DAILY MEAN DISCHARGE AT APIUNA (17/25)

Year : 1973

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	93.2	283.6	125.6	71.9	185.4	111.4	354.4	164.0	649.2	266.6	155.0	71.9
2	98.4	242.8	122.7	71.9	146.0	106.2	350.8	152.0	553.7	253.0	188.5	67.3
3	125.6	210.4	140.1	69.6	122.7	101.0	318.4	143.0	425.4	236.0	239.4	69.6
4	161.0	167.0	152.0	67.3	114.0	103.6	297.2	134.3	421.6	223.2	194.7	78.8
5	263.2	300.6	164.0	69.6	111.4	95.8	239.4	125.6	433.0	200.9	164.0	90.6
6	200.9	216.8	146.0	76.5	119.8	90.6	188.5	116.9	361.6	191.6	152.0	108.8
7	149.0	179.2	108.8	71.9	200.9	85.7	161.0	111.4	340.0	185.4	140.1	114.0
8	161.0	143.0	101.0	67.3	164.0	85.7	146.0	108.8	325.6	170.0	131.4	146.0
9	155.0	128.5	149.0	59.0	149.0	95.8	128.5	103.6	307.6	164.0	119.8	170.0
10	131.4	119.8	210.4	67.3	134.3	134.3	119.8	101.0	318.4	149.0	111.4	111.4
11	119.8	108.8	185.4	65.0	122.7	122.7	111.4	111.4	270.0	336.4	106.2	93.2
12	137.2	101.0	152.0	61.0	111.4	106.2	108.8	249.6	290.4	354.4	103.6	83.4
13	140.1	125.6	128.5	61.0	108.8	98.4	103.6	771.5	307.6	276.8	103.6	76.5
14	134.3	155.0	114.0	59.0	95.8	90.6	101.0	1090.6	406.4	229.6	108.8	78.8
15	173.0	287.0	101.0	57.0	88.0	83.4	98.4	666.5	740.3	197.8	108.8	101.0
16	185.4	332.8	90.6	57.0	85.7	81.1	95.8	460.0	692.6	176.1	93.2	88.0
17	167.0	361.6	83.4	57.0	78.8	85.7	98.4	410.2	670.9	164.0	106.2	81.1
18	125.6	290.4	78.8	98.4	71.9	226.4	93.2	336.4	762.5	155.0	170.0	74.2
19	98.4	242.8	74.2	290.4	71.9	468.0	93.2	311.2	670.9	152.0	229.6	85.7
20	101.0	197.8	90.6	311.2	69.6	325.6	93.2	259.8	692.6	143.0	173.0	204.0
21	116.9	220.0	88.0	216.8	358.0	213.6	287.0	263.2	727.3	137.2	131.4	220.0
22	170.0	188.5	85.7	161.0	857.0	173.0	1374.5	614.5	653.5	125.6	111.4	173.0
23	197.8	200.9	88.0	131.4	398.8	194.7	1129.5	1153.8	553.7	149.0	98.4	131.4
24	229.6	223.2	95.8	106.2	270.0	1003.2	740.3	771.5	476.0	263.2	103.6	116.9
25	361.6	188.5	143.0	93.2	239.4	2087.6	468.0	562.4	406.4	223.2	137.2	155.0
26	452.0	149.0	137.2	90.6	226.4	1252.6	391.2	670.9	343.6	176.1	143.0	185.4
27	440.6	134.3	111.4	88.0	204.0	683.9	368.8	1134.4	297.2	155.0	114.0	158.0
28	354.4	137.2	93.2	88.0	197.8	464.0	340.0	1902.3	273.4	146.0	103.6	122.7
29	311.2		90.6	93.2	170.0	414.0	293.8	2234.6	263.2	131.4	88.0	116.9
30	368.8		85.7	125.6	149.0	387.4	229.6	1354.2	270.0	116.9	76.5	134.3
31	347.2		78.8		122.7		182.3	884.0		125.6		176.1
Mean	202.3	201.3	116.6	100.1	178.9	319.1	293.7	563.7	463.5	192.7	133.5	118.8

Year : 1974

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	232.8	200.9	283.6	149.0	83.4	45.0	85.7	155.0	960.5	67.3	113.1	57.0
2	259.8	155.0	229.6	158.0	78.8	43.4	81.1	140.1	575.4	65.0	70.8	61.0
3	229.6	152.0	223.2	143.0	74.2	41.7	76.5	128.5	383.6	61.0	66.3	67.3
4	185.4	173.0	433.0	128.5	69.6	41.7	67.3	122.7	304.0	65.0	63.5	61.0
5	137.2	210.4	358.0	119.8	65.0	40.1	65.0	116.9	293.8	76.5	94.1	53.0
6	116.9	197.8	429.2	111.4	61.0	38.5	63.0	114.0	436.8	74.2	289.8	49.0
7	111.4	200.9	322.0	111.4	59.0	57.0	61.0	103.6	468.0	69.6	180.7	47.0
8	226.4	152.0	280.2	108.8	57.0	83.4	61.0	95.8	379.8	65.0	129.1	45.0
9	794.0	128.5	216.8	98.4	57.0	179.2	59.0	88.0	290.4	61.0	76.5	43.4
10	610.1	108.8	191.6	90.6	65.0	204.0	59.0	83.4	249.6	57.0	65.0	41.7
11	448.2	95.8	210.4	88.0	63.0	207.2	57.0	78.8	210.4	55.0	62.0	41.7
12	350.8	90.6	259.8	85.7	59.0	134.3	55.0	74.2	182.3	53.0	60.5	40.1
13	280.2	83.4	236.0	83.4	55.0	95.8	53.0	74.2	164.0	49.0	62.0	40.1
14	210.4	78.8	204.0	83.4	51.0	76.5	51.0	71.9	152.0	47.0	62.0	40.1
15	207.2	83.4	200.9	81.1	51.0	69.6	51.0	69.6	143.0	45.0	59.0	38.5
16	185.4	95.8	270.0	74.2	51.0	65.0	49.0	67.3	125.6	43.4	49.6	38.5
17	161.0	131.4	562.4	67.3	49.0	83.4	49.0	65.0	122.7	45.0	48.3	36.8
18	149.0	270.0	372.4	74.2	49.0	111.4	49.0	63.0	103.6	45.0	47.0	36.8
19	140.1	350.8	283.6	69.6	51.0	119.8	47.0	61.0	103.6	43.4	59.0	36.8
20	164.0	290.4	213.6	67.3	55.0	103.6	55.0	59.0	95.8	41.7	170.3	45.0
21	263.2	263.2	191.6	69.6	59.0	98.4	71.9	57.0	90.6	40.1	288.1	47.0
22	239.4	343.6	236.0	74.2	55.0	134.3	318.4	55.0	88.0	40.1	245.8	45.0
23	176.1	452.0	350.8	74.2	51.0	131.4	843.5	55.0	81.1	40.1	145.3	38.5
24	149.0	653.5	553.7	71.9	47.0	111.4	879.5	53.0	76.5	49.0	105.8	36.8
25	131.4	683.9	472.0	85.7	47.0	103.6	696.9	51.0	71.9	106.2	94.1	35.2
26	167.0	553.7	410.2	146.0	49.0	116.9	484.0	51.0	71.9	140.1	80.8	33.6
27	276.8	436.8	350.8	125.6	51.0	111.4	417.8	53.0	81.1	297.2	72.2	32.0
28	350.8	332.8	297.2	103.6	53.0	103.6	293.8	55.0	98.4	287.0	60.5	36.8
29	280.2		253.0	93.2	49.0	98.4	226.4	57.0	90.6	232.8	59.0	63.0
30	232.8		200.9	88.0	47.0	90.6	185.4	59.0	76.5	182.3	57.7	74.2
31	226.4		167.0		45.0		167.0	128.5		114.0		128.5
Mean	248.2	248.9	298.8	97.5	56.7	98.0	186.4	80.9	219.1	85.7	101.3	48.1

DAILY MEAN DISCHARGE AT APIUNA (18/25)

Year : 1975

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	182.3	78.8	220.0	179.2	51.0	57.0	71.9	51.0	358.0	696.9	179.2	266.6
2	149.0	95.8	161.0	158.0	63.0	93.2	65.0	49.0	558.0	2187.5	164.0	429.2
3	98.4	122.7	122.7	106.2	78.8	158.0	63.0	49.0	402.6	2405.1	155.0	480.0
4	69.6	106.2	95.8	98.4	74.2	170.0	61.0	51.0	318.4	1344.0	149.0	444.4
5	57.0	88.0	149.0	106.2	65.0	152.0	61.0	71.9	263.2	852.5	140.1	592.8
6	53.0	69.6	188.5	95.8	59.0	143.0	71.9	332.8	223.2	714.3	134.3	696.9
7	74.2	57.0	188.5	88.0	51.0	213.6	83.4	683.9	213.6	549.4	143.0	758.0
8	106.2	55.0	194.7	83.4	49.0	213.6	69.6	614.5	354.4	464.0	134.3	683.9
9	191.6	53.0	236.0	81.1	47.0	158.0	65.0	644.8	402.6	402.6	114.0	636.2
10	161.0	51.0	220.0	76.5	45.0	116.9	61.0	762.5	350.8	372.4	103.6	736.0
11	207.2	51.0	170.0	69.6	41.7	101.0	59.0	588.4	425.4	361.6	95.8	610.1
12	200.9	49.0	158.0	69.6	40.1	98.4	57.0	402.6	1405.0	354.4	93.2	579.7
13	158.0	47.0	122.7	67.3	41.7	116.9	55.0	314.8	1374.5	340.0	85.7	1163.5
14	119.8	51.0	122.7	65.0	41.7	134.3	53.0	273.4	965.0	468.0	83.4	924.5
15	95.8	45.0	114.0	69.6	38.5	119.8	55.0	253.0	666.5	714.3	78.8	692.6
16	103.6	40.1	103.6	71.9	40.1	95.8	111.4	236.0	425.4	516.0	74.2	488.0
17	128.5	47.0	95.8	71.9	98.4	85.7	263.2	213.6	387.4	410.2	111.4	417.8
18	108.8	85.7	95.8	65.0	354.4	98.4	197.8	191.6	395.0	347.2	167.0	343.6
19	101.0	71.9	103.6	59.0	256.4	95.8	143.0	164.0	402.6	311.2	143.0	336.4
20	88.0	65.0	111.4	55.0	179.2	93.2	106.2	149.0	376.0	259.8	131.4	336.4
21	85.7	59.0	164.0	49.0	131.4	95.8	95.8	131.4	391.2	229.6	143.0	325.6
22	69.6	57.0	329.2	47.0	106.2	88.0	88.0	119.8	492.0	194.7	149.0	300.6
23	61.0	55.0	304.0	45.0	93.2	85.7	78.8	114.0	601.4	170.0	158.0	350.8
24	53.0	51.0	273.4	47.0	78.8	90.6	71.9	106.2	623.1	152.0	307.6	329.2
25	47.0	53.0	263.2	49.0	71.9	85.7	67.3	95.8	500.0	140.1	528.0	304.0
26	45.0	95.8	239.4	45.0	67.3	81.1	65.0	90.6	448.2	140.1	500.0	246.2
27	51.0	236.0	216.8	43.4	65.0	78.8	61.0	78.8	398.8	131.4	365.2	253.0
28	74.2	322.0	194.7	43.4	61.0	71.9	59.0	74.2	421.6	131.4	290.4	283.6
29	101.0		179.2	43.4	59.0	63.0	57.0	69.6	410.2	125.6	242.8	287.0
30	85.7		239.4	47.0	57.0	78.8	55.0	88.0	562.4	125.6	256.4	229.6
31	71.9		223.2		55.0		53.0	152.0		140.1		176.1
Mean	103.2	80.7	180.7	73.2	82.6	111.1	81.5	232.8	503.9	508.1	180.7	474.3

Year : 1976

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	161.0	167.0	90.6	114.0	57.0	508.0	116.9	387.4	114.0	85.7	134.3	588.4
2	155.0	213.6	90.6	106.2	57.0	448.2	111.4	343.6	111.4	78.8	125.6	1046.9
3	143.0	204.0	101.0	98.4	55.0	365.2	114.0	280.2	103.6	76.5	122.7	771.5
4	140.1	167.0	290.4	93.2	53.0	329.2	125.6	246.2	119.8	78.8	146.0	492.0
5	149.0	146.0	406.4	90.6	53.0	553.7	122.7	322.0	179.2	95.8	280.2	421.6
6	143.0	137.2	472.0	116.9	51.0	1247.5	111.4	540.7	283.6	116.9	425.4	425.4
7	155.0	140.1	425.4	125.6	51.0	701.3	106.2	524.0	425.4	111.4	350.8	406.4
8	213.6	125.6	304.0	114.0	53.0	452.0	108.8	376.0	558.0	85.7	256.4	558.0
9	259.8	103.6	266.6	101.0	51.0	379.8	140.1	536.3	520.0	90.6	200.9	679.6
10	220.0	106.2	194.7	158.0	59.0	417.8	134.3	1037.2	436.8	98.4	167.0	488.0
11	280.2	98.4	270.0	188.5	111.4	584.1	119.8	906.5	354.4	101.0	137.2	395.0
12	421.6	85.7	207.2	155.0	158.0	504.0	114.0	653.5	266.6	83.4	119.8	297.2
13	601.4	81.1	170.0	128.5	108.8	440.6	111.4	524.0	236.0	74.2	111.4	223.2
14	592.8	78.8	173.0	116.9	119.8	433.0	119.8	444.4	226.4	69.6	106.2	179.2
15	520.0	95.8	164.0	106.2	164.0	410.2	122.7	318.4	200.9	69.6	103.6	155.0
16	492.0	74.2	170.0	101.0	191.6	332.8	111.4	280.2	182.3	134.3	103.6	143.0
17	402.6	76.5	164.0	93.2	164.0	276.8	103.6	232.8	170.0	304.0	98.4	137.2
18	280.2	81.1	197.8	88.0	125.6	242.8	98.4	226.4	161.0	293.8	93.2	122.7
19	239.4	95.8	263.2	85.7	103.6	204.0	90.6	304.0	140.1	290.4	90.6	114.0
20	223.2	111.4	239.4	81.1	95.8	197.8	88.0	325.6	128.5	259.8	93.2	116.9
21	210.4	114.0	311.2	78.8	90.6	188.5	88.0	276.8	125.6	210.4	125.6	134.3
22	229.6	137.2	318.4	74.2	88.0	179.2	85.7	232.8	122.7	191.6	134.3	143.0
23	191.6	122.7	242.8	69.6	103.6	164.0	85.7	210.4	111.4	170.0	93.2	188.5
24	170.0	108.8	191.6	67.3	111.4	155.0	81.1	191.6	108.8	158.0	88.0	307.6
25	182.3	125.6	164.0	65.0	108.8	149.0	78.8	176.1	103.6	149.0	83.4	249.6
26	273.4	114.0	152.0	61.0	173.0	134.3	111.4	164.0	103.6	167.0	88.0	176.1
27	421.6	161.0	158.0	59.0	361.6	131.4	500.0	152.0	101.0	191.6	76.5	191.6
28	332.8	137.2	179.2	57.0	902.0	134.3	440.6	140.1	98.4	191.6	81.1	216.8
29	287.0	111.4	170.0	57.0	1547.4	119.8	395.0	137.2	93.2	170.0	71.9	200.9
30	232.8		143.0	55.0	1012.9	119.8	358.0	119.8	83.4	158.0	69.6	152.0
31	185.4		125.6		723.0		402.6	111.4		146.0		125.6
Mean	274.5	121.4	219.9	96.9	229.2	350.1	158.0	345.9	199.0	145.2	139.3	317.7

DAILY MEAN DISCHARGE AT APIUNA (19/25)

Year : 1977

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	122.6	318.3	103.5	440.5	83.3	51.0	49.0	83.3	229.5	307.5	146.0	182.2
2	116.8	259.7	242.7	433.0	81.0	49.0	47.0	179.1	176.0	848.0	137.1	170.0
3	167.0	266.5	210.3	383.5	78.7	49.0	47.0	182.2	161.0	605.7	182.2	167.0
4	210.3	347.1	256.3	280.1	78.7	49.0	43.3	137.1	158.0	425.3	239.3	170.0
5	290.3	368.7	270.0	259.7	78.7	47.0	41.7	111.3	146.0	358.0	216.7	167.0
6	372.3	520.0	249.5	223.1	76.5	45.0	38.4	98.3	131.3	340.0	179.1	149.0
7	266.5	709.9	242.7	188.5	76.5	45.0	35.2	88.0	140.0	311.1	167.0	226.3
8	194.6	588.4	220.0	155.0	76.5	45.0	35.2	78.7	200.8	253.0	158.0	300.5
9	167.0	508.0	182.2	191.5	71.8	43.3	33.5	74.1	191.5	188.5	155.0	236.0
10	167.0	452.0	158.0	226.3	69.5	41.7	33.5	67.2	173.0	71.8	152.0	191.5
11	191.5	452.0	149.0	226.3	88.0	41.7	33.5	65.0	125.5	143.0	631.8	173.0
12	229.5	414.0	176.0	200.8	108.7	41.7	33.5	61.0	128.5	182.2	1313.4	164.0
13	232.7	414.0	197.7	167.0	90.5	40.1	31.9	61.0	111.3	492.0	767.0	146.0
14	249.5	387.3	173.0	146.0	78.7	40.1	31.9	65.0	98.3	767.0	549.3	134.2
15	433.0	332.7	146.0	134.2	74.1	38.4	35.2	71.8	95.7	592.7	433.0	119.7
16	429.1	283.5	197.7	122.6	67.2	38.4	47.0	297.1	164.0	718.6	379.7	111.3
17	440.5	242.7	220.0	119.7	65.0	38.4	55.0	1481.8	210.3	1585.4	283.5	106.1
18	701.2	197.7	170.0	149.0	61.0	40.1	53.0	1476.4	194.6	1124.3	220.0	95.7
19	1248.0	152.0	146.0	137.1	61.0	41.7	45.0	1080.6	167.0	798.5	173.0	93.1
20	974.0	131.3	116.8	122.6	57.0	49.0	43.3	875.0	146.0	636.1	146.0	90.5
21	753.5	125.5	143.0	116.8	57.0	63.0	40.1	640.5	128.5	504.0	152.0	111.3
22	584.0	116.8	197.7	125.5	53.0	65.0	45.0	488.0	116.8	433.0	158.0	119.7
23	476.0	108.7	249.5	122.6	53.0	63.0	103.5	444.3	106.1	387.3	173.0	103.5
24	425.3	108.7	242.7	111.3	53.0	61.0	229.5	425.3	106.1	318.3	176.0	98.3
25	468.0	98.3	191.5	98.3	51.0	67.2	263.1	429.1	101.0	297.1	210.3	93.1
26	365.1	93.1	194.6	95.7	51.0	76.5	207.1	410.1	90.5	329.1	213.5	90.5
27	314.7	106.1	185.3	93.1	51.0	63.0	131.3	318.3	81.0	314.7	191.5	83.3
28	283.5	108.7	176.0	88.0	51.0	61.0	108.7	276.7	78.7	259.7	232.7	83.3
29	270.0		200.8	85.6	51.0	57.0	90.5	259.7	74.1	200.8	242.7	69.5
30	297.1		242.7	83.3	51.0	53.0	85.6	226.3	78.7	155.0	216.7	71.8
31	290.3		304.0		51.0		76.5	266.5		134.2		71.8
Mean	378.4	293.3	198.6	177.6	67.6	50.1	70.8	349.0	137.0	454.3	286.5	135.1

Year : 1978

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	67.2	164.0	61.0	69.5	31.9	23.5	31.9	71.8	47.0	67.2	194.6	74.1
2	78.7	128.5	88.0	65.0	31.9	23.5	31.9	67.2	49.0	63.0	191.5	69.5
3	78.7	125.5	311.1	61.0	35.2	23.5	30.3	63.0	101.0	59.0	140.0	63.0
4	71.8	161.0	350.7	53.0	35.2	23.5	28.6	59.0	343.5	57.0	143.0	59.0
5	63.0	161.0	229.5	53.0	33.5	23.5	28.6	57.0	512.0	55.0	194.6	67.2
6	61.0	131.3	170.0	53.0	33.5	22.2	28.6	53.0	387.3	53.0	167.0	103.5
7	59.0	114.0	131.3	49.0	33.5	22.2	30.3	49.0	287.0	49.0	131.3	131.3
8	63.0	93.1	101.0	47.0	31.9	53.0	28.6	45.0	216.7	49.0	106.1	114.0
9	78.7	83.3	83.3	45.0	30.3	95.7	27.4	45.0	207.1	47.0	93.1	88.0
10	83.3	74.1	81.0	45.0	28.6	81.0	27.4	43.3	167.0	45.0	88.0	85.6
11	81.0	65.0	122.6	43.3	27.4	55.0	26.1	43.3	140.0	49.0	88.0	83.3
12	65.0	67.2	429.1	41.7	27.4	40.1	26.1	49.0	119.7	51.0	78.7	69.5
13	63.0	65.0	361.5	41.7	27.4	35.2	26.1	170.0	108.7	49.0	69.5	63.0
14	57.0	74.1	229.5	40.1	26.1	31.9	26.1	266.5	101.0	45.0	65.0	57.0
15	61.0	74.1	197.7	40.1	26.1	30.3	24.8	179.1	270.0	49.0	61.0	55.0
16	69.5	81.0	176.0	40.1	35.2	30.3	24.8	128.5	425.3	53.0	63.0	55.0
17	65.0	74.1	167.0	40.1	47.0	30.3	24.8	103.5	300.5	47.0	65.0	106.1
18	59.0	71.8	155.0	38.4	51.0	28.6	41.7	88.0	270.0	47.0	63.0	116.8
19	83.3	59.0	125.5	38.4	43.3	28.6	71.8	76.5	242.7	137.1	111.3	93.1
20	239.3	55.0	85.6	38.4	36.8	28.6	85.6	71.8	155.0	480.0	220.0	76.5
21	229.5	57.0	83.3	38.4	31.9	43.3	125.5	71.8	131.3	398.7	213.5	65.0
22	188.5	146.0	76.5	36.8	28.6	81.0	246.1	78.7	116.8	280.1	368.7	57.0
23	137.1	125.5	74.1	35.2	27.4	74.1	365.1	76.5	106.1	210.3	322.0	53.0
24	114.0	116.8	71.8	33.5	26.1	59.0	402.5	67.2	93.1	152.0	232.7	49.0
25	176.0	85.6	65.0	31.9	26.1	49.0	350.7	63.0	85.6	125.5	170.0	85.6
26	146.0	71.8	90.5	30.3	26.1	45.0	226.3	55.0	83.3	122.6	143.0	1973.3
27	213.5	67.2	93.1	30.3	24.8	43.3	161.0	51.0	76.5	119.7	116.8	1056.4
28	226.3	65.0	111.3	30.3	24.8	38.4	125.5	49.0	74.1	116.8	101.0	496.0
29	173.0		98.3	30.3	24.8	36.8	101.0	47.0	74.1	103.5	88.0	343.5
30	137.1		85.6	30.3	24.8	33.5	85.6	47.0	74.1	93.1	81.0	398.7
31	188.5		78.7		24.8		78.7	49.0		106.1		379.7
Mean	112.2	94.9	147.9	42.3	31.1	41.1	94.8	76.9	178.9	109.0	139.0	212.5

DAILY MEAN DISCHARGE AT APIUNA (20/25)

Year : 1979

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	340.0	35.2	63.0	27.4	49.0	128.5	59.0	67.2	74.1	332.7	504.0	179.1
2	220.0	31.9	53.0	26.1	47.0	111.3	59.0	65.0	131.3	701.2	440.5	170.0
3	158.0	30.3	47.0	61.0	43.3	98.3	69.5	67.2	128.5	947.0	421.5	173.0
4	164.0	28.6	41.7	158.0	90.5	93.1	95.7	67.2	101.0	701.2	350.7	246.1
5	155.0	27.4	38.4	152.0	143.0	85.6	76.5	59.0	88.0	549.3	266.5	361.5
6	125.5	26.1	33.5	253.0	122.6	93.1	67.2	55.0	81.0	592.7	226.3	300.5
7	108.7	27.4	31.9	182.2	90.5	116.8	106.1	53.0	71.8	1041.8	185.3	259.7
8	98.3	28.6	28.6	111.3	125.5	173.0	176.0	53.0	69.5	1629.0	304.0	300.5
9	95.7	43.3	28.6	78.7	1487.3	223.1	270.0	53.0	65.0	1379.1	383.5	229.5
10	85.6	65.0	36.8	61.0	1153.4	200.8	270.0	57.0	71.8	762.5	425.3	204.0
11	74.1	57.0	63.0	55.0	679.5	161.0	216.7	57.0	179.1	614.4	679.5	365.1
12	67.2	47.0	67.2	49.0	508.0	137.1	173.0	55.0	340.0	549.3	566.7	246.1
13	63.0	85.6	61.0	45.0	549.3	122.6	149.0	49.0	322.0	532.0	421.5	266.5
14	61.0	88.0	114.0	43.3	644.8	111.3	128.5	49.0	304.0	740.3	336.3	350.7
15	57.0	74.1	158.0	41.7	785.0	101.0	114.0	65.0	287.0	692.5	249.5	662.1
16	53.0	49.0	155.0	51.0	512.0	90.5	106.1	78.7	229.5	610.1	216.7	597.0
17	53.0	41.7	116.8	81.0	402.5	85.6	95.7	76.5	188.5	553.6	204.0	496.0
18	53.0	35.2	90.5	146.0	336.3	81.0	90.5	134.2	173.0	488.0	213.5	406.3
19	47.0	31.9	67.2	149.0	290.3	78.7	85.6	358.0	173.0	372.3	204.0	329.1
20	45.0	35.2	55.0	114.0	226.3	76.5	88.0	307.5	152.0	307.5	182.2	266.5
21	43.3	51.0	53.0	81.0	167.0	71.8	85.6	283.5	131.3	266.5	158.0	220.0
22	43.3	43.3	45.0	67.2	146.0	69.5	83.3	226.3	122.6	216.7	155.0	200.8
23	41.7	36.8	40.1	59.0	140.0	69.5	78.7	179.1	155.0	158.0	173.0	182.2
24	38.4	43.3	38.4	51.0	146.0	69.5	71.8	122.6	179.1	170.0	182.2	161.0
25	38.4	65.0	38.4	51.0	134.2	71.8	69.5	106.1	155.0	480.0	425.3	146.0
26	38.4	98.3	33.5	49.0	114.0	74.1	81.0	95.7	140.0	528.0	358.0	134.2
27	41.7	90.5	31.9	43.3	101.0	69.5	98.3	88.0	131.3	512.0	280.1	119.7
28	47.0	74.1	30.3	41.7	93.1	65.0	93.1	85.6	114.0	436.7	220.0	111.3
29	45.0		28.6	41.7	119.7	63.0	78.7	78.7	106.1	444.3	179.1	106.1
30	41.7		28.6	41.7	213.5	61.0	74.1	71.8	161.0	545.0	164.0	98.3
31	38.4		27.4		167.0		69.5	69.5		540.6		137.1
Mean	83.3	49.7	56.3	80.4	317.0	101.8	109.0	104.3	154.2	593.4	302.5	258.9

