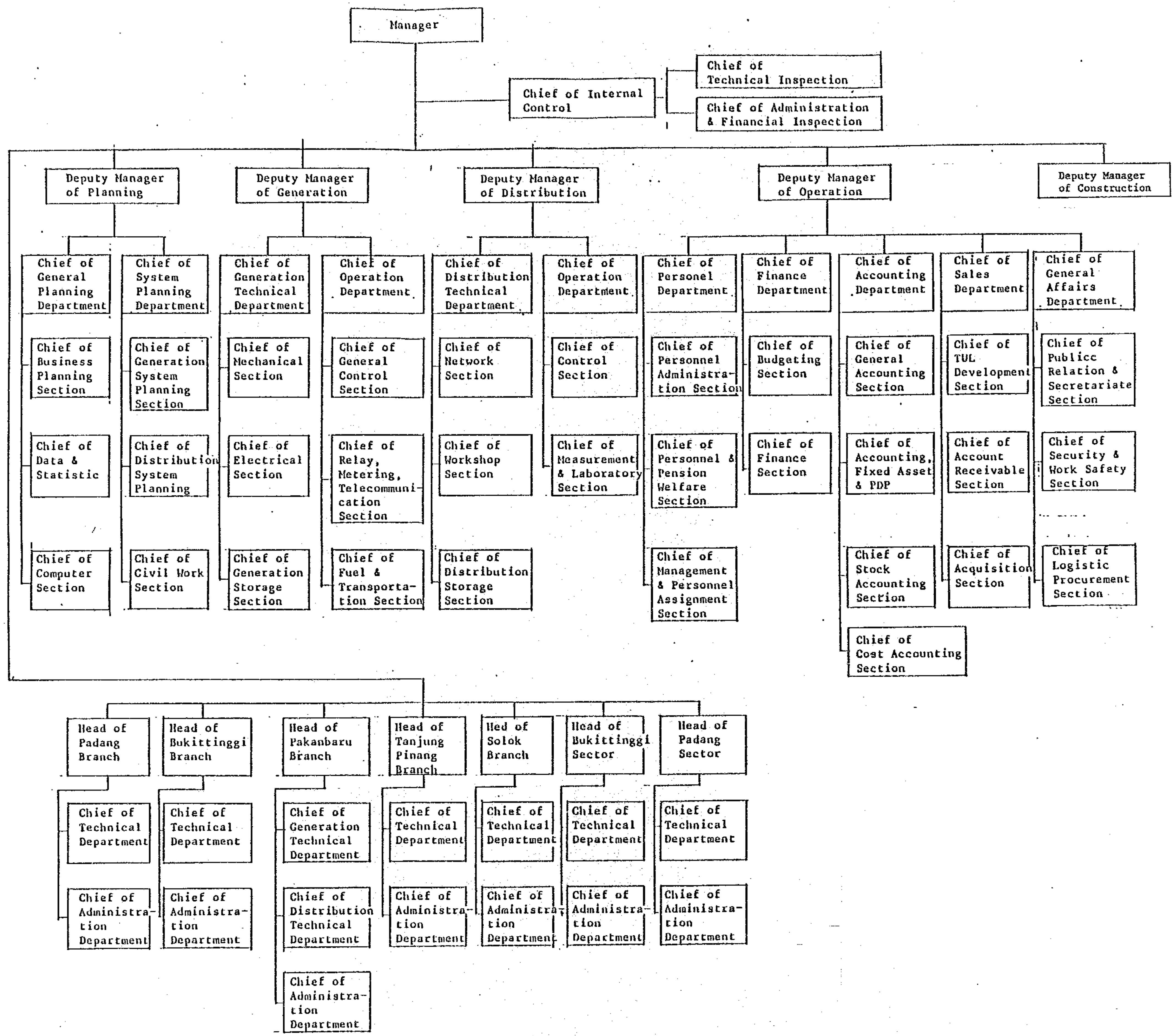
Annex 2-8 Organization of PLN Wilayah III



Annex 3-1 (1) Break-up of Population Growth in W. Sumatra Province

Year / Name of Kodya./Kab	1971 Sep.	1983 Dec. Nos. of Population by Natural Growth	1983 Dec. Nos. of Population by Transmigration	Total	Growth Rate by Natural Growth (%)	Total Growth Rate (%)
Kodya. Padang	196,339	509,670	-	509,670	8.27	8.27
Kodya. Bukittinggi	63,132	71,947	-	71,947	1.10	1.10
Kodya. Padang Panjang	30,711	34,660	-	34,660	1.01	1.01
Kodya. Sawahlunto	12,427	14,553	-	14,553	1.32	1.32
Kodya. Payakumbuh	63,388	83,557	-	83,557	2.33	2.33
Kodya. Solok	24,771	33,274	-	33,274	2.49	2.49
Kab. Pasir Selatan	253,606	332,547	9,000	341,547	2.28	2.51
Kab. Solok	295,398	372,351	-	372,351	1.95	1.95
Kab. Sawahlunto/Sijunjung	161,227	219,388	40,000	259,388	2.60	4.04
Kab. Tanan Datar	291,591	338,476	-	338,476	1.25	1.25
Kab. Padang Pariaman	442,649	498,392	-	498,392	0.99	0.99
Kab. Agam	347,044	401,302	-	401,302	1.22	1.22
Kab. 50 Kota	224,056	288,926	-	288,926	2.14	2.14
Kab. Pasaman	274,256	389,370	2,250	391,620	2.96	3.01
Total	2,793,196	3,588,413	51,250	3,639,663	2.11	2.23

Source: Biro Pusat Statistik (1980) and Dalam Angka (1983)

Annex 3-1 (2) Break-up of Population Growth in Riau Province

Name of Kodya./Kab. \ Year	1971 Sep.	1983 Dec. Nos. of Population by Natural Growth	Nos. of Population by Transmigration	Total	Growth Rate by Natural Growth (%)	Total Growth Rate (%)
Kodya. Pekanbaru	145,030	195,068	-	195,068	2.50	2.50
Kab. Kampar	258,692	374,728	81,333	456,061	2.89	4.84
Kab. Indragiri Hulu	197,156	240,099	32,728	272,827	1.53	2.74
Kab. Indragiri Hilir	286,028	402,345	15,030	417,375	2.66	3.20
Kab. Bengkalis	423,503	604,090	36,286	640,376	2.77	3.51
Kab. Kep. Riau	331,136	-	-	446,201	-	2.52
Total	1,641,545	-	-	2,427,908	-	3.32
	(1,310,409)	(1,816,330)	(165,377)	(1,981,707)	(2.64)	(3.51)

( ) figure does not include island.

Source: Biro Pusat Statistik (1980) and Dalam Angka (1984)

Annex 3-2 (1) Test of Significant Difference of Load Characteristics between Holidays and Week Days in July 1984 in Padang

(Unit: MW, MWh)

Time	July 1984 15 (Sun.) x_1	18 (Wed.) y_1	x_1^2	y_1^2	$x_1 y_1$	$_3\bar{x}_1$	$_3\bar{y}_1$	$_3\bar{x}_1^2$	$_3\bar{y}_1^2$	$_3\bar{x}_1\ _3\bar{y}_1$
1	22.1	29.6	488.4	876.2	654.2					
2	18.8	29.3	353.4	858.5	550.8	17.1	29.5	292.4	870.3	504.5
3	10.5	29.5	110.3	870.3	309.8					
4	14.8	29.4	219.0	864.4	435.1					
5	20.0	26.0	400.0	676.0	520.0	19.6	29.5	384.2	870.3	578.2
6	24.1	33.1	580.8	1095.6	797.7					
7	22.2	25.8	492.8	665.6	572.8					
8	20.3	15.9	412.1	252.8	322.8	21.3	18.7	453.7	349.7	398.3
9	21.3	14.5	453.7	210.3	308.9					
10	21.2	17.5	449.4	306.3	371.0					
11	21.0	15.2	441.0	231.0	319.2	20.7	16.7	428.5	278.9	345.7
12	20.0	17.3	400.0	299.3	346.0					
13	19.4	16.9	376.4	285.6	327.9					
14	19.1	17.3	364.8	299.3	330.4	18.8	17.1	353.4	292.4	321.5
15	18.0	17.2	324.0	295.8	309.6					
16	22.0	16.0	484.0	256.0	352.0					
17	28.0	19.2	784.0	368.6	691.6	26.5	20.0	702.3	400.0	530.0
18	29.5	24.7	870.3	610.1	728.7					
19	32.8	28.7	1075.8	823.7	941.4					
20	35.8	31.7	1281.6	1004.9	1134.9	36.2	31.9	1310.4	1017.6	1154.8
21	40.0	35.4	1600.0	1253.2	1416.0					
22	31.4	32.5	986.0	1056.3	1020.5					
23	27.6	29.2	761.8	852.6	805.9	28.5	29.5	812.3	870.3	840.8
24	26.4	26.8	697.0	718.2	707.5					
Σ	566.3	578.7	14406.6	15030.6	14274.7	188.7	192.9	4737.1	4949.4	4673.7
$\bar{\Sigma}$	23.6	24.1	600.3	626.3	594.8	23.6	24.1	592.1	618.7	584.2

Note: $_3\bar{x}_1$ and $_3\bar{y}_1$ refer respectively to means per every three hours of x_1 and y_1.

1) Unbiased estimate of variances between Sunday and week days

$$V_1 = \frac{14406.6 - 566.3^2/24}{24 - 1} = 45.40, \quad V_2 = \frac{15030.6 - 578.7^2/24}{24 - 1} = 46.81$$

$$F = \frac{V_2}{V_1} = 1.03 \qquad F_{23}^{23}\ (0.05) = 2.00 > F$$

Therefore, there is no difference in the variances.

2) Unbiased estimate of variances on combined data of Sunday and week days

$$V = \frac{14406.6 - 24\ (23.6)^2 + 15030.6 - 24\ (24.1)^2}{23 + 23}$$

$$= \frac{1039.6 + 1091.2}{46} = 46.32$$

$$\sigma_e = \sqrt{46.32} = 6.81$$

$$t = \frac{24.1 - 23.6}{6.81\sqrt{\frac{1}{24} + \frac{1}{24}}} = 0.254 \qquad t_{0.05}(\phi = 46) = 2.021 > t$$

∴ Therefore, there is no difference in the means.

3) Correlation in fluctuation on Sunday and week days

$$r_{\overline{_3x_1}\ \overline{_3y_1}} = \frac{8x4673.7 - 188.7x192.9}{\sqrt{8x4737.1-188.7^2}\ \sqrt{8x4949.4-192.9^2}} = \frac{989.4}{47.84 \times 48.83} = 0.424$$

$$t = \frac{0.424}{\sqrt{1-0.424^2}}\ \sqrt{8-2} = 0.468 \times 2.45 = 1.146$$

$$t_{0.05}\ (\phi = 6) = 2.447 > t$$

$$t_{0.01}\ (\phi = 6) = 3.707 > t$$

∴ Therefore, there cannot be said to be any correlation.

