

### Ⅲ. ルソン系統（一部VISAYA/MINDANAO）における 最近の発電所運転状況について



### Ⅲ. ルソン系統（一部VISAYAS/MINDANAO）における 最近の発電所運転状況について

1. ルソン系統では火力が発電の大半を占めている。1992年の最大電力は 3,250MW、発電電力量は 19,942GWHで、電力量の構成比は火力57.5%、地熱22.3%、ガスタービン10.5%、水力9.2%であった。また、1984年以降、電源開発はガスタービンが主体で、ベース電源が建設されていない。（Table 1-1）
2. ルソン系統ではここ数年間電力制限が続いている。特に1992年には、制限日数 267日間（年間日数の73.0%）、不足電力量1,008GWH（不足率 4.8%）、平日平均不足電力は 343 MW（不足率11.4%）であった。1993年1月～4月には、更に悪化して、制限日数110日（当期間日数の91.7%）、不足電力量970GWH（不足率13.7%）、平日平均不足電力は825MW（不足率26.9%）となった。最近は6～8時間に及ぶ停電が連日行われている。（Table 1-2, 3-1）
3. 地熱、水力及びガスタービンは比較的順調に運転されている。また、これらの発電所はユニット容量が小さい為、停止による影響が小さい。地熱では、ティウィ発電所が蒸気不足の為利用率が低い、生産井の増強が計画されている。2年続きの濁水とカラヤーン発電所の補修の為、1992年は水力の利用率が低かった。ガスタービンは非常に高い稼働率で運転されている。（Table 1-3）
4. 火力発電所は出力低下と事故停止多発の為利用率が低い。リハビリテーション等の特殊なケースを除いた実績は、稼働率80%程度に対し利用率は60%程度である。1992年はマラヤ発電所の利用率が特に低かった。（Table 1-3）

火力発電所の計画停止（Scheduled Outage）が短く、事故停止（Forced Outage）が多い。過去4年間の年平均停止日数は、リハビリテーション等を除いて、計画停止が44日、事故停止が22日であった。また、1992年のユニット当たり平均停止日数は、計画停止が4.5回、事故停止が7.4回であった。（Table 2-1, 2-2, 2-3）

火力発電所はユニット容量が大きい為、停止による影響が大きく、電力制限の原因の大半は火力発電所の出力低下と事故停止にあると言える。

出力低下と事故停止の多発は、不十分な保守、不適正な運転、不適当なパーツの使用等によるものである。この影響は1992年11月以降顕著に表れ、火力発電所の利用率は50%以下に低下している。最近では、マラヤ発電所2号機が、ボイラーチューブの劣化の為出力が大幅に低下し、事故停止が多い。（Table 3-1, 3-2, 3-3, 3-4, 2-3）

5. 現在新規電源の開発が鋭意進められており、電力危機は近い将来一応解消される見通しである。（Table 4-1, 4-2, 4-3） また、リハビリテーションも、現在実施中のスーカット

3号に続いてスーカット2号、バターン、マクバン、ティウィ発電所が計画されている。その結果、需要バランスはかなり改善される見込みであり、従って今後は、既設発電所、特に火力発電所の信頼度向上が重要な課題となる。

Table 1-1 GROSS GENERATION (LUZON GRID)

(GWH)

PLANT	CY	INS. MW	N	1987	1988	1989	1990	1991	1992
MAK-BAN	79-84	330	6	2247.07	2199.69	2431.15	2538.24	2451.82	2437.54
TIWI	79-82	330	6	1479.66	1824.80	2004.35	1956.76	2039.11	1997.45
		(14.4)		(23.3)	(23.1)	(24.4)	(23.9)	(23.0)	(22.3)
GPP		660	12	3726.73	4024.49	4435.50	4495.00	4490.93	4434.99
BATAAN 1	72	75	1	475.29	429.78	521.14	454.04	372.27	538.32
BATAAN 2	77	150	1	966.90	811.23	983.93	588.62	4.84	284.70
SUCAT 1	68	150	1	624.54	395.29	356.69	1044.68	973.24	1069.51
SUCAT 2	70	200	1	949.75	746.06	703.65	685.69	712.76	1096.72
SUCAT 3	71	200	1	439.52	629.43	933.35	740.93	562.12	996.67
SUCAT 4	72	300	1	1181.12	629.77	581.21	300.92	2332.77	1406.67
MANILA 1	65	100	1	590.84	564.73	508.95	663.67	728.83	661.41
MANILA 2	66	100	1	592.33	569.69	483.07	714.21	631.99	683.08
MALAYA 1	75	300	1	538.22	1884.32	1567.67	2106.03	1581.82	1245.69
MALAYA 2	79	350	1	2029.00	2121.67	2209.31	2197.69	1897.06	1828.97
CALACA	84	300	1	1948.93	1996.24	2053.14	1601.23	1826.70	1655.35
		(48.5)		(64.6)	(61.9)	(59.9)	(59.0)	(59.6)	(57.5)
TPP		2225	11	10336.44	10778.21	10992.11	11097.71	11624.40	11467.09
BATAAN GT	89	120	4	-	-	162.19	496.72	370.98	619.87
MALAYA GT	89	90	3	-	-	122.49	343.52	287.31	340.50
NAVOTAS PB	91	60	2	-	-	-	-	275.36	297.31
HOPEWELL GT	91	210	3	-	-	-	-	588.12	843.92
		(10.5)				(1.6)	(4.5)	(7.8)	(10.5)
GT, DSL		480	12	-	-	284.68	840.24	1521.77	2101.60
AMBUKLAO	56-57	75	3	263.04	337.91	202.93	91.11	0.00	0.00
ANGAT	67-86	228	8	315.42	515.56	520.72	478.93	486.47	345.94
BINGA	60	100	4	362.62	464.33	491.15	431.14	405.61	393.04
MAGAT	83	360	4	585.51	919.34	994.20	980.73	535.60	753.45
MASIWAY	81	12	1	48.97	24.67	29.16	37.79	23.53	28.68
PANTABANGAN	77	100	2	187.52	71.85	111.63	134.57	183.76	174.90
CALIRAYA	45-50	32	4	11.66	18.29	15.08	9.09	19.23	39.08
BARIT	57	1.8	1	4.16	5.70	9.24	4.51	3.69	1.54
BOTOCAN	48-60	17	3	41.89	58.87	57.88	46.59	33.97	46.96
KALAYAAN	82	300	2	123.72	190.17	160.81	154.51	165.80	58.02
		(26.7)		(12.1)	(15.0)	(14.2)	(12.6)	(9.5)	(9.2)
HPP		1225.8	32	1944.51	2606.69	2592.8	2368.97	1857.66	1841.61
		<37>						(0.1)	(0.5)
OTHERS								21.96	96.71
		(100)		(100)	(100)	(100)	(100)	(100)	(100)
TOTAL		4590.8	67	16007.68	17409.39	18215.09	18801.92	19516.72	19942.00

10MW

KALAYAAN PUMPING	420.44	446.87	434.69	559.15	433.17	309.98
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INS. CAP (MW) A	4111	4111	4321	4321	4621	4591
PEAK LOAD (MW) B	2592	2780	2938	2973	3045	3250
A-B/A (%)	36.9	32.4	32.0	31.2	34.1	29.2

Table 1-2 BROWNOUT RECORDS (LUZON GRID)

	FREQUENCY (DAYS)						UNSERVED ENERGY (GWH)					
	1988	1989	1990	1991	1992	1993	1988	1989	1990	1991	1992	1993
JAN	3	1	7		6	27	1.49	0.09	6.18		6.03	167.62
FEB			5		11	25			1.72		17.32	197.40
MAR			8	5	17	31			12.16	6.87	41.12	315.92
APR		1	27	1	24	27		0.05	99.27	0.23	113.76	289.03
MAY			24		25				64.66		173.81	
JUN		3	21	4	28			0.20	53.09	4.92	148.29	
JUL	2	1	5	2	25		0.45	0.10	11.95	2.63	36.07	
AUG		1	1	2	22			0.07	0.02	0.82	25.57	
SEP	2	1	1	6	25		0.25	7.59	0.37	14.26	21.20	
OCT	5	10	4		28		3.34	18.14	1.77		124.83	
NOV		23		8	28			71.13		9.43	153.96	
DEC					28						145.87	
TOTAL	12	41	103	28	267	110	5.53	97.37	251.19	39.20	1007.83	969.97

GENERATED ENERGY (GWH)	17409	18215	18802	19517	19942	6108
UNSERVED RATIO ( % )	0.03	0.5	1.3	0.2	4.8	13.7

Table 1-3 PLANT AVAILABILITY / PLANT CAPACITY FACTOR (LUZON GRID)

( % )