Year : 1980

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	179.1	119.7	468.0	85.6	65.0	65.0	188.5	816.5	558.0	210.3	592.7	122.6
2	140.0	114.0	414.0	95.7	88.0	67.2	870.5	566.7	902.0	182.2	444.3	125.5
3	103.5	103.5	512.0	88.0	131.3	65.0	798.5	436.7	1298.2	173.0	347.1	780.5
4	90.5	95.7	532.0	83.3	108.7	59.0	623.1	436.7	1041.8	164.0	273.3	575.3
5	83.3	88.0	566.7	78.7	76.5	55.0	484.0	395.0	753.5	155.0	229.5	460.0
6	81.0	81.0	504.0	76.5	67.2	53.0	406.3	391.1	575.3	143.0	197.7	436.7
7	85.6	116.8	444.3	71.8	65.0	51.0	340.0	332.7	558.0	137.1	226.3	354.3
8	131.3	116.8	410.1	69.5	88.0	53.0	242.7	290.3	406.3	167.0	229.5	332.7
9	263.1	88.0	504.0	65.0	149.0	53.0	273.3	283.5	429.1	239.3	226.3	297.1
10	398.7	78.7	429.1	65.0	155.0	53.0	398.7	263.1	395.0	216.7	354.3	273.3
11	336.3	93.1	372.3	67.2	161.0	53.0	347.1	249.5	318.3	179.1	290.3	259.7
12	200.8	131.3	368.7	67.2	207.1	51.0	307.5	167.0	246.1	188.5	236.0	226.3
13	182.2	122.6	436.7	140.0	149.0	53.0	297.1	149.0	210.3	229.5	200.8	249.5
14	149.0	98.3	417.7	194.6	119.7	61.0	276.7	137.1	207.1	249.5	176.0	273.3
15	116.8	81.0	329.1	332.7	106.1	61.0	236.0	131.3	229.5	229.5	152.0	213.5
16	108.7	74.1	242.7	293.7	93.1	53.0	191.5	128.5	332.7	182.2	149.0	155.0
17	111.3	78.7	200.8	200.8	88.0	49.0	173.0	137.1	340.0	176.0	137.1	146.0
18	155.0	81.0	176.0	146.0	88.0	49.0	161.0	167.0	287.0	158.0	131.3	125.5
19	220.0	88.0	161.0	122.6	90.5	47.0	149.0	188.5	249.5	204.0	125.5	143.0
20	297.1	88.0	152.0	111.3	88.0	49.0	131.3	297.1	270.0	236.0	119.7	336.3
21	204.0	71.8	134.2	106.1	98.3	61.0	128.5	767.0	293.7	300.5	111.3	3088.2
22	155.0	67.2	125.5	93.1	108.7	101.0	119.7	978.8	402.5	398.7	108.7	2046.5
23	128.5	65.0	119.7	83.3	116.8	119.7	114.0	1153.4	376.0	372.3	119.7	1075.8
24	128.5	85.6	108.7	78.7	98.3	88.0	111.3	933.5	283.5	311.1	343.5	942.5
25	182.2	90.5	93.1	76.5	88.0	161.0	101.0	960.5	242.7	249.5	232.7	762.5
26	256.3	98.3	83.3	74.1	78.7	387.3	103.5	1323.5	220.0	229.5	155.0	627.4
27	239.3	101.0	85.6	71.8	78.7	322.0	103.5	1075.8	204.0	216.7	128.5	520.0
28	194.6	125.5	114.0	69.5	74.1	210.3	103.5	753.5	197.7	293.7	137.1	553.6
29	191.5	207.1	140.0	67.2	67.2	143.0	103.5	610.1	270.0	266.5	108.7	834.5
30	173.0		119.7	65.0	65.0	131.3	1228.0	553.6	276.7	421.5	131.3	821.0
31	140.0		122.6		65.0		1248.0	508.0		740.3		679.5
Mean	175.0	98.3	286.7	108.0	100.7	94.2	334.2	502.6	412.5	245.8	213.8	575.4

DAILY MEAN DISCHARGE AT APIUNA (21/25)

Year : 1981

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	579.7	229.5	103.5	83.3	108.7	41.7	61.0	61.0	114.0	131.3	197.7	83.3
2	512.0	191.5	88.0	71.8	81.0	40.1	67.2	67.2	103.5	95.7	155.0	137.1
3	484.0	185.3	83.3	61.0	74.1	40.1	65.0	65.0	98.3	83.3	119.7	194.6
4	456.0	207.1	98.3	57.0	67.2	40.1	55.0	55.0	122.6	103.5	161.0	143.0
5	562.3	406.3	95.7	55.0	67.2	41.7	49.0	49.0	173.0	173.0	143.0	106.1
6	468.0	311.1	88.0	53.0	65.0	41.7	49.0	49.0	119.7	140.0	114.0	191.5
7	436.7	311.1	88.0	51.0	65.0	45.0	45.0	45.0	98.3	161.0	114.0	417.7
8	365.1	293.7	95.7	49.0	61.0	93.1	45.0	45.0	85.6	179.1	149.0	210.3
9	297.1	253.0	125.5	47.0	53.0	125.5	67.2	67.2	69.5	146.0	176.0	161.0
10	270.0	223.1	119.7	45.0	49.0	69.5	65.0	65.0	65.0	122.6	391.1	152.0
11	229.5	210.3	93.1	45.0	47.0	57.0	57.0	57.0	61.0	108.7	276.7	137.1
12	210.3	210.3	85.6	45.0	47.0	53.0	53.0	53.0	57.0	90.5	185.3	119.7
13	179.1	210.3	71.8	43.3	45.0	53.0	49.0	49.0	53.0	106.1	140.0	114.0
14	191.5	270.0	69.5	43.3	45.0	53.0	57.0	57.0	49.0	119.7	116.8	103.5
15	249.5	256.3	69.5	45.0	45.0	43.3	57.0	57.0	43.3	98.3	114.0	88.0
16	213.5	220.0	61.0	53.0	43.3	45.0	51.0	51.0	43.3	85.6	98.3	81.0
17	170.0	167.0	61.0	59.0	41.7	49.0	45.0	45.0	41.7	78.7	81.0	71.8
18	167.0	143.0	65.0	57.0	47.0	45.0	43.3	43.3	38.4	71.8	74.1	65.0
19	182.2	128.5	65.0	45.0	49.0	43.3	41.7	41.7	38.4	63.0	74.1	57.0
20	259.7	119.7	61.0	43.3	49.0	38.4	41.7	41.7	38.4	74.1	83.3	53.0
21	361.5	128.5	61.0	41.7	53.0	38.4	38.4	38.4	53.0	85.6	81.0	74.1
22	266.5	116.8	61.0	38.4	63.0	38.4	38.4	38.4	103.5	81.0	65.0	253.0
23	194.6	106.1	57.0	38.4	45.0	38.4	35.2	35.2	114.0	71.8	57.0	897.5
24	179.1	114.0	53.0	38.4	45.0	38.4	31.9	31.9	98.3	61.0	53.0	452.0
25	173.0	108.7	53.0	41.7	41.7	41.7	35.2	35.2	128.5	55.0	53.0	354.3
26	137.1	122.6	49.0	74.1	40.1	45.0	35.2	35.2	223.1	51.0	49.0	311.1
27	128.5	108.7	45.0	149.0	40.1	41.7	38.4	38.4	287.0	63.0	45.0	266.5
28	125.5	101.0	61.0	197.7	47.0	43.3	51.0	51.0	226.3	143.0	45.0	249.5
29	119.7		122.6	188.5	61.0	38.4	111.3	111.3	161.0	216.7	47.0	191.5
30	191.5		122.6	155.0	53.0	38.4	119.7	119.7	143.0	239.3	53.0	140.0
31	263.1		103.5		45.0		161.0	161.0		246.1		119.7
Mean	278.2	194.8	79.9	67.2	54.3	48.7	56.8	56.8	101.7	114.4	117.1	193.4

Year : 1982

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	106.1	35.2	239.3	300.5	49.0	65.0	468.0	95.7	229.5	61.0	161.0	372.3
2	131.3	33.5	223.1	242.7	45.0	61.0	340.0	98.3	216.7	106.1	152.0	406.3
3	197.7	35.2	185.3	179.1	41.7	61.0	270.0	158.0	179.1	158.0	188.5	508.0
4	167.0	49.0	155.0	137.1	41.7	57.0	204.0	155.0	158.0	125.5	229.5	496.0
5	143.0	297.1	137.1	119.7	41.7	57.0	185.3	125.5	137.1	93.1	516.0	414.0
6	122.6	398.7	134.2	114.0	40.1	53.0	179.1	106.1	131.3	78.7	1134.0	347.1
7	103.5	414.0	111.3	108.7	40.1	49.0	149.0	98.3	125.5	270.0	1095.2	293.7
8	90.5	276.7	101.0	90.5	38.4	45.0	137.1	93.1	125.5	640.5	812.0	236.0
9	88.0	188.5	93.1	85.6	36.8	45.0	137.1	103.5	114.0	562.3	627.4	197.7
10	88.0	152.0	95.7	78.7	36.8	45.0	143.0	128.5	106.1	512.0	508.0	179.1
11	108.7	223.1	103.5	74.1	38.4	65.0	143.0	114.0	98.3	549.3	584.0	164.0
12	116.8	188.5	95.7	71.8	78.7	143.0	191.5	98.3	93.1	421.5	843.5	149.0
13	103.5	194.6	93.1	71.8	93.1	125.5	848.0	88.0	90.5	332.7	666.5	146.0
14	78.7	179.1	88.0	69.5	61.0	93.1	803.0	83.3	88.0	263.1	789.5	170.0
15	67.2	322.0	78.7	78.7	51.0	88.0	492.0	78.7	88.0	194.6	1471.0	246.1
16	61.0	332.7	85.6	76.5	51.0	173.0	387.3	164.0	78.7	158.0	1283.1	210.3
17	57.0	368.7	83.3	65.0	47.0	229.5	318.3	246.1	78.7	146.0	920.0	239.3
18	53.0	314.7	76.5	61.0	45.0	179.1	283.5	307.5	83.3	197.7	644.8	188.5
19	49.0	406.3	191.5	57.0	45.0	149.0	287.0	332.7	88.0	246.1	512.0	226.3
20	49.0	311.1	155.0	57.0	45.0	242.7	242.7	270.0	88.0	179.1	460.0	311.1
21	45.0	270.0	179.1	57.0	41.7	270.0	210.3	223.1	76.5	155.0	429.1	290.3
22	41.7	229.5	179.1	57.0	38.4	223.1	197.7	185.3	69.5	311.1	398.7	220.0
23	41.7	290.3	232.7	53.0	36.8	188.5	161.0	179.1	65.0	558.0	410.1	311.1
24	47.0	496.0	207.1	49.0	38.4	210.3	149.0	270.0	65.0	636.1	421.5	387.3
25	53.0	553.6	161.0	47.0	83.3	276.7	137.1	311.1	63.0	500.0	417.7	361.5
26	45.0	429.1	149.0	45.0	270.0	283.5	125.5	266.5	61.0	368.7	391.1	263.1
27	38.4	354.3	131.3	45.0	270.0	290.3	114.0	223.1	63.0	283.5	460.0	210.3
28	35.2	290.3	114.0	49.0	179.1	304.0	108.7	197.7	67.2	276.7	476.0	173.0
29	35.2		146.0	49.0	119.7	696.9	106.1	161.0	69.5	249.5	468.0	158.0
30	35.2		383.5	49.0	81.0	722.9	108.7	146.0	65.0	223.1	406.3	137.1
31	35.2		361.5		71.8		103.5	197.7		185.3		131.3
Mean	78.5	272.6	153.9	88.0	70.9	183.1	249.4	171.1	102.1	291.7	595.9	262.7

DAILY MEAN DISCHARGE AT APIUNA (22/25)

Year : 1983

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	137.1	520.0	1338.6	103.5	149.0	601.4	376.0	2275.5	170.0	398.7	146.0	137.1
2	167.0	391.1	951.5	98.3	263.1	558.0	332.7	2481.1	179.1	376.0	155.0	122.6
3	143.0	358.0	834.5	98.3	318.3	532.0	325.5	1831.6	152.0	347.1	204.0	128.5
4	116.8	293.7	1973.3	98.3	332.7	500.0	290.3	1399.5	146.0	263.1	410.1	125.5
5	114.0	232.7	1178.0	125.5	311.1	464.0	263.1	1090.3	146.0	210.3	297.1	140.0
6	350.7	179.1	731.6	318.3	304.0	402.5	740.3	875.0	161.0	179.1	242.7	188.5
7	983.6	167.0	627.4	361.5	229.5	276.7	2475.2	749.0	155.0	185.3	210.3	210.3
8	718.6	173.0	575.3	270.0	210.3	229.5	3982.5	679.5	146.0	204.0	167.0	167.0
9	536.3	176.0	528.0	179.1	207.1	220.0	4047.5	618.8	137.1	155.0	149.0	140.0
10	429.1	161.0	516.0	140.0	391.1	259.7	3469.0	575.3	125.5	167.0	137.1	137.1
11	347.1	185.3	480.0	122.6	780.5	259.7	3254.5	532.0	119.7	253.0	128.5	200.8
12	361.5	176.0	476.0	114.0	597.0	601.4	4093.0	484.0	125.5	236.0	229.5	226.3
13	383.5	204.0	456.0	106.1	500.0	1248.0	3300.0	436.7	143.0	207.1	318.3	379.7
14	318.3	270.0	361.5	98.3	410.1	1095.2	2416.7	372.3	140.0	191.5	304.0	436.7
15	293.7	204.0	325.5	137.1	307.5	861.5	1848.0	340.0	263.1	173.0	249.5	425.3
16	276.7	191.5	297.1	204.0	270.0	735.9	1541.8	332.7	512.0	161.0	223.1	365.1
17	229.5	307.5	236.0	176.0	307.5	436.7	2252.0	354.3	402.5	173.0	164.0	436.7
18	283.5	398.7	185.3	263.1	322.0	361.5	1837.1	410.1	307.5	398.7	131.3	618.8
19	318.3	436.7	182.2	484.0	406.3	512.0	1404.6	448.1	325.5	361.5	119.7	536.3
20	410.1	460.0	182.2	429.1	3007.0	516.0	1138.8	391.1	263.1	270.0	207.1	614.4
21	354.3	402.5	161.0	350.7	1476.4	460.0	942.5	340.0	210.3	216.7	185.3	575.3
22	270.0	361.5	137.1	236.0	983.6	376.0	821.0	314.7	210.3	297.1	167.0	472.0
23	207.1	325.5	131.3	197.7	701.2	365.1	740.3	297.1	1793.5	347.1	155.0	383.5
24	167.0	311.1	128.5	197.7	575.3	758.0	714.2	280.1	1831.6	256.3	140.0	336.3
25	149.0	325.5	125.5	280.1	605.7	933.5	1100.0	270.0	1085.5	213.5	131.3	273.3
26	137.1	383.5	122.6	242.7	540.6	731.6	1596.3	256.3	848.0	179.1	119.7	220.0
27	131.3	414.0	119.7	204.0	496.0	592.7	1995.1	229.5	649.1	173.0	108.7	197.7
28	116.8	902.0	116.8	173.0	1183.0	532.0	2222.7	191.5	575.3	167.0	103.5	185.3
29	149.0		114.0	161.0	983.6	484.0	2164.2	176.0	508.0	161.0	103.5	191.5
30	290.3		108.7	149.0	709.9	429.1	1514.5	164.0	448.1	152.0	114.0	226.3
31	516.0		114.0		653.5		1487.3	161.0		149.0		311.1
Mean	303.4	318.2	445.7	204.0	597.8	544.5	1764.1	624.4	409.3	233.0	184.0	293.8

Year : 1984

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	256.3	276.7	167.0	108.7	103.5	93.1	128.5	134.2	229.5	256.3	122.6	155.0
2	204.0	253.0	137.1	155.0	103.5	88.0	122.6	207.1	213.5	229.5	122.6	179.1
3	173.0	229.5	290.3	216.7	95.7	83.3	125.5	383.5	197.7	200.8	155.0	170.0
4	149.0	173.0	226.3	194.6	85.6	81.0	191.5	444.3	185.3	185.3	155.0	146.0
5	170.0	134.2	173.0	149.0	83.3	78.7	223.1	566.7	179.1	173.0	173.0	125.5
6	185.3	119.7	143.0	119.7	78.7	76.5	197.7	3423.5	167.0	270.0	368.7	125.5
7	164.0	137.1	131.3	103.5	74.1	114.0	283.5	4086.5	155.0	444.3	584.0	185.3
8	149.0	103.5	179.1	98.3	69.5	106.1	347.1	2856.0	161.0	354.3	549.3	280.1
9	143.0	101.0	210.3	88.0	71.8	88.0	273.3	2234.4	161.0	843.5	532.0	276.7
10	114.0	93.1	167.0	88.0	88.0	83.3	223.1	1369.0	149.0	812.0	480.0	216.7
11	106.1	88.0	137.1	88.0	98.3	81.0	194.6	1308.3	137.1	618.8	391.1	188.5
12	125.5	83.3	103.5	85.6	108.7	74.1	155.0	1041.8	131.3	429.1	402.5	161.0
13	161.0	76.5	88.0	88.0	149.0	131.3	256.3	812.0	131.3	379.7	398.7	158.0
14	134.2	74.1	78.7	95.7	372.3	223.1	468.0	679.5	137.1	332.7	332.7	176.0
15	179.1	69.5	76.5	143.0	476.0	825.5	484.0	610.1	137.1	270.0	270.0	167.0
16	210.3	65.0	69.5	155.0	350.7	1138.8	468.0	549.3	143.0	229.5	229.5	161.0
17	204.0	61.0	65.0	152.0	256.3	1178.0	387.3	508.0	125.5	207.1	210.3	131.3
18	155.0	61.0	65.0	194.6	216.7	1003.0	314.7	472.0	114.0	249.5	204.0	161.0
19	167.0	65.0	67.2	204.0	182.2	758.0	263.1	444.3	122.6	220.0	188.5	137.1
20	173.0	61.0	173.0	173.0	200.8	627.4	229.5	383.5	429.1	194.6	179.1	111.3
21	179.1	57.0	402.5	155.0	239.3	536.3	325.5	325.5	336.3	173.0	297.1	98.3
22	173.0	55.0	488.0	131.3	256.3	468.0	398.7	307.5	259.7	155.0	229.5	85.6
23	161.0	83.3	340.0	122.6	223.1	406.3	347.1	347.1	176.0	149.0	204.0	88.0
24	137.1	106.1	283.5	146.0	182.2	340.0	297.1	304.0	149.0	143.0	176.0	78.7
25	119.7	108.7	232.7	161.0	155.0	280.1	256.3	460.0	223.1	146.0	194.6	81.0
26	103.5	88.0	185.3	140.0	137.1	229.5	263.1	566.7	776.0	143.0	325.5	76.5
27	114.0	204.0	143.0	119.7	125.5	179.1	229.5	444.3	722.9	131.3	297.1	106.1
28	200.8	249.5	125.5	106.1	116.8	155.0	179.1	354.3	566.7	119.7	226.3	106.1
29	223.1	200.8	119.7	98.3	108.7	143.0	155.0	297.1	421.5	114.0	185.3	88.0
30	179.1		119.7	98.3	103.5	137.1	143.0	263.1	332.7	111.3	164.0	83.3
31	182.2		114.0		98.3		134.2	242.7		119.7		93.1
Mean	164.4	119.9	171.0	132.6	161.6	326.9	260.2	852.5	245.7	271.1	278.3	141.8

DAILY MEAN DISCHARGE AT APIUNA (23/25)

Year : 1985

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	137.1	45.0	176.0	103.5	114.0	61.0	41.7	53.0	93.1	83.3	78.7	33.5
2	161.0	61.0	155.0	98.3	103.5	61.0	74.1	49.0	158.0	88.0	90.5	31.9
3	131.3	57.0	131.3	103.5	90.5	65.0	134.2	49.0	103.5	83.3	125.5	28.6
4	98.3	103.5	119.7	88.0	85.6	69.5	98.3	47.0	103.5	65.0	325.5	28.6
5	83.3	191.5	111.3	125.5	83.3	65.0	71.8	45.0	134.2	55.0	540.6	28.6
6	78.7	143.0	114.0	571.0	78.7	57.0	69.5	43.3	122.6	49.0	440.5	28.6
7	85.6	98.3	108.7	610.1	76.5	53.0	318.3	43.3	85.6	53.0	229.5	27.4
8	125.5	74.1	111.3	440.5	78.7	53.0	318.3	41.7	69.5	76.5	249.5	28.6
9	137.1	69.5	106.1	322.0	143.0	51.0	229.5	41.7	61.0	63.0	167.0	28.6
10	103.5	81.0	204.0	253.0	249.5	78.7	188.5	41.7	57.0	55.0	125.5	27.4
11	83.3	111.3	276.7	204.0	204.0	57.0	119.7	41.7	53.0	53.0	103.5	24.8
12	71.8	149.0	179.1	197.7	146.0	51.0	98.3	45.0	51.0	47.0	88.0	26.1
13	69.5	358.0	131.3	155.0	114.0	49.0	85.6	53.0	49.0	45.0	69.5	28.6
14	65.0	670.8	108.7	143.0	103.5	49.0	78.7	51.0	49.0	41.7	78.7	24.8
15	59.0	705.6	95.7	137.1	95.7	49.0	74.1	47.0	49.0	38.4	67.2	26.1
16	83.3	579.7	98.3	297.1	88.0	49.0	69.5	41.7	49.0	38.4	61.0	30.3
17	179.1	524.0	103.5	276.7	83.3	51.0	65.0	41.7	45.0	53.0	55.0	31.9
18	155.0	436.7	93.1	220.0	81.0	61.0	65.0	38.4	45.0	69.5	53.0	26.1
19	111.3	398.7	83.3	185.3	78.7	57.0	63.0	38.4	41.7	74.1	53.0	21.0
20	83.3	464.0	74.1	155.0	78.7	51.0	61.0	41.7	88.0	65.0	49.0	21.0
21	71.8	500.0	69.5	137.1	88.0	49.0	61.0	51.0	185.3	161.0	49.0	21.0
22	65.0	540.6	69.5	125.5	81.0	47.0	57.0	51.0	137.1	200.8	65.0	23.5
23	61.0	492.0	88.0	119.7	74.1	47.0	55.0	41.7	93.1	108.7	78.7	22.2
24	61.0	391.1	119.7	108.7	69.5	45.0	55.0	38.4	74.1	78.7	71.8	23.5
25	67.2	329.1	179.1	108.7	74.1	43.3	55.0	35.2	65.0	88.0	57.0	21.0
26	57.0	297.1	304.0	125.5	71.8	43.3	53.0	33.5	57.0	76.5	45.0	18.4
27	53.0	270.0	290.3	185.3	69.5	43.3	51.0	31.9	53.0	63.0	41.7	26.1
28	53.0	223.1	232.7	167.0	65.0	43.3	49.0	35.2	49.0	55.0	41.7	22.2
29	49.0		173.0	137.1	63.0	41.7	49.0	35.2	49.0	57.0	38.4	21.0
30	47.0		155.0	119.7	61.0	41.7	53.0	33.5	81.0	88.0	35.2	18.4
31	49.0		125.5		61.0		57.0	36.8		88.0		15.8
Mean	88.3	298.7	141.5	200.7	95.3	52.8	94.2	42.5	78.4	72.9	119.1	25.3

Year : 1986

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	15.8	191.5	210.3	38.4	41.7	340.0	38.4	35.2	53.0	108.7	98.3	155.0
2	15.8	270.0	210.3	36.8	41.7	236.0	40.1	35.2	53.0	93.1	194.6	137.1
3	15.8	290.3	155.0	35.2	38.4	134.2	40.1	35.2	51.0	83.3	280.1	125.5
4	22.2	179.1	108.7	35.2	35.2	101.0	40.1	31.9	51.0	76.5	318.3	452.0
5	18.4	114.0	83.3	53.0	35.2	85.6	38.4	30.3	55.0	71.8	429.1	365.1
6	15.8	81.0	69.5	114.0	33.5	74.1	40.1	30.3	55.0	65.0	1243.0	270.0
7	15.0	61.0	63.0	270.0	33.5	69.5	38.4	31.9	49.0	61.0	884.0	379.7
8	15.0	61.0	57.0	325.5	31.9	65.0	36.8	31.9	45.0	65.0	688.2	376.0
9	14.1	61.0	51.0	207.1	35.2	61.0	36.8	31.9	38.4	93.1	508.0	414.0
10	13.2	67.2	45.0	143.0	35.2	57.0	38.4	28.6	38.4	566.7	444.3	293.7
11	15.8	83.3	47.0	108.7	38.4	55.0	40.1	27.4	36.8	727.3	402.5	236.0
12	14.1	155.0	88.0	98.3	38.4	53.0	40.1	28.6	35.2	545.0	329.1	191.5
13	23.5	164.0	114.0	85.6	36.8	49.0	38.4	30.3	33.5	417.7	266.5	164.0
14	28.6	125.5	88.0	74.1	38.4	47.0	35.2	35.2	31.9	304.0	207.1	287.0
15	51.0	93.1	88.0	128.5	36.8	49.0	33.5	49.0	28.6	188.5	155.0	549.3
16	45.0	76.5	85.6	134.2	35.2	85.6	33.5	69.5	30.3	149.0	137.1	464.0
17	40.1	114.0	93.1	93.1	31.9	74.1	31.9	78.7	36.8	137.1	119.7	365.1
18	30.3	83.3	98.3	78.7	45.0	65.0	31.9	61.0	61.0	134.2	108.7	329.1
19	45.0	69.5	152.0	67.2	78.7	55.0	38.4	49.0	83.3	149.0	98.3	532.0
20	61.0	98.3	155.0	65.0	78.7	49.0	83.3	41.7	223.1	137.1	98.3	468.0
21	74.1	88.0	116.8	57.0	65.0	45.0	93.1	38.4	383.5	197.7	98.3	452.0
22	67.2	78.7	88.0	55.0	55.0	43.3	119.7	35.2	354.3	318.3	88.0	623.1
23	53.0	67.2	69.5	53.0	45.0	41.7	74.1	188.5	283.5	242.7	101.0	562.3
24	45.0	81.0	69.5	51.0	41.7	40.1	61.0	311.1	229.5	176.0	88.0	464.0
25	69.5	140.0	63.0	47.0	38.4	40.1	53.0	223.1	276.7	137.1	78.7	402.5
26	49.0	137.1	74.1	45.0	36.8	47.0	47.0	143.0	270.0	119.7	78.7	347.1
27	35.2	116.8	71.8	61.0	35.2	51.0	45.0	98.3	213.5	108.7	226.3	293.7
28	31.9	216.7	63.0	63.0	35.2	45.0	41.7	74.1	173.0	98.3	197.7	297.1
29	38.4		51.0	53.0	33.5	41.7	38.4	78.7	143.0	93.1	191.5	236.0
30	45.0		45.0	45.0	35.2	38.4	36.8	65.0	122.6	95.7	185.3	216.7
31	88.0		40.1		293.7		35.2	57.0		119.7		197.7
Mean	35.9	120.1	90.8	90.7	49.5	74.6	46.4	67.9	118.0	189.7	278.1	343.4

