Table 13.1-1 Forecasted Demand and Number of Subscribers for Local Exchange Office in the BMA (2/2)

No.	Staion Code	Local Exchange	ABBR Area		Telephone Demand 1992	1997	2002	2007	Number of Subscriber 1992	1997	2002	2007	Expamsion Plan Phase 1	Phase 2	Phase 3
32	130	Phasi Charoen	PSN	3	25,286	29,468	32,816	33,799	17,076	29,468	32,816	33,799	12,392	3,349	983
33	131	Charan Sanitwong	CSW	3	37,953	59,152	81,153	95,161	24,429	59,152	81,153	95,161	34,723	22,001	14,008
34	132	Rat Burana	RBN	3	29,447	53,278	79,442	95,066	18,839	53,278	79,442	95,066	34,439	26,164	15,625
35	133	Lat Ya	LTY	3	37,214	51,880	61,486	63,966	26,013	51,880	61,486	63,966	25,867	9,606	2,480
36	134	Muban Setthakit	MSK	3	29,452	64,668	93,741	111,610	12,436	64,668	93,741	111,610	52,232	29,073	17,869
37	135	Ekkachai	EKC	3	59,250	93,692	113,491	119,960	22,154	93,692	113,491	119,960	71,538	19,798	6,469
38	149	Nong Khaem	NGK	3	36,078	76,559	110,718	132,658	15,662	76,559	110,718	132,658	60,897	34,159	21,940
39	308	Phra Pradaeng	PPG	3	23,086	47,308	80,613	108,562	13,784	47,308	80,613	108,562	33,524	33,305	27,949
40	402	Bang Bue Thong	BBT	3	17,119	57,626	112,273	149,567	6,104	57,626	112,273	149,567	51,522	54,648	37,293
41	136	Phahonyothin	PYT	4	51,566	105,103	174,282	218,942	32,904	105,103	174,282	218,942	72,199	69,179	44,660
42	137	Inthamara	ITM	4	51,951	64,619	72,949	74,985	26,689	64,619	72,949	74,985	37,930	8,330	2,036
43	138	Bang Khen	BGN	4	35,389	43,719	52,055	56,775	24,453	43,719	52,055	56,775	19,266	8,336	4,721
44	139	Bang Su	BGS	4	41,221	95,357	147,323	169,197	22,807	95,357	147,323	169,197	72,550	51,966	21,874
45	140	Don Muang	DNM	4	75,494	146,268	202,905	237,614	28,792	146,268	202,905	237,614	117,476	56,637	34,709
46	141	Lak Si	LKS	4	31,475	57,308	88,253	110,297	14,918	57,308	88,253	110,297	42,390	30,945	22,044
47	142	Ram Inthra	RIT	4	54,721	79,519	98,148	106,499	17,813	79,519	98,148	106,499	61,706	18,629	8,352
48	143	Lat Phrao 1	LTP1	4	40,639	48,551	55,514	59,002	27,542	48,551	55,514	59,002	21,009	6,963	3,488
49	144	Lat Phrao 2	LTP2	4	45,023	52,497	61,712	68,058	28,572	52,497	61,712	68,058	23,925	9,215	6,346
50	145	Chaeng Watthana	CWT	4	40,765	56,978	70,371	78,578	16,259	56,978	70,371	78,578	40,719	13,393	8,207
51	401	Nonthaburi	NTB	4	19,416	46,312	97,646	163,043	12,187	46,312	97,646	163,043	34,125	51,334	65,398
52	405	Ngam Wong Wan	NWW	4	43,315	67,917	94,349	112,923	29,165	67,917	94,349	112,923	38,752	26,432	18,574
53	406	Pak Kret	PKK	4	27,769	56,467	80,082	94,731	15,896	56,467	80,082	94,731	40,571	23,615	14,649
54	501	Pathum Thani	PTT	4	16,514	36,236	51,695	59,815	7,146	36,236	51,695	59,815	29,090	15,459	8,120
55	502	Rangsit	RST	4	9,176	13,701	18,287	22,122	5,615	13,701	18,287	22,122	8,086	4,586	3,835
56	503	Thanyaburi	TYB	4	7,409	28,578	65,785	90,263	2,489	28,578	65,785	90,263	26,089	37,207	24,478
57	504	Nawa Nakhon	NWN	4	7,130	12,965	18,227	22,280	3,197	12,965	18,227	22,280	9,768	5,262	4,053
58	511	Bang Phun	BAN	4	3,005	6,832	11,145	14,796	2,700	6,832	11,145	14,796	4,132	4,313	3,651
		BMA Total			2,133,026	3,563,796	5,040,245	6,054,703	1,212,241	3,563,796	5,040,245	6,054,703	2,351,555	1,476,449	1,014,459

Note: Figures of 1992 for Number of Subscribers are calculated on the basis of the TOT Supply Plan.

Table 13.1-2 Forecasted Demand and Number of Subscribers for Local Exchange Office in the Surrounding Area

No.	Local Exchange	ABBR Area		Telephone Demand 1992	1997	2002	2007	Number of Subscriber 1992	1997	2002	2007	Expamsion Plan Phase 1	Phase 2	Phase 3
1	Nakhon Pathom	NPM	6	28,387	43,153	64,973	89,129	11413	32,365	64,973	89,129	20,952	32,608	24,156
2	Kamphaeng Saen	NPM	6	2,492	5,445	11,919	22,664	618	4,083	11,919	22,664	3,465	7,835	10,745
3	Nakhon Chaisi	NPM	6	6,851	13,510	24,768	37,312	1137	10,132	24,768	37,312	8,995	14,636	12,544
4	Don Tum	NPM	6	906	1,952	4,215	7,886	23	1,464	4,215	7,886	1,441	2,751	3,671
5	Bang Len	NPM	6	1,939	4,080	8,619	15,807	49	3,060	8,619	15,807	3,011	5,559	7,188
6	Sam Phran	NPM	6	10,466	16,729	23,887	29,470	2390	12,547	23,887	29,470	10,157	11,340	5,583
	Total			51,040	84,868	138,381	202,268	15631	63,651	138,381	202,268	48,020	74,729	63,887
6	Samut Sakhon	SKN	6	39,020	57,411	79,509	102,235	7601	43,058	79,509	102,235	35,457	36,451	22,725
7	Krathum baen	SKN	6	12,114	18,201	24,194	29,763	1188	13,651	24,194	29,763	12,463	10,543	5,569
8	Ban Phaew	SKN	6	8,602	12,567	18,118	24,015	1387	9,425	18,118	24,015	8,038	8,693	5,897
	Total			59,736	88,179	121,821	156,012	10176	66,134	121,821	156,012	55,958	55,687	34,191
8	Ayutthaya 1	AYA	9	4,406	4,915	5,535	6,332	1344	3,687	5,535	6,332	2,343	1,849	797
9	Ayutthaya 2	AYA	9	11,054	14,772	18,850	22,765	3761	11,079	18,850	22,765	7,318	7,771	3,915
10	Bang Pa-in	AYA	9	4,291	5,914	7,869	9,994	1045	4,435	7,869	9,994	3,390	3,434	2,125
11	Wang Noi	AYA	9	5,091	7,007	8,966	10,768	1148	5,255	8,966	10,768	4,107	3,710	1,802
12	Phachi	AYA	9	2,029	2,818	3,862	5,143	532	2,114	3,862	5,143	1,582	1,749	1,281
13	Tha Rua	AYA	9	3,724	5,233	6,921	8,604	937	3,925	6,921	8,604	2,988	2,996	1,683
14	Sena	AYA	9	2,587	3,855	5,578	7,885	774	2,891	5,578	7,885	2,117	2,687	2,307
15	Ban Phraek	AYA	9	496	796	1,309	2,236	115	597	1,309	2,236	482	712	927
16	Bang Sye	AYA	9	442	691	1,122	1,915	115	518	1,122	1,915	403	604	793
17	Bang Sai	AYA	9	679	985	1,470	2,234	246	739	1,470	2,234	493	731	764
18	Phak Hai	AYA	9	1,411	2,069	3,013	4,306	520	1,552	3,013	4,306	1,032	1,461	1,294
19	Bang Ban	AYA	9	1,058	1,619	2,531	4,006	377	1,214	2,531	4,006	837	1,317	1,475
20	Lat Bua Luang	AYA	9	563	850	1,325	2,163	206	638	1,325	2,163	432	688	838
21	Maharat	AYA	9	407	587	871	1,313	152	441	871	1,313	289	430	443
22	Nakhon Loang	AYA	9	1,520	2,298	3,475	5,210	552	1,724	3,475	5,210	1,172	1,751	1,735
23	Uthai	AYA	9	695	1,153	1,934	3,267	234	865	1,934	3,267	631	1,070	1,332
24	Bang Pahan	AYA	9	1,170	1,570	1,987	2,369	444	1,178	1,987	2,369	734	809	382
	Total			41,621	57,133	76,618	100,511	12503	42,850	76,618	100,511	30,346	33,768	23,893

Note: Figures of 1992 for Number of Subscribers are calculated on the basis of the TOT Supply Plan.

13.2 Outside Plant Facilities

13.2.1 Expansion Plan of Local Cable

1) The Number of Primary Cable Pairs to be Installed in Each Phase

The total capacity of primary cable pairs in this long-term plan is estimated by the following procedure.

a) Existing Cable Capacity

It is assumed the TOT 5th and 6th ESDP will be completed at the end of 1992. Hence, the planned figure will be the number of primary cable pairs at the end of 1992.

b) Number of Connected Lines

The number of connected lines at the end of 1992 includes the following figures;

i) the target number in 1991 and 1992 in the TOT telephone sales plan;

ii) the target number in 1991 and 1992 in the TOT public telephone installation plan.

And, the number of connected lines after 1992 is calculated with the following formula:

$$Lc = \{ Df \times (1 - Rf) + Lp \} \times 1.03,$$

where

Lc : Number of connected lines,

Df : Number of forecasted potential subscribers (ordinary telephone subscription demand),

Rf : $\frac{\text{waiting applicants}}{(\text{subscribers} + \text{waiting applicants})'}$

For the BMA, this coefficient is set at 0% after 1996, and before 1997 it is calculated by an interpolation,

For the Surrounding Areas, this coefficient is set at 25% at the end of 1997 and 0% after 2001, in other years it is calculated by an interpolation,

Lp : Number of public telephones,

The total number of public telephones is allocated over each exchange according to the number of subscribers,

1.03 : $1 + \frac{(\text{leased lines} + \text{test pairs} + \text{other lines})}{\text{total primary cable pairs}}$.

c) Required Number of Cable Pairs

The required number of primary cable pairs in each year is calculated with the following formula:

$$Lr = \frac{Lc}{0.7},$$

where

Lr : Required number of pairs,

0.7 : 1 - cable pair slack margin rate.

d) Judgment of Installation Limit for Primary Cable

The year when new primary cable pairs should be installed is judged with the following formula:

$$\frac{Le(t-1) - Lr(t)}{Lr(t+1) - Lr(t)} \times 12 \leq 3$$

where

t : The year when new primary cables should be installed,

Le(t-1) : The number of existing primary cable pairs at the end of the year(t-1),

12 : The constant to change the surplus ratio from a year basis to a month basis,

3 : Margin for construction period length (month).

e) Expansion Volume

How many primary cable pairs should be installed in each year depends on how many primary cable pairs are needed in five years ahead.

f) Calculation Unit for Estimation of Expansion Volume

At first, it was calculated for each exchange. But the result of this calculation shows that the large amount of expansion is concentrated in 1994 as shown in Figure 13.2.1-1.

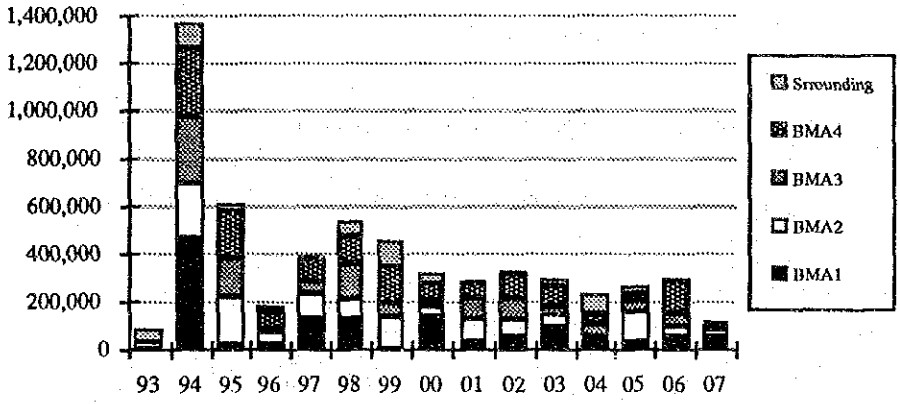

Figure 13.2.1-1 Expansion Volume of Primary Pairs (calculation unit = exchange)

In fact, the time when expansion of cable pairs will be required will not come all at the same time. Because exchange areas are divided into many cabinet areas, and the telephone demand trend in each cabinet area is different. Additionally, the expansion volume is too big to be installed at the end of 1994.

Therefore, in this estimation, some exchange areas are divided into 2 or 3 sub areas according to the result of the first calculation. That is as follows;

i) The exchange areas of which its expansion volume at one time was more than 30,000 pairs were divided into 3 sub areas,
ii) The exchange areas of which its expansion volume at one time was more than 10,000 pairs were divided into 2 sub areas,
iii) Other exchange areas were not divided.

And in the calculation, the completion time of expansion in sub areas is advanced or postponed according to the degree of the construction difficulty.

2) Cost Estimation Procedure

The investment cost for the local cable expansion is calculated as follows;

Investment Cost = Vc x Uc

where
Vc : The number of primary cable pairs to be expanded,
This is described in section 13.2,

Uc : The unit cost (7,944 Baht / pair) represented by cost per primary cable pair, including all local cable (excluding the drop wire) and conduit line facility expenditures.

13.2.2 Installation Plan of Main Telephone Line (Drop Wire)

The investment cost of the drop wire installation is calculated as follows;

Investment cost = Nd x Uc

where

Nd : The number of drop wires to be installed in the sales plan

Uc : The unit price of the drop wire installation

= labor cost + (unit price of materials x average length of drop wires)

= 400 + (5 x 40) = 600 (Baht / drop wire)

13.2.3 Expansion Plan of Public Telephone Sets

The investment cost of the expansion of public telephones is calculated as follows;

Investment cost = Np x Uc

where

Np : The number of public telephones to be expanded

Uc : The unit price of the public telephone installation

= unit price of telephone set (including tax) + unit price of booth construction (including material and labor cost)

= 58, 182 + 32,700 = 90,882 (Baht / set)

13.2.4 Rehabilitation Plan of Local Cable and Wire

1) Replacement Plan in each Phase

The number of local cables to be replaced in each phase is estimated as shown in Table 13.2.4.

2) Cost Estimation Procedure

The investment cost for the local cable rehabilitation is calculated as follows;

Investment Cost = Vc x Uc

where

Vc : The number of primary cable pairs to be rehabilitated,
This is described in section 13.2,

Uc : The unit cost (12,716 Baht / pair) represented by cost per primary cable pair, including all local cable (excluding the drop wire) and conduit line facility expenditures.

Table 13.2.4 Paper Insulated Cable Replacement Plan

Area	Exchange Name	Phase 1			Phase 2			Phase 3		
		Kind of cable	Lines	Pairs	Kind of cable	Lines	Pairs	Kind of cable	Lines	Pairs
BMA 1	Phloen Chit	ASP&LTJ	9	9,600	ASP	2	6,000	ASP	5	8,800
		ASP	9	16,600						
BMA 1	Samran Rat	ASP	6	12,800						
BMA 1	Krung Kasem	ASP	10	18,300	ASP	2	4,500			
BMA 1	Surawong	ASP	4	11,400	ASP	4	12,600	ASP	5	15,600
BMA 1	Sam Sen							ASP	1	3,000
BMA 1	Asok-Din Daeng							ASP	3	9,000
BMA 1	Pathum Wan							ASP	2	4,200
BMA 2	Chaiyaphruk	ASP	10	23,700	ASP	1	3,000			
BMA 2	Bang Na	ASP	3	6,300	ASP	1	2,700	ASP	3	7,200
BMA 2	Samut Prakhan				ASP	1	2,700	ASP	2	3,900
BMA 2	Khlong Chan	ASP	1	3,000	ASP	2	5,400	ASP	2	5,100
BMA 2	Thungmahamek	ASP	7	11,700	ASP	1	3,000			
BMA 2	Sathu Pradit	ASP	1	1,200	ASP	1	2,100			
BMA 2	Thanon Tok	ASP	1	3,000	ASP	1	2,100			
BMA 2	Pu Chao Saming Phrai				ASP	1	1,800	ASP	3	9,800
BMA 2	Phra Khanong							ASP	4	10,200
BMA 2	Hua Mak							ASP	4	10,800
BMA 2	Trok Chan							ASP	3	7,800
BMA 3	Thon Buri	LTJ	3	1,100	ASP	2	8,000	ASP	1	3,000
		ASP	6	13,800						
BMA 3	Bang Khae	ASP	2	5,100	ASP	1	2,400	ASP	1	2,100
BMA 3	Dao Khanong	ASP	2	5,400	ASP	2	2,400	ASP	3	7,800
BMA 3	Phra Pradaeng				ASP	1	2,400			
BMA 3	Bang Phlat	ASP	3	5,900	ASP	1	3,000	ASP	1	2,400
BMA 3	Phanu Rangsi							ASP	1	900
BMA 3	Phasi Charoen							ASP	2	5,400
BMA 3	Charansanitwong							ASP	3	8,400
BMA 4	Phahon Yothin	LTJ	8	3,500	ASP	2	6,100	ASP	3	3,600
		ASP	4	9,000						
BMA 4	Intramara	ASP	2	6,000	ASP	1	2,700			
BMA 4	Bang Khen	ASP	2	4,200	ASP	1	1,200			
BMA 4	Bang Su	ASP	2	4,200	ASP	4	9,900	ASP	1	2,400
BMA 4	Ngam Wong Wan				ASP	3	8,400			
BMA 4	Don Muang	ASP	1	1,200	ASP	1	3,000			
BMA 4	Nonthaburi							ASP	3	6,000
BMA 4	Lat Phrao 1							ASP	3	8,400
BMA 4	Lak Si	ASP	1	1,500				ASP	2	5,700
BMA 4	Lat Phrao 2							ASP	2	5,400
	TOTAL		97	178,500		36	95,400		63	156,900

Note: ASP stands for "Paper or Wood Pulp Insulation Stalpeth Sheathed Cable".
LTJ stands for "Lead Sheathed Paper Insulated Lead Sleeve Joint Cable".

3) Comparison between Fix Distribution System and Free Access Distribution System

Advantages and disadvantages of the fix distribution system and the free access distribution system for the local cable network are as follows.

