3.3 Model sheet

(1) Dummy, Social and Economic variables in North

All data of Dummy, Social and Economic variables in North are exogenous.

Table 3-3-1 Dummy, Social and Economic variables in North

	North							
5	Dummy		Thailand Dummy			NTHADUM	=	NTHADUM
6			Malaysia Dummy			NMAYDUM	=	NMAYDUM
7			Phlippines Dummy			NPHIDUM	=	NPHIDUM
8			Indonesia Dummy			NINDDUM	=	NINDDUM
9			Japan Dummy			NJAPDUM	=	NJAPDUM
10							=	DATADUM
11	Economic & Climate In							
12			Real GDP (1995 constant)					
13			(1) G.R Agricultute		%	NRAGR	=	NRAGR
14			(2) G.R Industry		%	NRIND	=	NRIND
15			(3) G.R Service		%	NRSER	=	NRSER
16			(1) Agricultute		Bill US$	NGAGR	=	NGAGR
17			(2) Industry		Bill US$	NGIND	=	NGIND
18			(3) Service		Bill US$	NGSER	=	NGSER
19			(4) GDP Total		Bill US$	NGDP	=	NGAGR+NGIND+NGSER
20			Population		Mill	NPOP	=	NPOP
21			Humidity		%	NHUM	=	NHUM
22			Electrified Population		Mill	NELPOP	=	NELPOP
23			Temperature		Deg	NDEG	=	NDEG

(2) Weekday data in North

Hourly load in weekday in North are forecasted by regression analysis. The regression equations are follows;

t hour load = f((Industry GDP + Service GDP) / GDP, GDP per capita,

Electrified pop*(Humidity + Temperature)

t=1～24

Table 3-3-2 Weekday data in North

	North														
26	Weekday Data														
27		〈1st Hour〉	Hourly	MW	NWELEC1	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
28		〈2nd Hour〉	Hourly	MW	NWELEC2	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
29		〈3rd Hour〉	Hourly	MW	NWELEC3	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
30		〈4th Hour〉	Hourly	MW	NWELEC4	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
31		〈5th Hour〉	Hourly	MW	NWELEC5	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
32		〈6th Hour〉	Hourly	MW	NWELEC6	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
33		〈7th Hour〉	Hourly	MW	NWELEC7	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
34		〈8th Hour〉	Hourly	MW	NWELEC8	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
35		〈9th Hour〉	Hourly	MW	NWELEC9	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
36		〈10th Hour〉	Hourly	MW	NWELEC10	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
37		〈11th Hour〉	Hourly	MW	NWELEC11	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
38		〈12th Hour〉	Hourly	MW	NWELEC12	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
39		〈13th Hour〉	Hourly	MW	NWELEC13	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
40		〈14th Hour〉	Hourly	MW	NWELEC14	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
41		〈15th Hour〉	Hourly	MW	NWELEC15	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
42		〈16th Hour〉	Hourly	MW	NWELEC16	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
43		〈17th Hour〉	Hourly	MW	NWELEC17	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
44		〈18th Hour〉	Hourly	MW	NWELEC18	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
45		〈19th Hour〉	Hourly	MW	NWELEC19	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
46		〈20th Hour〉	Hourly	MW	NWELEC20	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
47		〈21st Hour〉	Hourly	MW	NWELEC21	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
48		〈22nd Hour〉	Hourly	MW	NWELEC22	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
49		〈23rd Hour〉	Hourly	MW	NWELEC23	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
50		〈24th Hour〉	Hourly	MW	NWELEC24	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
51															

(3) Holiday data in North

Hourly load in Holiday in North are forecasted by regression analysis. The regression equations are follows;

t hour load = f((Industry GDP + Service GDP) / GDP, GDP per capita,
Electrified pop*(Humidity + Temperature)

t=1～24

Table 3-3-3 Holiday data in North

	North														
52	Holiday Data														
53		<1st Hour>	Hourly	MW	NHELEC1	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
54		<2nd Hour>	Hourly	MW	NHELEC2	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
55		<3rd Hour>	Hourly	MW	NHELEC3	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
56		<4th Hour>	Hourly	MW	NHELEC4	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
57		<5th Hour>	Hourly	MW	NHELEC5	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
58		<6th Hour>	Hourly	MW	NHELEC6	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
59		<7th Hour>	Hourly	MW	NHELEC7	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
60		<8th Hour>	Hourly	MW	NHELEC8	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
61		<9th Hour>	Hourly	MW	NHELEC9	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
62		<10th Hour>	Hourly	MW	NHELEC10	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
63		<11th Hour>	Hourly	MW	NHELEC11	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
64		<12th Hour>	Hourly	MW	NHELEC12	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
65		<13th Hour>	Hourly	MW	NHELEC13	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
66		<14th Hour>	Hourly	MW	NHELEC14	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
67		<15th Hour>	Hourly	MW	NHELEC15	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
68		<16th Hour>	Hourly	MW	NHELEC16	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
69		<17th Hour>	Hourly	MW	NHELEC17	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
70		<18th Hour>	Hourly	MW	NHELEC18	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
71		<19th Hour>	Hourly	MW	NHELEC19	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
72		<20th Hour>	Hourly	MW	NHELEC20	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
73		<21st Hour>	Hourly	MW	NHELEC21	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
74		<22rd Hour>	Hourly	MW	NHELEC22	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
75		<23rd Hour>	Hourly	MW	NHELEC23	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	
76		<24th Hour>	Hourly	MW	NHELEC24	$CA	(NGIND+NGSER)/NGDP	(NGDP)/NPOP	NELPOP*(NHUM+NDEG)	NTHADUM	NMAYDUM	NPHIDUM	NINDDUM	NJAPDUM	

(4) Peak day data in North

Hourly load in Peak day in North are forecasted by regression analysis. The regression equations are follows;

t hour load in Peak day = f (t hour load in weekday) t=1～24

Table 3-3-4 Peak day data in North

	North						
78	Peak day						
79		<1st Hour>	Hourly	MW	NPELEC1	$CA	NWELEC1
80		<2nd Hour>	Hourly	MW	NPELEC2	$CA	NWELEC2
81		<3rd Hour>	Hourly	MW	NPELEC3	$CA	NWELEC3
82		<4th Hour>	Hourly	MW	NPELEC4	$CA	NWELEC4
83		<5th Hour>	Hourly	MW	NPELEC5	$CA	NWELEC5
84		<6th Hour>	Hourly	MW	NPELEC6	$CA	NWELEC6
85		<7th Hour>	Hourly	MW	NPELEC7	$CA	NWELEC7
86		<8th Hour>	Hourly	MW	NPELEC8	$CA	NWELEC8
87		<9th Hour>	Hourly	MW	NPELEC9	$CA	NWELEC9
88		<10th Hour>	Hourly	MW	NPELEC10	$CA	NWELEC10
89		<11th Hour>	Hourly	MW	NPELEC11	$CA	NWELEC11
90		<12th Hour>	Hourly	MW	NPELEC12	$CA	NWELEC12
91		<13th Hour>	Hourly	MW	NPELEC13	$CA	NWELEC13
92		<14th Hour>	Hourly	MW	NPELEC14	$CA	NWELEC14
93		<15th Hour>	Hourly	MW	NPELEC15	$CA	NWELEC15
94		<16th Hour>	Hourly	MW	NPELEC16	$CA	NWELEC16
95		<17th Hour>	Hourly	MW	NPELEC17	$CA	NWELEC17
96		<18th Hour>	Hourly	MW	NPELEC18	$CA	NWELEC18
97		<19th Hour>	Hourly	MW	NPELEC19	$CA	NWELEC19
98		<20th Hour>	Hourly	MW	NPELEC20	$CA	NWELEC20
99		<21st Hour>	Hourly	MW	NPELEC21	$CA	NWELEC21
100		<22rd Hour>	Hourly	MW	NPELEC22	$CA	NWELEC22
101		<23rd Hour>	Hourly	MW	NPELEC23	$CA	NWELEC23
102		<24th Hour>	Hourly	MW	NPELEC24	$CA	NWELEC24
103							

(5) Dummy, Social and Economic variables in Center

All data of Dummy, Social and Economic variables in Center are exogenous .

Table 3-3-5 Dummy, Social and Economic variables in Center

105	Central							
106	Dummy				CTHADUM	=	CTHADUM	
107					CMAYDUM	=	CMAYDUM	
108					CPHIDUM	=	CPHIDUM	
109					CINDDUM	=	CINDDUM	
110								
111	Economic & Clima							
112								
113				%	CRAGR	=	CRAGR	
114				%	CRIND	=	CRIND	
115				%	CRSER	=	CRSER	
116				Bill US$	CGAGR	=	CGAGR	
117				Bill US$	CGIND	=	CGIND	
118				Bill US$	CGSER	=	CGSER	
119				Bill US$	CGDP	=	CGAGR+CGIND+CGSER	
120				Mill	CPOP	=	CPOP	
121				%	CHUM	=	CHUM	
122				Mill	CELPOP	=	CELPOP	
123				Deg	CDEG	=	CDEG	

(6) Weekday data in Center

Hourly load in weekday in Center are forecasted by regression analysis. The regression equations are follows;

Table 3-3-6 Weekday data in Center

105	Central												
126	Weekday Data												
127		〈1st Hour〉	Hourly	MW	CWELEC1	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM
128		〈2nd Hour〉	Hourly	MW	CWELEC2	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM
129		〈3rd Hour〉	Hourly	MW	CWELEC3	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM
130		〈4th Hour〉	Hourly	MW	CWELEC4	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM
131		〈5th Hour〉	Hourly	MW	CWELEC5	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM
132		〈6th Hour〉	Hourly	MW	CWELEC6	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM
133		〈7th Hour〉	Hourly	MW	CWELEC7	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM
134		〈8th Hour〉	Hourly	MW	CWELEC8	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM
135		〈9th Hour〉	Hourly	MW	CWELEC9	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM
136		〈10th Hour〉	Hourly	MW	CWELEC10	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM
137		〈11th Hour〉	Hourly	MW	CWELEC11	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM
138		〈12th Hour〉	Hourly	MW	CWELEC12	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM
139		〈13th Hour〉	Hourly	MW	CWELEC13	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM
140		〈14th Hour〉	Hourly	MW	CWELEC14	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM
141		〈15th Hour〉	Hourly	MW	CWELEC15	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM
142		〈16th Hour〉	Hourly	MW	CWELEC16	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM
143		〈17th Hour〉	Hourly	MW	CWELEC17	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM
144		〈18th Hour〉	Hourly	MW	CWELEC18	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM
145		〈19th Hour〉	Hourly	MW	CWELEC19	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM
146		〈20th Hour〉	Hourly	MW	CWELEC20	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM
147		〈21st Hour〉	Hourly	MW	CWELEC21	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM
148		〈22rd Hour〉	Hourly	MW	CWELEC22	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM
149		〈23rd Hour〉	Hourly	MW	CWELEC23	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM
150		〈24th Hour〉	Hourly	MW	CWELEC24	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM
151													

t hour load = f((Industry GDP + Service GDP) / GDP, GDP per capita,

Electrified pop*(Humidity + Temperature)

t=1～24

(7) Holiday data in Center

Hourly load in Holiday in Center are forecasted by regression analysis. The regression equations are follows;

t hour load = f((Industry GDP + Service GDP) / GDP, GDP per capita,
Electrified pop*(Humidity + Temperature)

t=1～24

Table 3-3-7 Holiday data in Center

105	Central													
152	Holiday Data													
153		〈1st Hour〉	Hourly	MW	CHELEC1	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM	
154		〈2nd Hour〉	Hourly	MW	CHELEC2	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM	
155		〈3rd Hour〉	Hourly	MW	CHELEC3	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM	
156		〈4th Hour〉	Hourly	MW	CHELEC4	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM	
157		〈5th Hour〉	Hourly	MW	CHELEC5	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM	
158		〈6th Hour〉	Hourly	MW	CHELEC6	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM	
159		〈7th Hour〉	Hourly	MW	CHELEC7	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM	
160		〈8th Hour〉	Hourly	MW	CHELEC8	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM	
161		〈9th Hour〉	Hourly	MW	CHELEC9	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM	
162		〈10th Hour〉	Hourly	MW	CHELEC10	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM	
163		〈11th Hour〉	Hourly	MW	CHELEC11	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM	
164		〈12th Hour〉	Hourly	MW	CHELEC12	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM	
165		〈13th Hour〉	Hourly	MW	CHELEC13	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM	
166		〈14th Hour〉	Hourly	MW	CHELEC14	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM	
167		〈15th Hour〉	Hourly	MW	CHELEC15	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM	
168		〈16th Hour〉	Hourly	MW	CHELEC16	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM	
169		〈17th Hour〉	Hourly	MW	CHELEC17	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM	
170		〈18th Hour〉	Hourly	MW	CHELEC18	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM	
171		〈19th Hour〉	Hourly	MW	CHELEC19	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM	
172		〈20th Hour〉	Hourly	MW	CHELEC20	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM	
173		〈21st Hour〉	Hourly	MW	CHELEC21	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM	
174		〈22rd Hour〉	Hourly	MW	CHELEC22	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM	
175		〈23rd Hour〉	Hourly	MW	CHELEC23	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM	
176		〈24th Hour〉	Hourly	MW	CHELEC24	$CA	(CGIND+CGSER)/CGDP	CGDP/CPOP	CELPOP*(CHUM+CDEG)	CTHADUM	CMAYDUM	CPHIDUM	CINDDUM	
177		Total Electricity												

(8) Peak day data in Center

Hourly load in Peak day in Center are forecasted by regression analysis. The regression equations are follows;

t hour load in Peak day = f (t hour load in weekday) t=1～24

Table 3-3-8 Holiday data in Center

105	Central						
178	Peak day						
179		<1st Hour>	Hourly	MW	CPELEC1	$CA	CWELEC1
180		<2nd Hour>	Hourly	MW	CPELEC2	$CA	CWELEC2
181		<3rd Hour>	Hourly	MW	CPELEC3	$CA	CWELEC3
182		<4th Hour>	Hourly	MW	CPELEC4	$CA	CWELEC4
183		<5th Hour>	Hourly	MW	CPELEC5	$CA	CWELEC5
184		<6th Hour>	Hourly	MW	CPELEC6	$CA	CWELEC6
185		<7th Hour>	Hourly	MW	CPELEC7	$CA	CWELEC7
186		<8th Hour>	Hourly	MW	CPELEC8	$CA	CWELEC8
187		<9th Hour>	Hourly	MW	CPELEC9	$CA	CWELEC9
188		<10th Hour>	Hourly	MW	CPELEC10	$CA	CWELEC10
189		<11th Hour>	Hourly	MW	CPELEC11	$CA	CWELEC11
190		<12th Hour>	Hourly	MW	CPELEC12	$CA	CWELEC12
191		<13th Hour>	Hourly	MW	CPELEC13	$CA	CWELEC13
192		<14th Hour>	Hourly	MW	CPELEC14	$CA	CWELEC14
193		<15th Hour>	Hourly	MW	CPELEC15	$CA	CWELEC15
194		<16th Hour>	Hourly	MW	CPELEC16	$CA	CWELEC16
195		<17th Hour>	Hourly	MW	CPELEC17	$CA	CWELEC17
196		<18th Hour>	Hourly	MW	CPELEC18	$CA	CWELEC18
197		<19th Hour>	Hourly	MW	CPELEC19	$CA	CWELEC19
198		<20th Hour>	Hourly	MW	CPELEC20	$CA	CWELEC20
199		<21st Hour>	Hourly	MW	CPELEC21	$CA	CWELEC21
200		<22rd Hour>	Hourly	MW	CPELEC22	$CA	CWELEC22
201		<23rd Hour>	Hourly	MW	CPELEC23	$CA	CWELEC23
202		<24th Hour>	Hourly	MW	CPELEC24	$CA	CWELEC24

(9) Dummy, Social and Economic variables in South

All data of Dummy, Social and Economic variables in South are exogenous.