DAILY MEAN DISCHARGE AT APIUNA (24/25)

Year : 1987

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	173.0	116.8	182.2	57.0	63.0	149.0	137.1	185.3	125.5	197.7	161.0	61.0
2	161.0	170.0	152.0	65.0	65.0	143.0	126.5	155.0	116.8	492.0	143.0	57.0
3	152.0	216.7	131.3	93.1	57.0	137.1	122.6	131.3	131.3	365.1	137.1	49.0
4	128.5	391.1	125.5	78.7	53.0	131.3	119.7	122.6	137.1	256.3	125.5	143.0
5	114.0	391.1	114.0	67.2	49.0	122.6	137.1	119.7	116.8	197.7	125.5	155.0
6	103.5	340.0	106.1	59.0	55.0	119.7	114.0	194.6	114.0	229.5	131.3	125.5
7	98.3	307.5	101.0	55.0	137.1	125.5	185.3	229.5	103.5	283.5	125.5	78.7
8	114.0	266.5	114.0	53.0	456.0	111.3	270.0	210.3	98.3	223.1	111.3	74.1
9	146.0	307.5	95.7	53.0	516.0	103.5	273.3	191.5	95.7	179.1	108.7	61.0
10	204.0	256.3	125.5	49.0	311.1	101.0	239.3	164.0	93.1	161.0	119.7	76.5
11	223.1	197.7	108.7	57.0	204.0	98.3	204.0	149.0	161.0	146.0	108.7	67.2
12	402.5	167.0	90.5	103.5	164.0	93.1	182.2	140.0	161.0	137.1	103.5	74.1
13	540.6	161.0	81.0	149.0	164.0	155.0	167.0	155.0	140.0	167.0	98.3	65.0
14	956.0	290.3	78.7	229.5	300.5	857.0	232.7	185.3	125.5	283.5	98.3	57.0
15	1017.6	340.0	74.1	173.0	965.0	834.5	210.3	161.0	122.6	675.2	98.3	53.0
16	843.5	391.1	69.5	125.5	812.0	670.8	167.0	167.0	200.8	762.5	119.7	49.0
17	929.0	358.0	67.2	111.3	592.7	484.0	155.0	448.1	242.7	701.2	95.7	65.0
18	785.0	336.3	67.2	98.3	448.1	361.5	143.0	484.0	185.3	740.3	88.0	83.3
19	614.4	332.7	65.0	71.8	406.3	283.5	204.0	340.0	164.0	983.6	78.7	125.5
20	508.0	391.1	63.0	78.7	683.8	236.0	242.7	368.7	152.0	821.0	69.5	61.0
21	444.3	350.7	65.0	83.3	1268.0	210.3	197.7	314.7	131.3	679.5	69.5	59.0
22	417.7	311.1	74.1	83.3	929.0	191.5	179.1	256.3	119.7	532.0	85.6	57.0
23	340.0	300.5	74.1	95.7	679.5	236.0	158.0	236.0	114.0	402.5	88.0	57.0
24	249.5	266.5	65.0	81.0	524.0	223.1	155.0	204.0	114.0	322.0	78.7	53.0
25	207.1	402.5	59.0	69.5	414.0	185.3	137.1	185.3	122.6	253.0	69.5	45.0
26	249.5	347.1	65.0	65.0	322.0	167.0	149.0	185.3	114.0	276.7	88.0	41.7
27	204.0	297.1	137.1	59.0	236.0	152.0	131.3	161.0	101.0	239.3	88.0	41.7
28	167.0	229.5	88.0	57.0	197.7	161.0	140.0	161.0	98.3	197.7	69.5	40.1
29	146.0		71.8	53.0	194.6	143.0	131.3	152.0	90.5	226.3	61.0	43.3
30	128.5		65.0	57.0	179.1	140.0	137.1	146.0	85.6	229.5	83.3	146.0
31	119.7		59.0		164.0		191.5	149.0		173.0		155.0
Mean	351.2	294.1	91.5	84.4	374.5	237.6	172.3	208.1	129.3	372.1	100.9	74.8

Year : 1988

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	122.6	232.7	143.0	65.0	155.0	216.7	158.0	63.0	41.7	101.0	128.5	40.1
2	78.7	210.3	146.0	65.0	194.6	185.3	155.0	61.0	41.7	83.3	114.0	38.4
3	63.0	164.0	204.0	49.0	304.0	173.0	137.1	59.0	40.1	101.0	98.3	49.0
4	53.0	108.7	249.5	41.7	520.0	182.2	131.3	59.0	38.4	216.7	88.0	45.0
5	49.0	83.3	210.3	38.4	558.0	191.5	122.6	57.0	38.4	179.1	81.0	41.7
6	45.0	88.0	179.1	35.2	417.7	167.0	119.7	57.0	36.8	131.3	76.5	36.8
7	45.0	98.3	108.7	31.9	311.1	149.0	114.0	57.0	36.8	103.5	71.8	33.5
8	33.5	67.2	93.1	57.0	516.0	143.0	114.0	51.0	36.8	88.0	67.2	31.9
9	31.9	78.7	93.1	65.0	553.6	137.1	108.7	57.0	35.2	83.3	61.0	30.3
10	78.7	173.0	88.0	61.0	414.0	143.0	101.0	55.0	35.2	81.0	67.2	30.3
11	78.7	146.0	78.7	45.0	347.1	137.1	101.0	53.0	33.5	98.3	65.0	30.3
12	53.0	131.3	74.1	38.4	256.3	131.3	98.3	51.0	31.9	98.3	65.0	33.5
13	45.0	98.3	81.0	47.0	270.0	131.3	93.1	53.0	31.9	98.3	90.5	31.9
14	88.0	83.3	74.1	152.0	304.0	216.7	90.5	53.0	61.0	103.5	101.0	35.2
15	128.5	78.7	65.0	122.6	259.7	216.7	85.6	53.0	98.3	93.1	81.0	69.5
16	103.5	108.7	61.0	83.3	210.3	179.1	83.3	49.0	65.0	74.1	67.2	53.0
17	143.0	188.5	65.0	67.2	270.0	161.0	83.3	49.0	57.0	67.2	57.0	41.7
18	158.0	158.0	65.0	69.5	304.0	155.0	78.7	49.0	71.8	61.0	53.0	35.2
19	116.8	114.0	65.0	59.0	249.5	149.0	78.7	53.0	74.1	65.0	51.0	30.3
20	119.7	98.3	61.0	53.0	210.3	429.1	76.5	53.0	71.8	95.7	51.0	35.2
21	101.0	83.3	61.0	49.0	223.1	549.3	74.1	53.0	311.1	143.0	61.0	36.8
22	106.1	69.5	49.0	53.0	354.3	398.7	74.1	51.0	636.1	108.7	63.0	40.1
23	114.0	65.0	45.0	78.7	803.0	304.0	74.1	47.0	512.0	119.7	61.0	33.5
24	140.0	65.0	41.7	103.5	1193.0	283.5	71.8	45.0	350.7	197.7	51.0	35.2
25	185.3	57.0	41.7	103.5	753.5	273.3	67.2	45.0	207.1	213.5	45.0	78.7
26	103.5	78.7	38.4	220.0	516.0	242.7	65.0	43.3	155.0	705.6	38.4	83.3
27	119.7	114.0	38.4	276.7	406.3	210.3	63.0	43.3	131.3	524.0	41.7	57.0
28	88.0	125.5	38.4	242.7	358.0	191.5	63.0	41.7	164.0	354.3	67.2	55.0
29	101.0	137.1	49.0	194.6	311.1	185.3	63.0	41.7	119.7	256.3	49.0	67.2
30	90.5		53.0	149.0	273.3	167.0	63.0	41.7	93.1	185.3	43.3	65.0
31	83.3		49.0		256.3		63.0	38.4		149.0		76.5
Mean	92.5	113.9	87.4	90.6	389.5	213.3	92.6	51.1	121.9	160.6	68.5	45.2

DAILY MEAN DISCHARGE AT APIUNA (25/25)

Year : 1989

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	83.3	731.6	368.7	194.6	197.7	88.0	78.7	270.0	152.0	176.0	83.3	98.3
2	78.7	749.0	290.3	575.3	229.5	78.7	83.3	194.6	161.0	158.0	81.0	81.0
3	69.5	520.0	223.1	614.4	242.7	85.6	119.7	161.0	131.3	149.0	74.1	69.5
4	67.2	402.5	204.0	417.7	709.9	85.6	164.0	131.3	111.3	220.0	74.1	63.0
5	143.0	300.5	210.3	332.7	1168.0	81.0	119.7	122.6	103.5	223.1	71.8	57.0
6	242.7	236.0	167.0	383.5	1328.5	74.1	103.5	125.5	95.7	185.3	69.5	53.0
7	347.1	197.7	232.7	354.3	960.5	74.1	90.5	106.1	197.7	158.0	63.0	53.0
8	239.3	167.0	259.7	287.0	744.6	85.6	78.7	93.1	210.3	143.0	61.0	53.0
9	290.3	146.0	188.5	239.3	614.4	85.6	76.5	71.8	383.5	134.2	59.0	51.0
10	332.7	131.3	161.0	207.1	516.0	78.7	71.8	83.3	452.0	128.5	59.0	53.0
11	280.1	119.7	134.2	182.2	383.5	71.8	69.5	83.3	329.1	155.0	67.2	76.5
12	239.3	108.7	125.5	216.7	314.7	81.0	65.0	78.7	852.5	223.1	76.5	71.8
13	191.5	101.0	122.6	194.6	276.7	71.8	65.0	74.1	1440.3	236.0	146.0	71.8
14	158.0	140.0	111.3	152.0	216.7	69.5	63.0	71.8	1374.0	191.5	119.7	59.0
15	155.0	134.2	140.0	149.0	182.2	65.0	59.0	67.2	1007.9	158.0	88.0	57.0
16	229.5	158.0	140.0	146.0	170.0	65.0	57.0	67.2	785.0	140.0	69.5	59.0
17	325.5	246.1	111.3	122.6	158.0	67.2	57.0	65.0	623.1	143.0	63.0	55.0
18	256.3	194.6	101.0	114.0	149.0	67.2	53.0	63.0	532.0	149.0	59.0	63.0
19	179.1	216.7	90.5	111.3	125.5	63.0	53.0	57.0	472.0	128.5	57.0	71.8
20	140.0	242.7	111.3	108.7	116.8	61.0	53.0	59.0	406.3	114.0	57.0	71.8
21	111.3	307.5	122.6	93.1	146.0	61.0	51.0	71.8	325.5	106.1	101.0	63.0
22	101.0	300.5	197.7	101.0	116.8	55.0	53.0	69.5	256.3	101.0	93.1	53.0
23	90.5	425.3	210.3	88.0	111.3	61.0	51.0	161.0	200.8	95.7	90.5	49.0
24	116.8	549.3	158.0	85.6	108.7	61.0	53.0	69.5	229.5	90.5	90.5	45.0
25	170.0	496.0	119.7	83.3	114.0	83.3	51.0	146.0	372.3	85.6	93.1	43.3
26	194.6	379.7	161.0	81.0	111.3	125.5	63.0	242.7	311.1	90.5	71.8	41.7
27	283.5	304.0	340.0	81.0	106.1	93.1	155.0	232.7	242.7	146.0	63.0	43.3
28	915.5	266.5	249.5	78.7	95.7	74.1	358.0	210.3	207.1	179.1	57.0	43.3
29	807.5		182.2	88.0	93.1	71.8	358.0	170.0	194.6	125.5	78.7	167.0
30	636.1		143.0	158.0	85.6	69.5	307.5	140.0	197.7	101.0	98.3	185.3
31	816.5		152.0		78.7		387.3	125.5		90.5		158.0
Mean	267.5	295.4	178.4	201.4	321.7	75.2	111.9	118.9	411.9	146.0	77.9	70.3

Year : 1990

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	216.7	207.1	179.1	311.1	297.1	1283.1	158.0	232.7	273.3	283.5	329.1	176.0
2	417.7	239.3	155.0	280.1	242.7	1288.1	149.0	216.7	270.0	300.5	358.0	170.0
3	605.7	194.6	140.0	307.5	213.5	1389.3	143.0	207.1	236.0	276.7	266.5	158.0
4	528.0	164.0	152.0	270.0	194.6	1100.0	152.0	194.6	207.1	256.3	226.3	188.5
5	391.1	108.7	226.3	216.7	173.0	830.0	236.0	182.2	232.7	223.1	246.1	173.0
6	318.3	103.5	280.1	266.5	140.0	1143.7	239.3	173.0	229.5	210.3	232.7	149.0
7	249.5	122.6	259.7	304.0	122.6	1080.6	229.5	164.0	276.7	200.8	210.3	140.0
8	256.3	114.0	246.1	318.3	116.8	875.0	204.0	155.0	372.3	194.6	191.5	128.5
9	290.3	106.1	207.1	414.0	111.3	825.5	182.2	149.0	553.6	220.0	540.6	116.8
10	361.5	197.7	173.0	376.0	103.5	683.8	173.0	143.0	480.0	1075.8	843.5	108.7
11	421.5	239.3	149.0	318.3	101.0	584.0	158.0	137.1	347.1	929.0	640.5	111.3
12	1032.1	322.0	134.2	256.3	98.3	520.0	143.0	131.3	293.7	789.5	592.7	137.1
13	875.0	601.4	125.5	200.8	93.1	436.7	137.1	125.5	488.0	920.0	500.0	140.0
14	636.1	709.9	155.0	194.6	90.5	383.5	128.5	122.6	468.0	1213.0	410.1	512.0
15	753.5	610.1	406.3	170.0	88.0	444.3	125.5	116.8	372.3	1634.5	336.3	343.5
16	649.1	528.0	297.1	152.0	88.0	414.0	134.2	134.2	290.3	1313.4	329.1	223.1
17	740.3	436.7	307.5	143.0	119.7	350.7	182.2	232.7	256.3	1022.5	391.1	173.0
18	575.3	358.0	266.5	134.2	143.0	290.3	433.0	204.0	229.5	897.5	425.3	146.0
19	1012.7	287.0	216.7	122.6	134.2	226.3	749.0	280.1	210.3	848.0	379.7	131.3
20	727.3	204.0	210.3	111.3	108.7	200.8	993.3	947.0	200.8	771.5	340.0	114.0
21	780.5	170.0	179.1	114.0	95.7	304.0	1618.1	731.6	226.3	670.8	365.1	108.7
22	929.0	216.7	158.0	119.7	88.0	336.3	1143.7	460.0	340.0	584.0	472.0	101.0
23	1129.1	273.3	152.0	119.7	83.3	283.5	839.0	343.5	425.3	468.0	414.0	93.1
24	825.5	266.5	185.3	114.0	78.7	226.3	714.2	270.0	361.5	395.0	350.7	88.0
25	627.4	256.3	216.7	114.0	78.7	216.7	627.4	239.3	290.3	354.3	354.3	106.1
26	549.3	259.7	191.5	128.5	74.1	232.7	480.0	280.1	242.7	290.3	322.0	128.5
27	456.0	246.1	164.0	106.1	74.1	220.0	425.3	553.6	216.7	249.5	322.0	103.5
28	391.1	210.3	173.0	188.5	69.5	194.6	379.7	731.6	200.8	229.5	256.3	90.5
29	340.0		158.0	293.7	90.5	176.0	318.3	508.0	210.3	213.5	207.1	149.0
30	276.7		213.5	343.5	951.5	167.0	276.7	372.3	270.0	200.8	185.3	131.3
31	216.7		280.1		1263.0		253.0	304.0		210.3		108.7
Mean	567.1	276.9	205.1	217.0	184.7	556.9	391.1	291.7	302.4	562.8	367.9	153.2

ANNEX IV

SOCIO-ECONOMIC STUDY

ANNEX IV. SOCIO-ECONOMIC STUDY

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1. INTRODUCTION

Socio-economic study aims at understanding present conditions and projections of socio-economic characteristics such as population and gross regional domestic product (GRDP) in a project area until a target year. The study also presents various indices and factors for project evaluation from the point of economic and financial view. These study results are essential for other sectoral studies, functioning the basic framework for proposed projects.

Chapter 2 mentions present socio-economic conditions and project back-ground in the country. Chapter three also mentions socio-economic conditions in the state of Santa Catarina, comparing with those of the country. Present conditions are illustrated from the following five aspects: administration, social conditions, economic conditions, infrastructure and land use.

Chapter 4 discusses the future socio-economic conditions, projected on the basis of the projection by the national government or an international organization such as the World Bank. These projections are vital to verify the existing projections such as electric power demand projections.

Chapter 5 analyzes status of CELESC from the financial view point. This could be effective to find a way out of constraint for electric power development in the future.

Chapter 6 presents various indices and factors for economic and financial evaluation. It includes factors to convert financial value to economic value for major cost items. It also provides a marginal cost of expansion for estimation of the proposed project benefit. This marginal cost is somewhat modified for economic evaluation, which was originally proposed by ELETROBRÁS.

2. NATIONAL SOCIO-ECONOMIC CONDITIONS

2.1 Administration

Brazil covers a national area of 8,512 thousand km^2, which amounts of approximately 22.5 times of the Japanese territory. It consists of five Grand Regions: "Norte", with an area of 3,581 thousand km^2, "Nordeste", 1,549 thousand km^2, "Sudeste", 925 thousand km^2, "Sul", 578 thousand km^2, and "Centro Oeste", 1,879 thousand km^2.

These Regions are divided into States. The States are further divided into Mid-Regions, Mid-Regions into Micro-Regions, and Micro-Regions into Municipalities. As of 1990, the country comprises 27 States, 136 Mid-Regions, 558 Micro-Regions and 4,491 Municipalities The administrative entity that has autonomy is the Nation, State and Municipality among above regional divisions. Other divisional levels are provided for an expedient on the basis of geographical and socio-economic homogeneity.

2.2 Population

According to the 1991 census, Brazil has a population of 146 million. This population increased by about 27 million as compared with the 1980 census as shown in Table IV.2.1. During the 70's, average growth rate was 2.48% per annum. Afterwards, the growth rate slowed down to 2.08% in the 80's.

An urban population of the country was 80.4 million in 1980. It accounted for 68% of the total population, which increased from 56% in 1970. This trend would be continuous to the census, although the late census analysis is not published so far. This means that the urbanization has proceeded since 1970 and that the centralization to big metropolitan cities such as São Paulo and Rio de Janeiro might be accelerated up to now continuously.

In 1980, the labor force registered at 43.2 million, of which 42.2 million or 98% was employed. A participation rate, which refers to the rate of labor force to total population of 10-years old and over, increased from 45.0% in 1970 to 49.3% in 1980. This might be mainly caused that the female power began to participate in the labor market.

2.3 Economic Conditions

The national economy of Brazil remarkably expanded in the 70's. Its GDP annually grew at the real rate of 8.6% on average. Afterwards, its growth rate decreased to an average of about 2% per annum in the first half of the 80's. Although it recovered to about 8% per annum during '85 to '86, it paced down with negative growth rates in 1988 and 1990 due to the world economic recession, as shown in Table IV.2.2.

In 1987, GDP per capita recorded the peak level of Cr$85 thousand at current price or equivalent to approximately US$ 2 thousand, as shown in this table.

Afterwards, it gradually went down to approximately US$ 1.9 thousand till 1992. This was caused by economic recession over few years and by constantly increasing population in the country.

The sectoral breakdown of the economy was presented in the same table. The composition of major economic sectors, i.e., agriculture, industry and services, changed from 10.8%, 41.1% and 50.7% in 1985 to 9.6%, 33.2% and 53.2% in 1991, respectively. Their annual growth rates were 1.32%, 0.68% and 3.14% on average during six years. Thus, the industrial sector recorded the lowest growth. On the contrary, the role of services' sector comparatively increased its importance in the national economy. Incidentally, the GDP growth during the same period was 1.83% per annum on average.

Owing to the economic recession, the labor market seemed to be influenced on the employment conditions. As shown in Table IV.2.3, an index of employment over the major economic fields was 100.5, which was almost the same level of the base year of 1984. Then, an average unemployment rate in the major cities was 6.14% in March 1992. In particular, São Paulo recorded the serious unemployment rate of 7.14% in the same month.

2.4 Foreign Trade

The exports of primary products have still increased, but their share continuously declined in the total exports because of rapid increase of manufactured products. Although its share used to be more than 50% in the 70's, it was 27.6% in 1992, as shown in Table IV.2.4. The exports of manufactured products was US$22.4 billion or 71% of the total export in 1992. They have shifted from light industrial products such as food products, textile and shoes, to heavy industrial products such as mechanical products, transport machines and chemical products.

Due to the oil crisis in the 70's, the proportion of fuel and lubricant to the total imports increased from 7% in 1970 to 51% in 1983. Its share, however, rapidly went down to 23% in 1992 because of softening oil prices and promotion of alcohol plan. Although the imports of capital goods, being essential for industrialization, decreased during the period when the imports of fuel increased, their share increased to US$6 billion or 28% of the total imports in 1991 as shown in Table IV.2.5. The government is trying to decrease the imports of primary goods that are available in the domestic products. The imports of capital goods are still increasing, as far as the statistical data indicate.

The trade balance in 1991 was US$10.6 billion, which was broken down to US$31.6 billion of exports and US$21.0 billion of imports. The trade balance has been in red during the 70's, due to oil problems. Afterwards, it has turned into the black, owing to retrenching in finance and intensification of import restriction.

The detailed annual information regarding foreign trade is compiled by Ministry of Industry and Commerce (MIC). Although the trade data are not published in printed form, they are available through a computer terminal in the centralized data base. In Santa Catarina, Secretaria de Estado da Tecnologia, Energia e Meio Ambiente installs a terminal to access the data server of the central computer system. Besides it, some public entities such as FIESC and CEPA, and large trading companies have the same kind of terminal, and they can also access to the central data base.

2.5 Electric Power Supply and Consumption

Generation and supply of electric energy are under the jurisdiction of Ministry of Infrastructure (MIE). In implementation of power supply over the country, MIE entrusted the works to the two entities, DNAEE and ELETROBRÁS. DNAEE is responsible for issuance of concession for utilization of river water and dealing in power among producers, suppliers and users. ELETROBRÁS is in charge of planning, financing and coordination of expansion and operation of the national power system.

ELETROBRÁS is functioning a federal holding company for four regional subsidiaries: ELETRONORTE, CHESF, FURNAS and ELETROSUL. They own and operate power generation systems and inter-regional transmission lines in the north, northeast, middles west/southeast and south regions, respectively. Within respective regions, there are state utilities, usually supervised by the state governments, which are in charge of local transmission and distribution as well as some of power generation.

The electric power supply during 1988-90 in the country is shown in Table IV.2.6. In 1990 hydropower plant capacity fulfilled 50.5 GW or 91.5% of the total generated capacity (55.2 GW). It also covered 236 GWh or 96.9% of the annual energy supplied in 1990. The power supply capacity expanded at an average rate of 4.5% per annum during 1988-90.

The power consumption by consumer types is shown in Table IV.2.7. The consumption grew at an average rate of 3.2% per annum during 1988-90. The industrial sector was the largest consumer, which consumed 105 TWh or more than a half of the total consumption (205 TWh) in the country. Succeedingly, the power was

consumed by residential sector (23%), commercial sector (12%) and others (14%), as shown in the table.

3. PROVINCIAL SOCIO-ECONOMIC CONDITIONS

3.1 Administration

The State of Santa Catarina , the objective area in this current study, is located in south Region. It comprises six Mid-Regions, 22 Micro-Regions and 260 Municipalities in January 1993. Although the number of Municipalities was 217 in the state in the census year 1991, 43 Municipalities have been established up to now since then.

The headquarters of the state government is located in the capital city, Florianópolis. The government consists of nine secretarias (secretaries), three procuradorias (procurator's offices) and seven special offices attached to the governor's cabinet as shown in Fig. IV.3.1. Among these sections, the following two secretarias are closely related to the current study.

(1) Secretaria de Planejamento e Fazenda (SPF): The secretary and his staff are in charge of public finance as treasury and planning of economic development strategy.

(2) Secretaria de Tecnologia, Energia e Meio Ambiente: The secretary is in charge of administrative affairs of technology, science, energy and environment. Under the jurisdiction of the secretary, CELESC manages electric power generation and supply in most of the state territory.

3.2 POPULATION

The state of Santa Catarina has a population of 4,538 thousand or 3.1% of the national total population (146,154 thousand) in the census year 1991, as shown in Table IV.3.1. The state population was 3,628 thousand in the previous 1980 census year. It increased at an average rate of 2.1% per annum during the two censuses.

The state occupies 95 thousand km^2 or 1.1% of the national territory. The population density of the state was 47.6 persons per km^2 in 1991, 2.8 times of the national one (17.2 persons per km^2). The most densely populated Micro-Region was "Foz do Rio Itajaí", which was 174.9 persons per km^2. Succeedingly, the following four Micro-Regions recorded comparatively high population density of more than 100

persons per km² in the census year 1991: Nordeste do Estado de Santa Catarina, Sul do Estado de Santa Catarina, Grande Florianópolis and Medio Vale do Itajaí.