Annex 3-2 (2) Test of Significant Difference in Load Characteristics on Holidays and Week Days in Dec. 1984 in Padang

(Unit: MW, MWh)

Time	Dec. 1984									
	16 (Sun.)	19 (Wed.)								
	x_2	y_2	x_2^2	y_2^2	x_2y_2	$_3\bar{x}_2$	$_3\bar{y}_2$	$_3\bar{x}_2^2$	$_3\bar{y}_2^2$	$_3\bar{x}_2\ _3\bar{y}_2$
1	31.1	31.2	967.2	973.4	970.3					
2	25.7	30.5	660.5	930.3	783.9	27.7	30.6	767.3	936.4	847.6
3	26.2	30.2	686.4	912.0	791.2					
4	26.2	29.9	686.4	894.0	783.4					
5	27.0	30.6	729.0	936.4	826.2	27.4	31.0	750.8	961.0	849.0
6	29.0	32.6	841.0	1062.8	945.4					
7	26.5	29.6	702.3	876.2	784.4					
8	26.0	27.4	676.0	750.8	712.4	27.1	25.7	734.4	660.5	696.5
9	28.8	20.0	829.4	400.0	576.0					
10	23.0	19.8	529.0	392.0	455.4					
11	20.0	19.5	400.0	380.3	390.0	22.9	18.7	524.4	349.7	428.2
12	25.7	16.7	660.5	278.9	429.2					
13	24.3	23.0	590.5	529.0	558.9					
14	26.5	23.5	702.3	552.3	622.8	24.6	22.5	605.2	506.3	553.5
15	23.0	21.1	529.0	445.2	485.3					
16	22.4	23.3	501.8	542.9	521.9					
17	30.2	25.8	912.0	665.6	779.2	29.1	27.2	846.8	739.8	791.5
18	34.7	32.4	1204.1	1049.8	1124.3					
19	41.7	38.3	1738.9	1466.9	1597.1					
20	41.8	33.8	1747.2	1142.4	1412.8	41.3	36.0	1705.7	1296.0	1486.8
21	40.4	35.8	1632.2	1281.6	1446.3					
22	33.2	33.3	1102.2	1108.9	1105.6					
23	29.1	29.0	846.8	841.0	843.9	30.6	29.9	936.4	894.0	914.9
24	29.5	27.5	870.3	756.3	811.3					
Σ	692.0	664.8	20700.2	19168.8	19757.1	230.7	221.6	6870.9	6343.6	6568.5
$\bar{\Sigma}$	28.8	27.7	862.5	798.7	823.2	28.8	27.7	858.9	793.0	821.1

1) Unbiased estimate of variances between Sunday and week days

$$V_1 = \frac{20700.2 - 692.0^2/24}{24 - 1} = 32.50, \quad V_2 = \frac{19168.8 - 664.8^2/24}{24 - 1} = 32.78$$

$$F = V_2/V_1 = 1.01 \qquad F_{23}^{23}\ (0.05) = 2.00 > F$$

<u>Therefore, there is no difference in the variances.</u>

2) Unbiased estimate of variances on combined data of Sunday and week days

$$V = \frac{20700.2 - 24(28.8)^2 + 19168.8 - 24\ (27.7)^2}{46}$$

$$= \frac{793.6 + 753.8}{46} = 33.64$$

$$\sigma_e = \sqrt{33.64} = 5.8$$

$$t = \frac{28.8 - 27.7}{5.8\sqrt{\frac{1}{24} + \frac{1}{24}}} = 0.657 \qquad t_{0.05}(\phi = 46) = 2.021 > t$$

<u>Therefore, there is no difference in the means.</u>

3) Correlation in fluctuation on Sunday and week days

$$r_{\overline{3^x 2}\ \overline{3^y 2}} = \frac{8x6568.5 - 230.7x221.6}{\sqrt{8x6870.9-230.7^2}\ \sqrt{8x6343.6-221.6^2}} = \frac{1424.9}{41.77 \times 40.52} = 0.842$$

$$t = \frac{0.842}{\sqrt{1-0.842^2}}\sqrt{8-2} = 1.56 \times 2.45 = 3.82$$

$$t_{0.05}(\phi = 6) = 2.447 < t$$

<u>Therefore, there is a correlation.</u>

Annex 3-2 (3) Test of Significant Difference in Load Characteristics on Holiday and Week Day in March 1985 in Padang

(Unit: MW, MWh)

Time	March 1985 17 (Sun.) x_3	20 (Wed.) y_3	x_3^2	y_3^2	$x_3 y_3$	$_3\bar{x}_3$	$_3\bar{y}_3$	$_2\bar{x}_3^2$	$_3\bar{y}_3^2$	$_3\bar{x}_3\ _3\bar{y}_3$
1	32.0	31.0	1024.0	961.0	992.0					
2	31.0	31.5	961.0	992.3	976.5	31.3	31.2	979.7	973.4	976.6
3	31.0	31.2	961.0	973.4	967.2					
4	31.5	31.2	992.3	973.4	982.8					
5	31.5	32.0	992.3	1024.0	1008.0	32.3	32.5	1043.3	1056.3	1049.8
6	34.0	34.2	1156.0	1069.6	1162.8					
7	30.3	31.7	918.1	1004.9	960.5					
8	24.5	25.5	600.3	650.3	624.8	28.5	27.3	812.3	745.3	778.1
9	30.7	24.8	942.5	615.0	761.4					
10	29.0	24.9	841.0	620.0	722.1					
11	26.0	24.7	676.0	610.1	642.2	27.8	26.4	772.8	697.0	733.9
12	28.3	29.5	800.9	870.3	834.9					
13	31.5	29.2	992.3	852.6	919.8					
14	27.0	29.5	729.0	870.3	796.5	27.4	28.9	750.8	835.2	791.9
15	23.6	28.0	557.0	784.0	660.8					
16	30.8	28.7	948.6	823.7	884.0					
17	32.5	24.6	1056.3	605.2	799.5	33.3	26.9	1108.9	723.6	895.8
18	36.5	27.5	1332.3	756.3	1003.8					
19	39.7	38.1	1576.1	1451.6	1512.6					
20	40.9	38.8	1672.8	1505.4	1586.9	42.3	38.1	1789.3	1451.6	1611.6
21	46.3	37.5	2143.7	1406.3	1736.3					
22	35.1	34.7	1232.0	1204.1	1218.0					
23	33.2	31.3	1102.2	979.7	1039.2	32.4	31.6	1049.8	998.6	1023.8
24	28.8	28.7	829.4	823.7	826.6					
Σ	765.7	728.8	25036.9	22527.1	23618.8	255.3	242.9	8306.8	7480.9	7861.4
$\bar{\Sigma}$	31.9	30.4	1043.2	938.6	984.1	31.9	30.4	1038.3	935.1	982.7

1) Unbiased estimate of variances between Sunday and week days

$$V_1 = \frac{25036.9 - 765.7^2/24}{24 - 1} = 26.43, \quad V_2 = \frac{22527.1 - 728.8^2/24}{24 - 1} = 17.21$$

$$F = V_1/V_2 = 1.536 \qquad F_{23}^{23}\ (0.05) = 2.00 > F$$

Therefore, there is no difference in the variances.

2) Unbiased estimate of variances on combined data of Sunday and week days

$$V = \frac{25036.9 - 24(31.9)^2 + 22527.1 - 24\ (30.4)^2}{23 + 23}$$

$$= \frac{614.3 + 347.3}{46} = 20.90$$

$$\sigma_e = \sqrt{20.90} = 4.57$$

$$t = \frac{31.9 - 30.4}{4.57\sqrt{\frac{1}{24} + \frac{1}{24}}} = 1.137 \qquad t_{0.05}(\phi = 46) = 2.021 > t$$

Therefore, there is no difference in the means.

3) Correlation in fluctuation on Sunday and week days

$$r_{\overline{3^{x}3}\ \overline{3^{y}3}} = \frac{8x7861.4 - 255.3x242.9}{\sqrt{8x8306.8-255.3^2}\ \sqrt{8x7480.9-242.9^2}} = \frac{878.8}{35.73 \times 29.10} = 0.845$$

$$t = \frac{0.845}{\sqrt{1-0.845^2}} = \sqrt{8-2} = 3.871$$

$$t_{0.05}(\phi = 6) = 2.447 < t$$

Therefore, there is a correlation.

Annex 3-3 Test of Significant Difference of Load Characteristics in Dec. 1982 and April 1985 in Pekanbaru

(Unit: MW, MWh)

Time	April 17 (Wed.) 1985 x_1	$_3\bar{x}_1$	Dec. 20 (Sun.) 1982 x_2	$_3\bar{x}_2$	x_1^2	x_2^2	$_3\bar{x}_1^2$	$_3\bar{x}_2^2$	$_3\bar{x}_1\ _3\bar{x}_2$
1	5.8		4.5		33.6	20.3			
2	5.7	5.7	4.2	4.3	32.5	17.6	32.5	18.5	24.5
3	5.6		4.1		31.4	16.8			
4	5.6		4.2		31.4	17.6			
5	6.1	6.1	4.5	4.6	37.2	20.3	37.2	21.2	28.1
6	6.7		5.0		44.9	25.0			
7	6.0		4.7		36.0	22.1			
8	5.0	5.2	4.0	4.3	25.0	16.0	27.0	18.5	22.4
9	4.6		4.2		21.2	17.6			
10	5.2		4.3		27.0	18.5			
11	5.9	5.1	4.2	4.3	24.0	19.6	26.0	18.5	21.9
12	5.3		4.3		28.1	18.5			
13	5.2		4.4		27.0	19.4			
14	5.4	5.3	5.0	4.8	29.2	25.0	28.1	23.0	25.4
15	5.4		5.1		29.2	26.0			
16	5.2		4.5		27.0	20.3			
17	4.8	5.2	3.8	4.5	23.0	14.4	27.0	20.3	23.4
18	5.7		5.3		32.5	28.1			
19	8.5		6.5		72.3	42.3			
20	10.1	9.5	7.9	7.4	102.0	62.4	90.3	54.8	70.3
21	9.8		7.9		96.0	62.4			
22	9.5		7.5		90.3	56.3			
23	9.0	9.0	6.6	6.6	81.0	43.6	81.0	43.6	59.4
24	8.5		5.6		72.3	31.4			
Σ		51.1		40.8	1054.1	659.5	349.1	218.4	275.4
$\bar{\Sigma}$		6.4		5.1	43.9	27.5	43.6	27.3	34.4

1) Unbiased estimate of variances when the data in 1985 and 1982 are combined

$$V = \frac{1054.1 - 24\ (6.4)^2 + 659.5 - 24\ (5.1)^2}{46} = 2.31$$

$$\sigma_e = \sqrt{2.31} = 1.52$$

$$t = \frac{6.4 - 5.1}{1.52\ \sqrt{\frac{1}{24} + \frac{1}{24}}} = 2.963$$

$$t_{0.05}(\phi = 46) = 2.021 < t$$

Therefore, <u>there cannot be said to be no difference in the means.</u> In this case, the means in 1985 is larger.

2) Correlation of fluctuation between $_3\bar{x}_1$ and $_3\bar{x}_2$

$$r_{\overline{_3x_1}\ \overline{_3x_2}} = \frac{8x275.4 - 51.1x40.8}{\sqrt{8x349.1-51.1^2}\ \sqrt{8x218.4-40.8^2}} = \frac{118.32}{13.48 \times 9.09}$$

$$= 0.966$$

$$t = \frac{0.966}{\sqrt{1-0.966^2}}\ \sqrt{8-2} = 3.736 \times 2.45 = 9.15$$

$$t_{0.05}(\phi = 6) = 2.447 < t$$

$$t_{0.01}(\phi = 6) = 3.707 < t$$

<u>Therefore there is a substantial correlation.</u>

Annex 3-4 Test of the Difference of Daily Energy Consumption between July and December 1984 and March 1985 in Padang

	Daily energy consumption (MWh) 1984 July a_1	1984 Dec. a_2	1985 March a_3		a_1^2	a_2^2	a_3^2	
Sunday Σx	566.3	692.0	765.7		320695.7	478864.0	586296.5	
Week day Σy	578.7	664.8	728.8	$Total_1$	334893.7	441959.0	531149.4	$Total_2$
Total $\Sigma.$	1145.0	1356.8	1494.5	3996.3	655589.4	920823.0	1117445.9	2693858
n	2	2	2	6 = N				
$\bar{\Sigma}$	572.5	678.4	747.3					

Total variance $\square = \Sigma\Sigma\, xy_{ij}^2 - \frac{(Total_1)^2}{N} = 2693858 - \frac{15970414}{6} = 32122$

Among-class variance $\Delta = \frac{(\Sigma a_1)^2}{n} + \frac{(\Sigma a_2)^2}{n} + \frac{(\Sigma a_3)^2}{n} - \frac{(Total_1)^2}{N}$

$= 655513 + 920453 + 1116765 - 2661736 = 30995$

Interclass variance $\otimes = \square - \Delta = 32122 - 30995 = 1127$

Variance Matrix

Factors		Fluctuation	Freedom	Unbiased variance	Variance ratio, F_0
Among-class	Δ	30,995	3-1=2	15,498	41.2
Interclass	$\otimes$	1,127	6-3=3	376	
Total	$\square$	32,122	6-1=5		

$F_3^2\ (0.01) = 30.81 < F_0$

Since the daily energy consumption varies extensively in each month, the values cannot be recognized as those in the same population. Therefore the energy demand in each month should be handled individually. Here, the value is assumed to increase successively toward the end of fiscal year.