PLANT	CAP MW	1987		1988		1989		1990		1991		1992	
		P A	PCF	P A	PCF	P A	PCF	P A	PCF	P A	PCF	P A	PCF
MAK-BAN	330	84.89	77.73	85.58	75.89	90.46	84.10	93.29	87.80	89.13	84.81	92.42	84.09
TIWI	330	70.49	51.19	79.46	62.95	80.88	69.34	82.02	67.69	82.39	70.54	86.93	68.91
GPP	660	77.69	64.46	82.52	69.42	85.67	76.72	87.65	77.75	85.76	77.67	89.67	76.50
BATAAN 1	75	81.78	72.34	74.98	65.24	91.13	79.32	83.23	69.11	77.48	56.66	89.71	81.71
BATAAN 2	150	80.32	73.58	70.52	61.57	88.82	74.88	52.68	44.80	0.92	0.37	35.57	21.61
SUCAT 1	150	97.45	47.53	64.55	30.00	54.13	27.15	88.44	79.50	86.64	74.07	91.68	81.17
SUCAT 2	200	82.06	54.21	78.85	42.47	83.75	40.16	90.78	39.14	58.59	40.68	83.66	62.43
SUCAT 3	200	67.49	25.09	60.27	35.83	94.39	53.27	64.67	42.29	68.14	32.08	89.11	56.73
SUCAT 4	300	70.77	44.94	51.77	23.90	75.10	22.12	16.21	11.45	93.75	88.77	70.57	53.38
MALAYA 1	300	25.02	20.48	85.82	71.51	73.06	59.65	89.89	80.14	74.44	60.19	67.88	47.27
MALAYA 2	350	89.46	66.18	84.48	69.01	90.58	72.06	85.99	71.68	75.50	61.87	87.93	59.49
MANILA 1	100	86.09	67.45	94.94	64.29	82.18	58.10	88.44	75.76	96.99	83.20	86.98	75.30
MANILA 2	100	88.04	67.62	93.08	64.86	75.54	55.14	96.44	81.53	84.54	72.14	90.32	77.76
CALACA	300	84.58	74.16	82.50	75.75	91.47	78.18	75.78	60.93	86.89	69.51	77.79	62.82
TPP	2225	(82.10)	(58.10)			(84.41)	(58.02)	(81.45)	(64.03)	(79.64)	(63.92)	(81.16)	(61.35)
		74.40	53.03	75.55	55.15	82.37	55.93	72.65	56.94	74.33	59.64	78.10	58.67
BATAAN GT	120	-	-	-	-	94.02	50.73	86.98	47.25	63.17	35.29	83.10	58.81
MALAYA GT	90	-	-	-	-	88.64	23.24	97.21	43.57	97.49	36.44	72.84	43.07
NAVOTAS PB	60	-	-	-	-	-	-	-	-	74.29	37.83	70.03	52.07
HOPEWELL GT	210	-	-	-	-	-	-	-	-	97.66	35.01	86.48	45.75
G T	480	-	-	-	-	91.71	33.62	91.36	45.67	85.39	35.85	80.91	49.33
AMBUKLAO	75	87.39	40.04	98.62	51.29	63.64	30.89	32.56	13.87	0.00	0.00	0.00	0.00
BINGA	100	91.36	41.39	97.78	52.86	95.40	56.07	92.60	49.22	89.73	46.30	94.23	44.74
ANGAT	280	77.72	15.79	87.10	25.74	90.98	26.07	96.51	23.98	99.38	24.36	76.22	17.27
PANTABANGAN	100	99.32	21.41	85.18	8.18	99.83	12.74	99.22	15.36	95.40	20.98	89.77	19.91
MAGAT	360	95.86	18.57	95.83	29.07	87.93	31.53	95.79	31.10	92.53	16.98	83.23	23.83
KALAYAAN	300	95.72	20.71	94.54	24.17	93.81	22.66	97.88	27.16	86.66	22.79	50.91	13.96
CALIRAYA	32	78.37	4.16	98.04	6.51	99.63	5.38	63.81	3.24	85.88	6.86	68.50	13.90
BOTOCAN	17	75.18	46.58	98.21	39.42	97.83	38.87	99.52	31.29	57.83	22.81	99.22	31.45
MASIWAY	12	99.99	28.13	98.02	23.40	85.33	27.74	79.54	35.95	94.95	22.38	84.38	27.21
HPP	1224	91.14	22.02	93.46	28.36	90.45	28.19	91.64	27.27	86.07	21.33	70.18	20.00
TOTAL	4589	(84.24)	(47.63)			(86.75)	(50.98)	(87.11)	(54.89)	(84.38)	(51.95)	(80.73)	(51.77)
		79.92	45.62	82.00	49.45	85.62	50.15	81.23	51.15	80.30	49.43	77.95	49.94

( ) : EX REHABILITATION (‡) &amp; BATAAN 2 (‡)

Table 2-1 POWER PLANT OUTAGE DURATION (LUZON GRID)

SCHEDULED OUTAGE			(DAY)						
PLANT	CAP	N	1987	1988	1989	1990	1991	1992	89-92 AV
TPP	2225	11	( 58.01) 87.09	69.83	( 37.45) 46.22	( 37.69) 73.84	( 59.97) 69.17	(39.74) 38.39	(43.71) 56.91
GPP	660	12	63.36	57.23	38.02	38.91	41.72	32.46	37.78
G T	480	12	--	--	1.68	8.92	28.42	35.26	18.57
HPP	1224	31	30.25	22.39	21.82	( 13.11) 27.35	( 26.63) 47.36	(69.23) 87.42	(32.70) 45.99
TOTAL	4589	66	( 50.02) 66.35	53.67	( 31.15) 35.89	( 29.20) 52.17	( 44.85) 54.97	(45.91) 50.29	(37.78) 48.33

FORCED OUTAGE									
PLANT	CAP	N	1987	1988	1989	1990	1991	1992	89-92 AV
TPP	2225	11	( 7.34) 6.35	19.65	( 19.45) 18.14	( 30.03) 25.98	( 14.33) 24.50	(25.65) 38.48	(22.37) 26.78
GPP	660	12	18.07	6.76	14.27	6.15	10.25	5.33	9.00
G T	480	12	--	--	7.40	22.62	18.59	34.62	20.81
HPP	1224	31	2.09	1.53	13.03	( 3.34) 3.18	( 3.71) 3.48	(23.12) 21.71	(10.80) 10.35
TOTAL	4589	66	( 7.51) 6.96	12.18	( 16.14) 15.58	( 17.86) 16.32	( 11.43) 16.24	(22.91) 28.84	(17.09) 19.25

TOTAL OUTAGE									
PLANT	CAP	N	1987	1988	1989	1990	1991	1992	89-92 AV
TPP	2225	11	( 65.35) 93.44	89.48	( 56.90) 64.35	( 67.72) 99.82	( 74.30) 93.68	(65.39) 76.88	(66.08) 83.68
GPP	660	12	81.43	63.99	52.29	45.06	51.97	37.79	46.78
G T	480	12	--	--	9.08	31.54	47.01	69.88	39.38
HPP	1224	31	32.34	23.93	34.85	( 16.45) 30.53	( 30.34) 50.84	(92.35) 109.13	(43.50) 56.34
TOTAL	4589	66	( 57.53) 73.31	65.86	( 47.29) 51.46	( 47.07) 68.50	( 56.28) 71.21	(68.81) 79.13	(54.86) 67.58

( ) : EX REHABILITATION &amp; BATAAN 2

1987 : MALAYA 1

1989 : SUCAT 1

1990 : SUCAT 4 AMBUKLAO

1991 : BATAAN 2 AMBUKLAO



Table 2-2 TPP OUTAGE DURATION (LUZON GRID)

SCHEDULED OUTAGE			(DAY)							
PLANT	CAP	N	1987	1988	1989	1990	1991	1992	89~92 AV	
BATAAN 1	75	1	55.29	62.91	19.70	51.32	73.78	< 7> 33.72	44.63	
BATAAN 2	150	1	61.13	74.70	23.72	68.21	☆196.47	< 3> ☆ 19.83	(45.97)	
SUCAT 1	150	1	9.00	108.73	†167.41	39.33	46.27	< 3> 13.91	(33.17)	
SUCAT 2	200	1	54.53	54.85	58.91	7.44	144.56	< 4> 11.70	55.65	
SUCAT 3	200	1	107.98	134.23	14.11	41.31	102.74	< 7> 27.55	46.43	
SUCAT 4	300	1	99.15	108.95	85.50	†305.84	14.23	< 5> 75.37	(58.37)	
MALAYA 1	300	1	†273.68	44.33	15.52	9.60	60.14	< 4> 64.80	37.52	
MALAYA 2	350	1	37.44	53.97	33.09	39.88	69.09	< 2> 4.75	36.70	
MANILA 1	100	1	44.10	17.24	60.83	37.39	2.24	< 3> 43.98	36.11	
MANILA 2	100	1	34.58	25.33	79.80	9.68	55.68	< 7> 33.47	44.66	
CALACA	300	1	45.97	53.97	7.09	70.91	34.07	< 5> 61.76	43.46	
			(58.01)		(37.45)	(37.69)	(59.97)	(39.74)	(43.71)	
TPP	2225	11	87.09	69.83	46.22	73.84	69.17	<4.5> 38.39	56.91	
FORCED OUTAGE										
BATAAN 1	75	1	11.21	28.66	12.69	9.91	8.42	< 7> 3.94	8.74	
BATAAN 2	150	1	10.71	33.18	17.09	104.51	☆165.18	<18> ☆215.99	(60.80)	
SUCAT 1	150	1	0.31	21.01	‡ 0	2.84	2.51	< 3> 16.53	( 7.29)	
SUCAT 2	200	1	10.96	22.58	0.40	26.20	6.59	< 4> 48.10	20.32	
SUCAT 3	200	1	10.70	11.17	6.36	87.66	13.56	< 4> 12.30	29.97	
SUCAT 4	300	1	7.56	67.56	5.37	‡ 0	8.57	<11> 32.35	(15.43)	
MALAYA 1	300	1	‡ 0	7.57	82.82	27.32	33.14	< 9> 52.76	49.01	
MALAYA 2	350	1	1.05	2.85	1.28	11.24	20.32	< 6> 18.34	12.80	
MANILA 1	100	1	6.66	1.27	4.24	4.79	8.74	< 4> 3.66	5.36	
MANILA 2	100	1	9.08	0	9.47	3.32	0.76	< 3> 1.97	3.88	
CALACA	300	1	10.33	10.09	24.05	17.50	13.77	<11> 19.53	18.71	
			( 7.34)		(19.45)	(30.03)	(14.33)	(25.65)	(22.37)	
TPP	2225	11	6.35	19.65	18.14	25.98	24.50	<7.3> 38.48	26.78	
TOTAL OUTAGE										
BATAAN 1	75	1	66.50	91.58	32.38	61.23	82.20	<14> 37.66	53.37	
BATAAN 2	150	1	71.85	107.88	40.81	172.72	☆361.65	<21> ☆235.82	(106.77)	
SUCAT 1	150	1	9.30	129.74	†167.41	42.18	48.78	< 6> 30.43	(40.46)	
SUCAT 2	200	1	65.49	77.42	59.31	33.64	151.15	< 8> 59.80	75.98	
SUCAT 3	200	1	118.68	145.40	20.47	128.97	116.30	<11> 39.85	76.40	
SUCAT 4	300	1	106.71	176.52	90.87	†305.84	22.80	<16> 107.72	(73.80)	
MALAYA 1	300	1	†273.68	51.89	98.34	36.91	93.28	<13> 117.56	86.52	
MALAYA 2	350	1	38.48	56.82	34.37	51.12	89.41	< 8> 23.10	50.16	
MANILA 1	100	1	50.76	18.51	65.06	42.18	10.98	< 7> 47.64	41.47	
MANILA 2	100	1	43.66	25.33	89.27	13.00	56.43	<10> 35.44	48.54	
CALACA	300	1	56.30	64.05	31.13	88.41	47.84	<16> 81.29	62.17	
			(65.35)		(56.90)	(67.72)	(74.30)	(65.39)	(66.08)	
TPP	2225	11	93.44	89.48	64.35	99.82	93.68	<11.8> 76.88	83.68	

( ) : EX REHABILITATION (‡) &amp; BATAAN 2 (☆)

&lt; &gt; : FREQUENCY

Table 2-3 TPP OUTAGE RECORDS (LUZON GRID) (1)

1992

(DURATION: DAYS)