Among 217 Municipalities, major Municipalities that had more than 100 thousand people were as follows, in order of the 1991 census population:

No	Municipality	1991 Census Population			Area	Density	Micro-Region
		Urban	Rural	Total	(km²)	(persons/km²)	
1	Joinville	333868	12464	346332	1080	320.7	5. Nordeste do Estado de SC
2	Florianópolis	239566	15375	254941	440	579.4	1. Grande Florianópolis
3	Blumenau	186227	25635	211862	509	416.2	3. Medio Vale do Itajaí
4	Lages	138445	12655	151100	5287	28.6	11. Serrana
5	Criciúma	132201	13961	146162	209	699.3	13. Sul do Estado de SC
6	São Jose	128203	11115	139318	256	544.2	1. Grande Florianópolis
7	Chapecó	96599	26290	122889	1042	117.9	9. Oeste de Santa Catarina
8	Itajaí	114558	5073	119631	304	393.5	2. Foz do Rio Itajaí

3.3 Labor Force and Employment

The labor force in Brazil and Santa Catarina was enumerated in Table IV.2.1, although the 1991 census figures were not shown in the table yet. According to the 1980 census, Santa Catarina marked a higher growth in labor force and gainful workers than the national average. Of the total labor force of 1,336 thousand in 1980, 1,331 thousand or 98.1% was engaged in some jobs as gainful workers as shown in Table IV.3.2. They were distributed as 418 thousand or 30.8% of the total labor force in agricultural sector, 319 thousand or 31.6% in industrial sector and 484 thousand or 35.7% in services' sector, as shown in the table. Then, the unemployment rate was only 1.9% in 1980.

On the basis of the 1990 estimation, the number of workers in respective major sectors changed to 407 thousand or 23.4% in agricultural sector, 619 thousand or 35.6% in industrial sector and 713 thousand or 41.0% in services' sector. Thus, although the number of workers in agricultural sector decreased at an average rate of 0.27% per annum during a decade between 1980 and 1990, the number of workers in other two sectors increased as follows: (a) that in industrial sector increased at the rate of 3.75% per annum and (b) that in services' sector, 3.95%.

3.4 Gross Regional Domestic Product

Gross Regional Domestic Product (GRDP) of Santa Catarina amounts to Cr$7,639 billion at current price in 1991, as shown in Table IV.3.3. It accounted for 4.6% of GDP in 1991. In 1985, that was about 3.8%, so the economic status of the

state could be said to increase comparatively in the country. GRDP grew at a real rate of 2.25% per annum on average between 1985 and 1991. This rate was larger than that of the country (1.83%) as discussed in Section 2.3.

Per capita GRDP was Cr$1,683 thousand at current price (equivalent to approximately US$2.4 thousand) in 1991. In 1987, that was the largest among the recent seven years. Afterwards, that has gradually been going down because of nationwide economic recession. However, that of the state has still kept at about 24% higher position than that of the country.

3.5 Industrial Structure

Table IV.3.3 also gives Gross Value Added (GVA) of economic sectors for the years 1985 to 1991. During the same period, the proportion for agricultural sector expanded, but that of both industrial and services' sectors declined slightly, though the ranking of shares among respective sectors were not changed throughout the period. In 1991, GVA of the respective sectors accounted for as follows: (a) in agricultural sector, Cr$1,213 billion or 15.9% of GRDP; (b) in industrial sector, Cr$2,632 billion or 34.5%; and (c) in services' sector, Cr$3,794 billion or 49.7%.

The agricultural sector has grown favorably until the year 1990, but in 1991 it recorded a negative growth as shown in the table. The average growth rate between 1985 and 1991, however, was 3.67% per annum, which was not worth as compared with the national average of 1.32%. Table IV.3.4 shows a comparison of state and national production of agricultural products. As shown in the table, Santa Catarina got the top rank of production in the country in terms of the following products: apple, onion, garlic, honey and swine.

The industrial sector has not well grown in the recent few years. Then, its average growth rate between 1985 and 1991 recorded 1.83% per annum, which was the lowest among three economic sectors. In the industrial sector, a manufacturing subsector has been a mainstay in regional economy. In 1988, GVA of the subsector in the state was Cr$1,056 million, accounting for 4.4% of that of the country. Table IV.3.5 shows a comparison of state and national production of manufacturing products. According to the table, three industrial types of product got the more than 10% share in the national total production, i.e., timber, garment and tobacco. Furthermore, seven types in the state exceeded the regional average share of 3.7% to the nation production. They were plastic product, furniture, textile, paper, food product and machinery. The most of them are mainly located in the northern and central coastal plains with exception of some food processing, ceramics and plastic industries.

An average growth rate of services' sector was 2.11% per annum between 1985 and 1991. This rate was slightly smaller than that of GRDP. The sector has still the largest share among the three major economic sector, but its share seems to be comparatively decreasing year by year as shown in Table IV.3.3.

3.6 Infrastructure

3.6.1 Physical infrastructure

(1) Road System

Santa Catarina has three types of road network systems, i.e., federal, state and municipal systems. The total length of these systems were 61,028km as of December 1991. They were distributed as follows. The pavement ratio is only 7.8%.

Type	Paved(km)	Unpaved(km)	Total(km)
Federal	2,018	103	2,121
Federal/State	600	304	914
State	2,226	2,472	4,698
Municipal	315	52,980	53,295
Total	5,159	55,859	61,028

Source: Ref.H-09

(2) Sea port

There are three major sea ports in Santa Catarina: Imbituba, São Francisco do Sul and Itajaí. São Francisco do Sul is the most active as the main gateway to the northern industrial area of the State. Regarding cargo handling, it accounted for more than 60% among three ports.

(3) Airport

There is only an international airport in the State, Hercílio Luz Airport, in Florianópolis. It plays an important role for time saving in person trips and mail, in particular. Besides, there are 26 airports in the State (Ref.H-09). Among them, the following six airports have regular flights: Florianópolis, Joinville, Navegantes, Chapecó, Criciúma and Lages.

(4) Communication

Telephone service is managed by Telecomunicações de Santa Catarina S.A. (TELESC) in the State. As of 1991, 267 thousand terminal units were installed for services over the State. There are 13 TV stations and 162 radio stations in the State in 1991 (Ref.H-09).

(5) Water supply

In 1991, water supply systems cover 61% of the total population in the state. In the light of urban population, the supply systems cover 85% in service. Most of them are managed by CASAN. Some parts are covered by municipal systems.

3.6.2 Social Infrastructure

(1) Schools

As of 1991, Santa Catarina has the following educational facilities. Rates of completion to enrollment were 81.2% in primary school and 78.1% in high school, according to the 1991 record.

Educational Facility	No. of Facilities	No. of Attendants
Pre-School (0 to 6 years old)	4,106	161,692
Primary School (7 to 14 years old)	8,481	843,392
High School (15 to 17 [or 19 for special courses] years old)	602	122,990
Vocational School (Data in 1990)	102	10,850
University / College	5 / 16	10,299

Source: Ref.H-09

(2) Medical facilities

There are 1590 medical facilities in the state in 1989. They are broken down as follows. The hospitals install 16,824 beds, so the average number of beds to one thousand people is 3.4 in 1989. Incidentally, life expectancy in the state was 66.8 years in 1980, which was much longer than that of the country (60.1 years).

Facility	Public	Private	Total	No. of Beds
Hospital	33	184	217	16,824
Clinic	950	423	1,373	-

Source: Ref.H-09

3.7 Land Use

No information regarding land use in the state is available as of 1993. The 1985 economic census of agricultural sector gave land utilization for agricultural purposes in the census report. According to this census, agricultural land covers 74.2 thousand km² in total, accounting for 78% of the state territory. The land use was summarized as follows: 21,933 km² or 23% of the state area for crop production; 24,691 km² or 26% for pasture and/or livestock yard; 19,094 km² or 20% for forest; and 2,498 km² or 3% for vacant land arable but not utilized. The detailed distribution by Micro-Region was tabulated in Table IV.3.6.

4. PROJECTION OF REGIONAL FRAMEWORK

4.1 Regional Development Plans

Any national development plans have not been proclaimed for recent years. Since Collor president and his political power started, some imperative economic policies were announced to restructure the disordered economy. They propose not to suggest any future development targets of the country, but to pronounce some policies for prevention of hyper-inflation and for promotion of modern industrialization by high technology.

A regional economic development plan was pronounced by the Governor in March 1991. It is titled as "Proposal for better life in Santa Catarina (Plano SIM para Viver Melhor em Santa Catarina)" (Ref.H-11). It is a rolling plan, so it is revised year by year. Although it proposes a picture of the better lives in the state, it does not show any definite targets in figures. Besides this SIM, no regional development plans are available in the state as of 1993. Thus, any official development targets are not indicated by the public sector.

4.2 Potential for Development

As regards industrial production, the state plays an important role in the national economy, as mentioned in Section 3.5. In particular, the manufacturing sector has a high degree of industrial accumulation. It is expected to grow with an expansive tendency in the future continuously, although it stagnated for the recent few years.

The services' sector has grown in linking with the growth of GRDP in Santa Catarina. This activities would be accelerated mostly in major urban centers. Thus, major cities mentioned in Section 3.2 will play the important part in commercial activities. Their importance becomes much more than the before. Then, urbanization in the state as well as major cities in particular will proceed with the growth of the sector.

Economic growth will be expected to exceed more than expected population growth in the state as well as in the country. Industrialization and its modernization are promoted to realize the expected growth. It needs more labor force than the before, so the centralization of population could be accelerated into urban areas. Though urbanization has to be managed with deep care to keep away from urban problems such as environmental pollution, labor force distribution will work out by centralization of population and by a rise in labor participation of female workers. In the long run, thus, the fulfillment of urban infrastructure would be imperative to embrace this phenomena in major urban cities.

4.3 Population Projection

Population projection comes under IBGE's jurisdiction. In 1991's Brazilian statistical yearbook (Ref.H-01), IBGE presents the national projection in total figure up to the year 2025. It shows the national total but is not broken down it to state level yet.

A population projection in Santa Catarina was presented in the study report of population projection (Ref.H-31). It shows an estimation of future population to the year 2010. According to the projection, the population increases to 5.3 million in 2000 and 6.2 million in 2010.

Both the above projections did not take the result of the 1991 census figures into consideration. In this current study, then, the 1991 census population figures were based on the projection. Afterwards, the population were assumed to grow in the same rates as estimated in the respective studies. In this manner, the future populations were projected as shown in Table IV.4.1. The state population would be 5,328 thousand or 3.1% of the national population (171 million) in 2000 and 6,276 thousand or 3.2% of the national one (198 million) in 2010.

4.4 Gross Regional Domestic Product

As mentioned in Section 4.1, any national development plans are not proclaimed at present. In addition, SIM plan in the state of Santa Catarina does not give any targets regarding economic development. Thus, it is quite difficult to project GDP and GRDP in the future.

In this study, the indices in the "World Development Report 1992" (Ref.H-32) was applied to project GDP in the future. In that reference, the growth of real per capita income was suggested to grow at an average rate of 2.2% per annum for 1990-2000 in "Latin America and the Caribbean Countries". This rate would not always be applicable for the Brazilian economy. However, any other information in terms of economic projection is not available, so this basic figure is applied in this study. Besides that, the following assumptions were set to project GRDP of Santa Catarina, because of no data availability.

(1) GDP up to the 2000 is projected on the basis of the aforesaid per capita GDP growth rate (2.2% per annum).

(2) Over 2000, its growth rate is assumed to reduce to two-thirds of the projection, i.e., 1.5% per annum.

(3) Percent share of the state product to the country grows up to 5.0% by the year 2000 and keeps constant at 5% thereafter. Incidentally, the share was 2.67% in 1970, 3.04% in 1980 and 4.64% in 1991.

GDP and GRDP were projected as shown in Table IV.4.2. In the year 2010, GRDP will reach to Cr$15.8 trillion or about twice of that in 1991. In the same year, GRDP per capita will be expected to grow to Cr$2.5 million (equivalent to US$3.6 thousand) or 50% more than that in 1991.

5. NEEDS AND CONSTRAINTS FOR ELECTRIC POWER DEVELOPMENT IN SANTA CATARINA

5.1 Electric Power Supply and Consumption

CELESC is a public corporation responsible for supply of electric power in the state. CELESC has its own transmission lines and distribution systems which are linked with the south/southeast power transmission system. It has a power generation facilities with a capacity of 74.3 MW which consists of 12 hydropower plants.

Table IV.5.1 shows electric power procurement and consumption during 1982-1992 in the territory of CELESC. In 1992, CELESC generated only 376 GWh or 4.8% of the total supply energy. The rest of 7,422 GWh or 95.2% was purchased through ELETROSUL, Itaipu system and others. Of the total purchased power, 4,586 GWh or 61.8% was procured through ELETROSUL. This quantity seems to be kept constant for late nine years. On the other hand, the purchased power through Itaipu system has increased year by year to meet the growing power demand since 1985. In 1992, its quantity increased to 2,806 GWh or 37.8% of the total purchased power. It has grown at an average rate of 17.9% per annum for recent five years.

7,111 GWh of power energy was distributed to consumers such as industrial, residential, commercial and rural users. Of the total distributed energy, 3,454 GWh or 48.6% was for industrial use and 1,708 GWh or 24.0%, for residential use. The residential use has increased at an average rate of 9.1% per annum for five years, but the industrial use has increased at only 2.1% per annum because of economic recession. On the other hand, commercial and rural use increased at more than 6% per annum as shown in Table IV.5.1.

Unit consumption rates of respective clients were as follows according to the consumption results in 1992: 156 KWh per month per unit client for residential use; 11,421 KWh for industrial use; 658 KWh for commercial use; and 206 KWh for rural use.

5.2 Financial Status of CELESC

CELESC is a public corporation. Its capital stock is held mostly by the public sectors such as the state government, city halls (municipal governments) and ELETROBRÁS. The capital stock was evaluated at Cr$168 billion (equivalent to approximately US$26 million) as of September 1992. The composition of capital stock was as follows (Ref.H-23).

Share Holders	Stock Sharing (Million)	Distribution (%)
State Government	223.3	55.2
CODESC	36.8	9.1
IPESC	32.8	8.1
ELETROBRÁS	78.3	19.4
Municipal Governments	22.7	5.6
Private	8.4	2.1
Others	2.2	0.5
Total	404.5	100.0

5,739 employees were working in CELESC in January 1993. Of the total employees, 1,975 or 34% were in the central office in Florianópolis. Other 5,739 or 66% were distributed in regional offices and local branches. The total wages for the entire employees were Cr$53.5 billion in January 1993, so the average wage was Cr$9.3 million per month (equivalent to approximately US$600) including social charge and fringe benefit. Besides these employees, 576 workers were in CELESC, who were temporarily employed on contract bases. The distribution of these workers are tabulated below. The organizational chart of CELESC is shown in Fig. IV.5.1.

Central Office		Regional Office	
Department	No. of Workers	Region Office	No. of Workers
Office of President	65	Florianópolis	626
Administration Dept	572	Vale do Itajaí	952
Economy & Finance Dept	295	Norte	692
Distribution Dept	242	Lages (Planalto)	355
Engineering & Operation Dept	335	Meio Oeste	380
Others	66	Extremo Oeste	573
		Sul	586
Total	1,575	Total	4,164
Contract Workers	163	Contract Workers	576

CELESC has been keeping more than 10% net profit before income of total sales taxes up to 1989. Afterwards, it has recorded negative profit since 1990, as shown in the profit and loss (P/L) in Table IV.5.2. Considering the P/L in 1992, gross sales, variable and fixed costs were estimated at Cr$4,008 billion, Cr$2,550 billion and Cr$1,973 billion, respectively, so a break-even point was calculated at Cr$5,424 billion. Hence, the break-even point was calculated through the following formula: (fixed cost)/{1-(variable cost / gross sales)}. Thus, the break-even point ratio, that is, the break-even point to total sales

was 135%. In other words, if this financial structure is kept in the future, CELESC would have to increase 35% more than the present total sales to keep balance in the cash flow. If it is impossible to increase power sales because of recession, the purchased costs and/or expenses would be drastically reduced from the present conditions. Otherwise, it would be quite difficult to recover the balanced management.

5.3 Needs for Electric Power Development

5.3.1 Increasing Power Demand

As seen in Section 5.1, electric power demand has continuously increased in spite of the economic recession for recent years. This would be due to two causes: (1) increment of power clients in CELESC's territory and (2) increase in unit consumption rate.

Santa Catarina, mostly overlapping with CELESC's territory, is expected to keep an important role in economic growth in the national economy. GRDP of the state was 3.8% in GDP in 1985 and increased to 4.6% in 1991, as discussed in Section 3.4. Moreover, as assumed in Section 4.4, it might increase to 5.0% by the year 2010. The economic growth is brought about by intensification of industry. Thus, the economic growth could make a definite promise to increase the power demand in the state.

The economic growth also encourages to improve both production system in industrial sector and level of living standard in state people. This transformation could increase unit consumption of electric power. As shown in Table IV.5.1, in fact, unit consumption rate increased from 134 KWh/month in 1982 to 156 KWh/month in 1992 for residential use and 611 KWh/month in 1982 to 658 KWh/month in 1992 for commercial use. However, since that of industrial use depends on its scale and type, this sector is not always under this rule. In principle, this trend will proceed even in the future, although its growth rates are changed in proportion to socio-economic conditions.

5.3.2 Expansion of Self Power Generation

CELESC procures electric power mostly through purchasing from ELETROSUL and Itaipu system. Self generation accounted for less than 5% of the total procurement and its percentage is still going down year by year. This is because its generation facilities are so old that they do not work more economically and efficiently than other late facilities. Then, CELESC is apt to depend on purchased sources.

Yet, ELETROSUL seems to has some difficulty to supply sufficient power energy sources for electric power distributors such as CELESC. Although ELETROSUL

try to build new large power plants to meet future increasing power demand, its expansion program intends to delay because of financial problems and environmental issues. Thus, CELESC has to strengthen its own sources of power generation to ensure stable power procurement.

5.3.3 Improvement of Management Efficiency

ELETROBRÁS and ELETROSUL have kept the management of CELESC under their long term control. However, its policy is changing to reduce the control power and to make full use of CELESC's real management ability. Thus, CELESC has to make an effort to succeed well from the point of view of efficient management.

Dependence of purchased energy sources seems to stiffen CELESC's management. To manage itself safely and efficiently, CELESC would rather try to find more economical power sources and to increase ratio of gross profit to sales. Purchased energy costs occupies the largest portion in the total expenses, i.e., 30% to 40% of sales amount for recent years. Thus, diversification of energy sources could lead the management to make net increased profit.

5.4 Constraints for Electric Power Development

5.4.1 Financial Constraints

According to Table IV.5.2, financial management indices of CELESC at the end of 1992 were as follows. Hence, a foreign exchange rate was assumed as Cr$12,400 per US$.

No.	Item	Cr$ billion	US$ million
1.	Property, Plant & Equipment (Fixed Assets)	8,562	690
2.	Liabilities	4,801	387
3.	Capital Stock (Net Worth)	5,250	423
4.	Long-term Capital (Capital Stock+Long-term Debt)	6,044	498

In the pre-feasibility study report, the total investment cost has been estimated at approximately US$180 million. This cost corresponds to 26% of the above fixed assets. So, this amount could be too much for CELESC. To examine management conditions of CELESC, the following index was estimated;

No.	Index for Safety of Management	Ratio	Target
1.	Ratio of Fixed Assets to Net Worth	163%	Less than 100%
2.	Ratio of Fixed Assets to Long-term Capital	142%	Less than 100%
3.	Ratio of Total Liability to Net Worth	91%	Less than 100%

As seen above, the ratio of fixed assets to net worth was much more than 100%. The ratio of fixed assets to long-term capital also exceeded 100% in 1992. Thus, in case of investment for the proposed project, CELESC should try to increase own capital or to procure long-term debt with low interest. Otherwise, its management might be driven into a tight corner.

5.4.2 Acquirement of Skilled Labor

CELESC already has experience of operation and maintenance of hydro-power plants in its territory. Therefore, it is not so serious constraint in this stage. However, if it plans to increase self generation of electric power, it must train the fairly large number of skilled workers for operation and maintenance of plants. To operate many plants in systematic network operation, highly trained staff could be necessary for safe and efficient operation.

5.4.3 Requirement of Environmental Protection

Environmental protection policy is required to avoid environment confessions in the future. It is stipulated by laws and regulations issued by the federal and state governments. In this project, these issues could be cleared in this current study. At the same time, it would be important to obtain people's consent before implementation.

6. INDICES AND FACTORS FOR ECONOMIC EVALUATION

6.1 Taxes and Foreign Trade Duties

In Brazil, there are 55 different types of tax and duty. Major taxes and duties are as follows:

(1) Income Tax: This tax is imposed on both personal income and corporate income. Tax rate varies from 0% to 50% maximum. This is a federal tax.

(2) Tax on Manufactured Goods (IPI): This tax is imposed on most of manufactured goods. The largest share of this tax comes from tobacco. Tax rate is comparatively lower for goods to be needed for economic development. The tax is imposed on imported goods, as well. This is also a federal tax.

(3) Customs Duties: This duty is imposed on CIF prices in general. The tariff is controlled by Committee of Tariff Policy (CPA). The duties are imposed (a) Temporally Tariff and (b) Ordinal Import Tariff in priority order.

(4) Transfer Tax on Commodities and Services (ICMS): This is an important tax for state revenue. The tariff varies among states. Santa Catarina provides the rate

as 17% in general. Tax rates varies among commodities and services. The state revenue of Santa Catarina is shown in Table IV.6.1. In 1992, the total revenue of SC accounted for 3.4% of the total amount (27 states) in the country.

Besides these taxes and duties, there are following taxes: financial transaction tax, fuel tax and tax for road traffic for federal revenue; inheritance tax and automobile tax for state revenue; and, land tax and housing tax for municipal revenue.

6.2 Prices, Inflation and Foreign Exchange Rates

In 1992, inflation in Brazil recorded 1,260% per annum. Monthly variation in 1992 were between 19.8% and 27.4%, as shown in Table IV.6.2. This situation is still going on up to present. As seen in the table, annual variation of price index in 1992 was 1,260% in consumer price and 1,254% in wholesale price. Civil works also recorded almost the same price increase of 1,231% in 1992.

Table IV.6.3 shows official foreign exchange rate between Cruzeiro and US dollar at the end of month. The foreign exchange rate has almost linked with inflation. The rate varied from Cr$1,069 per US$ at the end of 1991 to Cr$12,388 at the end of 1992. Thus, the rate increased about 1,159% per year. In spite of this confusion, however, there is not big difference between official and shadow rates these days.

6.3 Conversion Factors

6.3.1 Internal Transfer

Internal transfer, which is just a shift of money from one party to another and is not related with substantial economic activities, should be excluded in converting the financial construction cost to the economic cost. The internal transfer portion consists of excise and taxed out of outlays for the local currency portion. The foreign currency portion represents economic cost, since the cost estimated for the foreign currency portion is based on the CIF price.

The internal transfer for the local portion can be estimated as ratio of the sum of excise and taxes to the total production. These figures were assumed as follows, which were quoted from data in 1991:

(1) The federal revenue portion: It was assumed at 60% of the total revenue (Cr$52,809 billion), so it was estimated at Cr$31,686 billion.

(2) The state revenue portion: Since the state revenue through state taxes was Cr$373 billion in Santa Catarina (refer to Table IV 6.1), the total state revenue in

the country was estimated at Cr$10,971 billion, applying the ratio (3.4%) of actual ratio in 1992.

(3) The municipal revenue portion: This was assumed to be 10% of the municipal revenue portion, so it amounted at Cr$1,097 billion.

(4) The total production: Since GDP was Cr$164,991 billion, the total gross production was estimated at Cr$366,646 billion, using the ratio (45%) of GDP to total production which was conducted through the input-output table in 1980 (Ref.H-24).

Accordingly, the internal transfer of the local portion was calculated at 12% since the transfer portion was summed up to Cr$43,754 billion and the total production, Cr$366,646.

6.3.2 Shadow Wage Rate

Labor costs sharing considerable parts of the local portion of the project cost are estimated on the basis of wages to be actually paid at the 1993 price level. A shadow wage rate (SWR) of unskilled labor hired locally are assumed to be 50% of the actual market wages in consideration of the social conditions: (a) unemployment situation in the country in recent years and (b) social charge included in the wage, which consists of social security and fringe benefit, and which accounts for almost 50% of the total wage payment.

Yet, regarding skilled workers, their market prices are considered to reflect their economic value. Thus, SWR for them is defined at 1.00.

6.3.3 Conversion to economic cost

Conversion from the construction costs of the project to economic costs is made through the following procedure:

(1) Foreign currency portion of construction costs is used as economic cost without adjustment, because of reflecting international value.

(2) For local currency portion except labor costs, internal transfer costs (12% of financial price) have to be eliminated from material and equipment costs.

(3) For labor costs in local portion, SWR is applied to convert them into economic value, i.e., 50% for unskilled labor and 100% for skilled labor.

6.4 Interest Rates and Opportunity Cost of Capital

Banco Regional de Desenvolvimento do Extremo Sul (BRDE) give a loan to corporations for capital investment. It is a public bank supported by the federal government. It is located in Florianópolis and functions for public and/or private entities in South Region. According to Ref.H-25, the terms of loan for investment in special equipment or infrastructure by industries are as follows:

Program	Loan Ceiling (%)	Loan Period (Year)	Grace Period (Year)	Interest Rate (%)
Infrastructure (for Private)	50	10	2	12.0
Pollution Control (Small corporation)	75	8	-	9.0
Pollution Control (Large corporation)	75	8	-	11.5

CELESC gets some loans from private banks. According to a loan for capital investment from Banco do Brazil, the terms of loan were as follows: 20 years for repayment including 5 years of grace period; 9% of interest rate; and 0.2% for commission.

As seen in these examples, interest rate for long-term loans seems to be distributed between 9% and 12%. Besides that, the world bank recommend to apply 8% to 10% for opportunity cost of capital in most developing countries. Thus, in this current study, 10% would rather be applied as a hurdle rate for both economic and financial evaluation.

