	(10.0) 1,321.64	(10.1) 1,454.76	(10.3) 1,603.94	(10.2) 1,767.68	15.4	10.1	13.3
Energy requirement at sending end (GWh)	579.48	(17.2) 679.39	(16.8) 793.69	(15.6) 917.70	(16.8) 1,071.90	(13.3) 1,213.97	(11.9) 1,358.07	(9.8) 1,491.68	(9.9) 1,640.09	(10.1) 1,806.23	(10.1) 1,988.38	15.3	10.0	13.1
Loss factor (%)	12.1	12.0	11.9	11.8	11.7	11.6	11.5	11.4	11.3	11.2	11.1			
Load factor (%)	49	49	49	49	50	50	50	50	50	50	50			
Max. demand at sending end (MW)	135.97	(16.4) 158.26	(16.8) 184.92	(14.9) 212.53	(16.2) 246.96	(12.9) 278.88	(12.0) 312.42	(9.7) 342.63	(9.7) 375.88	(9.9) 413.21	(9.7) 453.01	14.9	9.7	12.8

Note : Figures in parenthesis indicate growth rate of the demand.

Table A - 1 - (10) Load Forecast for the Sistema El Oro

Unit : GWh

	(Estimated) 1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	Increase (%) 1974-1980	1980-1984	1974-1984
Energy demand at customers end (GWh)		(42.1)	(54.5)	(30.4)	(18.8)	(9.6)	(10.7)	(9.9)	(10.0)	(10.1)	(10.2)	26.6	10.1	19.7
Industry	5.04	7.16	11.05	14.41	17.13	18.77	20.78	22.85	25.14	27.69	30.51			
		(17.0)	(18.2)	(17.6)	(18.6)	(17.5)	(16.9)	(18.8)	(18.9)	(18.0)	(17.3)	17.6	18.2	17.9
Residential	6.58	7.70	9.11	10.71	12.71	14.94	17.46	20.75	24.67	29.11	34.13			
		(13.5)	(14.0)	(13.4)	(13.7)	(12.9)	(11.7)	(12.9)	(11.5)	(12.2)	(12.7)	13.2	12.3	12.9
Commercial	5.07	5.75	6.56	7.44	8.46	9.55	10.67	12.04	13.43	15.07	16.99			
		(20.2)	(18.8)	(15.8)	(14.0)	(13.7)	(11.6)	(12.4)	(12.1)	(11.0)	(11.0)	15.6	11.6	14.0
Others	1.44	1.74	2.06	2.39	2.72	3.09	3.45	3.88	4.35	4.82	5.35			
		(23.1)	(28.8)	(21.4)	(17.3)	(13.0)	(13.0)	(13.7)	(13.6)	(13.5)	(13.4)	19.3	13.5	17.0
Subtotal	18.13	22.35	28.78	34.95	41.01	46.35	52.36	59.52	67.59	76.69	86.98			
Energy requirement at sending end (GWh)		(23.0)	(28.1)	(20.9)	(16.6)	(12.7)	(12.4)	(13.2)	(13.2)	(13.1)	(13.1)	18.8	13.2	16.5
	22.39	27.55	35.26	42.66	49.75	56.08	63.03	71.32	80.76	91.37	103.34			
Loss factor (%)	19.0	18.8	18.4	18.0	17.5	17.3	16.9	16.5	16.3	16.0	15.8			
Load factor (%)	37	37	38	38	39	40	40	41	42	42	43			
Max. demand at sending end (MW)		(20.7)	(25.3)	(20.3)	(14.6)	(10.6)	(10.5)	(11.5)	(11.5)	(11.3)	(11.3)	16.9	11.4	14.6
	6.98	8.43	10.56	12.71	14.56	16.10	17.80	19.84	22.12	24.62	27.40			

Note : Figures in parenthesis indicate growth rate of the demand.

Table A - 1 - (11) Classification of Industrial Demand

Unit : GWh

Sistema		(Estimated) 1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	Increase (%) 1974-1980	1980-1984	1974-1984
(1) Norte	General	1.98	2.24	2.54	2.78	3.11	3.49	3.91	4.38	4.90	5.49	6.15	12.0	12.0	12.0
	Special	-	-	-	55.83	57.41	57.79	58.18	58.60	59.04	59.53	60.04			
	Subtotal	1.98	2.24	2.54	58.61	60.52	61.28	62.09	62.98	63.94	65.02	66.19	77.6	1.6	42.0
(2) Pichincha	General	99.34	108.19	119.23	131.38	144.78	159.55	175.82	193.76	213.52	235.30	259.30	10.0	10.2	10.1
	Special	-	-	5.06	10.23	15.96	21.90	29.20	38.08	49.80	61.68	77.06			
	Subtotal	99.34	108.19	124.29	141.61	160.74	181.45	205.02	231.84	263.32	296.98	336.36	12.8	13.2	13.0
(3) Centro-Norte	General	31.38	33.71	36.20	38.87	49.76	44.85	48.17	51.74	55.57	59.68	64.09	7.4	7.4	7.4
	Special		5.61	11.32	14.60	37.07	48.37	55.36	59.65	66.51	71.86	77.84			
	Subtotal	31.38	39.32	47.52	53.47	86.83	93.22	103.53	111.39	122.08	131.54	141.93	22.0	8.2	16.3
(4) Centro-Sur	General	11.16	12.38	13.85	15.49	17.34	19.41	21.72	24.30	27.19	30.43	34.05	11.7	11.9	11.8
	Special	-	-	-	19.55	22.38	22.80	33.06	34.42	36.17	38.19	40.45			
	Subtotal	11.16	12.38	13.85	35.04	39.72	42.21	54.78	58.72	63.36	68.62	74.50	30.4	8.0	20.9
(5) Sur	General	1.86	2.08	2.33	2.60	2.91	3.26	3.65	4.08	4.57	5.11	5.72	11.9	11.9	11.9
	Special	-	1.97	2.93	3.36	4.11	7.75	10.59	11.71	12.94	14.05	15.29			
	Subtotal	1.86	4.05	5.26	5.96	7.02	11.01	14.24	15.79	17.51	19.16	21.01	40.4	10.2	27.5
(6) Esmeraldas	General	4.24	4.88	5.61	6.45	7.42	8.54	9.82	11.29	12.98	14.93	17.17	15.0	15.0	15.0
	Special	-	1.68	2.79	4.21	7.78	8.94	20.79	21.41	22.02	22.66	28.69			
	Subtotal	4.24	6.56	8.40	10.66	15.20	17.48	30.61	32.70	35.00	37.59	45.86	39.0	10.6	26.9
(7) Manabi	General	7.66	8.33	9.06	9.86	10.73	11.67	12.70	13.82	15.04	16.36	17.80	8.8	8.8	8.8
	Special	-	2.09	7.75	13.57	14.56	15.70	20.85	22.31	23.93	25.74	27.75			
	Subtotal	7.66	10.42	16.81	23.43	25.29	27.37	33.55	36.13	38.97	42.10	45.55	27.9	7.9	19.5
(8) Guayas -Rio Lioa	General	178.57	195.34	213.71	233.81	255.78	279.81	306.12	334.91	366.38	400.82	438.50	9.4	9.4	9.4
	Special	-	33.71	72.24	114.36	174.31	214.25	247.04	274.31	307.65	348.68	395.47			
	Subtotal	178.57	229.05	285.95	348.17	430.09	494.06	553.16	609.22	674.03	749.50	833.97	20.7	10.8	16.7
(9) El Oro	General	5.04	5.43	5.85	6.31	6.80	7.33	7.90	8.52	9.18	9.90	10.67	7.8	7.8	7.8
	Special	-	1.73	5.20	8.10	10.33	11.44	12.88	14.33	15.96	17.79	19.84			
	Subtotal	5.04	7.16	11.05	14.41	17.13	18.77	20.78	22.85	25.14	27.69	30.51	26.6	10.1	19.7
Total	General	341.23	372.58	408.38	447.57	498.64	537.92	589.82	646.78	709.32	778.00	853.44	9.6	9.7	9.6
	Special	-	46.80	107.26	243.80	343.90	408.93	487.96	534.80	594.02	660.20	742.42			
	Subtotal	341.23	419.38	515.66	691.37	842.54	946.85	1,077.78	1,181.58	1,303.34	1,438.20	1,595.86	21.1	10.3	16.7

Table A - 1 - (12) Ratio of Energy Demand by Customers (1 - 3)

(Unit : %)

Sistema	Customers	(Estimated) 1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1 Norte	Industry	10.3	10.4	10.5	70.6	68.7	66.3	63.7	61.6	59.4	57.2	54.9
	Residential	44.5	45.4	46.2	15.5	16.8	18.5	20.2	21.7	23.2	24.7	26.2
	Commercial	21.7	22.1	22.5	7.5	8.1	8.8	9.6	10.3	11.1	11.9	12.8
	Others	23.5	22.1	20.8	6.4	6.4	6.4	6.5	6.4	6.3	6.2	6.1
2 Pichincha	Industry	30.8	30.5	31.4	31.9	32.4	32.8	33.2	33.6	34.1	34.5	35.0
	Residential	43.6	43.8	43.3	42.9	42.5	42.3	42.0	41.8	41.5	41.2	41.0
	Commercial	15.3	15.7	15.7	15.9	16.2	16.3	16.5	16.7	16.8	17.0	17.0
	Others	10.3	10.0	9.6	9.3	8.9	8.6	8.3	7.9	7.6	7.3	7.0
3 Centro-Norte	Industry	40.1	42.6	44.0	43.7	52.5	51.1	50.5	49.6	49.2	48.2	47.3
	Residential	30.9	30.8	31.3	32.5	28.2	29.9	30.9	32.0	32.8	33.9	35.0
	Commercial	17.6	16.4	15.4	15.1	12.4	12.3	12.2	12.2	12.1	12.2	12.2
	Others	11.4	10.2	9.3	8.7	6.9	6.7	6.4	6.2	5.9	5.7	5.5
4 Centro-Sur	Industry	29.9	29.5	29.2	47.6	47.1	44.7	46.8	45.7	44.8	44.0	43.2
	Residential	51.3	51.5	51.5	37.9	38.1	39.4	37.5	38.3	39.1	39.7	40.4
	Commercial	9.6	10.1	10.6	8.2	8.7	9.5	9.6	10.1	10.5	10.9	11.3
	Others	9.2	8.9	8.7	6.3	6.1	6.4	6.1	5.9	5.6	5.4	5.1

Table A - 1 - (12) Ratio of Energy Demand by Customers (2 - 3)

(Unit : %)

Sistema	Customers	(Estimated) 1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
5 Sur	Industry	16.1	27.5	30.4	30.2	30.5	36.9	38.7	36.2	33.7	31.7	30.3
	Residential	31.6	28.6	28.9	30.6	32.3	31.1	31.9	35.1	38.1	40.6	42.6
	Commercial	24.8	21.5	20.8	20.9	20.8	18.6	17.9	18.4	18.9	19.2	19.3
	Others	27.5	22.4	19.9	18.3	16.4	13.4	11.5	10.3	9.3	8.5	7.8
6 Esmeraldas	Industry	35.1	41.5	43.5	45.0	49.2	47.7	56.2	52.1	48.6	45.8	46.6
	Residential	35.2	31.7	30.7	30.1	28.1	29.3	24.9	27.8	30.3	32.3	32.1
	Commercial	17.7	16.0	15.7	15.5	14.5	15.2	13.0	14.4	15.7	16.7	16.5
	Others	12.0	10.8	10.1	9.4	8.2	7.8	5.9	5.7	5.4	5.2	4.8
7 Manabi	Industry	23.0	25.5	31.5	35.0	32.7	30.8	32.0	30.6	29.6	28.8	28.2
	Residential	42.1	42.1	39.8	38.8	41.3	43.4	43.4	44.8	45.9	46.7	47.5
	Commercial	21.2	20.0	18.2	17.0	17.4	17.7	17.2	17.5	17.7	17.9	17.9
	Others	13.7	12.4	10.5	9.2	8.6	8.1	7.5	7.1	6.8	6.6	6.4
8 Guayas -Los Rios	Industry	35.1	38.3	40.9	43.0	45.4	46.0	46.0	46.1	46.3	46.7	47.2
	Residential	37.6	35.9	34.7	33.7	32.5	32.4	32.7	32.9	33.1	33.1	33.0
	Commercial	17.1	16.5	16.0	15.6	15.0	15.0	15.0	14.9	14.8	14.6	14.4
	Others	10.2	9.3	8.4	7.7	7.1	6.6	6.3	6.1	5.8	5.6	5.4

Table A - 1 - (12) Ratio of Energy Demand by Customers (3 - 3)

(Unit : %)

Sistema	Customers	(Estimated) 1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
9 El Oro	Industry	27.8	32.0	38.4	41.2	41.8	40.5	39.7	38.4	37.2	36.1	35.1
	Residential	36.3	34.5	31.6	30.7	31.0	32.2	33.3	34.9	36.5	38.0	39.2
	Commercial	27.9	25.7	22.8	21.3	20.6	20.6	20.4	20.2	19.9	19.6	19.5
	Others	8.0	7.8	7.2	6.8	6.6	6.7	6.6	6.5	6.4	6.3	6.2
Total	Industry	32.8	34.9	37.0	41.2	43.2	43.1	43.3	42.9	42.8	42.6	42.7
	Residential	39.6	38.6	37.6	35.4	34.4	34.7	34.9	35.4	35.7	36.1	36.3
	Commercial	16.8	16.5	16.1	15.1	14.8	14.9	14.9	15.1	15.1	15.1	15.1
	Others	10.8	10.0	9.3	8.3	7.6	7.3	6.9	6.6	6.4	6.2	5.9

Table A-1-(13) Number of Customers and Energy Demand per Customers (1-5)

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	Increase (%) 1974 1980	1980 1984	1974 1984
Sistema Norte														
Number of customers (10^3)	20.55	22.19	24.02	26.04	28.36	30.98	33.91	36.02	38.22	40.53	42.99	8.7	6.1	7.7
Residential														
Requirement per customers (kWh/customer)	417	440	465	492	522	551	581	616	653	693	735	5.7	6.1	5.8
Number of customers (10^3)	3.52	3.79	4.10	4.43	4.82	5.26	5.73	6.19	6.51	6.94	7.39	8.5	6.6	7.7
Commercial														
Requirement per customers (kWh/customer)	1,184	1,257	1,329	1,400	1,473	1,548	1,626	1,732	1,842	1,960	2,089	5.4	6.5	5.8
Population (10^3)	330	336	343	350	357	364	371	378	386	394	401	2.0	2.0	2.0
Others														
Requirement per capital (kWh/capital)	13.7	14.1	14.7	15.2	15.7	16.3	17.0	17.3	17.6	17.9	18.2	3.7	1.7	2.9
Sistema Pichincha														
Number of customers (10^3)	89.43	95.36	101.54	108.97	116.69	125.15	134.49	144.79	156.30	168.07	180.31	7.0	7.6	7.3
Residential														
Requirement per customers (kWh/customer)	1,572	1,630	1,689	1,748	1,807	1,868	1,931	1,993	2,050	2,115	2,186	3.5	3.2	3.4
Number of customers (10^3)	16.01	16.99	18.05	19.36	20.76	22.22	23.85	25.61	27.57	29.37	31.09	6.9	6.9	6.9
Commercial														
Requirement per customers (kWh/customer)	3,074	3,275	3,457	3,654	3,858	4,071	4,291	4,519	4,701	4,986	5,257	5.7	5.2	5.5
Population (10^3)	936	978	1,019	1,068	1,115	1,164	1,215	1,269	1,325	1,383	1,444	4.4	4.4	4.4
Others														
Requirement per capital (kWh/capital)	35.4	36.4	37.4	38.6	39.7	40.9	42.1	43.2	44.3	45.6	46.9	2.9	2.7	2.9

Table A-1-(13) Number of Customers and Energy Demand per Customers (2-5)

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	Increase (%)		
												1974-1980	1980-1984	1974-1984
Sistema Centro Norte														
Number of customers (10^3)	37.19	41.44	46.18	51.61	58.09	65.33	73.43	80.52	87.86	96.23	105.75	12.0	9.5	11.0
Residential														
Requirement per customers (kWh/customer)	651	688	732	769	802	833	863	894	927	961	993	4.8	3.6	4.3
Number of customers (10^3)	11.18	11.86	12.56	13.32	14.17	14.99	15.93	16.68	17.45	18.35	19.37	6.1	5.0	5.7
Commercial														
Requirement per customers (kWh/customer)	1,232	1,277	1,329	1,384	1,441	1,500	1,562	1,639	1,722	1,805	1,891	4.0	4.9	4.4
Population (10^3)	965	986	1,006	1,027	1,050	1,073	1,097	1,121	1,145	1,171	1,199	2.2	2.2	2.2
Others														
Requirement per capital (kWh/capital)	9.2	9.5	9.9	10.4	10.9	11.4	12.0	12.4	12.9	13.3	13.7	4.5	3.4	4.1
Sistema Centro Sur														
Number of customers (10^3)	20.30	22.77	25.79	29.52	34.11	39.89	47.11	50.76	54.62	59.01	63.98	15.1	8.0	12.2
Residential														
Requirement per customers (kWh/customer)	945	948	950	947	942	934	931	970	1,011	1,124	1,090	-0.2	4.0	1.4
Number of customers (10^3)	2.55	2.93	3.41	4.01	4.78	5.79	7.15	7.78	8.47	9.26	10.16	18.7	9.2	14.8
Commercial														
Requirement per customers (kWh/customer)	1,413	1,444	1,474	1,503	1,529	1,555	1,576	1,661	1,749	1,835	1,917	1.8	5.0	3.1
Population (10^3)	503	515	527	540	553	566	579	593	607	621	636	2.4	2.4	2.4
Others														
Requirement per capital (kWh/ capital)	6.8	7.3	7.9	8.6	9.4	10.7	12.3	12.7	13.1	13.5	13.9	10.4	3.1	7.4

Table A-1-(13) Number of Customers and Energy Demand per Customers (3-5)

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	Increase (%)		
												1974-1980	1980-1984	1974-1984
Sistem-Sur														
Number of customers (10^3)	7.98	8.56	9.39	10.56	12.11	14.10	16.86	20.71	25.50	30.10	34.67	13.3	20.0	15.8
Residential														
Requirement per customers (kWh/customer)	455	492	531	572	614	658	699	738	776	814	853	7.4	5.1	6.5
Number of customers (10^3)	2.28	2.40	2.57	2.80	3.08	3.42	3.89	4.57	5.39	6.08	6.68	9.3	14.5	11.3
Commercial														
Requirement per customers (kWh/customer)	1,252	1,322	1,395	1,470	1,552	1,627	1,696	1,761	1,824	1,908	2,007	5.2	4.3	4.8
Population (10^3)	378	387	396	406	416	426	436	446	457	468	479	2.4	2.4	2.4
Others														
Requirement per capital (kWh/capital)	8.4	8.5	8.7	8.9	9.1	9.4	9.7	10.1	10.5	11.0	11.4	2.4	4.1	3.1
Sistema Esmeraldas														
Number of customers (10^3)	5.23	5.97	6.87	8.01	9.50	11.47	14.16	17.76	21.82	25.96	30.24	18.1	20.9	19.2
Residential														
Requirement per customers (kWh/customer)	814	838	863	888	912	936	959	981	998	1,020	1,044	2.8	2.1	2.5
Number of customers (10^3)	1.16	1.36	1.61	1.91	2.30	2.79	3.44	4.23	5.16	6.06	6.89	19.9	19.0	19.5
Commercial														
Requirement per customers (kWh/customer)	1,837	1,854	1,876	1,916	1,952	2,005	2,061	2,133	2,190	2,264	2,354	1.9	3.4	2.5
Population (10^3)	204	212	221	230	240	250	261	272	283	294	305	4.2	4.0	4.1
Others														
Requirement per capital (kWh/capital)	7.1	8.1	8.8	9.7	10.5	11.4	12.3	13.1	13.8	14.6	15.5	9.6	6.0	8.1

Table A-1-(13) Number of Customers and Energy Demand per Customers (4-5)

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	Increase (%) 1974-1980	Increase (%) 1980-1984	Increase (%) 1974-1984
Manabi														
Number of customers (10^3)	17.96	20.61	24.13	28.01	32.67	37.54	42.32	47.57	52.49	57.45	62.55	15.4	10.3	13.3
Residential														
Requirement per customers (kWh/customer)	781	833	880	927	975	1,025	1,073	1,113	1,150	1,188	1,224	5.4	3.3	4.6
Number of customers (10^3)	5.72	6.13	6.79	7.52	8.44	9.33	10.14	11.18	12.11	12.93	13.72	10.0	7.9	9.1
Commercial														
Requirement per customers (kWh/customer)	1,236	1,335	1,429	1,507	1,589	1,682	1,782	1,850	1,927	2,015	2,108	6.3	4.3	5.5
Population (10^3)	745	759	774	789	804	819	835	851	867	884	901	1.9	1.9	1.9
Others														
Requirement per capital (kWh/capital)	6.2	6.6	7.2	7.8	8.3	8.8	9.4	9.9	10.4	10.9	11.5	7.2	5.2	6.4
Sistema Guayas-Los Rios														
Number of customer (10^3)	132.53	144.30	159.77	177.12	197.53	222.77	248.51	268.71	288.74	307.77	326.01	11.0	7.0	9.4
Residential														
Requirement per customers (kWh/customer)	1,446	1,489	1,519	1,540	1,556	1,561	1,580	1,620	1,666	1,724	1,793	1.5	3.2	2.2
Number of customers (10^3)	25.59	27.64	30.29	33.32	37.17	41.65	46.32	48.66	51.03	53.32	55.49	10.4	4.6	8.0
Commercial														
Requirement per customers (kWh/customer)	3,412	3,571	3,686	3,778	3,828	3,854	3,900	4,052	4,209	4,382	4,574	2.3	4.1	3.0
Population (10^3)	1,969	2,035	2,102	2,174	2,246	2,321	2,396	2,476	2,560	2,645	2,732	3.3	3.3	3.3
Others														
Requirement per capital (kWh/capital)	26.3	27.1	28.1	28.8	29.7	30.6	31.5	32.3	33.2	34.1	35.0	3.1	2.7	2.9

Table A-1-(13) Number of Customer and Energy Demand per Customers (5-5)

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	Increase (%)			
												1974 1980		1980 1984	1974 1984
Sistema El Oro															
Number of customers (10^3)	10.88	12.22	13.84	15.60	17.70	19.97	22.43	25.55	29.15	33.08	37.39	12.8		13.6	13.1
Residential															
Requirement per customers (kWh/customer)	605	631	658	687	718	748	778	812	846	880	913	4.3		4.1	4.2
Number of customers (10^3)	4.54	4.97	5.46	5.96	6.49	7.06	7.58	8.20	8.70	9.20	9.74	8.9		6.5	7.9
Commercial															
Requirement per customers (kWh/customer)	1,116	1,157	1,201	1,247	1,303	1,353	1,407	1,469	1,544	1,638	1,744	3.9		5.5	4.6
Population (10^3)	260	271	282	294	306	318	331	344	358	372	387	4.1		4.0	4.1
Others															
Requirement per capital (kWh/capital)	5.6	6.4	7.3	8.1	8.9	9.7	10.4	11.3	12.1	13.0	13.8	10.9		7.3	9.4
Total															
Number of customers (10^3)	342.05	373.42	411.53	455.44	506.76	567.20	633.22	692.39	754.70	818.20	883.89	10.8		8.7	10.0
Residential															
Requirement per customers (kWh/customer)	1,207	1,243	1,275	1,303	1,327	1,346	1,370	1,406	1,444	1,487	1,535	2.1		2.9	2.4
Number of customers (10^3)	72.55	78.07	84.84	92.63	102.01	112.51	124.03	133.01	142.39	151.51	160.53	9.3		6.7	8.3
Commercial															
Requirement per customers (kWh/customer)	2,415	2,538	2,641	2,740	2,827	2,906	2,990	3,109	3,224	3,368	3,515	3.6		4.1	3.8
Population (10^3)	6,289	6,479	6,670	6,878	7,087	7,301	7,521	7,750	7,988	8,232	8,484	3.0		3.1	3.0
Others															
Requirement per capital (kWh/capital)	17.9	18.6	19.4	20.2	21.0	21.9	22.8	23.6	24.4	25.3	26.1	4.1		3.4	3.8

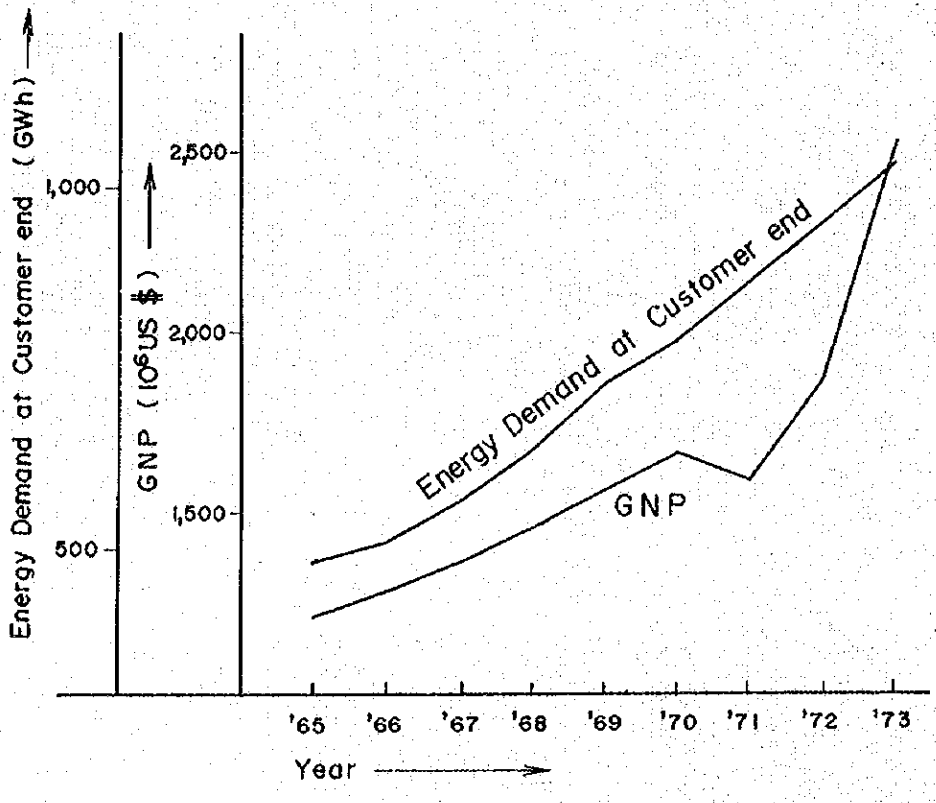
A-1-1 Trial Calculations by Macroscopic Method

Cross Check of Load Forecast by Macro Method Since the growthrate of GNP and that of electric power demand are mutually related, the cross check of forecast for power demand are performed employing the elastic coefficient of power demand to GNP.

(1) Elastic Coefficient of Electric Power Demand to GNP

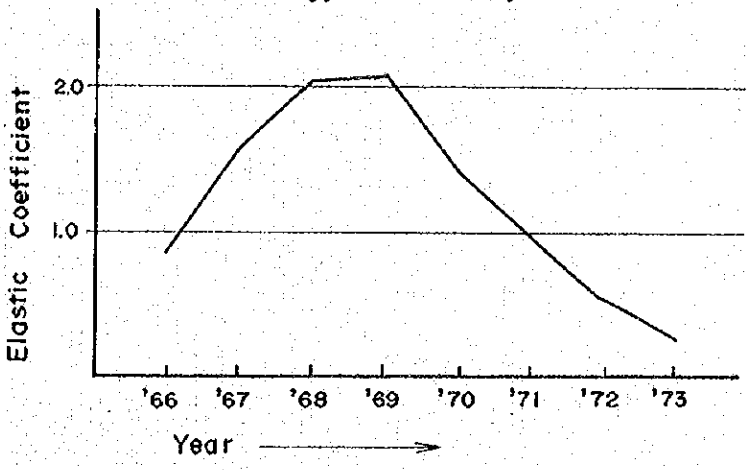
GNP and electlic power demand recorded from 1965 through 1973 are as shown in Fig. A-1-1-(1)

Fig. A-1-(1) Historical Trend of GNP and Energy Demand at Customer end



The elastic coefficient by year are shown in Fig. A-1-1-(2)

Fig. A-1-(2) Elastic Coefficient between GNP and Energy Demand by Year



The transitions in elastic coefficient due to moving of periods are as indicated in Table A-1-1-(1)

Table A-1-1-(1) Elastic Coefficient between GNP and Energy Demand by Various Period

to ↓ \ from →	'65	'66	'67	'68	'69	'70	'71	'72	'73
'65									
'66	0.84								
'67	1.21	1.57							
'68	1.50	1.81	2.04						
'69	1.63	1.92	2.07	2.09					
'70	1.58	1.78	1.86	1.73	1.39				
'71	2.17	2.59	3.08	3.79	8.64	—			
'72	1.58	1.71	1.75	1.66	1.53	1.56	0.53		
'73	1.05	1.07	1.01	0.89	0.73	0.62	0.35	0.25	

According to the above, in spite of the fact that GNP had fallen in 1971 (-4.2 %), the power demand had increased by 9.8%.

On the other hand, in 1972 and 1973, despite prominent increases in GNP (nominal growth rates 17.4% and 35% respectively) accompanying starting and expansion of pertroleum production, power demand showed a stable growth (9.3% for 1972, 8.9% for 1973). In effect it may be said that power demand is slightly inflexible against a large variation in GNP.

This requires an examination in depth of the flow of GNP, but in case of electric power demand.

① Especially, in case of the regional electrification program which is more a part of building of the infrastructure and a project for implementation from the aspect of policy rather than an economic investment, it is considered that power demand will have a slight inflexibility against large variation in GNP.

② The proportion in GNP occupied by the equipment investment (1972, 364 US million dollars, 19% of GNP, 1973, 416 US million dollars, 16% of GNP), and the capital goods and durable consumer goods in industrial production (1972, 459 US million dollars; 1973, 714 US million dollars) are extremely low in comparison with that of developed countries almost all of the capital goods and durable consumer goods must depend on imports, and it is considered that there will be a fair amount of time-lag for power demand to be actualized after economic incentive by investment. Therefore, the downturn in the elestic coefficient seen in Table A-1-1-(1) cannot be thought to be a real trend and it is assumed that in time there will be a shift to an upward course.

(2) Outlook on Elastic Coefficient

As described above, the elastic coefficients for the years 1971 through 1973 involve peculiar factors, and it is thought it would not necessarily be suitable for elastic coefficients to be used in units of years.

The regional electrification program may be considered as a main factor governing future elastic coefficients, and the electrification program, as frequently stated, is a project to spread electric power, and especially, at the primary stage up to around 1980, it is expected that the speed of growth in electric power will be high compared with the real speed of growth of the economy. At the secondary stage from 1981 and after, the speed of growth due to regional electrification is expected to shift to a relatively declining trend compared with the primary stage.

Therefore, of the elastic coefficients which should be used for the present cross check, from 1975 until 1980, the elastic coefficient of 1.58 for 1965 to 1970 seen in the elastic coefficient table will be employed, while for 1981 to 1984, the elastic coefficient of 1.05 in the same table for 1965 to 1973 will be employed.

(3) Forecast of Economic Growth

According to the "Five-Year Comprehensive Development Plan (1973-1977)" announced in 1972, a real economic growth rate of 10% is forecast for the futrue economic outlook. On the other hand, according to recent performance, the real growth rate was 10.4% in 1972, 12.0% in 1973 and 13.0% (estimated) in 1973.

The constitution of the Ecuadorian economy is dependent on the trends in petroleum, and when the recent world trend of relaxation in petroleum demand is taken into consideration, it may be said there is a considerable amount of fluid factors contained in economic growth for the future. On the other hand, when consideration is given from a comprehensive standpoint to the basic tone of surplus in the overall balance of income and expenditure since production of petroleum was started and the economic policies carried out by the authorities, it is thought the growth rate of the economy hereafter can be expected to be at least 10%.

(4) Trial Calculation Results by Macro Method

The results of calculations made based on the conditions assumed above are as indicated in Table A-1-1-(2).

Year	Energy demand at customer end (MWh)
1974	1,041,488
1975	1,206,043
1976	1,396,598
1977	1,617,260
1978	1,872,787
1979	2,168,688
1980	2,511,340
1981	2,775,031
1982	3,066,409
1983	3,388,382
1984	3,744,162

(5) Comparison between Results of Forecast by Analytical Method and Macro Method

The comparison between the forecast described in Chapter 4 and the trial calculation results of (4) above is as shown in Table A-1-1-(3).

Table A-1-1-(3) Comparison of Results between Analitical Method and Macro Method

Year	Energy Demand at Customer end		Deviation
	Analitical Method (A)	Macro Method (B)	$\frac{B-A}{A} \times 100$ (%)
1974	1,041,488	1,041,488	—
1975	1,202,203	1,206,043	0.3
1976	1,393,865	1,396,598	0.2
1977	1,677,620	1,617,260	3.6
1978	1,952,242	1,872,787	4.1
1979	2,197,336	2,168,688	1.3
1980	2,487,802	2,511,340	0.9
1981	2,751,876	2,775,031	0.8
1983	3,373,564	3,388,382	0.4
1984	3,738,602	3,744,162	0.1

Note: 1. Elastic Value between GNP and Energy Demand at Customer end
1975 – 1980 ; 1.58
1981 – 1984 ; 1.05
2. Annual growth rate of GNP ; 10 %

As seen in Table A-1-1-(3), there is no great difference between the results of forecasts in Chapter 4 and the trial calculations by macro method.

APPENDIX

A - 2 Supply Capability from 1975 to 1984 and Supply Capability of Existing Power Plants at the End of 1974

Table A-2

Table A - 2 - (1) Installed Capacity by Year (1975 to 1984) (1 - 3)

(Unit : kW)

Sistema	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
(1) Norte											
Hydro											
Reg.	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000
P-O-P	4,354	4,345	4,345	4,345	(- 3,034) 1,320	1,320	1,320	1,320	1,320	1,320	1,320
Sub-total	12,354	12,354	12,354	12,354	9,320	9,320	9,320	9,320	9,320	9,320	9,320
Thermal											
Diesel	1,409	1,409	1,409	(2,500) 3,909	3,909	3,909	3,909	3,909	3,909	3,909	3,909
Gas	0	0	0	0	0	0	0	0	0	0	0
Steam	0	0	0	0	0	0	0	0	0	0	0
Sub-total	1,409	1,409	1,409	3,909	3,909	3,909	3,909	3,909	3,909	3,909	3,909
Total	13,763	13,763	13,763	16,263	13,229	13,229	13,229	13,229	13,229	13,229	13,229
(2) Pichincha											
Hydro											
Reg.	79,400	79,400	79,400	79,400	79,400	79,400	79,400	79,400	79,400	79,400	79,400
R-O-R	3,760	(4,500) 8,260	8,260	8,260	8,260	8,260	8,260	8,260	8,260	8,260	8,260
Sub-total	83,160	87,660	87,660	87,660	87,660	87,660	87,660	87,660	87,660	87,660	87,660
Thermal											
Diesel	35,630	(8,720) 44,350	1/ (-8,720+3,855) 39,485	3/ (-2,180+8,720) 46,025	46,025	(+2,180) 48,205	48,205	48,205	48,205	48,205	48,205
Gas	0	(24,100) 24,100	24,100	24,100	24,100	24,100	24,100	24,100	24,100	24,100	24,100
Steam	0	0	0	0	0	0	0	0	0	0	0
Sub-total	35,630	68,450	63,585	70,125	70,125	72,305	72,305	72,305	72,305	72,305	72,305
Total	118,790	156,110	151,245	157,785	157,785	159,965	159,965	159,965	159,965	159,965	159,965
(3) Centro-Norte											
Hydro											
Reg.	0	0	0	0	0	0	0	0	0	0	0
R-O-R	15,516	15,516	15,516	(2,600) 18,116	18,116	18,116	18,116	18,116	18,116	18,116	18,116
Sub-total	15,516	15,516	15,516	18,116	18,116	18,116	18,116	18,116	18,116	18,116	18,116
Thermal											
Diesel	8,989	(7,000) 15,989	2/ (8,720+1,500) 26,209	(-8,720+2,500) 19,989	19,989	19,989	19,989	19,989	19,989	19,989	19,989
Sub-total	8,989	15,989	26,209	19,989	19,989	19,989	19,989	19,989	19,989	19,989	19,989
Total	24,505	31,505	41,725	38,105	38,105	38,105	38,105	38,105	38,105	38,105	38,105
(4) Centro-Sur											
Hydro											
Reg.	0	0	0	(8,000) 8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000
P-O-P	6,432	6,432	6,432	6,432	6,432	6,432	6,432	6,432	6,432	6,432	6,432
Sub-total	6,432	6,432	6,432	14,432	14,432	14,432	14,432	14,432	14,432	14,432	14,432
Thermal											
Diesel	10,820	(2,280) 13,100	(8,520) 21,620	21,620	21,620	21,620	21,620	21,620	21,620	21,620	21,620
Sub-total	10,820	13,100	21,620	21,620	21,620	21,620	21,620	21,620	21,620	21,620	21,620
Total	17,252	19,532	28,052	36,052	36,052	36,052	36,052	36,052	36,052	36,052	36,052

Table A - 2 - (1) Installed Capacity by Year (1975 to 1984) (2 - 3)

(Unit : kW)

Sistema	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
(5) Sur											
Hydro											
R-O-R	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
Sub-total	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
Thermal											
Diesel	2,406	(1,280) 3,686	(2,500) 6,186	6,186	6,186	*(5,000) 11,186	11,186	11,186	11,186	11,186	11,186
Sub-total	2,406	3,686	6,186	6,186	6,186	11,186	11,186	11,186	11,186	11,186	11,186
Total	4,806	6,086	8,586	8,586	8,586	13,586	13,586	13,586	13,586	13,586	13,586
(6) Esmeraldas											
Thermal											
Diesel	4,860	(5,460) 10,320	(6,000) 16,320	16,320	16,320	16,320	16,320	16,320	16,320	16,320	16,320
Total	4,860	10,320	16,320	16,320	16,320	16,320	16,320	16,320	16,320	16,320	16,320
(7) Manabi											
Thermal											
Diesel	20,600	20,600	20,600	20,600	20,600	20,600	20,600	20,600	20,600	20,600	20,600
Gas	0	0	0	(10,000) 10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Total	20,600	20,600	20,600	30,600	30,600	30,600	30,600	30,600	30,600	30,600	30,600
(8) Guayas-Los Rios											
Thermal											
(Guayaquil)											
Diesel	7,640	7,640	7,640	7,640	7,640	7,640	7,640	7,640	7,640	7,640	7,640
Gas	55,500	(21,500) 77,000	(21,500) 98,500	*(21,500) 120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000
Steam	63,000	63,000	63,000	63,000	63,000	63,000	63,000	63,000	63,000	63,000	63,000
Sub-total	126,140	147,640	169,140	190,640	190,640	190,640	190,640	190,640	190,640	190,640	190,640
Thermal (Others)											
Diesel	16,886	(6,480) 23,366	(18,160) 41,526	4/ (+2,180+1,000) 44,706	44,706	(- 2,180) 42,526	42,526	42,526	42,526	42,526	42,526
Sub-total	16,886	23,366	41,526	44,706	44,706	42,526	42,526	42,526	42,526	42,526	42,526
Total	143,026	171,006	210,666	235,346	235,346	233,166	233,166	233,166	233,166	233,166	233,166

Table A - 2 - (1) Installed Capacity by Year (1975 to 1984) (3 - 3)

(Unit : kW)

Sistema	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
(9) El Oro											
Hydro											
R-O-R	2,234	2,234	2,234	2,234	2,234	2,234	2,234	2,234	2,234	2,234	2,234
Sub-total	2,234	2,234	2,234	2,234	2,234	2,234	2,234	2,234	2,234	2,234	2,234
Thermal											
Diesel	6,432	(5,660) 12,092	12,092	(6,000) 18,092	18,092	18,092	18,092	18,092	18,092	18,092	18,092
Sub-total	6,432	12,092	12,092	18,092	18,092	18,092	18,092	18,092	18,092	18,092	18,092
Total	8,666	14,326	14,326	20,326	20,326	20,326	20,326	20,326	20,326	20,326	20,326
Total											
Hydro											
Reg.	87,400	87,400	87,400	95,400	95,400	95,400	95,400	95,400	95,400	95,400	95,400
R-O-R	34,696	39,196	39,196	41,796	38,762	38,762	38,762	38,762	38,762	38,762	38,762
Total	122,096	126,596	126,596	137,196	134,162	134,162	134,162	134,162	134,162	134,162	134,162
Thermal											
Diesel	115,672	152,552	193,087	205,087	205,087	210,087	210,087	210,087	210,087	210,087	210,087
Gas	55,500	101,100	122,600	154,100	154,100	154,100	154,100	154,100	154,100	154,100	154,100
Steam	63,000	63,000	63,000	63,000	63,000	63,000	63,000	63,000	63,000	63,000	63,000
Total	234,172	316,652	378,687	422,187	422,187	427,187	427,187	427,187	427,187	427,187	427,187
Grand-Total	356,268	443,248	505,283	559,383	556,349	561,349	561,349	561,349	561,349	561,349	561,349
INECEL											
Hydro											
Reg.	0	0	0	0	69,200	69,200	69,200	(200,000) 269,200	(100,000) 369,200	(100,000) 469,200	(100,000) 569,200
Sub-total	0	0	0	0	69,200	69,200	69,200	269,200	369,200	469,200	569,200
Thermal											
Diesel	0	0	0	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
Steam	0	0	0	0	73,000	(73,000) 146,000	146,000	146,000	146,000	146,000	146,000
Sub-total	0	0	0	30,000	103,000	176,000	176,000	176,000	176,000	176,000	176,000
Total				30,000	172,200	245,200	245,200	445,200	545,200	645,200	745,200

1/ Transfer to Latacunga 2,810
" " Ambato 2,810
" " Riobamba 2,810 x 2
} 8,720 kW

2/ Received from Quito

3/ Transfer to Santa Elena

4/ Received from Quito

* Additional Facilities
Guayaquil 21,500 kW
Sur (Cuenca) 5,000 kW

Note: Reg : Pondage type power plant
R-O-R : Natural inflow type power plant

Table A - 2 - (2) Dependable Power Supply Capability in National Interconnected System (1 - 3)

(Unit : MW)