PLANT	OUTAGE	DATE	DURATION	CAUSES
BATAAN 1	SCHEDULED	1/31~ 2/ 3	2.51	HP turbine steam leak
		2/26~ 3/17	19.70	HP turbine casing leak
		7/ 3~ 7/ 6	2.39	Maintenance
		8/28~ 9/ 1	3.69	BFP warming line leak, AH washing
		9/12~ 9/13	1.00	BFP leak
		10/30~11/ 1	1.23	FDF alignment
		11/13~11/16	2.36	FDF/air pre heater repair
	FORCED	1/ 8~ 1/ 9	1.28	FDF B motor bearing trouble
		2/18~ 2/19	0.44	BFP warming line repair due to excessive feedwater loss
		4/ 9	0.05	Changeover of BFP
		5/27	0.21	Excitator trouble
		6/15~ 6/16	0.44	Trip by load anticipator undercurrent relay
		7/17	0.86	Trip by low pressure turbine diaphragm explosion
		12/25~12/29	4.29	CWP B outage
BATAAN 2	SCHEDULED	5/19~ 6/ 2	13.45	Turbine vibration
		7/25~ 7/27	2.73	Maintenance
		8/15~ 8/19	4.15	Vibration probes installation
	FORCED	1/ 1~ 2/15	45.53	Excessive turbine vibration
		2/17	0.54	Economizer tube leak
		2/19~ 2/20	0.53	Trip by low condenser vacuum
		2/25	0.84	Repair of drain pipe going to economizer
		3/ 3	0.29	Excessive turbine vibration
		3/17~ 3/19	2.31	Trip due to ruptured SH/waterwall tube
		3/19~ 3/25	5.00	Boiler waterwall tube leak
		3/25~ 3/30	4.60	Boiler waterwall tube leak
		4/ 1~ 4/ 2	1.08	Boiler tube leak
		4/ 8~ 4/ 9	0.83	Failure of HIVIS pump to cut in
		4/14	0.29	Accidental opening of DS of general services Tr
		4/19~ 5/ 3	13.89	Turbine bearing inspection & correction
		5/ 4~ 5/ 5	1.07	Turbine balancing
6/11~ 6/14	2.58	Airheater repair		
6/23~ 6/27	3.73	Airheater trouble		
8/20~ 8/30	10.77	Excessive turbine vibration		
8/31~ 9/ 8	8.37	Excessive turbine vibration		
9/ 9~12/31	113.40	Excessive turbine vibration		
MANILA 1	SCHEDULED	1/13~ 2/20	38.21	Annual overhauling
		4/16~ 4/18	2.66	Condenser tube leak
		7/21~ 7/25	3.11	Boiler casing repair
	FORCED	5/ 2	0.62	Trip by bus diff'l activated by MECO's switchgear fault
		6/ 9~ 6/10	1.09	Raw water line to heat exchanger leak
		6/12~ 6/13	1.96	Condenser tube plugging
12/30~12/31	1.99	FDF balancing		
MANILA 2	SCHEDULED	1/ 1~ 1/ 2	1.77	AH washing
		3/13~ 3/15	1.52	Boiler stop valve packing leak
		7/28~ 7/29	0.45	Annual maintenance
		8/ 4~ 9/ 6	32.43	Annual maintenance
		9/25~ 9/29	3.80	FDF impeller repair
		10/31~11/ 1	0.79	FDF2B inlet vane repair
		12/12~12/13	0.74	FDF vibration
	FORCED	5/12	0.03	Trip due to low condenser vacuum
		5/13	0.11	FDF2B balancing
		7/19~ 7/20	1.18	Boiler trouble
SUCAT 1	SCHEDULED	1/ 1~ 1/ 6	5.35	Turbine balancing
		1/ 8~ 1/10	1.37	Turbine generator balancing
		4/15~ 4/20	5.03	Preventive maintenance
	FORCED	5/17~ 5/24	7.64	Turbine bearing vibration
		5/25~ 6/ 2	8.71	Turbine bearing vibration
7/24	0.19	Low drum level		
SUCAT 2	SCHEDULED	4/30~ 5/ 4	3.49	Preventive maintenance
		6/19~ 6/23	3.18	AH washing
		7/11~ 7/13	2.48	AH washing
		9/ 4~ 9/ 7	2.54	AH washing
	FORCED	7/20	0.21	Trip due to feedwater flow trouble
		7/31~ 8/ 3	2.52	Condenser tube leak
9/ 8~ 9/11	2.83	Condenser tube leak		
11/12~12/31	49.05	Turbine bearing vibration		

Table 2-3 TPP OUTAGE RECORDS (LUZON GRID) (2)

1992		(DURATION: DAYS)		
PLANT	OUTAGE	DATE	DURATION	CAUSES
SUCAT 3	SCHED- ULED	1/24~ 1/28	3.50	Boiler tube leak
		3/27~ 3/30	2.66	Gas leak
		4/10~ 4/14	3.74	Boiler tube leak
		6/27~ 7/ 2	4.92	AH washing
		8/ 8~ 8/10	2.93	AH gas leak
		10/ 2~10/ 9	6.50	AH repair
	FORCED	12/ 4~12/ 8	3.46	Gas leak repair
		1/17~ 1/20	2.48	Defective FDF 3A rotor
		4/24~ 4/27	2.54	Condenser tube leak
		5/13~ 5/17	3.27	Boiler tube leak
SUCAT 4	SCHED- ULED	10/10	0.33	Low condenser vacuum
		1/ 1~ 2/10	40.91	Planned Outage
		7/17~ 7/20	2.35	Boiler tube leak
		8/21~ 8/24	2.66	Condenser tube leak
		10/ 9~10/12	2.60	Busted gland steam seal heater
	FORCED	11/ 7~12/ 3	26.40	Annual maintenance
		2/18~ 2/23	5.53	Chloride contamination in condensate system
		4/ 4~ 4/ 6	1.98	Malfunction of boiler feed pump speed adjusting device
		4/ 6~ 4/10	3.61	Secondary SH tube leak
		5/ 6~ 5/ 8	1.91	Condenser tube leak
		5/ 9~ 5/11	1.67	Boiler tube leak
		6/ 3~ 6/ 7	4.00	AH washing, boiler tube leak
		6/16~ 6/19	3.03	Condenser tube leak
		10/13~10/15	1.81	Busted leak-off line of HP turbine
10/16~10/20	3.60	Main steam line header leak		
10/21~10/23	1.93	Leak at HP turbine leak-off header line		
10/26~10/29	2.88	Boiler tube leak		
MALAYA 1	SCHED- ULED	2/12~ 2/17	5.01	Boiler tube leak
		4/11~ 4/14	2.97	Trip due to station service loss, boiler inspection
		8/28~ 8/31	2.36	Boiler tube leak
		9/21~11/11	51.71	Annual maintenance
		FORCED	1/ 5	0.58
	2/23~ 2/24		1.13	Trip due to FW trouble
	4/ 6		0.64	BFP trouble
	5/ 9~ 5/10		1.77	SH tube leak
	5/27~ 5/28		1.21	Trip due to LA damage
	7/30~ 7/31		0.56	FDF stalling
	MALAYA 2	SCHED- ULED	9/12~ 9/16	4.04
9/19~ 9/20			1.60	Boiler tube leak
FORCED		11/16~12/31	45.76	Generator excitor trouble
		9/18~ 9/21	3.78	AH washing
		12/24~12/31	7.47	Condenser tube leak, boiler casing leak
	3/ 7~ 3/10	3.42	Boiler tube leak	
	3/30~ 4/ 2	2.58	Boiler tube leak	
	4/ 9~ 4/12	2.89	Boiler tube leak	
CALACA	SCHED- ULED	5/23	0.33	Busted thermocouple sensor
		5/27~ 6/ 2	5.52	CWP damage due to LA damage
		10/14~10/18	3.61	Boiler tube leak
		1/ 2~ 1/ 5	3.99	Condenser tube leak, contaminated feed water
		2/26~ 4/17	51.26	Annual maintenance
	FORCED	9/11~ 9/13	1.70	Preventive maintenance
		10/30~11/ 5	7.16	Preventive maintenance
		12/30	0.40	Warming lines repair
		1/ 6	0.22	Trip due to high drum level
		1/ 9~ 1/11	1.98	Boiler tube leak
		1/15~ 1/17	1.88	Leak at reheater tubes
MALAYA 1	FORCED	2/ 2	0.18	Trip due to critical flame out by Mill C trip
		2/14~ 2/16	2.01	Boiler tube leak
		5/ 5~ 5/ 7	1.72	Economizer tube leak
		6/ 4	0.07	Trip due to primary air loss <sup>1</sup>
		6/21~ 6/26	4.63	High silica content & low demi-water supply
		7/28~ 8/ 1	3.98	Reheater tube leak
		8/31	0.16	Low condenser vacuum
		11/ 5~11/ 7	2.04	Vibration damper damage

Table 2-3 TPP OUTAGE RECORDS (LUZON GRID) (3)

JAN~APR 1993

(DURATION: DAYS)

PLANT	OUTAGE	DATE	DURATION	CAUSES
BATAAN 1	SCHED- ULED			
	FORCED	4/ 1~ 4/ 3	2.34	Trip due to AH trouble
		4/20~ 4/24 4/25~ 4/27	3.93 1.86	Boiler tube leak Superheater insulation failure
BATAAN 2	SCHED- ULED			
	FORCED	1/ 1~ 4/10	99.05	Excessive turbine vibration
		4/14~ 4/15	0.39	Trip due to Hi-Vis pump trouble
		4/16~ 4/19	2.43	Cold reheat line balance pipe leak
4/19~ 4/20		0.53	Turbine adjustment (debugging)	
SUCAT 1	SCHED- ULED	3/26~ 3/29	2.58	Preventive maintenance
	FORCED			
SUCAT 2	SCHED- ULED			
	FORCED	1/ 1~ 4/11	100.88	Turbine bearing vibration
4/24~ 4/29		4.80	Thrust bearing inspection	
SUCAT 3	SCHED- ULED	2/13~	76.00	Rehabilitation
	FORCED	1/24~ 1/26	1.63	HPH 6-B equalizing line leak
1/29~ 2/ 2		3.87	Condenser tube leak	
SUCAT 4	SCHED- ULED	2/ 5~ 2/ 8	0.53	AH washing
	FORCED			
MANILA 1	SCHED- ULED	1/ 1~ 1/ 5	4.35	FDI balancing
		4/ 8~ 4/11	2.91	Condenser plugging
	FORCED	2/13	0.91	Condenser cleaning
MANILA 2	SCHED- ULED			
	FORCED	1/ 1~ 1/ 2	1.84	Trip by bus diff I relay, RH tube inspection
4/ 5~ 4/ 8		3.40	Heat exchanger trouble	
MALAYA 1	SCHED- ULED			
	FORCED	1/ 1~ 2/ 9	39.78	Generator excitor trouble
2/18~ 2/22		4.52	Leak at cold reheat line to condenser	
MALAYA 2	SCHED- ULED	1/ 1~ 1/ 3	2.17	Condenser tube leak, boiler casing leak
	FORCED	1/21~ 1/25	3.40	Boiler tube leak
		2/10~ 2/13	3.17	Boiler tube leak
		2/16~ 2/19	2.53	Boiler tube leak
		2/26~ 2/28	2.51	Boiler tube leak
		3/ 4~ 3/ 8	3.93	Boiler tube leak
		3/25~ 3/31	5.89	Boiler tube leak
CALACA	SCHED- ULED	4/17~ 4/19	2.16	Reheater tube leak repair, vulcanizing of B-14 line
	FORCED	1/ 7~ 1/ 8	0.81	Turbine control valve pin repair
		1/16~ 1/20	4.17	HPH 7&8 repair
		2/ 9~ 2/12	3.28	Reheater tube leak
		3/11~ 3/16	4.40	Primary air fan repair
		3/30~ 4/ 6	6.62	Reheater tube leak