6.5 Marginal Cost of Electricity

6.5.1 Short Term Marginal Cost

ELETROBRÁS has proposed "Marginal Cost of Expansion (CME)" to revise electric power tariff since 1984. It is also applied to evaluate a new project in the country. This theory is based on comparison of marginal energy output and monetary input for facilities and operation in accordance with the conceivable power demand.

The formula of CME is provided as follows:

$$CME = \frac{CATE \times 10^3}{8.76\,(ICEQ - EN))} + \frac{(CGTE+CDFE+COME)\times 10^3}{8.76\,ICEQ}$$

Where: CME : Marginal cost of expansion (US$/MWh)

CATE : Compound annual investment for construction of hydraulic/thermal power projects (US$ million/year)

ICEQ : Compound annual output (guaranteed energy) to be generated by all power projects (MW/year)

EN : Compound annual output (guaranteed energy) to be generated by nuclear power projects (MW/year)

CGTE : Compound annual average cost for compensation of presumed energy deficit (US$ million/year)

CDFE : Compound annual average cost for compensation of presumed energy deficit (US$ million/year)

COME: Compound annual operation and maintenance cost of all power projects, except fuel cost for thermal power projects (US$ million/year)

CME for interconnected system linkage of south, mid-east and central-west regions in 1992 was calculated at US$41 per MWh. Table IV.6.4 shows CME estimated in the past since 1984. The present value of US$41/MWh was 15% lower than that (US$48/MWh) in 1990. The latest CME was estimated through the following procedures:

(1) The power demand for the following ten years was projected by ELETROBRÁS, as shown in Table IV.6.5. An average electric power demand in the regions was estimated at 22.5 GW (annual demand divided by 8,760 hours) in 1992 and to increase to 37.0 GW or 65% more during 10 years. A peak capacity was estimated at 32.9 MWh/h in 1992 and to increase to 52.5 MWh/h or 60% more.

(2) To meet this power demand, 56 large scale promising hydro and thermal power schemes were planned as listed on Table IV.6.6. They were broken down to 47 hydro-power plants and nine thermal power plants.

(3) Annualized capital investments for these projects except nuclear power plants was estimated in Table IV.6.7. For annualization, a capital recovery factor (α) was applied, of which a formula is shown below:

$$A = P \times \alpha = P \times [i \times (1+i)^n]/[(1+i)^n - 1]$$

where,
- A : Annualized capital,
- P : PV of project construction cost,
- i : Interest rate (discount rate), 10%,
- n : Recovering period.

The annualized capital was based on the present value (PV) of respective project plants discounted at 10% per annum for economic life of 50 years for hydro-power plants and 25 years for thermal power plants, respectively.

(4) The operation and maintenance costs for all facilities were calculated in Table IV.6.8.

(5) The power energy to be generated by these schemes was estimated in Table IV.6.9.

(6) It was assumed that if a power deficit occurs due to a delay of project construction or water deficit due to hydrological conditions, such deficit will be compensated by existing thermal power plants. In this case, the implicit cost of US$430/MWh was introduced considering the high actual cost of operation of existing thermal power plants with inferior efficiency. This deficit was estimated in Table IV.6.9.

(7) The power energy to be generated by nuclear schemes was estimated in Table IV.6.10.

In this current study, this CME will be applied to evaluate the proposed projects. The study team reviewed the concept of CME and concluded to apply it on the basis the following considerations, as discussed in the pre-feasibility study.

(1) The concept of CME is principally based on the annual energy to be generated by the promising large scale projects including the majority of hydropower schemes and several thermal schemes, and their investment cost. These schemes are those selected from among the inventory study by ELETROBRÁS. The combination of these selected schemes is the most promising power supply source in the interconnected system and there are no more economical alternative schemes than those of the adopted combination. These results were calculated through linear programming method. Although the detailed information is not available, the result figures might be reasonable as far as judging from the study experience in Brazil.

(2) The implicit cost of US$430/MWh to estimate the cost for the presumed power deficit is introduced on the assumption that the power for the presumed deficit is supplied by the existing thermal plants, and relatively high costs are applied to the estimation. Considering the present power supply facilities including thermal plants with inferior efficiency for power generation and high operation cost have been operated, it is necessary to recognize the introduction of this high implicit cost.

6.5.2 Long Term Marginal Cost

ELETROBRÁS has applied a long term marginal cost (LTMC) of expansion to evaluate a project regarding its viability in the country, as well. ELETROBRÁS estimates

LTMC applying the same procedures as mentioned above. The LTMC calculated in Sul Region is as follows:

(Unit : US$/MWh)

Five-year Period	LTMC
2001 - 2005	58
2006 - 2010	58
2011 - 2015	58
2016 - 2020	67
2021 - 2025	70

6.5.3 CME in Economic Value

CME, discussed above, was based on market prices. In economic evaluation, CME estimated in economic value is necessary. In general way, the conversion factors discussed in Section 6.3 are applied to calculate the economic CME. Table IV.6.11 shows a procedure of the economic CME calculation. As shown in this table, the estimated economic value of CME was US$37 per MWh against CME in financial value of US$ 41 per MWh.

In the same manner, LTMC was calculated by applying the conversion factor (0.90) estimated in Table IV.6.11. The financial LTMC was converted to economic one as follows:

(Unit : US$/MWh)

Five-year Period	LTMC
2001 - 2005	52
2006 - 2010	52
2011 - 2015	52
2016 - 2020	60
2021 - 2025	63

Table

Table IV.2.1 Census Population by Sex, Urban/Rural Resident and Labor Force: 1970-1991

Item	Census Population (1,000)			Percentage Distribution (%)			Average Annual Growth Rate (%)		
	1970	1980	1991	1970	1980	1991	70/80	80/91	70/91
Brazil									
1. Population	93,139	119,003	146,155	100.0	100.0	100.0	2.48	2.08	2.17
2. Male	46,331	59,123	72,171	49.7	49.7	49.4	2.47	2.01	2.13
3. Female	46,808	59,879	73,983	50.3	50.3	50.6	2.49	2.14	2.20
4. Urban	52,085	80,436	-	55.9	67.6	-	4.44	-	-
5. Rural	41,054	38,566	-	44.1	32.4	-	-0.62	-	-
6. 10-Years and Over	65,684	87,677	-	70.5	73.7	-	2.93	-	-
7. Labor Force	29,557	43,236	-	31.7	36.3	-	3.88	-	-
8. Labor Participation Rate (%)	45.0	49.3	-	-	-	-	-	-	-
9. Gainful Worker	29,061	42,271	-	31.2	35.5	-	3.82	-	-
10. Employment Rate(%)	98.3	97.8	-	-	-	-	-	-	-
11. Unemployment	497	965	-	0.5	0.8	-	6.87	-	-
12. Unemployment Rate (%)	1.7	2.2	-	-	-	-	-	-	-
13. Population Density (Persons/km² : National territory 8,511,998 km²)	10.9	14.0	17.2	-	-	-	2.48	2.08	2.17
Santa Catarina									
1. Population	2,902	3,628	4,538	100.0	100.0	100.0	2.26	2.26	2.15
2. Male	1,463	1,830	2,274	50.4	50.4	50.1	2.27	2.19	2.12
3. Female	1,439	1,798	2,265	49.6	49.6	49.9	2.25	2.34	2.18
4. Urban	1,246	2,154	3,206	42.9	59.4	70.6	5.63	4.05	4.60
5. Rural	1,656	1,474	1,333	57.1	40.6	29.4	-1.16	-1.00	-1.03
6. 10-Years and Over	1,990	2,716	-	68.6	74.9	-	3.16	-	-
7. Labor Force	882	1,356	-	30.4	37.4	-	4.39	-	-
8. Labor Participation Rate (%)	44.3	49.9	-	-	-	-	-	-	-
9. Gainful Worker	868	1,331	-	29.9	36.7	-	4.37	-	-
10. Employment Rate(%)	98.3	98.1	-	-	-	-	-	-	-
11. Unemployment	15	25	-	0.5	0.7	-	5.61	-	-
12. Unemployment Rate (%)	1.7	1.9	-	-	-	-	-	-	-
13. Population Density (Persons/km² : State territory 95,318 km²)	30.4	38.1	47.6	-	-	-	2.26	2.26	2.15

Source: Ref.H-02, H-03 and H-25

Table IV.2.2 Gross Domestic Product by Sector: 1985-1991

Sector	1985	1986	1987	1988	1989	1990	1991
I. GDP at Current Prices (Unit: Cr$ million)							*2
Agriculture	149	375	1,076	8,251	103,667	2,989,255	15,770,744
Industry	570	1,472	4,764	34,146	495,213	11,040,248	54,733,924
Mining	41	87	231	1,500	18,085	468,112	2,471,799
Manufacturing	425	1,074	3,318	24,218	342,796	7,532,844	36,620,485
Construction	76	234	876	6,257	106,247	2,222,550	10,332,200
Utilities	29	77	339	2,173	28,083	816,742	5,309,440
Services	702	1,670	6,164	47,990	841,342	17,250,089	87,757,952
Trading	114	282	837	6,334	90,438	2,086,245	10,442,023
Transportation	54	136	436	3,303	48,560	1,206,185	6,347,378
Communication	14	29	107	923	15,104	366,123	1,669,393
Finance	157	261	1,610	12,085	279,441	3,527,296	11,896,886
Government	96	267	896	6,830	123,056	3,392,865	14,453,608
Real Estate	121	312	1,084	9,008	136,723	4,165,859	23,045,948
Other Services	147	382	1,195	9,508	148,020	2,505,516	19,902,714
Imputation of Services	-159	-247	-1,584	-12,165	-280,458	-3,621,289	-11,718,608
GDP at Factor Cost	1,262	3,269	10,420	78,223	1,159,763	27,658,303	146,544,012
Indirect Tax (IT)	146	457	1,337	9,384	136,407	4,628,253	21,335,041
Subsidies (S)	22	54	183	1,058	24,415	555,562	2,888,355
GDP at Market Prices	1,387	3,672	11,574	86,549	1,271,756	31,730,994	164,990,698
II. GDP at 1985 Constant Prices (Unit: Cr$ million)							
Agriculture	149	137	158	159	164	158	162
Industry	570	637	644	627	645	598	594
Services	702	760	785	803	834	829	846
Imputation, IT & S	-35	-43	-41	-46	-48	-53	-55
GDP at Market Price	1,387	1,492	1,546	1,544	1,595	1,531	1,546
III. Percentage Distribution by Major Sector (%)							
Agriculture	10.8	10.2	9.3	9.5	8.2	9.4	9.6
Industry	41.1	40.1	41.2	39.5	38.9	34.8	33.2
Services	50.7	45.5	53.3	55.4	66.2	54.4	53.2
Imputation, IT & S	-2.5	4.2	-3.7	-4.4	-13.2	1.4	4.1
GDP at Market Price	100.0	100.0	100.0	100.0	100.0	100.0	100.0
IV. Real Annual Growth Rate (%)							*3
Agriculture	9.96	-8.02	14.97	0.84	2.85	-3.72	2.47
Industry	8.27	11.76	1.06	-2.59	2.88	-7.40	-0.66
Services	6.48	8.25	3.28	2.30	3.88	-0.67	2.02
GDP at Market Price	7.95	7.58	3.62	-0.09	3.30	-4.03	0.96
V. GDP per Capita							
Population (1,000) *1	130,655	133,119	135,630	138,188	140,794	143,449	146,155
At Current Prices							
(Unit: Cr$1,000)	11	28	85	626	9,033	221,200	1,128,879
At 1985 Constant Prices (Exchange Rate: Cr$0.0055/US$ in Middle of 1985)							
(Unit: Cr$)	10,612	11,205	11,396	11,175	11,330	10,672	10,576
(Unit: US$)	1,929	2,037	2,072	2,032	2,060	1,940	1,923
Real Annual Growth Rate (%)		5.6	1.7	-1.9	1.4	-5.8	-0.9

Source: Ref.H-05and H-27

Note: *1 The 1980 census population was 119 million.
*2 Quoted from Ref.H-07.
*3 Quoted form Ref.H-04

Table IV.2.3 Trend of Employment and Unemployment Rate: 1988-1992

Item	1988		1989		1990		1991		1992
	Jun.	Dec.	Jun.	Dec.	Jun.	Dec.	Jun.	Dec.	April
I. Index of Employment (December 1984=100)									
1. Total	113.6	114.2	115.5	117.5	115.1	112.8	111.5	110.0	100.5
2. Mining and Quarrying	105.4	106.0	105.4	106.9	101.8	97.0	94.4	93.0	91.6
3. Manufacturing	115.9	115.8	118.6	120.4	115.2	110.7	109.1	105.8	102.9
1 Non-metallic Products	121.2	122.2	124.3	127.7	121.1	116.2	113.6	113.5	110.4
2 Metallurgic Products	117.2	116.4	117.3	120.9	112.0	107.8	103.8	102.4	98.8
3 Machinery	126.8	124.7	124.9	129.6	119.0	114.7	109.3	107.5	104.1
4 Elec./Comm. Products	123.5	122.5	124.1	129.5	121.2	115.8	109.7	106.5	99.4
5 Vehicle	112.9	112.6	111.9	115.7	108.8	103.7	98.7	98.6	95.6
6 Timber & Furniture	115.7	117.4	120.8	120.2	117.5	106.4	108.9	104.4	101.8
7 Paper	114.6	115.5	117.7	121.8	118.4	116.8	114.7	114.6	111.0
8 Rubber	117.9	116.7	119.9	120.9	115.7	112.3	111.2	107.2	107.3
9 Chemical Products	115.4	115.1	119.2	121.0	115.0	111.9	110.7	108.3	106.0
10 Textile/Garment	115.5	115.8	121.3	122.1	117.1	114.2	112.5	104.7	100.0
11 Food Products	111.4	111.7	115.3	115.4	115.4	111.0	112.9	110.2	108.8
4. Utility Services	106.3	107.8	106.6	110.3	109.9	109.5	107.9	107.0	106.6
5. Construction	119.1	117.2	112.9	114.9	109.2	105.5	103.1	103.6	115.0
6. Trading	115.4	118.5	120.3	124.2	122.8	121.5	118.0	115.9	112.4
7. Services	115.0	116.1	117.7	119.7	118.3	117.1	116.6	115.8	115.1
8. Public Services	106.8	105.5	106.0	106.0	106.3	106.1	106.5	106.6	107.0
9. Agriculture	107.1	102.2	106.1	103.5	107.2	99.3	102.3	97.1	97.1
10. Others	109.8	108.5	108.6	109.8	107.5	105.4	107.8	107.1	106.0
II. Unemployment Rate (%)									March
1. Rio de Janeiro	3.03	2.39	2.70	2.51	3.76	3.07	3.63	3.04	4.01
2. São Paulo	4.00	2.88	3.61	1.95	5.42	4.22	5.61	4.98	7.11
3. Porto Alegre	4.05	2.79	2.57	2.04	4.24	3.91	3.90	3.33	6.24
4. Average *1	3.90	2.92	3.37	2.36	4.90	3.93	4.86	4.15	6.14

Source: Ref. H-28

Note: *1 Average of the six cities: RIo de Janeiro, Sao Paulo, Porto Alegre, Belo Horizonte, Recife and Salvador.

Table IV.2.4 Export of Major Commodities: 1990-1991

Commodities	1990		1991	
	Value (FOB) (US$ million)	Composition (%)	Value (FOB) (US$ million)	Composition (%)
I. Primary Products	8,746	27.8	8,738	27.6
Traditional Products	4,013	12.8	4,365	13.8
Coffee beans	1,106	3.5	1,382	4.4
Ferrous ore	2,407	7.7	2,600	8.2
Other Products	4,733	15.1	4,347	13.7
Chicken meat	324	1.0	387	1.2
Soy beans (chaff)	1,610	5.1	1,369	4.3
Soy beans	910	2.9	448	1.4
Tobacco leaves	551	1.8	654	2.1
II. Manufactured Products	22,119	70.4	22,449	71.0
Semi-Products	5,108	16.3	4,693	14.8
Ground metal of aluminum	875	2.8	986	3.1
Pig iron	417	1.3	303	1.0
Alloy Iron	381	1.2	369	1.2
Wooden chemical powder	592	1.9	580	1.8
Steel semi-products	753	2.4	952	3.0
Manufactured Products	17,011	54.2	17,756	56.2
Refined sugar	186	0.6	142	0.4
Rubber manufactured	305	1.0	358	1.1
Coffee dissolved	147	0.5	97	0.3
Shoes' parts	1,184	3.8	1,245	3.9
Boiler & mechanical instruments	2,480	7.9	2,590	8.2
Gasoline	405	1.3	235	0.7
Machines & Electric Equipment	1,014	3.2	1,007	3.2
Transport Machines	2,146	6.8	2,136	6.8
Paper & Paper Products	613	2.0	658	2.1
Plastics Products	498	1.6	531	1.7
Organic Chemical Products	742	2.4	732	2.3
Ferrous Products	1,644	5.2	1,914	6.1
Orange Juice	1,468	4.7	900	2.8
III. Special Goods	549	1.7	434	1.4
Total	31,414	100.0	31,621	100.0

Source: Ref.H-26

Table IV.2.5 Import of Major Commodities: 1990-1991

Commodities	1990		1991	
	Value (FOB) (US$ million)	Composition (%)	Value (FOB) (US$ million)	Composition "(%)
I. Consumption Goods	2,789	13.5	2,790	13.3
Food	1,379	6.7	1,275	6.1
Livestock products	729	3.5	570	2.7
Food products	345	1.7	383	1.8
Clothings/Garment	320	1.5	358	1.7
Leather products	203	1.0	199	0.9
Others	1,090	5.3	1,157	5.5
Medical instruments	851	4.1	898	4.3
II. Primary Materials	6,577	31.8	7,427	35.3
Wheat	295	1.4	455	2.2
Fertilizer	319	1.5	376	1.8
Chemical Products	2,631	12.7	2,832	13.5
Inorganic products	408	2.0	422	2.0
Organic products	1,283	6.2	1,429	6.8
Pulp & Wooden Powder	394	1.9	445	2.1
Plastic & Rubber Products	668	3.2	740	3.5
Plastic products	384	1.9	456	2.2
Rubber products	284	1.4	284	1.4
Iron Molten & Steel	373	1.8	335	1.6
Non-ferrous Metals	412	2.0	433	2.1
III. Fuel & Lubricant	5,363	26.0	4,838	23.0
Petroleum & By-products	4,734	22.9	4,061	19.3
Crude Oil	4,354	21.1	3,370	16.0
By-products	380	1.8	691	3.3
Others	629	3.0	777	3.7
IV Capital Goods	5,932	28.7	5,962	28.4
Transport Materials	756	3.7	994	4.7
Cars & trailers	422	2.0	634	3.0
Aircraft	316	1.5	307	1.5
Machines & Electric Materials	5,176	25.1	4,968	23.6
Nuclear reactor	3,209	15.5	3,126	14.9
Machines & electric appliances	1,967	9.5	1,842	8.8
Total	20,661	100.0	21,017	100.0

Source: Ref.H-26

Table IV.2.6 Electric Power Supply in Brazil: 1988-1990

Area Year	Capacity (MW) Total	Hydro-power	Thermal Power *1	Energy Supplied (MWh) Total	Hydro-power	Thermal Power	Others *2
I. Capacity and Energy Supplied							
Brazil							
1988	50,594	45,968	4,626	230,195	221,689	8,274	232
1989	54,076	49,422	4,654	241,820	232,883	8,818	119
1990	55,203	50,534	4,669	243,387	235,837	7,400	150
South Region							
1988	6,738	5,586	1,152	25,516	22,533	2,925	58
1989	6,738	5,586	1,152	31,441	27,764	3,653	24
1990	6,738	5,586	1,152	36,705	33,737	2,940	28
Santa Catarina State							
1988	556	74	482	3,409	1,891	1,516	2
1989	556	74	482	3,787	2,080	1,694	13
1990	556	74	482	2,966	1,678	1,272	16
II. Percentage of Santa Catarina (%)							
To Brazil							
1988	1.1	0.2	10.4	1.5	0.9	18.3	0.9
1989	1.0	0.1	10.4	1.6	0.9	19.2	10.9
1990	1.0	0.1	10.3	1.2	0.7	17.2	10.7
To South Region							
1988	8.3	1.3	41.8	13.4	8.4	51.8	3.4
1989	8.3	1.3	41.8	12.0	7.5	46.4	54.2
1990	8.3	1.3	41.8	8.1	5.0	43.3	57.1

Source : Ref.H-01

Note: *1 Including oil, natural gas, nuclear and coal.

*2 Purchasing from other systems such as foreign countries.

Table IV.2.7 Electric Power Consumption in Brazil: 1988-1990

Area Year	Consumption of Electric Power (GWh)					Percentage Distribution (%)				
	Total	Residen-tial	Indust-rial	Commer-cial	Others	Total	Residen-tial	Indust-rial	ommer-cial	Others
I. Capacity and Energy Supplied										
Brazil										
1988	192,738	40,564	103,636	21,354	27,184	100	21	54	11	14
1989	201,415	43,685	107,183	22,380	28,167	100	22	53	11	14
1990	205,354	47,884	104,763	23,685	29,022	100	23	51	12	14
South Region										
1988	26,004	6,043	11,602	3,099	5,260	100	23	45	12	20
1989	27,552	6,594	12,240	3,235	5,483	100	24	44	12	20
1990	28,220	7,303	11,958	3,420	5,539	100	26	42	12	20
Santa Catarina State										
1988	6,283	1,210	3,318	568	1,187	100	19	53	9	19
1989	6,749	1,350	3,546	606	1,247	100	20	53	9	18
1990	6,779	1,524	3,373	650	1,232	100	22	50	10	18
II. Percentage of Santa Catarina (%)										
To Brazil										
1988	3.3	3.0	3.2	2.7	4.4	-	-	-	-	-
1989	3.4	3.1	3.3	2.7	4.4	-	-	-	-	-
1990	3.3	3.2	3.2	2.7	4.2	-	-	-	-	-
To South Region										
1988	24.2	20.0	28.6	18.3	22.6	-	-	-	-	-
1989	24.5	20.5	29.0	18.7	22.7	-	-	-	-	-
1990	24.0	20.9	28.2	19.0	22.2	-	-	-	-	-

Source: Ref.H-01

Table IV.3.1 1991 Census Population in Santa Catarina

Country/State Micro-Region	Number of Municipalities	1980 Census Population	1991 Census Population			Regional Area (km²)	Population Density (Persons / km²)
			Urban	Rural	Total		
I. Brazil	4,491 *1	119,002,706	-	-	146,154,502	8,511,996	17.2
II. Santa Catarina	217	3,627,933	3,205,600	1,332,648	4,538,248	95,318	47.6
1 Grande Florianópolis	13	387,119	484,979	65,891	550,870	4,620	119.2
2 Foz do Rio Itajaí	10	180,979	243,520	26,394	269,914	1,544	174.9
3 Medio Vale do Itajaí	11	276,304	291,654	71,767	363,421	3,420	106.3
4 Alto Vale do Itajaí	19	162,365	96,827	83,212	180,039	5,735	31.4
5 Nordeste do Estado de Santa Catarina	5	274,063	384,138	20,579	404,717	2,893	139.9
6 Planalto Norte	4	86,310	51,383	46,716	98,099	5,087	19.3
7 Alto Rio do Peixe	11	160,616	144,070	59,641	203,711	8,194	24.9
8 Meio Oeste Catarinense	14	146,633	92,473	68,352	160,825	7,222	22.3
9 Oeste de Santa Catarina	19	300,565	172,056	168,202	340,258	6,078	56.0
10 Extremo Oeste de Santa Catarina	13	181,003	66,450	120,338	186,788	4,214	44.3
11 Serrana	13	253,188	202,200	71,877	274,077	16,364	16.7
12 Vale do Rio Tubarao	11	145,814	115,833	58,826	174,659	2,709	64.5
13 Sul do Estado de Santa Catarina	8	200,383	215,183	63,118	278,301	2,119	131.4
14 Alto Uruguai Catarinense	12	121,075	58,096	76,871	134,967	3,330	40.5
15 Extremo Sul de Santa Catarina	10	111,278	77,268	61,069	138,337	2,939	47.1
16 Vales Tijucas e Itajaí Mirim	8	97,350	92,409	33,096	125,505	2,097	59.8
17 Alto Irani	9	117,769	65,662	64,423	130,085	4,813	27.0
18 Vale Canoinhas	5	101,621	76,223	41,475	117,698	4,134	28.5
19 Vale Itapocu	6	95,870	101,629	34,367	135,996	2,006	67.8
20 Laguna	6	109,571	80,182	42,765	122,947	1,929	63.7
21 Rio Itajaí do Sul	7	53,524	17,767	40,453	58,220	2,296	25.4
22 Alto Rio Negro	3	64,533	75,598	13,216	88,814	1,576	56.4

Source: H-03 and Data Files of SEPLAN/SC

Note: *1 As of January 1993, the number of Municipalities increased from 217 to 260 in the State of Santa Catarina.