	Fix Distribution System	Free Access Distribution System
Flexibility against Fluctuations of the Demand	No flexibility	It is flexible because cable pairs can be used every distribution point installed on the same cable route
Micro Demand Forecast and Design Work	High accuracy is required	Some errors in the micro demand forecast are recovered by its flexibility
Construction Work and Installation Cost	Total length of the cable pairs by this system is shorter than that by the free access distribution system but the cable splicing points are more than those of the free access distribution system	Contrary to the fix distribution system. Installation cost by this system is almost equal to the cost by the fix distribution system
Maintainability	Easy to assign cable pairs	Cable assignment is rather complicated
Reliability against Cable Faults	High	Lower than the fix distribution system because cable pairs are fingered every installation work and maintenance work

13.3 Switching Facilities

13.3.2 Expansion Plan for Switching Facilities

1) Cost Estimation Procedure for the Expansion Plan

- The unit cost is adopted from TOT's fifth and sixth expansion projects.

a) The investment cost of the expansion of SPC local switches is calculated as follows:

Investment cost = DPn x P1 (DPn : n =1,2,3)

- The number of local switch expansion lines in Phase-1, DP1, are cumulated as follows:

DP1=D1 - K1+D(2)

Note:

D1: Number of demands in Phase-1.

K1: Remaining line capacity at the end of 1992

D(2): D2 x 2/5

D2: Number of demands in Phase-2

- The number of local switch expansion lines in Phase-2, DP2, are cumulated as follows.

DP2=D2 - D(2)+D(3)

Note:

D2: Number of demands in Phase-2.

D(3): D3 x 2/5

D3: Number of demands in Phase-3

- The number of local switch expansion lines in Phase-3, DP3, are cumulated as follows:

DP3=D3 - D(3)

P1: The unit price of the SPC local switch = 6,955 (Baht / line)

The unit cost is adopted from the TOT's fifth and sixth expansion project.

b) Investment cost of land and building for the expansion of SPC switches is calculated as follows:

Investment Cost = Bn x Lp (Bn: n=1, 2, 3)

B1: Total amount of necessary room space in Phase-1
B2: Total amount of necessary room space in Phase-2
B3: Total amount of necessary room space in Phase-3
Lp: Unit cost for land and building = 15,319 (Baht / m^2)

Note : In order to estimate costs of Land & Building, it is necessary at first to estimate the required office room space and its capacity to accommodate future demand for subscriber telephones based on the present office space and switch capacity. In case of Japan, exchange office space is estimated to meet two times of the demand as of 15 years later. It is also necessary to estimate land space sufficient to build future exchange buildings.

TOT has a plan to install many Remote Switch Units (RSUs) to resolve shortage of the present exchange office space and difficulty to get land for new exchange offices. Therefore, the Study Team estimates the costs for Land & Building simply taking the total required office space to accommodate new switch units to be installed in the Project period for each office and each phase into consideration. Any margin of office and land space as mentioned above is not taken into account here.

Table 13.3.1 shows building and land expansion plan.

Table 13.3.1 Building and Land Expansion Plan

Bangkok Area (unit : M^2)

Unit name	Phase-1	Phase-2	Phase-3	Unit name	Phase-1	Phase-2	Phase-3
PNC-3	53			BGT-2	21		
SRR-4	242			CSW-2	113		
KKM-3	126			RBN	59	126	47
SRW-4	543			LTY		80	8
SMS-2	91			MSK	114	134	53
ASD-2	130			EKC	163	103	20
SKW-1	13	74	8	NGK	152	148	66
Sub total	1197	74	8	PPG-2	91	153	21
BNA-3	194			BBT	156	203	112
KGC	215			Sub total	868	794	327
TMM-2	130			PYT	353		
TNT-2	110			BGN-2	110		
BGC	127	122	44	BGS-2	243		
PKG-2	30			DNM-2	419	36	4
HAM-2	125			RIT-2	145	104	87
LKG-1		98	20	LTP-1	63		
KTI	53	105	24	LTP-2	64		
ONT	68	93	23	CWT	78	94	25
RKN		93	23	NTB-2	70		23
SPK-3	114	5	114	NWW-2	56		
PSP-2	146			PKK	91	120	44
BPL		172	83	PTT	10	98	24
BGU		97	43	RST		73	11
BBB		73	11	TYB		156	74
Sub Total	1312	858	385	NWN		74	12
				BAN		72	12
				Sub Total	1704	827	316
				Total	5081	2553	798

ProvinciaL Area (unit : M^2)

Unit name	Phase-1	Phase-2	Phase-3	Unit name	Phase-1	Phase-2	Phase-3
Ayutttthaya -1	75	2	2	Nakhon Pathon	103	128	73
Ayutttthaya -2		12	12	Sam Phran	111	80	16
Bang Pa in	80	6	6	Nakhon chaisi	111	95	38
Wang Noi	84	6	5	Others	39	50	65
PHACHI	68	3	4	Sub total	369	353	192
Tha Rua	78	5	5	Samut Sakhon	65	127	68
Others	15	30	37	Krathum Baen	116	17	17
Sub tortal	400	64	71	Ban Phaeo	109	17	18
				Sub total	290	162	102

c) Investment cost for the expansion of SPC tandem switches is calculated as follows:

The number of trunk switch expansion lines in each phase are got from the traffic forecast in each phase.

Investment Cost = Dn x P2 (Dn: n=1,2,3)

Note:

Table 13.3.3-2 Priority of Replacement of the XB Switches in the Surrounding Area

Prov-ince	EXCHANGE	SYSTEM	Openni Year	Line Capacity	1992year No of subscribe	Demand 1997 Year	Required Lines	Required Space	Remain Space	shortage Space	Demand 2002 Year	Required Lines	Required Space	shortage Space	Demand 2007 Year	Required Lines	Required Lines 2002+2007 Year	Required Space	shortage Space
6	NAKHON PATHOM	PC-1000C	1970	3000															
6		MSU NEAX 61	1984	8816															
6		MSU NEAX 61		1024															
6				12840	11,413	43,153	50,454	211	108	-103	21,820	22,754	128	-128	24,156	24,156	46,910	201	-201
6	SAM PHRAN	ARF-102	1975	1000															
6		MOBILE NEAX 6	1985	0															
6		MSU NEAX LSI		4096															
6				5096	2,390	16,729	16,886	111	0	-111	7,158	6,528	80	-80	5,583	5,583	12,111	96	-96
6	SAMUT SAKHON	ARF-102	1960	2000															
6		MSU AXE-10	1985	5120															
6		MSU AXE-10		1024															
6				8144	7,601	57,411	65,707	257	192	-65	22,098	22,349	127	-127	22,726	22,726	45,075	195	-195
6	TOTAL			26,080	21,404	117,293	133,047	579	300	-279	51,076	51,632	335	-335	52,465	52,465	104,097	492	-492

Prov-ince	EXCHANGE	SYSTEM	Openni Year	Line Capacity	1992year No of subscribe	Demand 1997 Year	Required Lines	Required Space	Remain Space	shortage Space	Demand 2002 Year	Required Lines	Required Space	shortage Space	Demand 2007 Year	Required Lines	Required Lines 2002+2007 Year	Required Space	shortage Space
9	AYUTTHAYA 1	PC-1000C	1960	1426	1,344	4,915	5,081	75	0	-75	620	691	2	-2	797	797	1,488	4	-4
9	BANG PA-IN	ARF-102	1979	1000	1,045	5,914	6,741	80	0	-80	1,955	2,023	6	-6	2,125	2,125	4,148	12	-12
9	WANG NOI	ARF-102	1979	1000	1,148	7,007	7,939	84	0	-84	1,959	1,896	6	-6	1,802	1,802	3,698	11	-11
9	PHACHI	ARF-102	1979	1000	532	2,818	2,768	68	0	-68	1,044	1,139	3	-3	1,281	1,281	2,420	7	-7
9	TOTAL			4,426	4,069	20,654	22,528				5,578	5,749			6,005	6,005	11,754		

Table 13.3.3-3 Replacement Term of XB Switches

Replacement of XB Local Switches in the BMA

Area	Unit Name	Switch TYP	Openn Year	No of Line Capacity	Phase-1 1993	1994	1995	1996	1997	Phase-2 1998	1999	2000	2001	2002	Phase-3 2003	2004	2005	2006	2007
1	PNC-1	C400	1971	12000	22000														
1	PNC-2	C400	1971	10000															
1	SRR-1	C400	1970	10000		30000													
1	SRR-2	C400	1970	10000															
1	SRR-3	C400	1978	10000															
1	KKM-2	C400	1970	10000		10000													
1	SRW-1	C400	1976	10000															
1	SRW-2	C400	1976	10000	30000														
1	SRW-3	C400	1978	10000															
1	SMS-1	C400	1980	5800				5800											
1	ASD-1	C400	1979	10000			10000												
1	PTW-1	C400	1980	5384					5384										
2	BNA-1	C400	1970	12000						12000									
2	CYP-2	C400	1970	13000								13000							
2	KGC-1	C400	1971	13000				13000											
2	TMM-1	C400	1968	10000						10000									
2	STD-1	C400	1971	3250			3250												
2	TNT-1	C400	1970	5250						5250									
2	PSP-1	C400	1977	7000				7000											
2	PKG-1	C400	1979	8000								8000							
2	HAM-1	C400	1979	8000					8000										
2	TKC-1	C400	1979	10000							10000								
2	SPK-1	ARF-102	1964	5000		5000													
3	TNB-1	C400	1970	20000					20000										
3	BKE-1	C400	1971	6000						6000									
3	DKN-1	C400	1971	12000							12000								
3	PPG-1	C400	1969	3310		3310													
3	PSN-1	C400	1979	5000								5000							
3	CSW-1	C400	1979	5100						5100									
3	BGT-1	C400	1976	11000			11000												
4	ITM-1	C400	1971	10000							10000								
4	BGN-1	C400	1970	10000								10000							
4	BGS-1	C400	1970	10000				10000											
4	NWW-1	C400	1969	5300				5300											
4	DNW-1	C400	1970	3480					3480										
4	PYT-1	C400	1967	12000			17800												
4	PYT-2	C400	1976	5800															
4	LKS-1	C400	1976	6000			6000												
4	NTB-1	C400	1979	3300					3300										
4	LTP-1	C400	1979	5200				5200											
4	LTP-2	C400	1979	3200							3200								
			Total	344374	52000	48310	48050	46300	40164	38350	35200	36000	0	0	0	0	0	0	0
Total number of Lines in each phase					234824					109550					0				

Replacement of XB Local Switches in Surrounding Area

Area	Unit Name	Switch TYP	Openn Year	No of Line Capacity	Phase-1 1993	1994	1995	1996	1997	Phase-2 1998	1999	2000	2001	2002	Phase-3 2003	2004	2005	2006	2007
6	SPR-1	ARF-102	1975	1000			1000												
6	SKN-1	ARF-102	1960	2000	2000														
6	NPT-1	PC1000	1970	3000		3000													
9	BPN-1	ARF-102	1979	1000			1000												
9	WNI-1	ARF-102	1979	1000				1000											
9	PCI-1	ARF-102	1979	1000					1000										
9	AYT-1	PC1000	1960	1426	1426														
			Total	10426	3426	3000	2000	1000	1000	0	0	0	0	0	0	0	0	0	0
Total number of Lines in each phase					10426					0					0				

Replacement of XB Tandem Switches in the BMA

Unit Name	Switch TYP	No of Circuits	Phase-1 1993	1994	1995	1996	1997	Phase-2 1998	1999	2000	2001	2002	Phase-3 2003	2004	2005	2006	2007
KKM T1	ARF-102	1505					1505										
PYT T2	C400	849								849							
TNB T5	C400	1357								1357							
SRW T7	C400	1952								1952							
	Total	5663					1505			4158							
Total number of Circuits in each phase			1505					4158					0				

1) Cost Estimation Procedure for the Replacement of XB Switch

- The unit cost is adopted from TOT's fifth and sixth projects.

a) Investment Cost for the Replacement of XB Switch

Investment Cost = Dn x P1 +(28 switch units x RM) (Dn: n=4, 5)

- The number of lines for the replacement of XB local switch in Phase-1, D4, and in Phase-2, D5, are cumulated as Table 13.3.3-2.

Note:

D4 : Number of Replacement of XB switch lines in Phase-1.

D5 : Number of Replacement of XB switch lines in Phase-2

P1 : Unit Cost for Replacement of XB switch = 6,955 (Baht / line).
Unit Cost is adopted from TOT's fifth and sixth project.

RM : Removal Cost for Replacement of XB switch = 1,363,636 (Baht / switch unit)

b) Investment Cost for the Replacement of XB Tandem Switch

Investment Cost = (T1 x Pa) x (T2 x Pb)+ (4 tandem switch units x RM)

Note:

T1 : Number of Replacement of XB tandem switches in Phase-1 (1,505 circuits)

T2 : Number of Replacement of XB tandem switches in Phase-2 (4,158 circuits)

Pa : Unit Cost for Replacement of XB tandem switch = 21,000 (Baht / circuit)).

Pb : Unit Cost for Replacement of XB tandem switch = 27,000 (Baht / circuit)).

RM : Removal Cost for Replacement of XB switch = 1,363,636 (Baht / switch unit)

2) Replacement of SPC switch

Investment Cost = Dn x P2 + (387 switch units x RM1) (Dn: n=12, 13)

Note;

D12 : Number of Replacement of SPC switch lines in Phase-2.

D13 : Number of Replacement of SPC switch lines in Phase-3.

P2 : Unit Cost for Replacement of SPC switch = 6,955 (Baht / line)

RM1 : Removal Cost for Replacement of SPC switch = 1,363,636 (Baht / switch unit)

2) Cost Estimation Procedure for the Replacement of Switch

a) Replacement of XB Switches

The unit cost is adopted from TOT's fifth and sixth expansion projects.

The number of lines for the replacement of local XB switches and tandem XB switches in each phase is shown in Table 13.3.3-3 of the present APPENDIX.

i) Investment Cost for the Replacement of XB Switch

Investment Cost = (Dn x P1) +(Sn x RM) (Dn: n=1,2), (Sn: n =1,2)

Note:

D1: Number of new installation of the local SPC switch lines in Phase-1

D2 : Number of new installation of the SPC local switch lines in Phase-2

P1 : Unit cost for new installation of local SPC switch = 6,955 (Baht/line).

Sn : Number of switch units for removal of XB switch unit in each phase
S1 (BMA) = 28 , S1 (SurroundingArea) = 7
S2 (BMA) = 13

RM: Removal cost of XB switch unit = 1,363,636 (Baht/switch unit)

ii) Investment Cost for the Replacement of XB Tandem Switch

Investment Cost = (Tn x Pn) + (Tn x RM) (Tn: n=1,2), (Pn: n = a, b)

Note:

T1: Number of new installation of the SPC tandem switches in Phase-1 (1,505 circuits)

T2: Number of new installation of the SPC tandem switches in Phase-2 (4,158 circuits)

Pa: Unit cost for new installation of the SPC tandem switch = 21,000 (Baht / circuit).

Pb: Unit cost for new installation of the SPC tandem switch = 27,000 (Baht / circuit).

Tn: Number of switch units for removal of XB tandem switch units in each phase
T1 = 1 , T2 = 4

RM: Removal cost of XB switch unit = 1,363,636 (Baht/switch unit)

b) Replacement of SPC switches

Investment Cost = (Dn x P1) + (Rs x RM) (Dn: n=2, 3)

Note:

D2: Number of new installation of local SPC switch lines in Phase-2.

D3: Number of new installation of local SPC switch lines in Phase-3.

P1: Unit cost for new installation of the SPC switch line= 6,955 (Baht/line)

Rs: Number of switch units for removal of local SPC switches unit in each area and phase as shown in below table.

(switch unit)

Area	Phase-2	Phase-3	Total
BMA	52	298	350
Surrounding Area	8	29	37
Total	60	327	387

RM1 : Removal cost of SPC switch unit = 1,363,636 (Baht/switch unit)

APPENDIX

13.4 Transmission Facilities

13.4.2 Transmission Expansion (Procedure of Trunk Circuits Estimation)

1) Estimation of Number of Circuits for Other Services

Transmission network is used not only to carry telephone traffic but also other service such as leased circuits. Capacity of transmission facilities in route, therefore, should considered to include all necessary circuits. As described in Chapter 8, various telecommunication services will be introduced in Thailand in near future. To meet these demands of the various telecommunication services, the Study team calculated necessary trunk circuits as in the following.

Ten (10) percents of telephone trunk circuits were added to them as other services in Phase-1. Fifteen (15) percents of telephone circuits were added to them as other services in Phase-2. Twenty (20) percents of telephone circuits were also added to them as other services in Phase-3. Table 13.4.2-1 shows a process of required trunk circuits in Table 13.4.3 in Chapter 13 (page 13-36) of the main report.

Table 13.4..2-1 Process of Estimation for Expanded Trunk Circuits

Item	Phase-1		Phase-2		Phase-3	
	No. of Telephone Circuits (A)	No. of Circuits (includes new services) Ax1.1	No. of Telephone Circuits (A)	No. of Circuits (includes new services) Ax1.15	No. of Telephone Circuits (A)	No. of Circuits (includes new services) Ax1.20
1. Junction Trunk Circuits	125,375	137,913	64,110	73,727	37,050	44,460
2. Long Distance Circuits	12,630	13,893	10,868	28,530	3,030	3,636
4. Spur Route						
1) Nakhon Pathom	6,767	7,444	10,530	12,110	17,432	20,918
2) Samut Sakhon	5,125	5,638	4,807	5,528	2,866	3,439
3)Ayutthaya	5,171	5,688	6,037	6,943	4,795	5,754
Sub Total		18,770		24,581		30,111

2) Calculation Method of Trunk Circuits of Spur Routes

As described in Chapter 8, number of telephone demands in the provincial areas in the Study area such as Nakhon Pathom are estimated by each district (Amphoe) basis because the boundaries of exchange areas are not specified in this area.

The Study team assumed that several RSUs will be installed in the provincial area. These installed RSUs are connected to the LE by microwave system or optical fiber system. In case of the connection, number of trunk circuits should be estimated between the RSUs and the MSU as shown in Figure 17.4.3.

Necessary number of trunk circuits between a RSU and a MSU were assumed as 25 % of the number of subscriber demands. Result of estimation of number of trunk circuits are shown in Table 13.4.2-2.