Annex 3-5 Estimation of Daily Average Power Consumption in April 1984 according to Linear Regression

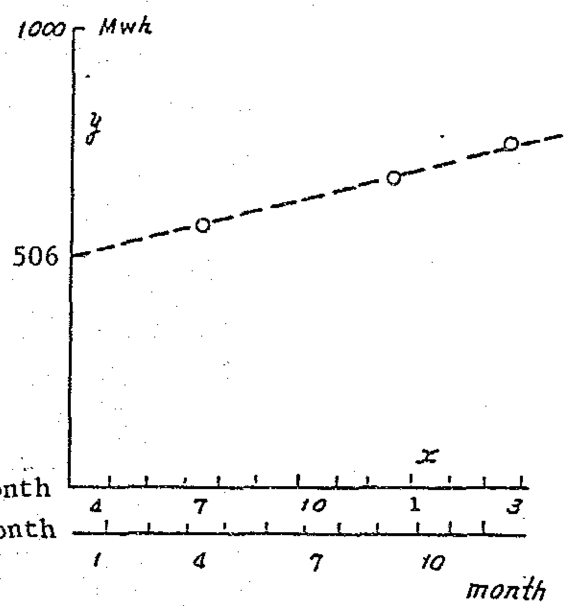
$$y = \bar{\alpha} x + \bar{\beta}$$

$$\bar{\alpha} = \left(\sum_{i=1}^{n} x_i y_i - n \bar{x}_i \bar{y}_i \right) / \left(\sum_{i=1}^{n} x_i^2 - n \bar{x}_i^2 \right)$$

$$\bar{\beta} = \left(\bar{y}_i \sum_{i=1}^{n} x_i^2 - \bar{x}_i \sum x_i y_i \right) / \left(\sum_{i=1}^{n} x_i^2 - n \bar{x}_i^2 \right)$$

Unit: MWh

Calender month	Coordinate month x	Daily average (Sun. + Wed.)/2, y	x^2	y^2	xy
7	4	572.5	16	327956.3	2270.0
12	9	678.4	81	460226.6	6105.6
3	12	747.3	144	558457.3	8967.6
Σ	25	1998.2	241	1346440.1	17363.2
$\bar{\Sigma}$	8.33	666.07	80.33	448813.4	5787.7



$\bar{\alpha}$ = (17363.2 − 3 x 8.3^2 x 666.07)/(241 − 3 x 8.33^2)

= 712.2/32.7 = 21.79

$\bar{\beta}$ = (666.1 x 241 − 8.33 x 17363.2)/32.83

= 15894.6/32.83 = 484.1

y = 21.79x + 484.1

at x = 1 : y = 506.0 MWh

Annex 3-6 Regression Analysis

Unit : MWh

	x	y	x^2	y^2
	4	572.5	16	327,756.3
	9	678.4	81	460,226.6
	12	747.3	144	558,457.3
Σ	25	1,998.2	24	1,346,440.1
$\bar{\Sigma}$	8.33	666.07	80.33	448,813.4

o Total variance □ = 32,122 (From Annex 3-4)

o Among class variance Δ = 30,995 (Same as above)

o Interclass variance ⊗ = □ − Δ = 1,127 (Same as above)

o Variance based on regression

$$S_R = b^2(\Sigma x_1^2 - n\bar{x}_1^2)$$
$$= (21.79)^2(241 - 3 \times 8.33^2) = 15,589$$

o Variance from regression

$$S_E = \Delta - S_R = 15,406$$

Variance Matrix

Factors		Fluctuation	Freedom	Unbiased variance	Variance ratio, Fo	F_3^1 (0.05) F_3^1 (0.01)
Based on regression	S_R	15,589	1	15,589		10.13
Around regression	S_E	15,406	3 − 2 = 1	15,406	15,406/376 = 41	34.12
Among-class	Δ	30,995	3 − 1 = 2	15,498		
Interclass	⊗	1,127	6 − 3 = 3	376		
Total	□	32,122	6 − 3 = 3			

$$Fo > F_3^1 \ (0.01)$$

The difference is highly significant. This fact proves that the data are small in dispersion, and y, namely, the demand grows linearly followed by the change of x along with elapse of months.

Annex 3-7 (1) Example of Preparing Totalized Load Curves: Demand Forecast and Load Curves in Fiscal Year 19xx

Consumer type	Sold energy (GWh)	Daily sales energy (MWh)		Sending and energy (MWh)		Loss ratio, %
		Week day	Holiday	Week day	Holiday	
Residential	178.1	487.9	487.9	587.8	587.8	17
Commercial	46.6	B 130.2	A 117.2	156.9	141.2	17
Public	43.5	B 121.6	A 109.4	146.5	131.8	17
Small Ind.	164.8	D_1 479.9	C_1 335.9	578.2	404.7	17
Medium Ind.	70.6	D_2 205.6	C_2 143.9	247.7	173.4	17
(Industry total)	(235.4)					
Cement	179.0	490.4	490.4	505.6	505.6	3
PERTAMINA	-	-	-	-	-	-
Sub total		1915.6	1684.7	2222.7	1924.5	
Yearly total	682.6	682.6 GWh		π 791.3 GWh		

Note: π is explained later. (Annex 3-13)

Conditions 1. Out of 365 days in one year, 293 and 72 days are assumed to be week days and holidays, respectively.

2. The ratio of sold energy on holidays (A) to that on week days (B) for commercial and public consumers is assumed at 0.9: 1.0.

Therefore,

$$\frac{\text{Commercial: } 46.5}{\text{Public : } 43.5} \text{ GWh} = 72\text{ A} + 293\text{ B}$$

$$\frac{A}{B} = 0.9$$

$$\therefore B = \frac{\text{Commercial or Public}}{357.8} = \frac{130.2}{121.6} \text{ MWh}$$

A = Above x 0.9 = 109.4 MWh

3. The industrial demand is a total of small and medium industry demand with the ratio being:

m : n
0.7 : 0.3

a. Small industry = 164.8 GWh, Medium industry = 70.6 GWh

b. Holiday (C) : Week day (D) for industrial = 0.7: 1.0

Small or medium industry demand, GWh = 72 C + 293 D

$$\frac{C}{D} = 0.7$$

$$\therefore D_1 = \frac{\text{Small ind.}}{343.4} = 479.9 \text{ MWh} \qquad D_2 = \frac{\text{Medium ind.}}{343.4} = 205.6 \text{ MWh}$$

$$C_1 = 0.7 \times D_1 = 335.9 \qquad C_2 = 0.7 \times D_2 = 143.9$$

Annex 3-7 (2) Calculation Chart for Load Curves

(Unit: MW)

Allocation ratio		430	600	560	590	600	690	690	
Time zone \ Type		Residential	Commercial	Public	Small Ind.	Medium Ind.	Cement	PERTAMINA	Total
Week day	1	22.8	4.4	6.1	16.3	6.7	22.0	-	78.3
	2	27.3	4.4	6.1	16.3	6.7	22.0	-	82.8
	3	18.2	7.0	5.2	26.1	12.0	19.5	-	88.0
	4	13.7	8.7	5.2	32.7	13.3	19.5	-	93.1
	5	13.7	7.8	4.4	31.0	12.7	19.5	-	89.1
	6	18.2	8.7	7.0	32.7	13.3	19.5	-	99.4
	7	45.6	7.0	8.7	21.2	11.3	24.4	-	118.2
	8	36.5	4.4	6.1	16.3	6.7	22.0	-	92.0
		196.0	52.4	48.8	192.6	82.7	168.4	-	740.9
x 3 =		588.0	157.2	146.4	577.8	248.1	505.2	-	2222.7 ←— For check
Holiday	1	22.8	3.9	5.5	11.4	4.7	22.0	-	70.3
	2	27.3	3.9	5.5	11.4	4.7	22.0	-	74.8
	3	18.2	6.3	4.7	18.3	8.4	19.5	-	75.4
	4	13.7	7.8	4.7	22.9	9.3	19.5	-	77.9
	5	13.7	7.1	3.9	21.7	8.9	19.5	-	74.8
	6	18.2	7.8	6.3	22.9	9.3	19.5	-	84.0
	7	45.6	6.3	7.8	14.9	7.9	24.4	-	106.9
	8	36.5	3.9	5.5	11.4	4.7	22.0	-	84.0
		196.0	47.0	43.9	134.9	57.9	168.4		648.1
x 3		588.0	141.0	131.7	404.7	173.7	505.2		1944.5 ←— For check

Calculation formula: $\frac{\text{Sending end daily energy}}{\text{Allocation ratio} \times 3}$ x Time zone allocation ratio

(Refer to Table 3.7-1)

Annex 3-8 (1) Estimation of Load Curves and Test of Goodness of Fit in Padang in 1984

Consumer type	Sold energy (GWw)	Daily sold energy (MWh)		Sending and energy (MWh)		Loss ratio, %
		Week day	Holiday	Week day	Holiday	
Residential	33.32	91.29	91.29	121.7	121.7	25
Commercial	5.15	B 14.39	A 12.95	19.2	17.3	"
Public	14.27	B 39.88	A 35.89	53.2	47.9	"
Small Ind.	11.29	D_1 32.88	C_1 23.01	43.8	30.7	"
Medium Ind.	1.25	D_2 3.64	C_2 2.55	4.9	3.4	"
(Industry total)	(12.54)					
Cement	87.16	238.8	238.8	280.9	280.9	15
PERTAMINA	-	-	-	-	-	-
Sub total		420.88	404.49	523.7	θ 501.9	
Yearly total	152.44	152.44 GWh		189.58 GWh		

Conditions 1. Out of 365 days in one year, 293 and 72 days are assumed to be week days and holidays, respectively.

2. The ratio of sold energy on holidays (A) to that on week days (B) for commercial and public consumers is assumed at 0.9: 1.0.