Table 3-1 LUZON GRID MONTHLY OPERATION RECORDS

B/O ブラウン・アウト

	DAILY AVERAGE GENERATION										WEEKDAY AVERAGE		
	GPP		TPP		GT&DSL		HPP		TOTAL		PEAK	RESERVE	B/O
	MW	MWH	MW	MWH	MW	MWH	MW	MWH	MW	MWH	MW	MW	MWH
JAN	522	12306	1273	28791	429	5141	632	5779	2856	52017	2845	9	274
FEB	497	11800	1435	32517	413	5591	567	5509	2912	55417	2967	▲63	843
MAR	495	11746	1461	33533	377	6867	538	5557	2871	57703	3037	▲114	1220
APR	518	12488	1371	31780	397	7561	299	3438	2585	55267	3037	▲450	4025
MAY	513	12208	1391	32655	389	7885	202	1947	2495	54695	3153	▲699	7221
JUN	522	12407	1518	35246	363	7696	277	1971	2680	57320	3100	▲600	6238
JUL	510	12339	1588	37093	318	5443	367	3438	2783	58313	2960	▲208	1508
AUG	503	12089	1418	33071	330	5302	497	5788	2748	56250	2931	▲150	1119
SEP	466	11450	1377	31129	300	4315	657	11542	2800	58436	3011	▲188	869
OCT	493	11791	1244	28372	237	4705	655	10481	2629	55349	3071	▲524	4767
NOV	518	12397	1096	24546	255	4864	655	9556	2524	51363	3093	▲639	6905
DEC	506	12107	1100	25670	313	6015	563	6007	2482	49799	2949	▲618	6487
'92	505	12095	1356	31199	343	5949	492	5912	2696	55155	3010	▲343	3334
JAN	510	12210	1060	24859	350	6877	568	6198	2489	50145	2958	▲716	7155
FEB	527	12639	1098	25659	374	7877	525	5348	2524	51523	3035	▲783	8866
MAR	477	11339	1066	25595	406	8814	424	4596	2372	50344	3085	▲888	11189
APR	497	11892	1148	26883	515	10241	247	2674	2407	51689	3202	▲903	12067
MAY													
JUN													
JUL													
AUG													
SEP													
OCT													
NOV													
DEC													
'93	502	12006	1092	25742	411	8452	441	4705	2446	50904	3071	▲825	9881

'92 CAP	660	15840	2225	53400	493	11832	1224	29376	4602	110448			
'93 CAP	660	15840	2225	53400	725	17400	1242	29808	4852	116448			

▲マイナスの最大

	CAPACITY UTILIZATION FACTOR / PLANT CAPACITY FACTOR (%)									
	GPP		TPP		GT, DSL		HPP		TOTAL	
	CUF	PCF	CUF	PCF	CUF	PCF	CUF	PCF	CUF	PCF
JAN	79	78	57	54	89	45	52	20	62	47
FEB	75	74	64	61	86	49	46	19	63	50
MAR	75	74	66	63	79	60	44	19	63	52
APR	78	79	62	60	83	66	24	12	56	50
MAY	78	77	63	61	79	67	17	7	54	50
JUN	79	78	68	66	74	65	23	7	58	52
JUL	77	78	71	69	65	46	30	12	60	53
AUG	76	76	64	62	67	45	41	20	60	51
SEP	71	72	62	58	61	36	54	39	61	53
OCT	75	74	56	53	48	40	54	36	57	50
NOV	78	78	49	46	52	41	54	33	55	47
DEC	77	76	49	48	63	51	45	20	54	45
'92	77	76	61	58	70	50	40	20	59	50
JAN	77	77	48	47	63	52	46	21	53	45
FEB	80	80	49	48	67	59	42	18	54	46
MAR	72	72	48	48	73	66	34	15	51	45
APR	75	75	52	50	79	65	20	9	50	45
MAY										
JUN										
JUL										
AUG										
SEP										
OCT										
NOV										
DEC										
'93	76	76	49	48	71	61	36	16	52	45

Table 3-2 TPP MONTHLY OPERATION RECORDS (LUZON GRID)

DAILY AVERAGE GENERATION ( MW MWH)

	BATAAN 1		BATAAN 2		SUCAT 1		SUCAT 2		SUCAT 3		SUCAT 4		MANILA 1		MANILA 2		MALAYA 1		MALAYA 2		CALACA		TOTAL	
	75 1800	150 3600	150 3600	200 4800	200 4800	300 7200	100 2400	100 2400	300 7200	350 8400	300 7200	2225 53400												
JAN	66 1541	0 0	111 2558	160 3619	130 2672	0 0	28 608	92 2040	252 5783	290 6512	144 3459	1273 28792												
FEB	57 1272	59 1257	140 3323	160 3708	133 3216	119 2510	30 600	99 2210	194 4351	290 6456	154 3605	1435 32516												
MAR	33 755	76 1911	135 3273	153 3556	107 2358	255 5875	95 2180	86 1977	270 6208	251 5445	0 0	1461 33538												
APR	69 1651	35 873	121 2828	155 3588	115 2449	204 4768	86 1915	96 2193	202 4691	180 4389	109 2434	1372 31779												
MAY	66 1629	26 608	72 1734	141 3165	133 3022	150 3699	92 2000	95 2137	186 4399	173 4287	255 5976	1389 32656												
JUN	69 1651	66 1506	132 3054	141 3169	130 2836	181 4278	87 1887	96 2185	215 5062	205 4844	196 4782	1518 35256												
JUL	62 1442	83 2014	135 3173	145 3169	135 3049	214 5058	84 1814	85 1871	205 4850	215 5184	223 5469	1586 37093												
AUG	57 1373	39 1030	140 3139	149 3305	126 2797	209 4931	100 2121	11 259	136 3165	215 5097	235 5855	1417 33072												
SEP	65 1551	1 27	140 3040	130 2969	135 2823	240 5680	98 2071	65 1324	70 1595	187 4283	246 5691	1377 31062												
OCT	67 1590	0 0	140 3146	160 3583	101 2251	133 3023	97 2160	90 2230	0 0	192 4456	259 5933	1239 28372												
NOV	64 1490	0 0	140 3122	64 1403	140 2953	40 981	100 2188	98 2179	27 629	215 4701	209 4900	1096 24546												
DEC	60 1412	0 0	134 3070	0 0	115 2678	226 5315	85 1930	94 2138	0 0	127 3046	260 6082	1101 25671												
'92	61 1446	32 768	128 2952	130 2934	125 2756	164 3851	82 1794	84 1893	146 3394	211 4887	180 4521	1355 31195												
JAN	65 1564	0 0	130 3050	0 0	107 2563	227 5357	80 1796	92 2092	0 0	155 3599	204 4838	1060 24859												
FEB	62 1482	0 0	123 2947	0 0	50 1154	220 5117	89 2062	98 2275	112 2390	140 3322	203 4911	1098 25659												
MAR	61 1455	0 0	108 2584	0 0	0 0	245 5880	90 2165	93 2205	212 5082	86 2099	171 4125	1066 25595												
APR	47 1047	83 1760	114 2706	55 1227	0 0	229 5502	71 1670	84 1920	198 4650	100 2405	167 3996	1148 26883												
MAY					0 0																			
JUN					0 0																			
JUL					0 0																			
AUG					0 0																			
SEP					0 0																			
OCT					0 0																			
NOV					0 0																			
DEC					0 0																			
'93																								

CAPACITY UTILIZATION FACTOR / PLANT CAPACITY FACTOR (%)

	BATAAN 1		BATAAN 2		SUCAT 1		SUCAT 2		SUCAT 3		SUCAT 4		MANILA 1		MANILA 2		MALAYA 1		MALAYA 2		CALACA		TOTAL	
	CUF PCF	CUF PCF	CUF PCF	CUF PCF	CUF PCF	CUF PCF	CUF PCF	CUF PCF	CUF PCF	CUF PCF	CUF PCF	CUF PCF	CUF PCF	CUF PCF	CUF PCF	CUF PCF	CUF PCF	CUF PCF	CUF PCF	CUF PCF	CUF PCF	CUF PCF		
JAN	88 86	0 0	74 71	80 75	65 56	0 0	28 25	92 85	04 80	83 78	48 48	57 54												
FEB	76 71	39 35	93 92	80 77	67 67	40 35	30 25	99 92	65 60	83 77	51 50	64 61												
MAR	44 42	51 53	90 91	77 74	54 49	85 82	95 91	86 82	90 86	72 65	0 0	66 63												
APR	92 92	23 24	81 79	78 75	58 51	68 66	86 80	96 91	67 65	51 52	36 34	62 60												
MAY	88 91	17 17	48 48	71 66	67 63	50 51	92 83	95 89	62 61	49 51	85 83	62 61												
JUN	92 92	44 42	88 85	71 66	65 59	60 59	87 79	96 91	72 70	59 58	65 66	68 66												
JUL	83 80	55 56	90 88	73 66	68 64	71 70	84 76	85 78	68 67	61 62	74 76	71 69												
AUG	76 76	26 29	93 87	75 69	63 58	70 68	100 88	11 11	45 44	61 61	78 81	64 62												
SEP	87 86	1 1	93 84	65 62	68 59	80 79	98 86	65 55	23 22	53 51	82 79	62 58												
OCT	89 88	0 0	93 87	80 75	51 47	44 42	97 90	98 93	0 0	55 53	83 82	56 53												
NOV	85 83	0 0	93 87	32 29	70 62	13 14	100 91	98 91	9 9	61 56	70 68	49 46												
DEC	80 78	0 0	89 85	0 0	58 56	75 74	85 80	94 89	0 0	36 35	87 84	49 48												
'92	81 80	21 21	85 82	65 61	63 57	55 53	82 75	84 79	49 47	60 58	63 63	61 58												
JAN	87 87	0 0	87 85	0 0	54 53	76 74	80 75	92 87	0 0	44 43	68 67	48 47												
FEB	83 82	0 0	82 82	0 0	25 24	73 71	89 86	98 95	37 33	40 40	68 68	49 48												
MAR	81 81	0 0	72 72	0 0	0 0	82 82	90 90	93 92	71 71	25 25	57 57	48 48												
APR	63 58	55 49	76 75	28 26	0 0	76 76	71 70	84 80	66 65	29 29	56 56	52 50												
MAY					0 0																			
JUN					0 0																			
JUL					0 0																			
AUG					0 0																			
SEP					0 0																			
OCT					0 0																			
NOV					0 0																			
DEC					0 0																			
'93																								