Sistema		Installed Capacity	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
A. Regional System		kW)											
(1) Norte		-	11.20	-	-	13.62	10.93	10.93	10.93	10.93	10.93	10.93	10.93
Existing power plants	H	9,320	7.14	-	-	7.14	7.14	7.14	7.14	7.14	7.14	7.14	7.14
"	"	3,034	2.69	-	-	2.69	-	-	-	-	-	-	-
"	T	1,409	1.37	-	-	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
New power plant (Ibarra)	"	2,500	-	-	-	2.24	2.24	2.24	2.24	2.24	2.24	2.24	2.24
(2) Pichincha		-	116.77	-	-	145.76	153.53	155.64	155.64	155.64	155.64	155.64	155.64
Quito		-	112.74	-	-	145.76	145.76	147.87	147.87	147.87	147.87	147.87	147.87
Existing power plants	H	83,160	82.20	-	-	82.20	82.20	82.20	82.20	82.20	82.20	82.20	82.20
"	T	31,475	30.54	-	-	28.43	28.43	30.54	30.54	30.54	30.54	30.54	30.54
New power plant (Pasochoa)	H	4,500	-	-	-	3.29	3.29	3.29	3.20	3.29	3.29	3.29	3.29
" (Lulumcoto)	T	8,720	-	-	-	8.46	8.46	8.46	8.46	8.46	8.46	8.46	8.46
" (Guangopolo)	"	24,100	-	-	-	23.38	23.38	23.38	23.38	23.38	23.38	23.38	23.38
Sto. Domingo		-	4.03	-	-	-	7.77	7.77	7.77	7.77	7.77	7.77	7.77
Existing power plants	T	4,155	4.03	-	-	-	4.03	4.03	4.03	4.03	4.03	4.03	4.03
New power plant (Sto. Domingo)	"	1,575	-	-	-	-	1.53	1.53	1.53	1.53	1.53	1.53	1.53
" (")	"	2,280	-	-	-	-	2.21	2.21	2.21	2.21	2.21	2.21	2.21
(3) Centro-Norte		-	20.94	-	-	31.48	32.40	32.40	32.40	32.40	32.40	32.40	32.40
Latacunga & 3 Other Cities		-	20.51	-	-	31.48	31.48	31.48	31.48	31.48	31.48	31.48	31.48
Existing power plants	H	15,416	12.13		-	12.13	12.13	12.13	12.13	12.13	12.13	12.13	12.13
"	T	8,633	8.38	-	-	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38
New power plant (Latacunga)	"	1,000	-	-	-	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
" (")	"	2,500	-	-	-	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42
" (Ambato)	"	6,000	-	-	-	5.82	5.82	5.82	5.82	5.82	5.82	5.82	5.82
" (Riobamba)	"	2,600	-	-	-	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
" (Guaranda)	"	1,000	-	-	-	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Puyo		-	0.43	-	-	-	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Existing power plant	H	100	0.08	-	-	-	0.08	0.08	0.08	0.08	0.08	0.08	0.08
"	T	356	0.35	-	-	-	0.35	0.35	0.35	0.35	0.35	0.35	0.35
New power plant (Puyo)	"	500	-	-	-	-	0.49	0.49	0.49	0.49	0.49	0.49	0.49
(4) Centro-Sur		-	15.41	-	-	-	-	-	33.88	33.88	33.88	33.88	33.88
Existing power plants	H	6,432	4.91	-	-	-	-	-	4.91	4.91	4.91	4.91	4.91
"	T	10,820	10.50	-	-	-	-	-	10.50	10.50	10.50	10.50	10.50
New power plant (Cuenca)	H	8,000	-	-	-	-	-	-	8.00	8.00	8.00	8.00	8.00
" (")	T	2,280	-	-	-	-	-	-	2.21	2.21	2.21	2.21	2.21
" (")	"	8,520	-	-	-	-	-	-	8.26	8.26	8.26	8.26	8.26

Note : H ; Hydro power plant
T ; Thermal power plant

Table A - 2 - (2) Dependable Power Supply Capability in National Interconnected System (2 - 3)

(Unit : kW)

Sistema		Installed Capacity	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
(5) Sur		kW	4.72	–	–	–	–	–	–	13.24	13.24	13.24	13.24
Existing power plant	H	2,400	2.39	–	–	–	–	–	–	2.39	2.39	2.39	2.39
"	T	2,406	2.33	–	–	–	–	–	–	2.33	2.33	2.33	2.33
New power plant (Loja)	"	1,280	–	–	–	–	–	–	–	1.24	1.24	1.24	1.24
" (")	"	5,000	–	–	–	–	–	–	–	4.85	4.85	4.85	4.85
" (Catamayo)	"	2,500	–	–	–	–	–	–	–	2.43	2.43	2.43	2.43
(6) Esmeraldas		–	4.71	–	–	–	–			15.83	15.83	15.83	15.83
Existing power plants	T	4,860	4.71	–	–	–	–	–	–	4.71	4.71	4.71	4.71
New power plant (Esmeraldas)	"	5,460	–	–			–	–	–	5.30	5.30	5.30	5.30
" (")	"	6,000	–	–	–	–	–	–	–	5.82	5.82	5.82	5.82
(7) Manabi		–	19.98	–	–	–	–	29.68	29.68	29.68	29.68	29.68	29.68
Existing power plants	T	20,600	19.98	–		–	–	19.98	19.98	19.98	19.98	19.98	19.98
New power plant (Manta)	"	10,000	–	–	–		–	9.70	9.70	9.70	9.70	9.70	9.70
(8) Guayas-Los Rios		–	138.74	–	–	–	215.60	226.20	226.20	226.20	226.20	226.20	226.20
Guayaquil & 4 Other Cities		–	133.65	–		–	215.60	215.60	215.60	215.60	215.60	215.60	215.60
Existing power plant	T	137,786	133.65	–		–	133.65	133.65	133.65	133.65	133.65	133.65	133.65
New power plant (Guayaquil)	"	21,500	–	–	–	–	20.86	20.86	20.86	20.86	20.86	20.86	20.86
" (")	"	21,500	–	–	–	–	20.86	20.86	20.86	20.86	20.86	20.86	20.86
" (")	"	21,500	–	–	–	–	20.86	20.86	20.86	20.86	20.86	20.86	20.86
" (Babahoyo)	"	12,500	–	–	–	–	12.13	12.13	12.13	12.13	12.13	12.13	12.13
" (Quevedo)	"	800	–	–	–	–	0.78	0.78	0.78	0.78	0.78	0.78	0.78
" (")	"	5,660	–	–	–	–	5.49	5.49	5.49	5.49	5.49	5.49	5.49
" (Vince)	"	1,000	–	–	–	–	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Santa Elena		–	5.09	–	–	–	–	10.60	10.60	10.60	10.60	10.60	10.60
Existing power plants	T	5,240	5.09	–	–	–	–	5.09	5.09	5.09	5.09	5.09	5.09
New power plant (Salinas)	"	5,680	–	–	–	–	–	5.51	5.51	5.51	5.51	5.51	5.51
(9) El Oro		–	7.05	–	–	–	–	–	–	18.36	18.36	18.36	18.36
Existing power plants	H	2,234	0.81	–	–	–	–	–	–	0.81	0.81	0.81	0.81
"	T	6,432	6.24	–	–	–	–	–	–	6.24	6.24	6.24	6.24
New power plant (Machala)	"	5,660	–	–	–	–	–	–	–	5.49	5.49	5.49	5.49
" (")	"	6,000	–	–	–	–	–	–	–	5.82	5.82	5.82	5.82
Total (1) - (9) Systems		–	339.52	–	–	190.86	412.46	454.85	488.73	536.16	536.16	536.16	536.16
Hydro		–	112.35	–	–	108.24	105.63	105.63	118.54	121.74	121.74	121.74	121.74
Thermal		–	227.17	–	–	82.62	306.83	349.22	370.19	414.42	414.42	414.42	414.42

Note ; H ; Hydro power plant
T ; Thermal power plant

Table A - 2 - (2) Dependable Power Supply Capability in National Interconnected System (3 - 3)

(Unit : MW)

Sistema		Installed Capacity	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
B. National System Projects		kW	–	–	–	–	–	–	–	–	–	–	–
New power plants			–	–	–	29.10	167.89	237.48	237.48	437.48	537.48	637.48	737.48
Quito Norte	T	30,000	–	–	–	29.10	29.10	29.10	29.10	29.10	29.10	29.10	29.10
Guayaquil	"	73,000	–	–	–	–	69.59	69.59	69.59	69.59	69.59	69.59	69.59
"	"	73,000	–	–	–	–		69.59	69.59	69.59	69.59	69.59	69.59
Pisayambo	H	69,200	–	–	–	–	69.20	69.20	69.20	69.20	69.20	69.20	69.20
Paute I - (1)	"	200,000	–	–	–	–	–	–	–	200.00	200.00	200.00	200.00
" (2)	"	100,000	–	–	–	–	–	–	–	–	100.00	100.00	100.00
" (3)	"	100,000	–	–	–	–	–	–	–	–	–	100.00	100.00
" (4)	"	100,000	–	–	–	–	–	–	–	–	–	–	100.00
G - Total (A + B)			–	–	–	219,96	580.35	692.33	726,21	973.64	1,073.64	1,173.64	1,273.64
Hydro			–	–	–	108.24	174.83	174.83	187.74	390.94	490.94	490.94	490.94
Thermal			–	–	–	111.72	405.52	517.50	538.47	582.70	582.70	682.70	782.70

Note ; H ; Hydro power plant
T ; Thermal power plant

Table A - 2 - (3) Summary of Dependable Power Supply Capability in National Interconnected System (1 - 2)

(Unit : GWh)

Sistema	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
A. Regional System											
(1) Norte	76.50	–	–	97.74	76.63	76.63	76.63	76.63	76.63	76.63	76.63
Hydro	64.52	–	–	64.52	43.41	43.41	43.41	43.41	43.41	43.41	43.41
Thermal	11.98	–	–	33.22	33.22	33.22	33.22	33.22	33.22	33.22	33.22
(2) Pichincha	648.84	–	–	903.19	971.25	989.73	989.73	989.73	989.73	989.73	989.73
Quito	613.53	–	–	903.19	903.19	921.67	921.67	921.67	921.67	921.67	921.67
Hydro	346.05	–	–	375.34	375.34	375.34	375.34	375.34	375.34	375.34	375.34
Thermal	267.48	–	–	527.85	527.85	546.33	546.33	546.33	546.33	546.33	546.33
Sto. Domingo	35.31	–	–	–	68.06	68.06	68.06	68.06	68.06	68.06	68.06
Thermal	35.31	–	–	–	68.06	68.06	68.06	68.06	68.06	68.06	68.06
(3) Centro-Norte	188.82	–	–	278.31	288.00	288.00	288.00	288.00	288.00	288.00	288.00
Latacunga & Others	185.06	–	–	278.31	280.02	280.02	280.02	280.02	280.02	280.02	280.02
Hydro	111.66	–	–	115.73	117.44	117.44	117.44	117.44	117.44	117.44	117.44
Thermal	73.40	–	–	162.58	162.58	162.58	162.58	162.58	162.58	162.58	162.58
Puyo	3.76	–	–	–	7.98	7.98	7.98	7.98	7.98	7.98	7.98
Hydro	0.71	–	–	–	0.71	0.71	0.71	0.71	0.71	0.71	0.71
Thermal	3.05	–	–	–	7.27	7.27	7.27	7.27	7.27	7.27	7.27
(4) Centro-Sur	143.87	–	–	–	–	–	281.13	281.13	281.13	281.13	281.13
Hydro	51.95	–	–	–		–	97.42	97.42	97.42	97.42	97.42
Thermal	91.92	–	–	–	–	–	183.71	183.71	183.71	183.71	183.71
(5) Sur	39.96	–	–	–	–	–	–	114.54	114.54	114.54	114.54
Hydro	19.49	–	–	–	–	–	–	19.49	19.49	19.49	19.49
Thermal	20.47	–	–	–	–	–	–	95.05	95.05	95.05	95.05
(6) Esmeraldas	41.26	–	–	–	–	–	–	138.67	138.67	138.67	138.67
Thermal	41.26	–	–	–	–	–	–	138.67	138.67	138.67	138.67
(7) Manabi	175.08	–	–	–	–	260.01	260.01	260.01	260.01	260.01	260.01
Thermal	175.08	–	–	–	–	260.01	260.01	260.01	260.01	260.01	260.01

Table A - 2 - (3) Summary of Dependable Power Supply Capability in National Interconnected System (2 - 2)

(Unit : GWh)

Sistema	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
(8) Guayas-Los Rios	1,215.33	–	–	–	1,888.47	1,981.27	1,981.27	1,981.27	1,981.27	1,981.27	1,981.27
Guayaquil & Others Thermal	1,170.71	–	–	–	1,888.47	1,888.47	1,888.47	1,888.47	1,888.47	1,888.47	1,888.47
Santa-Elena Thermal	44.52	–	–			92.80	92.80	92.80	92.80	92.80	92.80
(9) El Oro	71.03	–	–	–	–	–	–	170.13	170.13	170.13	170.13
Hydro	16.40	–	–	–	–	–	–	16.40	16.40	16.40	16.40
Thermal	54.63	–	–	–	–	–	–	153.73	153.73	153.73	153.73
Regional System Total	2,600.59		–	1,279.24	3,224.35	3,612.74	3,893.87	4,300.11	4,300.11	4,300.11	4,300.11
Hydro	610.78	–	–	555.59	536.90	554.00	651.42	670.21	670.21	670.21	670.21
Thermal	1,989.81	–	–	723.65	2,687.45	3,058.74	3,242.45	3,629.90	3,629.90	3,629.90	3,629.90
B. National System Projects	0	–	–	254.92	1,076.51	1,686.10	1,686.10	3,438.10	3,804.10	4,170.10	4,536.10
Hydro	0	–	–		212.00	212.00	212.00	1,964.00	2,330.00	2,696.00	3,062.00
Thermal	0	–	–	254.92	864.51	1,474.10	1,474.10	1,474.10	1,474.10	1,474.10	1,474.10
G - Total		–	–	1,534.16	4,300.86	5,298.84	5,579.97	7,738.21	7,738.21	8,470.21	8,836.21
Hydro		–	–	555.59	748.90	766.00	863.42	2,634.21	3,000.21	3,366.21	3,732.21
Thermal		–	–	978,57	3,551.96	4,532.84	4,716.55	5,104.00	5,104.00	5,104.00	5,104.10

Table A - 2 - (4) Existing Power Plants in Sistema Norte

(Unit : kW)

Power Plants	Hydro	Thermal	Year of Operation	Location
La Playa	1,320	—	1956, 1960	Tulcan
El Ambi	8,000	—	1967	Ibarra
Montufar	300	—	1955	San Gabriel
El Angel	472	—	1955, 1969	Espejo
Hoja Blanca	600	—	1933, 1950	Ibarra
San Luis	822	—	1950, 1956	Otavalo
Quiroga y Imantag	440	—	1953, 1962	Cotacachi
Ontañon	400	—		Ontañon
Tulcan	—	775	1973	Tulcan
El Sagrario	—	634	1961	Ibarra
Total	12,354	1,409		
	13,763			

Table A - 2 - (5) Existing Power Plants in Sistema Pichincha

(Unit : kW)

Power Plants	Hydro	Thermal	Year of Operation	Location
(Sistema Quito)				
Los Chillos	1,760	—	1922,	Quito
La Calera	2,000	—		Machachi
Guangopolo	9,400	—	1935, 1944 1953	Quito
Cumbaya	40,000	—	1959, 1964	"
Nayon	30,000	—	1974	"
Calorina	—	11,500	1956 - 1972	"
Luluncoto	—	19,975	1971, 1973	"
	83,160	31,475		
Sub total	114,635			
(Sistema Sto, Domingo)				
Sto, Domingo	0	4,155		Sto, Domingo
	0	4,155		
Sub total	4,155			
	83,160	35,630		
Total	118,790			

Table A - 2 - (6) Existing Power Plants in Sistema Centro Norte

(Unit : kW)

Power Plants	Hydro	Thermal	Year of Operation	Location
(Sistema Latacunga)				
Illuchi (I), (II)	4,200	—	1951, 1954 1967	Latacunga
Latacunga	—	813	1970, 1974	"
Salcedo	—	325	1974	Salcedo
Sub total	4,200	1,138		
	5,338			
(Sistema Ambato)				
La Peninsula	3,000	—	1961	Ambato
Mira-Flores	1,128	—	1957	"
El Batan	—	3,000	1967	"
Sub total	4,128	3,000		
	7,128			
(Sistema Riobamba)				
Alao (I)	5,300	—	1954	Riobamba
San Luis	—	3,360	1973	"
Guadalupe	458	—	1911, 1928	Guadalupe
Cordovez	680	—	1925, 1952	Cordovez
Guamote	—	360		Guamote
Sub total	6,438	3,720		
	10,158			
(Sistema Guaranda)				
Chimbo	650	—	1965	Guaranda
Chillanes	—	775	1972	"
Sub total	650	775		
	1,425			
(Sistema Puyo)				
Puyo	100		1965	Puyo
Puyo		356	1972	"
Sub total	100	356		
	456			
Total	15,516	8,989		
	24,505			

Table A - 2 - (7) Existing Power Plants in Sistema Centro Sur

(Unit : kW)

Power Plants	Hydro	Thermal	Year of Operation	Location
Saimilin	6,432		1957, 1964	Cuenca
Monay I		4,500	1970	"
Erco		3,054	1963, 1964 1966, 1967	"
Guapan		2,500	1963, 1965	"
Azogues		766	1973	Azogues
Total	6,432	10,820		
	17,252			

Table A - 2 - (8) Existing Power Plants in Sistema Sur

(Unit : kW)

Power Plants	Hydro	Thermal	Year of Operation	Location
San Francisco	2,400		1957, 1961 1968	Loja
Loja		1,266	1969, 1974	"
Catamayo		1,140	1974	Catamayo
Total	2,400	2,406		
	4,806			

Table A - 2 - (9) Existing Power Plants in Sistema Esmeraldas

(Unit : kW)

Power Plants	Hydro	Thermal	Year of Operation	Location
(System Esmeraldas)				
Santas Bainas		4,020	1964, 1965 1968, 1971	Esmeraldas
Quininde		190	1971, 1974	Quininde
Limones		285	1971, 1974	Limones
San Lorenzo		240	1967, 1973	San Lorenzo
Muisne		125	1972	Muisne
Total	0	4,860		
	4,860			

Table A - 2 - (10) Existing Power Plants in Sistema Manabi

(Unit : kW)

Power Plants	Hydro	Thermal	Year of Operation	Location
Manta		20,600	1972, 1973	Manta
Total	0	20,600		
	20,600			

Table A - 2 - (11) Existing Power Plants in Sistema Guayas-Los Rios

(Unit : kW)

Power Plants	Hydro	Thermal	Year of Operation	Location
(Sistema Guayaquil)				
EMELEC		33,000	1970	
"		20,000	1958, 1962	
"		10,000	1954, 1957	
"		3,050	1946, 1952	
"		42,000	1973, 1974	
"		13,500	1968	
(Sistema Duran)		4,590	1965, 1973	Duran
(Sistema Salinas)		4,740	1967, 1972	Salinas
(Sistema Playas)		500	1969	Playas
(Sistema Milagro)		6,640	1972, 1974	Milagro
(Sistema Babahoyo)		2,240	1974	Babahoyo
(Sistema Quevedo)		2,766	1967, 1968 1973	Quevedo
Total	0	143,026		
	143,026			

Table A - 2 - (12) Existing Power Plants in Sistema El Oro

(Unit : kW)

Power Plants	Hydro	Thermal	Year of Operation	Location
Machala-Diesel		6,432	1971	Machala
La Calera	1,266		1937	Zaruma
Amalilla	672		1929	Zaruma
La Cueva	296			Pinas
Total	2,234	6,432		
	8,666			

Table A-2-(13) Summary of Dependable Supply Capability of Existing Power Plants (1 - 4)

Unit : GWh (MW)

Sistema		Installed Capacity (kW)	1	2	3	4	5	6	7	8	9	10	11	12	Total
(1) Norte															
	H	12,354	4.68 (6.29)	3.57 (5.32)	3.82 (5.14)	4.83 (6.70)	5.91 (7.94)	7.17 (9.97)	5.58 (7.50)	4.61 (6.20)	4.32 (6.01)	5.47 (7.36)	7.22 (10.02)	7.34 (9.86)	64.52 (7.37)
	T	1,409	1.02 (1.37)	0.92 (1.37)	1.02 (1.37)	0.98 (1.37)	1.02 (1.37)	0.98 (1.37)	1.02 (1.37)	1.02 (1.37)	0.98 (1.37)	1.02 (1.37)	0.98 (1.37)	1.02 (1.37)	11.98 (1.37)
Total		13,763	5.70 (7.76)	4.49 (6.69)	4.84 (6.51)	5.81 (8.07)	6.93 (9.31)	8.15 (11.34)	6.60 (8.87)	5.63 (7.75)	5.30 (7.38)	6.49 (8.73)	8.20 (11.39)	8.36 (11.23)	76.50 (8.74)
(2) Pichincha															
Quito	H	83,160	31.10 (41.81)	37.64 (56.01)	41.12 (55.26)	32.62 (45.30)	31.60 (42.86)	29.09 (40.41)	24.67 (33.16)	20.79 (27.95)	18.49 (25.69)	27.06 (36.38)	27.46 (38.13)	24.41 (32.81)	346.05 (39.50)
	T	31,475	22.72 (30.54)	20.52 (30.54)	22.72 (30.54)	21.98 (30.54)	22.72 (30.54)	21.98 (30.54)	22.72 (30.54)	22.72 (30.54)	21.98 (30.54)	22.72 (30.54)	21.98 (30.54)	22.72 (30.54)	267.48 (30.54)
Sub-total		114,635	53.82 (72.35)	58.16 (86.55)	63.84 (85.80)	54.60 (75.84)	54.32 (73.40)	51.07 (70.95)	47.39 (63.70)	43.51 (58.49)	40.47 (56.23)	49.78 (66.92)	49.44 (68.67)	47.13 (63.35)	613.53 (70.04)
Sto. Domingo	T	4,155	3.00 (4.03)	2.71 (4.03)	3.00 (4.03)	2.90 (4.03)	3.00 (4.03)	2.90 (4.03)	3.00 (4.03)	3.00 (4.03)	2.90 (4.03)	3.00 (4.03)	2.90 (4.03)	3.00 (4.03)	35.31 (4.03)
Total		118,790	56.82 (76.38)	60.87 (90.58)	66.84 (89.83)	57.50 (79.87)	57.32 (77.43)	53.97 (74.98)	50.39 (67.73)	46.51 (62.52)	43.37 (60.26)	52.78 (70.95)	52.34 (72.70)	50.13 (67.38)	648.84 (74.07)
(3) Centro Norte															
Latacunga	H	4,200	2.42 (3.25)	2.03 (3.02)	2.44 (3.28)	2.36 (3.28)	2.44 (3.28)	2.36 (3.28)	2.44 (3.28)	1.60 (2.15)	2.36 (3.28)	2.44 (3.28)	2.06 (2.86)	2.44 (3.28)	27.39 (3.12)
	T	1,138	0.82 (1.11)	0.74 (1.11)	0.82 (1.11)	0.80 (1.11)	0.82 (1.11)	0.80 (1.11)	0.82 (1.11)	0.82 (1.11)	0.80 (1.11)	0.82 (1.11)	0.80 (1.11)	0.82 (1.11)	9.68 (1.11)
Sub-total		5,338	3.24 (4.36)	2.77 (4.13)	3.26 (4.39)	3.16 (4.39)	3.26 (4.39)	3.16 (4.39)	3.26 (4.39)	2.42 (3.26)	3.16 (4.39)	3.26 (4.39)	2.86 (3.97)	3.26 (4.39)	37.07 (4.23)
Ambato	H	4,128	2.23 (2.99)	1.92 (2.86)	2.68 (3.60)	2.71 (3.69)	2.10 (2.75)	2.65 (3.61)	3.12 (4.12)	2.89 (3.88)	1.95 (2.71)	2.87 (3.85)	1.76 (2.44)	1.56 (2.09)	28.44 (3.24)
	T	3,000	2.17 (2.91)	1.96 (2.91)	2.17 (2.91)	2.10 (2.91)	2.17 (2.91)	2.10 (2.91)	2.17 (2.91)	2.17 (2.91)	2.10 (2.91)	2.17 (2.91)	2.10 (2.91)	2.17 (2.91)	25.55 (2.91)
Sub-total		7,128	4.40 (5.90)	3.88 (5.77)	4.85 (6.51)	4.81 (6.60)	4.27 (5.66)	4.75 (6.52)	5.29 (7.03)	5.06 (6.79)	4.05 (5.62)	5.04 (6.76)	3.86 (5.35)	3.73 (5.00)	53.99 (6.15)

Table A-2-(13) Summary of Dependable Supply Capability of Existing Power Plants (2 - 4)

Unit : GWh (MW)

Sistema		Installed Capacity (kW)	1	2	3	4	5	6	7	8	9	10	11	12	Total
Riobamba	H	6,438	4.58 (6.16)	4.13 (6.15)	3.00 (4.03)	2.84 (3.95)	4.58 (6.16)	4.42 (6.14)	4.58 (6.16)	4.58 (6.16)	4.42 (6.14)	4.58 (6.16)	4.42 (6.14)	4.58 (6.16)	50.71 (5.78)
	T	3,720	2.68 (3.61)	2.42 (3.61)	2.68 (3.61)	2.60 (3.61)	2.68 (3.61)	2.60 (3.61)	2.68 (3.61)	2.68 (3.61)	2.60 (3.61)	2.68 (3.61)	2.60 (3.61)	2.68 (3.61)	31.58 (3.61)
Sub-total		10,158	7.26 (9.77)	6.55 (9.76)	5.68 (7.64)	5.44 (7.56)	7.26 (9.77)	7.02 (9.75)	7.26 (9.77)	7.26 (9.77)	7.02 (9.75)	7.26 (9.77)	7.02 (9.75)	7.26 (9.77)	82.29 (9.39)
Guaranda	H	650	0.45 (0.60)	0.40 (0.60)	0.45 (0.60)	0.43 (0.60)	0.45 (0.60)	0.43 (0.60)	0.45 (0.60)	0.37 (0.50)	0.36 (0.50)	0.45 (0.60)	0.43 (0.60)	0.45 (0.60)	5.12 (0.58)
	T	775	0.56 (0.75)	0.51 (0.75)	0.56 (0.75)	0.54 (0.75)	0.56 (0.75)	0.54 (0.75)	0.56 (0.75)	0.56 (0.75)	0.54 (0.75)	0.56 (0.75)	0.54 (0.75)	0.56 (0.75)	6.59 (0.75)
Sub-total		1,425	1.01 (1.35)	0.91 (1.35)	1.01 (1.35)	0.97 (1.35)	1.01 (1.35)	0.97 (1.35)	1.01 1.35)	0.93 (1.25)	0.90 (1.25)	1.01 (1.35)	0.97 (1.35)	1.01 (1.35)	11.71 (1.33)
Puyo	H	100	0.06 (0.08)	0.05 (0.08)	0.06 (0.08)	0.06 (0.08)	0.06 (0.08)	0.06 (0.08)	0.06 (0.08)	0.06 (0.08)	0.06 (0.08)	0.06 (0.08)	0.06 (0.08)	0.06 (0.08)	0.71 (0.08)
	T	356	0.26 (0.35)	0.23 (0.35)	0.26 (0.35)	0.25 (0.35)	0.26 (0.35)	0.25 (0.35)	0.26 (0.35)	0.26 (0.35)	0.25 (0.35)	0.26 (0.35)	0.25 (0.35)	0.26 (0.35)	3.05 (0.35)
Sub-total		456	0.32 (0.43)	0.28 (0.43)	0.32 (0.43)	0.31 (0.43)	0.32 (0.43)	0.31 (0.43)	0.32 (0.43)	0.32 (0.43)	0.31 (0.43)	0.32 (0.43)	0.31 (0.43)	0.32 (0.43)	3.76 (0.43)
Total		24,505	16.23 (21.81)	14.39 (21.43)	15.12 (20.32)	14.69 (20.33)	16.12 (21.60)	16.21 (22.44)	17.14 (22.97)	15.99 (21.50)	15.44 (21.44)	16.89 (22.70)	15.02 (20.85)	15.58 (20.94)	188.82 (21.53)
(4) Centro Sur															
	H	6,432	3.86 (5.19)	3.96 (5.89)	4.39 (5.90)	4.60 (6.39)	4.69 (6.30)	4.61 (6.40)	4.69 (6.30)	4.61 (6.20)	4.25 (5.90)	4.61 (6.20)	4.03 (5.60)	3.65 (4.91)	51.95 (5.93)
	T	10,820	7.81 (10.50)	7.05 (10.50)	7.81 (10.50)	7.55 (10.50)	7.81 (10.50)	7.55 (10.50)	7.81 (10.50)	7.81 (10.50)	7.55 (10.50)	7.81 (10.50)	7.55 (10.50)	7.81 (10.50)	91.92 (10.50)
Total		17,252	11.67 (15.69)	11.01 (16.39)	12.20 (16.40)	12.15 (16.89)	12.50 (16.80)	12.16 (16.90)	12.50 (16.80)	12.42 (16.70)	11.80 (16.40)	12.42 (16.70)	11.58 (16.10)	11.46 (15.41)	143.87 (16.43)

Table A-2-(13) Summary of Dependable Supply Capability of Existing Power Plants (3 - 4)

Unit : GWh (MW)

Sistema		Installed Capacity (kW)	1	2	3	4	5	6	7	8	9	10	11	12	Total
(5) Sur															
	H	2,400	1.78	1.61	1.78	1.72	1.78	1.37	1.41	1.04	1.72	1.78	1.72	1.78	19.49
			(2.39)	(2.40)	(2.39)	(2.39)	(2.39)	(1.90)	(1.90)	(1.40)	(2.39)	(2.39)	(2.39)	(2.39)	(2.22)
	T	2,406	1.74	1.57	1.74	1.68	1.74	1.68	1.74	1.74	1.68	1.74	1.68	1.74	20.47
			(2.33)	(2.33)	(2.33)	(2.33)	(2.33)	(2.33)	(2.33)	(2.33)	(2.33)	(2.33)	(2.33)	(2.33)	(2.33)
Total		4,806	3.52	3.18	3.52	3.40	3.52	3.05	3.15	2.78	3.40	3.52	3.40	3.52	39.96
			(4.72)	(4.73)	(4.72)	(4.72)	(4.72)	(4.23)	(4.23)	(3.73)	(4.72)	(4.72)	(4.72)	(4.72)	(4.55)
(6) Esmeraldas															
	T	4,860	3.50	3.16	3.50	3.40	3.50	3.40	3.50	3.50	3.40	3.50	3.40	3.50	41.26
			(4.71)	(4.71)	(4.71)	(4.71)	(4.71)	(4.71)	(4.71)	(4.71)	(4.71)	(4.71)	(4.71)	(4.71)	(4.71)
(7) Manabi															
	T	23,160	16.72	15.10	16.72	16.18	16.72	16.18	16.72	16.72	16.18	16.72	16.18	16.72	196.86
			(22.47)	(22.47)	(22.47)	(22.47)	(22.47)	(22.47)	(22.47)	(22.47)	(22.47)	(22.47)	(22.47)	(22.47)	(22.47)
(8) Guayas-Los Rios															
Guayaquil	T	55,500	40.06	36.18	40.06	38.76	40.06	38.76	40.06	40.06	38.76	40.06	38.76	40.06	471.64
			(53.84)	(53.84)	(53.84)	(53.84)	(53.84)	(53.84)	(53.84)	(53.84)	(53.84)	(53.84)	(53.84)	(53.84)	(53.84)
	T	66,050	47.67	43.06	47.67	46.13	76.67	46.13	47.67	47.67	46.13	47.67	46.13	47.67	561.27
			(64.07)	(64.07)	(64.07)	(64.07)	(64.07)	(64.07)	(64.07)	(64.07)	(64.07)	(64.07)	(64.07)	(64.07)	(64.07)
Sub-total		121,550	87.73	79.24	87.73	84.89	87.73	84.89	87.73	87.73	84.89	87.73	84.89	87.73	1,032.91
			(117.91)	(117.91)	(117.91)	(117.91)	(117.91)	(117.91)	(117.91)	(117.91)	(117.91)	(117.91)	(117.91)	(117.91)	(117.91)
Duran	T	4,590	3.31	2.99	3.31	3.20	3.31	3.20	3.31	3.31	3.20	3.31	3.20	3.31	38.96
			(4.45)	(4.45)	(4.45)	(4.45)	(4.45)	(4.45)	(4.45)	(4.45)	(4.45)	(4.45)	(4.45)	(4.45)	(4.45)
Santa Elena Salinas	T	4,740	3.42	3.09	3.42	3.31	3.42	3.31	3.42	3.42	3.31	3.42	3.31	3.42	40.27
			(4.60)	(4.60)	(4.60)	(4.60)	(4.60)	(4.60)	(4.60)	(4.60)	(4.60)	(4.60)	(4.60)	(4.60)	(4.60)
Santa Elena Playas	T	500	0.36	0.33	0.36	0.35	0.36	0.35	0.36	0.36	0.35	0.36	0.35	0.36	4.25
			(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)
Milagro	T	6,640	4.79	4.33	4.79	4.64	4.79	4.64	4.79	4.79	4.64	4.79	4.64	4.79	56.42
			(6.44)	(6.44)	(6.44)	(6.44)	(6.44)	(6.44)	(6.44)	(6.44)	(6.44)	(6.44)	(6.44)	(6.44)	(6.44)
Babahoyo	T	2,240	1.61	1.46	1.61	1.56	1.61	1.56	1.61	1.61	1.56	1.61	1.56	1.61	18.97
			(2.17)	(2.17)	(2.17)	(2.17)	(2.17)	(2.17)	(2.17)	(2.17)	(2.17)	(2.17)	(2.17)	(2.17)	(2.17)
Quevedo	T	2,766	1.99	1.80	1.99	1.93	1.99	1.93	1.99	1.99	1.93	1.99	1.93	1.99	23.45
			(2.68)	(2.68)	(2.68)	(2.68)	(2.68)	(2.68)	(2.68)	(2.68)	(2.68)	(2.68)	(2.68)	(2.68)	(2.68)
Total		143,026	103.21	93.24	103.21	99.88	103.21	99.88	103.21	103.21	99.88	103.21	99.88	103.21	1,215.23
			(138.74)	(138.74)	(138.74)	(138.74)	(138.74)	(138.74)	(138.74)	(138.74)	(138.74)	(138.74)	(138.74)	(138.74)	(138.74)

Table A-2-(13) Summary of Dependable Supply Capability of Existing Power (4 - 4)

Unit : GWh (MW)

Sistema		Installed Capacity (kW)	1	2	3	4	5	6	7	8	9	10	11	12	Total
(9) El Oro															
	H	2,234	1.26 (1.69)	1.46 (2.17)	1.62 (2.17)	1.57 (2.17)	1.62 (2.17)	1.57 (2.17)	1.62 (2.17)	1.54 (2.06)	1.40 (1.94)	1.15 (1.55)	0.99 (1.37)	0.60 (0.81)	16.40 (1.87)
	T	6,432	4.64 (6.24)	4.19 (6.24)	4.64 (6.24)	4.49 (6.24)	4.64 (6.24)	4.49 (6.24)	4.64 (6.24)	4.64 (6.24)	4.49 (6.24)	4.64 (6.24)	4.49 (6.24)	4.64 (6.24)	54.63 (6.24)
Total		8,666	5.90 (7.93)	5.65 (8.41)	6.26 (8.41)	6.06 (8.41)	6.26 (8.41)	6.06 (8.41)	6.26 (8.41)	6.18 (8.30)	5.89 (8.18)	5.79 (7.79)	5.48 (7.61)	5.24 (7.05)	71.03 (8.11)
Grand Total		356,268	221.42 (297.62)	209.42 (311.66)	230.36 (309.62)	217.28 (301.72)	224.23 (301.70)	217.27 (301.72)	217.62 (292.44)	211.09 (283.75)	202.87 (281.81)	219.47 (295.02)	213.69 (296.80)	215.87 (290.16)	2,600.59 (296.89)
	H	122,096	52.42 (70.45)	56.77 (84.49)	61.36 (82.45)	53.74 (74.55)	55.23 (74.53)	53.73 (74.55)	48.62 (65.27)	42.09 (56.58)	39.33 (54.64)	50.47 (67.85)	50.15 (69.36)	46.87 (62.99)	610.78 (69.72)
	T	178,674	128.94 (173.33)	116.47 (173.33)	128.94 (173.33)	124.78 (173.33)	128.94 (173.33)	124.78 (173.33)	128.94 (173.33)	128.94 (173.33)	124.78 (173.33)	128.94 (173.33)	124.78 (173.33)	128.94 (173.33)	1,518.17 (173.33)
	T	55,500	40.06 (53.84)	36.18 (53.84)	40.06 (53.84)	38.76 (53.84)	40.06 (53.84)	38.76 (53.84)	40.06 (53.84)	40.06 (53.84)	38.76 (53.84)	40.06 (53.84)	38.76 (53.84)	40.06 (53.84)	471.64 (53.84)

Note : H : Hydro power plants
T : Thermal power plants

Figure in parenthesis indicate average output of the power plants

Table A-2-(14) Dependable Supply Capability of Existing Power Plants (1 - 6)

Unit : GWh (MW)

Sistema		Installed Capacity (kW)	1	2	3	4	5	6	7	8	9	10	11	12	Total
(1) Norte															
La Playa	H	1,320	0.70 (0.94)	0.61 (0.91)	0.70 (0.94)	0.92 (1.28)	0.83 (1.12)	0.95 (1.32)	0.98 (1.32)	0.97 (1.30)	0.92 (1.28)	0.98 (1.32)	0.95 (1.32)	0.91 (1.22)	10.42 (1.19)
El Amabi	H	8,000	2.20 (2.96)	1.44 (2.14)	1.31 (1.76)	2.04 (2.83)	3.08 (4.14)	4.29 (5.96)	2.94 (3.95)	2.19 (2.94)	2.00 (2.78)	2.78 (3.74)	4.29 (5.96)	4.43 (5.95)	32.99 (3.77)
Montufar	H	300	0.18 (0.24)	0.16 (0.24)	0.18 (0.24)	0.17 (0.24)	0.18 (0.24)	0.17 (0.24)	0.18 (0.24)	0.17 (0.23)	0.17 (0.24)	0.17 (0.23)	0.18 (0.25)	0.19 (0.26)	2.10 (0.24)
El Angel	H	472	0.27 (0.36)	0.27 (0.40)	0.28 (0.38)	0.29 (0.40)	0.27 (0.36)	0.27 (0.38)	0.30 (0.40)	0.27 (0.36)	0.27 (0.38)	0.30 (0.40)	0.29 (0.40)	0.30 (0.40)	3.38 (0.39)
Ontañon	H	400	0.30 (0.40)	0.26 (0.39)	0.28 (0.38)	0.26 (0.36)	0.30 (0.40)	0.29 (0.40)	0.22 (0.30)	0.25 (0.34)	0.24 (0.33)	0.29 (0.39)	0.29 (0.40)	0.30 (0.40)	3.28 (0.37)
Hoja Blanca	H	600	0.34 (0.46)	0.29 (0.43)	0.34 (0.46)	0.34 (0.47)	0.41 (0.55)	0.38 (0.53)	0.26 (0.35)	0.19 (0.26)	0.18 (0.25)	0.26 (0.35)	0.41 (0.57)	0.37 (0.50)	3.77 (0.43)
San Luis	H	822	0.41 (0.55)	0.30 (0.45)	0.47 (0.63)	0.52 (0.72)	0.54 (0.73)	0.54 (0.75)	0.45 (0.60)	0.37 (0.50)	0.35 (0.49)	0.44 (0.59)	0.52 (0.72)	0.54 (0.73)	5.45 (0.62)
Quiroga Yimantag	H	440	0.28 (0.38)	0.24 (0.36)	0.26 (0.35)	0.29 (0.40)	0.30 (0.40)	0.28 (0.39)	0.25 (0.34)	0.20 (0.27)	0.19 (0.26)	0.25 (0.34)	0.29 (0.40)	0.30 (0.40)	3.13 (0.36)
Tulcan	T	775	0.56 (0.75)	0.51 (0.75)	0.56 (0.75)	0.54 (0.75)	0.56 (0.75)	0.54 (0.75)	0.56 (0.75)	0.56 (0.75)	0.54 (0.75)	0.56 (0.75)	0.54 (0.75)	0.56 (0.75)	6.59 (0.75)
El Sagrario	T	634	0.46 (0.62)	0.41 (0.62)	0.46 (0.62)	0.44 (0.62)	0.46 (0.62)	0.44 (0.62)	0.46 (0.62)	0.46 (0.62)	0.44 (0.62)	0.46 (0.62)	0.44 (0.62)	0.46 (0.62)	5.39 (0.62)
Total		13,763	5.70 (7.66)	4.49 (6.69)	4.84 (6.51)	5.81 (8.07)	6.93 (9.31)	8.15 (11.34)	6.60 (8.87)	5.63 (7.57)	5.30 (7.38)	6.49 (8.73)	8.20 (11.39)	8.36 (11.23)	76.50 (8.74)
(2) Pichincha (Quito)															
Los Chillos	H	1,760	0.89 (1.20)	0.81 (1.21)	0.97 (1.30)	0.93 (1.29)	0.97 (1.30)	1.00 (1.39)	1.04 (1.40)	1.04 (1.40)	1.00 (1.39)	1.04 (1.40)	0.93 (1.29)	0.89 (1.20)	11.51 (1.31)
La Calera	H	2,000	1.12 (1.51)	1.17 (1.74)	1.49 (2.00)	1.41 (1.96)	1.32 (1.77)	1.25 (1.74)	1.13 (1.52)	1.10 (1.48)	1.28 (1.78)	1.45 (1.95)	1.19 (1.65)	1.19 (1.60)	15.10 (1.72)
Guangopolo	H	9,400	5.73 (7.70)	6.32 (9.40)	6.94 (9.33)	6.00 (8.33)	5.65 (7.59)	5.27 (7.32)	4.53 (6.09)	3.76 (5.05)	3.26 (4.53)	4.73 (6.36)	5.10 (7.08)	4.50 (6.05)	61.79 (7.05)
Cumbaya	H	40,000	13.20 (17.74)	15.65 (23.29)	17.00 (22.85)	13.73 (19.07)	13.37 (17.97)	12.22 (16.97)	10.15 (13.64)	8.42 (11.32)	7.35 (10.21)	11.22 (15.08)	11.42 (15.86)	10.07 (15.53)	143.80 (16.42)

Table A-2-(14) Dependable Supply Capability of Existing Power Plants (2 - 6)

Unit : GWh (MW)