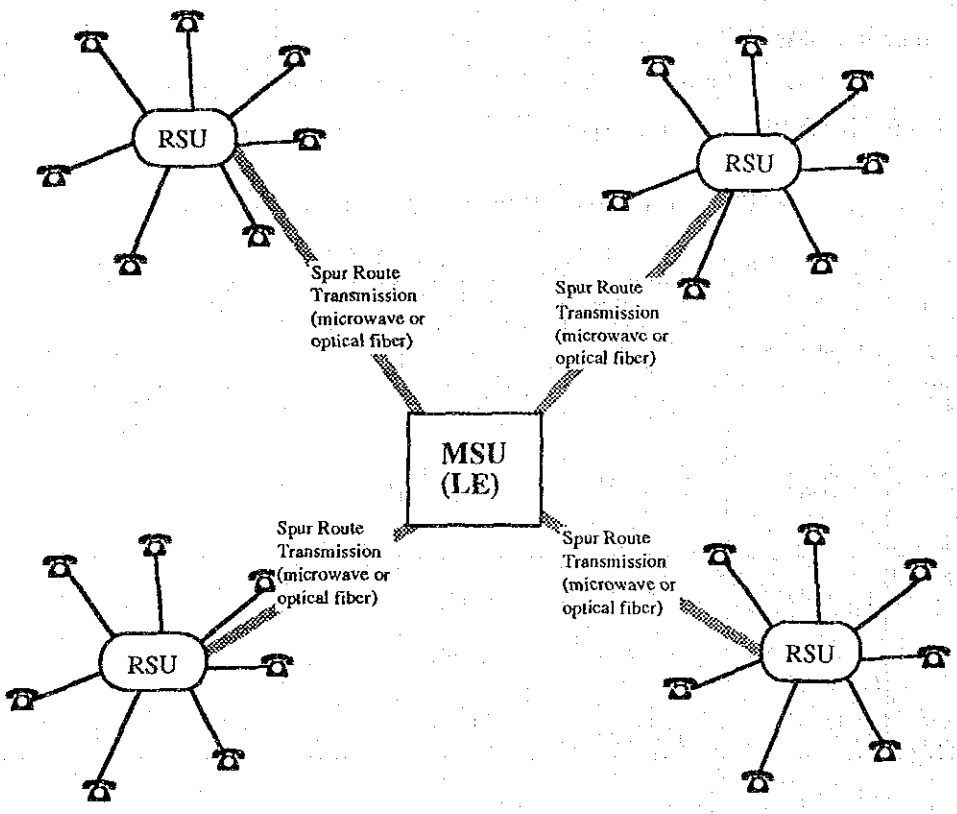

Figure 17.4.3 Configuration of Spur Rote Transmission System

Table 13.4.2-2 Estimation of Trunk Circuits in Spur Routes

Item	Phase-1		Phase-2		Phase-3	
	No. of Telephone Demands (A)	No. of Trunk Circuits Ax0.25	No. of Telephone Demands (A)	No. of Trunk Circuits Ax0.25	No. of Telephone Demands (A)	No. of Trunk Circuits Ax0.25
1) Nakhon Pathom	27,068	6,767	42,121	10,530	69,731	17,432
2) Samut Sakhon	20,501	5,125	19,236	4,809	11,466	2,866
3)Ayutthaya	20,685	5,171	24,148	6,037	19,181	4,795
Sub Total		17,063		75,920		25,092

3) Cost Estimation Procedure

The invest cost for transmission facilities is estimated with the unit price by the number of lines or number of circuits. The unit price is used of TOT's previous projects.

- The number of expanded trunk circuits in each Phase is obtained from the traffic forecast in each Phase.
- The investment cost of the long distance transmission facilities is excluded in this study.
- The investment cost of the trunk circuits for new services are estimated by adding 20 % of the total investment cost.

CHAPTER 14 OPERATION AND MAINTENANCE

APPENDIX

APPENDIX

14. OPERATION AND MAINTENANCE PLAN

14.2 Manpower

14.2.5 Microscopic Estimation Method

The microscopic estimation is developed on the basis of Figure 14.2.5-1.

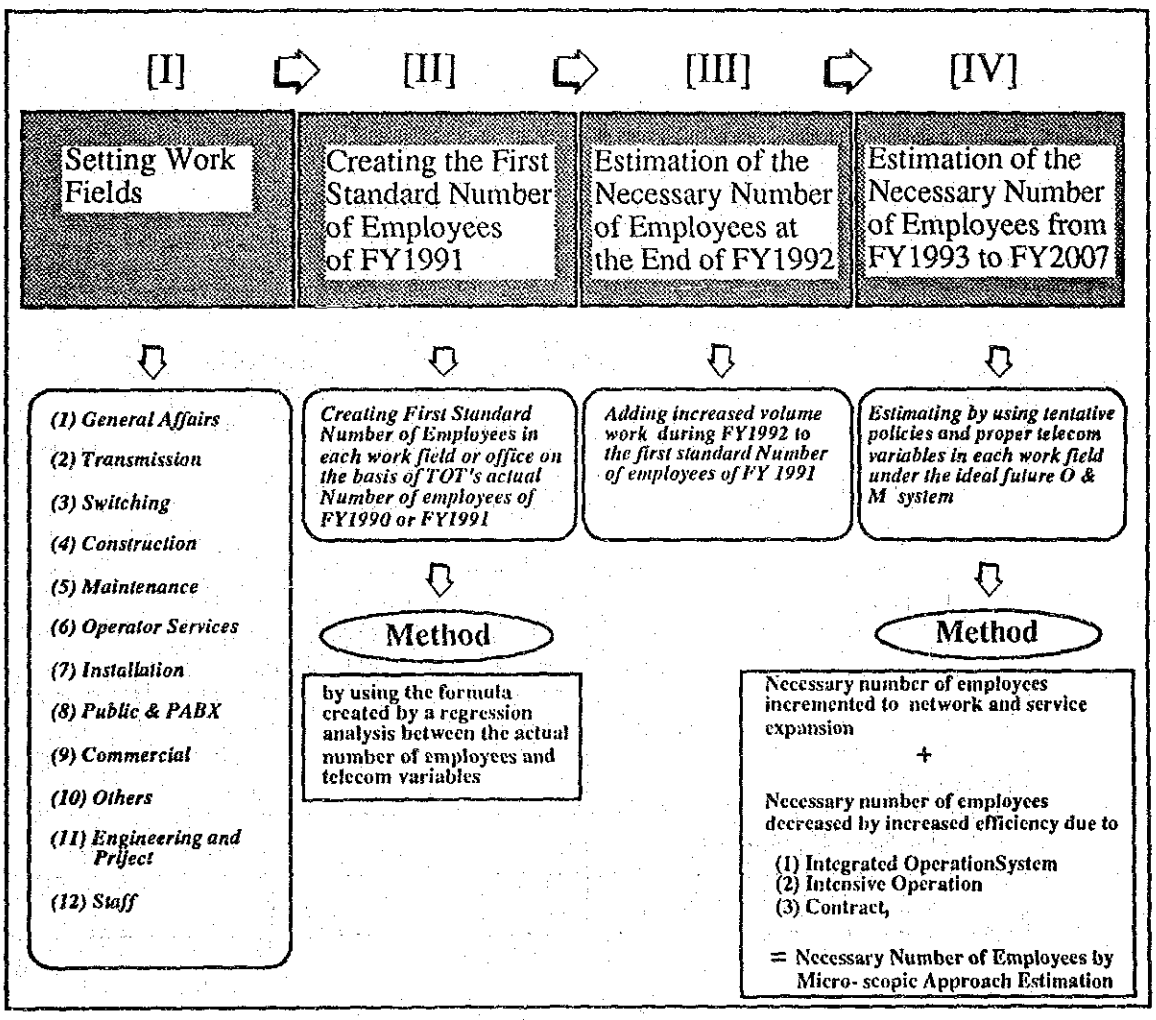

Figure 14.2.5-1 Microscopic Estimation Method

1) Estimation of First Standard Employees

Before the necessary number of employees from FY1993 to FY2007 is calculated, we need to set the standard number of employees for each field at the end of FY1992. The method is as follows;

a) Setting Work Field

There are 12 O & M work fields to estimate the necessary number of employees in the TOT organization. They are as follows.

Table 14.2.5-1 Work Fields

Bureau & Office		Department	Work Fields
1	General Affairs		**General Affairs**
2	Operations	Network	**Transmission**
3	Ditto	Ditto	**Switching**
4	Ditto	Telephone Services	**Construction**
5	Ditto	Ditto	**Maintenance**
6	Ditto	Ditto	**Operator Services**
7	Ditto	Ditto	**Installation**
8	Ditto	Ditto	**Public & PABX**
9	Ditto	Ditto	**Commercial**
10	Ditto		**Others**
11	Engineering & Project		**Engineering & Projects**
12	Staff (CPO, CAO and IAO)		**Staff**

b) First Standard Number of Headquarters Employees

The first standard number of employees in the planning field such as the headquarters is the actual number of employees. Because the planning field does not have a clear telecom variable, and it is made an induction not only some quantitative variables but also management itself such as organization. So it seemed that planning unit is not necessary to level.

The employees of the General Affairs Bureau are allocated according to the proportion of the total number of employees in the Study Area and other areas, the employees of other bureaus and offices are allocated according to the proportion of the main telephone lines in the Study Area and other areas in FY1991. The allocation method of headquarter employees is described in Table 14.2.5 -2 and Table 14.2.5-3.

Table 14.2.5-2 Allocations of Headquarters Employees

Item	Study area	Rate	Other area	Rate	Sub Total	Head.	Total
(1) The Number of Employees	5,124	0.45	6,193	0.55	11,317	7568	18885
(2) The Number of Connected Lines	1,020,535	0.70	438,656	0.30	1,459,191		
#1 (11) X Study area [45%], Other area [55%]	1,323		1,599		2922	0	2922
#2 (17) X Study area [70%], Other area [30%]	3,249		1,397		4646	0	4646
TOTAL	9,696		9,189		18885	0	18885

Table 14.2.5-3 Number of Headquarters Employee

Bureau and Office	Headquarters
(11) General Affairs	2,922
(12) Operations	2,714
(13) Engineering & Project	1,515
(14) Office of Corporate Affairs	222
(15) Office of Internal Audit	111
(16) Office of Corporate Planning	84
(17) = (12)+(13)+(14)+(15)+(16)	4,646
(18) TOTAL	7,568

c) First Standard Number in the Actual Work-sites

As mentioned in Chapter 7.2 "Actual Situation of Operation and Maintenance", there are differences between the actual number of employees and necessary number of employees in each telecommunication maintenance area and office. This situation may cause not only inefficient staffing but also the unbalance of service level to their customers.
For improving this situations, the first standard number of employees for each actual work-site such as an exchange office is calculated by using the formula created by a regression analysis between the actual number of employees and the number of line capacity. The used telecom variables are shown Table 14.2.5-4.

Table 14.2.5-4 Used Telecom Variables

Work Fields		Used telecom Variables
i)	Switching	The Number of Line Capacity
ii)	Maintenance	The Number of Faults
iii)	Installation	The Number of Installation
iv)	Public & PABX	The Number of Faults
v)	Commercial	The Number of Subscribers

d) First Standard Employees in Each Work Field at the End of FY1992

Table 14.2.5-5 shows the first standard number of employees in each work field at the end of FY1992. The necessary number of employees in the future is calculated on the basis of this first standard number of employees.

Table 14.2.5-5 First Standard Employees in Each Work Field at the end of FY1992

	Bureau & Office	Department	Work Field	The actual No.of Employees (Refer to Table 7.3.1-1)	Estimation Method	The Necessary No.of Employees at the end of FY1992
1	General Affairs		General Affairs	2,922	2,922 X 45% X 1.02	**1,340**
2	Operations	Network	Transmission	Refer to ANNEX		**150**
3	ditto	ditto	Switching	Refer to ANNEX	By using regression	**1,390**
4	ditto	Tele. Services	Construction	826	826 X 70%	**580**
5	ditto	ditto	Maintenance	Refer to ANNEX	By using regression	**2,220**
6	ditto	ditto	Ope. Services	484	484 X 70%	**340**
7	ditto	ditto	Installation	Refer to ANNEX	By using regression	**320**
8	ditto	ditto	Public & PABX	Refer to ANNEX	By using regression	**790**
9	ditto	ditto	Commercial	Refer to Table 14.2.5-11	By using regression	**1,290**
10	ditto	ditto	Others	540	540 X 70% X 1.02	**390**
11	Engi. & Proj.		Engi. & Proj.	1,515	1,515 X 70% X 1.02	**1,080**
12	Staff		Staff	417	417 X 70% X 1.02	**300**
	Total					**10,190**

Note: Increase rate of work quantity in the headquarters excluding "Construction" and "Operator Services" from FY 1991 to FY1992, 1.02 % assumed.

2) Necessary Employee Plan

The necessary number of employees of "Switching", "Maintenance", "Installation", "Public & PABX" and "Commercial" work fields are calculated by using proper telecom variables in each work field under the ideal future O & M management system.

The necessary number of employees of "General Affairs" and "Others" work fields are estimated by using the decrease rate of 3% in each year in order to aim at efficient work performances. 3% reduction rate in the each year is a target.

The necessary number of employees of "Transmission", "Construction", "Operator Services", "Engineering & Project" and "Staff" work fields assume that the work volume in the future remain the same at the end of FY 1992. Because these work fields do not have clear telecom variable, it is made an induction management itself such as organization and business course.

a) General Affairs

In the General Affairs field, the number of employees will decrease by 3 % in each year in order to aim at efficient work performances. 3% reduction rate in each year is a target. This work field has very important functions such as job work coordination among line, finance management, human resource management. However, there are some ways to reduce the amount of works, by introducing an integrated computer system, by carrying out reorganization aiming at integrated work systems.
If this field does not try to decrease the amount of work and to establish an efficient O & M work system, it is difficult to extend the efficient work system to other fields.

b) Transmission

The number of DTIs, which is a telecom variable in the transmission field, increases in the years ahead. However, the necessary number of transmission employees in the future remain the same at the end of FY1992. Because it can be foreseen that necessary number of employees will not change because of development of network management such as a concentrated control system.
Actually, in Japan, the necessary number of transmission employees have not increased for ten years

c) Switching

This section as a reference shows how to estimate the necessary number of employees during the study period by the first standard number of employees of FY1992 .

i) The First Standard Number of Employees of FY1992

The estimation method of the first standard number of employees for each switching unit is as follows;

- Five Job Categories

Switching O & M jobs are divided into the following five job categories.

SPC Maintenance Job
SPC Test (Jumper) Job

XB Maintenance Job
XB Test (Jumper) Job
Planning, Management and Administration Job

For allocating the amount of work, the first standard number of employees is calculated for each local switching unit of an exchange office by using the formula created by a regression analysis between the actual number of employees of FY1990 each switch and the number of line capacity each switch of FY 1990.

After allocating the amount of works, the first standard number of employees of FY1992 is estimated by the increased line capacity from 1991 to 1992.

-SPC Maintenance Job

$$E = 0.0000622648X + (-0.0000000001)X^2 + 1.9229622028$$

Where
E : Necessary Number of Employees
X : Line Capacity

- SPC Test (Jumper) Job

$$E = 0.000951887X + (-0.0000000001)X^2 + 1.3297095129$$

Where
E : Necessary Number of Employees
X : Line Capacity

- XB Maintenance Job

$$E = 0.0005773013X + (-0.0000000105)X^2 + 1.5165607259$$

Where
E : Necessary Number of Employees
X : Line Capacity

- XB Test (Jumper) Job

$$E = 0.0002174844X + (-0.0000000013)X^2 + 1.6745117836$$

Where

E : Necessary Number of Employees

X : Line Capacity

Note: The detailed data is described in ANNEX.

ii) The Necessary Number of Employees

The estimation method of the necessary number of employees for each switching unit is as follows;

- SPC Maintenance Job

The necessary number of employees for SPC switch maintenance jobs is estimated by the following formula.

$$E = 0.0000622648X + (-0.0000000001)X^2 + 1.9229622028$$

Where

E : Necessary Number of Employees

X : Line Capacity

- SPC Test (MDF Exchanges) Job

The SPC test job exists in each exchange office in the future.

$$E = \frac{S \cdot M}{W \cdot D \cdot P} + \frac{I \cdot Pr}{Wp \cdot D \cdot P} + Fp$$

where

E : Necessary number of Employees

S : Number of Subscribers

M : Annual subscriber moving out rate, 12.5% of the total line capacity in each unit assumed

W : Working days in a year, 200 days assumed

D : Number of dealings in a day for changing MDFs, forty assumed.

P : An MDF change job is dealt by a pair

I : Number of Installations.

Pr : When a new switch unit is installed, jumper jobs to connect 60 % of the total line capacity are assumed to be completed by a supplier. In other words, TOT carries out the remaining jumper jobs.

Wp : Working days in each Phase (five years), 1,000 days assumed.

Fp : Fixed number of necessary employees for tests and type jobs, two persons in each exchange office assumed.

The items of efficient O & M jobs in the switching field is as follows;

- Centralization
- Replacing XB Switches with SPC Switches
- 3% reduction rate of the number of administrative employees in each year

Note: The detailed data is described in ANNEX.

d) Outside Plant Maintenance

i) The Necessary Number of Employees

The estimation method of the necessary number of employees for each outside plant maintenance area is as follows;

- Four Job Categories

Outside Plant O & M works are divided into the following four job categories.

Ordinary Telephone Maintenance Job
Public Telephone Maintenance Job
PABX Maintenance Job
Planning, Management and Administration Job

- Ordinary Telephone Maintenance Job

Table 12.2.5-8 shows the necessary number of employees for the ordinary telephone maintenance jobs. The estimation method is estimated by the following formula.

$$E = \frac{F}{W \cdot \frac{D}{P}}$$

where

E : Necessary number of employees
F : Number of fault s (A Year)
W : Working days in a year, 200 days assumed
P : A repair job is dealt by three persons.
D : Number of dealings in a day for repairs, four assumed.

Note: The detailed data is described in ANNEX.

- Public Telephone Maintenance Job

Table 12.2.5-9 shows the necessary number of employees for the public telephone maintenance jobs. The estimation method is estimated by the following formula.

$$E = \frac{F}{W \cdot \frac{D}{P}}$$

where

E : Necessary number of employees
F : Number of faults
W : Working days in a year, 200 days assumed
P : A repair job is dealt by two persons
D : Number of dealings in a day for repairs, four assumed.

Note: The detailed data is described in ANNEX.

- PABX Maintenance Job

Table 12.2.5-10 shows the necessary number of employees for PABX. The estimation method is the same formula of the public telephone maintenance jobs.

The items of efficient O & M jobs in the switching field is as follows;

- 3% reduction rate of the number of administrative employees in each year

Note: The detailed data is described in ANNEX.

e) Commercial

i) The Necessary Number of Employees

Table 12.2.5-11 shows the necessary number of employees for commercial jobs. The estimation method of the necessary number of employees for each commercial office is as follows;

- Three Job Categories

Commercial O & M works are divided into the following three job categories.

