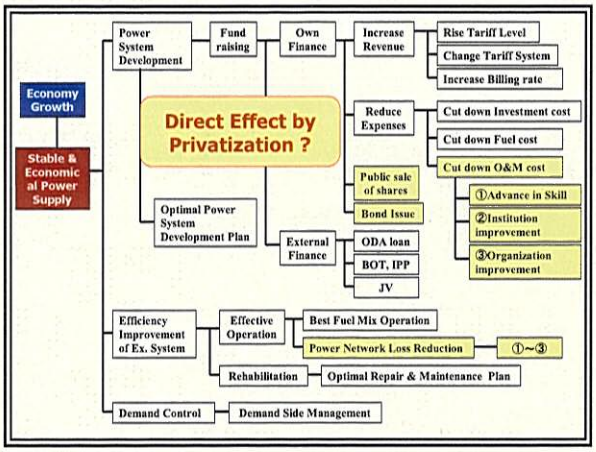
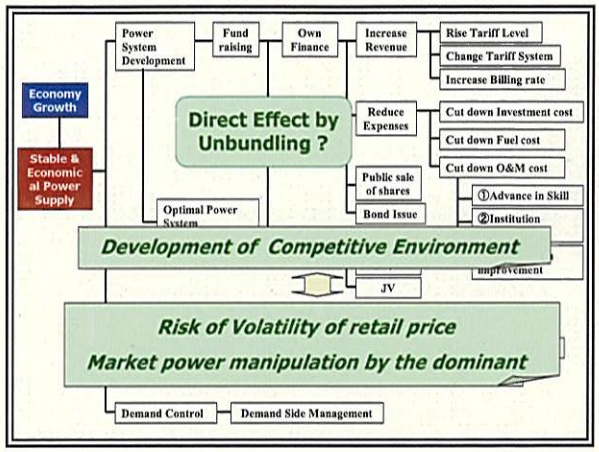
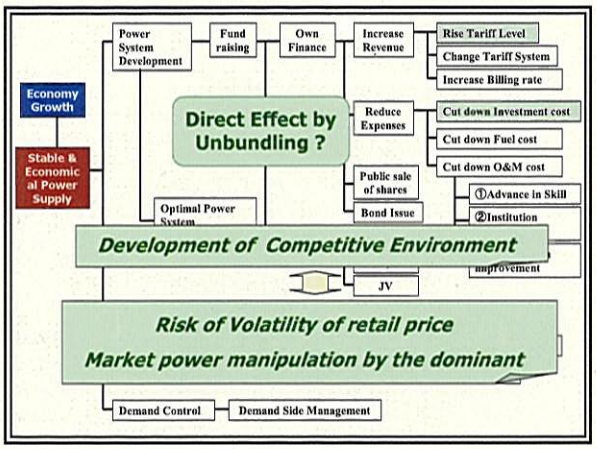
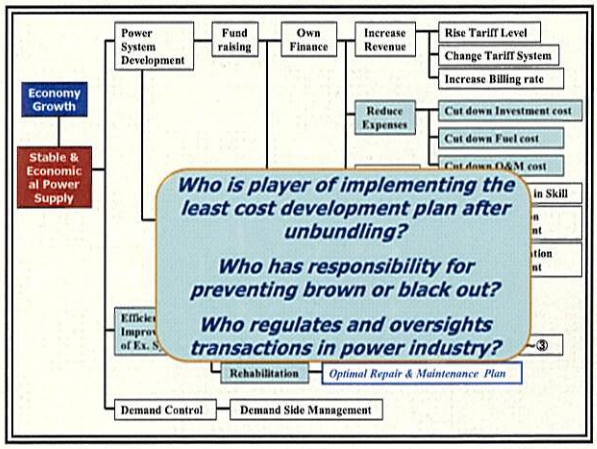