Table IV.3.2 Number of Population 10 Years Old and Over in Santa Catarina: 1980-1990

Item	Number of Workers (1,000)			Percentage Distribution (%)			Average Annual Growth Rate (%)		
	1980	1985	1990	1980	1985	1990	80/85	85/90	80/90
1. Agriculture	418	410	407	30.8	26.7	23.4	-0.40	-0.15	-0.27
2. Industry	428	525	619	31.6	34.2	35.6	4.15	3.35	3.75
Manufacturing	319	-	-	23.5	-	-	-	-	-
Construction	81	-	-	6.0	-	-	-	-	-
Utilities	28	-	-	2.1	-	-	-	-	-
3. Services	484	598	713	35.7	39.0	41.0	4.31	3.58	3.95
Trading	110	-	-	8.1	-	-	-	-	-
Transport. & Commun.	50	-	-	3.7	-	-	-	-	-
Communication	324	-	-	23.9	-	-	-	-	-
4. Not Specified	25	-	-	1.9	-	-	-	-	-
5. Total	1,356	1,533	1,739	100.0	100.0	100.0	2.48	2.55	2.52

Source: Ref. H-25 and H-26

Table IV.3.3 Gross Regional Domestic Product of Santa Catarina State by Sector: 1985-1991

Sector	1985	1986	1987	1988	1989	1990	1991
I. GRDP at Current Prices (Unit: Cr$ million) *1							
Agriculture	7.6	18.6	69.6	550.4	8,182.4	249,645.0	1,212,545.3
Industry	18.4	50.5	169.9	1,224.5	18,904.6	501,352.0	2,632,410.4
Mining	0.7	1.4	4.0	35.2	-	-	-
Manufacturing	16.1	44.1	148.6	1,055.9	-	-	-
Construction	1.3	3.9	13.8	105.1	-	-	-
Utilities	0.4	1.0	3.6	28.3	-	-	-
Services	26.1	70.6	224.8	1,822.4	26,045.6	721,835.0	3,793,583.6
Trading	5.7	16.7	45.6	312.6	-	-	-
Transport. & Commu	4.9	12.9	47.3	405.3	-	-	-
Finance	5.8	15.0	50.7	407.6	-	-	-
Government	2.1	5.2	16.9	138.5	-	-	-
Real Estate	1.7	4.6	16.3	138.6	-	-	-
Other Services	6.0	16.2	47.9	419.9	-	-	-
GRDP at Market Prices	52.1	139.7	464.3	3,597.4	53,132.6	1,472,832.0	7,638,539.2
II. GRDP at 1985 Constant Prices (Unit: Cr$ million) *1							
Agriculture	7.6	7.7	8.8	8.9	9.3	10.0	9.4
Industry	18.4	20.8	21.6	19.8	21.5	20.1	20.5
Services	26.1	29.1	28.5	29.5	29.7	29.0	29.6
GRDP at Market Price	52.1	57.6	58.9	58.2	60.5	59.1	59.5
III. Percentage Distribution by Major Sector (%)							
Agriculture	14.6	13.3	15.0	15.3	15.4	17.0	15.9
Industry	35.3	36.1	36.6	34.0	35.6	34.0	34.5
Services	50.1	50.5	48.4	50.7	49.0	49.0	49.7
GRDP at Market Price	100.0	100.0	100.0	100.0	100.0	100.0	100.0
IV. Real Annual Growth Rate (%)							
Agriculture	6.03	0.94	14.96	0.79	4.69	7.40	-5.60
Industry	7.12	13.08	3.61	-8.13	8.72	-6.60	2.00
Services	10.11	11.56	-1.97	3.32	0.65	-2.40	2.10
GRDP at Market Price	11.01	10.55	2.30	-1.25	4.01	-2.39	0.76
V. GRDP per Capita (Unit: Cr$1,000)							
Population (1,000) *2	4,016	4,098	4,182	4,268	4,356	4,445	4,536
At Current Prices							
(Unit: Cr$1,000)	13	34	111	843	12,198	331,331	1,683,821
At 1985 Constant Prices (Exchange Rate: Cr$0.0055/US$ in Middle of 1985)							
(Unit: Cr$)	12,974	14,053	14,088	13,632	13,894	13,290	13,122
(Unit: US$)	2,359	2,555	2,561	2,479	2,526	2,416	2,386
Real Annual Growth Rate (%)		8.3	0.2	-3.2	1.9	-4.3	-1.3

Source: Ref.H-01 and Estimation by CODESC

Note: *1 Provisional Estimation

*2 The 1980 census population was 3.63 million.

Table IV.3.4 Production of Major Agricultural Products in Santa Catarina: 1990

Product	National Ranking *1	Production			
		Unit	Santa Catarina	Brazil	Share of SC to Brazil (%)
I. Crop Production (1990/91 Crop Year)					
1 Garlic	1	1,000 tons	19.9	71.1	28.0
2 Onion	1	1,000 tons	289.0	869.1	33.3
3 Apple	1	1,000 tons	1,519.3	2,717.6	55.9
4 Tobacco	2	1,000 tons	145.6	445.5	32.7
5 Grape	3	1,000 tons	44.1	804.8	5.5
6 Beans	4	1,000 tons	197.5	2,234.5	8.8
7 Rice	4	1,000 tons	597.1	7,420.9	8.0
8 Banana	4	1,000 bunch	36.7	550.6	6.7
9 Potatoes	5	1,000 tons	162.1	2,233.7	7.3
10 Wheat	5	1,000 tons	108.3	3,093.8	3.5
11 Maize	6	1,000 tons	1,559.3	21,347.8	7.3
12 Tomato	6	1,000 tons	71.8	2,260.9	3.2
13 Cassava	9	1,000 tons	1,099.9	24,322.1	4.5
14 Soy Beans	9	1,000 tons	249.5	19,897.8	1.3
II. Livestock Production (1990)					
1 Cattle	13	1,000 heads	2,994.0	147,102.3	2.0
2 Swine	1	1,000 heads	3,330.5	33,623.2	9.9
3 Chicken	2	1,000 heads	66,635.3	548,699.5	12.1
4 Milk	7	Million liters	650.4	14,484.4	4.5
5 Egg	7	Million dozens	99.1	2,050.7	4.8
6 Honey	1	1,000 tons	4.0	33.4	12.1
III. Fishery Production (1989)	2	1,000 tons	115.8	798.6	14.5
IV Forestry Production (1989)					
1 Firewood	4	1,000 m^3	10.0	27.0	37.0
2 Lumber	4	1,000 m^3	3.3	62.7	5.3
3 Charcoal	5	1,000 tons	171.0	5,660.6	3.0

Source: H-09
Note: *1 National ranking was evaluated by quantitative comparison among 27 States in Brazil.

Table IV.3.5 Production of Manufacturing Industry in Santa Catarina:

Product	National Ranking *1	Santa Catarina Production (Cr$ Billion)	Santa Catarina Share (%)	Brazil Production (Cr$ Billion)	Brazil Share (%)
I. Mining and Quarrying	7	624	3.2	45,991	8.8
II. Manufacturing Industry	6	18,765	96.8	477,913	91.2
1 Non-metallic Products	5	1,112	5.7	20,523	3.9
2 Metallurgic Products	6	1,077	5.6	58,370	11.1
3 Machinery	5	1,677	8.6	43,968	8.4
4 Electric/Communication Products	7	731	3.8	36,151	6.9
5 Vehicle	7	320	1.7	30,715	5.9
6 Timber	3	1,228	6.3	7,566	1.4
7 Furniture	4	618	3.2	6,844	1.3
8 Paper	6	957	4.9	14,015	2.7
9 Rubber	11	36	0.2	8,805	1.7
10 Leather	8	63	0.3	2,874	0.5
11 Chemical Products	7	456	2.4	82,797	15.8
12 Medicine	6	49	0.3	8,071	1.5
13 Soap/Perfume	13	8	0.0	4,264	0.8
14 Plastic Products	4	983	5.1	10,713	2.0
15 Textile	2	2,230	11.5	28,434	5.4
16 Garment	4	2,556	13.2	24,749	4.7
17 Food Products	7	3,671	18.9	57,406	11.0
18 Beverage	12	97	0.5	5,936	1.1
19 Tobacco	3	497	2.6	3,637	0.7
20 Printing	8	108	0.6	9,278	1.8
21 Others	7	291	1.5	12,797	2.4
III. Total	7	19,389	100.0	523,904	100.0

Source: H-13
Note: *1 National ranking was evaluated by quantitative comparison among 27 States in Brazil.

Table IV.3.6 Land Use of Agricultural Purpose by Micro-Region in Santa Catarina: 1985

(Unit: km²)

Micro-Region	Micro-Region Total Area	Land Use of Agricultural Purpose									
		*1	Crop Land			Pasture Land		Forest Land		Arable but not Utilized	Non-Agricultural Use
		Total	Parmanent	Annual	Fallow	Natural	Artificial	Natural	Afforested		
1 Grande Florianópolis	4,620	2,625	48	309	189	630	282	584	102	198	1,995
2 Foz do Rio Itajaí	1,544	760	23	171	35	199	44	153	35	47	783
3 Medio Vale do Itajaí	3,420	2,315	43	308	105	421	124	720	135	176	1,105
4 Alto Vale do Itajaí	5,735	3,987	16	1,013	207	752	436	864	97	182	1,748
5 Nordeste do Estado de Santa Catarina	2,893	1,096	58	98	18	112	65	432	165	46	1,797
6 Planalto Norte	5,087	4,691	28	758	252	853	106	770	1,525	93	396
7 Alto Rio do Peixe	8,194	7,099	117	687	300	2,345	554	1,458	849	124	1,095
8 Meio Oeste Catarinense	7,222	6,527	44	1,578	331	2,095	591	949	385	169	695
9 Oeste de Santa Catarina	6,078	5,408	64	3,183	228	352	395	554	81	155	669
10 Extremo Oeste de Santa Catarina	4,214	3,678	42	2,118	138	110	432	423	53	107	536
11 Serrana	16,364	14,659	48	857	349	7,655	739	2,877	839	210	1,705
12 Vale do Rio Tubarao	2,709	2,067	32	488	112	289	381	293	128	125	642
13 Sul do Estado de Santa Catarina	2,119	1,303	41	376	35	221	168	169	124	60	816
14 Alto Uruguai Catarinense	3,330	3,055	31	1,257	278	381	275	357	56	160	275
15 Extremo Sul de Santa Catarina	2,939	1,783	67	674	61	423	57	158	151	66	1,156
16 Vales Tijucas e Itajaí Mirim	2,097	938	20	180	33	172	27	299	22	58	1,159
17 Alto Irani	4,813	4,025	50	1,768	116	596	273	700	133	126	788
18 Vale Canoinhas	4,134	3,027	8	826	183	625	86	730	313	95	1,107
19 Vale Itapocu	2,006	1,249	89	280	63	120	76	292	95	91	757
20 Laguna	1,929	1,037	14	241	56	224	191	116	53	63	891
21 Rio Itajaí do Sul	2,296	1,673	6	484	110	452	32	233	67	117	623
22 Alto Rio Negro	1,576	1,192	10	130	52	248	80	324	232	29	384
Total (Santa Catarina)	95,318	74,194	899	17,785	3,249	19,275	5,416	13,454	5,640	2,498	21,124
Percentage Distribution (%)	100.0	77.8	0.9	18.7	3.4	20.2	5.7	14.1	5.9	2.6	22.2

Source: Ref.H-20

Note: *1 Including not-arable land.

Table IV.4.1 Population Projection: 1995-2010

Item	1991	1995	2000	2005	2010
I. Population (1,000)	*1				
1. Brazil *2	146,155	157,367	171,096	184,553	197,756
Male	72,171	77,641	84,324	90,857	97,247
Female	73,983	79,727	86,775	93,701	100,517
2. Santa Catarina *3	4,538	4,874	5,328	5,782	6,276
Male	2,274	2,439	2,663	2,887	3,130
Female	2,265	2,434	2,665	2,895	3,146
Urban	3,206	3,595	4,115	4,632	5,186
Rural	1,333	1,278	1,213	1,150	1,090
II. Average Annual Growth Rate (%)					
1. Brazil	2.17	1.87	1.69	1.53	1.39
Male	2.13	1.84	1.67	1.50	1.37
Female	2.20	1.89	1.71	1.55	1.41
2. Santa Catarina	2.15	1.80	1.80	1.65	1.65
Male	2.12	1.77	1.77	1.63	1.63
Female	2.18	1.82	1.82	1.67	1.68
Urban	4.60	2.91	2.74	2.40	2.28
Rural	-1.03	-1.04	-1.05	-1.06	-1.07

Source: Ref. H-01 and H-27

Note: *1 1991 census populations

*2 The growth rates were quoted from the population projection by IBGE inRef.H-01.

*3 The growth rates were quoted from the population projection by SEPLAN/SC in Ref.H27.

	153,322	165,083	179,487	193,603	207,454
	76,449	82,243	89,323	96,243	103,011
	76,872	82,840	90,164	97,360	104,442
	4,465	4,795	5,242	5,689	6,175
	2,273				
	2,192				
	3,204				
	1,261				
59.4	70.6	73.8	77.2	80.1	82.6
40.6	29.4	26.2	22.8	19.9	17.4
4.05	4.60				
-1.01	-1.03				

Table IV.4.2 Projecttion of Gross Regional Domestic Product

Item	1991	2000	2010
I. Projected Value (at 1991 Constant Prices)			
Brazil			
GDP (Cr$billion)	164,991	234,934	315,134
Population (1,000)*1	146,155	171,096	197,756
Per Capita GDP (Cr$ 1,000)	1,129	1,373	1,594
Per Capita GDP (US$)	1,923	2,339	2,715
Santa Catarina			
GRDP (Cr$ billion)	7,639	11,747	15,757
Population (1,000)*1	4,535	5,328	6,276
Per Capita GRDP (Cr$ 1,000)	1,684	2,205	2,511
Per Capita GRDP (US$)	2,386	3,124	3,558
II. Average Annual Growth Rate (%)	1985/1991	1991/2000	2000/2010
Brazil			
GDP	1.83	4.00	2.98
Population	2.08	1.77	1.46
Per Capita GDP	0.00	2.20	1.50
Santa Catarina			
GRDP	2.25	4.90	2.98
Population	2.26	1.81	1.65
Per Capita GRDP	0.19	3.04	1.31

Note: *1 Refer to Table 4.3.1.

Table IV.5.1 Electric Power Supply and Consumption in CELESC Market: 1982-

Item	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
I. Sources of Electric Supply (GWh)										
Self Generation	414	482	404	333	281	411	375	386	406	309
Hydro-power	414	482	404	333	281	411	375	386	406	309
Thermal-power	0	0	0	0	0	0	0	0	0	0
Power Purchased	3,627	3,877	4,490	5,079	5,340	5,767	6,209	6,680	6,732	7,256
ELETROSUL	3,615	3,868	4,490	4,827	4,687	4,536	4,708	4,652	4,109	4,483
Itaipu	0	0	0	252	653	1,231	1,497	2,003	2,589	2,737
Others	11	9	0	0	0	0	4	26	33	35
Total	4,040	4,360	4,894	5,412	5,622	6,178	6,584	7,066	7,138	7,565
II. Counsumption (GWh)										
Distribution	3,580	3,994	4,473	4,980	5,182	5,685	6,009	6,457	6,528	6,923
Residential	642	763	818	884	953	1,105	1,188	1,327	1,499	1,645
Industry	1,996	2,156	2,496	2,841	2,948	3,114	3,282	3,507	3,331	3,434
Commercial	387	442	463	473	466	537	555	593	638	686
Rural	118	151	176	207	227	260	273	294	311	343
Cooperatives	169	170	187	214	240	266	274	291	276	296
Government	71	75	79	89	84	100	115	117	127	135
Public Light	141	167	174	187	174	205	214	216	225	248
Public Services	49	61	71	77	83	90	98	103	112	126
Self Consumption	8	9	8	8	7	9	9	8	10	11
Resale	163	42	71	85	91	99	99	103	107	110
Power Loss	298	324	350	347	349	395	476	507	503	531
Total	4,040	4,360	4,894	5,412	5,622	6,178	6,584	7,066	7,138	7,565

III. Special Features

	Percentage Distribution in 1992 (%)		Ave. Annual Growth Rate (%) 82/92	87/92
Sources of Electric Supply				
Self Generation	4.8	-	-0.9	-1.8
Power Purchased	95.2	100.0	7.4	5.2
ELETROSUL	58.8	61.8	2.4	0.2
Itaipu	36.0	37.8	-	17.9
Others	0.4	0.4	10.1	-
Total	100.0	-	6.8	4.8
Counsumption				
Distribution	91.2	100.0	7.1	4.6
Residential	21.9	24.0	10.3	9.1
Industry	44.3	48.6	5.6	2.1
Commercial	9.3	10.2	6.5	6.1
Rural	4.6	5.0	11.7	6.7
Others	11.0	12.0	7.2	5.3
Self Consumption	0.1	0.2	4.1	4.5
Resale	1.6	-	-2.8	4.5
Power Loss	7.2	-	6.6	7.4
Total	100.0	-	6.8	4.8

Number of Clients Unit Consumptio		
Number of Clients (1,000)		Ave Consu (KWh
1987	1992	1991
911	1,185	520
688	910	134
18	25	14,032
73	92	611
120	145	180
11	14	5,123
-	-	-
-	-	-
-	-	-
-	-	-

Source: Ref.F-03

Table IV.5.2 Financial Status of CELESC: 1988-1992

(Unit: Cr$ million)

Item	1988	1989	1990	1991	1992
I. Balance Sheet					
1 Assets	256	4,598	59,564	799,708	10,051,480
Current Assets	49	834	12,992	64,997	956,831
Quick Assets	39	713	11,400	58,893	836,631
Accounts Receivable	11	121	1,592	6,104	120,200
Fixed Assets	194	3,537	43,982	694,559	8,583,322
Intangible Assets	1	29	141	1,585	20,946
Property, Plant & Equipment	193	3,508	43,842	692,973	8,562,377
Valuation Loss/Profit	12	226	2,589	40,153	511,327
2 Liabilities and Shareholders' Stock	256	4,598	59,564	799,708	10,051,480
Liabilities	138	2,027	41,181	355,102	4,801,296
Current Liabilites	66	1,271	34,633	272,417	4,007,433
Long-term Debt	71	756	6,548	82,685	793,863
Capital Stock	118	2,570	18,383	444,606	5,250,185
II-A. Profit and Loss (at Current Prices)					
1 Sales Amount	91	1,015	29,673	153,539	1,909,468
Sales of Electric Power	83	1,251	36,469	189,344	2,356,117
ICMS	0	-274	-8,375	-42,539	-517,446
Other Sales	8	38	1,579	6,733	70,796
2 Purchase Cost	47	546	16,883	94,318	1,209,684
Fuel	1	14	436	1,126	53,815
Electric Power	46	532	16,447	93,192	1,155,868
3 Gross Profit/Loss	44	469	12,790	59,221	699,784
4 Expenses	46	712	18,848	101,614	1,135,981
Personnel Expenses	32	469	11,839	57,798	634,193
Depreciation	3	48	793	15,150	165,809
Other Expenses	11	194	6,217	28,667	335,978
5 Interest	-3	-193	-13,786	-142,047	-2,473,863
6 Ordinary Profit/Loss	-5	-436	-19,845	-184,439	-2,910,060
7 Extraordinary Loss/Profit	-1	3	21	95	-5,495
8 Inflation Adjustment	26	749	9,877	103,081	2,401,005
9 Corporation Profit/Loss before Tax	19	316	-9,946	-81,263	-514,550
II-B. Profit and Loss (arranged into values of the year end)					
1 Sales Amount	213	2,974	53,391	311,889	4,008,149
Sales of Electric Power	200	3,518	65,055	388,157	5,070,927
ICMB	0	-708	-14,619	-79,011	-1,185,920
Other Sales	14	164	2,955	2,742	123,142
2 Purchase Cost	111	1,395	32,178	211,255	2,549,899
Fuel	4	50	422	2,737	80,070
Electric Power	107	1,345	31,756	208,518	2,469,829
3 Gross Profit/Loss	103	1,579	21,213	100,634	1,458,250
4 Expenses	90	1,367	28,264	140,209	2,273,637
Personnel Expenses	60	679	17,210	65,831	1,109,844
Other Expenses	31	688	11,054	74,378	1,163,794
5 Interest	9	84	-2,913	-42,026	314,681
6 Ordinary Profit/Loss	21	297	-9,964	-81,601	-500,706
7 Extraordinary Loss/Profit	-1	20	17	338	-13,844
8 Corporation Profit/Loss before Tax	19	316	-9,946	-81,263	-514,550
(Equivalent to US$ million)	26	28	-58	-76	-42

Source: Ref.H-16 and H021

Table IV.6.1 Colletion of State Taxes in Santa Catarina: 1990-1991

Item	Inheritance Tax	ICMS	Automobile Tax	Other Taxes	Total
I. State Tax Revenue (Unit: Cr$ million)					
1990	19	85,024	2,401	408	87,853
1991					
January	1	13,992	459	72	14,524
February	2	15,213	532	85	15,831
March	2	19,777	617	134	20,531
April	3	22,002	794	153	22,953
May	4	24,284	771	113	25,172
June	5	26,410	772	176	27,363
July	10	25,466	945	167	26,588
August	1	31,532	1,073	148	32,753
September	3	35,931	1,152	224	37,310
October	3	39,457	2,328	206	41,995
November	11	49,247	451	152	49,861
December	6	57,711	389	279	58,385
Total	51	361,021	10,284	1,909	373,266
II. Percentage Distribution (Unit: %)					
1990	0.0	96.8	2.7	0.5	100.0
1991	0.0	96.7	2.8	0.5	100.0
III. ICMS Collected in 1992 (Unit: Cr$ billion)					
Brazil (Total of 27 States)		113,374			
Santa Catarina		3,858			
Rate of SC to Brazil (%)		3.4			

Source: SPF/SC

Table IV.6.2 Inflation and Price Indices: 1985-1992

Year / Month	Inflation		Wholesale Price Index		Consumer Price Index (Rio de Janeiro)		Civil Works (Rio de Janeiro)	
	Index (Base: Dec.'89)	Monthly Variation (%)	Index (Base: Dec.'89)	Monthly Variation (%)	Index (Base: Dec.'89)	Monthly Variation (%)	Index (Base: Dec.'89)	Monthly Variation (%)
1985 *1	0.03	-	0.03	-	0.03	-	0.02	-
1986 *1	0.08	-	0.08	-	0.08	-	0.06	-
1987 *1	0.26	-	0.26	-	0.27	-	0.23	-
1988 *1	2.02	-	2.04	-	2.08	-	1.78	-
1989 *1	28.62	-	28.53	-	28.79	-	29.50	-
1990 *1	812.73	-	808.74	-	883.29	-	599.78	-
December	1,576.56	16.5	1,549.52	15.0	1,751.01	-	985.78	11.4
1991 *1	812.73	-	4,081.44	-	4,709.28	-	2,823.45	-
January	1,890.83	19.9	1,864.37	20.3	2,137.45	22.1	1,182.75	20.0
February	2,289.94	21.1	2,266.62	21.6	2,574.35	20.4	1,347.32	13.9
March	2,455.88	7.2	2,436.12	7.5	2,735.24	6.2	1,550.61	15.1
April	2,670.50	8.7	2,656.45	9.0	2,930.27	7.1	1,683.90	8.6
May	2,844.75	6.5	2,801.28	5.5	3,116.05	6.3	1,778.21	5.6
June	3,125.28	9.9	3,046.82	8.8	3,487.79	11.9	1,878.68	5.7
July	3,526.20	12.8	3,426.14	12.4	3,975.03	14.0	2,213.84	17.8
August	4,072.38	15.5	3,960.69	15.6	4,636.08	16.6	2,457.78	11.0
September	4,731.87	16.2	4,561.53	15.2	5,414.00	16.8	3,314.09	34.8
October	5,954.92	25.8	5,808.52	27.3	6,713.32	24.0	4,176.55	26.0
November	7,489.05	25.8	7,290.58	25.5	8,409.11	25.3	5,545.33	32.8
December	9,146.88	22.1	8,858.10	21.5	10,382.72	23.5	6,752.38	21.8
1992 *1	45,655.12	-	43,953.38	-	51,854.72	-	34,409.39	-
January	11,602.00	26.8	11,259.91	27.1	13,180.87	27.0	8,293.14	22.8
February	14,478.60	24.8	14,129.06	25.5	16,491.90	25.1	9,810.70	18.3
March	17,475.82	20.7	16,908.22	19.7	19,770.49	19.9	14,165.77	44.4
April	20,716.27	18.5	19,917.92	17.8	23,546.65	19.1	15,962.70	12.7
May	25,366.26	22.4	24,145.86	21.2	29,070.70	23.5	19,185.41	20.2
June	30,798.76	21.4	29,192.80	20.9	35,812.19	23.2	23,074.10	20.3
July	37,469.64	21.7	35,669.51	22.2	42,702.46	19.2	29,285.88	26.9
August	47,052.20	25.6	45,441.96	27.4	53,262.78	24.7	36,370.14	24.2
September	59,932.61	27.4	57,787.36	27.2	67,089.80	26.0	44,972.40	23.7
October	74,878.69	24.9	72,134.17	24.8	85,539.49	27.5	55,331.35	23.0
November	93,017.87	24.2	89,756.97	24.4	104,939.85	22.7	73,332.29	32.5
December	115,062.71	23.7	111,096.87	23.8	130,849.49	24.7	83128.75	13.4

Source: Ref.H-07
Note: *1 Annual average

Table IV.6.3 Foreign Exchange Rate to US$ at End of Month: 1984-1992

Month	1984 Cr$	1985 Cr$	1986 Jan-Feb: Cr$ Mar-Dec: Cz$	1987 Cz$	1988 Cz$
January	1,080,000	3,585,000	12,155,000	16.53	83.40
February	1,213,000	3,951,000	13,840,000	19.79	98.50
March	1,335,000	4,450,000	13.84	22.01	114.55
April	1,453,000	4,980,000	13.84	25.49	137.44
May	1,682,000	5,480,000	13.84	33.99	162.89
June	1,728,000	5,980,000	13.84	43.37	194.63
July	1,905,000	6,440,000	13.84	48.02	241.23
August	2,107,000	8,970,000	13.84	48.38	292.49
September	2,329,000	7,825,000	13.84	51.28	362.98
October	2,622,000	8,560,000	14.09	55.88	483.34
November	2,881,000	9,350,000	14.19	63.07	588.07
December	3,184,000	10,490,000	14.89	71.71	756.55

Month	1989 NCz$	1990 Jan-Feb: NCz$ Mar-Dec: Cr$	1991 Cr$	1992 Cr$	1993 Cr$
January	1.000	17.731	220.14	1,319.45	15,720.00
February	1.000	30.636	223.43	1,630.85	-
March	1.000	42.560	238.93	1,988.00	-
April	1.032	51.243	260.95	2,396.10	-
May	1.153	55.219	284.70	2,849.10	-
June	1.519	61.022	312.23	3,446.70	-
July	2.166	68.990	348.57	4,204.60	-
August	2.802	71.874	393.78	5,131.00	-
September	3.797	84.223	464.93	6,400.00	-
October	5.225	106.950	645.02	8,034.10	-
November	7.366	144.710	840.41	9,949.90	-
December	11.358	170.060	1,068.80	12,387.50	-

Source: Ref.H-08

Table IV.6.4 Transition of Marginal Cost in System Linkage of Sul, Sudeste and Centro-Oeste Regions

(Unit: US$/MWh)

Year Calculated	Marginal Cost of Expansion *									Period of Calculation	Increment of MC to Previous Year	Increment of MC to Year 1981
	81	84	85	86	87	88	89	90	91/92			
1981 *1	26	23	23	27	27	28	36	45	46	80/90	-	-
1985 *2	-	-	26	31	31	32	41	52	52	91/95	13%	13%
1987 *3	-	-	-	-	24	25	32	40	40	93/97	-23%	-13%
1989 *4	-	-	-	-	-	-	36	45	46	95/99	15%	0%
1990 *5	-	-	-	-	-	-	-	48	48	96/00	4%	4%
1992 *6	-	-	-	-	-	-	-	-	41	98/02	-15%	-11%

[Reference]	Jun/80	Jun/84	Jun/85	Jun/86	Jun/87	Jun/88	Jun/89	Jun/90	Dec/91
Price Indes (Dec.1989 = 100)	0.00028	0.00887	0.0285	0.0786	0.2566	1.34	12.7	734.1	9,146.9
Foregin Exchange Rate (per US$)	51.33	1843.3	5980	13.84	43.38	177.88	1.34	57.19	959.64
Unit:	Cr$	Cr$	Cr$	Cz$	Cz$	Cz$	NCz$	Cr$	Cr$
Equivalent to Present Cr$	10^9	10^9	10^9	10^3	10^3	10^3	1	1	1

Source: Ref.H-15

Note: * Long-run marginal cost of expansion consists of KWh-value and KW-value. Since 1987, the all costs have been included in KWh-value.