Subscriber Services Job
Revenue Collection Job
Planning, Management and Administration Job

- Subscriber Services Job

The necessary number of employees for the subscriber services is estimated by the following formula.

$$E = \frac{S}{P}$$

where

E : Necessary Number of Employees
S : Number of Subscribers
P : Subscribers Per Employee, 2,000 assumed

- Revenue Collection Job

The necessary number of employees for the revenue collection is estimated by the following formula.

$$E = \frac{S}{P}$$

where

E : Necessary Number of Employees

S : Number of Subscribers

P : Subscribers Per Employee, 3,500 assumed (Phase 1)
Subscribers Per Employee, 4,000 assumed (Phase 2)
Subscribers Per Employee, 4,500 assumed (Phase 3)

The items of efficient O & M jobs in the commercial field are as follows;

- Efficient work Operation of Revenue Collection Section
- 3% reduction rate of the number of administrative employees in each year

Note: The detailed data is described in ANNEX.

f) Other Work Fields

The necessary number of employees of "Construction", "Operator Services", "Engineering & Project" and "Staff" work fields assume that the work quantity in the future remain the same at the end of FY 1992. Because work quantity of these work fields depend on management itself such as organization and business course. This action is aiming at efficient work system.

CHAPTER 16 FINANCIAL ANALYSIS

APPENDIX

APPENDIX

16. FINANCIAL ANALYSIS PROCEDURES

This section describes the procedures of the revenue estimation and the cost estimation for the financial analysis of the project.

16.1 Cash In-flow (Revenues) Estimation

The revenue of the project is estimated on the revenue from the Study Area, e.g., Bangkok Metropolitan area (BMA) and its Surrounding Area which are Nakhon Pathom, Samut Sakhon, and Ayutthaya. As described in Chapter 16, an issue of the trunk call revenue distribution for the Study Area and the other areas is not taken into consideration.

The call revenue is estimated separately for the local call revenue and the trunk call revenue; in the BMA, Nakhon Pathom, Samut Sakhon, and Ayutthaya. The call revenue is estimated by using a regression analysis. The public telephone revenue is estimated differently from the call revenue.

16.1.1 Call Revenues from the Bangkok Metropolitan Telecommunication Area

1) Past Trend of Local Telephone Usage

Tables 16.1.1-1 ~ 16.1.1-4 show:

a) the classified number of local telephone usage (pulses) by type of subscribers,
b) the number of main telephone stations by type of subscribers,
c) the number of average main telephone stations by type of subscribers,
d) the number of local telephone usages (pulses) per average main telephone stations classified by type of subscribers,

in the Bangkok Metropolitan Telecommunication area.

In these tables, the average telephone lines are calculated by the following equation.

Average main tel. line = (Main Tel. station at the beginning of the year + Main Tel. station at the end of the year) ÷ 2

Total Private = Business + Residence

Private & Government = Total Private + Government

Total = Business + Residence + Government + Public + TOT

Table 16.1.1-1 The Classified Number of Local Telephone Usage by Type of Subscribers in BMA.

(Unit: Thousand Pulse)

Year	Business	Residence	Total Priv.	Govt.	Priv.& Govt.	Public	TOT	TOTAL
1981	304,055	210,626	514,681	53,784	568,465	110,987		679,452
1982	314,603	244,103	558,706	70,000	628,706	132,706	1,477	762,889
1983	319,491	276,574	596,065	84,246	680,311	154,921	5,022	840,254
1984	332,619	307,979	640,598	89,369	729,967	168,473	5,609	904,049
1985	334,978	329,514	664,492	94,815	759,307	205,814	5,980	971,101
1986	362,127	389,957	752,084	109,987	862,071	306,665	9,854	1,178,590
1987	391,123	431,245	822,368	118,617	940,985	339,550	7,272	1,287,807
1988	451,932	508,382	960,314	127,210	1,087,524	368,353	8,058	1,463,935
1989	523,956	604,072	1,128,028	134,302	1,262,330	368,408	13,839	1,644,577
1990	634,380	743,484	1,377,864	166,484	1,544,348	481,172	12,602	2,038,122

Table 16.1.1-2 The Number of Main Telephone Stations by Type of Subscribers in BMA.

Year	Business	Residence	Total Priv.	Govt.	Priv.& Gov.	Public	TOT	TOTAL
1980	92,875	149,758	242,633	19,979	262,612	5,160	1,762	269,534
1981	96,368	160,980	257,348	22,004	279,352	5,950	1,788	287,090
1982	101,047	176,804	277,851	24,579	302,430	7,645	1,987	312,062
1983	105,610	196,683	302,293	26,906	329,199	8,176	2,135	339,510
1984	108,726	212,825	321,551	28,820	350,371	9,260	2,293	361,924
1985	123,732	263,328	387,060	31,972	419,032	11,298	3,187	433,517
1986	142,980	352,887	495,867	35,029	530,896	13,229	3,955	548,080
1987	155,521	403,191	558,712	36,962	595,674	14,435	4,598	614,707
1988	172,414	454,890	627,304	39,007	666,311	14,485	5,355	686,151
1989	192,742	538,076	730,818	40,770	771,588	14,533	6,082	792,203
1990	219,255	618,531	837,786	41,849	879,635	14,665	6,641	900,941

Table 16.1.1-3 The Number of Average Main Telephone Stations by Type of Subscribers in BMA.

Year	Business	Residence	Total Priv.	Govt.	Priv.& Gov.	Public	TOT	TOTAL
1981	94,622	155,370	249,992	20,992	270,984	5,556	1,776	278,315
1982	98,708	168,893	267,601	23,292	290,893	6,798	1,888	299,579
1983	103,329	186,744	290,073	25,743	315,816	7,911	2,062	325,789
1984	107,169	204,755	311,923	27,864	339,787	8,719	2,215	350,720
1985	116,230	238,077	354,307	30,397	384,703	10,280	2,741	397,723
1986	133,357	308,108	441,465	33,501	474,966	12,264	3,572	490,801
1987	149,251	378,040	527,291	35,996	563,287	13,833	4,277	581,396
1988	163,968	429,041	593,009	37,985	630,994	14,461	4,977	650,432
1989	182,579	496,484	679,062	39,889	718,951	14,510	5,719	739,180
1990	205,999	578,304	784,303	41,310	825,613	14,600	6,362	846,575

Table 16.1.1-4 The Number of Local Telephone Usages per Average Main Telephone Stations Classified by Type of Subscribers in BMA.

(Unit: Pulse/line)

Year	Business	Residence	Total Priv.	Govt.	Priv.& Gov.	Public	TOT	TOTAL
1981	3,213	1,356	2,059	2,562	2,098	19,978	0	2,441
1982	3,187	1,445	2,088	3,005	2,161	19,521	782	2,547
1983	3,092	1,481	2,055	3,273	2,154	19,583	2,436	2,579
1984	3,104	1,504	2,054	3,207	2,148	19,324	2,533	2,578
1985	2,882	1,384	1,875	3,119	1,974	20,022	2,182	2,442
1986	2,715	1,266	1,704	3,283	1,815	25,005	2,759	2,401
1987	2,621	1,141	1,560	3,295	1,671	24,547	1,700	2,215
1988	2,756	1,185	1,619	3,349	1,724	25,473	1,619	2,251
1989	2,870	1,217	1,661	3,367	1,756	25,391	2,420	2,225
1990	3,080	1,286	1,757	4,030	1,871	32,958	1,981	2,407

Though the number of local telephone usages per line for private and governmental users declined from FY 1982 to 1987, it increased again from FY 1987 to 1990 as shown in Figure 16.1.1-1.

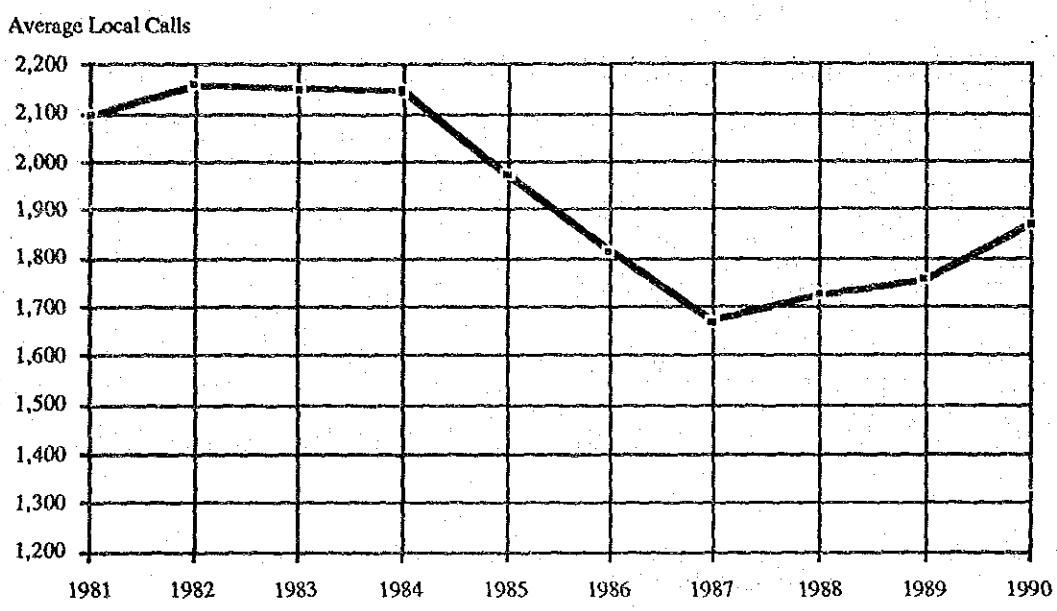

Figure 16.1.1-1 Number of Local Calls per Average Telephone Line in BMA (Private & Government)

2) Local Call Revenue Forecasting

Total local call traffic tends to increase in accordance with the number of main telephone lines. The relationship between the number of local calls and the number of main telephone lines is analyzed by linear regression models.

Table 16.1.1-5 shows the number of local calls made by the private and government users and their number of telephone lines in the metropolitan area for the past ten years.

Table 16.1.1-5 The Number of Local Calls in BMA (Private + Government)

Year	Pulses (Thousand)	Main Tel. Line	Average Main Tel. Line	Pulse/Average Main Tel. Line
1981	568,465	279,352	270,984	2,098
1982	628,706	302,430	290,893	2,161
1983	680,311	329,199	315,816	2,154
1984	729,967	350,371	339,787	2,148
1985	759,307	419,032	384,703	1,974
1986	862,071	530,896	474,966	1,815
1987	940,985	595,674	563,287	1,671
1988	1,087,524	666,311	630,994	1,724
1989	1,262,330	771,588	718,951	1,756
1990	1,544,348	879,635	825,613	1,871

The regression result is as follows:

Dependent Variable: Number of local pulses (1,000)
Independent Variable: Number of average main telephone line
Degree of Freedom: 9

Variable Name1.566	Coefficient	Std. Err. Estimate	T Statistics	Probability of T
Constant	151748.3719	50.790976	2.987734	0.017
Ave. Tel. Lines	973	0.098465	15.914054	0.000

Coefficient of Determination (R^2)	0.969379
Adjusted Coefficient (R^2)	0.965551
Coefficient of Correlation (R)	0.984570

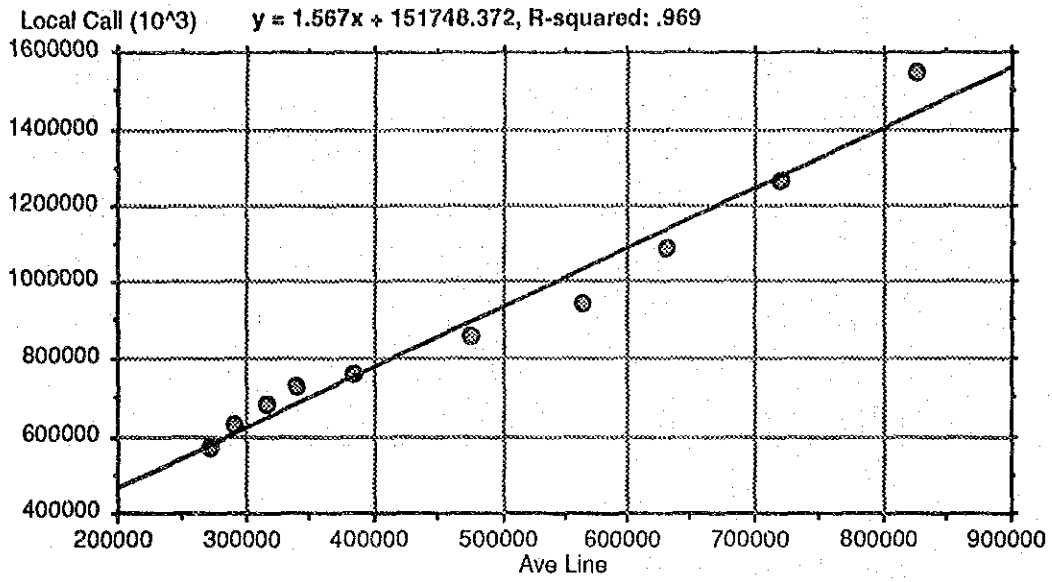

Figure 16.1.1-2 Past Trend of Local Calls in BMA(Private + Government)

The number of local calls in the future can be estimated by the following equation.

Pulses(1,000) = 1.566973 x Ave. Main Tel. Line + 151748.3719

For the number of main telephone lines of the private and the government users increased in accordance with the installation schedule, the number of local pulses are estimated as shown in Table 16.1.1-6. Figure 16.1.1-3 shows the trend of the estimated number of pulses per average telephone line between FY 1992 and 2007.

Table 16.1.1-6 Estimated Local Calls in BMA (Private + Government)

Year	Main Telephone Lines	Average Main Telephone Lines	Local Pulses (1,000)	Pulses/Ave. L.
1991	1,031,618	955,626	1,649,189	1,726
1992	1,204,205	1,117,912	1,903,486	1,703
1993	1,673,713	1,438,959	2,406,558	1,672
1994	2,143,140	1,908,426	3,142,201	1,646
1995	2,612,479	2,377,809	3,877,711	1,631
1996	3,081,720	2,847,099	4,613,076	1,620
1997	3,550,855	3,316,287	5,348,281	1,613
1998	3,844,850	3,697,852	5,946,183	1,608
1999	4,138,716	3,991,783	6,406,765	1,605
2000	4,432,440	4,285,578	6,867,134	1,602
2001	4,726,008	4,579,224	7,327,269	1,600
2002	5,019,403	4,872,705	7,787,146	1,598
2003	5,220,210	5,119,806	8,174,347	1,597
2004	5,420,809	5,320,510	8,488,843	1,595
2005	5,621,179	5,520,994	8,802,997	1,594
2006	5,821,296	5,721,237	9,116,773	1,593
2007	6,021,136	5,921,216	9,430,134	1,593

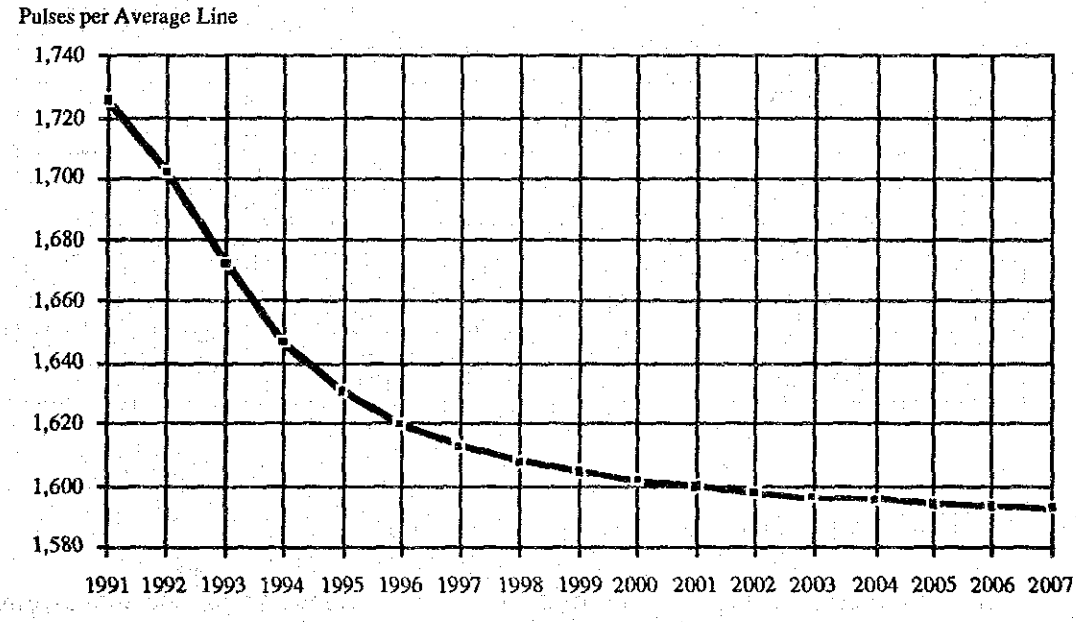

Figure 16.1.1-3 Estimated Local Calls per Telephone in BMA (Private + Government)

3) Past Trend of Trunk Telephone Revenue

Table 16.1.1-7 shows the number of trunk calls, trunk call minutes, trunk call revenue, number of main telephone lines, average telephone lines, trunk revenue per average telephone line, trunk revenue per trunk call, number of trunk call per line, and trunk call minutes per trunk call for the past ten years in the BMA, which are used as the basic data for the future revenue estimation..

Table 16.1.1-7 Trunk Call Statistics in Metropolitan Telecom. Area (Private + Government)

Year	Trunk Call	Call Minutes	Trunk Revenue (Baht)	Main Telephone Line	Average Telephone Line
1981	9,031,291		303,247,610	279,352	270,982
1982	12,189,558		377,168,350	302,430	290,891
1983	14,545,378		435,421,530	329,199	315,815
1984	16,167,814		483,609,136	350,371	339,785
1985	18,932,796		563,870,503	419,032	384,702
1986	22,719,118	91,015,331	803,013,337	530,896	474,964
1987	27,485,356	103,374,616	1,015,700,872	595,674	563,285
1988	35,081,957	128,827,531	1,180,276,737	666,311	630,993
1989	45,828,999	171,450,611	1,475,964,082	771,588	718,950
1990	60,390,730	225,982,237	1,865,756,185	879,635	825,612

Year	Rev/Ave. line	Trunk Rev./Call	Trunk Call per line	Min./Call
1981	1,119.07	33.58	33.3	
1982	1,296.60	30.94	41.9	
1983	1,378.73	29.94	46.1	
1984	1,423.28	29.91	47.6	
1985	1,465.74	29.78	49.2	
1986	1,690.68	35.35	47.8	4.01
1987	1,803.17	36.95	48.8	3.76
1988	1,870.51	33.64	55.6	3.67
1989	2,052.95	32.21	63.7	3.74
1990	2,259.85	30.89	73.1	3.74

4) Trunk Revenue Forecasting

This section presents the estimates of the trunk call revenues by private and government subscribers in BMA. The future trunk revenue is estimated by regressing the trunk revenue on the number of telephone lines since the total trunk traffic increases in accordance with the increase of the number of main telephone lines.