Sistema		Installed Capacity (kW)	1	2	3	4	5	6	7	8	9	10	11	12	Total
Nayon	H	30,000	10.16 (13.66)	13.69 (20.37)	14.72 (19.78)	10.55 (14.65)	10.29 (13.83)	9.35 (12.99)	7.82 (10.51)	6.47 (8.70)	5.60 (7.78)	8.62 (11.59)	8.82 (12.25)	7.76 (10.43)	113.85 (13.00)
Calorina	T	11,500	8.30 (11.16)	7.50 (11.16)	8.30 (11.16)	8.03 (11.16)	8.30 (11.16)	8.03 (11.16)	8.30 (11.16)	8.30 (11.16)	8.03 (11.16)	8.30 (11.16)	8.03 (11.16)	8.30 (11.16)	97.72 (11.16)
Luluncoto	T	19,975	14.42 (19.38)	13.02 (19.38)	14.42 (19.38)	13.95 (19.38)	14.42 (19.38)	13.95 (19.38)	14.42 (19.38)	14.42 (19.38)	13.95 (19.38)	14.42 (19.38)	13.95 (19.38)	14.42 (19.38)	169.76 (19.38)
Sub-total		114,635	53.82 (72.35)	58.16 (86.55)	63.84 (85.80)	54.60 (75.84)	54.32 (73.00)	51.07 (70.95)	47.39 (63.70)	43.51 (58.49)	40.47 (56.23)	49.78 (66.92)	49.44 (68.67)	47.13 (63.35)	613.53 (70.04)
(Sto. Domingo)															
Sto. Domingo	T	4,155	3.00 (4.03)	2.71 (4.03)	3.00 (4.03)	2.90 (4.03)	3.00 (4.03)	2.90 (4.03)	3.00 (4.03)	3.00 (4.03)	2.90 (4.03)	3.00 (4.03)	2.90 (4.03)	3.00 (4.03)	35.31 (4.03)
Sub-total		4,155	3.00 (4.03)	2.71 (4.03)	3.00 (4.03)	2.90 (4.03)	3.00 (4.03)	2.90 (4.03)	3.00 (4.03)	3.00 (4.03)	2.90 (4.03)	3.00 (4.03)	2.90 (4.03)	3.00 (4.03)	35.31 (4.03)
Total		118,790	56.82 (76.38)	60.87 (90.58)	66.84 (89.83)	57.50 (79.87)	57.32 (77.03)	53.97 (74.98)	50.39 (67.73)	46.51 (62.52)	43.37 (60.26)	52.78 (70.95)	52.34 (72.70)	50.13 (67.38)	648.84 (74.07)
(3) Centro Norte (Latacunga)															
Illuchi (I)	H	2,800	1.38 (1.85)	1.09 (1.62)	1.40 (1.88)	1.35 (1.88)	1.40 (1.88)	1.35 (1.88)	1.40 (1.88)	1.40 (1.88)	1.35 (1.88)	1.40 (1.88)	1.05 (1.46)	1.40 (1.88)	15.97 (1.82)
" (II)	H	1,400	1.04 (1.40)	0.94 (1.40)	1.04 (1.40)	1.01 (1.40)	1.04 (1.40)	1.01 (1.40)	1.04 (1.40)	0.20 (0.27)	1.01 (1.40)	1.04 (1.40)	1.01 (1.40)	1.04 (1.40)	11.42 (1.30)
Latagunga	T	813	0.59 (0.79)	0.53 (0.79)	0.59 (0.79)	0.57 (0.79)	0.59 (0.79)	0.57 (0.79)	0.59 (0.79)	0.59 (0.79)	0.57 (0.79)	0.59 (0.79)	0.57 (0.79)	0.59 (0.79)	6.94 (0.79)
Salcido	T	325	0.23 (0.32)	0.21 (0.32)	0.23 (0.32)	0.23 (0.32)	0.23 (0.32)	0.23 (0.32)	0.23 (0.32)	0.23 (0.32)	0.23 (0.32)	0.23 (0.32)	0.23 (0.32)	0.23 (0.32)	2.74 (0.32)
Sub-total		5,338	3.24 (4.36)	2.77 (4.13)	3.26 (4.39)	3.16 (4.39)	3.26 (4.39)	3.16 (4.39)	3.26 (4.39)	2.42 (3.26)	3.16 (4.39)	3.26 (4.39)	2.86 (3.97)	3.26 (4.39)	37.07 (4.23)

Table A-2-(14) Dependable Supply Capability of Existing Power Plants (3 - 6)

Unit : GWh (MW)

Sistema		Installed Capacity (kW)	1	2	3	4	5	6	7.	8	9	10	11	12	Total
(Ambato)															
La Peninsula	H	3,000	1.49 (2.00)	1.25 (1.86)	1.94 (2.61)	1.85 (2.57)	1.21 (1.63)	1.79 (2.49)	2.23 (3.00)	2.15 (2.89)	1.23 (1.71)	2.13 (2.86)	1.04 (1.44)	0.82 (1.10)	19.13 (2.18)
Miraflores	H	1,128	0.74 (0.99)	0.67 (1.00)	0.74 (0.99)	0.86 (1.12)	0.89 (1.12)	0.86 (1.12)	0.89 (1.12)	0.74 (0.99)	0.72 (1.00)	0.74 (0.99)	0.72 (1.00)	0.74 (0.99)	9.31 (1.06)
El Batan	T	3,000	2.17 (2.91)	1.96 (2.91)	2.17 (2.91)	2.10 (2.91)	2.17 (2.91)	2.10 (2.91)	2.17 (2.91)	2.17 (2.91)	2.10 (2.91)	2.17 (2.91)	2.10 (2.91)	2.17 (2.91)	25.55 (2.91)
Sub-total		7,128	4.40 (5.90)	3.88 (5.77)	4.85 (6.51)	4.81 (6.60)	4.27 (5.66)	4.75 (6.52)	5.29 (7.03)	5.06 (6.79)	4.05 (5.62)	5.04 (6.76)	3.86 (5.35)	3.73 (5.00)	53.99 (6.16)
(Riobamba)															
Alao I	H	5,300	3.91 (5.26)	3.53 (5.25)	2.33 (3.13)	2.20 (3.06)	3.91 (5.26)	3.78 (5.25)	3.91 (5.26)	3.91 (5.26)	3.78 (5.25)	3.91 (5.26)	3.78 (5.25)	3.91 (5.26)	42.86 (4.89)
Guadalupe	H	458	0.22 (0.30)	0.20 (0.30)	0.22 (0.30)	0.21 (0.29)	0.22 (0.30)	0.21 (0.29)	0.22 (0.30)	0.22 (0.30)	0.21 (0.29)	0.22 (0.30)	0.21 (0.29)	0.22 (0.30)	2.58 (0.29)
Cordovez	H	680	0.45 (0.60)	0.40 (0.60)	0.45 (0.60)	0.43 (0.60)	0.45 (0.60)	0.43 (0.60)	0.45 (0.60)	0.45 (0.60)	0.43 (0.60)	0.45 (0.60)	0.43 (0.60)	0.45 (0.60)	5.27 (0.60)
San Luis	T	3,360	2.42 (3.26)	2.19 (3.26)	2.42 (3.26)	2.35 (3.26)	2.42 (3.26)	2.35 (3.26)	2.42 (3.26)	2.42 (3.26)	2.35 (3.26)	2.42 (3.26)	2.35 (3.26)	2.42 (3.26)	28.53 (3.26)
Guamote	T	360	0.26 (0.35)	0.23 (0.35)	0.26 (0.35)	0.25 (0.35)	0.26 (0.35)	0.25 (0.35)	0.26 (0.35)	0.26 (0.35)	0.25 (0.35)	0.26 (0.35)	0.25 (0.35)	0.26 (0.35)	3.05 (0.35)
Sub-total		10,158	7.26 (9.77)	6.55 (9.76)	5.68 (7.64)	5.44 (7.56)	7.26 (9.77)	7.02 (9.75)	7.26 (9.77)	7.26 (9.77)	7.02 (9.75)	7.26 (9.77)	7.02 (9.75)	7.26 (9.77)	82.29 (9.39)
(Guaranda)															
Rio Chimbo	H	650	0.45 (0.60)	0.40 (0.60)	0.45 (0.60)	0.43 (0.60)	0.45 (0.60)	0.43 (0.60)	0.45 (0.60)	0.37 (0.50)	0.36 (0.50)	0.45 (0.60)	0.43 (0.60)	0.45 (0.60)	5.12 (0.58)
Chillanes	T	775	0.56 (0.75)	0.51 (0.75)	0.56 (0.75)	0.54 (0.75)	0.56 (0.75)	0.54 (0.75)	0.56 (0.75)	0.56 (0.75)	0.54 (0.75)	0.56 (0.75)	0.54 (0.75)	0.56 (0.75)	6.59 (0.75)
Sub-total		1,425	1.01 (1.35)	0.91 (1.35)	1.01 (1.35)	0.97 (1.35)	1.01 (1.35)	0.97 (1.35)	1.01 (1.35)	0.93 (1.25)	0.90 (1.25)	1.01 (1.35)	0.97 (1.35)	1.01 (1.35)	11.71 (1.33)

Table A-2-(14) Dependable Supply Capability of Existing Power Plants (4 - 6)

Unit : GWh (MW)

Sistema		Installed Capacity (kW)	1	2	3	4	5	6	7	8	9	10	11	12	Total
(Puyo)															
Puyo	H	100	0.06 (0.08)	0.05 (0.07)	0.06 (0.08)	0.06 (0.08)	0.06 (0.08)	0.06 (0.08)	0.06 (0.08)	0.06 (0.08)	0.06 (0.08)	0.06 (0.08)	0.06 (0.08)	0.06 (0.08)	0.71 (0.08)
Puyo	T	356	0.26 (0.35)	0.23 (0.35)	0.26 (0.35)	0.25 (0.35)	0.26 (0.35)	0.25 (0.35)	0.26 (0.35)	0.26 (0.35)	0.25 (0.35)	0.26 (0.35)	0.25 (0.35)	0.26 (0.35)	3.05 (0.35)
Sub-total		456	0.32 (0.43)	0.28 (0.42)	0.32 (0.43)	0.31 (0.43)	0.32 (0.43)	0.31 (0.43)	0.32 (0.43)	0.32 (0.43)	0.31 (0.43)	0.32 (0.43)	0.31 (0.43)	0.32 (0.43)	3.76 (0.43)
Total		24,505	16.23 (21.81)	14.39 (21.43)	15.12 (20.32)	14.69 (20.33)	16.12 (21.60)	16.21 (22.44)	17.14 (22.97)	15.99 (21.50)	15.44 (21.44)	16.89 (22.70)	15.02 (20.85)	15.58 (20.94)	188.82 (21.54)
(4) Centro Sur															
Saimilin	H	6,430	3.86 (5.19)	3.96 (5.89)	4.39 (5.90)	4.60 (6.39)	4.69 (6.30)	4.61 (6.40)	4.69 (6.30)	4.61 (6.20)	4.25 (5.90)	4.61 (6.20)	4.03 (5.60)	3.65 (4.91)	51.95 (5.93)
Monay I	T	4,500	3.25 (4.37)	2.93 (4.37)	3.25 (4.37)	3.14 (4.37)	3.25 (4.37)	3.14 (4.37)	3.25 (4.37)	3.25 (4.37)	3.14 (4.37)	3.25 (4.37)	3.14 (4.37)	3.25 (4.37)	38.24 (4.37)
Erco	T	3,054	2.20 (2.96)	1.99 (2.96)	2.20 (2.96)	2.13 (2.96)	2.20 (2.96)	2.13 (2.96)	2.20 (2.96)	2.20 (2.96)	2.13 (2.96)	2.20 (2.96)	2.13 (2.96)	2.20 (2.96)	25.91 (2.96)
Guapan	T	2,500	1.81 (2.43)	1.63 (2.43)	1.81 (2.43)	1.75 (2.43)	1.81 (2.43)	1.75 (2.43)	1.81 (2.43)	1.81 (2.43)	1.75 (2.43)	1.81 (2.43)	1.75 (2.43)	1.81 (2.43)	21.30 (2.43)
Azogues	T	766	0.55 (0.74)	0.50 (0.74)	0.55 (0.74)	0.53 (0.74)	0.55 (0.74)	0.53 (0.74)	0.55 (0.74)	0.55 (0.74)	0.53 (0.74)	0.55 (0.74)	0.53 (0.74)	0.55 (0.74)	6.47 (0.74)
Total		17,252	11.67 (15.69)	11.01 (16.39)	12.20 (16.40)	12.15 (16.89)	12.50 (16.80)	12.16 (16.90)	12.50 (16.80)	12.42 (16.70)	11.80 (16.40)	12.42 (16.70)	11.58 (16.10)	11.46 (15.41)	143.87 (16.43)
(5) Sur															
San Francisco	H	2,400	1.78 (2.39)	1.61 (2.40)	1.78 (2.39)	1.72 (2.39)	1.78 (2.39)	1.37 (1.90)	1.41 (1.90)	1.04 (1.40)	1.72 (2.39)	1.78 (2.39)	1.72 (2.39)	1.78 (2.39)	19.49 (2.22)
Loja	T	1,266	0.92 (1.23)	0.83 (1.23)	0.92 (1.23)	0.89 (1.23)	0.92 (1.23)	0.89 (1.23)	0.92 (1.23)	0.92 (1.23)	0.89 (1.23)	0.92 (1.23)	0.89 (1.23)	0.92 (1.23)	10.83 (1.23)
Catamayo	T	1,140	0.82 (1.10)	0.74 (1.10)	0.82 (1.10)	0.79 (1.10)	0.82 (1.10)	0.79 (1.10)	0.82 (1.10)	0.82 (1.10)	0.79 (1.10)	0.82 (1.10)	0.79 (1.10)	0.82 (1.10)	9.64 (1.10)
Total		4,806	3.52 (4.72)	3.18 (4.73)	3.52 (4.72)	3.40 (4.72)	3.52 (4.72)	3.05 (4.23)	3.15 (4.23)	2.78 (3.73)	3.40 (4.72)	3.52 (4.72)	3.40 (4.72)	3.52 (4.72)	39.96 (4.55)

Table A-2-(14) Dependable Supply Capability of Existing Power Plants (5 - 6)

Unit : GWh (MW)

Sistema		Installed Capacity (kW)	1	2	3	4	5	6	7	8	9	10	11	12	Total
(6) Esmeraldas															
Santa Bainas	I T	4,020	2.90 (3.90)	2.62 (3.90)	2.90 (3.90)	2.81 (3.90)	2.90 (3.90)	2.81 (3.90)	2.90 (3.90)	2.90 (3.90)	2.81 (3.90)	2.90 (3.90)	2.81 (3.90)	2.90 (3.90)	34.16 (3.90)
Quinindé	I T	190	0.13 (0.18)	0.12 (0.18)	0.13 (0.18)	0.13 (0.18)	0.13 (0.18)	0.13 (0.18)	0.13 (0.18)	0.13 (0.18)	0.13 (0.18)	0.13 (0.18)	0.13 (0.18)	0.13 (0.18)	1.55 (0.18)
Limones	T	285	0.21 (0.28)	0.19 (0.28)	0.21 (0.28)	0.20 (0.28)	0.21 (0.28)	0.20 (0.28)	0.21 (0.28)	0.21 (0.28)	0.20 (0.28)	0.21 (0.28)	0.20 (0.28)	0.21 (0.28)	2.46 (0.28)
San Lorenzo	T	240	0.17 (0.23)	0.15 (0.23)	0.17 (0.23)	0.17 (0.23)	0.17 (0.23)	0.17 (0.23)	0.17 (0.23)	0.17 (0.23)	0.17 (0.23)	0.17 (0.23)	0.17 (0.23)	0.17 (0.23)	2.02 (0.23)
Muisne	T	125	0.09 (0.12)	0.08 (0.12)	0.09 (0.12)	0.09 (0.12)	0.09 (0.12)	0.09 (0.12)	0.09 (0.12)	0.09 (0.12)	0.09 (0.12)	0.09 (0.12)	0.09 (0.12)	0.09 (0.12)	1.07 (0.12)
Total		4,860	3.50 (4.71)	3.16 (4.71)	3.50 (4.71)	3.40 (4.71)	3.50 (4.71)	3.40 (4.71)	3.50 (4.71)	3.50 (4.71)	3.40 (4.71)	3.50 (4.71)	3.40 (4.71)	3.50 (4.71)	41.26 (4.71)
(7) Manabi															
Monta	T	20,600	14.87 (19.98)	13.43 (19.98)	14.87 (19.98)	14.39 (19.98)	14.87 (19.98)	14.39 (19.98)	14.87 (19.98)	14.87 (19.98)	14.39 (19.98)	14.87 (19.98)	14.39 (19.98)	14.87 (19.98)	175.08 (19.98)
Total		20,600	14.87 (19.98)	13.43 (19.98)	14.87 (19.98)	14.39 (19.98)	14.87 (19.98)	14.39 (19.98)	14.87 (19.98)	14.87 (19.98)	14.39 (19.98)	14.87 (19.98)	14.39 (19.98)	14.87 (19.98)	175.08 (19.98)
(8) Guayas-Los Ríos															
(Guayaquil) EMELEC	T	3,050	2.20 (2.96)	1.99 (2.96)	2.20 (2.96)	2.13 (2.96)	2.20 (2.96)	2.13 (2.96)	2.20 (2.96)	2.20 (2.96)	2.13 (2.96)	2.20 (2.96)	2.13 (2.96)	2.20 (2.96)	25.91 (2.96)
"	T	63,000	45.47 (61.11)	41.07 (61.11)	45.47 (61.11)	44.00 (61.11)	45.47 (61.11)	44.00 (61.11)	45.47 (61.11)	45.47 (61.11)	44.00 (61.11)	45.47 (61.11)	44.00 (61.11)	45.47 (61.11)	535.36 (61.11)
"	T	55,500	40.06 (53.84)	36.18 (53.84)	40.06 (53.84)	38.76 (53.84)	40.06 (53.84)	38.76 (53.84)	40.06 (53.84)	40.06 (53.84)	38.76 (53.84)	40.06 (53.84)	38.76 (53.84)	40.06 (53.84)	471.64 (53.84)
Sub-total		121,550	87.73 (117.91)	79.24 (117.91)	87.73 (117.91)	84.89 (117.91)	87.73 (117.91)	84.89 (117.91)	87.73 (117.91)	87.73 (117.91)	84.89 (117.91)	87.73 (117.91)	84.89 (117.91)	87.73 (117.91)	1,032.91 (117.91)

Table A-2-(14) Dependable Supply Capability of Existing Power Plants (6 - 6)

Unit : GWh (MW)

Sistema		Installed Capacity (kW)	1	2	3	4	5	6	7	8	9	10	11	12	Total
(Duran)	T	4,590	3.31 (4.45)	2.99 (4.45)	3.31 (4.45)	3.20 (4.45)	3.31 (4.45)	3.20 (4.45)	3.31 (4.45)	3.31 (4.45)	3.20 (4.45)	3.31 (4.45)	3.20 (4.45)	3.31 (4.45)	38.96 (4.45)
(Santa Elena Salinas)	T	4,740	3.42 (4.60)	3.09 (4.60)	3.42 (4.60)	3.31 (4.60)	3.42 (4.60)	3.31 (4.60)	3.42 (4.60)	3.42 (4.60)	3.31 (4.60)	3.42 (4.60)	3.31 (4.60)	3.42 (4.60)	40.27 (4.60)
(Santa Elena Playas)	T	500	0.36 (0.49)	0.33 (0.49)	0.36 (0.49)	0.35 (0.49)	0.36 (0.49)	0.35 (0.49)	0.36 (0.49)	0.36 (0.49)	0.35 (0.49)	0.36 (0.49)	0.35 (0.49)	0.36 (0.49)	4.25 (0.49)
(Milagro)	T	6,640	4.79 (6.44)	4.33 (6.44)	4.79 (6.44)	4.64 (6.44)	4.79 (6.44)	4.64 (6.44)	4.79 (6.44)	4.79 (6.44)	4.64 (6.44)	4.79 (6.44)	4.64 (6.44)	4.79 (6.44)	56.42 (6.44)
(Babahoyo)	T	2,240	1.61 (2.17)	1.46 (2.17)	1.61 (2.17)	1.56 (2.17)	1.61 (2.17)	1.56 (2.17)	1.61 (2.17)	1.61 (2.17)	1.56 (2.17)	1.61 (2.17)	1.56 (2.17)	1.61 (2.17)	18.97 (2.17)
(Quevedo)	T	2,766	1.99 (2.68)	1.80 (2.68)	1.99 (2.68)	1.93 (2.68)	1.99 (2.68)	1.93 (2.68)	1.99 (2.68)	1.99 (2.68)	1.93 (2.68)	1.99 (2.68)	1.93 (2.68)	1.99 (2.68)	23.45 (2.68)
Sub-total		21,476	15.48 (20.83)	14.00 (20.83)	15.48 (20.83)	14.99 (20.83)	15.48 (20.83)	14.99 (20.83)	15.48 (20.83)	15.48 (20.83)	14.99 (20.83)	15.48 (20.83)	14.99 (20.83)	15.48 (20.83)	182.32 (20.83)
Total		143,026	103.21 (138.74)	93.24 (138.74)	103.21 (138.74)	99.88 (138.74)	103.21 (138.74)	99.88 (138.74)	103.21 (138.74)	103.21 (138.74)	99.88 (138.74)	103.21 (138.74)	99.88 (138.74)	103.21 (138.74)	1,215.23 (138.74)
(9) Sistema El Oro															
Machala I	T	6,432	4.64 (6.24)	4.19 (6.24)	4.64 (6.24)	4.49 (6.24)	4.64 (6.24)	4.49 (6.24)	4.64 (6.24)	4.64 (6.24)	4.49 (6.24)	4.64 (6.24)	4.49 (6.24)	4.64 (6.24)	54.63 (6.24)
La Calera	H	1,266	0.72 (0.96)	0.83 (1.23)	0.92 (1.23)	0.89 (1.23)	0.92 (1.23)	0.89 (1.23)	0.92 (1.23)	0.87 (1.17)	0.79 (1.10)	0.65 (0.88)	0.56 (0.78)	0.34 (0.46)	9.30 (1.06)
Amalilla	H	672	0.37 (0.50)	0.44 (0.65)	0.48 (0.65)	0.47 (0.65)	0.48 (0.65)	0.47 (0.65)	0.48 (0.65)	0.46 (0.61)	0.42 (0.58)	0.34 (0.46)	0.30 (0.41)	0.18 (0.24)	4.89 (0.56)
La Cueva	H	296	0.17 (0.23)	0.19 (0.29)	0.23 (0.29)	0.21 (0.29)	0.22 (0.29)	0.21 (0.29)	0.22 (0.29)	0.21 (0.28)	0.19 (0.26)	0.16 (0.21)	0.13 (0.18)	0.08 (0.11)	2.21 (0.25)
Total		8,666	5.90 (7.93)	5.65 (8.41)	6.06 (8.41)	6.06 (8.41)	6.26 (8.41)	6.06 (8.41)	6.26 (8.41)	6.18 (8.30)	5.89 (8.18)	5.79 (7.79)	5.48 (7.61)	5.24 (7.05)	71.03 (8.11)

Note : H : Hydro power plants
T : Thermal power plants

Figure in parenthesis indicate average output of the power plants.

APPENDIX

A-3 Estimated Generating Energy Cost by Diesel Power Plants

Table A-3

Table A-3-(1) Estimated Generating Energy Cost by Diesel Power Plants in Sistema Centro-Sur

		Year	1977	1978	1979	1980	1981	1982	1983	1984
Total Production		GWh		105.34	117.27	143.83	157.07	172.13	189.20	208.37
Peak Load		MW		27.57	31.21	38.56	42.04	45.96	50.45	55.54
1.25 x Peak		MW		34.46	39.01	48.19	52.54	57.46	63.07	69.42
Installed Capacity		MW								
3.00 MW Units	(US$500/kW)			-	-	-	-	-	-	-
5.00 MW Units	(US$460/kW)			35.00	35.00	35.00	35.00	35.00	35.00	35.00
10.00 MW Units	(US$450/kW)			-	10.00	20.00	20.00	30.00	30.00	40.00
Total				35.00	45.00	55.00	55.00	65.00	65.00	75.00
Capital Recovery Factor	i = 10.5 %		0.1215							
Fixed Cost	Amortization	(10^3 US$)		1,956	2,503	3,050	3,050	3,597	3,597	4,144
	Fuel Cost	(10^3 US$)		1,459	1,624	1,992	2,175	2,384	2,620	2,886
	Lub Oil Cost	(10^3 US$)		141.5	157.6	193.3	211.1	231.3	254.3	280.1
Variable Cost	Number of Persons			(45)	(50)	(55)	(55)	(60)	(60)	(65)
	Salaries	(10^3 US$)		180	200	220	220	240	240	260
	Repair	(10^3 US$)		378.4	484.2	589.9	589.9	695.8	695.8	801.4
	Maintenance	(10^3 US$)								
	Sub-total			2,158.9	2,465.8	2,995.2	3,196.0	3,551.1	3,810.1	4,227.5
Administrative Cost		(10^3 US$)		32.2	41.2	50.2	50.2	59.2	59.2	68.2
Total Annual Cost		(10^3 US$)		4,147.1	5,010.0	6,095.4	6,296.2	7,207.3	7,407.1	8,433.7
Generating Cost at sending end (mills/kWh)				39.37	42.7	42.4	40.1	41.9	39.1	40.5

Note : Bunker C Oil : 240 gr/kWh Lubricating Oil : 4gr/GWh Bunker C Oil : US$57.5/ton

Table A-3-(2) Estimated Generating Energy Cost by Diesel Power Plants in Sistema Manabi

		Year	1977	1978	1979	1980	1981	1982	1983	1984
Total Production		GWh		96.59	110.00	128.75	143.47	158.89	175.27	192.84
Peak Load		MW		23.72	26.80	30.74	34.79	38.14	42.22	46.59
1.25 x Peak		MW		29.65	33.50	38.43	43.49	47.67	52.77	58.24
Existing Installed Capacity		MW								
3.00 MW Units	(US$430/kW)			-	-	-	-	-	-	-
5.00 MW Units	(US$400/kW)			30.00	35.00	35.00	35.00	35.00	35.00	35.00
10.00 MW Units	(US$390/kW)			-	-	10.00	20.00	20.00	20.00	30.00
Total				30.00	35.00	45.00	55.00	55.00	55.00	65.00
Capital Recovery factor	i = 10.5 %		0.1215							
Fixed Cost	Amortization	(10^3 US$)		1,458	1,701	2,175	2,175	2,649	2,649	3,123
	Fuel Cost	(10^3 US$)		1,098.8	1,251.3	1,464.7	1,632.1	1,807.5	1,993.8	2,193.7
	Lub Oil Cost	(10^3 US$)		129.8	147.8	173.0	192.8	213.5	235.6	259.2
Variable Cost	Number of Persons			(40)	(40)	(45)	(45)	(50)	(50)	(55)
	Salaries	(10^3 US$)		160	160	180	180	200	200	220
	Repair	(10^3 US$)		282	329	421	421	512	512	604
	Maintenance	(10^3 US$)								
	Sub-total	(10^3 US$)		1,670.6	1,888.1	2,238.7	2,425.9	2,733.0	2,941.4	3,276.9
Administrative Cost		(10^3 US$)		24.0	28.0	35.8	35.8	43.6	43.6	51.4
Total Annual Cost		(10^3 US$)		3,152.6	3,617.1	4,449.5	4,636.7	5,425.6	5,634.0	6,451.3
Generating Cost at sending end (mills/kWh)				32.6	32.9	34.6	32.3	34.1	32.1	33.5

Table A-3-(3) Estimated Generating Energy Cost by Diesel Power Plants in Sistema Esmeraldas

	Year	1977	1978	1979	1980	1981	1982	1983	1984
Total Production	GWh		38.21	45.16	66.74	76.41	87.27	98.99	118.09
Peak Load	MW		9.06	10.64	14.27	16.81	19.54	22.19	26.23
1.25 x Peak	MW		11.33	13.30	17.84	21.01	24.42	27.74	32.79
Existing Installed Capacity	MW								
3.00 MW Unit (US$430/kW)			9.00	9.00	9.00	9.00	9.00	9.00	9.00
5.00 MW Unit (US$400/kW)			5.00	5.00	10.00	15.00	15.00	20.00	25.00
Total			14.00	14.00	19.00	24.00	24.00	29.00	34.00
Generating energy by 3.00 MW Diesel Units			11.93	5.74	13.18	10.71	8.43	7.01	12.97
" 5.00 MW "			26.28	39.42	53.56	65.70	78.84	91.98	105.12
Capital Recovery factor i = 10.5 %		0.1215							
Fixed Cost Amortization	(10^3 US$)		713.2	713.2	956.2	1,199.2	1,199.2	1,442.2	1,685.2
			(D=296.3 C=299.0)	(D=142.5 C=448.4)	(D=327.6 C=597.9)	(D=266.1 C=747.4)	(D=209.6 C=896.9)	(D= 174.2 C=1,035.0)	(D= 322.4 C=1,195.8)
Fuel Cost	(10^3 US$)		595.3	590.9	925.5	1,013.5	1,106.5	1,209.2	1,518.2
Lub Oil Cost	(10^3 US$)		51.4	60.7	89.7	102.7	117.3	133.0	158.7
Variable Cost Number of Persons			(35)	(35)	(40)	(40)	(40)	(40)	(40)
Salaries	(10^3 US$)		140	140	160	160	160	160	160
Repair	(10^3 US$)		136	136	183	230	230	277	324
Maintenance	(10^3 US$)								
Sub-total			922.7	927.6	1,358.2	1,506.2	1,613.8	1,779.2	2,160.9
Administrative Cost	(10^3 US$)		11.7	11.7	15.7	19.7	19.7	23.7	27.7
Total Annual Cost	(10^3 US$)		1,647.6	1,652.5	2,330.1	2,725.1	2,832.7	3,245.1	3,873.8
Generating Cost at sending end (mills/kWh)			43.1	36.6	34.9	35.7	32.5	32.8	32.8

Note : Bunker C Oil : 240 gr/kWh Lubricating Oil : 4 gr/kWh Diesel Oil : US$105.3/ton
Diesel Oil : 236 gr/kWh Bunder C Oil : US$47.4/ton

Table A-3-(4) Estimated Generating Energy Cost by Diesel Power Plants in Sistema Santa Elena (Guayas-Los Rios)

		Year	1977	1978	1979	1980	1981	1982	1983	1984
Total Production		GWh		41.30	67.91	79.88	85.13	90.36	100.00	106.21
Peak Load		MW		11.24	15.75	18.23	19.43	20.56	22.72	23.97
1.25 x Peak		MW		14.05	19.69	22.79	24.28	25.69	28.40	29.96
Installed Capacity										
3.00 MW Unit	(US$430/kW)			12.00	12.00	12.00	12.00	12.00	12.00	12.00
5.00 MW Unit	(US$400/kW)			5.00	10.00	15.00	15.00	15.00	20.00	20.00
Total				17.00	22.00	27.00	27.00	27.00	32.00	32.00
Generating energy by 3.00 MW Diesel Units				15.02	15.35	14.18	6.29	11.52	8.02	14.23
" 5.00 MW "				26.28	52.56	65.70	78.84	78.84	91.98	91.98
Capital Recovery factor	i = 10.5 %		0.1215							
Fixed Cost	Amortization	(10^3 US$)		870	1,113	1,356	1,356	1,356	1,599	1,599
				(D=373.2 C=299.0)	(D=381.4 C=597.9)	(D=352.5 C=747.4)	(D=156.4 C=896.9)	(D=286.3 C=896.9)	(D= 199.3 C=1,046.4)	(D= 353.7 C=1,046.4)
	Fuel Cost	(10^3 US$)		672.2	979.3	1 099.9	1,053.3	1,183.2	1,245.7	1,400.1
	Lub Oil Cost	(10^3 US$)		55.5	91.3	107.4	114.4	121.4	134.4	142.7
Variable Cost	Number of Persons			(35)	(40)	(40)	(40)	(40)	(40)	(40)
	Salaries	(10^3 US$)		140	160	160	160	160	160	160
	Repair	(10^3 US$)		168	215	262	262	262	309	309
	Maintenance	(10^3 US$)								
	Sub-total	(10^3 US$)		1,035.7	1,445.6	1,629.3	1,589.7	1,726.6	1,849.1	2,011.8
Administrative Cost		(10^3 US$)		14.3	18.3	22.3	22.3	22.3	26.3	26.3
Total Annual Cost		(10^3 US$)		1,920.0	2,576.9	3,007.6	2,968.0	3,104.9	3,474.4	3,637.1
Generating Cost at sending end (mills/kWh)				46.5	37.9	37.6	34.9	34.4	34.7	34.2

Note : Bunder C Oil : 240 gr/kWh Lubricating Oil : 4 gr/kWh Diesel Oil : US$105.3/ton
Diesel Oil : 236 gr/kWh Bunker C Oil : US$47.4/ton

Table A-3-(5) Estimated Generating Energy Cost by Diesel Power Plants in Sistema Babahoyo (Guayas-Los Rios)

		Year	1977	1978	1979	1980	1981	1982	1983	1984
Total Production		GWh		60.46	70.09	80.94	90.40	100.69	111.76	123.85
Peak Load		MW		15.33	17.85	20.60	23.02	25.51	28.20	30.98
1.25 x Peak		MW		19.16	22.31	25.75	28.78	31.96	35.25	38.73
Installed Capacity		MW								
3.00 MW Unit	(US$430/kW)			9.00	9.00	9.00	9.00	9.00	9.00	9.00
5.00 MW Unit	(US$400/kW)			10.00	15.00	20.00	20.00	25.00	30.00	30.00
Total				19.00	24.00	29.00	29.00	34.00	39.00	39.00
Capital Recovery factor	i = 10.5 %		0.1215							
Fixed Cost	Amortization	(10^3 US$)		956	1,199	1,442	1,442	1,685	1,928	1,928
	Fuel Cost	(10^3 US$)		760	881	1,017	1,137	1,266	1,406	1,558
	Lub Oil Cost	(10^3 US$)		81.3	94.2	108.8	121.5	135.3	150.2	166.5
Variable Cost	Number of Persons			(40)	(40)	(40)	(40)	(45)	(45)	(45)
	Salaries	(10^3 US$)		160	160	160	160	180	180	180
	Repair	(10^3 US$)		184.9	231.9	278.9	278.9	325.9	372.9	372.9
	Maintenance	(10^3 US$)								
	Sub-total	(10^3 US$)		1,186.2	1,367.1	1,564.7	1,697.4	1,907.2	2,109.1	2,277.4
Administrative Cost		(10^3 US$)		15.7	19.7	23.7	23.7	27.7	31.7	31.7
Total Annual Cost		(10^3 US$)		2,157.9	2,585.8	3,030.4	3,163.1	3,619.9	4,068.8	4,237.1
Generating Cost at sending end (mills/kWh)				35.7	36.7	37.4	35.0	35.9	36.4	34.2

Note : Bunker C Oil : 240 gr/kWh Lubricating Oil : 4 gr/kWh
Bunker C Oil : US$52.4/ton

Table A-3-(6) Estimated Generating Energy Cost by Diesel Power Plants in Sistema El Oro

		Year	1977	1978	1979	1980	1981	1982	1983	1984
Total Production		GWh		49.75	56.08	63.03	71.32	80.76	91.37	103.34
Peak Load		MW		14.56	16.10	17.80	19.84	22.12	24.62	27.40
1.25 x Peak		MW		18.20	20.13	22.25	24.80	27.65	30.77	34.26
Installed Capacity		MW								
3.00 MW Unit	(US$430/kW)			12.00	12.00	12.00	12.00	12.00	12.00	12.00
5.00 MW Unit	(US$400/kW)			10.00	10.00	10.00	15.00	15.00	20.00	25.00
Total				22.00	22.00	22.00	27.00	27.00	32.00	37.00
Generating energy by 3.00 MW Units				10.33	3.52	10.47	5.62	25.06	12.53	11.36
" " 5.00 MW Units				39.42	52.56	52.56	65.70	65.70	78.84	91.98
Capital Recovery factor	i = 10.5 %		0.1215							
Fixed Cost	Amortization	(10^3 US$)		1,113	1,113	1,113	1,356	1,356	1,599	1,842
				(D=256.6 C=448.4)	(D= 87.5 C=597.9)	(D=260.1 C=597.9)	(D=139.6 C=747.4)	(D=374.2 C=747.4)	(D=311.3 C=896.9)	(D= 282.2 C=1,046.4)
	Fuel Cost	(10^3 US$)		705.0	685.4	858.0	887.0	1,121.6	1,208.2	1,328.6
	Lub Oil Cost	(10^3 US$)		66.9	75.4	84.7	95.8	108.5	122.8	138.9
Variable Cost	Number of Persons			(40)	(40)	(40)	(40)	(40)	(40)	(45)
	Salaries	(10^3 US$)		160	160	160	160	160	160	180
	Repair	(10^3 US$)		215	215	215	262	262	309	356
	Maintenance	(10^3 US$)								
	Sub-total	(10^3 US$)		1,146.9	1,135.8	1,317.7	1,404.8	1,652.1	1,800.0	2,003.5
Administrative Cost		(10^3 US$)		18.3	18.3	18.3	22.3	22.3	26.3	30.3
Total Annual Cost		(10^3 US$)		2,278.2	2,267.1	2,449.0	2,783.1	3,030.4	3,425.3	3,875.8
Generating Cost at sending end (mills/kWh)				45.8	40.4	38.9	39.0	37.5	37.5	37.5

Table A-3-(7) Estimated Generating Energy Cost by Diesel Power Plants in Sistema Sur (Loja)

		Year	1977	1978	1979	1980	1981	1982	1983	1984
Total Production		GWh		27.82	35.90	44.23	52.30	62.12	72.10	82.71
Peak Load		MW		8.33	10.60	12.78	14.92	17.51	19.97	22.55
1.25 x Peak		MW		10.42	13.25	15.97	18.65	21.89	24.97	28.19
Installed Capacity		MW								
3.00 MW Unit	(US$480/kW)			12.00	12.00	12.00	12.00		12.00	12.00
5.00 MW Unit	(US$440/kW)			-	15.00	5.00	10.00		15.00	20.00
Total				12.00	17.00	17.00	22.00		27.00	32.00
Generating energy by 3.00 MW Diesel Units				-	9.62	17.95	12.88		6.40	3.87
" " 5.00 MW "				-	26.28	26.28	39.42		65.70	78.84
Capital Recovery factor	i = 10.5 %		0.1215							
Fixed Cost	Amortization	(10^3 US$)		670	937	937	1,204	1,204	1,471	1,738
					(D=255.2 C=337.9)	(D=476.2 C=337.9)	(D=341.6 C=506.9)	(D=253.6 C=675.9)	(D=169.8 C=844.9)	(D= 102.7 C=1,013.9)
	Fuel Cost	(10^3 US$)		737.5	593.1	814.1	848.5	929.5	1,014.7	1,116.6
	Lub Oil Cost	(10^3 US$)		37.4	48.2	59.4	70.3	83.5	96.9	111.1
Variable Cost	Number of Persons			(30)	(35)	(35)	(40)	(40)	(40)	(40)
	Salaries	(10^3 US$)		120	140	140	160	160	160	160
	Repair	(10^3 US$)		135	187	187	239	239	291	343
	Maintenance	(10^3 US$)								
	Sub-total			1,029	968.3	1,200.5	1,317.8	1,412.0	1,562.6	1,730.7
Administrative Cost		(10^3 US$)		11.5	15.9	15.9	20.3	20.3	24.7	29.1
Total Annual Cost		(10^3 US$)		1,711.4	1,921.2	2,153.4	2,542.1	2,636.3	3,058.3	3,497.8
Generating Cost at sending end (mills/kWh)				61.5	53.5	48.7	48.6	42.4	42.4	42.3

Note : Bunker C Oil : 240 gr/kWh Lubricating Oil : 4 gr/kWh Diesel Oil : US$112.4/ton
Diesel Oil : 236 gr/kWh Bunker C Oil : US$54.5/ton D : Diesel Oil C : Bunker C Oil

APPENDIX

A-4 Hydro Power Plants to be Installed in and after 1985.

Table A-4

Fig. A-4

A-4 Hydroelectric Power Project after 1985

A-4-1 Hydroelectric Power Projects under Study

INECEL has been proceeding with investigations on nine sites in order to study the technical and economic feasibilities of hydrolectric porjects which should be developed in the future. The states of the major projects studied are as described below.

(1) Paute Hydroelectric Project, Second Stage, 500 MW

The Second Stage of the Project is included in the feasibility study for Paute Project as a whole, and is the expansion work to follow the First Stage of the Project.

(2) Toachi Hydroelectric Project, 350 MW

The feasibility study for the Project was completed in September 1974, and site investigations to perform the detail design of the Project are presently being carried out.

(3) Montufar Hydroelectric Project, 150 MW

A feasibility study for the Project was finished in 1974, and additional investigation work is being carried out on the damsite.

(4) Coca Hydroelectric Project, 3,200 MW

A feasibility study is scheduled to be carried out soon for this project. A loan from IDB is already definite in regard to the funds necessary for the study.

(5) Jubones Hydroelectric Project (Comprehensive Development), 380 MW

A feasibility study on the Project is presently being conducted jointly with INERHI.

(6) Chimbo-Pangor Hydroelectric Project, 419 MW

A feasibility study is scheduled to be started soon for this project. The consulting firm has already been selected.

(7) Zamora-Sabanilla Hydroelectric Project, 325 MW

A prefeasibility study on the Project has already been completed and a feasibility study is scheduled to be started soon.

(8) Guayllabamba Hydroelectric Project, 740 MW

A preliminary study is presently being conducted for the Project.

Preparation of basic data and geological surveys are mainly being carried out.

In connection with the projects listed above, studies are presently being carried out on (1) to (5) under contracts by foreign consulting firms. Therefore, the Mission examined the three sites of (6) to (8), namely, Chimbo-Pangor, Guayllabamba, and Zamora-Sabanilla which are at the preliminary study stage. The results of the examinations are described below.

A-4-2 Projects Studied by the Mission

(1) Zamora-Sabanilla Hydroelectric Project

This project would be for construction of hydroelectric power stations on the Rio Zamora located 45 km northeast to the city of Loja, which has a V-shaped valley and a swift stream of an annual average discharge of 48.8 m^3/sec. The swift part of the river is from the Loja Basin (El. 2,000 m) to an elevation of 980 m and the optimum plan will be to divide this head of 1,020 m into three steps and utilize then for electric power development. It will be possible to construct three power stations of 70 MW, 65 MW and 325 MW from the upstream side, while at the farthest downstream power station an additional 325 MW can be developed.

The particulars of the project are as indicated in Tables A-4- (2) to (6).

Of these power station sites, the No.1 site for 325 MW (First Stage) located farthest downstream will be the easiest to develop viewed from the conditions of location. The sites for both dam and power station of the No.1 project are located along an existing road going from Loja to Zamora, and it will be possible to develop 325 MW utilizing a maximum discharge of 60 m^3/sec, a tunnel of 9.6 km, a tailrace tunnel of 4 km, and head of 700 m.

The reservoir would have an effective storage capacity of 46 x 10^6 m^3, and judging by the discharge duration, it will be possible to regulate dry season discharge of 23.5 m^3/sec to an average of 29.3 m^3/sec. Further, if plant factor of 50% were to be assumed, the maximum discharge would be 60 m^3/sec.

The annual energy production of this power station would be 1,411.6 GWh of primary energy and 837.8 GWh of secondary energy for a total of 2,249.4 GWh. The funds required for construction would be 224 US million dollars amounting to unit cost of 689.2 US dollars per kW and 0.16 US dollars per kWh of primary energy. Taking the annual rate of the power station to be 12% of the construction cost, the energy cost will be 19.2 mills/kWh. This energy cost is low for the hydroelectric projects presently being studied in Ecuador, and this site will be the most promising when seekin a hydroelectric site in the southern part of Ecuador in the future.

In the event of development of the Rio Zamora at an early date as a supply capacity for the Sur System, it will be the most economical to utilize Sabanilla Project only and the scale in that case will be 32 MW. The construction cost would be 26.5 US million dollars which amounts to a unit cost of 0.095 US dollars per kWh

and the energy cost will be 11.4 mills/kWh. This power station can generate the 32 MW throughout the year and in case loads were to be met combined with a diesel thermal plant, this power station would carry the base load and the diesel plant would supply the peak load.