Table 3-3 LUZON GRID DAILY OPERATION RECORDS

MAR 1993

	GPP		TPP		GT&DSL		HPP		TOTAL		PEAK MW	RESERVE MW	B/O MWH
	MW	MWH	MW	MWH	MW	MWH	MW	MWH	MW	MWH			
1	525	11985	1240	28566	366	6650	333	4265	2464	51466	3075	▲858	8435
2	522	12478	1244	29772	373	7497	490	4799	2629	54546	2987	▲731	6100
3	522	12295	1229	30006	207	6227	494	5237	2452	53765	3009	▲770	7173
4	525	12529	1001	25591	433	8427	588	5730	2547	52277	3025	▲819	9143
5	515	12400	1058	24986	428	10177	512	4826	2513	52389	2967	▲825	8899
6	469	12104	1058	25357	428	8335	601	5025	2556	50821	2975	▲696	7580
7	474	11900	1042	24934	418	7159	584	6577	2518	49860	2563	▲1414	3055
8	456	10847	1171	27209	430	9754	464	4884	2521	52694	3023	▲803	7629
9	400	10068	1154	27960	358	8980	557	4947	2469	51955	3128	▲928	10384
10	404	9618	1145	27633	422	9848	427	5247	2398	52346	3106	▲818	10151
11	410	9785	1024	25348	366	9230	329	4523	2129	48886	3179	▲1172	13620
12	403	9766	966	23085	425	9992	417	4418	2211	47261	3032	▲1126	14187
13	412	9712	964	23083	396	9269	442	5007	2214	47071	2993	▲962	12390
14	328	9197	939	22980	359	8116	310	4153	1936	44446	2612	▲676	5979
15	402	9602	926	22697	362	8079	377	4570	2067	44948	3039	▲1048	16927
16	402	9555	1108	23921	275	6938	333	4439	2118	44853	3130	▲1057	17182
17	428	10251	1131	26818	306	6661	305	4939	2170	48669	3099	▲972	14836
18	466	11364	1152	27965	371	7275	495	4485	2484	51089	3241	▲848	11724
19	469	11387	1139	27530	270	6615	323	4658	2201	50190	3036	▲953	12862
20	486	11486	1145	27456	388	9182	464	4438	2483	52562	3048	▲640	7784
21	481	11484	1144	27284	325	7183	416	3496	2366	49447	2489	▲1123	5665
22	557	13030	1191	27758	470	8482	373	3659	2591	52929	3064	▲734	7432
23	562	13438	1192	28295	517	9651	349	4021	2620	55405	3180	▲719	7966
24	564	13268	1207	28628	518	10868	430	4027	2719	56791	3049	▲507	5968
25	564	11349	1082	27726	518	11059	416	4137	2580	54271	3097	▲726	7497
26	506	12049	1061	25660	524	11402	403	4169	2494	53280	3035	▲815	10673
27	484	11584	882	22348	414	10992	412	4393	2192	49317	3032	▲905	11608
28	479	11424	864	21038	352	6884	446	4881	2141	44227	2717	▲537	9609
29	479	11163	943	21865	516	10867	330	4446	2268	48341	3092	▲953	14785
30	539	12561	735	19971	516	9462	363	4399	2153	46393	3165	▲1201	17722
31	539	12533	894	19986	541	11969	359	3676	2333	48164	3194	▲1041	16044

AVERAGE	477	11339	1066	25595	406	8814	424	4596	2373	50344	3012	▲819	10191
CAPACITY	660	15840	2225	53400	555	13320	1242	29808	4682	112368	▲3085	▲1888	▲11189
PCF %	72	72	48	48	73	66	34	15	51	45			

APR 1993

	GPP		TPP		GT&DSL		HPP		TOTAL		PEAK MW	RESERVE MW	B/O MWH
	MW	MWH	MW	MWH	MW	MWH	MW	MWH	MW	MWH			
1	390	11113	856	20624	517	12070	297	4418	2060	48225	3048	▲1077	15120
2	547	10879	857	20286	534	12719	196	3436	2134	47320	3153	▲1235	16715
3	524	12588	864	19957	532	12586	223	3471	2143	48602	3074	▲931	13495
4	542	12437	888	21196	411	8429	290	3643	2131	45705	2817	▲686	7656
5	533	12679	801	19995	531	10090	293	3722	2158	46486	3046	▲1172	18039
6	545	12877	1017	23069	532	12666	345	3311	2439	51923	3184	▲838	12782
7	537	12479	1015	24676	539	12128	352	3302	2443	52585	3044	▲794	10052
8	534	12947	1036	24232	539	5720	391	2158	2500	45057	2195	▲305	0
9	515	12067	1061	23686	523	1606	251	2404	2356	39763	2105	▲251	0
10	489	12314	1164	26889	539	3739	285	2792	2477	45734	2400	77	0
11	509	12200	1177	26953	521	4721	254	2659	2461	46533	2546	▲85	48
12	513	12161	1391	30830	532	9212	241	2869	2677	55072	3137	▲580	5098
13	513	12047	1365	31323	534	10757	224	2544	2636	56671	3205	▲801	7302
14	504	12027	1344	32891	530	10242	250	2415	2628	57575	3104	▲594	6679
15	504	12268	1340	31904	528	11694	219	2231	2591	58097	3092	▲564	7611
16	504	12188	1329	32456	595	10957	234	2190	2662	57791	3240	▲786	8738
17	514	12239	949	22708	508	13609	319	3252	2290	51808	3100	▲933	11360
18	513	12226	939	22293	475	11433	254	2573	2181	48525	2873	▲692	5615
19	475	12130	1259	26733	492	11463	185	2304	2411	52630	3297	▲1014	12546
20	460	11022	1259	27929	569	11735	123	2384	2411	53070	3255	▲981	13791
21	499	11902	1240	28669	542	11722	236	2240	2517	54533	3259	▲944	12983
22	498	11840	1267	30476	578	12486	308	2109	2651	56911	3316	▲874	10280
23	444	10907	1244	30252	513	12126	167	2030	2368	55315	3315	▲949	12323
24	487	11528	1352	30684	577	12380	228	2304	2644	56896	3144	▲611	7647
25	490	11663	1169	27317	421	9654	281	2299	2361	50933	2470	▲154	1872
26	491	11693	1173	28149	423	9459	300	2301	2387	51602	3313	▲926	14771
27	486	11576	1250	29071	489	9980	253	2329	2478	52956	3394	▲916	14396
28	388	10637	1205	29514	462	10249	164	2298	2219	52698	3410	▲1191	16777
29	464	10581	1260	29724	498	10910	108	2089	2330	53304	3128	▲1001	13438
30	489	11540	1358	32003	477	10675	146	2140	2470	56358	3108	▲829	11896
31													

AVERAGE	497	11892	1148	26883	515	10241	247	2674	2407	51689	3026	▲718	9634
CAPACITY	660	15840	2225	53400	655	15720	1242	29808	4782	114768	▲3202	▲1903	▲12067
PCF %	75	75	52	50	79	65	20	9	50	45			

\*: WEEKDAY AVERAGE





Table 4-1 POWER DEVELOPMENT PROGRAM (APRIL 1993)

YEAR	LUZON				VISAYAS				MINDANAO			
	MON	POWER PLANT	TYPE	MW	MON	POWER PLANT	TYPE	MW	MON	POWER PLANT	TYPE	MW
1993	FEB	SUCAT-LBGT	OIL	30	OCT	CEBU-NEGROS INTERCONNECTION			APR	TOMEN DIESEL	OIL	58
	MAR	F/T HOPEWELL	OIL	100					MAY	ORBETA CC	OIL	135
	APR	F/T ENRON DSL-1	OIL	25	OCT	PALINPINON II - 1	GEO	20	SEP	TOMEN DIESEL	OIL	40
	APR	BATAAN I SC-1	OIL	70	DEC	PALINPINON II - 2	GEO	20				
	MAY	BACMAN I - 1	GEO	55								
	MAY	F/T ENRON DSL-2	OIL	25								
	MAY	BATAAN I SC-2 & 3	OIL	140								
	JUN	F/T ENRON,DSL-3	OIL	55								
	JUL	POLAR PB	OIL	90								
	AUG	BACMAN I - 2	GEO	55								
	AUG	BACMAN II - 1	GEO	20								
SEP	BATAAN II SC-1	OIL	70									
OCT	BATAAN II SC-2	OIL	70									
NOV	BATAAN II SC-3	OIL	70									
1994	JAN	BACMAN II - 2	GEO	20	FEB	PALINPINON II - 3	GEO	20	JAN	AGUS I UNIT 1	HYDRO	40
	JAN	SUBIC(ENRON)-2	OIL	105	APR	PALINPINON II - 4	GEO	20	MAR	LARGE PB 1 & 2	OIL	200
	MAR	ORMAT MAKBAN	GEO	16					JUL	NSC DIESEL 50	OIL	50
	MAY	BATAAN I CC-4	OIL	90								
	JUN	ORMAT BACMAN	GEO	16								
	JUL	FPPC	OIL	200								
	OCT	MAIBARARA BINARY	GEO	11								
	OCT	BATAAN II CC-4	OIL	90								
	OCT	MAKBAN D & E	GEO	80								
1995	JAN	DIESEL PLANT	OIL	100					AUG	MINDANAO GEO A	GEO	60
	NOV	CALACA II	COAL	300								
1996	FEB	HOPEWELL I	COAL	350	JAN	LEYTE-CEBU INTERCONNECTION			JAN	MINDANAO GEO B	GEO	60
	MAY	HOPEWELL II	COAL	350	JAN	TONGONAN GEO	GEO	110				
	DEC	MASINLOC I	COAL	300	JAN	BOHOL DIESEL	OIL	11				
					JAN	MAMBUCAL	GEO	20				
1997	JAN	LUZON-LEYTE INTERCONNECTION			JAN	TONGONAN GEO	GEO	495	JAN	LEYTE-MINDANAO INTERCONNECTION		
	JAN	DEL GALLEGO	GEO	120	JAN	MAMBUCAL	GEO	60				
	JUN	MASINLOC II	COAL	300	JAN	BOHOL DIESEL	OIL	6				
1998	JAN	SUAL 1	COAL	500	JAN	TONGONAN GEO	GEO	275	JAN	MINDANAO GEO	GEO	120
	JAN	GAS TURBINE	OIL	200	JAN	BOHOL DIESEL	OIL	11				
1999	JAN	SUAL 2	COAL	500	JAN	BOHOL DIESEL	OIL	6	JAN	MINDANAO	COAL	200
	JAN	BASELOAD PLANT	(I)	600	JAN	TIMBABAN	HYDRO	35				
	JAN	GAS TURBINE	OIL	100								
	JAN	KALAYAAN 3/4	HYDRO	300								
	JAN	NALATANG B	HYDRO	45								
2000	JAN	BASELOAD PLANT	(I)	1800	JAN	BOHOL DIESEL	OIL	6				
	JAN	COMBINED-CYCLE	OIL	300								
2001	JAN	BASELOAD PLANT	(I)	900	JAN	CEBU-BOHOL INTERCONNECTION			JAN	AGUS 3	HYDRO	224
	JAN	COMBINED-CYCLE	OIL	600								
	JAN	GAS TURBINE	OIL	200								
2002	JAN	BASELOAD PLANT	(I)	1200								
	JAN	GAS TURBINE	OIL	100								
	JAN	COMBINED-CYCLE	OIL	600								
	JAN	BAKUN A/B	HYDRO	45								
2003	JAN	BASELOAD PLANT	(I)	2100								
	JAN	GAS TURBINE	OIL	100								
2004	JAN	BASELOAD PLANT	(I)	1500					JAN	BULANOG-BATANG	HYDRO	150
	JAN	COMBINED-CYCLE	OIL	300					JAN	PULANGI V	HYDRO	300
	JAN	AMBURAYAN	HYDRO	93								
	JAN	PASIL B	HYDRO	20								
2005	JAN	BASELOAD PLANT	(I)	1500	JAN	VILLASIGA	HYDRO	29	JAN	SMALL HYDRO 1	HYDRO	27
	JAN	COMBINED-CYCLE	OIL	300					JAN	SMALL HYDRO 2	HYDRO	40
	JAN	GAS TURBINE	OIL	100								
	JAN	S. ROQUE	HYDRO	390								
	JAN	KANAN B1	HYDRO	112								
	JAN	PASIL C	HYDRO	22								

(I) TYPE AND DEFINITE LOCATIONS IN LUZON, VISAYAS, AND MINDANAO ARE STILL TO BE VERIFIED.

