

(2) Financial Internal Rate of Return (FIRR)

The cost flow and the flow of income from sales based on the above construction cost and the other premises are described in Table 12.4-2.

The FIRR is 11.79%. It is concluded from this FIRR, that this Project is financially sound.

12.5 Calculation of Debt Service Ratio

(1) Loan reimbursement schedule

The Loan Reimbursement Schedule based on the fund procurement conditions in Clause 12.3.2 is described in Tables 12.5-5 through 12.5-12.

The construction as the basic factor for the loan calculation, including the interest during the construction and the escalation, is described in Tables 12.5-1 and 12.5-2. These costs are to be recovered as the depreciation.

(2) Profit and loss statement and cash flow

The profit and loss statement and cash flow are described in Tables 12.5-13 and 12.5-14 respectively.

(3) Debt service ratio

The debt service ratio calculation result is described in Table 12.5-15. The average debt service ratio in FY 2029 is 4.48. This 4.48 is an acceptable value.

12.6 Revision of Electricity Fee

The calculations show that this Project is financially sound. But to be more attractive Project, it is necessary to revise the current electricity fee equivalent to the escalation rate of local currency.

Table 12.4-1 Construction Cost for Financial Analysis

FY	Subtransmission Line			Distribution Substation			Telecommunication			Distribution System			Total Construction Cost for Analysis
	Total Construction Cost	Value Added Tax	Construction Cost Analysis	Total Construction Cost	Value Added Tax	Construction Cost Analysis	Total Construction Cost	Value Added Tax	Construction Cost Analysis	Total Construction Cost	Value Added Tax	Construction Cost Analysis	
	A	B	C=A+B	D	E	F=D+E	G	H	I=G+H	J	K	L=J+K	
1996	0.00	0.00	0.00	1,431.21	81.47	1,349.74	0.00	0.00	0.00	958.63	54.57	904.06	2,253.80
1997	701.20	39.92	661.28	3,136.11	178.54	2,957.57	73.69	4.33	69.37	2,619.59	149.22	2,470.37	6,158.59
1998	592.24	33.67	558.58	2,261.69	128.80	2,132.89	60.82	3.57	57.25	1,952.31	111.21	1,841.10	4,589.82
1999	997.60	56.79	940.81	2,564.93	145.96	2,418.97	51.48	3.02	48.45	2,420.66	137.83	2,282.84	5,691.07
2000	2,901.10	165.40	2,735.70	3,819.14	217.31	3,601.83	77.21	4.53	72.68	4,552.94	259.37	4,293.57	10,703.78
2001	341.37	19.45	321.92	2,582.48	147.05	2,435.43	73.69	4.33	69.37	2,007.76	114.42	1,893.34	4,720.06
2002	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2003	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	0.00	0.00	0.00	3,909.26	222.53	3,686.73	0.00	0.00	0.00	2,618.43	149.05	2,469.38	6,156.11
2006	8,261.94	470.96	7,790.98	5,863.90	333.79	5,530.11	169.60	9.95	159.64	9,575.10	545.69	9,029.41	22,510.14
2007	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2008	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2009	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	0.00	0.00	0.00	2,680.64	152.58	2,528.06	0.00	0.00	0.00	1,795.50	102.20	1,693.30	4,221.36
2011	1,348.36	76.77	1,271.59	4,020.95	228.87	3,792.08	96.52	5.66	90.85	3,661.02	208.51	3,452.51	8,607.03
2012	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	0.00	0.00	0.00	2,258.53	128.52	2,130.01	0.00	0.00	0.00	1,512.77	86.08	1,426.68	3,556.69
2016	2,058.60	117.37	1,941.23	3,387.79	192.76	3,195.03	76.61	4.50	72.11	3,699.31	210.74	3,488.57	8,696.94
Total	17,202.42	980.33	16,222.09	37,916.63	2,158.18	35,758.45	679.61	39.89	639.72	37,374.00	1,228.89	35,245.11	87,865.37

Table 12.4-2 Calculation of FIRR

Discount Rate	No.	FY	Cost				Benefit		
			Construction	O & M	Energy Purchase	Total	Energy Sales	PV	NPV
11.7922%	1	1996	2,253.80	0.00		2,253.80	2,016.06	0.00	(2,016.06)
	2	1997	6,158.59	0.00		6,158.59	4,927.86	0.00	(4,927.86)
	3	1998	4,589.82	252.76	3,745.26	8,587.84	6,146.81	4,555.61	(2,886.10)
	4	1999	5,691.07	433.27	7,789.50	13,913.84	8,908.44	9,422.10	(2,875.87)
	5	2000	10,703.78	601.95	12,009.28	23,315.01	13,353.00	14,505.69	(5,045.28)
	6	2001	4,720.06	961.43	16,809.76	22,491.25	11,522.46	20,200.64	(1,173.50)
	7	2002	0.00	1,238.59	20,968.60	22,207.19	10,176.86	25,166.13	1,355.99
	8	2003	0.00	1,238.59	25,022.70	26,261.29	10,765.27	30,006.57	1,535.30
	9	2004	0.00	1,238.59	29,260.09	30,498.68	11,183.52	35,065.84	1,674.73
	10	2005	6,156.11	1,238.59	33,578.94	40,973.63	13,439.74	40,222.38	(246.42)
	11	2006	22,510.14	1,238.59	37,956.72	61,705.45	18,104.99	45,457.07	(4,767.43)
	12	2007	0.00	2,245.60	42,398.88	44,644.48	11,717.40	50,761.24	1,605.41
	13	2008	0.00	2,245.60	46,897.77	49,143.37	11,537.64	56,133.14	1,641.02
	14	2009	0.00	2,245.60	51,453.39	53,698.99	11,277.35	61,572.77	1,653.58
	15	2010	4,221.36	2,245.60	56,064.28	62,531.24	11,746.99	67,078.41	854.22
	16	2011	8,607.03	2,245.60	60,748.42	71,601.05	12,031.99	72,653.51	176.86
	17	2012	0.00	2,718.87	64,645.66	67,364.53	10,126.00	77,306.38	1,494.42
	18	2013	0.00	2,718.87	68,544.36	71,263.22	9,582.10	81,960.98	1,438.43
	19	2014	0.00	2,718.87	72,441.60	75,160.47	9,040.10	86,613.85	1,377.58
	20	2015	3,556.69	2,718.87	76,338.84	82,614.40	8,888.50	91,266.72	930.90
	21	2016	8,696.94	2,718.87	80,278.86	91,694.66	8,824.81	95,921.32	406.78
	22	2017		3,163.88	80,278.86	83,442.74	7,183.54	95,921.32	1,074.27
	23	2018		3,163.88	80,278.86	83,442.74	6,425.80	95,921.32	960.96
	24	2019		3,163.88	80,278.86	83,442.74	5,747.99	95,921.32	859.59
	25	2020		3,163.88	80,278.86	83,442.74	5,141.67	95,921.32	768.92
	26	2021		3,163.88	80,278.86	83,442.74	4,599.31	95,921.32	687.81
	27	2022		3,163.88	80,278.86	83,442.74	4,114.16	95,921.32	615.26
	28	2023		3,163.88	80,278.86	83,442.74	3,680.19	95,921.32	550.36
	29	2024		3,163.88	80,278.86	83,442.74	3,291.99	95,921.32	492.31
	30	2025		3,163.88	80,278.86	83,442.74	2,944.74	95,921.32	440.38
	31	2026		3,163.88	80,278.86	83,442.74	2,634.12	95,921.32	393.92
	32	2027		3,163.88	80,278.86	83,442.74	2,356.27	95,921.32	352.37
	33	2028		3,163.88	80,278.86	83,442.74	2,107.72	95,921.32	315.20
	34	2029		3,163.88	80,278.86	83,442.74	1,885.39	95,921.32	281.95
	Total		87,865.37	74,395.14	1,850,578.07	2,012,838.58	267,430.79	2,212,847.51	0.00

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Table 12.5-1 Construction Cost divided into Foreign and Local Currency Portion