In order to proceed with development of the Second Stage of Zamora Project having capacity of 325 MW, it will be necessary for seasonal regulation with water storage upstream. For this purpose, a dam having height of 105 m should be constructed upstream of the reservoir of Zamora No.1 power station to provide effective storage of 280 x 10^6 m^3, of Zamora Power Station. Also, utilizing the head provided by this dam, it will be possible to construct a power station of 65 MW immediately downstream of the dam.

Table A-4-(1) Economic Comparison of Zamora, and Sabanilla Projects

	Zamora No. 1 1st stage	Sabanilla	Zamora No. 2	Zamora No. 1 2nd stage	Total
Installed capacity (MW)	325.0	32.0	65.0	325.0	747.0
Firm energy (GWh)	1,411.6	279.9	185.0	984.9	2,861.4
Construction cost (10^6 US$)	224.0	26.5	101.0	139.0	490.5
Construction cost per kW (US$)	689.2	828.1	1,553.8	427.7	656.6
Construction cost per kWh (US$)	0.159	0.095	0.546	0.141	0.171
Unit cost per kWh (US$) 1/	0.019	0.011	0.065	0.067	0.021

1/: Annual cost ratio 12%

Table A-4-(2) Zamora No. 1 Project (1st stage)

Location :	Zamora,Chinchipe
River :	Zamora
Type of power plant :	Dam-Waterway (Reservoir)
Installed capacity :	325.0 MW
Catchment area :	1,173.0 km^2
Annual average river inflow :	48.8 m^3/s
Total storage capacity :	65.0 x 10^6 m^3
Effective storage capacity :	46.0 x 10^6 m^3
Maximum discharge :	60.0 m^3/s
Total head :	700.0 m
Intake level :	1,680.0 m
Discharge level :	980.0 m
Effective head :	660.0 m
Annual generating energy :	2,249.4 GWh
Firm power :	159.9 MW
Firm energy :	1,411.6 GWh
Estimated construction cost :	US$ 224.0 x 10^6
Unit cost per kW :	US$ 689.2/kW
Unit cost per kWh :	US$ 0.10/kWh
Construction period :	66 months

Monthly river inflow

Month	Natural inflow (m^3/s)	Generating energy (GWh)
1	58.5	199.3
2	42.3	158.6
3	49.0	203.3
4	56.2	225.8
5	46.2	191.8
6	56.0	224.7
7	80.5	241.8
8	66.6	241.8
9	46.3	185.7
10	32.6	135.4
11	23.5	121.3
12	26.8	119.9
Total		2,249.4

Note: Montly energy was calculated in consideration of regulating effect by water reservoir.

Zamora No. 1 Project (1st stage)

(Principal characteristics and dimensions)

Dam
- Type : Rockfill
- Height : 150 m
- Crest length : 320 m
- Volume : 7 x 10^6 m^3
- Flood discharge : 1,860 m^3/s

High water level : 1,700 m
Low water level : 1,650 m
Available head : 50 m
Elevation on riverbed : 1,560 m
Dam crest/dam height = 2.13
Effective storage capacity : 46x$10^6$$m^3$
Duration capacity : 8.9 days
(Effective capacity/Max. discharge)

Intake Type :
Max. intake flow : 60 m^3/s

Tunnel

Pressure tunnel
- Length : 9,600 m
- Section : 5.0 m

Surge tank
- Type : restricted-orifice
- Height : 100 m
- Section : 10 m

Penstock
- Number of penstock : upper part 1, lower part 3
- Length : 1,000 m
- Total length : 1,300 m
- Section : 4.0 m to 1.7 m

Branch tunnel
Length : 5,100 m, Intake capacity : 20 m^3/s

Power house
- Type : Underground
- Number of generator : 3 units
- Dimension : Height : 43 m, Width : 24 m, Depth : 125 m (1st, 2nd stages)

Turbine
- Type : Pelton
- Output : 114 MW x 3 units

Generator
- Output : 120 MVA x 3 units

Switchyard
Transformer
- Voltage : 230 kV
- Capacity : 120 MVA x 3 units

Tailrace tunnel Type : Pressure tunnel
- Length : 4,000 m
- Section : 5.0 m

Table A-4-(3) Zamora No. 1 Project (2nd stage)

Location :	Zamora, Chinchipe
River :	Zamora
Type of power plant :	Dam-Waterway (Reservoir)
Installed capacity :	325.0 MW
Catchment area :	1,173.0 km^2
Annual average river inflow :	54.8 m^3/s
Total storage capacity :	65.0 x 10^6 m^3
Effective storage capacity :	46.0 x 10^6 m^3
Maximum discharge :	60.0 m^3/s
Total head :	700.0 m
Intake level :	1,680.0 m
Discharge level :	980.0 m
Effective head :	660.0 m
Annual generating energy :	147.1 GWh
Firm power :	113.4 MW
Firm energy :	981.5 GWh
Estimated construction cost :	US$ 139.0 x 10^6
Unit cost per kW :	US$ 427.7/kW
Unit cost per kWh :	US$ 0.141/kWh
Construction period :	60 months

Monthly river inflow and generating energy

Month	Natural inflow (m^3/s)	Generating energy (GWh)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
Total		

Note: Monthly energy was calculated in consideration of regulating effect by water reservoir.

Zamora No. 1 Project (2nd stage)

(Principal characteristics and dimensions)

Dam

Type : -

Height : -

Crest length : -

Volume : -

Flood discharge : -

High water level : 1,700 m

Low water level : 1,650 m

Available head : 50 m

Elevation on riverbed : 1,560 m

Dam crest/dam height = 2.13

Effective storage capacity: 46 $10^6 m^3$

Duration capacity 44 days
(Effective capacity/Max. discharge)

Intake Type :

Max. intake flow : 60 m^3/s

Tunnel

Pressure tunnel

Length : 9,600 m

Section : 5.0 m

Surge tank

Type : restricted-orifice

Height : 100 m

Section : 10 m

Penstock

Number of penstock :
upper part 1
lower part 3

Length : 1,000 m

Total length : 1,300 m

Section: 4.0 m to 1.7 m

Branch tunnel

Length : 5,100 m, Intake capacity : 20 m^3/s

Power house

Type : Underground

Number of generator : 3 units

Dimension: Height : 43 m
Width : 24 m
Depth : 125 m
(1st, 2nd stages)

Turbine

Type : Pelton

Output : 114 MW x 3 units

Generator

Output : 120 MW x 3 units

Switchyard

Transformer

Voltage : 230 kV

Capacity:
120 MVA
x 3 units

Tailrace tunnel Type : Pressure tunnel

Length : 4,000 m

Section : 5.0 m

Table A-4-(4) Zamora No. 2 Project

Location : Zamora, Chinchipe

River : Zamora

Type of power plant : Dam (Run-River)

Installed capacity : 65.0 MW

Catchment area : 890.0 km^2

Annual average river inflow : 32.8 m^3/s

Total storage capacity : 462.0 x 10^6 m^3

Effective storage capacity : 280.0 x 10^6 m^3

Maximum discharge : 100.0 m^3/s

Total head : 80.0 m

Intake level : 1,790.0 m

Discharge level : 1,710.0 m

Effective head : 76.0 m

Annual generating energy : 185.0 GWh

Firm energy : 128. GWh

Estimated construction cost : US$ 101.0 x 10^6

Unit cost per kW : US$ 1,553.8/kW

Unit cost per kWh : US$ 0.546/kWh

Construction period : 66 months

Monthly river inflow and generating energy

Month	Natural inflow (m^3/s)	Generating energy (GWh)
1	34.8	12.1
2	30.5	14.4
3	32.4	14.7
4	34.5	13.1
5	31.6	15.5
6	35.0	13.5
7	43.3	10.9
8	40.4	13.8
9	31.5	16.8
10	27.7	20.0
11	25.2	20.8
12	25.9	19.4
Total		185.0

Note: Monthly energy was calculated in consideration of regulating effect by water reservoir.

Zamora No. 2 Project

(Principal characteristics and dimensions)

Dam

Type : Rockfill

Height : 105 m

Crest length : 390 m

Volume : 6.2×10^6 m^3

Flood discharge : 1,260 m^3/s

High water level : 1,800 m

Low water level : 1,760 m

Available head : 40 m

Elevation on riverbed : 1,710 m

Dam crest/dam height = 3.71

Effective storage capacity: 280×10^6 m^3

Duration capacity : 32.4 days
(Effective capacity/Max. discharge)

Intake Type :

Max. intake flow : 100 m^3/s

Tunnel

Pressure tunnel

Length : 500 m

Section : 5.7 m

Surge tank

Type : restricted-orifice

Height : 65 m

Section : 10 m

Penstock

Number of penstock : 1

Length : 150 m

Total length : 150 m

Section : 5.7 m to 3.8 m

Branch tunnel

Length : – m, Intake capacity : – m^3/s

Power house

Type : Half underground

Number of generator : 1 unit

Dimension: Height : 32 m
Width : 25 m
Depth : 30 m

Turbine

Type : Francis

Output : 68.4 MW x 1 unit

Generator

Output : 72.2 MVA x 1 unit

Switchyard

Transformer

Voltage : 230 kV

Capacity : 72.2 MVA x 1 unit

Tailrace tunnel Type : –

Length : – m

Section : –

Table A-4-(5) Zamora No. 3 Project

Location : Zamora, Chinchipe

River : Zamora

Type of power plant : Dam-Waterway (Reservoir)

Installed capacity : 70.0 MW

Catchment area : 561.0 km^2

Annual average river inflow : 17.2 m^3/s

Total storage capacity : 241.0 x 10^6 m^3

Effective storage capacity : 165.0 x 10^6 m^3

Maximum discharge : 50.0 m^3/s

Total head : 190.0 m

Intake level : 1,990.0 m

Discharge level : 1,800.0 m

Effective head : 170.0 m

Annual generating energy : 215.3 GWh

Firm power : 23.1 MW

Firm energy : 204.7 GWh

Estimated construction cost : US$ 146.6 x 106

Unit cost per kW : US$ 2,094.3/kW

Unit cost per kWh : US$ 0.681/kWh

Construction period : 60 months

Monthly river inflow and generating evergy

Month	Natural inflow (m^3/s)	Generating energy (GWh)
1	19.7	17.7
2	14.9	16.1
3	17.1	17.7
4	19.3	17.2
5	16.2	17.8
6	19.9	17.3
7	29.0	18.2
8	23.2	21.2
9	16.0	18.0
10	11.9	18.5
11	9.1	17.7
12	9.9	17.9
Total		215.3

Note: Monthly energy was calculated in consideration of regulating effect by water reservoir.

Zamora No. 3 Project

(Principal characteristics and dimensions)

Dam

Type : Rockfill

Height : 140 m

Crest length : 380 m

Volume : 10 x 10^6 m^3

Flood discharge : 670 m^3/s

High water level : 2,000 m

Low water level : 1,960 m

Available head : 40 m

Elevation on riverbed : 1,880 m

Dam crest/dam height = 2.71

Effective storage capacity : 165 $10^6 m^3$

Duration capacity 38.2 days
(Effective capacity/Max. discharge)

Intake Type :

Max. intake flow : 50 m^3/s

Tunnel

Pressure tunnel

Length : 5,300 m

Section : 4.0 m

Surge tank

Type : restricted-orifice

Height : 80 m

Section: 8 m

Penstock

Number of penstock : 1

Length : 360 m

Total length : 360 m

Section : 4.0 m to 2.7 m

Branch tunnel

Length : – m, Intake capacity : – m^3/s

Power house

Type : Underground

Number of generator : 1 unit

Dimension: Height : 40 m
Width : 20 m
Depth : 35 m

Turbine

Type : Francis

Output : 73.7 MW x 1 unit

Generator

Output : 77.8 MVA x 1 unit

Switchyard

Transformer

Voltage : 230 kV

Capacity : 77.8 MVA x 1 unit

Tailrace tunnel Type : Pressure tunnel

Length : 100 m

Section : 4.0 m

Table A-4-(6) Sabanilla Project

Location : Zamora,Chinchipe

River : Sabanilla

Type of power plant : Water way (Run-of-River)

Installed capacity : 32.0 MW

Catchment area:: 137.0 km^2

Annual average river inflow : 14.1 m^3/s

Total storage capacity : -

Effective storage capacity : -

Maximum discharge : 6.0 m^3/s

Total head : 700.0 m

Intake level : 1,740.0 m

Discharge level : 1,040.0 m

Effective head : 660.0 m

Annual generating energy : 279.9 GWh

Firm power : 31.7 MW

Firm energy : 277.7 GWh

Estimated construction cost : US$ 26.5 x 10^6

Unit cost per kW : US$ 828.1/kW

Unit cost per kWh : US$ 0.095/kWh

Construction period : 36 months

Monthly river inflow and generating energy

Month	Natural inflow (m^3/s)	Generating energy (GWh)
1	18.9	23.8
2	12.7	21.5
3	14.4	23.8
4	16.3	23.0
5	13.8	23.8
6	15.1	23.0
7	18.5	23.8
8	17.6	23.8
9	14.1	23.0
10	10.4	23.8
11	7.7	23.8
12	9.2	23.8
Total		279.9

Note: Monthly energy was calculated in consideration of regulating effect by water reservoir.

(Principal characteristics and dimensions)

Dam
- Type : –
- Height : –
- Crest length : –
- Volume : –
- Flood discharge : –

High water level : –
Low water level : –
Available head : –
Elevation on riverbed : –
Dam crest/dam height –
Effective storage capacity : –
Duration capacity –
(Effective capacity/Max. discharge)

Intake Type :
Max. intake flow : 6.0 m^3/s

Tunnel

Non-Pressure tunnel
- Length : 5,000 m
- Section : 3.10 m

Surge tank
- Type : –
- Height : –
- Section: –

Penstock
- Number of penstock : 1
- Length : 1,850 m
- Total length : 1,850 m
- Section : 1.6 m to 1.0 m

Branch tunnel
- Length : –
- Intake capacity : –

Power house
- Type : Half underground
- Number of generator : 1 unit
- Dimension : Height : 25 m
  Width : 15 m
  Depth : 30 m

Turbine
- Type : Pelton
- Output : 33.7 MW x 1 unit

Generator
- Output : 35.6 MVA x 1 unit

Switchyard

Transformer
- Voltage : 230 kV
- Capacity : 35.6 MVA x 1 unit

Tailrace tunnel Type : –
- Length : –
- Section : –

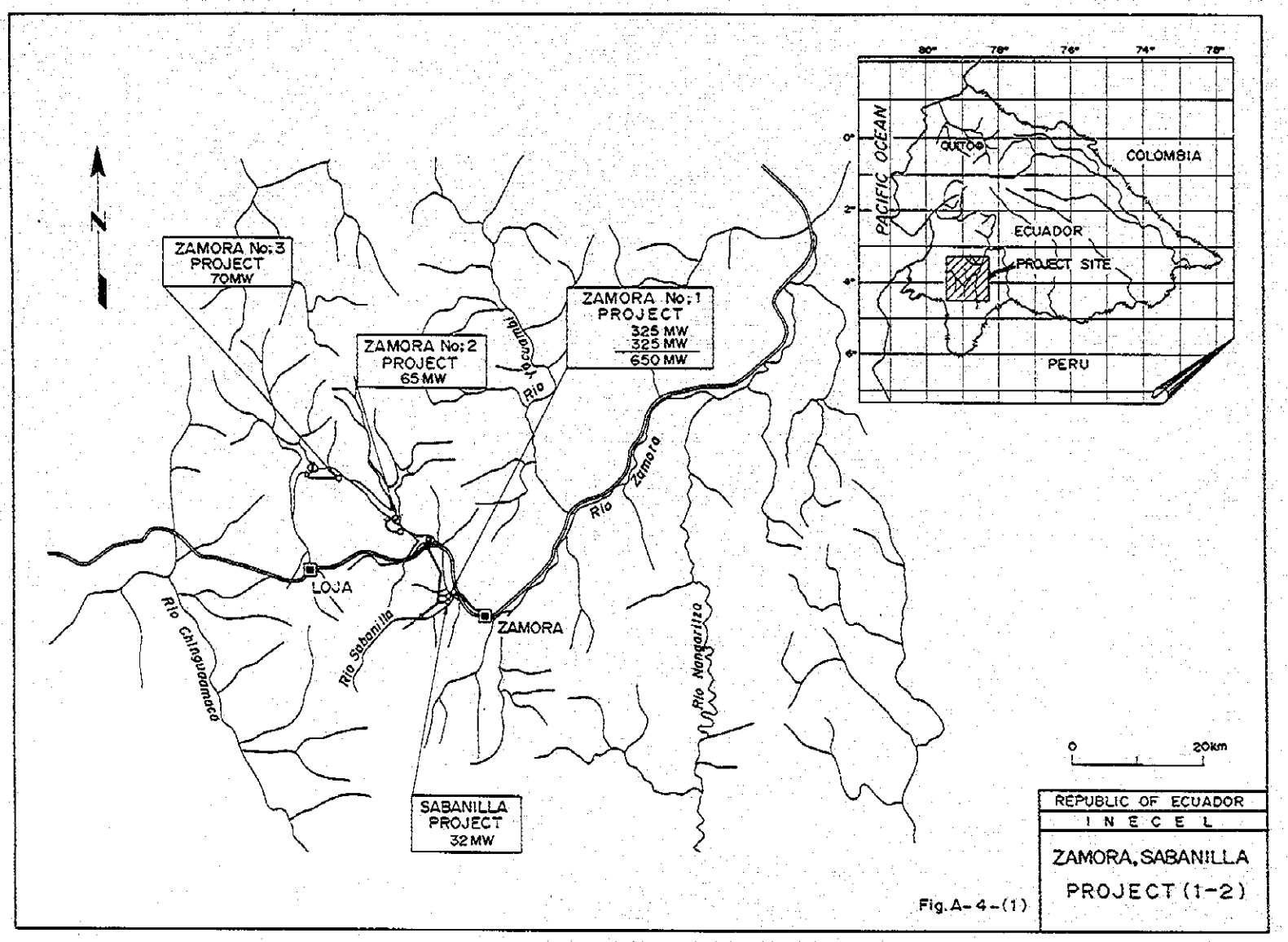

ZAMORA No:3
PROJECT
70MW
ZAMORA No:2
PROJECT
65MW
ZAMORA No:1
PROJECT
325 MW
325 MW
650 MW
SABANILLA
PROJECT
32MW
LOJA
ZAMORA
Río Zamora
Río Yacuambi
Río Chinguamaca
Río Sabanilla
Río Nangaritza
PACIFIC OCEAN
QUITO
COLOMBIA
ECUADOR
PROJECT SITE
PERU
80°
78°
76°
74°
72°
0°
2°
4°
6°
0
20km
REPUBLIC OF ECUADOR
I N E C E L
ZAMORA, SABANILLA
PROJECT (1-2)

Fig. A-4-(1)

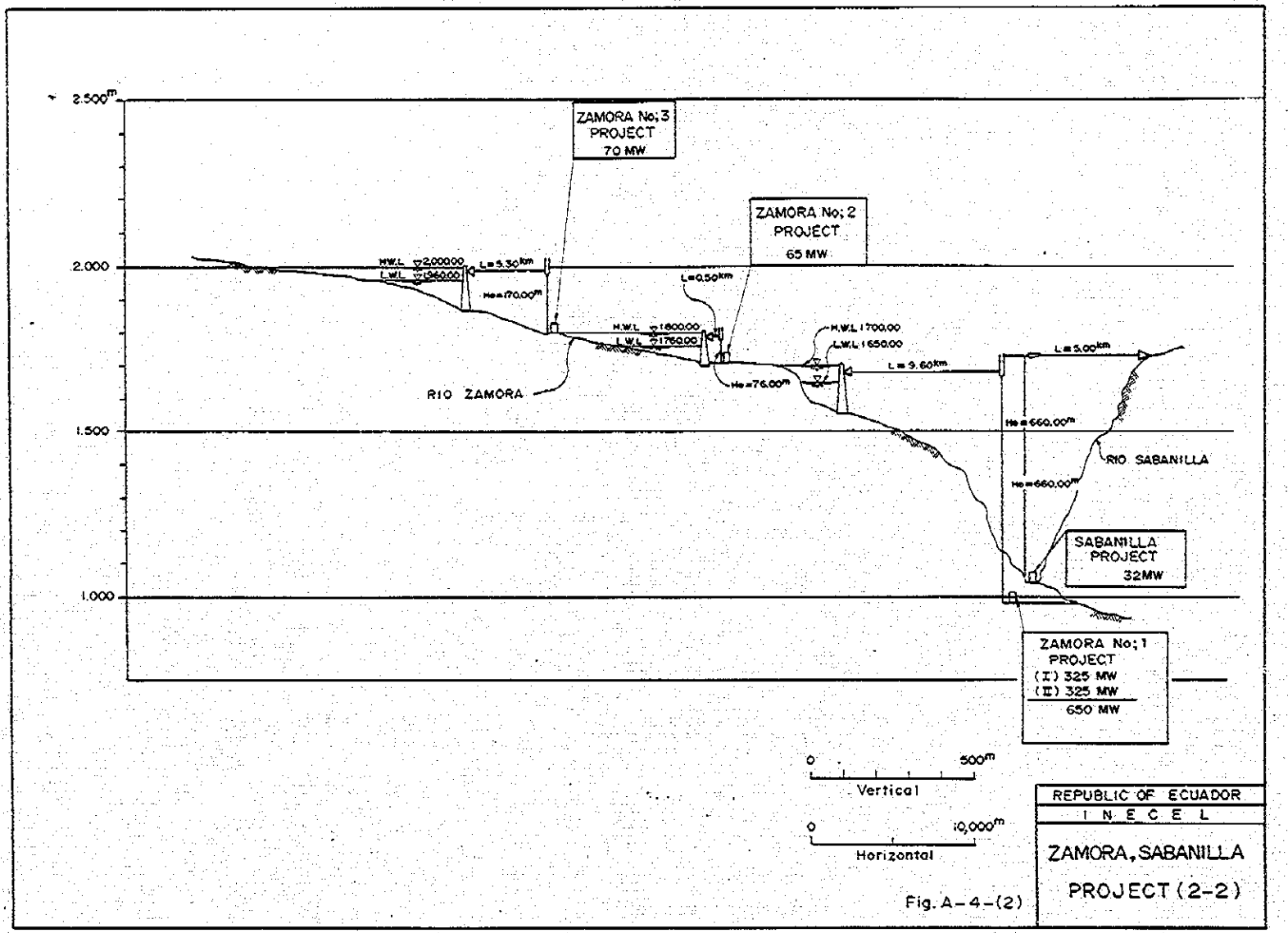
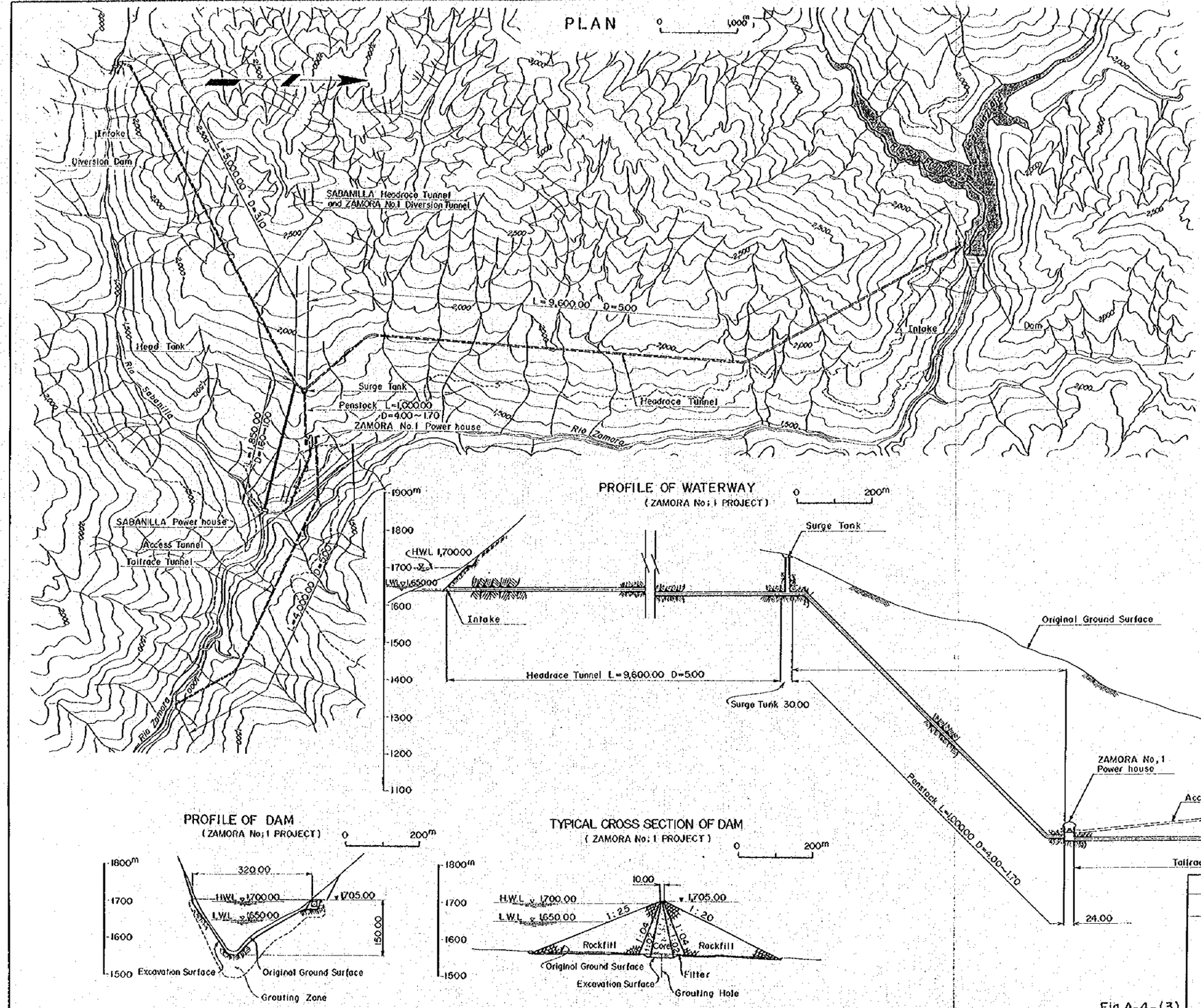
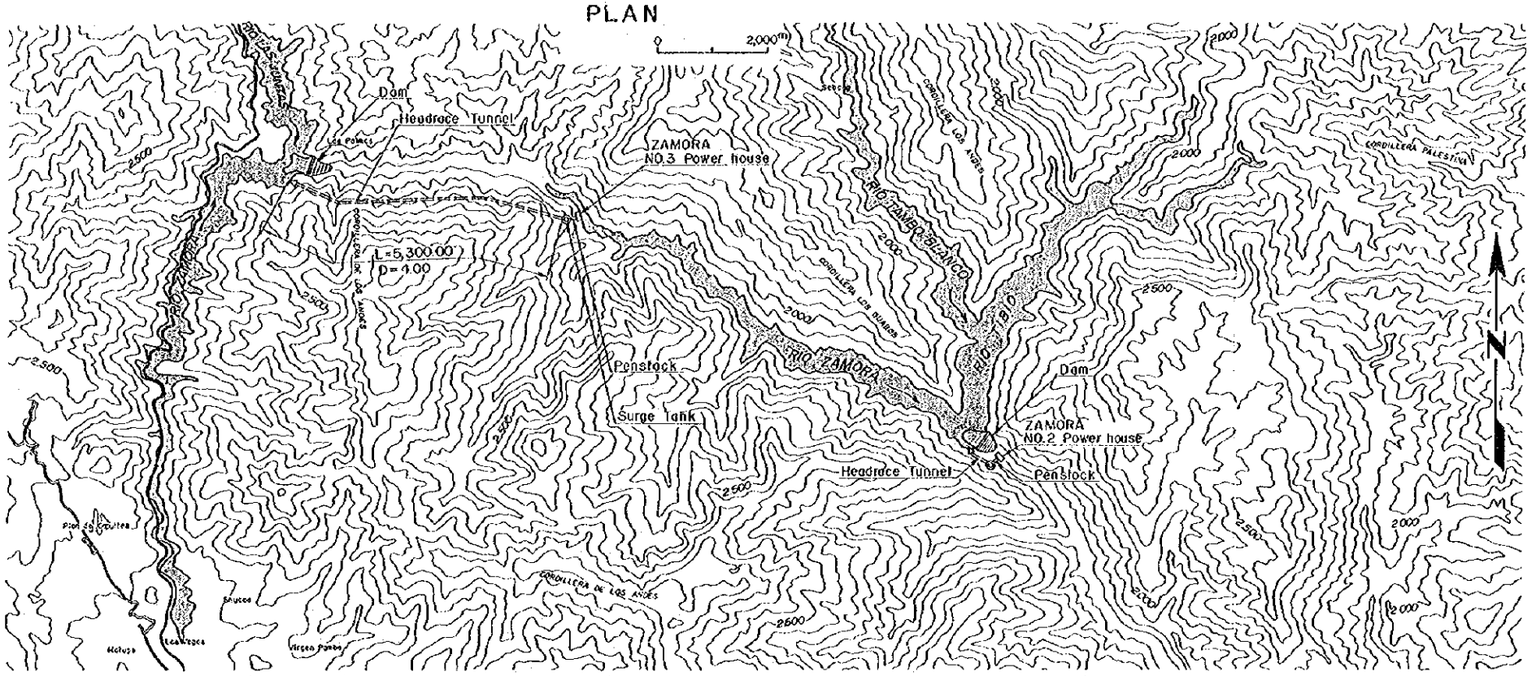

2.500m
2.000
1.500
1.000
ZAMORA No; 3
PROJECT
70 MW
ZAMORA No; 2
PROJECT
65 MW
H.W.L ▽2.000.00
L.W.L ▽1960.00
L=5.30km
He=170.00m
L=0.50km
H.W.L ▽1800.00
L.W.L ▽1760.00
RIO ZAMORA
H.W.L 1700.00
L.W.L 1650.00
L=9.60km
He=76.00m
L=3.00km
He=660.00m
He=660.00m
RIO SABANILLA
SABANILLA
PROJECT
32MW
ZAMORA No; 1
PROJECT
(I) 325 MW
(II) 325 MW
650 MW
0
500m
Vertical
0
10,000m
Horizontal
REPUBLIC OF ECUADOR
I N E C E L
ZAMORA, SABANILLA
PROJECT (2-2)

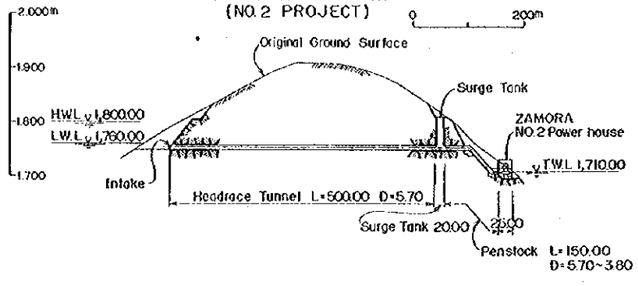
Fig. A-4-(2)


PLAN
0 1000m
Intake
Diversion Dam
L=5,000.00 D=3.10
SABANILLA Headrace Tunnel
and ZAMORA No.1 Diversion Tunnel
L=9,600.00 D=5.00
Intake
Dam
Head Tank
Rio Sabanilla
Surge Tank
Penstock L=1,000.00
D=4.00~1.70
ZAMORA No.1 Power house
Headrace Tunnel
Rio Zamora
L=1,850.00
D=1.60~1.00
SABANILLA Power house
Access Tunnel
Tailrace Tunnel
L=4,000.00 D=5.00
Rio Zamora
PROFILE OF WATERWAY
(ZAMORA No; 1 PROJECT)
0 200m
1900m
1800
1700
1600
1500
1400
1300
1200
1100
HWL 1,700.00
LWL 1,650.00
Intake
Surge Tank
Headrace Tunnel L=9,600.00 D=5.00
Surge Tank 30.00
Original Ground Surface
Penstock L=1,000.00 D=4.00~1.70
ZAMORA No.1
Power house
Access Tunnel
Outlet
TWL 98.00
Tailrace Tunnel L=4,000m D=5.00
24.00
PROFILE OF DAM
(ZAMORA No;1 PROJECT)
0 200m
1800m
1700
1600
1500
320.00
HWL 1700.00
LWL 1650.00
1705.00
150.00
Excavation Surface
Original Ground Surface
Grouting Zone
TYPICAL CROSS SECTION OF DAM
(ZAMORA No;1 PROJECT)
0 200m
1800m
1700
1600
1500
10.00
H.W.L 1700.00
L.W.L 1650.00
1705.00
1:2.5
1:2.0
1:2.0
Rockfill
Core
Rockfill
Original Ground Surface
Excavation Surface
Filter
Grouting Hole
REPUBLIC OF ECUADOR
INECEL
HYDRO — ELECTRIC
POWER PROJECT
ZAMORA NO; 1
Fig.A-4-(3)

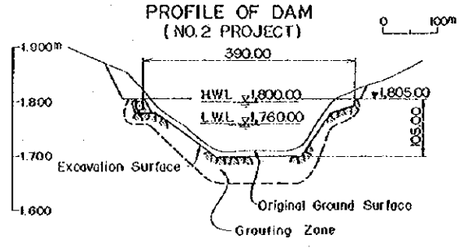
PLAN



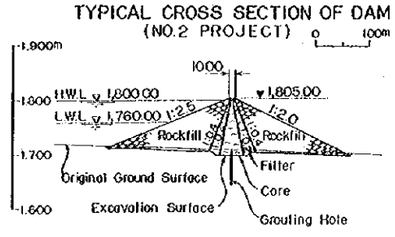
PROFILE OF WATERWAY (NO.2 PROJECT)



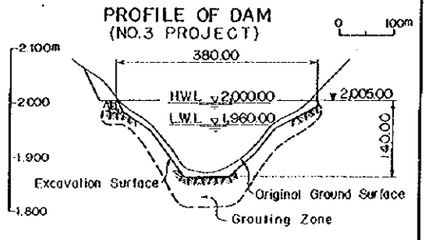
PROFILE OF DAM (NO.2 PROJECT)



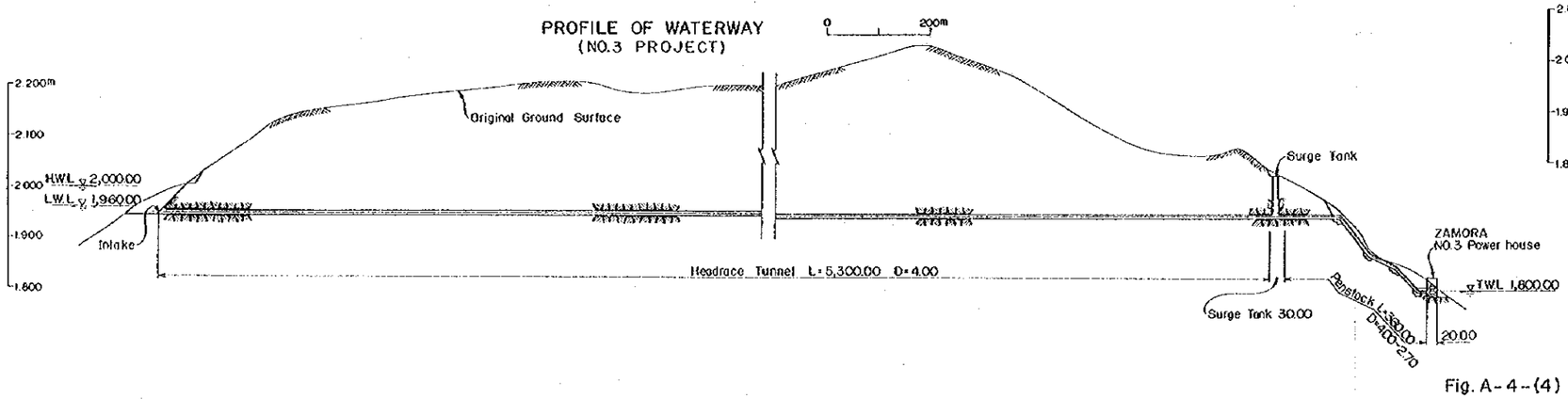
TYPICAL CROSS SECTION OF DAM (NO.2 PROJECT)



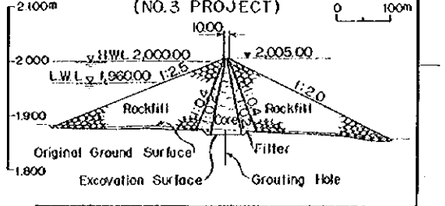
PROFILE OF DAM (NO.3 PROJECT)



PROFILE OF WATERWAY (NO.3 PROJECT)



TYPICAL CROSS SECTION OF DAM (NO.3 PROJECT)



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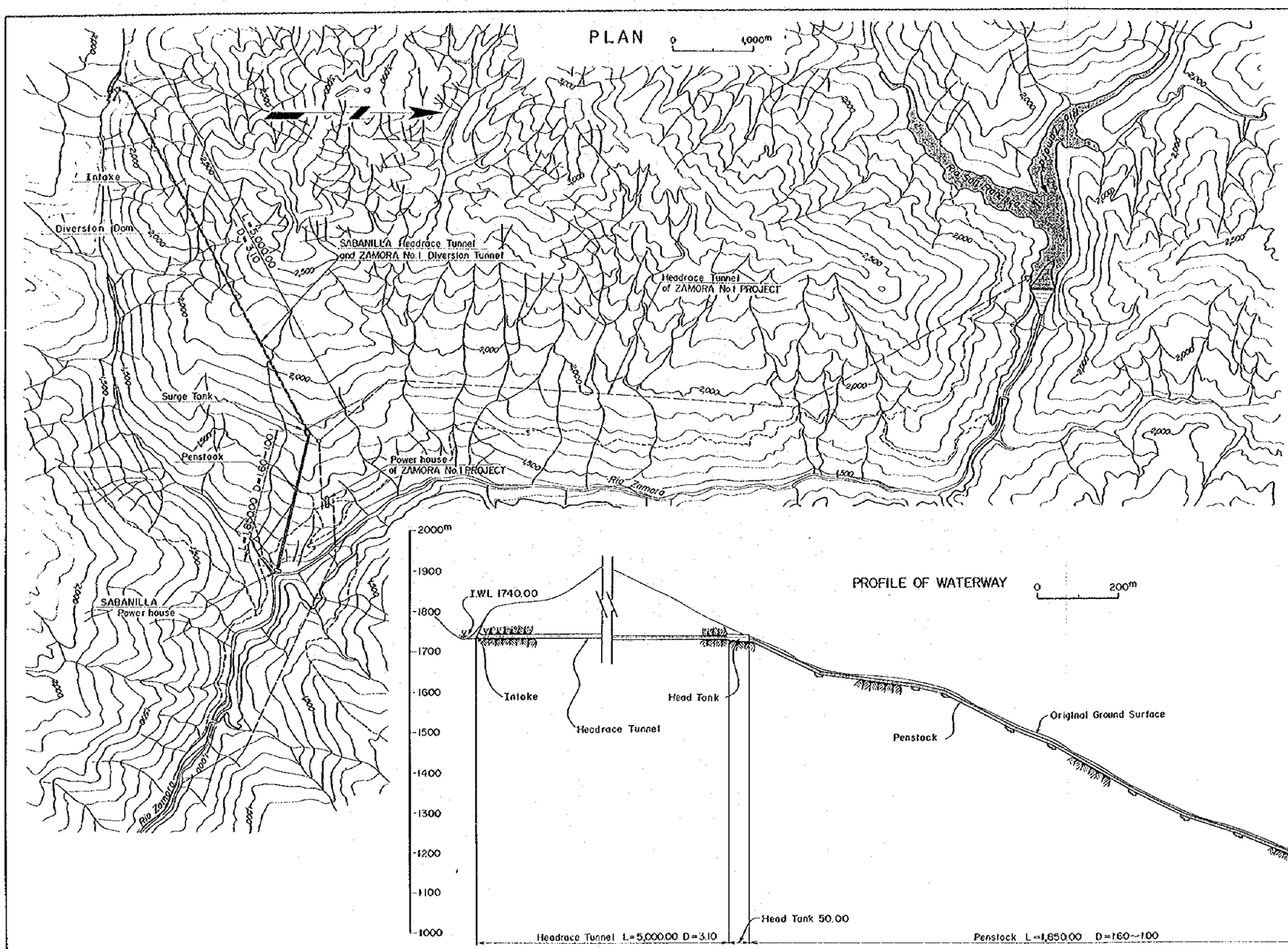
HYDRO — ELECTRIC POWER PROJECT

ZAMORA NO;2, NO;3

Fig. A-4-(4)



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HYDRO — ELECTRIC POWER PROJECT

SABANILLA

Fig. A-4-(5)

(2) Guayllabamba Hydroelectric Project

This project would be for construction of power stations on the midstream part of the Rio Guayllabamba located 50 km northwest of Quito, Pichincha Province.

It will be optimum for this river to be developed in three steps utilizing the head of 880 m (EL. 1,550m to 670m) from the confluence of the Rio Guayllabamba mainstream and the tributary Rio Perlabi to the Rio Intag. In this case, it will be possible to develop No.1 Power Plant, 420 MW, No.2 Power Plant, 100 MW and No.3 Power Plant, 220 MW in order from the upstream side for a total of 740 MW.

The particulars of the project are as indicated in Tables A-4-(7) to A-4- (10).

The No.1 power station farthest upstream in the three-stepped development would have a dam of 185 m, a main tunnel of 7.4 km, providing a head of 565 m and making possible generation of 420 MW with maximum discharge of 100 m^3/sec. The effective storage capacity provided by the dam would be 149 x 10^6 m^3 making possible annual energy production of 1,883.5 GWh. Construction funds required for the project would be 338 US million dollars amounting to a unit cost of 804.8 US dollars per kW, 0.178 US dollars per kWh and energy cost of 22.0 mills/kWh.

This is a large-scale, moreover highly economical project which can be developed in the northern part of Ecuador, and being close to the load center of Quito, it is looked forward to being developed at an early date similarly to Paute Hydroelectric Project.

The No.2 power station would use water discharged from the No.1 power station and obtaining a head of 130 m conducting this water with a tunnel of 4.1 km it will be possible for power generation of 100 MW.

The No.3 power station would consist of constructing a dam of 140 m immediately downstream of the junction of the mainstream and the Rio Alambi and a powerhouse immediately downstream of the dam to provide a maximum discharge of 240 m^3/sec for a power station of maximum output of 220 MW. The annual energy production of this No.3 power station woudl be 889.4 GWh while the construction cost would be 184 US million dollars. The unit costs would be 836.4 US dollars per kW and 0.207 US dollars per kWh and the energy cost is 24.8 mills/kWh.

There will be 740 MW of electric power which can be obtained from these three sites, the required construction cost will be 582 US million dollars, and the energy production will be 3,204.5 GWh. The overall generating cost would be 786.5 US dollars per kW and 0.182 US dollars per kWh and the energy cost will be 21.8 mills/kWh, provided that the annual rate of power station is 12 % of the construction cost.