The regression result is as follows:

Dependent Variable: Trunk Revenue (Thousand Baht)
Independent Variable: Number of Average Main Telephone Line
Degree of Freedom: 9

Variable Name	Coefficient	Std. Err. Estimate	T Statistics	Probability of T
Constant	-440149.5616	45278.8646	-9.7209	0.000
Ave. Tel. Lines	2.6797	0.0878	30.5282	0.000

Coefficient of Determination (R^2)	0.9915
Adjusted Coefficient (R^2)	0.9904
Standard Error of Estimate	51290.8813

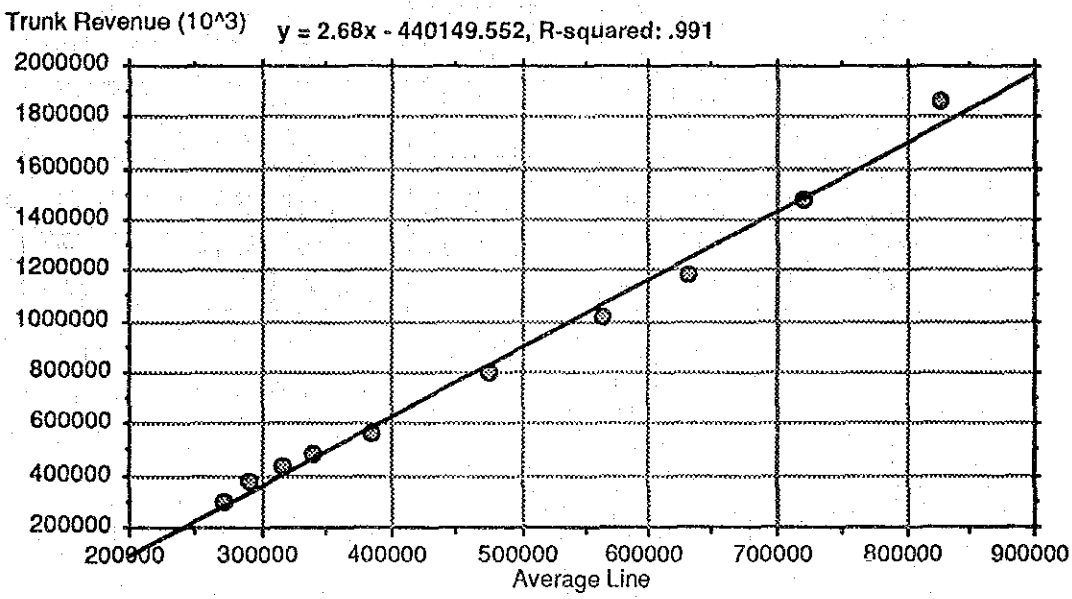

Figure 16.1.1-4 Past Trend of the Trunk Revenue in BMA (Private + Government)

The trunk revenue in the future can be estimated by the following equation.

Trunk Revenue (Thousand Baht) = 2.6797 x Ave.Main Tel. Line - 440149.5516

Table 16.1.1-8 shows the estimated trunk revenues in the metropolitan area for the increased number of main telephone lines of the private and the government in accordance

with the installation schedule. Figure 16.1.1-5 shows the trend of the estimated trunk revenues per line in the future.

Table 16.1.1-8 Estimated Trunk Revenue in BMA (Private + Government)

Year	Main Tel. Lines	Ave. Lines	Trunk Rev (1,000)	Trunk Rev/Ave. Line
1991	1,031,618	955,626	2,120,643	2,219
1992	1,204,205	1,117,912	2,555,518	2,286
1993	1,673,713	1,438,959	3,415,829	2,374
1994	2,143,140	1,908,426	4,673,861	2,449
1995	2,612,479	2,377,809	5,931,666	2,495
1996	3,081,720	2,847,099	7,189,223	2,525
1997	3,550,855	3,316,287	8,446,506	2,547
1998	3,844,850	3,697,852	9,468,986	2,561
1999	4,138,716	3,991,783	10,256,632	2,569
2000	4,432,440	4,285,578	11,043,915	2,577
2001	4,726,008	4,579,224	11,830,797	2,584
2002	5,019,403	4,872,705	12,617,239	2,589
2003	5,220,210	5,119,806	13,279,396	2,594
2004	5,420,809	5,320,510	13,817,220	2,597
2005	5,621,179	5,520,994	14,354,458	2,600
2006	5,821,296	5,721,237	14,891,050	2,603
2007	6,021,136	5,921,216	15,426,934	2,605

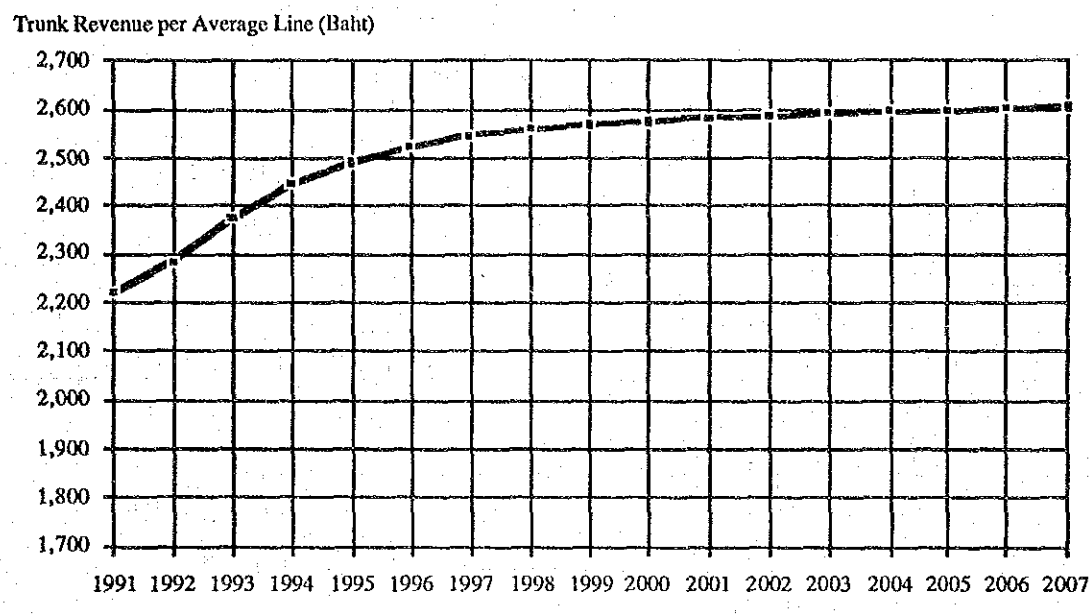

Figure 16.1.1-5 Estimated Trunk Revenue per Average Telephone Line in BMA (Private + Government)

16.1.2 Call Revenue Estimation in the Surrounding Area

This section presents the historical data of telephone usage in the Surrounding Area, e.g., Nakhon Pathom, Samut Sakhon, and Ayutthaya.

1) Call Revenues Estimation in Nakhon Pathom

1) Past Trend of Local and Trunk Telephone Usage in Nakhon Pathom

Table 16.1.2-1 and Table 16.1.2-2 show the number of local calls, trunk calls and trunk revenue of main telephone line in Nakhon Pathom for the past eleven years.

Table 16.1.2-1 The Revenue Statistics in Nakhon Pathom

Year	Main Tel. Station	Pulse Metered Service	Trunk Call	Trunk Minutes	Subscription Fee & Call Charge	Trunk Rev.	Total Rev.
1980	2,791	2,835,422	255,750		7,231,074	3,182,108.50	10,413,182.5
1981	2,797	3,056,976	678,300		7,755,852	10,409,154.00	18,165,006.0
1982	2,804	3,187,845	869,662		N. A.	13,202,584.45	13,202,584.5
1983	2,817	3,620,328	1,097,093		7,955,230	12,873,940.50	20,829,170.5
1984	5,535	5,113,232	1,141,114		11,983,701	17,299,234.30	29,282,935.3
1985	8,447	7,528,159	1,641,462		20,336,796	25,387,603.00	45,724,399.0
1986	8,768	11,436,709	2,211,036	7,758,246	28,891,232	42,645,639.50	71,536,871.5
1987	8,946	7,396,395	2,438,850	8,075,954	30,470,742	52,618,085.00	83,088,827.0
1988	9,137	8,283,437	2,966,320	9,655,885	33,380,531	60,647,864.50	94,028,395.5
1989	11,394	9,253,046	3,644,884	12,278,775	37,240,718	65,607,538.50	102,848,256.5
1990	14,432	19,920,827	5,262,075	18,559,895	59,275,775	63,430,750.50	122,706,525.5

Table 16.1.2-2 Local Pulse and Trunk Revenue per Average Line in Nakhon Pathom

Year	Average. Line	Local Pulse /Ave.line	Subscription & Local /Ave.line	Trunk Revenue /Ave.line
1981	2,794	1,094.12	2,776	6,501
1982	2,801	1,138.31	N. A.	4,714
1983	2,811	1,288.14	2,831	7,411
1984	4,176	1,224.43	2,870	7,012
1985	6,991	1,076.84	2,909	6,540
1986	8,608	1,328.69	3,357	8,311
1987	8,857	835.09	3,440	9,381
1988	9,042	916.16	3,692	10,400
1989	10,266	901.37	3,628	10,019
1990	12,913	1,542.70	4,590	9,503

b) Local Call Revenue Forecasting

The regression result is as follows:

Dependent Variable: Number of local pulses (1,000)

Independent Variable: Number of average main telephone line

Degree of Freedom: 9

Variable Name	Coefficient	Std. Err. Estimate	T Statistics	Probability of T
Constant	-848.3357	1712.5033	-0.4954	0.634
Ave. Tel. Lines	1.2602	0.2218	5.6826	0.000

Coefficient of Determination (R^2)	0.8014
Adjusted Coefficient (R^2)	0.7766
Coefficient of Correlation (R)	0.8952

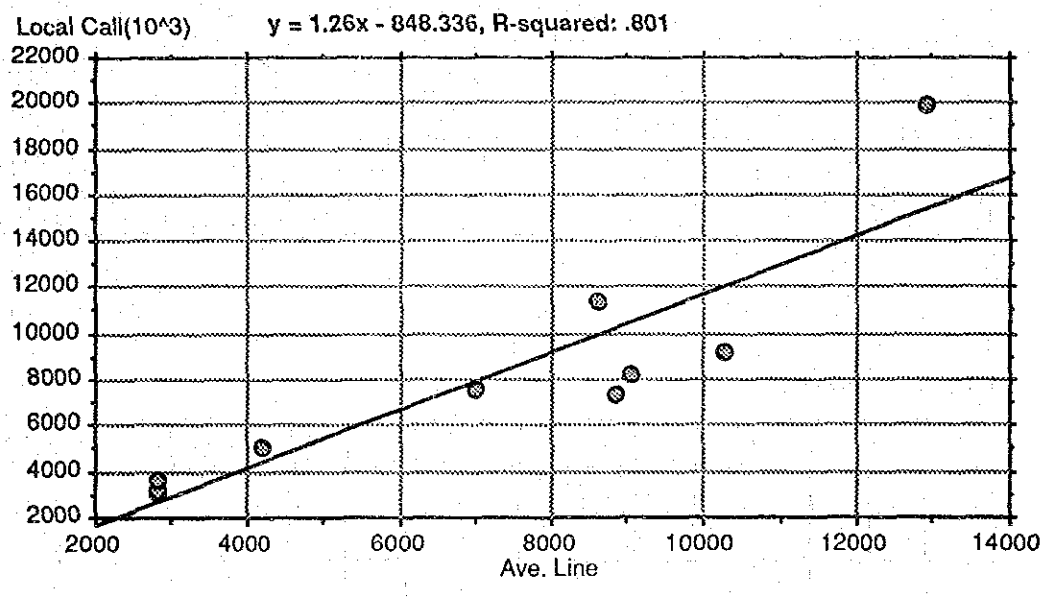

Figure 16.1.2-1 Past Trend of Local Call in Nakhon Pathom

The number of local calls in the future can be estimated by the following equation.

Pulses (1,000) = 1.2602 x Ave. Main Tel. Line - 848.3357

Since the number of main telephone lines of the private and the government users increased in accordance with the installation schedule, the number of local pulses is estimated as shown in Table 16.1.2-3. Figure 16.1.2-2 shows the trend of the estimated number of pulses per average telephone line for the fifteen years from FY 1992 to 2007.

Table 16.1.2-3 Estimated Local Calls in Nakhon Pathom

Year	Main Telephone Lines	Average Main Telephone Lines	Local Pulses (1,000)	Pulses/Ave. L.
1991	11,907	11,720	12,099	1,032
1992	12,279	12,093	12,491	1,033
1993	18,326	15,303	15,864	1,037
1994	24,371	21,349	22,219	1,041
1995	30,413	27,392	28,572	1,043
1996	36,453	33,433	34,921	1,045
1997	42,489	39,471	41,268	1,046
1998	49,207	45,848	47,971	1,046
1999	55,921	52,564	55,030	1,047
2000	62,631	59,276	62,085	1,047
2001	69,337	65,984	69,135	1,048
2002	76,037	72,687	76,181	1,048
2003	80,758	78,398	82,184	1,048
2004	85,473	83,115	87,142	1,048
2005	90,181	87,827	92,095	1,049
2006	94,882	92,532	97,040	1,049
2007	99,576	97,229	101,977	1,049

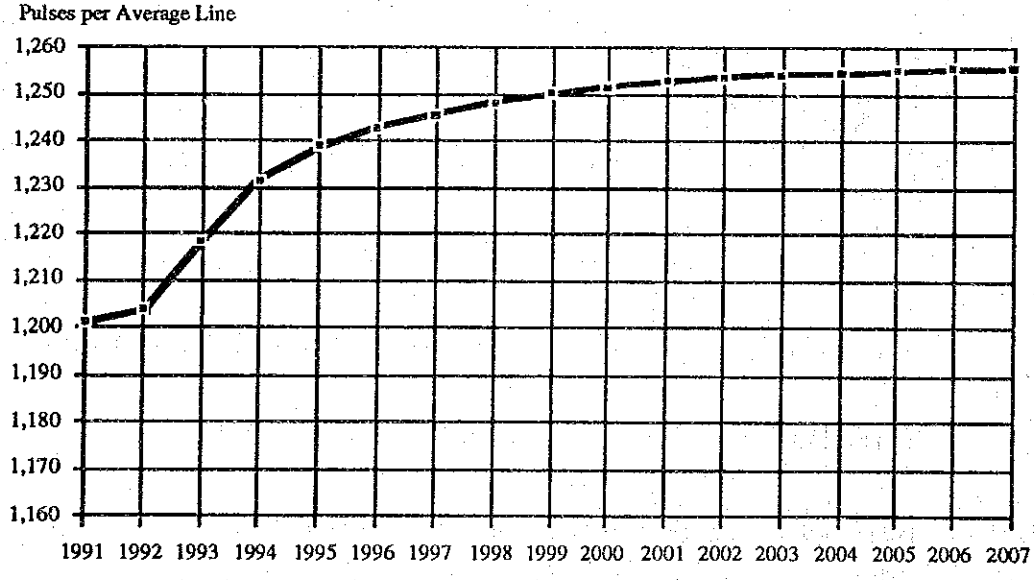

Figure 16.1.2-2 Estimated Local Calls per Average Telephone Line in Nakhon Pathom (Private + Government)

c) Trunk Call Revenue Forecasting

The regression result is as follows:

Dependent Variable: Trunk Revenue (1,000)
Independent Variable: Number of average main telephone line
Degree of Freedom: 9

Variable Name	Coefficient	Std. Err. Estimate	T Statistics	Probability of T
Constant	-14988.9426	5591.5495	-2.6806	0.028
Ave. Tel. Lines	10.8481	0.7241	14.9811	0.000

Coefficient of Determination (R^2)	0.9656
Adjusted Coefficient (R^2)	0.9613
Coefficient of Correlation (R)	0.9826

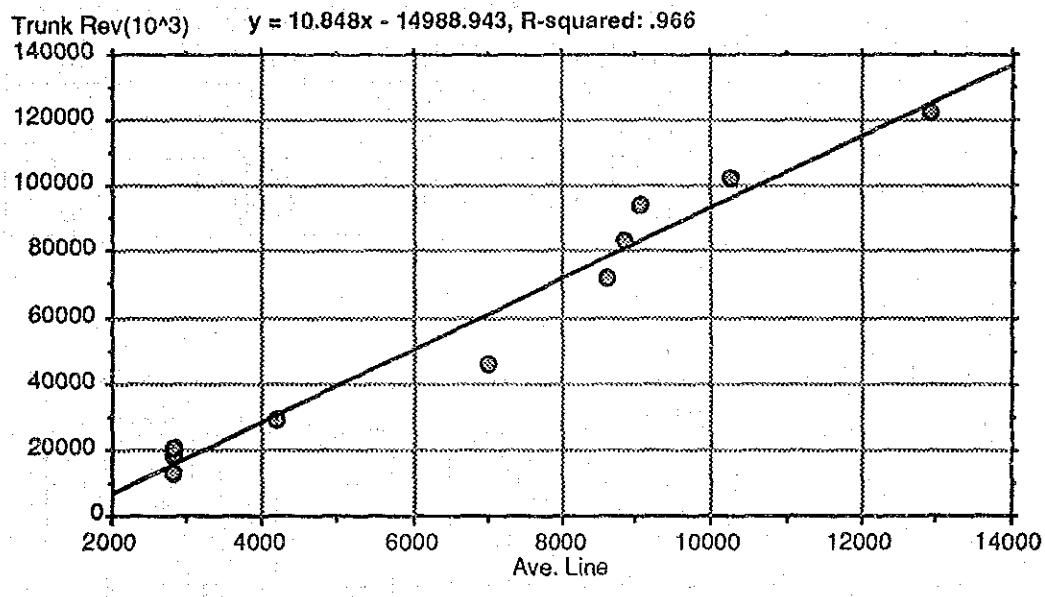

Figure 16.1.2-3 Past Trend of Trunk Revenue in Nakhon Pathom

The trunk revenue in the future can be estimated by the following equation.

Trunk Revenue (1,000) = 10.8481 x Ave. Main Tel. Line - 14988.9426

Table 16.1.2-4 shows the estimated trunk revenue in Nakhon Pathom for the main telephone lines of the private and the government increased in accordance with the installation schedule. Figure 16.1.2-4 shows the trend of the estimated trunk revenues per line in the future.