Therefore,

$$\frac{\text{Commercial: } 5.15}{\text{Public : } 14.27} \text{ GWh} = 72\text{ A} + 293\text{ B}$$

$$\frac{B}{A} = 0.9$$

$$B = \frac{\text{Commercial or public}}{357.8} = \frac{14.39}{39.88} \text{ MWh}$$

$$A = \text{Above} \times 0.9 = \frac{12.95}{35.89} \text{ MWh}$$

3. The industrial demand is a total of small and medium industry demand, with the composition being $\overset{m}{0.9} : \overset{n}{0.1}$

a. Holidays : Week days for industrial = 0.7: 1.0 (C : D)

b. Small or medium Industry demand GWh = 72 C + 293 D

$$\frac{C}{D} = 0.7$$

$$\therefore D_1 = \frac{\text{Small ind.}}{343.4} = 32.84 \text{ MWh} \qquad D_2 = \frac{\text{Medium ind.}}{343.4} = 3.64 \text{ MWh}$$

$$C_1 = 0.7 \times D_1 = 23.01 \qquad C_2 = 0.7 \times D_2 = 2.55$$

Annex 3-8 (2) Calculation Chart for Load Curves

(Unit: MW)

Allocation ratio		430	600	560	590	600	690	690	
Time zone \ Type		Residential	Commercial	Public	Small Ind.	Medium Ind.	Cement	PERTAMINA	Total
Week day	1	4.7	0.5	2.2	1.2	0.1	12.2	-	20.9
	2	5.7	0.5	2.2	1.2	0.1	12.2	-	21.9
	3	3.8	0.9	1.9	2.0	0.2	10.9	-	19.7
	4	2.8	1.1	1.9	2.5	0.3	10.9	-	19.5
	5	2.8	1.0	1.6	2.4	0.3	10.9	-	19.0
	6	3.8	1.1	2.5	2.5	0.3	10.9	-	21.1
	7	9.4	0.9	3.2	1.6	0.2	13.6	-	28.9
	8	7.5	0.5	2.2	1.2	0.1	12.2	-	23.8
Σ		40.5	6.5	17.7	14.6	1.6	93.8	-	174.8
Σ x 3 =		121.5	19.5	53.1	43.8	4.8	281.4	-	524.1 ← For check
Holiday	1	4.7	0.5	2.0	0.9	0.1	12.2	-	20.4
	2	5.7	0.5	2.0	0.9	0.1	12.2	-	21.4
	3	3.8	0.8	1.7	1.4	0.2	10.9	-	18.8
	4	2.8	1.0	1.7	1.7	0.2	10.9	-	18.3
	5	2.8	0.9	1.4	1.6	0.2	10.9	-	17.8
	6	3.8	1.0	2.3	1.7	0.2	10.9	-	19.9
	7	9.4	0.8	2.9	1.1	0.2	13.6	-	28.0
	8	7.5	0.5	2.0	0.9	0.1	12.2	-	23.2
Σ		40.5	6.0	16.0	10.2	1.3	93.8	-	167.8
Σ x 3 =		121.5	18.0	48.0	30.6	3.9	281.4	-	503.4 ← For check

Annex 3-8 (3)

Test of Goodness of Fit in Padang

(Unit: MW)

	July 18, 1984 y_1	z_1, estimated	$\frac{(y_1 - z_1)^2}{z_1}$	Dec. 19, 1984 y_2	z_2, estimated	$\frac{(y_2 - z_2)^2}{z_2}$	Mar. 20, 1985 y_3	z_3, estimated	$\frac{(y_3 - z_3)^2}{z_3}$
1	29.5	23.1	1.773	30.6	27.6	0.326	31.2	29.0	0.167
2	29.5	24.2	1.161	31.0	28.9	0.153	32.5	30.4	0.145
3	18.7	21.7	0.415	25.7	26.0	0.003	27.3	27.4	0.000
4	16.7	21.5	1.072	18.7	25.7	1.907	26.4	27.1	0.018
5	17.1	21.0	0.724	22.5	25.1	0.269	28.9	26.4	0.237
6	20.0	23.3	0.467	27.2	27.8	0.013	26.9	29.3	0.197
7	31.9	31.9	0	36.0	38.1	0.116	38.1	40.2	0.110
8	29.5	26.3	0.389	29.0	31.4	0.183	31.6	33.1	0.068
Σ	192.9	192.9	6.001 = χ_1^2	230.7	230.7	2.865 = χ_2^2	242.9	242.9	0.942 = χ_3^2

The estimated values were compared with actual energy consumption in the respective time zones so that the daily energy consumption in the load curves obtained in the previous table would match the actual daily energy consumption. Since only the total consumption is affected by the actual values, χ^2-test of $n - 1 = 8 - 1 = 7$ was carried out with respect to the freedom.

Regarding the week day in July 1984,

$$\chi_1^2 < \chi^2_{\phi=7}(0.50) = 6.346$$

Therefore, the estimated values have a goodness of fit with the actual values.

Similarly regarding the week day in Dec. 1984,

$$\chi_2^2 < \chi^2_{\phi=7}(0.80) = 3.822$$

Also, the estimated values comply nearly perfectly with the actual values.

Regarding the week days in March 1985, moreover,

$$\chi_3^2 < \chi^2_{\phi=7}(0.99) = 1.239$$

Therefore, the estimated values also comply entirely with the actual values.

Annex 3-9 (1) Estimation of Load Curves and Check of their Applicability in Pekanbaru in 1984

Consumer type	Sold energy (GWh)	Daily sold energy (MWh)		Sending end energy (MWh)		Loss ratio, %
		Week day	Holiday	Week day	Holiday	
Residential	22.70	62.19	62.19	82.9	82.9	25
Commercial	5.66	B 15.82	A 14.24	21.1	19.0	"
Public	6.19	B 17.30	A 15.57	23.1	20.8	"
Small Ind.	5.52	D_1 16.07	C_1 11.25	21.4	15.0	"
Medium Ind.	0.61	D_2 1.78	C_2 1.24	2.4	1.7	"
(Industry total)	(6.13)					
Cement	-	-	-	-		
PERTAMINA	-	-	-	-		
Sub total		113.16	104.49	150.9	Θ 139.4	
Yearly total	40.68	40.68 GWh		54.25 GWh		

Conditions 1. Out of 365 days in one year, 293 and 72 days are assumed to be week days and holidays, respectively.

2. The ratio of sold energy on holidays (A) to that on week days (B) for commercial and public consumers is assumed at 0.9: 1.0.

Therefore,

$$\frac{\text{Commercial: } 5.66}{\text{Public : } 6.19} \text{ GWh} = 72\ A + 293\ B$$

$$\frac{A}{B} = 0.9$$

$$B = \frac{\text{Commercial or public}}{357.8} = \begin{matrix}15.82\\17.30\end{matrix} \text{ MWh}$$

$$A = \text{Above} \times 0.9 = \begin{matrix}14.24\\15.57\end{matrix} \text{ MWh}$$

3. The industrial demand is a total of small and medium industry demand, with the composition being $\overset{m}{0.9} : \overset{m}{0.1}$

a. Small ind. = 5.52 GWh, Medium ind. = 0.61 GWh

b. Holiday : Week day for industry = 0.7: 1.0
   C   D

Small or medium ind., GWh = 72 C + 293 D

$$\frac{C}{D} = 0.7$$

$$D_1 = \frac{\text{Small ind.}}{343.4} = 16.07 \text{ MWh} \qquad D_2 = \frac{\text{Medium ind.}}{343.4} = 1.98 \text{ MWh}$$

$$C_1 = 0.7 \times D_1 = 11.25 \qquad C_2 = 0.7 \times D_2 = 1.24$$

Annex 3-9 (2) Calculation Chart for Load Curves in 1984

(Unit: MW)

Allocation ratio		430	600	560	590	600	690	690	
Time zone \ Type		Residen-tial	Commer-cial	Public	Small Ind.	Medium Ind.	Cement	PERTAMINA	Total
Week day	1	3.2	0.6	1.0	0.6	0.1	-	-	5.5
	2	3.9	0.6	1.0	0.6	0.1	-	-	6.2
	3	2.6	0.9	0.8	1.0	0.1	-	-	5.4
	4	1.9	1.2	0.8	1.2	0.1	-	-	5.4
	5	1.9	1.1	0.7	1.1	0.1	-	-	4.9
	6	2.6	1.2	1.1	1.2	0.1	-	-	6.2
	7	6.4	0.9	1.4	0.8	0.1	-	-	9.6
	8	5.1	0.6	1.0	0.6	0.1	-	-	7.4
Σ		27.6	7.1	7.8	7.1	0.8	-	-	50.6
Σ x 3 =		82.8	21.3	23.4	21.3	2.4	-	-	151.8 ← For check
Holiday	1	3.2	0.5	0.9	0.4	0.0	-	-	5.0
	2	3.9	0.5	0.9	0.4	0.0	-	-	5.7
	3	2.6	0.8	0.7	0.7	0.1	-	-	4.9
	4	1.9	1.1	0.7	0.8	0.1	-	-	4.6
	5	1.9	0.9	0.6	0.8	0.1	-	-	4.3
	6	2.6	1.1	1.0	0.8	0.1	-	-	5.6
	7	6.4	0.8	1.2	0.6	0.1	-	-	9.1
	8	5.1	0.5	0.9	0.4	0.0	-	-	6.9
Σ		27.6	6.2	6.9	4.9	0.5	-	-	46.1
Σ x 3 =		82.8	18.6	20.7	14.7	1.5	-	-	138.3 ← For check

Annex 3-9 (3)

Test of Goodness of Fit in Pekanbaru

(Unit: 10^2 kW)

	April 17, 1984		$\frac{(x_1 - z_1)^2}{z}$	Dec. 20, 1982		$\frac{(x_2 - z_2)^2}{z}$
	x_1	z_1, estimated		x_2	z_2, estimated	
1	57	56	0.018	43	44	0.023
2	61	63	0.063	46	50	0.320
3	52	55	0.164	43	44	0.023
4	51	55	0.291	43	44	0.023
5	53	49	0.327	48	40	1.600
6	52	63	1.921	45	50	0.500
7	95	97	0.041	74	77	0.117
8	90	75	3.000	66	60	0.600
Σ	511	511	5.825	408	408	3.206
			‖ χ_1^2			‖ χ_2^2

The test of goodness of fit for load curves in Pekanbaru was checked with respect to each one day in 1985 and 1982. Since the estimated values have been corrected to match actually daily energy consumption, the freedom for performing χ^2-test is $\phi = n - 1 = 7$.

$$\chi_1^2 < \chi^2_{\phi=7}(0.5) = 6.35$$

$$\chi_2^2 < \chi^2_{\phi=7}(0.75) = 4.25$$

In both cases, the estimated load curves match very well with the actual values.

Annex 3-10 Analysis for Estimating the Maximum Power Demand per Hour from the Model Load Curve

Unit: MW

Time	July 1984 15 (Sun.)	18 (Wed.)			Dec. 1984 16 (Sun.)	19 (Wed.)			March 1985 17 (Sun.)	20 (Wed.)		
	x_1	y_1	x_1^2	y_1^2	x_2	y_2	x_2^2	y_2^2	x_3	y_3	x_3^2	y_3^2
1	22.1	x29.6	488.4		31.1	x31.2	967.2		x32.0	x31.0		
2	18.8	29.3	353.4	858.5	x25.7	30.5		930.3	31.0	31.5	961.0	992.3
3	x10.5	29.5		870.3	26.2	30.2	686.4	912.0	31.0	31.2	961.0	973.4
Σ	99.7		2570.6		118.0		3495.9		124.7		3887.7	
$\bar{\Sigma}$	24.9		642.7		29.5		874.0		31.175		971.9	
σ_1		4.76 (19.1%)				1.94 (6.6%)				0.21 (0.7%)		
4	x14.8	29.4		864.4	x26.2	29.9		894.0	31.5	x31.2	992.3	
5	20.0	26.0	400.0	676.0	27.0	30.6	729.0	936.4	31.5	32.0	992.3	1024.0
6	24.1	x33.1	580.8		29.0	x32.6	841.0		34.0	x34.2	1156.0	
Σ	99.5		2521.2		116.5		3400.4		129.0		4164.6	
$\bar{\Sigma}$	24.9		630.3		29.1		850.1		32.25		1041.2	
σ_2		3.21 (12.9%)				1.81 (6.2%)				1.04 (3.2%)		
7	22.2	x25.8	492.8		26.5	x29.6	702.3		30.3	x31.7	918.1	
8	20.3	15.9	412.1	252.8	26.0	27.4	676.0	750.8	x24.5	25.5		650.3
9	21.3	x14.5	453.7		28.8	x20.0	829.4		30.7	24.8	942.5	615.0
Σ	79.7		1611.4		108.7		2958.5		111.3		3125.9	
$\bar{\Sigma}$	19.9		402.9		27.18		739.6		27.83		781.5	
σ_3		2.62 (13.2%)				0.92 (3.4%)				2.64 (9.5%)		
19	32.8	x28.7	1075.8		41.7	38.3	1738.9	1466.9	39.7	38.1	1576.1	1451.6
20	35.8	31.7	1281.6	1004.9	x41.8	x33.8			40.9	38.8	1672.8	1505.4
21	x40.0	35.4		1253.2	40.4	35.8	1632.2	1281.6	x46.3	x37.5		
Σ	135.7		4615.5		156.2		6119.6		157.5		6205.9	
$\bar{\Sigma}$	33.93		1153.9		39.05		1529.9		39.38		1551.5	
σ_7		1.62 (4.8%)				2.24 (5.7%)				0.83 (2.1%)		
22	31.4	x32.5	986.0		33.2	x33.3	1102.2		x35.1	34.7		1204.1
23	27.6	29.2	761.8	852.6	29.1	29.0	846.8	841.0	33.2	31.3	1102.2	979.7
24	x26.4	26.8		718.2	29.5	x27.5	870.3		28.8	x28.7	829.4	
Σ	115.0		3318.6		120.8		3660.3		128.0		4115.4	
$\bar{\Sigma}$	28.75		829.7		30.2		915.1		32.0		1028.9	
σ_8		1.76 (6.1%)				1.74 (5.8%)				2.20 (6.9%)		

Note: The values denoted by x refer to the values calculated from those in statistics excluding the maximum and minimum values from groups x_i and y_i.
The values in parenthesis refer to the ratio to average values.

