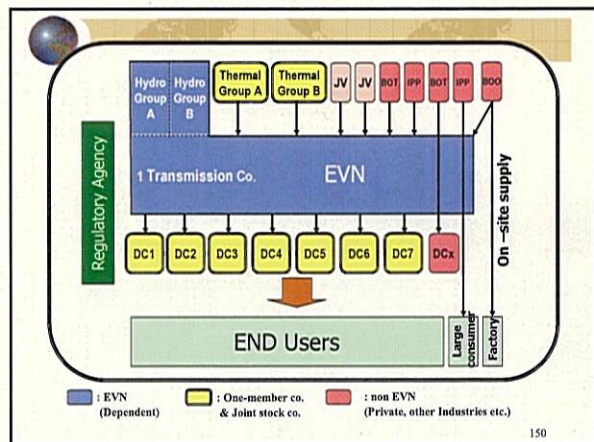


Structural & Institutional Reform in Vietnam

- 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

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Privatization and Unbundling

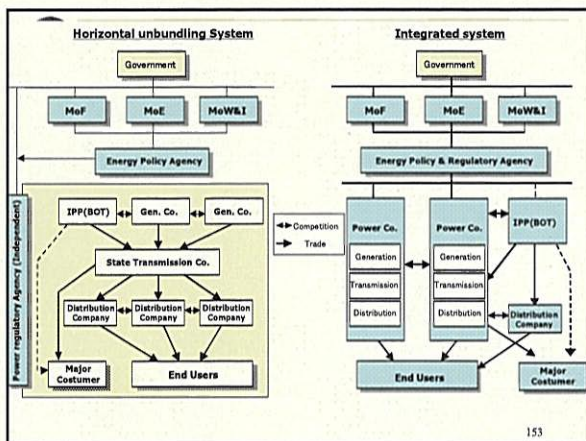
- ❖ Principle of market mechanism is hard to work under the current unbundling manner
 - ❑ Generation companies have been established by plants which generation costs differ and distances from power demand centers and fuel sources differ.
 - ❑ Distribution companies based on region have been established.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

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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

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Electricity tariffs

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

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Introduction of time-of-day and seasonal tariff system

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

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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

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End of Session
Thank you for your attention!

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*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

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(1) Initial Environmental Study


Contents of the Study & Study Method

- Number of Candidate Sites

97 sites	{	71 sites + 26 Additional sites
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- ↓
- Number of Studied Candidate Sites

65 sites	{	37 HPP 26 TPP 2 NPP
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(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)

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(1) Initial Environmental Study

Study Items (2)

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

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(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

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(1) Initial Environmental Study

Environment Impact	Class of Power Development	Weight	Thermal Power Generation		Hydro Power	Remarks
			CO2E	SO2E		
Social-environment	Infrastructure	Medium				Responsible for construction and / or starting, this rating is in the group?
	Primary	Low				
	Secondary	Low				
	Cultural Heritage/Asset	Low				
Life	Medium					Isolation of Local Area/Road
	Power					
	Energy Utilization					
	Power					
Natural environment	Terrestrial	High				Including influences of location and / or starting in construction of process and, water intake channel water resource etc.
	Forest/Marine					
	Water					
	Forest					
Natural environment	Terrestrial	High				Including influences of location and / or starting in construction of process and, water intake channel water resource etc.
	Forest/Marine					
	Water					
	Forest					
Pollution	Water quality	High				What will flow many and to which?
	Soil Contamination	High				
	Noise	High				
	Land Subsidence	High				
Other	Bad Smell	High				Forest Decree/Classification
	Land Subsidence	High				
	Bad Smell	High				
	Bad Smell	High				
Notes						CO2E, SO2E, etc. Considerable adverse environmental impact Less environmental impact No environmental issue.



(1) Initial Environmental Study

a. Summary of Initial Environmental Study (TPP)