																	(Million Baht)
FY	Construction Cost for Subtransmission Line				Construction Cost for Substation				Construction Cost for Telecommunication				Construction Cost for Distribution System				Total Const Cost
	Total (a)+(b)	Foreign (a)	Local (b)	Local Vat (c)	Total (d)+(e)	Foreign (d)	Local (e)	Local Vat (f)	Total (g)+(h)	Foreign (g)	Local (h)	Local Vat (i)	Total (j)+(k)	Foreign (j)	Local (k)	Local Vat (l)	arbitrage adjustment
1995	0.00	0.00	0.00	0.00	1,431.21	809.83	621.38	81.47	0.00	0.00	0.00	0.00	958.63	542.42	416.20	54.57	2,389.84
1997	701.20	338.96	362.24	39.92	2,146.81	1,214.74	932.07	122.20	73.69	43.04	30.65	4.33	1,956.96	1,069.50	887.46	111.48	4,876.66
	701.20				3,578.02				73.69				2,915.58				7,268.49
1997	0.00	0.00	0.00	0.00	989.30	613.13	376.17	56.34	0.00	0.00	0.00	0.00	662.63	410.68	251.96	37.74	1,651.93
1998	592.24	187.24	405.00	33.67	1,483.95	919.70	564.25	84.50	60.82	35.52	25.30	3.57	1,431.38	765.22	666.15	81.54	3,568.39
	592.24				2,473.25				60.82				2,094.01				5,220.33
1998	0.00	0.00	0.00	0.00	777.74	499.17	278.57	44.30	0.00	0.00	0.00	0.00	520.93	334.34	186.59	29.67	1,298.67
1999	997.60	484.19	513.41	56.79	1,166.60	748.77	417.83	66.44	51.48	30.10	21.38	3.02	1,484.06	845.99	638.07	84.56	3,699.73
	997.60				1,944.34				51.48				2,004.99				4,998.40
1999	0.00	0.00	0.00	0.00	1,398.33	827.84	570.49	79.52	0.00	0.00	0.00	0.00	936.60	554.49	382.11	53.26	2,334.93
2000	2,901.10	1,810.75	1,090.35	165.40	2,097.49	1,241.76	855.73	119.28	77.21	45.14	32.07	4.53	3,399.78	2,074.81	1,324.97	193.71	8,475.58
	2,901.10				3,495.82				77.21				4,336.38				10,810.51
2000	0.00	0.00	0.00	0.00	1,721.65	1,011.85	709.80	98.03	0.00	0.00	0.00	0.00	1,153.16	677.74	475.42	65.66	2,874.81
2001	341.37	196.96	144.42	19.45	2,582.48	1,517.77	1,064.71	147.05	73.69	43.04	30.65	4.33	2,007.76	1,177.35	830.40	114.42	5,005.30
	341.37				4,304.13				73.69				3,160.92				7,880.11
2005	0.00	0.00	0.00	0.00	3,909.26	2,412.73	1,496.53	222.53	0.00	0.00	0.00	0.00	2,618.43	1,616.05	1,002.38	149.05	6,527.69
2006	8,261.94	5,056.75	3,203.19	470.86	5,863.90	3,619.10	2,244.80	333.79	169.60	99.03	70.57	9.95	9,575.10	5,878.76	3,696.33	545.69	23,870.54
	8,261.94				9,773.16				169.60				12,193.52				30,398.22
2010	0.00	0.00	0.00	0.00	2,680.64	1,533.26	1,147.38	152.58	0.00	0.00	0.00	0.00	1,795.50	1,026.98	768.52	102.20	4,476.14
2011	1,348.36	683.36	665.00	76.77	4,020.95	2,299.90	1,721.05	228.87	96.52	56.43	40.09	5.66	3,661.02	2,035.99	1,625.03	208.51	9,126.85
	1,348.36				6,701.59				96.52				5,456.51				13,602.98
2015	0.00	0.00	0.00	0.00	2,258.53	1,334.70	923.83	128.52	0.00	0.00	0.00	0.00	1,512.77	893.98	618.78	86.08	3,771.30
2016	2,058.80	1,273.02	785.58	117.37	3,387.79	2,002.06	1,385.73	192.76	76.61	44.70	31.90	4.50	3,699.31	2,223.60	1,475.71	210.74	9,222.30
	2,058.80				5,646.32				76.61				5,212.07				12,993.60
Total	17,202.42	10,033.23	7,169.19	980.33	37,916.63	22,606.31	15,310.32	2,158.18	679.61	397.01	282.60	39.89	37,374.00	22,127.91	15,246.08	2,128.89	93,172.65

Table 12.5-2 Calculation of Interest during Construction

Table 12.5-2 Calculation of interest during construction (Million Baht)												
FY	Construction Cost without VAT before Escalation			Construction Cost without VAT after Escalation			Interest during Construction			Financing for Construction		
	Foreign and total	Local b+c+e+f+h+k	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Grand Total
1996	1,352.25	901.54	2,253.80	1,382.01	940.93	2,322.94	48.37	61.16	109.53	1,430.38	1,002.09	2,432.47
1997	2,666.24	1,934.49	4,600.73	2,784.85	2,107.74	4,892.59	194.21	259.32	453.53	2,979.06	2,367.07	5,346.13
			6,854.53			7,215.53			563.07			7,778.60
1997	1,023.81	534.05	1,557.86	1,069.34	580.09	1,649.43	37.43	37.71	75.13	1,106.77	617.79	1,724.56
1998	1,907.68	1,457.44	3,365.12	2,036.39	1,658.93	3,695.31	146.13	183.24	329.37	2,182.51	1,842.17	4,024.68
			4,922.98			5,344.74			404.50			5,749.24
1998	833.51	391.18	1,224.70	889.75	441.88	1,331.63	31.14	28.72	59.86	920.89	470.60	1,391.50
1999	2,109.05	1,379.87	3,488.92	2,300.84	1,634.97	3,935.81	142.81	163.72	306.53	2,443.66	1,798.69	4,242.34
			4,713.62			5,267.45			366.39			5,633.84
1999	1,382.33	819.82	2,202.15	1,508.05	972.93	2,480.97	52.78	63.24	116.02	1,560.83	1,036.17	2,597.00
2000	5,172.47	2,820.19	7,992.65	5,767.05	3,471.22	9,238.26	307.41	352.11	659.52	6,074.46	3,823.33	9,897.78
			10,194.80			11,719.24			775.54			12,494.78
2000	1,689.59	1,021.53	2,711.12	1,883.80	1,262.77	3,146.57	65.93	82.08	148.01	1,949.74	1,344.85	3,294.59
2001	2,935.12	1,784.93	4,720.06	3,344.50	2,298.37	5,642.86	248.92	313.55	562.48	3,593.42	2,611.92	6,205.34
			7,431.18			8,789.44			710.49			9,499.93
2005	4,028.78	2,127.33	6,156.11	5,008.20	3,242.55	8,250.75	175.29	210.77	386.05	5,183.49	3,453.32	8,636.81
2006	14,655.65	7,854.49	22,510.14	18,619.36	12,433.51	31,052.87	1,002.25	1,229.71	2,231.96	19,621.61	13,663.22	33,284.83
			28,666.24			39,303.63			2,618.01			41,921.64
2010	2,560.24	1,661.12	4,221.36	3,548.49	3,189.42	6,737.91	124.20	207.31	331.51	3,672.69	3,396.73	7,069.42
2011	5,075.68	3,531.35	8,607.03	7,189.67	7,094.79	14,284.45	500.03	875.79	1,375.82	7,889.70	7,970.57	15,660.27
			12,828.39			21,022.37			1,707.33			22,729.70
2015	2,228.68	1,328.01	3,556.69	3,444.03	3,170.67	6,614.70	120.54	206.09	326.63	3,564.57	3,376.76	6,941.33
2016	5,543.38	3,153.56	8,696.94	8,754.74	7,761.18	16,515.92	547.50	916.66	1,464.16	9,302.24	8,677.85	17,980.09
			12,253.63			23,130.62			1,790.80			24,921.42
Total	55,164.46	32,700.91	87,865.37	69,531.07	52,261.94	121,793.01	3,744.95	5,191.19	8,936.13	73,276.01	57,453.13	130,729.15

Escalation
 Foreign Currency Portion : 2.2%
 Local Currency Portion : 5.0%

Interest Rate
 Foreign Currency Portion : 7.0%
 Local Currency Portion : 13.0%

Table 12.5-3 Operation and Maintenance Cost

FY	Subtransmission Line				Distribution Substation				Telecommunication				Distribution Facilities				(Million Baht)
	Construction Cost			Operation and Maintenance Cost	Construction Cost			Operation and Maintenance Cost	Construction Cost			Operation and Maintenance Cost	Construction Cost			Operation and Maintenance Cost	
	without VAT and Import Duty	Escalation	Total		without VAT and Import Duty	Escalation	Total		without VAT and Import Duty	Escalation	Total		without VAT and Import Duty	Escalation	Total		
1996	0.00	0.00	0.00	0.00	1,279.77	39.87	1,319.64	0.00	0.00	0.00	0.00	0.00	857.19	26.70	883.90	0.00	0.00
1997	626.51	43.30	669.81	0.00	2,801.65	174.38	2,976.03	0.00	52.18	2.69	54.88	0.00	2,331.14	147.61	2,478.74	0.00	0.00
1998	534.47	66.29	600.76	20.09	2,015.45	181.62	2,197.07	134.44	43.06	3.38	46.44	2.20	1,736.78	168.31	1,905.09	109.47	266.20
1999	891.33	127.94	1,019.27	38.78	2,296.87	286.10	2,582.97	234.02	36.50	3.88	40.38	4.11	2,159.91	279.92	2,439.83	194.14	471.07
2000	2,566.04	398.23	2,964.27	70.65	3,423.12	559.03	3,982.15	316.47	54.76	7.38	62.14	5.84	4,048.22	646.12	4,694.34	280.33	675.30
2001	303.17	61.08	364.25	161.93	2,303.73	459.62	2,763.35	473.65	52.18	8.56	60.74	8.49	1,781.06	354.50	2,135.56	467.57	1,111.64
2002	0.00	0.00	0.00	178.24	0.00	0.00	0.00	671.36	0.00	0.00	0.00	11.16	0.00	0.00	0.00	616.36	1,477.11
2003	0.00	0.00	0.00	184.16	0.00	0.00	0.00	693.64	0.00	0.00	0.00	11.47	0.00	0.00	0.00	636.79	1,526.06
2004	0.00	0.00	0.00	190.29	0.00	0.00	0.00	716.65	0.00	0.00	0.00	11.79	0.00	0.00	0.00	657.90	1,576.63
2005	0.00	0.00	0.00	196.61	3,494.63	1,207.72	4,702.35	740.43	0.00	0.00	0.00	12.11	2,340.71	808.93	3,149.64	679.72	1,628.88
2006	7,315.39	2,829.55	10,144.94	203.15	5,241.95	2,030.27	7,272.22	765.00	120.04	38.94	158.98	12.45	8,491.32	3,281.19	11,772.51	702.25	1,682.85
2007	0.00	0.00	0.00	514.25	0.00	0.00	0.00	1,269.37	0.00	0.00	0.00	19.16	0.00	0.00	0.00	1,322.42	3,125.19
2008	0.00	0.00	0.00	531.34	0.00	0.00	0.00	1,311.49	0.00	0.00	0.00	19.69	0.00	0.00	0.00	1,366.26	3,228.78
2009	0.00	0.00	0.00	549.01	0.00	0.00	0.00	1,355.01	0.00	0.00	0.00	20.24	0.00	0.00	0.00	1,411.55	3,335.81
2010	0.00	0.00	0.00	567.26	2,397.54	1,456.73	3,854.27	1,399.97	0.00	0.00	0.00	20.80	1,605.87	975.72	2,581.59	1,458.35	3,446.38
2011	1,203.61	866.68	2,070.29	586.12	3,596.32	2,379.23	5,975.55	1,446.42	68.45	34.96	103.41	21.38	3,260.85	2,197.53	5,458.38	1,506.70	3,560.62
2012	0.00	0.00	0.00	667.71	0.00	0.00	0.00	1,887.61	0.00	0.00	0.00	26.11	0.00	0.00	0.00	1,878.25	4,459.68
2013	0.00	0.00	0.00	689.91	0.00	0.00	0.00	1,950.25	0.00	0.00	0.00	26.84	0.00	0.00	0.00	1,940.52	4,607.51
2014	0.00	0.00	0.00	712.84	0.00	0.00	0.00	2,014.96	0.00	0.00	0.00	27.58	0.00	0.00	0.00	2,004.85	4,760.23
2015	0.00	0.00	0.00	736.54	2,024.18	1,773.65	3,797.83	2,081.82	0.00	0.00	0.00	28.35	1,355.80	1,187.99	2,543.79	2,071.32	4,918.02
2016	1,820.70	1,617.87	3,438.57	761.02	3,036.28	2,853.17	5,889.45	2,150.90	54.17	39.37	93.54	29.14	3,289.50	3,021.08	6,310.57	2,139.99	5,081.05
2017				889.48				2,609.76				33.69				2,565.11	6,098.04
2018				919.04				2,696.36				34.63				2,650.15	6,300.18
2019				949.60				2,785.83				35.59				2,738.01	6,509.03
2020				981.16				2,878.27				36.59				2,828.78	6,724.80
2021				1,013.78				2,973.77				37.60				2,922.56	6,947.72
2022				1,047.48				3,072.45				38.65				3,019.45	7,178.03
2023				1,082.30				3,174.40				39.72				3,119.55	7,415.98
2024				1,118.28				3,279.73				40.83				3,222.98	7,661.82
2025				1,155.46				3,388.56				41.97				3,329.83	7,915.81
2026				1,193.87				3,501.00				43.13				3,440.22	8,178.22
2027				1,233.55				3,617.17				44.33				3,554.27	8,449.33
2028				1,274.56				3,737.20				45.57				3,672.10	8,729.43
2029				1,316.93				3,861.21				46.84				3,793.84	9,018.82
Total	15,261.22	6,010.93	21,272.16	21,735.39	33,911.49	13,401.39	47,312.88	63,191.16	481.34	139.17	620.50	838.07	33,256.33	13,095.61	46,351.94	62,301.59	148,066.20

Table 12.5-4 Energy Purchase and Sales

FY	Energy Purchase			Energy sales		
	Incremental Energy	Purchase Price of MEA	Purchase Baht	Incremental Energy without Street Lighting	Sales Price of MEA	Sales Baht
	A	B	F=DxE	D	E	F=DxE
	GWh	Baht/kWh	Million Baht	GWh	Baht/kWh	Million Baht
1998	2,696	1.6083	4,335.61	2,612	2.0194	5,273.68
1999	5,607	1.6887	9,468.19	5,401	2.1203	11,452.62
2000	8,644	1.7731	15,327.23	8,316	2.2263	18,513.35
2001	12,099	1.8618	22,526.69	11,580	2.3377	27,070.78
2002	15,093	1.9549	29,504.92	14,427	2.4545	35,411.27
2003	18,011	2.0526	36,969.93	17,202	2.5773	44,333.37
2004	21,061	2.1553	45,392.00	20,102	2.7061	54,398.63
2005	24,170	2.2630	54,696.55	23,058	2.8414	65,518.02
2006	27,321	2.3762	64,918.87	26,059	2.9835	77,747.02
2007	30,518	2.4950	76,142.30	29,100	3.1327	91,159.89
2008	33,756	2.6197	88,432.75	32,179	3.2893	105,847.40
2009	37,035	2.7507	101,874.20	35,297	3.4538	121,909.88
2010	40,354	2.8883	116,553.62	38,454	3.6265	139,451.19
2011	43,726	3.0327	132,606.18	41,650	3.8078	158,593.50
2012	46,531	3.1843	148,169.04	44,317	3.9982	177,187.63
2013	49,337	3.3435	164,960.17	46,985	4.1981	197,248.87
2014	52,143	3.5107	183,056.32	49,653	4.4080	218,868.88
2015	54,948	3.6862	202,549.68	52,320	4.6284	242,157.77
2016	57,784	3.8705	223,653.89	54,988	4.8598	267,233.21
2017	57,784	4.0641	234,836.59	54,988	5.1028	280,594.87
2018	57,784	4.2673	246,578.42	54,988	5.3580	294,624.62
2019	57,784	4.4806	258,907.34	54,988	5.6259	309,355.85
2020	57,784	4.7047	271,852.70	54,988	5.9072	324,823.64
2021	57,784	4.9399	285,445.34	54,988	6.2025	341,064.82
2022	57,784	5.1869	299,717.61	54,988	6.5126	358,118.06
2023	57,784	5.4462	314,703.49	54,988	6.8383	376,023.97
2024	57,784	5.7185	330,438.66	54,988	7.1802	394,825.16
2025	57,784	6.0045	346,960.59	54,988	7.5392	414,566.42
2026	57,784	6.3047	364,308.62	54,988	7.9162	435,294.74
2027	57,784	6.6199	382,524.05	54,988	8.3120	457,059.48
2028	57,784	6.9509	401,650.26	54,988	8.7276	479,912.45
2029	57,784	7.2985	421,732.77	54,988	9.1639	503,908.08
Total	1,332,022		5,880,794.56	1,268,544		7,029,549.13

Table 12.5-5 Repayment Schedule of Debt (Loan Supplied 1996 - 1997)

(Million Baht)

No	FY	Financing for Construction			Repayment of Foreign Currency				Repayment of Local Currency			
		Foreign	Local	Total	Interest	Principal	Total	Balance	Interest	Principal	Total	Balance
	1996	1,430.38	1,002.09	2,432.47								
	1997	2,979.06	2,367.07	5,346.13				4,409.44				3,369.16
1	1998				308.66	107.56	416.22	4,301.88	437.99	264.10	702.09	3,105.06
2	1999				301.13	115.09	416.22	4,186.79	403.66	298.43	702.09	2,806.63
3	2000				293.08	123.14	416.22	4,063.65	384.86	337.23	702.09	2,469.41
4	2001				284.46	131.76	416.22	3,931.88	321.02	381.07	702.09	2,088.34
5	2002				275.23	140.99	416.22	3,790.89	271.48	430.60	702.09	1,657.74
6	2003				265.36	150.86	416.22	3,640.04	215.51	486.58	702.09	1,171.16
7	2004				254.80	161.42	416.22	3,478.62	152.25	549.84	702.09	621.32
8	2005				243.50	172.72	416.22	3,305.90	80.77	621.32	702.09	0.00
9	2006				231.41	184.81	416.22	3,121.10				
10	2007				218.48	197.74	416.22	2,923.35				
11	2008				204.63	211.59	416.22	2,711.77				
12	2009				189.82	226.40	416.22	2,485.37				
13	2010				173.98	242.24	416.22	2,243.13				
14	2011				157.02	259.20	416.22	1,983.93				
15	2012				138.87	277.34	416.22	1,706.58				
16	2013				119.46	296.76	416.22	1,409.82				
17	2014				98.69	317.53	416.22	1,092.29				
18	2015				76.46	339.76	416.22	752.53				
19	2016				52.68	363.54	416.22	388.99				
20	2017				27.23	388.99	416.22	0.00				
	Total	4,409.44	3,369.16	7,778.60	3,914.96	4,409.44	8,324.40		2,247.55	3,369.16	5,616.71	

Table 12.5-6 Repayment Schedule of Debt (Loan Supplied 1997 - 1998)

(Million Baht)

No	FY	Financing for Construction			Repayment of Foreign Currency				Repayment of Local Currency			
		Foreign	Local	Total	Interest	Principal	Total	Balance	Interest	Principal	Total	Balance
	1997	1,106.77	617.79	1,724.56								
	1998	2,182.51	1,842.17	4,024.68				3,289.28				2,459.96
1	1999				230.25	80.24	310.48	3,209.05	319.80	192.83	512.62	2,267.13
2	2000				224.63	85.85	310.48	3,123.20	294.73	217.90	512.62	2,049.24
3	2001				218.62	91.86	310.48	3,031.33	266.40	246.22	512.62	1,803.02
4	2002				212.19	98.29	310.48	2,933.04	234.39	278.23	512.62	1,524.78
5	2003				205.31	105.17	310.48	2,827.87	198.22	314.40	512.62	1,210.38
6	2004				197.95	112.53	310.48	2,715.34	157.35	355.27	512.62	855.11
7	2005				190.07	120.41	310.48	2,594.93	111.16	401.46	512.62	453.65
8	2006				181.64	128.84	310.48	2,466.08	58.97	453.65	512.62	0.00
9	2007				172.63	137.86	310.48	2,328.23				
10	2008				162.98	147.51	310.48	2,180.72				
11	2009				152.65	157.83	310.48	2,022.88				
12	2010				141.60	168.88	310.48	1,854.00				
13	2011				129.78	180.71	310.48	1,673.29				
14	2012				117.13	193.35	310.48	1,479.94				
15	2013				103.60	206.89	310.48	1,273.05				
16	2014				89.11	221.37	310.48	1,051.68				
17	2015				73.62	236.87	310.48	814.81				
18	2016				57.04	253.45	310.48	561.36				
19	2017				39.30	271.19	310.48	290.17				
20	2018				20.31	290.17	310.48	0.00				
	Total	3,289.28	2,459.96	5,749.24	2,920.42	3,289.28	6,209.70		1,641.03	2,459.96	4,100.99	

Table 12.5-7 Repayment Schedule of Debt (Loan Supplied 1998 - 1999)

(Million Baht)

No	FY	Financing for Construction			Repayment of Foreign Currency				Repayment of Local Currency			
		Foreign	Local	Total	Interest	Principal	Total	Balance	Interest	Principal	Total	Balance
	1998	920.89	470.60	1,391.50								
	1999	2,443.86	1,798.69	4,242.54				3,364.55				2,269.29
1	2000				235.52	82.07	317.59	3,282.48	295.01	177.88	472.89	2,091.41
2	2001				229.77	87.82	317.59	3,194.66	271.88	201.01	472.89	1,890.40
3	2002				223.63	93.86	317.59	3,100.70	245.75	227.14	472.89	1,663.26
4	2003				217.05	100.54	317.59	3,000.16	218.22	258.67	472.89	1,406.60
5	2004				210.01	107.58	317.59	2,892.58	182.86	290.03	472.89	1,116.57
6	2005				202.48	115.11	317.59	2,777.47	145.15	327.74	472.89	788.83
7	2006				194.42	123.17	317.59	2,654.30	102.55	370.34	472.89	418.49
8	2007				185.80	131.79	317.59	2,522.52	54.40	418.49	472.89	0.00
9	2008				176.58	141.01	317.59	2,381.50				
10	2009				166.71	150.88	317.59	2,230.62				
11	2010				156.14	161.45	317.59	2,089.17				
12	2011				144.84	172.75	317.59	1,896.42				
13	2012				132.75	184.84	317.59	1,711.58				
14	2013				119.81	197.78	317.59	1,513.80				
15	2014				105.97	211.62	317.59	1,302.18				
16	2015				91.15	226.44	317.59	1,075.74				
17	2016				75.30	242.29	317.59	833.46				
18	2017				58.34	258.25	317.59	574.21				
19	2018				40.19	277.40	317.59	296.81				
20	2019				20.78	296.81	317.59	0.00				
	Total	3,364.55	2,269.29	5,633.84	2,987.25	3,364.55	6,351.80		1,513.83	2,269.29	3,783.12	

Table 12.5-8 Repayment Schedule of Debt (Loan Supplied 1999 - 2000)

(Million Baht)												
No.	FY	Financing for Construction			Repayment of Foreign Currency				Repayment of Local Currency			
		Foreign	Local	Total	Interest	Principal	Total	Balance	Interest	Principal	Total	Balance
	1999	1,560.83	1,036.17	2,597.00								
	2000	6,074.46	3,823.33	9,897.78				7,635.29				4,859.49
1	2001				534.47	186.25	720.72	7,449.04	631.73	380.92	1,012.65	4,478.57
2	2002				521.43	199.28	720.72	7,249.75	582.21	430.44	1,012.65	4,048.13
3	2003				507.48	213.23	720.72	7,036.52	526.26	486.40	1,012.65	3,561.74
4	2004				492.56	228.16	720.72	6,808.36	463.03	549.63	1,012.65	3,012.11
5	2005				476.59	244.13	720.72	6,564.23	391.57	621.08	1,012.65	2,391.03
6	2006				459.50	261.22	720.72	6,303.01	310.83	701.82	1,012.65	1,689.21
7	2007				441.21	279.51	720.72	6,023.50	219.60	793.06	1,012.65	896.15
8	2008				421.65	299.07	720.72	5,724.43	116.50	896.15	1,012.65	0.00
9	2009				400.71	320.01	720.72	5,404.42				
10	2010				378.31	342.41	720.72	5,062.01				
11	2011				354.34	366.38	720.72	4,695.64				
12	2012				328.69	392.02	720.72	4,303.62				
13	2013				301.25	419.46	720.72	3,884.15				
14	2014				271.89	448.83	720.72	3,435.33				
15	2015				240.47	480.24	720.72	2,955.08				
16	2016				206.86	513.86	720.72	2,441.22				
17	2017				170.89	549.83	720.72	1,891.39				
18	2018				132.40	588.32	720.72	1,303.07				
19	2019				91.21	629.50	720.72	673.57				
20	2020				47.15	673.57	720.72	0.00				
Total		7,635.29	4,859.49	12,494.78	6,779.05	7,635.29	14,414.34		3,241.74	4,859.49	8,101.23	

Table 12.5-9 Repayment Schedule of Debt (Loan Supplied 2000 - 2001)

(Million Baht)												
No.	FY	Financing for Construction			Repayment of Foreign Currency				Repayment of Local Currency			
		Foreign	Local	Total	Interest	Principal	Total	Balance	Interest	Principal	Total	Balance
	2000	1,949.74	1,344.85	3,294.59								
	2001	3,593.42	2,611.92	6,205.34				5,543.16				3,956.77
1	2002				388.02	135.21	523.23	5,407.94	514.38	310.16	824.54	3,646.61
2	2003				378.58	144.68	523.23	5,263.26	474.06	350.48	824.54	3,296.13
3	2004				368.43	154.81	523.23	5,108.46	428.50	396.04	824.54	2,900.09
4	2005				357.59	165.64	523.23	4,942.82	377.01	447.53	824.54	2,452.57
5	2006				346.00	177.24	523.23	4,765.58	318.83	505.70	824.54	1,946.86
6	2007				333.59	189.64	523.23	4,575.93	253.09	571.45	824.54	1,375.41
7	2008				320.32	202.92	523.23	4,373.01	178.80	645.73	824.54	729.68
8	2009				306.11	217.12	523.23	4,155.89	94.86	729.68	824.54	0.00
9	2010				290.91	232.32	523.23	3,923.57				
10	2011				274.65	248.59	523.23	3,674.98				
11	2012				257.25	265.99	523.23	3,409.00				
12	2013				238.63	284.61	523.23	3,124.39				
13	2014				218.71	304.53	523.23	2,819.86				
14	2015				197.39	325.84	523.23	2,494.02				
15	2016				174.58	348.65	523.23	2,145.37				
16	2017				150.18	373.06	523.23	1,772.31				
17	2018				124.06	399.17	523.23	1,373.13				
18	2019				96.12	427.12	523.23	946.02				
19	2020				66.22	457.01	523.23	489.00				
20	2021				34.23	489.00	523.23	0.00				
Total		5,543.16	3,956.77	9,499.93	4,921.54	5,543.16	10,464.70		2,639.54	3,956.77	6,596.31	

Table 12.5-10 Repayment Schedule of Debt (Loan Supplied 2005 - 2006)

(Million Baht)												
No.	FY	Financing for Construction			Repayment of Foreign Currency				Repayment of Local Currency			
		Foreign	Local	Total	Interest	Principal	Total	Balance	Interest	Principal	Total	Balance
	2005	5,183.49	3,453.32	8,636.81								
	2006	19,621.61	13,663.22	33,284.83				24,805.10				17,116.54
1	2007				1,736.36	605.07	2,341.43	24,200.03	2,225.15	1,341.71	3,566.86	15,774.83
2	2008				1,694.00	647.42	2,341.43	23,552.60	2,050.73	1,516.13	3,566.86	14,258.70
3	2009				1,648.68	692.74	2,341.43	22,659.86	1,853.63	1,713.23	3,566.86	12,545.47
4	2010				1,600.19	741.24	2,341.43	22,118.63	1,630.91	1,935.95	3,566.86	10,609.52
5	2011				1,548.30	793.12	2,341.43	21,325.50	1,379.24	2,187.62	3,566.86	8,421.90
6	2012				1,492.79	848.64	2,341.43	20,476.86	1,094.85	2,472.01	3,566.86	5,949.89
7	2013				1,433.38	908.05	2,341.43	19,568.82	773.49	2,793.37	3,566.86	3,156.51
8	2014				1,369.82	971.61	2,341.43	18,597.21	410.35	3,156.51	3,566.86	0.00
9	2015				1,301.80	1,039.62	2,341.43	17,557.99				
10	2016				1,229.03	1,112.39	2,341.43	16,445.19				
11	2017				1,151.16	1,190.26	2,341.43	15,254.93				
12	2018				1,067.85	1,273.58	2,341.43	13,981.35				
13	2019				978.69	1,362.73	2,341.43	12,618.62				
14	2020				883.30	1,458.12	2,341.43	11,180.50				
15	2021				781.23	1,560.19	2,341.43	9,800.31				
16	2022				672.02	1,669.40	2,341.43	7,930.90				
17	2023				555.16	1,786.26	2,341.43	6,144.64				
18	2024				430.12	1,911.30	2,341.43	4,233.34				
19	2025				296.33	2,045.09	2,341.43	2,188.25				
20	2026				153.18	2,188.25	2,341.43	0.00				
Total		24,805.10	17,116.54	41,921.64	22,023.42	24,805.10	46,828.51		11,418.34	17,116.54	28,534.88	

Table 12.5-11 Repayment Schedule of Debt (Loan Supplied 2010 - 2011)

(Million Baht)

No	FY	Financing for Construction			Repayment of Foreign Currency				Repayment of Local Currency			
		Foreign	Local	Total	Interest	Principal	Total	Balance	Interest	Principal	Total	Balance
	2010	3,672.69	3,396.73	7,069.42								
	2011	7,689.70	7,970.57	15,660.27				11,362.39				11,362.39
1	2012				795.37	277.16	1,072.53	11,085.23	1,477.75	891.05	2,368.80	10,476.26
2	2013				775.97	296.56	1,072.53	10,788.67	1,361.91	1,006.88	2,368.80	9,469.38
3	2014				755.21	317.32	1,072.53	10,471.34	1,231.02	1,137.78	2,368.80	8,331.60
4	2015				732.99	339.54	1,072.53	10,131.81	1,083.11	1,285.69	2,368.80	7,045.91
5	2016				709.23	363.30	1,072.53	9,768.51	915.97	1,452.83	2,368.80	5,593.09
6	2017				683.80	388.73	1,072.53	9,379.77	727.10	1,641.69	2,368.80	3,951.39
7	2018				656.58	415.95	1,072.53	8,963.83	513.68	1,855.11	2,368.80	2,096.28
8	2019				627.47	445.06	1,072.53	8,518.76	272.52	2,096.28	2,368.80	0.00
9	2020				596.31	476.22	1,072.53	8,042.55				
10	2021				562.98	509.55	1,072.53	7,533.00				
11	2022				527.31	545.22	1,072.53	6,987.78				
12	2023				489.14	583.38	1,072.53	6,404.39				
13	2024				448.31	624.22	1,072.53	5,780.17				
14	2025				404.61	667.92	1,072.53	5,112.25				
15	2026				357.86	714.67	1,072.53	4,397.58				
16	2027				307.83	764.70	1,072.53	3,632.86				
17	2028				254.30	818.23	1,072.53	2,814.66				
18	2029				197.03	875.50	1,072.53	1,939.15				
19	2030				135.74	936.79	1,072.53	1,002.36				
20	2031				70.17	1,002.36	1,072.53	0.00				
	Total	11,362.39	11,367.30	22,729.70	10,088.20	11,362.39	21,450.59		7,563.06	11,367.30	18,950.36	

Table 12.5-12 Repayment Schedule of Debt (Loan Supplied 2015 - 2016)

(Million Baht)

No	FY	Financing for Construction			Repayment of Foreign Currency				Repayment of Local Currency			
		Foreign	Local	Total	Interest	Principal	Total	Balance	Interest	Principal	Total	Balance
	2015	3,564.57	3,376.76	6,941.33								
	2016	9,302.24	8,677.85	17,980.09				12,866.81				12,054.61
1	2017				900.68	313.86	1,214.54	12,552.95	1,567.10	944.92	2,512.02	11,109.69
2	2018				878.71	335.83	1,214.54	12,217.12	1,444.26	1,067.78	2,512.02	10,041.93
3	2019				855.20	359.34	1,214.54	11,857.78	1,305.45	1,206.57	2,512.02	8,835.36
4	2020				830.04	384.49	1,214.54	11,473.29	1,148.60	1,363.42	2,512.02	7,471.93
5	2021				803.13	411.41	1,214.54	11,061.89	971.35	1,540.67	2,512.02	5,931.26
6	2022				774.33	440.20	1,214.54	10,621.68	771.06	1,740.96	2,512.02	4,190.31
7	2023				743.52	471.02	1,214.54	10,150.67	544.74	1,967.28	2,512.02	2,223.03
8	2024				710.55	503.99	1,214.54	9,646.68	288.99	2,223.03	2,512.02	0.00
9	2025				675.27	539.27	1,214.54	9,107.41				
10	2026				637.52	577.02	1,214.54	8,530.39				
11	2027				597.13	617.41	1,214.54	7,912.98				
12	2028				553.91	660.63	1,214.54	7,252.36				
13	2029				507.66	706.87	1,214.54	6,545.49				
14	2030				458.18	756.35	1,214.54	5,789.13				
15	2031				405.24	809.30	1,214.54	4,979.84				
16	2032				348.59	865.95	1,214.54	4,113.89				
17	2033				287.97	926.56	1,214.54	3,187.33				
18	2034				223.11	991.42	1,214.54	2,195.90				
19	2035				153.71	1,060.82	1,214.54	1,135.08				
20	2036				79.46	1,135.08	1,214.54	0.00				
	Total	12,866.81	12,054.61	24,921.42	11,423.91	12,866.81	24,290.72		8,041.56	12,054.61	20,096.17	

Table 12.5-13 Statement of Profit and Loss

FY	Revenue A	Business Expenses				Business Profit F=A-E	(Million Baht)	
		O & M Cost B	Energy Purchase C	Depreciation D	Total E=B+C+D		Financial Cost (Interest) G	Net Profit H=F-G
1998	5,273.68	266.20	4,335.61	353.57	4,955.38	318.30	746.65	-428.35
1999	11,452.62	471.07	9,468.19	614.90	10,554.16	898.46	1,254.83	-356.37
2000	18,513.35	675.30	15,327.23	870.99	16,873.51	1,639.84	1,707.82	-67.99
2001	27,070.78	1,111.64	22,526.69	1,438.93	25,077.26	1,993.53	2,758.36	-764.84
2002	35,411.27	1,477.11	29,504.92	1,870.74	32,852.78	2,558.48	3,468.73	-910.24
2003	44,333.37	1,526.06	36,969.93	1,870.74	40,366.73	3,966.63	3,204.03	762.60
2004	54,398.63	1,576.63	45,392.00	1,870.74	48,839.38	5,559.25	2,907.73	2,651.52
2005	65,518.02	1,628.88	54,696.55	1,870.74	58,196.17	7,321.85	2,575.91	4,745.94
2006	77,747.02	1,682.85	64,918.87	1,870.74	68,472.47	9,274.55	2,204.16	7,070.39
2007	91,159.89	3,125.19	76,142.30	3,776.27	83,043.77	8,116.12	5,840.30	2,275.82
2008	105,847.40	3,228.78	88,432.75	3,776.27	95,437.81	10,409.60	5,326.18	5,083.42
2009	121,909.88	3,335.81	101,874.20	3,776.27	108,986.28	12,923.60	4,813.17	8,110.43
2010	139,451.19	3,446.38	116,553.62	3,776.27	123,776.27	15,674.92	4,372.04	11,302.87
2011	158,593.50	3,560.62	132,606.18	3,776.27	139,943.07	18,650.43	3,988.17	14,662.26
2012	177,187.63	4,459.68	148,169.04	4,809.44	157,438.16	19,749.47	5,835.45	13,914.02
2013	197,248.87	4,607.51	164,960.17	4,809.44	174,377.12	22,871.76	5,227.50	17,644.26
2014	218,868.88	4,760.23	183,056.32	4,809.44	192,625.99	26,242.89	4,550.76	21,692.14
2015	242,157.77	4,918.02	202,549.68	4,809.44	212,277.14	29,880.63	3,797.00	26,083.63
2016	267,233.21	5,081.05	223,653.89	4,809.44	233,543.38	33,688.83	3,420.68	30,268.15
2017	280,594.87	5,098.04	234,836.59	5,942.23	246,876.86	33,718.01	5,475.76	28,242.25
2018	294,624.62	6,300.18	246,578.42	5,942.23	258,820.83	35,803.78	4,878.04	30,925.74
2019	309,355.85	6,509.03	258,907.34	5,942.23	271,358.60	37,997.25	4,247.44	33,749.81
2020	324,823.64	6,724.80	271,852.70	5,588.66	284,166.16	40,657.48	3,571.63	37,085.85
2021	341,064.82	6,947.72	285,445.34	5,327.33	297,720.39	43,344.43	3,152.93	40,191.51
2022	358,118.06	7,178.03	299,717.61	5,071.25	311,966.89	46,151.18	2,744.73	43,406.45
2023	376,023.97	7,415.98	314,703.49	4,503.30	326,622.77	49,401.19	2,332.57	47,068.63
2024	394,825.16	7,661.82	330,438.66	4,071.49	342,171.97	52,653.19	1,877.97	50,775.22
2025	414,566.42	7,915.81	346,960.59	4,071.49	358,947.89	55,618.53	1,376.21	54,242.32
2026	435,284.74	8,178.22	364,308.62	4,071.49	376,558.33	58,736.41	1,148.55	57,587.86
2027	457,059.48	8,449.33	382,524.05	4,071.49	395,044.87	62,014.61	904.96	61,109.65
2028	479,912.45	8,729.43	401,650.26	4,071.49	414,451.17	65,461.28	808.21	64,653.07
2029	503,908.08	9,018.82	421,732.77	2,165.96	432,917.54	70,990.53	704.69	70,285.84
Total	7,029,549.13	148,066.20	5,880,794.56	116,401.35	6,145,262.11	884,287.02	101,223.19	783,063.84

Table 12.5-14 Cash Flow

FY	Cash Inflow				Cash Outflow			Balance	
	Financing	Net Profit	Depreciation	Total	Investment	Repayment of Principal	Total	Total	Accumulated
1996	2,322.94			2,322.94	2,432.47		2,432.47	-109.53	-109.53
1997	6,542.02			6,542.02	7,070.69		7,070.69	-528.67	-638.20
1998	5,026.95	-428.35	353.57	4,952.17	5,416.18	371.66	5,787.84	-835.67	-1,473.87
1999	6,416.79	-356.37	614.90	6,675.32	6,839.34	686.58	7,525.92	-850.60	-2,324.47
2000	12,384.84	-67.99	870.99	13,187.84	13,192.37	1,024.07	14,216.44	-1,028.60	-3,353.07
2001	5,642.86	-764.84	1,438.93	6,316.96	6,205.34	1,706.90	7,912.24	-1,595.29	-4,948.36
2002		-910.24	1,870.74	960.50		2,344.31	2,344.31	-1,383.81	-6,332.17
2003		762.60	1,870.74	2,633.35		2,609.01	2,609.01	24.34	-6,307.83
2004		2,651.52	1,870.74	4,522.27		2,905.31	2,905.31	1,616.96	-4,690.87
2005	8,250.75	4,745.94	1,870.74	14,867.44	8,636.81	3,237.13	11,873.94	2,993.50	-1,697.37
2006	31,052.87	7,070.39	1,870.74	39,994.01	33,284.83	2,906.79	36,191.62	3,802.39	2,105.01
2007		2,275.82	3,776.27	6,052.09		4,666.31	4,666.31	1,385.78	3,490.79
2008		5,083.42	3,776.27	8,859.69		4,707.54	4,707.54	4,152.15	7,642.94
2009		8,110.43	3,776.27	11,886.70		4,207.90	4,207.90	7,678.80	15,321.74
2010	6,737.91	11,302.87	3,776.27	21,817.06	7,069.42	3,824.49	10,893.91	10,923.15	26,244.89
2011	14,284.45	14,662.26	3,776.27	32,722.98	15,660.27	4,208.36	19,868.63	12,854.35	39,099.25
2012		13,914.02	4,809.44	18,723.47		5,802.41	5,802.41	12,921.06	52,020.30
2013		17,644.26	4,809.44	22,453.70		6,410.36	6,410.36	16,043.34	68,063.64
2014		21,692.14	4,809.44	26,501.58		7,087.10	7,087.10	19,414.48	87,478.12
2015	6,614.70	26,083.63	4,809.44	37,507.77	6,941.33	4,274.00	11,215.33	26,292.44	113,770.56
2016	16,515.92	30,268.15	4,809.44	51,593.52	17,980.09	4,650.32	22,630.40	28,963.11	142,733.67
2017		28,242.25	5,942.23	34,184.48		6,321.79	6,321.79	27,862.69	170,596.37
2018		30,925.74	5,942.23	36,867.98		6,503.29	6,503.29	30,364.69	200,961.05
2019		33,749.81	5,942.23	39,692.04		6,823.41	6,823.41	32,868.63	233,829.69
2020		37,085.85	5,588.66	42,674.51		4,812.83	4,812.83	37,861.68	271,691.36
2021		40,191.51	5,327.33	45,518.84		4,510.82	4,510.82	41,008.02	312,699.38
2022		43,406.45	5,071.25	48,477.70		4,395.78	4,395.78	44,081.91	356,781.29
2023		47,068.63	4,503.30	51,571.93		4,807.95	4,807.95	46,763.99	403,545.28
2024		50,775.22	4,071.49	54,846.71		5,262.54	5,262.54	49,584.17	453,129.45
2025		54,242.32	4,071.49	58,313.81		3,252.28	3,252.28	55,061.53	508,190.98
2026		57,587.86	4,071.49	61,659.35		3,479.94	3,479.94	58,179.41	566,370.38
2027		61,109.65	4,071.49	65,181.14		1,382.11	1,382.11	63,799.03	630,169.41
2028		64,653.07	4,071.49	68,724.56		1,478.85	1,478.85	67,245.70	697,415.12
2029		70,285.84	2,165.96	72,451.80		1,582.37	1,582.37	70,869.43	768,284.54
Total	121,793.01	783,063.84	116,401.35	1,021,258.20	130,729.15	122,244.51	252,973.65	768,284.54	

* Note: Investment including interest during construction

Table 12.5-15 Calculation of Debt Service Ratio

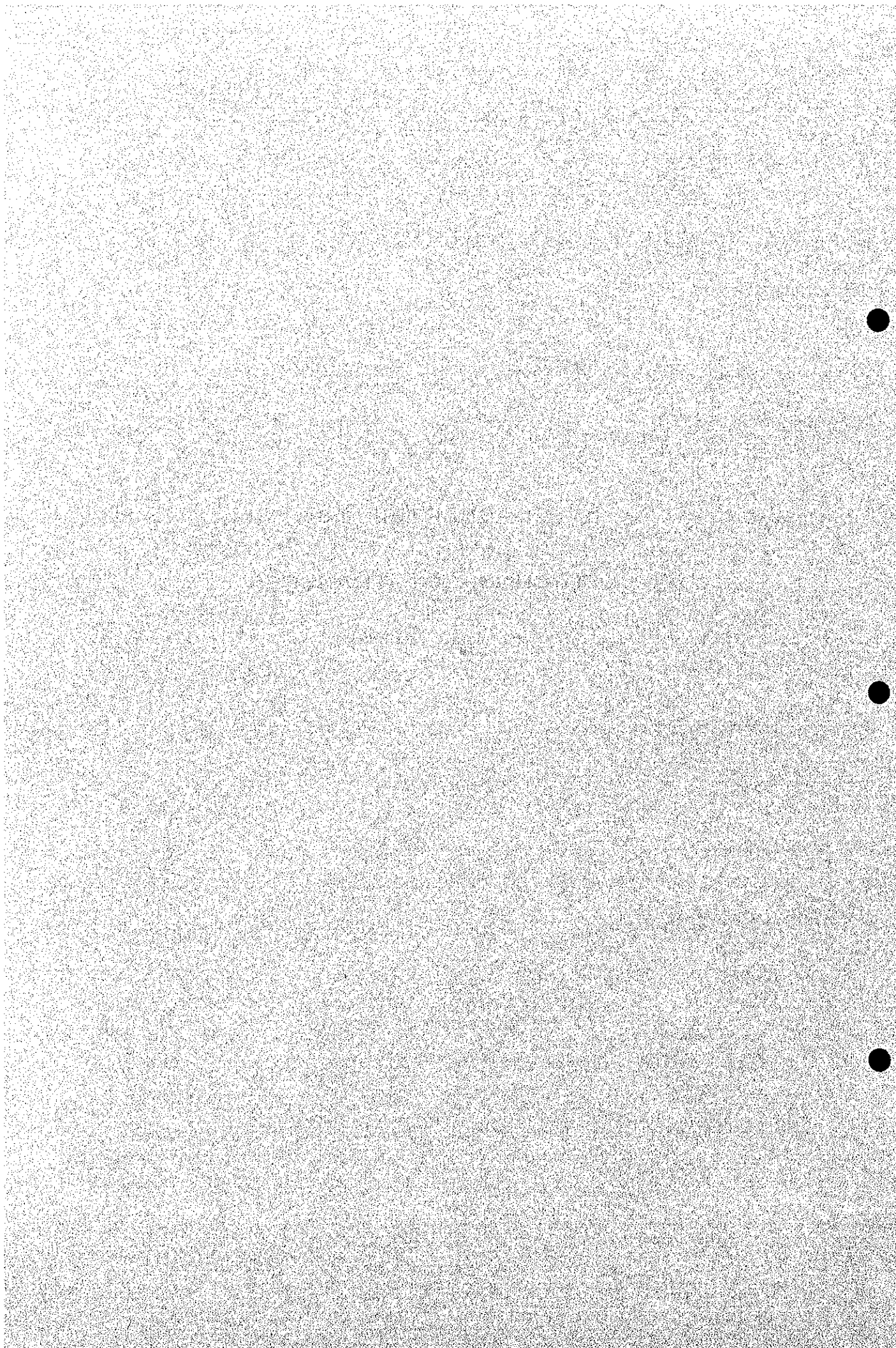
(Million Baht)

FY	Internal Fund Procured				Payment of Debt				Debt Service Ratio(A/B)
	Business Profit	Depreciation	Total	Accumulated (A)	Interest	Principal	Total	Accumulated (B)	
1996									
1997									
1998	318.30	353.57	671.87	671.87	746.65	371.66	1,118.31	1,118.31	0.60
1999	898.46	614.90	1,513.36	2,185.24	1,254.83	686.58	1,941.42	3,059.72	0.71
2000	1,639.84	870.99	2,510.82	4,696.06	1,707.82	1,024.07	2,731.90	5,791.62	0.81
2001	1,993.53	1,438.93	3,432.46	8,128.52	2,758.36	1,706.90	4,465.27	10,256.89	0.79
2002	2,558.48	1,870.74	4,429.23	12,557.75	3,468.73	2,344.31	5,813.04	16,069.93	0.78
2003	3,966.63	1,870.74	5,837.38	18,395.13	3,204.03	2,609.01	5,813.04	21,882.97	0.84
2004	5,559.25	1,870.74	7,430.00	25,825.13	2,907.73	2,905.31	5,813.04	27,696.01	0.93
2005	7,321.85	1,870.74	9,192.59	35,017.72	2,575.91	3,237.13	5,813.04	33,509.05	1.05
2006	9,274.55	1,870.74	11,145.30	46,163.02	2,204.16	2,906.79	5,110.95	38,620.00	1.20
2007	8,116.12	3,776.27	11,892.40	58,055.41	5,840.30	4,666.31	10,506.61	49,126.61	1.18
2008	10,409.60	3,776.27	14,185.87	72,241.29	5,326.18	4,707.54	10,033.72	59,160.34	1.22
2009	12,923.60	3,776.27	16,699.87	88,941.16	4,813.17	4,207.90	9,021.07	68,181.41	1.30
2010	15,674.92	3,776.27	19,451.19	108,392.35	4,372.04	3,824.49	8,196.53	76,377.94	1.42
2011	18,650.43	3,776.27	22,426.70	130,819.05	3,988.17	4,208.36	8,196.53	84,574.47	1.55
2012	19,749.47	4,809.44	24,558.91	155,377.97	5,835.45	5,802.41	11,637.86	96,212.33	1.61
2013	22,871.76	4,809.44	27,681.20	183,059.17	5,227.50	6,410.36	11,637.86	107,850.19	1.70
2014	26,242.89	4,809.44	31,052.33	214,111.50	4,550.76	7,087.10	11,637.86	119,488.04	1.79
2015	29,880.63	4,809.44	34,690.07	248,801.57	3,797.00	4,274.00	8,071.00	127,559.04	1.95
2016	33,688.83	4,809.44	38,498.27	287,299.84	3,420.68	4,650.32	8,071.00	135,630.04	2.12
2017	33,718.01	5,942.23	39,660.25	326,960.09	5,475.76	6,321.79	11,797.55	147,427.59	2.22
2018	35,803.78	5,942.23	41,746.02	368,706.11	4,878.04	6,503.29	11,381.33	158,808.92	2.32
2019	37,997.25	5,942.23	43,939.48	412,645.59	4,247.44	6,823.41	11,070.85	169,879.77	2.43
2020	40,657.48	5,588.66	46,246.14	458,891.73	3,571.63	4,812.83	8,384.46	178,264.24	2.57
2021	43,344.43	5,327.33	48,671.76	507,563.49	3,152.93	4,510.82	7,663.75	185,927.98	2.73
2022	46,151.18	5,071.25	51,222.42	558,785.92	2,744.73	4,395.78	7,140.51	193,068.49	2.89
2023	49,401.19	4,503.30	53,904.50	612,690.42	2,332.57	4,807.95	7,140.51	200,209.00	3.06
2024	52,653.19	4,071.49	56,724.68	669,415.10	1,877.97	5,262.54	7,140.51	207,349.52	3.23
2025	55,618.53	4,071.49	59,690.02	729,105.12	1,376.21	3,252.28	4,628.49	211,978.01	3.44
2026	58,736.41	4,071.49	62,807.90	791,913.02	1,148.55	3,479.94	4,628.49	216,606.50	3.66
2027	62,014.61	4,071.49	66,086.10	857,999.11	904.96	1,382.11	2,287.07	218,893.56	3.92
2028	65,461.28	4,071.49	69,532.77	927,531.88	808.21	1,478.85	2,287.07	221,180.63	4.19
2029	70,990.53	2,165.96	73,156.49	1,000,688.37	704.69	1,582.37	2,287.07	223,467.69	4.48
Total	884,287.02	116,401.35	1,000,688.37		101,223.19	122,244.51	223,467.69		



CHAPTER 13

TECHNOLOGY TRANSFER



CHAPTER 13 TECHNOLOGY TRANSFER

(1) Provision of Equipment

At the time of the Second Field Investigation, the Study Team purchased a personal computer in Bangkok and used it for reproducing the results of system analysis carried out at the Home Office Work as well as for carrying out analysis on the modified case of the system conditions at the MEA's office. In addition, technology transfer was carried out by using the personal computer at the time of the Third Field Investigation. Incidentally, this computer was provided by JICA to MEA on October 3, 1995 after completion of the Third Field Investigation.

The personal computer, software, etc. purchased are as follows:

Item	Type	Quantity
Computer	COMPAQ 486DX4-100 RAN 16 MB	1 set
Laser Printer	LASER HP JET 4V	1 set
Software	MS EXCEL 5 THAI EDITION	1 set
	MS WORD 6 THAI EDITION	1 set

(2) Training for Counterpart

For technology transfer related to this Study, training was carried out by executing joint work, lectures and field investigation in Japan, and data and information required for the system planning and design of facilities were collected.

The following two trainees in total, one at the expense of JICA and another at the expense of MEA took part in this training program.

(a) Trainees

- 1) Name : Mr. Nipon CHIRATAWEEWOOT (at the expense of JICA)
Period : June 20 to July 19, 1995 (30 days)
- 2) Name : Mr. Napadol PUTARUNGSI (at the expense of MEA)
Period : June 25 to July 19, 1995 (25 days)

(b) Contents of Training

1) Lecture (related to TEPCO power system)

- Method of load forecasting.
- Power distribution system planning.
- Substation design.
- Design and construction of underground transmission line.

2) Joint work (related to the Study)

- System planning and analysis.
- Planning of distribution facilities.
- Planning of protective relay and telecommunication facilities.

3) Field investigation

- Interconnecting 500 kV Transmission Line between Honsyu and Shikoku of EPDC (three-day trip).
- Underground Transmission Line Takanawa Tunnel, and 275 kV Takanawa Substation (underground type) of TEPCO.
- Yaesu Automatic Control & Maintenance Office and Minamikobikicho Substation (underground type distribution substation) of TEPCO.
- Central Load Dispatching Office and Research and Development Centers of TEPCO.
- Futtsu Thermal Power Station and New Energy Park of TEPCO.
- Distribution Automation System (Shibuya Branch of TEPCO), and nearby distribution system facilities.
- DC substation (Hikifune Substation of Tobu Railway Co.,).
- TOSHIBA Hamakawasaki Works (GIS and gas transformer).
- Common utility tunnel (Ginza District).

(3) Seminar

In order that the significance and contents of this Study could be recognized widely by the relevant officials of the Government of Thailand including the MEA staff, seminars were held as explained below. Incidentally, the seminars were held twice during the Second and Third Field Investigation with the contents being as presented below.

(a) First Seminar

1) Period

- Date : May 25, 1995
- Time : 8:30-16:30
- Place : Conference Room in MEA Head Office
- No. of participants : 85

2) Contents

- Progress and achievement of the Study.
- History of TEPCO's power distribution system development.
- TEPCO power system planning and fundamental design of facilities.
- Construction of underground transmission line facilities of TEPCO.
- Environmental impact assessment.

(b) Second Seminar

1) Period

- Date : September 28, 1995
- Time : 8:30-16:30
- Place : Conference Room in MEA Head Office
- No. of participants : 80

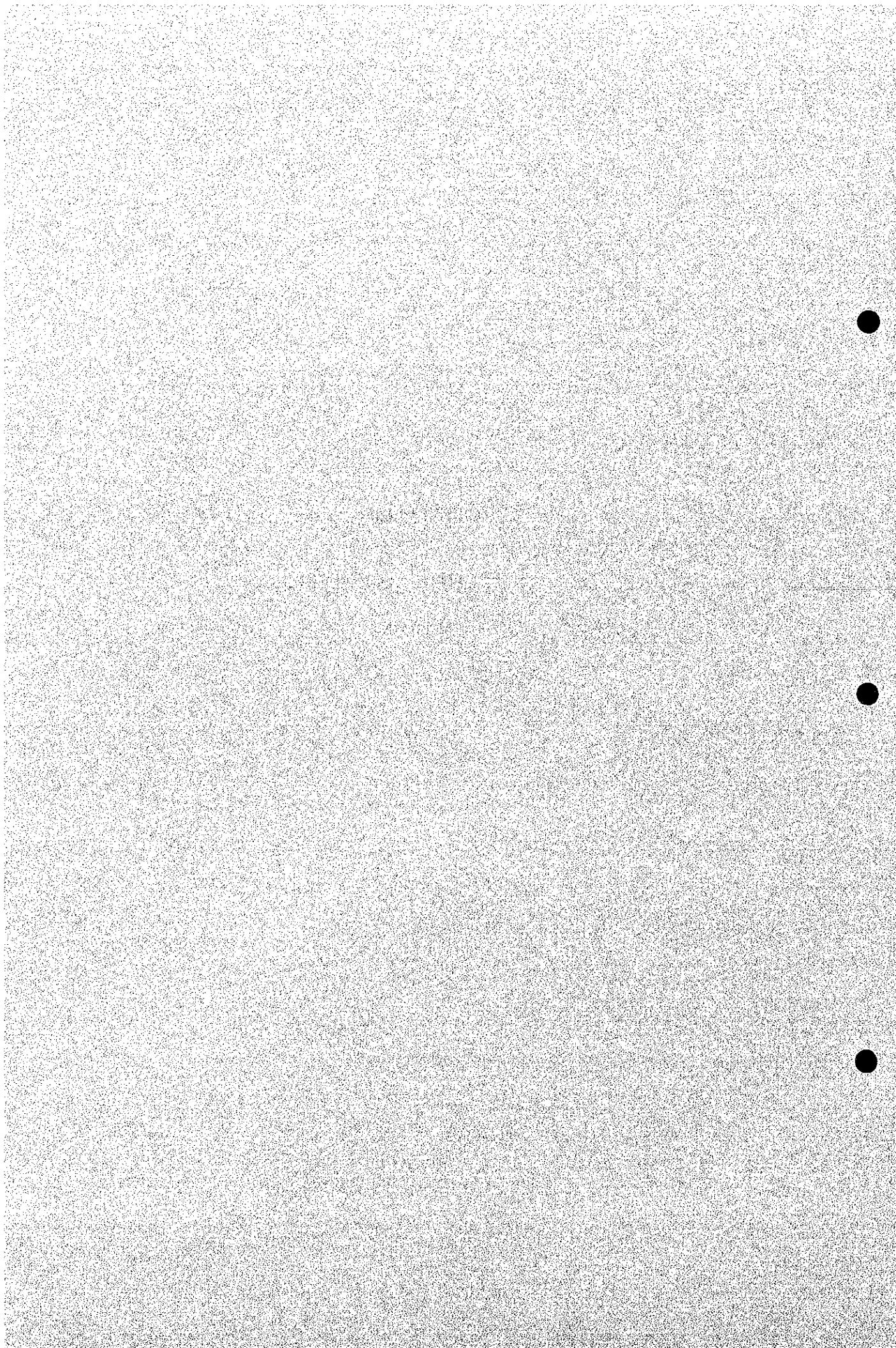
2) Contents

- Outline of the Study.
- Power distribution system plan.
- Power system analysis.
- Subtransmission line design.
- Substation design and underground substation.
- Study on distribution system of model districts.
- Telecommunication facilities plan.
- Reliability improvement countermeasures for protective relay system.
- Future environmental countermeasures.



CHAPTER 14

FUTURE STUDIES



CHAPTER 14 FUTURE STUDIES

It is required to execute future studies on the basis of this report, and steadily promote this plan to ensure smooth and undisturbed electric power supply in the metropolitan area of Thailand. The items for future studies are as described belows:

(1) Implementation of this plan

The Study has been carried out from a global point of view on the improvement and expansion of the metropolitan power distribution system.

It is necessary, therefore, to study this plan in detail in advance to the actual implementation. When better alternatives are found, it is advisable that the plan will be reviewed on each occasion taking long range views into consideration.

(2) Review of this plan

This is a feasibility study, prepared basing itself on the results of initial basic desk study carried out taking into account the present situation. This plan, therefore, has to be reviewed as required whenever there is any change in the power supply, social environment, basic assumptions and so forth.

Furthermore, terminal stations which supply power to the MEA's distribution area are connected to the 230 kV EGAT's transmission network, based on the latest Power Development Plan (PDP). Therefore, if there is any change in the EGAT's system, this plan has to be reviewed accordingly.

(3) Study plan of distribution system

At present, MEA is promoting use of insulated wire instead of bare wire in its 24 kV and 12 kV primary line systems. This will contribute greatly to eliminating faults judging from the past experience in Japan. At the same time, countermeasures for preventing burn-out of line due to lightning surge should also be steadily promoted together with the use of insulated wire.

Next, appropriate countermeasures should be taken in view of system configuration by installing line switches on the 24 kV and 12 kV primary

line systems to improve the reliability at the time of fault in distribution substation as well as of fault in primary line. At the same time, research should be carried out for introducing the distribution automation system including automatic and remote control of line switches for the purpose of realizing automatic separation of a section of distribution line in fault and early restoration in sound section. In addition, introduction of underground primary line systems should also be systematically promoted in the high load density areas.

To ensure the reliability of integrated power distribution system as mentioned above, it would be of an urgent necessity to execute feasibility study for the 24 kV and 12 kV primary line systems subsequent to implementation of this plan.

(4) Arrangement for site survey

The topographic maps of the line routes, longitudinal sections should be prepared urgently as required for formulation of work execution plan and calculation of the volume of work, by executing site survey for selecting the locations of subtransmission lines and substations under this plan.

(5) Procurement of fund for this plan

The fund procurement plan for the work will be formulated by preparing a fund plan for each category of work schedule and a cash flow plan by each fiscal year for this plan at the same time. Meanwhile, the fund procurement plan should be formulated taking into account allocation of local fund and loan from third countries.

(6) Work schedule for this plan

The work schedule for this plan should be so formulated as to average the work volume per each fiscal year and match the best timing for power demand. It is preferable, therefore, to start preparatory actions one or two years before commencement of the corresponding work in anticipation of the necessity of a long time period for procurement of fund, field survey, detailed design and negotiations for land acquisition for the respective work categories.

(7) Establishment of organization for work execution

Expansion of scope of work and reinforcements of the existing sector in charge of land acquisition should be performed to acquire the land timely for proceeding the power distribution facilities construction just as planned. In addition, establishment of new organization in charge of implementing an important substation/subtransmission line construction project, like a comprehensive construction center, is recommended to promote the construction work intensively.

(8) Mechanization of operation and maintenance

To maintain the power distribution system facilities under this plan, it is essential to realize modernization of protective relay system and telecommunication facilities, mobilization of transportation of equipment and materials for patrol inspections, mechanization of maintenance work, modification of work method, and so forth as promptly as possible.

(9) Effective utilization of underground space

Power cable of MEA is buried as an independent work separately from the other buried works (water supply, sewage and other system) in a same section, an environmental problem can be raised due repetition of road excavation. To avoid such a problem, therefore, Common Duct plans are under feasibility study for several routes in central part of Bangkok. In any case, early implementation of such project is desired also for effective utilization of underground space for common uses.

Also it will become essential to adopt underground substation in the overpopulated center area of Bangkok in future. Since the ground is soft and the groundwater level is high in the area, the design and execution of civil, architectural and structural work for underground room will require extensive and high level know-how and technology.

It is recommended to construct a pilot scale underground substation in as early period as possible and accumulate data and information to contribute for dissemination of such an underground type substation in future.

(10) Training of MEA's engineers

In consideration of the necessity to prior advance training of technical experts as the staff in charge of executing management of this plan, it is essential to let these engineers take part positively in the Colombo Plan and other expert training programs of JICA to transfer technical knowledge to the engineers.

Moreover, training of the MEA's maintenance and management staff should also be provided at the same time to sustain maintenance of the power distribution system facilities under this plan.