Annex 3-11 Example of Obtaining Daily Maximum and Minimum Power Demand

The daily maximum and minimum power demand is obtained by calculation from the values in Annex 3-7 (1), (2).

(Unit: MW, MWh)

Week day	Minimum	$78.3 - 2 \times 0.07 \times 78.3 \fallingdotseq 67.3$	Daily L.F.
	Maximum	$118.2 + 2 \times 0.07 \times 118.2 \fallingdotseq 134.8$	68.7%
	Daily	2,222.7	
Holiday	Minimum	$70.3 - 2 \times 0.07 \times 70.3 \fallingdotseq 60.5$	Daily L.F.
	Maximum	$106.9 + 2 \times 0.07 \times 106.9 \fallingdotseq 121.9$	66.5%
	Daily	1,944.5	

Annex 3-12 Example of Obtaining Yearly Maximum and Minimum Power Demand

The yearly maximum and minimum power demand is obtained as follows form the calculation chart in Annex 3-7 (1), (2).

Unit: MW, GWh

Yearly	Minimum	Holiday minimum 70.3 ÷ 1.059 - (14% portion) = 57.1	Yearly L.F 63.3%
	Maximum	Week day maximum 118.2 x 1.059 + (14% portion) = 142.7	
	Yearly	791.3	

Note: Coefficient of increase/6 months $\frac{\text{Sold energy in the next year}}{\text{Sold energy in this year}} \div 2 = 1.059$

Annex 3-13 Example of Obtaining Monthly Sending End Energy Demand

Average power $P_A = \frac{\pi}{8,760 \text{ hr.}}$ = 0.09033 GWh

: from Annex 3-7 (1), (2).

When an increase rate per six months is taken into account, the power demand in one month is,

6 m increase rate

$P_{Mar.} = P_A \times 1.059$ x 730 hr. = 69.83 GWh

$P_{Apr.} = P_A \div 1.059$ x 730 hr. = 62.27 GWh

where $\Delta = \frac{P_{Mar.} - P_{Apr.}}{11}$ = 0.687 GWh

$P_{Feb.} = P_{Mar.} - \Delta$

$P_{Jan.} = P_{Feb.} - \Delta$

Months	Monthly allocation (GWh)
4	62.3
5	63.0
6	63.7
7	64.3
8	65.0
9	65.7
10	66.4
11	67.1
12	67.8
1	68.4
2	69.1
3	69.8

Annex 4-1 Effect of Transmission Loss upon the Respective Alternative Plans for Trunk Power System

1. Comparison between Basic 150 kV Plan and Alternative Plans

Year	(A) Basic Plan		(B) Alternative 150 kV Plan		(C) Alternative 150 kV Plan In case no investment is made in 2005	
	T/L loss (MW)	Capacity of converter (MVA)	T/L loss (MW)	Capacity of converter (MVA)	T/L loss (MW)	Capacity of converter (MVA)
1993	2.3	0	2.0	0	2.0	0
1995	5.8	31	8.7	31	8.7	31
2000	9.6	48	10.4	7	10.4	7
2005	18.7	171	23.1	156	23.1	156
2005*	16.0	152	16.0	152	-	

* In case of loop operation

The Plans (B) and (C) are apparently disadvantageous over the basic plan (A) since these plans require higher construction cost and are larger in transmission loss than the basic plan (A).

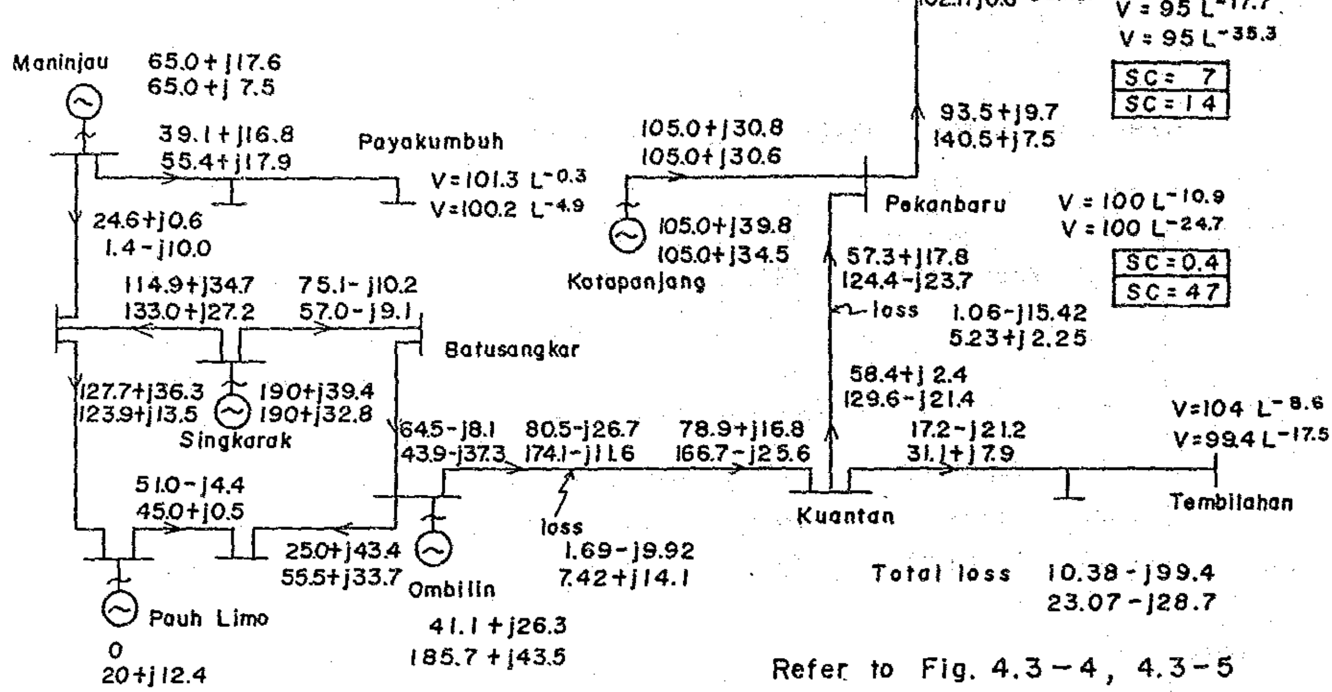
In case a loop configuration is not adopted for the basic plan (A), the capacity of condensers required to be installed is by 15 MVA larger in 2005 than that for the Plans (B) and (C), and a resultant additional cost is about ¥10 million per year. Even in this case, the effect of increase in power loss (4.4 MW, namely, 4.4 MW x 8,760h x 0.432 = 16,650 MWh/year) of Plans (B) and (C) is still greater that in the case of the basic plan (A).

0.432: Loss factor

2. Power Flow of Alternative 150kV Plan

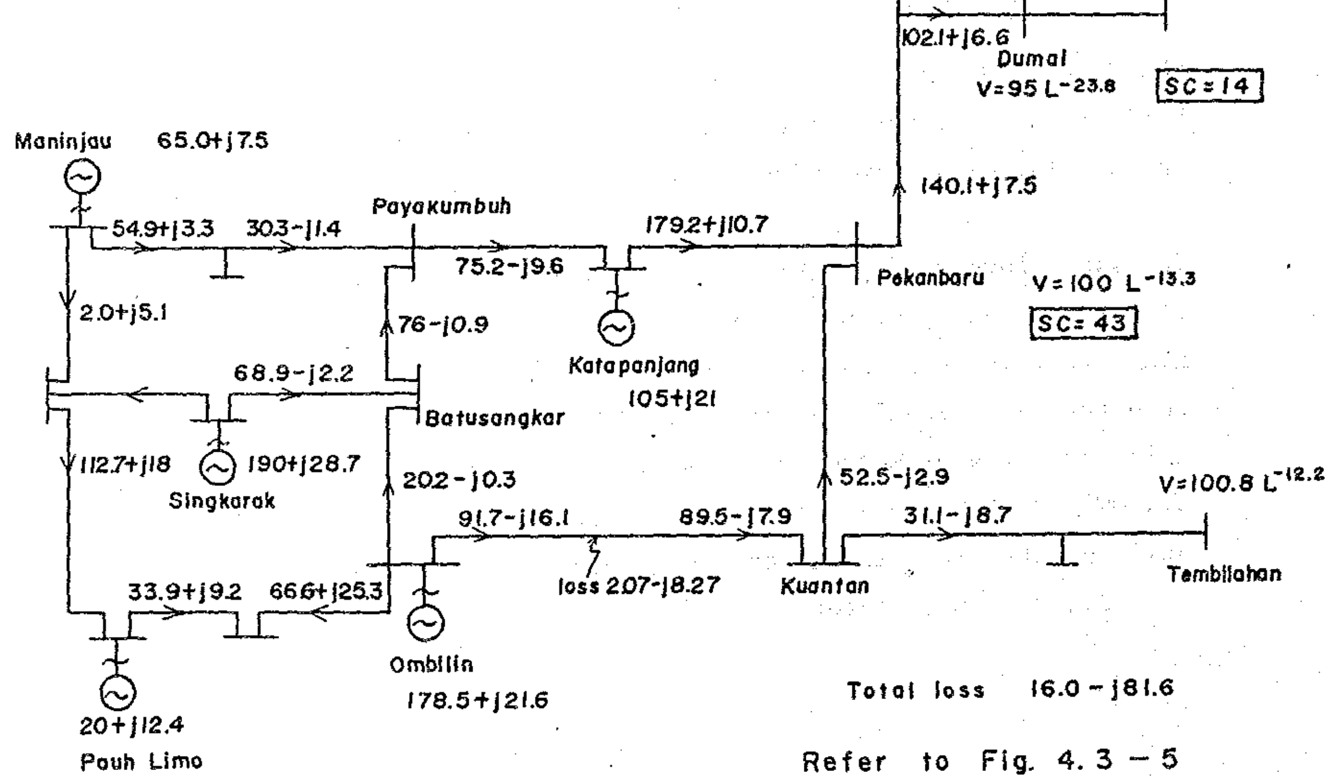
Upper figure shows Power Flow in 2000

Lower figure shows Power Flow in 2005



Refer to Fig. 4.3-4, 4.3-5

3. Power Flow in Case of Loop System in 2005



Refer to Fig. 4.3 - 5

4. Comparison between 150 kV Plan and 275 kV Introduction Plan

The amount of power loss in the basic plan and alternative 275 kV introduction plan is roughly calculated and compared as listed below.