Summary table: Class of Power I

Name of Thermal PP	NORTH REGION											
	Nghi Son No.1-2	Ninh Binh Est	Mong Duong	Uong Bi	Mao Khe	Quang Ninh	Son Dong	Hai Phong				
Project code	S.16	S46nd	S4.77		248.47ad							
Fuel used	Coal	Coal	Coal	Coal	Coal	Coal	Coal	Coal				
Capacity (MW)	600	300	500-1500	300	200	300	200	600				
Year construction/operation	2011-2012	2011-2012	2006	2009	2008-2009	2008	2008-2009					
Evaluation criteria	Rank	Weight	Rank	Weight	Rank	Weight	Rank	Weight	Rank	Weight	Rank	Weight
Social-environment	Inhabitant											
	Monuments	c/c		c/c		b/c		b/b		c/c		
	Wildlife	b/b		b/b		b/b		b/b		b/b		
	Heritage	b/b		b/b		b/b		b/b		b/b		
	Large Scale											
	Middle Scale											
	Small or non											
	Cultural Heritage/Asset	b/b	a/a	c/c		b/c		b/b		b/b		
	Scenery	b/b	b/b	b/b		b/b		b/b		b/b		
	Other	b/b	b/b	c/c		b/b		b/b		b/b		
Natural environment	Ecology											
	Terrestrial	c/c	b/b	b/b		b/b		b/b		b/b		
	Forest	b/a	b/a	b/a		b/b		b/b		b/b		
	Water	c/c	b/b	b/b		b/b		b/b		b/b		
	Marine	c/c	b/b	b/b		b/b		b/b		b/b		
	Water Utilization	b/a	b/a	b/a		b/a		b/a		b/a		
	Other	b/a	b/a	b/a		b/a		b/a		b/a		
	Ecology											
	Terrestrial	c/c	b/b	b/b		b/b		b/b		b/b		
	Forest	b/a	b/a	b/a		b/b		b/b		b/b		
Water	c/c	b/b	b/b		b/b		b/b		b/b			
Marine	c/c	b/b	b/b		b/b		b/b		b/b			
Water Utilization	b/a	b/a	b/a		b/a		b/a		b/a			
Other	b/a	b/a	b/a		b/a		b/a		b/a			



(1) Initial Environmental Study

b. Summary of Initial Environmental Study (HPP)

Class of Power Development	Summary Table: Class of Power Development														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Project code	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Capacity (MW)	25	27	31	31	31	31	31	31	31	31	31	31	31	31	31
Year construction/operation	2010	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Social-environment	Inhabitant	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
	Monuments	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
	Wildlife	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
	Heritage	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
	Large Scale	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
	Middle Scale	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
	Small or non	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
	Cultural Heritage/Asset	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
	Scenery	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
	Other	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
Natural environment	Ecology	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
	Terrestrial	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
	Forest	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
	Water	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
	Marine	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
	Water Utilization	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
	Other	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
	Ecology	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
	Terrestrial	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
	Forest	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



(2) Analysis on the Study Result

Evaluation Methodology

$$E_I = \sum_{i=1}^m (V_i)I W_i$$

- In which:
- E_I : environmental impact
 - $(V_i)I$: quality value of the category "i" environmental parameter of the project 'I'
 - W_i : weight of the category "i" factor
 - m : sum of factors

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(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	Amala Bien Hoa CCGT	82	83
11	17	Nhon Trach No 1 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	78	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 Phuc 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 Strah	123	75
3	13,49	Dakrith 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	Huai 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 J56	85	56
18	62	New PSPP No 2 JN5	92	85
19	59	New PSPP No 1 JN	102	100



(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	Dakml No 1. Hydropower Plant	100	85
25	16adf	Dakml No 4 Hydropower Plant	82	64
26	1	Extend Thac Ma 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



(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 Man No 2 Thermal Power Plant	3
36	Nhon Trach No3 Thermal Power Plant	4
41	Nhon Trach No 4 Thermal Power Plant	5
17/41ad	Nhon Trach No1 Thermal Power Plant	6
30,31/62ad	Nhon Trach No 2 Thermal Power Plant	7
7	O Man No1 Thermal Power Plant	8
7adf	Son Dong Thermal Power Plant	9
42	O Man 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 Man 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	Along Duong Thermal Power Plant	21
8,16	Nghi Son Thermal Power Plant	22
6adf	Hai Phong Thermal Power Plant	23



(2) Analysis on the Study Result

d. Priority Selection HPP

Plant/project code	Projects/Plants	Priority order
12adf	Dong Nai No4 Hydropower Plant	1
1	Extend Thac Ma Hydropower Plant	2
43	New PSPP No3 J56	3
14adf	Dakml No4 Hydropower Plant	4
26	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	Dakrith 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



(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

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(3) Selection of Important Points

The most serious impacts

[HPP]