Table 4-2 POWER DEVELOPMENT PROGRAM (APRIL 1993)  
CAPACITY ADDITIONS (MW)

LUZON

TYPE	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	93-98	99-05	93-05
BLP							600	1800	900	1200	2100	1500	1500		9600	9600
COAL			300	1000	300	500	500							2100	500	2600
C C	420	180						300	600	600		300	300	600	2100	2700
G T	130					200	100		200	100	100		100	330	600	930
DSL	195	305	100											600		600
GEO	130	143			120									393		393
HYDRO							345			45		113	524		1027	1027
TOTAL	875	628	400	1000	420	700	1545	2100	1700	1945	2200	1913	2424	4023	13827	17850

VISAYAS

TYPE	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	93-98	99-05	93-05
BLP																
COAL																
C C																
G T																
DSL				11	6	11	6	6						28	12	40
GEO	40	40		130	555	275								1040		1040
HYDRO							35						29		64	64
TOTAL	40	40		141	561	286	41	6					29	1068	76	1144

MINDANAO

TYPE	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	93-98	99-05	93-05
BLP																
COAL							200								200	200
C C	135													135		135
G T																
DSL	98	250												348		348
GEO			60	60		120								240		240
HYDRO		40							224			450	67	40	741	781
TOTAL	233	290	60	60		120	200		224			450	67	763	941	1704

TOTAL

TYPE	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	93-98	99-05	93-05
BLP							600	1800	900	1200	2100	1500	1500		9600	9600
COAL			300	1000	300	500	700							2100	700	2800
C C	555	180						300	600	600		300	300	735	2100	2835
G T	130					200	100		200	100	100		100	330	600	930
DSL	293	555	100	11	6	11	6	6						976	12	988
GEO	170	183	60	190	675	395								1673		1673
HYDRO		40					380		224	45		563	620	40	1832	1872
TOTAL	1148	958	460	1201	981	1106	1786	2106	1924	1945	2200	2363	2520	5854	14844	20698

Table 4-3 POWER DEVELOPMENT PROGRAM (APRIL 1993)  
GENERATION AND PEAK LOAD

GENERATION

YEAR	LUZON				VISAYAS				MINDANAO				TOTAL			
	CAP ADD	INS CAP	GEN	PCF	CAP ADD	INS CAP	GEN	PCF	CAP ADD	INS CAP	GEN	PCF	CAP ADD	INS CAP	GEN	PCF
	MW	MW	GWH	(%)	MW	MW	GWH	(%)	MW	MW	GWH	(%)	MW	MW	GWH	(%)
1990		4321	18802	49.7		668	2052	35.1		1111	3927	40.3		6100	24781	46.4
1991		4621	19517	48.2		714	2279	36.4		1206	3647	34.5		6541	25443	44.6
1992		4609	19942	49.5		621	2487	45.6		1438	3119	24.7		6668	25548	43.7
1993	875	5484	21416	44.6	40	661	2949	50.9	233	1671	5160	35.3	1148	7816	29525	43.1
1994	628	6112	23267	43.5	40	701	3492	56.9	290	1961	5676	33.0	958	8774	32435	42.2
1995	400	6512	25515	44.7		701	3912	63.7	60	2021	6358	35.9	460	9234	35785	44.2
1996	1000	7512	28072	42.7	141	842	4420	59.9	60	2081	7216	39.6	1201	10435	39708	43.4
1997	420	7932	31156	44.8	561	1403	5039	41.0		2081	8262	45.3	981	11416	44457	44.5
1998	700	8632	34935	46.2	286	1689	5745	38.8	120	2201	9542	49.5	1106	12522	50222	45.8
1999	1545	10177	40302	45.2	41	1730	6607	43.6	200	2401	11046	52.5	1786	14308	57955	46.2
2000	2100	12277	45282	42.1	6	1736	7591	49.9		2401	12788	60.8	2106	16414	65661	45.7
2001	1700	13977	50173	41.0		1736	8796	57.8	224	2625	14962	65.1	1924	18338	73931	46.0
2002	1945	15922	54990	39.4		1736	9856	64.8		2625	17353	75.5	1945	20283	82199	46.3
2003	2200	18122	59939	37.8		1736	10918	71.8		2625	19957	86.8	2200	22483	90814	46.1
2004	1913	20035	64973	37.0		1736	11761	77.3	450	3075	22949	85.2	2363	24846	99683	45.8
2005	2424	22459	70431	35.8	29	1765	12592	81.4	67	3142	26392	95.9	2520	27366	109415	45.6

PEAK LOAD

YEAR	LUZON				VISAYAS				MINDANAO				TOTAL			
	CAP ADD	INS CAP	PEAK LOAD	A-B A	CAP ADD	INS CAP	PEAK LOAD	A-B A	CAP ADD	INS CAP	PEAK LOAD	A-B A	CAP ADD	INS CAP	PEAK LOAD	A-B A
	MW	A MW	B MW	(%)	MW	A MW	B MW	(%)	MW	A MW	B MW	(%)	MW	A MW	B MW	(%)
1990		4321	2973	31.2		668	380	43.1		1111	621	44.1		6100	3974	34.9
1991		4621	3045	34.1		714	410	42.6		1206	626	48.1		6541	4081	37.6
1992		4609	3250	29.2		621	472	24.0		1438	693	51.8		6668	4415	33.6
1993	875	5484	3463	36.9	40	661	511	22.7	233	1671	837	49.9	1148	7816	4811	38.4
1994	628	6112	3762	38.4	40	701	600	14.4	290	1961	920	53.1	958	8774	5282	39.8
1995	400	6512	4126	36.6		701	663	5.4	60	2021	1031	49.0	460	9234	5820	37.0
1996	1000	7512	4539	39.6	141	842	752	10.7	60	2081	1183	43.2	1201	10435	6474	38.0
1997	420	7932	5038	36.5	561	1403	858	38.8		2081	1354	34.9	981	11416	7250	36.5
1998	700	8632	5732	33.6	286	1689	978	42.1	120	2201	1564	28.9	1106	12522	8274	33.9
1999	1545	10177	6613	35.0	41	1730	1124	35.0	200	2401	1810	24.6	1786	14308	9547	33.3
2000	2100	12277	7430	39.5	6	1736	1291	25.6		2401	2096	12.7	2106	16414	10817	34.1
2001	1700	13977	8232	41.1		1736	1495	13.9	224	2625	2452	6.6	1924	18338	12179	33.6
2002	1945	15922	9023	43.3		1736	1675	3.5		2625	2844	48.3	1945	20283	13542	33.2
2003	2200	18122	9977	44.9		1736	1856	46.9		2625	3271	24.6	2200	22483	15104	32.8
2004	1913	20035	10816	46.0		1736	2000	15.2	450	3075	3761	22.3	2363	24846	16577	33.3
2005	2424	22459	11724	47.8	29	1765	2143	21.4	67	3142	4326	37.7	2520	27366	18193	33.5

1992-2005 GROWTH RATE (%)

	LUZON	VISAYAS	MINDANAO	TOTAL
INSTALLED CAPACITY	12.96	8.37	6.20	11.47
GENERATION	10.19	13.29	17.85	11.84
PEAK LOAD	10.37	12.34	15.13	11.51

Table 4-4 POWER DEVELOPMENT PROGRAM (APRIL 1993)  
INSTALLED CAPACITY (MW)

LUZON

TYPE	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
BLP								600	2400	3300	4500	6600	8100	9600
COAL	300	300	300	600	1600	1900	2400	2900	2900	2900	2900	2900	2900	2900
OIL	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925
C C		420	600	600	600	600	600	600	900	1500	2100	2100	2400	2700
G T	480	610	610	610	610	610	810	910	910	1110	1210	1310	1310	1410
DSL		195	500	600	600	600	600	600	600	600	600	600	600	600
GEO	660	790	933	933	933	1053	1053	1053	1053	1053	1053	1053	1053	1053
HYDRO	1244	1244	1244	1244	1244	1244	1244	1589	1589	1589	1634	1634	1747	2271
TOTAL	4609	5484	6112	6512	7512	7932	8632	10177	12277	13977	15922	18122	20035	22459

VISAYAS

TYPE	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
BLP														
COAL	105	105	105	105	105	105	105	105	105	105	105	105	105	105
OIL														
C C														
G T	85	85	85	85	85	85	85	85	85	85	85	85	85	85
DSL	201	201	201	201	212	218	229	235	241	241	241	241	241	241
GEO	228	268	308	308	438	993	1268	1268	1268	1268	1268	1268	1268	1268
HYDRO	2	2	2	2	2	2	2	37	37	37	37	37	37	66
TOTAL	621	661	701	701	842	1403	1689	1730	1736	1736	1736	1736	1736	1765

MINDANAO

TYPE	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
BLP														
COAL								200	200	200	200	200	200	200
OIL														
C C		135	135	135	135	135	135	135	135	135	135	135	135	135
G T	180	180	180	180	180	180	180	180	180	180	180	180	180	180
DSL	274	372	622	622	622	622	622	622	622	622	622	622	622	622
GEO				60	120	120	240	240	240	240	240	240	240	240
HYDRO	984	984	1024	1024	1024	1024	1024	1024	1024	1248	1248	1248	1698	1765
TOTAL	1438	1671	1961	2021	2081	2081	2201	2401	2401	2625	2625	2625	3075	3142

TOTAL

TYPE	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
BLP								600	2400	3300	4500	6600	8100	9600
COAL	405	405	405	705	1705	2005	2505	3205	3205	3205	3205	3205	3205	3205
OIL	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925
C C		555	735	735	735	735	735	735	1035	1635	2235	2235	2535	2835
G T	745	875	875	875	875	875	1075	1175	1175	1375	1475	1575	1575	1675
DSL	475	768	1323	1423	1434	1440	1451	1457	1463	1463	1463	1463	1463	1463
GEO	888	1058	1241	1301	1491	2166	2561	2561	2561	2561	2561	2561	2561	2561
HYDRO	2230	2230	2270	2270	2270	2270	2270	2650	2650	2874	2919	2919	3482	4102
TOTAL	6668	7816	8774	9234	10435	11416	12522	14308	16414	18338	20283	22483	24846	27366

Table 4-5 POWER DEVELOPMENT PROGRAM (APRIL 1993)  
INSTALLED CAPACITY (%)

LUZON

TYPE	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
BLP								5.9	19.5	23.7	28.2	36.5	40.4	42.7
COAL	6.5	5.5	4.9	9.2	21.3	23.9	27.8	28.6	23.7	20.7	18.2	16.0	14.5	12.9
OIL	41.8	35.0	31.4	29.6	25.6	24.2	22.2	18.9	15.7	13.8	12.1	10.6	9.6	8.6
C C		7.7	9.8	9.2	8.0	7.6	7.0	5.9	7.3	10.7	13.2	11.6	12.0	12.0
G T	10.4	11.1	10.0	9.4	8.1	7.7	9.4	8.9	7.4	7.9	7.6	7.2	6.5	6.3
DSL		3.6	8.2	9.2	8.0	7.6	7.0	5.9	4.9	4.3	3.8	3.3	3.0	2.7
GEO	14.3	14.4	15.3	14.3	12.4	13.3	12.2	10.3	8.6	7.5	6.6	5.8	5.3	4.7
HYDRO	27.0	22.7	20.4	19.1	16.6	15.7	14.4	15.6	12.9	11.4	10.3	9.0	8.7	10.1
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

VISAYAS

TYPE	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
BLP														
COAL	16.9	15.9	15.0	15.0	12.5	7.5	6.2	6.1	6.0	6.0	6.0	6.0	6.0	5.9
OIL														
C C														
G T	13.7	12.9	12.1	12.1	10.1	6.1	5.0	4.9	4.9	4.9	4.9	4.9	4.9	4.8
DSL	32.4	30.4	28.7	28.7	25.2	15.5	13.6	13.6	13.9	13.9	13.9	13.9	13.9	13.7
GEO	36.7	40.5	43.9	43.9	52.0	70.8	75.1	73.3	73.1	73.1	73.1	73.1	73.1	71.9
HYDRO	0.3	0.3	0.3	0.3	0.2	0.1	0.1	2.1	2.1	2.1	2.1	2.1	2.1	3.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

MINDANAO

TYPE	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
BLP														
COAL								8.3	8.3	7.6	7.6	7.6	6.5	6.4
OIL														
C C		8.1	6.9	6.7	6.5	6.5	6.1	5.6	5.6	5.1	5.1	5.1	4.4	4.3
G T	12.5	10.8	9.2	8.9	8.6	8.6	8.2	7.5	7.5	6.9	6.9	6.9	5.9	5.7
DSL	19.1	22.3	31.7	30.8	29.9	29.9	28.3	25.9	25.9	23.7	23.7	23.7	20.2	19.8
GEO				3.0	5.8	5.8	10.9	10.0	10.0	9.1	9.1	9.1	7.8	7.6
HYDRO	68.4	58.8	52.2	50.6	49.2	49.2	46.5	42.7	42.7	47.6	47.6	47.6	55.2	56.2
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TOTAL

TYPE	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
BLP								4.2	14.6	17.9	22.2	29.3	32.7	35.1
COAL	6.1	5.2	4.6	7.6	16.3	17.6	20.0	22.4	19.6	17.5	15.8	14.3	12.9	11.7
OIL	28.9	24.6	21.9	20.8	18.4	16.9	15.4	13.5	11.7	10.5	9.5	8.6	7.7	7.0
C C		7.1	8.4	8.0	7.0	6.4	5.9	5.1	6.3	8.9	11.0	9.9	10.2	10.4
G T	11.2	11.2	10.0	9.5	8.4	7.7	8.6	8.2	7.2	7.5	7.3	7.0	6.3	6.1
DSL	7.1	9.8	15.1	15.4	13.7	12.6	11.6	10.2	8.9	8.0	7.2	6.5	5.9	5.3
GEO	13.3	13.5	14.1	14.1	14.3	19.0	20.4	17.9	15.6	14.0	12.6	11.4	10.3	9.4
HYDRO	33.4	28.6	25.9	24.6	21.9	19.8	18.1	18.5	16.1	15.7	14.4	13.0	14.0	15.0
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 5-1 VISAYAS / MINDANAO GRID OPERATION RECORDS

GROSS GENERATION (MINDANAO) (GWH)					GROSS GENERATION (VISAYAS) (GWH)			
PLANT	INS. MW 1992	1990	1991	1992	PLANT	INS. MW 1992	1991	1992
AGUS 1 HYDRO	80.00	-	-	35.98	PALINPINON GEO.	112.50	745.90	728.27
AGUS 2 HYDRO	180.00	633.03	554.12	382.69	NEGROS PPP GEO	3.00	12.47	10.70
AGUS 4 HYDRO	158.10	734.01	673.57	449.07	LEYTE GEO	112.50	510.62	525.86
AGUS 5 HYDRO	55.00	259.27	226.46	150.76	GEO	228.00	1268.99	1264.83
AGUS 6 HYDRO	200.00	961.90	864.60	568.21	CEBU THERMAL 1	50.00	228.19	282.27
AGUS 7 HYDRO	54.00	197.03	175.78	115.55	CEBU THERMAL 2	55.00	-	31.67
AGUSAN HYDRO	1.60	9.81	10.41	9.62	THERMAL	105.00	228.19	313.94
PULANGI 4 HYDRO	255.00	875.86	725.05	596.06	CEBU DSL 1	43.80	89.31	62.77
HYDRO	983.70	3670.91	3229.99	2307.94	CEBU DSL 2	57.90	82.40	114.74
APLAYA DSL	126.72	152.91	166.31	205.00	PANAY DSL 1	36.50	18.68	40.20
GEN. SANTOS DSL	22.32	15.58	20.68	34.46	PANAY DSL 2	11.00	2.91	0.00
POWER BARGE 101	32.00	-	-	64.42	BOHOL DSL	19.80	52.47	54.56
POWER BARGE 102	32.00	-	21.35	118.17	POWER BARGE 101	-	104.24	4.40
POWER BARGE 104	32.00	-	-	52.13	POWER BARGE 103	32.00	31.99	72.90
POWER BARGE 105	14.40	-	-	25.20	POWER BARGE 104	-	97.82	23.42
POWER BARGE 106	14.40	-	-	8.24	POWER BARGE 206	-	75.61	59.23
POWER BARGE 201	30.00	-	-	59.31	POWER BARGE 207	30.00	38.33	120.65
POWER BARGE 202	30.00	-	26.99	34.66	LAND BASED GT 1	27.50	89.83	77.68
POWER BARGE 205	30.00	-	-	73.05	LAND BASED GT 2	27.50	88.44	79.06
POWER BARGE 206	30.00	-	-	12.97	GT & DSL	286.00	772.03	709.61
POWER BARGE 208	30.00	-	89.07	49.10	AMLAN HYDRO	0.80	2.40	1.40
POWER BARGE 209	30.00	-	92.50	33.99	LOBOC HYDRO	1.20	7.15	5.52
OTHERS	<35.50>	87.29	-	42.25	HYDRO	2.00	9.55	6.92
GT & DSL	453.84	255.78	416.90	812.95	OTHERS	<134.50>	36.24	191.66
TOTAL	1437.54	3926.69	3646.89	3120.89	TOTAL	621.00	2315.00	2486.96

PLANT AVAILABILITY / PLANT CAPACITY FACTOR (MINDANAO) (%)

PLANT	INS. MW 1992	1990		1991		1992	
		P A	PCF	P A	PCF	P A	PCF
AGUS 1 HYDRO	80.00	-	-	-	-	28.57	5.12
AGUS 2 HYDRO	180.00	74.09	40.15	88.10	35.15	94.74	24.20
AGUS 4 HYDRO	158.10	85.95	53.00	92.08	48.63	92.13	32.34
AGUS 5 HYDRO	55.00	95.87	53.81	92.08	47.00	91.16	31.21
AGUS 6 HYDRO	200.00	96.12	54.90	85.40	49.35	77.16	32.34
AGUS 7 HYDRO	54.00	99.52	41.65	95.08	37.16	90.62	24.36
AGUSAN HYDRO	1.60	98.17	69.99	96.76	74.27	95.66	68.45
PULANGI 4 HYDRO	255.00	88.09	39.21	91.09	32.46	92.34	26.61
HYDRO	983.70	87.88	46.37	89.72	40.80	84.32	26.71
APLAYA	126.72	49.33	13.77	42.62	14.98	38.38	18.42
GEN. SANTOS	22.32	19.73	7.97	45.34	10.58	42.51	17.58
POWER BARGE 101	32.00	-	-	-	-	42.75	22.92
POWER BARGE 102	32.00	-	-	62.27	7.62	71.53	42.04
POWER BARGE 104	32.00	-	-	-	-	33.90	18.55
POWER BARGE 105	14.40	-	-	-	-	82.88	19.92
POWER BARGE 106	14.40	-	-	-	-	73.60	6.51
POWER BARGE 201	30.00	-	-	-	-	27.28	22.51
POWER BARGE 202	30.00	-	-	35.03	10.27	20.09	13.15
POWER BARGE 205	30.00	-	-	-	-	57.28	27.72
POWER BARGE 206	30.00	-	-	-	-	39.22	4.92
POWER BARGE 208	30.00	-	-	61.13	33.89	23.89	18.63
POWER BARGE 209	30.00	-	-	54.73	35.20	15.43	12.90
GT & DSL	453.84	44.90	12.90	47.71	17.56	40.33	19.33
TOTAL	1437.54	82.22	41.97	80.65	35.78	70.43	24.38

#### IV. J I C A への技術協力の書簡

1. 本調査各案件に対するN E D A の書簡（別紙－1）
2. マラヤ発電所信頼度向上計画F / S（別紙－2）  
を要望するN. P. C の書簡







REPUBLIC OF THE PHILIPPINES  
**NATIONAL ECONOMIC AND DEVELOPMENT AUTHORITY**  
 NEDA sa Pasig, Amber Avenue, Pasig, Metro Manila

Cable Address: NEDAPHIL  
 P.O. Box 419, Greenhills  
 Tels. 631-09-45 to 64

MAY 25 1993

MR. MASATAKA IIJIMA  
 Resident Representative  
 Japan International Cooperation Agency  
 12/F Pacific Star Building  
 Sen. Gil J. Puyat Avenue Cor. Makati Avenue  
 Makati, Metro Manila

Attention: Mr. Motofumi Kohara  
 Assistant Resident Representative

Dear Mr. Iijima:

As agreed upon with the JICA Project Identification Mission on Energy Development in the Philippines during our meeting on 18 May 1993, we would like to inform you of our priorities with regard to the power projects pipelined under the FY 1993 Development Survey Program. The following projects are prioritized taking into consideration the immediate needs of the country:

1. Feasibility Study on Malaya Power Plant Reliability Improvement Project;
2. Master Plan/Feasibility Study for the Lake Lanao/Mandulog River Hydropower Project;
3. Mini Hydropower Potential Study in the Philippines;
4. Feasibility Studies for Three Small Hydropower Projects in Samar; and,
5. Development Survey Assistance Program in the Preparation of a Master Plan for Coal Utilization.

Among the hydropower projects, project (2) above has been accorded top priority in view of its readiness/advance stage of preparation inasmuch as the pre-feasibility study has already been conducted. Project (3), on the other hand, should take into account the reactivation of the National Electrification Administration's (NEA) mini-hydro development program and the Department of Energy's (DOE) long-term plan as sole and exclusive authority of the mini-hydro law. It is necessary to focus on the preparation of a master plan for mini-hydro rather than on a piece-meal basis. The study on hydropower projects in Samar is prioritized third due to adequate and reliable power supply from geothermal sources in the Leyte-Samar grid.

The study on coal utilization may be given last priority in view of the policy issues and reforms that need to be resolved and instituted as well as constraints of the local coal industry, i.e., low quality of coal.

We hope you find the above information in order.

Attached, for your reference, are the minutes of the 18 May 1993 meeting between the Mission and the NEDA Secretariat.

Thank you and best regards.

Very truly yours,



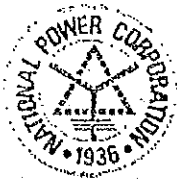
JOSEFINA U. ESGUERRA

Director

Public Investment Staff

for:

MP 290 # 3/3



REPUBLIKA NG PILIPINAS  
**Pambansang Korporasyon Sa Elektrisidad**  
 (NATIONAL POWER CORPORATION)

10 June 1993

Mr. KAZUO TANIGAWA  
 Dep. Executive Director  
 Mining & Industry Development Survey Dept.  
 Japan International Cooperation Agency (JICA)  
 P.O. Box No. 216, 48th Flr., Shinjuku Mitsui Bldg.  
 1-1, Nishi-Shinjuku 2-Chome, Shinjuku-ku  
 Tokyo, Japan

Fax: 00-81-3-3346-5439

Subject : Feasibility Study on the Reliability Improvement Project for the Malaya Thermal Plant

Dear Mr. Tanigawa:

The National Power Corporation wishes to convey its intention to avail of the grant being offered by the JICA for the implementation of a Feasibility Study on the Reliability Improvement Project for the Malaya Thermal Plant.

We expect the study to take cognizance of the following considerations:

1. The recommendations made specifically on the Malaya Plant and its associated transmission lines under the recently conducted "Master Plan Study on the Rehabilitation/Renovation and Operation/Maintenance Improvement of Power Facilities in the Luzon Grid".
2. The study shall be within the context of the 1993-2005 Power Development Program (PDP).
3. NPC Management's plan to offer the Malaya facility for "ROL" (Rehabilitate-Operate-Lease).
4. The applicability of some of the general recommendations to be formulated from the proposed study, to other thermal plants of the Corporation.

Office Address:  
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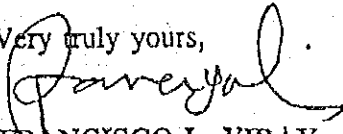
Tel. Nos.  
 92-13-541 571  
 551 580  
 561

MP 290 号 3/3

Letter to JICA  
Page - 2 -

We appreciate JICA's continued support and concern for NPC and look forward to a sustained and fruitful cooperative relationship with the Agency.

Very truly yours,



FRANCISCO L. VIRAY  
President

cc: Mr. Masataka Iijima  
Phil. Resident Representative  
JICA

Ms. M. M. Pajarillo  
VP Finance

Mr. M. E. Maño  
VP, MMRC

## V. 総合所見



## V. 総合所見

現在のフィリピンにおける電力事情は危機的状況にあり、一日平均約10時間の計画停電（Brownout）の社会・経済に与える影響は計り知れない。この電力危機をもたらせた背景は、種々指摘されているところである。

約6年間のアキノ前政権下において本格的な発電所建設が行われなかった。現有設備が経年劣化する一方で、定期点検手入れも含めた予防保全が適切でなかったため、故障が頻発し、設備の能力を発揮できなくなっている。さらに増大する電力需要に対し、ますます設備を酷使するという悪循環を生み、電力事情を悪化させている。また、部品調達が資本難や複雑な承認手続きのためうまくいかないこと、故障の根本原因も把握されず場当たりの修理されていること、NPCの賃金体系等にインセンティブがなく技術者の定着率が悪く人材確保が難しいこと、などが主たる要因とされている。

ラモス大統領はこの電力危機を乗り切るため、本年1月にエネルギー省（DOE）を新しく設置した。また、4月に「電力危機法」が成立したのを受けてNPCの組織・機構改革を積極的に推進している。ヴィライ総裁は5/3に就任したばかりで、副総裁（SVP）ポストはすべてなくすとのこと。人員も合理化で16,000人から14,000人位へと2,000人削減することになっている。

NEDA, DOE, NPC関係者とすでに要請のあがっている4案件に加え、アドバンスコピーが接到しているが、要請途上にある1案件の計5件について協議を行ったところ、優先順位は1位が「マラヤ発電所信頼度向上計画調査F/S」とすることでほぼ考え方は一致している。2位にはNEDAは「マンドログ川・ラナオ湖水力発電開発計画、F/S」を、DOEは「石炭利用計画、M/P」を挙げている。他の小水力関連2件については、緊急性・成熟度等は他との比較において低いと考えられる。また、NEDAは同5案件以外の新規要請案件候補として、非公式ながら「ルソン系統送電網リハビリ計画調査」をあげた。

協議を通じ得た印象としては、NPCの組織改革、人事異動の影響で先方関係者が要望内容に必ずしも精通しておらず、要請背景、内容の確認が難しい案件もあった。また組織がきちっと固まっておらず、協力の窓口、責任者も曖昧な状況で、当方からの所定の照会事項に対する先方理事（VP）クラスの発言内容もちぐなところがあった。しかし、先方政府関係者が電力危機の打開策につき真剣に模索している状況は十分に汲み取れた。

最近策定されたばかりの「電力開発計画（PDP）」は、1993～2005年にかかる電力需要予測とそれに見合う電力開発計画で、ハード中心の内容となっている。資金計画を伴った具体的な建設計画は盛り込まれていない。電力不足対策について比側関係者は共通して、電力設備の拡張により問題解決は可能との見解を有している。現在稼働していない発電設備に対す

る補修、その後の運転・維持管理は、NPCが行うのではなく、単に民間への委託契約により急場を凌ぎつつ対応してゆこうとする、いわゆるROM、ROL、ROT方式の経営形態の導入をDOE、NPCのトップは民営化政策の中で検討している。

マラヤ火力発電所(650MW)は現在、1号機、2号機とも稼働しておらず現場所長の談によれば、設備は目一杯運転し続け、定期点検等の予防保全も、事後補修もやれていない由である。この悪循環を断ち切るためには、NPC関係者がこうしたソフト面の必要性を一刻も早く認識し、所定の改善を図る必要があると思料される。

については、今後の調査は以下のとおり位置付けることが望ましいと考えられる。

①ルソン系統の全火力発電所に共通な運転・保守の改善方法についての提言を行うため、マラヤ火力発電所をモデルケースとして調査を実施することについて、比側の確認を取り付けるとともに本件調査にかかる正式要請書が接到し次第、次のステップに進めることとする。

②本調査と運転保守民営化(ROM、ROL、ROT方式)との関連について

a. NPCが民営化をするしないにかかわらず、NPCの各機関及び発電設備に共通なソフト面(例えば、日本の電気事業法の保安規程等のような「比」国に合った規程のようなものの作成、整備。プロキュアメントのガイドラインの作成。本社～各発電所間の決済手続き等の作成整備。教育訓練設備計画実行書の作成他)については、JICAが実施したM/Pで指摘している事項であり、今後のスタディで具体的な改善方法につき提言してゆくこととする。

b. 民営化をした場合は、日本で電力会社が民間を使用しているようなソフト面でのノウハウを「比」国に合った方法で提言するとともに、JICAの調査と民営化項目との区分を明確にして、今後の本格調査でのSCOPEを見きわめていく必要がある。

以上



## VI. 収集資料リスト



VI 収集資料リスト

Items	Description
1. National development Plan for approximately five(5) years(1994-2000)	See Attachment A. The Power Development Program (1993-2005)
2. Energy Policy and Electric Power Policy	See Attachment B. Rules On Sales of Electricity
3. The Relation between The Electric Power Crisis Act of 1993 and Administration	See Attachment C. The Electric Power Crisis Act of 1993
4. Organization of Ministries and Agencies in Charge of Energy and Power	The effect is more on the future NPC projects due to Sec. 3 provision of the Act wherein NPC may enter into NEGOTIATED contracts for the construction, repair or rehabilitation of the project.
5. The Relation Environmental Act or Regulations and Power Development Program	See Attachment D. Department of Energy Organization The existing Power Development Program (PDP) do not have direct concern on environmental requirements as these concerns are being handled by the Engineering Planning during the conduct of feasibility studies of a particular power project. See Attachment E
6. Power Supply and Demand (Gross of the Philippines and Each Grid)	See Attachment A. Power Development Program Summary
(1) Forecast Method of Power Supply and Demand (2) Typical Daily Load Curve (3) Loss Ratio of Transmission Lines and Distribution Lines	See Attachment F See Attachment F
7. Long Term Programme on Power Development	See Attachment A. PDP (1993-2005)
8. Inventory Study on Power Potential (1) Outline of Study Method (2) Result of the Study	Official listing from NPC Library to be finalized next week.

Items	Description
9.	Respective Power Outlines
(1)	Present Condition and Background
(2)	Necessity and Urgency of Each Project
(3)	Maturity of Project
(4)	Cost Estimation of Project
(5)	Economic Analysis of Project
10.	Current and Future Electricity Tariff
11.	Organization of Administration
12.	Annual Report (NPC)
13	Operation/ Maintenance of Power Facilities
(1)	Specifications, Manufacturers' name of Main Machines
(2)	Specification of Transmission Lines/Substation(Luzon grid only)
(3)	Annual Power Production Plan for Each Plant (Luzon grid only)
(4)	Annual Operation/Maintenance Plan Budget for Each Plant (Luzon grid only)
(5)	Present Situation of Operation/Maintenance for Each Plant (Malaya only)
(6)	Scope of Regular Inspection and its Schedule (Oil thermal plants only)
(7)	Cause and Countermeasures of Main Troubles for Power Facilities
(8)	Environmental Countermeasures
(9)	Future Operation/Maintenance Plan related to Software.
(10)	Current Operation/Maintenance Situation of the Malaya Thermal Power Plant



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