Original Sources:

*1 Nova Tarifa de Energia Elétrica - Metodologia e Aplicação, 1985, MME/DANEE/ELETROBRÁS, Brasília

*2 Relatório do Ciclo Anual de 1985 do GCPS, January 1986, GTPG-S/SE/CO

*3 Relatório do Ciclo Anual de 1987 do GCPS, December 1987, GTPG-S/SE/CO

*4 Relatório Parcial do Ciclo Anual de 1989 do GCPS, July 1989, GTPG-S/SE/CO

*5 Relatório do Ciclo Anual de 1990 do GCPS, GTPG-S/SE/CO

*6 Relatório do Ciclo Anual de 1991/92 do GCPS, GTPG-S/SE/CO

Table IV.6.5 Power Demand Projection

Area/Company	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
I. Electric Power Demand (MW*1)										
1. South Area										
ELETROSUL	187	187	228	234	261	262	266	267	268	285
CELESC	882	932	981	1,036	1,088	1,146	1,204	1,262	1,322	1,383
ENERSUL	216	232	253	275	300	328	368	409	447	486
CEEE	1,685	1,775	1,876	1,983	2,083	2,208	2,337	2,461	2,590	2,740
COPEL	1,339	1,445	1,530	1,610	1,686	1,795	1,905	2,003	2,102	2,199
Sub-total	4,309	4,571	4,868	5,138	5,418	5,739	6,080	6,402	6,729	7,093
2. South-east and Central East Area										
FURNAS	683	718	746	779	817	872	940	991	1,048	1,110
ECELSA	534	575	601	622	643	669	695	723	753	784
CELG	535	561	594	627	659	713	789	825	865	905
LIGHT	2,544	2,661	2,778	2,903	3,033	3,186	3,385	3,597	3,846	4,100
CERJ	684	727	765	808	849	894	960	1,019	1,074	1,130
CEB	284	295	305	319	329	341	352	365	376	388
CEMIG	3,609	3,831	4,040	4,243	4,435	4,640	4,834	5,018	5,204	5,382
CESP	1,499	1,573	1,656	1,731	1,812	1,902	1,992	2,087	2,188	2,293
ELETROPAULO	5,938	6,220	6,497	6,805	7,111	7,470	7,822	8,189	8,570	8,965
CPFL	1,582	1,650	1,720	1,797	1,877	1,976	2,088	2,211	2,344	2,484
ELETRONORTE	10	12	14	16	18	23	27	31	34	39
CEMAT	190	214	255	292	330	403	452	507	566	616
Sub-total	18,092	19,037	19,971	20,942	21,913	23,089	24,336	25,563	26,868	28,196
3. Total	22,401	23,608	24,839	26,080	27,331	28,828	30,416	31,965	33,597	35,289
II Capacity (MWh/h)										
1. South Area										
ELETROSUL	275	275	355	373	373	364	364	361	361	385
CELESC	1,410	1,449	1,508	1,581	1,648	1,724	1,806	1,885	1,957	2,038
ENERSUL	354	376	407	437	473	514	575	635	685	748
CEEE	2,515	2,640	2,765	2,900	3,020	3,185	3,345	3,500	3,630	3,825
COPEL	2,097	2,188	2,279	2,371	2,462	2,575	2,685	2,795	2,892	2,985
Sub-total	6,651	6,928	7,314	7,662	7,976	8,362	8,775	9,176	9,525	9,981
2. South-east and Central East Area										
FURNAS	935	970	1,007	1,051	1,107	1,176	1,264	1,332	1,407	1,485
SCELSA	709	762	798	827	856	891	926	960	995	1,040
CELG	935	978	1,031	1,085	1,137	1,220	1,338	1,394	1,454	1,514
LIGHT	3,493	3,652	3,813	3,986	4,168	4,378	4,650	4,941	5,283	5,632
CERJ	1,019	1,082	1,138	1,202	1,262	1,326	1,432	1,496	1,570	1,655
CEB	468	486	504	529	547	566	585	604	623	643
CEMIG	4,654	4,938	5,209	5,474	5,719	5,984	6,233	6,471	6,692	6,940
CESP	2,386	2,475	2,574	2,690	2,808	2,944	3,080	3,222	3,364	3,531
ELETROPAULO	8,720	9,133	9,513	9,820	10,261	10,779	11,288	11,800	12,314	12,900
CPFL	2,630	2,719	2,815	2,922	3,040	3,172	3,327	3,490	3,666	3,851
ELETRONORTE	18	21	25	29	32	41	47	53	59	66
CEMAT	301	349	423	468	524	669	741	829	942	1,014
Sub-total	26,268	27,565	28,850	30,083	31,461	33,146	34,911	36,592	38,369	40,271
3. Total	32,919	34,493	36,164	37,745	39,437	41,508	43,686	45,768	47,894	50,252

Source: Ref.H-15

Note: *1 Annual demand divided by 8,760 hours.

Table IV.6.6 List of Proposed Power Projects

Power Project	River Basin	State	Company	Fuel/ Energy Source	Project Phase *1	Capacity (MW)	Implementation
1 Candiota III-1	-	RS	CEEE	Coal	C	350	1992
2 Candiota III-2	-	RS	CEEE	Coal	D	350	1993
3 Candiota III-3	-	RS	CEEE	Coal	D	350	1996
4 Queimado	S.Francisco	MG	CEMIG	Hydro	MP	100	1994
5 Santa Rita	Atlantico-E	MG	CEMIG	Hydro	D	75	1995
6 Igarape II	-	MG	CEMIG	Petroleum	FS	125	1992
7 Picada	Atlantico-E	MG	CEMIG	Hydro	MP	100	1996
8 Bocaina	Parana	MG	CEMIG	Hydro	D	150	1994
9 Formoso	S.Francisco	MG	CEMIG	Hydro	FS	300	1996
10 Quartel	S.Francisco	MG	CEMIG	Hydro	MP	100	1996
11 Capim Branco	Parana	MG	CEMIG	Hydro	FS	600	1996
12 Irape	Atlantico-E	MG	CEMIG	Hydro	MP	420	1997
13 Manhuaçu	Atlantico-E	MG	CEMIG	Hydro	MP	110	1997
14 Sobragi	Sobragi	MG	CEMIG	Hydro	MP	110	1998
15 Funil Grande	Parana	MG	CEMIG	Hydro	MP	164	1998
16 Franca Amaral	Atlantico-E	RJ/ES	CERJ	Hydro	MP	33	1998
17 Duas Vendas	Atlantico-E	RJ	CERJ	Hydro	MP	5.3	1996
18 Tombos	Atlantico-E	RJ	CERJ	Hydro	MP	5.4	1996
19 Paulinia I	-	SP	CESP	Petroleum	FS	350	1994
20 Paulinia II	-	SP	CESP	Petroleum	FS	350	1994
21 Funil Ribeira	Atlantico-SE	SP	CESP	Hydro	FS	150	1994
22 S.Jose dos Campos	-	SP	CESP	Petroleum	FS	350	1995
23 Batatal	Atlantico-SE	SP	CESP	Hydro	FS	95	1998
24 Salto Caxias	Parana	PR	COPEL	Hydro	D	1,000	1993
25 Jataizinho	Parana	PR	COPEL	Hydro	MP	192	1995
26 Cebolão	Parana	PR	COPEL	Hydro	MP	194	1996
27 São Jeronimo	Parana	PR	COPEL	Hydro	MP	444	1997
28 Telemaco Borba	Parana	PR	COPEL	Hydro	MP	128	1998
29 São Sebastiao	Parana	SP	CPFL	Hydro	FS	19	1995
30 Monjolinho-SE	Parana	SP	CPFL	Hydro	MP	21.7	1995
31 Santa Rita	Parana	SP	CPFL	Hydro	FS	16.5	1996
32 Sapucai	Parana	SP	CPFL	Hydro	FS	15.2	1996
33 São Domingos	Parana	SP	CPFL	Hydro	FS	13.9	1996
34 Viradouro	Parana	SP	CPFL	Hydro	FS	45	1999
35 Barretos	Parana	SP	CPFL	Hydro	FS	51	1999
36 Jaborandi	Parana	SP	CPFL	Hydro	FS	51	2000
37 Manso	Parana	MT	ENORTE	Hydro	C	210	1988
38 Couto Magalhaes	Tocantins	MT/GO	ENORTE	Hydro	D	220	1995
39 Barra do Peixe	Tocantins	MT/GO	ENORTE	Hydro	MP/FS	450	1996
40 Ita	Uruguai	SC/RS	ELETROSUL	Hydro	D	1,620	1992
41 Carvão-50MW 1/4	-	SC	ELETROSUL	Coal	MP	50	1996
42 Campos Novos	Uruguai	SC	ELETROSUL	Hydro	D	880	1996
43 Carvão-50MW 2/4	-	SC	ELETROSUL	Coal	MP	50	1997
44 Garabi - 50I	Uruguai	--	ELETROSUL	Hydro	D	900	1995
45 Carvão-50MW 3/4	-	SC	ELETROSUL	Coal	MP	50	1998
46 Machadinho	Uruguai	SC/RS	ELETROSUL	Hydro	D	1,200	1997
47 Barra Grande	Parana	SC/RS	ELETROSUL	Hydro	D	690	1997
48 Monjolinho Sul	Uruguai	RS	ELETROSUL	Hydro	MP	72	1998
49 Serra da Mesa	Tocantins	GO	FURNAS	Hydro	C	1,200	1987
50 Corumba I	Parana	GO	FURNAS	Hydro	C	375	1987
51 Cana Brava	Tocantins	GO	FURNAS	Hydro	D	450	1996
52 Simplicio	Atlantico-E	RJ/MG	FURNAS	Hydro	D	180	1997
53 Sapucaia/Anta	Atlantico-E	RJ/MG	FURNAS	Hydro	D	316	1998
54 Itaocara	Atlantico-E	RJ	FURNAS	Hydro	D	210	1998
55 Serra do Facão	Parana	GO	FURNAS	Hydro	FS	210	1997
56 Foz do Bezerra	Tocantins	GO	FURNAS	Hydro	FS	300	1998
Total						16,567	

Source: Ref.H-15

Note: *1 MP:Master Plan; FS: Feasibility Study; D: Design; C: Construction; and O: Operation

Table IV.6.7 Annualized Investment for Hydro/Thermal Power Projects (1/2)

(Unit: US$ million)

Power Project	*1	Annualized Invest-ment *2	PV at Jan/93	Disbursement Schedule												
				Total	Up to 1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1 Candiota III-1	*	68.08	617.92	717.66	180.48	0.14	90.04	176.09	145.20	76.05	49.66	0.00	0.00	0.00	0.00	0.00	0.00
2 Candiota III-2	*	34.53	313.44	546.56	0.00	0.00	0.00	0.00	0.00	81.98	109.31	191.30	109.31	54.66	0.00	0.00	0.00
3 Candiota III-3	*	38.32	347.85	667.21	0.00	0.00	0.00	0.00	0.00	0.00	100.08	133.44	233.53	133.44	66.72	0.00	0.00
4 Queimado		9.13	90.57	143.06	0.00	0.02	0.00	0.79	15.35	36.63	47.77	36.52	5.98	0.00	0.00	0.00	0.00
5 Santa Rita		13.32	132.10	201.23	10.09	0.00	0.00	1.05	20.51	48.95	63.84	48.80	7.99	0.00	0.00	0.00	0.00
6 Igarape II	*	13.86	125.79	200.71	0.24	0.00	0.00	2.00	18.51	49.29	72.63	35.80	13.31	8.93	0.00	0.00	0.00
7 Picada		12.50	123.94	215.36	0.00	0.00	0.00	0.00	1.19	23.11	55.15	71.93	54.98	9.00	0.00	0.00	0.00
8 Bocaina		15.04	149.08	250.67	5.38	0.00	0.00	0.00	0.00	0.00	112.86	99.98	32.43	0.02	0.00	0.00	0.00
9 Formoso		32.82	325.44	601.50	4.70	0.00	0.00	2.00	2.00	1.13	114.17	199.77	111.21	117.79	48.73	0.00	0.00
10 Quartel		9.44	93.55	178.82	0.00	0.00	0.00	0.00	0.00	0.98	19.19	45.80	59.73	45.65	7.47	0.00	0.00
11 Capim Branco		34.46	341.70	643.67	7.41	0.00	0.00	0.00	2.00	10.88	75.84	152.34	192.74	159.52	42.94	0.00	0.00
12 Irape		29.16	289.14	545.48	4.09	0.50	0.50	1.00	2.00	9.37	64.26	129.00	163.28	135.11	36.37	0.00	0.00
13 Manhuaçu		5.17	51.25	104.22	0.00	0.37	0.37	1.00	1.25	2.00	2.04	10.49	25.03	32.64	24.95	4.08	0.00
14 Sobragi		8.74	86.69	191.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.53	35.65	58.72	61.40	27.24	0.61
15 Funil Grande		5.98	59.26	127.42	0.13	0.00	0.00	0.00	0.00	0.00	0.60	11.16	27.39	37.62	35.63	14.56	0.33
16 Franca Amaral		2.02	20.00	35.32	0.00	0.00	0.00	0.54	0.83	3.23	6.15	10.00	10.00	4.57	0.00	0.00	0.00
17 Duas Vendas		0.43	4.29	8.24	0.00	0.00	0.00	0.00	0.00	0.00	0.31	2.19	3.86	1.88	0.00	0.00	0.00
18 Tombos		0.41	4.07	7.82	0.00	0.00	0.00	0.00	0.00	0.00	0.42	2.19	3.02	2.19	0.00	0.00	0.00
19 Paulinia I	*	45.69	414.77	610.97	0.81	0.00	0.02	79.83	86.69	184.91	184.62	74.09	0.00	0.00	0.00	0.00	0.00
20 Paulinia II	*	40.20	364.86	581.77	0.81	0.00	0.00	14.30	66.98	137.26	142.97	130.31	89.14	0.00	0.00	0.00	0.00
21 Funil Ribeira		16.44	162.96	250.12	0.00	0.29	4.56	3.70	37.12	70.80	76.46	46.76	10.43	0.00	0.00	0.00	0.00
22 S.Jose dos Campos	*	39.49	358.45	575.87	0.54	0.00	0.00	0.02	36.56	168.77	175.42	123.54	71.02	0.00	0.00	0.00	0.00
23 Batatal		8.03	79.64	169.37	0.00	1.65	1.15	0.42	0.92	1.49	1.46	9.80	28.36	46.34	59.54	18.24	0.00
24 Salto Caxias		70.10	695.04	1,048.53	0.04	5.64	59.35	65.33	157.17	194.12	270.55	220.52	62.36	13.45	0.00	0.00	0.00
25 Jataizinho		13.04	129.28	221.79	0.00	1.45	1.87	3.33	7.96	23.54	46.66	61.43	52.01	23.54	0.00	0.00	0.00
26 Cebolão		12.10	119.96	209.44	0.00	0.73	2.41	2.09	4.92	18.80	39.41	60.64	54.57	25.87	0.00	0.00	0.00
27 São Jeronimo		21.43	212.50	378.71	0.00	0.00	3.94	1.74	20.37	32.89	67.61	76.75	78.57	71.26	25.58	0.00	0.00
28 Telemaco Borba		7.32	72.55	156.89	0.00	0.00	0.00	0.07	1.91	1.16	2.35	11.81	24.68	43.00	43.90	28.01	0.00
29 São Sebastiao		2.72	26.96	39.60	0.00	0.00	0.00	0.00	10.30	16.50	12.80	0.00	0.00	0.00	0.00	0.00	0.00
30 Monjolinho-SE		2.94	29.18	42.80	0.00	0.00	0.00	0.00	10.70	19.40	12.70	0.00	0.00	0.00	0.00	0.00	0.00
31 Santa Rita		2.25	22.32	35.80	0.00	0.00	0.00	0.00	0.00	9.50	17.40	8.90	0.00	0.00	0.00	0.00	0.00
32 Sapucai		2.11	20.96	33.80	0.00	0.00	0.00	0.00	0.00	9.00	14.50	10.30	0.00	0.00	0.00	0.00	0.00

(To be continued)

Table IV.6.7 Annualized Investment for Hydro/Thermal Power Projects (2/2)

(Conclusion) (Unit: US$ million)

Power Project		Annualized Invest-ment *2	PV at Jan/93	Disbursement Schedule													
	*1			Total	Up to 1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
33 São Domingos		2.10	20.78	33.30	0.00	0.00	0.00	0.00	0.00	10.90	12.20	10.20	0.00	0.00	0.00	0.00	0.00
34 Viradouro		3.31	32.81	69.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.60	32.20	13.40	0.00	0.00
35 Barretos		4.01	39.72	83.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.80	38.00	17.00	0.00	0.00
36 Jaborandi		3.81	37.80	87.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29.90	40.60	17.20	0.00
37 Manso		47.23	468.29	586.40	123.10	15.06	15.06	91.77	105.12	92.47	87.91	55.91	0.00	0.00	0.00	0.00	0.00
38 Couto Magalhaes		30.03	297.78	486.17	39.67	0.25	0.25	6.00	24.70	52.50	68.60	103.00	115.90	50.60	24.70	0.00	0.00
39 Barra do Peixe		56.76	562.80	1,143.41	25.80	0.35	0.35	5.91	6.00	6.00	90.30	188.20	188.20	185.20	185.20	132.50	129.40
40 Ita		121.19	1,201.59	1,528.49	228.90	26.04	98.86	240.40	338.07	316.64	165.27	71.39	42.92	0.00	0.00	0.00	0.00
41 Carvão-50MW 1/4	*	6.01	54.54	95.00	0.00	0.00	0.00	0.00	1.42	4.28	24.70	42.75	19.00	2.85	0.00	0.00	0.00
42 Campos Novos		50.60	501.72	853.17	21.36	0.30	1.71	7.60	34.83	93.85	140.73	257.88	218.31	55.51	21.09	0.00	0.00
43 Carvão-50MW 2/4	*	5.46	49.58	95.00	0.00	0.00	0.00	0.00	0.00	1.42	4.28	24.70	42.75	19.00	2.85	0.00	0.00
44 Garabi - 50I		54.57	541.08	1,029.73	3.89	0.60	0.71	0.93	17.49	90.55	131.71	174.58	231.53	150.24	113.40	71.00	43.10
45 Carvão-50MW 3/4	*	4.97	45.07	95.00	0.00	0.00	0.00	0.00	0.00	0.00	1.42	4.28	24.70	42.75	19.00	2.85	0.00
46 Machadinho		66.03	654.71	1,260.33	46.96	0.00	0.00	2.16	6.06	37.62	131.25	181.15	235.32	271.64	201.40	83.81	62.96
47 Barra Grande		40.82	404.70	801.10	2.89	0.00	2.52	0.00	6.97	13.50	60.95	135.37	188.65	232.32	124.54	23.09	10.30
48 Monjolinho Sul		8.42	83.47	165.81	0.00	0.00	0.00	0.56	1.99	2.82	12.60	27.36	38.97	49.08	25.70	4.64	2.09
49 Serra da Mesa		128.59	1,274.99	1,604.07	318.87	83.60	83.60	83.60	309.50	323.90	291.90	89.80	18.50	0.40	0.40	0.00	0.00
50 Corumba I		64.37	638.19	772.55	279.45	20.80	20.80	43.23	74.49	87.37	82.66	94.58	59.45	9.07	0.54	0.11	0.00
51 Cana Brava		46.61	462.16	821.15	8.61	0.63	0.63	6.75	22.84	87.15	128.83	175.68	212.55	140.03	31.86	5.59	0.00
52 Simplicio		20.63	204.51	387.54	13.09	0.02	0.02	1.12	2.10	7.64	14.99	61.34	144.83	94.40	40.49	7.50	0.00
53 Sapucaia/Anta		26.26	260.41	555.20	12.33	0.10	0.10	0.94	0.52	5.20	7.95	34.19	71.99	152.34	182.40	51.24	35.90
54 Itaocara		13.50	133.87	280.21	3.68	0.01	0.01	0.13	0.32	3.67	5.34	29.43	43.62	84.02	84.97	18.28	6.73
55 Serra do Facão		14.92	147.89	294.27	0.00	0.00	0.00	1.12	7.17	6.56	27.46	38.08	62.31	72.84	58.22	20.51	0.00
56 Foz do Bezerra		23.49	232.94	443.76	3.10	0.00	0.00	0.00	3.62	4.84	74.64	98.23	101.55	88.42	50.30	9.53	9.53
Total		1,460.99 (CATE)		23,313.92	1,346.42	158.55	388.83	847.52	1,613.65	2,480.62	3,524.88	3,921.19	3,674.03	2,826.01	1,691.29	539.98	300.95

Source: Ref.H-15

Note: *1 Projects marked by "*" are thermal systems.

*2 Annualized by means of "Capital Recover Factor"

In case of hydropower: durable periods-50 years; and interest rate-10%

In case of thermal power: durable periods-25 years; and interest rate-10%

Table IV.6.8 Annualized Operation and Maintenance Cost

Power Project	Capa-city (MW)	O&M Cost Unit Cost (US$/KW/y)	O&M Cost PV at Jan./93 (US$ million)	Increment of Power Installation between 6th and 10th Years (MW) PV at Jan./93	6th 1998	7th 1999	8th 2000	9th 2001	10th 2002
1 Candiota III-1	350	23.78	5.17	217	350	0	0	0	0
2 Candiota III-2	350	23.78	3.88	163	0	0	0	350	0
3 Candiota III-3	350	23.78	3.53	148	0	0	0	0	350
4 Queimado	100	6.61	0.37	56	0	100	0	0	0
5 Santa Rita	75	7.87	0.33	42	0	75	0	0	0
6 Igarape II	125	12.00	0.77	64	0	0	125	0	0
7 Picada	100	6.61	0.34	51	0	0	100	0	0
8 Bocaina	150	5.23	0.40	77	0	0	150	0	0
9 Formoso	300	4.78	0.69	145	0	0	100	200	0
10 Quartel	100	6.61	0.31	47	0	0	0	100	0
11 Capim Branco	600	4.38	1.19	271	0	0	0	400	200
12 Irape	420	4.58	0.87	190	0	0	0	280	140
13 Manhuaçu	110	6.24	0.29	47	0	0	0	0	110
14 Sobragi	110	6.24	0.29	47	0	0	0	0	110
15 Funil Grande	164	5.17	0.36	70	0	0	0	0	164
16 Franca Amaral	33	12.95	0.20	15	0	0	0	33	0
17 Duas Vendas	5.3	39.27	0.10	2	0	0	0	5.3	0
18 Tombos	5.4	38.82	0.10	3	0	0	0	5.4	0
19 Paulinia I	350	12.00	2.37	198	0	350	0	0	0
20 Paulinia II	350	12.00	2.37	198	0	350	0	0	0
21 Funil Ribeira	150	5.23	0.47	90	100	50	0	0	0
22 S.Jose dos Campos	350	12.00	2.16	180	0	0	350	0	0
23 Batatal	95	6.82	0.28	40	0	0	0	0	95
24 Salto Caxias	1,000	4.10	2.37	579	250	750	0	0	0
25 Jataizinho	192	5.06	0.50	99	0	0	192	0	0
26 Cebolão	194	5.06	0.50	100	0	0	194	0	0
27 São Jeronimo	444	4.55	0.86	188	0	0	0	0	444
28 Telemaco Borba	128	5.69	0.31	54	0	0	0	0	128
29 São Sebastiao	19	18.10	0.21	12	19	0	0	0	0
30 Monjolinho-SE	21.7	16.70	0.23	13	21.7	0	0	0	0
31 Santa Rita	16.5	19.72	0.18	9	0	16.5	0	0	0
32 Sapucai	15.2	20.73	0.18	9	0	15.2	0	0	0
33 São Domingos	13.9	21.88	0.17	8	0	13.9	0	0	0
34 Viradouro	45	10.73	0.23	21	0	0	0	45	0
35 Barretos	51	9.95	0.22	22	0	0	0	17	34
36 Jaborandi	51	9.95	0.22	22	0	0	0	0	51
37 Manso	210	5.01	0.64	127	158	52	0	0	0
38 Couto Magalhaes	220	4.98	0.55	110	0	0	165	55	0
39 Barra do Peixe	450	4.54	0.87	191	0	0	0	0	450
40 Ita	1,620	3.85	3.64	945	540	1,080	0	0	0
41 Carvão-50MW 1/4	50	23.78	0.61	26	0	0	50	0	0
42 Campos Novos	880	4.17	1.75	421	0	0	220	660	0
43 Carvão-50MW 2/4	50	23.78	0.55	23	0	0	0	50	0
44 Garabi - 50I	900	4.16	1.61	388	0	0	0	150	750
45 Carvão-50MW 3/4	50	23.78	0.50	21	0	0	0	0	50
46 Machadinho	1,200	4.00	2.04	509	0	0	0	0	1,200
47 Barra Grande	690	4.30	1.26	293	0	0	0	0	690
48 Monjolinho Sul	72	8.47	0.26	31	0	0	0	0	72
49 Serra da Mesa	1,200	4.00	2.89	723	800	400	0	0	0
50 Corumba I	375	4.63	1.01	219	125	250	0	0	0
51 Cana Brava	450	4.54	0.98	215	0	0	112	338	0
52 Simplicio	180	5.11	0.44	87	0	0	60	120	0
53 Sapucaia/Anta	316	4.75	0.64	134	0	0	0	0	316
54 Itaocara	210	5.01	0.45	89	0	0	0	0	210
55 Serra do Facão	210	5.01	0.45	89	0	0	0	0	210
56 Foz do Bezerra	300	4.78	0.61	127	0	0	0	0	300
Total	16,567		54.76 (COME)	8,264	2,364	3,503	1,818	2,809	6,074