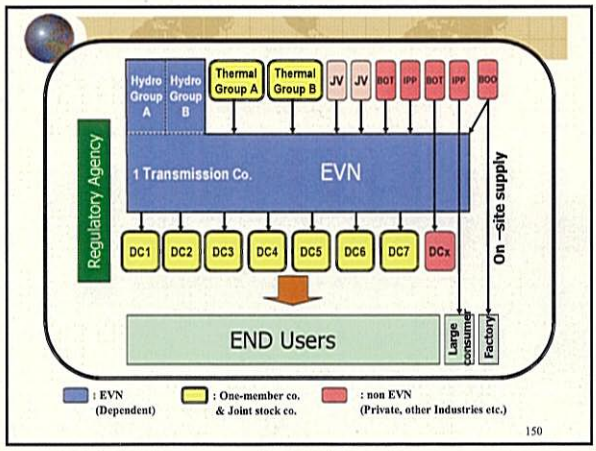




Structural & Institutional Reform in Vietnam

- Horizontal unbundling
  - Generation subsector
  - Transmission subsector
  - Distribution subsector
- Establishment of Regulatory Agency
  - Formulate electricity power development M/P
  - Set up electricity retail price
  - License electricity activities to organizations
  - And so on

149



150

Privatization and Unbundling

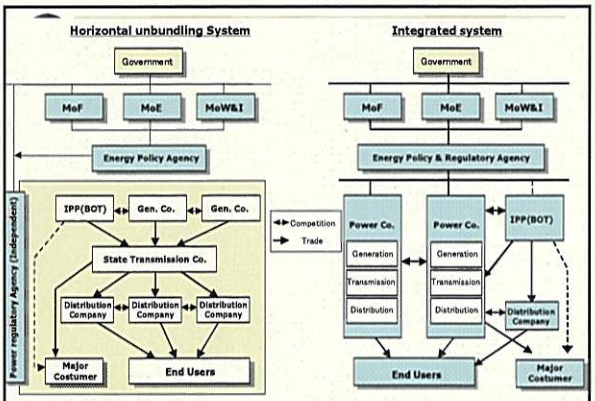
- Principle of market mechanism is hard to work under the current unbundling manner
  - Generation companies have been established by plants which generation costs differ and distances from power demand centers and fuel sources differ.
  - Distribution companies based on region have been established. However, Vietnam policy is to maintain uniform tariffs across all distribution companies even though distribution costs differ and the customer mix differs.

151

Privatization and Unbundling

- Integrated system is maintained in Japan
  - Power industry has close relationships of technology between ups and downs subsectors
  - It can avoid unprofitable overlaps such as overhead cost of every subsector and save costs
  - It is clear the locus of power supply responsibility

152



153

Electricity tariffs

- Building norms for setting the electricity tariffs
- Introduction of time-of-day and seasonal tariff system
- Introduction of two-part pricing

154

Introduction of time-of-day and seasonal tariff system

- Time-of-day and seasonal tariff system reflecting the differrnet generation cost of time should be applyed
- These System can be of assistance for the demand control (DSM)

155

Introduction of the two-part pricing

- Two-part pricing has many advantages over single pricing
- Advantages:
  - *Easy to recover invested capital*
  - *Easy to set rational tariffs with reflecting the gap of capacity factor by plants*
  - *The more energy consumption is, the cheaper the unit price per kWh under the same capacity contract is*

156

End of Session

Thank you for your attention!