Table 3-3-9 **Dummy, Social and Economic variables in South**

205	South						
206	Dummy				STHADUM	=	STHADUM
207					SMAYDUM	=	SMAYDUM
208					SPHIDUM	=	SPHIDUM
209					SINDDUM	=	SINDDUM
210					SJAPDUM	=	SJAPDUM
211							
212	Economic & Clima						
213							
214				%	SRAGR	=	SRAGR
215				%	SRIND	=	SRIND
216				%	SRSER	=	SRSER
217				Bill US$	SGAGR	=	SGAGR
218				Bill US$	SGIND	=	SGIND
219				Bill US$	SGSER	=	SGSER
220				Bill US$	SGDP	=	SGAGR+SGIND+SGSER
221				Mill	SPOP	=	SPOP
222				%	SHUM	=	SHUM
223				Mill	SELPOP	=	SELPOP
224				Deg	SDEG	=	SDEG

(10) Weekday data in South

Hourly load in weekday in Center are forecasted by regression analysis. The regression equations are follows;

Table 3-3-10 **Weekday data in South**

205	South														
227	Weekday Data														
228		〈1st Hour〉	Hourly	MW	SWELEC1	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM	
229		〈2nd Hour〉	Hourly	MW	SWELEC2	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM	
230		〈3rd Hour〉	Hourly	MW	SWELEC3	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM	
231		〈4th Hour〉	Hourly	MW	SWELEC4	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM	
232		〈5th Hour〉	Hourly	MW	SWELEC5	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM	
233		〈6th Hour〉	Hourly	MW	SWELEC6	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM	
234		〈7th Hour〉	Hourly	MW	SWELEC7	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM	
235		〈8th Hour〉	Hourly	MW	SWELEC8	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM	
236		〈9th Hour〉	Hourly	MW	SWELEC9	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM	
237		〈10th Hour〉	Hourly	MW	SWELEC10	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM	
238		〈11th Hour〉	Hourly	MW	SWELEC11	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM	
239		〈12th Hour〉	Hourly	MW	SWELEC12	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM	
240		〈13th Hour〉	Hourly	MW	SWELEC13	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM	
241		〈14th Hour〉	Hourly	MW	SWELEC14	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM	
242		〈15th Hour〉	Hourly	MW	SWELEC15	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM	
243		〈16th Hour〉	Hourly	MW	SWELEC16	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM	
244		〈17th Hour〉	Hourly	MW	SWELEC17	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM	
245		〈18th Hour〉	Hourly	MW	SWELEC18	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM	
246		〈19th Hour〉	Hourly	MW	SWELEC19	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM	
247		〈20th Hour〉	Hourly	MW	SWELEC20	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM	
248		〈21st Hour〉	Hourly	MW	SWELEC21	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM	
249		〈22nd Hour〉	Hourly	MW	SWELEC22	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM	
250		〈23rd Hour〉	Hourly	MW	SWELEC23	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM	
251		〈24th Hour〉	Hourly	MW	SWELEC24	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM	

t hour load = f((Industry GDP + Service GDP) / GDP, GDP per capita,

Electrified pop*(Humidity + Temperature)

t=1～24

(11) Holiday data in South

Hourly load in Holiday in South are forecasted by regression analysis. The regression equations are follows;

t hour load = f((Industry GDP + Service GDP) / GDP, GDP per capita,
Electrified pop*(Humidity + Temperature)

t=1～24

Table 3-3-11 Holiday data in South

205	South															
253	Holiday Data															
254		〈1st Hour〉	Hourly	MW	SHELEC1	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM		
255		〈2nd Hour〉	Hourly	MW	SHELEC2	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM		
256		〈3rd Hour〉	Hourly	MW	SHELEC3	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM		
257		〈4th Hour〉	Hourly	MW	SHELEC4	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM		
258		〈5th Hour〉	Hourly	MW	SHELEC5	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM		
259		〈6th Hour〉	Hourly	MW	SHELEC6	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM		
260		〈7th Hour〉	Hourly	MW	SHELEC7	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM		
261		〈8th Hour〉	Hourly	MW	SHELEC8	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM		
262		〈9th Hour〉	Hourly	MW	SHELEC9	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM		
263		〈10th Hour〉	Hourly	MW	SHELEC10	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM		
264		〈11th Hour〉	Hourly	MW	SHELEC11	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM		
265		〈12th Hour〉	Hourly	MW	SHELEC12	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM		
266		〈13th Hour〉	Hourly	MW	SHELEC13	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM		
267		〈14th Hour〉	Hourly	MW	SHELEC14	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM		
268		〈15th Hour〉	Hourly	MW	SHELEC15	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM		
269		〈16th Hour〉	Hourly	MW	SHELEC16	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM		
270		〈17th Hour〉	Hourly	MW	SHELEC17	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM		
271		〈18th Hour〉	Hourly	MW	SHELEC18	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM		
272		〈19th Hour〉	Hourly	MW	SHELEC19	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM		
273		〈20th Hour〉	Hourly	MW	SHELEC20	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM		
274		〈21st Hour〉	Hourly	MW	SHELEC21	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM		
275		〈22nd Hour〉	Hourly	MW	SHELEC22	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM		
276		〈23rd Hour〉	Hourly	MW	SHELEC23	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM		
277		〈24th Hour〉	Hourly	MW	SHELEC24	$CA	(SGIND+SGSER)/SGDP	(SGDP)/SPOP	SELPOP*(SHUM+SDEG)	STHADUM	SMAYDUM	SPHIDUM	SINDDUM	SJAPDUM		

(12) Peak day data in South

Hourly load in Peak day in South are forecasted by regression analysis. The regression equations are follows;

Table 3-3-12 Peak day data in South

205	South						
279	Peak day						
280		<1st Hour>	Hourly	MW	SPELEC1	$CA	SWELEC1
281		<2nd Hour>	Hourly	MW	SPELEC2	$CA	SWELEC2
282		<3rd Hour>	Hourly	MW	SPELEC3	$CA	SWELEC3
283		<4th Hour>	Hourly	MW	SPELEC4	$CA	SWELEC4
284		<5th Hour>	Hourly	MW	SPELEC5	$CA	SWELEC5
285		<6th Hour>	Hourly	MW	SPELEC6	$CA	SWELEC6
286		<7th Hour>	Hourly	MW	SPELEC7	$CA	SWELEC7
287		<8th Hour>	Hourly	MW	SPELEC8	$CA	SWELEC8
288		<9th Hour>	Hourly	MW	SPELEC9	$CA	SWELEC9
289		<10th Hour>	Hourly	MW	SPELEC10	$CA	SWELEC10
290		<11th Hour>	Hourly	MW	SPELEC11	$CA	SWELEC11
291		<12th Hour>	Hourly	MW	SPELEC12	$CA	SWELEC12
292		<13th Hour>	Hourly	MW	SPELEC13	$CA	SWELEC13
293		<14th Hour>	Hourly	MW	SPELEC14	$CA	SWELEC14
294		<15th Hour>	Hourly	MW	SPELEC15	$CA	SWELEC15
295		<16th Hour>	Hourly	MW	SPELEC16	$CA	SWELEC16
296		<17th Hour>	Hourly	MW	SPELEC17	$CA	SWELEC17
297		<18th Hour>	Hourly	MW	SPELEC18	$CA	SWELEC18
298		<19th Hour>	Hourly	MW	SPELEC19	$CA	SWELEC19
299		<20th Hour>	Hourly	MW	SPELEC20	$CA	SWELEC20
300		<21st Hour>	Hourly	MW	SPELEC21	$CA	SWELEC21
301		<22rd Hour>	Hourly	MW	SPELEC22	$CA	SWELEC22
302		<23rd Hour>	Hourly	MW	SPELEC23	$CA	SWELEC23
303		<24th Hour>	Hourly	MW	SPELEC24	$CA	SWELEC24

t hour load in Peak day = f (t hour load in weekday) t=1～24

(14) Load factor forecasting

In Data analysis sheet, Load factor, Peak demand and Monthly power consumption are calculated. The load factors in data analysis sheet are calculated from peak demand and monthly consumption. In the SimpleE sheets, the load factors in future are estimated by regression equations by using actual peak demand and monthly power consumption, and load factor data calculated in the actual terms.

Table 3-3-13 **Load factor forecasting**

E	F	G	I	J	Y	Type	X1	X2
307		Load factor	North		DLNRTH	$CA	(PKNRTH)/(PLNRTH*30*24)	
308			Central		DLCENT	$CA	(PKCENT)/(PLCENT*30*24)	
309			South		DLSOUT	$CA	(PKSOUT)/(PLSOUT*30*24)	
310			Total		DLTOTL	$CA	(PKTOTL)/(PLTOTL*30*24)	
311								
312		Monthly Comsur	North	MWh	PKNRTH	=	PKNRTH	
313			Central	MWh	PKCENT	=	PKCENT	
314			South	MWh	PKSOUT	=	PKSOUT	
315			Total	MWh	PKTOTL	=	PKTOTL	
316								
317		Peak demand	North	MW	PLNRTH	=	PLNRTH	
318			Central	MW	PLCENT	=	PLCENT	
319			South	MW	PLSOUT	=	PLSOUT	
320			Total	MW	PLTOTL	=	PLTOTL	
321								

Future load factors are estimated by the following regression equations.

Load factor in North = f(Monthly power demand in North / (Peak demand in North 30*24))

Load factor in Center = f(Monthly power demand in Center / (Peak demand in Center 30*24))

Load factor in South = f(Monthly power demand in South / (Peak demand in South 30*24))

Load factor in Whole = f(Monthly power demand in Whole / (Peak demand in Whole30*24))

Monthly power demand and Peak demand in North, Center and South are exogenous.

3.4 Simulation sheet

In the Simulation sheet, Input data for actual and calculation value for forecasting are outputted. The all kinds of the results from the model are shown in the Simulation sheet. The contents are as follows;

(1) Regarding actual data

· In the model, the variable name described in data sheet appeared in the same line number position in Simulation sheet as Data sheet.

· The comment area in Data sheet, Model sheet, Simulation sheet and Growth sheet are filled out with the same sentences.

· In Simulation sheet, the value with black color are the data described in Data sheet. The values with red color are ones forecasted by SimpleE.

a. North region data

The actual data in North region are input in the following trend area.

Thailand data are located in 1-9 trend area
Malaysia data are located in 10-14 trend area
Philippines data are in 15-17 trend area
Indonesia data are in 18-25 trend area
Japan data are in 26-43 trend area
Vietnam data are in 44-151 trend area.

b. Center region data

The actual data in Center region are input in the following trend area. For Center region, Japan data are not used.

Thailand data are located in 19-27 trend area
Malaysia data are located in 28-32 trend area
Philippines data are in 33-35 trend area
Indonesia data are in 36-43 trend area
Vietnam data are in 44-151 trend area.

c. South region data

The actual data in South region are input in the following trend area.

Thailand data are located in 1-9 trend area

Malaysia data are located in 10-14 trend area
Philippines data are in 15-17 trend area
Indonesia data are in 18-25 trend area
Japan data are in 26-43 trend area
Vietnam data are in 44-151 trend area

d. Load factor data

The actual data of load factor are input in 44-151 trend area.

(2)Regarding forecasting

· In the simulation sheet, the forecasting years of Vietnam are from Jan 2005 to Dec 2025. The forecasted values are shown with red values.

· The forecasted values have the expressions that calculated them. The expressions are described in each cell.

· The actual values and the forecasted values are referred by the Data analysis sheet.

3.5 Data analysis

3.5.1 Actual hourly data and future values

Actual hourly data and the future hourly values forecasted in Simulation sheet are brought to Data analysis sheet. The data types are follows;

Region types : North, Center, South and Whole country

Demand types : Peak demand, Week demand and Holiday demand

Time types : Daily Monthly and Annual

(1) Daily load data of Peak demand, Weekday demand and Holiday demand in North

The forecasted daily load data of Peak, Weekday and holiday demand in North from 2005 to 2025 come from Simulation sheet. However the values are not kept the continuation between the actual values and the forecasted values. Then the forecasted values of 2005, 2010, 2015 and 2020 are estimated by linear function connected two points of 2004 and 2025.

(2) Daily load data of Peak demand, Weekday demand and Holiday demand in Center

The forecasted daily load data of weekday demand in Center from 2005 to 2025 are brought from Simulation sheet. However the values are not kept the continuation between the actual values and the forecasted values. Then the forecasted values of 2005, 2010, 2015 and 2020 are estimated by linear function connected two points of 2004 and 2025.

(3) Daily load data of Peak day demand, Weekday demand and Holiday demand in South

The forecasted daily load data of weekday demand in South from 2005 to 2025 are brought from simulation sheet. However the values are not kept the continuation between the actual values and the forecasted values. Then the forecasted values of 2005, 2010, 2015 and 2020 are estimated by linear function connected two points of 2004 and 2025.

(4) Daily load data of Peak demand, Weekday demand and Holiday demand in Whole country

The forecasted daily load data of weekday demand in Whole country from 2005 to 2025 are summed up the above regional data.

Peak day demand = Peak day demand in North + Peak day demand in Center
+ Peak day demand in South

Week day demand = Week day demand in North + Week day demand in Center
+ Week day demand in South

Holiday demand = Holiday demand in North + Holiday demand in Center

+ Holiday demand in South

3.5.2 Data analysis for comparing hourly data and power forecasted values

(1) Daily Consumption Calculated

Daily power consumptions are calculated with summation of hourly data in peak day, weekday and holiday demand.

Peak day daily consumption in North is the summation of consumption in 24 hours.
Weekday daily consumption in North is the summation of consumption in 24 hours.
Holiday daily consumption in North is the summation of consumption in 24 hours

Peak day daily consumption in Center is the summation of consumption in 24 hours.
Weekday daily consumption in Center is the summation of consumption in 24 hours.
Holiday daily consumption in Center is the summation of consumption in 24 hours

Peak day daily consumption in South is the summation of consumption in 24 hours.
Weekday daily consumption in South is the summation of consumption in 24 hours.
Holiday daily consumption in South is the summation of consumption in 24 hours

Peak day daily consumption in Whole is the summation of consumption in 24 hours.
Weekday daily consumption in Whole is the summation of consumption in 24 hours.
Holiday daily consumption in Whole is the summation of consumption in 24 hours

(2) Number of days

Peak demand days are the top 3 days that registered peak demand in a month
Weekdays are the days except Sundays, National holidays and Peak demand days.
Holidays are the number of days of Sundays and National holidays.

(3) Monthly Consumption (MWh)

Monthly consumption in North, Center and South are calculated by the following expression. And monthly consumption in whole country are summation of the regional monthly consumption.

Peak demand days * 3 days/month + Weekday demand * number of weekdays/month
+ Holiday demand * number of holiday/month

(4) Annual consumption (GWh)

Monthly consumptions are calculated by the following expression.

Peak demand days * 3 days/month + Weekday demand * number of weekdays/month
+ Holiday demand * number of holiday/month

(5) Annual demand (GWh)

The annual demands come from Simulation sheet of Power demand forecasting model. The data are from 1996 to 2005 and 2010, 2015, 2020 and 2025.

It is considered that the annual demands basically meet to the above Annual consumption except distribution loss.

(6) Distribution loss rate

The distribution loss rate comes from Simulation sheet of Power demand forecasting model.

(7) Annual Dispatched data (GWh)

Annual consumption calculated by hourly load data is annual dispatched data, however as annual demand data cam from Power demand forecasting model do not include distribution loss, then the annual demand is not annual dispatched data.

And the annual dispatched data from annual demand is calculated by the following expression.

Annual demand = Annual dispatch*(1 - Distribution loss rate)

Annual dispatch = Annual demand /(1 -Distribution loss rate)

(8) Ratio of Model Value to Actual Record

The dispatched data calculated from annual demand basically equal to Annual consumption summed up from hourly data. Then the following ratios are calculated.

Model value = The dispatched data

Actual record =Annual consumption

Ratio of Model Value to Actual Record = The dispatched data / Annual consumption

3.5.3 Data adjustment

(1) Data adjustment of Peak demand, Weekday demand and Holiday demand in North

For adjusting daily load data of Peak, Weekday and holiday demand in North from 2005 to 2025, the following operations are done.

Adjusted hourly data in Peak demand in North

= Hourly data in Peak demand * the ratio Model Value to Actual Record

Adjusted hourly data in Week day demand in North

= Hourly data in Week demand * the ratio Model Value to Actual Record

Adjusted hourly data in Holiday demand in North

= Hourly data in Holiday demand * the ratio Model Value to Actual Record

Adjusted hourly data in Peak demand in Center

= Hourly data in Peak demand * the ratio Model Value to Actual Record

Adjusted hourly data in Week day demand in Center

= Hourly data in Week demand * the ratio Model Value to Actual Record

Adjusted hourly data in Holiday demand in Center

= Hourly data in Holiday demand * the ratio Model Value to Actual Record

Adjusted hourly data in Peak demand in South

= Hourly data in Peak demand * the ratio Model Value to Actual Record

Adjusted hourly data in Week day demand in South

= Hourly data in Week demand * the ratio Model Value to Actual Record

Adjusted hourly data in Holiday demand in South

= Hourly data in Holiday demand * the ratio Model Value to Actual Record

The Adjusted hourly data in Peak day, Weekday and Holiday demand are the summation of the above items.

(2) Number of days

Peak demand days are the top 3 days that registered peak demand in a month

Weekdays are the days except Sundays, National holidays and Peak demand days.

Holidays are Sundays and National holidays.

All data are copied from the previous “Number of Days”

(3) Monthly Consumption (MWh)

Monthly consumption in North, Center and South are calculated by the following expression. And monthly consumptions in whole country are summation of the regional monthly consumption.

Peak demand days * 3 days/month + Weekday demand * number of weekdays/month

+ Holiday demand * number of holiday/month

(4) Peak load in Month(MW)

The maximum hourly consumption in a Month is selected as Peak load in month.

Peak load in 1996/01= Max(1 o’clock, 2 o’clock, 3 o’clock, 4 o’clock …… 24 o’clock)

Peak load in 1996/02= Max(1 o’clock, 2 o’clock, 3 o’clock, 4 o’clock …… 24 o’clock)

Peak load in 2025/11= Max(1 o’clock, 2 o’clock, 3 o’clock, 4 o’clock …… 24 o’clock)

Peak load in 2025/12= Max(1 o’clock, 2 o’clock, 3 o’clock, 4 o’clock …… 24 o’clock)

(5) Monthly load factor

During the actual terms (1996/01 – 2004/12), Monthly load factors are calculated by the following expressions.

Monthly load factor = Monthly consumption / (Peal load * 24 * days in a month)

The future monthly load factors are estimated in Simulation sheet and the values are copied from the sheet.

(6) Estimated Peak load

The estimated Peak loads are calculated by the following expressions.

The estimated Peak load = Monthly consumption / days in a month / load factor

(7) Annual consumption (GWh)

The annual consumptions in North are the summation of monthly consumption in North.

The annual consumptions in Center are the summation of monthly consumption in Center.

The annual consumptions in South are the summation of monthly consumption in South.

The annual consumptions in whole country are the summation of monthly consumption in whole.

(8) Annual Peak Load(MW)

The peak demand in North in a month is selected as Annual Peak Load in North.

The peak demand in Center in a month is selected as Annual Peak Load in Center.

The peak demand in South in a month is selected as Annual Peak Load in South.

The peak demand in whole country in a month is selected as Annual Peak Load in whole.

(9) Peak load in Annual(MW)

The maximum hourly consumption in 12 Months is selected as Peak load in Annual.

Peak load in Annual in 1996 =

Max [(1 o'clock, 2 o'clock, 3 o'clock, 4 o'clock …… 24 o'clock in 1996/01)

(1 o'clock, 2 o'clock, 3 o'clock, 4 o'clock …… 24 o'clock in 1996/02)

(1 o'clock, 2 o'clock, 3 o'clock, 4 o'clock …… 24 o'clock in 1996/11)

(1 o'clock, 2 o'clock, 3 o'clock, 4 o'clock …… 24 o'clock in 1996/12)]

(10) Annual load factor

Annual load factors are calculated by the following expressions.

Annual load factor = Annual consumption / (Peal load * 24 * 365)

3.6 Whole sheet

Daily load curves forecasted are shown in “Whole sheet”. The daily load curves are in whole county. The regional daily load curves are shown in each regional load curve sheets.

(1) Daily Load Curves in the Whole country (2005 2010 2015 2020 2025)

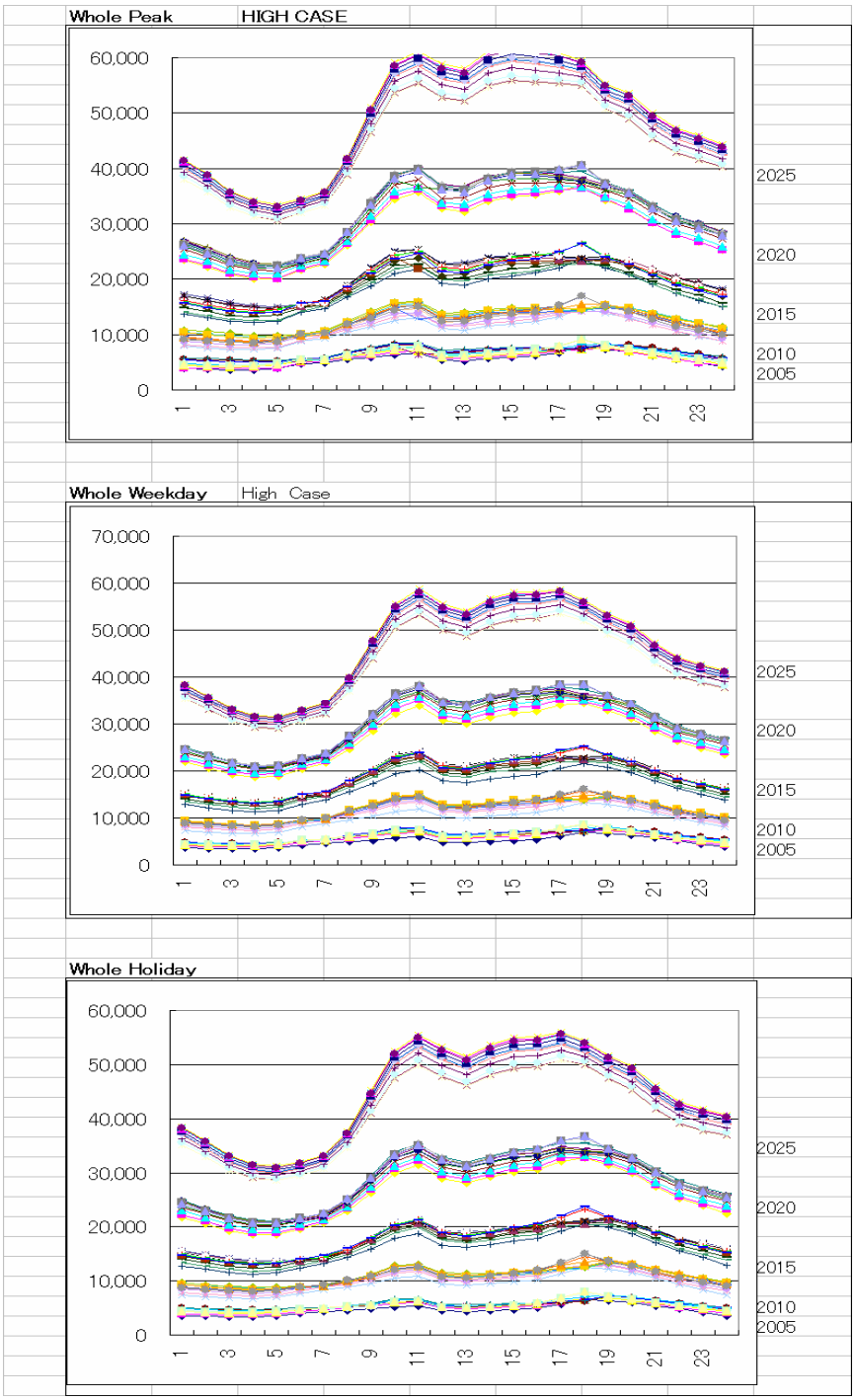

Figure 3-6-1 Daily Load Curves in the Whole country (2005 2010 2015 2020 2025)

(2) Daily Load Curves in the Whole country (2005 2010)

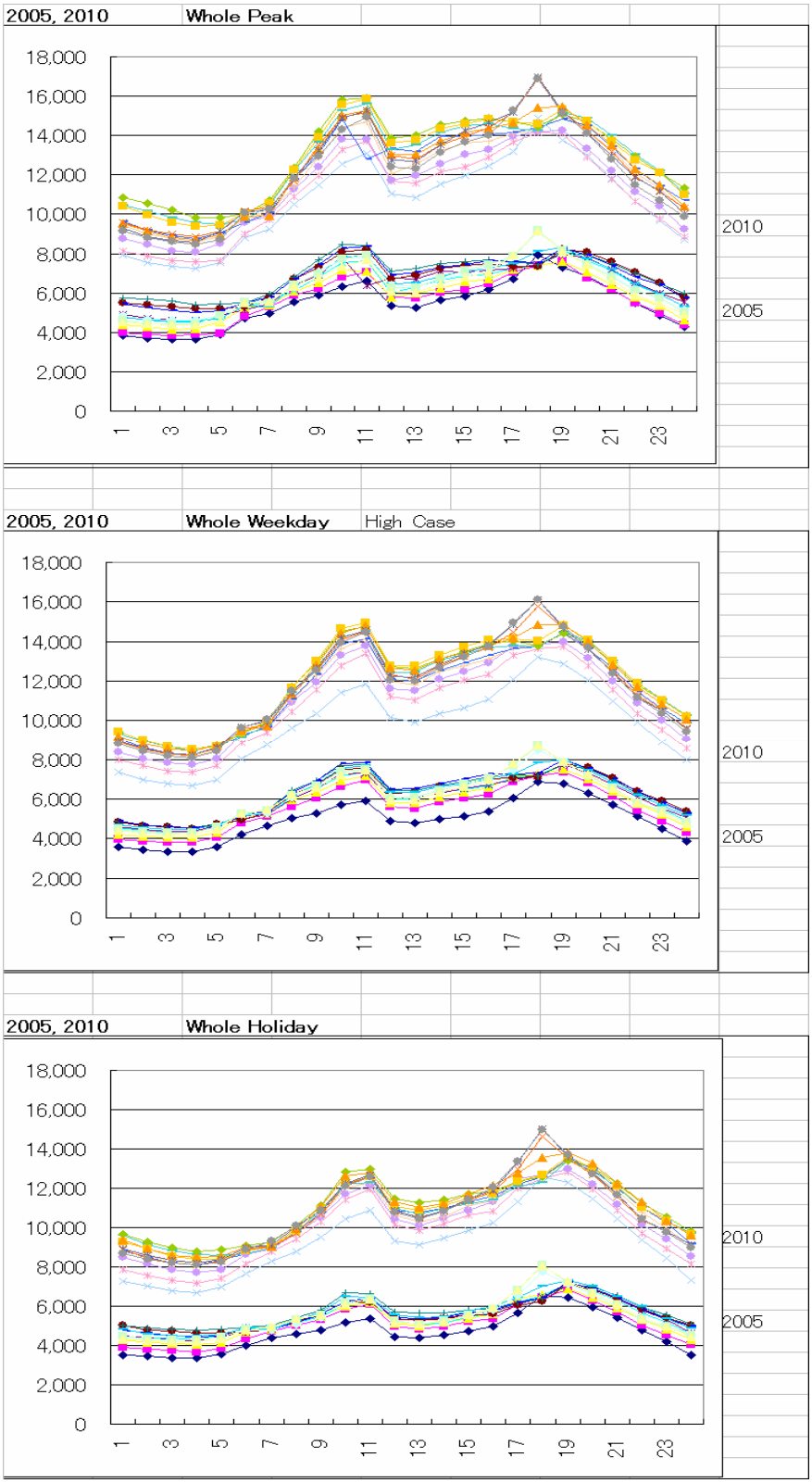

Figure 3-6-2 Daily Load Curves in the Whole country (2005 2010)

3.7 North sheet

North daily load curves forecasted are shown in “North sheet”. The daily load curves in 2005 2010, 2015, 2020 and 2025 are in the North region.

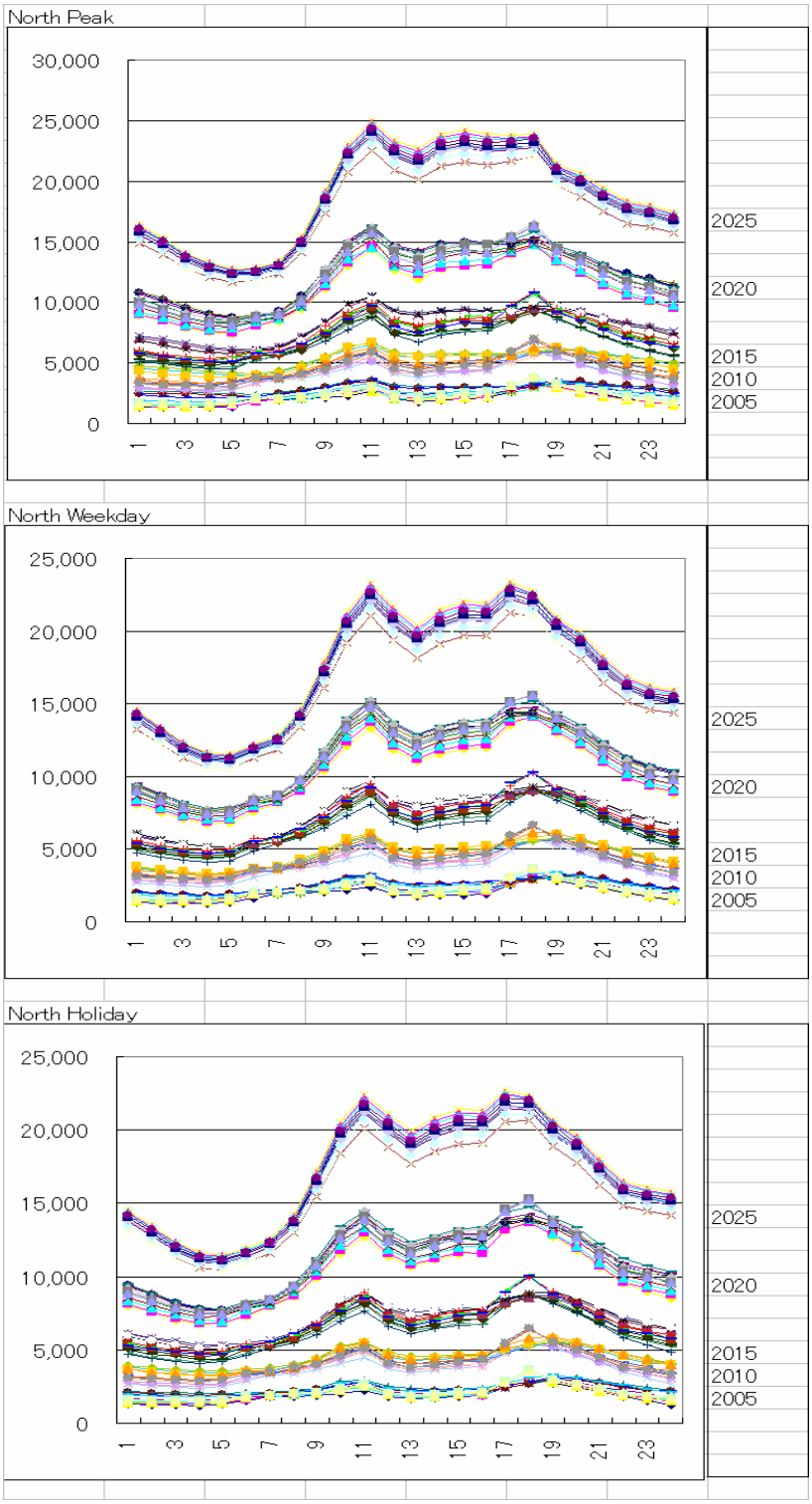

Figure 3-7-1 Daily Load Curves in North (2005 2010 2015 2020 2025)

3.8 Center sheet

Center daily load curves forecasted are shown in “Center sheet”. The daily load curves in 2005 2010, 2015, 2020 and 2025 are in the Center region

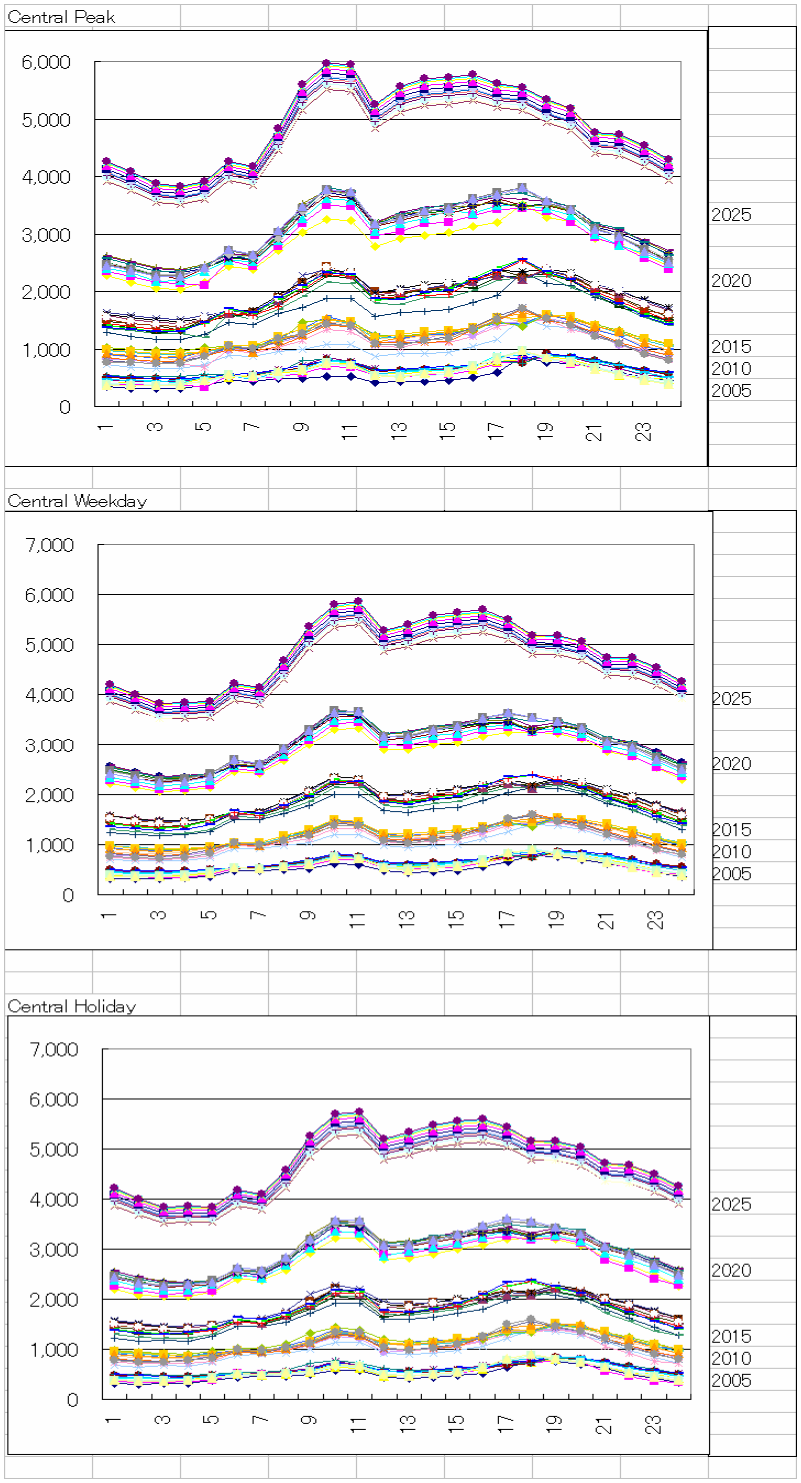

Figure 3-8-1 Daily Load Curves in Center (2005 2010 2015 2020 2025)

3.9 South sheet

South daily load curves forecasted are shown in “South sheet”. The daily load curves in 2005 2010, 2015, 2020 and 2025 are in the South region

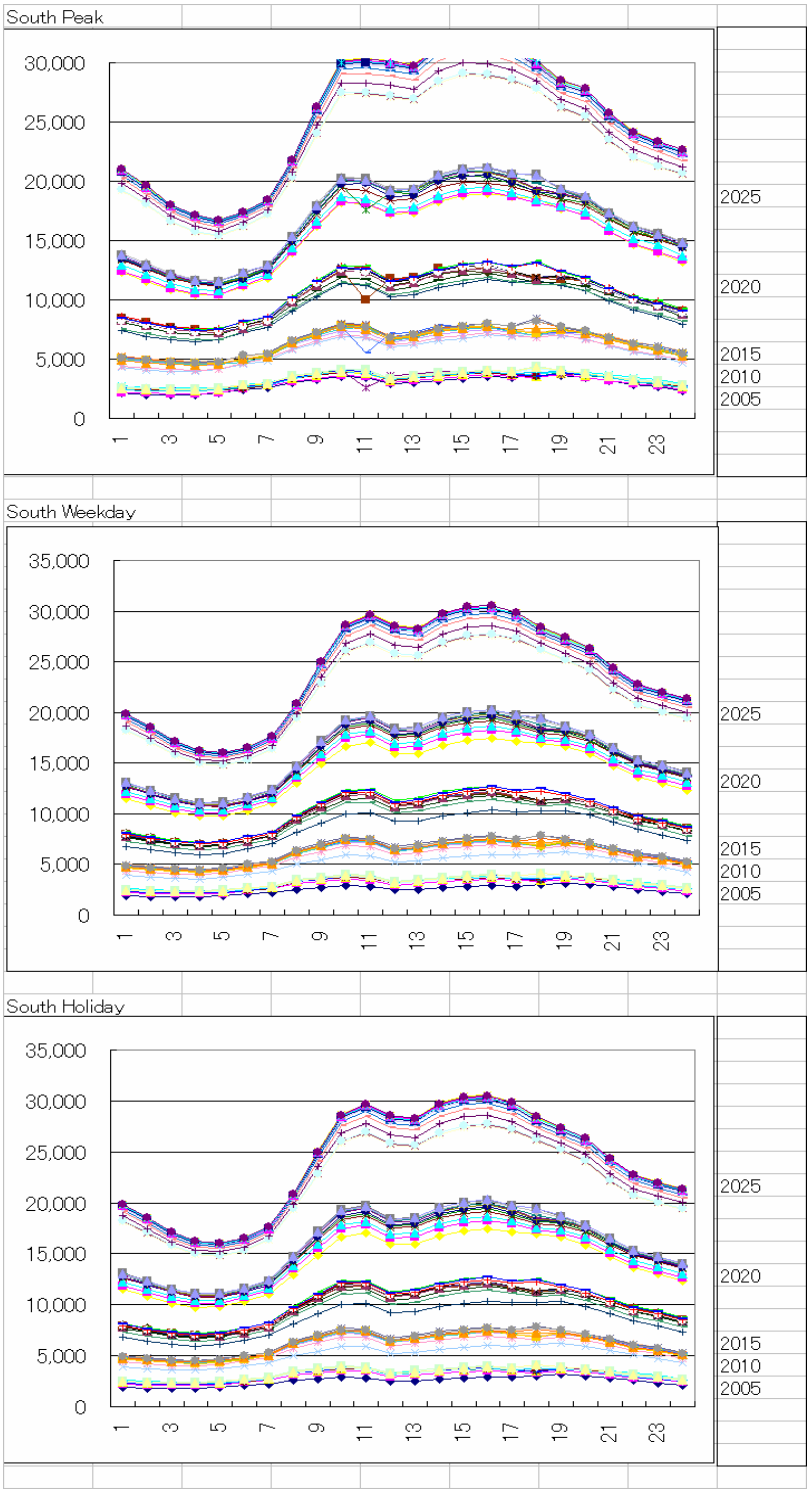

Figure 3-9-1 Daily Load Curves in South (2005 2010 2015 2020 2025)

3.10 Load factor sheet

In the sheet, Peak demand and the growth rate are shown in the figures. And peak demand estimation of other organizations and projects are compared to the current peak demand estimated.

(1) Peak demand and Load factor

Table 3-10-1 Load factor sheet

Annual Consumption in BASE CASE											
		2000	2001	2002	2003	2004	2005	2010	2015	2020	2025
17. Annual Consumption (GWh)											
	North	10,043	11,346	12,971	15,325	17,906	20,642	41,827	68,303	99,989	142,183
	Central	2,529	2,932	3,515	3,966	4,657	5,389	10,782	16,933	25,833	39,266
	South	12,354	14,203	17,197	20,070	26,108	30,230	58,545	88,299	126,729	167,890
	Whole	24,926	28,481	33,684	39,360	48,671	56,261	111,154	173,535	252,550	349,338
18. Annual Peak Load(MW)											
	North	2,025	2,273	2,598	3,020	3,536	4,065	7,878	12,316	17,455	24,666
	Central	510	567	689	744	880	1,041	1,950	2,861	4,068	6,079
	South	2,044	2,403	2,858	3,306	4,348	5,134	9,718	14,316	20,442	27,427
	Whole	4,564	5,221	6,145	7,062	8,645	10,329	19,668	29,569	41,472	58,049
19. Annual Load Factor											
	North	0.57	0.57	0.57	0.58	0.58	0.58	0.61	0.63	0.65	0.66
	Central	0.57	0.59	0.58	0.61	0.60	0.59	0.63	0.68	0.72	0.74
	South	0.69	0.67	0.69	0.69	0.69	0.67	0.69	0.70	0.71	0.70
	Whole	0.62	0.62	0.63	0.64	0.64	0.62	0.65	0.67	0.70	0.69
Annual Peak Load in BASE CASE											
		2000	2001	2002	2003	2004	2005	2010	2015	2020	2025
MW	PDP6	4,564	5,221	6,145	7,062	8,645	10,329	19,668	29,569	41,472	58,049
	PDP5	4,564	5,292	5,820	6,419	7,081	7,797	12,003	18,197	27,204	
	Revised PDP 5th	4,564	5,559	6,465	7,231	8,150	9,199	15,256	22,575	31,432	
			2001	2002	2003	2004	2005	2010	2015	2020	2025
	PDP6		14.4	17.7	14.9	22.4	19.5	13.7	8.5	7.0	7.0
%	PDP5		15.9	10.0	10.3	10.3	10.1	9.0	8.7	8.4	
	Revised PDP 5th		21.8	16.3	11.8	12.7	12.9	10.6	8.2	6.8	

PDP6th Peak demand estimated by PDP6th project

PDP5th : Peak demand estimated by PDP5th project

Revised PDP5th: Peak demand estimated by PDP5th project in 2002

(2) Peak demand and the growth rate

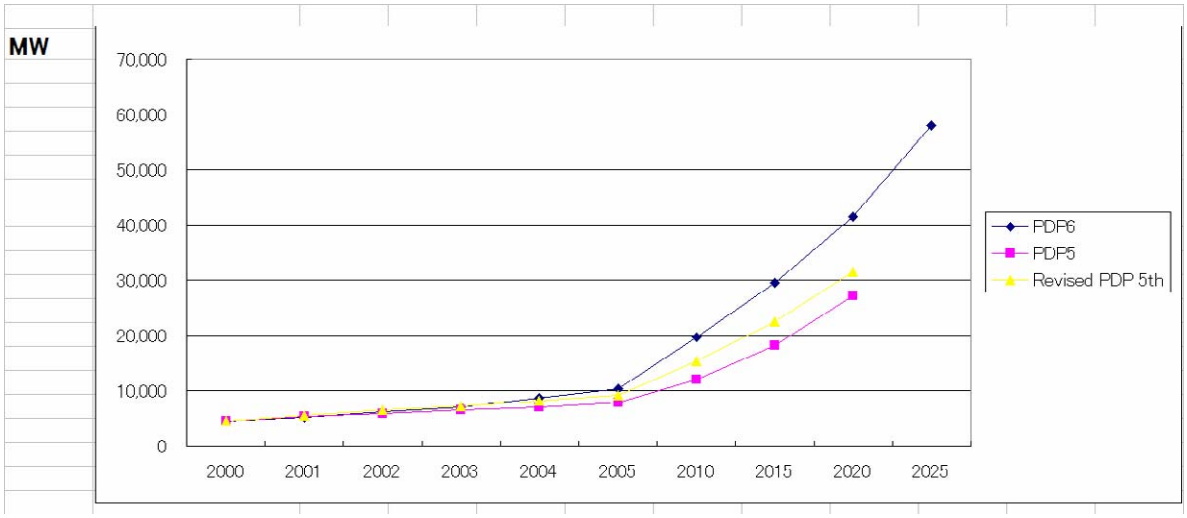

Figure 3-10-1 Peak demands by PDP6, PDP5th and Revised PDP5th

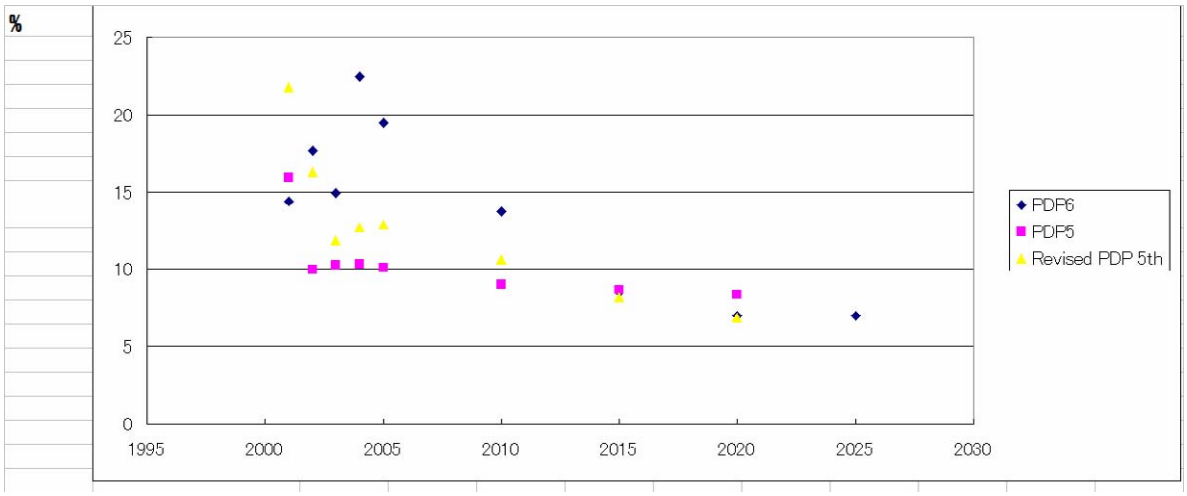

Figure 3-10-2 **Peak demand growth rates by PDP6th, PDP5th and Revised PDP5th**

Chapter 4. Social Economic Development Scenario Setting

4.1 Social Economic Forecast

Energy demand and social economic activities have strong correlation with each another. Generally, social economic outlook is established before energy demand is forecasted. It is considered that social economic indicators are preconditions for energy demand forecasting. The official long range social economic outlook in Vietnam does not exist at present. But fortunately the expert group in Vietnam studied "ECONOMIC DEVELOPMENT FORECAST SERVING STUDY ON ENERGY DEVELOPMENT FOR THE PERIOD UP TO 2050". In the JICA study, the social economic forecast is used as the precondition for the energy and power demand forecast. The report is also used as preconditions for the power demand forecast studied by The Institute of Energy - EVN.

4.2 Economic Development Scenarios

The socio-economic development forecast scenarios for the period up to 2050 can be considered based on the following factors:

(1) Scenario Factors

- Assume that the international environment is stable with economic globalization and liberalization, the international economic relationships are widened. The balance of international payments of Vietnam after 2006 is assumed to change without major problems.
- The investment flows (especially FDI) is expected to be positive.
- Technological development and innovation will be continued but will not bring about big changes in the society and economy.
- Assume that the energy issues are solved, and the oil prices in the world will change stably.

(2) Strategy Factors (selection of development models)

- Assume that Vietnam integration is successful, overcoming the challenges of globalization and international economic integration (joining WTO in 2005, successful implementation of AFTA commitments etc.);
- Vietnamese economy will meet initial difficulties with its international commitments for AFTA, WTO etc., but the economy will recover and develop toward high growth rates.
- The positive factors within the country are pointed out as follows:

(i) Drafting of high level policies, regulatory reforms, administration reforms are assumed to be well implemented.

(ii) Average levels as in the previous years.

(iii) The wide-ranged reformation in progress is assumed to be sustainable up to 2050.

- Selected development models:

+ The following economic reformation is assumed to be implemented for promotion of export-oriented economy and development of labor-intensive industry:

(i) Implement infrastructure investment aiming at high added value of agricultural products, however, urbanization and rural infrastructure development are still slow.

(ii) Promotion of development in services, especially in tourism, commerce, and finance.

(iii) Expansion of production sectors substituting import and maintenance of the domestic markets. .

(iv) The economic infrastructure facilities, basic industries which create inputs for the whole national economy will be invested based on the economic potential (capital, human resources etc.) and making accumulation in 2020, setting base for sustainable development in the next period. According to this model, the economy will be rapidly developed in the period up to 2020 then becomes stable and sustainable in the next periods.

+ Objectives for making Vietnam basically become an industrialized country by 2020:

(i) The infrastructure systems are invested and developed. Basically the transport, telecommunication, water supply systems etc. are accomplished.

(ii) The main industries (such as metallurgy, chemical, machinery, information technology etc.) have initial development, meeting requirement of the economic development;

(iii) Agriculture and rural areas are relatively developed for urbanization. The period up to 2020 requires intensive investment, brings in little immediate benefits but setting base for strong development in the next period.

(3) High Growth Rate Scenario

This scenario is designed based on the following assumptions:

- The international situation is stable (see above section)
- Vietnamese integration is successful, overcoming the challenges of globalization and

international economic integration (entering WTO in 2005, successful implementation of AFTA commitments etc.);

- The positive factors within the country are activated at high levels:

(i) Policy, regulatory reform, administration reform are well implemented.

(ii) Comprehensive renovation is continuously implemented, creating resources, stability and sustainability for the period up to 2020 and the following years up to 2050.

- The policies are set for rapid promotion of industries, which have high added values, promotion of export. The labor issues are solved based on the development of tourism, services, and labor intensive industries. Infrastructure systems are basically accomplished. The main industries which create input for economy in 2020 are developed, setting preconditions for development at high level in the next periods.

(4) The Anticipated Scenarios: Scenario with Unfavorable Growth Rate

This scenario is designed based on the following assumptions:

- The international situation is less stable (markets, economic relationships are not really stable).
- Vietnam meets unfavorable conditions in integration into international economy because of challenges and risks from globalization and international economic integration (the economy meets big difficulties after entering WTO in 2005 and implementation of commitments for AFTA in 2006 etc.).
- The positive factors within the country are activated at low levels:

(i) Policy, regulatory reform and administration reform to meet requirements of economic development are slowly implemented in the unfavorable internal conditions.

(ii) Comprehensive renovation is slowly implemented, creating resources, stability and sustainability for the period after 2020 and the following years up to 2050.

- The industries for export, which have high added values, are moderately developed. The laboring issues are not completely solved. Infrastructure systems are developed at low level. Selective main industries which create input for economy in 2020 are developed, setting preconditions for sustainable development in the next periods.

(5) Base Growth Rate Scenario

There is an opinion much capital funds are required in order to implement the high growth scenario. I t can be considered that the some policies and reforms in high growth scenario are not implemented. The situation is considered as another scenario. The

scenario is defended as "Base growth rate scenario". The assumptions of "Base growth rate scenario" are the same ones of the high growth scenario, but it is assumed that some assumptions of them are realized.

4.3 Social Economic Development plan by Scenario

(1) High Growth Rate Scenario

The scenario with high economic growth rate is determined with growth rate of 7.5 % for the period 2001-2005 and 8.5 % for the period 2006-2010. The conditions are very favorable. The integration is successful and Vietnam will become industrialized country in 2020. Growth rate is 8.5 % for the period 2011-2020 and 8.0 % for 2021-2030.

The industries and construction sector will be relatively developed, with average growth rate of 10 % for the period up to 2020. Development of agriculture is stable at growth rate of 2-3.5 %. Services will have rapid development. The average growth rate of services will be above 7 %.

The economic structure is strongly changed because of high growth rates of industries, construction and services. The share of agriculture in GDP is reduced to 10.8 % in 2020 and 3.2 % in 2050. By 2050 the economic structure will be as follows: share of industry is 46.6 %, services 50.2 %, agriculture 3.2 %.

(2) Low Growth Rate Scenario

The analysis and calculations indicate that there are many challenges for all countries including Vietnam for maintaining high economic growth rates for long term economic development in the period up to 2020 (and years after 2020). If management and operation of the national economy are not good, the policy environment is not improved to encourage investment activities (within the country and from overseas), local resources are not activated enough, economic activities are ineffective, international economic integration is unsuccessful, the economic growth rate will be very low. In such context, growth rates are 6.0 % in the period 2006-2010; 7.0 % in 2011-2020; 7.0 % in 2021-2030 and 5 % in the next period. Average growth rate over the whole period is about 6.3 %.

In this scenario, growth rates of industry, construction, agriculture and services are low. The industry and construction will reach a growth rate of 8.0 % in the period 2006-2010, then over 8 %, and then will be reduced to 6-7 % at the end of the period. Development of

agriculture is stable at a low level; average growth rate is of 2.5 % over the whole period. Development of services is also at a low level with average growth rate of 5.6 % for the whole period up to 2050.

(3) Base Growth Rate Scenario

The economic growth rates are anticipated as follows: over 7.5 % for the period 2006-2010; about 7.2 % for 2011-2020; about 7.0 % for 2021-2030. In this scenario, the development of agriculture is maintained at a similar level to that of a high development scenario, the growth rates of industry and service sectors are lower than high development scenario.

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Table 4-3-1 Economic Forecast (High Case)

No	Item	Unit	2004	2005	2010	2015	2020	2030
I	Population	Mill. Person	82.07	83.22	87.77	93.01	97.85	105.41
II	GDP (At Constant 1994 P	Bill. VND	362,092	390,814	586,878	884,179	1,329,501	2,870,294
1	Agriculture, Forest & Fish	Bill. VND	73,309	75,802	90,028	104,368	120,991	154,878
2	Industry & Construction	Bill. VND	142,601	157,574	265,522	427,625	688,694	1,557,127
3	Service	Bill. VND	146,182	157,438	231,328	352,186	519,816	1,158,288
III	GDP (At Present Price)	Bill. VND	713,071	808,440	1,549,231	2,968,159	5,666,719	19,705,072
1	Agriculture, Forest & Fish	Bill. VND	155,144	169,434	264,501	403,031	614,115	1,358,121
2	Industry & Construction	Bill. VND	285,864	330,446	697,603	1,407,554	2,840,022	10,078,719
3	Service	Bill. VND	272,063	308,560	587,127	1,157,574	2,212,582	8,268,231
IV	Share of Economic Secto	%	100.0	100.0	100.0	100.0	100.0	100.0
1	Agriculture, Forest & Fish	%	21.8	21.0	17.1	13.6	10.8	6.9
2	Industry & Construction	%	40.1	40.9	45.0	47.4	50.1	51.1
3	Service	%	38.2	38.2	37.9	39.0	39.0	42.0
V	GDP per capita	USD	550	604	1002	1652	2736	8058
	Exchange Rate	VND/USD	15785	16077	17621	19313	21168	23200
VI	GDP							
	GDP (At Current Prices)	Bill. USD	45.2	50.3	87.9	153.7	267.7	849.3
	GDP (At Constant 1994 P	Bill. USD	32.9	35.6	53.5	80.4	120.9	260.9
VII	**Growth Rate**		**2004-2005**	**2006-2010**	**2011-2020**	**2021-2030**	**2031-2040**	**2041-2050**
1	Population		1.40%	1.07%	1.09%	0.75%	0.52%	0.32%
2	GDP (At Constant 1994 Prices)		8.0%	8.5%	8.5%	8.0%	7.0%	6.3%
	Agriculture, Forest & Fishery		3.4%	3.5%	3.0%	2.5%	2.0%	2.0%
	Industry & Construction		10.5%	11.0%	10.0%	8.5%	7.0%	6.0%
	Service		7.7%	8.0%	8.4%	8.3%	7.5%	6.9%

Table 4-3-2 Economic Forecast (Base Case)

No	Item	Unit	2000	2004	2005	2010	2015	2020	2030
I	Population	Mill. Person	77.64	82.07	83.22	87.77	93.01	97.85	105.41
II	GDP (At 1994 Price)	Bill. VND	273,666	362,092	390,814	564,536	794,802	1,125,208	2,213,455
1	Agriculture, Forest & Fishery	Bill. VND	63,717	73,309	75,802	87,875	101,871	118,096	151,173
2	Industry & Construction	Bill. VND	96,913	142,601	157,574	253,775	376,344	558,111	1,150,285
3	Service	Bill. VND	113,036	146,182	157,438	222,886	316,587	449,000	911,996
III	GDP (At Present Price)	Bill. VND	441,646	713,071	808,440	1,490,615	2,672,715	4,812,107	15,281,132
1	Agriculture, Forest & Fishery	Bill. VND	108,356	155,144	169,434	258,174	393,390	599,424	1,325,632
2	Industry & Construction	Bill. VND	162,220	285,864	330,446	666,741	1,238,758	2,301,526	7,445,381
3	Service	Bill. VND	171,070	272,063	308,560	565,701	1,040,567	1,911,157	6,510,120
IV	Share of Economic Sectors	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1	Agriculture, Forest & Fishery	%	24.5	21.8	21.0	17.3	14.7	12.5	8.7
2	Industry & Construction	%	36.7	40.1	40.9	44.7	46.3	47.8	48.7
3	Service	%	38.7	38.2	38.2	38.0	38.9	39.7	42.6
V	GDP per capita	USD	404	550	604	964	1488	2323	6249
	Exchange Rate	VND/USD	14094	15785	16077	17621	19313	21168	23200
VI	GDP								
	GDP (At Present Price)	Bill. USD	31.3	45.2	50.3	84.6	138.4	227.3	658.7
	GDP (At 1994 Price)	Bill. USD	24.9	32.9	35.6	51.0	72.3	102.3	201.2
VIII	**Growth Rate**		**2001-2004**	**2004-2005**	**2006-2010**	**2011-2020**	**2021-2030**	**2031-2040**	**2041-2050**
1	Population		1.40%	1.40%	1.07%	1.09%	0.75%	0.52%	0.32%
2	GDP (At 1994 Price)		7.3%	8.0%	7.6%	7.2%	7.0%	6.5%	5.0%
	Agriculture, Forest & Fishery		3.6%	3.4%	3.0%	3.0%	2.5%	2.0%	1.8%
	Industry & Construction		10.1%	10.5%	10.0%	8.2%	7.5%	6.5%	5.1%
	Service		6.6%	7.7%	7.2%	7.3%	7.3%	7.1%	5.2%

Table 4-3-3 Economic Forecast (Low Case)

No	Item	Unit	2000	2004	2005	2010	2015	2020	2030
I	Population	Mill. Person	77.64	82.07	83.22	87.77	93.01	97.85	105.41
II	GDP (At 1994 Price)	Bill. VND	273,666	362,092	390,814	527,322	733,991	1,029,461	2,025,105
1	Agriculture, Forest & Fishery	Bill. VND	63,717	73,309	75,802	90,028	104,368	120,991	154,878
2	Industry & Construction	Bill. VND	96,913	142,601	157,574	231,528	348,139	523,481	1,183,582
3	Service	Bill. VND	113,036	146,182	157,438	205,765	281,485	384,989	686,645
III	GDP (At Present Price)	Bill. VND	441,646	713,071	808,440	1,395,039	2,474,142	4,411,528	13,920,509
1	Agriculture, Forest & Fishery	Bill. VND	108,356	155,144	169,434	264,501	403,031	614,115	1,358,121
2	Industry & Construction	Bill. VND	162,220	285,864	330,446	608,292	1,145,920	2,158,719	7,660,900
3	Service	Bill. VND	171,070	272,063	308,560	522,246	925,192	1,638,694	4,901,488
IV	Share of Economic Sectors	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1	Agriculture, Forest & Fishery	%	24.5	21.8	21.0	19.0	16.3	13.9	9.8
2	Industry & Construction	%	36.7	40.1	40.9	43.6	46.3	48.9	55.0
3	Service	%	38.7	38.2	38.2	37.4	37.4	37.1	35.2
V	GDP per capita	USD	404	550	604	902	1377	2130	5692
	Exchange Rate	VND/USD	14094	15785	16077	17621	19313	21168	23200
VI	GDP								
	GDP (At Present Price)	Bill. USD	31.3	45.2	50.3	79.2	128.1	208.4	600.0
	GDP (At 1994 Price)	Bill. USD	24.9	32.9	35.6	47.6	66.7	93.6	184.1
VIII	**Growth Rate**		**2001-2004**	**2004-2005**	**2006-2010**	**2011-2020**	**2021-2030**	**2031-2040**	**2041-2050**
1	Population		1.40%	1.40%	1.07%	1.09%	0.75%	0.52%	0.32%
2	GDP (At 1994 Price)		7.3%	8.0%	6.2%	7.0%	7.0%	6.5%	5.0%
	Agriculture, Forest & Fishery		3.6%	3.4%	3.5%	3.0%	2.5%	2.0%	2.0%
	Industry & Construction		10.1%	10.5%	8.0%	8.5%	8.5%	7.0%	6.0%
	Service		6.6%	7.7%	5.5%	6.5%	6.0%	6.5%	3.4%

Chapter 5. Data Collection

For building and simulating a model, the actual data and future policies are required. The actual data have to be prepared more than ten years for econometric model.

In JICA model, especially, power demand forecasting model uses economic data, energy and power demand data, several kinds of coefficient data and energy and power supply data. In the model, those data are collected from the following sources (Organizations and internet services).

The econometric model usually needs exogenous variables. The variables are usually political or intentional variables. The energy demand are affected by the national energy supply plan, then the energy supply plan are input in the model as exogenous variables.

In the following “Data sheet”, “Actual data” column and “Future value” column are prepared for describing the sources. The data of the variables are collected from the numbers in actual data column and future value column. The numbers are allocated to the sources in the following table.

Table 5-1-1 Data sources

NO	Sources	Supplied by
Blank	The data are Calculated in the model	
1	The data are collectable by IE. The data are published by IE	The Institute of Energy
2	Key Indicators (Vietnam) http://www.adb.org/Documents/Books/Key_Indicators/2005/xls/VIE.xls	Asian Development Bank
3	Political matters	EEN and MOI
4	WTI (West Texas Index) http://www.oilnergy.com/1opost.htm#since78	WTI
5	IEA data and report http://www.iea.org/	IEA
6	Latest data are used for the future	

Table 5-1-2 Data sources for economic data

NO	Sources	Supplied by
Blank	Calculation in the model	
1	The data are collected by IE, or published by IE	The Institute of Energy
2	Economic Indicators	Asian Development Bank
3	Refer to EVN and MOI plans	EVN and MOI
4	WTI (West Texas Index)	http://www.oilnergy.com/1opost.htm#since78
5	IEA data and report	IEA
6	Latest data are used for the future	Analyst

						Actual Data	Future values
5	IE data	Economic data	Exchange rate	Dn/US$	ECEXC	1	1
7	IE data	Population	Country number	Million persons	POPNUM	1	
8			Growth rate	G%	POPNGR		1
9			Urban number	Million persons	POPUBN		
10			Urban population share	S%	POPUGR	1	1
12	IE data	Household	County Number	Million HH	HHNUM	1	
13			Growth rate	G%	HHNGR		
14			Urban number	Million HH	HHUBN		
15			Urban HH rate	S%	HHUGR		
17	ADB	Labor number	Agriculture	Million persons	LABAGR	2	
18	ADB		Manufacturing & Mining	Million persons	LABMAN	2	
19	ADB		Services & Others	Million persons	LABOTH	2	
20	ADB		Unemployed	Million persons	LABUNE	2	
21			Total	Million persons	LABTOT		
23			Labor force share to Pop	%	LABSHP		
25		Labor shares	Agriculture & Forestry	S%	LASAGR		
26			Manufacturing & Mining	S%	LASMAN		
27			Services & Others	S%	LASOTH		
28			Unemployed	S%	LASUNE		
29			Total	S%	LASTOT		
31	IE data	GDP	nGDP at current price	Billion Dn	GDNOM	1	
32			Growth rate	G%	GDNGR		
34			uGDP on US $ base	Million US$	GDDOL		
35			Growth rate	G%	GDDGR		
37			uGDP per capita on US$ bas	US$ per capita	GDPDOL		
38			Growth rate	G%	GDPDGR		
40			rGDP at 1994 price	Billion Dn	RGDP	1	
41	IE data		Growth rate	G%	RGDPGR		1
43	IE data		GDP deflator 1994 price	1994=100	GDFLT	1	
44			Growth rate	G%	GDFGR		1
46	ADB		rGross Domestic Savings	Billion Dn	GDSAV	1	
47			Share to GDP	%	GDSHA		6
48			Elasticity to Private Con		GDEVPC		
50			rLabor productivity in Man	1000 Dn /persons	LAPMAN		
51			Growth rate	G%	LAPMGR		
54	IE data	nGDE at the cu	Final consumption	Billion Dn	NGEFC	1	
55	IE data		Gross fixed capital format	Billion Dn	NGEGF	1	
56	IE data		Exports of goods and servi	Billion Dn	NGEEX	1	
57	IE data		Import of goods and servic	Billion Dn	NGEIM	1	
58	IE data		Statistical discrepancy	Billion Dn	NGESD	1	
59			Total	Billion Dn	NGETOT		

Table 5-1-3 Data sources for GDP data

NO	Sources	Supplied by
Blank	Calculation in the model	
1	The data are collected by IE, or published by IE	The Institute of Energy
2	Economic Indicators	Asian Development Bank
3	Refer to EVN and MOI plans	EVN and MOI
4	WTI(West Texas Index)	http://www.oilnergy.com/1opost.htm#since78
5	IEA data and report	IEA
6	Latest data are used for the future	Analyst

						Actual Data	Future values
61		rGDE at 1994 p	Final consumption	Billion Dn	RGEFC		
62			Gross fixed capital format	Billion Dn	RGEGF		
63			Exports of goods and servi	Billion Dn	RGEEX		
64			Import of goods and servic	Billion Dn	RGEIM		
65			Statistical discrepancy	Billion Dn	RGESD		
66			Total	Billion Dn	RGETOT		
67							
68		Shares of rGDE	Final consumption	%	RREFC		
69			Gross fixed capital format	%	RREGF		
70			Exports of goods and servi	%	RREEX		
71			Import of goods and servic	%	RREIM		
72			Statistical discrepancy	%	RRESD		
73			Total	%	RRETOT		
74							
75	IE data	nGDP at the cu	Agriculture & Forestry	Billion Dn	NGPAGR	1	
76	IE data		Manufacturing & Mining	Billion Dn	NGPMAN	1	
77	IE data		Commercial & Trade	Billion Dn	NGPTRA	1	
78	IE data		Transport and communicatic	Billion Dn	NGPTRN	1	
79	IE data		Service & Others	Billion Dn	NGPSER	1	
80			Total	Billion Dn	NGPTOT		
81							
82		rGDP at 1994 p	Agriculture & Forestry	Billion Dn	RGPAGR		
83			Manufacturing & Mining	Billion Dn	RGPMAN		
84			Commercial & Trade	Billion Dn	RGPTRA		
85			Transport and communicatic	Billion Dn	RGPTRN		
86			Service & Others	Billion Dn	RGPSER		
87			Total	Billion Dn	RGPTOT		
88							
89		Shares of rGDP	Agriculture & Forestry	S%	SHPAGR		
90			Manufacturing & Mining	S%	SHPMAN		
91			Commercial & Trade	S%	SHPTRA		
92			Transport and communicatic	S%	SHPTRN		
93			Service & Others	S%	SHPSER		
94			Total	S%	SHPTOT		
95							
96		Sector growth	Agriculture & Forestry		RRPAGR		1
97			Manufacturing & Mining		RRPMAN		1
98			Commercial & Trade		RRPTRA		1
99			Transport and communications		RRPTRN		1
100			Service & Others		RRPSER		1
101			Total		RRPTOT		
102							
103		Elasticity	Agriculture & Forestry		ELAAGR		
104			Manufacturing & Mining		ELAMAN		
105			Commercial & Trade		ELATRA		
106			Transport and communications		ELATRN		
107			Service & Others		ELASER		
108			Total		ELATOT		
109							
110							
111		rGDP by Elasti	Agriculture & Forestry		WRKAGR		
112			Manufacturing & Mining		WRKMAN		
113			Commercial & Trade		WRKTRA		
114			Transport and communications		WRKTRN		
115			Service & Others		WRKSER		
116			Total		WRKTOT		
117							

Table 5-1-4 Data sources for Energy efficiencies and prices

NO	Sources	Supplied by
Blank	Calculation in the model	
1	The data are collected by IE, or published by IE	The Institute of Energy
2	Economic Indicators	Asian Development Bank
3	Refer to EVN and MOI plans	EVN and MOI
4	WTI(West Texas Index)	http://www.oilnergy.com/1opost.htm#since78
5	IEA data and report	IEA
6	Latest data are used for the future	Analyst

						Actual Data	Future values
119	Energy Demand						
120	IE data	Conversion fac	Standard Oil(10000Kcal/kg)	10,000	COFASCO	1	6
121	IE data		Coal(5600Kcal/kg)	5,600	COFACOA	1	6
122	IE data		Gasoline(10500Kcal/kg)	10,500	COFAGAS	1	6
123	IE data		Kerosene (10320Kcal/kg)	10,320	COFAKER	1	6
124	IE data		Diesel (10150Kcal/kg)	10,150	COFADIE	1	6
125	IE data		Petroluem Products	11,500	COFAPET	1	6
126	IE data		Fuel oil (9910Kcal/Kg)	9,910	COFAFUE	1	6
127	IE data		Natural gas (9000Kcal/m3)	9,000	COFANAG	1	6
128	IE data		Renewable energy (3302Kcal	3,302	COFAREW	1	6
129	IE data		Electricity (860Kcal/KWh)	860	COFAELE	1	6
130							
131	IE data	Power efficien	Power from Thermal(Coal)	35%	COPOCOA	1	6
132	IE data		Power from Thermal(FO)	35%	COPOFOT	1	6
133	IE data		Power from Gasturbine(FO)	48%	COPOFOB	1	6
134	IE data		Power from Gasturbine(GAS)	48%	COPOGAB	1	6
135	IE data		Power from Gas steam	40%	COPODAS	1	6
136	IE data		Power from Diesel	36%	COPODIE	1	6
137							
138	IEEJ	Energy price	WTI crude oil price	US$/bbl	EPRCWTI	4	5
139	IE data		Crude oil Price in Vietnam	1000Dn/bbl	EPRCRD	1	
140	IE data		NG price in Vietnam	$/MMBTU	EPRNG	1	
141	IE data		Gasoline price in Vietnam	Dong/kg	EPRGAS	1	
142	IE data		Kerosene price in Vietnam	Dong/kg	EPRKER	1	
143	IE data		Diesel price in Vietnam	Dong/kg	EPRDIE	1	
144	IE data		Fuel oil price in Vietnam	Dong/kg	EPRFO	1	
145	IE data		Electricity for Agricultur	Dn/KWh	EPRELA	1	
146	IE data		Electricity for Residentia	Dn/KWh	EPRELR	1	
147	IE data		Electricity for Industry u	Dn/KWh	EPRELI	1	
148	IE data		Electricity for Commercial	Dn/KWh	EPRELC	1	
149							
150		G.R of Eneergy	WTI crude oil price	%	GRPRWTI		
151			Crude oil Price in Vietnam	%	GRPRCRD		
152			NG price in Vietnam	%	GRPRNG		
153			Gasoline price in Vietnam	%	GRPRGAS		
154			Kerosene price in vietnam	%	GRPRKER		
155			Diesel price in Vietnam	%	GRPRDIE		
156			Fuel oil price in Vietnam	%	GRPRFO		
157			Electricity for Agricultur	%	GRPRAGR		
158			Electricity for Residentia	%	GRPRELR		
159			Electricity for Industry u	%	GRPRELI		
160			Electricity for Commercial	%	GRPRELC		
161							

Table 5-1-5 Data sources for energies in Agriculture and Industry

NO	Sources	Supplied by
Blank	Calculation in the model	
1	The data are collected by IE, or published by IE	The Institute of Energy
2	Economic Indicators	Asian Development Bank
3	Refer to EVN and MOI plans	EVN and MOI
4	WTI(West Texas Index)	http://www.oilnergy.com/1opost.htm#since78
5	IEA data and report	IEA
6	Latest data are used for the future	Analyst

						Actual Data	Future values
4							
162		Agriculture.Fo	Energy conservation rate	S%	PAENCOR	3	3
163			Technical Improvement	%	PAENTEC	3	3
164			Elasticity to Energy price		PAENEVP	3	3
165			Energy intensity to GDP	TOE/Bil Don 1994 pri	PAENEFF		
166			Energy demand before E.sav	KTOE	PAENDEM		
167			Energy demand after E.sav	KTOE	PAENDEA		
168			Electricity ratio	S%	PAENELR		5
169			Power demand (kTOE)	KTOE	PAENELT		
170	IE data		Power demand (GWh)	GWh	PAENELE	5	
171							
172	IE data		Coal demand	KTOE	PADMCOA	5	
173	IE data		LPG demand	KTOE	PADMLPG	5	
174	IE data		Gasoline demand	KTOE	PADMGAS	5	
175	IE data		Jetfuel demand	KTOE	PADMJET	5	
176	IE data		Kerosene demand	KTOE	PADMKER	5	
177	IE data		Diesel demand	KTOE	PADMDIE	5	
178	IE data		Fuel oil demand	KTOE	PADMFUL	5	
179	IE data		Natural gas demand	KTOE	PADMNG	5	
180	IE data		Renewable energy demand	KTOE	PADMREW	5	
181			Total	KTOE	PADMTOT		
182							
183		0.0	Coal demand	S%	PASMCOA		3
184		0.0	LPG demand	S%	PASMLPG		3
185		0.0	Gasoline demand	S%	PASMGAS		3
186		0.0	Jetfuel demand	S%	PASMJET		3
187		0.0	Kerosene demand	S%	PASMKER		3
188		0.0	Diesel demand	S%	PASMDIE		3
189		0.0	Fuel oil demand	S%	PASMFUL		3
190		0.0	Natural gas demand	S%	PASMNG		3
191		0.0	Renewable energy demand	S%	PASMREW		3
192		0.0	Total	S%	PASMTOT		3
193							
194		Industry	Energy conservation rate	S%	MANNCOR	3	3
195			Technical Improvement	%	MANNTEC	3	3
196			Elasticity to Energy price		MANNEVP	3	3
197			Energy intensity to GDP	TOE/Bil Don	MANNEFF		
198			Energy demand before E.sav	KTOE	MANNDEM		
199			Energy demand after E.sav	KTOE	MANNDEA		
200			Electricity ratio	S%	MANNELR		5
201			Power demand (kTOE)	KTOE	MANNELT		
202	IE data		Power demand (GWh)	GWh	MANNELE	5	
203							
204	IE data		Coal demand	KTOE	MANMCOA	5	
205	IE data		LPG demand	KTOE	MANMLPG	5	
206	IE data		Gasoline demand	KTOE	MANMGAS	5	
207	IE data		Jetfuel demand	KTOE	MANMJET	5	
208	IE data		Kerosene demand	KTOE	MANMKER	5	
209	IE data		Diesel demand	KTOE	MANMDIE	5	
210	IE data		Fuel oil demand	KTOE	MANMFUL	5	
211	IE data		Natural gas demand	KTOE	MANMNG	5	
212	IE data		Renewable energy demand	KTOE	MANMREW	5	
213			Total	KTOE	MANMTOT		
214							
215		0.0	Coal demand	S%	MASMCOA		3
216		0.0	LPG demand	S%	MASMLPG		3
217		0.0	Gasoline demand	S%	MASMGAS		3
218		0.0	Jetfuel demand	S%	MASMJET		3
219		0.0	Kerosene demand	S%	MASMKER		3
220		0.0	Diesel demand	S%	MASMDIE		3
221		0.0	Fuel oil demand	S%	MASMFUL		3
222		0.0	Natural gas demand	S%	MASMNG		3
223		0.0	Renewable energy demand	S%	MASMREW		3
224		0.0	Total	S%	MASMTOT		3
225							

Table 5-1-6 Data sources for energies in Transportation and Commercial

NO	Sources	Supplied by
Blank	Calculation in the model	
1	The data are collected by IE, or published by IE	The Institute of Energy
2	Economic Indicators	Asian Development Bank
3	Refer to EVN and MOI plans	EVN and MOI
4	WTI (West Texas Index)	http://www.oilnergy.com/1opost.htm#since78
5	IEA data and report	IEA
6	Latest data are used for the future	Analyst

						Actual Data	Future values
226		Transportation	Energy conservation rate	S%	TRENCOR	3	3
227			Technical Improvement	%	TRENTEC	3	3
228			Elasticity to Energy price		TRENEVP	3	3
229			Energy intensity to GDP	TOE/Bil Don	TRENEFF		
230			Energy demand before E.sav	KTOE	TRENDEM		
231			Energy demand after E.sav	KTOE	TRENDEA		
232			Electricity ratio	S%	TRENELR		5
233	IE data		Power demand (kTOE)	KTOE	TRENELT		
234			Power demand (GWh)	GWh	TREENELE	5	
235							
236	IE data		Coal demand	KTOE	TREMCOA	5	
237	IE data		LPG demand	KTOE	TREMLPG	5	
238	IE data		Gasoline demand	KTOE	TREMGAS	5	
239	IE data		Jetfuel demand	KTOE	TREMJET	5	
240	IE data		Kerosene demand	KTOE	TREMKER	5	
241	IE data		Diesel demand	KTOE	TREMDIE	5	
242	IE data		Fuel oil demand	KTOE	TREMFUL	5	
243	IE data		Natural gas demand	KTOE	TREMNG	5	
244	IE data		Renewable energy demand	KTOE	TREMREW	5	
245			Total	KTOE	TREMTOT		
246							
247		0.0	Coal demand	S%	TRSMCOA		3
248		0.0	LPG demand	S%	TRSMLPG		3
249		0.0	Gasoline demand	S%	TRSMGAS		3
250		0.0	Jetfuel demand	S%	TRSMJET		3
251		0.0	Kerosene demand	S%	TRSMKER		3
252		0.0	Diesel demand	S%	TRSMDIE		3
253		0.0	Fuel oil demand	S%	TRSMFUL		3
254		0.0	Natural gas demand	S%	TRSMNG		3
255		0.0	Renewable energy demand	S%	TRSMREW		3
256		0.0	Total	S%	TRSMTOT		3
257							
258		Commercials &	Energy conservation rate	S%	COMNCOR	3	3
259			Technical Improvement	%	COMNTEC	3	3
260			Elasticity to Crude oil price		COMNEVP	3	3
261			Energy intensity to GDP	TOE/Bil Don	COMNEFF		
262			Energy demand before E.sav	KTOE	COMNDEM		
263			Energy demand after E.sav	KTOE	COMNDEA		
264			Electricity ratio	S%	COMNELR		5
265			Power demand (kTOE)	KTOE	COMNELT		
266	IE data		Power demand (GWh)	GWh	COMNELE	5	
267							
268	IE data		Coal demand	KTOE	COMMCOA	5	
269	IE data		LPG demand	KTOE	COMMLPG	5	
270	IE data		Gasoline demand	KTOE	COMMGAS	5	
271	IE data		Jetfuel demand	KTOE	COMMJET	5	
272	IE data		Kerosene demand	KTOE	COMMKER	5	
273	IE data		Diesel demand	KTOE	COMMDIE	5	
274	IE data		Fuel oil demand	KTOE	COMMFUL	5	
275	IE data		Natural gas demand	KTOE	COMMNG	5	
276	IE data		Renewable energy demand	KTOE	COMMREW	5	
277			Total	KTOE	COMMTOT		
278							
279		0.0	Coal demand	S%	COSMCOA		3
280		0.0	LPG demand	S%	COSMLPG		3
281		0.0	Gasoline demand	S%	COSMGAS		3
282		0.0	Jetfuel demand	S%	COSMJET		3
283		0.0	Kerosene demand	S%	COSMKER		3
284		0.0	Diesel demand	S%	COSMDIE		3
285		0.0	Fuel oil demand	S%	COSMFUL		3
286		0.0	Natural gas demand	S%	COSMNG		3
287		0.0	Renewable energy demand	S%	COSMREW		3
288		0.0	Total	S%	COSMTOT		3
289							

Table 5-1-7 Data sources for energies in Residential and Others sectors

NO	Sources	Supplied by
Blank	Calculation in the model	
1	The data are collected by IE, or published by IE	The Institute of Energy
2	Economic Indicators	Asian Development Bank
3	Refer to EVN and MOI plans	EVN and MOI
4	WTI(West Texas Index)	http://www.oilnergy.com/1opost.htm#since78
5	IEA data and report	IEA
6	Latest data are used for the future	Analyst

						Actual Data	Future values
290		Residentials	Energy conservation rate	S%	RESNCOR	3	3
291			Technical Improvement	%	RESNTEC	3	3
292			Elasticity to Energy price		RESNEVP	3	3
293			Energy intensity to GDP	TOE/Bil Don	RESNEFF		
294			Energy demand before E.sav	KTOE	RESNDEM		
295			Energy demand after E.sav	KTOE	RESNDEA		
296			Electricity ratio	S%	RESNELR		5
297			Power demand (kTOE)	KTOE	RESNELT		
298	IE data		Power demand (GWh)	GWh	RESENELE	5	
299							
300	IE data		Coal demand	KTOE	REDMCOA	5	
301	IE data		LPG demand	KTOE	REDMLPG	5	
302	IE data		Gasoline demand	KTOE	REDMGAS	5	
303	IE data		Jetfuel demand	KTOE	REDMJET	5	
304	IE data		Kerosene demand	KTOE	REDMKER	5	
305	IE data		Diesel demand	KTOE	REDMDIE	5	
306	IE data		Fuel oil demand	KTOE	REDMFUL	5	
307	IE data		Natural gas demand	KTOE	REDMNG	5	
308	IE data		Renewable energy demand	KTOE	REDMREW	5	
309			Total	KTOE	REDMTOT		
310							
311		0.0	Coal demand	S%	RESMCOA		3
312		0.0	LPG demand	S%	RESMLPG		3
313		0.0	Gasoline demand	S%	RESMGAS		3
314		0.0	Jetfuel demand	S%	RESMJET		3
315		0.0	Kerosene demand	S%	RESMKER		3
316		0.0	Diesel demand	S%	RESMDIE		3
317		0.0	Fuel oil demand	S%	RESMFUL		3
318		0.0	Natural gas demand	S%	RESMNG		3
319		0.0	Renewable energy demand	S%	RESMREW		3
320		0.0	Total	S%	RESMTOT		3
321							
322		Others	Energy conservation rate	S%	NONNCOR	3	3
323			Technical Improvement	%	NONNTEC	3	3
324			Elasticity to Energy price		NONNEVP	3	3
325			Energy intensity to GDP	TOE/Bil Don	NONNEFF		
326			Energy demand before E.sav	KTOE	NONNDEM		
327			Energy demand after E.sav	KTOE	NONNDEA		
328			Electricity ratio	S%	NONNELR		5
329			Power demand (kTOE)	KTOE	NONNELT		
330	IE data		Power demand (GWh)	GWh	NONNELE	5	
331							
332	IE data		Coal demand	KTOE	NONMCOA		
333	IE data		LPG demand	KTOE	NONMLPG		
334	IE data		Gasoline demand	KTOE	NONMGAS		
335	IE data		Jetfuel demand	KTOE	NONMJET		
336	IE data		Kerosene demand	KTOE	NONMKER		
337	IE data		Diesel demand	KTOE	NONMDIE		
338	IE data		Fuel oil demand	KTOE	NONMFUL		
339	IE data		Natural gas demand	KTOE	NONMNG		
340	IE data		Renewable energy demand	KTOE	NONMREW		
341			Total	KTOE	NONMTOT		
342							
343		0.0	Coal demand	S%	NOSMCOA		
344		0.0	LPG demand	S%	NOSMLPG		
345		0.0	Gasoline demand	S%	NOSMGAS		
346		0.0	Jetfuel demand	S%	NOSMJET		
347		0.0	Kerosene demand	S%	NOSMKER		
348		0.0	Diesel demand	S%	NOSMDIE		
349		0.0	Fuel oil demand	S%	NOSMFUL		
350		0.0	Natural gas demand	S%	NOSMNG		
351		0.0	Renewable energy demand	S%	NOSMREW		
352		0.0	Total	S%	NOSMTOT		
353							

Table 5-1-8 Power Demand and Supply in the whole country

NO	Sources	Supplied by
Blank	Calculation in the model	
1	The data are collected by IE, or published by IE	The Institute of Energy
2	Economic Indicators	Asian Development Bank
3	Refer to EVN and MOI plans	EVN and MOI
4	WTI(West Texas Index)	http://www.oilnergy.com/1opost.htm#since78
5	IEA data and report	IEA
6	Latest data are used for the future	Analyst

						Actual Data	Future values
354		Power demand in	Agriculture.Forestry.Fishe	GWh	PWDMPA		
355			manufacturing	GWh	PWDMMN		
356			Transportation	GWh	PWDMTR		
357			Commercials.Banking..Servi	GWh	PWDMCM		
358			Residentials	Gwh	PWDMRE		
359			Other	GWh	PWDMNO		
360			Total	GWh	PWDMTOT		
361							
362		Energy Demand	Coal demand	KTOE	DEDCOA		
363			LPG demand	KTOE	DEDLPG		
364			Gasoline demand	KTOE	DEDGAS		
365			Jetfuel demand	KTOE	DEDJET		
366			Kerosene demand	KTOE	DEDKER		
367			Diesel demand	KTOE	DEDDIE		
368			Fuel oil demand	KTOE	DEDFUE		
369			Petroleum total	KTOE	DEDSTO		
370			Natural gas demand	KTOE	DEDNG		
371			Renewable energy demand	KTOE	DEDREW		
372			Power	KTOE	DEDPOW		
373			Total(Coal+Petro+Renew+Pow	KTOE	DEDTOT		
374							
375		Power supply	Power distribution loss	S%	PWGELOR	1	1
376	IE data		Power distribution loss (G	GWh	PWLOSSG	1	
377	IE data		Own use in Power sector(GW	GWh	PWOWNG	1	
378			Power distribution loss (K	KTOE	PWLOSST		
379			Own use in Power sector(KT	KTOE	PWOWNT		
380							
381	IE data		Power from Hydro	GWh	PWGEHYD	1	1
382	IE data		Power from Fossil	GWh	PWGEFOS		
383	IE data		Power foreign trade balanc	GWh	PWGEBAL	1	1
384	IE data		Power from Renewable energ	GWh	PWGENEW	1	1
385	IE data		Power from Nuclear	GWh	PWGENCL	1	1
386			Total of power generation	GWh	PWGETOT		
387							
388			Power from Thermal(Coal)	GWh	PWGECOA	1	
389			Power from Thermal(FO)	GWh	PWGEFOT	1	
390			Power from Gasturbine(FO)	GWh	PWGEFOB	1	
391			Power from Gasturbine(GAS)	GWh	PWGEGAB	1	
392			Power from Gas steam	GWh	PWGEGAS	1	
393			Power from Diesel	GWh	PWGEDIE	1	
394			Power from Fossil	GWh	PWGEFTT	1	
395							
396	IE data	Power resources	Coal consumption for Therm	KTOE	PWCCCOA	1	
397	IE data		FO consumption for Thermal	KTOE	PWCCFOT	1	
398	IE data		FO consumption for Gasturb	KTOE	PWCCFOB	1	
399	IE data		NG & AG consumption for Tu	KTOE	PWCCGAT	1	
400	IE data		NG & AG consumption for Ga	KTOE	PWCCGAB	1	
401	IE data		Diesel consumption for Die	KTOE	PWCCDIE	1	
402			Total	KTOE	PWCCTOT		
403							
404		0.0	Power from Thermal(Coal)	S% of KTOE	PWSCCOA		3
405		0.0	Power from Thermal(FO)	S% of KTOE	PWSCFOT		3
406		0.0	Power from Gasturbine(FO)	S% of KTOE	PWSCFOB		3
407		0.0	Power from Gasturbine(GAS)	S% of KTOE	PWSCGAT		3
408		0.0	Power from Gas steam	S% of KTOE	PWSCGAB		3
409		0.0	Power from Diesel	S% of KTOE	PWSCDIE		3
410		0.0	Power from Fossil	S% of KTOE	PWSCTOT		3
411							

Table 5-1-9 Power Demand in North region

NO	Sources	Supplied by
Blank	Calculation in the model	
1	The data are collected by IE, or published by IE	The Institute of Energy
2	Economic Indicators	Asian Development Bank
3	Refer to EVN and MOI plans	EVN and MOI
4	WTI(West Texas Index)	http://www.oilnergy.com/1opost.htm#since78
5	IEA data and report	IEA
6	Latest data are used for the future	Analyst

						Actual Data	Future values
462	Regional Power demand						
463		<Northern region >					
464	Year Boo	(1) Census	Population	Million	NPOP	1	
465			G.R. of Population	G%	NPOPX		1
466							
467		(3) NGDP nomin	NGDP	Million Dong	NGNTL	1	
468			Industry	Million Dong	NGNIN	1	
469			Commercial	Million Dong	NGNCO	1	
470			Agriculture	Million Dong	NGNAG	1	
471							
472			Share of NGDP	%	NGNTLX		
473			Share of Industry	%	NGNINX		
474			Share of Commercial	%	NGNCOX		
475			Share of Agriculture	%	NGNAGX		
476							
477	IE data	(4) RGDP 1994	RGDP	Million Dong	NGRTL	1	
478	IE data		Industry	Million Dong	NGRIN	1	
479	IE data		Commercial	Million Dong	NGRCO	1	
480	IE data		Agriculture	Million Dong	NGRAG	1	
481							
482			G.R. of RGDP	%	NGRTLX		
483			G.R. of Industry	%	NGRINX		
484			G.R. of Commercial	%	NGRCOX		
485			G.R. of Agriculture	%	NGRAGX		
486							
487			GDP E.V. to RGDP		NEVTLX		
488			Industry E.V. to RGDP		NEVINX		
489			Commercial E.V. to RGDP		NEVCOX		
490			Agriculture E.V. to RGDP		NEVAGX		
491							
492	IE data	(5) Power dema	N-total	GWh	NWDTOT	1	
493	IE data		Agriculture.Forestry.Fishe	GWh	NWDMAG	1	
494	IE data		Industry & Construction	GWh	NWDMIN	1	
495	IE data		Commercials & Services.	GWh	NWDMCO	1	
496	IE data		Office & Residentials	Gwh	NWDMRE	1	
497	IE data		Others	GWh	NWDMOT	1	
498							
499		(6) Power dema	N-total	GWh	NADTOT	1	
500		Adjusted	Agriculture.Forestry.Fishe	GWh	NADMAG	1	
501			Industry & Construction	GWh	NADMIN	1	
502			Commercials & Services.	GWh	NADMCO	1	
503			Office & Residentials	GWh	NADMRE	1	
504			Others	GWh	NADMOT	1	
505							
506		(7) Load facto	LF	%	NLOADF	1	3
507			Peak demand	MW	NPMAX	1	
508							
509							
460							

Table 5-1-10 Power Demand in Center region

NO	Sources	Supplied by
Blank	Calculation in the model	
1	The data are collected by IE, or published by IE	The Institute of Energy
2	Economic Indicators	Asian Development Bank
3	Refer to EVN and MOI plans	EVN and MOI
4	WTI(West Texas Index)	http://www.oilnergy.com/1opost.htm#since78
5	IEA data and report	IEA
6	Latest data are used for the future	Analyst

						Actual Data	Future values
4							
510		<Central region >					
511		(1) Census	Population	Milliom	CPOP	1	
512			G.R. of Population	G%	CPOPX		1
513							
514		(3) GDP nomin	NGDP	Million Dong	CGNTL	1	
515			Industry	Million Dong	CGNIN	1	
516			Commercial	Million Dong	CGNCO	1	
517			Agriculture	Million Dong	CGNAG	1	
518							
519			Share of NGDP	%	CGNTLX		
520			Share of Industry	%	CGNINX		
521			Share of Commercial	%	CGNCOX		
522			Share of Agriculture	%	CGNAGX		
523							
524	IE data	(4) RGDP 1994 p	RGDP	Million Dong	CGRTL	1	
525	IE data		Industry	Million Dong	CGRIN	1	
526	IE data		Commercial	Million Dong	CGRCO	1	
527	IE data		Agriculture	Million Dong	CGRAG	1	
528							
529			G.R. of RGDP	%	CGRTLX		
530			G.R. of Industry	%	CGRINX		
531			G.R. of Commercial	%	CGRCOX		
532			G.R. of Agriculture	%	CGRAGX		
533							
534	IE data		GDP E.V. to RGDP		CEVTLX		
535	IE data		Industry E.V. to RGDP		CEVINX		
536	IE data		Commercial E.V. to RGDP		CEVCOX		
537	IE data		Agriculture E.V. to RGDP		CEVAGX		
538							
539	IE data	(5) Power dema	C-total	GWh	CWDTOT	1	
540	IE data		Agriculture.Forestry.Fishe	GWh	CWDMAG	1	
541	IE data		Industry & Construction	GWh	CWDMIN	1	
542	IE data		Commercials & Services.	GWh	CWDMCO	1	
543	IE data		Office & Residentials	Gwh	CWDMRE	1	
544	IE data		Others	GWh	CWDMOT	1	
545							
546		(6) Power dema	C-total	GWh	CADTOT	1	
547		Adjusted	Agriculture.Forestry.Fishe	GWh	CADMAG	1	
548			Industry & Construction	GWh	CADMIN	1	
549			Commercials & Services.	GWh	CADMCO	1	
550			Office & Residentials	Gwh	CADMRE	1	
551			Others	GWh	CADMOT	1	
552							
553		(7) Load facto	LF	%	CLOADF	1	3
554			Peak demand	MW	CPMAX	1	
555							
556							

Table 5-1-11 Power Demand in South region

NO	Sources	Supplied by
Blank	Calculation in the model	
1	The data are collected by IE, or published by IE	The Institute of Energy
2	Economic Indicators	Asian Development Bank
3	Refer to EVN and MOI plans	EVN and MOI
4	WTI(West Texas Index)	http://www.oilnergy.com/1opost.htm#since78
5	IEA data and report	IEA
6	Latest data are used for the future	Analyst

						Actual Data	Future values
4							
557		<Southern region >					
558		(1) Census	Population	Milliom	SPOP	1	
559			Population share	S%	SPOPX		1
560							
561		(3) GDP nomin	NGDP	Million Dong	SGNTL	1	
562			Industry	Million Dong	SGNIN	1	
563			Commercial	Million Dong	SGNCO	1	
564			Agriculture	Million Dong	SGNAG	1	
565							
566			Share of NGDP	%	SGNTLX		
567			Share of Industry	%	SGNINX		
568			Share of Commercial	%	SGNCOX		
569			Share of Agriculture	%	SGNAGX		
570							
571	IE data	(4) RGDP 1994	RGDP	Million Dong	SGRTL	1	
572	IE data		Industry	Million Dong	SGRIN	1	
573	IE data		Commercial	Million Dong	SGRCO	1	
574	IE data		Agriculture	Million Dong	SGRAG	1	
575							
576			G.R. of RGDP	%	SGRTLX		
577			G.R. of Industry	%	SGRINX		
578			G.R. of Commercial	%	SGRCOX		
579			G.R. of Agriculture	%	SGRAGX		
580							
581	IE data		GDP E.V. to RGDP		SEVTLX		
582	IE data		Industry E.V. to RGDP		SEVINX		
583	IE data		Commercial E.V. to RGDP		SEVCOX		
584	IE data		Agriculture E.V. to RGDP		SEVAGX		
585							
586	IE data	(5) Power dema	S-total	GWh	SWDTOT	1	
587	IE data		Agriculture.Forestry.Fishe	GWh	SWDMAG	1	
588	IE data		Industry & Construction	GWh	SWDMIN	1	
589	IE data		Commercials & Services.	GWh	SWDMCO	1	
590	IE data		Office & Residentials	Gwh	SWDMRE	1	
591	IE data		Others	GWh	SWDMOT	1	
592							
593		(6) Power dema	S-total	GWh	SADTOT	1	
594		Adjusted	Agriculture.Forestry.Fishe	GWh	SADMAG	1	
595			Industry & Construction	GWh	SADMIN	1	
596			Commercials & Services.	GWh	SADMCO	1	
597			Office & Residentials	Gwh	SADMRE	1	
598			Others	GWh	SADMOT	1	
599							
600		(7) Load facto	LF	%	SLOADF	1	3
601			Peak demand	MW	SPMAX	1	
602							
603							

添付資料 10-2　参加者リスト及びセミナー実施状況（写真）

Participation List of the Seminar on 28 September, 2005

Ser. No	Name	Institution	Position	Signature
1	Hoàng Đăng Khoa	IE	Engineer	
2	Lê Thu Hà	IE	"	
3	Lê Khắc Hưng	NLDC	"	
4	Nguyễn Thu Hà	NLDC	"	
5	Trần Huyền Linh	IE	"	
6	Nguyễ Hồng Anh	IE	"	
7	Nguyễn Đức Soay	IE	"	
8	Nguyễn Mạnh Cường	IE	"	
9	Nguyễn Thế Thắng	IE	"	
10	Trần Đức	IE	Techn "	
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

Participation List of the Seminar on 29 September, 2005

Ser. No	Name	Institution	Position	Signature
1	Hoàng Đăng Khoa	IE	Staff	
2	Lê Thu Hà	IE	staff	
3	Nguyễn Đức Sang	IE	Staff	
4	Nguyễn Thế Thắng	IE	"	
5	Nguyễn Hoàng Anh	IE	"	
6	~~Nguyễn Đức Sang~~	~~IE~~	"	
7	Nguyễn Mạnh Cường	IE	engineer	
8	Nguyễn Thu Hà	NLDC	engineer	
9	Lê Khắc Hưng	NLDC	"	
10	Trần Huyền Trinh	IE	"	
11	Trần Đức	IE	"	
12				
13				
14				
15				
16				
17				
18				
19				
20				

Explanation of the program theory and the instructions (1)

Explanation of the program theory and the instructions (2)

Exercise in PDPATII

Exercise in MIDFILDER (Improved IMPACT)

Exercise in Training Program for PDP

Explanation of Simulation Result of Training Program for PDP

Questions regarding the theory of MIDFILDER

Questions regarding the theory of PDPATII

Questions regarding the theory of Training Program for PDP

Participants

添付資料 10-3　ソフトライセンス及び供与に関する合意書

Software License and Distribution Agreement

THIS AGREEMENT is made on, October 17, 2005, between
(1) The Tokyo Electric Power Company, Incorporated, a Japanese corporation, having its principal office at 1-3, Uchisaiwai-cho 1-chome, Chiyoda-ku, Tokyo, Japan ("TEPCO"), and
(2) Institute of Energy-Electricity of Vietnam office at No.6 Ton That Tung, Khuong Thuong, Dong Da, Hanoi, Vietnam ("IE").

Whereas, TEPCO has developed, markets and licenses on a worldwide bases and owns all copyright and other proprietary rights to or has the right to license the computer software programs called "MidFielder" (the "Program"), as described more fully in Exhibit A attached hereto; and, Whereas, IE desires to obtain and TEPCO in willing to grant the said license to IE.

NOW THEREFORE, in consideration of the mutual promises and covenants herein contained, TEPCO and IE (the "Parties") agree hereto as follows:

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1.1 Subject to the terms and conditions hereof, TEPCO grants to IE, and IE accepts, a non-transferable and non-exclusive license to use the Program for free.
1.2 IE shall not grant a license to any third parties to use the Program.
1.3 IE shall not render services to any third parties using the Program.
1.4 IE shall not use the Program for any other purpose than those define in Exhibit B.
1.5 IE shall not install the Program to computers that possessed by any third parties.

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2.1 Within thirty(30) business days after execution this agreement, TEPCO shall ship one (1) set of CD-ROMs of the Program to IE by air.

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3.1 Copyright and full ownership of the Program and all materials relating thereto

shall at all times remain in TEPCO.

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4.1 NOTHING IN THIS AGREEMENT SHALL BE CONSTRUED AS:

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C) A REQUIREMENT THAT TEPCO SHALL FILE ANY PATENT APPLICATION, SECURE ANY PATENT OR MAINTAIN ANY PATENT IN FORCE; OR

D) AN OBLIGATION TO BRING OR PROSECUTE ACTIONS OR SUITS AGAINST THIRD PARTIES FOR INFRINGEMENT;

ARTICLE 5. Infringement and Indemnification

5.1 In case IE find third party's infringement of licensed the Program, IE shall promptly notify TEPCO of the infringement.

5.2 IE shall, indemnify and hold TEPCO harmless against any and all liability, damage, loss, cost, or expense (including reasonable attorney's fees) of any kind or nature whatsoever arising out of third party claim or suits in connection with use of the Program.

ARTICLE 6. Confidentiality

6.1 IE acknowledges that the proprietary information and other information disclosed to it by TEPCO under this Agreement ("Confidential Information") is valuable, confidential and proprietary in nature, and agrees that, at all times during the term of this Agreement and forever thereafter, it will hold in confidence all of the Confidential Information received from TEPCO, and that it will not disclose the Confidential Information to any third party, except to its authorized employees, without the prior written consent of TEPCO.

6.2 IE's obligation under this Article with respect to Confidential Information shall not apply to information which i) is already in the possession of IE prior to disclosure by TEPCO and was not acquired by IE directly or indirectly from

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TEPCO; ii) is part of the public domain at the time of disclosure by TEPCO; or, thereafter becomes part of the public domain without fault on the part of IE; or iii) may be acquired hereafter by IE from any third party without any obligation of secrecy.

6.3 Notwithstanding any provision herein to the contrary, the burden of proving that applicability of any of the foregoing exceptions shall be upon IE by clear and convincing evidence by written records.

ARTICLE 7. Term and Termination

7.1 This Agreement shall become effective on the date first above written and shall continue to be in force for five (5) years thereafter.

7.2 IE shall have the right, exercisable in its sole discretion, to renew this Agreement for additional terms of three (3) years each, by notifying TEPCO of such decision in writing, on or before the expiration day of this Agreement.

ARTICLE 8. Effect of Termination or Expiration

8.1 Upon expiration or termination of this Agreement, all the rights of IE under this Agreement shall cease to exist and IE shall promptly return to TEPCO all materials constituting the Program furnished by TEPCO, and IE further agrees that IE will not make further use of any such Program unless otherwise agreed by the Parties in writing.

ARTICLE 9. No Assignment

9.1 This Agreement or any part of this Agreement shall not be assigned or transferred by either Party without the prior consent of the other Party. Any assignment or transfer without such consent shall be null and void.

ARTICLE 10. Governing Law

10.1 This Agreement shall be governed by and construed in accordance with the laws of Japan.

ARTICLE 11. Jurisdiction

11.1 TEPCO and IE submit to the under-exclusive-contract jurisdiction of the Tokyo

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District Court of Japan with respect to all difference and controversies arising in relation to this Agreement.

ARTICLE 12. Notice

12.1 Any notice or demand under this Agreement shall be in writing and in English and shall be deemed to have been sufficiently given for all purposes when personally presented or sent by airmail or telecopier to the addressee at its address set forth above in this Agreement or at such address as the party shall have designated in a written notice sent in accordance with this Agreement. Such notice shall be deemed to be given when actually received, or seven (7) days after the date of mailing if sent by certified or registered airmail.

ARTICLE 13. Entire Agreement

13.1 This Agreement sets forth the entire understanding and agreement between the Parties as to the matters covered in this Agreement and supersedes and replaces any prior understanding, agreement, intent, or memorandum of understanding, in each case, written or oral.

ARTICLE 14. Amendments

14.1 This Agreement may not be amended or modified except by an instrument in writing signed by each of the Parties and expressly referring to this Agreement.

IN WITNESS WHEREOF, the Parties hereto have caused this Agreement to be executed by their duly authorized representatives as of the day and year first above written.

LICENSOR	LICENSEE
The Tokyo Electric Power Company, Incorporated	Institute of Energy-Electricity of Vietnam
By :	By:
Name : Miyamoto Koji	Name : Pham Khanh Toan
Title : Director, General Manager, Intellectual Property Center	Title : Director

Exhibit A

Module of MidFielder

A) MODELGEN: Data handling graphical user interface, which include Database interface
B) MidFielder: Integrated power system analysis software environment, which include script function based on Python
C) APP: Advanced power flow calculation program
D) SCC: Fault current calculation program
E) VTS: Transient stability simulation program
F) LINEAR: Linearized power system calculation system
G) HTML manual

Exhibit B

The purpose of using MidFielder is to analyze

A) Power System Planning,
B) Power System Protection,
C) Power System Operation,
D) Power System Control,
E) Power System Modeling,
F) Power System Simulation,
G) Power System Stability, and
H) Power System Reliability

of IE's power system.