Table 16.1.2-4 Estimated Trunk Revenue in Nakhon Pathom (Private + Government)

Year	Main Telephone Lines	Average Main Telephone Lines	Trunk Revenue (Thousand Baht)	Trunk Revenue /Ave. Line
1991	14,717	14,359	136,471	9,504
1992	15,431	15,074	144,015	9,554
1993	25,015	20,223	198,329	9,807
1994	34,597	29,806	299,412	10,045
1995	44,177	39,387	400,473	10,168
1996	53,755	48,966	501,509	10,242
1997	63,329	58,542	602,519	10,292
1998	78,243	70,786	731,673	10,336
1999	93,154	85,699	888,969	10,373
2000	108,061	100,607	1,046,229	10,399
2001	122,964	115,513	1,203,450	10,418
2002	137,863	130,414	1,360,628	10,433
2003	150,589	144,226	1,506,321	10,444
2004	163,309	156,949	1,640,525	10,453
2005	176,024	169,667	1,774,671	10,460
2006	188,732	182,378	1,908,754	10,466
2007	201,434	195,083	2,042,768	10,471

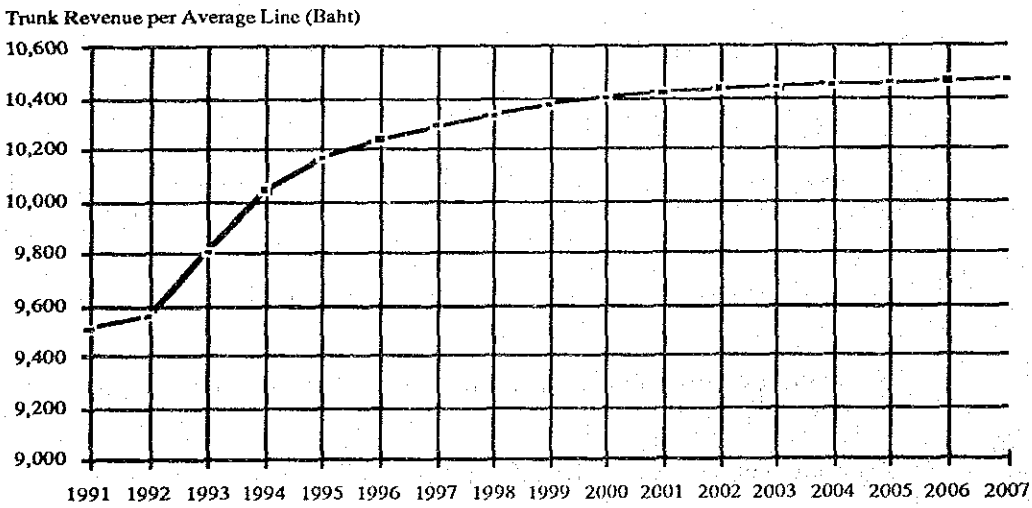

Figure 16.1.2-4 Estimated Trunk Revenue per Average Telephone Line in Nakhon Pathom (Private + Government)

2) Call Revenues Estimation in Samut Sakhon

a) Past Trend of Local and Trunk Telephone Usage in Samut Sakhon

Table 16.1.2-5 and Table 16.1.2-6 show the number of local calls, trunk calls and trunk revenue of main telephone line in Samut Sakhon for the past 11 years.

Table 16.1.2-5 Revenue Statistics in Samut Sakhon

Year	Main Tel. Station	Pulse Metered Service	Trunk Call	Trunk Minutes	Subscription Fee & Call Charge	Trunk Revenue	Total Revenue
1980	989	1,083,324	76,706		2,708,494	738,197.00	3,446,690.5
1981	1,273	1,315,541	316,080		3,293,882	4,974,684.00	8,268,566.0
1982	1,969	2,225,355	467,628		N. A.	7,219,289.00	7,219,289.0
1983	1,981	2,715,535	577,623		6,862,581	9,061,921.30	15,924,502.3
1984	3,343	3,789,574	831,345		9,875,840	13,061,090.20	22,936,930.0
1985	3,556	4,636,580	959,043		12,139,886	15,014,403.50	27,154,289.5
1986	3,577	8,009,311	1,293,118	4,488,376	17,819,185	25,377,105.00	43,196,289.5
1987	5,453	4,465,439	1,584,239	5,238,576	18,174,196	34,009,757.00	52,183,952.8
1988	6,348	6,081,349	2,241,868	7,286,886	24,390,705	44,959,885.50	69,350,590.5
1989	8,310	7,542,806	3,161,186	10,505,631	30,998,266	53,756,493.00	84,754,759.3
1990	9,241	11,588,069	4,414,732	15,302,576	38,657,316	51,905,050.50	90,562,366.3

Table 16.1.2-6 Local Pulse and Trunk Revenue per Average Line in Samut Sakhon

Year	Average. Line	Local Pulse /Ave.line	Subscription & Local /Ave.line	Trunk Revenue /Ave.line
1981	1,131	1,163.17	2,912	7,311
1982	1,621	1,372.83	N. A.	4,454
1983	1,975	1,374.95	3,475	8,063
1984	2,662	1,423.58	3,710	8,616
1985	3,450	1,344.13	3,519	7,872
1986	3,567	2,245.71	4,996	12,112
1987	4,515	989.02	4,025	11,558
1988	5,901	1,030.65	4,134	11,753
1989	7,329	1,029.17	4,230	11,564
1990	8,776	1,320.50	4,405	10,320

b) Local Call Revenue Forecasting

The regression result is as follows:

Dependent Variable: Local Call (1,000)
Independent Variable: Number of average main telephone line
Degree of Freedom: 9

Variable Name	Coefficient	Std. Err. Estimate	T Statistics	Probability of T
Constant	731.4896	926.9521	0.7891	0.453
Ave. Tel. Lines	1.1009	0.1952	5.6391	0.000

Coefficient of Determination (R^2)	0.7990
Adjusted Coefficient (R^2)	0.7739
Coefficient of Correlation (R)	0.8939

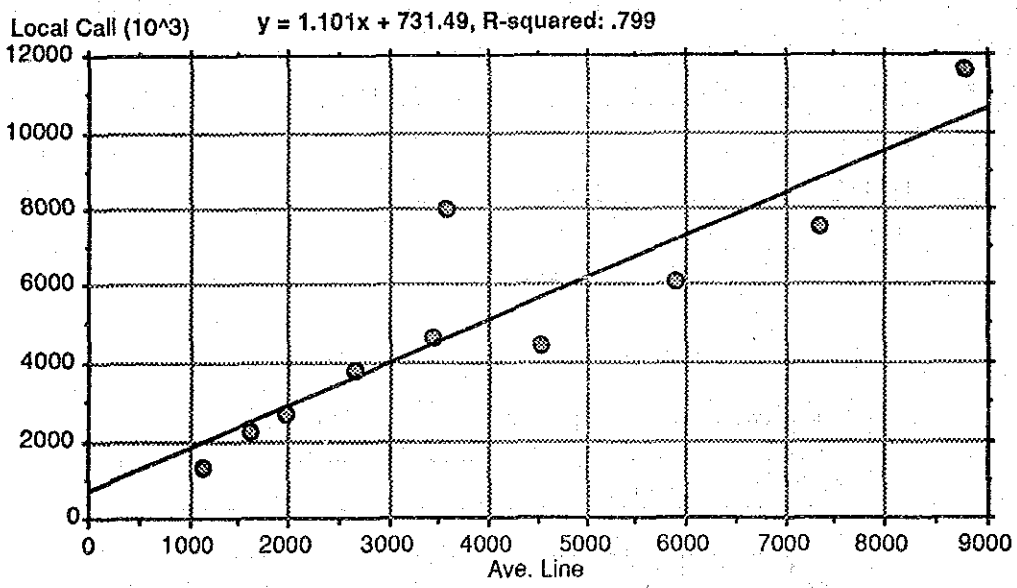

Figure 16.1.2-5 Past Trend of Local Call in Samut Sakhon

The number of local call in the future can be estimated by the following equation.

Local Call (1,000) = 1.1009 x Ave. Main Tel. Line + 731.4896

Since the number of main telephone lines of the private and the government users increased in accordance with the installation schedule, the number of local pulses is

estimated as shown in Table 16.1.2-7. Figure 16.1.2-6 shows the trend of the estimated number of pulses per average telephone line between FY 1992 and 2007.

Table 16.1.2-7 Estimated Local Calls in Samut Sakhon (Private + Government)

Year	Main Telephone Lines	Average Main Telephone Lines	Local Pulses (1,000)	Pulses /Ave. Line.
1991	9,607	9,349	11,023	1,179
1992	10,124	9,866	11,593	1,175
1993	21,310	15,717	18,035	1,147
1994	32,496	26,903	30,349	1,128
1995	43,682	38,089	42,664	1,120
1996	54,866	49,274	54,977	1,116
1997	66,050	60,458	67,290	1,113
1998	77,179	71,615	79,572	1,111
1999	88,307	82,743	91,824	1,110
2000	99,435	93,871	104,074	1,109
2001	110,561	104,998	116,324	1,108
2002	121,686	116,123	128,572	1,107
2003	128,511	125,098	138,452	1,107
2004	135,334	131,922	145,965	1,106
2005	142,156	138,745	153,476	1,106
2006	148,976	145,566	160,985	1,106
2007	155,795	152,385	168,493	1,106

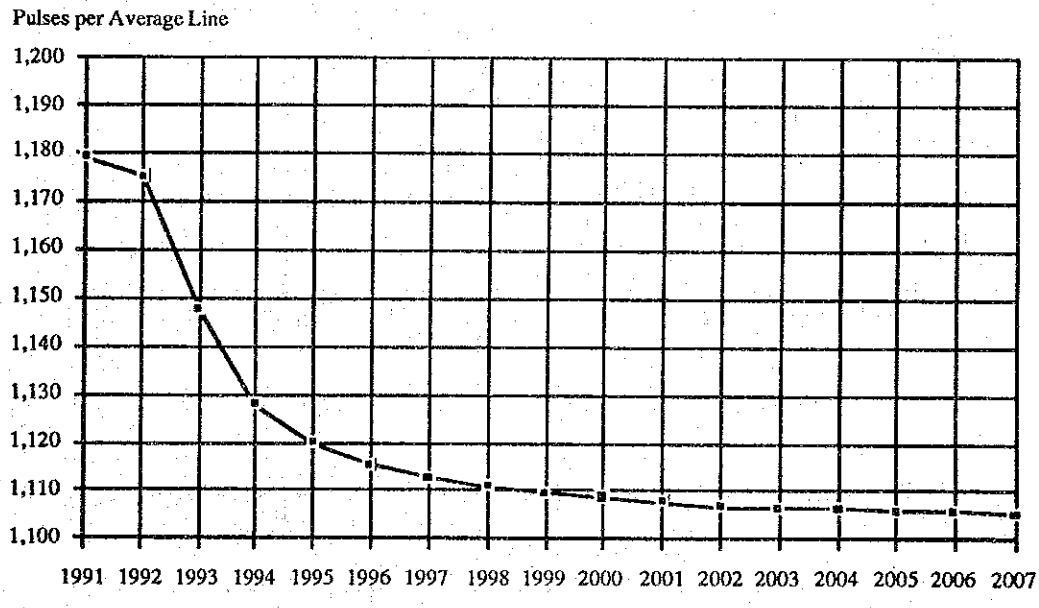

Figure 16.1.2-6 Estimated Local Calls per Telephone Line in Samut Sakhon (Private + Government)

c) Trunk Call Revenue Forecasting

The regression result is as follows:

Dependent Variable: Trunk Revenue (1,000)
Independent Variable: Number of average main telephone line
Degree of Freedom: 9

Variable Name	Coefficient	Std. Err. Estimate	T Statistics	Probability of T
Constant	-7052.3754	3638.2744	-1.9384	0.089
Ave. Tel. Lines	12.0238	0.7663	15.6914	0.000

Coefficient of Determination (R^2)	0.9685
Adjusted Coefficient (R^2)	0.9646
Coefficient of Correlation (R)	0.9841

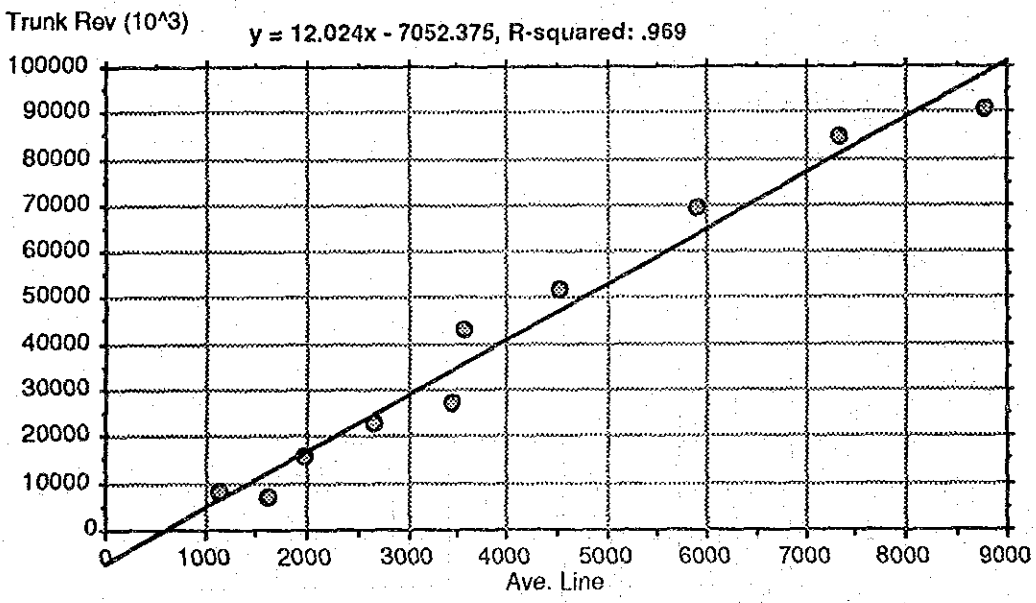

Figure 16.1.2-7 Past Trend of Trunk Revenue in Samut Sakhon

The trunk revenue in the future can be estimated by the following equation.

Trunk Revenue (1,000) = 12.0238 x Ave. Main Tel. Line - 7052.3754

Table 16.1.2-8 shows the estimated trunk revenues in Samut Sakhon for the main telephone lines of the private and the government increased in accordance with the

installation schedule. Figure 16.1.2-8 shows the trend of the estimated trunk revenues per line in the future.

Table 16.1.2-8 Estimated Trunk Revenue in Samut Sakhon (Private + Government)

Year	Main Telephone Lines	Average Main Telephone Lines	Trunk Revenue (Thousand Baht)	Trunk Rev /Ave. Line
1991	9,607	9,349	105,353	11,269
1992	10,124	9,866	111,569	11,309
1993	21,310	15,717	181,928	11,575
1994	32,496	26,903	316,428	11,762
1995	43,682	38,089	450,921	11,839
1996	54,866	49,274	585,407	11,881
1997	66,050	60,458	719,885	11,907
1998	77,179	71,615	854,029	11,925
1999	88,307	82,743	987,837	11,939
2000	99,435	93,871	1,121,634	11,949
2001	110,561	104,998	1,255,420	11,957
2002	121,686	116,123	1,389,193	11,963
2003	128,511	125,098	1,497,106	11,967
2004	135,334	131,922	1,579,157	11,970
2005	142,156	138,745	1,661,190	11,973
2006	148,976	145,566	1,743,205	11,975
2007	155,795	152,385	1,825,200	11,978

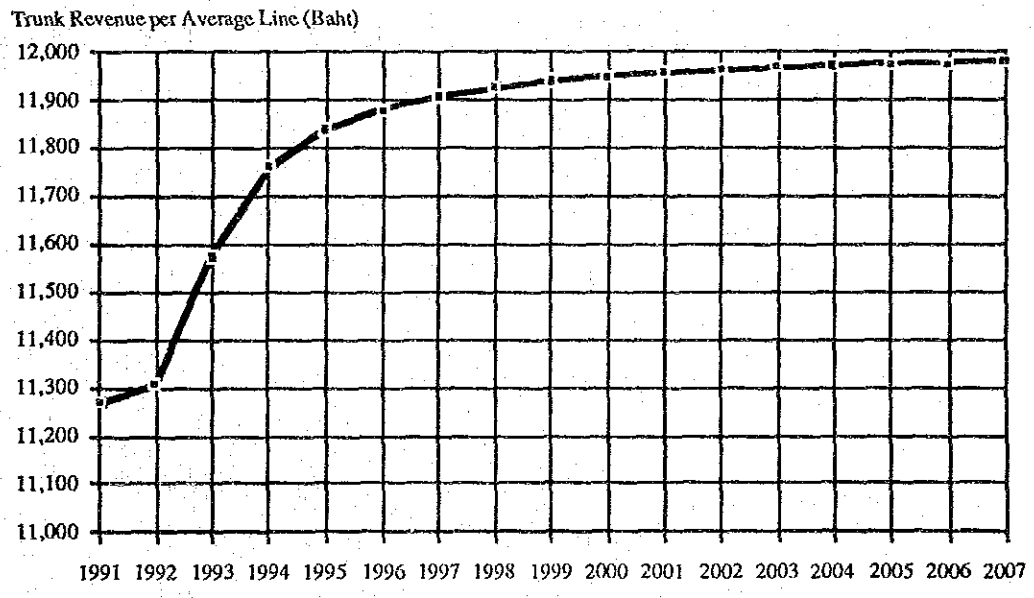

Figure 16.1.2-8 Estimated Trunk Revenue per Average Telephone Line in Samut Sakhon (Private + Government)

3) Call Revenues Estimation in Ayutthaya

a) Past Trend of Local and Trunk Telephone Usage in Ayutthaya

Table 16.1.2-9 and Table 16.1.2-10 show the number of local calls, trunk calls and trunk revenue of main telephone lines in Ayutthaya for the past 11 years.