157

The Study on National Power Development Plan for the period of 2006-2015, perspective up to 2025 in Vietnam

Environmental and Social Considerations

December 2005

Japan International Cooperation Agency (JICA)

Tokyo Electric Power Co., Inc. (TEPCO)
Tokyo Electric Power Service Co., Ltd. (TEPSCO)

Scope of the Study

1. **Study Result**
   (1) Result of Initial Environmental Study
   (2) Analysis on the Study Result
   (3) Selection of Important Points
2. **SEA**
   (1) Energy Development Policy
   (2) Study on the Alternatives
   - **Discussion on the Social Impact**
   - **Discussion on the Natural Environmental Impact**
3. **Conclusions**

159

(1) Initial Environmental Study

Contents of the Study & Study Method

- Number of Candidate Sites
  97 sites { 71 sites + 26 Additional sites
- Number of Studied Candidate Sites
  65 sites { 37 HPP, 26 TPP, 2 NPP

160

(1) Initial Environmental Study

Study Items (1)

- **[Socio-environmental Items]**
  - Minorities / Ethnic People, Weakness / Gender, Involuntary Resettlement
  - World Heritage, Cultural Asset
  - Scenery
  - Life (Agriculture, Fishery, Water utilization / Water Rights)
  - Others (Isolation and / or splitting)

161

(1) Initial Environmental Study

Study Items (2)

- **[Natural Environmental Items]**
  - Ecology (Flora and Fauna, Biodiversity)
  - Migration
  - Topography, Geography
  - National Park, Reserved Area
  - Costal Zone
  - Hydrological Situation
  - Meteorology, Climate Change / Global Warming

162

(1) Initial Environmental Study

Study Items (3)

- **[Pollution Items]**
  - Air Quality Pollution
  - Water Quality Pollution
  - Soil Contamination
  - Noise
  - Vibration
  - Land Subsidence
  - Bad Smell
  - Solid Waste / Hazardous Waste

(1) Initial Environmental Study

Environment Impact			Class of Power Development / Weight	Hydro Power Generation: CHFP	Thermal Power Generation: PFP, Coal Gene.	Thermal Power Generation: Gas Gene.	Nuclear FP	Remark
Socio-environment	Inhabitant	Minorities						Possibility for isolation and / or splitting, how many & in the group?
	Involuntary Resettlement	Large Scale (> 1,000 families)						
		Middle Scale (- 100 families)						
		Small or non (< 100 families)						
	Cultural Heritage/Asset							
	Scenery							
	Life	Agriculture						
		Fishery						
		Water Utilization						
		Others						Isolation of Local Area/Road
Natural environment	Ecology (Upper-stream)	Terrestrial	Fauna					
			Flora					
			Insects/Microbe					Breaking influences of isolation and / or splitting by construction of access road, water intake channel, water reservoir etc.
		Aquatic	Flora					
			Fauna					
	Ecology (Down-stream)	Terrestrial	Fauna					
			Flora					
			Insects/Microbe					Breaking influences of isolation and / or splitting by construction of access road, water intake channel, water reservoir etc.
		Aquatic	Flora					
			Fauna					
	Topography/ Geology							
	Migration							What kind, how many and to where?
	Reserved/Park Area							
	Meteorology/Climate Change							Forest Decrease/Desertification
Pollution	Air Quality							
	Water Quality							
	Soil Contamination							
	Noise							
	Vibration							
	Land Subsidence							
	Bad Smell							
Waste								Solid, Hazardous
Notes			3 High				a:	Considerable serious environmental impact
			2 Middle				b:	Less environmental impact
			1 Low				c:	No environmental impact

(1) Initial Environmental Study

a. Summary of Initial Environmental Study (TPP)

Summary table: Class of Power I

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 / Wag ht	Rank / Wag ht	Rank / Wag ht	Rank / Wag ht	Rank / Wag ht	Rank / Wag ht	Rank / Wag ht	Rank / Wag ht
Socio-environment	Inhabitant	Minorities		c/c	c/c	c/c	c/c	c/c	a/b	b/b	c/c
		Weakness s/Gender		b/b					NA	NA	NA
	Involuntary Resettle	Large Scale (>									
		Middle Scale (>									
		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	Agricultur e		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)	Terrestria l	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/M	c/c	b/b	b/b	c/c	b/b	NA	NA	b/b
		Aquatic	icrobe	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	b/b	c/b	c/b	b/b	a/b	b/b	b/a