Table A-4-(7) Economic Comparison of Guayllabamba Projects

	Guayllabamba No. 1	Guayllabamba No. 2	Guayllabamba No. 3	Total
Installed capacity (MW)	420.0	100.0	220.0	740.0
Firm energy (GWh)	1,435.0	340.9	606.2	2,382.1
Construction cost (10^6 US $)	338.0	60.0	184.0	582.0
Construction cost per kW (US $)	804.8	600.0	836.4	786.5
Construction cost per kWh (US $)	0.179	0.139	0.207	0.182
Unit cost per kWh (US $) 1/	0.021	0.017	0.025	0.022

1/ : Annual cost ratio 12%

Table A-4-(8) Guayllabamba No. 1 Project

Location :	Pichincha, Imbabura
River :	Guayllabamba
Type of power plant :	Dam-Waterway (Reservoir)
Installed capacity :	420.0 MW
Catchment area :	4,295.0 km^2
Annual storage capacity :	49.5 m^3/s
Total storage capacity :	214.0 x 10^6 m^3
Effective storage capacity :	149.0 x 10^6 m^3
Maximum discharge :	100.0 m^3/s
Total head :	565.0 m
Intake level :	1,535.0 m
Discharge level :	970.0 m
Effective head :	520.0 m
Annual generating energy :	1,883.5 GWh
Firm power :	163.8 MW
Firm energy :	1,435.0 GWh
Estimated construction cost :	US$ 338.0 x 10^6
Unit cost per kW :	US$ 804.8/kW
Unit cost per kWh :	0.179/kWh
Construction period :	72 months

Monthly river inflow and generating energy

Month	Natural inflow (m^3/s)	Generating energy (GWh)
1	47.9	162.1
2	61.6	176.1
3	62.6	192.9
4	67.9	189.8
5	57.7	193.3
6	48.2	154.7
7	40.2	134.7
8	36.1	135.4
9	31.9	123.0
10	41.3	124.9
11	54.6	150.6
12	45.5	146.0
Total		1,883.5

Note: Monthly energy was calculated in consideration of regulating effect by water reservoir.

Guayllabamba No. 1 Project

(Principal characteristics and dimensions)

Dam

Type : Rockfill

Height : 185 m

Crest length : 420 m

Volume : 12×10^6 m^3

Flood discharge : 5,200 m^3/s

High water level : 1,550 m

Low water level : 1,500 m

Available head : 50 m

Elevation on riverbed : 1,380 m

Dam crest/dam height = 420/185 = 2.27

Effective storage capacity : 149×10^6 m^3

Duration capacity 17.2 days
(Effective capacity/Max. discharge)

Intake Type :

Max. intake flow : 100 m^3/s

Tunnel

Pressure tunnel

Length : 7,500 m

Section : 5.0 m

Surge tank

Type : restricted-orifice

Height : 105 m

Section: 10 m

Penstock

Number of penstock :
upper part 2
lower part 4

Length : 800 m

Total length : 1,720 m

Section : 3.5 m to 1.8 m

Branch tunnel

Length : –

Intake capacity : –

Power house

Type : Underground

Number of generator : 4 units

Dimension : Height : 43 m
Width : 24 m
Depth ;: 92 m

Turbine

Type : Pelton

Output : 111 MW
x 4 units

Generator

Output : 117 MVA
x 4 units

Switchyard

Transformer

Voltage : 230 kV

Capacity :
117 kVA
x 4 units

Tailrace tunnel Type : Pressure tunnel

Length : 190 m

Section : 5.0 m

Table A-4-(9) Guayllabamba No. 2 Project

Location : Pichincha, Imbabura

River : Guayllabamba

Type of power plant : Waterway (Run-of -River)

Installed capacity : 100.0 MW

Catchment area : 4,295.0 km^2

Annual average river inflow : 49.5 m^3/s

Total average capacity : –

Effective storage capacity : –

Maximum discharge : 100.0 m^3/s

Total head : 130.0 m

Intake level : 970.0 m

Discharge level : 840.0 m

Effective head : 120.0 m

Annual generating energy : 431.6 GWh

Firm power : 38.9 MW

Firm energy : 340.9 GWh

Estimated construction cost : US$60.0 x 10^6

Unit cost per kW : US$600.0/kW

Unit cost per kWh : US$0.139/kWh

Construction period : 48 months

Monthly river inflow and generating energy

Month	Natural inflow (m^3/s)	Generating energy (GWh)
1	47.9	37.2
2	61.6	40.7
3	62.6	44.1
4	67.9	43.3
5	57.7	43.9
6	48.2	35.2
7	40.2	30.7
8	36.1	31.0
9	31.9	28.4
10	41.3	29.0
11	54.6	34.6
12	45.5	33.5
Total		431.6

Note: Monthly energy was calculated in consideration of regulating effect by water reservoir.

Guayllabamba No. 2 Project

(Principal characteristics and dimensions)

Dam

Type : –

Height : –

Crest length : –

Volume : –

Flood discharge : –

High water level : –

Low water level : –

Available head : –

Elevation on riverbed : –

Dam crest/dam height = –

Effective storage capacity : –

Duration capacity –
(Effective capacity/Max. discharge)

Intake Type :

Max. intake flow : 100 m^3/s

Tunnel

Pressure tunnel

Length : 4,200 m

Section : 5.7 m

Surge tank

Type : restricted-orifice

Height : 50 m

Section: 11 m

Penstock

Number of penstock : 1

Length : 220 m

Total length : 220 m

Section : 5.7 m to 3.7 m

Branch tunnel

Length : –

Intake capacity : –

Power house

Type : Half underground

Number of generator : 1 unit

Dimension : Height : 43 m
Width : 25 m
Depth : 50 m

Turbine

Type :

Output :

x 1 unit

Generator

Output : 111 MVA
x 1 unit

Switchyard

Transformer

Voltage : 230 kV

Capacity :
111 MVA
x 1 unit

Tailrace tunnel Type : –

Length : –

Section : –

Table A-4-(10) Guayllabamba No. 3 Project

Location : Pichincha, Imbabura

River : Guayllabamba

Type of power plant : Dam (Reservoir)

Installed capacity : 220.0 MW

Catchment area : 6,486.0 km^2

Annual average river inflow : 117.9 m^3/s

Total storage capacity : 200.0 x 10^6 m^3

Effective storage capacity : 148.0 x 10^6 m^3

Maximum discharge : 240.0 m^3/s

Total head : 115.0 m

Intake level : 785.0 m

Discharge level : 670.0 m

Effective head : 110.0 m

Annual generating energy : 889.4 GWh

Firm power : 69.2 MW

Firm energy : 606.2 GWh

Estimated construction cost : US$ 184.0 x 10^6

Unit cost per kW : US$ 836.4/kW

Unit cost per kWh : US$ 0.207/kWh

Construction period : 54 months

Monthly river inflow and generating energy

Month	Natural inflow (m^3/s)	Generating energy (GWh)
1	117.2	61.1
2	157.0	70.6
3	155.4	91.6
4	166.7	99.9
5	149.4	107.9
6	122.4	92.3
7	93.5	74.2
8	77.5	66.9
9	76.4	56.9
10	86.6	51.5
11	114.0	56.6
12	103.4	59.9
Total		889.4

Note: Monthly energy was calculated in consideration of regulating effect by water reservoir.

Guayllabamba No. 3 Project

(Principal characteristics and dimensions)

Dam

Type : Rockfill

Height : 145 m

Crest length : 270 m

Volume : 4.8×10^6 m^3

Flood discharge : 2,300 m^3/s

High water level : 800 m

Low water level : 750 m

Available head : 50 m

Elevation on riverbed : 670 m

Dam crest/dam height = 1.93

Effective storage capacity : 148×10^6 m^3

Duration capacity 7 days
(Effective capacity/Max. discharge)

Intake Type :

Max. intake flow : 240 m^3/s

Tunnel

Pressure tunnel

Length : —

Section : —

Surge tank

Type : —

Height : —

Section: —

Penstock

Number of penstock : 2

Length : 320 m

Total length : 640 m

Section : 5.5 m to 3.9 m

Branch tunnel

Length : 3,100 m, Intake capacity : 20 m^3/s

Power house

Type : Underground

Number of generator : 2 units

Dimension : Height : 43 m
Width : 25 m
Depth : 68 m

Turbine

Type : Francis
Output : 116 MW
x 2 units

Generator

Output : 122 MVA
x 2 units

Switchyard

Transformer

Voltage : 230 kV

Capacity :
122 MVA
x 2 units

Tailrace tunnel Type : Pressure tunnel

Length : 480 m 2

Section : 5.5 m

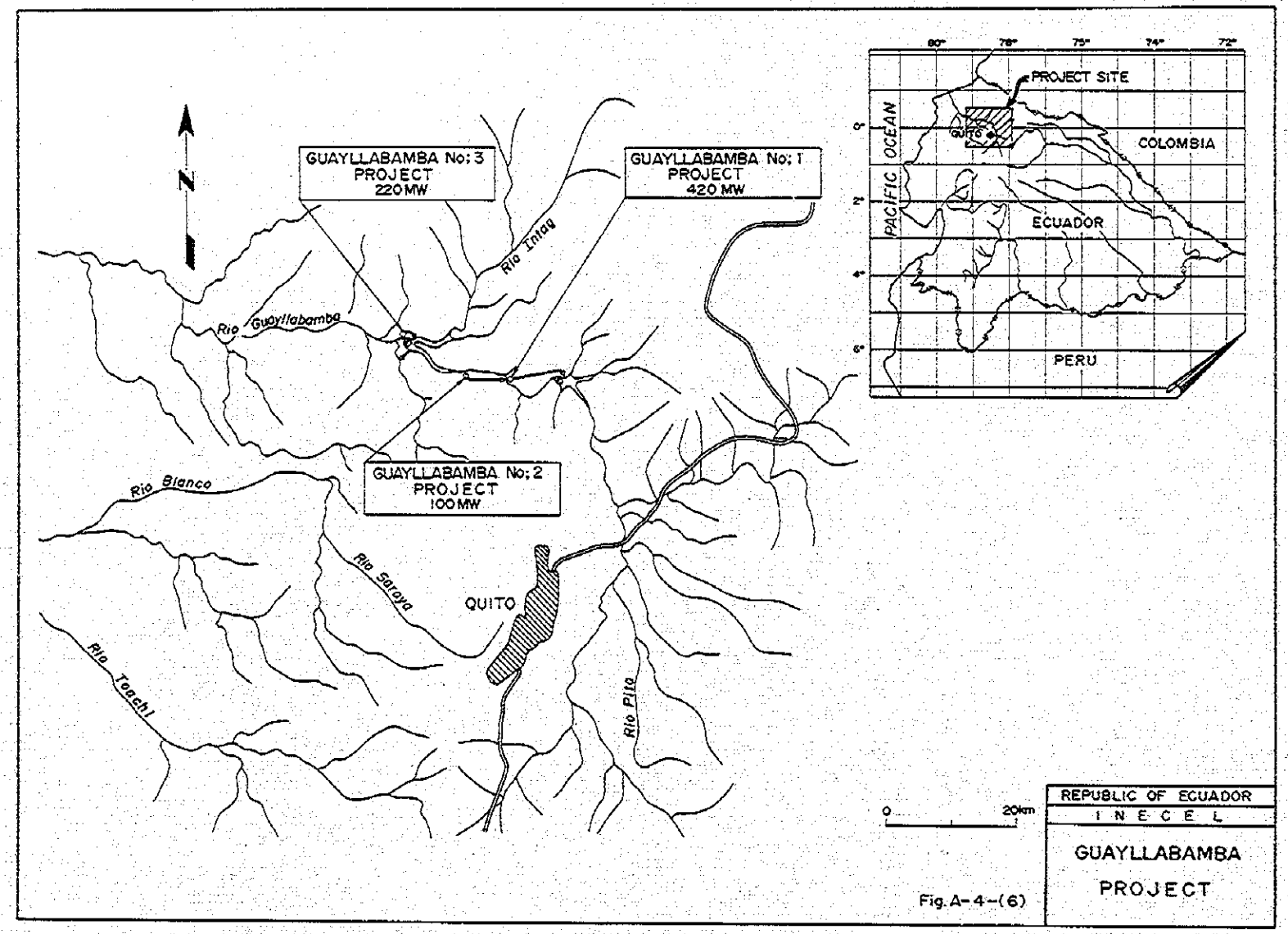

GUAYLLABAMBA No; 3
PROJECT
220 MW
GUAYLLABAMBA No; 1
PROJECT
420 MW
GUAYLLABAMBA No; 2
PROJECT
100 MW
N
Río Guayllabamba
Río Intag
Río Blanco
Río Saraya
Río Toachi
Río Pita
QUITO
PROJECT SITE
PACIFIC OCEAN
COLOMBIA
ECUADOR
PERU
80°
78°
75°
74°
72°
0
2°
4°
6°
0
20km
REPUBLIC OF ECUADOR
I N E C E L
GUAYLLABAMBA
PROJECT

Fig. A-4-(6)

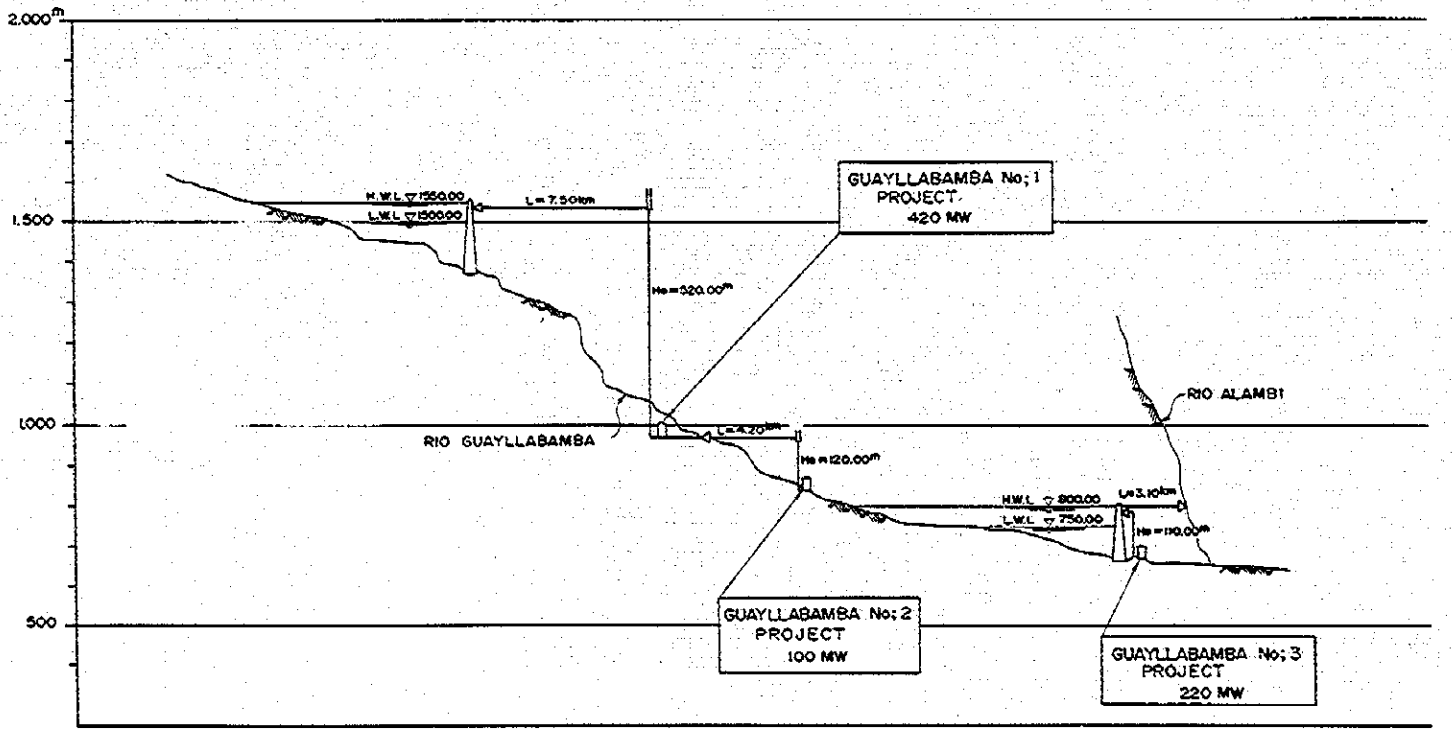
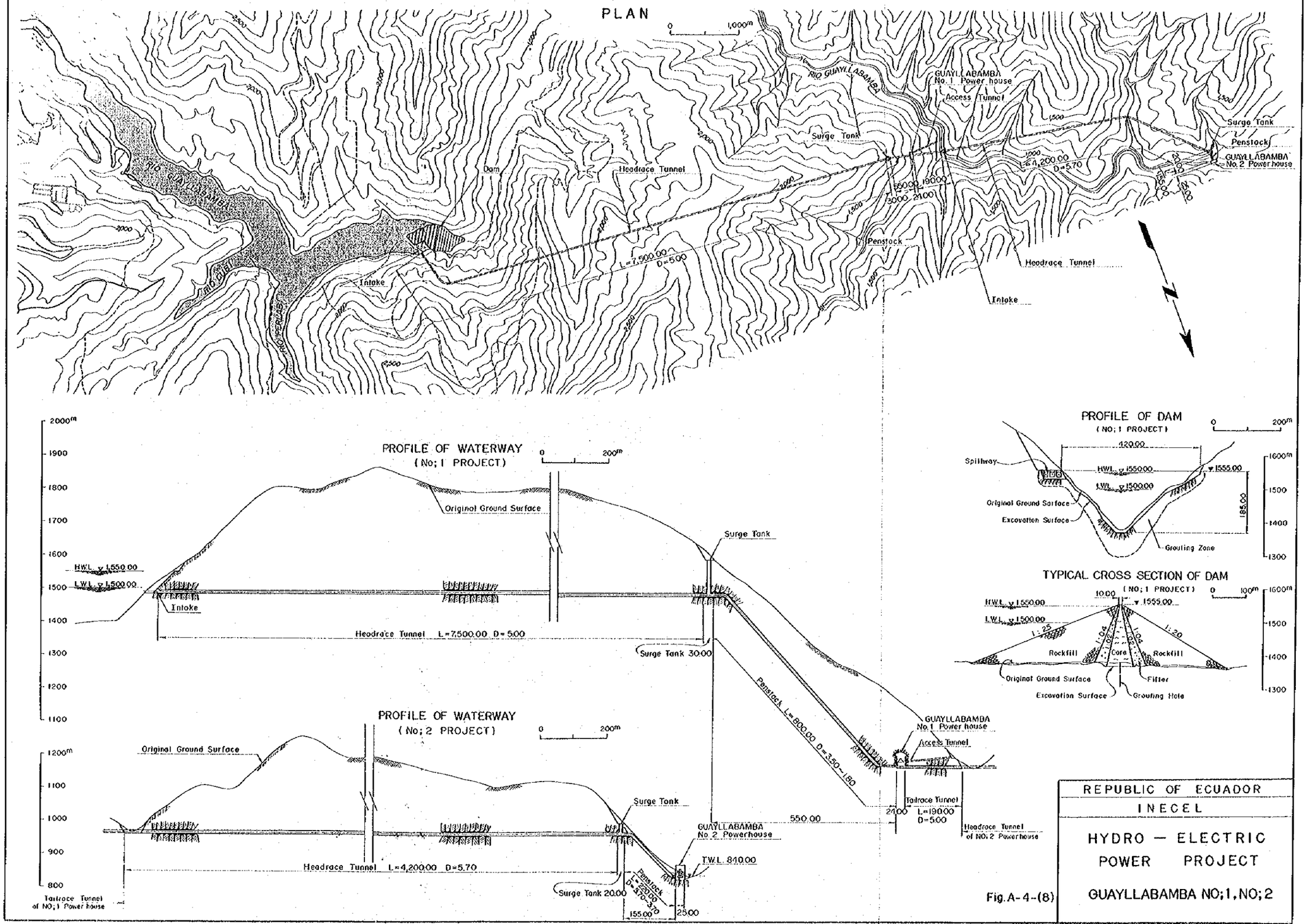


Fig. A-4-(7)

REPUBLIC OF ECUADOR
I N E C E L

GUAYLLABAMBA
PROJECT



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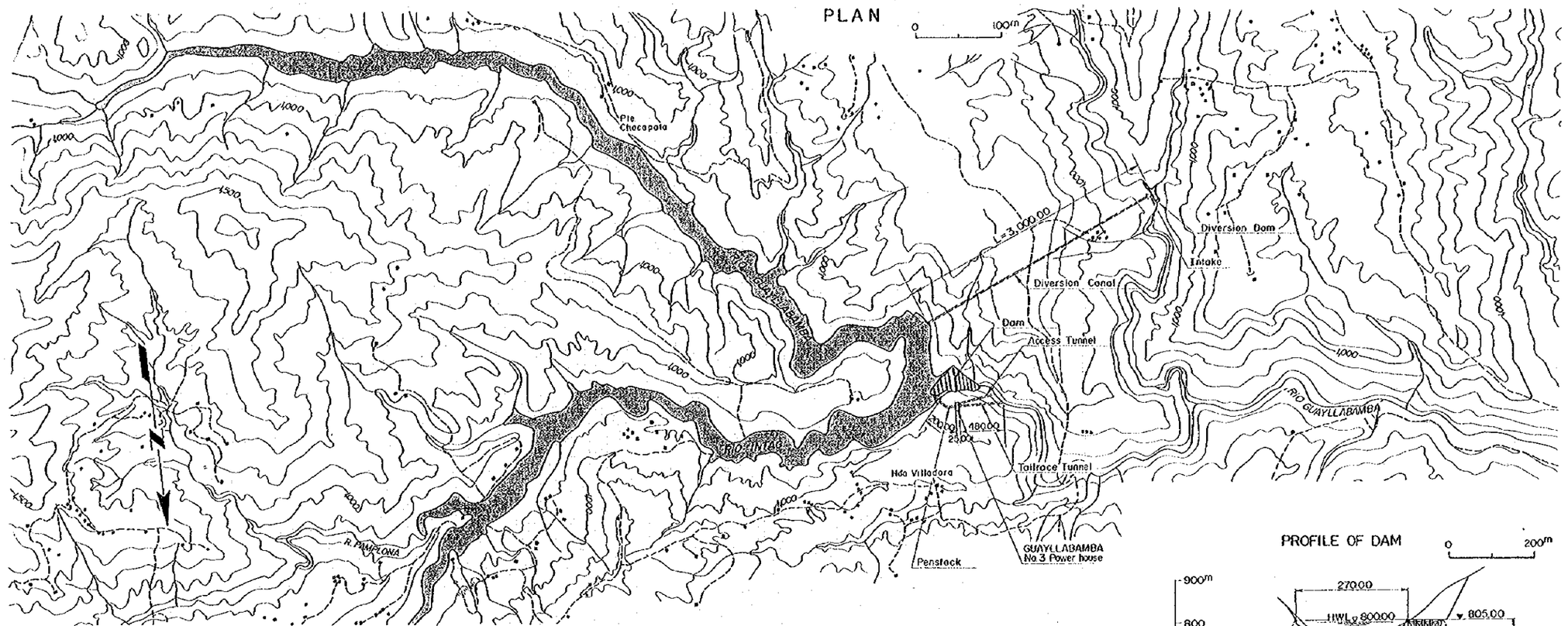
HYDRO — ELECTRIC POWER PROJECT

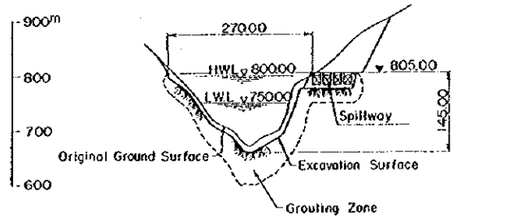
GUAYLLABAMBA NO;1, NO;2

Fig. A-4-(8)

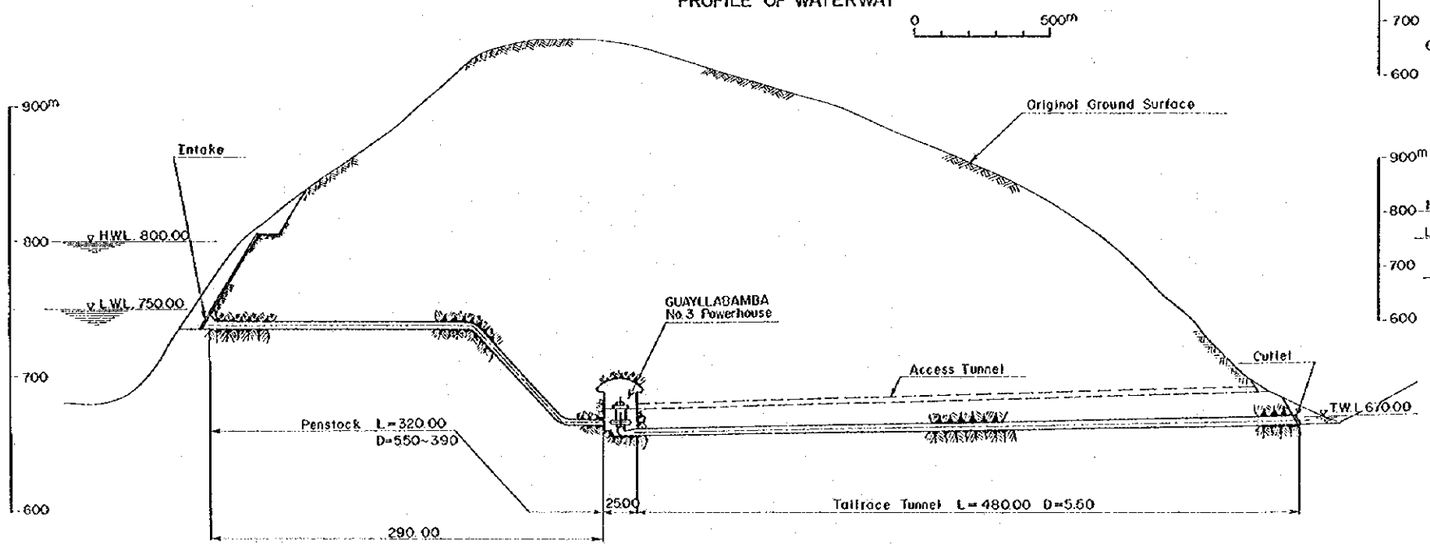
PLAN



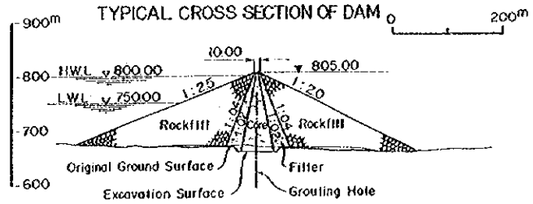
PROFILE OF DAM



PROFILE OF WATERWAY



TYPICAL CROSS SECTION OF DAM



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HYDRO — ELECTRIC POWER PROJECT

GUAYLLABAMBA NO; 3

Fig. A-4-(9)

(3) Chimbo-Pangor Hydroelectric Project

The Rio Chimbo has its fountain head on Mt. Chimborazo, flows south through the Western Andes, and joined by the tributary Rio Pangor, flows down through the Guayas Plain. In case of utlizing this river for hydroelectric power, there would be various development forms conceivable, but according to the results of field investigations it will be appropriate for the development form indicated in Table A-4-(11) to A-4-(15) to be adopted.

According to this development scheme, it will be possible to construct four power stations. Namely, with Chimbo No.1 Power Plant, it would be possible for generation of 61 MW through effective water storage of 114×10^6 m^3 by a dam of 155 m in the vicinity of San Miguel on the mainstream of the Rio Chimbo for seasonal regulation of runoff, maximum discharge of 15 m^3/sec, water conduction by a main tunnel of 12 km and head of 540 m.

Pangor No.2 Power Plant would use the discharge of Chimbo No.1 through a tunnel of 4.8 km and the water of the Rio Pangor through a tunnel of 7.1 km for daily regulation to a maximum discharge of 40 m^3/sec, and with a head of 328 m, generate 110 MW of power.

Chimbo No.2 Power Plant would take the discharge of Pangor No.2 and divert it to the Guayas Plain side by a main tunnel of 16.1 km to obtain a head of 800 m for generation of a maximum 230 MW.

Meanwhile, Pangor No.1 Power Plant would utilize the head of 790 m upstream of Pangor No.2 Power Plant and it would be possible for 17 MW to be generated.

It will become possible for a total of 419 MW to be generated with these four power stations and a total amount of 378.6 US million dollars would be required for this construction. Meanwhile, the annual energy production through these power stations would be 1,449.6 GWh and the unit costs would be 903.6 US dollars per kW and 0.26 US dollars per kWh. The energy cost would be 31.32 mills/kWh.

These power stations would be inferior in economy to Zamora-Sabanilla and Guayllabamba Projects, but are at a distance of only 80 km from the load center of Guayaquil, and consequently, it will be possible to develop them in the future. Regarding Pangor No.1 Power Plant, although the scale is small at 17 MW, it should be developed as supply capacity for Riobamba.

Table A-4-(11) Economic Comparison of Chimbo, and Pangor Projects

	Chimbo No. 1	Chimbo No. 2	Pangor No. 1	Pangor No. 2	Total
Installed capacity (MW)	62.0	230.0	17.0	110.0	419.0
Firm energy (GWh)	271.3	605.6	48.2	252.9	1,178.0
Construction cost (10^6 US $)	135.0	145.0	24.8	73.8	378.6
Construction cost per kW (US $)	2,177.4	630.4	1,458.8	670.9	903.6
Construction cost per kWh (US $)	0.474	0.193	0.261	0.232	0.321
Unit cost per kWh (US $) 1/	0.057	0.023	0.031	0.028	0.039

1/ : Annual cost ratio 12%

Table A-4-(12) Chimbo No. 1 Project

Location : Bolivar, Chimborago

River : Chimbo

Type of power plant : Dam-Waterway (Reservoir)

Installed capacity : 62.0 MW

Catchment area : 1,102.0 km^2

Annual average river inflow : 7.7 m^3/s

Total storage capacity : 222.0 x 10^6 m^3

Effective storage capacity : 114.0 x 10^6 m^3

Maximum discharge : 15.0 m^3/s

Total head : 540.0 m

Intake level : 2,340.0 m

Discharge level : 1,800.0 m

Effective head : 510.0 m

Annual generating energy : 285.1 GWh

Firm power : 31.0 MW

Firm energy : 271.3 GWh

Estimated construction cost : US$ 135.0 x 10^6

Unit cost per kW : US$ 2,177.4/kW

Unit cost per kWh : US$ 0.474/kWh

Construction period : 60 months

Monthly river inflow and Generating energy

Month	Natural inflow (m^3/s)	Generating energy (GWh)
1	7.5	23.8
2	12.5	21.6
3	15.1	24.1
4	15.0	23.5
5	11.5	25.6
6	7.5	23.6
7	4.0	24.4
8	2.7	24.3
9	2.7	23.3
10	4.9	24.0
11	5.0	23.1
12	4.8	23.8
Total		285.1

Note: Monthly energy was calculated in consideration of regulating effect by water reservoir.

(Principal characteristics and dimensions)

Dam

Type : Rockfill

Height : 155 m

Crest length : 420 m

Volume : 9×10^6 m^3

Flood discharge : 1,320 m^3/s

High water level : 2,350 m

Low water level : 2,320 m

Available head : 30 m

Elevation on riverbed : 2,210 m

Dam crest/dam height : 2.71

Effective storage capacity : 114×10^6 m^3

Duration capacity 88 days
(Effective capacity/Max. discharge)

Intake Type :

Max. intake flow : 15 m^3/s

Tunnel

Pressure tunnel

Length : 12,200 m

Section : 2.5 m

Surge tank

Type : restricted-orifice

Height : 70 m

Section: 5 m

Penstock

Number of penstock : 1

Length : 1,450 m

Total length : 1,450 m

Section : 2.5 m to 1.5 m

Branch tunnel

Length : –

Intake capacity : –

Power house

Type : Half underground

Number of generator : 1 unit

Dimension : Height : 35 m
Width : 20 m
Depth : 40 m

Turbine

Type : Pelton

Output : 65.3 MW x 1 unit

Generator

Output : 68.9 MVA x 1 unit

Switchyard

Transformer

Voltage : 138 kV

Capacity : 68.9 MVA. x 1 unit

Tailrace tunnel Type : –

Length : –

Section : –

Table A-4-(13) Chimbo No. 2 Project

Location : Bolivar, Chimborago

River : Chimbo

Type of power plant : Waterway (Pondage)

Installed capacity : 230.0 MW

Catchment area 1,535.0 km^2

Annual average river inflow : -

Total storage capacity : -

Effective storage capacity : -

Maximum discharge : 40.0 m^3/s

Total head : 800.0 m

Intake level : 1,400.0 m

Discharge level : 600.0 m

Effective head : 720.0 m

Annual generating energy : 751.0 GWh

Firm power : 69.1 MW

Firm energy : 605.6 GWh

Estimated construction cost : US$ 145.0 x 10^6

Unit cost per kW : US$ 630.4/kW

Unit cost per kWh : US$ 0.193/kWh

Construction period : 96 months

Monthly river inflow and generating energy

Month	Natural inflow (m^3/s)	Generating energy (GWh)
1	12.9	56.5
2	15.2	60.2
3	16.1	70.5
4	16.7	71.0
5	18.6	81.7
6	16.8	71.2
7	14.9	65.5
8	13.4	59.0
9	13.0	55.1
10	12.7	55.9
11	12.5	53.0
12	11.7	51.4
Total		751.0

Note: Monthly energy was calculated in consideration of regulating effect by water reservoir.

(Principal characteristics and dimensions)

Dam

Type : Concrete gravity

Height : 60 m

Crest length : 200 m

Volume : 150 x 10^3 m^3

Flood discharge : 1,500 m^3/s

High water level : 1,400 m

Low water level : — m

Available head : — m

Elevation on riverbed : 1,345 m

Dam crest/dam height : 3.33

Effective storage capacity : —

Duration capacity : —
(Effective capacity/Max. discharge)

Intake Type :

Max. Intake flow : 40 m^3/s

Tunnel

Pressure tunnel

Length : 16,100 m

Section : 3.7 m

Surge tank

Type : restricted-orifice

Height : 50 m

Section: 6 m

Penstock

Number of penstock : upper part 1, lower part 2

Length : 3,350 m

Total length : 3,400 m

Section : 3.7 m to 1.7 m

Branch tunnel

Length : 3,300 m, Intake capacity : 1.0 m^3/s

Power house

Type : Half underground

Number of generator : 2 units

Dimension : Height : 43 m
Width : 24 m
Depth : 64 m

Turbine

Type : Pelton

Output : 121MW x 2 units

Generator

Output : 128 MVA x 2 units

Switchyard

Transformer

Voltage : 230 kV

Capacity : 128 MVA x 2 units

Tailrace tunnel Type : —

Length : —

Section : —

Table A-4-(14) Pangor No. 1 Project

Location : Chimborago

River : Pangor

Type of power plant : Dam-Waterway (Pondage)

Installed capacity : 17.0 MW

Catchment area : 128.7 km^2

Annual average river inflow : 1.8 m^3/s

Total storage capacity : 0.2 x 10^6 m^3

Effective storage capacity : 0.07 x 10^6 m^3

Maximum discharge : 2.8 m^3/s

Total head : 790.0 m

Intake level : 2,554.0 m

Discharge level : 1,764.0 m

Effective head : 750.0 m

Annual generating energy : 94.9 GWh

Firm power : 5.5 MW

Firm energy : 48.2 GWh

Estimated construction cost : US$ 24.8 x 10^6

Unit cost per kW : US$ 1,458.8/kW

Unit cost per kWh : US$ 0.261/kWh

Construction period : 36 months

Monthly river inflow and generating energy

Month	Natural inflow (m^3/s)	Generating energy (GWh)
1	1.24	5.66
2	1.92	7.95
3	2.19	10.01
4	2.38	10.55
5	2.83	12.97
6	2.40	10.63
7	1.99	9.12
8	1.56	7.12
9	1.42	6.29
10	1.19	5.46
11	1.13	4.98
12	0.89	4.09
Total		94.83

Note: Monthly energy was calculated in consideration of regulating effect by water reservoir.

Pangor No. 1 Project

(Principal characteristics and dimensions)

Dam

Type : Concrete gravity

Height : 35 m

Crest length : 100 m

Volume : 25 x 10^3 m^3

Flood discharge : 130 m^3/s

High water level : 2,555 m

Low water level : 2,551 m

Available head : 4 m

Elevation on riverbed : 2,525 m

Dam crest/dam height : 2,86

Effective storage capacity : 0.07 x 10^6 m^3

Duration capacity 0.3 days
(Effective capacity/Max. discharge)

Intake Type :

Max. intake flow : 2.8 m^3/s

Tunnel

Pressure tunnel

Length : 4,400 m

Section : 2.0 m

Surge tank

Type : restricted-orifice

Height : 20 m

Section: 4 m

Penstock

Number of penstock : 1

Length : 3,000 m

Total length : 3,000 m

Section : 2.0 m to 0.6 m

Branch tunnel

Length : – m, Intake capacity : –

Power house

Type : Half underground

Number of generator : 1 unit

Dimension : Height : 22 m
Width : 13 m
Depth : 25 m

Turbine

Type : Pelton

Output : 17.9 MW x 1 unit

Generator

Output : 18.9 MVA x 1 unit

Switchyard

Transformer

Voltage : 138 kV

Capacity : 18.9 MVA x 1 unit

Tailrace tunnel Type : –

Length : –

Section : –

Table A-4-(15) Pangor No. 2 Project

Location : Bolivar, Chimborago

River : Pangor

Type of power plant : Dam-Waterway (Pondage)

Installed capacity : 110.0 MW

Catchment area : 1,502.5 km^2

Annual average river inflow : 13.2 m^3/s

Total storage capacity : 1.9×10^6 m^3

Effective storage capacity : 0.53×10^6 m^3

Maximum discharge : 40.0 m^3/s

Total head : 348.0 m

Intake level : 1,748.0 m

Discharge level : 1,400.0 m

Effective head : 324.0 m

Annual generating energy : 318.6 GWh

Firm power : 28.9 MW

Firm energy : 252.9 GWh

Estimated construction cost : US$ 73.8×10^6

Unit cost per kW : US$ 670.9/kW

Unit cost per kWh : US$ 0.232/kWh

Construction period : 48 months

Monthly river inflow and generating energy

Month	Natural inflow (m^3/s)	Generating energy (GWh)
1	11.5	23.66
2	13.7	25.31
3	14.5	29.74
4	15.1	29.94
5	16.9	34.63
6	15.2	30.07
7	13.9	28.49
8	12.5	25.71
9	12.1	23.99
10	11.4	23.40
11	11.2	22.21
12	10.5	21.48
Total		318.60

Note: Monthly energy was calculated in consideration of regulating effect by water reservoir.