Table 16.1.2-9 Revenue Statistics in Ayutthaya

Year	Main Tel. Station	Pulse Metered Service	Trunk Call	Trunk Minutes	Subscription Fee & Call Charge	Trunk Revenue	Total Revenue
1980	1,345	1,167,695	146,464		3,091,468	2,021,284.60	5,112,752.1
1981	1,920	1,503,464	503,995		4,120,928	7,268,392.00	11,389,320.0
1982	2,004	1,776,909	644,215		N. A.	9,058,883.00	9,058,883.0
1983	2,023	1,846,116	800,962		4,824,093	10,966,041.00	15,790,134.0
1984	2,027	2,060,746	811,222		5,079,344	11,555,043.00	16,634,387.0
1985	2,059	2,434,537	792,689		5,660,649	11,650,167.68	17,310,816.4
1986	4,536	5,576,498	1,215,444	4,260,163	10,819,947	23,795,537.14	34,615,484.1
1987	5,861	3,738,580	1,709,535	5,768,097	15,897,658	36,409,467.00	52,307,125.0
1988	6,498	4,509,478	2,230,638	7,477,559	19,588,159	45,520,503.00	65,108,662.3
1989	7,516	4,939,275	2,881,929	9,943,133	22,051,059	58,047,502.50	80,098,561.8
1990	12,054	12,658,027	4,053,409	14,059,083	36,773,783	72,733,314.00	109,507,097.0

Table 16.1.2-10 Local Pulse and Trunk Revenue per Average Line in Ayutthaya

Year	Average. Line	Local Pulse /Ave.line	Subscription & Local /Ave.line	Trunk Revenue /Ave.line
1981	1,633	920.96	2,524	6,977
1982	1,962	905.66	N. A.	4,617
1983	2,014	916.87	2,396	7,842
1984	2,025	1,017.65	2,508	8,215
1985	2,043	1,191.65	2,771	8,473
1986	3,298	1,691.13	3,281	10,497
1987	5,199	719.17	3,058	10,062
1988	6,180	729.75	3,170	10,536
1989	7,007	704.91	3,147	11,431
1990	9,785	1,293.62	3,758	11,191

b) Local Call Revenue Forecasting

The regression result is as follows:

Dependent Variable: Local Call (1,000)
Independent Variable: Number of average main telephone line
Degree of Freedom: 9

Variable Name	Coefficient	Std. Err. Estimate	T Statistics	Probability of T
Constant	-220.2249	982.2489	-0.2242	0.828
Ave. Tel. Lines	1.0511	0.2006	5.2399	0.001

Coefficient of Determination (R^2) 0.7744
Adjusted Coefficient (R^2) 0.7462
Coefficient of Correlation (R) 0.8800

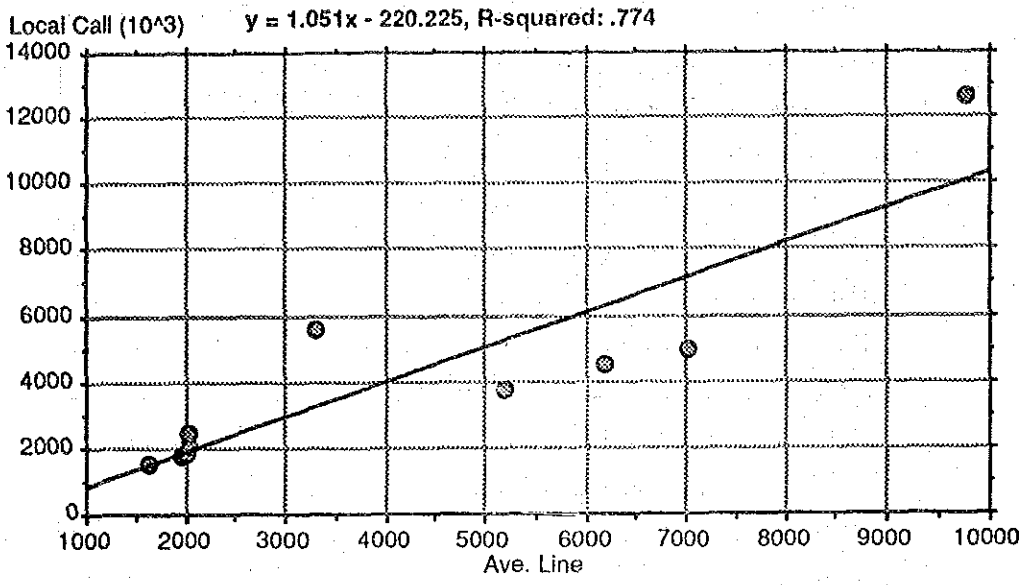

Figure 16.1.2-9 Past Trend of Local Call in Ayutthaya

The number of local calls in the future can be estimated by the following equation.

Local Call (1,000) = 1.0511 x Ave. Main Tel. Line - 220.2249

Since the number of main telephone lines of the private and the government users increased in accordance with the installation schedule, the number of local pulses are estimated as shown in Table 16.1.2-11. Figure 16.1.2-10 shows the trend of the estimated number of pulses per average telephone line between FY 1992 and 2007.

Table 16.1.2-11 Estimated Local Calls in Ayutthaya (Private + Government)

Year	Main Telephone Lines	Average Main Telephone Lines	Local Pulses (1,000)	Pulses /Ave. Line.
1991	11,907	11,720	12,099	1,032
1992	12,279	12,093	12,491	1,033
1993	18,326	15,303	15,864	1,037
1994	24,371	21,349	22,219	1,041
1995	30,413	27,392	28,572	1,043
1996	36,453	33,433	34,921	1,045
1997	42,489	39,471	41,268	1,046
1998	49,207	45,848	47,971	1,046
1999	55,921	52,564	55,030	1,047
2000	62,631	59,276	62,085	1,047
2001	69,337	65,984	69,135	1,048
2002	76,037	72,687	76,181	1,048
2003	80,758	78,398	82,184	1,048
2004	85,473	83,115	87,142	1,048
2005	90,181	87,827	92,095	1,049
2006	94,882	92,532	97,040	1,049
2007	99,576	97,229	101,977	1,049

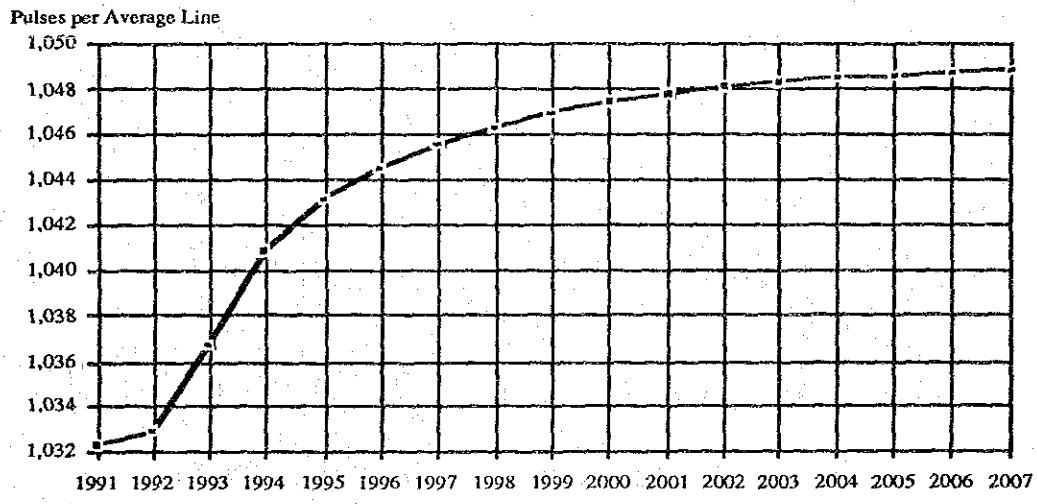

Figure 16.1.2-10 Estimated Local Calls per Telephone Line in Ayutthaya (Private + Government)

c) Trunk Call Revenue Forecasting

The regression result is as follows:

Dependent Variable: Trunk Revenue (1,000)
Independent Variable: Number of average main telephone line
Degree of Freedom: 9

Variable Name	Coefficient	Std. Err. Estimate	T Statistics	Probability of T
Constant	-9246.7560	1709.8820	-5.4078	0.001
Ave. Tel. Lines	12.2568	0.3492	35.1002	0.000

Coefficient of Determination (R^2)	0.9935
Adjusted Coefficient (R^2)	0.9927
Coefficient of Correlation (R)	0.9968

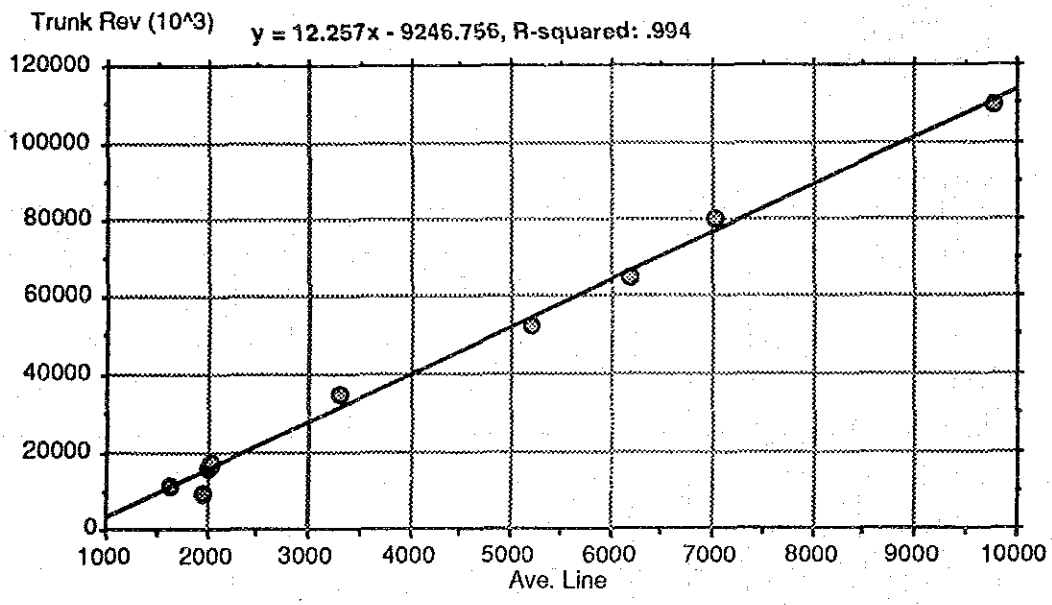

Figure 16.1.2-11 Past Trend of Trunk Revenue in Ayutthaya

The trunk revenue in the future can be estimated by the following equation.

Trunk Revenue (1,000) = 12.2568 x Ave. Main Tel. Line - 9246.7560

Table 16.1.2-12 shows the estimated trunk revenues in Ayutthaya for the main telephone lines of the private and the government increased in accordance with the

installation schedule. Figure 16.1.2-12 shows the trend of the estimated trunk revenues per line in the future.

Table 16.1.2-12 Estimated Trunk Revenue in Ayutthaya (Private + Government)

Year	Main Telephone Lines	Average Main Telephone Lines	Trunk Revenue (Thousand Baht)	Trunk Revenue /Average Line
1991	11,907	11,720	134,403	11,468
1992	12,279	12,093	138,976	11,492
1993	18,326	15,303	178,315	11,653
1994	24,371	21,349	252,418	11,824
1995	30,413	27,392	326,493	11,919
1996	36,453	33,433	400,536	11,980
1997	42,489	39,471	474,544	12,023
1998	49,207	45,848	552,706	12,055
1999	55,921	52,564	635,020	12,081
2000	62,631	59,276	717,287	12,101
2001	69,337	65,984	799,503	12,117
2002	76,037	72,687	881,663	12,130
2003	80,758	78,398	951,658	12,139
2004	85,473	83,115	1,009,481	12,146
2005	90,181	87,827	1,067,229	12,152
2006	94,882	92,532	1,124,895	12,157
2007	99,576	97,229	1,182,471	12,162

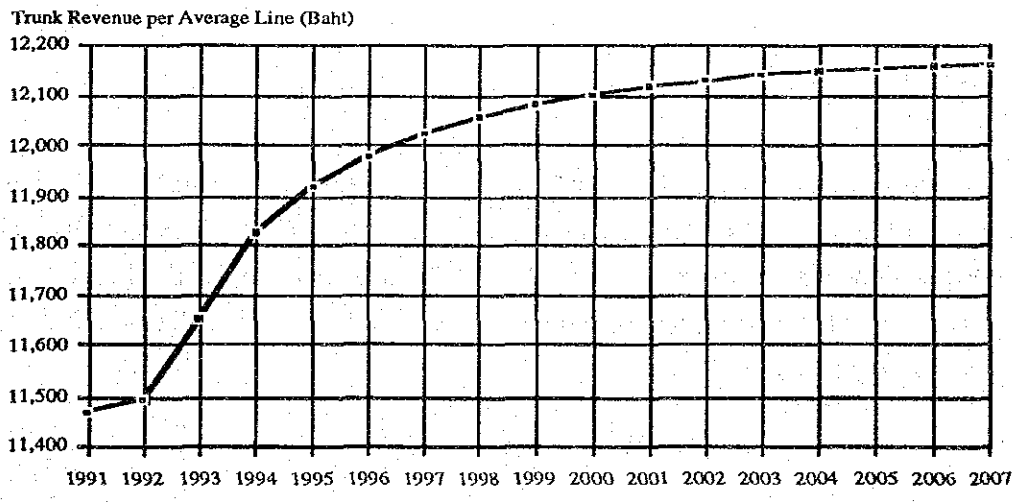

Figure 16.1.2-12 Estimated Trunk Revenue per Average Telephone Line in Ayutthaya (Private + Government)

16.1.3 Other Revenues

Besides the local call and trunk call revenues, there are other revenues such as leased circuit charges, relocation charge, revenue from advertising in the directory. Table 16.1.3-1 shows the operating revenue of TOT in the past ten years. A weighted average share of these revenues to the total telephone revenue in the past ten years is 8.12%. Therefore in this revenue estimation, 8% of the total telephone revenue is assumed for other revenues.

Table 16.1.3-1 Operating Revenue in the Past Ten Years

(Unit: Million Baht)

Year	1. Local Service (Subscription + Call Revenue)	2. Trunk Service	3. Telephone Revenue (=1+2)	4. Revenue from Other Service	5. Share (=4/3)	Total Operating Revenue
1981	1,739.129	925.008	2,664.137	256.112	9.61%	2,920.249
1982	2,013.404	1,230.556	3,243.960	301.795	9.30%	3,545.755
1983	2,183.506	1,417.636	3,601.142	316.915	8.80%	3,918.057
1984	2,463.533	1,733.101	4,196.634	370.662	8.83%	4,567.296
1985	2,702.853	1,899.571	4,602.424	614.113	13.34%	5,216.537
1986	3,931.245	2,834.305	6,765.550	1,062.477	15.70%	7,828.027
1987	5,052.440	3,564.902	8,617.342	789.161	9.16%	9,406.503
1988	5,870.430	4,489.874	10,360.304	678.298	6.55%	11,038.602
1989	6,844.848	5,457.437	12,302.285	903.933	7.35%	13,206.218
1990	8,382.714	6,980.206	15,362.920	1,047.319	6.82%	16,410.239
Total (81-90)	41,184.102	30,532.596	71,716.698	6,340.785	8.84%	78,057.483

16.1.4 Deposit

A subscriber must deposit 3,000 Baht when he applies for a telephone line. This deposit will be refunded upon a subscriber's termination of the service, if no telephone bill is left unpaid. Therefore, deposits are not counted as the revenue but a source of funds. From the view point of cash flow of the Project, deposits are to be taken into the Cash Inflow and refunded at the end of the Project period.

16.1.5 Public Telephone Revenue

Table 16.1.5-1 shows the revenue per public telephone in BMA, Provincial are, and the whole Kingdom. The revenue per public telephone increased more than double within these six

years. In order to estimate the public telephone revenue, the revenue per public telephone in FY 1990 is applied.

Table 16.1.5-1 Revenue per Public Telephone

Year	1985	1986	1987	1988	1989	1990
1. BMA Tel. Area						
1.1 Local Public Telephone	13,679	22,352	23,818	25,551	25,389	32,390
1.2 Trunk & Rural Long Public Telephone	23,310	6,798	4,332	2,788	2,792	2,408
1.3 Total Public Telephone	14,063	21,620	22,780	24,313	24,119	30,513
2. Prov. Tel. Area						
2.1 Local Public Telephone	10,704	57,984	68,412	77,654	82,746	96,190
2.2 Trunk & Rural Long Public Telephone	86,277	73,697	76,409	84,766	83,854	83,658
2.3 Total Public Telephone	42,307	65,598	72,607	81,589	83,405	88,222
3. Whole Kingdom						
3.1 Local Public Telephone	13,250	27,970	31,207	34,294	35,024	43,130
3.2 Trunk & Rural Long Public Telephone	70,206	59,050	61,683	69,418	70,268	70,747
3.3 Total Public Telephone	20,213	32,929	36,901	41,447	43,068	50,282

Table 16.1.5-2 shows the number of local public telephones, trunk public telephones, and rural long distance public telephones in the Bangkok Metropolitan telecommunication area, the provincial telecommunication area, and the whole Kingdom.

Table 16.1.5-2 The Number of Public Telephone Lines in Thailand

Year	1985	1986	1987	1988	1989	1990
1. Total Public Telephone in BMA	11,306	13,229	14,435	14,485	14,533	14,666
1-1. Local Public Telephone	10,855	12,607	13,666	13,697	13,716	13,748
1-2. Trunk Public Telephone	451	622	752	770	797	898
1-3. Rural Long Distance			17	18	20	20
2. Province	3,147	4,579	5,709	6,183	6,827	7,642
2-1. Local Public Telephone	1,831	2,360	2,714	2,762	2,769	2,783
2-2. Trunk Public Telephone	1,181	1,327	1,600	2,021	2,209	2,459
2-3. Rural Long Distance	135	892	1,395	1,400	1,849	2,400
3. The Whole Kingdom	14,453	17,808	20,144	20,668	21,360	22,308
3-1. Local Public Telephone	12,686	14,967	16,380	16,459	16,485	16,531
3-2. Trunk Public Telephone	1,632	1,949	2,352	2,791	3,006	3,357
3-3. Rural Long Distance	135	892	1,412	1,418	1,869	2,420

Table 16.1.5-3 shows the public telephone usages in the BMA, the provincial are, and the whole Kingdom.

Table 16.1.5-3 Public Telephone Usage

Year	1985	1986	1987	1988	1989	1990
1. BMA						
1.1 Local & Trunk Public Telephone (1,000 Pulse)	206,348	306,666	355,989	382,536	380,160	481,172
1.2 Trunk Public Telephone (1,000 Call)	189	104	82	47	47	45
1.3 Local Public Telephone Revenue (1,000 Baht)	148,486	281,787	325,493	349,973	348,241	445,293
1.4 Trunk Public Telephone Revenue (1,000 Baht)	10,513	4,228	3,331	2,197	2,281	2,210
1.5 Public Telephone Revenue (1,000 Baht)	158,999	286,016	328,824	352,170	350,521	447,503
2. Prov. Tel. Area						
2.1 Local & Trunk Public Telephone (1,000 Pulse)	37,007	116,913	160,842	183,692	193,200	222,364
2.2 Trunk Public Telephone (1,000 Call)	3,987	6,051	8,955	11,907	13,537	16,211
2.3 Local Public Telephone Revenue (1,000 Baht)	19,600	136,843	185,671	214,480	229,125	267,697
2.4 Trunk Public Telephone Revenue (1,000 Baht)	113,541	163,533	228,844	289,984	340,278	406,493
2.5 Public Telephone Revenue (1,000 Baht)	133,140	300,375	414,515	504,465	569,403	674,190
3. Whole Kingdom						
3.1 Local & Trunk Public Telephone (1,000 Pulse)	243,355	423,579	516,831	566,229	573,361	703,536
3.2 Trunk Public Telephone (1,000 Call)	4,176	6,155	9,036	11,953	13,583	16,256
3.3 Local Public Telephone Revenue (1,000 Baht)	168,086	418,630	511,163	564,453	577,365	712,989
3.3 Trunk Public Telephone Revenue (1,000 Baht)	124,054	167,761	232,175	292,182	342,559	408,704
3.4 Public Telephone Revenue (1,000 Baht)	292,139	586,391	743,338	856,635	919,924	1,121,693

16.1.6 Total Revenue Estimation

Table 16.1.6-1 shows the future total operating revenue estimates. Table 16.1.6-2 shows the future cash in-flow estimates of the project.

Table 16.1.6-1 Total Operating Revenue Estimation of the Project

(Unit: Million Baht)

Year	Installation Fee	Subscription Fee	Local Call Charge	Trunk Call Charge	Public Telephone	Other Service	Total
1993	1,663	223	1,224	706	79	179	4,073
1994	1,662	670	3,617	2,178	240	536	8,904
1995	1,662	1,117	5,972	3,690	407	895	13,743
1996	1,662	1,563	8,308	5,221	580	1,254	18,587
1997	1,661	2,009	10,633	6,762	758	1,613	23,437
1998	1,095	2,380	12,547	8,112	933	1,918	26,985
1999	1,094	2,674	14,054	9,266	1,106	2,168	30,362
2000	1,094	2,968	15,559	10,421	1,285	2,419	33,745
2001	1,093	3,261	17,062	11,577	1,468	2,669	37,131
2002	1,093	3,555	18,563	12,734	1,655	2,921	40,520
2003	754	3,803	19,829	13,718	1,848	3,136	43,088
2004	753	4,005	20,862	14,530	2,045	3,315	45,511
2005	752	4,208	21,894	15,341	2,247	3,495	47,938
2006	752	4,410	22,924	16,152	2,455	3,675	50,367
2007	751	4,611	23,953	16,962	2,666	3,855	52,798

Table 16.1.6-2 Details of the Project Cash In-flow Estimation

(Unit: Million Baht)

Year	Insta-llation Fee	Subscrip-tion Fee	Local Call Charge	Trunk Call Charge	Public Telephone Usages	Other Service	Deposit	Total
1993	1,663	223	1,224	706	79	179	1,489	5,562
1994	1,662	670	3,617	2,178	240	536	1,489	10,392
1995	1,662	1,117	5,972	3,690	407	895	1,488	15,231
1996	1,662	1,563	8,308	5,221	580	1,254	1,488	20,076
1997	1,661	2,009	10,633	6,762	758	1,613	1,488	24,925
1998	1,095	2,380	12,547	8,112	933	1,918	980	27,965
1999	1,094	2,674	14,054	9,266	1,106	2,168	980	31,342
2000	1,094	2,968	15,559	10,421	1,285	2,419	979	34,724
2001	1,093	3,261	17,062	11,577	1,468	2,669	979	38,110
2002	1,093	3,555	18,563	12,734	1,655	2,921	978	41,498
2003	754	3,803	19,829	13,718	1,848	3,136	675	43,763
2004	753	4,005	20,862	14,530	2,045	3,315	675	46,186
2005	752	4,208	21,894	15,341	2,247	3,495	674	48,612
2006	752	4,410	22,924	16,152	2,455	3,675	673	51,040
2007	751	4,611	23,953	16,962	2,666	3,855	672	53,471
2008	0	4,712	24,467	17,367	2,773	3,946	0	53,264
2009	0	4,712	24,467	17,367	2,773	3,946	0	53,264
2010	0	4,712	24,467	17,367	2,773	3,946	0	53,264
2011	0	4,712	24,467	17,367	2,773	3,946	0	53,264
2012	0	4,712	24,467	17,367	2,773	3,946	0	53,264
2013	0	4,712	24,467	17,367	2,773	3,946	0	53,264
2014	0	4,712	24,467	17,367	2,773	3,946	0	53,264
2015	0	4,712	24,467	17,367	2,773	3,946	0	53,264
2016	0	4,712	24,467	17,367	2,773	3,946	0	53,264
2017	0	4,712	24,467	17,367	2,773	3,946	0	53,264
2018	0	4,712	24,467	17,367	2,773	3,946	0	53,264
2019	0	4,712	24,467	17,367	2,773	3,946	0	53,264
2020	0	4,712	24,467	17,367	2,773	3,946	0	53,264
2021	0	4,712	24,467	17,367	2,773	3,946	0	53,264
2022	0	4,712	24,467	17,367	2,773	3,946	0	53,264
2023	0	4,712	24,467	17,367	2,773	3,946	0	53,264
2024	0	4,712	24,467	17,367	2,773	3,946	0	53,264
2025	0	4,712	24,467	17,367	2,773	3,946	0	53,264
2026	0	4,712	24,467	17,367	2,773	3,946	0	53,264
2027	0	4,712	24,467	17,367	2,773	3,946	-15,708	37,557

16.2. Cash Out-flow Estimation

16.2.1 Working Capital

Working capital is the current assets which correspond to fund in hand, inventory, uncollected revenue, and so forth. Table 16.2.1-1 shows the percentage share of the current assets on the total revenue in the past nine years of TOT.

Table 16.2.1-1 The Share of Current Assets to Total Revenue in TOT

(Unit: Million Baht)

Year	1. Current Assets	2. Total Revenue	Share (1/2)
1982	4,628	3,948	117.22%
1983	4,257	4,320	98.54%
1984	4,821	4,978	96.85%
1985	6,277	5,505	114.02%
1986	5,158	8,105	63.64%
1987	4,226	9,553	44.24%
1988	5,283	11,291	46.79%
1989	7,706	13,596	56.68%
1990	9,841	17,036	57.76%

Table 16.2.1-2 shows the details of the current assets of TOT. It can be said that the amount of the accounts receivable is quite large.

Table 16.2.1-2 Detail of Current Assets

(Unit: Million Baht)

Year	Cash & Deposits		Accounts Receivable		Inventory		Others		Total
1982	1,799	38.87%	1,535	33.17%	1,117	24.14%	177	3.82%	4,628
1983	978	22.97%	1,632	38.34%	1,452	34.11%	195	4.58%	4,257
1984	1,343	27.86%	1,403	29.10%	1,906	39.54%	169	3.51%	4,821
1985	2,411	38.42%	1,283	20.44%	2,429	38.70%	153	2.44%	6,276
1986	1,059	20.53%	1,766	34.23%	2,101	40.72%	233	4.52%	5,159
1987	545	12.89%	1,948	46.08%	1,482	35.06%	252	5.96%	4,227
1988	1,182	22.37%	2,207	41.78%	1,588	30.06%	306	5.79%	5,283
1989	2,978	38.64%	2,512	32.60%	1,757	22.81%	458	5.95%	7,706
1990	4,472	45.45%	2,935	29.83%	2,051	20.84%	383	3.89%	9,841

Note: Right side figure in each category is a percentage shares to the total current assets.

For the future estimation, the amount of the working capital is set to be 50% of the total revenue. An annual necessary increase of the working capital is estimated as a cash out-flow of each year and the net working capital is refunded at the end of the project year 2027.

16.2.2 Operating Expenditures Estimation

Operating expenditure is the expenses which are indispensable to operate and maintain a telecommunications networks and facilities. This cost is composed of personnel expenses, operation and administration expenses, and maintenance and repair expenses. This section describes the procedures to estimate these operating expenditures of the long-term plan.

1) Personnel Expenses Estimation (Staff Remuneration)

Personnel Expenses for this Project is calculated by the following equation:

Personnel Expenses = [Number of employees increased by the Project] x [Average Personnel Expenses per Employee]

The required number of employees as a whole in the future is analyzed and estimated in Chapter 14. The number of employees increased with the project is calculated by the share of the number of main telephone lines increased by the Project on the total main telephone lines.

Table 16.2.2-1 shows the average personnel expenses per employee in the last 6 years. The total personnel expenses is calculated by summation of "1.2 Staff Remuneration Expenses" and "1.3 Welfare Expenses" in Table 16.2.2-2. In this study, the average personnel expense per employee is to be 110 thousand Baht and annual wage increase rate is to be 8% as an average increase rate in these 6 years.

Table 16.2.2-1 Average Manpower Cost per Employee

(Unit: Thousand Baht)

Year	1985	1986	1987	1988	1989	1990
1. Personnel Expenses (1.2+1.3)	1,264,701	1,318,721	1,459,478	1,576,764	1,774,639	2,063,521
2. Number of Employee	16,926	17,399	17,746	17,956	18,243	18,788
3. Average Expense per Employee	74.72	75.79	82.24	87.81	97.28	109.83
4. Growth Rate of Personnel Expenses per Employee	-	1.44%	8.51%	6.77%	10.78%	12.91%

Table 16.2.2-2 Past Detailed Expenses of TOT

(Unit: Thousand Baht)

Year	1985	1986	1987	1988	1989	1990
1. Administrative Expenses	1,773,739	1,920,744	2,213,480	2,464,982	2,668,828	3,192,763
1.1 No Cost Code	84	0	0	0	0	0
1.2 Staff remuneration Expenses	1,103,644	1,141,696	1,249,422	1,354,181	1,533,549	1,792,600
1.3 Welfare Expenses	161,057	177,025	210,056	222,583	241,090	270,921
1.4 Other Expenses on Employee	76,862	67,437	49,512	65,120	93,348	129,176
1.5 Expenses on Vehicle	9,142	9,125	9,424	8,929	8,693	9,145
1.6 Rent	73,982	93,636	97,930	107,678	117,115	143,646
1.7 Ceremonies Expenses	842	1,436	1,259	1,661	1,814	17,358
1.8 Consultants	56,284	104,616	209,994	316,639	239,598	279,080
1.9 Insurance Premium	1,155	601	621	614	636	624
1.10 Advertisement	1,835	2,724	2,722	3,900	12,450	40,031
1.11 Turnkey Contracts	16,837	19,880	24,599	25,978	27,675	51,027
1.12 Instruments Equipment and Office Equipments	57,385	59,272	84,746	75,964	78,936	86,351
1.13 Inventory Expenses	0	3,104	2,438	0	0	0
1.14 Public Utilities	185,465	199,321	229,577	229,635	248,355	280,012
1.15 Miscellaneous	25,300	26,291	31,967	46,251	62,589	92,418
1.16 Petty Expenses	0	9,250	4,327	0	0	0
1.17 Work Order Cost	590	1,000	466	438	348	201
1.18 Land and Property Taxes	3,275	4,329	4,419	5,411	2,631	173
2. Depreciation	687,283	971,017	1,714,215	1,656,110	1,776,942	2,129,643
3. Royalty of Thai-Malaysia Submarine Cable System	0	0	0	13,655	15,886	16,113
4. Bad Debt Expenses	34,328	9,108	19,213	28	8,013	8,973
5. Operating Expense	0	0	0	0	32,595	24,039
6. Repair and Maintenance Expenses	261,458	349,480	358,367	362,895	393,065	501,369
7. Interest Payment	1,127,148	1,425,721	1,812,182	1,970,618	1,909,175	1,933,542
8. Other Expenses	1,283,116	666,027	931,607	1,566,287	728,410	628,495
• Loss from Currency Exchange	1,205,677	594,312	718,743	1,086,872	571,170	517,291
Total	5,167,073	5,342,097	7,049,064	8,034,574	7,532,915	8,434,936
9. Prior Period Adjustment	0	0	0	528,596	275,548	560,150
Grand Total	5,167,073	5,342,097	7,049,064	8,563,170	7,808,463	8,995,086

2) Other Administrative Expenses Estimation

In general, the operating expenditure increases in accordance with the increase of facilities and services. In order to estimate the future operating expenditure, we use the result from a regression analysis between the operating expenditure and the number of subscribers. Table 16.2.2-3 shows the past operating expenses of TOT.

Table 16.2.2-3 Past Operating Expenses of TOT

(Unit: Million Baht)

Year	1981	1982	1983	1984	1985
Line Connected	389,238.0	425,679.0	463,231.0	519,491.0	626,498.0
Number of Employee	11,228.0	12,123.0	13,257.0	15,415.0	16,926.0
Staff Remuneration	713.1	894.1	1,018.1	1,115.0	1,264.7
Other Administrative Expenses	276.8	257.5	395.6	352.8	509.0
Bad Debt Expense	3.5	3.0	4.6	62.1	34.3
Repair & Maintenance Expenses	152.8	129.8	208.2	212.2	261.5
Depreciation	390.7	410.8	442.0	468.2	687.3
Total Operating Expenses	1,536.9	1,695.1	2,068.5	2,210.3	2,756.8

Year	1986	1987	1988	1989	1990
Line Connected	798,912.0	901,622.0	1,005,872.0	1,158,014.0	1,324,522.0
Number of Employee	17,399.0	17,746.0	17,956.0	18,243.0	18,788.0
Staff Remuneration	1,323.8	1,459.5	1,576.8	1,774.6	2,063.5
Other Administrative Expenses	596.9	754.0	888.2	926.8	1,153.3
Bad Debt Expense	9.1	19.2	0.0	8.0	9.0
Repair & Maintenance Expenses	349.5	358.4	362.9	393.1	501.4
Depreciation	971.0	1,714.2	1,656.1	1,776.9	2,129.6
Right of Thai-Malaysia Submarine Cable			13.7	15.9	16.1
Total Operating Expenses	3,250.3	4,305.3	4,497.7	4,895.3	5,872.9

Figure 16.2.2-1 shows the past trend of the relationship between the number of telephone lines connected and the other administrative expenses.

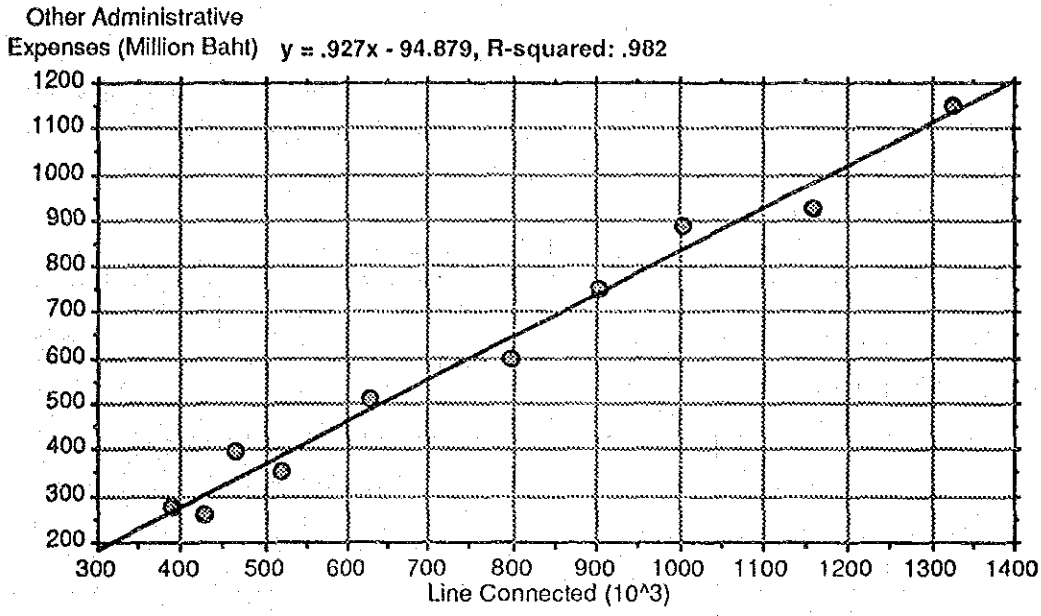

Figure 16.2.2-1 Other Administrative Expenses and the Number of Telephone Line Connected

The results of the linear regression is as follows:

Dependent Variables: Other Administrative Expenses (Million Baht)
Independent Variable: Line Connected (Thousand)
Degree of Freedom: 9

Variable Name	Coefficient	Std. Err. Estimate	T Statistic	Probability of T
Constant	-94.8792	36.7605	-2.5810	0.033
Line Connected	0.9273	0.0447	20.7524	0.000

Coefficient of Determination (R^2)	0.9818
Adjusted Coefficient (R^2)	0.9795
Standard Error of Estimate	44.0558

The operation cost in the future can be estimated by the following equation:

Other Administrative Expenses (Million Baht) = 0.9273 X Line connected (thousand) - 94.8792

3) Repair and Maintenance Expenses

Figure 16.2.2-2 shows the past trend of the relationship between the number of telephone lines connected and the Repair and Maintenance Expenses.

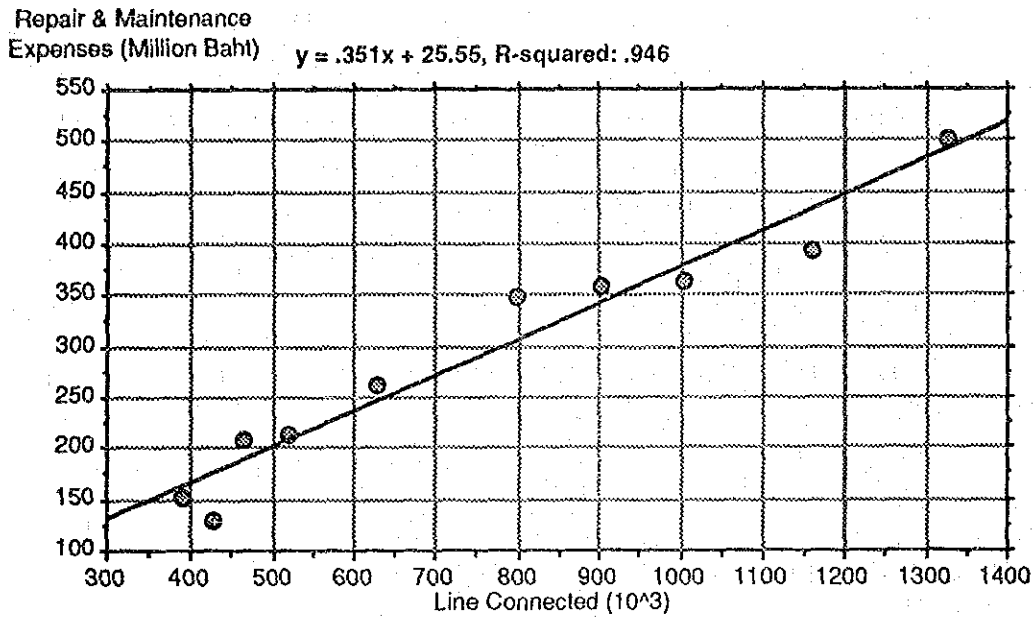

Figure 16.2.2-2 Maintenance Cost and The Number of Telephone Line Connected

The regression results is as follows:

Dependent Variables: Repair and Maintenance Expenses (Million Baht)
Independent Variable: Line Connected (Thousand)
Degree of Freedom: 9

Variable Name	Coefficient	Std. Err. Estimate	T Statistic	Probability of T
Constant	25.5502	24.4183	-1.0464	0.326
Line Connected	0.3513	0.0297	11.8342	0.000

Coefficient of Determination (R^2)	0.9460
Adjusted Coefficient (R^2)	0.9392
Standard Error of Estimate	29.2642

The repair and maintenance expenses in the future can be estimated by the following equation:

Maintenance cost (Million Baht) = 0.3513 x Line connected (Thousand) + 25.5502

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