(1) Initial Environmental Study

b. Summary of Initial Environmental Study (HPP)

Summary Table: Class of Power Develops

Class of Power Development*			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Area												North Region					
Type			H	H	H	H	H	H	H	H	PS	PS	H	H	H	H	H
Project code			23	27		23	19				39	62	12,22	30	24	26	
Environmental Impact																	
Capacity (MW)			210	1200	2060		64	173	180	340	1000	1000	520	30	41	68	144
Year construction / operation																	
Evaluation Criteria			Rat	Wa	Rat	Wag	Rat	Wa	Rat	Wa	Rat	Wa	Rat	Wag	Rat	Wa	Rat	Wa	Rat	Wa	Rat	Wa	Rat	Wa	Rat	Wa	Rat	Wa	Rat	Wa
Socio-environment	Inhabitant	Minorities	n/b		n/a		n/a		n/a		n/a		n/b		n/a		n/b		n/a		n/b		n/a		n/b		n/a		n/b	
		Weakness/Gender	n/b		n/b		n/a		n/b		n/b		n/b		n/a		n/b		n/a		n/b		n/a		n/b		n/a		n/b	
	Involuntary Resettle	Large Scale (>	n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a	
		Middle Scale (>					n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a	
		Small or non (<=																												
	Cultural Heritage/Asset		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b	
	Scenery		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b	
	Life	Agriculture	n/b		n/b		n/a		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b	
		Fishery	n/b		n/b		n/a		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b	
		Water Utilization	n/b		n/b		n/a		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b		n/b	
		Others/Rec			n/b																									
Natural environment	Ecology (Upper-stream)	Terrestrial	Fauna	n/b		n/b		n/b		n/b		n/b		n/b		n/a		n/b		n/b		n/b		n/a		n/b		n/b		n/b	
			Flora	n/b		n/b		n/a		n/b		n/b		n/b		n/a		n/b		n/b		n/b		n/a		n/b		n/b		n/b	
		Aquatic	Insect/Mic	n/b		n/b		n/a		n/b		n/b		n/b		n/a		n/b		n/b		n/b		n/a		n/b		n/b		n/b	
			Flora	n/b		n/b		n/a		n/b		n/b		n/b		n/a		n/b		n/b		n/b		n/a		n/b		n/b		n/b	
			Fauna	n/b		n/b		n/a		n/b		n/b		n/b		n/a		n/b		n/b		n/b		n/a		n/b		n/b		n/b	
	Ecology (Down-stream)	Terrestrial	Fauna																											
			Flora																											
		Aquatic	Insect/Mic																											
			Flora																											
			Fauna																											
	Topography/Geology		n/b		n/b		n/b		n/b		n/b		n/b		n/a		n/b		n/b		n/b		n/a		n/b		n/b		n/b	
	Migration		n/b		n/c		n/b		n/b		n/b		n/b		n/a		n/b		n/b		n/b		n/a		n/b		n/b		n/b	
	Reserved/Park Area		n/b		n/b		n/b		n/b		n/b		n/b		n/a		n/b		n/b		n/b		n/a		n/b		n/b		n/b	
	Coastal Area																													

(2) Analysis on the Study Result

Evaluation Methodology

$$E_I = \sum_{i=1}^{m} (Vi)I\ Wi$$

In which:

- E_I : environmental impact
- (Vi)I : quality value of the category "i" environmental parameter of the project 'I'
- Wi : weight of the category "i" factor
- m : sum of factors

(2) Analysis on the Study Result

a. Result of Evaluation (TPP)

No.	Plant/project code	Project/Plant	Total adverse impact (Construction phase)	Total adverse impact (Operation phase)
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

(2) Analysis on the Study Result

b. Result of Evaluation HPP

No.	Plant / project code	Project/Plant	Total adverse impact (Construction phase)	Total adverse impact (Operation phase)
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 JNS	92	85
19	59	New PSPP No 1 JN	102	65