(Principal characteristics and dimensions)

Dam

Type : Concrete gravity

Height : 50 m

Crest length : 250 m

Volume : 130 x 10^3 m^3

Flood discharge : 1,500 m^3/s

High water level : 1,750 m

Low water level : 1,744 m

Available head : 6 m

Elevation on riverbed : 1,705 m

Dam crest/dam height : 5.0

Effective storage capacity : 0.53 x 10^6 m^3

Duration capacity : --
(Storage capacity/Max. discharge)

Intake Type :

Max. intake flow : 40 m^3/s

Tunnel

Pressure tunnel

Length : 5,200 m

Section : 3.8 m

Surge tank

Type : restricted-orifice

Height : 35 m

Section: 11 m

Penstock

Number of penstock : 1

Length : 900 m

Total length : 900 m

Section : 3.8 m to 2.4 m

Branch tunnel

Length : 6,600 m, Intake capacity : 5.5 m^3/s

Power house

Type : Half underground

Number of generator : nit

Dimension : Height : 35 m
Width : 25 m
Depth : 40 m

Turbine

Type : Francis

Output : 116 MW x 1 unit

Generator

Output : 122 MVA x 1 unit

Switchyard

Transformer

Voltage : 230 kV

Capacity : 122 MVA x 1 unit

Tailrace tunnel Type : –

Length : –

Section : –

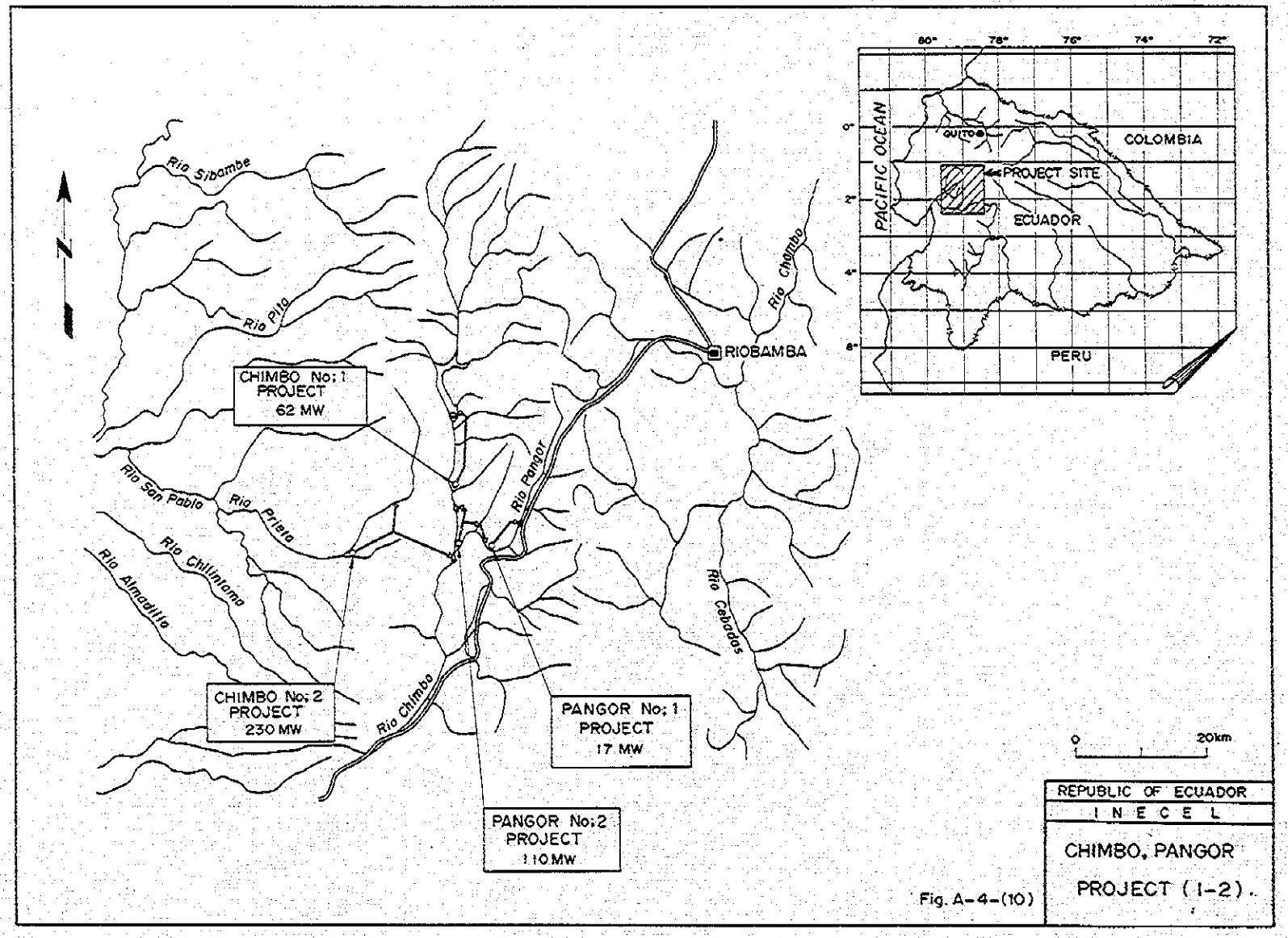
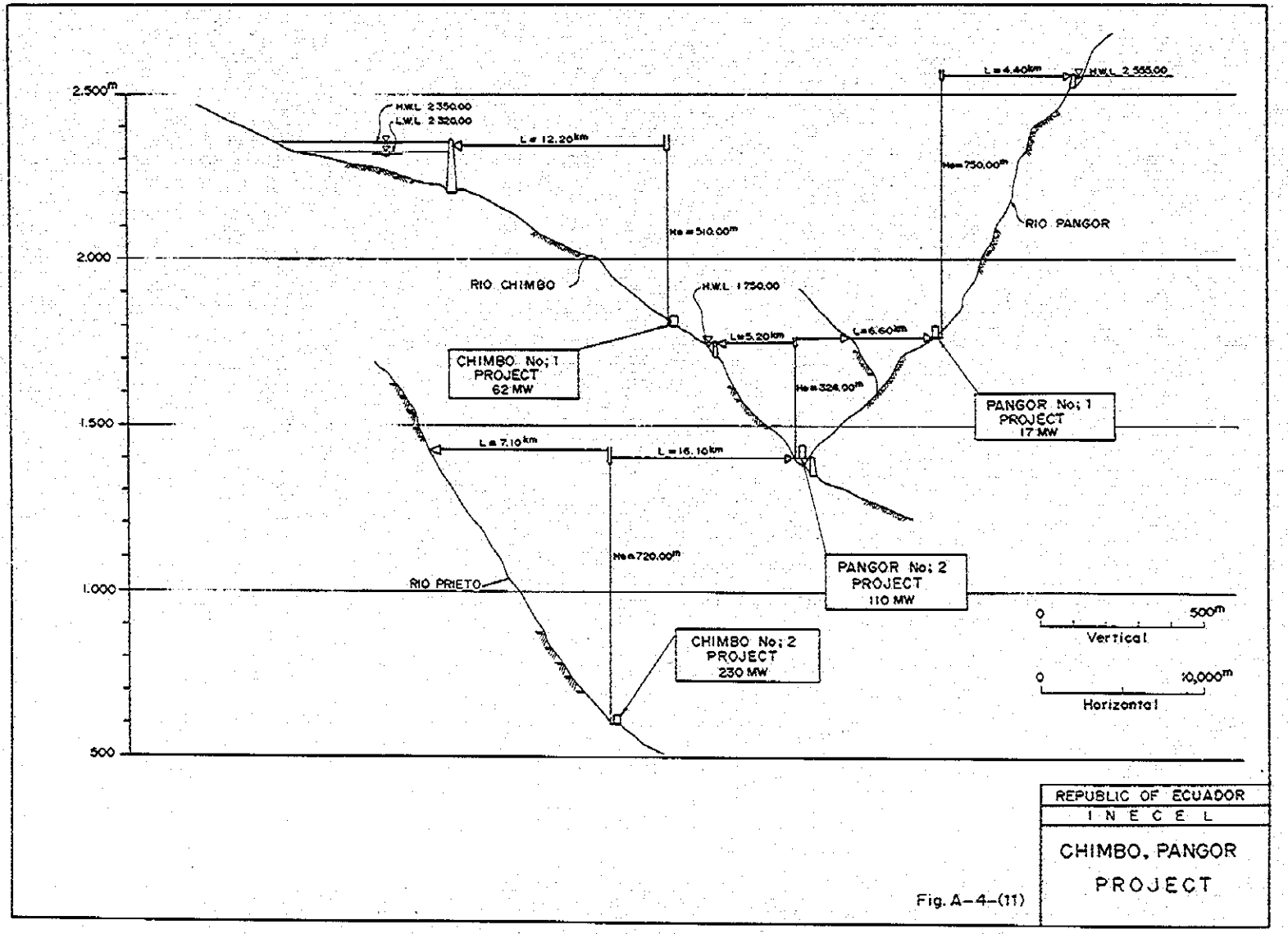

Río Sibambe
Río Pita
Río Chambo
RIOBAMBA
CHIMBO No; 1
PROJECT
62 MW
Río San Pablo
Río Pristá
Río Pangor
Río Chilintomo
Río Almaguilla
Río Cebadas
CHIMBO No; 2
PROJECT
230 MW
Río Chimbo
PANGOR No; 1
PROJECT
17 MW
PANGOR No; 2
PROJECT
110 MW
80°
78°
76°
74°
72°
PACIFIC OCEAN
QUITO
COLOMBIA
PROJECT SITE
ECUADOR
PERU
0
20km
REPUBLIC OF ECUADOR
I N E C E L
CHIMBO, PANGOR
PROJECT (1-2).

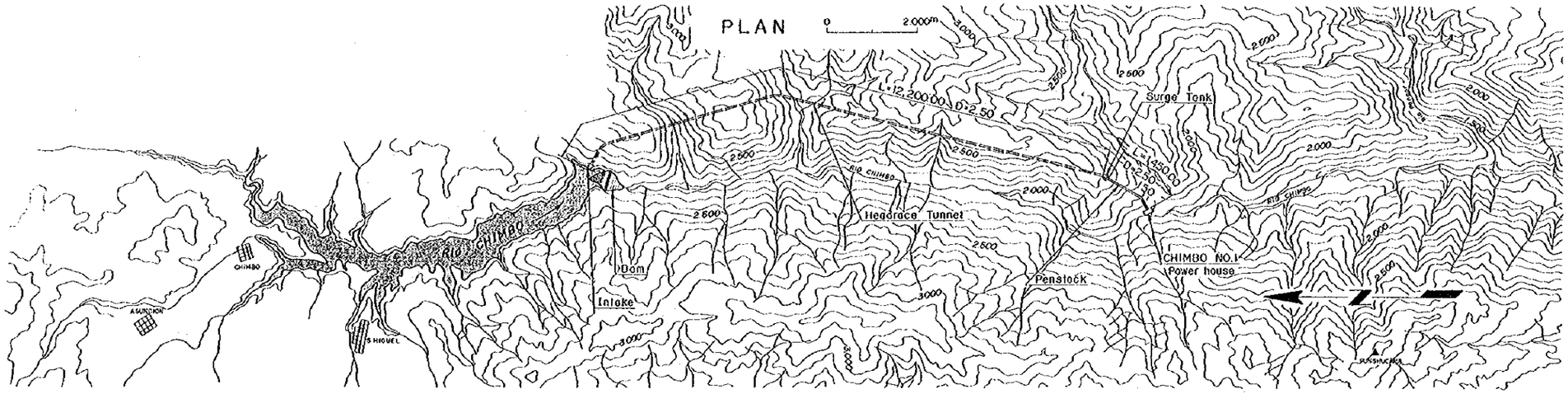
Fig. A-4-(10)

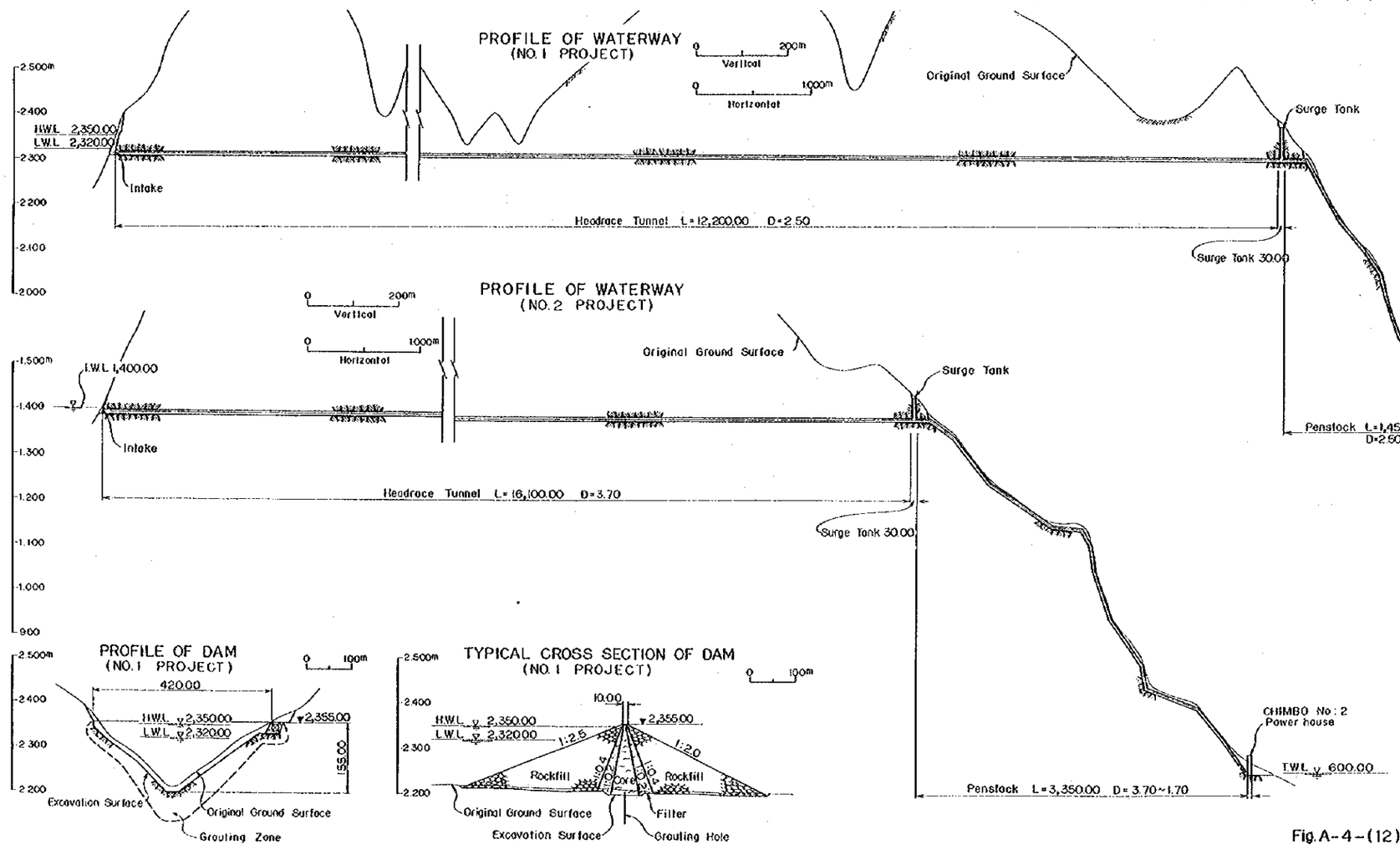


REPUBLIC OF ECUADOR
I N E C E L

CHIMBO, PANGOR
PROJECT

Fig. A-4-(11)





REPUBLIC OF ECUADOR

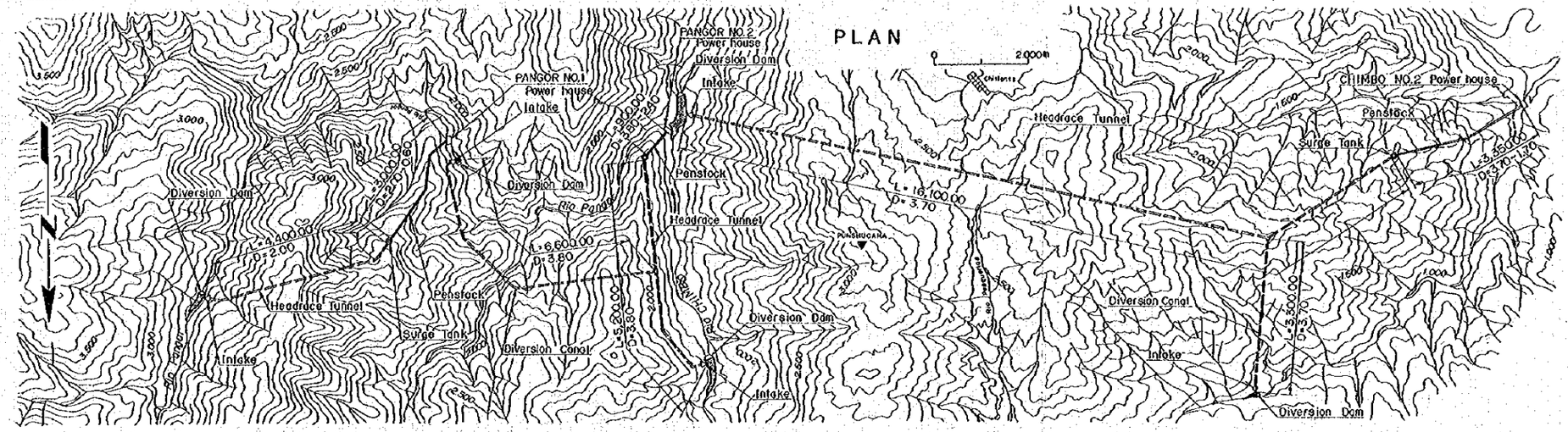
INECEL

HYDRO — ELECTRIC POWER PROJECT

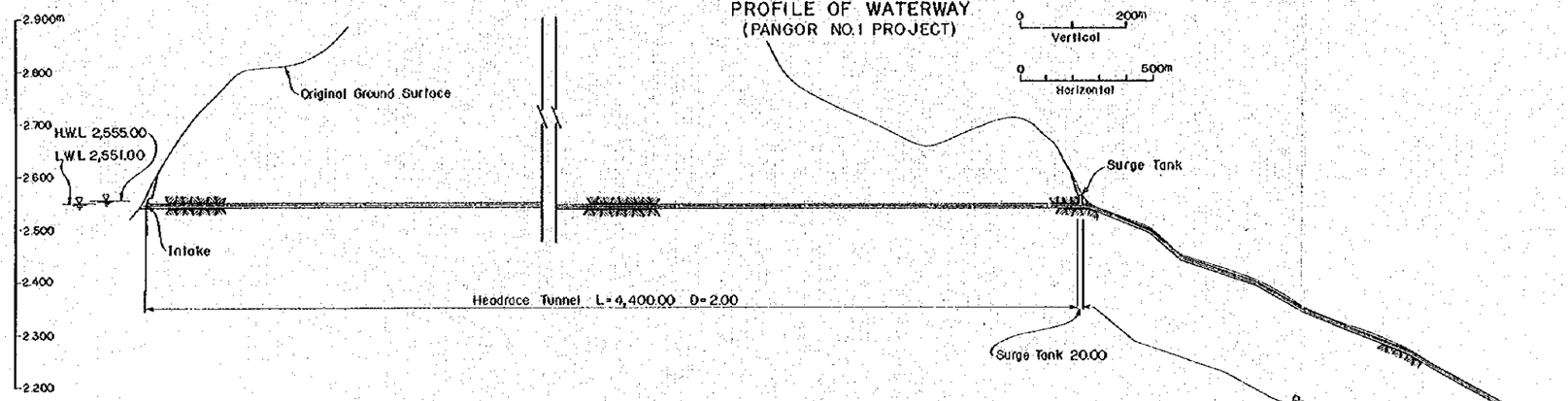
CHIMBO NO;1, NO;2

Fig.A-4-(12)

PLAN



PROFILE OF WATERWAY (PANGOR NO.1 PROJECT)



PROFILE OF WATERWAY (PANGOR NO.2 PROJECT)

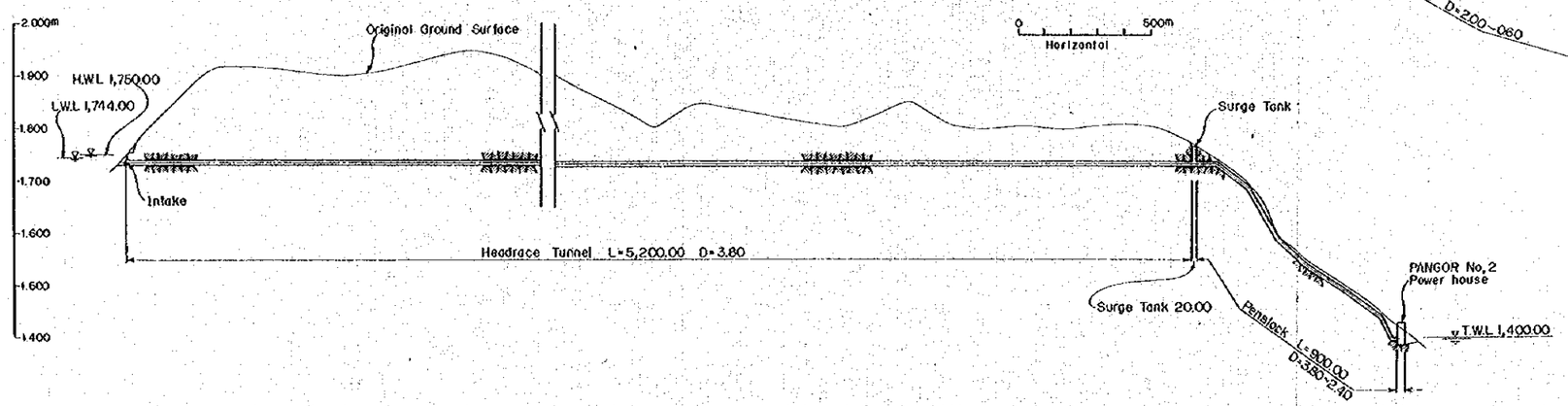


Fig. A-4-(13)

REPUBLIC OF ECUADOR
INECEL

HYDRO — ELECTRIC
POWER PROJECT
CHIMBO NO; 2
PANGOR NO; 1, NO; 2

APPENDIX

A-5 KW Balance in The Regional System

Fig. A-5-

Fig. A-5-(1) kW Balance in the Regional System
Sistema Norte

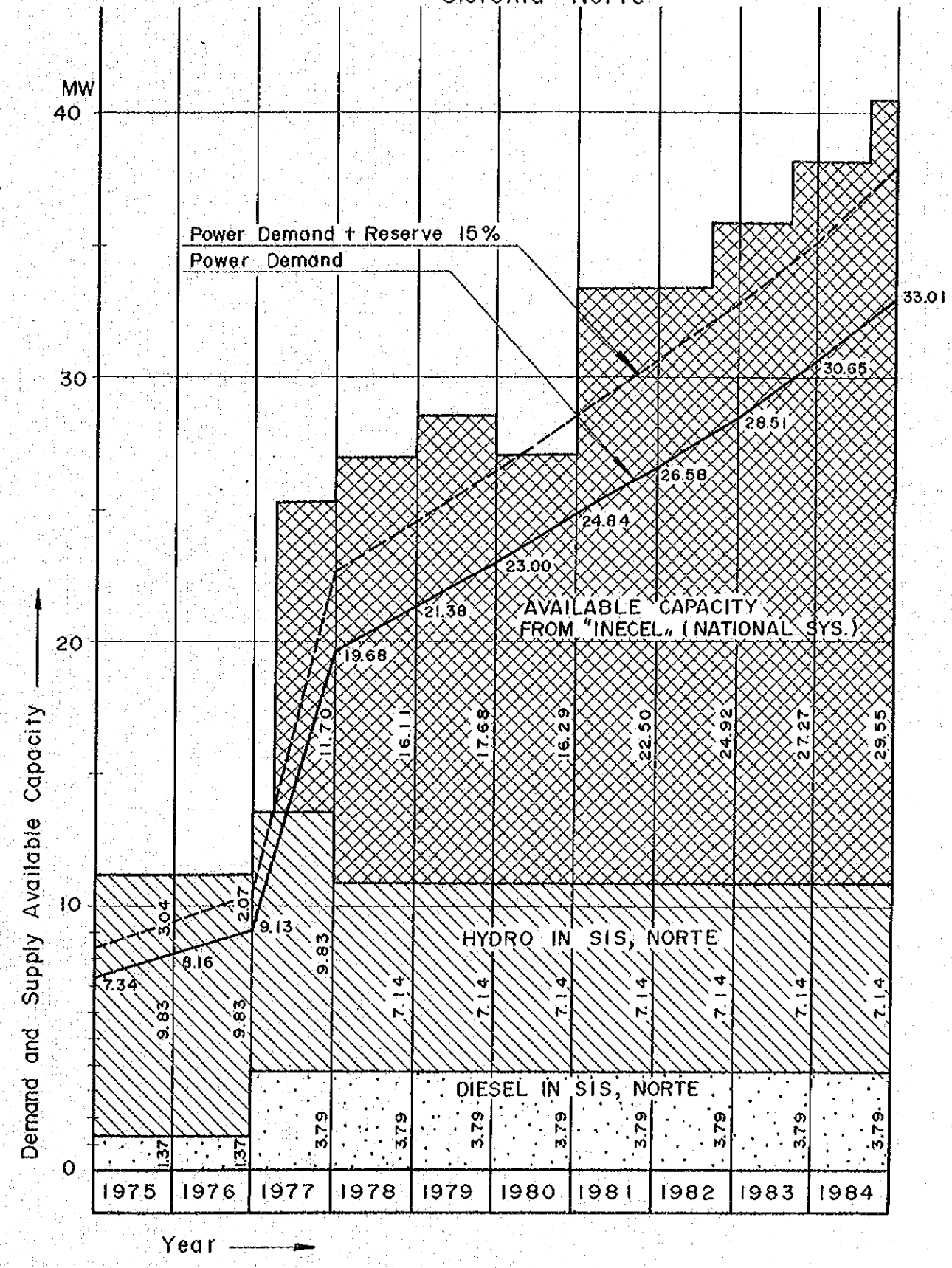


Fig. A-5-(2) kW Balance in the Regional System
Sistema Pichincha (Quito)

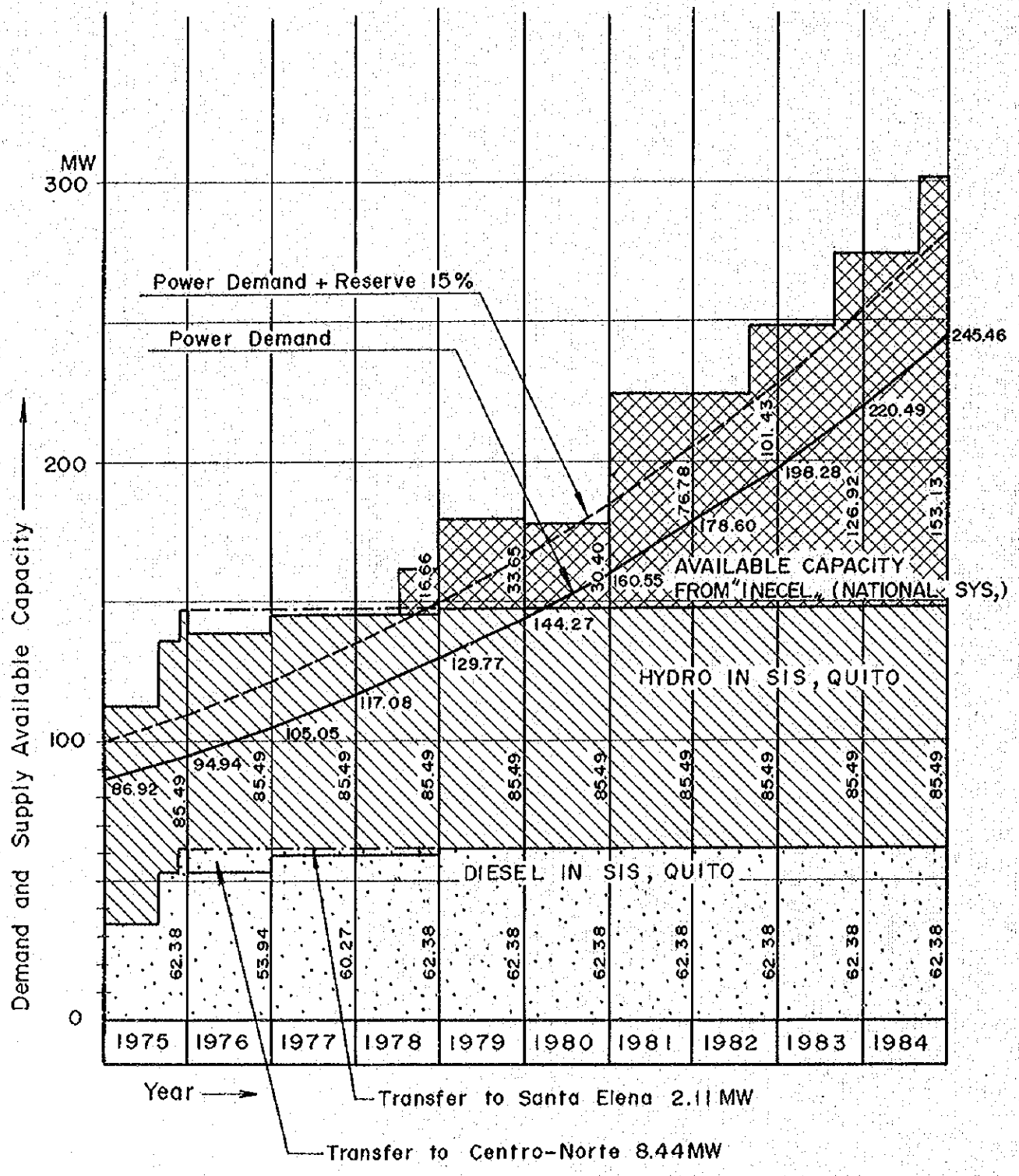


Fig. A-5-(3) kW Balance in the Regional System
Sistema Pichincha (Santo Domingo)

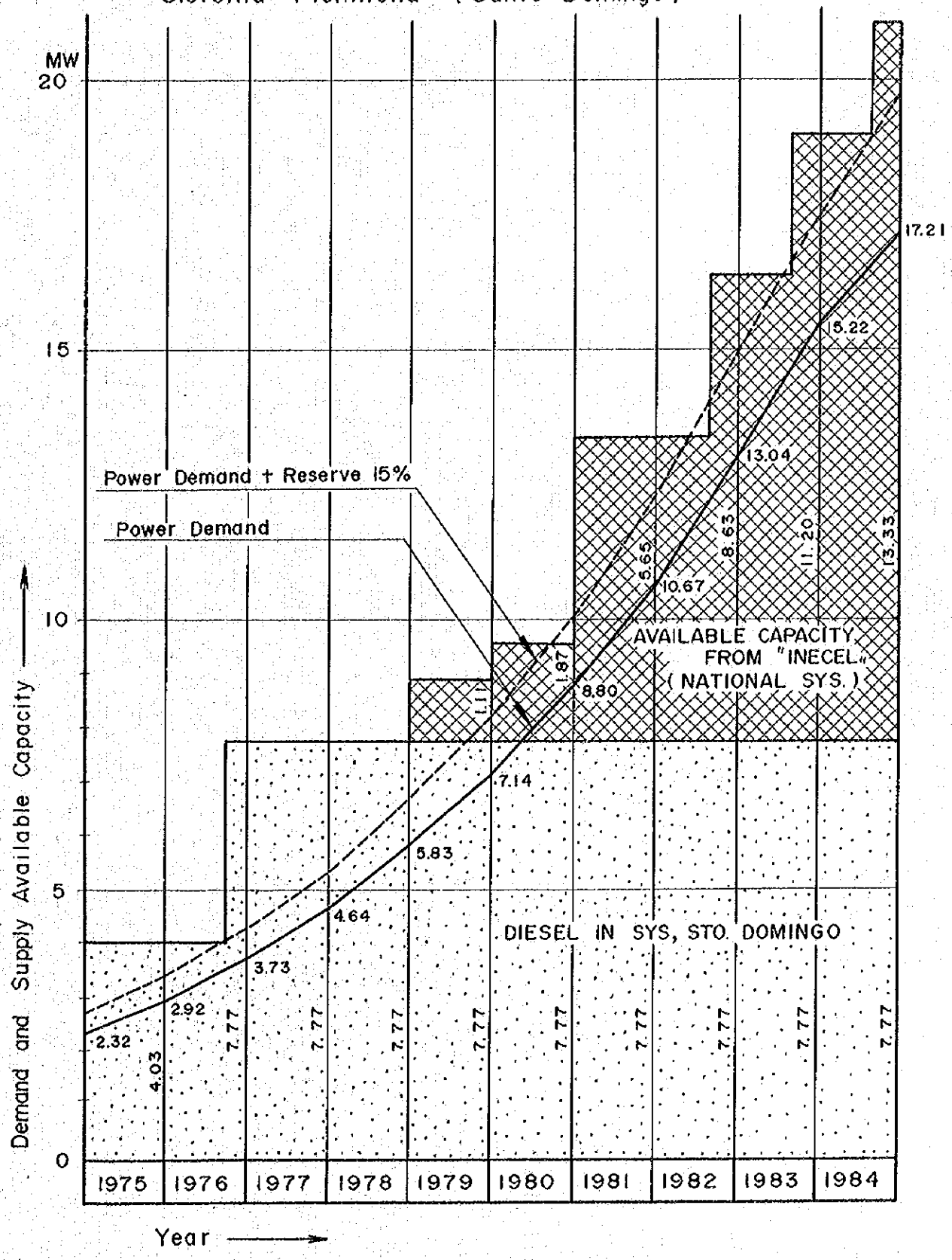


Fig. A-5-(4) kW Balance in the Regional System
Sistema Centro-Norte (Latacunga)

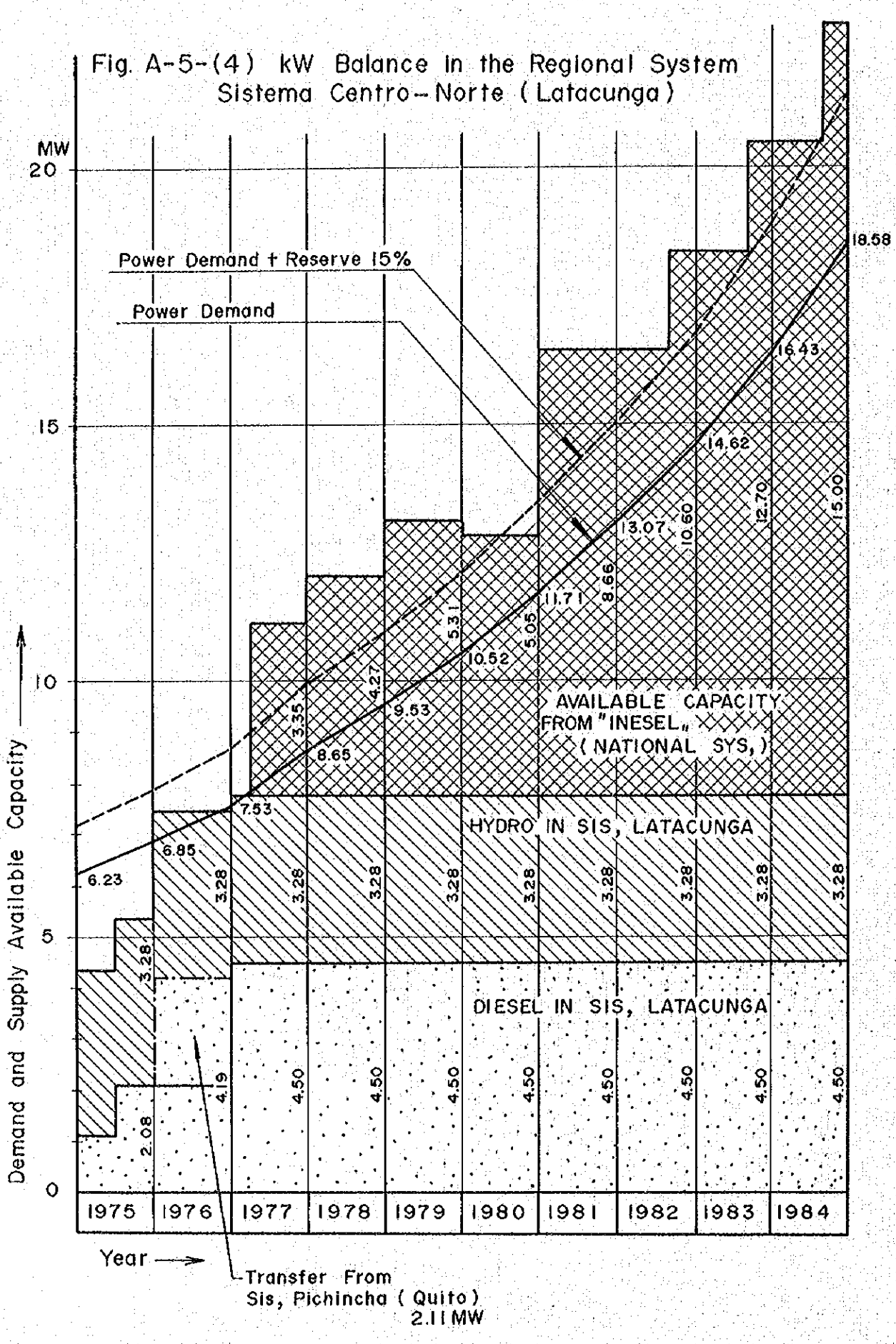


Fig. A-5-(5) kW Balance in the Regional System
Sistema Centro–Norte (Ambato)

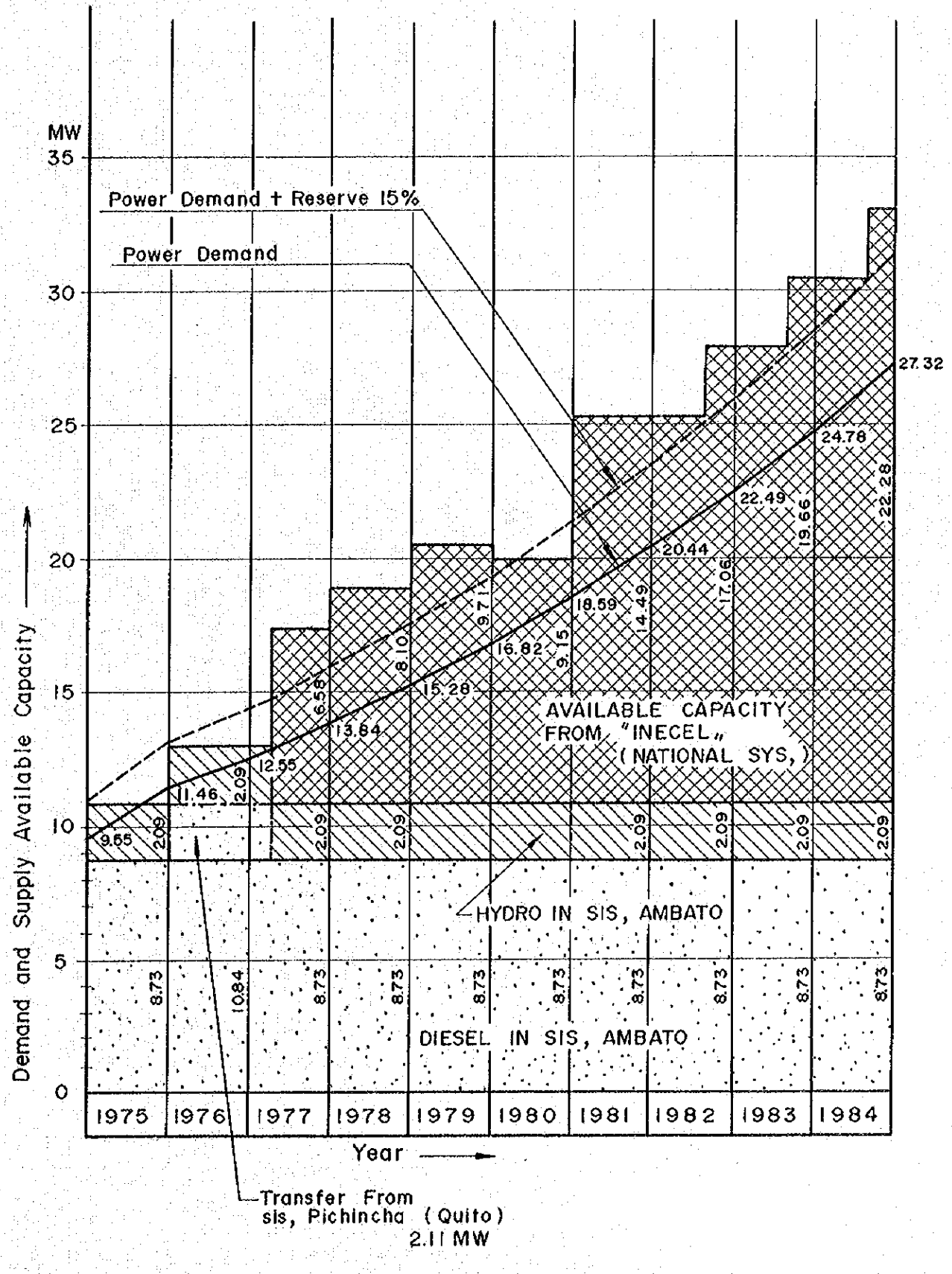


Fig. A-5-(6) kW Balance in the Regional System
Sistema Centro-Norte (Riobamba)

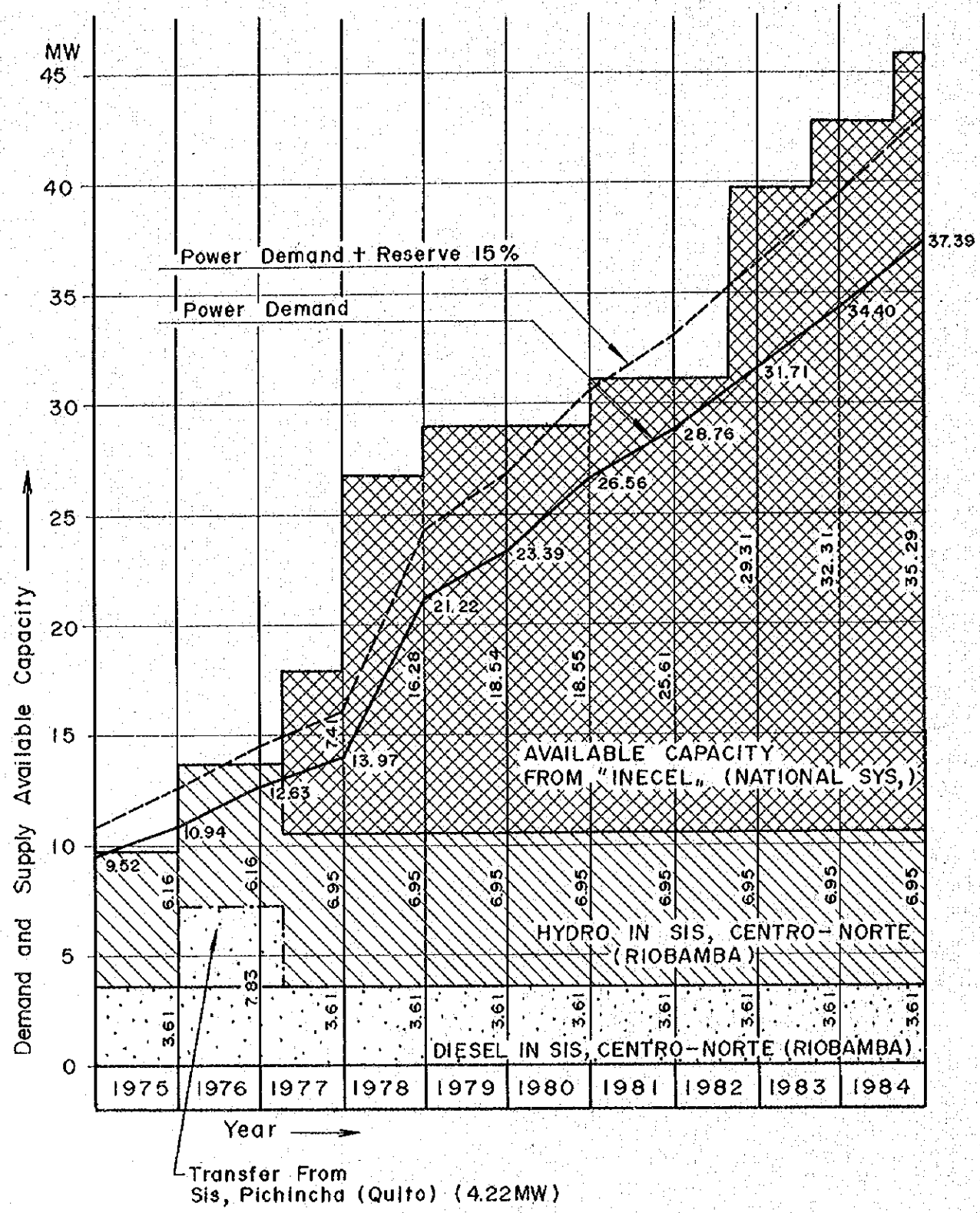


Fig. A-5-(7) kW Balance in the Regional System
Sistema Centro-Norte (Guaranda)

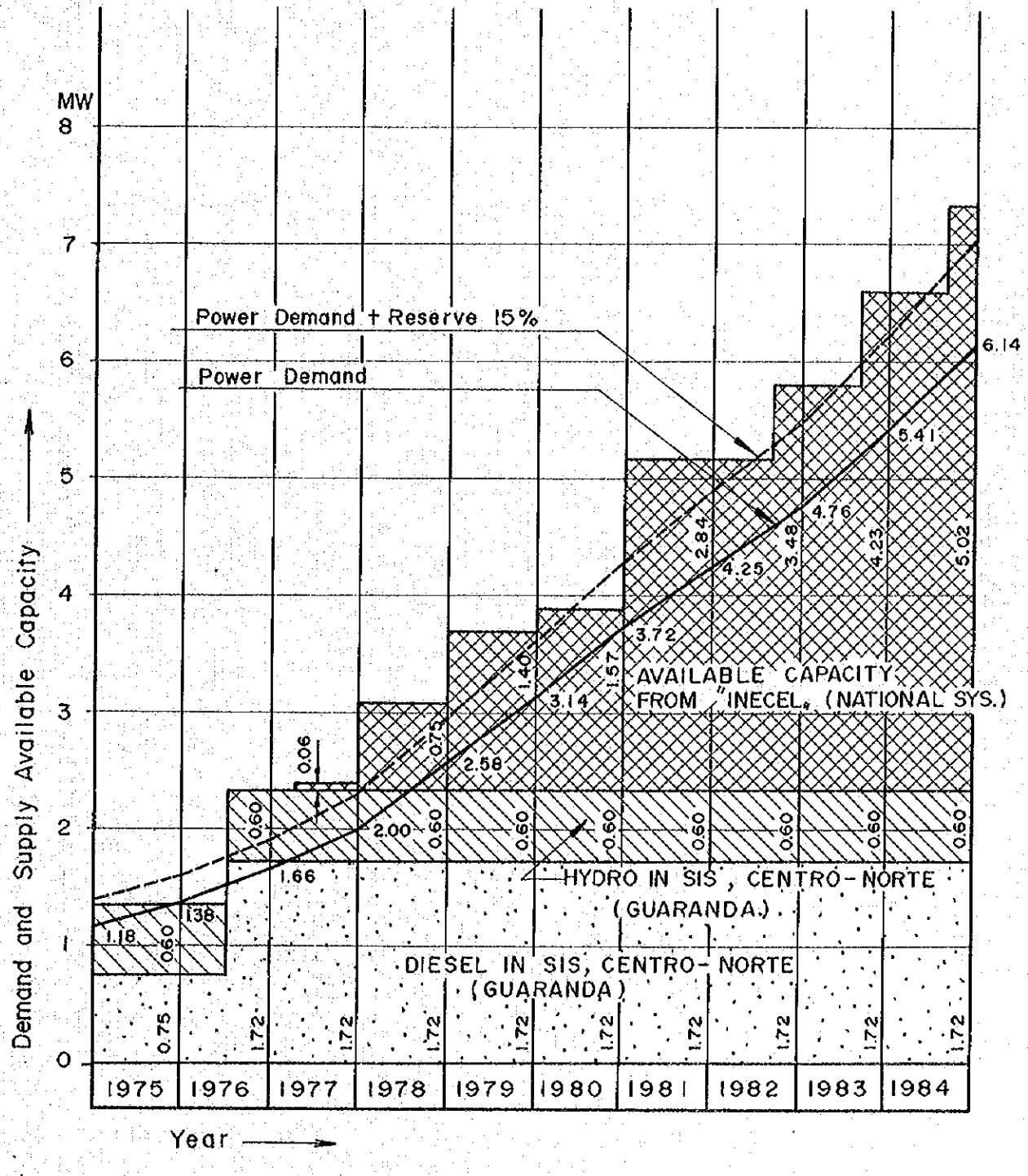


Fig. A-5-(8) kW Balance in the Regional System
Sistema Centro – Norte (Puyo)