Social environment impact

- Inhabitants

[TPP] Ethnic minorities, The week, Gender

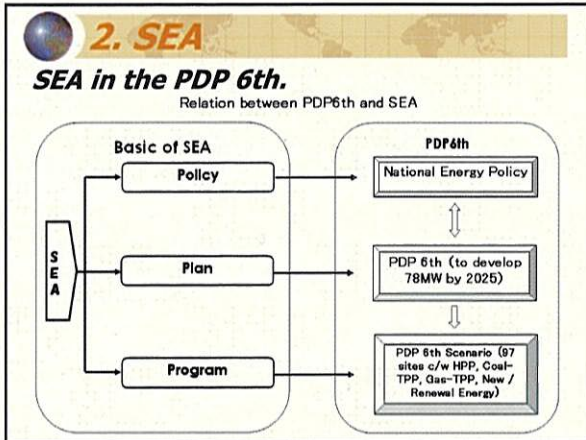
Natural environment impact

- Meteorology/Climate change

Pollution

- Air pollution

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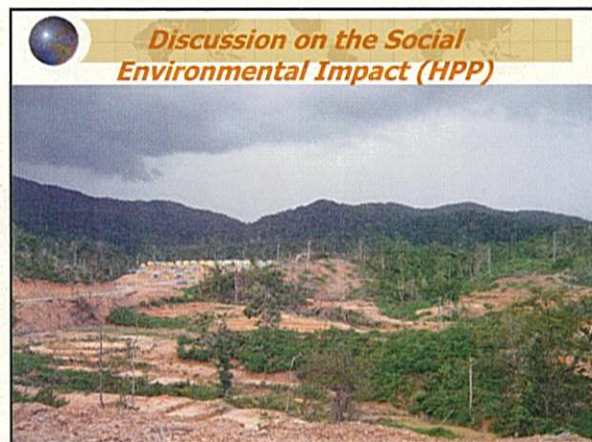


- 2. SEA**
- (1) Energy Development Policy**
- ✦ To develop energy resources and to keep **energy security** with protection of **natural resources** and **environment**.
 - ✦ To transit energy sector to competitive energy market.
 - ✦ To propel **export / import of energy resources**.
 - ✦ To promote **international cooperation** and introducing foreign investment.
 - ✦ To develop energy along with **international environmental regulation**.
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- 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.
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- 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)
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- 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.
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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

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Discussion on the Social Environmental Impact (HPP)

Cost for involuntary resettlement (1)

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

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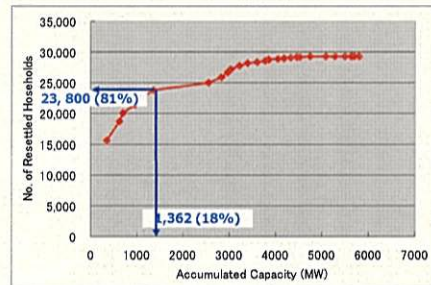


Discussion on the Social Environmental Impact (HPP)



Discussion on the Social Environmental Impact (HPP)

Accumulated Distribution Curve of Households



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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.

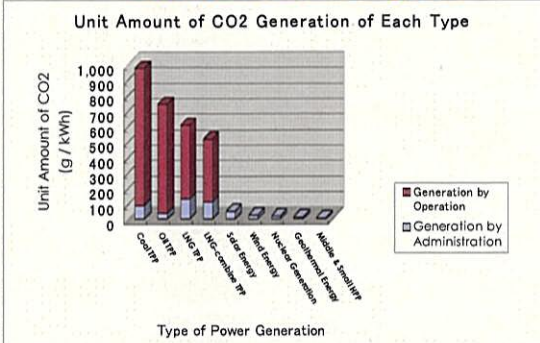
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Discussion on the Natural Environmental Impact (TPP)



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)



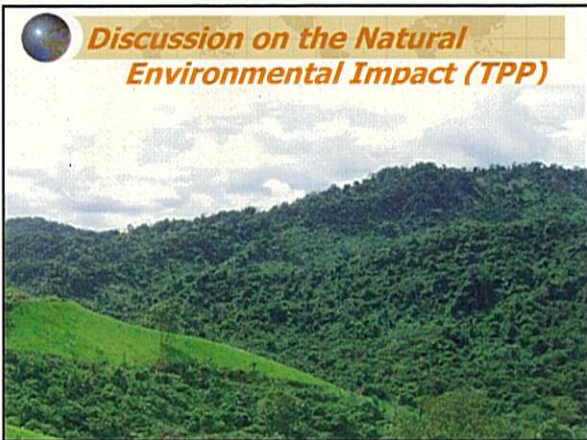
Ex. Son La: 4,500 ha / 2,400 MW



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

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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%



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



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

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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)

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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%)

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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

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End of Session

Thank you for your attention!

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