169

(2) Analysis on the Study Result

b. Result of Evaluation HPP (continue)

No.	Plant / project code	Project/Plant	Total adverse impact (Construction phase)	Total adverse impact (Operation phase)
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	44

170

(2) Analysis on the Study Result

c. Priority Selection (TPP)

Plant/project code	Projects/Plants	Priority order
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

171

(2) Analysis on the Study Result

d. Priority Selection HPP

Plant/project code	Projects/Plants	Priority order
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 JNS	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

(3) Selection of Important Points

Sum of the Study Result

As the result of summarize of the check list,

- **higher rank (which have smaller impact) 1st to 16th candidate sites → HPP**
- **middle rank 17th to 31st sites → mix of HPP and TPP**
- **lower rank (which have bigger impact) under 32nd → TPP**

173

(3) Selection of Important Points

The most serious impacts

[HPP]

Social environment impact

- **Inhabitants**

[TPP] **Ethnic minorities, The week, Gender**

Natural environment impact

- **Meteorology/Climate change**

Pollution

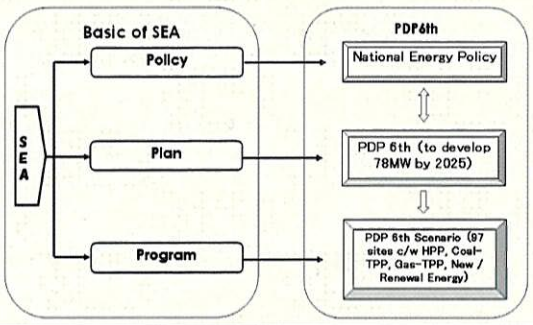
- **Air pollution**

174

2. SEA

SEA in the PDP 6th.

Relation between PDP6th and SEA



2. SEA

(1) Energy Development Policy

- To develop energy resources and to keep energy security with protection of natural resources and environment.
- To transit energy sector to competitive energy market.
- To propel export / import of energy resources.
- To promote international cooperation and introducing foreign investment.
- To develop energy along with international environmental regulation.

176

2. SEA

(1) Energy Development Policy (continued)

- To accelerate introduction of new energy / renewable energy.
- To minimize elasticity (→ energy saving).
- To enforce supply net work.
- To commence national storage of oil.
- To introduce nuclear power plant and increase nuclear power rate.

177

2. SEA

(2) Study on the Alternatives

Return to the summary of the check lists

- On the aspect of the Social Environmental Impact on the Summary of Initial Environmental Study (HPP)
- On the aspect of the Natural Environmental Impact on the Summary of Initial Environmental Study (TPP)

178

2. SEA

(2) Study on the Alternatives

- Alternative I:

  Replace higher 6 ranks of HPP candidate sites which require large number of involuntary resettlements, with other HPP or import HPP.

- Alternative II:

  Replace TPP with import HPP, small HPP or Renewable Energy AMAP.

179

Discussion on the Social Environmental Impact (HPP)

Discussion on the Social Environmental Impact (HPP)

Distribution of Households in Candidate Sites for HPP

Number of Households	>10,000	>2,000	>1,000	>500	<500	Total
Candidate Sites	2	1	5	4	16	34

181

Discussion on the Social Environmental Impact (HPP)

Cost for involuntary resettlement (1)

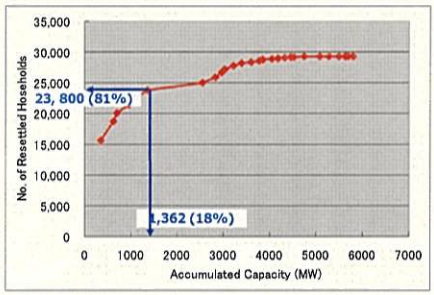
- In the case of 18,897 households involuntary resettlement: VND 545milion / household (US$ 34,500 / household)
- The ratio of the cost for involuntary resettlement in the total construction cost : 40%

182

Discussion on the Social Environmental Impact (HPP)

Discussion on the Social Environmental Impact (HPP)

Accumulated Distribution Curve of Households



184

Discussion on the Social Environmental Impact (HPP)

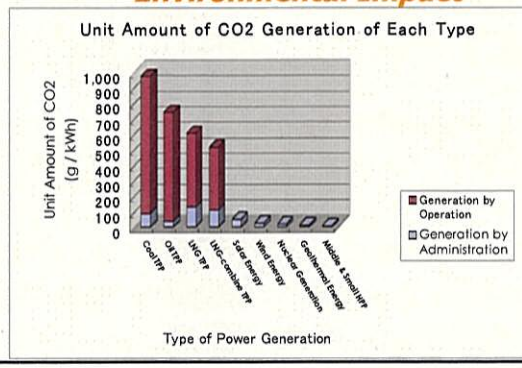
Cost for involuntary resettlement (2)

In case of less than 500 households of involuntary resettlement / site, the rate of the cost will be 5 to 10 % of total construction cost.

185

Discussion on the Natural Environmental Impact (TPP)

Discussion on the Natural Environmental Impact



Discussion on the Natural Environmental Impact (HPP)

Consideration of CO2 absorption Cap.

- CO2 absorption capacity of Rain forest:

100 ~ 150 t-CO2 / ha

(350 t-CO2 / ha)

⇩

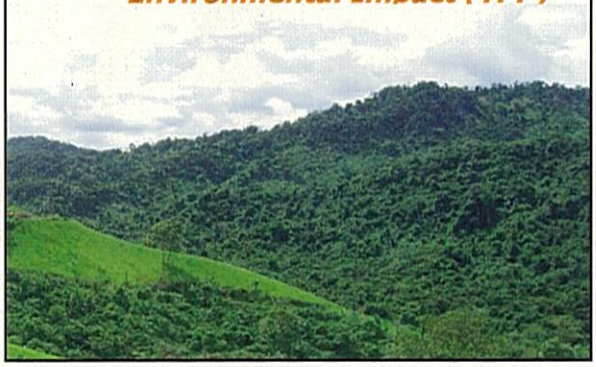
Ex. Son La: 4,500 ha / 2,400 MW

⇩

190 ~ 280 thousand t-CO2 / 1,000 MW

188

Discussion on the Natural Environmental Impact (TPP)



Discussion on the Natural Environmental Impact (TPP)

Estimation of CO2 emission amount

in case of the plant capacity 1,000MW in yearly operation rate 70%

⇩

CO2 = (unit amount [g/kWh]) * 1000 MW * 24 hr * 365 days/ year * 70 %

⇩

= **6 million tons-CO2 / year**

190

Discussion on the Natural Environmental Impact (TPP)

Calculation for CO2 unit price

6 million tons-CO2 / year / 1000MW

⇩

In case of Carbon Credit: US$10 / ton-CO2

⇩

US$ 60 / year/kW

⇩

NPV: US$ 525 / kW (Life Time 25y)

191

Discussion on the Natural Environmental Impact (TPP)

Room for HPP development cost

Generally

- HPP Development cost: US$1,700 / kW
- In case of taking into consideration Carbon Credit:

+

Increase more room as US$ 525 / kW

⇩

- Total: US$ 2,225 / kW (+30%)

192

3. Conclusions

Social and Environmental Consideration Group recommends following two alternatives.

- **Alternative I**: on the view point of social consideration aspect

  Replace higher 6 ranks of HPP candidate sites which require large scale involuntary resettlement, to other HPP or import HPP energy.

- **Alternative II**: on the view point of environmental consideration aspect

  Replace TPP with import to HPP or New Energy as much as possible

193

End of Session

Thank you for your attention!

194

APPENDIX

Appendix JICA Comments on Vietnam Power Development Master Plan No.6

Letter No. JICAST-05/2006

May 24, 2006

Dr. Pham Khanh Toan
Director, Institute of Energy
Electricity of Vietnam
The Socialist Republic of Vietnam

Subject: JICA Comments on Vietnam Power Development Master Plan No.6

Dear Sir,

First of all, I would like to express sincere thanks for your cooperation with JICA Study Team in our works of the Study on National Power Development Plan for the Period of 2006-2025, Perspective up to 2025 in Vietnam. Thanks to your cooperation, the Study has ended successfully.

We received the request letter dated 26 April 2006 from IE for JICA comments on the Final PDP 6th through JICA Vietnam Office. Our comments on the Vietnam Power Development Master Plan No.6 are attached herewith.

We will submit the Final Report to JICA Head Quarter on 30 May 2006 in accordance with the contract with JICA.

Sincerely yours,

Masayuki ITO
Team Leader
JICA Study Team

CC: 1. JICA Head Quarter, Tokyo
2. Resident Representative of JICA Vietnam Office

JICA Comments on Vietnam Power Development Master Plan No.6

May 23, 2006

JICA Study Team

1. Power Demand Forecast and Primary Energy (Chapter 3 and Chapter 4)

(1) GDP Growth Rate

In the section 3.2.3.1 of Chapter3, the original report states Base Case and High Case of Vietnam future economic scenarios. The periods of growth rate of the Cases are not corresponding with those of the previous table of the pre-conditional economic scenarios. It is desirable to homologize them.

(2) Case Name

For forecasting energy demand of table 3-6, the Base Case of the economic scenario is applied to the energy demand forecast of Low Case in JICA study and the High Case of the economic scenario is applied to that of Base Case and High Case in JICA study. Therefore, the case names in Table 3-6 should be modified from 'Base case' to 'Low case' and from 'High case' to 'Base case' respectively.

(3) Unit Conversion Factor

In the section 3.2.3.1 of Chapter3, there are some inconsistency between figures in Table3-7 and those in the sentences. The conversion factor of 0.086 should be applied theoretically to convert from million TOE to Billion kWh.

(4) Peak Demands and Load Curves

Figure 4-1, Figure 4-2 and Table 4-5 to Table 4-9 show Peak Loads and Load Curves of the Low Case. Since in the Chapter of the Power Development Plan, the study results of Base case is mainly described, the peak load in Figure4-1, 4-2 and Table4-5 to Table4-9 should show those of the Base Case.

2. Power Generation Development Plan (Chapter 7)

Final Draft of PDP 6th was rather improved in comparison with the PDP 6th as of January 2006. Main revised points and required further study items are listed as follows.

- Total power generation capacities between year of 2009 and 2015 are reduced at around 1GW every year. In the PDP 6th as of January 2006, the reserve margin between 2009 and 2015 were set at around 20%, while required reserve margin is around 10%, taking into account the risk of progress of some projects behind schedule. The reserve margin during 2009 and 2015 were revised at around 10% and this revised plan can secure appropriate supply reliability. The plan need to be continuously reviewed and revised as needed in line with change of growth rate of power demand and change of progress of each project after completion of the study on PDP 6th.

- While the Draft Final Report of the JICA study was made, total capacity of nuclear power plants of 8,000MW was planned to develop by 2025, the development capacity was reduced to 4,000MW because nuclear power plant is not so economical than imported coal TPP by 2025 and there remains critical issues such as radioactive waste disposal and public acceptance. Upon introducing nuclear power plants, deliberate and comprehensive study on such as nuclear fuel cycle, radioactive waste disposal and decommissioning of reactor need to be continuously carried out.

- In line with the review of production plan of the coal sector, the fuel of Vung Anh coal TPP in the North was changed from imported coal to domestic coal, and the development time of the first unit of imported coal TPP in the North, which unit size is 1GW, was postponed from 2022 to 2023 and total number of units was also reduced from 7 to 5. Accordingly, the total capacity of imported coal TPP developed by 2025 in the North reduced from 10.5GW to 5.0 GW. It is desirable that exploration of coal reserve and improvement of exploitation technology are continuously furthered in view of security of energy supply and restraint of increase of annual generation cost.

3. Power Network Development Plan (Chapter 8)

Construction of a power network system takes a long time and a system component in the power network affects each other. If the power network were planed based on just a short term prediction, there would be risks with constructing excessive and duplicated facilities or with insufficient amount of system. Therefore, making a long term plan is required in order to develop highly reliable and efficient power network system to meet its rapidly growing power demand.

The power network development planning in the PDP 6th can be considered to show the correct direction in the power system configuration. It is advised that technical standards or

grid code should include the methodologies of power network planning described in the PDP 6th to be standardized. Because high transparency of the power network planning methodology would lead to strengthening of the impartial access for independent power producers, and reinforcement of the quasi-pubic roles of power network systems.

Noteworthy points and required further study items are listed as follows.

- While the Draft Final Report of the JICA study was made, the power network development planning had been carried out on the condition that nuclear power plants with total capacity of 8,000 MW would be developed by 2025. Therefore, study of 1,000 kV transmission lines had been recommended. According to the Latest PDP 6th, the total capacity of nuclear power plants developed by 2025 was reduced to 4,000 MW, therefore, it no longer need to carry out the study on introduction of 1,000 kV transmission line. On the other hand, the number of circuits of the 500 kV transmission lines from the coal thermal power plants of 3,000 MW in Tra Vinh, coal thermal power plants of 1,200 MW in Soc Trang to Ho Chi Min City and the methods of power transmission from new large coal thermal power plants of 5000MW developed in such as Da Nang and Doc Soi need to be continuously studied including power system stability after completion of the study on PDP 6th that have suggested the direction of such kind of studies

- Against the increase in power demand in the future, the adoption of the large sizes of 500 kV transformers, the duplicated supplies to 220 kV substations around Hanoi and Ho Chi Min city and the ring shaped configuration of 500 kV power system were clearly described in the PDP 6th. Those countermeasures can be considered adequate to lead efficient power network configuration. The countermeasures against the increase in fault currents in around Ho Chi Min city and other places can be considered to have several alternatives, which are listed in the Report, and should be studied continuously. The configuration of 220 kV system operation with open points on the way of the system is considered one of the adequate alternatives.

- The Report describes the required capacity of the shunt capacitors. Moreover, it is necessary that the methods of their regulation and control be studied continuously because the system voltage would be largely changed day and night and season by season.

- The Report recommended that the limit of installation of the series capacitors that have a possibility with causing turbine-vibration, the consideration with the effective exciter

system of large power plants and the installation of synchronous condensers against the instability caused by the faults around Son La hydropower plant and an interregional connection to China. Each countermeasure can be effective.

- The words in 8.4.3.2 ”500 kV transformers with Uk% more than 20 %” are unclear.

3. Investment Plan and Financial Analysis (Chapter 13 and Chapter 14)

Noteworthy points and required further study items are listed as follows.

- It is recommended that the investment cost between year of 2021 and 2025 is dealt with as a reference because investment costs in power generation and network projects which will be commissioned after 2026 are not counted.

- In line with the above- mentioned revision of power generation and network development plan, the investment costs in power projects during 2007 and 2011 are reduced and number of projects which IPP or BOT scheme is applied is increased. Therefore, the financial condition of EVN will be improved.

- Since LRMC is calculated with incremental cost against incremental income, it can be a index for determining the electricity tariff but does not indicate the financial condition of the electric power industry. Accordingly, it is recommended that the electricity tariff be determined based on the financial analysis of the whole electric power industry in order to ensure appropriate revenue taking into account corporate efforts and principle of market mechanism.