Source: Ref.H-15

Table IV.6.9 Garanteed Output and Deficit of both Energy and Fuel Cost

Item	PV at Jan/93	Total	1995 (Incial)	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005 (Final)
I. Capacity Planned (MW)													
Sul System	-	71,198	5,475	5,475	5,475	5,990	6,293	6,293	6,648	7,085	7,488	7,488	7,488
Sueste/C.Oeste System	-	287,550	21,900	21,900	21,900	24,900	25,650	25,650	27,100	28,700	29,950	29,950	29,950
Total	-	358,748	27,375	27,375	27,375	30,890	31,943	31,943	33,748	35,785	37,438	37,438	37,438
Increment (ICEQ)	5,120.17	10,063	0	0	0	3,515	1,053	0	1,805	2,037	1,653	0	0
II. Deficit of Power Generation													
1) Deficit of Power (Thousand MWh/year)													
Energy Deficit	-	15,190	1,312	1,279	930	1,637	1,476	1,199	1,417	1,526	1,599	1,303	1,514
Fuel Cost by Thermal Power Plant	-	13,442	886	899	930	1,129	1,205	1,336	1,411	1,427	1,423	1,400	1,397
2) Deficit of Power in Monetary Term (US$ million/year)													
Energy Deficit	-	6,531.84	564.30	549.81	399.70	703.76	634.80	515.50	609.35	656.02	687.55	560.14	650.91
Fuel Cost by Thermal Power Plant	-	5,780.19	380.86	386.45	400.09	485.28	518.11	574.48	606.67	613.82	611.69	602.00	600.74
3) Increment of Deficit (US$ million)													
Total Power (CDFE)	35.23	86.61	0.00	-14.49	-150.11	304.06	-68.96	-119.30	93.85	46.67	31.53	-127.41	90.77
Fuel Cost by Thermal Power Plant (CGTE)	127.30	219.88	0.00	5.59	13.64	85.19	32.83	56.37	32.19	7.15	-2.13	-9.69	-1.26

Source: Ref.H-15
Note: Implicit cost of deficit (CDIE): US$430/MWh

Table IV.6.10 Annualized Nuclear Project Output

Item	PV at Jan./93	Total	1997	1998	1999	2000	2001	2002
I. Nucrear Power Plant Angra II (F.C.Max. = 65%)								
1. Percentage of Construction (%)	-	-	-	89	94	95	98	100
2. Guaranteed Capacity of Energy (MW)	-	-	-	803.86	849.02	858.05	885.15	903.21
II. Increment of Nucrear Energy								
Increment of Guaranteed Energy (MW) (EN)	549.56	903.21	0.00	803.86	45.16	9.03	27.10	18.06

Source: Ref.H-15

Table IV.6.11 Marginal Cost of Expansion in Economic Value

Cost Item	Foreign Portion			Local Portion			Total Conposition	
	Financial Cost (%)	Conver- sion Factor	Economic Cost (%)	Financial Cost (%)	Conver- sion Factor	Economic Cost (%)	Financial Cost (%)	Economic Cost (%)
I. Construction Cost of Plants								
1. Material & Equipment	35	1.00	35	25	0.88	22	60	57
2. Labor								
- Skilled Labor	0	1.00	0	15	1.00	15	15	15
- Unskilled Labor	0	-	0	15	0.50	8	15	8
3. Engineering	10	1.00	10	0	1.00	0	10	10
Total	45	-	45	55	-	45	100	90
II. Operation and Maintenance Costs								
1. Material & Equipment	0	1.00	0	30	0.88	26	30	26
2. Fuel *1	20	1.00	20	0	-	0	20	20
3. Labor								
- Skilled Labor	0	1.00	0	30	1.00	30	30	30
- Unskilled Labor	0	-	0	20	0.50	10	20	10
Total	20	-	20	80	-	66	100	86

Note: O&M cost of thermal plant was 40% of the total COME (refer to Table 6.5.3 and 6.5.5).

III. CME in Economic Value

Formula:

$$CME = \frac{CATE * 10^3}{8.76\,(ICEQ - EN)} + \frac{(CGTE + CDFE + COME) * 10^3}{8.76\,ICEQ}$$

$$= \frac{1460.99*90\% * 10^3}{8.76\,(5120.17 - 549.56)} + \frac{(127.30 + 35.23 + 54.76)*86\% * 10^3}{8.76*5120.17}$$

= 37.05 ⟹ 37 US$/MWh

(Conversion Factor:0.90 (<=37.05/41.38))

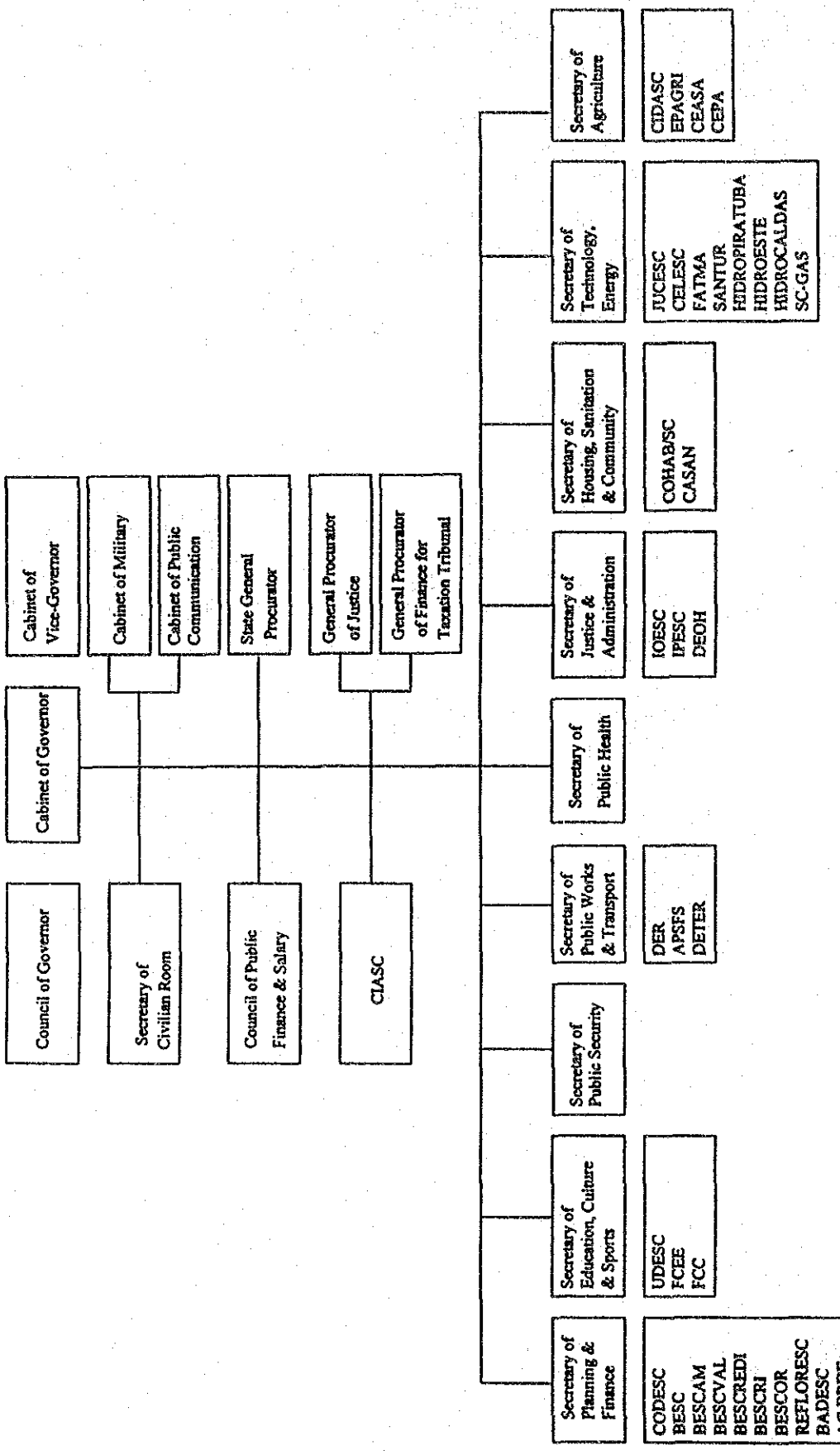
[Reference]

CME in Financial Value : 41.38 ⟹ 41 US$/MWh

List of References and Data Collected

No.	Title	Issued on	Issued by
H-01	Anuário Estatístico do Brasil (AEB) 91	1991	IBGE
H-02	Censo Demográfico 1991, Resultados Preliminares	1992	IBGE
H-03	Sinopse Preliminar do Censo Demográfico 1991, Numero 21, Santa Catarina	1991	IBGE
H-04	Indicadores IBGE, Produto Interno Bruto Trimestal, 3° Trimestre de 1992	1991	IBGE
H-05	Indicadores IBGE	Julho 1991	IBGE
H-06	Conjuntura Econômica, Vol.47, No.2	Feb. 1993	FGV
H-07	Conjuntura Econômica, Vol.47, No.1	Jan. 1993	FGV
H-08	Suma Econômica, Edição 160	Feb. 1993	Consultoria e Publicações
H-09	Geoeconomica de Santa Catina, dados Básicos, 1991	1992	SEPLAN/SC
H-10	Análise, Conjuntural de Santa Catarina	Dec. 1989	SEPLAN/SC
H-11	Plano SIM para Viver Melhor em Santa Catarina	March 1991	Governor, SC
F-03	Boletim Estatistico, 1991	May 1991	CELESC
H-13	O Potencial Catarinense 1991	1992	FIESC,Setor Econômico
H-14	Boletim Infromativo, Estato de Santa Catarine, Janeiro 93	Jan. 1993	SPF/SC
H-15	Programa Decenal de Geração 1993/2002, Sistema Interligado Sul/Sudeste/Centro-Oeste Relatório Final, Ciclo de 91/92	Sep. 1992	ELETROBRÁS
H-16	Relatório da Administração, Exercício de 1992	1993	CELESC
H-17	Indicadores IBGE, Pesquisa Mensal de Emprego, Junho a Agosto de 1991	1991	IBGE
H-18	Indicadores IBGE, Indicadores Conjunturais da Industria, Produção Fisica - Brasil, Junho 1991	1991	IBGE
H-19	Indicadores IBGE, Indicadores Conjunturais da Industria, Produção Fisica - Regional, Junho 1991	1991	IBGE
H-20	Censo Agropecuario, Santa Catarina, 1985	1988	IBGE
H-21	Relatório da Administração, Exercício de 1991	1992	CELESC
H-22	Atlas Escolar de Santa Catarina	1991	SEPLAN/SC
H-23	Managerial Indicator	Sep.1992	CELESC
H-24	Matriz de Insumo-Produto Brasil-1980, Série Relatórios Metodológicos, Volume 7	1989	IBGE
H-25	Modalidades Operacionais	1993	BRDE
H-26	Relatório de 1991	1992	Banco Central do Brasil
H-27	Anuário Estatístico do Brasil 1992	1993	IBGE
H-28	Boletim Mensal, Vol.28-No.4, 5 e 6, Abril, Maio e Junho de 1992	1992	Banco Central do Brasil
H-29	Censo Demográfico Mao-de Obra - 1980, Santa Catarina	1983	IBGE
H-30	Censo Econômico 1985 - Tabelas com dados de Santa Catarina	1986	IBGE
H-31	Santa Catarina, Estatuto da Evolução Populacional, 1976-2010	1989	SEPLAN/SC
H-32	World Development Report 1992, Development and the Environment	March 1992	World Bank

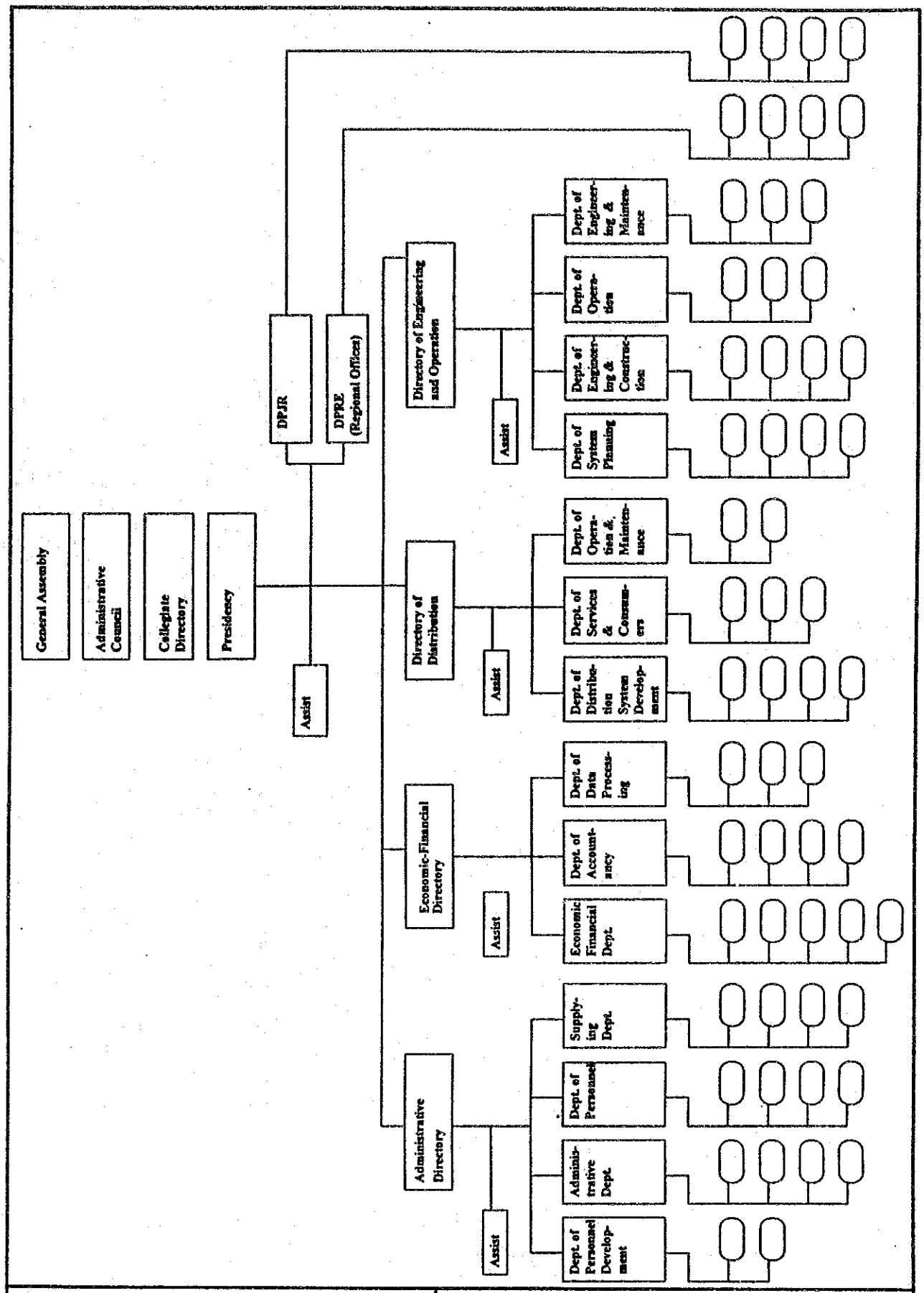
Figure



JAPAN INTERNATIONAL COOPERATION AGENCY
CENTRAIS ELÉTRICAS DE SANTA CATARINA S.A.,BRAZIL
SALTO PILÃO HYDROELECTRIC POWER DEVELOPMENT PROJECT

Fig. IV.3.1

Organizational Chart of State Government



JAPAN INTERNATIONAL COOPERATION AGENCY
CENTRAIS ELÉTRICAS DE SANTA CATARINA S.A.,BRAZIL
SALTO PILÃO HYDROELECTRIC POWER DEVELOPMENT PROJECT

Fig. IV.5.1
Organizational Chart of CELESC

ANNEX V

POWER SUPPLY AND DEMAND STUDY

ANNEX V. POWER SUPPLY AND DEMAND STUDY

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1. INTRODUCTION

Power system in Brazil comprises four regional systems; north, northeast, south and southeast systems. They are presently interconnected between the north and northeast systems and between the south and southeast systems. These systems are operated by four regional generation/transmission enterprises respectively; ELETRONORTE, CHESF, ELETROSUL and FURNAS. Besides, the world-largest Itaipu power station owned by Brazil and Paraguay is connected to the integrated south / southeast system. On the other hand, distribution of electric power in each state is handled by state-owned electric companies except in a few states. These state companies also operate their own generation plants.

CELESC - Centrais Elétricas de Santa Catarina is a state government owned utility responsible for electric power supply in the state of Santa Catarina. CELESC's own generation at present is only 5% of total power requirement in the state. The remaining 95% is purchased from ELETROSUL and the Itaipu. Power demand in CELESC system is increasing at 7% annually. Purchasing of more electricity from the other companies is becoming difficult due to delayed implementation of federal generation expansion program.

To keep stable power supply in the future, CELESC is intending to develop its own hydro power plants on rivers in the state including the Itajaí river. The Salto Pilão project was identified at the JICA's previous study in 1990-91 as the most competitive hydro power scheme in the Itajaí basin.

For further examination of feasibility of the Salto Pilão project, this report analyses the present status of power supply systems and future projection of power demand.

Chapter 2 describes on federal authorities for power supply and on federal and Santa Catarina's power industries.

Chapter 3 and 4 deal with the existing situations of power supply systems and power market relating to the Salto Pilão project.

Chapter 5 and 6 state power demand and power balance in the future.

2. POWER AUTHORITY AND POWER INDUSTRIES

DNAEE, which belongs to the Ministry of Mines and Energy, is the competent authority in power sector in Brazil. DNAEE is responsible for framing national electric power policy. It has the right to approve implementation programs for construction of power facilities and decide electric power tariffs.

Nation wide electric power supply is entrusted to ELETROBRAS; a partly state-owned corporation under the jurisdiction of the Ministry of Mines and Energy. ELETROBRAS is responsible for implementing the national electric power policy and for planning, financing and supervising the programs of power generation, transmission and distribution systems. ELETROBRAS is a principal funding agency for the power sector, both for federal and state utilities, and operates regional power systems in the whole of Brazil via four regional subsidiaries; ELETRONORTE in the north and middle west region, CHESF in the northeast region, FURNAS in the southeast and middle west, and ELETROSUL in the south. In addition, ELETROBRAS has two state subsidiaries, LIGHT for the state of Rio de Janeiro and ESCELSA for the state of Espírito Santo. ELETROBRAS is also a partner of state power utilities and further holds 50% of the stock of Itaipu Binational. A nation wide organization of the electric power authority and industries is shown in Fig. V. 2.1.

Most of state governments also have their own electric power enterprises mainly for electric power distribution in respective states and have also the right to develop generating plants by themselves within their territories with DNAEE's approval.

ELETROSUL controls electric power supply to all three states (Paraná, Santa Catarina and Rio Grande do Sul) in the south region and also to the state of Mato Grosso do Sul in middle-west region. State power enterprises under ELETROSUL are COPEL; CELESC, CEEE and ENERSUL. In this report, power system controlled by ELETROSUL is called the south system. On the other hand, FURNAS controls power supply to four states in the southeast region plus one state (Goiás) and one federal district (Brasília) of the middle-west region. The FURNAS-controlled system is called the southeast system.

CELESC is a Santa Catarina state government owned entity and is responsible for supplying electric power in the state. CELESC has been established in 1956 by merger of several power companies in the state. At present, CELESC has its own generating facilities of 72.87 MW in total capacity which corresponds to about 5 % of power demand in the

state. The rest is purchased from others, mainly from ELETROSUL and the Itaipu Binational through FURNAS and ELETROSUL.

3. EXISTING POWER SUPPLY SYSTEM

3.1 Whole of Brazil

ELETROBRAS has divided power network in Brazil into four regional areas and established the subsidiary companies for each area, ELETRONORTE, CHESF, FURNAS and ELETROSUL as shown in Fig.V.3.1. These subsidiary companies have their own power transmission network. They are also interconnected in two major power systems, namely, north/northeast and south/southeast systems. These two integrated systems are operated separately and will not be interconnected until 2000. Most of major load centers and major power plants in each system are interconnected by trunk transmission lines of ultra high voltage of AC 230/345/440/500/750 kV and DC ± 600 kV. Network of the trunk lines is shown in Fig.V.3.2.

The power supply status in Brazil in 1992 is summarized as follows:

	Hydro	Thermal	Total
Installed capacity (MW)			
ELETROBRAS group;	22,299	3,090	25,389
ELETRONORTE	(4,685)	(694)	(5,379)
CHESF	(7,251)	(453)	(7,704)
FURNAS	(6,800)	(1,323)	(8,123)
ELETROSUL	(2,602)	(620)	(3,222)
ESCELSA	(160)	-	(160)
LIGHT	(801)	-	(801)
State Companies & Others	18,486	1,665	20,151
Itaipu Binational	12,600	-	12,600
TOTAL	53,385	4,755	58,140
	(91.9%)	(8.2%)	(100%)
Energy Production (GWh)			
ELETROBRAS group	98,837	1,244	106,081
State Companies & Others	95,954	880	96,834
Itaipu Binational	50,156	-	50,156
TOTAL	244,947	8,124	253,071
	(96.8%)	(3.2%)	(100%)

As seen in this table, share of hydro power in Brazil reaches 92% in the installed capacity and 97% in the energy production, respectively.

3.2 South and Southeast Systems

The power network formed by the south and southeast power systems and the Itaipu power station which are interconnected with each other is the biggest one in Brazil. Capacities of the existing power stations in this network are listed in Table V.3.1. Total of the installed capacities is summarized below together with energy production in 1992 presented in power statistics;

	Hydro	Thermal	Nuclear	Total
Installed capacity (MW)				
South System	6,298	1,133	-	7,431
Southeast System	23,039	1,317	657	25,013
Itaipu Binational	12,600	-	-	12,600
Total	41,937	2,450	657	45,044
	(93.1%)	(5.4%)	(1.5%)	(100%)
Energy Production (GWh)				
South System	25,521	3,223	-	28,744
Southeast System	117,835	382	1,759	119,976
Itaipu Binational	50,156	-	-	50,156
Total	193,512	3,605	1,759	198,876
	(97.3%)	(1.8%)	(0.9%)	(100%)

3.3 CELESC Power System

CELESC's transmission and distribution lines are linked with the south/southeast transmission system through ELETROSUL's substations in the state. CELESC takes care 100% of power demand in the state of Santa Catarina with an area of 95,483 km^2. The existing power supply facilities owned and operated by CELESC itself in 1992 comprise 12 stations of run-of-river type hydro power plants with 72.87 MW in total effective capacity, transmission lines of 3,454.2 km in total length and substation transformers of 3,157.4 MVA in total installed capacity. Network of the transmission system of CELESC is shown in Fig. V.3.2. The existing power stations in Santa Catarina and the existing substations of CELESC are listed in Tables V.3.2 and V.3.3, respectively.

According to CELESC's statistics as summarized below, electric energy required in the CELESC system increased from 4,360 GWh in 1983 to 7,798 GWh in 1992; 6.7% growth on the annual average for the recent 10 years. However, amount of energy generated by CELESC itself basically unchanged while annual amounts of energy varied between 282 GWh and 482 GWh depending on available river flows. In 1992, CELESC's own generation was 376 GWh which was only 4.8% of the total energy required. CELESC's self supply ratio is gradually decreasing as shown below;

Past Energy Supply in CELESC System

Power Source	1983		1987		1993	
	Energy (Gwh)	Ratio (%)	Energy (GWh)	Ratio (%)	Energy (GWh)	Ratio (%)
CELESC's own generation	482	11.1	411	6.7	376	4.8
Purchased from:						
ELETROSUL	3,868	88.7	4,536	73.4	4,575	58.7
Itaipu	0	0	1,231	19.9	2,806	36.0
Others	9	0.2	0	0	41	0.5
Total	4,360	100	6,178	100	7,798	100

Source : CELESC's annual report 1992

Capacity factor of the CELESC's power plants was 59% on an average in 1992.

Power trading between CELESC and ELETROSUL and between CELESC and Itaipu via ELETROSUL is made at 9 substations of CELESC and/or ELETROSUL through 138kV or 69kV lines.

4. POWER MARKET

4.1 Present Power Demands

4.1.1 South and Southeast Systems

Integrated Network

The integrated south/southeast system is the biggest power network in Brazil, and involves Brazil's major power consumption centers such as São Paulo and Rio de Janeiro. Energy and peak power demands in the south/southeast system in 1992 are summarized as follows:

		South System	Southeast System	Total
• Energy Consumed	(GWh)	32,684	137,200	169,884
• Peak Power	(MWh/h)	6,650	26,268	32,923
• Installed Capacity	(MW)	7,431	37,613	45,044
• Load Factor	(%)	65	69	68

* : Including Itaipu Binational

South System

The south system in which the CELESC system is involved is one-fifth of the integrated south/southeast system in power market scale. Overall operation of the south system is commanded by ELETROSUL.

Distribution of electric power to consumers in the south system is handled by four state power companies ; COPEL (Paraná), CELESC (Santa Catarina), CEEE (Rio Grande do Sul) and ENERSUL (Mato Grosso do Sul). Energy and peak power handled in 1990 - 1992 by these four state companies are shown in Table V.4.1 and summarized for 1992 as follows:

Description	Energy (GWh)	Ratio (%)
• Sold Energy		
Residential	8,572	26.9
Industrial	12,770	40.1
Commercial	4,145	13.0
Rural	2,879	9.1
Public & Others	3,479	10.9
Sub-total	31,845	100
• Bulk supply to local distribution companies	573	
• Losses and difference	3,242	
• Total energy required :	35,660	
- own generation	(14,296)	
- received from ELETROSUL and others	(21,364)	
• Annual peak demand	4,260 MWh/h	
• Average load factor	62.8%	

4.1.2 CELESC System

Total energy requirement recorded in the CELESC system in 1992 was 7,798 GWh. Except own use and losses, 7,234 GWh (93% of the total) was sold to consumers and supplied to the several local power distribution companies in the state, which are to be merged into CELESC in the future.

The CELESC's energy supply in the recent 10 years is broken down in Table V.4.2 and summarized for 1992 as follows: