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ベトナム国

電力セクターマスタープラン調査

ファイナルレポート
付属資料-Ⅰ

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独立行政法人
国際協力機構（JICA）

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ファイナルレポート
付属資料-Ⅰ

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ACRONYMS / ABBREVIATIONS

ADB	:	Asian Development Bank	アジア開発銀行
AFC	:	Automatic Frequency Control	自動周波数制御
AFTA	:	ASEAN Free Trade Area	
ASEAN	:	Association of Southeast Asian Nations	東南アジア諸国連合
BOD	:	Board of Directors	
BOM	:	Board of Management	
BOT	:	Build -Operate-Transfer	
CC	:	Combined Cycle	コンバインドサイクル
CDM	:	Clean Development Mechanism	クリーン開発メカニズム
C/P	:	Counterpart	カウンターパート
DO	:	Diesel Oil	ディーゼルオイル
DOE	:	Department of Energy	アメリカ合衆国: エネルギー省
DSCR	:	Debt Service Coverage Ratio	
DSM	:	Demand Side Management	需要側マネジメント
DSS	:	Daily Start and Stop	1日に1回運転停止
DWT	:	Dead Weight Tonnage	積貨荷重トン数
EGAT	:	Electricity Generating Authority of Thailand	タイ電力庁
EIA	:	Environmental Impact Assessment	環境影響評価
EL	:	Elevation	標高
EVN	:	Elctricity of Vietnam	ベトナム電力公社
FO	:	Furnace Oil	重油
FPD	:	Forest Protection Department	
F/S	:	Feasibility Study	フィージビリティ・スタディ
GDP	:	Gross Domestic Product	国内総生産
GMS	:	Greater Mekong Sulregaion	
GT	:	Gas Turbine	ガスタービン
HPP	:	Hydro Power Plant	水力発電所
IE	:	Institute of Energy	エネルギー研究所
IEA	:	International Energy Agency	
IEE	:	Initial Envelopmental Evaluation	初期環境影響評価
IES	:	Initial Envelopmental Study	初期環境調査
IGA	:	Inter Goverment Agreement	
IMPACT	:	Integrated & Multi-purpose Package of Advanced Computational Tools for power system engineering	
IPP	:	Independent Power Producer	独立発電事業者
JBIC	:	Japan Bank for International Cooperation	国際協力銀行
JETRO		Japan External Trade Organization	日本貿易振興機構
JICA	:	Japan International Cooperation Agency	国際協力事業団
LOLE	:	The Loss Of Load Expectation	供給支障時間
M/P, MP	:	Master Plan	マスタープラン
MARD	:	Ministry of Agriculture and Rural Development	農業・地方開発省
MOI	:	Ministry of Industry	工業省
MOF	:	Ministry of Finance	
MONRE	:	Ministry of Natural Resources and Environment	資源環境省
MOSTE	:	Ministry of Science Technology and Environment	科学技術環境省
MPI	:	Ministry of Planning and Investment	計画投資省
NCMPC	:	Ho Chi Minh Power Company	

ACRONYMS / ABBREVIATIONS

NEDO	:	New Energy and Industrial Technology Development Organization	新エネルギー・産業技術総合開発機構
NGO(s)	:	Non-Government Organization(s)	非政府組織
NLDC	:	National Load Dispatching Centers	中央制御所
NTFP	:	Non-Timber Forest Products	非木材森林産物
ODA	:	Official Development Assistance	政府開発援助
OE	:	Oil Equivalent	
OECF	:	The Overseas Economic Cooperation	海外経済協力基金
OJT	:	On the Job Training	
Pre-F/S	:	Preliminary Feasibility Study	
P/S	:	Power Station	発電所
PDPATⅡ	:	Power Development Planning Assist Tool	
PECC1	:	Power Engineering Counsulting Company 1	
PLN	:	Perusahaan Umum Listrik Negara	インドネシア国電力公社
PP	:	Power Purchase	発電事業者
PSPP	:	Pumped Storage Power Plant	揚水発電所
PSS/E	:	Power System Simulator for Engineering	
RETICS	:	Reliability Evaluation Tool for Inter-Connected System	連系系統信頼度評価ツール
SCADA	:	Supervisory Control and Data Acquisition	遠隔監視制御データ収集システム
SEA	:	Strategic Enviromental Assessment	戦略的環境影響評価
SFR	:	Self Financing Ratio	
SHM	:	Stakeholder Meeting	ｽﾃｰｸﾎﾙﾀﾞｰﾐｰﾃｨﾝｸﾞ
Son La PMB	:	Son La Hydropower Project Management Board	
S/S	:	Substation	変電所
ST	:	Steam Turbine	蒸気タービン
TA	:	Technical Asistance	
TEPCO	:	Tokyo Electric Power Company	東京電力㈱
TEPSCO	:	Tokyo Electric Power Services Co., Ltd.	東電設計㈱
T/L	:	Transmission Line	送電線
TOU	:	Time-Of-Use	
VEEA	:	Vietnam Electricity Engineering Association	
WASP	:	Wien Automatic System Planning Package	電源計画プログラム
WB	:	The World Bank	世界銀行
WSS	:	Weekly Start and Stop	週末起動停止
WTI	:	West Texas Intermediate	米国産標準油種
WWF	:	World Wide Fund for Nature	世界自然保護基金

UNITS

Prefixes

μ	:	micro-	=	10^{-6}
m	:	milli-	=	10^{-3}
c	:	centi-	=	10^{2}
d	:	deci-	=	10^{9}
da	:	deca-	=	10
h	:	hecto-	=	10^{2}
k	:	kilo-	=	10^{3}
M	:	mega-	=	10^{6}
G	:	giga-	=	10^{9}

Units of Length

m	:	meter
km	:	kilometer

Units of Area

m^2	:	square meter
km^2	:	square kilometer

Units of Volume

m^3	:	cubic meter
l	:	liter
kl	:	kiloliter

Units of Mass

kg	:	kilogram
t	:	ton (metric)
DWT	:	Dead Weight Tonnage

Units of Energy

kcal	:	kilocalorie
kWh	:	kilowatt-hour
ktoe		Kilo ton oil equivalent (toe)
MWh	:	megawatt-hour
GWh	:	gigawatt-hour
Btu	:	British thermal unit

Units of Heating Value

kcal/kg	:	kilocalorie per kilogram
Btu/kWh	:	British thermal unit per kilo watt hour

Units of Temperature

℃	:	degree Celsius or Centigrade

Units of Electricity

W	:	watt
kW	:	kilowatt
MW	:	megawatt
GW	:	gigawatt
A	:	ampere
V	:	volt
kV	:	kilovolt
kVA	:	kilovolt ampere
MVA	:	megavolt ampere
MVar	:	megavar (mega volt-ampere-reactive)
Ω	:	ohm

UNITS

Units of Time

s	:	second
min	:	minute
h	:	hour
d	:	day
m	:	month
y	:	year

Units of Flow Rate

m/s	:	meter per second
m^3/s	:	cubic meter per second

Units of Currency

VND	:	Vietnam Dong
US$/USD	:	US Dollar

Exchange Rate

1 US$	=	VND 15,830	As of May 2005
1 US$	=	VND 15,825	As of September 2006
1 US$	=	VND 15,844	As of January 2006

添付資料

第 2 章　第 5 次電力 MP のレビュー

添付資料 2-1 ：1997 年以降の電力料金の推移

Electricity Tariff

Unit: dong/kWh

Customers	15/05/97-31/12/98	01/01/99-30/06/99	07/01/99-30/09/99	01/10/99-28/02/02	01.03.02-now
A- Manufacturing					
I- Conventional industries					
Above 110 KV					
-Normal time	700	636	636	700	785
-On-peak time	1150	1045	1045	1240	1325
-Off-peak time	400	364	364	340	425
Under 110 KV					
-Normal time	730	664	664	730	815
-On-peak time	1200	1091	1091	1290	1370
-Off-peak time	420	382	382	360	445
Under 22 KV					
-Normal time	770	700	700	770	860
-On-peak time	1250	1136	1136	1340	1430
-Off-peak time	450	409	409	390	480
Under 6 KV					
-Normal time	810	736	736	800	895
-On-peak time	1300	1182	1182	1390	1480
-Off-peak time	480	436	436	410	505
II- Running water, Waste water, steel, Apatite,					
Above 110 KV					
-Normal time					740
-On-peak time					1265
-Off-peak time					390
Under 110 KV					
-Normal time					770
-On-peak time					1310
-Off-peak time					410
Under 22 KV	720	665	655		
-Normal time				710	795
-On-peak time				1250	1350
-Off-peak time				350	425
Under 6 KV	760	691	691		
-Normal time				750	835
-On-peak time				1330	1420
-Off-peak time				360	445
B- Agriculture					
Above 6 KV					
-Normal time	630	573	573	573	600
-On-peak time	630	573	573	900	950
-Off-peak time	250	227	227	227	240
Under 6 KV					
-Normal time	660	600	600	600	630
-On-peak time	660	600	600	950	1000
-Off-peak time	260	236	236	236	250
C- Administration					
I - Hospitals, kindergartens, schools					
Above 6 KV	770	700	700	700	780
Under 6 KV	810	736	736	736	820
II - Public lighting					
Above 6 KV	770	700	700	770	860
Under 6 KV	810	736	736	800	895
III - Administrative offices					
Above 6 KV	770	700	700	790	880
Under 6 KV	810	736	736	820	920
Note: - Since 01.01.2005 there has been no price discrimination for foreign custon					
- Figures smaller than 1 are in dollar unit					

Customers	15/05/97-31/12/98	01/01/99-30/06/99	07/01/99-30/09/99	01/10/99-28/02/02	01/03/02-now
D - Residential					
I - Retail price					
-0-:-100 kWh	500	455	455	454	600
-101-:-150 kWh	650	591	591	640	810
-151-:-200 kWh	900	818	818	870	1020
-201-:-300 kWh	1000	909	909	1060	1230
-above 300 kWh	1250	1136	1136	1270	1400
II - Bulk					
Rural					
-Rural residential	360	327	327	327	390
-Others	650	591	591	650	730
Living squares, living areas					
-Consumers substation	470	427	427	450	570
-Power company substation	490	445	445	460	580
-Others	700	636	636	690	770
D - Commercial and service					
Above 6 KV					
-Normal time	1200	1091	1091	1220	1350
-On-peak time	1875	1705	1705	2060	2190
-Off-peak time	750	682	682	660	790
Under 6 KV					
-Normal time	1250	1136	1136	1270	1410
-On-peak time	1950	1773	1773	2170	2300
-Off-peak time	780	709	709	680	815
E - Foreign customers	Figures smaller than 1 are in dollars				
I- Production					
Above 110 KV					
-Normal time	0.075	0.068	830	830	830
-On-peak time	0.12	0.109	1410	1410	1410
-Off-peak time	0.05	0.045	440	440	440
Under 110 KV					
-Normal time	0.08	0.073	890	890	890
-On-peak time	0.125	0.114	1510	1510	1510
-Off-peak time	0.055	0.05	480	480	480
Under 22 KV					
-Normal time	0.085	0.077	950	950	950
-On-peak time	0.13	0.118	1600	1600	1600
-Off-peak time	0.06	0.055	520	520	520
Under 6 KV					
-Normal time	0.09	0.082	1020	1020	1020
-On-peak time	0.135	0.123	1710	1710	1710
-Off-peak time	0.065	0.059	560	560	560
II- Commercial and service					
Above 22 KV					
-Normal time	0.105	0.095	1260	1260	1260
-On-peak time	0.16	0.145	2110	2110	2110
-Off-peak time	0.075	0.068	690	690	690
Under 22 KV					
-Normal time	0.115	0.105	1400	1400	1400
-On-peak time	0.17	0.155	2360	2360	2360
-Off-peak time	0.08	0.073	760	760	760
Under 6 KV					
-Normal time	0.125	0.114	1530	1530	1530
-On-peak time	0.18	0.164	2550	2550	2550
-Off-peak time	0.085	0.077	850	850	850
III- Residential					
Above 22 KV	0.095	0.086	0.086	1200	1200
Under 22 KV	0.105	0.105	0.105	1330	1330
Under 6 KV	0.115	0.095	0.095	1470	1470

（※）なお、首相は、工業省（MOI）が提出していた電気料金におけるベトナム人と外国人との 2 重価格撤廃案に同意し、2005 年 1 月 1 日からの施行を認可した。この電気料金 2 重価格撤廃は、一連の価格統一計画の 1 つで、これにより外国企業による一層のベトナム投資促進を図ることを目的としている。

工業省（MOI）によると、この 2 重価格撤廃により EVN の収入は約 3000 億ドン(約 20 億円)減少する見込みだとしている。

添付資料 2-2：連結財務諸表

Consolidated Balance Sheet of EVN （Billion VND）

	2000	2001	2002	2003	2003
ASSETS					
Non-current assets					
Fixed assets	23,716	30,914	45,079	49,121	56,064
Construction in progress	20,971	15,926	8,931	10,983	12,704
Deferred tax assets ※1	—	—	—	609	304
Other non-current assets	4,157	4,364	4,534	5,020	5,164
Sub-total	48,844	51,204	58,545	65,735	74,236
Current assets					
Bank balance and cash	6,693	7,653	10,792	12,855	12,232
Trade and other receivables	2,619	2,665	4,074	5,748	7,395
Inventories ※2	1,374	1,731	2,298	2,859	3,777
Other current assets	503	670	463	518	797
Sub-total	11,191	12,720	17,629	21,981	24,203
TOTAL ASSETS	60,035	63,924	76,174	87,716	98,439
EQUITY & LIABILITIES					
Equity					
Capital	26,073	26,831	28,731	32,698	35,540
Fixed assets revaluation reserve ※3	—	—	3,154	3,154	3,698
Funds and reserves	1,761	1,850	2,012	1,875	1,721
Accumulated profit	62	65	256	(979)	(410)
Sub-total	27,897	28,747	34,154	36,749	40,540
Long-term borrowings	25,565	26,601	32,640	39,349	45,308
Current liabilities					
Trade and other payables	5,217	6,843	7,597	8,670	8,917
Short-term loans	68	112	136	146	391
Current potion of long-term borrowings	1,287	1,620	1,646	2,777	3,223
Sub-total	6,572	8,576	9,380	11,595	12,533
TOTAL EQUITY & LIABILITIES	60,035	63,924	76,174	87,716	98,439

Source) EVN

Note) ※1 2003 年度より税効果会計を導入し、Deferred tax assets（繰延税金資産）を、2003 年に 609 Billion VND、2004 年に 304 Billion VND 計上している。ベトナム会計基準では 2005 年度から税効果会計を導入する予定だが、国際会計基準に基づいて作成している本財務諸表では、これに先立って計上している。

※ 2 2000 年度に、Inventories の一部を Fixed assets へ組み替えている。

※ 3 2002 年に、固定資産の内、Hoa Binh Hydro Power Plant について再評価を実施している。

Consolidated Income Statement of EVN (Billion VND)

	2000	2001	2002	2003	2004
Net sales	16,510	19,209	23,565	30,245	34,530
Cost of sales	(13,574)	(15,958)	(19,087)	(21,886)	(26,451)
Gross profit	2,936	3,250	4,477	8,358	8,078
Selling expenses	(335)	(405)	(476)	(655)	(747)
General and administration expenses	(674)	(904)	(1,092)	(1,302)	(1,501)
Other operating income	271	552	580	729	892
Other operating expenses	(250)	(366)	(378)	(4,249)	(1,780)
Profit from operations	1,947	2,127	3,110	2,880	4,940
Finance cost	(550)	(587)	(782)	(1,032)	(1,312)
Net profit before tax	1,397	1,540	2,328	1,848	3,627
Corporate income tax ※1	(514)	(541)	(677)	(19)	(296)
Profit after tax	882	999	1,650	1,828	3,331

Source) EVN

Note) 2001 年度より利益の表示区分が変更されたことより、2000 年は表示区分を調整して記載した。

※1 Corporate income tax の税率は、25%－32%の間で適用されている。但し、2003 年、2004 年は税効果会計が導入されたため、税金支払額と損益計算書計上が異なっている。

	2003 年	2004 年
Current taxes	(629)	(601)
Deferred taxes	609	304
total	(19)	(296)

Consolidated Cash flow Statement of EVN (Billion VND)

	2000	2001	2002	2003	2004
I Cash flows from operating activities					
Profit from operations	1,397	1,540	3,110	2,880	4,940
Adjustment for:					
Depreciation and amortization	4,462	5,134	7,055	8,375	8,084
Loss from foreign exchange	153	245	313	3,087	1,500
0ther	721	491	(10)	(5)	(56)
Sub-total	6,580	7,412	10,469	14,339	14,468
Increase in trade and other receivables	1,310	(34)	(1,374)	(1,643)	(1,628)
Increase in inventories	(24)	(265)	(600)	(875)	(1,068)
(Increase)/Decrease in other current assets	9	(166)	(161)	(22)	(67)
Increase in trade and other payables	913	1,258	1,360	844	1,004
Increase in non-current assets	(292)	(207)	(170)	(7)	(138)
Interest paid	(547)	(577)	(769)	(1,015)	(1,282)
Corporate income tax paid	(640)	(678)	(664)	(714)	(633)
Sub-total	730	(672)	(2,056)	(3,435)	(3,814)
Net cash flows from operating activities	7,311	6,739	8,412	10,903	10,654
II Cash flows from investing activities					
Disbursement for capital assets and construction costs	(13,869)	(9,218)	(9,928)	(13,347)	(16,297)
Increase in investment accounts	–	–	–	(192)	24
Proceeds from disposal of fixed assets	172	11	14	18	41
Net cash flows from investing activities	(13,696)	(9,206)	(9,913)	(13,522)	(16,232)
III Cash flows from financing activities					
Additional loans obtained	8,865	6,131	6,507	6,336	8,184
Repayment of loans	(1,486)	(3,224)	(2,040)	(1,687)	(3,190)
Other	392	518	173	31	(40)
Net cash flows from financing activities	7,772	3,426	4,640	4,680	4,954
IV Net increase in cash	1,387	959	3,139	2,064	(623)
V Bank balance and cash at beginning of the year	5,306	6,693	7,653	10,792	12,855
VI Bank balance and cash at end of the year	6,693	7,653	10,792	12,855	12,232

Source) EVN

添付資料 2-3: 予測財務諸表

Forecasted income statement

Unit: Mill. USD

	2003	2004	2005	2006	2007	2008	2009	2010
Revenue	**1,756**	**1,971**	**2,230**	**2,512**	**2,826**	**3,171**	**3,553**	**3,975**
Expenses	**1487**	**1806**	**2073**	**2452**	**2703**	**3131**	**3469**	**3944**
Fuel	384	523	510	598	551	532	504	598
Materials	49	49	56	62	67	73	82	92
Repairs	83	97	103	107	122	137	150	160
Salaries	116	127	139	149	160	171	183	195
Electricity purchase	104	320	536	727	981	1262	1545	1694
Depreciation	514	524	546	609	591	732	818	967
Interests	68	82	93	107	135	177	216	270
Natural resource tax	17	14	15	14	14	17	22	25
Other expenses	152	70	77	84	91	99	110	126
Expected decrease of operating expense in member companies			2	5	9	69	161	183
Operating income*	**137**	**88**	**22**					
Income before income tax	**131**	**77**	**135**	**60**	**123**	**40**	**84**	**31**
Income tax	**42**	**22**	**38**	**17**	**34**	**11**	**23**	**9**
Capital cost	**34**	**38**	**40**	**42**	**43**		**45**	
Net income	**55**	**18**	**57**	**1**	**45**	**29**	**16**	**22**

* Additional revenue as the result of selling price increase will be transferred to the investment fund

Forecasted cash flow statement

Unit: Mill. USD

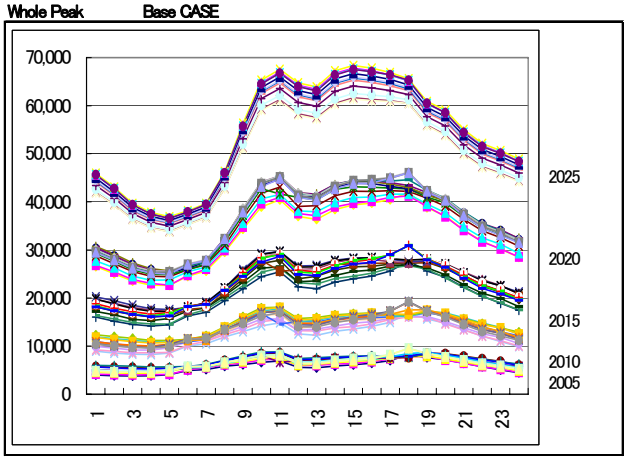
	2003	2004	2005	2006	2007	2008	2009	2010
Source of fund	**1,227**	**1,508**	**1,833**	**2,385**	**2,776**	**2,847**	**2,917**	**2,843**
Internal fund	448	699	877	937	1,086	1,016	1,135	1,324
Depreciation	*514*	*524*	*546.3*	*609*	*591*	*732*	*818*	*967.3*
Internal generation	*-267*	*49*	*182*	*163*	*191*	*109*	*24*	*246*
Additional revenue due to increase in tariff	*171*	*126*	*62*	*42*	*43*	*0*	*45*	*0*
Income from investment activities	*30*	*0*	*36*	*17*	*62*	*84*	*94*	*108*
Disposal of fixed assets	*0*	*0*	*50.3*	*106*	*199*	*91*	*154*	*3*
Fund from the government	197	23	32	34	27	0	0	0
Borrowings	582	786	924	1414	1663	1831	1782	1518.3
Application of fund	**1227**	**1508**	**1833**	**2385**	**2776**	**2847**	**2917**	**2843**
Investments	1103	1293	1532	1975	2254	2195	2097	1781
Generation	*630*	*547.3*	*891.3*	*1319*	*1645*	*1644*	*1595.3*	*1278.3*
Network	*472*	*628*	*590*	*592*	*526*	*480*	*463*	*470*
Others	*0*	*109*	*0*	*0*	*0*	*0*	*0*	*0*
Joint ventures	*0*	*9*	*51*	*64*	*83*	*71*	*39*	*33*
Debt payment	124	214	300	410	522	652	819	1061

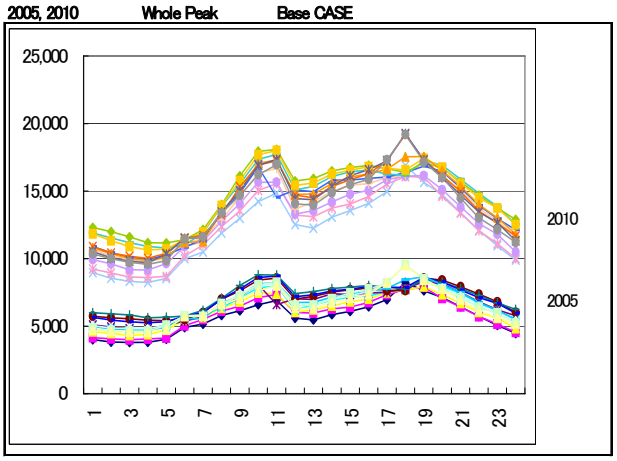
添付資料

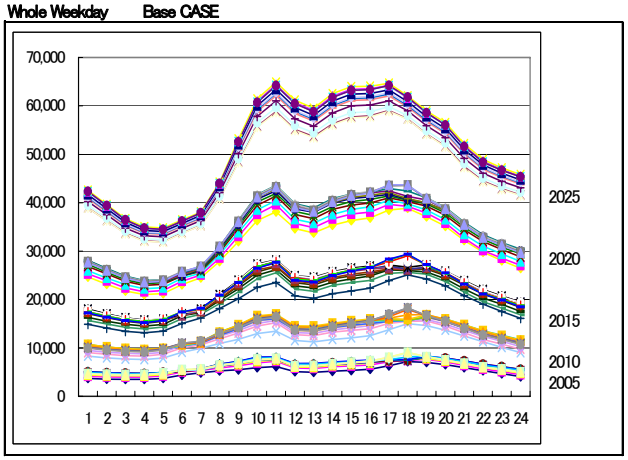
第 3 章　電力需要予測

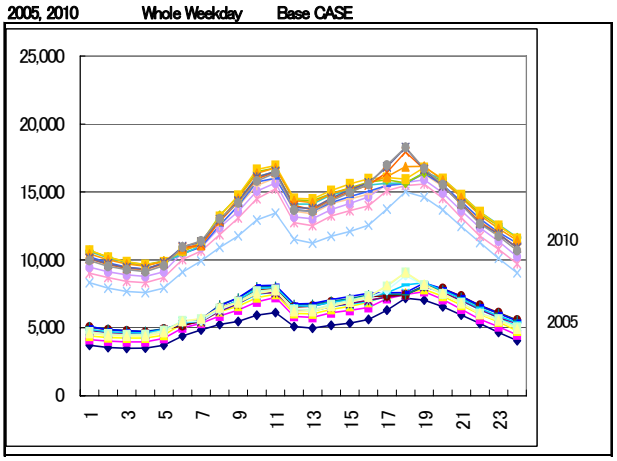
添付資料 3-１　　ケース別日負荷曲線予測

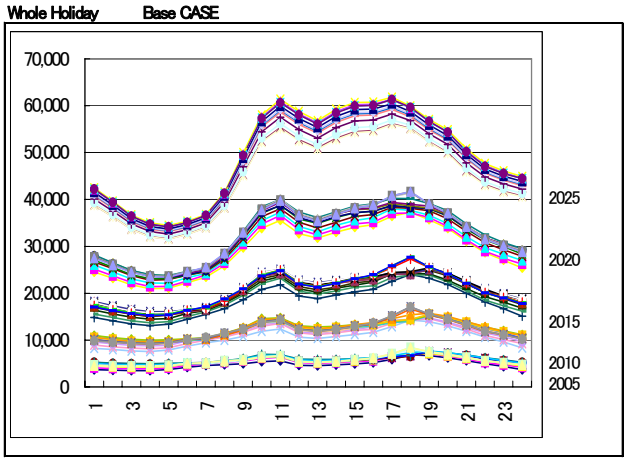
(1) Base Case の予測

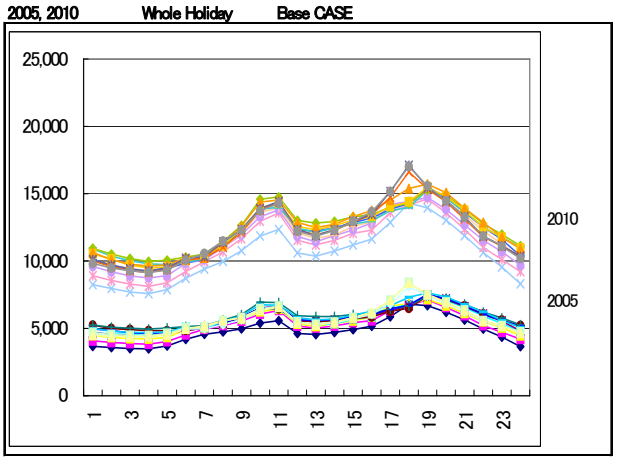








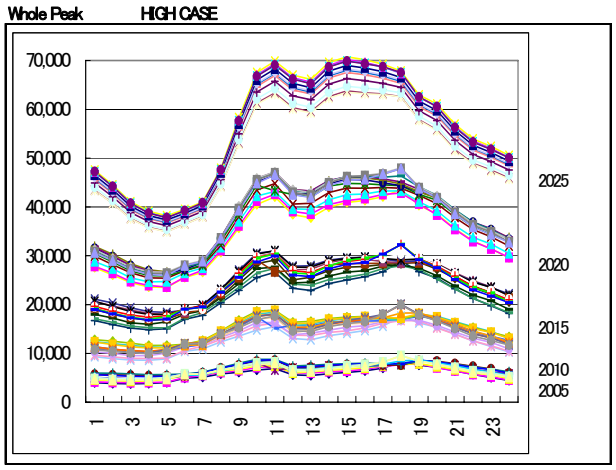


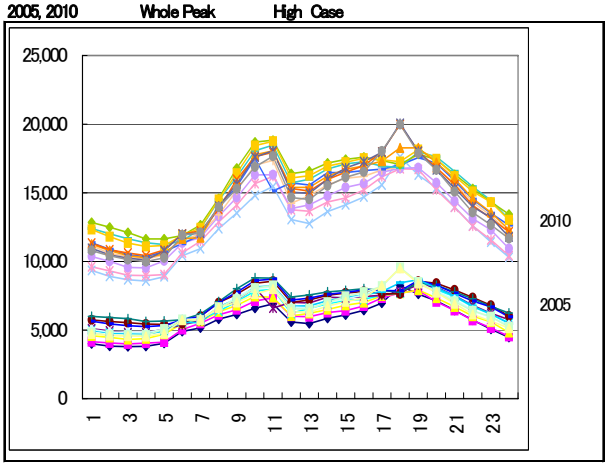


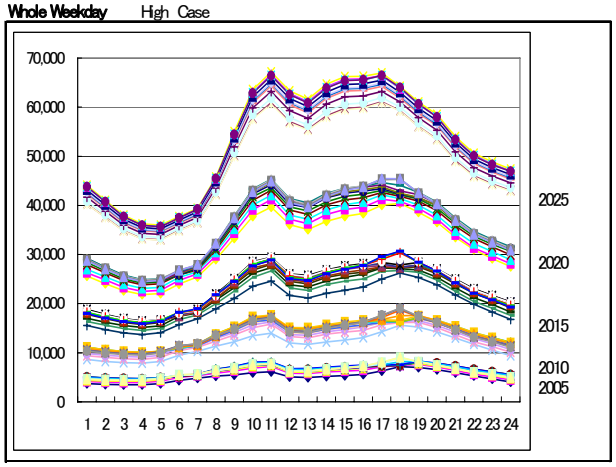
（Base　2005、2010、2015、2020、2025 年）　　（Base　2005、2010 年）

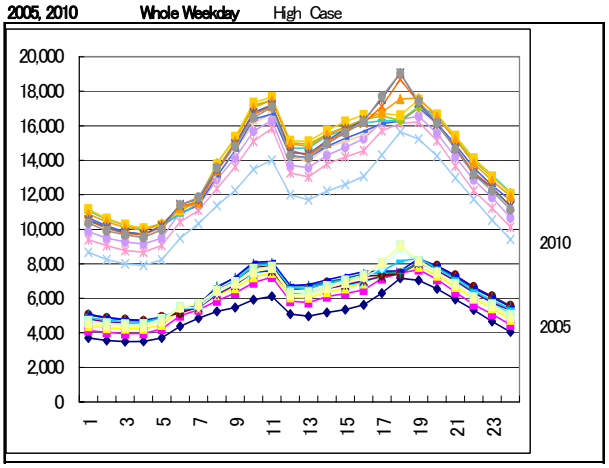
添付図　3-1-1　日負荷曲線　（単位：MW）

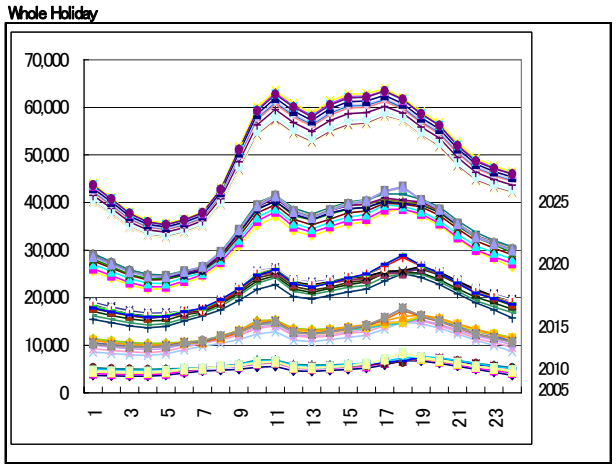
(2) High Case の予測

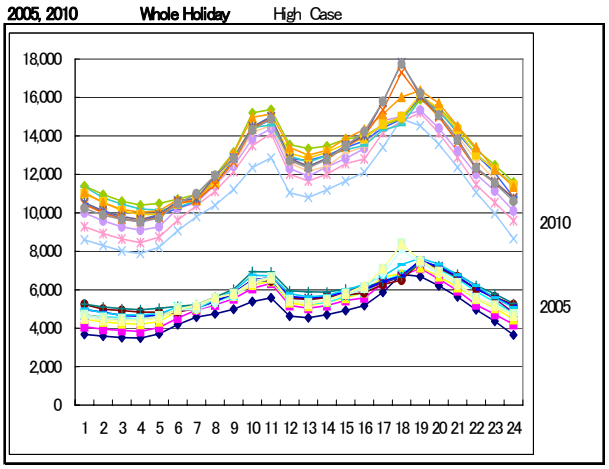








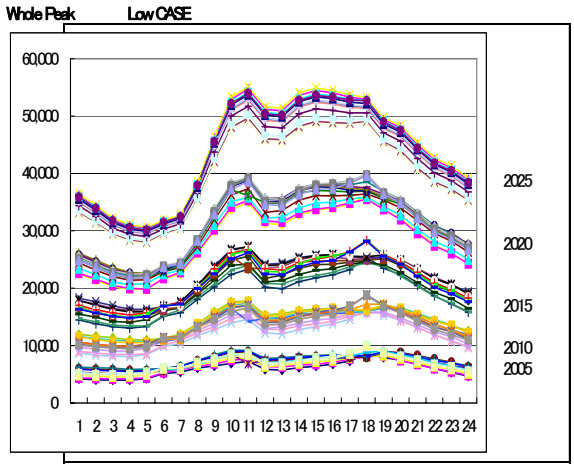


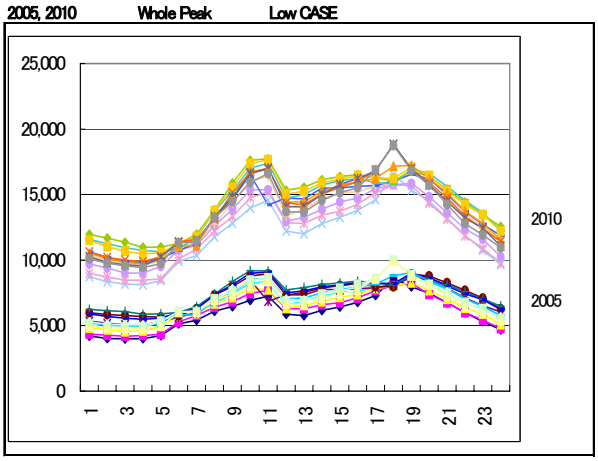


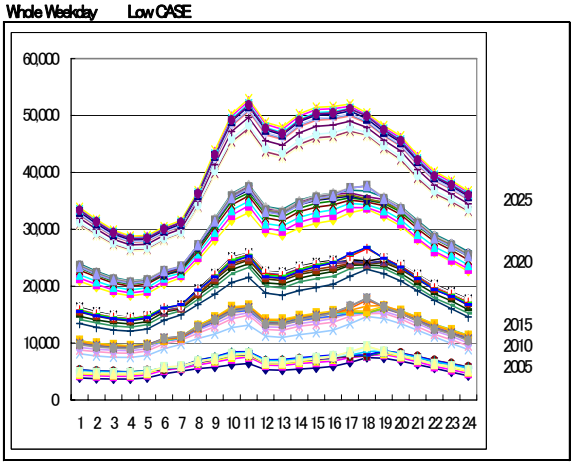
（High　2005、2010、2015、2020、2025 年）　　（High　2005、2010 年

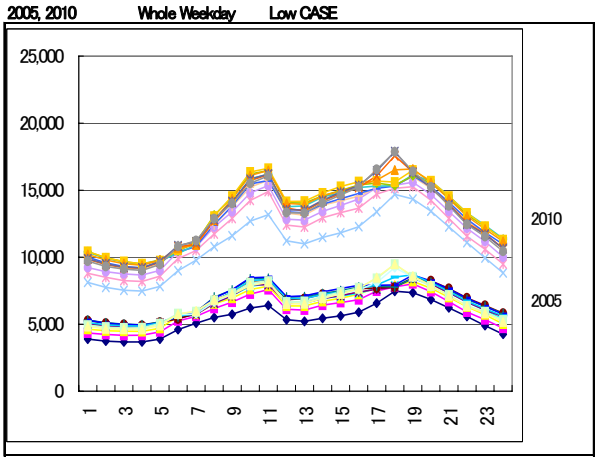
添付図　3-1-2　日負荷曲線　　(単位：MW)

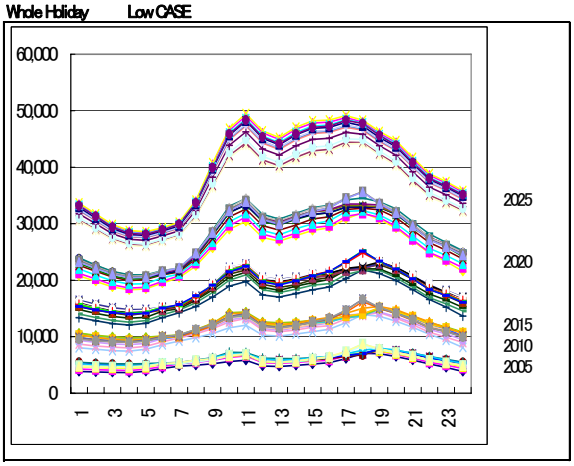
(3) Low Case の予測

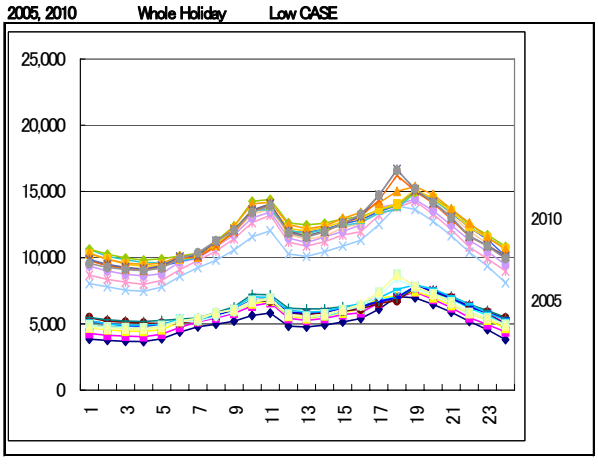












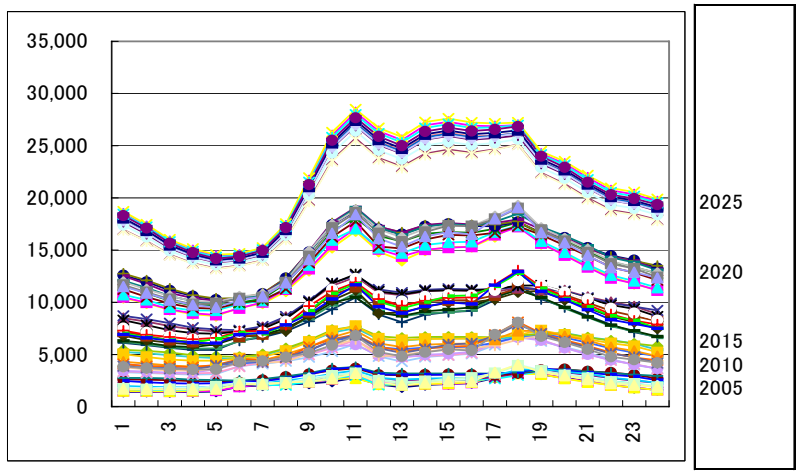
（Low　2005、2010、2015、2020、2025 年）　　（Low　2005、2010 年）

添付図　3-1-3　日負荷曲線　　(単位：MW)

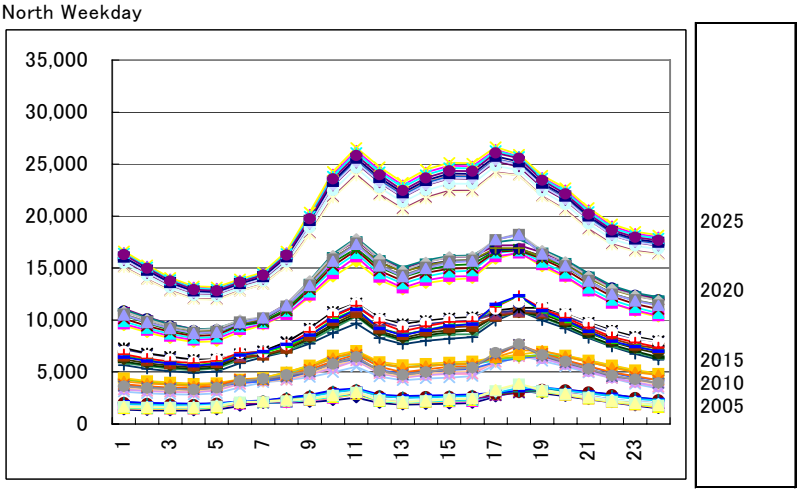
添付資料 3-2　地域別日負荷曲線予測

(1) 北部地区

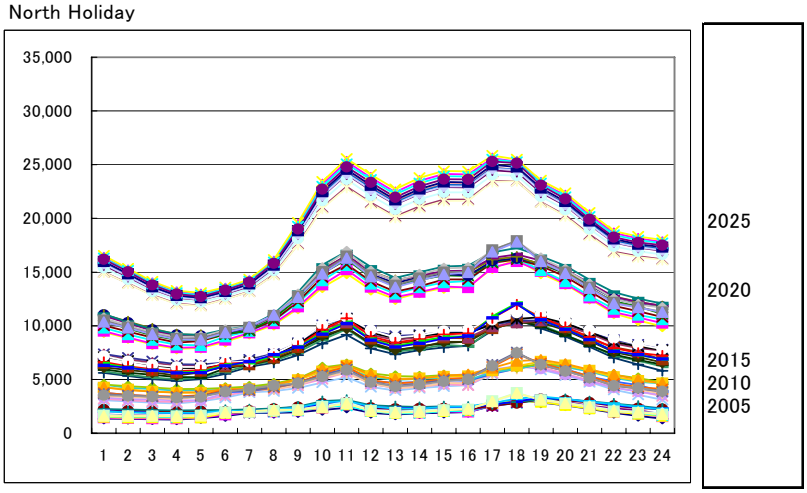
North Peak



North Weekday

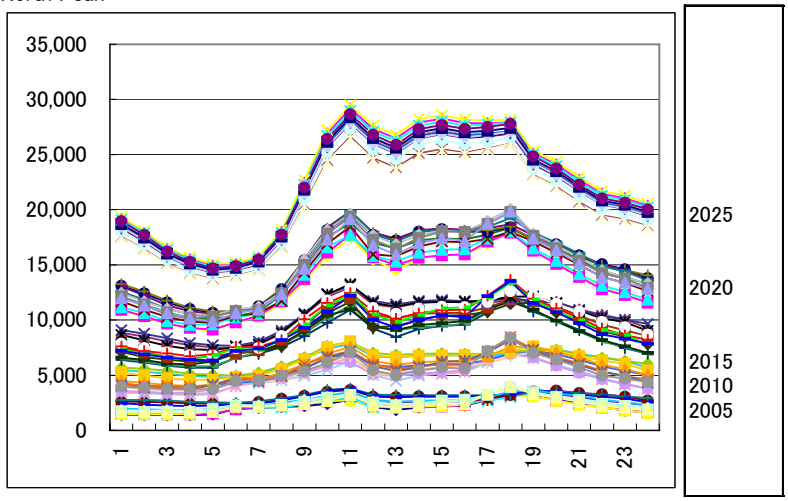


North Holiday

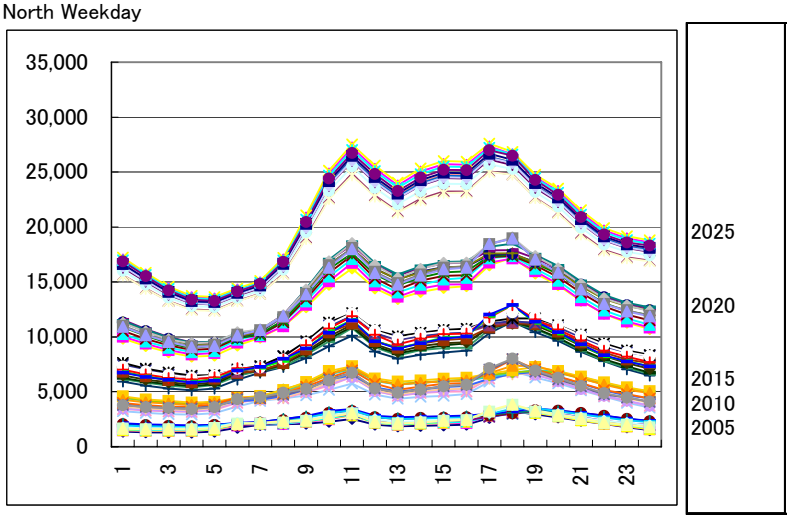


添付図 3-2-1　北部　Base　Case（単位：MW）

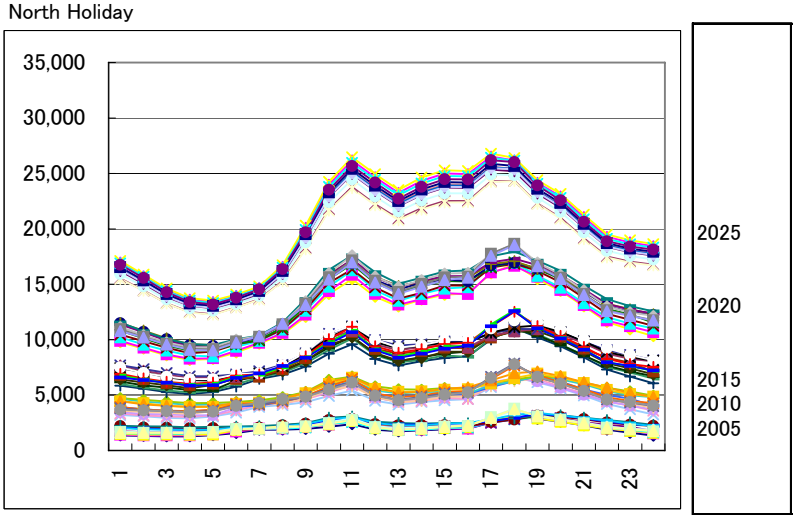
North Peak



North Weekday

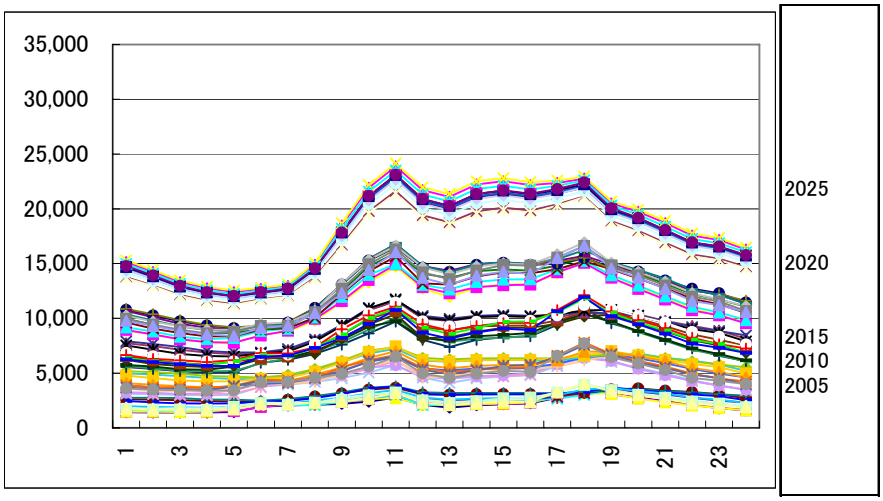


North Holiday

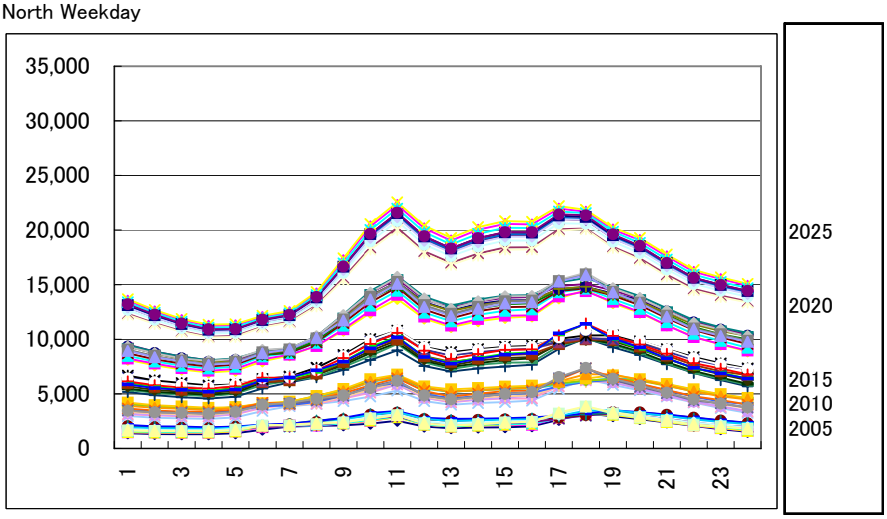


添付図 3-2-2　北部　High　Case　（単位：MW）

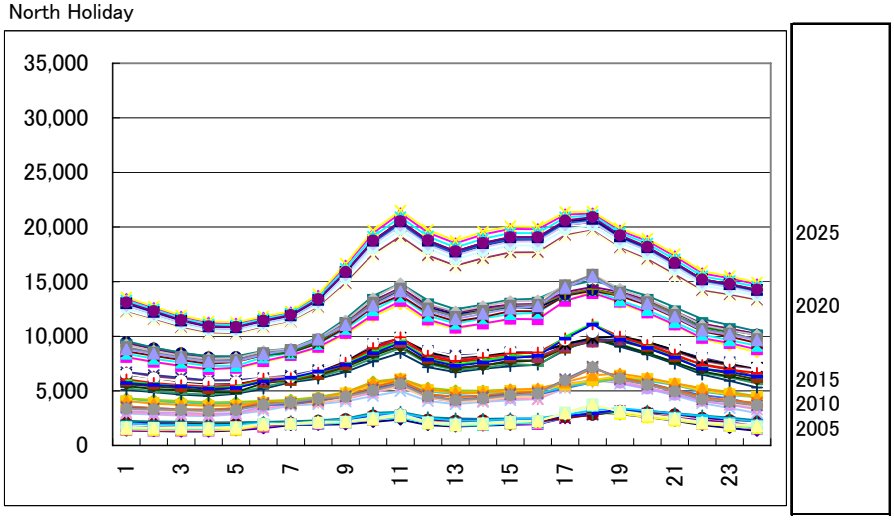
North Peak



North Weekday

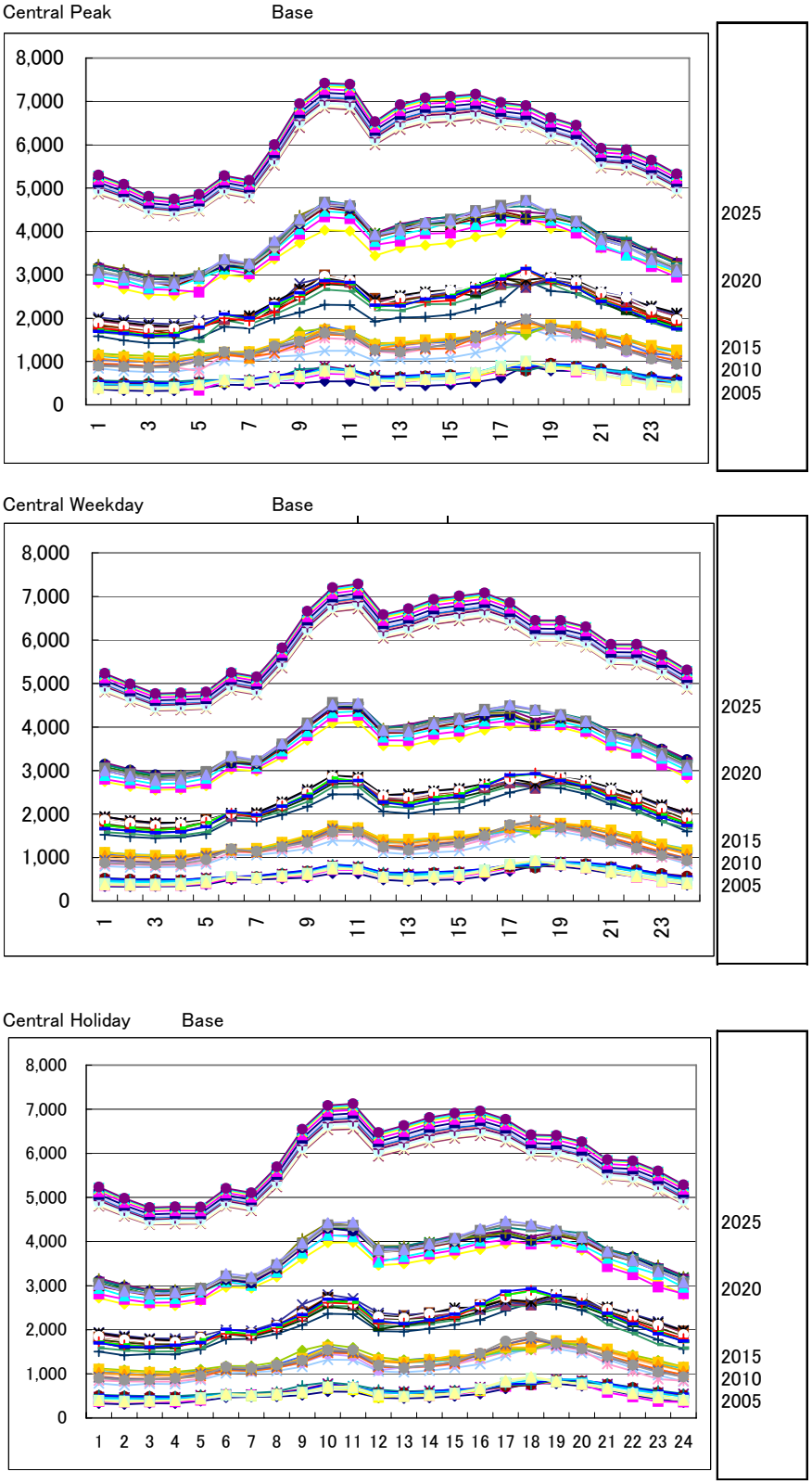


North Holiday

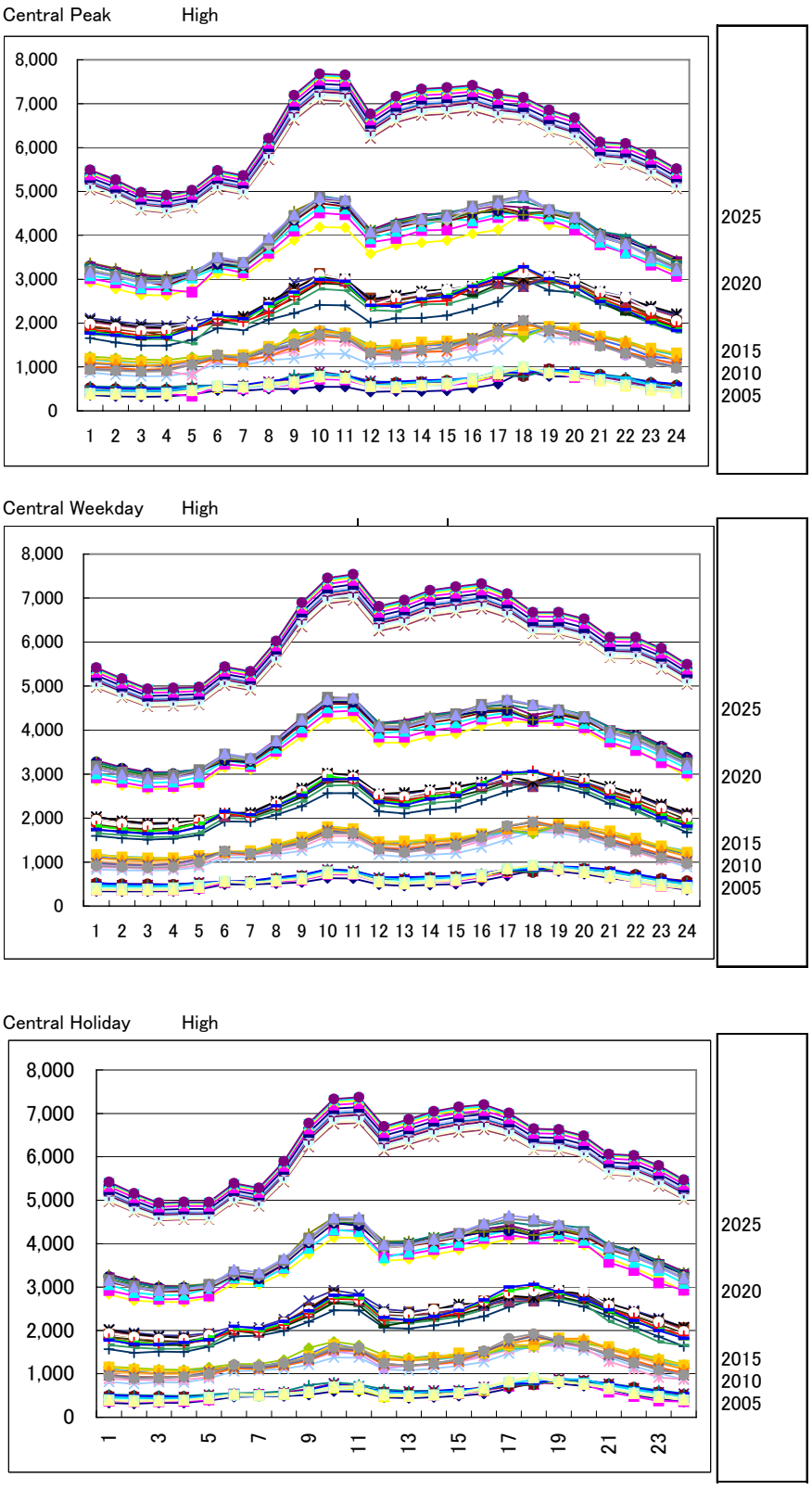


添付図 3-2-3　北部　Low　Case（単位：MW）

(2) 中部地区

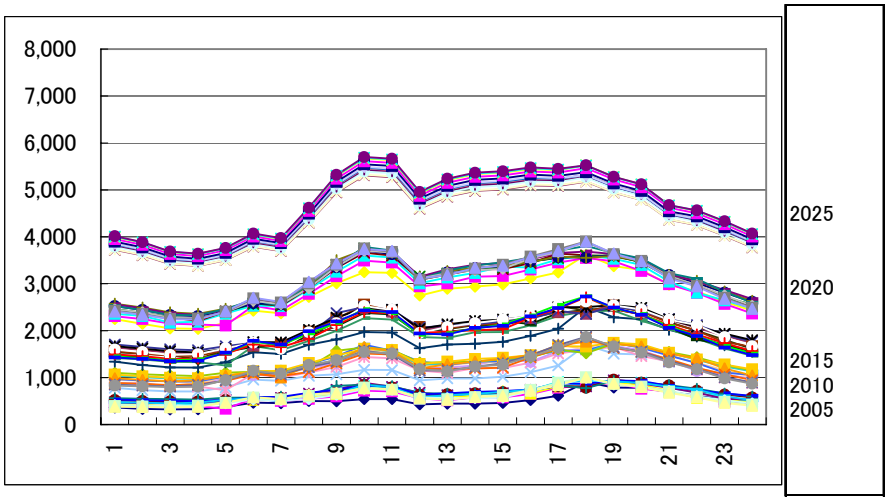


添付図 3-2-4　中部　Base　Case（単位：MW）

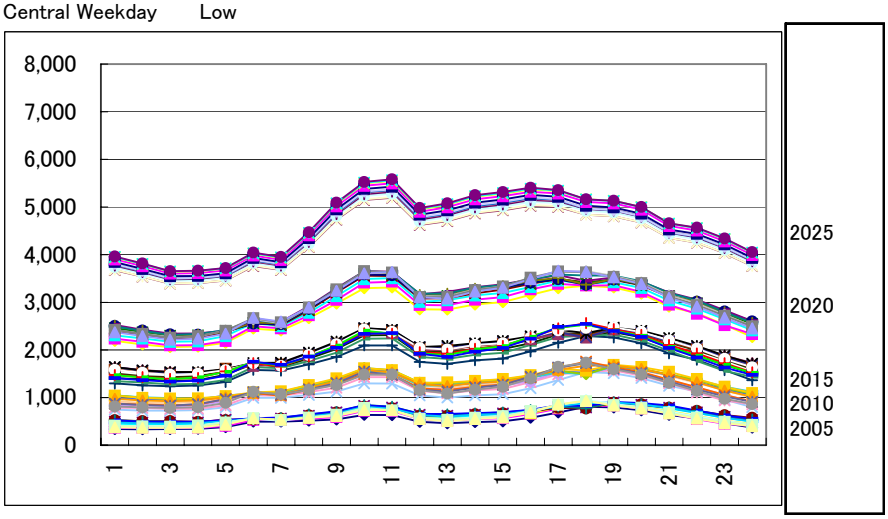


添付図 3-2-5　中部　High　Case　（単位：MW）

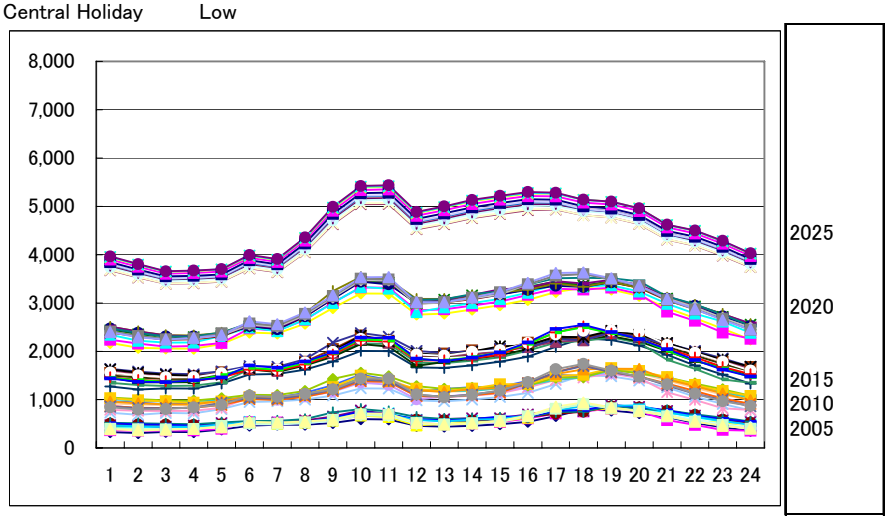
Central Peak　　Low



Central Weekday　　Low



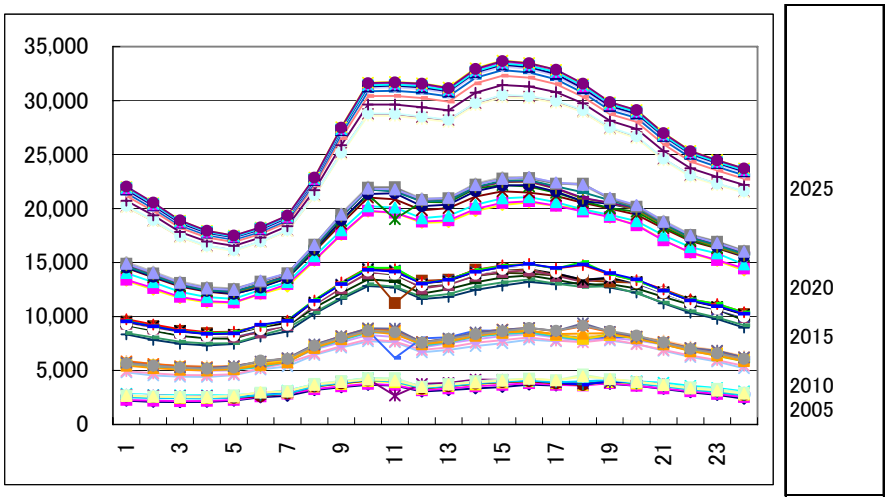
Central Holiday　　Low



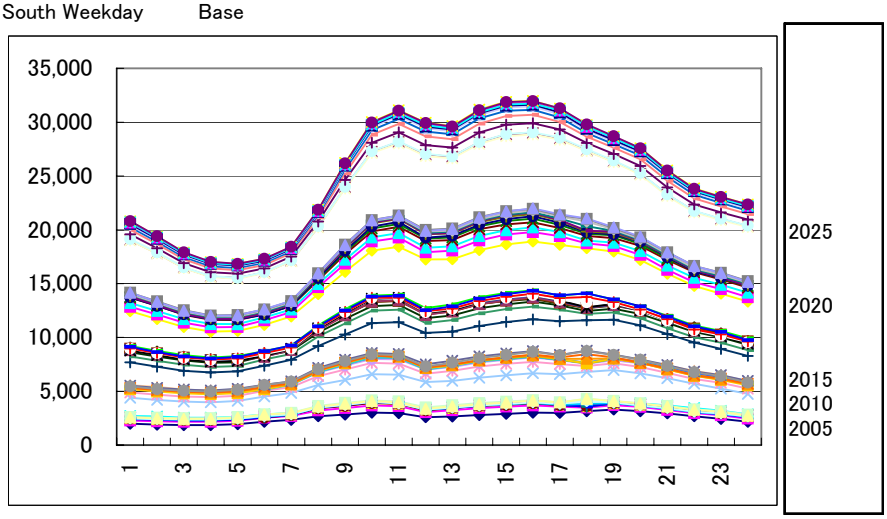
添付図 3-2-6　中部　Low　Case（単位：MW）

(3) 南部地区

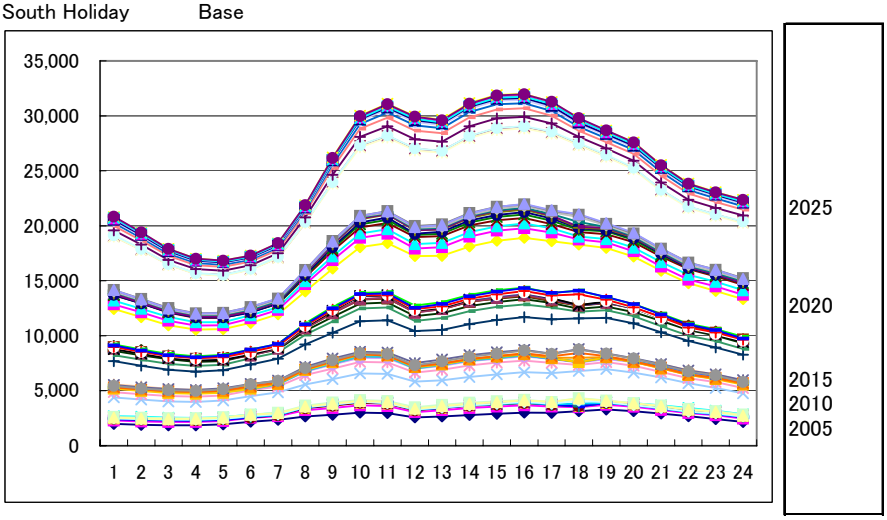
South Peak　　Base



South Weekday　　Base

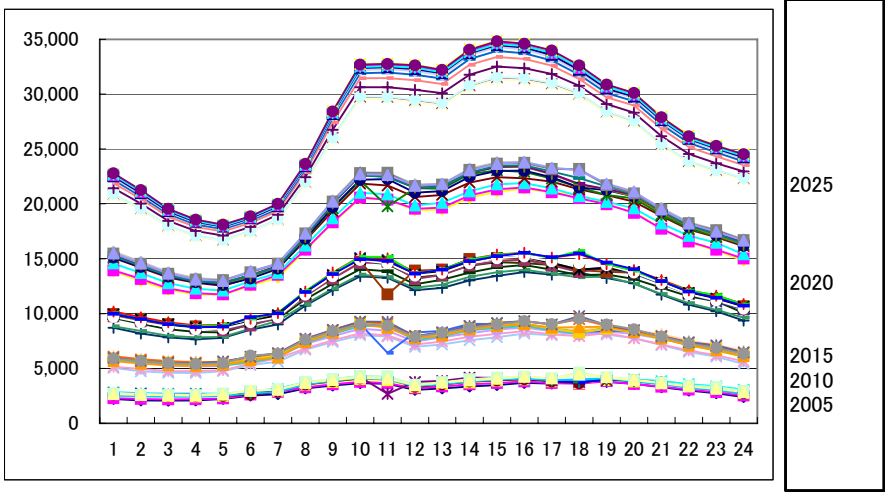


South Holiday　　Base

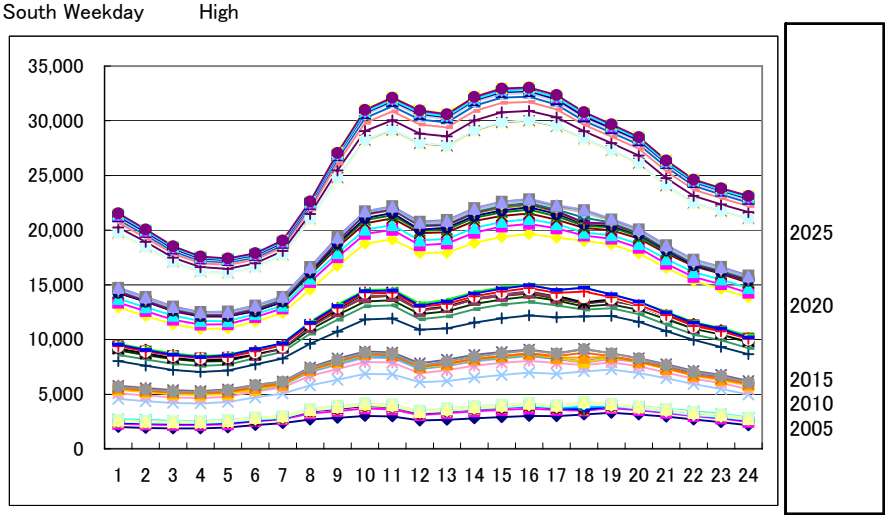


添付図 3-2-7　南部　Base　Case（単位：MW）

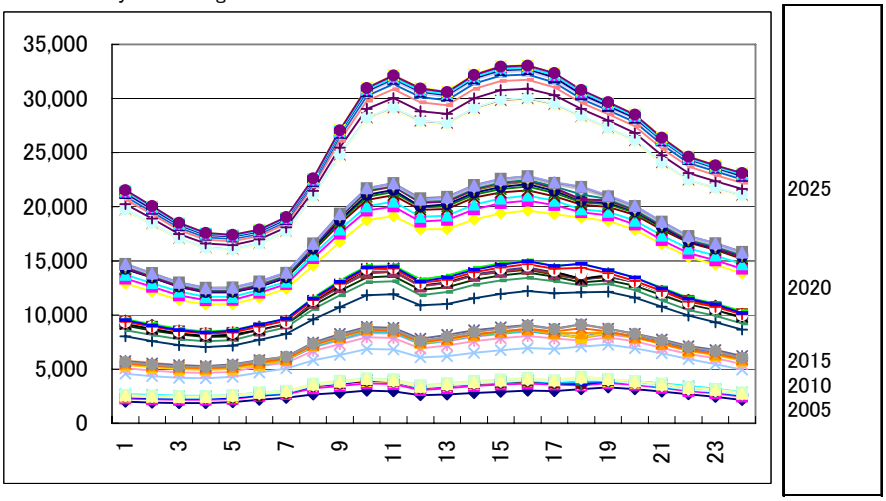
South Peak　　High



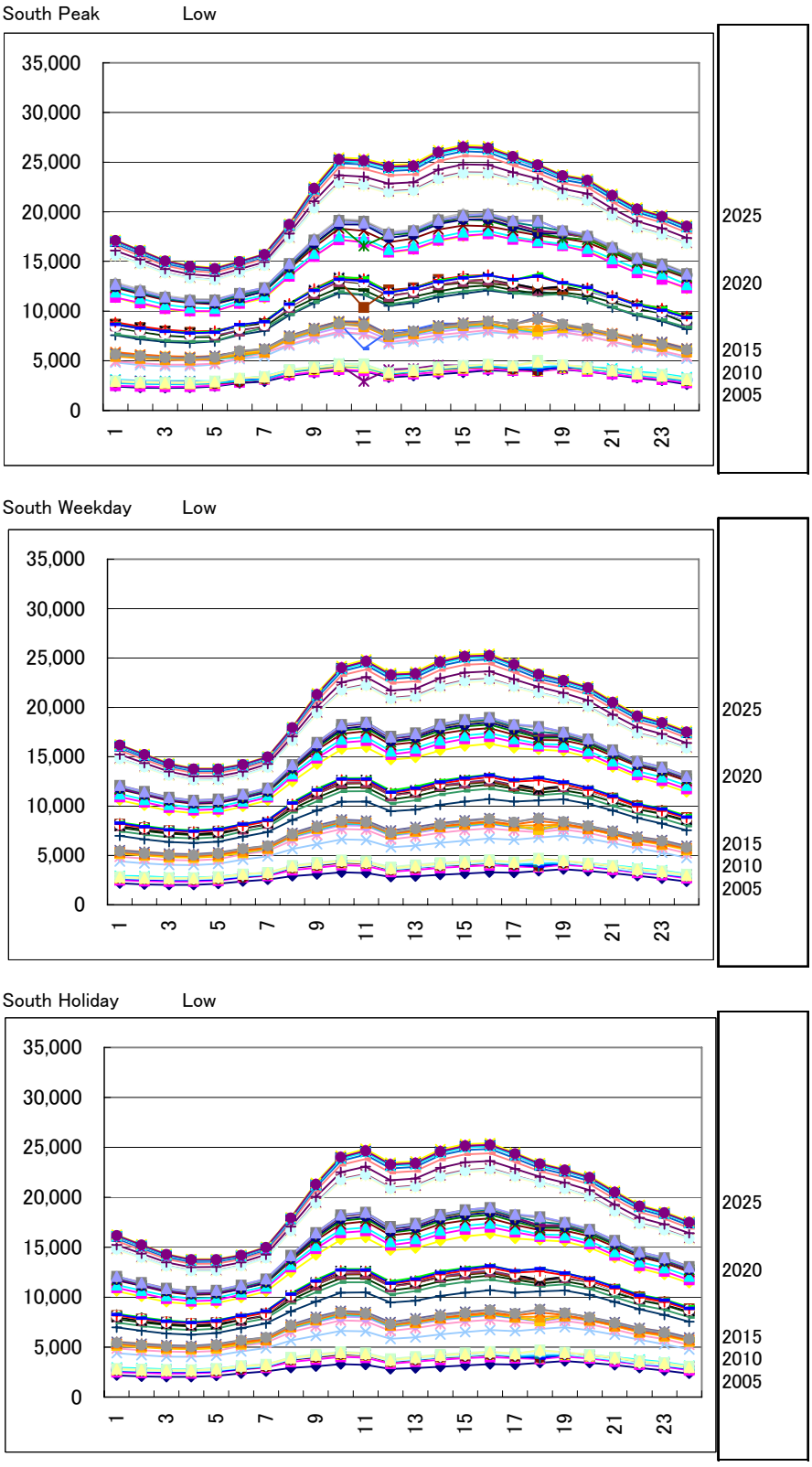
South Weekday　　High



South Holiday　　High



添付図 3-2-8　南部　High　Case　（単位：MW）



添付図 3-2-9　南部　Low　Case（単位：MW）

添付資料

第 5 章　電源開発計画

添付資料 5-1 (1)　IE による電源開発計画（北部地域、水力発電及び輸入）

Name	Capacity (MW)	Commission Year	Month	Abolition Year	Owner	Type
NOMURA (50MW)	50	2005	1	2010	IPP	Purchase
Nhap khau TQ-2 (40MW)	40	2005	1	2010	CSG	Import
Nhap khau TQ-3 (40MW)	40	2005	6	2010	CSG	Import
Nhap khau TQ-5 (40MW)	40	2006	1	2010	CSG	Import
Nhap khau TQ-4 (40MW)	40	2006	1	2010	CSG	Import
Nam Dong-Suoi Sap	51	2006	6	-	IPP	Hydro
Nhap khau TQ-6 (200MW)	200	2007	1	2010	CSG	Import
TDN mien Bac1-(M.Luong)	114	2007	6	-	IPP	Hydro
Tuyen Quang #1 (114MW)	114	2007	10	-	EVN	Hydro
Tuyen Quang #2 (114MW)	114	2008	1	-	EVN	Hydro
THAI AN (44MW)	44	2008	1	-	IPP	Hydro
TDNMB2(NgoiFat-Tr.Tau1&2)	76	2008	1	-	IPP	Hydro
Van Chan (35MW)	35	2008	3	-	IPP	Hydro
Coc San (40MW)	40	2008	3	-	IPP	Hydro
Tuyen Quang #3 (114MW)	114	2008	6	-	EVN	Hydro
Ban La #1(160MW)	160	2008	12	2009	EVN	Hydro
Thac Muoi (53MW)	53	2009	1	-	IPP	Hydro
NGOI BO (35MW)	35	2009	1	-	IPP	Hydro
Na Le (90MW)	90	2009	1	-	IPP	Hydro
ImportFromChina1(Malutang-300MW)	300	2009	1	-	IPP	Hydro
Hac han-Ban Coc-Huong Son(100MW)	100	2009	1	-	IPP	Hydro
Ban La (320MW)	320	2009	3	-	EVN	Hydro
Chu Linh (30MW)	30	2010	1	-	IPP	Hydro
Ban Chat #1	100	2010	4	2010	EVN	Hydro
Song Hieu (Ban Mong 53MW)	53	2010	9	-	IPP	Hydro
Cua Dat (97MW)	97	2010	9	-	IPP	Hydro
Ban Chat 200 MW	100	2010	9	-	EVN	Hydro
Import From Laos (Nam Mo, 2010-,100MW)	100	2010	12	-	IPP	Import
Son La 6x400 #1,2,3	1200	2011	1	2012	EVN	Hydro
Khe Bo 96MW	96	2011	1	-	IPP	Hydro
Huoi Quang #1(280MW)	280	2011	1	-	EVN	Hydro
HoaBinh (Sla 6x400- chay tam 2010)		2011	1	2012	EVN	Hydro
Nho Que 140MW	140	2011	4	-	EVN	Hydro
Nam Chien (210MW)	210	2011	9	-	IPP	Hydro
Huoi Quang #2(280MW)	280	2011	9	-	EVN	Hydro
Hua Na (195MW)	195	2012	1	-	EVN	Hydro
Son La 3x400 (chay tam 2011)	1200	2012	4	2012	EVN	Hydro
Son La 3x400	1200	2013	1	-	EVN	Hydro

Lai Chau #1-#2 (2x300MW)	600	2013	11	-	EVN	Hydro
Lai Chau #3-#4 (2x300MW)	600	2014	3	-	EVN	Hydro
Trung Son (310MW)	310	2015	1	-	EVN	Hydro
ImportFromLaos(NamThen1-400MW)	400	2015	1	-	IPP	Import
Ban Uon (250MW)	250	2016	1	-	EVN	Hydro
BacMe (280MW)	280	2016	1	-	EVN	Hydro
Thuy dien nho moi MB 1	100	2018	1	-	IPP	Hydro
ImportFromChina2(250MW)	250	2018	1	-	IPP	Import
ImportFromChina3(250MW)	250	2019	1	-	IPP	Import
ImportFromChina4(250MW)	250	2019	1	-	IPP	Import
PSPP #1 (200MW)	200	2020	1	-	EVN	PSPP
ImportFromChina5(250MW)	250	2020	1	-	IPP	Import
ImportFromChina6(250MW)	250	2020	6	-	IPP	Import
PSPP #2 (200MW)	200	2021	1	-	EVN	PSPP
Thuy dien nho moi MB 3	100	2022	1	-	IPP	Hydro
Thuy dien nho moi MB 2	100	2022	1	-	IPP	Hydro
PSPP #3 (200MW)	200	2022	1	-	EVN	PSPP
ImportFromChina7(250MW)	250	2022	1	-	IPP	Import
ImportFromChina8(250MW)	250	2023	1	-	IPP	Import
Thuy dien nho moi MB 4	100	2024	1	-	IPP	Hydro
PSPP #4 (200MW)	200	2024	1	-	EVN	PSPP
PSPP #5 (200MW)	200	2024	4	-	EVN	PSPP

添付資料 5-1 (2)　IE による電源開発計画（中南部地域、水力発電及び輸入）

Name	Capacity (MW)	Commission Year	Month	Abolition Year	Owner	Type
Sesan 3A (100MW)	100	2006	9	-	IPP	Hydro
Sesan 3 #1(130MW)	130	2006	9	-	EVN	Hydro
Srok Phu Mieng(54MW)	54	2006	10	-	IPP	Hydro
Sesan 3 #2(130MW)	130	2006	12	-	EVN	Hydro
Da Dang Dachamo (16MW)	16	2007	1	-	IPP	Hydro
Tdnho Mien Trung1 (Bao Loc, Dan Sach, Tra Xom)	22	2007	6	-	IPP	Hydro
Rao Quan (Quang Tri 70MW)	70	2007	6	-	EVN	Hydro
HChan, HMun (27MW)	27	2007	6	-	IPP	Hydro
Dai Ninh # 1(150MW)	150	2007	11	-	EVN	Hydro
PleiKrong (110MW)	110	2007	12	-	EVN	Hydro
Dai Ninh # 2(150MW)	150	2007	12	-	EVN	Hydro
Bac Binh (35MW)	35	2008	5	-	IPP	Hydro
Song Ba Ha (250MW)	250	2008	6	-	EVN	Hydro
Co Bi (48MW)	48	2008	6	-	IPP	Hydro
Buon Kuop # 1(140MW)	140	2008	6	-	EVN	Hydro
A Vuong (210MW)	210	2008	6	-	EVN	Hydro
Buon Kuop # 2(140MW)	140	2008	9	-	EVN	Hydro
La ngau (38MW)	38	2008	12	-	IPP	Hydro
Ea Rong Rou (34MW)	34	2008	12	-	IPP	Hydro
Dong Nai 3 (180MW)	180	2008	12	-	EVN	Hydro
Buon Tua Srah (85MW)	85	2008	12	-	EVN	Hydro
Lagrai (9MW)	9	2009	1	-	IPP	Hydro
Binh Dien (44MW)	44	2009	6	-	IPP	Hydro
Srepok 3 #1 (110MW)	110	2009	9	-	EVN	Hydro
Sesan 4 #1(110MW)	110	2009	9	-	JV	Hydro
An Khe + Ka Nak (173MW)	173	2009	10	-	JV	Import
Dong Nai 4 (340MW)	340	2009	11	-	EVN	Hydro
Thac Mo Extension (75MW)	75	2009	12	-	EVN	Hydro
Srepok 3 #2 (110MW)	110	2009	12	-	EVN	Hydro
Sesan 4 #2(110MW)	110	2009	12	-	JV	Hydro
Dam Bri (72MW)	72	2009	12	-	IPP	Hydro
Song Tranh 2 (132MW)	132	2010	1	-	EVN	Hydro
Song Bung 2 (108MW)	108	2010	1	-	EVN	Hydro
EaKrong Hnang (65MW)	65	2010	1	-	IPP	Hydro
Sesan 4 #3(110MW)	110	2010	3	-	JV	Hydro
ImportFromLaos(Xekaman3-260MW)	260	2010	3	-	IPP	Import
Dak Rtih (72MW)	72	2010	3	-	IPP	Hydro
Song Con 2 (70MW)	70	2010	9	-	IPP	Hydro

Dak Drinh 1(100MW)	100	2010	9	-	EVN	Hydro
Upper Kon Tum #1(110MW)	110	2011	1	-	EVN	Hydro
Srepok 4 (28MW)	28	2011	1	-	IPP	Hydro
Upper Kon Tum #2(110MW)	110	2011	9	-	EVN	Hydro
Song Bung 4 (165MW)	165	2012	1	-	EVN	Hydro
Dong Nai 5 (100MW)	100	2012	1	-	EVN	Hydro
Dak Mi 1 (210MW) 2020	210	2012	1	-	EVN	Hydro
Dong Nai 2 (80MW)	80	2012	6	-	EVN	Hydro
Dak Mi 4 (210MW)	210	2012	6	-	EVN	Hydro
ImportFromLaos(Xekaman1-450MW)	450	2013	4	-	IPP	Import
ImportFromLaos(Sekong4-450MW)-2016	450	2014	3	-	IPP	Import
Song Bung 5 (85MW)	85	2015	1	-	EVN	Hydro
Duc Xuyen (52MW)	52	2015	1	-	IPP	Hydro
ImportFromLaos(2014Sekong5-250MW)	250	2015	6	-	IPP	Import
ImportFromLaos(NamKong1-240MW)	240	2016	9	-	IPP	Import
Thuy dien nho moi MT_MN 1	100	2017	1	-	IPP	Hydro
ImportFromCPC(LowerSeRepok2-222MW)	222	2019	1	-	IPP	Import
PSPP #1 (200MW)	200	2020	1	-	EVN	PSPP
PSPP #2 (200MW)	200	2021	1	-	EVN	PSPP
ImportFromCPC(LowerSeSan3-375MW-71)-2014	375	2021	6	-	IPP	Import
Thuy dien nho moi MT_MN 2	100	2022	1	-	IPP	Hydro
PSPP #3 (200MW)	200	2022	1	-	EVN	PSPP
Thuy dien nho moi MT_MN 3	100	2023	1	-	IPP	Hydro
ImportFromCPC(LowerSeSan2-207MW)-2017	207	2023	1	-	IPP	Import
PSPP #4 (200MW)	200	2023	4	-	EVN	PSPP
PSPP #5 (200MW)	200	2024	1	-	EVN	PSPP
PSPP #7 (200MW)	200	2025	1	-	EVN	PSPP
PSPP #6 (200MW)	200	2025	1	-	EVN	PSPP
PSPP #8 (200MW)	200	2025	4	-	EVN	PSPP
PSPP #9 (200MW)	200	2025	6	-	EVN	PSPP

添付資料 5-1 (3)　IE による電源開発計画（北部地域、火力発電）

Name	Capacity	Comissioning year	Month	AboLishing year	Owner	Fuel Type
Na Duong TPP #1 50MW	50	2005	2	-	Vinacoal	COAL
Na Duong TPP #2 50MW	50	2005	5	-	Vinacoal	COAL
Cao Ngan #1	50	2005	10	-	Vinacoal	COAL
Cao Ngan #2	50	2005	12	-	Vinacoal	COAL
Diesel mien Bac	40	2006	1	-	EVN	DIESEL
Uong Bi (Extension)	300	2006	6	-	EVN	COAL
To F6-GE 1	35	2006	10	-	EVN	OIL
To F6-GE 2	35	2006	10	-	EVN	OIL
To F6-GE 3	35	2006	11	-	EVN	OIL
To F6-GE 4	35	2006	11	-	EVN	OIL
Son Dong #1	98	2008	4	-	Vinacoal	COAL
Son Dong #2	98	2008	9	-	Vinacoal	COAL
Hai Phong TPP #1	300	2008	12	-	JV	COAL
Cam Pha I	300	2009	3	-	Vinacoal	COAL
Quang Ninh#1	300	2009	3	-	EVN	COAL
Mao Khe #1	100	2009	1	-	Vinacoal	COAL
Mao Khe #2	100	2009	4	-	Vinacoal	COAL
Hai Phong TPP #2	300	2009	3	-	JV	COAL
Quang Ninh#2	300	2009	6	-	EVN	COAL
Quang Ninh#3	300	2009	6	-	EVN	COAL
Ninh Binh (extension)	300	2009	6	-	EVN	COAL
Uong Bi extension #2	300	2010	1	-	EVN	COAL
Quang Ninh#4	300	2010	4	-	EVN	COAL
Hai Phong II#1	300	2010	3	-	JV	COAL
Hai Phong II#2	300	2010	7	-	JV	COAL
Cam Pha II	300	2010	11	-	Vinacoal	COAL
Vung Ang I #1	600	2010	11	-	EVN	COAL
Nghi Son I #1	300	2011	9	-	EVN	COAL
Nghi Son I #2	300	2012	6	-	EVN	COAL
Mong Duong I #1	500	2012	12	-	EVN	COAL
Mong Duong I #2	500	2013	12	-	EVN	COAL
Mong Duong II #1	500	2015	1	-	EVN	COAL
Mong Duong II #2	500	2015	11	-	EVN	COAL
Mao Khe II #1	100	2016	1	-	Vinacoal	COAL
Mao Khe II #2	100	2016	1	-	Vinacoal	COAL
Vung Ang I #2	600	2016	9	-	EVN	COAL-Imp.
Nghi Son II #1	600	2017	1	-	EVN	COAL
Nghi Son II #2	600	2017	9	-	EVN	COAL

Vung Ang II #1	600	2018	1	-	EVN	COAL-Imp.
Vung Ang II #2	600	2018	9	-	EVN	COAL-Imp.
Vung Ang II #3	600	2019	1	-	EVN	COAL-Imp.
Nghi Son III #1	600	2019	4	-	EVN	COAL-Imp.
Nghi Son III #2	600	2020	1	-	EVN	COAL-Imp.
New Imp. Coal #1	600	2020	1	-	EVN	COAL-Imp.
New Imp. Coal #2	600	2020	6	-	EVN	COAL-Imp.
New Imp. Coal #3	600	2021	1	-	EVN	COAL-Imp.
New Imp. Coal #4	1000	2021	4	-	EVN	COAL-Imp.
New Imp. Coal #5	1000	2022	1	-	EVN	COAL-Imp.
New Imp. Coal #6	1000	2022	6	-	EVN	COAL-Imp.
New Imp. Coal #7	1000	2023	1	-	EVN	COAL-Imp.
New Imp. Coal #8	1000	2023	9	-	EVN	COAL-Imp.
New Imp. Coal #9	1000	2024	1	-	EVN	COAL-Imp.
New Imp. Coal #10	1000	2024	11	-	EVN	COAL-Imp.
New Imp. Coal #11	1000	2025	1	-	EVN	COAL-Imp.
New Imp. Coal #12	1000	2025	9	-	EVN	COAL-Imp.

添付資料 5-1 (4)　IE による電源開発計画（中南部地域、火力発電）

Name	Capacity	Comissioning year	Month	AboLishing year	Owner	Fuel Type
Phu My 2.2 CC	720	2005	1	-	BOT	GAS
Phu My 2.1Ex. GT2x145MW, ST1x160MW	451	2005	12	-	EVN	GAS
Phu My ADD	160	2006	1	2009	EVN	GAS
GT-E9GE 117MW 1	107	2007	1	2008	EVN	OIL
GT-E9GE 117MW 2	107	2007	2	2008	EVN	OIL
GT-E9GE 117MW 3	107	2007	3	2008	EVN	OIL
GT-E9GE 117MW 4	107	2007	4	2008	EVN	OIL
Ca Mau　GT1+2	480	2007	4	2007	IPP	GAS
Ca Mau I CC	720	2008	1	-	PetroVN	GAS
CC-GE I (2x117+100MW)	330	2008	1	-	EVN	OIL
CC-GE II (2x117+100MW)	330	2008	1	-	EVN	OIL
Ca Mau II CC	720	2008	6	-	PetroVN	GAS
O Mon I #1 ST	300	2009	6	-	EVN	GAS
O Mon I #2 ST	300	2010	11	-	EVN	GAS
O Mon II CC GT	720	2011	11	-	IPP	GAS
Nhon Trach I #1 F9E	330	2011	11	-	IPP	GAS
Nhon Trach I #2 F9E	330	2012	6	-	IPP	GAS
O Mon III #1 F9E	330	2012	11	-	EVN	GAS
O Mon III #2 F9E	330	2013	1	-	EVN	GAS
New CC #1 (Tien Giang I)	720	2013	9	-	EVN	GAS
New CC #2 (Tien Giang II)	720	2014	1	-	EVN	GAS
New CC #3 (O Mon IV)	720	2014	9	-	EVN	GAS
New CC #4 (Binh Thuan 1)	720	2015	1	-	EVN	GAS
New CC #5 (Binh Thuan 2)	720	2015	1	-	EVN	GAS
South Coal #1 (Soc Trang1)	600	2016	1	-	EVN	COAL-Imp.
South Coal #2 (Soc Trang2)	600	2016	1	-	EVN	COAL-Imp.
New CC #6 (O Mon V)	720	2016	6	-	EVN	GAS
New CC #7 (Cai lay 1)	720	2017	1	-	EVN	GAS
Nuclear #1-2017	1000	2017	5	-	EVN	Nuclear
New CC #8 (Cai Lay 2)	720	2018	1	-	EVN	GAS
South Coal #3 (Tra Vinh 1)	1000	2018	1	-	EVN	COAL-Imp.
Nuclear #2-2019	1000	2019	4	-	EVN	Nuclear
South Coal #4 (Tra Vinh 2)	1000	2019	1	-	EVN	COAL-Imp.
South Coal #5 (Tra Vinh 3)	1000	2019	9	-	EVN	COAL-Imp.
South Coal #6 (Soc Trang 3)	1000	2020	7	-	EVN	COAL-Imp.
Nuclear #3-2010	1000	2020	1	-	EVN	Nuclear
Nuclear #4-2020	1000	2021	1	-	EVN	Nuclear

South Coal #7 (Soc Trang 4)	1000	2021	1	-	EVN	COAL-Imp.
South Coal #8	1000	2022	1	-	EVN	COAL-Imp.
South Coal #9	1000	2022	1	-	EVN	COAL-Imp.
Nuclear #5-2021	1000	2022	11	-	EVN	Nuclear

添付資料

第 7 章　電力セクター改革と財務分析

添付資料7-1 （1） 長期投資計画（北部地域）

	MW	YY/MM	Investment	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
NamDong-SuoiSap	22	Y2006/6	3,958	676	247	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NhapkhauTQ-4(40MW)	40	Y2006/1	4,896	734	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NhapkhauTQ-5(40MW)	40	Y2006/1	4,896	734	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NhapkhauTQ-220kV(200MW)	200	Y2007/1	24,480	4,896	3,672	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TDNmienBac1-(M.Luong)	22	Y2007/6	3,958	792	676	247	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TuyenQuang#1(114MW)	114	Y2007/10	15,664	3,133	2,937	1,762	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CocSan(40MW)	30	Y2008/3	4,551	910	910	721	114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TDNMB2(NgoiFat-Tr.Tau1&2)	76	Y2008/1	13,672	2,734	2,734	2,051	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
THAIAN(44MW)	44	Y2008/1	6,675	1,335	1,335	1,001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TuyenQuang#2(114MW)	114	Y2008/1	15,664	3,133	3,133	2,350	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TuyenQuang#3(114MW)	114	Y2008/6	15,664	3,133	3,133	2,676	979	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VanChan(35MW)	35	Y2008/3	6,297	1,259	1,259	997	157	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BanLa(320MW)	320	Y2009/3	43,968	8,427	8,794	8,794	6,962	1,099	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hachan-BanCoc-HuongSon(100MW)	100	Y2009/1	13,740	2,748	2,748	2,748	2,061	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ImportFromChina1(Malutang-300MW)	300	Y2009/1	36,720	7,344	7,344	7,344	5,508	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NaLe(90MW)	90	Y2009/1	13,653	2,731	2,731	2,731	2,048	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NGOIBO(35MW)	35	Y2009/1	6,297	1,259	1,259	1,259	944	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TDNSeoChungHo	21.7	Y2009/1	3,904	781	781	781	586	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BanChat200MW	200	Y2010/7	27,480	3,435	4,809	5,496	5,496	4,809	2,061	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ChuLinh(30MW)	40	Y2010/6	6,068	784	1,087	1,214	1,214	1,037	379	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CuaDat(97MW)	97	Y2010/6	14,715	1,901	2,636	2,943	2,943	2,514	920	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NamChien(210MW)	210	Y2010/3	28,854	4,088	5,530	5,771	5,771	4,569	721	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SongHieu(BanMong53MW)	53	Y2010/1	8,040	1,206	1,608	1,608	1,608	1,206	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HuoiQuang#1(280MW)	280	Y2011/1	38,472	3,847	5,771	7,694	7,694	7,694	5,771	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HuoiQuang#2(280MW)	280	Y2011/9	38,472	1,282	4,488	6,412	7,694	7,694	7,053	3,847	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ImportFromLaos(NamMo,2010-,100MW)	100	Y2011/6	12,240	714	1,581	2,193	2,448	2,448	2,091	765	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HuaNa(195MW)	180	Y2012/12	24,732	0	206	2,576	3,813	4,946	4,946	4,843	3,401	0	0	0	0	0	0	0	0	0	0	0	0	0
KheBo96MW	68	Y2012/1	10,316	0	1,032	1,547	2,063	2,063	2,063	1,547	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NhoQue140MW	140	Y2012/4	19,236	0	1,443	2,645	3,607	3,847	3,847	3,126	721	0	0	0	0	0	0	0	0	0	0	0	0	0
LaiChau#1-#2(2x300MW)	600	Y2013/9	82,440	0	0	2,748	9,618	13,740	16,488	16,488	15,114	8,244	0	0	0	0	0	0	0	0	0	0	0	0
SonLa6x400	2400	Y2013/1	297,840	0	0	29,784	44,676	59,568	59,568	59,568	44,676	0	0	0	0	0	0	0	0	0	0	0	0	0
LaiChau#3-#4(2x300MW)	600	Y2014/6	82,440	0	0	0	4,809	10,649	14,771	16,488	16,488	14,084	5,153	0	0	0	0	0	0	0	0	0	0	0
ImportFromChina2(250MW)	250	Y2015/1	30,600	0	0	0	0	3,060	4,590	6,120	6,120	6,120	4,590	0	0	0	0	0	0	0	0	0	0	0
ImportFromChina3(250MW)	250	Y2015/1	30,600	0	0	0	0	3,060	4,590	6,120	6,120	6,120	4,590	0	0	0	0	0	0	0	0	0	0	0
BanUon(80MW)	80	Y2016/9	12,136	0	0	0	0	0	405	1,416	2,023	2,427	2,427	2,225	1,214	0	0	0	0	0	0	0	0	0
ImportFromChina4(250MW)	250	Y2016/1	30,600	0	0	0	0	0	3,060	4,590	6,120	6,120	6,120	4,590	0	0	0	0	0	0	0	0	0	0
ImportFromChina5(250MW)	250	Y2016/1	30,600	0	0	0	0	0	3,060	4,590	6,120	6,120	6,120	4,590	0	0	0	0	0	0	0	0	0	0
ImportFromLaos(NamThen1-400MW)	400	Y2016/4	48,960	0	0	0	0	0	3,672	6,732	9,180	9,792	9,792	7,956	1,836	0	0	0	0	0	0	0	0	0
TrungSon(310MW)	310	Y2016/1	42,594	0	0	0	0	0	4,259	6,389	8,519	8,519	8,519	6,389	0	0	0	0	0	0	0	0	0	0
BacMe(280MW)	280	Y2017/1	38,472	0	0	0	0	0	0	3,847	5,771	7,694	7,694	7,694	5,771	0	0	0	0	0	0	0	0	0
ImportFromChina6(250MW)	250	Y2017/1	30,600	0	0	0	0	0	0	3,060	4,590	6,120	6,120	6,120	4,590	0	0	0	0	0	0	0	0	0
ImportFromChina7(250MW)	250	Y2017/3	30,600	0	0	0	0	0	0	2,550	4,335	5,865	6,120	6,120	4,845	765	0	0	0	0	0	0	0	0
ThuydiennhomoiMB1	100	Y2017/1	17,990	0	0	0	0	0	0	1,799	2,699	3,598	3,598	3,598	2,699	0	0	0	0	0	0	0	0	0
ImportFromChina8(250MW)	250	Y2018/1	30,600	0	0	0	0	0	0	0	3,060	4,590	6,120	6,120	6,120	4,590	0	0	0	0	0	0	0	0
PSPP#1	200	Y2018/6	15,000	0	0	0	0	0	0	0	875	1,938	2,688	3,000	3,000	2,563	938	0	0	0	0	0	0	0
PSPP#2	200	Y2020/4	15,000	0	0	0	0	0	0	0	0	0	1,125	2,063	2,813	3,000	3,000	2,438	563	0	0	0	0	0
ThuydiennhomoiMB2	100	Y2020/1	17,990	0	0	0	0	0	0	0	0	0	1,799	2,699	3,598	3,598	3,598	2,699	0	0	0	0	0	0
PSPP#3	200	Y2021/4	15,000	0	0	0	0	0	0	0	0	0	0	1,125	2,063	2,813	3,000	3,000	2,438	563	0	0	0	0
PSPP#4	200	Y2022/6	15,000	0	0	0	0	0	0	0	0	0	0	0	875	1,938	2,688	3,000	3,000	2,563	938	0	0	0
PSPP#5	200	Y2023/6	15,000	0	0	0	0	0	0	0	0	0	0	0	0	875	1,938	2,688	3,000	3,000	2,563	938	0	0
ThuydiennhomoiMB3	100	Y2023/1	17,990	0	0	0	0	0	0	0	0	0	0	0	0	1,799	2,699	3,598	3,598	3,598	2,699	0	0	0
PSPP#6	200	Y2024/4	15,000	0	0	0	0	0	0	0	0	0	0	0	0	0	1,125	2,063	2,813	3,000	3,000	2,438	563	0
PhaLai2TPP#1	300	Y2002/1	1,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PhaLai2TPP#2	300	Y2002/1	1,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NaDuongTPP#150MW,VinaCoal	50	Y2005/2	6,470	108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NaDuongTPP#250MW,VinaCoal	50	Y2005/5	6,470	431	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CaoNgan#1	50	Y2005/10	6,470	971	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CaoNgan#2	50	Y2005/12	6,470	1,186	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DieselmienBac	40	Y2006/1	1,400	280	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UongBi(Extension)	300	Y2006/6	24,000	5,800	2,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ToF6-GE1	35	Y2006/10	1,502	413	225	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ToF6-GE2	35	Y2006/10	1,502	413	225	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ToF6-GE3	35	Y2006/11	1,502	425	250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ToF6-GE4	35	Y2006/11	1,502	425	250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SonDong#1	98	Y2008/4	12,681	3,487	3,804	2,853	634	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SonDong#2	98	Y2008/9	12,681	2,959	3,804	3,382	1,691	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HaiPhongTPP#1	300	Y2008/12	35,100	7,313	10,530	10,238	6,435	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CamPhaI	300	Y2009/3	35,100	5,850	9,945	10,530	7,605	1,170	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QuangNinh#1	300	Y2009/3	35,100	5,850	9,945	10,530	7,605	1,170	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MaoKhe#1	100	Y2009/1	12,940	2,588	3,882	3,882	2,588	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MaoKhe#2	100	Y2009/4	12,940	1,941	3,559	3,882	2,912	647	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HaiPhongTPP#2	300	Y2009/3	35,100	5,850	9,945	10,530	7,605	1,170	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QuangNinh#2	300	Y2009/6	35,100	4,095	9,068	10,530	8,483	2,925	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QuangNinh#3	300	Y2009/6	35,100	4,095	9,068	10,530	8,483	2,925	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NinhBinh(extension)	300	Y2009/6	29,400	3,430	7,595	8,820	7,105	2,450	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UongBiextension(generator2)	300	Y2010/1	35,100	0	7,020	10,530	10,530	7,020	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QuangNinh#4	300	Y2010/4	35,100	0	5,265	9,653	10,530	7,898	1,755	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HaiPhongII#1	300	Y2010/3	32,580	0	5,430	9,231	9,774	7,059	1,086	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HaiPhongII#2	300	Y2010/7	32,580	0	3,258	8,145	9,774	8,145	3,258	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CamPhaII	300	Y2010/11	35,100	0	1,170	7,605	10,530	9,945	5,850	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VungAngI#1	600	Y2010/11	70,200	0	2,340	15,210	21,060	19,890	11,700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NghiSonI#1	300	Y2011/9	35,100	0	0	2,340	8,190	10,530	9,360	4,680	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NghiSonI#2	300	Y2012/6	35,100	0	0	0	4,095	9,068	10,530	8,483	2,925	0	0	0	0	0	0	0	0	0	0	0	0	0
MongDuongI#1	500	Y2012/12	54,300	0	0	0	905	11,313	16,290	15,838	9,955	0	0	0	0	0	0	0	0	0	0	0	0	0
MongDuongI#2	500	Y2013/12	54,300	0	0	0	0	905	11,313	16,290	15,838	9,955	0	0	0	0	0	0	0	0	0	0	0	0
MongDuongII#1	500	Y2015/1	54,300	0	0	0	0	0	0	10,860	16,290	16,290	10,860	0	0	0	0	0	0	0	0	0	0	0
MongDuongII#2	500	Y2015/11	54,300	0	0	0	0	0	0	1,810	11,765	16,290	15,385	9,050	0	0	0	0	0	0	0	0	0	0
MaoKheII#1	100	Y2016/1	12,940	0	0	0	0	0	0	0	2,588	3,882	3,882	2,588	0	0	0	0	0	0	0	0	0	0
MaoKheII#2	100	Y2016/1	12,940	0	0	0	0	0	0	0	2,588	3,882	3,882	2,588	0	0	0	0	0	0	0	0	0	0
VungAngI#2	600	Y2016/9	70,200	0	0	0	0	0	0	0	4,680	16,380	21,060	18,720	9,360	0	0	0	0	0	0	0	0	0
NghiSonII#1	600	Y2017/1	70,200	0	0	0	0	0	0	0	0	14,040	21,060	21,060	14,040	0	0	0	0	0	0	0	0	0
NghiSonII#2	600	Y2017/9	70,200	0	0	0	0	0	0	0	0	4,680	16,380	21,060	18,720	9,360	0	0	0	0	0	0	0	0
VungAngII#1	600	Y2018/1	70,200	0	0	0	0	0	0	0	0	0	14,040	21,060	21,060	14,040	0	0	0	0	0	0	0	0
VungAngII#2	600	Y2018/9	70,200	0	0	0	0	0	0	0	0	0	4,680	16,380	21,060	18,720	9,360	0	0	0	0	0	0	0
VungAngII#3	600	Y2019/1	70,200	0	0	0	0	0	0	0	0	0	0	14,040	21,060	21,060	14,040	0	0	0	0	0	0	0
NghiSonIII#1	600	Y2019/4	65,160	0	0	0	0	0	0	0	0	0	0	9,774	17,919	19,548	14,661	3,258	0	0	0	0	0	0
NghiSonIII#2	600	Y2020/1	65,160	0	0	0	0	0	0	0	0	0	0	0	13,032	19,548	19,548	13,032	0	0	0	0	0	0
NewImp.Coal#1	600	Y2020/1	58,800	0	0	0	0	0	0	0	0	0	0	0	11,760	17,640	17,640	11,760	0	0	0	0	0	0
NewImp.Coal#2	600	Y2020/6	58,800	0	0	0	0	0	0	0	0	0	0	0	6,860	15,190	17,640	14,210	4,900	0	0	0	0	0
NewImp.Coal#3	600	Y2021/1	58,800	0	0	0	0	0	0	0	0	0	0	0	0	11,760	17,640	17,640	11,760	0	0	0	0	0
NewImp.Coal#4	1000	Y2021/4	98,000	0	0	0	0	0	0	0	0	0	0	0	0	14,700	26,950	29,400	22,050	4,900	0	0	0	0
NewImp.Coal#5	1000	Y2022/1	98,000	0	0	0	0	0	0	0	0	0	0	0	0	0	19,600	29,400	29,400	19,600	0	0	0	0
NewImp.Coal#6	1000	Y2022/6	98,000	0	0	0	0	0	0	0	0	0	0	0	0	0	11,433	25,317	29,400	23,683	8,167	0	0	0
NewImp.Coal#7	1000	Y2023/1	98,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19,600	29,400	29,400	19,600	0	0	0
NewImp.Coal#8	1000	Y2023/9	98,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6,533	22,867	29,400	26,133	13,067	0	0
NewImp.Coal#9	1000	Y2024/1	98,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19,600	29,400	29,400	19,600	0	0
NewImp.Coal#10	1000	Y2024/11	98,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,267	21,233	29,400	27,767	16,333	0
NewImp.Coal#11	1000	Y2025/1	98,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19,600	29,400	29,400	19,600	0
NewImp.Coal#12	1000	Y2025/9	98,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6,533	22,867	29,400	26,133	13,067

IPP
Import
Joint Venture

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
North	EVN(PP)	375.8	633.1	1272.1	1667.8	1904.3	1827.1	1739.7	1590.4	1205.4	1310.7	1536.4	1706.1	1727.5	1812.0	1833.4	1844.6	1928.8	1714.7	1226.1	626.3	130.7
	IPP	427.2	527.4	577.5	454.7	231.5	99.3	33.5	78.7	113.6	131.6	114.7	63.0	54.0	63.0	63.0	36.0	36.0	27.0	0.0	0.0	0.0
	JV	272.0	538.2	620.1	491.4	160.9	17.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Imp	147.3	126.0	95.4	79.6	85.7	210.6	345.3	456.5	508.5	495.7	355.0	173.9	53.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	1222.3	1824.6	2565.1	2693.5	2382.3	2154.6	2118.5	2125.6	1827.5	1938.0	2006.1	1942.9	1835.1	1875.0	1896.3	1880.5	1964.7	1741.7	1226.1	626.3	130.7
C&S	EVN(PP)	908.0	1013.3	1023.1	935.5	945.3	986.1	1113.3	1217.0	1440.3	1727.2	2092.2	2559.0	2970.6	3120.7	3435.3	3657.2	3949.1	3390.3	2086.2	869.8	1.9
	IPP	468.7	483.7	364.9	178.2	98.9	73.4	81.8	91.9	88.9	67.3	70.9	91.1	70.9	81.0	70.9	40.5	30.4	0.0	0.0	0.0	0.0
	JV	84.9	105.2	121.1	202.3	203.7	134.6	79.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Imp	54.1	70.2	174.3	252.1	426.9	508.1	613.4	594.4	432.2	326.4	106.5	22.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	1515.7	1672.5	1683.4	1568.2	1674.7	1702.3	1887.7	1903.4	1961.4	2121.0	2269.6	2672.6	3041.5	3201.7	3506.1	3697.7	3979.5	3390.3	2086.2	869.8	1.9
Whole	EVN(PP)	1283.8	1646.4	2295.3	2603.4	2849.6	2813.2	2853.0	2807.4	2645.7	3037.9	3628.6	4265.1	4698.2	4932.7	5268.6	5501.8	5877.8	5105.0	3312.3	1496.0	132.5
	IPP	896.0	1011.1	942.4	632.9	330.4	172.8	115.3	170.7	202.5	198.9	185.6	154.1	124.8	144.0	133.8	76.5	66.4	27.0	0.0	0.0	0.0
	JV	356.9	643.4	741.2	693.7	364.5	152.2	79.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Imp	201.4	196.2	269.6	331.7	512.6	718.8	958.7	1050.9	940.6	822.2	461.5	196.4	53.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	2738.0	3497.1	4248.5	4261.6	4057.1	3856.9	4006.2	4029.0	3788.8	4059.0	4275.7	4615.6	4876.6	5076.6	5402.5	5578.3	5944.2	5132.0	3312.3	1496.0	132.5

Power Grids	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
500kV Trans. Line &	272.0	125.9	125.9	125.9	125.9	125.9	125.9	125.9	125.9	125.9	125.9	256.7	256.7	256.7	256.7	256.7	300.0	300.0	300.0	300.0	300.0
500kV Trans. Line &	182.0	154.0	154.0	154.0	154.0	154.0	200.0	200.0	200.0	300.0	300.0	300.0	400	400	400	500	500	500	600	600	600
110kV Trans. Line &	320.0	167.0	131.0	148.0	167.0	138.0	200.0	200.0	200.0	300.0	300.0	300.0	400	400	400	500	500	500	600	600	600
Distribution System	268.0	325.0	255.0	288.0	326.0	269.0	400.0	400.0	400.0	600.0	600.0	600.0	800	800	800	1,000	1,000	1,000	1,200	1,200	1,200
Subtotal	1,042	772	666	716	773	687	926	926	926	1,326	1,326	1,457	1,857	1,857	1,857	2,257	2,300	2,300	2,700	2,700	2,700

添付資料7-1 (2) 長期投資計画（中南部地域）

	MW	YY/MM	Investment	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Sesan3#1(130MW)	130	Y2006/9	17,862	3,275	1,786	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sesan3#2(130MW)	130	Y2006/12	17,862	3,498	2,456	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sesan3A(100MW)	86	Y2006/9	11,816	2,166	1,182	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SrokPhuMieng(54MW)	51	Y2006/10	6,982	1,309	785	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DaDangDachamo(16MW)	16	Y2007/1	3,240	648	486	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DaiNinh#1(150MW)	150	Y2007/11	20,610	4,122	3,950	2,576	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DaiNinh#2(150MW)	150	Y2007/12	20,610	4,122	4,036	2,834	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HChan,HMun(27MW)	27	Y2007/6	5,468	1,094	934	342	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PleiKrong(110MW)	110	Y2007/12	15,114	3,023	2,960	2,078	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RaoQuan(QuangTri70MW)	64	Y2007/6	8,762	1,752	1,497	548	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TdnhoMienTrung1(BaoLoc,DanSach,TraXom)	55	Y2007/6	11,138	2,228	1,903	696	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AVuong(210MW)	210	Y2008/6	28,854	5,771	5,771	4,929	1,803	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BacBinh(35MW)	35	Y2008/5	7,088	1,418	1,418	1,181	354	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BuonKuop#1(140MW)	140	Y2008/6	19,236	3,847	3,847	3,286	1,202	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BuonKuop#2(140MW)	140	Y2008/9	19,236	3,847	3,847	3,527	1,924	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BuonTuaSrah(85MW)	86	Y2008/12	11,816	2,363	2,363	2,314	1,625	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CoBi(48MW)	48	Y2008/6	9,720	1,944	1,944	1,661	608	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DongNai3(180MW)	180	Y2008/12	24,732	4,946	4,946	4,843	3,401	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EaRongRou(34MW)	28	Y2008/12	5,670	1,134	1,134	1,110	780	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Langau(38MW)	38	Y2008/12	7,695	1,539	1,539	1,507	1,058	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SongBaHa(250MW)	220	Y2008/6	30,228	6,046	6,046	5,164	1,889	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AnKhe+KaNak(173MW)	163	Y2009/10	22,396	3,639	4,479	4,479	4,199	2,520	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BinhDien(44MW)	44	Y2009/1	8,910	1,782	1,782	1,782	1,337	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DamBri(72MW)	72	Y2009/12	9,857	1,520	1,971	1,971	1,930	1,355	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DongNai4(340MW)	340	Y2009/11	46,716	7,397	9,343	9,343	8,954	5,840	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ImportFromLaos(Xekaman3-260MW)	260	Y2009/12	35,100	5,411	7,020	7,020	6,874	4,826	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lagrai(9MW)	9	Y2009/1	1,823	365	365	365	273	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sesan4#1(110MW)	120	Y2009/9	16,488	2,748	3,298	3,298	3,023	1,649	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sesan4#2(110MW)	120	Y2009/12	16,488	2,542	3,298	3,298	3,229	2,267	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Srepok3#1(110MW)	110	Y2009/9	15,114	2,519	3,023	3,023	2,771	1,511	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Srepok3#2(110MW)	110	Y2009/12	15,114	2,330	3,023	3,023	2,960	2,078	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DakDrinh1(100MW)	100	Y2010/9	13,740	1,603	2,290	2,748	2,748	2,519	1,374	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DakRtih(72MW)	72	Y2010/1	9,857	1,479	1,971	1,971	1,971	1,479	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EaKrongHnang(65MW)	65	Y2010/6	8,899	1,149	1,594	1,780	1,780	1,520	556	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sesan4#3(110MW)	120	Y2010/3	16,488	2,336	3,160	3,298	3,298	2,611	412	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SongBung2(108MW)	108	Y2010/11	14,839	1,608	2,350	2,968	2,968	2,844	1,855	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SongCon2(70MW)	70	Y2010/9	9,618	1,122	1,603	1,924	1,924	1,763	962	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SongTranh2(132MW)	160	Y2010/1	21,984	3,298	4,397	4,397	4,397	3,298	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SongBung4(165MW)	165	Y2011/11	33,413	557	3,620	5,290	6,683	6,683	6,404	4,177	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Srepok4(28MW)	28	Y2011/1	5,670	567	851	1,134	1,134	1,134	851	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UpperKonTum#1(110MW)	110	Y2011/1	15,114	1,511	2,267	3,023	3,023	3,023	2,267	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UpperKonTum#2(110MW)	110	Y2011/6	15,114	882	1,952	2,708	3,023	3,023	2,582	945	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DakMi1(210MW)2020	210	Y2012/9	28,854	0	962	3,366	4,809	5,771	5,771	5,290	2,885	0	0	0	0	0	0	0	0	0	0	0	0	0
DakMi4(210MW)	210	Y2012/1	28,854	0	2,885	4,328	5,771	5,771	5,771	4,328	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DongNai2(80MW)	78	Y2012/1	10,678	0	1,068	1,602	2,136	2,136	2,136	1,602	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DongNai5(170MW)	173	Y2012/6	23,770	0	1,387	3,070	4,259	4,754	4,754	4,061	1,486	0	0	0	0	0	0	0	0	0	0	0	0	0
Winturbine1	50	Y2012/1	500	0	50	75	100	100	100	75	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Winturbine2	50	Y2012/6	500	0	29	65	90	100	100	85	31	0	0	0	0	0	0	0	0	0	0	0	0	0
ImportFromLaos(Sekong4-450MW)-2016	485	Y2013/6	65,475	0	0	3,819	8,457	11,731	13,095	13,095	11,185	4,092	0	0	0	0	0	0	0	0	0	0	0	0
ImportFromLaos(Xekaman1-450MW)	488	Y2013/1	65,880	0	0	6,588	9,882	13,176	13,176	13,176	9,882	0	0	0	0	0	0	0	0	0	0	0	0	0
DucXuyen(52MW)	52	Y2014/6	10,530	0	0	0	614	1,360	1,887	2,106	2,106	1,799	658	0	0	0	0	0	0	0	0	0	0	0
SongBung5(85MW)	85	Y2014/1	11,637	0	0	0	1,164	1,745	2,327	2,327	2,327	1,745	0	0	0	0	0	0	0	0	0	0	0	0
ThuydiennhomoiMT_MN1	100	Y2014/1	20,250	0	0	0	2,025	3,038	4,050	4,050	4,050	3,038	0	0	0	0	0	0	0	0	0	0	0	0
ImportFromCPC(LowerSeSan3-375MW-71)-20	375	Y2015/1	50,625	0	0	0	0	5,063	7,594	10,125	10,125	10,125	7,594	0	0	0	0	0	0	0	0	0	0	0
ImportFromLaos(2014Sekong5-250MW)	405	Y2015/1	54,675	0	0	0	0	5,468	8,201	10,935	10,935	10,935	8,201	0	0	0	0	0	0	0	0	0	0	0
ImportFromLaos(NamKong1-240MW)	240	Y2015/4	32,400	0	0	0	0	2,430	4,455	6,075	6,480	6,480	5,265	1,215	0	0	0	0	0	0	0	0	0	0
ImportFromCPC(LowerSeRepok2-222MW)	222	Y2016/7	29,970	0	0	0	0	0	1,499	3,746	5,245	5,994	5,994	5,245	2,248	0	0	0	0	0	0	0	0	0
ImportFromCPC(LowerSeSan2-207MW)-2017	207	Y2016/1	27,945	0	0	0	0	0	2,795	4,192	5,589	5,589	5,589	4,192	0	0	0	0	0	0	0	0	0	0
ThuydiennhomoiMT_MN2	100	Y2017/1	20,250	0	0	0	0	0	0	2,025	3,038	4,050	4,050	4,050	3,038	0	0	0	0	0	0	0	0	0
Winturbine3	50	Y2017/1	500	0	0	0	0	0	0	50	75	100	100	100	75	0	0	0	0	0	0	0	0	0
PSPP#1(300MW)	200	Y2018/1	15,000	0	0	0	0	0	0	0	1,500	2,250	3,000	3,000	3,000	2,250	0	0	0	0	0	0	0	0
PSPP#2(300MW)	200	Y2018/4	15,000	0	0	0	0	0	0	0	1,125	2,063	2,813	3,000	3,000	2,438	563	0	0	0	0	0	0	0
PSPP#3(300MW)	200	Y2019/4	15,000	0	0	0	0	0	0	0	0	1,125	2,063	2,813	3,000	3,000	2,438	563	0	0	0	0	0	0
PSPP#4(300MW)	200	Y2020/4	15,000	0	0	0	0	0	0	0	0	0	1,125	2,063	2,813	3,000	3,000	2,438	563	0	0	0	0	0
ThuydiennhomoiMT_MN3	100	Y2020/1	20,250	0	0	0	0	0	0	0	0	0	2,025	3,038	4,050	4,050	4,050	3,038	0	0	0	0	0	0
Winturbine4	50	Y2020/1	500	0	0	0	0	0	0	0	0	0	50	75	100	100	100	75	0	0	0	0	0	0
PSPP#5(300MW)	200	Y2021/1	15,000	0	0	0	0	0	0	0	0	0	0	1,500	2,250	3,000	3,000	3,000	2,250	0	0	0	0	0
PSPP#6(300MW)	200	Y2021/4	15,000	0	0	0	0	0	0	0	0	0	0	1,125	2,063	2,813	3,000	3,000	2,438	563	0	0	0	0
ThuydiennhomoiMT_MN4	100	Y2022/1	20,250	0	0	0	0	0	0	0	0	0	0	0	2,025	3,038	4,050	4,050	4,050	3,038	0	0	0	0
PSPP#7(300MW)	200	Y2023/4	15,000	0	0	0	0	0	0	0	0	0	0	0	0	1,125	2,063	2,813	3,000	3,000	2,438	563	0	0
PSPP#8(300MW)	200	Y2024/4	15,000	0	0	0	0	0	0	0	0	0	0	0	0	0	1,125	2,063	2,813	3,000	3,000	2,438	563	0
PSPP#9(300MW)	200	Y2025/2	15,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,375	2,188	2,938	3,000	3,000	2,313	188
PhuMy1GT1x240MW	240	Y2000/1	12,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PhuMy1GT2x240MW	240	Y2000/1	12,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PhuMy1GT3x240MW	240	Y2000/1	12,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BaRiaC/C#2GT3x37.5MW,ST1x62MW	174.5	Y2001/1	15,688	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PhuMy1CC	1090	Y2001/1	54,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PhuMy2.1GT2x145MW,ST1x144MW	430	Y2003/1	21,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PhuMy3CC	720	Y2004/1	64,728	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PhuMy4(3x150MW)	450	Y2004/8	40,455	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Formosa1(150MW)	150	Y2004/8	15,930	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VeDan-Amata-BouBon	109	Y2004/1	5,450	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DieselMTrung	91	Y2004/1	3,185	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DieselMNam	62	Y2004/1	2,170	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PhuMy2.2CC	720	Y2005/1	47,520	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PhuMy2.1Ex.GT2x145MW,ST1x160MW	451	Y2005/12	29,766	5,457	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PhuMyADD	160	Y2006/1	10,560	2,112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CaMauGT1+2	480	Y2007/4	24,000	7,200	5,400	1,200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CaMauICC	720	Y2008/1	47,520	14,256	14,256	9,504	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CC-GEI(2x117+100MW)	330	Y2008/1	14,157	4,247	4,247	2,831	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CC-GEII(2x117+100MW)	330	Y2008/1	14,157	4,247	4,247	2,831	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CaMauIICC	720	Y2008/6	47,520	12,276	14,256	11,484	3,960	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OMonI#1ST	300	Y2009/6	15,000	1,750	3,875	4,500	3,625	1,250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OMonI#2ST	300	Y2010/11	15,000	0	500	3,250	4,500	4,250	2,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OMonIICCGT	720	Y2011/11	47,520	0	0	1,584	10,296	14,256	13,464	7,920	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NhonTrachI#1F9E	330	Y2011/11	30,030	0	0	1,001	6,507	9,009	8,509	5,005	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NhonTrachI#2F9E	330	Y2012/6	30,030	0	0	0	3,504	7,758	9,009	7,257	2,503	0	0	0	0	0	0	0	0	0	0	0	0	0
OMonIII#1F9E	330	Y2012/11	30,030	0	0	0	1,001	6,507	9,009	8,509	5,005	0	0	0	0	0	0	0	0	0	0	0	0	0
OMonIII#2F9E	330	Y2013/1	30,030	0	0	0	0	6,006	9,009	9,009	6,006	0	0	0	0	0	0	0	0	0	0	0	0	0
NewCC#1(TienGiangI)	720	Y2013/9	47,520	0	0	0	0	3,168	11,088	14,256	12,672	6,336	0	0	0	0	0	0	0	0	0	0	0	0
NewCC#2(TienGiangII)	720	Y2014/1	47,520	0	0	0	0	0	9,504	14,256	14,256	9,504	0	0	0	0	0	0	0	0	0	0	0	0
NewCC#3(OMonIV)	720	Y2014/9	47,520	0	0	0	0	0	3,168	11,088	14,256	12,672	6,336	0	0	0	0	0	0	0	0	0	0	0
NewCC#4(BinhThuan1)	720	Y2015/1	47,520	0	0	0	0	0	0	9,504	14,256	14,256	9,504	0	0	0	0	0	0	0	0	0	0	0
NewCC#5(BinhThuan2)	720	Y2015/1	47,520	0	0	0	0	0	0	9,504	14,256	14,256	9,504	0	0	0	0	0	0	0	0	0	0	0
SouthCoal#1(SocTrang1)	600	Y2016/1	58,800	0	0	0	0	0	0	0	11,760	17,640	17,640	11,760	0	0	0	0	0	0	0	0	0	0
SouthCoal#2(SocTrang2)	600	Y2016/1	58,800	0	0	0	0	0	0	0	11,760	17,640	17,640	11,760	0	0	0	0	0	0	0	0	0	0
NewCC#6(OMonV)	720	Y2016/6	47,520	0	0	0	0	0	0	0	5,544	12,276	14,256	11,484	3,960	0	0	0	0	0	0	0	0	0
NewCC#7(Cailay1)	720	Y2017/1	47,520	0	0	0	0	0	0	0	0	9,504	14,256	14,256	9,504	0	0	0	0	0	0	0	0	0
Nuclear#1-2017	1000	Y2017/5	170,000	0	0	0	0	0	0	0	0	22,667	45,333	51,000	39,667	11,333	0	0	0	0	0	0	0	0
NewCC#8(CaiLay2)	720	Y2018/1	47,520	0	0	0	0	0	0	0	0	0	9,504	14,256	14,256	9,504	0	0	0	0	0	0	0	0
SouthCoal#3(TraVinh1)	1000	Y2018/1	98,000	0	0	0	0	0	0	0	0	0	19,600	29,400	29,400	19,600	0	0	0	0	0	0	0	0
Nuclear#2-2019	1000	Y2019/4	170,000	0	0	0	0	0	0	0	0	0	0	25,500	46,750	51,000	38,250	8,500	0	0	0	0	0	0
SouthCoal#4(TraVinh2)	1000	Y2019/1	98,000	0	0	0	0	0	0	0	0	0	0	19,600	29,400	29,400	19,600	0	0	0	0	0	0	0
SouthCoal#5(TraVinh3)	1000	Y2019/9	98,000	0	0	0	0	0	0	0	0	0	0	6,533	22,867	29,400	26,133	13,067	0	0	0	0	0	0
SouthCoal#6(SocTrang3)	1000	Y2020/7	98,000	0	0	0	0	0	0	0	0	0	0	0	9,800	24,500	29,400	24,500	9,800	0	0	0	0	0
Nuclear#3-2010	1000	Y2020/1	170,000	0	0	0	0	0	0	0	0	0	0	0	34,000	51,000	51,000	34,000	0	0	0	0	0	0
Nuclear#4-2020	1000	Y2021/1	170,000	0	0	0	0	0	0	0	0	0	0	0	0	34,000	51,000	51,000	34,000	0	0	0	0	0
SouthCoal#7(SocTrang4)	1000	Y2021/1	98,000	0	0	0	0	0	0	0	0	0	0	0	0	19,600	29,400	29,400	19,600	0	0	0	0	0
SouthCoal#8	1000	Y2022/1	98,000	0	0	0	0	0	0	0	0	0	0	0	0	0	19,600	29,400	29,400	19,600	0	0	0	0
SouthCoal#9	1000	Y2022/1	98,000	0	0	0	0	0	0	0	0	0	0	0	0	0	19,600	29,400	29,400	19,600	0	0	0	0
Nuclear#5-2021	1000	Y2022/11	170,000	0	0	0	0	0	0	0	0	0	0	0	0	0	5,667	36,833	51,000	48,167	28,333	0	0	0
NewCC#9(MienTrung)	720	Y2022/4	47,520	0	0	0	0	0	0	0	0	0	0	0	0	0	7,128	13,068	14,256	10,692	2,376	0	0	0
SouthCoal#10	1000	Y2023/1	98,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19,600	29,400	29,400	19,600	0	0	0
Nuclear#6-2022	1000	Y2023/6	170,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19,833	43,917	51,000	41,083	14,167	0	0
SouthCoal#11	1000	Y2023/1	98,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19,600	29,400	29,400	19,600	0	0	0
SouthCoal#12	1000	Y2024/1	98,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19,600	29,400	29,400	19,600	0	0
SouthCoal#13	1000	Y2024/1	98,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19,600	29,400	29,400	19,600	0	0
SouthCoal#14	1000	Y2024/11	98,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,267	21,233	29,400	27,767	16,333	0
Nuclear#7-2022	1000	Y2024/6	170,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19,833	43,917	51,000	41,083	14,167	0
SouthCoal#15	1000	Y2025/1	98,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19,600	29,400	29,400	19,600	0
Nuclear#8-2022	1000	Y2025/1	170,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34,000	51,000	51,000	34,000	0

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
	EVN	908.0	1013.3	1023.1	935.5	945.3	986.1	1113.3	1217.0	1440.3	1727.2	2092.2	2559.0	2970.6	3120.7	3435.3	3657.2	3949.1	3390.3	2086.2	869.8	1.9
IPP	IPP	468.7	483.7	364.9	178.2	98.9	73.4	81.8	91.9	88.9	67.3	70.9	91.1	70.9	81.0	70.9	40.5	30.4	0.0	0.0	0.0	0.0
Import	JV	84.9	105.2	121.1	202.3	203.7	134.6	79.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Joint Venture	Imp	54.1	70.2	174.3	252.1	426.9	508.1	613.4	594.4	432.2	326.4	106.5	22.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	1515.7	1672.5	1683.4	1568.2	1674.7	1702.3	1887.7	1903.4	1961.4	2121.0	2269.6	2672.6	3041.5	3201.7	3506.1	3697.7	3979.5	3390.3	2086.2	869.8	1.9

添付資料 7-2 (1) PDP6thにおける運転維持費用算出結果 (Base Scenario) (1/2)

Unit : million USD

Total O & M Cost (million USD)				263	291	321	357	396	464	529	596	685	803	912	1,022	1,173	1,325	1,508	1,729	1,937	2,156	2,438	2,701	3,001
Norm\Year	***com. Year***	***com.Month***	***CS***	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
NORTH																								
Hydro				**20.3**	**20.3**	**20.6**	**23.2**	**26.6**	**28.0**	**44.6**	**53.4**	**65.7**	**71.2**	**73.7**	**77.3**	**80.4**	**81.3**	**81.9**	**83.0**	**84.5**	**86.4**	**87.5**	**89.4**	**89.4**
Thac Ba	1973		108	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Hoa Binh	1994		1,920	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2
Tuyen Quang (Na Hang)#1	2007	10	114			0.3	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Tuyen Quang (Na Hang)#2	2008	1	114				1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Tuyen Quang (Na Hang)#3	2008	6	114				0.5	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Ban Ve (Ban La) #1	2008	12	160				0.1	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Ban Ve (Ban La) #2	2009	3	160					1.3	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Ban Chat	2010	4,9	200						1.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Huoi Quang	2011	1,9	560							3.7	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Son La #1,#2,#3	2011	1	1,200							12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
Son La #4,#5,#6	2012	3,7,12	1,200								5.7	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
Nho Que	2012	4	140								1.1	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Lai Chau #1,#2	2013	9	600									4.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lai Chau #3,#4	2014	6	600										3.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Hua Na	2012	12	180								0.2	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Trung Son	2016	1	310												3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Ban Uon	2016	9	80												0.5	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Bac Me	2017	1	280													2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
PSPP (North) #1	2018	6	200														0.9	1.5	1.5	1.5	1.5	1.5	1.5	1.5
PSPP (North) #2	2020	4	200																1.1	1.5	1.5	1.5	1.5	1.5
PSPP (North) #3	2021	4	200																	1.1	1.5	1.5	1.5	1.5
PSPP (North) #4	2022	6	200																		1.5	1.5	1.5	1.5
PSPP (North) #5	2023	6	200																			1.1	1.5	1.5
PSPP (North) #6	2024	4	200																				1.5	1.5
PSPP (North) #7	2026	1	200																					
PSPP (North) #8	2026	1	200																					
THERMAL				**42.0**	**49.7**	**56.8**	**56.8**	**62.7**	**94.0**	**121.2**	**139.4**	**156.2**	**171.4**	**190.8**	**211.5**	**251.7**	**287.1**	**335.4**	**392.0**	**430.8**	**495.8**	**550.8**	**603.3**	**668.3**
Coal																								
Ninh Binh #1~#4	1976		100	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
Uong Bi #1,#2	1977		100	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
Pha Lai 1 #1~#4	1986		440	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9
Pha Lai 2	2002		600	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3
Uong Bi extension 1	2006	6	300		5.9	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2
Uong Bi extension 2	2010	1	300						10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2
Ninh Binh Ext.	2009	6	300					5.9	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2
Hai Phong II #1	2010	3	300						8.5	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2
Hai Phong II #2	2010	7	300						5.1	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2
Nghi Son I #1	2011	9	300							3.4	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2
Nghi Son I #2	2012	6	300								5.9	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2
Vung Ang I #1	2010	11	600						3.4	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3
Vung Ang I #2	2016	9	600												6.8	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3
Mong Duong I #1	2012	12	500								5.6	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7
Mong Duong I #2	2013	12	500									1.4	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7
Vung Ang II #1	2018	1	600														20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Vung Ang II #2	2018	9	600														6.7	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Nghi Son II #1	2017	1	600													20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Nghi Son II #2	2017	9	600													6.7	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Vung Ang II #3	2019	1	600															20.0	20.0	20.0	20.0	20.0	20.0	20.0
Nghi Son III #1	2019	4	600															15.0	20.0	20.0	20.0	20.0	20.0	20.0
Nghi Son III #2	2020	1	600																20.0	20.0	20.0	20.0	20.0	20.0
Mong Duong II #1	2015	1	500											16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7
Mong Duong II #2	2015	11	500											2.8	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7
NewCoal #1	2020	1	600																20.0	20.0	20.0	20.0	20.0	20.0
NewCoal #2	2020	6	600																11.7	20.0	20.0	20.0	20.0	20.0
NewCoal #3	2021	1	600																	18.0	18.0	18.0	18.0	18.0
NewCoal #4	2021	4	1,000																	12.5	30.0	30.0	30.0	30.0
NewCoal #5	2022	1	1,000																		30.0	30.0	30.0	30.0
NewCoal #6	2022	6	1,000																		17.5	30.0	30.0	30.0
NewCoal #7	2023	1	1,000																			30.0	30.0	30.0
NewCoal #8	2023	9	1,000																			12.5	30.0	30.0
NewCoal #9	2024	1	1,000																				30.0	30.0
NewCoal #10	2024	11	1,000																				5.0	30.0
NewCoal #11	2025	1	1,000																					30.0
NewCoal #12	2025	9	1,000																					10.0
Oil																								
ToF6-GE 1,2,3,4,	2006	10,11	140		0.7	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5								
Diesel Mien Bac	2006	1	40		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0								
CENTRE																								
Hydro				**8.8**	**9.3**	**11.9**	**17.1**	**22.2**	**27.6**	**31.1**	**35.8**	**37.2**	**38.0**	**38.0**	**38.0**	**38.0**	**38.0**	**38.0**	**38.0**	**38.0**	**38.0**	**38.0**	**38.0**	**38.0**
Vinh Son	1994		66	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Dray Hling	1990		12	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Song Hinh	2000		70	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Yaly	2001		720	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2
Se San3	2006	9,12	260		0.5	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Quang Tri(Rao Quan)	2007	6	70			0.4	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Plei Krong	2007	12	110			0.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
A Vuong	2008	6	210				1.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Song Ba Ha	2008	6	220				1.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
BuonTua Srah	2008	12	85				0.1	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Buon Kuop	2008	6,9	280				1.3	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Se San4	2009-10	9,12,3	360					1.0	3.4	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Song Tranh2	2010	1	160						1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Dak Drinh	2010	9	100						0.7	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Song Bung 2	2010	11	108						0.5	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Song Con 2	2010	9	70						0.2	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Thuong Kon Tum	2011	1,6	220							1.7	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Song Bung 4	2011	11	165							0.3	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Dak My 4	2012	9	210								0.7	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Dak My 1	2012	1	210								2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Song Bung 5	2014	1	85										0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9

添付資料 7-2 (2)　PDP6thにおける運転維持費用算出結果（Base Scenario）(2/2)

Unit : million USD

Norm\Year	*com. Year*	*om.Month*	*CS*	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
SOUTH																								
Hydro			***11899***	**8.6**	**8.6**	**9.0**	**11.8**	**14.0**	**17.6**	**17.6**	**19.3**	**20.1**	**20.1**	**20.1**	**20.1**	**20.1**	**22.7**	**24.2**	**25.7**	**28.7**	**29.1**	**30.2**	**31.7**	**33.4**
Da Nhim	1964		54	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Tri An	1989		400	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Suoi Vang	1995		10	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Thac Mo	1995		150	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Ham Thuan	2001		150	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Da Mi	2001		86	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Dai Ninh	2007	11,12	300			0.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Dong Nai3	2008	12	180				0.2	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Dong Nai4	2009	11	340					0.6	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
Thac Mo Ex.	2009	12	75					0.1	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Dong Nai 2	2012	1	78								0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Dong Nai 5	2012	6	173								1.0	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
PSPP (South) #1	2018	1	200														1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
PSPP (South) #2	2018	4	200														1.1	1.5	1.5	1.5	1.5	1.5	1.5	1.5
PSPP (South) #3	2019	4	200															1.1	1.5	1.5	1.5	1.5	1.5	1.5
PSPP (South) #4	2020	4	200																1.1	1.5	1.5	1.5	1.5	1.5
PSPP (South) #5	2021	1	200																	1.5	1.5	1.5	1.5	1.5
PSPP (South) #6	2021	4	200																	1.1	1.5	1.5	1.5	1.5
PSPP (South) #7	2023	4	200																			1.1	1.5	1.5
PSPP (South) #8	2024	4	200																				1.1	1.5
PSPP (South) #9	2025	2	200																					1.4
THERMAL				**93.0**	**102.0**	**109.5**	**121.6**	**129.4**	**138.2**	**137.1**	**149.0**	**183.0**	**252.5**	**309.5**	**362.0**	**392.3**	**443.7**	**483.7**	**518.7**	**563.7**	**639.7**	**705.0**	**770.0**	**825.0**
Oil																								
Thu Duc #1 ST	1966		33.0	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Thu Duc #4 GT	1989		23.0	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Thu Duc #5 GT	1968		15.0	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Thu Duc #6 GT	1969		15.0	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Thu Duc #2 ST	1972		66.0	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Thu Duc #3 ST	1972		66.0	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Thu Duc #7 GT	1992		37.5	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Thu Duc #8 GT	1992		37.5	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Can Tho #1	1975		33.0	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Can Tho GT	1999		150	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
DieselMTrung	2004	1	91	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
DieselMNam	2004	1	62	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
GT-E9GE117MW	2007	1,2,3,4	428			7.4																		
CC-GEI(4x117+2x100MW)	2008	1	330				9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8
CC-GEII(4x117+2x100MW)	2008	1	330				9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8
O Mon 1 #1	2009	6	300					3.9	6.6															
O Mon 1 #2	2010	9	300						2.2															
Gas																								
Ba Ria GT #1,#2	1991		46.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Ba Ria CC 1	1999		169	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Ba Ria CC 2	2001		175	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2
PM2-1 CC 1	2003		430	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8
PM2-1 Ext #1,#2 GT	1999		290	5.3																				
Phu My 1	2001		1,090	32.4	32.4	32.4	32.4	32.4	32.4	32.4	32.4	32.4	32.4	32.4	32.4	32.4	32.4	32.4	32.4	32.4	32.4	32.4	32.4	32.4
PM2-1 Ext CC	2005	12	450	2.2	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4
Phu My 4	2004	8	450	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4
O Mon 1 #1	2009	6	300					3.9	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
O Mon 1 #2	2010	11	300						1.1	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Phu My ADD	2006	1	160		3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Nhon Trach 1 #1,#2	2011	11	660							2.2	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1
Nhon Trach 3 CCGT	2013	4	720									16.0	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4
Nhon Trach 4 CCGT	2014	1	720										21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4
O Mon III #1 ST	2012	11	330								1.0	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9
O Mon III #2 ST	2013	1	330									5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9
NewCC#3(OMonIV)	2014	9	720										7.1	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4
NewCC#4(BinhThuan1)	2015	1	720											21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4
NewCC#5(BinhThuan2)	2015	1	720											21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4
NewCC#6(OMonV)	2016	6	720												12.5	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4
NewCC#7(Cailay1)	2017	1	720													21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4
NewCC#8(Cailay2)	2018	1	720														21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4
NewCC#1(TienGiangI)	2013	9	720									7.1	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4
NewCC#2(TienGiangI)	2014	1	720										21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4
NewCC#9(MienTrung)	2022	4	720																		16.0	21.4	21.4	21.4
Coal																								
Soc Trang #1	2016	1	600												20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Soc Trang #2	2016	1	600												20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Tra Vinh #1	2018	1	1,000														30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Tra Vinh #2	2019	1	1,000															30.0	30.0	30.0	30.0	30.0	30.0	30.0
Tra Vinh #3	2019	9	1,000															10.0	30.0	30.0	30.0	30.0	30.0	30.0
Soc Trang #3	2020	7	1,000																15.0	30.0	30.0	30.0	30.0	30.0
Soc Trang #4	2021	1	1,000																	30.0	30.0	30.0	30.0	30.0
New Coal #1	2022	1	1,000																		30.0	30.0	30.0	30.0
New Coal #2	2022	1	1,000																		30.0	30.0	30.0	30.0
New Coal #3	2023	1	1,000																			30.0	30.0	30.0
New Coal #4	2023	1	1,000																			30.0	30.0	30.0
New Coal #5	2024	1	1,000																				30.0	30.0
New Coal #6	2024	1	1,000																				30.0	30.0
New Coal #7	2024	11	1,000																				5.0	30.0
New Coal #8	2025	1	1,000																					30.0
New Coal #9	2026	1	1,000																					
Nuclear				**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**39.9**	**59.8**	**104.7**	**179.4**	**239.2**	**249.2**	**333.9**	**393.7**	**478.4**
Newclear 1	2017	5	1,000													39.9	59.8	59.8	59.8	59.8	59.8	59.8	59.8	59.8
Newclear 2	2019	4	1,000															44.9	59.8	59.8	59.8	59.8	59.8	59.8
Newclear 3	2020	1	1,000																59.8	59.8	59.8	59.8	59.8	59.8
Newclear 4	2021	1	1,000																	59.8	59.8	59.8	59.8	59.8
Newclear 5	2022	11	1,000																		10.0	59.8	59.8	59.8
Newclear 6	2023	6	1,000																			34.9	59.8	59.8
Newclear 7	2024	6	1,000																				34.9	59.8
Newclear 8	2025	1	1,000																					59.8

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Power Grids		**90**	**101**	**113**	**126**	**142**	**159**	**178**	**199**	**223**	**250**	**280**	**313**	**351**	**393**	**440**	**493**	**552**	**618**	**692**	**775**	**868**
	500kV	19	21.3	23.8	26.7	29.9	33.5	37.5	42.0	47.0	52.7	59.0	66.1	74.0	82.9	92.9	104.0	116.5	130.5	146.1	163.6	183.3
	220kV	21	23.5	26.3	29.5	33.0	37.0	41.5	46.4	52.0	58.2	65.2	73.0	81.8	91.6	102.6	114.9	128.7	144.2	161.5	180.9	202.6
	110kV	31	34.7	38.9	43.6	48.8	54.6	61.2	68.5	76.8	86.0	96.3	107.8	120.8	135.3	151.5	169.7	190.0	212.8	238.4	267.0	299.0
	Diatribution	19	21.3	23.8	26.7	29.9	33.5	37.5	42.0	47.0	52.7	59.0	66.1	74.0	82.9	92.9	104.0	116.5	130.5	146.1	163.6	183.3

添付資料7-3　PDP6thにおける電力購入費（Base Scenario）

Unit : million USD

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Power Purchase (million USD		**582**	**649**	**780**	**1,152**	**1,771**	**2,137**	**2,209**	**2,361**	**2,495**	**2,571**	**2,910**	**3,148**	**3,225**	**3,312**	**3,360**	**3,380**	**3,405**	**3,449**	**3,503**	**3,523**	**3,549**
Hydro	Capacity	**36**	**64**	**126**	**173**	**306**	**491**	**527**	**547**	**695**	**758**	**1,083**	**1,307**	**1,474**	**1,533**	**1,540**	**1,580**	**1,592**	**1,622**	**1,663**	**1,669**	**1,681**
Nam Mu	11	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Na Loi	9	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Suoi Sap+Nam Dong	22	0.0	2.0	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
TDN mien Bac1-(M.Luong)	114	0.0	0.0	2.0	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Thai An	44	0.0	0.0	0.0	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1
Coc San	40	0.0	0.0	0.0	5.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Van Chan	35	0.0	0.0	0.0	4.6	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ngoi Phat	36	0.0	0.0	0.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
Tram Tau	40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ngoi Bo	35	0.0	0.0	0.0	0.0	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Na Le	90	0.0	0.0	0.0	0.0	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
Hachan-BanCoc-HuongSon	100	0.0	0.0	0.0	0.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0
TDN Seo Chung Ho	22	0.0	0.0	0.0	0.0	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Chu Linh	40	0.0	0.0	0.0	0.0	0.0	2.1	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Cua Dat	97	0.0	0.0	0.0	0.0	0.0	10.4	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6
Song Hieu	53	0.0	0.0	0.0	0.0	0.0	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
Nam Chien	210	0.0	0.0	0.0	0.0	0.0	25.9	31.1	31.1	31.1	31.1	31.1	31.1	31.1	31.1	31.1	31.1	31.1	31.1	31.1	31.1	31.1
Khe Bo	96	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5
New Small Hydro (N)1	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8
New Small Hydro (N)2	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.8	15.8	15.8	15.8	15.8	15.8
New Small Hydro (N)3	200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.5	31.5	31.5
Import(North)																						
NhapkhauTQ-1	40	6.3	6.4	6.4	6.5	6.6	6.6	6.7	6.8	6.8	6.9	7.0	7.0	7.1	7.2	7.2	7.3	7.4	7.5	7.5	7.6	7.7
NhapkhauTQ-2,3	80	12.6	12.7	12.9	13.0	13.1	13.3	13.4	13.5	13.7	13.8	13.9	14.1	14.2	14.4	14.5	14.6	14.8	14.9	15.1	15.2	15.4
NhapkhauTQ-4,5	80	0.0	12.7	12.9	13.0	13.1	13.3	13.4	13.5	13.7	13.8	13.9	14.1	14.2	14.4	14.5	14.6	14.8	14.9	15.1	15.2	15.4
NhapkhauTQ-6	200	0.0	0.0	32.2	32.5	32.8	33.1	33.5	33.8	34.1	34.5	34.8	35.2	35.5	35.9	36.2	36.6	37.0	37.3	37.7	38.1	38.5
Import form China1(Malutang)	300	0.0	0.0	0.0	0.0	44.1	44.5	45.0	45.4	45.9	46.3	46.8	47.3	47.7	48.2	48.7	49.2	49.7	50.2	50.7	51.2	51.7
Import form Lao(Nam Mo)	100	0.0	0.0	0.0	0.0	0.0	0.0	12.3	21.3	21.5	21.7	21.9	22.1	22.3	22.6	22.8	23.0	23.3	23.5	23.7	24.0	24.2
Import form Lao(Nam Then1)	400	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.6	60.0	60.6	61.2	61.8	62.5	63.1	63.7	64.3	65.0
Import form China 2	250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	87.1	88.0	88.8	85.5	86.4	87.3	88.1	89.0	89.9	90.8	91.7
Import form China 3,4	500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	88.0	88.8	89.7	86.4	87.3	88.1	89.0	89.9	90.8	91.7
Import form China 5,6	500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.4	44.9	45.3	43.6	44.1	44.5	45.0	45.4	45.9
Import form China 7	250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.0	44.9	45.3	45.8	46.2	44.5	45.0	45.4	45.9
Import form China 8	250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.9	45.3	45.8	46.2	46.7	45.0	45.4	45.9
Se San 3A	100	0.0	11.1	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7
H'Chan	12	0.0	0.0	2.5	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
H'Mun	15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Da Dan Dachamo	16	0.0	0.0	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Co Bi	48	0.0	0.0	0.0	4.4	7.6	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1
Eak Rong Rou	34	0.0	0.0	0.0	0.3	3.8	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9
Dam Bri	72	0.0	0.0	0.0	0.0	0.9	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4
Binh Dien	44	0.0	0.0	0.0	0.0	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1
Lagnai	9	0.0	0.0	0.0	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Ea Krong Hnang	65	0.0	0.0	0.0	0.0	0.0	4.5	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7
Srepok 4	28	0.0	0.0	0.0	0.0	0.0	0.0	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
Duc Xuyen	52	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
New Small Hydro (C&S)1	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8
New Small Hydro (C&S)2	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8
New Small Hydro (C&S)3	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.8	15.8	15.8	15.8	15.8	15.8
New Small Hydro (C&S)4	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0	21.0	15.8	15.8
Import(Centre)																						
Import form Lao(Xekaman3)	260	0.0	0.0	0.0	0.0	3.6	54.3	54.8	55.4	55.9	56.5	57.1	57.6	58.2	58.8	59.4	60.0	60.6	61.2	61.8	62.4	63.0
Import form Lao(Xekaman1)	450	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.4	91.3	92.2	93.1	94.0	95.0	95.9	96.9	97.8	98.8	99.8	100.8	101.8
Import form Lao(Sekong4)	450	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	55.4	95.9	96.9	97.8	98.8	99.8	100.8	101.8	102.8	103.9	104.9	105.9	107.0
Import form Lao(Sekong5)	250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	79.2	80.0	80.8	81.6	82.4	83.2	84.0	84.9	85.7	86.6	87.4
Import form Lao(Nam Kong 1)	240	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.5	53.2	53.7	54.3	54.8	55.4	55.9	56.5	57.0	57.6	58.2
Can Don	72.0	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6
Ry Ninh	8.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Srok Phu Mieng	54.0	0.0	2.2	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7
BaoLoc,DanSach,TraXom	55.0	0.0	0.0	8.7	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6
La Ngau	38.0	0.0	0.0	0.0	0.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Bac Binh	35.0	0.0	0.0	0.0	6.2	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3
Dak Rtih	72.0	0.0	0.0	0.0	0.0	0.0	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6
Import(South)																						
ImportFromCPC(LowerSeRepok	222	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.9	58.3	58.9	59.5	60.1	60.7	61.3	61.9	62.5	63.1
ImportFromCPC(LowerSeSan3)	375	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	112.5	113.6	114.8	115.9	117.1	118.2	119.4	120.6	121.8	123.0	124.3
ImportFromCPC(LowerSeSan2)	207	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	42.7	43.2	43.6	44.0	44.5	44.9	45.4	45.8	46.3	46.7
An Khe+Ka Nak	163	0.0	0.0	0.0	0.0	6.6	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3
Srepok 3	180	0.0	0.0	0.0	0.0	10.7	51.3	51.3	51.3	51.3	51.3	51.3	51.3	51.3	51.3	51.3	51.3	51.3	51.3	51.3	51.3	51.3
Thermal	Capacity	**546.1**	**584.9**	**653.8**	**978.9**	**1,465.7**	**1,646.5**	**1,681.9**	**1,813.4**	**1,799.7**	**1,813.1**	**1,826.6**	**1,840.2**	**1,751.4**	**1,779.4**	**1,820.1**	**1,800.2**	**1,813.6**	**1,827.0**	**1,840.6**	**1,854.3**	**1,868.1**
Hai Phong 1	300	0.0	0.0	0.0	6.2	74.9	69.8	70.0	70.2	65.0	65.2	65.4	65.6	65.8	66.0	71.7	66.4	66.6	66.8	67.0	67.2	67.4
Hai Phong 2	300	0.0	0.0	0.0	0.0	62.4	69.8	70.0	70.2	65.0	65.2	65.4	65.6	65.8	66.0	71.7	66.4	66.6	66.8	67.0	67.2	67.4
Quang Ninh 1	300	0.0	0.0	0.0	0.0	62.4	69.8	70.0	70.2	65.0	65.2	65.4	65.6	65.8	66.0	71.7	66.4	66.6	66.8	67.0	67.2	67.4
Quang Ninh 2	300	0.0	0.0	0.0	0.0	43.7	69.8	70.0	70.2	65.0	65.2	65.4	65.6	65.8	66.0	71.7	66.4	66.6	66.8	67.0	67.2	67.4
Quang Ninh 3	300	0.0	0.0	0.0	0.0	43.7	69.8	70.0	70.2	65.0	65.2	65.4	65.6	65.8	66.0	71.7	66.4	66.6	66.8	67.0	67.2	67.4
Quang Ninh 4	300	0.0	0.0	0.0	0.0	0.0	69.8	70.0	70.2	70.4	70.6	70.8	71.0	71.3	71.5	71.7	66.4	66.6	66.8	67.0	67.2	67.4
Na Duong IPP	100	23.1	30.9	35.5	35.6	31.2	31.3	31.4	31.5	31.6	31.7	31.8	31.9	32.0	32.1	32.2	32.3	32.4	32.5	32.6	32.7	32.7
Cao Ngan IPP	100	5.1	30.9	35.5	35.6	31.2	31.3	31.4	31.5	31.6	31.7	31.8	31.9	32.0	32.1	32.2	32.3	32.4	32.5	32.6	32.7	32.7
Song Dong IPP	196	0.0	0.0	0.0	40.7	61.2	61.4	61.6	61.7	61.9	62.1	62.3	62.5	62.7	62.9	63.0	63.2	63.4	63.6	63.8	64.0	64.2
Cam Pha IPP	300	0.0	0.0	0.0	0.0	43.7	75.1	75.4	75.6	75.8	76.0	76.3	76.5	76.7	77.0	77.2	77.4	77.7	77.9	78.1	78.4	78.6
Mao Khe #1 IPP	100	0.0	0.0	0.0	0.0	31.2	31.3	31.4	31.5	31.6	31.7	31.8	31.9	32.0	32.1	32.2	32.3	32.4	32.5	32.6	32.7	32.7
Mao Khe #2 IPP	100	0.0	0.0	0.0	0.0	23.4	31.3	31.4	31.5	31.6	31.7	31.8	31.9	32.0	32.1	32.2	32.3	32.4	32.5	32.6	32.7	32.7
NOMURA IPP	50																					
Hiep Phuoc (IPP) #1,#2,#3 ST	375	49.0	49.5	49.9	50.4	51.0	51.5	52.0	52.5	53.0	53.6	54.1	54.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VeDan-Amata-BouBon	109	15.3	15.5	15.6	15.8	15.9	16.1	16.2	16.4	16.6	16.7	16.9	17.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PM 3 BOT	720	200.7	202.7	232.0	206.7	208.8	210.9	213.0	215.1	217.3	219.5	221.7	223.9	226.1	228.4	230.7	233.0	235.3	237.6	240.0	242.4	244.8
PM2-2 BOT	720	200.7	202.7	232.0	206.7	208.8	210.9	213.0	215.1	217.3	219.5	221.7	223.9	226.1	228.4	230.7	233.0	235.3	237.6	240.0	242.4	244.8
Ca Mau I	720	0.0	0.0	0.0	206.7	208.8	210.9	213.0	215.1	217.3	219.5	221.7	223.9	226.1	228.4	230.7	233.0	235.3	237.6	240.0	242.4	244.8
Ca Mau II	720	0.0	0.0	0.0	120.6	208.8	210.9	213.0	215.1	217.3	219.5	221.7	223.9	226.1	228.4	230.7	233.0	235.3	237.6	240.0	242.4	244.8
O Mon 2 CC JV	720	0.0	0.0	0.0	0.0	0.0	0.0	23.7	143.4	144.9	146.3	147.8	149.2	120.6	137.0	138.4	139.8	141.2	142.6	144.0	145.5	146.9
Formosa 1	150	52.3	52.8	53.3	53.9	54.4	54.9	55.5	56.0	56.6	57.2	57.7	58.3	58.9	59.5	60.1	60.7	61.3	61.9	62.5	63.2	63.8

添付資料

第 8 章　環境社会配慮

添付資料 8-1 初期の環境調査におけるチェックリスト

Class of Power Development and Environment Impact Checklist List

Investigation Date: _____ Researcher: _____

Site Name: _____ Organization: _____

Location: _____ Title/ Division: _____

Environment Impact \ Class of Power Development				Weight	Hydro Power		Thermal Power Generation		Nuclear PP	Remark
					CHPP	PSPP	Coal Gene.	Gas Gene.		
Socio-environment	Inhabitant	Minorities								
		Weakness/Gender								
	Involuntary Resettlement (*1)	Large Scale (> 1,000 families)								
		Middle Scale (> 100 families)								
		Small or non (<= 100 families)								
	Cultural Heritage/Asset									
	Scenery									
	Life	Agriculture								
		Fishery								
		Water Utilization								
		Others (emigrant)								
Natural environment	Ecology(Upper-stream)	Terrestrial	Fauna							
			Flora							
			Insects/Microbe							
		Aquatic								
			Flora							
			Fauna							
	Ecology (Down-stream)	Terrestrial								
		Aquatic								
	Topography/Geology									
	Reserved/Park Area									
	Migration Possibility									
	Coastal Area									
	Hydrological Situation									
	Meteorology/Climate Change									
Pollution	Environmental	Air Quality								
		Water Quality								
		Soil Contamination								
	Circumstances	Noise								
		Vibration								
		Land Subsidence								
		Bad Smell								
	Waste									
Notes				3:High 2:Middle 1:Low					a: b: c:	Considerable serious Less environmental impact No environmental impact

添付資料 8-2　電源開発候補地点リスト

	Name of power station	Location	Gross Capacity (MW)	Type	Province	River system
1	Thac Mo extension	S	75	H	Binh Phuoc	Dong Nai
2	Mao Khe		200	C		
3	Dambri		72	H		
4	Sekaman3	C	260	H		
5	Ninh Binh ext	N	300	C	Ninh Binh	
6	Quang Ninh #3,4	N	600	C	Quang Ninh	
7	O Mon I #2	S	300	FO-G	Kien Giang	
8	Nghi Son #1	N	300	C	Thanh Hoa	
9	Serepok 4	C	28	H	Dak lak	Serepok
10	Eak Rong Hnang	C	64	H	Phu Yen	Ba
11	Song Buong 2	C	128(126)	H	Quang Ngai	Vu gia-Thu Bon
12	Huoi Quang #1	N	280(270)	H	Lao Cai	Da
13	Dak Tik	S	72	H	Dong Nai	Dong Nai
14	Song Con 2	C	70	H	Quang Nam	Vu gia-Thu Bon
15	O Mon 2	S	720	G	Kien Giang	
16	Nghi Son #2	N	300	C	Thanh Hoa	
17	Nhon Trach 1 #1	S	300	G	Baria-Vuntau	
18	Song Buong 4	C	165(200)	H	Quang Ngai	Vu gia-Thu Bon
19	Khe Bo		96(68)	H		
20	Upper Kontum #1,2	C	220	H	Kontum	Se San
21	Song Hieu	N	53	H	Cao Bang	Ky Cung-Bang Giang
22	Huoi Quang #2	N	280(270)	H	Lao Cai	Da
23	Ban Uon	N	280(250)	H	Thanh Hoa	Ma
24	Nho Que #1	N	70	H		
25	Nam Chien	N	210(140)	H	Lao Cai	Da
26	Nho Que #2	N	70	H		
27	Lai Chau	N	1200(1100)	H	Lai Chau	
	Lai Chau (cascade dev.)		(1100)			
28	Dong Nai 2	S	100(78)	H	Dong Nai	Dong Nai
29	Dak Mi 4	C	210	H		Thu Bon
30	Nhon Trach 1 #2	S	300	G	Baria-Vuntau	
31	Nhon Trach 2	S	600	G	Baria-Vuntau	
32	O Mon 3 #1	S	300	G	Kien Giang	
33	Hon Dat ST	S	720	G	Kien Giang	
34	Mong Duong	N	1000	C		

35	O Mon 3 #2	S	300	G	Kien Giang	
36	Nhon Trach 3	S	720	G	Baria-Vuntau	
37	Dak Mi 1	C	210	H	Quang Ngai	Thu Bon
38	Dong Nai 5	S	173(170)	H	Dong Nai	Dong Nai
39	Duc Xuyen	C	52(100)	H		Serepok
40	Se Kong 4	C	450	H		
41	Nhon Trach 4	S	720	G	Baria-Vuntau	
42	O Mon 4	S	720	G	Kien Giang	
43	TBKHH new 1		720	G		
44	Dai Nga		20	H	Song Be	Dong Nai
45	Dak Drinh 1	C	100	H		Huong
46	Khe Bo	N	68	H		Ca
47	Thac Muoi	N	53	H		Ca
48	Buon Tua Srah	C	85	H		Srepok
49	Dak Rtih	C	72	H	Dak lak	Dong Nai
50	Chu Linh-Coc San	N	70	H	Lao Cai	Hong
51	Nam Mu	N	11	H	Tuyen Quang	Lo-Gam
52	Iagrai	C	9	H	Gia Lai	Se San
53	New CCGT	S	4320	G		
54	Hua Na	N	195	H	Thanh Hoa	Chu
55	Hua Na(cascade dev.)		195			
56	Bac Quang	N	115	H	Tuyen Quang	Lo-Gam
57	Mong Duong #2	N	500	C		
58	Iayun Thuong	C	116	H	Gia Lai	Se San
59	PSPP #1	N	1200	P		
60	Quang Tri CCGT	C	720	G	Quang Tri	
61	Vung Ang	N	1000	C		
62	PSPP #2	N	1000	P		
63	PSPP #3	S	1000	P		
64	New coal-fired TPP	N	2500	C		
65	Nuclear	C	4000	N	Phu Yen	
66	Bac Me	N	280	H	Cao Bang	Gam
67	Ha Tay	N	600	C	Ha Tay	
68	Dong Nai 6	S	180	H	Dong Nai	Dong Nai
69	Dong Nai 8	S	195	H	Dong Nai	Dong Nai
70	Se Kong 1	C	190	H		
71	Bac Muc	N	215	H	Thanh Hoa	Ma

**H: Hydropower, *C: Coal,*G: Gas,*P: Pumped Storage,*N: Nuclear*

添付資料 8-3　　チェックリストに基づく初期の環境調査結果（火力発電）

				NORTH REGION															
Environment Impact / Name of Thermal PP				Nghi Son No1-2		Ninh Binh Ext		Mong Duong		Uong Bi		Mao Khe		Quang Ninh		Son Dong		Hai Phong	
Project code				8,16		5/40ad		34,57				2/48,49ad		6					
Fuel used				Coal		Coal		Coal		Coal		Coal		Coal		Coal		Coal	
Capacity (MW)				600		300		500-1500		300		220		300		200		600	
Year construction/ operation				2011		2010		2011-2012		2006		2009		2008-2009		2008		2008-2009	
Evaluation criteria				Rank	Waig ht	Rank	Waig ht	Rank	Waig ht	Rank	Waig ht	Rank	Waig ht	Rank	Waig ht	Rank	Waig ht	Rank	Waig ht
Socio-environment	Inhabitant	Minorities		c/c		c/c		c/c		c/c		c/c		a/b		b/b		c/c	
		Weakness /Gender		b/b										NA		NA		NA	
	Involuntary Resettle	Large Scale (>																	
		Middle Scale (> 100																	
		Small or non (<=																	
	Cultural Heritage/Asset			b/b		a/a		c/c		c/c		b/c		a/b		b/b		b/b	
	Scenery			b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b	
	Life	Agriculture		a/b		b/b		c/b		c/c		b/b		b/b		b/b		a/b	
		Fishery		b/a		c/b		b/b		c/b		b/b		b/b		NA		a/a	
		Water Utilization		b/a		b/b		b/a		b/a		b/b		b/a		b/b		b/a	
		Others										b/b		NA					
Natural environment	Ecology (Upper-stream)	Terrestrial	Fauna	c/c		b/b		b/b		c/c		b/b		b/b		b/b		b/b	
			Flora	b/a		b/a		b/a		b/a		b/b		b/b		b/b		b/b	
			Insects/Mi	c/c		b/b		b/b		c/c		b/b		NA		NA		b/b	
		Aquatic	crobe	c/b		b/b		b/b		c/b		b/b		NA		NA		b/b	
			Flora	c/b		b/b		b/b		b/b		c/c		a/b		b/b		b/a	
			Fauna	c/b		c/b		c/b		c/b		b/b		a/b		b/b		b/a	
	Ecology (Down-stream)	Terrestrial	Fauna																
			Flora																
			Insects/Mi																
		Aquatic	crobe																
			Flora																
			Fauna																
	Topography / Geograpy /			b/c		b/c		b/b		c/c		b/b		b/b		b/b		b/c	
	Reserved / Park Area																		
	Migration Possibility			c/c		b/a		c/b		c/c		c/c		b/b		b/b		b/b	
	Coastal Area																		
	Hydrological Situation																		
	Meteorology/Climate Change			b/a		c/b		b/a		c/a		b/b		b/b		b/b		b/a	
Pollution	Environmental	Air Quality		b/a		b/a		b/a		b/a		b/a		b/b		b/a		b/a	
		Water Quality		b/a		b/b		b/a		b/a		b/a		b/b		b/a		b/a	
		Soil Contamination		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b	
	Circumstances	Noise		b/b		b/b		b/b		b/b		b/b		b/b		b/c		b/b	
		Vibration		b/b		a/c		b/b		c/c		b/b		b/b		b/c		b/b	
		Land Subsidence		b/b		b/b		c/c		c/c		c/c		b/c		b/c		b/b	
		Bad Smell		b/b		b/b		c/b		c/b		b/b		b/b		b/b		b/b	
	Waste			b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b	
Point Total																			
Weight 2		S:	3																
		L:	2																
		I:	1																
Point Gran Total																			

				SOUTH REGION																													
Environment Impact / Name of Thermal PP				South CCGT		Atmata B. Hoa		PhuMy No1		PhuMy No2		PhuMy No3		PhuMy No4		Nhon Trach No1		Nhon Trach No2		Nhon Trach No3		Nhon Trach No4		Omon No1		Omon No2		Omon No3		Omon No4		Hiep Phuoc	
Project code				43		4										17/61ad		30,31/62ad		36		41		7		15		32,35		42			
Fuel used				Gas DO		Gas DO				Gas DO						Gas FO		Gas FO		Gas DO		Gas DO		Gas FO		Gas FO		Gas FO		Gas FO		Gas FO	
Capacity (MW)				300-600		212		900		715		600		600-900		600		600		720		720		720		720		600		720		675	
Year construction/ operation										2005						2011-2013		2013		2014		2015		2006-2007		2010-2011		2012		2014			
Evaluation criteria				Rank	Waig ht	Rank	Waig ht	Rank	Waig ht	Rank	Waig ht	Rank	Waig ht	Rank	Waig ht	Rank	Waig ht	Rank	Waig ht	Rank	Waig ht	Rank	Waig ht	Rank	Waig ht	Rank	Waig ht	Rank	Waig ht	Rank	Waig ht	Rank	Waig ht
Socio-environment	Inhabitant	Minorities		b/b		b/b		NA		NA		NA		NA		NA		NA		NA		NA		c/c		c/c		c/c		c/c		c/c	
		Weakness /Gender		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA				b/b		b/b		b/b			
	Involuntary Resettle	Large Scale (>																															
		Middle Scale (> 100																															
		Small or non (<=																															
	Cultural Heritage/Asset			NA		c/c		b/b		b/b		b/b		b/b		NA		NA		NA		NA		b/c		c/b		c/b		c/c		b/b	
	Scenery			NA		c/c		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b	
	Life	Agriculture		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		a/b		b/b		b/b		b/b		b/b	
		Fishery		NA		b/b		b/a		b/a		b/a		b/a		b/b		b/b		b/b		b/b		b/b		b/a		b/a		b/a		b/a	
		Water Utilization		b/a		b/b		b/a		b/a		b/a		b/a		b/a		b/a		b/a		b/a		b/a		b/a		b/a		b/a		b/a	
		Others		NA																						b/b		b/b		b/b			
Natural environment	Ecology (Upper-stream)	Terrestrial	Fauna	b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		c/c		c/c		c/c		c/c		b/b	
			Flora	c/c		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/a	
			Insects/Mi	b/b		b/b		b/b		b/b		b/b		b/b		NA		NA		NA		NA		c/c		c/c		c/c		c/c		b/b	
		Aquatic	crobe	b/b		b/b		b/b		b/b		b/b		b/b		NA		NA		NA		NA		b/b		b/b		b/b		b/b		b/b	
			Flora	b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/a	
			Fauna	b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/a		b/b		b/b		b/b		b/a	
	Ecology (Down-stream)	Terrestrial	Fauna																														
			Flora																														
			Insects/Mi																														
		Aquatic	crobe																														
			Flora																														
			Fauna																														
	Topography / Geograpy /			b/c		b/c		b/c		b/c		b/c		b/c		NA		NA		NA		NA		b/b		b/b		b/b		b/b		b/b	
	Reserved / Park Area																																
	Migration Possibility			c/c		c/c		b/b		b/b		b/b		b/b		a/b		a/b		a/b		a/b		c/c		c/c		c/c		c/c		b/a	
	Coastal Area																																
	Hydrological Situation																																
	Meteorology/Climate Change			c/b		c/b		b/b		b/b		b/b		b/b		b/a		b/a		b/a		b/a		b/a		b/b		b/b		b/b		b/a	
Pollution	Environmental	Air Quality		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/a		a/b		a/b		a/b		b/a	
		Water Quality		b/a		b/b		b/a		b/a		b/a		b/a		b/a		b/a		b/a		b/a		b/a		b/a		b/a		b/a		b/a	
		Soil Contamination		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b	
	Circumstances	Noise		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b	
		Vibration		b/c		b/c		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		c/b	
		Land Subsidence		b/b		b/b		b/b		b/b		b/b		b/b		b/c		b/c		b/c		b/c		b/b		b/b		b/b		b/b		b/b	
		Bad Smell		b/b		c/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/a	
	Waste			b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b		b/b	
Point Total																																	
Weight 2		S:	3																														
		L:	2																														
		I:	1																														
Point Gran Total																																	

Notes				
	3:High	S: Strong impacts last during operation (life time)	a:	Considerable serious environmental and / or social impact
	2:Middle	L: Less impacts last during operation (life time)	b:	Less environmental and / or social impact
	1:Low	I: Impact is tentative (not last during operation)	c:	No environmental and / or social impact

添付資料 8-4　チェックリストに基づく初期の環境調査結果（水力発電）

Class of Power Development*				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Area				North Regeon																				Central Regeon										South Regeon						
Type				H	H	H	H	H	H	H	H	PS	PS	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	PS	H	H	H	H	H	H	H	H	H	H
Project code				25	27		23	10				59	62	12,22	50	24	26		66			56	71	14	37		1	11	18	63			54,55				47ad	3	13,49	48
Environmental Impact																																								
Capacity (MW)				210	1200	2060		64	173	180	340	1000	1000	520	30	41	68	144	70	170	196	115	215	57	225	180	150	100	165	1000	165	160	180	220	70	72	330	70	82	86
Year construction / operation																																								
Evaluation Criteria				Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight	Rank Weight
Socio-environment	Inhabitant	Minorities		b/b	a/a	b/a	a/a	b/c	a/a	b/b	b/b	a/b	b/b	a/a	b/b	a/b	a/b	a/b	a/a	a/a	a/a	a/a	a/a	b/a	a/a	b/b	c/c	a/a	a/b	c/c	b/b	b/b	a/a	a/b	a/a	b/b	b/b	b/b	b/b	a/b
		Weakness/Gender			b/b	b/b	a/a	b/c	a/a	b/b		a/b	b/b	a/a	c/c	NA	NA	NA	NA	NA	NA	nA	nA	b/a	nA	b/b	c/c	nA	a/b	c/c	b/b	b/b	b/b	a/b	b/b	c/c	b/b	b/b	b/b	a/b
		Involuntary Resettlement (*1)	Large Scale (>	a/a	a/a	a/a	a/a					NA		a/a					a/a	a/a	a/a	a/a	a/a	a/a	NA								a/a				NA		NA	a/a
			Middle Scale (> 100 families)					b/b	b/b	a/b		NA				b/b			b/b						NA				a/b		b/b	a/b		a/b		b/b	NA		NA	
			Small or non (<= 100 families)								c/c	NA	c/c		b/b		b/b								NA	b/b	c/c	c/c			c/c					NA	b/b	NA	NA	
	Cultural Heritage / Asset			c/c	c/c	b/b	c/c	c/c	c/c	b/c	c/c	c/c	c/c	c/c	c/c	NA	NA	NA	NA	NA	NA	nA	nA	c/a	nA	c/c	c/c	nA	a/c	c/c	c/c	c/c	c/c	a/c	c/c	c/c	c/c	c/b	c/c	a/c
	Scenery			b/c	a/c	b/b	b/b	b/c	b/c	c/c	c/c	b/b	b/b	b/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	b/b	b/b	b/a	b/a	c/c	c/c	b/a	a/c	b/b	b/c	a/c	c/c	b/b	b/b	b/b	a/c	b/b	b/b	a/b
	Life	Agriculture		b/a	a/b	b/a	a/a	b/c	a/b	b/a	b/a	a/c	a/c	b/a	b/a	a/b	a/a	a/b	a/a	b/a	b/a	a/b	a/a	c/a	a/a	b/c	c/a	a/a	c/b	b/c	a/c	c/a	b/c	c/b	a/b	a/b	b/c	a/b	a/b	a/c
		Fishery		c/c	c/c	b/c	c/c	c/c	b/c	c/c	c/c	c/c	c/c	c/c	c/c	b/b	a/b	b/b	b/b	b/a	a/b	c/c	c/c	c/c	c/c	b/c	b/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c
		Water Utiliz		c/c	c/c	a/b	b/b	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	b/b	b/b	c/c	b/b	b/b	c/c	b/b	c/c	b/c	c/c	b/c	c/c	b/b	b/b	b/b	b/c	b/b	b/c	c/c
		Other/Res.				b/a			a/a							a/b	b/b	b/b	a/b									a/a			NA				NA	NA				
Natural environment	Ecology (Upper-stream)	Terrestrial	Fauna	b/a	a/b	b/b	b/b	a/c	a/b	b/a	c/b	a/b	a/b	b/a	a/b	b/b	b/b	b/b	b/b	b/b	b/b	b/b	b/b	b/a	a/a	b/b	a/b	a/a	a/b	c/a	a/a	a/b	a/b	a/b	a/b	a/b	a/c	a/b	a/b	a/b
			Flora	b/a	a/b	b/a	a/a	a/c	a/b	b/a	b/b	a/c	a/c	b/a	a/c	b/b	b/b	b/b	b/b	b/b	b/b	b/b	b/b	b/a	a/c	a/b	a/b	a/b	a/b	a/c	a/a	a/c	a/b	a/c	a/b	a/b	a/c	a/b	a/b	a/b
			Insects/Microbe	b/b	b/b	b/b	b/b	b/c		b/c	b/c	c/c	c/c	c/b	c/b			b/b	b/b	b/b	b/b	b/b	b/b	c/c	a/b	NA	b/c	b/b	b/c	a/c	c/c	c/c	b/c	c/c	b/c	b/c	a/c	b/c	b/c	c/c
		Aquatic		b/c	a/c	b/b	c/c		b/c	b/c	b/c	c/c	c/c	a/c		NA	NA	NA	NA	NA	NA	c/c	c/c		c/c	NA	b/c	c/c					b/c		c/c	c/c	c/c			
			Flora	b/b	b/c	c/c	c/c	b/c	b/c	b/c	b/c	c/c	b/c	b/c	c/b	NA	NA	NA	NA	NA	NA	c/c	c/c	c/b	c/c	b/c	b/c	c/c	c/c	b/c	c/c	b/c	b/c	b/c	c/c	c/c	b/c	c/c	c/c	b/c
			Fauna	b/b	b/c	b/b	b/b	b/c	b/c	b/c	b/c	b/c	b/c	b/c	c/b	NA	NA	NA	NA	NA	NA	c/c	b/b	c/b	c/c	b/c	b/c	c/c	c/c	b/c	b/c	b/c	b/c	b/c	c/c	c/c	b/c	c/c	c/c	b/c
	Ecology (Down-stream)	Terrestrial	Fauna																																					
			Flora																																					
			Insects/Microbe																																					
		Aquatic																																						
			Flora																																					
			Fauna																																					
	Topography/Geology			b/b	b/b	b/b	a/b	c/b	b/b	c/c	c/c	b/c	b/c	b/b	b/c	b/b	b/c	b/b	b/b	b/b	b/b	b/b	b/b	c/b	c/c	b/c	b/b	c/c	b/b	b/c	b/c	b/b	c/c	b/c	b/b	b/b	a/b	b/b	b/b	b/c
	Migration Possibility			b/b	c/c	c/c	b/b	b/b	c/c	c/c	b/b	b/c	c/c	a/a	c/c	c/c	c/c	c/c	b/b	c/c	b/b	c/c	c/c	b/b	c/c	c/c	c/c	c/c	c/c	c/c	c/c	a/a	c/c	a/a	c/c	c/c	b/b	c/c	c/c	a/a
	Reserved/Park Area			c/c	b/c	b/b	c/c	b/b	c/c	b/b	c/c	c/c	c/c	c/c	c/c	NA	NA	NA	NA	NA	NA	nA	nA	c/b	b/b	c/c	c/c	b/b	c/c	c/c	c/c	c/c	c/c	c/b	c/c	c/c	c/c	c/c	c/c	b/c
	Coastal Area																																							
	Hydrological Situation																																							
	Meteorology / Climate Change			c/c	c/c	a/c	c/b	c/c	c/c	c/c	c/c	b/c	b/c	b/b	c/c	c/c	c/c	c/c	c/c	c/c	c/c	b/b	b/b	c/b	c/c	b/c	b/b	c/c	c/c	b/c	b/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	b/c
Pollution	Environment	Air Quality		b/c	b/c	a/b	c/c	b/c	b/c	c/c	b/c	b/c	b/c	b/c	b/c	b/c	b/c	b/c	b/c	b/c	b/c	a/c	a/c	b/c	b/c	b/c	b/c	a/c	b/c	b/c	b/c	b/c	b/c	b/c	b/c	b/c	b/c	b/c	b/c	b/c
		Water Quality		c/b	b/c	a/b	a/c	b/c	b/c	b/c	b/c	b/b	b/b	b/c	b/c	b/c	b/c	b/c	b/c	b/c	b/c	a/c	a/c	c/b	b/c	b/c	b/c	a/c	b/b	b/b	a/b	b/b	b/c	b/b	b/b	b/b	b/c	b/b	b/b	b/c
		Soil		c/c	c/c	a/b	c/c	c/c	b/c	c/c	c/c	b/b	b/b	b/c	c/c	b/c	b/c	b/c	b/c	c/c	b/c	c/c	c/c	b/b	c/c	c/c	c/c	c/c	b/c	b/c	b/c	c/c	b/c	c/c	c/c	c/c	c/c	c/c	c/c	b/b
	Circumstances	Noise		b/c	b/c	c/c	a/b	b/c	b/c	b/c	b/c	a/c	a/c	b/c	b/c	b/c	b/c	b/c	b/c	b/c	b/c	a/b	a/b	a/c	b/c	c/c	b/c	b/b	a/c	b/c	b/c	b/c	b/c	b/c	c/c	c/c	c/c	b/c	c/c	a/c
		Vibration		b/c	b/c	c/c	b/b	b/b	b/c	b/c	b/c	b/b	b/b	b/b	b/b	b/c	b/c	b/c	b/c	b/c	b/c	c/c	c/c	b/c	c/c	c/c	b/c	c/c	c/c	b/b	c/c	b/c	b/c	b/c	c/b	c/b	b/c	c/b	c/b	b/c
		Land Subsidence		c/c	c/b	c/c	c/c	c/b	b/c	c/c	c/c	c/b	c/b	c/b	c/b	b/c	b/c	b/c	b/c	b/c	b/c	c/c	c/c	c/b	b/c	c/c	b/c	c/c	c/c	c/b	c/c	c/c	b/c	c/c	c/c	c/c	b/a	c/c	c/c	c/b
		Bad Smell		c/c	c/c	b/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	b/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c	b/c	c/c	c/c	c/c	c/c	c/c	c/c	c/c
	Waste			b/c	b/c	b/c	c/c	c/c	c/c	c/c	c/c	c/c	b/c	b/c	b/c	b/c	c/c	c/c	b/c	c/c	c/c	c/c	c/c	c/c	c/c	b/c	c/c	c/c	b/c	b/c	c/c	b/c	b/c	b/c	b/c	b/c	b/c	b/c	b/c	b/c
Point Total																																								
Weight 2	S:	3																																						
	L:	2																																						
	I:	1																																						
Point Gran Total																																							

Notes				
3:High	S:	Strong impacts last during operation (life time)	a:	Considerable serious environmental and / or social impact
2:Middle	L:	Less impacts last during operation (life time)	b:	Less environmental and / or social impact
1:Low	I:	Impact is tentative (not last during operation)	c:	No environmental and / or social impact

PROJECT NUMBERS (Class of Power Development*)

I PROJECT UNDER CONSTRUCTION STAGE

In Northern area

1.Nam Chien Hydropower Plant,
2. Lai Chau Hydropower Plant
3. Pa vinh Hydropower Plant.
4. Ban Uon Hydropower Plant

2.2 In central area :

5. EA Krong Hnang Hydropower Plant
6. An Khe Hydropower Plant
7. Dong nai No 3 Hydropower plant
8. Dong nai No 4 Hydropower Plant;

II PROJECTS AT FEASIBILITY STATUS

2.1 In Northern area :

9. New PSPP No 1- JN3
10. PSPP No 2-JN5
11. Huoi Quang Hydropower Plant
12. Chu Linh Coc San Hydropower Plant
13. Nho Quế No. 1
14. Nho Quế No. 2
15. Nho Quế No. 3
16. Bac Me plant
17. Bao Lac plant
18. Tuyen Quang Plant
19. Bac Quang Hydropower Plant
20 Bac Muc Hydropower Plant

2.2 In central area : 10 projects:

21. Con River Hydropower Plant No 2,
22 Dac Mi Hydropower Plant No 1
23 Dac Mi Hydropower Plant No 4
24. Extended Thac Mo Hydropower Plant
25 Bung River Hydropower Plant No 2
26. Bung River Hydropower Plant No 4
27. PPSP No 3-JS6 project
28. Asap Hydropower Plant,
29. Tranh River Hydropower Plant No 2,
30. Hua Na Hydropower Plant.

In Southern area : 7 projects :

31. Srepok Hydropower Plant No 3,
32. Hinh River HydroPower Plant,
33. Can Don HydroPower Plant(on Be river),
34. Sesan River HydroPower Plant No 4,
35. Da M'bri HydroPower Plant (on Dong Nai river),
36. Dakr'tih HydroPower Plant (on Dong Nai river)
37. Buon tua Srah HydroPower Plant (on srepok river).

添付資料 8-5　LC による初期の環境調査結果（火力発電所）

No.	Plant/project code	Project/Plant	Total adverse impact (Construction phase)	Total adverse impact (Operation phase)
Thermal power plant				
1	**7**	O Mon No1 Thermal Power Plant	91	98
2	**15**	O Mon No 2 Thermal Power Plant	90	95
3	**32,35**	O Mon No 3 Thermal Power Plant	92	107
4	**42**	O Mon No 4 Thermal Power Plant	90	102
5	**1adf**	Phu My No 1 Thermal Power Plant	91	108
6	**2adf**	Phu My No 2 Thermal Power Plant	91	108
7	**3adf**	Phu My No 3 Thermal Power Plant	91	108
8	**4adf**	Phu My No 4 Thermal Power Plant	91	108
9	**43**	South CCGT Thermal Power Plant	86	91
10	**4**	Amata Bien Hoa CCGT	82	83
11	**17**	Nhon Trach No1 Thermal Power Plant	90	97
12	**30,31**	Nhon Trach No 2 Thermal Power Plant	90	97
13	**36**	Nhon Trach No3 Thermal Power Plant	89	96
14	**41**	Nhon Trach No 4 Thermal Power Plant	89	96
15	**2/48,49ad**	Mao Khe Thermal Power Plant	97	106
16	**8adf**	Uong Bi Extended Thermal Power Plant	75	109
17	**5/40ad**	Ninh Binh Extended Thermal Power Plant	106	121
18	**8,16**	Nghi Son Thermal Power Plant	101	126
19	**34,57**	Mong Duong Thermal Power Plant	91	125
20		Hiep Phuoc Thermal Power Plant	91	114
21	**6**	Quang Ninh Thermal Power Plant	112	104
22	**6adf**	Hai Phong Thermal Power Plant	115	136
23	**7adf**	Son Dong Thermal Power Plant	94	101

添付資料 8-6　LCによる初期の環境調査結果（水力発電所＆原子力発電所）

Hydro power plants				
1	**25**	Nam Chien Hydropower Station	82	84
2	**48**	Hydropower Plant Buon Tua Srah	123	75
3	**13,49**	Dakrtih Hydropower Plant	87	70
4	**27**	Lai Chau Hydropower Plant	118	82
5	**9adf**	Pavinh (Son La) Hydropower Plant	117	112
6	**23**	Ban Uon Hydropower Plant	115	105
7	**10**	EA Krong Hnang Hydropower Plant	89	60
8	**10adf**	Ankhe Kanak Hydropower Plant	110	79
9	**11adf**	Dong Nai No3 Hydropower Plant	103	74
10	**12adf**	Dong Nai No4 Hydropower Plant	70	64
11	**12,22**	Huoi Quang Hydropower Station	101	95
12	**50**	Chu Linh – Coc San Hydropower Plant	86	65
13	**13adf**	Bao Lac Hydropower Plant	84	83
14	**14adf**	Tuyen Quang Hydropower Plant	90	80
15	**56**	Bac Quang Hydropower Plant	100	89
16	**71**	Ban Muc Hydropower Plant	102	91
17	**63**	New PSPP No 3 JS6	85	56
18	**62**	New PSPP No 2 JN5	92	85
19	**59**	New PSPP No 1 JN	102	65
20	**24**	Nho Que No 1 Hydropower Plant	89	66
21	**26**	Nho Que No 2 Hydropower Plant	85	70
22	**15adf**	Nho Que No 3 Hydropower Plant	85	66
23	**66**	Bac Me Hydropower Plant	94	82
24	**37**	Dakmi No 1. Hydropower Plant	100	85
25	**16adf**	Dakmi No 4 Hydropower Plant	82	64
26	**1**	Extend Thac Mo Hydropower Plant	79	59
27	**11**	Bung 2 River Hydropower Plant	101	90
28	**18**	Bung 4 River Hydropower Plant	115	67
29	**17adf**	A Sap Hydropower Plant	96	76
30	**18adf**	Song Tranh 2 Hydropower Plant	98	65
31	**54,55**	Hua Na Hydropower Plant	104	74
32	**19adf**	Serepok 3 Hydropower Plant	115	69
33	**20adf**	Song Hinh Hydropower Plant	96	79
34	**21adf**	Can Don Hydropower Plant	85	65
35	**47ad**	Sesan No 4 Hydropower Plant	97	57
36	**3**	Dambri Hydropower Plant	89	74
37	**14**	Con river No2 Hydropower Plant	83	64
Nulear power plant				
1	**22adf**	Hoa Tam Nuclear Power Plant	103	120
2	**65**	Phuoc Dinh Nuclear Power Plant	102	130

添付資料 8-7　IE 作成のステークフォルダーミーティング参加者リスト

PARTICIPANTS INVITED TO THE STAKEHOLDER MEETING ON ENVIRONMENTAL AND SOCIAL ISSUES (18 January 2006, MELIA Hotel)

No	Organization	Address	Number of participants	Remark
I	**Organizers**			
1	IE		10	
2	JICA			
3	**Local consultants (Faculty of Environmental Sciences – University of Science – Vietnam National University, Hanoi)** Prof. Dr. Luu Duc Hai - Head of Environment Department Prof. Dr. Hoang Xuan Co - Vice Director of Science and Technology Department Dr. Nguyen Thi Ha - Deputy Head of Environment Department Dr. Nguyen Xuan Cu - Deputy Head of Environment Department Dr. Nguyen Thi Loan - Environment Department	**334 - Nguyễn Trãi – Thanh Xuân – Hà Nội**	**05**	Presentation
II	**Participants**			
1	EVN	18 - Trần Nguyên Hãn – Hà Nội	02	
2	MONRE (Departments of International Cooperation, Approval, Environment)	36 - Nguyễn Chí Thanh – Hà Nội	03	
3	Vietnam Environment Protection Agency (VEPA-MONRE)	67 - Nguyễn Du – Hà Nội	02	
4	Ministry of Industry (Science and Technology Department)	54-Hai Bà Trưng – Hà Nội	01	
5	Water Resource Management Bureau - MONRE	57 - Nguyễn Du – Hà Nội	01	
6	Mekong River Committee	23 – Hàng Tre – Hà Nội	01	
7	Institute of Science Technology and Environment – Ha Noi University of Technology.	C10 – ĐH Bách Khoa Hà Nội	01	
8	The World Conservation Union - IUCN Vietnam	44/4 - Vạn Bảo – Hà Nội	01	

9	Center for Environment Research Education and Development(CERED)	K40 – A1 - Giảng Võ	01	
10	Institute of Environmental Research and Stable Development	402 – 27- Trần Xuân Soạn	01	
11	Environmental Research, Monitoring and Modeling Centre - University of Science – Vietnam National University, Hanoi	334 - Nguyễn Trãi – Thanh Xuân – Hà Nội	01	
12	United Nation Development Program – UNDP	25-29 Phan Bội Chau- Hai Ba Trung – Ha Noi	01	
13	Center of Urban and Industrial Zone Environmental – Construction University	55 - Giải Phóng	01	
14	UNIDO	27-29 Phan Bội Chau- Hai Ba Trung – Ha Noi	01	
15	Vietnam Development Forum(VDF)	44B Ly Thuong Kiet	01	
16	Board of Environment and Development - Vietnam Co-operative Union	77 Nguyen Thai Hoc - Hanoi	01	
17	Center for assisting community sustainable Development	5 Nguyen Viet Xuan - Hanoi	01	
	Total		37	

添付資料 8-8　ステークフォルダーミーティングの議事次第

AGENDA FOR THE STAKE-HOLDER MEETING
ON THE STUDY ON NATIONAL POWER DEVELOPMENT PLAN
FOR THE PERIOD OF 2006-2015, PERSPECTIVE UP TO 2025
Venue: MELIA HOTEL
January 18 Wednesday, 2006

Time	*Content/Activity*	*Person*
8:30 ÷ 8:45	*Register for participants*	
8:45 ÷ 9:00	*- Welcome address by MOI* *- Welcome address by JICA*	*Mr. Ta Van Huong* *Mr. Koji Oshigiri*
9:00 ÷ 9:40	*Abstract Scenario of PDP6th*	*Mr.ITO,Leader of JICA Study Team*
9:40 ÷ 10:30	*Abstract result of the study on Environmental and Social Consideration and SEA aspect in the PDP6th with Alternatives*	*Dr.Hai (LC) /* *Ms. Nguyen Thi Thu Huyen (IE) /* *Mr.OOKI(JICA study Team)*
10:30÷ 10:45	*Tea Break*	
10:45÷ 12:20	*Dissection, Question & Answer* *(1) PDP6th* *(2) Socio-environmental Issues* *(3) Natural Environmental Issues* *(4) Environmental Pollution*	*IE, Stake Holders, JICA Study Team*
12:20 ÷ 12:30	*- Closing remarks by IE*	*Dr.Pham Khanh Toan*
12:30 ÷ 14:00	*Lunch*	

Hanoi university of Science
Vietnam National university, Hanoi
Faculty of Environmental Sciences

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FINal report

Environmental and Social Consideration Survey

the Study on National Power Development Plan
for the Period of 2006-2015,
Perspective up to 2015 in Vietnam

October -2005

Table of content

Introduction

Nowadays, when there are great achievements in economic and technological development, the goals of human race are heading to one direction, which is sustainable development. Accordingly, all socio- economic development projects have been considered in the relation of Economic – Environmental and Societal factors.

Energy is an important economic sector in any national economy, in which electricity is the blood vessel nourishing socio- economic development. Vietnam is one of the countries that have rapid economic growth in the world with annual GDP growth is about 7-8% and the annual demand for electricity increases 11-12% relatively.

The Prime Minister of Vietnam approved Electricity Development Plan Period 2001-2010 in June 2001. It was predicted in the plan that electricity demand would increase to 70-80 billion KWh in 2010. The Government of Vietnam is pushing the economy to make the country become industrial in 2020 according to the orientation of socio- economic development policies. To achieve this goal, commercial power development planning is the priority of the Government and of all sectors as well as of the foreign investment attraction policy.

Vietnam Electricity General Cooperation is collaborating with foreign partners including Japan International Cooperation Agency (JICA), to conduct the plan for national energy development period 2005-2015 and orientation to 2025. The main target is to establish the planning of power plants. Nearly hundred of hydro power, thermo and nuclear power plants are proposed; feasibility studies and economic and technological facts are prepared.

The objectives of the report:

- Collect documents related to the power projects in Vietnam period 2006- 2015, orientation to 2025.
- Survey and assess the environmental and social conditions of those above-mentioned projects using the JICA check list with the negative impacts of the power plants construction as the main focus.
- Prepare a list of prioritized projects, which has least negative impacts to the environment and society based on the list provided by JICA.

Methodology and organization:

The report has been made by the group of scientific experts in Faculty of Environmental Sciences, University of Science, Vietnam National University-Hanoi as request by JICA (See included list of participants).

Methodology to make the report: Collection of data and documents related to power projects in the plan for national energy development period 2005-2015 and orientation to 2025; environmental and social assessment is carried out by the common assessment methods (check list, matrix); conducting survey and case studies in different areas (North, Central and South Region) to check the pre-assessment; analysis and selection of prioritized projects (hydro power, thermo, nuclear power plants).

The project implementation has 3 stages:

- Stage 1: Collection of data and documents related to power projects.

This is the longest and most complicated stage since data and documents are kept by many agencies such as members of Vietnam Electricity General Cooperation, ministries, local agencies and appraisal agencies (National Environment Agency in the former Ministry of Science, Technology and Environment; Department of Environmental Appraisal in Ministry

of Natural Resources and Environment; Department of Science, Technology and Environment in Ministry of Investment and Planning etc.). There are also differences in details of projects: some projects have economic and technological facts and environmental impacts assessment reports; some are in feasible studied and lack of environmental information and some are only in idea with project name and the place of establishment has not been decided. In order to have proper information, the research group had approached most related agencies and organization like Vietnam Institute of Energy; Design and Construction Center 1, 2, 3 in Vietnam Electricity General Cooperation; Information department and Department of Environmental Appraisal in Ministry of Natural Resources and Environment. Some data and documents were provided by the local environmental agencies such as document on Son La hydro power plant was provided by Son La Department of Natural Resources and Environment; document on Pha Lai thermo power plant I, II was provided by Hai Duong Department of Natural Resources and Environment. Some documents on thermo power using coal were provided by Vietnam Coal General Cooperation and at last, data and documents also had been collected from Department of Science, Technology and Environment in Ministry of Investment and Planning.

- Stage 2: Environmental and social assessment of power projects

The research group divided into 3 assessment sub-group: thermo, hydro and other power plants. There are 1 or 2 environmental experts, 1 or 2 assistants and 1 secretary in each sub-group. Members of sub-groups had to review project documents and fill in the questionnaires and the check lists provided by JICA. After one week study, members in the sub-groups discussed and agreed with each other on the assessment of each project (especially the assessment of level of impact a, b, c to environmental and social components); the short report was conducted and submitted to the project manager. Working parallel with the assessment sub-groups, other staff prepared maps for each proposed project place. During the process of implementation, experts also went to the site for assessment of case studies to check the pre-assessment and make suggestions for the assessment sub-groups in the workshops. Final assessment report had been discussed in the meeting of assessment sub-groups. At this meeting, beside the environmental and social assessment for each power project, members of sub-groups also contributed valuable ideas concerning the importance of environmental and social impacts to the experts for preparing final report.

- Stage 3. Analysis and selection of prioritized projects and conduct final report.

This is the most difficult task and the outcome is the most important in the project. Therefore, most experienced experts were assigned this task. Prioritized projects were selected based on Vietnam's environmental and social legislation and the total score of each project. According to the environmental legislation, socio- economic development projects including power projects violate the Law on Environmental Protection (Article 12, 13,16, 18, 23, 24, 25, 28, 29 etc.) should not be listed as prioritized projects. Projects that did not fall under the above-mentioned group would be selected based on total score calculated by the following formula:

The final report had been conducted by the most experienced experts as the request of project manager (See the included list). The English version of final report was edited by Associate Professor. Nguyen Dinh Hoe; Dr. Nguyen Thi Ha and PhD Candidate. Nguyen Thi Anh Tuyet.

Contents of report and the conductors:

	Conductor
Contents	
List of project participants	
List of assessment projects	
List of tables	
Introduction - Objectives - Methodology and organization - Contents	*Assoc.Prof.Luu Duc Hai* *Dr. Nguyen Thi Ha*
Chapter 1. General overview on environmental and social aspects of power projects	
1.1. Hydro power plants	*Prof. Nguyen Can* *Dr. Nguyen Thi Loan* *Dr. Vu Quyet Thang* *Dr. Nguyen Xuan Cu* *Dr. Nguyen Thi Kim Hoa*
1.2. Thermo power plants	*Assoc.Prof.Luu Duc Hai* *Dr. Nguyen Thi Ha* *Assoc.Prof.Hoang Xuan Co* *Dr. Nguyen Xuan Hai*
1.3. Other power plants	*Prof. Nguyen Can* *Assoc.Prof.Luu Duc Hai*
Chapter 2. Assessment and selection of power projects based on environmental and social criteria	
2.1. Overview of environmental and social assessment methods for power projects in Vietnam and in the world	*Assoc.Prof. Hoang Xuan Co*
2.2. Analysis and selection of criteria for prioritized power projects in Vietnam	*Assoc.Prof.Luu Duc Hai* *Dr. Nguyen Thi Kim Hoa*
2.3. List of prioritized power project in the period 2006-2015 orientation to 2025 based on selection criteria	
Chapter 3. Vietnam's legal documents related to the construction and operation of power projects	*Dr. Vu Quyet Thang*
References	*Dr. Nguyen Thi Ha*
Appendices	*Dr. Nguyen Thi Loan*

Section 1 - overview of natural and social environment in site location

1.1. THERMAL POWER PLANTS

1.1.1. Current operation plants

1.1.1.1. In the Northern region

NA

1.1.1.2. In the Central region

NA

1.1.1.2. In the South region (4 plants)

1. Phu My No1 thermal power plant
2. Phu My No2 thermal power plant
3. Phu My No3 thermal power plant
4. Phu My No4 thermal power plant

(1) Phu My No1 thermal power plant

- **Location:** Phu My town, Tan Thanh dist. Ba Ria-Vung Tau province (172ha: 1st phase: 90ha; 2nd phase 82ha)
- **Project type**: Building – Operation (1998-2000)
- **Investment**: Vietnam Electric Corporation, ODA (Japan)
- **Report:**
- **Technical specifications:**

Technology	CCGT
Capacity	900MW ± 10%
Performance (fine)	
Operating hour per year	
Fuel	
Water consume	
(operating)	
Cooling water (condense tank)	
Steam specifications	

- **Socio-economic and environmental impact**

Phu My power plants locate in the middle of Vinakyoei Steel enterprise and Thi Vai river along No.51 high way, 75km from Ho Chi Minh city and 40km from Vung Tau. The area of project is even and flat terrain, red-yellow soil above graphite curdle plait layer. The plant ground is sand mixed clay, poor water conserve/keep.

During construction and operation phases it have adverse impacts on some pagodas e.g. Dai Tung Lam pagoda and Church belong Ngoc Ha parish. Impact mainly on mangrove located in the middle of project areas and Thi Vai river.

Noise and land subsidence are occurred by activities of drilling machine and others during construction phase. This is insignificant impact if effectively controls the operating time and number of heavy loading capacity- equipment and machines, during the operation phase the impact will be reduced to b or c depend on management and control.

Significant impact on Terrestrial and aquatic ecologies e.g. vegetation cover in project area and surrounding (mangrove along Thi Vai river). However this impact is eliminated in case of all measurements for pollutant control and elimination are effectively carried out.

Drinking water is mainly from underground water that majority contaminated by alum (in dry season). Gas emission generated from fuel burning process will cause air pollution. Solid wastes (production and domestic solid waste cause fewer impacts in case they are well controlled and collected/treated.

- **Other information**

  Some information available in report of Phu My No2-2

(2) Phu My No2-2 thermal power plant

- **Location:** Phu My town, Tan Thanh dist. Ba Ria-Vung Tau province (Total area: 128ha; Phu My 2-2: 8ha)
- **Project type**: Building – Operation – Transfer (BOT)
- **Investment**: Vietnam Electric Corporation, ODA (Japan)
- **Report:** Feasibility study: Power electric consultant company-No2 (PECC -2) 2001
- EIA report: Center for Sustainable development (Southern Branch) –VESDEC in coordination with: Southern Irrigation planning Sub-Institution (MARD); Southern hydrometeorology Station; Tropical Biology institution (VAST) and Aquatic product Growing research Institution No2 (MARD).
- **Technical specifications:**

Technology	CCGT
Capacity	715MW
Fuel	Gas: 37-47MJ/m^3
	DO: 2909ton/h (10800kCal/kg)
Water consume	3850m3/day
(operating)	
Cooling water (condense tank)	17m3/s
Steam specifications	

- **Socio-economic and environmental impact**

Phu My power plants locate in the middle of Vinakyoei Steel enterprise and Thi Vai river along No.51 high way, 75km from Ho Chi Minh city and 40km from Vung Tau. The area of project is even and flat terrain, red-yellow soil above graphite curdle plait layer. The plant ground is sand mixed clay, poor water conserve/keep.

During construction and operation phases it have adverse impacts on some pagodas e.g. Dai Tung Lam pagoda and Church belong Ngoc Ha parish. Impact mainly on mangrove located in the middle of project areas and Thi Vai river.

Noise and land subsidence are occurred by activities of drilling machine and others during construction phase. This is insignificant impact if effectively controls the operating time and number of heavy loading capacity- equipment and machines, during the operation phase the impact will be reduced to b or c depend on management and control.

Significant impact on Terrestrial and aquatic ecologies e.g. vegetation cover in project area and surrounding (mangrove along Thi Vai river). However this impact is eliminated in case of all measurements for pollutant control and elimination are effectively carried out.

Drinking water is mainly from underground water that majority contaminated by alum (in dry season). Gas emission generated from fuel burning process will cause air pollution. Solid wastes (production and domestic solid waste cause fewer impacts in case they are well controlled and collected/treated.

- **Other information**

Diagram of site area; Detailed design of technology (production diagram; equipment, mass flow, related systems e.g. diagram,); Map and Appendixes (data)

(3) Phu My No3 thermal power plant

- **Location:** Phu My town, Tan Thanh dist. Ba Ria-Vung Tau province
- **Project type**: Building – Operation (1998-2000). *As planned it would be operated by 2003 but not in fact*
- **Investment**: Vietnam Electric Corporation, ODA (Japan)
- **Report:**
- **Technical specifications:**

Technology	CCGT
Capacity	600MW
Performance (fine)	
Operating hour per year	
Fuel	
Water consume	250m3/day
(operating)	
Cooling water (condense tank)	
Steam specifications	

- **Socio-economic and environmental impact**

Phu My power plants locate in the middle of Vinakyoei Steel enterprise and Thi Vai river along No.51 high way, 75km from Ho Chi Minh city and 40km from Vung Tau. The area of project is even and flat terrain, red-yellow soil above graphite curdle plait layer. The plant ground is sand mixed clay, poor water conserve/keep.

During construction and operation phases it have adverse impacts on some pagodas e.g. Dai Tung Lam pagoda and Church belong Ngoc Ha parish. Impact mainly on mangrove located in the middle of project areas and Thi Vai river.

Noise and land subsidence are occurred by activities of drilling machine and others during construction phase. This is insignificant impact if effectively controls the operating time and number of heavy loading capacity- equipment and machines, during the operation phase the impact will be reduced to b or c depend on management and control.

Significant impact on Terrestrial and aquatic ecologies e.g. vegetation cover in project area and surrounding (mangrove along Thi Vai river). However this impact is eliminated in case of all measurements for pollutant control and elimination are effectively carried out.

Drinking water is mainly from underground water that majority contaminated by alum (in dry season). Gas emission generated from fuel burning process will cause air pollution. Solid wastes (production and domestic solid waste cause fewer impacts in case they are well controlled and collected/treated.

- **Other information**

  Some information available in report of Phu My No2-2

（4）Phu My No4 thermal power plant

- **Location:** Phu My town, Tan Thanh dist. Ba Ria-Vung Tau province
- **Project type**: Building – Operation (1998-2000). **Investment**: Vietnam Electric Corporation, ODA (Japan)
- **Report:**
- **Technical specifications:**

Technology	CCGT
Capacity	600-900MW
Fuel	
Water consume	Total 6,100m3/day (2002)
(operating)	
Cooling water (condense tank)	
Steam specifications	

- **Socio-economic and environmental impact**

Phu My No4 power plant is constructed (extension of Phu My power plant) to ensure the consumption of natural gas from Con Son mining (already having gas pipeline to the project area). This because Phu My No 2 and 3 have not been operated as planned (by 2002, 2003).

Phu My No4 power plant locates in the middle of Vinakyoei Steel enterprise and Thi Vai river along No.51 high way, 75km from Ho Chi Minh city and 40km from Vung Tau. The area of project is even and flat terrain, red-yellow soil above graphite curdle plait layer. The plant ground is sand mixed clay, poor water conserve/keep.

During construction and operation phases it have adverse impacts on some pagodas e.g. Dai Tung Lam pagoda and Church belong Ngoc Ha parish. Impact mainly on mangrove located in the middle of project areas and Thi Vai river.

Noise and land subsidence are occurred by activities of drilling machine and others during construction phase. This is insignificant impact if effectively controls the operating time and number of heavy loading capacity- equipment and machines, during the operation phase the impact will be reduced to b or c depend on management and control.

Significant impact on Terrestrial and aquatic ecologies e.g. vegetation cover in project area and surrounding (mangrove along Thi Vai river). However this impact is eliminated in case of all measurements for pollutant control and elimination are effectively carried out.

Drinking water is mainly from underground water that majority contaminated by alum (in dry season). Gas emission generated from fuel burning process will cause air pollution. Solid wastes (production and domestic solid waste cause fewer impacts in case they are well controlled and collected/treated.

- **Other information:** Annex of EIA report with few information.

1.1.2. Current construction plants

1.1.2.1. In the Northern region (1 plant)

5. Ninh Binh No. 2 thermal power plant

(5) Ninh Binh No. 2 thermal power plant

- **Location:** Thanh Binh precinct, Ninh Binh town, Ninh Binh province (planned operating on 7/2007)
- **Project type**: Building – Operation
- **Investment**: Vietnam Electric Corporation
- **Report:** EIA report: Science and technology institution and energy institution (2004)
- **Technical specifications:**

Module	
Capacity	300MW
Capacity (fine)	
Performance (fine)	6132 hours/year (Lifespan: 25 years)
Operating hour per year	
Fuel	Coal (approximately 824140tones/year), taken from Hon Gai, Cam Pha (coarse coal 4b and 5) and FO

- **Socio-economic and environmental impact**

Station locates at the delta of Day river, beside Canh Dieu mountain. The temperature varies from 7.1 to 35.9^{0}C; the average rainfall is 1820mm; solar radiation is 120Kcal/m^2/year; average humidity is 84%. The dominate wind direction is south-east.

Total population of Ninh Binh town is 62605 people, population density is very high, and the number of labor in industry and handicraft field is biggest.

The project in both two phases: building and operating impacts on environment and society. For social aspect: this project creates many socio-economic benefits; adapts increasing demand for electric; gives jobs to local people, Although, there are some disadvantages such as: making harmful effects to human health; generating and enhancing social devils; damaging some production field, for example: agriculture, forestry, aquaculture, For environmental aspect: bad impacts is caused by some activities: transporting and burning fuel, discharging coal ashes, waste water, construction activities,…. Besides, Canh Dieu mountain accelerates such impacts (particularly for air environment). Minimizing methods therefore should be vital and forceful.

- **Other information:** EIA report

1.1.2.2. In the Central region

NA

1.1.2.3. In the Southern region

NA

1.1.3. Planned construction plants

1.1.3.1. In the Northern region (7 plants)

6. Quang Ninh thermal power plant
7. Son Dong thermal power plant
8. Hai Phong thermal power plant
9. Mao Khe thermal power plant
10. Mong Duong thermal power plant
11. Uong Bi thermal power plant
12. Nghi Son thermal power plant

(6) Quang Ninh thermal power plant

- **Location:** Xom Cho (Bang village), Thong Nhat commune, Hoang Bo district, Quang Ninh province (120ha)
- **Project type**: Building – Operation – Transfer (BOT)
- **Investment**: Oxbow International Power corporation (America) and Marubeni corporation (Japan)
- **Report:** Feasibility study: Raytheon Consultant Company (America)

  EIA study: Environmental protection center (EPC) in cooperation with some institutions and centers: IENR (NCNST); CETTIA; institution of Chemistry (NCNST); Institution of Mechanics (NCNST); Quang Ninh DOSTE; Hai Phong Ocean institution (NCNST)
- **Technical specifications:**
  - Capacity: 300 MW
  - Fuel: coal (low quality: heating energy value: 3000-3990Kcal/kg): $1.09x10^6$ – $1.54x10^6$ ton/year; DO: 2500ton/year
  - Steam specifications: 13.03Mpa/538^0C
- **Socio-economic and environmental impact**

Adverse impacts of construction phase are mainly caused by land use, emigration for clear the ground. The area of agriculture land, mangrove and aquaculture is therefore reduced. Number of environmental pollutants generated in this phase also cause bad impacts for people and ecology of locality (project area), in particular the impact on natural ecologies e.g. reduction of forest area, water body of Dien Vong rive mouth and northern coastal of Bai Chay bay.

During operation phase the discharge/emission of wastes (production and domestic) is considered as the major adverse impacts on the environment. Some impacts can be eliminated when control/treatment measures are effectively implemented. The significant impacts may be caused by the ash, coal residues, polluted gases and wastewater (high temperature and oil/grease). These pollutants will directly impact on water ecology and vegetational cover in locality.

– **Other information**

Diagram of site area; Detailed design of technology (production diagram; equipment, mass flow, related systems e.g. diagram,); Map and Appendixes (data)

(7) Son Dong thermal power plant

- **Location:** Dong Ri mountain village, Thanh Luan commune, Son Dong district, Bac Giang province (10ha excluding water system area and working staff living quarter)
- **Project type**: Building – Operation
- **Investment**: Vietnam Electric Corporation
- **Report:** Feasibility study: Power electric consultant company-No1 (PECC -1) 6/2004.

  EIA study: Vietnam Electric Corporation in cooperation with Power electric consultant company-No1 and Quang Ninh center for environmental monitoring and analysis, Quang Ninh DoNRE
- **Technical specifications:**

Module	2 x 100MW
Capacity	200MW
Capacity (fine)	2 x 90MW
Performance (fine)	68.49%
Operating hour per year	6000
Fuel	Coal (low quality) Low heat value: 4410 Kcal/kg

- **Socio-economic and environmental impact**

Adverse impacts of construction phase are mainly caused by land use, emigration for clear the ground. However less environmental impact is assessed because small number of minorities in project area (scattered), only 5 households have to emigrant for plant areas; for dam construction detailed data not available. No cultural heritage in project area but relative significant impacted on the sceneries (forestry) during clear the ground phase. Land can be contaminated by pollutants/solid wastes (domestic and production) and significant impact found during construction phase depends on operating time and number of heavy loading capacity- equipment and machines.

Minor impact on agriculture (cultivation crop) because project area majority is forestry land (90%). However significant impact on terrestrial and aquatic ecologies e.g. vegetational covers in project area due to forestry land loss and dam construction. Less impact found on Khe Ro Preservation areas because it is 25km far from project area.

During operation phase the discharge/emission of wastes (production and domestic) is considered as the major adverse impacts on the environment. Wastewater discharge in operating phase (high temperature and oil/grease contaminated) will also impact water ecology its species, mainly impact to water quality of Dong Ri and Nuoc Vang streams. The impacts will be limited if wastewater is effectively treated before discharge. Gas emission will cause impact during construction and operating phases. However the impact level will be considered as 'less level' in case of all pollutant control and elimination measures are effectively carried out. Solid wastes (production and domestic solid waste cause less impact in case they are well controlled and collected/treated

- **Other information:** Diagram of site area; Detailed design of technology (production diagram; equipment, mass flow, related systems e.g. diagram,); Map and Appendixes (data)

(8) Hai Phong thermal power plant

- **Location:** Tam Hung commune, Thuy Nguyen district, Hai Phong city (120ha including 36ha of site area; 7ha of water system and 87ha of coal residues dump)
- **Project type**: Building – Operation
- **Investment**: Vietnam Electric Corporation
- **Report:** Feasibility study: Institute of Energy, Ministry of Industry.
- Labor Protection Institute; Institute of Ecology and Bio-resource; Hai Phong Center for Environmental consultancy and technical assistance.
- **Technical specifications:**

Steam furnace		**Turbine**	
Module	2 x 300MW	Capacity	2 x 300MW
Steam productivity(Max)	2 x 99ton/h	Speed	3000rpm
Steam furnace performance	92%	Steam specifications	Pressure (input): 166kg/cm^2 Temperature: 538^{o}C/541^{o}C Pressure (output): 0.035kg/cm^2
Over-heat steam pressure/medium over-heat	172/40kg/cm^2/541^o C/541^{o}C	Fuel	Coal (low quality) Low heat value: 4410 Kcal/kg
Over-heat steam temperature/medium over-heat	541^{o}C/541^{o}C		

- **Socio-economic and environmental impact**

No minorities to be impacted, however local inhabitants (~280 households) have to move for clear the ground. Number of cultural heritage in project area may be impacted, therefore impact on sceneries such as Cau Gia tourist area. Forest decrease is assessed to be impact when project constructed. Significant impact on agriculture (cultivation crop) and aquaculture (~47ha cultivation land and ~66ha aquaculture area) have lost for clear the ground.

Adverse impact to water quality of Song Gia lake assessed during Dam construction to supply fresh water for Minh Duc district. In some specific areas the impact on Terrestrial and aquatic ecologies can be higher e.g. fishery, aquaculture or brackish water ecology.

When plant operates different kinds of wastes generated will cause impact on environment and people depend on the implementation of pollutant control and elimination measures. Land can be contaminated by pollutants/solid wastes (domestic and production). Gas emission from fuel burning process during the operation phase with major gas pollutants: ammoniac, hydrafin, oil and grease, SO_2, NO_x…is considered as major impact for local air environment and somehow impact on forest/natural ecology. Noise and smell pollution cause significant or insignificant impact during construction phase depend on operating time and number of heavy loading capacity- equipment and machines. Solid wastes (production and domestic) containing hazardous components e.g. heavy metals; mineral; This cause less impacts in case they are well collected/treated

- **Other information**

Diagram of site area; Detailed design of technology (production diagram; equipment, mass flow, related systems e.g. diagram,); Map and Appendixes (data)

(9) Mao Khe thermal power plant

- **Location:** Dong Ram hamlet, Binh Khe commune, Dong Trieu district, Quang Ninh province (total area of 47 ha, 3 km away from Mao Khe town in the north western).
- **Project type**: Building – Operation
- **Investment**: Vietnam Electric Corporation
- **Report:**
- **Technical specifications:**

Module	2 x 110MW
Capacity	220MW
Capacity (fine)	
Performance (fine)	
Operating hour per year	
Fuel	Coal (low quality) Low heat value: 4450 Kcal/kg

- **Socio-economic and environmental impact**

The construction site locates near Mao Khe coal mine and Hoang Thach cement factory which are now having high dust concentration, nearby Cau river (a branch of Da river originating from Yen Tu stream) which are now having sign of SS and oil pollution. The landform is quite flat (short hill) with an average altitude of 9m , nearby Mao Khe mountain which has poor regenerative forest, less densely populated, most of them are farmers; 2 km away from Highroad and national railroad.

Major negative impacts of the project to the environment around area: -) to compensate and remove 22 households in the construction site, to lost 29 ha cultivated land and 1.5 litchi hill; -) the construction may cause air pollution (dust and waste gases from vehicles...), water pollution (SS, sewage from households…), noise and vibration; -) in the process of operating these factories may cause air pollution (dust, NOx, SO2,..), water pollution(SS, oil, thermal pollution…) , discharge 326000 ton/year of solid wastes, consume 1300 m^3/h, affect to fish in Cau and Da Vach river, may impact to people health in hamlets of Binh Khue commune, Dong Trieu district.

(10) Mong Duong thermal power plant

- **Location:** Mong Duong precinct, Cam Pha district, Quang Ninh province, planned operating in 2008
- **Project type**: Building – Operation
- **Investment**: Vietnam Electric Corporation
- **Report:** EIA report: Power electric consultant company-No1 (2004)
- **Technical specifications:**

Module	
Capacity	1500MW (500MW –stage 1)
Capacity (fine)	
Performance (fine)	
Operating hour per year	
Fuel	Coal (low quality): 2850720tones/year FO

- **Socio-economic and environmental impact**

Station locates at an un-flat topology area; is affected by both Mong Duong river's hydrological regime; the various range of temperature is large; dominate wind direction is north and south; the average amount of rainfall is 2000mm/year.

Total population of Mong Duong is 12628 people, population density is high, in recent years, the number of labor in forestry, aquaculture, industry and handicraft field increases but decreases in agriculture one.

The project in both two phases: building and operating impacts on environment and society. For social aspect: this project creates many socio-economic benefits; adapts increasing demand for electric; gives jobs to local people, Although, there are some disadvantages such as: making harmful effects to human health; generating and enhancing social devils; damaging some production field, for example: agriculture, forestry, aquaculture, For environmental aspect: bad impacts is caused by some activities: transporting and burning fuel, discharging coal ashes, waste water, construction activities,…. Minimizing methods therefore should be vital and forceful.

- **Other information:** EIA report (2004)

(11) Uong Bi thermal power plant

- **Location:** Uong Bi district, Quang Ninh province
- **Project type**: Building – Operation
- **Investment**: Vietnam Electric Corporation
- **Report:** EIA report by IE (1998)
- **Technical specifications:**

Module	
Capacity	300MW
Capacity (fine)	
Performance (fine)	
Operating hour per year	
Fuel	Coal (approximately 828324 tones/year), taken from Vang Danh

– **Socio-economic and environmental impact**

Station locates at un-flat topology area; the various range of temperature is large; the dominate wind direction includes: North - North East and South-South East; the average amount of rainfall is over 1500mm/year.

Total population of Uong Bi is around 60000 people, population density is 350people/km^2. The project in both two phases: building and operating impacts on environment and society. For social aspect: this project creates many socio-economic benefits; adapts increasing demand for electric; gives jobs to local people, Although, there are some disadvantages such as: making harmful effects to human health; generating and enhancing social devils; damaging some production field, for example: agriculture, forestry, aquaculture, For environmental aspect: bad impacts is caused by some activities: transporting and burning fuel, discharging coal ashes, waste water, construction activities,…. Minimizing methods therefore should be vital and forceful.

– **Other information:** EIA report

(12) Nghi Son thermal power plant

– **Location:** Nghi Son industrial zone, Tinh Gia district, Thanh Hoa province

– **Project type**: Building – Operation

– **Investment**: Vietnam Electric Corporation

– **Report:** IEA report is conducted on 9/2004 by Ho Chi Minh University of Technology

– **Technical specifications:**

Module	
Capacity	600MW
Capacity (fine)	
Performance (fine)	
Operating hour per year	
Fuel	Coal (approximately 1700000 tones/year), taken from Hon Gai-Cam Pha (coarse coal 5HG) and HFO (around 60000 tons/year

– **Socio-economic and environmental impact**

Station locates on small valley of Yen Hoa. The gradient of temperature is not height, the average rainfall rounds 2000mm; solar radiation is 120Kcal/m^2/year; average humidity is height. The dominate wind direction includes: North, North-East, North West.

For social aspect: this project creates many socio-economic benefits; adapts increasing demand for electric; gives jobs to local people, Although, there are some disadvantages such as: making harmful effects to human health; generating and enhancing social devils; damaging some production field, for example: agriculture, forestry, aquaculture, For environmental aspect: bad impacts is caused by some activities: transporting and burning fuel, discharging coal ashes, waste water, construction activities.

– **Other information:** EIA report

1.1.3.2 In the Central region

NA

1.1.3.3 In the Southern region (11 plants)

13. Nhon Trach No1 thermal power plant
14. Nhon Trach No2 thermal power plant
15. Nhon Trach No3 thermal power plant
16. Nhon Trach No4 thermal power plant
17. Amata Bien Hoa thermal power plant
18. South CCGT thermal power plant
19. Hiep Phuoc thermal power plant
20. Mon No1 thermal power plant
21. Mon No2 thermal power plant
22. Mon No3 thermal power plant
23. Mon No4 thermal power plant

(13) Nhon Trach No1 thermal power plant

- **Location:** Tay Khanh village, Phuoc Khanh commune, Nhon Trach district, Dong Nai province (20ha)
- **Project type**: Building – Operation
- **Investment**: Vietnam Electric Corporation
- **Report:** EIA study: Institution of Environment and Sustainable development (Southern branch) in cooperation with Power electric consultant company-No2 (PECC -2).
- **Technical specifications:**

	Option 1	***Option 2***
Technology	Condense Steam	Condense Steam
Module	1 x 600MW	2 x 300MW
Capacity	600MW	600MW
Performance (fine)	43.28%	41.79%
Operating hour per year	6000	6000
Fuel	FO or Gas Low heat value: FO = 9700Kcal/kg Gas = 3,152mil. ton/day (8832Kcal/Nm^3)	FO or Gas Low heat value: FO = 9700Kcal/kg Gas = 3,152mil. ton/day (8832Kcal/Nm^3)
Water consume (operating)	3,400m^3/day	
Cooling water (condense tank)	26m^3/s	26m^3/s
Steam specifications	250bar/560^{o}C/560^{o}C	167bar/538^{o}C/538^{o}C

- **Socio-economic and environmental impact**

The site planned building in Ong Keo industrial zone therefore impact on inhabitants is minority. Sceneries impacted mainly are the surrounding areas like Can Gio biosphere reserve and Vung Tau tourist areas.

Significant impact on agriculture (cultivation crop) and aquaculture because they are majority in project area. Significant impact on terrestrial and aquatic ecologies e.g. vegetational cover in project area and surrounding (Can Gio mangrove).

Forest decrease is assessed relative significant when project constructed, whereas when it is operating majority adverse impacts due to gas emission (SO_2; NO_x; dust…); wastewater, noise. etc. Wastewater (cooling water) discharge to river will affect aqua species due to high temperature and pollutants. However these impacts will be reduced in case of all measurements for pollutant control and elimination are effectively carried out.

Another impact should be carefully considered is the risk for environment and people due to the fuel used is FO or gas (burning, explosion and leaking). Solid wastes (production and domestic solid waste) cause less impacts in case they are well collected/treated.

– **Other information**

Diagram of site area; Detailed design of technology (production diagram; equipment, mass flow, related systems e.g. diagram,); Map and Appendixes (data)

(14) Nhon Trach No2 thermal power plant

– **Location:** Tay Khanh village, Phuoc Khanh commune, Nhon Trach district, Dong Nai province (20ha)

– **Project type**: Building – Operation

– **Investment**: Vietnam Electric Corporation

– **Report:** EIA study: Institution of Environment and Sustainable development (Southern branch) in cooperation with Power electric consultant company-No2 (PECC -2).

– **Technical specifications:**

Technology	Condense Steam
Module	1 x 600MW
Capacity	600MW
Performance (steam cycle)	45%
Operating hour per year	6000
Fuel	FO or Gas Low heat value: FO = 9700Kcal/kg Gas = 3,152mil. ton/day (8832Kcal/Nm^3)
Water consume (operating)	3,400m^3/day
Cooling water (condense tank)	26m^3/s
Steam specifications	250bar/560^oC/560^oC

– **Socio-economic and environmental impact**

The site planned building in Ong Keo industrial zone therefore impact on inhabitants is minority. Sceneries impacted mainly are the surrounding areas like Can Gio biosphere reserve and Vung Tau tourist areas.

Significant impact on agriculture (cultivation crop) and aquaculture because they are majority in project area. Significant impact on terrestrial and aquatic ecologies e.g. vegetational cover in project area and surrounding (Can Gio mangrove).

Forest decrease is assessed relative significant when project constructed, whereas when it is operating majority adverse impacts due to gas emission (SO_2; NO_x; dust…); wastewater, noise. etc. Wastewater (cooling water) discharge to river will affect aqua species due to high

temperature and pollutants. However these impacts will be reduced in case of all measurements for pollutant control and elimination are effectively carried out.

Another impact should be carefully considered is the risk for environment and people due to the fuel used is FO or gas (burning, explosion and leaking). Solid wastes (production and domestic solid waste) cause less impacts in case they are well collected/treated.

- **Other information**

Diagram of site area; Detailed design of technology (production diagram; equipment, mass flow, related systems e.g. diagram,); Map and Appendixes (data)

(15) Nhon Trach No3 thermal power plant

- **Location:** Tay Khanh village, Phuoc Khanh commune, Nhon Trach district, Dong Nai province (20ha)
- **Project type**: Building – Operation
- **Investment**: Vietnam Electric Corporation
- **Report:** EIA study: Institution of Environment and Sustainable development (Southern branch) in cooperation with Power electric consultant company-No2 (PECC -2).
- **Technical specifications:**

Technology	CCGT
Capacity	720MW
Performance (steam cycle)	37%
Fuel	Gas or DO: DO = 2,637ton/day Gas = 3,032 mil. ton/day (8832Kcal/Nm^3)
Water consume (operating)	2,872m^3/day
Cooling water (condense tank)	15m^3/s

- **Socio-economic and environmental impact**

The site planned building in Ong Keo industrial zone therefore impact on inhabitants is minority. Sceneries impacted mainly are the surrounding areas like Can Gio biosphere reserve and Vung Tau tourist areas.

Significant impact on agriculture (cultivation crop) and aquaculture because they are majority in project area. Significant impact on terrestrial and aquatic ecologies e.g. vegetational cover in project area and surrounding (Can Gio mangrove).

Forest decrease is assessed relative significant when project constructed, whereas when it is operating majority adverse impacts due to gas emission (SO_2; NO_x; dust…); wastewater, noise. etc. Wastewater (cooling water) discharge to river will affect aqua species due to high temperature and pollutants. However these impacts will be reduced in case of all measurements for pollutant control and elimination are effectively carried out.

Another impact should be carefully considered is the risk for environment and people due to the fuel used is FO or gas (burning, explosion and leaking). Solid wastes (production and domestic solid waste) cause less impacts in case they are well collected/treated.

- **Other information:** Diagram of site area; Detailed design of technology (production diagram; equipment, mass flow, related systems e.g. diagram,); Map and Appendixes (data)

(16) Nhon Trach No4 thermal power plant

- **Location:** Tay Khanh village, Phuoc Khanh commune, Nhon Trach district, Dong Nai province (20ha)
- **Project type**: Building – Operation
- **Investment**: Vietnam Electric Corporation
- **Report:** EIA study: Institution of Environment and Sustainable development (Southern branch) in cooperation with Power electric consultant company-No2 (PECC -2).
- **Technical specifications:**

Technology	CCGT
Capacity	720MW
Performance (steam cycle)	37%
Fuel	Gas or DO: DO=2,637 ton/day Gas = 3,032 mil. ton/day (8832Kcal/Nm^3)
Water consume (operating)	2,872m^3/day
Cooling water (condense tank)	15m^3/s

- **Socio-economic and environmental impact**

The site planned building in Ong Keo industrial zone therefore impact on inhabitants is minority. Sceneries impacted mainly are the surrounding areas like Can Gio biosphere reserve and Vung Tau tourist areas.

Significant impact on agriculture (cultivation crop) and aquaculture because they are majority in project area. Significant impact on terrestrial and aquatic ecologies e.g. vegetational cover in project area and surrounding (Can Gio mangrove).

Forest decrease is assessed relative significant when project constructed, whereas when it is operating majority adverse impacts due to gas emission (SO_2; NO_x; dust…); wastewater, noise. etc. Wastewater (cooling water) discharge to river will affect aqua species due to high temperature and pollutants. However these impacts will be reduced in case of all measurements for pollutant control and elimination are effectively carried out.

Another impact should be carefully considered is the risk for environment and people due to the fuel used is FO or gas (burning, explosion and leaking). Solid wastes (production and domestic solid waste) cause less impacts in case they are well collected/treated.

- **Other information:** Diagram of site area; Detailed design of technology (production diagram; equipment, mass flow, related systems e.g. diagram,); Map and Appendixes (data)

(17) Amata Bien Hoa thermal power plant

- **Location:** Long Binh Modern Industrial zone (700ha), Tam Hoa commune, Bien Hoa city, Dong Nai province (9ha)

- **Project type**: Building – Operation – Transfer (BOT)
- **Investment**: Amata Power limited – Bien Hoa (160 mil USD)
- **Report:** Economic-Technical theoretical and factual foundation report: Energy center (VEC); EIA report: Center for Environmental Technology and Management (CEFINEA) in coordination with Energy center and Bioresourse center
- **Technical specifications:**

Technology	CCGT
Capacity	212MW (supply electric for Long Binh industrial zone)
Fuel	Gas: 37-47MJ/m^3
	DO: 2909ton/h (10800kCal/kg)
Water consume	3850m3/day
(operating)	Added water: 392m3 x 2 tank systems x 24h = 18816m3/24h
Cooling water	11200m3/h
(condense tank)	

- **Socio-economic and environmental impact**

Amana power plant locates in Long Bin modern industrial zone, along to No1 highway, 30km from Bien Hoa city in the east; 30km from Ho Chi Minh city in the northern east. This plan plays a very important role for the development of key triangle economic zone. The transportation is convenience (road, airway, railway, and waterway).

There is no impact on minorities because small number of ethnic residence (5% minorities). No cultural heritage/asset and sceneries in project area (area/ground already available) therefore no impact on these aspects. Insignificant impact assessed on agriculture because only 13.11% population do agriculture, forestry and fishery, mainly are handcraft and light industries and services. Forest decrease is assessed at c level when project constructed (area already available) but at b level when it is operating majority due to gas emission.

During construction and operation phase it cause impact on surface water (Dong Nai river water, Buong river and Ben Go ditch) and underground water (tube well). Significant impact on Terrestrial and aquatic ecologies e.g. vegetation cover in project area and surrounding (Dong Nai river water, Buong river and Ben Go ditch).

Working of drilling machine and others during construction phase cause the noise and land subsidence. In case of implementing the effective control of operating time and number of heavy loading capacity- equipment and machines the impact will be reduced to c depend on management and control. Similar to operation phase b-c level will only attain in case of all measurements for pollutant control and elimination is effectively carried out.

Solid wastes (production and domestic solid waste cause less impact in case they are well controlled and collected/treated.

- **Other information**

EIA report: Diagram of site area; Detailed design of technology (production diagram; equipment, mass flow, related systems e.g. diagram,); Map and Appendixes (data)

(18) South CCGT thermal power plant

- **Location:** Phu My commune, Chau Thanh dist, Ba Ria-Vung Tau province (2 stages total area: 15-20ha; plant area: 7-12ha; outside/surrounding:8-8ha)
- **Project type**: Building – Operation
- **Investment**: VEC, IE
- **Report:** EIA report: : Power electric consultant company-No2 (PECC -2).
- **Technical specifications:**

Technology	CCGT
Capacity	300 (1st stage) – 600 (extend stage)
Operating hour per year	65000h(Max)
Fuel	Gas: 424.7mil m3/year – 849.6 mil m3/year
Water consume (operating)	DO: 8887 ton/7days – 17774 ton/7days 30000m3/h - 60000m3/h (Cooling water (condense tank)) 410m3/24h – 800m3/24h (Fresh water)

- **Socio-economic and environmental impact**

South CCGT power plant locates in convenience area in General planning area of BR_VT province, near gas/DO Bach Ho-Thu Duc pipeline and economic zone: Ho Chi Minh city-Bien Hoa –Vung Tau. The infrastructure in project area is good e.g. transportation, water, electric supply,

The project causes little impact on minorities because there are only 2 Thai houses and 2 Khmer households in this area (the rest are Kinh). Though 80% population of Phu My commune do agriculture (paddy cultivation), the project area locate in General planning area of BR-VT therefore the impact on agriculture is insignificant.

Construction and operation phases cause adverse impact on surface water (Thi Vai river, 1.5km far from project area. Relatively significant impact on terrestrial and aquatic ecologies e.g. Thi Vai river found (mainly for aquatic because no bush in this area). Working of drilling machine and others during construction phase cause noise, land subsidence and air pollution. These impacts can be reduced in case of all measurements for pollutant control and elimination is effectively carried out.

Land can be contaminated by solid wastes (domestic and production). Solid wastes (production and domestic solid waste cause fewer impacts in case they are well controlled and collected/treated

- **Other information**

EIA report (1995): Diagram of site area; Detailed design of technology (production diagram; equipment, mass flow, related systems e.g. diagram,); Map and Appendixes (data)

(19) Hiep Phuoc thermal power plant

- **Location:** Hiep Phuoc commune, Nha Be dist. Ho Chi Minh city (25km from Ho Chi Minh city in the South, in the bank of Soai Rap canal.
- **Project type**: Building – Operation – Transfer (BOT)
- **Investment**:
- **Report:** EIA report – Tropical Technical center prepared in 1997.

- **Technical specifications:**

  Capacity: 675 MW (max) two periods:

  1st period: 125MW (3 machine groups)

  2nd period: 300MW additional

  Fuel: FO and natural gas

- **Socio-economic and environmental impact**

Plant locates in the area of 40ha, mainly is alluvial soil contaminated alum (soft foundation). Within 5km from site's area is agricultural land with the population of 12,600. Economic relies mainly on agriculture and fishery.

The air quality is lightly polluted. River water is salt contaminated and lightly polluted. Mangrove ecology in downstream of plant is rich with many symbolic flora and fauna species.

Air pollution by SO2, odor, heat, NOx may cause adverse impact for local community and environment.

Wastewater including cooling water contains oil, grease and high temperature will cause adverse impact for aquatic, mangrove in Soai Rap basin, Nha Be. The direct impact on aquatic fauna and flora include. fish, particularly in case of oil spilling when plant operates.

During construction the waste may impact on the quality of local community livings.

- **Other information:** EIA report (1997)

(20) O Mon No1 thermal power plant

- **Location:** The Loi , Phuoc Thoi commune, O Mon district, Can Tho city (total area of 162ha)
- **Project type**: Building – Operation (2006-7)
- **Investment**: Vietnam Electric Corporation,
- **Report:** Final report on EIA O Mon thermal power plant project, Ho Chi Minh city 1998. Electricity of Vietnam –company of electrical design 2, ND2002-02 project.
- **Technical specifications:**

Capacity	600MW
Performance (fine)	
Operating hour per year	
Fuel	Gas, FO oil
Water consume (operating)	
Cooling water (condense tank) Steam specifications	

- **Socio-economic and environmental impact**

The site is 18 km from north-eastern to Can Tho city,150 km to Ho Chi Minh city, nearby 191 highway(about 1km) and Hau Giang river (about 2km).

This is a rather flat cultivated land (growing wet-rice) with an altitude of 0.8 – 1 m.

Geological condition: the site has earth quake of 7 level .As results of drilling holes, the site foundation composes of 5 layers: - Clay layer width 1-2m; -mud sandy clay width 10-15m;

- multicolored sandy clay thickness 20-25m; -sandy clay thickness 33-35m; and -clayey sand, darkish grey>500-600m.

These site places situates within residential agricultural areas with 3 main economical activities: planting wet rice cultivation, aquaculture in Hau river and water-bird (duck) breeding in interior field. Within a radius of 5 km from the construction site, the population is about 70,000, people concentrate in 3 big administrative units: Phuoc Thoi commune (18,159), Thoi An commune (25,480) and O Mon town (17,294). This site is not near heritage sites, cultural sites and other valuable environmental forests. This region's climate has typical characteristics of southern delta region.

The sources of gas supplementary for these plants are from west-southern gas mines with a projected supply of 120 billion m^3 with an average supply of 4 billion m^3 /year. In the case of using FO petroleum, we need 1,7 billion ton/year. The water resources for cooling purposes and drainage are from Hau Giang river, 2 km away from the plant to the north. The development of the group of thermal power plants depends much on the speed of extraction and transportation gases from west-northern mines to land.

Some of environmental issues must be included in the course of design-construct and operate plant: the ability of subsidence land caused by weak land base when building big industrial projects and installation of heavy equipments; controlling and reducing environmental pollution substances (SO2, NOx, dust..) caused by fuel burning, especially when constructing and operating these plants at the later phase (O Mon 3 – O Mon 4); waste water and water use for cooling purposes cause thermal pollution to Hau Giang river, especially in dry season. The increasing in water temperature also affects to marine ecosystems and marine life as well as aquaculture activities in downstream of Hau river; these impacts can cause changes in air temperature and regional climate; one of the impacts can be predicted:

- negative impact on rice yield in fields in 2 km scope from the center of these factories.

- increase in the number of construction and operation workers will increase the population density and create conflict problems among inhabitants and these workers.

- aquaculture activities and raising domestic fowls are less affected.

– **Other information:** Final report on EIA OMOM THERMAL POWER PLANT PROJECT, HCM city 1998. Electricity of Vietnam – company of electrical design 2, ND2002-02 project. "General programming for construction site of thermal power plant running by gas" Ho Chi Minh city, 12/2003.

(21) O Mon No2 thermal power plant

– **Location:** The Loi , Phuoc Thoi commune, O Mon district, Can Tho city (total area of 162ha).

– **Project type**: Building – Operation (2010-2012)

– **Investment**: Vietnam Electric Corporation,

– **Report:** Final report on EIA O Mon thermal power plant project, Ho Chi Minh city 1998. Electricity of Vietnam – company of electrical design 2, ND2002-02 project.

– **Technical specifications:**

Capacity	720MW
Performance (fine)	
Operating hour per year	
Fuel	Gas, FO oil
Water consume (operating)	
Cooling water (condense tank) Steam specifications	

- **Socio-economic and environmental impact**

The site is 18 km from north-eastern to Can Tho city,150 km to Ho Chi Minh city, nearby 191 highway(about 1km) and Hau Giang river (about 2km).

This is a rather flat cultivated land (growing wet-rice) with an altitude of 0.8 – 1 m.

Geological condition: the site has earth quake of 7 level .As results of drilling holes, the site foundation composes of 5 layers: - Clay layer width 1-2m; -mud sandy clay width 10-15m;

- multicolored sandy clay thickness 20-25m; -sandy clay thickness 33-35m; and -clayey sand, darkish grey>500-600m.

These site places situates within residential agricultural areas with 3 main economical activities: planting wet rice cultivation, aquaculture in Hau river and water-bird (duck) breeding in interior field. Within a radius of 5 km from the construction site, the population is about 70,000, people concentrate in 3 big administrative units: Phuoc Thoi commune (18,159), Thoi An commune (25,480) and O Mon town (17,294). This site is not near heritage sites, cultural sites and other valuable environmental forests. This region's climate has typical characteristics of southern delta region.

The sources of gas supplementary for these plants are from west-southern gas mines with a projected supply of 120 billion m^3 with an average supply of 4 billion m^3 /year. In the case of using FO petroleum, we need 1,7 billion ton/year. The water resources for cooling purposes and drainage are from Hau Giang river, 2 km away from the plant to the north. The development of the group of thermal power plants depends much on the speed of extraction and transportation gases from west-northern mines to land.

Some of environmental issues must be included in the course of design-construct and operate plant: the ability of subsidence land caused by weak land base when building big industrial projects and installation of heavy equipments; controlling and reducing environmental pollution substances (SO2, NOx, dust..) caused by fuel burning, especially when constructing and operating these plants at the later phase (O Mon 3 – O Mon 4); waste water and water use for cooling purposes cause thermal pollution to Hau Giang river, especially in dry season. The increasing in water temperature also affects to marine ecosystems and marine life as well as aquaculture activities in downstream of Hau river; these impacts can cause changes in air temperature and regional climate; one of the impacts can be predicted:

- negative impact on rice yield in fields in 2 km scope from the center of these factories.

- increase in the number of construction and operation workers will increase the population density and create conflict problems among inhabitants and these workers.

- aquaculture activities and raising domestic fowls are less affected.

- **Other information:** Final report on EIA OMOM THERMAL POWER PLANT PROJECT, HCM city 1998. Electricity of Vietnam – company of electrical design 2, ND2002-02 project. "General programming for construction site of thermal power plant running by gas" Ho Chi Minh city, 12/2003.

(22) O Mon No3 thermal power plant

- **Location:** The Loi , Phuoc Thoi commune, O Mon district, Can Tho city (total area of 162ha).
- **Project type**: Building – Operation (2012)
- **Investment**: Vietnam Electric Corporation,

- **Report:** Final report on EIA O Mon thermal power plant project, Ho Chi Minh city 1998. Electricity of Vietnam – company of electrical design 2, ND2002-02 project.

- **Technical specifications:**

Capacity	600MW
Performance (fine)	
Operating hour per year	
Fuel	Gas, FO oil
Water consume (operating)	
Cooling water (condense tank) Steam specifications	

- **Socio-economic and environmental impact**

The site is 18 km from north-eastern to Can Tho city,150 km to Ho Chi Minh city, nearby 191 highway(about 1km) and Hau Giang river (about 2km).

This is a rather flat cultivated land (growing wet-rice) with an altitude of 0.8 – 1 m.

Geological condition: the site has earth quake of 7 level .As results of drilling holes, the site foundation composes of 5 layers: - Clay layer width 1-2m; -mud sandy clay width 10-15m;

- multicolored sandy clay thickness 20-25m; -sandy clay thickness 33-35m; and -clayey sand, darkish grey>500-600m.

These site places situates within residential agricultural areas with 3 main economical activities: planting wet rice cultivation, aquaculture in Hau river and water-bird (duck) breeding in interior field. Within a radius of 5 km from the construction site, the population is about 70,000, people concentrate in 3 big administrative units: Phuoc Thoi commune (18,159), Thoi An commune (25,480) and O Mon town (17,294). This site is not near heritage sites, cultural sites and other valuable environmental forests. This region's climate has typical characteristics of southern delta region.

The sources of gas supplementary for these plants are from west-southern gas mines with a projected supply of 120 billion m^3 with an average supply of 4 billion m^3 /year. In the case of using FO petroleum, we need 1,7 billion ton/year. The water resources for cooling purposes and drainage are from Hau Giang river, 2 km away from the plant to the north. The development of the group of thermal power plants depends much on the speed of extraction and transportation gases from west-northern mines to land.

Some of environmental issues must be included in the course of design-construct and operate plant: the ability of subsidence land caused by weak land base when building big industrial projects and installation of heavy equipments; controlling and reducing environmental pollution substances (SO2, NOx, dust..) caused by fuel burning, especially when constructing and operating these plants at the later phase (O Mon 3 – O Mon 4); waste water and water use for cooling purposes cause thermal pollution to Hau Giang river, especially in dry season. The increasing in water temperature also affects to marine ecosystems and marine life as well as aquaculture activities in downstream of Hau river; these impacts can cause changes in air temperature and regional climate; one of the impacts can be predicted:

- negative impact on rice yield in fields in 2 km scope from the center of these factories.

- increase in the number of construction and operation workers will increase the population density and create conflict problems among inhabitants and these workers.

- aquaculture activities and raising domestic fowls are less affected.

- **Other information:** Final report on EIA OMOM THERMAL POWER PLANT PROJECT, HCM city 1998. Electricity of Vietnam – company of electrical design 2,

ND2002-02 project. “General programming for construction site of thermal power plant running by gas” Ho Chi Minh city, 12/2003.

(23) O Mon No4 thermal power plant

- **Location:** The Loi , Phuoc Thoi commune, O Mon district, Can Tho city (total area of 162ha).
- **Project type**: Building – Operation (2014)
- **Investment**: Vietnam Electric Corporation,
- **Report:** Final report on EIA O Mon thermal power plant project, Ho Chi Minh city 1998. Electricity of Vietnam – company of electrical design 2, ND2002-02 project.
- **Technical specifications:**

Capacity	720MW
Performance (fine)	
Operating hour per year	
Fuel	Gas, FO oil
Water consume (operating)	
Cooling water (condense tank) Steam specifications	

- **Socio-economic and environmental impact**

The site is 18 km from north-eastern to Can Tho city,150 km to Ho Chi Minh city, nearby 191 highway(about 1km) and Hau Giang river (about 2km).

This is a rather flat cultivated land (growing wet-rice) with an altitude of 0.8 – 1 m.

Geological condition: the site has earth quake of 7 level .As results of drilling holes, the site foundation composes of 5 layers: - Clay layer width 1-2m; -mud sandy clay width 10-15m;

- multicolored sandy clay thickness 20-25m; -sandy clay thickness 33-35m; and -clayey sand, darkish grey>500-600m.

These site places situates within residential agricultural areas with 3 main economical activities: planting wet rice cultivation, aquaculture in Hau river and water-bird (duck) breeding in interior field. Within a radius of 5 km from the construction site, the population is about 70,000, people concentrate in 3 big administrative units: Phuoc Thoi commune (18,159), Thoi An commune (25,480) and O Mon town (17,294). This site is not near heritage sites, cultural sites and other valuable environmental forests. This region’s climate has typical characteristics of southern delta region.

The sources of gas supplementary for these plants are from west-southern gas mines with a projected supply of 120 billion m^3 with an average supply of 4 billion m^3 /year. In the case of using FO petroleum, we need 1,7 billion ton/year. The water resources for cooling purposes and drainage are from Hau Giang river, 2 km away from the plant to the north. The development of the group of thermal power plants depends much on the speed of extraction and transportation gases from west-northern mines to land.

Some of environmental issues must be included in the course of design-construct and operate plant: the ability of subsidence land caused by weak land base when building big industrial projects and installation of heavy equipments; controlling and reducing environmental pollution substances (SO2, NOx, dust..) caused by fuel burning, especially when constructing and operating these plants at the later phase (O Mon 3 – O Mon 4); waste water and water use for cooling purposes cause thermal pollution to Hau Giang river, especially in dry season. The increasing in water temperature also affects to marine ecosystems and marine life as well as aquaculture activities in downstream of Hau river; these impacts can cause changes in air temperature and regional climate; one of the impacts can be predicted:

- negative impact on rice yield in fields in 2 km scope from the center of these factories.

- increase in the number of construction and operation workers will increase the population density and create conflict problems among inhabitants and these workers.

- aquaculture activities and raising domestic fowls are less affected.

– **Other information:** Final report on EIA OMOM THERMAL POWER PLANT PROJECT, HCM city 1998. Electricity of Vietnam – company of electrical design 2, ND2002-02 project. “General programming for construction site of thermal power plant running by gas” Ho Chi Minh city, 12/2003.

1.2. HYDRO POWER PLANTS

1.2.1. Current operation plants

1.2.1.1. In the Northern region
NA

1.2.1.1. In the Central region
NA

1.2.1.1. In the Southern region
NA

1.2.2. Current construction plants

1.2.2.1. In the Northern region (4 plants)

1. Nam Chien Hydropower Plant,
2. Lai Chau Hydropower Plant
3. Pa Vinh Hydropower Plant.
4. Ban Uon Hydropower Plant

(1) Nam Chien Hydropower plant

- **Location**: Chien Stream, Muong La district, Son La province, $104^0 08$ - 104^0, $23^0 50$ - $23^0 59$.
- **Project type**: expected start work in 12/2003 and end in 3/2007.
- **Investment**: Song Da corporation.
- **Report**: Report of Environmental Impact Assessment - establishing counselor office: Song Da company of constructive consultant.
- **Technical specification**
  - Design capacity: 210 MW
  - Annual electric energy: 883.01×10^6 KWh
  - Lake area (strengthened water level): 4,15 km2.
  - Lake capacity: Vtb=$157,75 \times 10^6$ m
  - Normal water level: 945m
  - Dead water level: 906m
  - Maximum flux: 35,36m^3.
  - Total investment: $3,624,517.63 \times 10^6$ VND
- **Social – economic and environment impact**

Start constructing road, building project causes landscape disfigurement, loses about 572.65 ha of land in construction site, and produces amount of solid, liquid and gas wastes and noisy, which affect the environment in the area. Socio-economic is affected in the area, mainly in Ngoc Chien commune, Muong La district, Son La province. 7455 inhabitants should be resettled. Especially it affects traditional customs, lifestyle of ethnic minority.

The forming of big lake with an area of 4.15 km^2 will lead to the loss of forests, cultivated land and households need to be removed, disturbing their lives, strengthen the risk of erosion, geo-motive power activities, seism and stimulating earthquake in the area.

Re-settlement and transport activities after finishing the project increase effect on forest resources, lead to the risk of erosion and degradation of land in the regions around unless we have suitable management.

- **Other information:** Report of Environmental Impact Assessment updated 10/2003.

(2) Lai Chau Hydro power plant

- **Location**: on Da River, Muong Lay district, Dien Bien province.
- **Project type:** is expected to carry out in period of 2005 - 2012
- **Investment:** Electricity of Vietnam.
- **Report:** Report of Environmental Impact Assessment – establishing counselor office: Institute of Geography, Vietnam Science and Technology Institute.
- **Technical specification :**
  Design capacity: 1200 MW
  Annual electric energy: 4.625×10^9 KWh
  Lake area (normal water level): 39.63 km2.
  Lake capacity: Vtb=$1,215 \times 10^6$ m
  Normal water level: 295 m
  Dead water level: 270 m
  Maximum flux: 99.3m3/s.
  Total investment: $14,618.74 \times 10^9$ VND
- **Social – economic and environment impact.**

Forming of lake makes flood on 3,963 ha of farm land, forest land and residential area with infrastructure, house, other buildings and seriously affects lives of more 6,071 people because they have to move to new places. This effect can be long if management for resettlement is not good.

The forming of the lake leads the loss of a large of natural forests, affects bio-diversity in the area, especially Muong Ne natural conservation in Nam Cha village, Muong Mo commune. Slope landform strengthens erosion, land slide and deposits lake bed, strengthens risk of stimulating earthquake and other exogenous seism activities.

The progress of construction has great effects on regional environment and lives of people living in the area. Agglomeration of water makes a part or total of 18 ore and mine point.

- **Other information:** Report of Environmental Impact Assessment updated 12/2004.

(3) Pa Vinh hydropower plant

- **Location**: Pa Vinh District Son La Province
- **Project type:** This project is under construction. Project owner: Electric consultant construction Company No. 1
- **Investment: Song Da corporation.**
- **Report : Hydropower plant Lai Chau and Small Son La**
- **Technical specification:**
  Capacity: 2060 MW
  Area of dam (correspondence to normal water level rose): km^2
  Capacity of dam: $376x10^6m^3$ (useful volume: 302.310^6m^3)
  Normal water level rose: 150m (water entrance height: 106m)

Death water level rose: 120m
Max Q = 215m^3/s

- **Social – economic and environment impact.**

Son La hydropower plant with 205m dam's height at Pa Vinh is the biggest scale hydropower project in Viet Nam. This project is expected to have the installed power of 2060 MW at the factory in Pa Vinh dam area, Son La province. This also lets increase generating output capacity of Hoa Binh Hydropower plant near the upper dam.

Some noticeable environmental problems of this project:

Part of rice field and cropland may be lost. 11.183 households (63.978 people), mainly ethnic people (88% are Thai people, 3,5% is Xa, La Ha : 5,62% and Khang : 0.35%), have to move out of the proposed lakebed area to resettle in various area in two provinces : Son La and Lai Chau.

Poor forest area and production forest of people may be underwater. Although there is no important cultural heritage, but many cultural customs of ethnic people in lakebed area with many assets: houses, transport and non-material properties (graves, non-object culture) may be strongly affected when people have to move.

Aquatic plants and animals are less affected. And up to now, they haven't found the activities of valuable and rare aquatic plants.

Air quality is affected only during construction period. Water quality is strongly affected during construction period and about first ten years in a period of water accumulation. Climatic changes tend to increase humidity and rainfall and there may appear abnormal weather in lakebed area after water accumulation on lakebed. Lakebed area is the sensitive geological structure in Viet Nam. According to prediction that, there may appear 8-level earthquake. Accumulating water to the lake with the volume of over 10 billion m^3 may cause stimulating earthquake during first 10 years after operation.

1.2.2.2. In the Southern region (4 plants)

5. EA Krong Hnang Hydropower Plant
6. An Khe Hydropower Plant
7. Dong Nai No 3 Hydropower plant
8. Dong Nai No 4 Hydropower Plant;

(5) Ea Krong Hnang hydro power plant

- **Location:** Ea Kar and Cu Prao communes, Ma Drak district, Daklak province (Krong Hnang river that belong to Ba river system) $12^0$45' -$13^0$18' North; $108^0$18' -$108^0$50' East
- **Project type**: Building Hydroelectric plant (4-year construction, operation: 2008)
- **Investment**: VEC (1,238,684 x 10^6VND)
- **Report:** Feasibility study: Power electric consultant company-No4 (PECC -4).
- **Technical specifications:**
  Capacity: 64 MW
  Annual electric capacity: 254.4 x10^6kWh
  Area of dam (correspondence to normal water level rose): 13.67km^2
  Capacity of dam: 171.6x$10^6$$m^3$
  Normal water level rose: 255m
  Death water level rose: 242.5m

Max Q = 72.7m^3/s

- **Socio-economic and environmental impact**

Construction of Ea Krong Hnang dam will cause the flood of 13.67km^2 including cultivation lands, forest land and residence area, of which there are many primeval forest. Therefore it causes adverse impact on local biodiversity. 133 households have to be moved that cause adverse impact for their livings.

Ea Krong Hnang hydroelectric plant locates in the geological area with some faults (IV, V degrees) characterized by initial belt that is disable in vibration generating. However, it will more create land subsidence and landscape change.

The project will affect biodiversity in the area nearby Ea So natural reserve area (direct impact on No3 region – buffer zone of reserve area).

No cultural heritage, historical or mineral mining's locate in the project area so minor adverse impacts on these aspects.

- **Other information:** Feasibility study report (10/2003).

(6) An Khe -Kanak hydro power plant

- **Location:** An Khe and Kbang districts, Gia Lai province
- **Project type**: Building Hydroelectric plant (construction: 2004; operation: 2008)
- **Investment**: Hydroelectric project management unit No 3; VEC (3 161 billion)
- **Report:** EIA report: Power electric consultant company-No1 (PECC -1).
- **Technical specifications:**

Capacity: 173 MW
Annual electric capacity: 684.5 x 10^6 kWh

An Khe:

Area of basin: 1246km2
Capacity: 160 MW
Flow Volume (total): 884 x 10^6m3
Required Flow: 11.4m3/s
Flow (crest of a flood) with p=0.5%: 4730m3/s
Annual electric capacity: 604.7 x 10^6kWh
Normal water level rose: 427.5m
Death water level rose: 427m
Area of dam (correspondence to normal water level rose): 2.8km^2
Q (annual average) = 28m^3/s

Ka Nak:

Area of basin: 833km2
Capacity: 13 MW
Flow Volume (total): 588 x 10^6m3
Required Flow: 11m3/s
Flow (crest of a flood) with p=0.5%: 3590m3/s
Annual electric capacity: 55.5 x 10^6kWh
Normal water level rose: 515m
Death water level rose: 485m
Area of dam (correspondence to normal water level rose): 17km^2
Q (annual average) = 18.7m^3/s

- **Socio-economic and environmental impact**

An Khe -Kanak hydroelectric plant is the first plant in terraced flow of Ba river; 7 km from An Khe town in upstream side. The plant is nearby Ca stream, Con River's branch in Tay Son district, Binh Dinh province. The output water of above terraced (Ka Nak dam) will be the input water of An Khe dam (below terraced).

No natural protected area in surrounding so no impact on this. KonKaKink and KonChaKang protected areas area far from project area and have no impact. The flooded area mainly is poor forest so cause less impact on ecotourism.

Ethnic people e.g. Banar, Jarai, of which banar is majority just after Kinh people will be significantly impacted when constructing of plant. Total 479households (2214 persons) have to move. As planned, resettlement will be in the commune (LoKu, Dong commune and K'roong).

The project cause major impact on agriculture: 1698.7ha cultivation land and 67.9ha forestry land are flooded. Deforestation causes significant impact on terrestrial fauna and flora (lost place for habitation). Cause insignificant impact on aquatic species due to dam construction will change their living conditions. However some good impacts also found. Some adverse impact on air and water environment found during construction phase (local and short time), when operation the impact can be ignored.

- **Other information:** EIA report.

(7). Dong Nai No3 hydroelectric plant

- **Location:** Dac Nong district, Dac Nong province; Bao Lam, Di Linh, Lam Ha, Lam Dong provinces (Dong Nai river)
- **Project type**: Building Hydroelectric plant – (2004-2008)
- **Investment**: VEC (3,597,831x 10^6VND
- **Report:** EIA study: VEC
- **Technical specifications:**
  Capacity: 180 MW
  Annual electric capacity: 589 x10^6kWh
  Area of dam (correspondence to normal water level rose): 56km^2
  Capacity of dam: 1423.6x$10^6$$m^3$
  Normal water level rose: 590m
  Death water level rose: 570m
  Max Q = 215m^3/s
- **Socio-economic and environmental impacts**

Construction of 5200 ha dam will cause the lost of agriculture land, forestry land and residence area. About 528 households (3026 persons) have to be emigrated. Particularly, 1162 graves have to be moved.

The flood of second forest will partly affect to biodiversity, especially aquatic ecology will be significantly changed.

Dam construction causes the variation of flow and hydro mechanism of Dong Nai river. About 4km far from the dam, water is lost. It may cause the impact on Cat Tien biosphere reserve area, particularly the water regime (water gourds), e.g. Sau gourd will be reduced from 5360ha to 3370ha when flood.

The decomposition of organic matters in the bowel may cause water pollution (in the beginning).

During construction phase, air, water and soil may be polluted due to the wastes generation.

- **Other information:** Brief EIA report (12/2004).

(8) Dong Nai No4 hydroelectric plant

- **Location:** Dac Nong and Lam Dong provinces (Dong Nai river)
- **Project type**: Building Hydroelectric plant – (start 2004)
- **Investment**: VEC (4,912,000x 10^6VND)
- **Report:** Technical design 1: Power electric consultant company-No2 (PECC -2).
- **Technical specifications:**
  Capacity: 340 MW
  Annual electric capacity: 1,103.8x10^6kWh
  Area of dam (correspondence to normal water level rose): 5600 ha
  Normal water level rose: 185m
  Death water level rose: 175m
  Max Q = 221m^3/s
- **Socio-economic and environmental impacts**

Construction of 5600ha dam will cause the lost of agriculture land, forestry land and residence area. About 43 households (229 persons) have to be emigrated of which 23 households (141persons) are minorities.

It causes the flood of 1603ha forestry land; 136ha agricultural land therefore the project will affect to local biodiversity, especially aquatic ecology will be significantly changed.

The decomposition of organic matters in the bowel may cause water pollution (in the beginning).

During construction phase, air, water and soil may be polluted due to the wastes generation.

- **Other information:** Technical design 1 report (11/2004).

1.2.3. Planned construction plants

1.2.3.1. In the Northern region (11 plants)

9. New PSPP No 1- JN3
10. PSPP No 2-JN5
11. Huoi Quang Hydropower Plant (on Nam Mu river)
12. Chu Linh Coc San Hydropower Plant
13. Nho Que No. 1
14. Nho Que No. 2
15. Nho Que No. 3
16. Bac Me plant
17. Bao Lac plant
18. Tuyen Quang Plant
19. Bac Quang Hydropower Plant
20 Bac Muc Hydropower Plant

(9) New PSPP No 1-JN3

- **Location :** This site is located 20km east from Phu Yen, capital of district, and has a existing road to access to the dam sites. Upper dam/reservoir Son La Province/Phu Yen District/Muong Lang (Dong An) Commune; Lower dam/reservoir Son La Province/ Phu Yen District/Muong Lang Commune (Song Mua River)

- **Project type**: This is a promising potential site for Pump Storage Power Plant (PSPP) No 1. It has not been built yet. No EIA was conducted, only site investigation and feasibility study were undertaken.

- **Investment**: Estimated Economic value: 760 million

- **Technical specification**

  Installed Capacity P(MW): 1,000
  Design Discharge Qd(m^3/s): 230
  Effective Head He(m): 560
  Peak Duration Time T(hrs): 7

  Upper dam: Facing type poundage is suitable for this upper reservoir, which H.W.L. is 880 m based on the topographical condition. There is a mountain composed of limestone in the west side of the plain, which has a very steep slant, it is necessary to build a bank keeping some distance from the skirts of the mountain to avoid the influences of collapse of the mountain.

  The lower dam: The elevation of the riverbed at the dam site is 210 m, which is the identical value of the topographical map. Since the river flow in the lower dam site is as little as 0.3-0.4 m3/s and the catchments area is small, sediment volume is assumed to be little.

- **Socio-economic and environmental impacts**

The terrestrial ecosystem at upper and lower dams / reservoirs has already been degraded due to human activities. Some secondary forests are left; they should be protected and recovered. Although the aquatic ecosystem of both areas is not fully understood, the impacts are not significant because of small size of the aquatic ecosystem**.**

In Upper dam / reservoir**:** An approach road from the closest national road is planned. The road is long and goes through several villages, which may lead resettlement.

Rice field and grazing land will be lost. An approach road from the closest national road is planned, which may lead lost of agricultural lands.

In Lower dam / reservoir: The rice field of Thang Lang village will be lost. An approach road from the closest national road is planned, which may lead lost of agricultural lands. The entire households of Thung Lang village (c. 37 households) may have to move out from the site. An approach road from the closest national road is planned. The road is long and goes through several villages, which may lead resettlement.

- **Other information:** Feasibility study report.

(10) PSPP No 2-JN5

- **Location:** Upper dam/reservoir : Son La Province/Phu Yen District/Kim Bon Commune (Suoi On River). Lower dam/reservoir: Son La Province/Left Bank Phu Yen District/ Sap Xa Commune Right Bank Bac Yen District/ Hong Ngai Commune (Suoi Sap River)

- **Project type:** This is a promising potential site for Pump Storage Power Plant (PSPP) No 2. It has not been built yet. No EIA was conducted, only site investigation and feasibility study were undertaken

- **Technical specification**

  Installed Capacity P(MW) : 1 000
  Design Discharge Qd(m^3/s) : 240
  Effective Head He(m) : 525
  Peak Duration Time T(hrs) : 7

The river flow at the upper dam site is less than 0.1 m^3/s and the catchment's area of the site is as small as about 3.5 km^2.

- **Socio-economic and environmental impacts**

Terrestrial ecosystem at upper and lower dams / reservoirs has already been degraded due to human activities (logging, clearing for agricultural activities), only some secondary forests are left.

Aquatic ecosystem of both areas has not been fully investigated. Especially the aquatic ecosystem of Sap river needs to be studied and necessary mitigation measures should be undertaken.

In upper dam / reservoir: A couple of families of Suoi Let village need to be resettled. Rice field and grazing land will be lost. In lower dam /reservoir Although precise number of the resettling families is not identified yet, resettlement is expected to occur.

An approach road is planned from the closest national road to go through 8 villages, and resettlement may occur. People of Phieng Luong had been moved to this place by Hoa Bin dam project. They may be badly impacted by the project because the village is very close to the dam site. Careful assessment of the impacts and consultation with the people need to be undertaken. Rice field along Sap river will be lost. An approach road is planned from the closest national road to go through 8 villages, which may lead loss of agricultural lands. Secondary impacts by lost of the rice fields need to be carefully assessed. After the project, people are supposed to buy rice, which may lead more cultivation on steep slopes for cash crops. It may lead severe erosion of these slopes.

- **Other information:** Feasibility study report.

(11) Huoi Quang hydropower Plant on Nam Mu river

- **Location**: Muong La district (Son La) and Than Uyen district (Lai Chau).
- **Project type:** Project status: at feasibility study stage
- **Investment:** Electricity of Vietnam.
- **Report:** Report of Environmental Impact Assessment – establishing counselor office: Institute of Geography, Vietnam Science and Technology Institute.
- **Technical specification :**
  Design capacity: 520 MW
  Annual electric energy: 1829.3×10^6 KWh
  Lake area (normal water level): 8.7 km^2.
  Lake capacity: $V_{average}=184.2 \times 10^6$ m
  Normal water level: 370 m
  Dead water level: 368 m
  Maximum flux: 389.1 m^3/s.
  Total investment: $7{,}946.43 \times 10^6$ VND

- **Socio-economic and environmental impacts**

The construction will have strong affect to environmental ecosystems around the region within 5 years, and will be steady in the time later. Water in the lake may be affected if the reservoir bottom has not been completely cleaned.

The formation of big lake with an area of 8.7 km2 will lead to the loss of forests, cultivated land and households need to be removed, disturbing their lives, strengthen the risk of landslip, seism and stimulating earthquake in the area

Resettlement and transport activities after finishing the project increase effect to forest resources, lead to the risk of landslide and degradation of land in the regions around unless we have suitable management.

- **Other information:** Feasibility study report.

(12) Chu Linh –Coc san hydro power plant

- **Location: Lao Cai** province
- **Project profile:** Type: Building Hydroelectric plant.
- **Investment**: 1,467,372.88 10^6VND. Report: Feasibility study: Institution of Irrigation Science
- **Technical specifications:**

Installed Capacity: 70 MW
Annual electric capacity: 316,389,040kWh
Area of dam (correspondence to normal water level rose): 121ha

Chu Linh:

Capacity: 30 MW
Annual electric capacity: 120,355,677kWh
Normal water level rose: 1275m
Death water level rose: 1245m
Q = 7,2m^3/s
Investment: 755,136 x 10^6VND

Coc San:

Capacity: 40 MW
Annual electric capacity: 196,033,363kWh
Normal water level rose: 699m
Death water level rose: 693m
Q = 9,6m^3/s
Investment: 508,393,808 x 10^6VND

- **Socio-economic and environmental impacts**

Construction of Sa Pa dam will cause the flood of 26ha paddy field, 11.5ha cereal cultivation land, 4.5ha forestry and 53ha poor forestry (mainly brushwood). Infrastructure of Sa Pa will be flooded out including 67 households and 255 graves have to be moved. It also causes the flood of section of No4 highway and 35kV electric line.

Chu Linh-Coc San hydroelectric plant locates in Sa Pa tourist area will create more beautiful landscape for this area; improve the environment and socio-economic development in Sa Pa district. Because the project is small size and no cultural heritage or reserve areas locate in the project area so minor adverse impacts on environment found.

- **Other information:** Feasibility study repot

(13) Nho Que No1 hydro power plant

- **Location:** In the boarder of Pai Lung and Sin Cai communes, Meo Vac dist. Ha Giang province
- **Project type**: Hydroelectric plant
- **Investment**: VEC (859,395x10^6 VND)
- **Report:** Revised and Additional Planning report: Power electric consultant company-No1 (PECC -1).

– **Technical specifications:**

Capacity: 41 MW
Annual electric capacity: 172.2 x 10^6 kWh
Area of basin: 4223km2
L_{River}: 136.9km
Flow Volume (total): 1.7x $10^6 m^3$
Normal water level rose: 480m
Death water level rose: 475m
Q (max) = 129.3m^3/s

– **Socio-economic and environmental impacts**

Nho Que No1 hydroelectric plant is one of four cascades belongs to general planning for hydroelectric plants in Gam river. Nho Que River is branch of Gam River. Nho Que No1 hydroelectric plant including the dam locates in the lime stone area (geological structure is Cacbon-Pecmi, Bac Son formation). Due to strong development of limestone, likeable for water lost therefore it causes disadvantage for dam construction. It is appropriate to build the pipeline plant type, mainly exploitation of topographical water column.

Topography is strong partitioned, great slope: the highest and lowest places are of 2400m and 88m respectively. In Ha Giang province reserve of surface water is large (265km river and 554km stream). The annual average rainfall is 1400-1600mm.

Economic relies mainly on agriculture, forestry: within Ha Giang province there is 579,435ha forestry land and 156,350ha agricultural land (natural land in total: 783,520ha).

The flood is insignificant because using mainly water column. The majority concerned for socio-economic is emigration of about 100 households (approx. 470-500 persons). Ratio of ethnics is high in the area with > 20 minorities in Ha Giang province (H'Mong, Dao, Tay, Nung, Cao Lan, Meo, Hoa…).

– **Other information:** Planning hydroelectric cascade in Gam river (revised and additional report) (PCCC No1): Map and detail analysis data (topography, cost…)

(14) Nho Que No.2 hydro power plant

– **Location:** Giang Su Phin commune, Meo Vac dist. Ha Giang province

– **Project type**: Building Hydroelectric plant

– **Investment**: VEC (1,210,666x10^6 VND)

– **Report:** Planning report: Power electric consultant company-No1 (PECC -1).

– **Technical specifications:**

Capacity: 68 MW
Annual electric capacity: 285.9 x 10^6 kWh
Area of basin: 4315km2
L_{River}: 147.7km
Flow Volume (total): 9.6x $10^6 m^3$
Normal water level rose: 430m
Death water level rose: 425m
Q (max) = 131.9m^3/s

– **Socio-economic and environmental impact**

Nho Que No2 hydroelectric plant is one of four cascades belongs to general planning for hydroelectric plants in Gam river. Nho Que river is branch of Gam river. Nho Que No2

hydroelectric plant including the dam locates in the lime stone area (geological structure is Cacbon-Pecmi, Bac Son formation). Due to strong development of limestone, likeable for water lost (hydrophilic) therefore it cause disadvantage for dam construction. It is appropriate to build the plant type pipeline, mainly exploitation of topographical water column.

Topography is strong partitioned, great slope: the highest and lowest places are of 2400m and 88m respectively; average: 250-1200m. In Ha Giang province reserve of surface water is large (265km river and 554km stream). Soil and stone mainly are Paleozoic middle age. The annual average rainfall is 1400-1600mm.

Economic relies mainly on agriculture, forestry: within Ha Giang province there is 579,435ha forestry land and 156,350ha agricultural land (natural land in total: 783,520ha).

The majority concerned for socio-economic is resettlement of about 100 households (approx. 470-500 persons). The flood is insignificant because using mainly water column. Ratio of minorities is high in the area with more than 20 in Ha Giang province (H'Mong, Dao, Tay, Nung, Cao Lan, Meo, Hoa…).

- **Other information**

Planning hydroelectric cascade in Gam river (revised and additional report) (PCCC No1): Map and detail analysis data (topography, cost…)

(15) Nho Que No3 hydro power plant

- **Location:** Niem Son communes, Meo Vac dist. Ha Giang province
- **Project type**: Hydroelectric plant
- **Investment**: VEC (1,628,011x10^6 VND)
- **Report:** Planning report: Power electric consultant company-No1 (PECC -1).
- **Technical specifications:**

  Capacity: 144MW
  Annual electric capacity: 603.6x 10^6 kWh
  Area of basin: 4370km2
  L_{River}: 153.7km
  Flow Volume (total): 4.2x $10^6 m^3$
  Normal water level rose: 365m
  Death water level rose: 360m
  Q (max) = 130.1m^3/s

- **Socio-economic and environmental impact**

Nho Que No3 hydroelectric plant is one of four cascades belongs to general planning for hydroelectric plants in Gam river. Nho Que River is branch of Gam River. Nho Que No3 hydroelectric plant including the dam locates in the lime stone area (geological structure is Cacbon-Pecmi, Bac Son formation). Due to strong development of lime stone, likeable for water lost therefore it cause disadvantage for dam construction. It is appropriate to build the plant type pipeline, mainly exploitation of topographical water column.

Topography is strong partitioned, great slope: the highest and lowest places are of 2400m and 88m respectively. In Ha Giang province reserve of surface water is large (265km river and 554km stream). The annual average rainfall is 1400-1600mm.

Economic relies mainly on agriculture, forestry: within Ha Giang province there is 579,435ha forestry land and 156,350ha agricultural land (natural land in total: 783,520ha).

The majority concerned for socio-economic is emigration of about 100 households (approx. 470-500 persons). The flood is insignificant because using mainly water column. Ratio of minorities is high in the area with more than 20 in Ha Giang province (H'Mong, Dao, Tay, Nung, Cao Lan, Meo, Hoa…).

- **Other information:** Planning hydroelectric cascade in Gam river (revised and additional report) (PCCC No1): Map and detail analysis data (topography, cost…)

(16) Bac Me hydro power plant

- **Location:** Bac Me town (upstream), Vi Xuyen district. Ha Giang province; Bao Lac dist. Cao Bang province
- **Project type**: Building Hydroelectric plant (as planned: end of 2004)
- **Investment**: VEC (2,174,243x10^6 VND)
- **Report:** Planning report: Power electric consultant company-No1 (PECC -1).
- **Technical specifications:**

  Capacity: 70MW (2 machine groups)
  Capacity (ensure): 97MW
  Annual electric capacity: 1432.1x 10^6 kWh
  Area of basin: 10,980km^2
  L_{River}: 150km
  Flow Volume (total): 1910x 10^6m^3
  Normal water level rose: 145 - 240m
  Death water level rose: 190-200m (normal water level rose: 220-230m)
  Q (max) = 493.7m^3/s
  Volume (dam): 3050x10^6m^3 (normal water level rose: 235m)

- **Socio-economic and environmental impact**

Bac Me hydroelectric plant is one of four cascades belonged to general planning for hydroelectric plants in Gam river.

Gam River origins from Van Nam mountain- China with the height of > 1600m. From Vietnam-China boarder Gam River runs following North-South direction. From Ma river junction it runs following Northern East-Southern West then North-South before joining to Lo river in Khe Lau where 9km from Tuyen Quang town in upstream.

Bac Me dam planned 6 options with normal water level rose from 145-240m. Pre-feasibility study concluded that Bac Me plant construction will cause significant flood therefore it has low economic benefit. In case of normal water level rose of >200m, Bao Lac and Bac Mieu town will be completely flooded. When normal water level rose is 230m, it causes the flood for: 3067households (16,772 persons); 322ha paddy cultivation land; 700ha agricultural land; and 932ha forestry land.

Main impact on forestry due to land lost therefore will be impact on forest ecological flora and fauna.

Economic relies mainly on agriculture (89% population of Cao Bang); industry, forestry and service. Cao Bang has great tourist potential but still limited due to infrastructure disadvantages.

Ratio of ethnic people is high in the area with 26 minorities in Cao Bang province (Tay: 45%, Nung: 31.5%, Dao: 10.9%, H'Mong: 6.7%, Kinh: 4.2%, San Chi:1.1%, Ho Lo: 0.1%…); and >20 minorities in Ha Giang province (H'Mong, Dao, Tay, Nung, Cao Lan, Meo, Hoa…).

– **Other information**

Planning hydroelectric cascade in Gam river (revised and additional report) (PCCC No1): Map and detail analysis data (topography, cost…)

(17) Bao Lac hydro power plant

- **Location:** Ly Bon communes, Bao Lac dist. Cao Bang province
- **Project type**: Building Hydroelectric plant
- **Investment**: VEC (4,539,050x10^6 VND)
- **Report:** Planning report: Power electric consultant company-No1 (PECC -1).
- **Technical specifications:**

  Capacity: 170MW (2 machine groups)
  Annual electric capacity: 713.70x 10^6 kWh
  Area of basin: 10,356km2
  L_{River}: 123km
  Flow Volume (total): 910.4x $10^6 m^3$
  Normal water level rose: 230m
  Death water level rose: 200m
  Q (max) = 277.2m^3/s

– **Socio-economic and environmental impact**

Bao Lac dam line is 40km from Bac Me in the upstream and 2 km from Nho Que river junction in downstream. The 3km length dam locates in curve river section in low terrain. It is appropriate to build water input entrance and operating overflow.

Bao Lac hydroelectric plant is one of four cascades belonged to general planning for hydroelectric plants in Gam River. A big dam will be built that mainly impact on community livings due to flood. Population of Bao Lac district is 90,055. According to calculation if water level is from 195 m to 240m, 518-1775 households; 2786 -8502 persons would be affected. The plan for resettlement, about 700-1700 persons will be locally resettled in Bao Lam and Bao Lac districts; the rest will be moved in concentration zone in 2 these districts.

Economic relies mainly on agriculture (89% population); industry, forestry and service. Cao Bang has great tourist potential but still limited due to infrastructure disadvantages.

The flood is insignificant because using mainly water column. Ratio of ethnic people is high in the area with 26 minorities in Cao Bang province (Tay: 45%, Nung: 31.5%, Dao: 10.9%, H'Mong: 6.7%, Kinh: 4.2%, San Chi:1.1%, Ho Lo: 0.1%…).

– **Other information**

Planning hydroelectric cascade in Gam river (revised and additional report) (PCCC No1): Map and detail analysis data (topography, cost…)

(18) Tuyen Quang hydroelectric plant (Lo river)

- **Location:** Tuyen Quang town, Chiem Hoa district and part of Yen Son, Tuyen Quang province
- **Project type**: Building Hydroelectric plant (construction completes: 2007)
- **Investment**: VEC
- **Report:** Planning report: Power electric consultant company-No1 (PECC -1).

– **Technical specifications:**

Capacity: 196MW (3 machine groups)
Annual electric capacity: 188x 10^6 kWh
Area of basin: 14,972km^2
L_{River}: 216.5km
Flow Volume (total): 2260x $10^6 m^3$
Flow rate: 216.77-265.79m^3/s
Normal water level rose: 40m
Area of dam: 89.1km^2
Q (max) = 750m^3/s
Volume (dam): 1356x$10^6 m^3$ (normal water level rose: 50m)
2193x$10^6 m^3$ (normal water level rose: 55m)

– **Socio-economic and environmental impact**

Gam River starts in Van Nam mountain, China with the height of > 1600m. From Vietnam-China boarder Gam River runs following North-South direction. From Ma river junction it runs following Northern East-Southern West then North-South before joining to Lo river in Khe Lau where 9km from Tuyen Quang town in upstream.

Tuyen Quang is mountainous province in the North with many high mountains (>2000m). Local topography is complex and strong partitioned by high mountain, river and stream, particularly in the north of province. The terrain becomes lower in the south and less partitioned. There are many low mountains and valley along rivers. The annual average rainfall is 1500-1800mm.

Tuyen Quang hydroelectric plant is one of four cascades belong to general planning for hydroelectric plants in Gam River. It is constructing in Gam River with the normal water level up to 120m. The dam has flood preventive volume of 1000million m^3.

When normal water level rose is 40m, it causes the flood for: 15600households (100,590 persons); 3301ha paddy cultivation land; 4448ha agricultural land; 4093ha forestry land and 241ha industrial tree land. There is plan for resettlement of 4589 households (22145persons).

Economic relies mainly on agriculture; industry, forestry, and breeding. Chiem Hoa district has 145,575ha agricultural land; 90,907ha forestry land. Main impact on forestry due to land lost therefore will be impact on forest ecological flora and fauna.

– **Other information**

Planning hydroelectric cascade in Gam river (revised and additional report) (PCCC No1): Map and detail analysis data (topography, cost…)

(19) Bac Quang hydro power plant

– **Location**: On Lo river, Ha Giang province.

– **Project type**: The project was proposed in the ladder plan of Lo-Gam hydropower plant

– **Investment**: Electric Construction Company No.1 in May of 2001; No design is ratified yet.

– **Technical specifications:**

Maximum capacity: 115 MW
The basin's area: 9330 km2.
.Normal water level: 100 m.
Dead water level: 87 m.
Water output: Q_o=240 m^3/s; Q_{design}=6600 m^3/s;
Lake surface: 89 km^2.
Water capacity: 1,019 × $10^6 m^3$; Useful capacity: 684 × $10^6 m^3$.

Expected investment: 331×10^6 $
Coefficient B/C=0.630.

– **Socio-economic and environmental impacts**

The project affects 53,500 people directly, 50,000 others indirectly, mainly ethnic minority.

The project has strong impact on agriculture in the area. Construction process has strong impact on air, water quality. At low level, the project affects terrestrial fauna and flora and bio-aquatic. The project is not prioritized for investment because economic result is low and it has strong effects on the environment and social conditions in the area.

– **Other information:** Company of electric construction consultant 1.

Commentary of Adjusted and added report of Ladder project of hydroelectric plant on Gam River.

(20) Bac Muc hydro power plant

- **Location:** : On Lo river, Ha Giang province
- **Project type:** The project was proposed in the ladder plan of Lo-Gam hydropower plant
- **Investment: E**lectric Construction Company No.1 in May of 2001; No design is ratified yet.
- **Technical specifications:**
  Maximum capacity: 215 MW.
  The catchments area: 11,770 km^2.
  Normal water level: 75 m.
  Dead water level: 61 m.
  Water output: Q_o=371 m3/s; Q_{design}=8620 m^3/s;
  Capacity: total $2820.10^6 m^3$; Useful capacity: $2006.10^6 m^3$.
  Normal water area: 203 km^2.
  Annual electric production: E_o=883 $.10^6$ KWh.
  Expected investment: $532.3.10^6$ $
  Coefficient B/C=0.670.
- **Socio-economic and environmental impacts**

The project has impact on lives of local people: 112,000 people are affected directly and 120,000 people are affected indirectly. The project has strong impact on agriculture and forestry in the area. Construction process has strong impact on air, water quality in the area where damp and lakebed are constructed. At lower level, terrestrial fauna, flora and fish in Lo River are affected. The project isn't prioritized for investment because economic result is low and it has strong effects on social conditions in the area.

– **Other information:** Company of electric construction consultant 1.Commentary of Adjusted and added report of Ladder project of hydroelectric plant on Gam River.

1.2.3.2. In the Central region (10 plants)

21. Con River Hydropower Plant No 2,
22 Dac Mi Hydropower Plant No 1
23 Dac Mi Hydropower Plant No 4
24. Extended Thac Mo Hydropower Plant
25 Bung River Hydropower Plant No 2
26. Bung River Hydropower Plant No 4
27. PPSP No 3-JS6 project
28. Asap Hydropower Plant,
29 Tranh River Hydropower Plant No 2,
30. Hua Na Hydropower Plant.

(21) Con river hydro power Plant

- **Location:** Con River, a branch of Vu Gia river, Dong Giang dist., Quang Nam province.
- **Project type:** Project classification: Cascade Hydropower Plant Project status: in the technical design stage and construction preparation phase
- **Investment**: EVN - Implementation Organization: Central construction Company.
- **Technical specifications:**

Installed Capacity P(MW)	
First step	54
Second step	3
Maximum Volum Qmax (m^3/s)	
First step	4.33
Second step	13.26
Water shape area (m^2)	
First step	81
Second step	250
Water level	
Max Head (m) H_{max}; Min Head H_{min}	
First step	44.9- 26.4
Second step	260.4-242.7
Factory size(B x h) (m x m)	
First step	15 x 27.4
Second step	18.5 x 42
Reservoir area	1976 ha

- **Socio-economic and environmental impacts**

This plant will be built on Con River, which is a branch of Vu Gia River. The topography is complicated with high slope and maximum seismic les than 60C with frequency less than 500 years. Biodiversity is not very abundant. RESETTLEMENT. There are 10 resettling households (52 persons). LOSS OF ASSETS: 2 classrooms, a 0.5 ha yard is underwater. Water supply system, irrigation system, electrical lines, roads are under water. 88.9 ha of agriculture land, cropland and other areas may be lost.

- **Other information:** Feasibility study report.

(22) Dac Mi hydroelectric plant No.1

- **Location**: The plant will be constructed on Vu Gia-Thu Bon river basin. No design and adjustment are ratified yet. Phuoc Kim commune, Phuoc Son district, Quang Nam province.

- **Technical specifications:**
  Designed capacity: 225 MW
  The catchment's area: 403 km^2.
  Normal water level: 820 m.
  Dead water level: 770 m.
  Water output: Q_{mean}=26.6 m^3/s; Qmax=52.7 m^3/s; $Q_{special}$=16.3 m^3/s.
  Reservoir area: 7.9 km^2.
  Useful capacity: $223.3x10^6 m^3$.
  Annual electric production: 850.10^6 KWh.
  B/C=1.29

- **Socio-economic and environmental impacts**

It is a high mountainous region with highly segmental terrain and center of heavy rain in the central of Vietnam. In the area, gravelly soil is old, firm at pre-Cambric age. The area has high biodiversity in Vietnam.

The project has strong impact on lives of local people, mainly ethnic minority.

The project has strong impact on agriculture, biodiversity of terrestrial fauna and flora.

Process of construction damp and lake has strong impact on air, water quality and causes noises. The project site is near a natural reserve of Vietnam.

- **Other information:** Electricity of Vietnam.

Song Bung (Bung river) hydroelectric plant 4. Pre-feasibility study 1. Main report.

(23) Dakmi Hydropower Plant No. 4

- **Location:** In Phuoc Chanh, Phuoc Kim, Phuoc Hiep communes and Kham Duc, Phuoc Son District, Quang Nam province
- **Project type:** Project classification: Cascade Hydropower Plant. Project status: in the technical design stage and construction preparation phase
- **Investment:** Administration of hydropower plant Srok Phu Mieng.
- **Report:** Report prepared by Consultant Organization: Consultant Company for electricity construction No. 2. EIA report was conducted from June, 2005
- **Technical specifications:**
  Installed Capacity P(MW) 180
  Highest water level: 258 m
  Powerhouse size: (L*W): 54,6* 16,0m
- **Socio-economic and environmental impacts**

In the construction period will cause soil erosion, landslide and sediment in riverbed. Some kind of animal and plan will be affected by loss or lack of habitat and food because of higher water level. There are 4 ethnic minorities in Phuoc Son district: MoNong, Gie Trieng, Nung and Tay. Number of resettling households is 47. The normal life of these people will be affected in resettling time. Number of affected household is 296 and lost of 86 ha of rice field

- **Other information:** Feasibility study report (EIA report was conducted from June, 2005).

(24) Extend Thac Mo hydro power plant

- **Location:** Thac Mo town, Phuoc Long and Bu Dang districts, Binh Dinh province (Be river)
- **Project type**: Hydroelectric plant (4 year for design and construction)
- **Investment**: VEC; JETRO (50.5 Mil USD)
- **Report:** Final report: Tokyo electric power services Co.Ltd.; Kyushu electric power services Co, Inc.
- **Technical specifications (2 options):**

	Existing Thac Mo	Option 1	Option 2
Area of barin	2200km2		
Capacity	150MW	75MW	75MW
Flow Volume (total):		93m3/s	140m3/s
Required Flow	66m3/s	81.4m3/s	
Max flow	186m3/s	93m3/s	
Flow (crest of a flood) with	220.8m3/s		
Annual electric capacity		52GWh	43GWh
Normal water level rose	218m	218m	218m
Water level in downstream	198m	113m	147m
Total of water column	105m	106m	71m
Dam volume	1360 x 10^6m3		
Lowest water column	83.4m	82.7m	
Average flow (annual)	87.4m3/s	103.6m3/s	
Total investment		50.5 x 10^6USD	54.3 x 10^6USD

- **Socio-economic and environmental impact**

Extended Thac Mo plant locates next to existing Thac Mo power plant in Be River. As planned, two options are proposed in which Duc Hanh dam will be built in upstream or downstream site of existing Thac Mo. However, the option of upstream is rejected due to high cost and less electric capacity. Extended Thac Mo plant will be located near Be river valley's slope base. The infrastructure is good, majority concrete and asphalted road. The plant is 170km far from Ho Chi Minh City by road.

No natural protected area in project area or close surrounding. Resettlement is unnoticeable because only 5 households have to move. Major occupation in Phuoc Long district is agriculture (8604ha cultivation land) therefore remarkable impacts on agriculture are considered. Fishery relatively developed (Thac Mo dam and Be river). Deforestation (578ha in 2000) cause significant impact on terrestrial fauna and flora (lost place for habitation).

Adverse impacts on air and water environment can be occurred during construction phase (increase turbidity of dam water), during operation phase, the impacts can be neglected, e.g. digging of underground trench will reduce the level of underground water and deep well. Impact only when it is constructed (local and short time)

- **Other information:** EIA report.

(25) Bung River hydro power plant No. 2

- **Location:** My commune, Giang district, Quang Nam province. It is a highly, segmental mountainous region and center of heavy rain in the central of Vietnam. In the area, the gravelly soil is metamorphism pre- Cambric. Biodiversity in the area is high.
- **Project type:** The project was formed in the project of the Vu Gia-Thu Bon river basin. No design and adjustment are ratified yet.
- **Technical specifications:**
  Designed capacity: 100 MW
  The catchment's area: 337 km^2.
  Water output: Qmean=20.4 m^3/s; Qmax=39.9 m^3/s.
  Medium water level: 570m.
  Dead water level: 525 m.
  Useful capacity of the reservoir: 209.4million m^3.
  Reservoir's surface: 14.5 million km^2.
  Annual electric production: 379 million KWh.
  B/C: 1.09.
- **Socio-economic and environmental impacts**

The project has strong impact on lives of local people, mainly ethnic minority. The project has strong impact on terrain, landscape and biodiversity of terrestrial fauna and flora. The project has strong impact on agriculture and services in the area. The site of project is near by Thanh river natural reserve.

- **Other information:** Electricity of Vietnam. Project of Song Bung (Bung river) hydroelectric plant. Pre-feasibility study 1. Main report.

(26) Bung River hydropower plant No 4

- **Location:** This hydropower plant will be built on Bung river 4, which is a branch of Vu Gia river, in Ta Bhing commune and ZuoiH commune, Nam Giang District, Quang Nam province, about 95 km southeast far away from Da Nang city as crow flies
- **Project type:** This plan is under preliminary feasibility study. The project owner is EVN. It has not been built yet. EIA has not been conducted.
- **Technical specifications:**
  Installed Capacity P(MW): 165
  Catchments area: 1 477 km^2
  Max Discharge Qmax (m^3/s): 174.09
  Maximum Head H(max): 135.92
  Normal water level: 230 m
  Dead water level: 192.5
  Reservoir area with normal water level (Km^2): 18.43
  Effective volume: 468 10^6 m^3
- **Socio-economic and environmental impacts**

The terrestrial ecosystem will be directly affected because a large area of forest land and agricultural land will be lost. As consequences, plant and animal.

The aquatic ecosystem Bung river 4 was not fully studied. When the dam is constructed and the aquatic ecosystem will be affected severely by the project. A comprehensive study on the aquatic ecosystem need to be undertaken and mitigation measures should be proposed. In upper dam / reservoir: There is no village or house at the site. No asset will be lost. In lower dam /reservoir:

Although precise number of the resettling families is not identified yet, resettlement is expected to occur. Some families of Ta Lot village need to be resettled.

Rice field and cropland upstream of the dam site will be lost. They belong to Ta Lot village. Sedimentation balance to the downstream will be changed, which may cause impacts to the natural and social environments of the downstream.

- **Other information:** Feasibility study report.

(27) PSPP No 3-JS6

- **Location:** Upper dam/reservoir : Ninh Thuan Province/Bac Ai District / Phuoc Hoa Commune. Lower dam/reservoir : Ninh Thuan Province/Bac Ai District / Phuoc Hoa Commune (Cai River)
- **Project type**: This is a promising potential site for Pump Storage Power Plant (PSPP) No 3. It has not been built yet. No EIA was conducted, only site investigation and feasibility study were undertaken.
- **Technical specifications:**

Installed Capacity P(MW):	1,000
Design Discharge Qd(m^3/s):	350
Effective Head He(m):	360
Peak Duration Time T(hrs)	7

- **Socio-economic and environmental impacts**

The terrestrial ecosystem will be directly affected by the project because the area of upper dam / reservoir is well-conserved forests. The aquatic ecosystem of Cai river is not fully studied. At the moment the project is the first one to build a dam for this river, and the aquatic ecosystem will be affected severely by the project. A comprehensive study on the aquatic ecosystem need to be undertaken and mitigation measures should be proposed.
In upper dam / reservoir: There is no village or house at the site. No asset will be lost. In lower dam /reservoir: Although precise number of the resettling families is not identified yet, resettlement is expected to occur. Some families of Ta Lot village need to be resettled.

Rice field and cropland upstream of the dam site will be lost. They belong to Ta Lot village. Sedimentation balance to the downstream will be changed, which may cause impacts to the natural and social environments of the downstream.

- **Other information:** Feasibility study report.

(28) Hydropower Plant Asap

- **Location:** Hong Thai and Hong Ha communes, A Luoi District- Thua Thien Hue Province
- **Project type:**

  Project classification: Cascade Hydropower Plant on the upstream of Xe Kong river. Project status: in the technical design stage and construction preparation phase, will be in operation in 2010.

- **Investment:** Electricity Company No 2 and Electricity Company No 3
- **Report:** Consultant Company for electricity construction No. 3 conducted pre-feasibility study report

– **Technical specifications:**

Installed Capacity P(MW)	165
Average Volume Q (m^3/s)	19,78
Height of highest dam	34,4
Average Water level	550
Dead water level	546
An effective capacity of reservoir (m^3)	278

– **Socio-economic and environmental impacts**

In upper stream area, Construction of road for transportation of materials can cause erosion, landslides. It also makes easy access to forest. As results local people could hunt and log off trees in the forest. Increase pressure on natural resources and environment. In surrounding reservoir area and reservoir: Landscape is excavated, and ecologically poor; Forest area, terrestrial and aquatic flora and fauna will be decreased; Water quality will be worse because the reservoir contains hazardous and toxic minerals, or plant generates toxic substance when being decayed in water. No cultural, historical sites as well as national park or conservative area in the project area. 19 to 242 households should resettle, corresponding to 114 to 1294 people (depending on normal water level). The normal life of people will be affected. About 18.53 to 356.55 ha of agricultural land and forestland will be lost. Medical center, People council office, border post, road, electricity line etc. will be under water.

– **Other information:** Pre-feasibility study report.

(29) Tranh river hydro power Plant No. 2

– **Project location:** in communes: Tra Tanta Doc, Tra Bui, Tra Giac, Tra Don , North Tra Mi district, Quang Nam province.

– **Project type:** Project classification: Cascade Hydropower Plant; Project status: in the technical design stage and construction preparation phase

– **Investment**: EVN

– **Report**: Consultant Organization: Consultant Company for electricity construction No. 1

– **Technical specifications**

Installed Capacity P(MW)	160
Maximum Volume Qmax (m^3/s)	209.7
Max Head (m)	180
Average Volume Q (m^3/s)	106
Height of highest dam (m)	95
Average Water level (m)	175
Dead water level (m)	140
An effective capacity of reservoir (m^3)	$521,1.10^6$
Reservoir capacity (m^3)	$733,4.10^6$

– **Socio-economic and environmental impacts**

The terrestrial ecosystem consists of: Flora: 169 wooden plant species, 86 medical plant species, from that ,there are 15 dear and rare species. Fauna: is rich in species: There are 21 mammal species; 240 bird species, 48 reptile and amphibian species in the proposed project area. The terrestrial ecosystem will be directly or indirectly affected by the project because a large land area will be lost. The aquatic ecosystem of Srepok river consists of phytoplankton species with low density (14.512 cells/l), zooplankton species(36-41 p/m^3), 10 benthos species, 53 fish species(2

of those are rare and dear. The aquatic ecosystem will be affected by the project because baseline environment and hydrological regime will be changed due to project construction and operation. Mitigation measures to protect aquatic ecosystem should be proposed
There are 717 resettling households belonging to 4 communes: Tra Doc,Tra Bui,Tra Giac, Tra Don. (mainly Kadong people). Firstly, the resettlement will be in difficulties.

There will be from 1218 ha to 2875 ha of land area underwater,23.3% -31.3% of which is agriculture land. Residential land may be lost from 23,957 m^2 to 53,087 m^2. Many roads, electrical systems, and other buildings may be underwater.

- **Other information**: Feasibility study report.

(30) Hua Na Hydropower Plant

- **Project location:** DongVan commune, Que Phong District, Nghe An Province on Chu River
- **Project type:** Project classification: Cascade Hydropower Plant; Project status: in the technical design stage and construction preparation phase
- **Investment:** EVN
- **Report**: Consultant Organization: Consultant Company for electricity construction No.1. Consultant Company conducted pre-feasible report for electricity construction No. 1 since October, 2004
- **Technical specifications**
  Highest water level: 245 m
  An effective capacity of reservoir: 470.2 millions m^3
  Powerhouse size: (L*W*H): 58,8* 30,5*40m
  Installed CapacityP(MW) 180
  Maximum Volum Qmax (m^3/s) 98.9
  Area for plant construction: 120 ha

– **Socio-economic and environmental impacts**

In the construction period will cause soil erosion, landslide and sediment in riverbed. Some kind of animal and plan will be affected by loss or lack of habitat and food because of higher water level. There are 8 resettlement areas at 9 commune in the district ensure for 800-1200 resettling households. The normal life of people will be affected in resettling time.

– **Other information:** Pre-feasible report was conducted by Consultant Company for electricity construction No. 1 since October, 2004.

1.2.3.3. In the Southern region (7 plants)

31. Srepok Hydropower Plant No 3,
32. Hinh River HydroPower Plant,
33. Can Don HydroPower Plant(on Be river),
34. Sesan River HydroPower Plant No 4,
35. Da M'bri HydroPower Plant (on Dong Nai river),
36. Dakr'tih HydroPower Plant (on Dong Nai river)
37. Buon Tua Srah HydroPower Plant (on Srepok river).

(31) Srepok Hydropower Plant

- **Location:** in Daknong province/Cu jut district/Eapo commune and in Dak Lak Province/Buon Don district/Eanol commune.
- **Project type:** Project classification: Cascade Hydropower Plant; Project status: in the technical design stage and construction preparation phase
- **Investment**: EVN
- **Report**: Consultant Organization: Consultant Company for electricity construction No. 2. Full EIA was conducted by EVN with collaboration of experts from Geology and Environment Institute- Vietnam Geology Association, from Geographical Institute and from Ecology and Biological resources Institute- National Science and Technology Institute
- **Technical specifications**

Installed Capacity P(MW)	220
Maximum Volume Qmax (m^3/s)	373.6
Calculative Head (m)	59
Average Water level (m)	272
Dead water level (m)	267
An effective capacity of reservoir (m^3)	$75,38.10^6$
Reservoir capacity (m^3)	$222,73.\ 10^6$

- **Socio-economic and environmental impacts**

The terrestrial ecosystem consists of: Six conservation areas: Ch- Sang Chin, Ta Dung , Nam Ka, Nam Nung, Chu Hoa, Ho Lac. National park: Yok don Flora: is rich in species (1700 higher plants species) from that many dear and rare species with high economic value(59 species). Fauna: There are 331 higher species belonged to 4 classes. They consist of 68 mammal species; 184 bird species, 38 reptile species and 21 amphibian species in the proposed project area. The terrestrial ecosystem will be directly or indirectly affected by the project because a large land area will be lost.

The aquatic ecosystem of Srepok River consists of 19 phytoplankton species, zooplankton species, 22 fish species. The aquatic ecosystem will be affected by the project because baseline environment and hydrological regime will be changed due to project construction and operation. Mitigation measures to protect aquatic ecosystem should be proposed.

There are 176 resettling households, 65 from that are ethnic minorities (Hmong, Ede, Gia Rai). The normal life of people will be affected.

Rice field and cropland of the dam site will be lost. Sedimentation balance to the downstream will be changed, which may cause impacts to the natural and social environments of the downstream.

- **Other information**: Feasibility study report.

(32) Hinh Hydropower plant

- **Location**: Song Hinh Nuclear power plant, the Hinh river valley, Song Hinh district, Phu Yen province.
- **Project type**: Project status: at feasibility stage;
- **Investment**: Company of electric survey and design I.
- **Reports**: Environmental Impact Assessment;. Technical design of 1st and 2nd phase.

– **Technical specifications**

Maximum capacity is 70 MW
Main dam and sub-dams is soil compressor
Maximum height of main dam is 42m and sub- dams are 19m.
Overflowed dam has the valve with threshold of 196m,
Maximum overflowed output discharge by design is 6952m^3/s
water surface area of Hinh river is 41km^2
Normal water level is 209m.
Minimum of operating water level is 196m.
Total capacity is 357.10^6 m^3.

– **Socio-economic and environmental impacts**

Terrain: low mountain (500 ~ 1,000m) along with hills (200 ~300m).

Geological foundation is Mesozoic - age mainly eruptive sedimentary rock, and is granite in other areas. Loose, thin sediments distribute unsteady on the surface.

Reserve of surface water is large, especially in rainy season (November and December) about 70 - 90%. Average rainfall is above 2,500m in total of 772 km^2 area.

Economic activities include agriculture, forestry, breeding, (aquaculture), industry, small-scale industry, etc.

– **Other information:** Environmental Impact Assessment report.

(33) Can don hydroelectric plant (Be river)

– **Location:** Phuoc Long, Loc Ninh districts - Binh Phuoc province

– **Project type**: Building Hydroelectric plant (CHPP)

– **Investment**:

– **Report:** Feasibility study: Da river construction cooperation. Power electric design and survey company-No2 (PECC -2). EIA Report

– **Technical specifications:**

Capacity: 72 MW
Total volume: 165.5x$10^6$$m^3$
Area of dam (correspondence to normal water level rose = 110m): 19km^2
Normal water level rose = 110m
Total discharge volume: 4983m^3/s
Turbine passes volume (Q_{max}): 136.4m^3/s

– **Socio-economic and environmental impact**

Terrain is mountainous and gently slops height of 100-180m from sea-level. The geological foundation is mainly sand-friable aged mezzos, friable sediment alluvium, and thin proluvium, unequal distribution in valley and mountainside.

Reserve of surface water is large, 90% from rain season (Apr-Nov) and 10% from dry season (Jan-Mar). The annual average rainfall is 2,100-2,300mm.

Kinh people count 79.4%. There are 16 minorities counts 20.6% 0f which S'Tieng people counts 13.2%; Khmer 3.4%.

Economic relies mainly on agriculture, forestry. Industry and handicraft is limited.

– **Other information:** EIA report.

(34) Se San No4 hydro power plant

- **Location:** Yagrai district (Gia Lai province) and Sa Thay district (Kon Tum province) in Se San river. $13^0$58' -$107^0$30'
- **Project type**: Building Hydroelectric plant – 1st level (5-year construction, start: 2005)
- **Investment**: VEC (4,831,741 x 10^6VND)
- **Report:** Feasibility study: Power electric consultant company-No1 (PECC -1).
- **Technical specifications:**
  Capacity: 330 MW
  Annual electric capacity: 1,390.2 x10^6kWh
  Area of dam (correspondence to normal water level rose): 58.4km^2
  Capacity of dam: 893.3x10^6m^3
  Normal water level rose: 215m
  Death water level rose: 210m
  Max Q = 678.5m^3/s
- **Socio-economic and environmental impacts**

Construction of dam will cause the flood of ~ 58.41km^2, of which majority forestland and part of agriculture land. Construction phase will cause the change of local view and landscape, burn off land for cultivation, deforestation will be likely to occur and increase of land erosion.

Se San 4 hydroelectric plant locates in the geological area that earthquake is assessed at VII level; therefore excited earthquake can be happened.

No cultural heritage, historical or mineral mining's locate in the project area so minor adverse impacts on these aspects.

The project constructed on Se San River, downstream passes to Cambodia therefore it should be taken into account particularly in term of water resource use.

- **Other information:** Brief report of Se San hydroelectric plant (19/7/2003).

(35) Dambri hydro power plant (Dong Nai river)

- **Location:** Bao Lam, Da The, Da Huoai dist; Lam Dong province (Dong Nai river barin)
- **Project Type**: Building Hydroelectric plant –1st level (5year construction, start: 2005)
- **Investment**: VEC.
- **Report:** Project document: Feasibility study: Power electric consultant company-No3 (PECC -3).
- **Technical specifications:**
  Capacity: 70 MW (2x35MW)
  Total volume of reservoir: 103.96x10^6m^3
  Effective volume: 92.67 x10^6m^3
  Total overflow volume: 1,725.12m3/s
  Highest Head: 425.38 m
  Area of dam (correspondence to normal water level rose 620m): 4.25km^2
  Catchment's area: 215km^2
  Normal water level rose 620m
  Dead water level: 585
  Dam height: 623.5 m
  Max Q = 20.87m^3/s

– **Socio-economic and environmental impact**

Terrain is mountainous and gently slops like Bazan highland, height of 400-500m to 700-800m compared to sea-level. The geological foundation oldest is sand layer-friable and Granite stone aged Mezzos, bazan rock aged Kaizozoi is upper layer and covered by weathering bazan red soil as top layer (relative thick) and part of Friable stone (alluvium, and proluvium) aged fourth.

Reserve of surface water and underground water is rich, reaches 180-427.9mm/month during rain season (Apr-Nov) and 40-100mm/month during dry season (Dec-Mar). The annual average rainfall is 2,621mm. Underground water contain large amount of bicarbonate.

Kinh people count approx. 70-80%, 20-30% are minorities of which Chau Ma (50%); K'Ho appxi. 30%. Economic relies on agriculture, forestry, breeding, industry and handicraft, mineral and stone exploitation for construction.

– **Other information:** Feasibility study report (Volume 1).

(36) Dakrtih hydro power plant (Dong Nai river)

– **Location:** Nhan Co commune (Dakr'Lap dist); Quang Thanh commune and Gia Nghia town (DakNong dist.) Dak +Lak province

– **Project type**: Hydroelectric plant

– **Investment**:

– **Report:** Feasibility study report by Eastern Construction Company; Construction cooperation No1 – Ministry of Construction; Power electric consultant company-No2 (PECC -2).

– **Technical specifications:**

Capacity: 82 MW (2 x 41MW) – upper cascade
59 MW (2 x29.5MW) – lower cascade
Total volume of reservoir: $137.09x10^6m^3$(upper cascade);
$1.808x10^6m^3$(lower cascade);
Area of dam (correspondence to normal water level rose 618m): $10.16km^2$(upper cascade)
Area of dam (correspondence to normal water level rose 415m): $10.16km^2$ (lower cascade)
Total overflow volume: $2,360m^3/s$ (upper cascade); $3,330m^3/s$ (lower cascade)
Q_{max}: $50m^3/s$ (upper cascade); $67m^3/s$ (lower cascade)
Dead water level: 603 m (upper cascade); 413 (lower cascade)
Catchment's area: 718 km^2 (upper cascade); 1072 km^2 (lower cascade)

– **Socio-economic and environmental impact**

Terrain is mountainous and gently slops like Bazan highland, height of 600-780m from sea-level. The geological foundation is mainly sand-friable aged mezzos, bazan rock aged Kaizozoi, covered by weathering bazan red soil as upper layer. Friable sediment alluvium, and thin proluvium, unequal distribution in valley and mount inside.

Reserve of surface water and underground water is large, reaches 180-457.8mm/month during rain season (Apr-Nov) and 15-91.8mm/month during dry season (Dec-Mar). The annual average rainfall is 2,490mm. Kinh people count 60%, 40% are minorities including Tay, Hoa, Muong and Khmer. Economic relies on agriculture, forestry, industrial tree, fishery, industry and handicraft.

– **Other information:** Feasibility study report

(37) Hydropower Plant Buon Tua Srah

- **Location:** on Kr«ng Kn« river, which is main branch of Srepok river, about 60 km east away from Buon Me Thuot city as the crow flies, Dac Lac Province
- **Project type:** Project classification: Cascade Hydropower Plant; Project status: in the technical design stage and construction preparation phase
- **Investment**: EVN
- **Report:** Consultant Organization: Consultant Company for electricity construction No. 4. Full EIA was conducted by EVN with consultation of experts from Environmental Hydrology Department of Consultant Company for electricity construction No. 4, and with collaboration of experts from Geology and Environment Institute- Vietnam Geology Association, from Geographical Institute and from Ecology and Biological resources Institute- National Science and Technology Institute.
- **Technical specifications**

Installed Capacity P(MW)	86
Maximum Volume Qmax (m^3/s)	204.9
Highest Head Hmax (m)	58.5
Water level at downstream of powerhouse (m) with Qmax	430.29
An effective capacity of reservoir	522.6 millions m^3
Powerhouse size: (L*W*H):	66,6* 32,4*14,53 m

- **Socio-economic and environmental impacts**

The terrestrial ecosystem consists of: Three conservation areas: Ch- Sang Chin, Tµ §ïng vµ Nam Ka. Flora: is rich in species (1900 higher plants species, 150 medical plants) from that many dear and rare species with high economic value. Fauna: There are 434 species belonged to 4 classes. They consist of 86 mammals species; 273 bird species, 54 reptile species and 21 amphibian species in the proposed project area. The terrestrial ecosystem will be directly or indirectly affected by the project because a large land area will be lost and the surrounding area of the dam / reservoir are three conservation area: Chu Sang Chin, Ta Dung and Nam Ka

The aquatic ecosystem of Srepok River consists of 19 phytoplankton species, 22 zooplankton species, 14 benthos species and 47 fish species. The aquatic ecosystem will be affected by the project because baseline environment and hydrological regime will be changed due to project construction and operation. Mitigation measures to protect aquatic ecosystem should be proposed.

There are 4 resettlement areas: Thac 11 & 12, Lach Dong, Phi Dih A and Ro Men with 1348 resettling households, 78% from that are ethnic minorities (Tay, Nung, Dao, Hmong, Ede, Gia Rai, K'ho). The normal life of people will be affected

Rice field and cropland upstream of the dam site will be lost.

Sedimentation balance to the downstream will be changed, which may cause impacts to the natural and social environments of the downstream.

- **Other information:** Feasibility study report.

1.3. NUCLEAR POWER PLANTS

1.3.1. Nuclear power plant in Phuoc Dinh, Ninh Thuan Province

- **Location:** Phuoc Dinh, Ninh Thuan Province, the area is about 100 ha
- **Project type**: Nuclear power plant
- **Investment**: VEC, IE
- **Report:** Pre-feasibility study including Environmental Impact Assessment.
- **Technical specifications:**
  Maximum capacity is 4,000 MW inclusive basic and extensive additional charges. Used fuel is 2-4% rich in Uranium. Steam flux into turbine is 6620 m^3.
- **Socio-economic and environmental impact**

Terrain: coastal Low Mountain. On the flooded part, seaside is sloping, deep and opened directly into The East. Geological foundation is relatively good, mainly on granite. The area is dry and has great radiation.

The Kinh people are about 68%. Ethnic minorities are about 32%, mainly Cham. Economic activities include agriculture, forestry, cattle-breeding, aquatic-sea fishing and aquaculture.

- **Other information**

Existing materials: Environmental Impact Assessment, pre-feasibility report (2005)

1.3.2. Nuclear power plant in Hoa Tam, Phu Yen Province

- **Location:** Hoa Tam, Tuy Hoa district, Phu Yen province (100ha)
- **Project type**: Nuclear power plant
- **Investment**: VEC, IE
- **Report:** Pre-feasibility study including Environmental Impact Assessment.
- **Technical specifications:**
  Maximum capacity is 4,000 MW inclusive basic and extensive additional charges. Used fuel is 2 - 4% rich in Uranium. Steam flux into turbine is 66,200 m3
- **Socio-economic and environmental impact**

Terrain: coastal Low Mountain. On the flooded part, seaside is sloping, deep and opened directly into The East. Lower geological foundation is pre-Cambri old degenerate rock, surface loose sediment is sand with over 40m in depth, changes, and breaks and faults complexly.

Surface water reserves is large and unsteady, 70-80% in rainy season causing flood and 20 – 30% in dry season causing draught.

The number of population is mainly the Kinh and small number of Cham, Ede, and Bana…Economic activities include agriculture, forestry, breeding, aquatic-sea product fishing, industry, tourism, ...

- **Other information:** Environmental Impact Assessment (2003), Pre-feasibility report (2005).

Section 2 - Priority evaluation based on natural and social environmental criteria

2.1 OVERVIEW OF THE ENVIRONMENTAL AND SOCIAL ASSESSMENT METHODS FOR THE WORLD AND VIET NAM ELECTRICAL ENERGY SOURCES PROJECT

Energy industry including electrical energy is a key economy of every country and the government must control a large rate of investment. Therefore, in the countries which are deficient in energy, sometimes the governments can encourage to develop this industry by a lot of different ways such as tax reducing, reducing level of environmental impact consideration. In the countries which have a great and various reserve of energy, they may make a plan of a long-term development. Viet Nam has a rather large potential of hydro-electricity. We own plentiful sources of charcoal and gas to expand thermo-electricity and can build a lot of power stations such as power houses using wind energy, solar energy and nuclear energy. Programming of electrical development was carried out but the result was not as good as it was expected. We ought to do lots of works to consider and decide which electrical industry is preferred for development and which factory is previously developed... so that it is suitable for growing economy and protecting environment.

Clearly, this work is difficult. Because when we choose a project, we are supposed to give the reason why we do not select another one. Especially in Viet Nam, we do not have enough relevant information. Furthermore, our conditions of manpower and devices are limited.

Hence, in this episode we only give out some approaches of gathering and processing information which are helpful to choose projects that will get given purposes.

2.1.1 Gathering information

Gathering information plays a deciding role in choosing a plan. If we do not have an orientation, the information gathered will be weak. It may be both deficient and redundant and difficult to process. So we must plan and discuss widely to make a decision: what kind of information is collected, whether the information is available or we must conduct a survey. The information which serves the program of selecting a project can be taken from many sources but it must definitely be from the following main sources:

- From government agencies
- From scientific research agencies
- From local communities
- From a series of surveys

Goals of development, master development planning and orthodox data system can be got from government agencies. As these are agencies which order and choose a final project, certainly the information sources from these are deciding and have an orientation.

We can gather a lot of relevant information from scientific research agencies, especially the information is a scientific basis of choosing a project. In many cases, this information is not widely announced so that we must make a detail plan to collect.

Locals and communities are also abundant data stores but we should have an appropriate method to collect.

In many cases, we still have to conduct a series of special subject studies in order to check gathered data or to get some useful information for clearing a controversial problem.

When the amount of information is rather sufficient, we can process and bring methods which are useful for choosing a plan.

2.1.2 Some methods of processing and providing data for selecting a plan

Now there are a lot of data processing methods but they can be added up into the following ones:

- Statistical processing method
- Expert
- Model

About data providing, many methods have been applied in the world and in Viet Nam. So hereafter we only introduce briefly some of main methods.

2.1.2.1. Figure enumerating method

This method is simple, lucid and easy to use. But the information is not adequate and not much directly related to the assessment. However this is one of the popularly used methods.

According to this method, they analyze developing operations, choose a parameter related to environment, enumerate and give the data involved those parameters, hand on the decision makers to consider. The assessors do not analyze deeply and criticize any more. Let the decision makers select the project subjectively after reading enumerated figures.

Figure enumerating method of environmental parameter is simple and cursory, yet very necessary and useful in a preliminary assessment of environmental impact or in case the conditions of experts, figures and expenditures are not adequate for a full assessment.

2.1.2.2. Listing method

This is one of the popularly used methods in Environment Impact Assessment (EIA), especially in researching impacts. When using this way, they often divide lists into many kinds based on their characteristics and complications. Lists may be merely enumerating environmental factors which are able to be affected or in a higher level they consider importance levels of each factor and techniques of giving point the impacts of replaced projects. Lists provide us an assessing medium by listing the factors that need to be considered but not provide information for separate figure demands, for assessing the importance of impacts or for assessing the changes of environmental factors. There are some of popularly used lists: **Simple List, Question List, and List with the importance levels of impacts.**

Besides giving the impact level, there are some important levels of each environmental factor affected. Accompanied by giving this list, we may use the general impact assessment method through the changes of environmental factors. Each environmental factor has a quality norm (for example by point) and an important level. To exemplify this method, we see the multipurpose water resources Pattani Project (Thailand). The experts described environmental factors, gave points of quality both non-project and project, and then estimated the importance of each factor. From that point, we can assess the impact of project by means of Evaluating Impact Unit (EIU). This unit is calculated by the following formula:

$$E_I = \sum(V_i)_1 W_i - \sum(V_i)_2 W_i \qquad (2.1)$$

In there

E_I : environmental impact

$(V_I)_1$: quality value of the category i environmental parameter with project

$(V_I)_2$: quality value of the category i environmental parameter with non-project

W_i : the important level of the category i factor

m : sum of factors

For the multipurpose irrigation project, they divided factors into three kinds: biological factor, physiochemical factor and welfare for human. Each kind has its own compositions. Each composition has different parameters. For instance, biological factor includes terrestrial and aquatic compositions; physiochemical factor includes soil, surface water, ground water and atmosphere; welfare factor includes health, economy – society, culture – aestheticism. The following figure is the result of environmental impact assessment of Pattani Project:

Table 2.1. The matrix of environmental impact assessment of Pattani Project, Thailand

Factor	Composition	EIU with project	EIU with non-project	EIU change
Ecology	Terrestrial	883	693	-190
	Aquatic	484,3	721,6	237,3
Physiochemical environment	Soil	518,5	368,3	-150,2
	Surface water	535,9	341,9	-194,0
	Ground water	530,8	270,6	-260,2
	Atmosphere	405,6	355,3	-50,3
Welfare	Health	247,6	779	531,4
	Economy - Society	806,0	1586,2	780,2
	Culture - Aestheticism	660,5	618,2	-42,3

When collecting the figures in the above table for each factor, we get the difference of impact unit with non-project and project: for ecology it is 47,3; for physiochemical environment, it is -654,7; for economy - society, it is 1260,3; and the algebraic sum is 661,9. This means partially the environmental impact calculated by EIU is 661,9 but the biggest contribution is the welfare for human. Generally, listing method is clear and easily understood. If the assessor is knowledgeable about the content of developing operations, natural and social conditions where the operations take place, this method will give good bases for making decision. However, it has many subjective factors of assessors and depends on impulsive agreements about importance, levels, defined points for each parameter. The subjective estimations of assessors will be mingled when calculating a sum of impacts. It is difficult to analyze. For this reason, collecting all impacts, collating and comparing different projects are limited. This method has two disadvantages: either too general or not adequate. Some impacts are easily repeated, so they are calculated two or many times in collecting the sum of impacts. When using this method, we need to note those disadvantages, repair them suitably and decrease subjective compositions in general assessing result.

2.1.2.3. Environmental matrix method

This method enumerates simultaneously the operations of one project (or projects) with the list of conditions or the list of environmental characteristics that are able to be impacted. When combining these lists coordinately, we will have a matrix: in there, horizontal axis is environmental factor and vertical axis is developing operation. Since then we can find more clearly the causal relation between operations and impacts at the same time. The square lying between column and row in matrix is used to show the impact ability. Depending on how to use this square, we can divide environmental matrix into the following kinds: simple matrix, step matrix and quantitative or qualitative matrix.

In quantitative matrix, squares not only mark the impact ability but also show the impact level, kind of impact and the importance of factor, etc. The impact level may be not clear, positive or negative, etc. like the table 3 or it can be quantitative, qualitative like the matrix in table 3. Generally, each square in the qualitative matrix show the impact level and the importance of impact. In Leopold matrix, the qualitative system with levels from 1 to 10 is used for the impact level and the importance of impact. For the impact level, the level is the lowest and the level 10 is

the highest. For the importance of impact, the level 1 is the lowest and 10 is the highest. Leopold established a matrix including 100 impacts and 88 environmental parameters.

Matrix method is simple, easy to use. It does not demand much environmental data but it can analyze clearly the impact of many different activities on the same factor. Here are some detail advantages of this method:

- We use this method in defining and presenting impacts used in many projects. It is because they change easily. Their forms were built and used. The interactive matrix was established to determine and quantify indirect impacts but it is not often used.
- Matrix provides some methods of presenting easily understood impacts

However, this method also has some following disadvantages:

- It is difficult to define secondary impacts except step matrix.
- It does not consider time changing of operations and impacts. So it does not discriminate long impacts or temporary impacts.

Now we attempt to innovate and create many kinds of matrices which can overcome the above disadvantages. Although this method has disadvantages, it is still used widely.

2.1.2.4. Method of environmental map overlay

This method uses maps presenting specific environmental characteristics in the research area drawn on the transparent paper. Each map describes the research area with each environmental characteristic determined based on investigation documents in the field. The attribute of environmental characteristics is defined by level. For example, mean pollution area painted with the light color and serious pollution one painted with darker color. The slope of ground for example, could divide into five different level. In order to pass judgment on suitability of land use for some purposes at the research area(e.g. planting tree, etc), we fasten together related maps. The light- colorless and dark level combination or color could fast judge generally to the suitability of each area in the map.

The method of environmental map overlay is simple, clear and easy to understand. The considered results manifest directly by image, which is suitable for the assessment of land use projects. However, the method have some shortcomings as followings: expressing nature and environment are in a stationeries, the measured level of environmental specific characteristics are usually in a generalization, the final assessment about the sum of impacts depend on the subjective point of view of the assessor.

Recent time, based on the principle of map overlay, some countries have used tool of GIS running on the computer to synthesize and compare the combination of environmental and natural conditions at one place with many detail parameters and measured level.

One concrete method of the map overlay spaciously used is the Metropolitan Landscape Planning Model, abbreviated as METLAND. The use of method is divided into three phases: 1) assessing generally landscape, 2) suggesting the ways and means of planning, 3) assessing and comparing the ways and means. In part of the generally landscape assessment, which divided including: the landscape assessment, the assessment on the ecology correspondence and the assessment on public services. In part of the landscape assessment divided by the assessment on resources value, the assessment on the environmental harmfulness, the assessment on the suitableness for development. Based on the analysis in turn of the landscape's specific characteristics, the ecology suitableness and the kinds of services, one composes necessary maps to overlay by real image or to overlay by computer. This method also has the same defect as of the general map overlay method. The environmental impact assessment (EIA) has stated that this method requires modern means of calculation because of big data as well as it can not adjusted line if using manpower.

This method is not only used for division of territory to assess but is also used for the classified assessment of the project by level of priority and the suitable level of each affected element.

2.1.2.5. Method of extra benefit-cost analysis

The benefit- cost analysis is one method of the economic- effectively project assessment. This method is also applied in the EIA to the case of considering to the cost and benefit obtained from the project. In such case, this method is called as the method of extra benefit-cost analysis.

In the method of economic benefit-cost analysis to the project, the benefits-costs are listed, for example, including:

- The first investment cost, fixed capital
- Mobile capital
- Production Costs
- Turnover from selling products …

These costs are converted into money by year during the project's longevity. In case of calculating benefit-cost, one counts to the money discounting. It means that the money being got in the future will bear a discounting comparing with the present time. The present time is relatively stated, which usually chosen at the beginning time of the project constructed or the beginning time of the project run.

The benefit- cost analysis must be calculated before the project run, supplying base for the decisive- makers to consider the project should be done or not. This method helps for effective comparison of the economic project which can replace each other at the same place or different ways and means to implement the project.

Factors have usually been used in the benefit-cost analysis including:

(1). Net Present Value

$$NPV = \sum_{t=1}^{n} \frac{Bt}{(1+r)^t} - \left[C_o + \sum_{t=1}^{n} \frac{C_t}{(1+r)^t} \right] \qquad (2.2)$$

In which:

Bt: Benefit of the year t; Ct: Cost of the year t; Co: First cost

r: Coefficient of discounting; t: Time(year); n: Project's longevity

So NPV is the accumulate net profit depending on the coefficient of discounting and the time. For the project in the constructed beginning stage, NPV gets negative sign at first(it means that the cost is higher than the profit) and at the certain time NPV will equal to 0 and then get positive sign.

When using NPV to compare the projects, we must pay attention to the first investment capital because in some cases NPV of two projects are the same but the first investment capitals are very different. In case of the consideration to the economic aspect only, the plan has the small first investment must be preceded first.

(2). Internal Return Rate: K

This coefficient is calculated by following formula:

$$\sum_{t=1}^{n} \frac{Bt}{(1+K)^t} - \left[C_o + \sum_{t=1}^{n} \frac{C_t}{(1+K)^t} \right] = 0 \qquad (2.3)$$

The project selected to carry out is the one with K getting big value. People usually compare value of K with the interest due to borrowing money from the bank to estimate the obtained economic effect. Therefore, the project with big K will be chosen.

(*3). Benefit-cost rate: B/C*

$$B/C = \sum_{t=1}^{n} \frac{Bt}{(1+r)^t} / \left[C_o + \sum_{t=1}^{n} \frac{C_t}{(1+r)^t} \right] \qquad (2.4)$$

At the time which B/C equals to 1, the accumulate profit equals to the accumulate cost. Then this ratio is higher than 1 and increases to a certain bound value.

The use of the above characteristics separately can not answer the project or the plan has high economic benefit. So the usual ways used is to combine these characteristics together.

Thus, in the method of extra benefit-cost analysis, we often consider to all the running time of the project. In fact, there are many projects giving high interest rate in the short time, then may lose interminably. So the benefit- cost calculation for the whole project's longevity can determine the ability of capital restoration as well as the economic effect of the project. This can be done in case of the money's stability. For this reason, this method can just apply to Vietnam for recent years.

The method of benefit-cost analysis uses the money discounting, which corresponds to the market economy and in accordance with the sense of money, especially capital money. By that, if the money is not invested to produce profits, it will lose value with the time. Using the money discounting will encourage manufacturer putting the money in a business to produce having and goods, avoiding the state of stagnant capital. One easily seen image of the money discounting is the interest rate of savings. This is a part of gained profit through the investment of the bank. Besides, coefficient of discounting is also used as a tool in the economic management. For example, banks can define different interest rate of loan for different branches. E.g. some projects, for some branches, will be received a low interest rate is the ones bringing many positive impacts on environment and is useful for many people. On the contrary, for some branches creating much toxic and hazardous wastes or just brings benefits for very few people in the community, of which the project must accept a high interest rate.

If the data is complete and parameters in the extra benefit-cost analysis such as NPV, IPP, B/C can be calculated for each projects, we can classify and sort projects by different purposes aiming to select the preferential projects.

2.2. NATURAL AND SOCIAL ENVIRONMENTAL EVALUATION AND PRIORITY SELECTION METHODOLOGY AND FOR POWER PLANT PROJECTS

Due the lack of detailed information regarding to power project, the major methodology for natural and social environmental evaluation and priority selection is point calculation based on the following formula:

$$E_I = \sum_{i=1}^{m} (V_i)_1 W_i \qquad (2.5)$$

In which:: E_I : environmental impact
$(V_I)_1$: quality value of the category i environmental parameter with project
W_i : the importance level of the category i factor
m : sum of factors

Value $(V_I)_1$ of natural and social environmental factors is calculated by impact level (a, b, c) in the Project checklist. For quantitative calculation, the follow numeral is preliminary assumed: a =

4, b = 2, c = 1. In another word, significant impact, less impact, and no impact of project is corresponding to 4, 2 and 1, respectively. For the items which information related is not available

(NA – in the Checklist) will be also calculated as 1 (be underlined for distinguish) during priority analysis and final decision making.

The importance level of individual natural and social environmental item in the Checklist (W_i) is identified for thermal and hydro power plants. The fuel usage (coal, gas, DO, FO) is also considered. They are assessed as three level 3, 2, 1 (table 2.2).

Table 2.2. Importance level of natural and social environmental aspects

			Importance level		
Environmental impact	**Impacted aspect**	**Impact item**	**Thermal P P**		**Hydro power plants**
			Coal usage	**Gas and DO/FO usage**	
Social	Inhabitant	Minority	2	2	3
		Weakness	2	2	2
	Resetlement		—	—	3
	Cultural Heritage/ Asset		3	3	3
	Scenery		2	2	2
	Life	Agriculture	3	3	2
		Fishery	2	2	1
		Water Utilization	3	3	2
		Others	1	2	1
Natural	Terrestrial	Fauna	1	1	2
		Flora	2	2	3
		Insect / Mic.	2	2	2
	Aquatic	Fauna	3	2	2
		Flora	2	2	1
		Insect / Mic.	2	2	2
	Topography		1	2	2
	Reserved/Park Area		3	3	3
	Meteorology/Climate Change		1	1	2
Polution	Air Quality		3	2	1
	Water Quality		3	3	2
	Soil Contamination		2	1	2
	Noise		2	1	1
	Vibration		2	1	1
	Land Subsidence		1	1	2
	Bad Smell		2	2	1
	Waste		3	1	1

Total adverse impact on natural and social environmental of power plants is shown in table 2.３. The caculatation based on fomular (2.5) with the value corresponding with a, b, c (see appendix 2) and inportant levels in table 2.2

Table 2３. Total adverse impact on natural and social environmental of Power plants

No.	Plant/project code	Project/Plant	Total adverse impact	
			Construction phase	Operation phase
Thermal power plant				
1	**7**	O Mon No1 Thermal Power Plant	91	98
2	**15**	O Mon No 2 Thermal Power Plant	90	95
3	**32,35**	O Mon No 3 Thermal Power Plant	92	107
4	**42**	O Mon No 4 Thermal Power Plant	90	102
5	**1adf**	Phu My No 1 Thermal Power Plant	91	108
6	**2adf**	Phu My No 2 Thermal Power Plant	91	108
7	**3adf**	Phu My No 3 Thermal Power Plant	91	108
8	**4adf**	Phu My No 4 Thermal Power Plant	91	108
9	**43**	South CCGT Thermal Power Plant	86	91
10	**4**	Amata Bien Hoa CCGT	82	83
11	**17**	Nhon Trach No1 Thermal Power Plant	90	97
12	**30,31**	Nhon Trach No 2 Thermal Power Plant	90	97
13	**36**	Nhon Trach No3 Thermal Power Plant	89	96
14	**41**	Nhon Trach No 4 Thermal Power Plant	89	96
15	**2/48,49ad**	Mao Khe Thermal Power Plant	97	106
16	**8adf**	Uong Bi Extended Thermal Power Plant	75	109
17	**5/40ad**	Ninh Binh Extended Thermal Power Plant	106	121
18	**8,16**	Nghi Son Thermal Power Plant	101	126
19	**34,57**	Mong Duong Thermal Power Plant	91	125
20		Hiep Phuoc Thermal Power Plant	91	114
21	**6**	Quang Ninh Thermal Power Plant	112	104
22	**6adf**	Hai Phong Thermal Power Plant	115	136
23	**7adf**	Son Dong Thermal Power Plant	94	101
Hydro power plants				
1	**25**	Nam Chien Hydropower Station	82	84
2	**48**	Hydropower Plant Buon Tua Srah	123	75
3	**13,49**	Dakrtih Hydropower Plant	87	70
4	**27**	Lai Chau Hydropower Plant	118	82
5	**9adf**	Pavinh (Son La) Hydropower Plant	117	112
6	**23**	Ban Uon Hydropower Plant	115	105
7	**10**	EA Krong Hnang Hydropower Plant	89	60
8	**10adf**	Ankhe Kanak Hydropower Plant	110	79
9	**11adf**	Dong Nai No3 Hydropower Plant	103	74
10	**12adf**	Dong Nai No4 Hydropower Plant	70	64
11	**12,22**	Huoi Quang Hydropower Station	101	95
12	**50**	Chu Linh – Coc San Hydropower Plant	86	65
13	**13adf**	Bao Lac Hydropower Plant	84	83
14	**14adf**	Tuyen Quang Hydropower Plant	90	80
15	**56**	Bac Quang Hydropower Plant	100	89
16	**71**	Ban Muc Hydropower Plant	102	91

17	**63**	New PSPP No 3 JS6	85	56
18	**62**	New PSPP No 2 JN5	92	85
19	**59**	New PSPP No 1 JN	102	65
20	**24**	Nho Que No 1 Hydropower Plant	89	66
21	**26**	Nho Que No 2 Hydropower Plant	85	70
22	**15adf**	Nho Que No 3 Hydropower Plant	85	66
23	**66**	Bac Me Hydropower Plant	94	82
24	**37**	Dakmi No 1. Hydropower Plant	100	85
25	**16adf**	Dakmi No 4 Hydropower Plant	82	64
26	**1**	Extend Thac Mo Hydropower Plant	79	59
27	**11**	Bung 2 River Hydropower Plant	101	90
28	**18**	Bung 4 River Hydropower Plant	115	67
29	**17adf**	A Sap Hydropower Plant	96	76
30	**18adf**	Song Tranh 2 Hydropower Plant	98	65
31	**54,55**	Hua Na Hydropower Plant	104	74
32	**19adf**	Serepok 3 Hydropower Plant	115	69
33	**20adf**	Song Hinh Hydropower Plant	96	79
34	**21adf**	Can Don Hydropower Plant	85	65
35	**47ad**	Sesan No 4 Hydropower Plant	97	57
36	**3**	Dambri Hydropower Plant	89	74
37	**14**	Con river No2 Hydropower Plant	83	64
Nulear power plant				
1	**22adf**	Hoa Tam Nuclear Power Plant	103	120
2	**65**	Phuoc Dinh Nuclear Power Plant	102	130

The findings show that:

1. For thermal PP:

- In the construction phase, many adverse impacts on natural and social environment found, mainly due to pollutants (emission gases, solid waste and high temperature of waste water).
- Coal used thermal power plants normally cause more serious adverse impact on natural and social environment during operation phase in comparison with Gas or/and DO/FO thermal power plants.
- For the thermal power plant constructed in one location (plants group/zone): the later constructed will generate more adverse impact due to the integrated impacts of pollutants.

2. For hydro PP:

- In the construction phase, number of adverse impacts on natural and social environment found. Of which the significant impacts include: land lost; immigrant/resettlement and environmental pollution (water, air).
- The impact of high capacity power plants is increased. However the projects/plants located in Northern East, Central Southern and Highland regions seem to have less impact on natural and social environment. By contrast, their advantage impacts on water equable making in rain season and drought elimination in dry season will be considered for priority selection.

It should be noticed that in table 2. 3 some plants/projects listed in 71 plant list and some additional ones (added by JICA team) have not been included due to the information is not available or the plant/projects are located outside Vietnam or even plant/projects are just idea. In fact some project are rejected due to significant environmental impact caused e.g. Dong Nai No8. The details will be in table 2. 4 . The detailed analyzed checklist for individual plant is presented in Appendix 2.

Table 2 4 – List of plant/projects have not been analysed

	Name of Power plant	Location	Type	Remark
4	Sekaman3	Central	H	In Laos
9	Serepok 4	Central	H	In Laos
19	Khe Bo		H	NA
20	Upper Kontum #1,2	Central	H	NA
21	Song Hieu	North	H	NA
28	Dong Nai 2	South	H	Dong Nai No3 and 4 are analysed
33	Hon Dat ST	South	G	NA
38	Dong Nai 5	South	H	Dong Nai No3 and 4 are analysed
39	Duc Xuyen	Central	H	NA
40	Se Kong 4	Central	H	In Laos
44	Dai Nga		H	Be rejected
45	Dak Drinh 1	Central	H	Idea
47	Thac Muoi	North	H	NA
52	Iagrai	Central	H	NA
56	Bac Quang	North	H	Replaced by Tuyen Quang HPP
58	Iayun Thuong	Central	H	NA
60	Quang Tri CCGT	Central	G	Idea
61	Vung Ang	North	C	In preparation for pre-feasibility
64	New coal-fired TPP	North	C	Idea
67	Ha Tay	North	C	Idea
68	Dong Nai 6	South	H	Dong Nai No3 and 4 are analysed
69	Dong Nai 8	South	H	Be ofiicially rejected due to significant impact on Cat Tien natural area
70	Se Kong 1	Central	H	In Laos
44ad	Vung Ang 300#1	North	C	In preparation for pre-feasibility
47ad	Vung Ang 300#2	North	C	In preparation for pre-feasibility
50,51ad	New Coal #1(Vung Ang 1), #2(Vung Ang 2)	North	C –Imp	In preparation for pre-feasibility
52,53ad	New Coal #3 (Nghi Son #3), #4 (Nghi Son #4)	North	C	Idea
54,55ad	New Coal #5 (Vung Ang 3), #6 (Vung Ang 4)	North	C-Imp	In preparation for pre-feasibility
56,57ad	New Coal #7 (Nghi Son #5), #8 (Nghi Son #6)	North	C-Imp	Idea
58,59ad	New Coal #9 (Hai Phong #3), #10 (Hai Phong #4)	North	C	Idea
64,65ad	New CC #4, #5 (Binh Thuan 1)	South	G	Idea
66,67ad	South Coal #1, #2 (Soc Trang1)	South	C -Imp	Idea
68ad	New CC #5 (O Mon V)	South	G	Idea
69,70ad	New CC #6 (Tien Giang 1), #7 (Tien Giang 2)	South	G - Imp	Idea
72,73ad	South Coal #3 (Tra Vinh 1), #4 (Tra Vinh 2), #5 (Tra Vinh 3)	South	C -Imp	Idea
77ad	South Coal #6	South	C -Imp	Idea
79,80ad	South Coal #7 (Soc Trang 3), #8 (Soc Trang 4)	South	C -Imp	Idea
83ad	New CC #8 (Mien Trung)	Central	G - Imp	Idea

45ad	Trung Son Hydropower Plant	North	H	NA
36ad	Binh Dien Hydropower Plant	Central	H	NA
47ad	Sesan 4 #3 Hydropower Plant	South	H	NA
62ad	Song Bung #5 Hydropower Plant	Central	H	Idea
72ad	Thuy dien nho moi MT_MN 1, MN 2, MN 3	South	H	NA

**H: Hydropower, *C: Coal,*G: Gas,*P: Pumped Storage,*N: Nuclear*

2.3. LIST OF PRIORITY POWER PLANTS BASED ON NATURAL AND SOCIAL ENVIRONMENTAL CRITERIA

For thermal power plants, the priority selection is mainly based on the impact during operation phase. The impacts during construction phase are only considered just in case similar previous impact found. For hydro power plants the consideration is based on the impacts during both construction and operation phases due to more significant impact on natural and social environment when it is constructed (see table 2.5).

Table 2. 5 . Priority selection of power plants based on natural/social environmental criteria

Plant/project code	Projects/Plants	Priority order	Remark
Thermal Power plants			
4	Amata Bien Hoa CCGT	1	
43	South CCGT Thermal Power Plant	2	
15	O Mon No 2 Thermal Power Plant	3	
36	Nhon Trach No3 Thermal Power Plant	4	
41	Nhon Trach No 4 Thermal Power Plant	5	
17/61ad	Nhon Trach No1 Thermal Power Plant	6	
30,31/62ad	Nhon Trach No 2 Thermal Power Plant	7	
7	O Mon No1 Thermal Power Plant	8	
7adf	Son Dong Thermal Power Plant	9	
42	O Mon No 4 Thermal Power Plant	10	
6	Quang Ninh Thermal Power Plant	11	
2/48,49ad	Mao Khe Thermal Power Plant	12	
32,35	O Mon No 3 Thermal Power Plant	13	
1adf	Phu My No 1 Thermal Power Plant	14	
2adf	Phu My No 2 Thermal Power Plant	15	
3adf	Phu My No 3 Thermal Power Plant	16	
4adf	Phu My No 4 Thermal Power Plant	17	
8adf	Uong Bi Extended Thermal Power Plant	18	
6adf	Hiep Phuoc Thermal Power Plant	19	
5/40ad	Ninh Binh Extended Thermal Power Plant	20	
34,57	Mong Duong Thermal Power Plant	21	
8,16	Nghi Son Thermal Power Plant	22	
6adf	Hai Phong Thermal Power Plant	23	
Hydro Power plants			
12adf	Dong Nai No4Hydropower Plant	1	
1	Extend Thac Mo Hydropower Plant	2	
63	New PSPP No3 JS6	3	
16adf	Dakmi No4 Hydropower Plant	4	
14	Con river No2 Hydropower Plant	5	
10	EA Krong Hnang Hydropower Plant	6	
21adf	Can Don Hydropower Plant	7	
50	Chu Linh – Coc San Hydropower Plant	8	
15adf	Nho Que No3 Hydropower Plant	9	
47ad	Sesan No4 Hydropower Plant	10	
24	Nho Que No1 Hydropower Plant	11	
26	Nho Que No2 Hydropower Plant	12	
13,49	Dakrtih Hydropower Plant	13	
18adf	Song Tranh No2 Hydropower Plant	14	
3	Dambri Hydropower Plant	15	
25	Nam Chien Hydropower Station	16	
59	New PSPP No 1 JN	17	
13adf	Bao Lac Hydropower Plant	18	
14adf	Tuyen Quang Hydropower Plant	19	
17adf	A Sap Hydropower Plant	20	
20adf	Song Hinh Hydropower Plant	21	
66	Bac Me Hydropower Plant	22	

62	New PSPP No 2 JN5	23	
54,55	Hua Na Hydropower Plant	24	
11adf	Dong Nai No3 Hydropower Plant	25	
18	Bung 4 River Hydropower Plant	26	
19adf	Serepok 3 Hydropower Plant	27	
37	Dakmi No 1. Hydropower Plant	28	
56	Bac Quang Hydropower Plant	29	
10adf	Ankhe Kanak Hydropower Plant	30	
11	Bung 2 River Hydropower Plant	31	
71	Ban Muc Hydropower Plant	32	
12,22	Huoi Quang Hydropower Station	33	
48	Hydropower Plant Buon Tua Srah	34	
27	Lai Chau Hydropower Plant	35	
23	Ban Uon Hydropower Plant	36	
9adf	Pa Vinh (Son La) Hydropower Plant	37	
Nuclear power plants			
65	Hoa Tam Nuclear power plant	1	
22adf	Phuoc Dinh Nuclear power plant	2	

Section 3- Overview of Vietnam's legal documents related to environment, culture-society and minorities people

3.1. GENERAL OVERVIEW OF LEGAL DOCUMENTS ON SENSITIVE ENVIRONMENT, NATURAL PROTECTED AREAS, CULTURAL HERITAGES AND ETHNIC MINORITIES

Energy development by investment in hydropower, nuclear power, gas power and thermo power plants is most important in economic development and improvement of people's living conditions. However, together with energy development, there are negative impacts to the environment, natural resources, cultural and social lifestyles of local communities, especially the ethnic minorities.

Environmental protection is the responsibility of each citizen, organization including foreign companies. This responsibility has been legalized by legal documents such as laws, decrees and standards etc.

Legal documents include: (1) Constitution, (2) Laws and state laws; (3) Decrees, Decisions, Implementation Guidance documents, Regulations (4) Environmental Standards

3.1.1. Legal documents on environment and resources

The country Constitution 1992 defines: "All governmental agencies, army units, socio-economic organizations and individuals must conform state laws and regulations concerning the proper use of natural resources and environment. Any activity that harms the environment and resource should be strictly prohibited. (Article 29)

3.1.1.1. Law on Environmental Protection (2003)

The Law on Environmental Protection was approved by the Parliament of Socialist Republic of Vietnam on December 27th 1993 and took effect on January 10th 1994. This law is the demonstration of environmental and resource protection defined by the Constitution. It helps improving state administration and responsibilities of army units, socio-economic organizations and individuals in environmental protection to ensure the good health of citizens and the civil rights to live in the good environment.

Up to now, the Law on Environmental Protection 1993 is still the umbrella law and the most comprehensive legal base relating to many environmental issues such as prevention and mitigation of environmental degradation, pollution and environmental hazards.

The aim of this law is to prevent and mitigate the environmental consequences caused by nature and human activities, to adjust the exploration and utilization of environmental components to achieve sustainable development and protect the health of people.

There are 7 chapters and 55 articles in this law:

- Chapter I General provisions (Article 1 to Article 9): defines the objects, effecting sphere and responsibilities and rights of organizations and individuals in environmental protection.
- Chapter II (Article 10 to Article 29) Prevent environmental degradation, environmental pollution and environmental hazards relating to the use of environmental components (soil, water, air, biodiversity, ecologies, genetic sources and landscape): This chapter defines the general principles, which are specified in other legal documents on environmental and resource protection. In Article 18, it is mentioned that Environmental Impact Assessment Reports should be carried out by organizations and individuals before constructing, upgrading or developing socio-economic development projects.

- Chapter III (Article 30 to Article 36): Remedies of environmental degradation, pollution and environmental hazards. In this chapter, responsibilities and rights of organization and individuals in taking remedies for environmental degradation, pollution and environmental hazards are defined. Enterprises are responsible for waste treatment by using proper technology. All methods should be done to treat radioactivity, electromagnetic and ionization. Payment and compensation for environmental hazards is also mentioned.
- Chapter IV (Article 37 to Article 44) defines state administration on environmental protection. Mandate and functions of governmental agencies in environmental protection are defined. Besides, functions and tasks of state inspection on environmental protection are specified.
- Chapter V (Article 45 to Article 48) International relation in environmental protection.
- Chapter VI (Article 49 to Article 52) Rewards and punishments.
- Chapter VII (Article 52 to Article 55) Implementation provisions.

To improve the Law on Environmental Protection 1993, the Government is making adjustment. The draft has been reviewed by the Parliament and public opinions are asked.

3.1.1.2. Decree No 175/CP

To specify general provisions in the Law on Environmental Protection 1993, Decree No 174/CP dated October 18th1994 on Guidance for enforcement of the Law on Environmental Protection and Decree No 143/2004/N§-CP dated July 12th 2004 on adjustment and amendment Article 14, Decree No 175/CP were promulgated by the Government.

Decree No 175/CP includes 7 chapters, 40 articles and 5 appendices such as follow:

- General provisions (Chapter I)
- Responsibility assignment on state administration on environmental protection (Chapter II)
- Environmental impact assessment (Chapter III)
- Prevention and mitigation environmental degradation, pollution and hazards (Chapter IV)
- Finance for environmental protection (Chapter V)
- Inspection on environmental protection (Chapter VI)
- Implementation provisions (Chapter VI).

In Chapter III, with respect to environmental impact assessment (EIA), there are definitions of objects, contents, implementation steps and assessment methods. Moreover, organization for environmental impact assessment should be sufficient in terms of human resources, knowledge and material base; environmental assessment should follow Vietnamese standards and appraisal procedures (files for EIA appraisal, appraisal agencies, list of EIA reports reviewed by the Parliament, responsibilities of governmental agencies in EIA appraisal etc.).

Decree No 143/2004/N§-CP on adjustment and amendment Article 14-Decree No 175/CP

Concerning the appraisal of EIA reports, the Government establish Decree No 143/2004/N§-CP, on adjustment and amendment Article 14, Decree No 175/CP. Accordingly, since August 3rd2004, Ministry of Natural Resources and Environment has reviewed the EIA reports of the following projects: construction of infrastructure in the third ranking urban areas and upward (with the population of 100 000 people and upward); industrial parks and high tech parks with the area more than 150 ha; economic and commercial sites with the area more than 1000 ha;

construction of permanent bridges with the length more than 1000 m; sea harbor for ships with capacity over 50 000 DWT, petrol chemistry and filtration, oil exploration, alcohol factories with annual capacity over 1000 000 liters of products and breweries and beverages with the annual capacity over 10000 000 liters of products etc.

3.1.2. Legal documents related to environmental components

There is a close relation and supporting link among the provisions of the Law on Environmental Protection and other legal documents on exploration, utilization and protection of natural resources. Social relations in this aspect are regulated by those legal documents.

3.1.2.1. Land

Law on Land 2003

Land is the most important components of the environment. It is a special resources. On December 26th2003, the Parliament of the Socialist Republic of Vietnam approved the new Law on Land, which replaces Law on Land 1993. Land administration and utilization is defined in this new law.

There are 7 chapters and 146 articles in the Law on Land :

- Chapter I : General provisions (Article 1 to Article 15)
- Chapter II : State rights of land and land administration (Article 16 to Article 65)
- Chapter III : Regulation on utilization of different types of land (Article 66 to Article 104)
- Chapter IV : Rights and responsibilities of the land users (Article 105 to Article 121)
- Chapter V : Administrative procedures on land management and utilization (Article 122 to Article 131)
- Chapter VI : Inspection, resolutions for conflicts, complaints, accusations and violations of the law (Article 132 to Article 144)
- Chapter VII : Implementation provisions (Article 145 to Article 146).

The Law defines that land belongs to all citizens and the State is representative owner (Article 5). Based on purposes of use, land can be classified in 3 categories : (a) agricultural land (land for perennial plants, production and protection forests, special forests and aquaculture etc.) ; (b) non-agricultural land (residential land in urban and rural areas, office and construction land etc.) ; (c) unused land including unspecified purpose land – Article 13. Two important types of land in environmental, ecological and biological protection are protection forest land and special forest land - Chapter III : Regulation on utilization of different types of land (Article 76 and Article 77). In the Law on Land 2003, all acts including transgression, un-use or use for wrong purposes, violation of public plans and planning, land deterioration and inproper conformation of the law with respect to the rights and responsibilities of land users are strictly prohibited. (Article 15).

3.1.2.2. Water resource and environment

Water is an extremely important resource, the essential component of life and the environment. On one hand, it determines the existence and sustainable development of the country. On the other hand, it can create damages and disasters to human and the environment. Energy development based on water resource has many effects on the environment.

The Law on Water Resource dated August 20th 1998 defines the management, protection, exploration and utilization of water resources and prevention, mitigation damages and disasters caused by water.

The Law on Water Resource 1998 includes 10 chapters and 75 articles.

Chapter I-General provisions (Article 1 to Article 9) define water resource ownerships, objects and effecting sphere of the law. There are also explanation of terms, water management protection, exploration and utilization of water resources and prevention, mitigation damages and disasters caused by water. Water resource development policies are mentioned in Article 6. Financial policies in water resource are defined in Article 7. Article 8 is about international relations in water resource and prohibited acts are described in Article 9.

Chapter II-Water resource protection (Article 10 to 19) defines responsibilities in water resource protection. All organizations and individuals when carrying out the construction of water resource development projects should explore, utilize and obey the regulations on prevention water degradation properly.

Wastewater discharge to water sources should be permitted by the relevant governmental agencies and should be based on the receiving capacity of the water sources (Article 18). Strictly prohibited acts include discharge of hazardous waste into water, discharge of untreated wastewater or improper treated wastewater and especially the discharge of wastewater and pollutants to the protective area of water for domestic use.

Chapter III-Exploration and utilization of water resource (Article 20 to 35). Main issues in this chapter are regulation and distribution of water resource (Article 20); transference of water from one river basin to another (Article 21); rights of organizations and individuals in exploration and utilization of water resource (Article 22); responsibilities of organizations and individuals in exploration and utilization of water resource (Article 23); permission for water resource exploration and utilization (Article 24); water resource exploration and utilization in domestic activities, salt production, aquaculture, agriculture, industry, mining, hydro power, transportation and other uses (Article 25 to 31).

The Government encourages development of hydropower projects. However, the construction and operation of hydro power plants should follow the planning of river basin, law on environmental protection and water regulation procedures appraised by relevant governmental agencies.

- Decree No 179/1999/N§-CP dated December 30th 1999 on the implementation of the Law on water resource
- Directive No 02/2004/CT-BTNMT of Ministry of Natural Resources and Environment in strengthening the underground water resource management

According to this Directive dated June 2nd 2004, it is necessary to carry out inspection and checking of exploration of underground water, banning illegal exploration of organizations and individuals who are not capable in skills, technology and do not protect the water resource.

3.1.2.3. Forest and biological resource

Forest is not only the precious resource but also the most important element of the ecology. Thus, the Law on Forest Protection and Development was promulgated to increase the forest cover and quality, prevent the forest destruction, fires; socialize forest protection and development; stably delegate forest and forest land to improve the living conditions of people and develop the economy in mountainous areas; increase economic value of forest, maintain and protect the existing forest areas and plant, explore forest following the national and local forest planning.

There are specific definitions of forest protection in the Law on Environmental Protection 1993. For example, in Article 12, it is stressed that forest exploration should follow the planning and regulations of the Law on Forest Protection and Development such as management of protection forest, special forest, production forest and protection of the rare species.

The Law on Forest Protection dated December 3rd 2004 includes 8 chapters and 88 articles:

- Chapter I: General provisions (Article 1-12),
- Chapter II: Government authority on forest protection and development (Article 13-35);
- Chapter III: Forest protection (Article 36-44);
- Chapter IV: Forest development and utilization (Article 45-58);
- Chapter V: Rights and responsibilities of forest owners (Article 59-78);
- Chapter VI: Forest guarding (Article 79 - 83);
- Chapter VIII: Resolutions for conflicts and punishment for violations of the Law (Article 84-86) and
- Chapter VIII: Implementation provisions (Article 87-88).

Specifications of the international conventions that were ratified by Vietnam are also in the Law on Forest Protection and Development 2004. For instance, international conventions have been mentioned such as biodiversity convention, convention on protection of the world's natural and cultural heritage, RAMSAR convention on the international important wetlands, especially the wetlands which are habitats of water birds, international convention on trade of endangered wild species, convention on prevention of desertification, ASEAN agreement on control of Tran boundary smoke and dust pollution etc.

In the chapter of forest protection, there are regulations on (a) forest ecologies, (b) fauna and flora, (c) fire and harmful species prevention and extinguishment and (d) trade, transport, import and export; temporary export and re-import of fauna and flora. Forest exploration and hunting should follow the regulations. Rare species and genetic sources should be protected and managed under special conditions. Environmental impact assessment reports should be carried out in the case of projects that have potential effects on forest ecologies.

Forest development and utilization is defined clearly in the Law. Forest exploration and utilization must be done parallel with forest development, environmental and biodiversity protection. According to the law, forest can be classified into 4 categories, in which the most 2 important categories include protection forests (upstream forests, wind and sand shield forests, wave shield forests and environmental protection forests) and special forests (for nature conservation, standardization for national forest ecology, genetic resource, for scientific research, tourism, entertainment and protection). Special forests are also can be divided into national forests, nature parks (nature conservation and species conservation), landscape parks (conservation of historical and cultural heritage forests); research and experimental forests.

There are three main principles in development and utilization of special forests: (a) to ensure the natural development and protection of biodiversity and landscape; (b) national parks and nature conservation parks should be defined into strictly protected areas, ecological rehabilitation areas, service and administration areas ands buffer zones; (c) all activities in special forests must be permitted by forest owners and follow forest management regulations.

Decree 14/CP dated December 5th 1992 of the Government defines punishments of violations of forest protection and management regulation. There are 14 violation acts that should be punished such as forest destruction and illegal exploration, violation of fire prevention and extinguishment; damages to the forest environment, illegal buying and storage of forest products etc.

*In **Decree 26/CP*** dated April 26th 1996 on punishment of violation of the law on environmental protection, 2 violation acts related to forest protection had been mentioned such as violation of biodiversity and nature conservation protection and violation of exploration and trade rare species (Article 7 and Article 8).

On June 25th 2004, the Government established Decree No 139/2004/N§-CP on punishment of administrative violation in forest protection and management and forest products management. This Decree has taken effect since July 21st 2004. According to the Decree, the highest punishment fees are 30 million VND and the prescription is one year since the violation act takes place. Punishments include warning, maximum punishment fees 30 million VND, revoking of permission, confiscation of forest products, means and payment for afforestation.

3.1.2.4. Nature and biodiversity conservation parks

Establishment of protected parks is an effective measure in biodiversity conservation. Nature conservation parks (special forests, wetlands protection areas and marine conservation areas etc.) are established under the Law on Environmental Protection, Law on Land, Law on Forest Protection and Development and Law on Aquaculture.

Article 4, 7, 15, 49 and 50 in the Law on Forest Protection and Development define the establishment and management of special forest.

- Decision No 192/2003/QD-TTg on the appraisal of the strategy on management of nature conservation systems in Vietnam to 2010

This Decision was promulgated by the Prime Minister on September 17th2003. Development, activities and management mandate of nature conservation systems in Vietnam are defined in the Decision. In 2003, list of established nature conservation parks to 2010 was developed by Forest Guarding Agency-Ministry of Agriculture and Rural Development and submitted to the Government. If the list is approved, number of special forests in Vietnam will be 121, in which there will be 27 national parks, 57 nature conservation areas and 37 historical and cultural areas with the total area of 2 518 339 ha.

- Wetlands protection areas

Wetlands have particular ecologies, high biodiversity and function as the retention areas for water resources and maintain ecological balance.

Decree No 109/2003/ND-CP on protection and sustainable development of wetlands

Based on Law on Environmental Protection (1993), Law on Land (1993, 1998 and 2001), Law on Water Resources (1998), Law on Forest Protection and Development (1991) and State Law on Protection and Development of aquatic products (1989), the Government established Decree No 109/2003/ND-CP on protection and sustainable development of wetlands on September 23rd 2003 and followed by Circular No 18/2004/QD-BTNMT dated April 2nd 2004 of Ministry of Natural Resources and Environment providing guidance for enforcement of Decree No 109/2003/ND-CP.

In Decree No 109/2003, organizations and individuals have activities in the wetlands should obey regulations on protection and sustainable development of wetlands defined in this Decree.

Article 12 defines that protected areas of wetlands should be determined. Wetland protection areas should be established such as RAMSAR parks, nature conservation parks etc. Wetland protection areas should be strictly protected; people migration from outside is prohibited; construction of projects that have large effects on the protected areas should be banned (Article 14).

According to this Decree, the prohibited acts include forest destruction; activities that change and damage nature, ecology; pollution and degradation of wetlands, exploration of aquatic products at the breeding and nursing young off springs; construction and exploration at the young warp where wetland forest regenerates naturally; discharge of wastes containing hazardous substances into the wetland areas and activities that harm the communities at wetlands and surrounding areas.

In Circular No 18/2004/QD-BTNMT dated April 2nd 2004 of Ministry of Natural Resources and Environment providing guidance for enforcement of Decree No 109/2003/ND-CP, it defines that

there should be management regulations for each wetland protection area including prohibitions, management and development measures, development of functional areas and buffer zones, management of tourism, scientific research and other activities in the wetland protection areas.

To 2006, inventory and planning of protection and sustainable development of wetlands in the whole country should be completed. Besides, it is necessary to make zoning of protected wetlands and establish new wetland protection areas for national and international endangered wetlands and adjust the boundary of existing protection areas.

- Conservation areas of inland water and marine

To manage the aqua environment, the Government made planning of conservation areas of inland water and marine (national parks and conservation areas) – Law on Aquaculture No 17/2003/QH11, approved by the Parliament on November 26th 2003).

3.1.2.5. Air and radiation safety

State law on radiation control and safety 1996

Radiation safety is an important issue in utilization of nuclear power and ionization. To improve radiation safety, the country Chairman had signed State law on radiation control and safety on June 25th 1996.

The state law includes 8 chapters and 38 articles:

- Chapter I: General provisions
- Chapter II: Radiation safety
- Chapter III: Responsibilities in radiation incidents
- Chapter IV: Information, registration and permission
- Chapter V: Administration on radiation control and safety
- Chapter VI: Inspection on radiation control and safety
- Chapter VII: Punishments and rewards
- Chapter VIII: Implementation provisions

3.1.3. Environmental protection in economic sectors

3.1.3.1. Electricity

Law on Electricity 2004, approved on December 3rd 2004

In this law, electricity planning and investment, electricity saving, market, rights and responsibilities of organization and individuals in electricity development and utilization, protection of electric equipment, construction and safety are defined.

There are 10 chapters and 70 articles in the law. Chapter I – General provisions; chapter II- Development planning and investment in electricity; chapter III – Saving in electricity generation, transference, distribution and utilization; chapter IV – Electricity market; chapter V – Permit for electricity activities; chapter VI – Rights and responsibilities of electricity agencies and customers; chapter VII – Protection of electric equipment, construction and safety; chapter VIII – Electricity for rural, mountainous and island areas; chapter IX – State administration on electricity activities and utilization; chapter X – Implementation provisions.

Concerning electricity activities and the environment, Article 7, Term 8 defines that all acts violating the protection of national grid corridor and the safe distance of electric lines and stations should be strictly prohibited. Article 11, Term 2 defines that electricity project developers are responsible for conformation of investment, construction and environmental protection legislation. One condition for granting operation permit is that the environmental impact assessment (EIA)

should be carried out and EIA reports are approved by the relevant governmental authorities (Article 33, Term 3).

3.1.3.2. Construction

- Law on Construction 2003

Law on Construction which consists of 9 chapters and 123 articles was approved by the Parliament of the Socialist Republic of Vietnam on November 26th 2003. The law defines regulations on construction activities, rights and responsibilities of organization and individuals who invest and carry out construction activities.

According to Article 4, Term 1, major principle in construction is to ensure the construction follow planning and design, ensure aesthetic view, environmental protection and landscape protection, suit with natural and social conditions at the local areas. It is strictly prohibited all acts transgress protection corridor of transport, irrigation works, dykes, energy works and historical, cultural heritages. It is also prohibited to construct at the area having land slide or floods.

- Ordinance on environmental protection in construction sector**:** Decision No 29/1999/QD-BXD dated October 22nd1999 of Minister of Construction in establishment of Ordinance on environmental protection in construction sector.
- Circular of Ministry of Construction No 10/2000/TT-BXD dated August 8th 2000: Guidance on making EIA reports for construction planning projects.
- Joint Circular No 01/2001/TTLT-BKHCNMT-BXD: Guidance on environmental protection for site selection, construction and operation of landfills.

3.1.3.3. Transport and tourism

- Ordinance on environmental protection in transport sector**:** Decision No 2242QD/KHKT-PC dated September 9th 1997 of Minister of Transport in establishment of Ordinance on environmental protection in transport sector.
- Ordinance on environmental protection in tourism sector**:** Decision No 02/2003/QD-BTNMT in establishment of Ordinance on environmental protection in tourism sector.

On July 29th2003, Minister of Natural Resources and Environment issued Decision No 02/2003/QD-BTNMT in establishment of Ordinance on environmental protection in tourism sector. According to this Decision, construction of tourism sites should be harmonized with the landscape and surrounding environment. Organizations and individuals should reserve a proper green areas and water surface in the tourism site. It is prohibited to cause erosion, land slide and spilling of construction materials during the construction of tourism sites at the sea, beaches, lakes, rivers and streams.

3.1.3.4. Aquaculture

- Law on Aquaculture, No 17/2003/QH11 dated November 26th 2003

Objects and effecting scope of the Law on Aquaculture include aquaculture activities of organizations and individuals at mainland, islands, internal water, sea territories, economic privilege areas and continent bench of the Socialist Republic of Vietnam. The law consists of 10 chapter and 62 articles, in which the protection and development of aquatic products are mentioned in Article 7 to 10, chapter II. Closely related to the Law on Environmental Protection, Article 7 defines that all organizations and individuals are responsible for protection of the habitats of aquatic species, activities affecting the habitats, migration and breeding of aquatic species should conform the Law on Environmental Protection and the Law on Water Resources and EIA reports should be carried out for those activities.

3.1.4. Health, culture and society

3.1.4.1. Law on Protection of citizens' health

NA

3.1.4.2. Cultural heritages

The Law on Cultural Heritages, 26-9-2001, includes 7 chapters and 74 articles. Cultural heritages consist of material and immaterial heritages. They are the spiritual and material products that have great value in culture and history passing from one generation to another.

Based on historical, cultural and scientific value, historical and cultural heritages and famous sight seeing are assessed and ranked as local, national and international class. Ranked heritages should be protected. The Law on Cultural Heritage prohibits all acts that distort, destroy or endanger cultural heritages and transgress the heritage land. (Article 13).

3.1.4.3. Migration and minorities' people (?)

3.1.5. Environmental Standards, tax and fees

3.1.5.1. Vietnam Environmental Standards

On June 25th 2002, former Minister of Science, Technology and Environment established Decision No 35/2002/QD-BKHCNMT in publishing a list of obligatory Environmental Standards. There are 31 Standards concerning air quality, water quality, soil quality, noise and vibration. Permitted levels of gas emissions, wastewater, noise by traffics, noise at the public and residential areas, vibration and shake in construction and industrial production, pesticide contamination in soil etc. were set.

3.1.5.2. Environmental Standards in Construction Sector

Decision No 27/2002/QD-BXD dated 23/9/2002 of the Minister of Construction in establishment Vietnam Construction Standards 282-2002: Air at working place; Standards for dust and air pollutants in industry and asbestos products.

Decision No 35/2001/QD-BXD dated 26/129/2001 of the Minister of Construction in establishment Vietnam Construction Standards 261- 2001: Landfill- Design Standards.

Decision No 22/1999/QD-BXD dated 28/7/1999 of the Minister of Construction in establishment Vietnam Construction Standards for selection criteria of surface and underground water for domestic use.

3.1.5.3. Vietnam Red Book 1992

Vietnam Red Book is a national document and has international importance. In this book, there are lists of rare species, which are in danger of degradation or extinction that need to be protected, rehabilitated and developed. It is the scientific base and legal base for recommendation of protection and rehabilitation measures for mentioned species and for punishment of destruction activities.

3.1.5.4. State law No 05/1998/PL-UBTVQH10 on resource tax

In 1998, in order to renovate the economic management mechanisms for protection, exploration and utilization resources properly, for environmental protection and ensure the income of State budget, Standing Committee of the national assembly issues State law No 05/1998/PL-UBTVQH10 on resource tax (adjustment). This is the resource policy in operation in Vietnam. The main contents of the law are described below.

Objects of resource tax are organizations and individuals who explore natural resources at mainland, islands, internal water, sea territories, economic privilege areas and continent bench of the Socialist Republic of Vietnam (including metal resources, non metal resources, soil, mineral

water, natural hot streams, oil and gas, natural forest products, natural aquatic products, natural water and other resources). Resource tax is calculated based on the actual explored resource commodities productivity.

Resource tax income is distributed based on percentage of different levels of the local budget. Resource tax income from oil and gas contributes to the state budget.

By establishing resource tax, the positive effects on resource exploration are created. Moreover, resource users also show positive changes in their behaviors since the tax is internalized in resource prices. Resource tax helps encouraging saving and proper exploration of resources and creates an income for state budget to reinvest in environmental and resource protection and development.

3.1.5.5. Decree 36 on wastewater fees

Fees are the income of state budget for compensation of expenses in construction, buying, maintenance and management of properties, resources or national sovereignty to serve organizations, individuals in non-productive activities and public activities. *Charges* are the income of state budget for state administration and judiciary according to the relevant regulations (State law 38/2001).

Wastewater fees

Legal base for economic instruments in general and environmental protection fees includes: Law on Environmental Protection (1993), Decree 175/ND-CP Guidance for Enforcement of the Law on Environmental Protection (Article 8, 32, 33, 34), State law on fees and charges No 38/2001/PL-UBTVQH of Standing Committee of National Assembly (28/8/2001) and Decree No 57/2002/ND-CP of the Government (3/6/2002) on specifications in fees and charges enforcement.

In the State law on fees and charges No 38/2001/PL-UBTVQH of Standing Committee of National Assembly (28/8/2001) and Decree No 57/2002/ND-CP, lists of environmental protection fees are defined including wastewater fees. Followed Decree No 57/2002/ND-CP, on June 13th 2003, Decree No 67/2003/ND-CP on environmental protection fees for wastewater including 3 chapters and 18 articles was established. On December 18th 2003, Ministry of Finance and Ministry of Natural Resources and Environment had issued joint Circular No 125/2003/TTLT-BTC-BTNMT guidance for enforcement of Decree No 67/2003/ND-CP.

The main contents of Decree No 67/2003/ND-CP and Circular No 125/2003/TTLT-BTC-BTNMT is specifications of objects and effecting sphere and the fees rates for wastewater.

Table 3.1. Fees rates for industrial wastewater based on pollutants

No	**Pollutants in wastewater**		**Fees rate** *(VND/kg* of pollutants in wastewater)			
	Name		RE A	RE B	RE C	RE D
1	Biochemical oxygen demand	A_{BOD}	300	250	200	100
2	Chemical oxygen demand	A_{COD}	300	250	200	100
3	Total suspended solids	A_{TSS}	400	350	300	200
4	Mercury	A_{Hg}	20000000	18000000	15000000	10000000
5	Lead	A_{Pb}	500000	450000	400000	300000
6	Arsenic	A_{As}	1000000	900000	800000	600000
7	Cadmium	A_{Cd}	1000000	900000	800000	600000

** RE: Receiving environment*

Objects and effecting sphere: industrial and domestic wastewater excluding wastewater from hydro power plants, salt production, domestic wastewater from households that have subsidies

from the Government, domestic wastewater in rural areas and areas without clean water supply. Industrial wastewater is the wastewater that comes from industrial enterprises such as food factories, agricultural, forest and aquatic products processing factories, slaughter houses, breweries and beverages factories, leather tanning and reprocessing factories etc.

Relating to the fees rates, wastewater is classified into 2 categories and fees rates based on (a) For domestic wastewater, fees are calculated based on percentage of the price of $1m^3$ clean water (maximum rate should not be more than 10% of the water supply price excluding Value Added Tax). At the areas without clean water supply, the fees are based on average consumption per capita and the price of clean water in communes and wards; (b) For industrial wastewater, the fees are calculated based on pollutants in wastewater including BOD, COD, TSS, Hg, Pb, As and Cd.

Total amount of wastewater is estimated in a certain period of time (one day, one month, a year). Fees rates also depend on receiving environment. According to joint Circular, receiving environment can be classified into 4 categories (A, B, C, D), based on the ranking of urban areas (Class I to IV) and rural areas.

Decree No 121/2004/ND-CP dated 12-5-2004 of the Government on punishment of administrative violation in environmental protection

According to Decree No 121/2004/ND-CP dated 12-5-2004 of the Government on punishment of administrative violation in environmental protection, the maximum punishment fees is up to 70 million VND applied for wastewater discharge, gas emissions discharge and solid waste disposal, transport and treatment of wastes containing radio activity that exceeds the permitted levels.

Violation of regulations on registration for meeting environmental standards will be warned or punished by paying the fees from 500 000 – 1 000 000 VND, the violation inside industrial parks can be punished by paying 3 to 5 million VND.

Punishment fees range from 2 to 5 million VND for activities that make noise and vibration exceed the permitted levels from 22p.m to 6a.m.

Punishment fees range from 10 to 20 million VND for importing toxic technology and chemicals, genetic modified organisms and banned products.

Punishment fees range from 15 to 30 million VND for exploration at the nature conservation areas.

The Decree also defines punishment frame for emergency cases and unexpected incidents or the violation of unconscious individuals.

Decree No 34/2005/ND-CP dated 17/3/2005 of the Government on punishment of violation of the regulations on water resources.

3.2. LIST OF LEGAL DOCUMENTS RELATING TO THE ENVIRONMENT

3.2.2. Legal documents in environmental sectors

- Law on Environmental Protection issued on 21/12/1993
- **National Environmental Protection Strategy to 2010 and orientation to 2020** and Decision No 256/2003/QD-TTg dated 02/12/2003 of the Government in appraisal of National Environmental Protection Strategy to 2010 and orientation to 2020
- **Strategy on Management of Vietnam Nature Conservation Systems to 2010** and Decision No 192/2003/QD-TTg dated 17/9/2003 of the Government in appraisal of Strategy on Management of Vietnam Nature Conservation Systems to 2010
- **Vietnam's Action Plan on Biodiversity (approved by Decision No 845-TTg dated 22/12/1995 of the Prime Minister)**

Decree No 109/2003/ND-CP dated 23/9/2003 of the Government in conservation and development of wetlands and the Circular guidance for enforcement of Directive No 359/1996/CT-TTg dated 29/5/1996 of the Prime Minister on emergency measures for protection and development of wildlife

- **Law on Land promulgated on 26/11/2003**
- **Law on Forest Protection and Development, amended on 14/12/2004**

Decree No 18/HDBT dated 17/1/1992 of the Ministerial Council on list of rare fauna and flora and protection mechanism

- **Law on Water Resources**

Decree No 34/2005/ND-CP dated 17/3/2005 of the Government on punishments of violation of the law on water resources

Decree No 149/2004/ND-CP dated 27/7/2004 of the Government on permission grant for exploration, utilization and discharge into water sources.

- **Law on Mineral Resources (20-3-1996) and the amended Law on Mineral Resources dated 27/6/2005**
- **Decree No 68-CP dated 01-11-1996 of the Government on enforcement of the Law on Mineral Resources.**

Decree No 63/2000/QD-BCN of Minister of Industry on conditions of organizations and individuals exploring mineral resources.

Joint Circular No 01/2003/TTLT-BCN-BTNMT dated 29/10/2003 of Ministry of Industry and Ministry of Natural Resources and Environment providing guidance for transference of state administration on mineral resources.

Directive No 10/2005/CT-TTg dated 15/4/2005 of the Prime Minister on strengthening of state administration on exploration, procession and export of mineral resources.

- **Law on Oil and Gas 06/7/1993 and amended law 09/6/2000**

Decree No 48/2000/ND-CP dated 12/9/2000 of the Government on enforcement of Decision No 116/2001/QD-TTg dated 02/8/2001 of the Prime Minister on incentives in foreign investment in oil and gas activities. Decree No 34/2001/ND-CP on Regulations of bidding of oil and gas exploration projects

- **Law on Protection of Citizens' health**
- Decree No 68/2005/ND-CP dated 20/5/2005 on chemical safety

- Decree No 1329/2002/BYT/QD dated 18/4/2002 of Minister of Health on Foods Hygiene Standards
- **State law on radiation safety and control (**25-6-1996)
- **Circular No 2891-TT/KCM dated 19/12/1996 of the former Ministry of Science, Technology and Environment on environmental protection at Ha Long Bay.**

3.2.2. Legal documents in economic sectors

Law on Construction 26/11/2003

- Decision of Minister of Construction No 29/1999/QD-BXD dated 22/10/1999 in establishment of Ordinance on Environmental Protection in Construction sector.
- Decision No 27/2002/QD-BXD dated 23/9/2002 of the Minister of Construction in establishment Vietnam Construction Standards 282-2002: Air at working place; Standards for dust and air pollutants in industry and asbestos products.
- Circular of Ministry of Construction No 10/2000/TT-BXD dated August 8th 2000: Guidance on making EIA reports for construction planning projects.
- Joint Circular No 01/2001/TTLT-BKHCNMT-BXD: Guidance on environmental protection for site selection, construction and operation of landfills.
- Decision No 35/2001/QD-BXD dated 26/129/2001 of the Minister of Construction in establishment Vietnam Construction Standards 261- 2001: Landfill- Design Standards.
- Decision No 22/1999/QD-BXD dated 28/7/1999 of the Minister of Construction in establishment Vietnam Construction Standards for selection criteria of surface and underground water for domestic use.

Law on Electricity 03/12/2004

- Decree No 95/2001/QD-TTg on appraisal of Vietnam's electricity development planning period 2001-2010 orientation to 2020
- Decree No 45/2001/N§ -CP on electricity activity and utilization

Law on Oil and Gas 06/7/1993 and amended law 09/6/2000

- Decree No 48/2000/ND-CP dated 12/9/2000 of the Government on enforcement of Decision No 116/2001/QD-TTg dated 02/8/2001 of the Prime Minister on incentives in foreign investment in oil and gas activities.
- Decree No 34/2001/ND-CP on Regulations of bidding of oil and gas exploration projects

Transport sector

- Decision No 35/20052005/QD-BGTVT dated 21/7/2005 of Minister of Transport in quality and safety checking and environmental protection for imported cars
- Ordinance on Environmental Protection in Transport sector
- Decision No 2242QD/KHKT-PC dated September 9th 1997 of Minister of Transport in establishment of Ordinance on environmental protection in transport sector.
- Joint Circular No 12/2005/TTLT-BTM-BTNMT-BGTVT dated 08/7/2005 providing guidance for marine safety in oil supply for ships.
- Decision No 34/2005/QD-BGTVT dated 21/7/2005 of Minister of Transport in quality, safety checking and environmental protection in car production and assembly
- Decision No 3155/1999/QD-BGTVT dated 12/11/1999 in temporary technical and environmental standards for vehicles and equipment used in construction of road

Agricultural sector

- State law of Standing Committee of National Assembly on protection and quarantine of vegetations dated 25/7/2001
- Decision No 17/2001/QD-BNNPTNT dated 06/3/2001 of Minister of Agriculture and Rural Development in list of permitted, restrict used and banned pesticides in Vietnam
- Decree No 78/1996/ND-CP of the Government on punishment of violation of regulations of protection and quarantine of vegetations

Aquacultural sector

- Directive No 01/1998/CT-TTg dated 02/1/2998 of the Prime Minister on prohibition of explosives, electricity and toxic substances in fishing
- Decree No 187-TS/QD dated 27/6/1991 of Minister of Aquaculture on protection of aquatic products.
- Decision No 02/2003/QD-BTNMT of Minister of Natural Resources and Environment in establishment of environmental protection ordinance in tourism.

International conventions on environmental protection ratified by Vietnam

- Convention on wetlands having international importance (RAMSAR) (20/9/1988).
- Supplement Protocol on wetlands having international importance and being habitats of water birds, Paris, 1982.
- Convention on protection of natural and cultural heritages
- Convention on trade of endangered species (20/1/1994)
- Convention on prevention of pollution caused by ships MARPOL (29/8/1991).
- United Nations' Convention on Environmental changes (26/8/1980).
- Vienna Convention on protection of the ozone layer, 1985 (26/4/1994).
- Basel Convention on control of Tran boundary transport and disposal of hazardous wastes (13/5/1995).
- United Nations' Frame Convention on Climate change, 1992 (16/11/1994).
- Convention on Biodiversity, 1992 (16/11/1994).

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