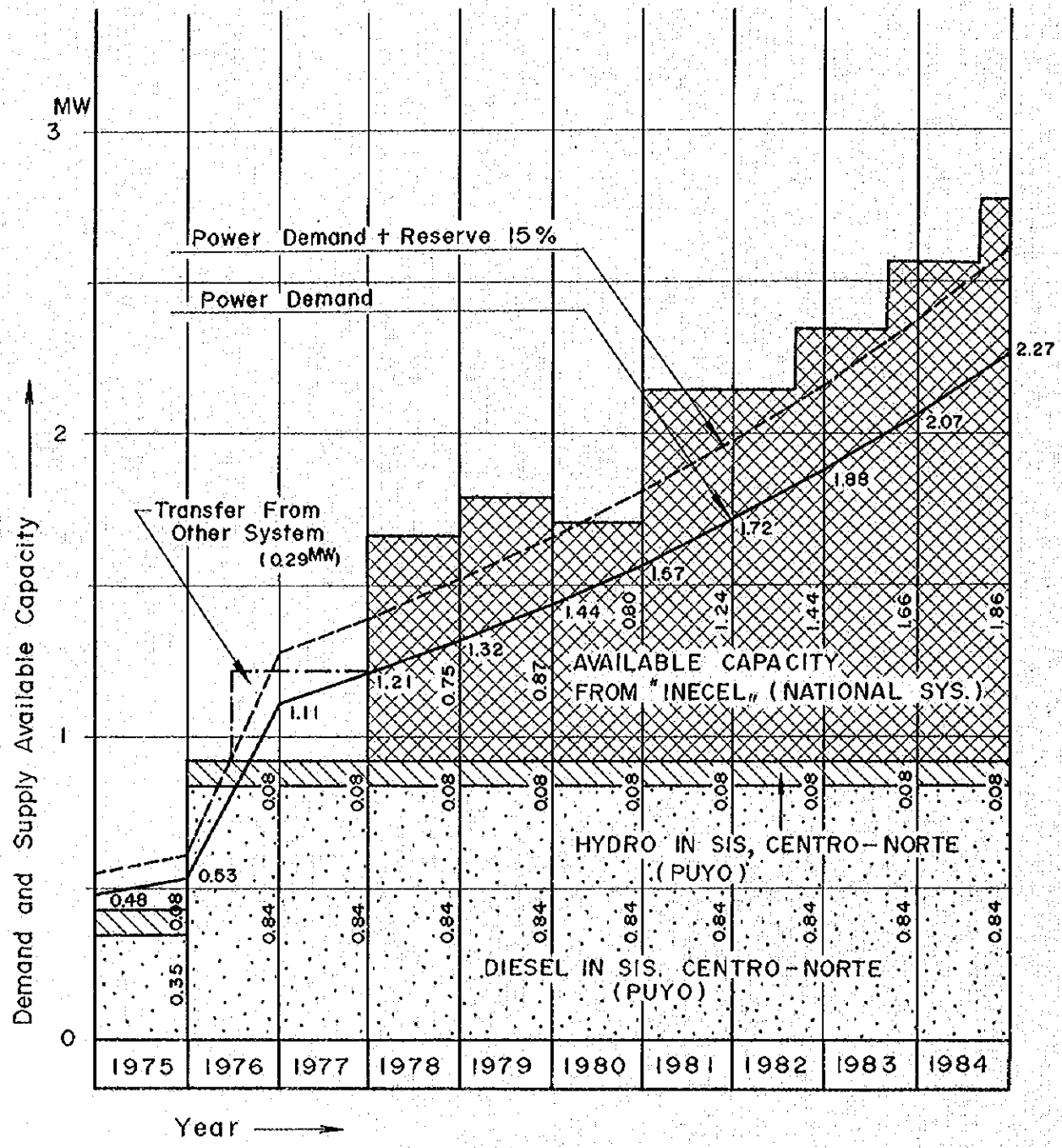


Fig. A-5-(9) kW Balance in the Regional System
Sistema Centro-Sur

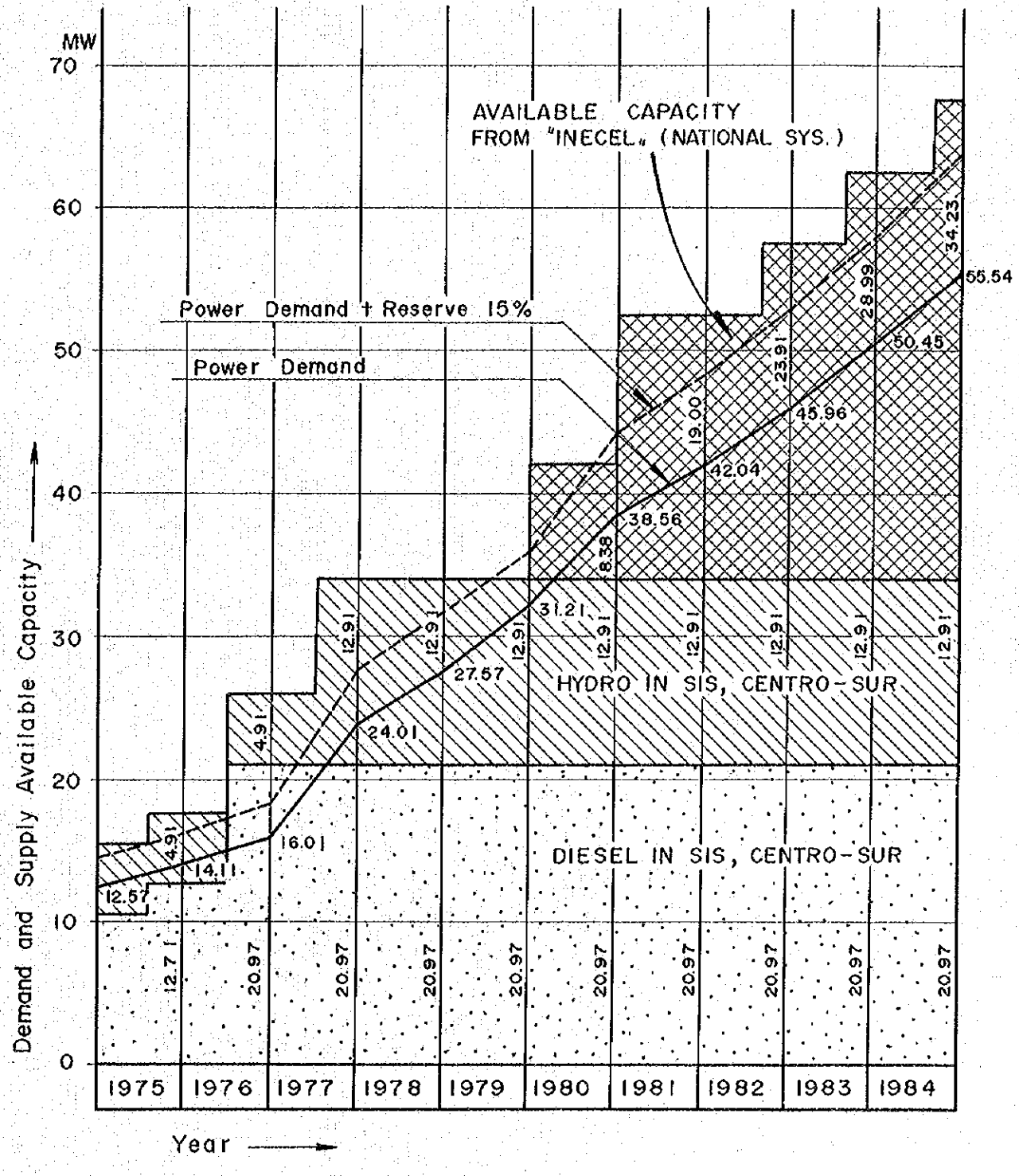


Fig. A-5-(10) kW Balance in the Regional System
Sistema Sur

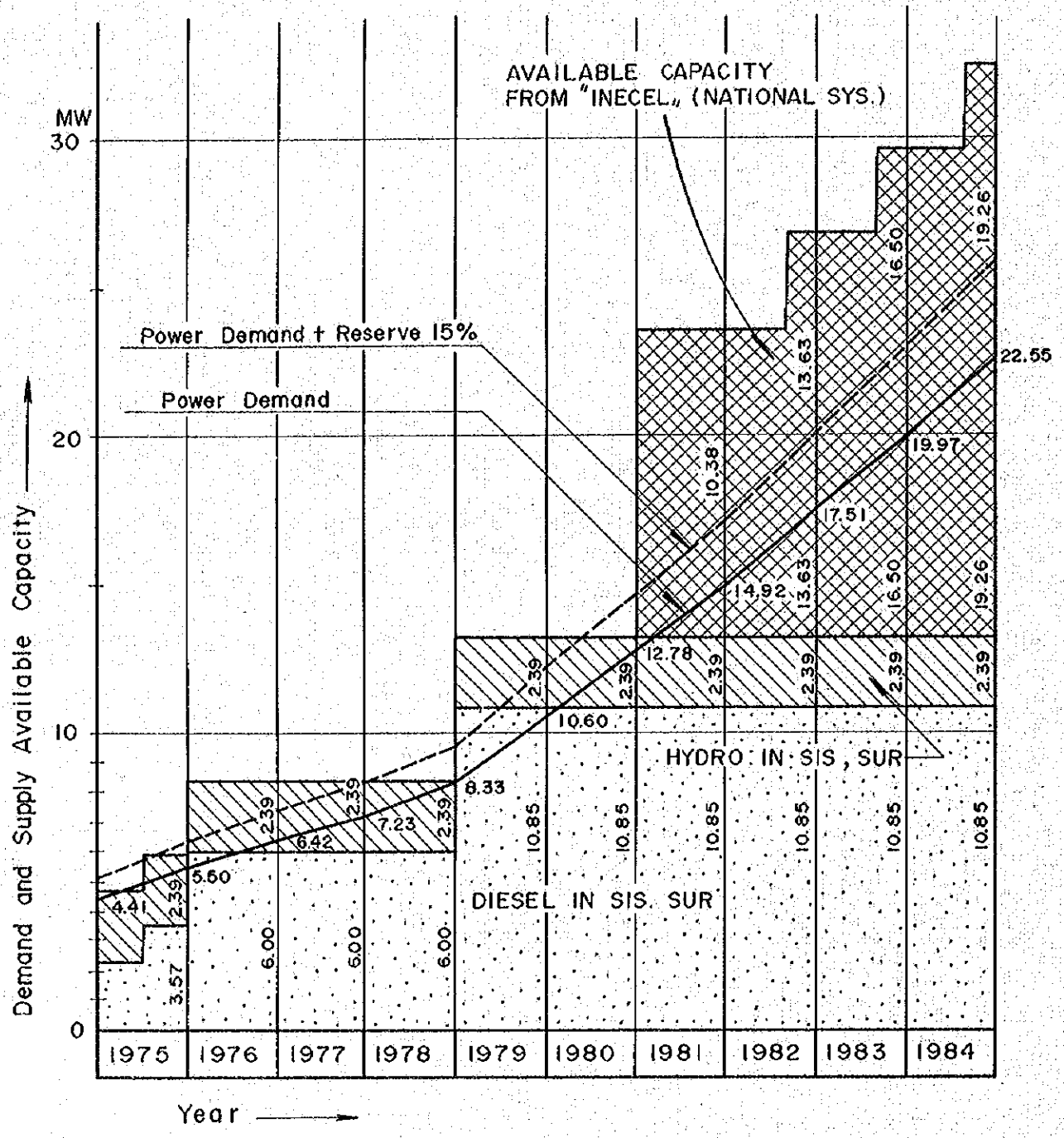


Fig. A-5-(11) kW Balance in the Regional System
Sistema Esmeraldas

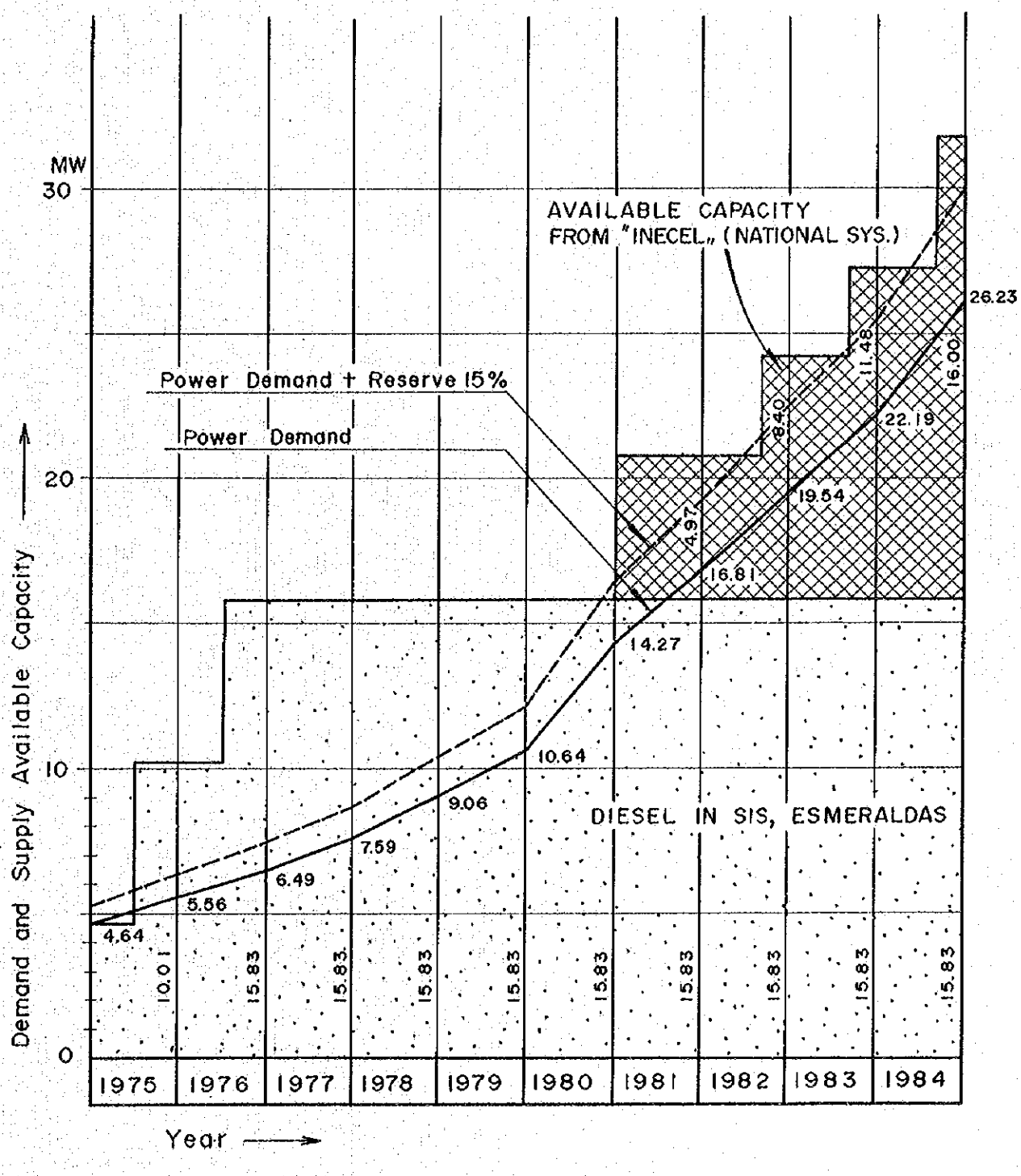


Fig. A-5-(12) kW Balance in the Regional System
Sistema Manabi

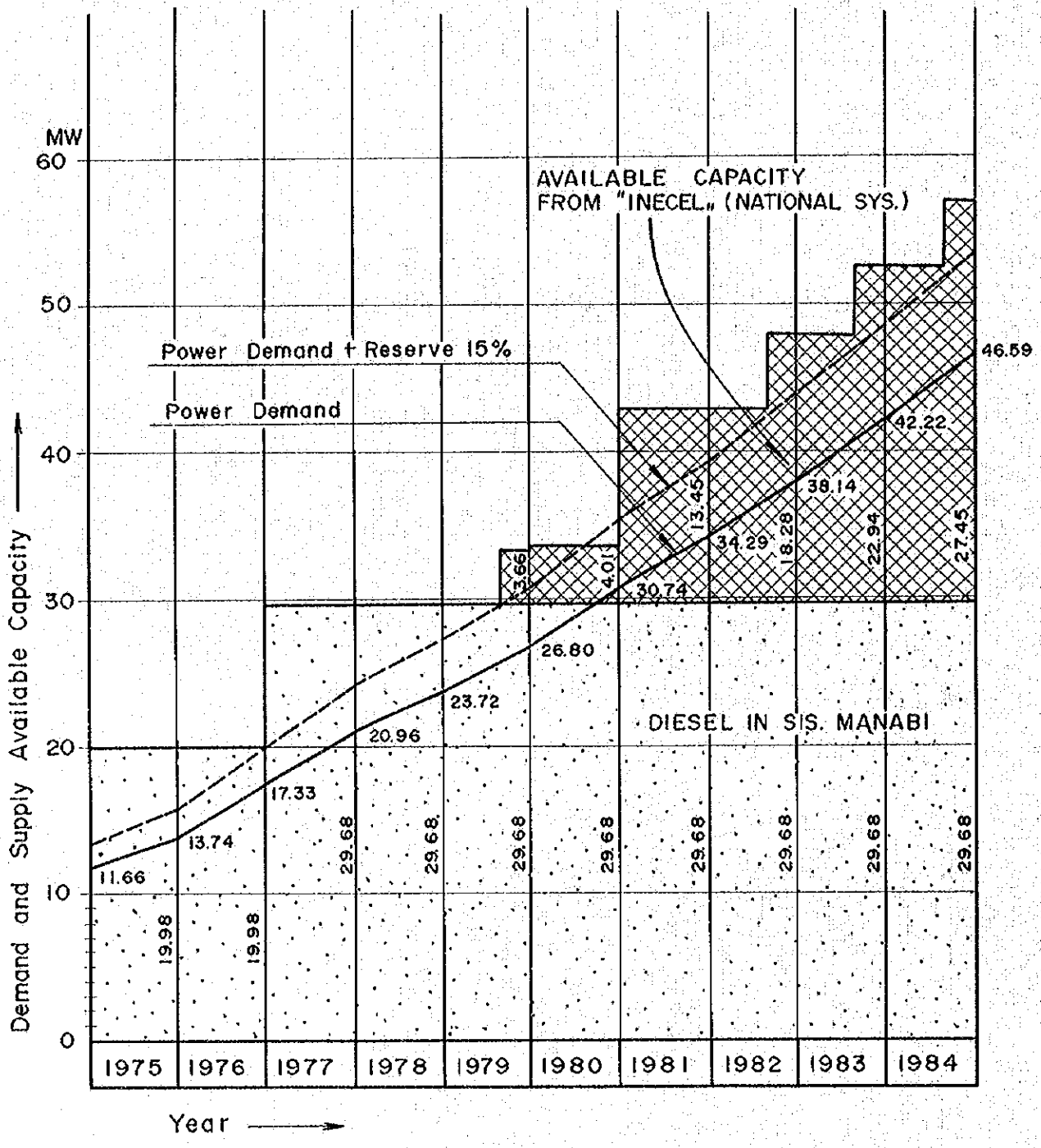


Fig. A-5-(13) kW Balance in the Regional System
Sistema Guayas – Los Rios (Babahoyo)

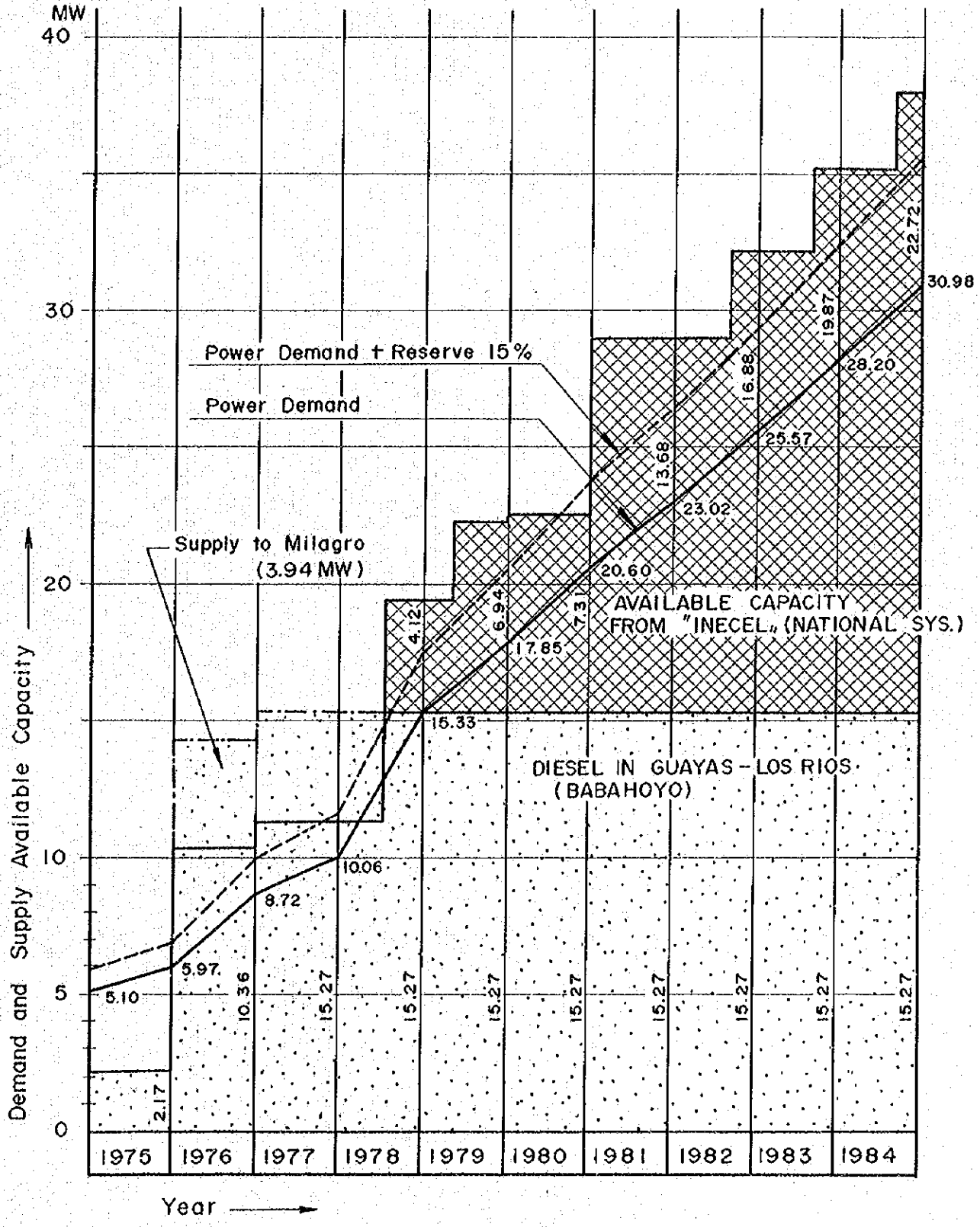


Fig. A-5-(14) kW Balance in the Regional System
Sistema Guayas – Los Rios (Guayaquil, Duran)

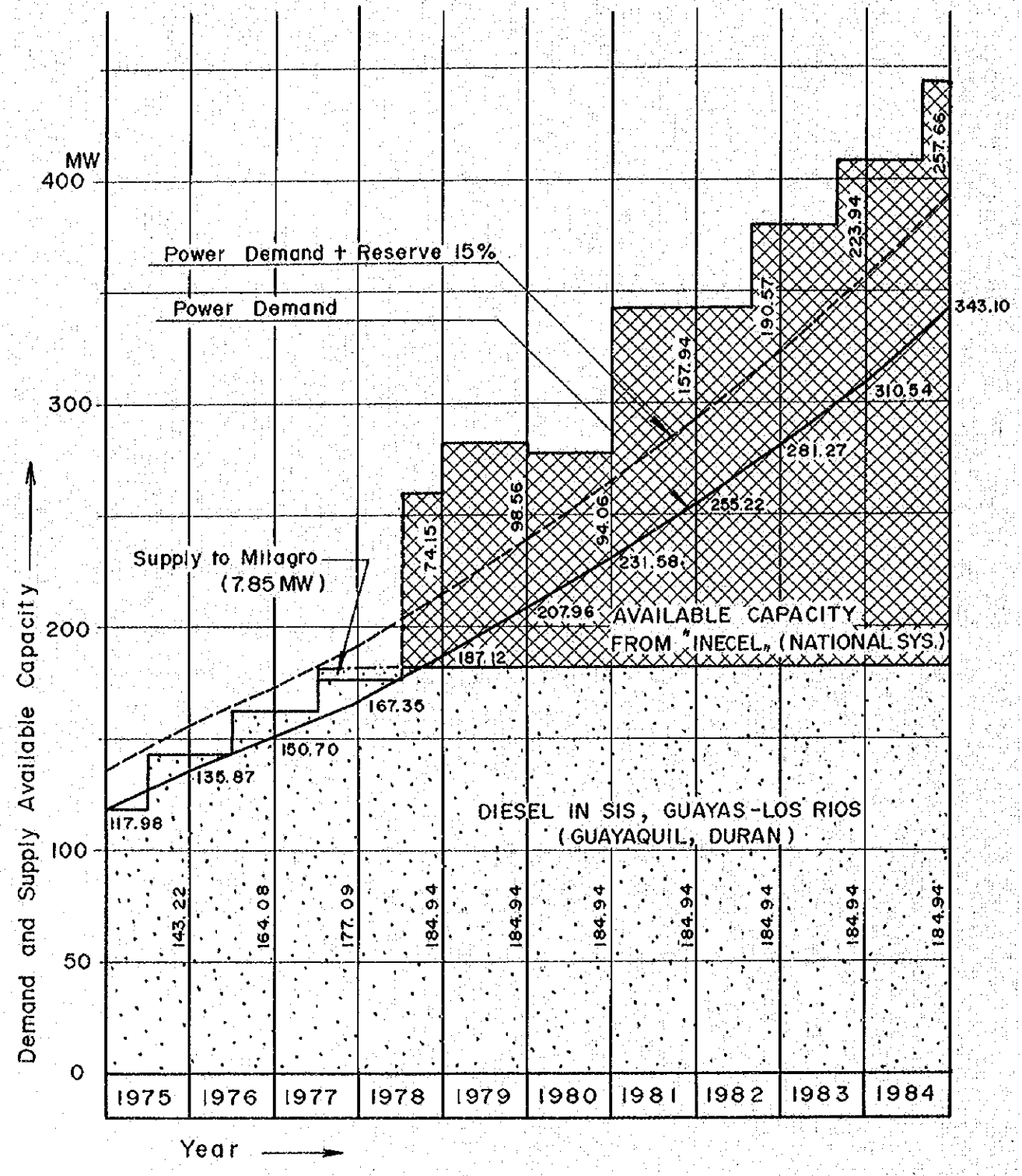


Fig. A-5-(15) kW Balance in the Regional System
Sistema Guayas-Los Rios (Quevedo)

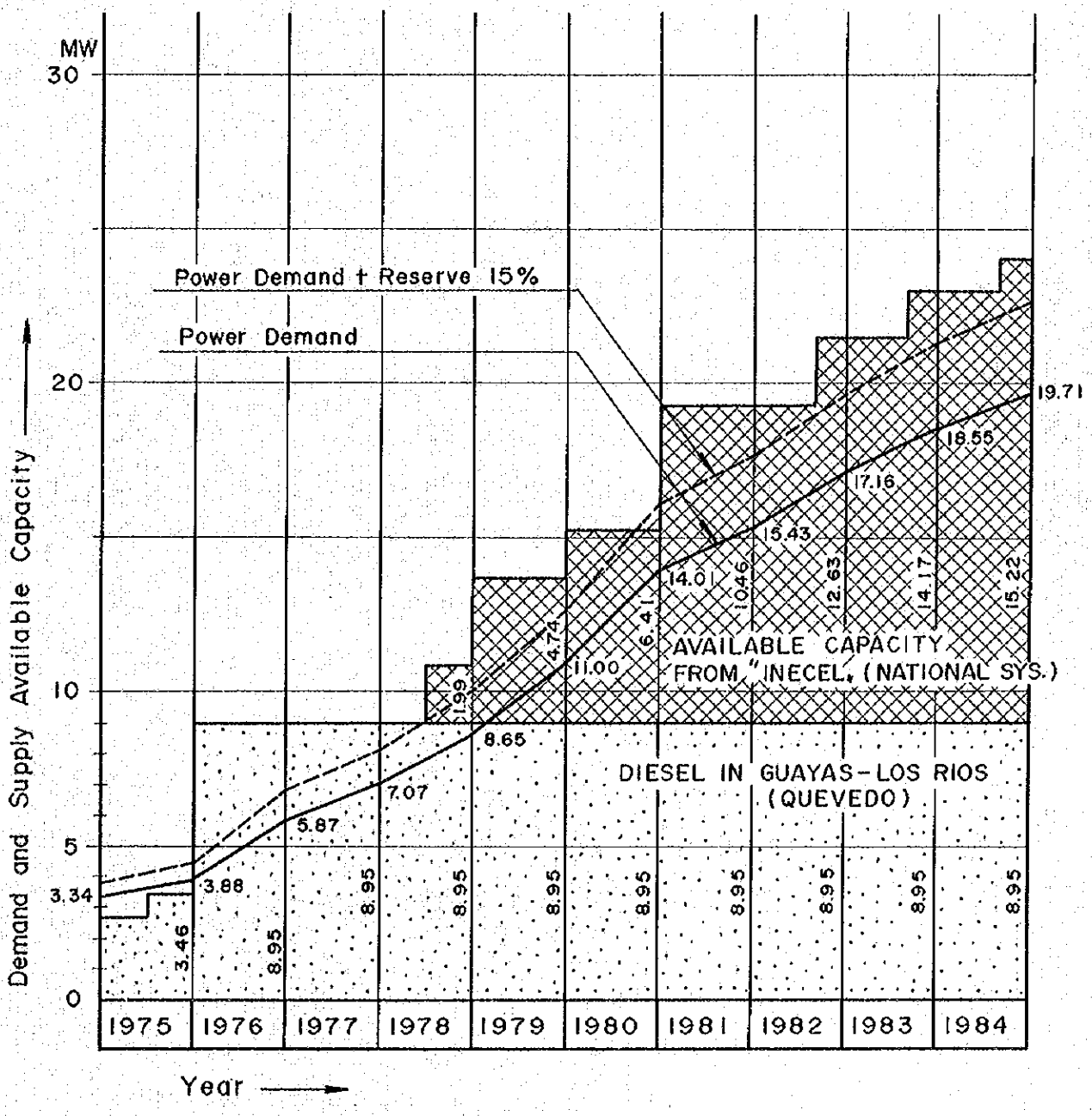


Fig. A-5-(16) kW Balance in the Regional System
Sistema Guayas – Los Rios (Milagro)

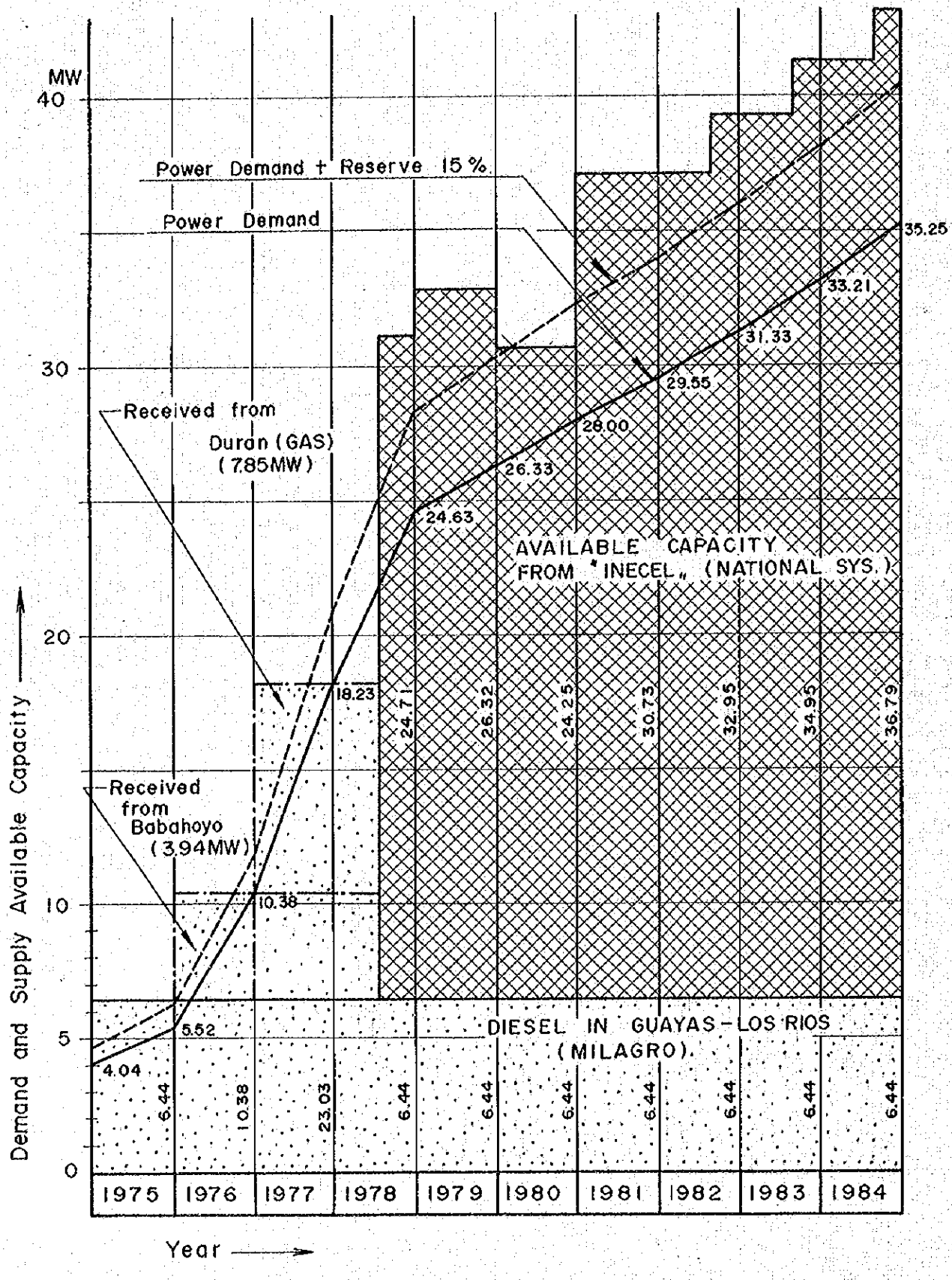


Fig. A-5-(17) kW Balance in the Regional System
Sistema Guayas-Los Rios (Santa Elena)

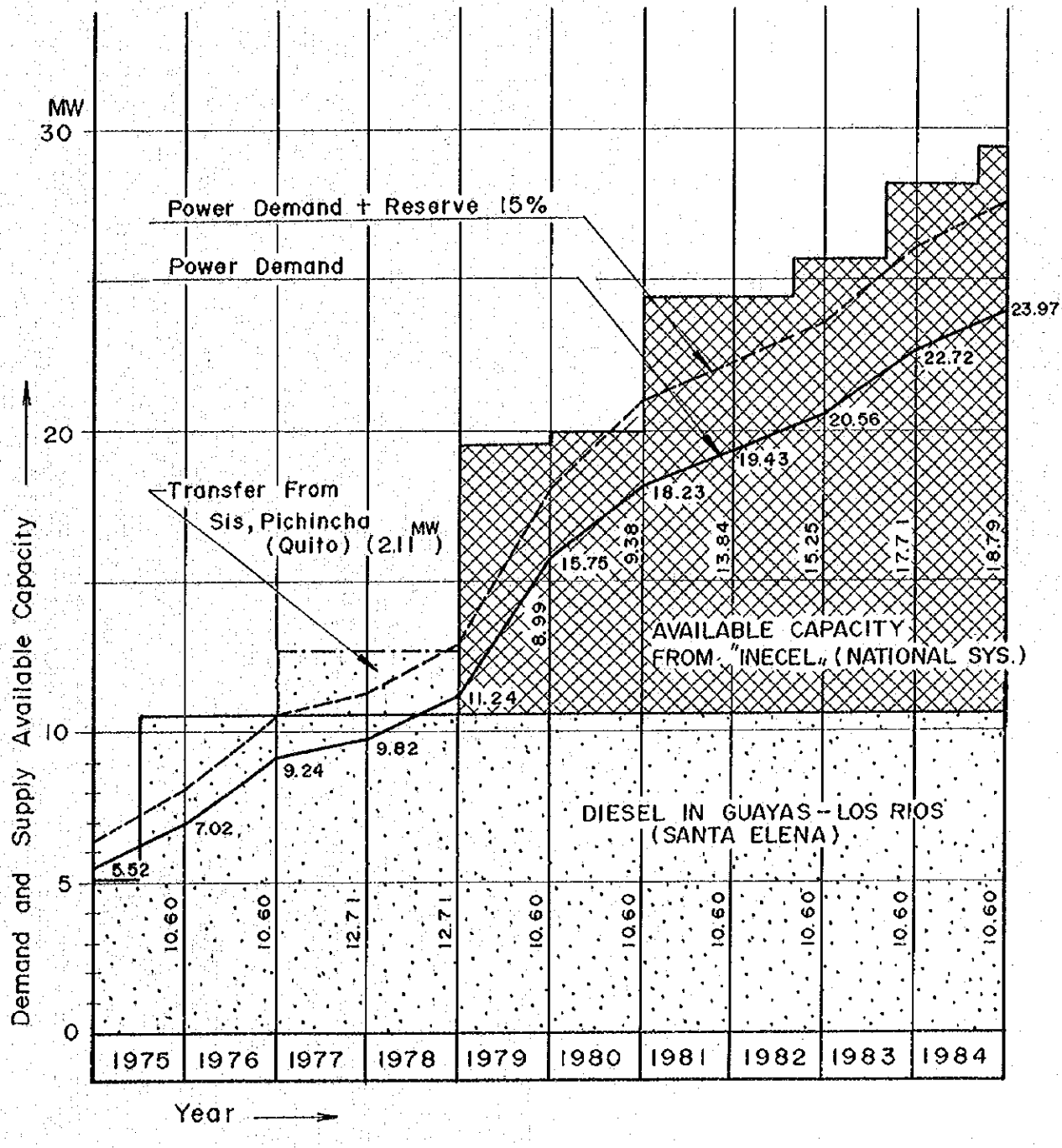
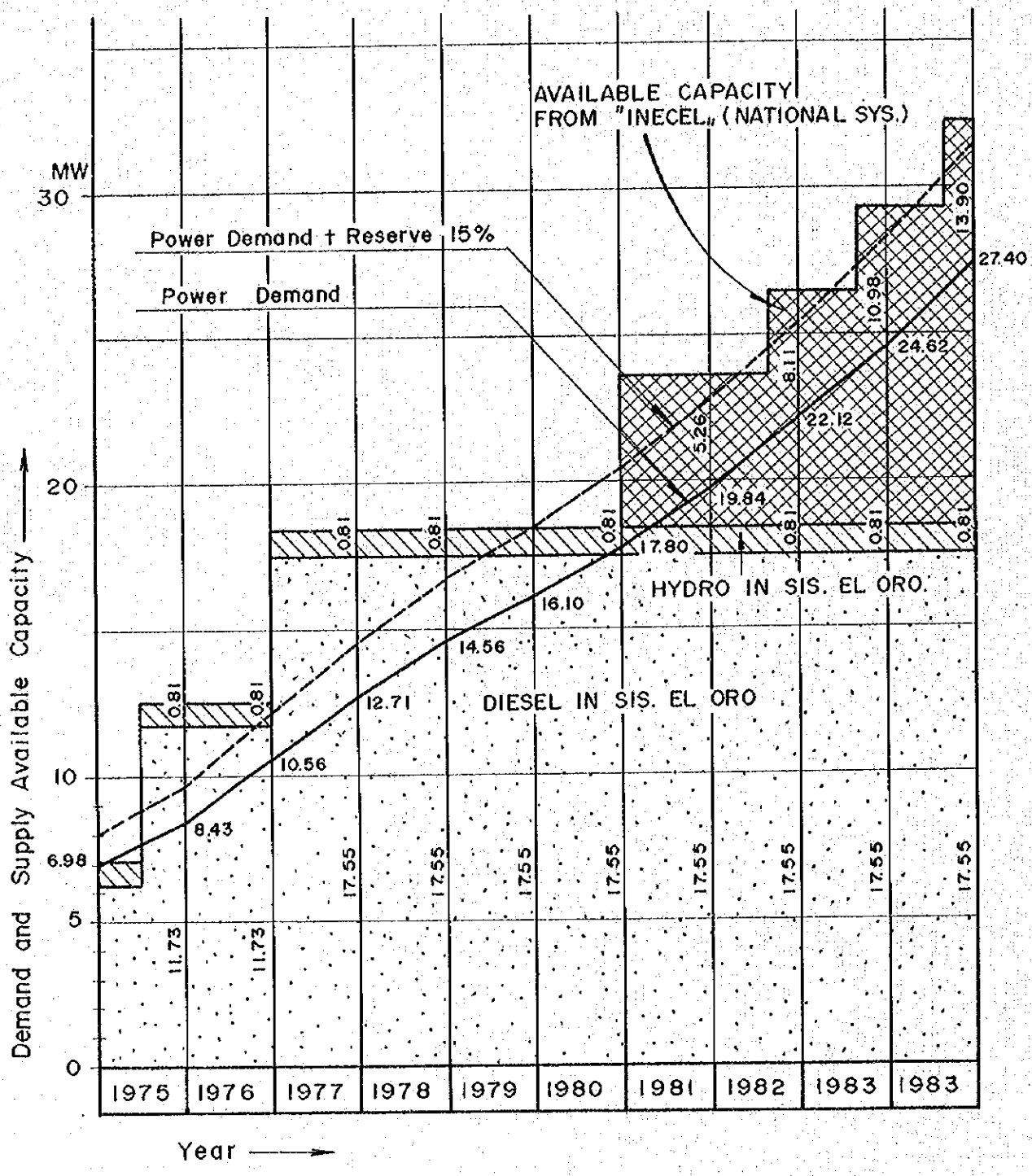


Fig. A-5-(18) kW Balance in the Regional System
Sistema El Oro



APPENDIX

A-6 Regional Power Systems for Electrification

Existing			
(1)	LA PLAYA	1.320 kw	H
(2)	EL AMBI	8.000	H
(3)	MONTUFAR	300	H
(4)	EL AVGEL	472	H
(5)	ONTANON	400	H
(6)	HOJA BLANCA	600	H
(7)	SAN LUIS	822	H
(8)	QUIROGA Y IMANTAG	440	H
(9)	TURCAN	775	D
(10)	EL SAGRARIO	634	D
Project			
(11)	IBARRA	D 2.500 kw	(1976)

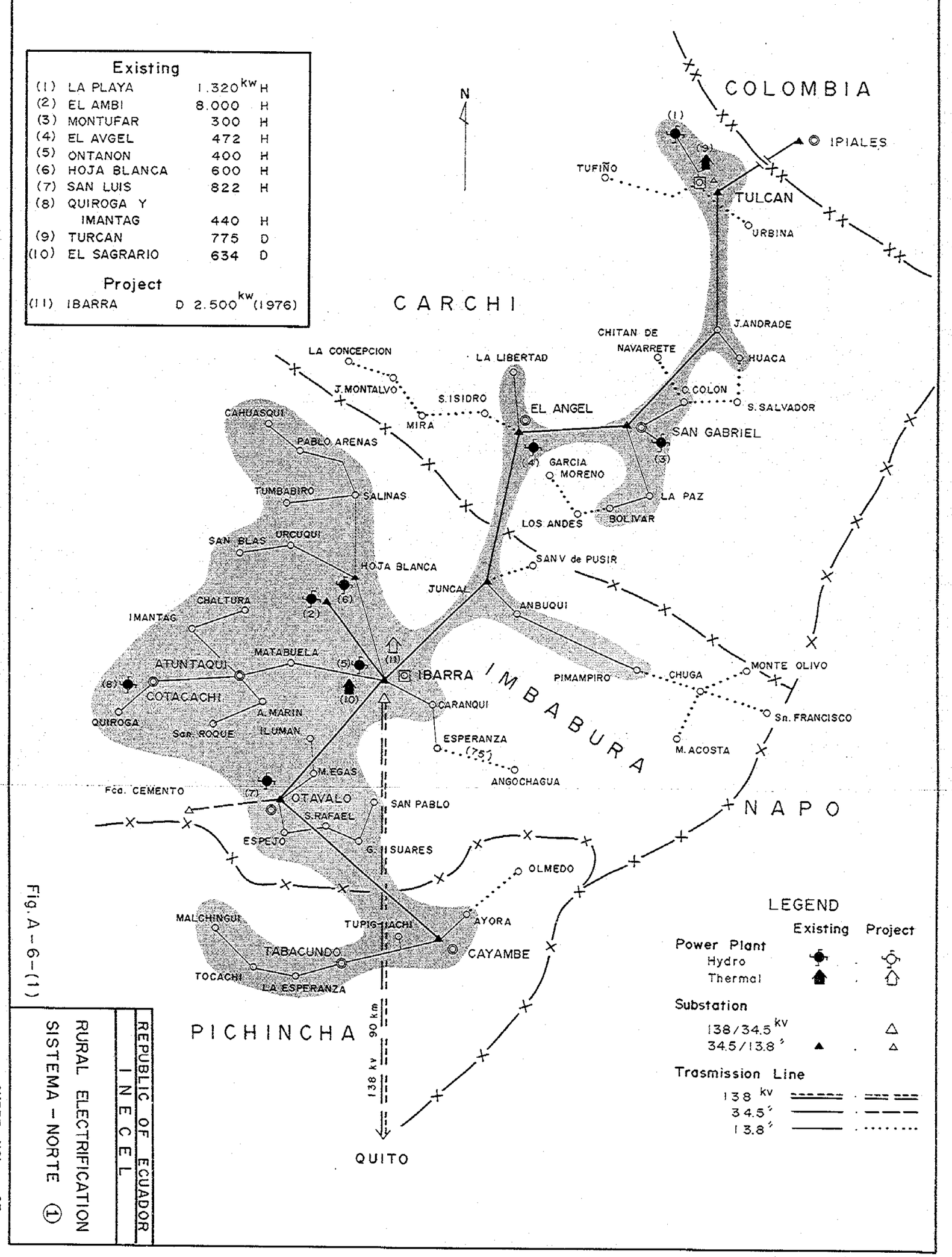
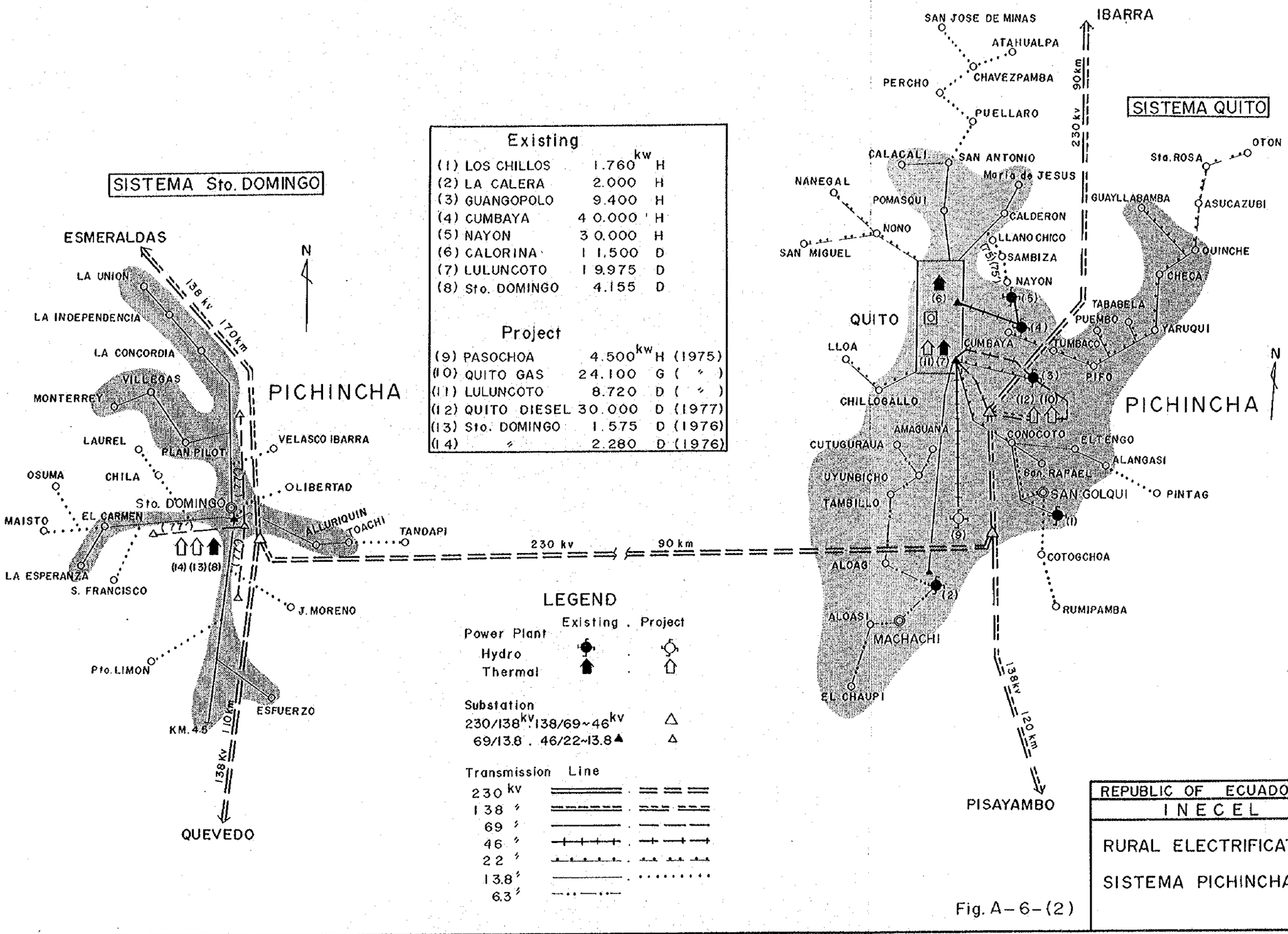


Fig. A-6-(1)

RURAL ELECTRIFICATION
SISTEMA - NORTE ①

REPUBLIC OF ECUADOR
INECEL

SHEET NO; OF



Existing			
(1) LOS CHILLOS	1.760 kw	H	
(2) LA CALERA	2.000	H	
(3) GUANGOPOLO	9.400	H	
(4) CUMBAYA	40.000	H	
(5) NAYON	30.000	H	
(6) CALORINA	11.500	D	
(7) LULUNCOTO	19.975	D	
(8) Sto. DOMINGO	4.155	D	
Project			
(9) PASOCHOA	4.500 kw	H	(1975)
(10) QUITO GAS	24.100	G	(〃)
(11) LULUNCOTO	8.720	D	(〃)
(12) QUITO DIESEL	30.000	D	(1977)
(13) Sto. DOMINGO	1.575	D	(1976)
(14) 〃	2.280	D	(1976)

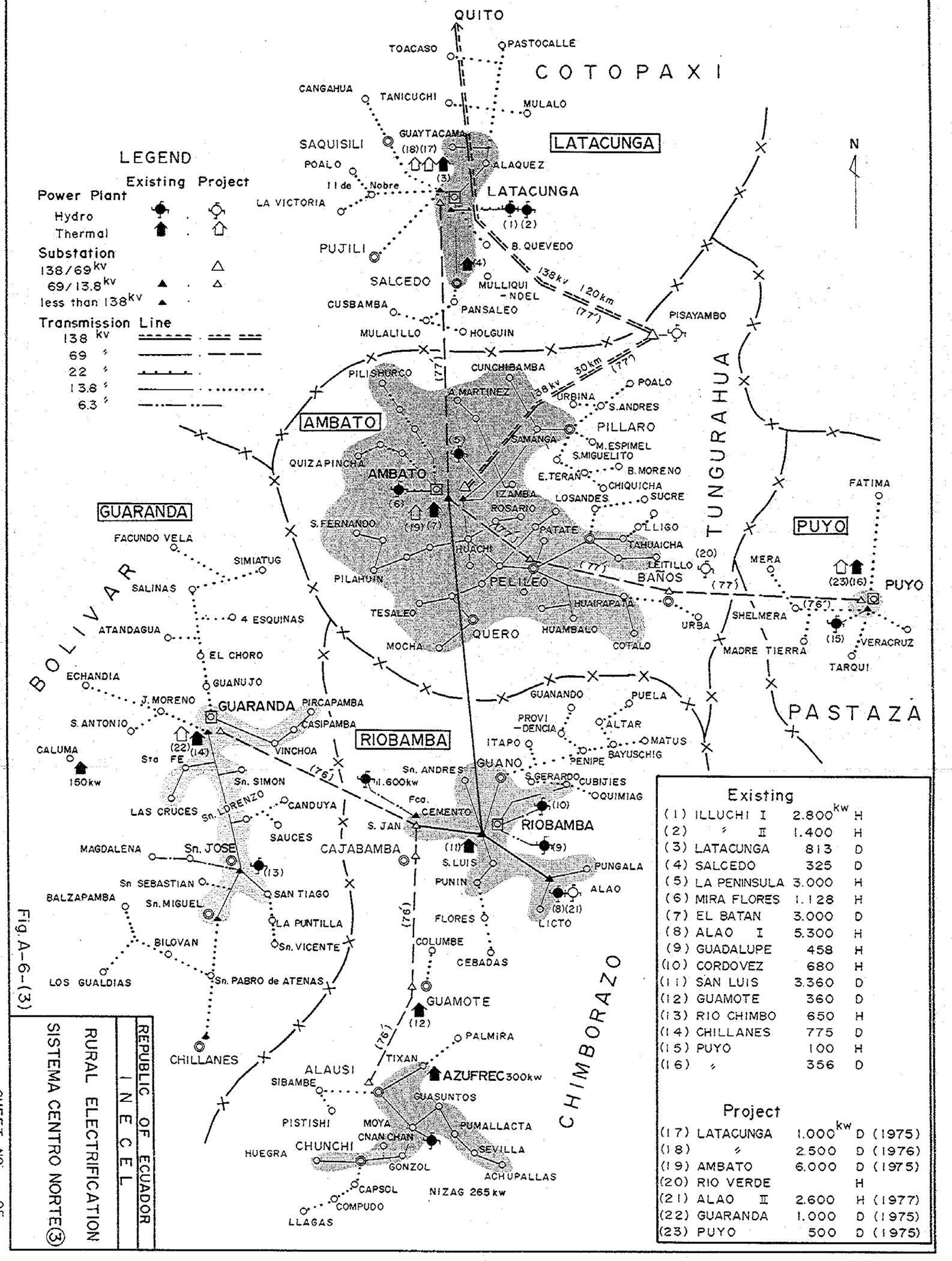
LEGEND

	Existing	Project
Power Plant		
Hydro	●	○
Thermal	▲	△
Substation		
230/138 kv 138/69~46 kv		△
69/13.8 . 46/22~13.8		△
Transmission Line		
230 kv	═══	═══
138 〃	═══	═══
69 〃	———	———
46 〃	+++++	+++++
22 〃	•••••	•••••
13.8 〃	———	·····
6.3 〃	—··—	

Fig. A-6-(2)

REPUBLIC OF ECUADOR
INECEL
RURAL ELECTRIFICATION
SISTEMA PICHINCHA ②

SHEET NO, OF



LEGEND

Existing Project

Power Plant
- Hydro
- Thermal

Substation
- 138/69 kv
- 69/13.8 kv
- less than 138 kv

Transmission Line
- 138 kv
- 69 "
- 22 "
- 13.8 "
- 6.3 "

Existing

(1)	ILLUCHI I	2.800 kw	H
(2)	" II	1.400	H
(3)	LATACUNGA	813	D
(4)	SALCEDO	325	D
(5)	LA PENINSULA	3.000	H
(6)	MIRA FLORES	1.128	H
(7)	EL BATAN	3.000	D
(8)	ALAO I	5.300	H
(9)	GUADALUPE	458	H
(10)	CORDOVEZ	680	H
(11)	SAN LUIS	3.360	D
(12)	GUAMOTE	360	D
(13)	RIO CHIMBO	650	H
(14)	CHILLANES	775	D
(15)	PUYO	100	H
(16)	"	356	D

Project

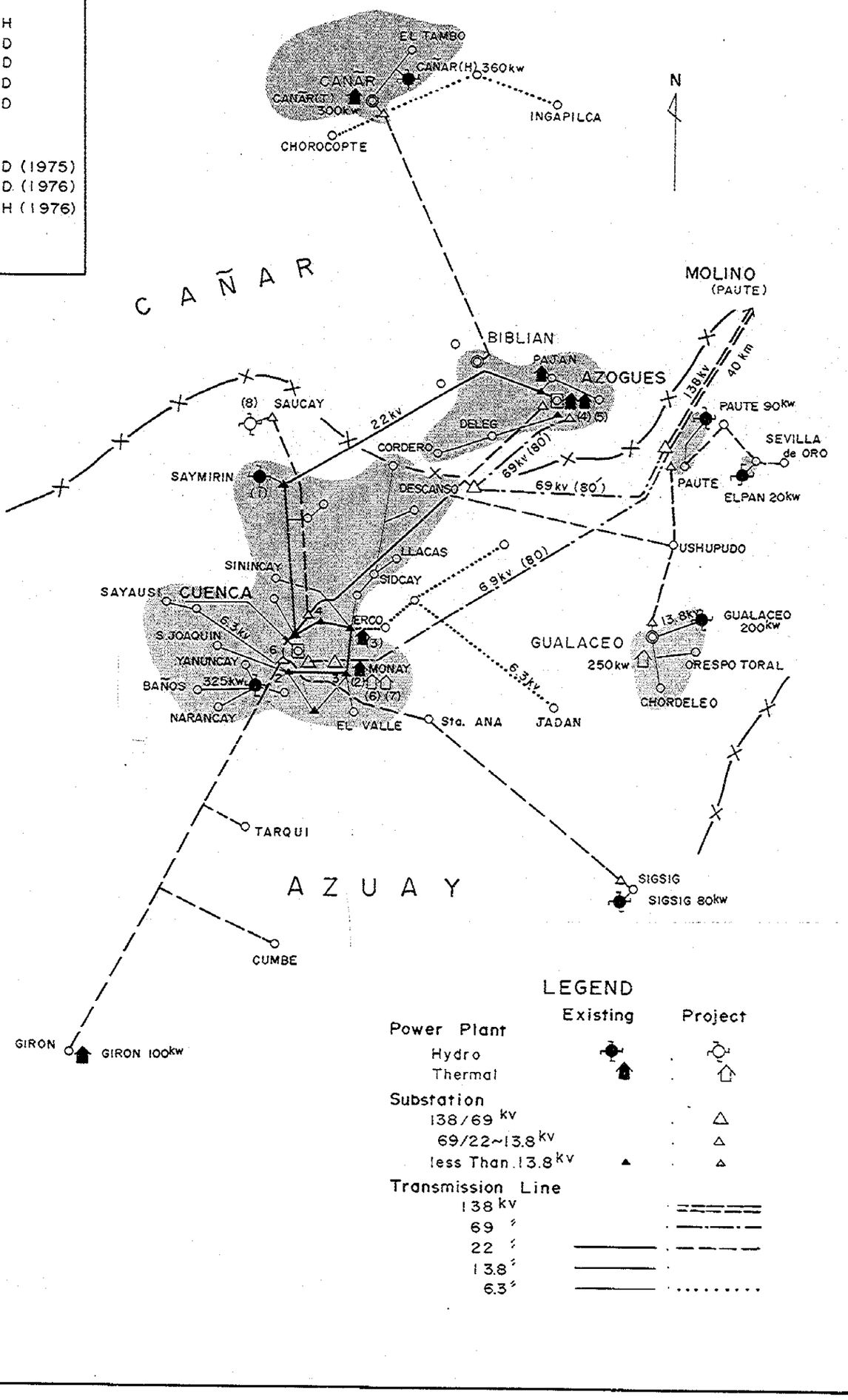
(17)	LATACUNGA	1.000 kw	D	(1975)
(18)	"	2.500	D	(1976)
(19)	AMBATO	6.000	D	(1975)
(20)	RIO VERDE		H	
(21)	ALAO II	2.600	H	(1977)
(22)	GUARANDA	1.000	D	(1975)
(23)	PUYO	500	D	(1975)

Fig. A-6-(3)

REPUBLIC OF ECUADOR
INECEL
RURAL ELECTRIFICATION
SISTEMA CENTRO NORTE ③

SHEET NO. OF

Existing			
(1)	SAYMIRIN	6.430 kw	H
(2)	MONAY I	4.500	D
(3)	ERCO	3.054	D
(4)	GUAPAN	2.500	D
(5)	AZOGUES	766	D
Project			
(6)	MONAY II	2.280 kw	D (1975)
(7)	MONAY III	8.500	D (1976)
(8)	SAUCAY	8.000	H (1976)



LEGEND

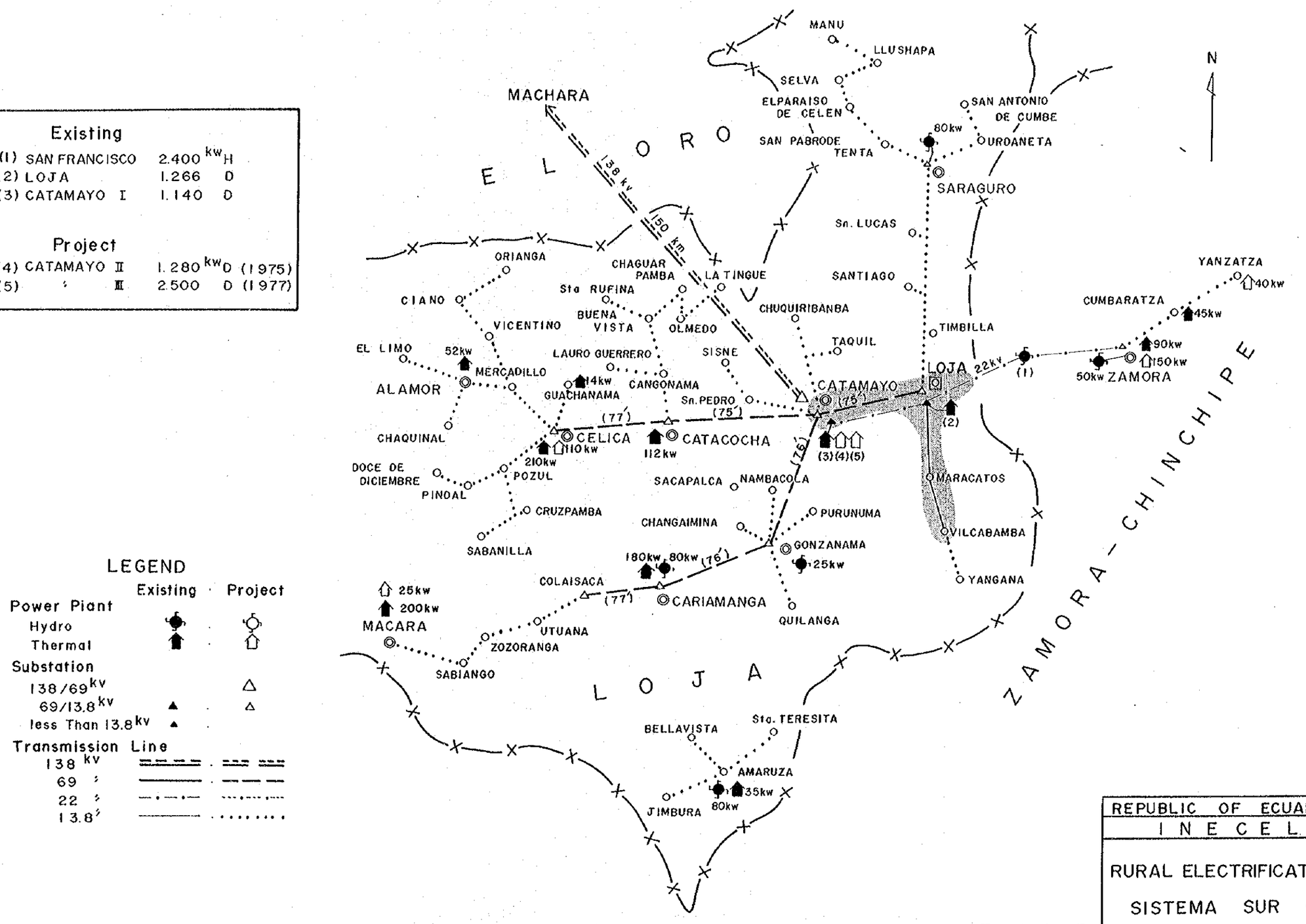
	Existing	Project
Power Plant		
Hydro		
Thermal		
Substation		
138/69 kv		
69/22~13.8 kv		
less Than 13.8 kv		
Transmission Line		
138 kv		
69 "		
22 "		
13.8 "		
6.3 "		

Fig. A-6-(4)

REPUBLIC OF ECUADOR
INECEL
RURAL ELECTRIFICATION
SISTEMA CENTRO SUR ④

SHEET NO. OF

Existing			
(1) SAN FRANCISCO	2.400	kw	H
(2) LOJA	1.266		D
(3) CATAMAYO I	1.140		D
Project			
(4) CATAMAYO II	1.280	kw	D (1975)
(5) " III	2.500		D (1977)



LEGEND

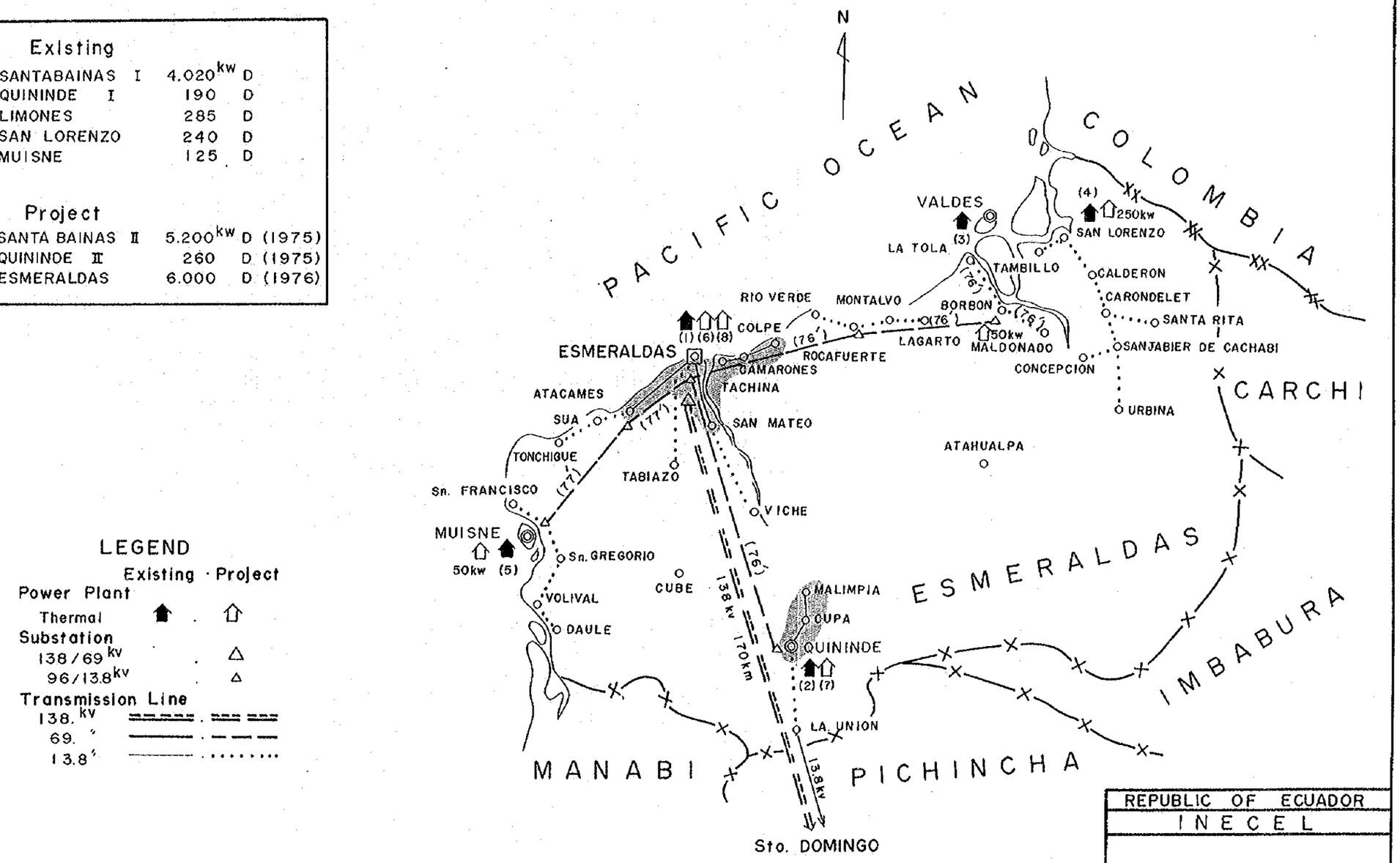
	Existing	Project
Power Plant		
Hydro	●	○
Thermal	▲	△
Substation		
138/69 kv		△
69/13.8 kv	▲	△
less Than 13.8 kv	▲	
Transmission Line		
138 kv	═══	═══
69 "	———	———
22 "	—·—·—	····
13.8 "	———	·····

REPUBLIC OF ECUADOR
I N E C E L
RURAL ELECTRIFICATION
SISTEMA SUR ⑤

Fig. A-6-(5)

SHEET NO, OF

Existing			
(1) SANTABAINAS I	4.020 kw	D	
(2) QUININDE I	190	D	
(3) LIMONES	285	D	
(4) SAN LORENZO	240	D	
(5) MUISNE	125	D	
Project			
(6) SANTA BAINAS II	5.200 kw	D	(1975)
(7) QUININDE II	260	D	(1975)
(8) ESMERALDAS	6.000	D	(1976)



LEGEND

	Existing	Project
Power Plant		
Thermal	⬆	⇧
Substation		
138/69 kv		△
96/13.8 kv		△
Transmission Line		
138. kv	═══	═══
69. "	———	— — —
13.8 "	———	.....

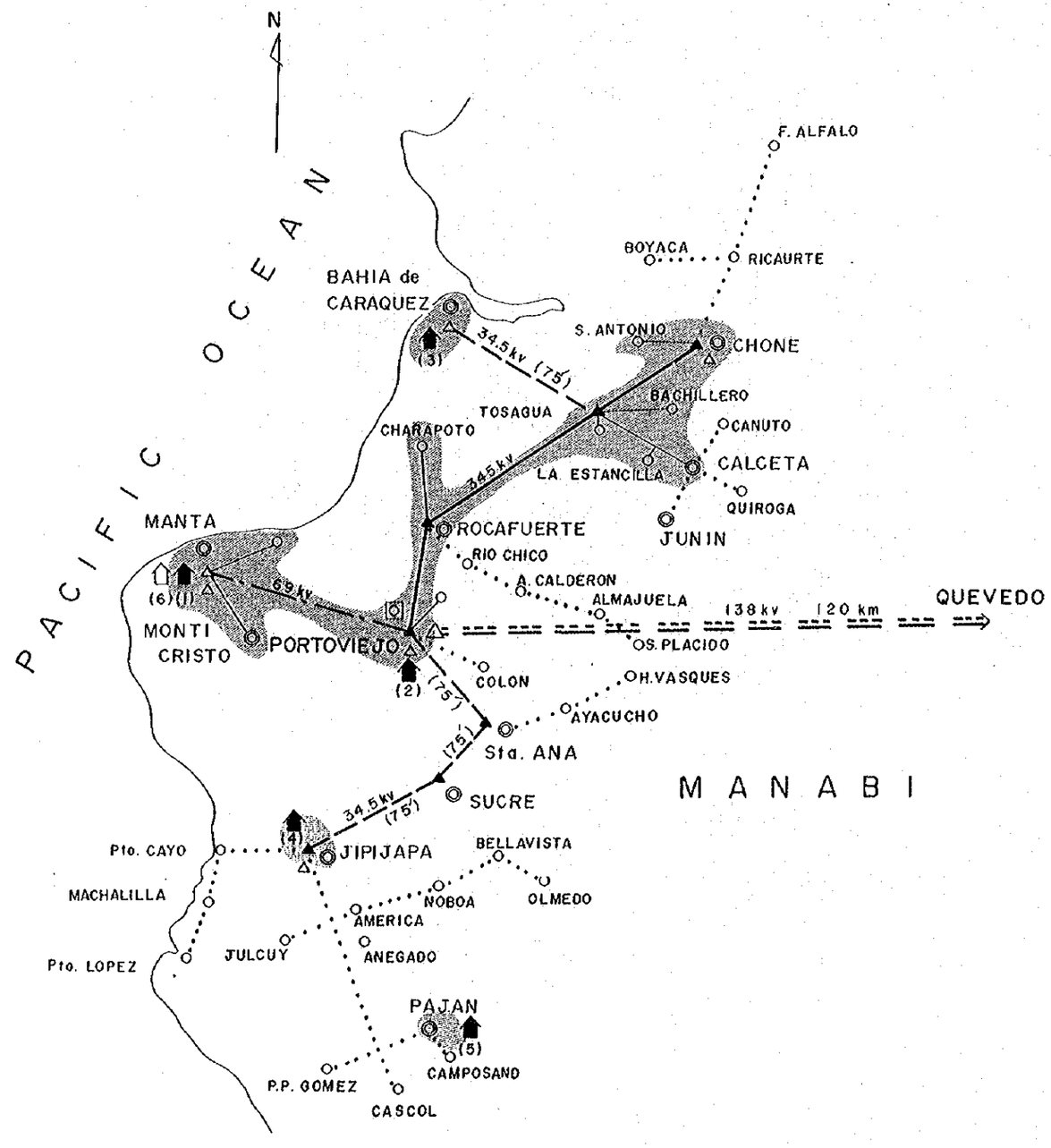
REPUBLIC OF ECUADOR
I N E C E L

RURAL ELECTRIFICATION

SISTEMA ESMERALDAS ⑥

Fig. A-6-(6)

SHEET NO, OF



Existing		
(1) MANTA	20.600 kw	D
(2) PORTOVIEJO	800	D
(3) BAHIA	1.020	D
(4) JIPIJAPA	590	D
(5) PAJAN	150	D
Project		
(6) MANTA	10.000 KVA	G (1976)

LEGEND

	Existing	Project
Power Plant		
Thermal	⬟	⇧
Substation		
138/69 kv		△
69/13.8·34.5/13.8	▲	△
Transmission Line		
138 kv	═══	═══
69 "	—·—	
34.5 "	———	— — —
13.8 "	———	·····

REPUBLIC OF ECUADOR
INECEL
RURAL ELECTRIFICATION
SISTEMA MANABI ⑦

Fig. A-6-(7)

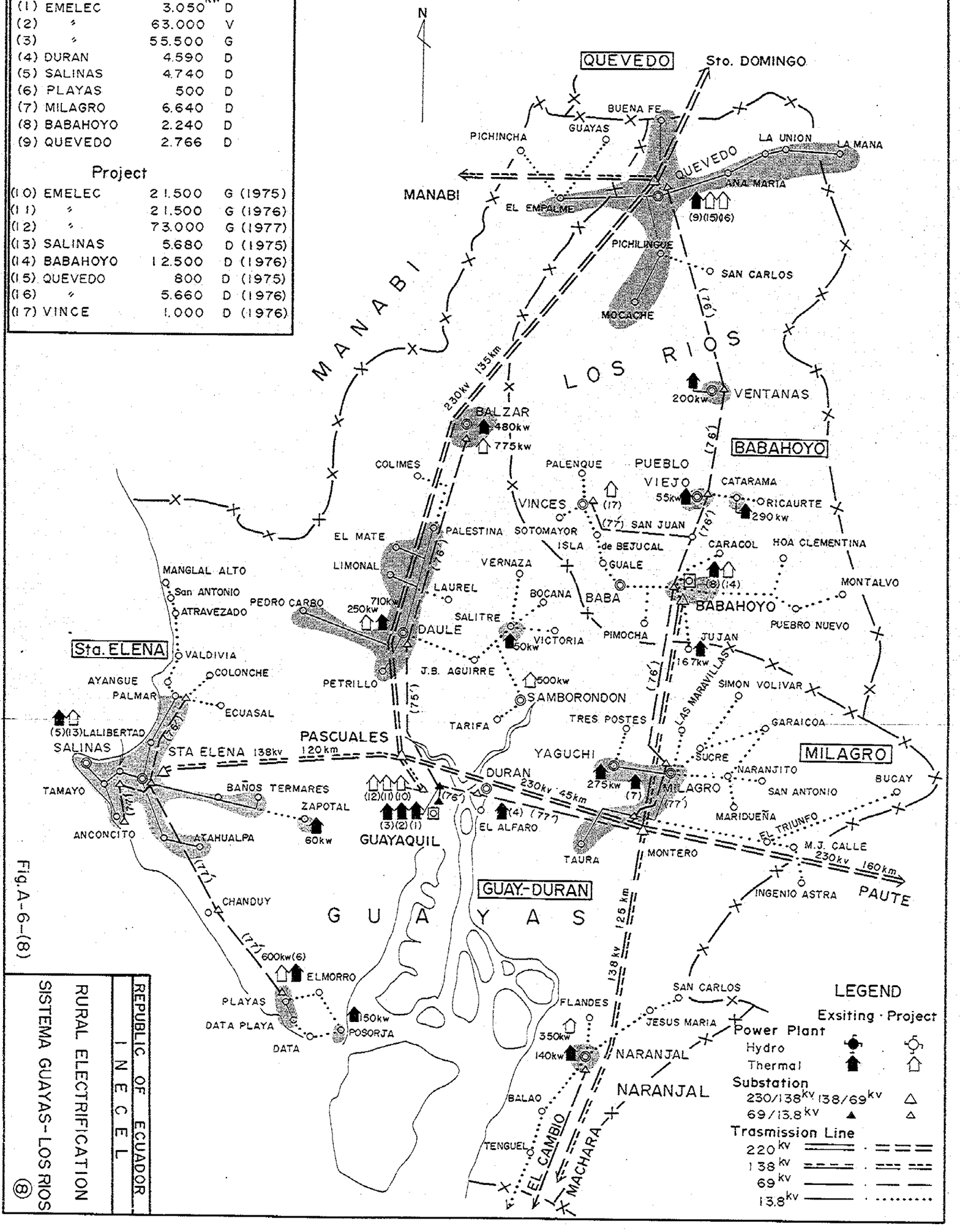
SHEET NO, OF

Existing

(1)	EMELEC	3.050 kw	D
(2)	〃	63.000	V
(3)	〃	55.500	G
(4)	DURAN	4.590	D
(5)	SALINAS	4.740	D
(6)	PLAYAS	500	D
(7)	MILAGRO	6.640	D
(8)	BABAHOYO	2.240	D
(9)	QUEVEDO	2.766	D

Project

(10)	EMELEC	21.500	G (1975)
(11)	〃	21.500	G (1976)
(12)	〃	73.000	G (1977)
(13)	SALINAS	5.680	D (1975)
(14)	BABAHOYO	12.500	D (1976)
(15)	QUEVEDO	800	D (1975)
(16)	〃	5.660	D (1976)
(17)	VINCE	1.000	D (1976)



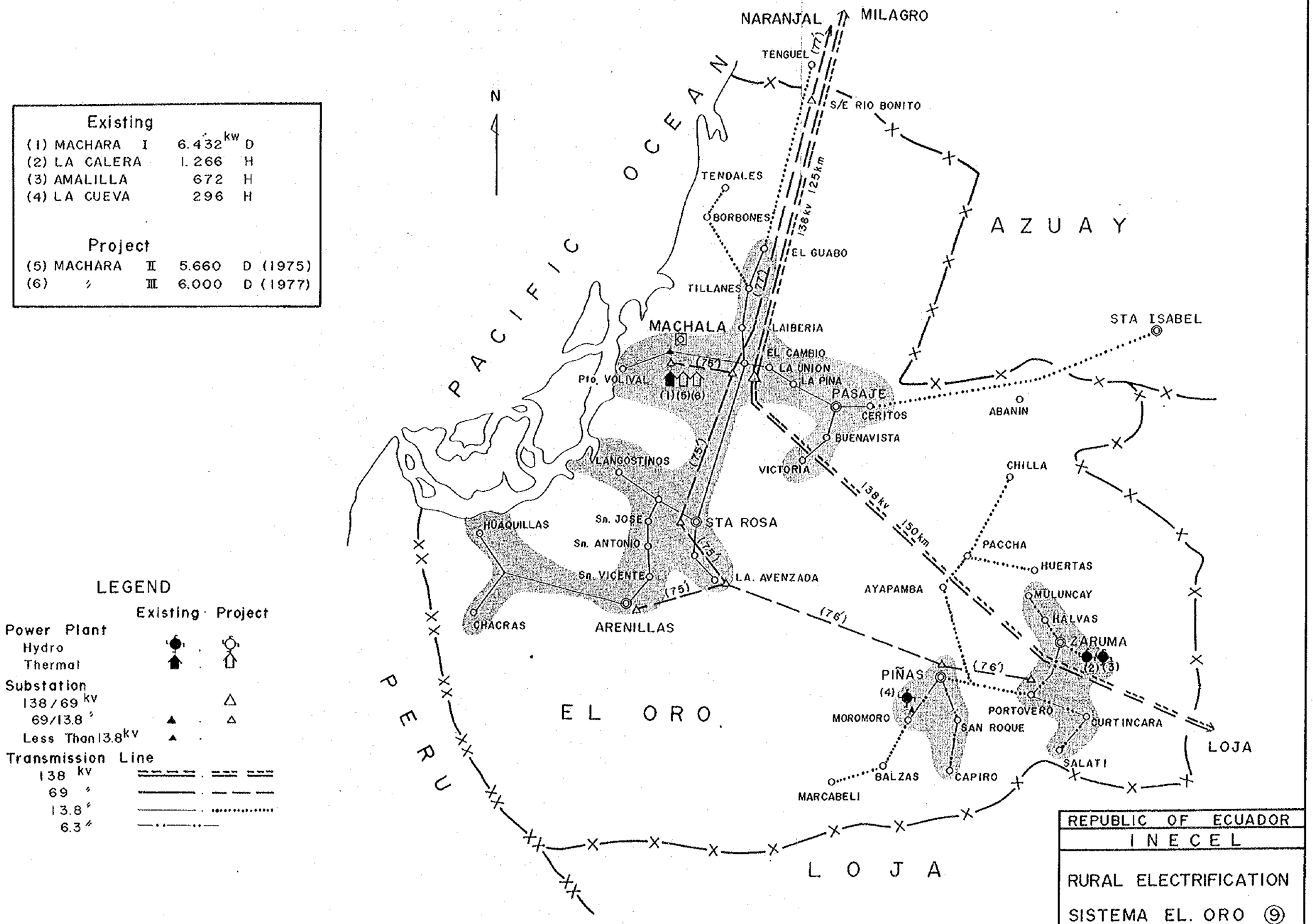
REPUBLIC OF ECUADOR
INECEL
RURAL ELECTRIFICATION
SISTEMA GUAYAS-LOS RIOS
⑧

Fig. A-6-(8)

SHEET NO. OF

Existing			
(1) MACHARA	I	6.432 kw	D
(2) LA CALERA		1.266	H
(3) AMALILLA		672	H
(4) LA CUEVA		296	H

Project			
(5) MACHARA	II	5.660	D (1975)
(6) "	III	6.000	D (1977)



LEGEND

	Existing	Project
Power Plant		
Hydro	●	○
Thermal	▲	△
Substation		
138/69 kv		△
69/13.8 "	▲	△
Less Than 13.8 kv	▲	
Transmission Line		
138 kv	═══	═══
69 "	———	— — —
13.8 "	———	·····
6.3 "	—·—·—	

REPUBLIC OF ECUADOR
I N E C E L

RURAL ELECTRIFICATION

SISTEMA EL. ORO ⑨

Fig. A-6-(9)

SHEET NO; OF