Transmission loss in 2005

(Unit: MW)

	Ombilin - Kuantan	Kuantan - Pekanbaru	Other sections	Total
Power loss in 150 kV line	7.4	5.2	10.4	23.0
Power loss in 275 kV line *1	1.5	1.1	10.4	13.0
Power loss in 150 kV loop line (Basic Plan)				16.0

*1. This power loss is approximately calculated by taking into account the difference of voltage and resistance between conductors.

In the case of the 275 kV plan, transmission loss is reduced by about 3 MW. This amount is equivalent to about ¥116 million in terms of annual expenditures*2, about ¥935 million in terms of the amount of investment or ¥240 million in terms of present value. The results of economic comparison taking into consideration transmission loss as shown in Table 4.2-3 become as follows:

Unit: 10^6 Yen

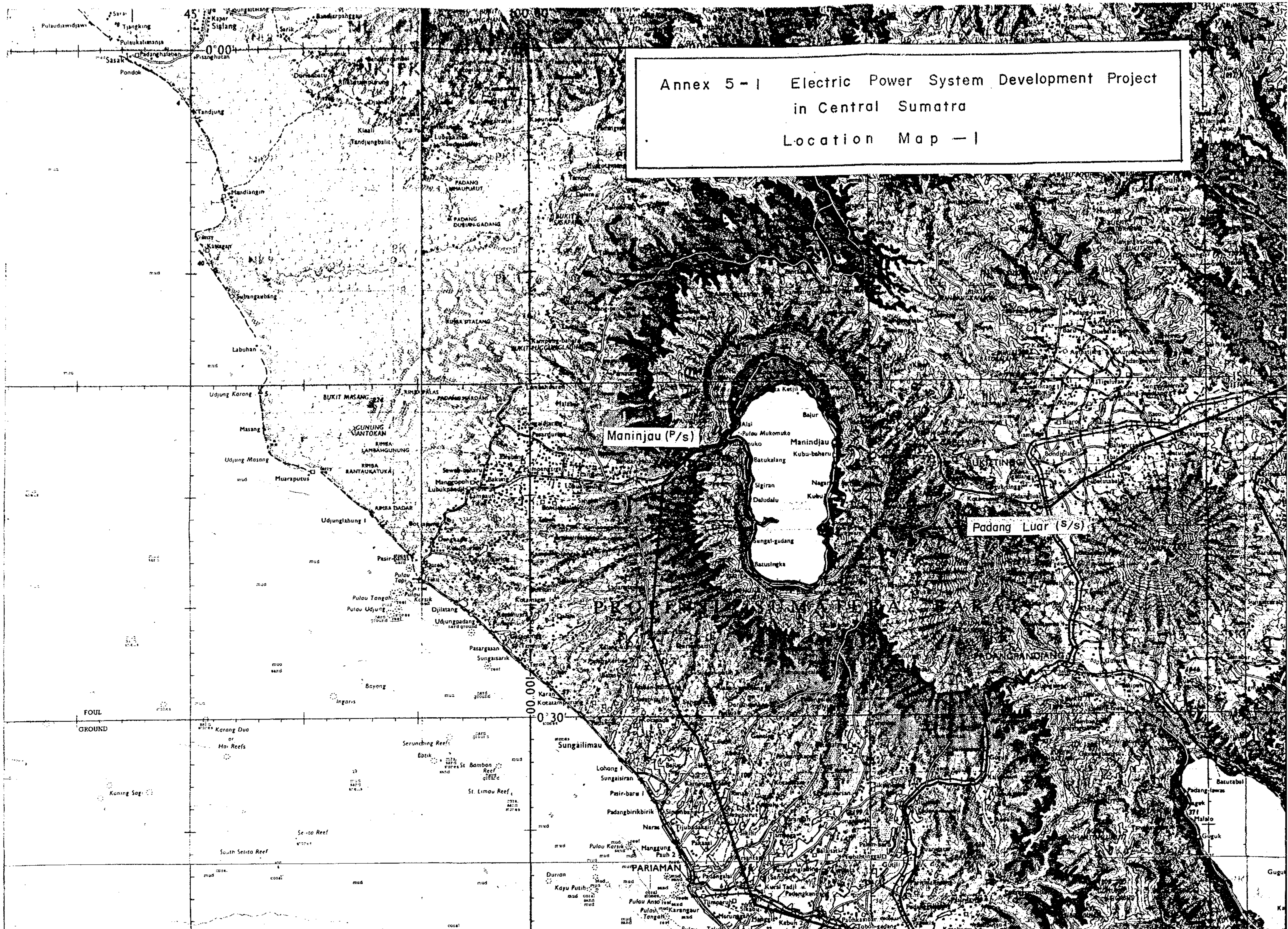
	A: Basic 150 kV plan	B: 275 kV plan	C: Initial 150 kV & later 275 kV plan
Present value of construction cost	6,041	11,634	8,321
Reduction of power loss		-240	-240
Total	6,041	11,394	8,081

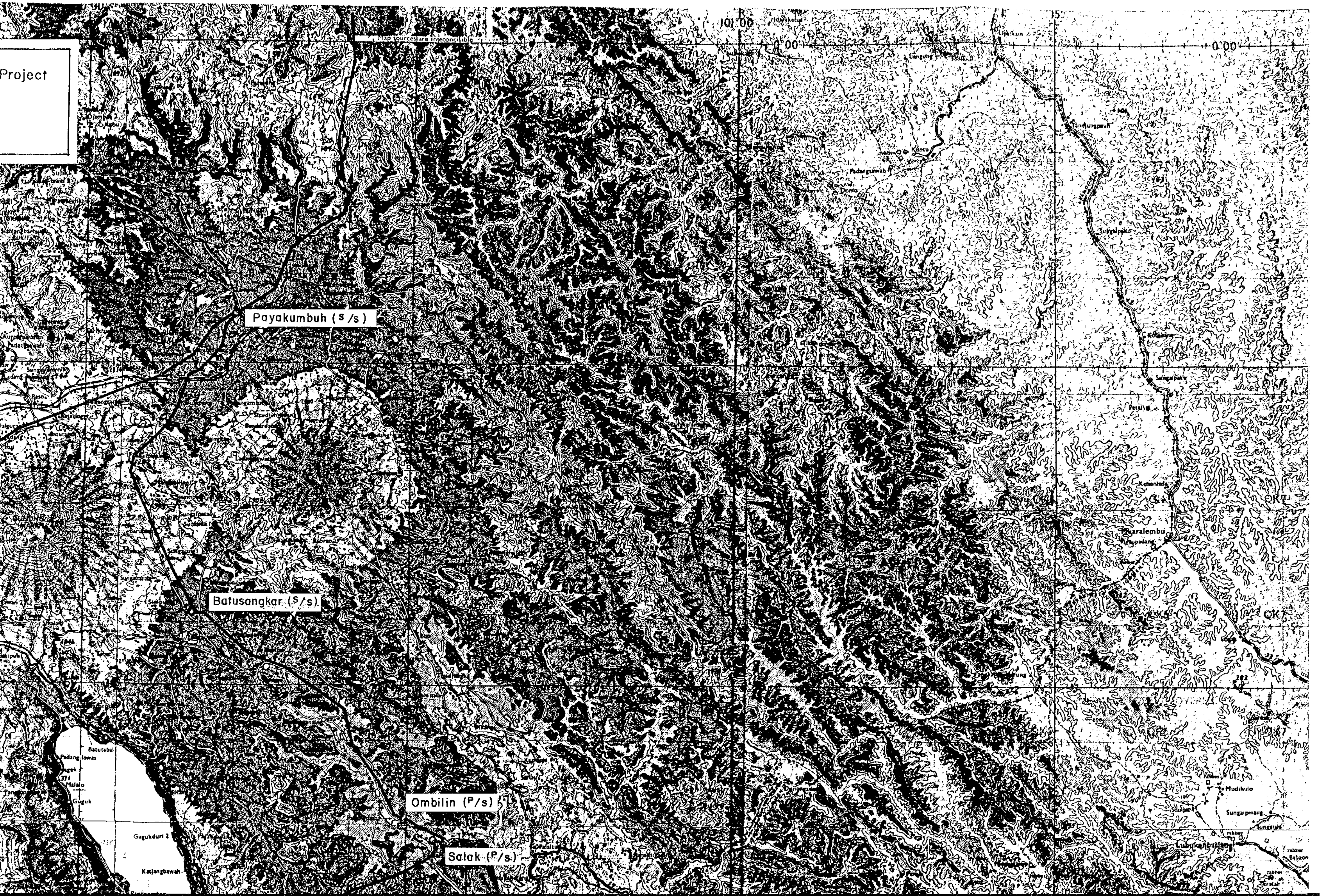
As listed above, the basic 150 kV plan (A) is apparently advantageous over the other alternative plans even though the amount of power loss is considered.

*2. Regarding conversion of power loss in terms of monetary value, refer to 4.4(d).

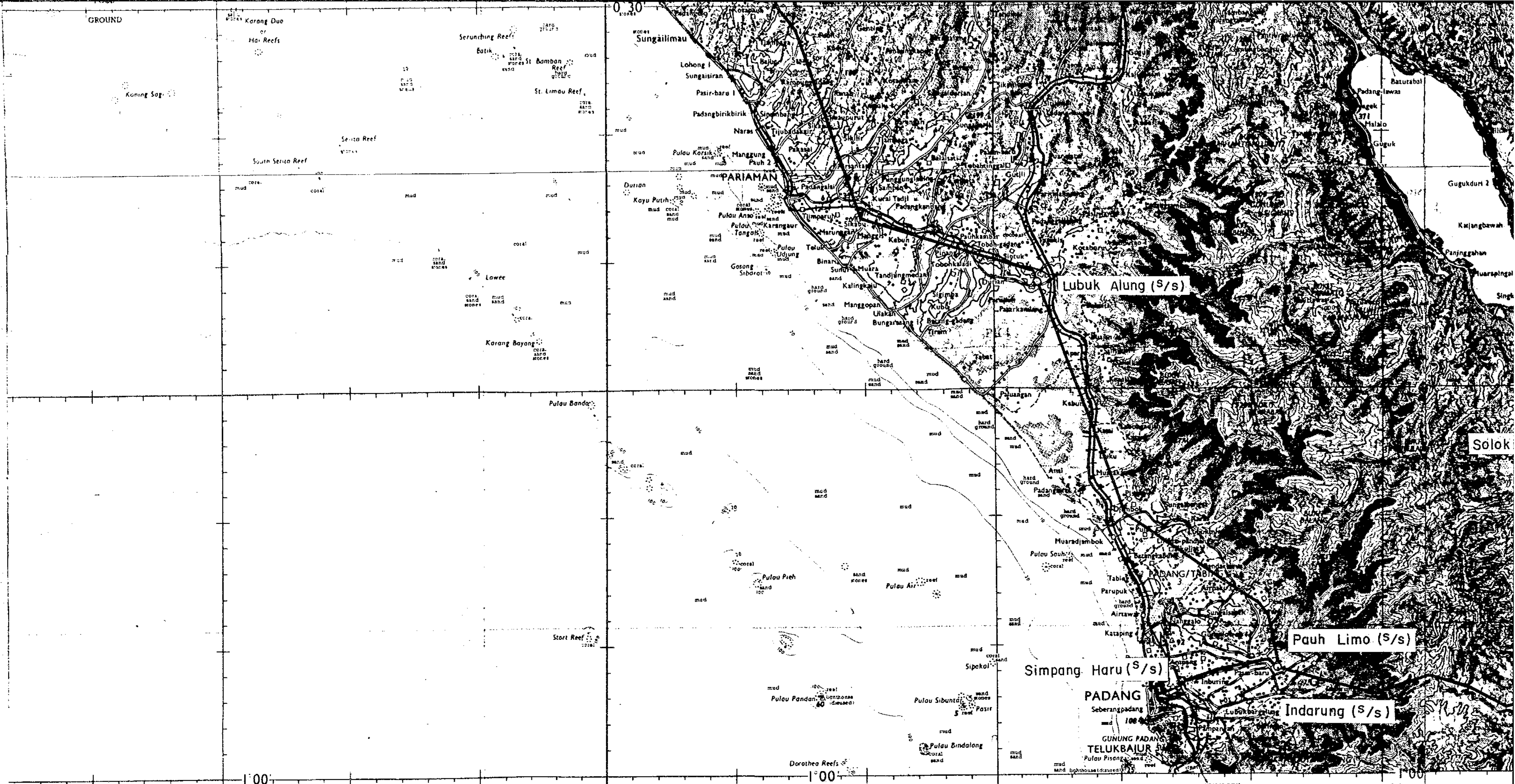
Annex 5-1 Electric Power System Development Project in Central Sumatra

Location Map -1





Project
Map sources are irreconcilable
Payakumbuh (S/s)
Batusangkar (S/s)
Ombilin (P/s)
Salak (P/s)



ELEVATIONS IN METRES

DEPTHS IN FATHOMS

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...RATIONS GRAPHIC-GROUND

Scale 1 250,000

20 Statute Miles

30 Kilometres

20 Nautical Miles

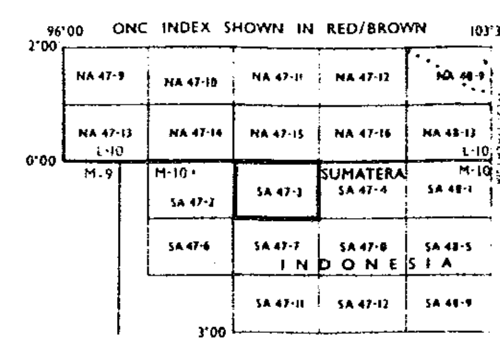
INTERVAL 100 METRES WITH SUPPLEMENTARY CONTOUR AT 50 METRES

TRANSVERSE MERCATOR PROJECTION

GLOSSARY

Air, A.	river
Batang, B.	river
Bukit	hill, mountain
Danau	lake
Gosong	bank, reef, shoal
Guguk	mountain
Gunung	mountain
Kabupaten	regency
Karang	reef
Kotapradja	municipality
Muara	estuary
Padang	open grass area
Propinsi	province
Pulau	island
Rawang	marsh, swamp
Rimba	patch of trees
Sungai, S.	river
Udjung	cape, point

LOCATION DIAGRAM FOR SA 47-3



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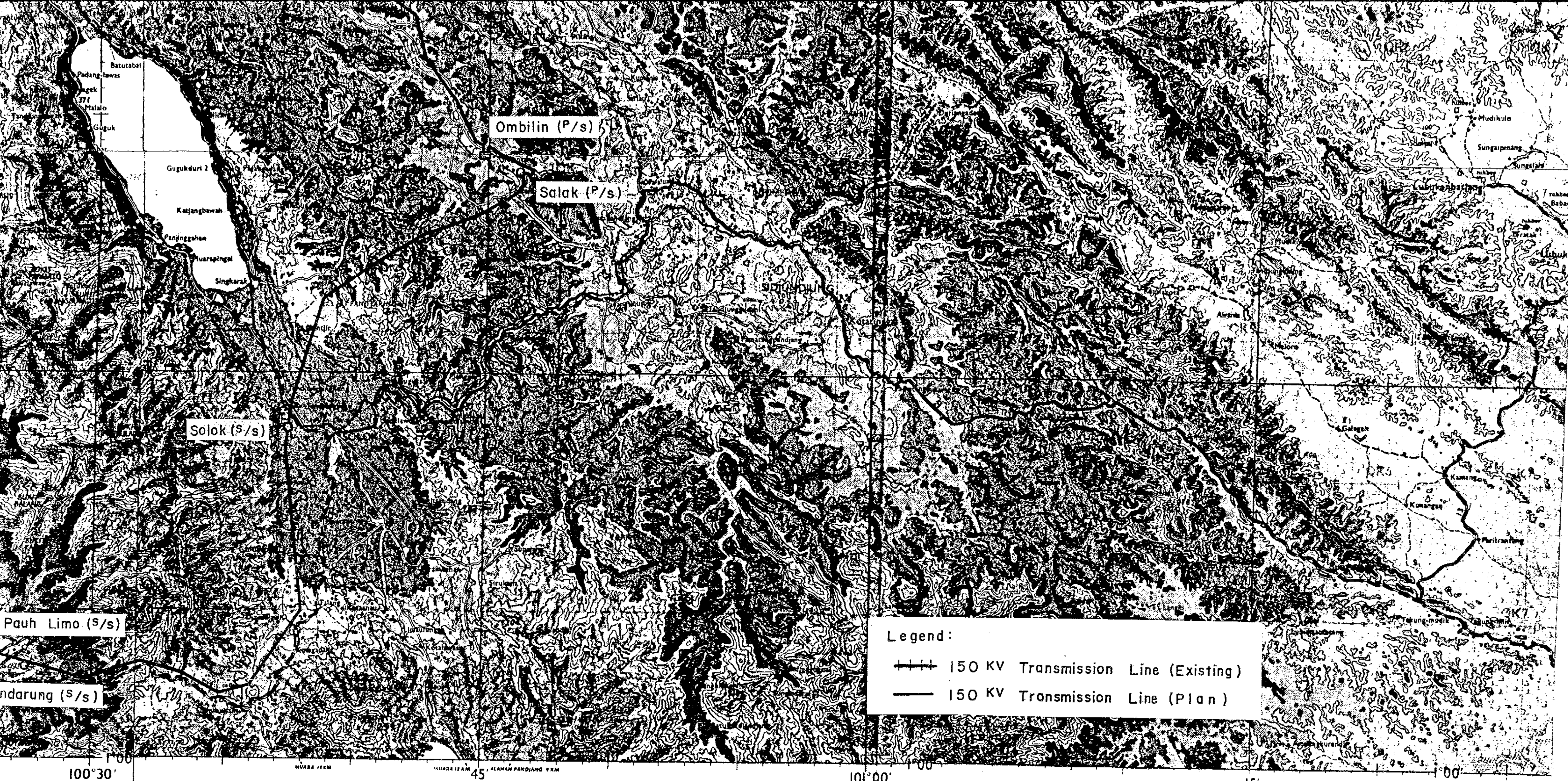

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ELEVATIONS IN METRES

DEPTHS IN FATHOMS

AGRAM FOR SA 47-3

WN IN RED/BROWN

NA 47-11	NA 47-12	NA 48-9
NA 47-15	NA 47-16	NA 48-13
SA 47-3	SUMATERA SA 47-4	SA 48-1
SA 47-7	SA 47-8	SA 48-5
SA 47-11	SA 47-12	SA 48-9

INDONESIA

01XSA4703

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HEET	SA 47-3
DITION	1-GSGS

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JOINT OPERATIONS GRAPHIC-GROUND

Scale 1:250 000

Statute Miles
Kilometres
Nautical Miles

CONTOUR INTERVAL 100 METRES WITH SUPPLEMENTARY CONTOUR AT 50 METRES

TRANSVERSE MERCATOR PROJECTION

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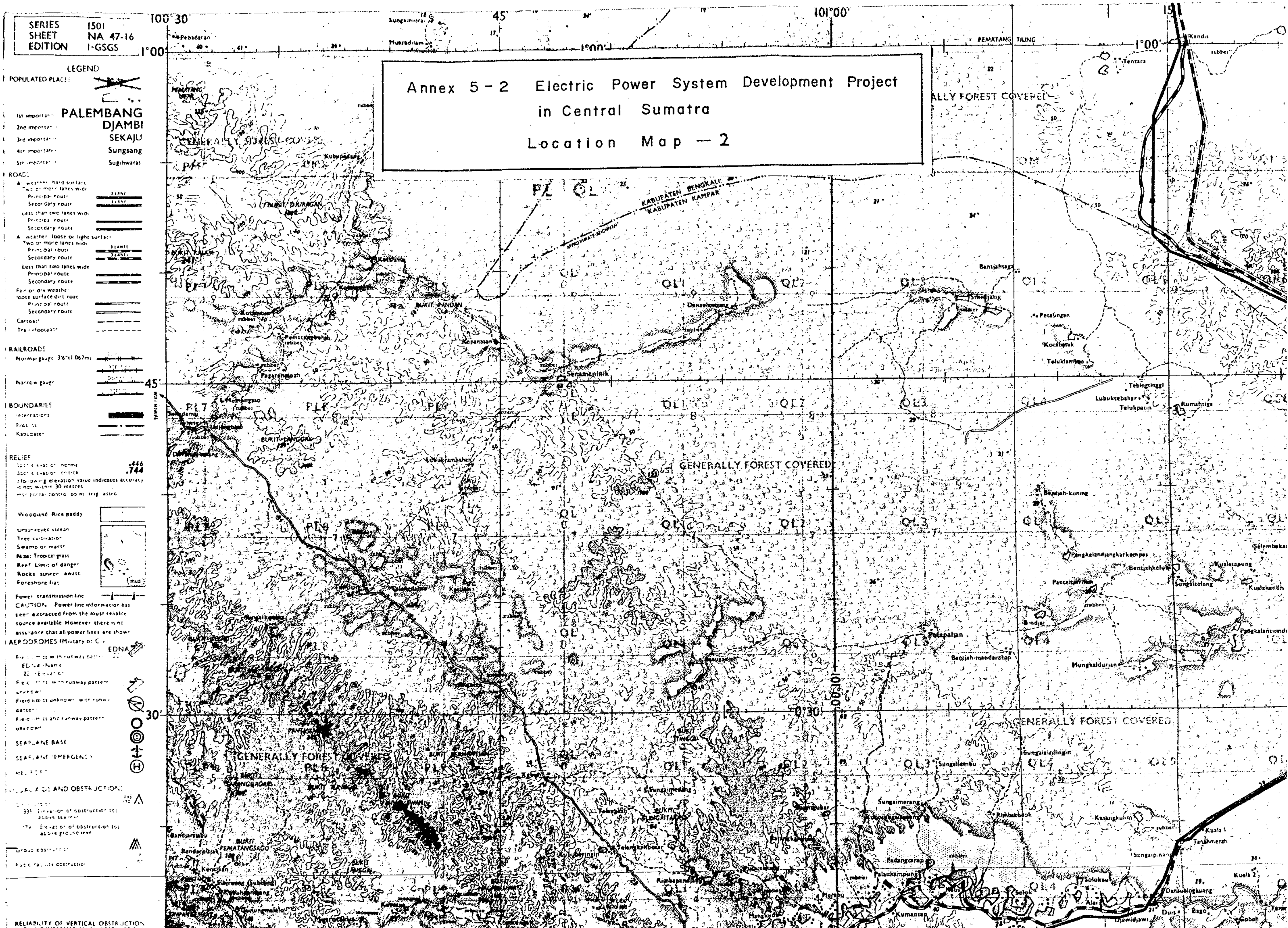
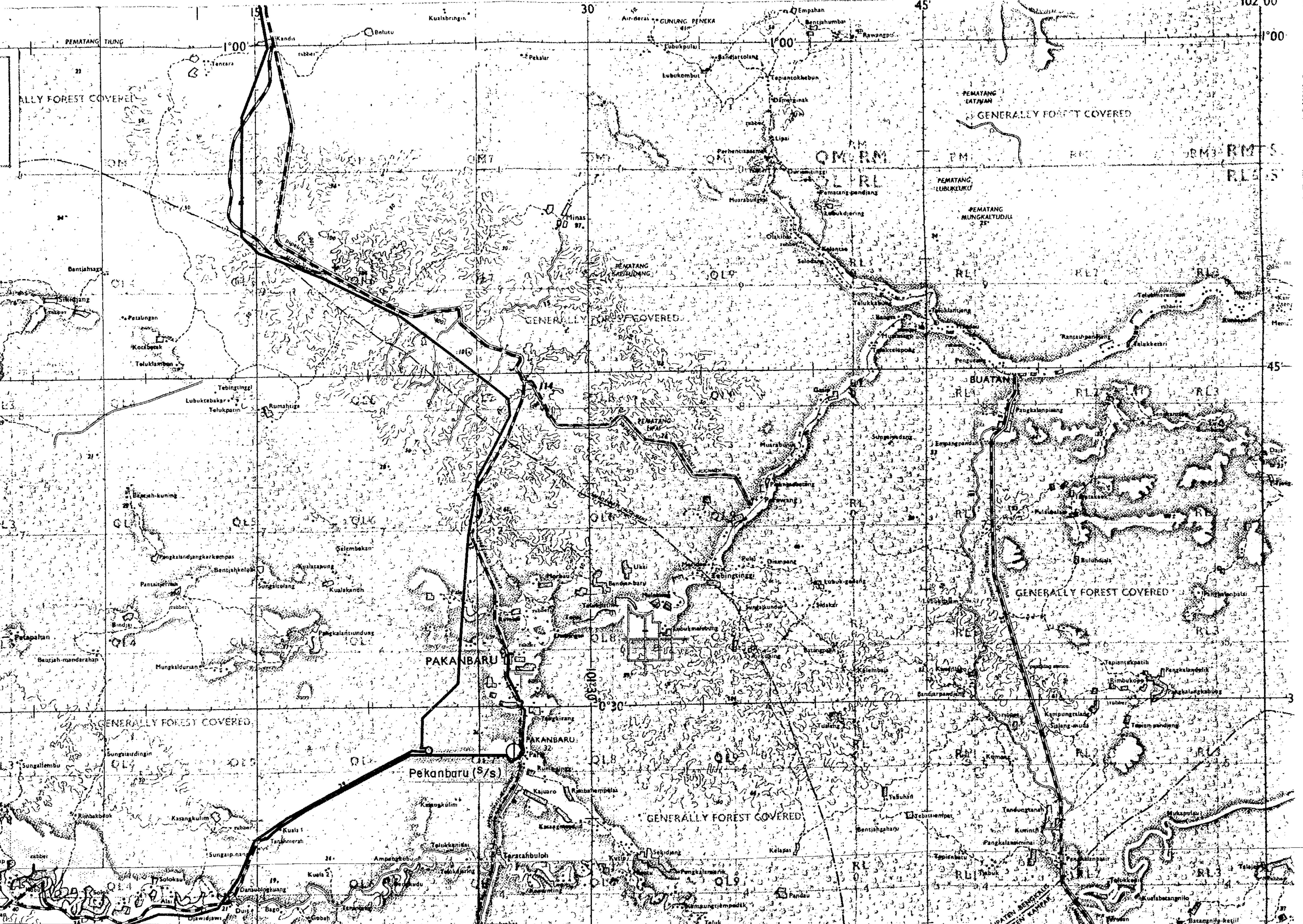
Annex 5-2 Electric Power System Development Project in Central Sumatra

Location Map - 2





30'
45'
102°00'
1°00'
1°00'
45'
0°30'
PEMATANG TIUNG
Kandis
Belutu
Kualabringin
Empehan
GUNUNG PENEKA
Lubukpulai
Bandjarsolang
Lubukombut
Tepiantokkebun
Pekalar
Tentara
ALLY FOREST COVERED
PEMATANG LATIJAN
GENERALLY FOREST COVERED
OM7
QM
RM
QL
RL
PEMATANG LUBUKLUKU
PEMATANG MUNGKALTUDJU
Pematang-pandjang
Minas
Bantjahsaga
Sikidjang
Petabungan
Kotabesak
Teluklambon
GENERALLY FOREST COVERED
BUATAN
Pangkalanpinang
Tebingtinggi
Lubuktebakar
Telukpatin
Rumahtige
PEMATANG LIPAI
Muarabungo
Pangkalanbetung
Sungaipadang
Empangpandan
Bentjah-kuning
Selembekan
Kualasapung
Kualakandit
Pantaijeriah
Sungaiselang
Bindjai
Petapahan
Mungkaldursan
Tebingtinggi
GENERALLY FOREST COVERED
Lubukkulim
Pangkalantjundung
Lubukmalebung
PAKANBARU
Kelembaja
Bandarpandjang
Tepiantakpatih
Rimbukopo
GENERALLY FOREST COVERED
Sungaiandingin
Sungailembu
PAKANBARU
Pekanbaru (S/s)
Kumbaliang
Kajuaro
Kasangkulim
Rijnbakodok
Kuala 1
Tanahmerah
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GENERALLY FOREST COVERED
Talisuhai
Tandungtanah
Kurinchi
Pangkalankuras
Teratahbuloh
Teluknipidat
Ampangkolu
Solokau
Solok
Alai
Danaubingkuang
Duis
Bago
Gobah
Pangkalanmarik
Sekidjang
Kelapas
Pandau
QL9
Kampungtjempedak
Teluk
Tjinak
Kuelabatangnilo
Batangnilo-ketjil

AND OBSTRUCTION

Elevation of obstruction top above sea level

Elevation of obstruction top above ground level

Group obstruction

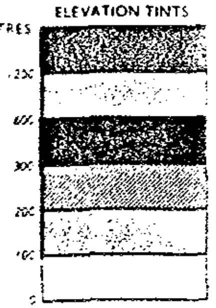
Vertical facility obstruction

RELIABILITY OF VERTICAL OBSTRUCTION DATA. NO INFORMATION ON OBSTRUCTIONS IS AVAILABLE WITHIN THE AREA OF THIS GRAPHIC

GEOREF
BASIC 15 QUADRANGLE

ELEVATION TINTS

METRES



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INDONESIA

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EDITION	1-GSGS

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ELEVATIONS IN METRES

JOINT OPERATIONS GRAPHIC-GR

Scale 1:250,000

CONTOUR INTERVAL 100 METRES WITH SUPPLEMENTARY CONTOUR AT 50 METRES

Contour 100 Supplementary contour 50

TRANSVERSE MERCATOR PROJECTION

Figures in red/brown along roads denote approximate distances in kilometres between markers

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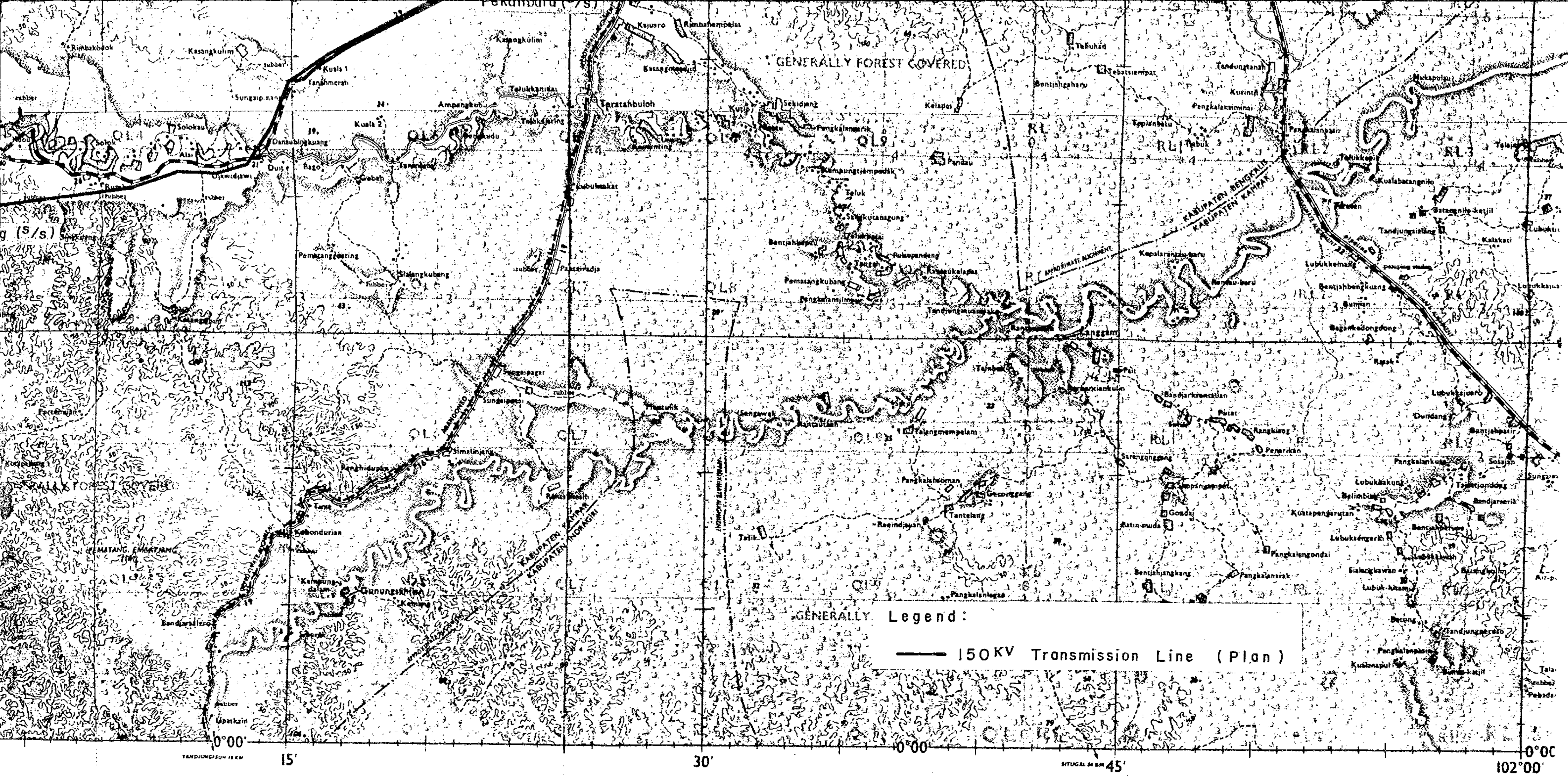

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Scale 1 250.000

20 Statute Miles

30 Kilometres

20 Nautical Miles

CONTOUR INTERVAL 100 METRES WITH SUPPLEMENTARY CONTOUR AT 50 METRES

Contour 100 Supplementary contour 50

TRANSVERSE MERCATOR PROJECTION

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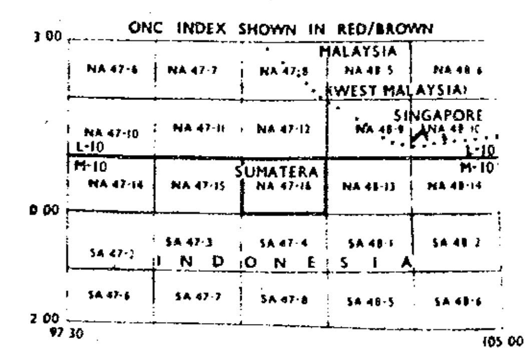

GLOSSARY

Air	stream
Bantjah, Bentjah	marsh
Batang	river
Bukit	hill
Danau	lake
Gunung	mountain
Kabupaten	regency
Pematang	hillock
Propinsi	province
Rawa, Rawang	marsh, swamp
Sungai S.	river
Tasik	lake
Tengah -tengah	central

STOCK NO. 1501XNA4716

A-42

SERIES	1501
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EDITION	1-GSGS