(4) Unit Generation Cost Calculation

Unit generation cost of each project at the busbar was calculated with parametric study of the coal kinds and the transportation fees.

a. Construction Cost

Unit construction cost of plant was based on the actual construction cost of Pha Lai coal TPP (300MW per unit including flue gas desulfurization facility).

And unit construction cost of plant of 600MW per unit was estimated 85% of the above unit construction cost taking scale merit into account, construction cost of the private harbor was estimated based on the experiences in Japan.

- Plant construction cost (excluding civil works) : 850 US\$/KW (300MW, Anthracite coal)

722 US\$/KW (600MW, Subbituminous coal)

- Civil works construction cost (excluding harbor) : 15% of the plant construction cost

Items / project	t site name	Phong So	Vinh Hy	Son Hai			
A with we aid a	Plant	850 USD/kW					
Anthracite	Civil & Arch	153 mln USD					
Subhituminaua	Plant	722 USD/kW					
Suboltuminous	Civil & Arch	130 mln USD					
	Total	90.6	201.3	156.6			
Harbor	Break Water	31.1	181.1	135.6			
	Reclamation	36.6	11.6	12.4			
	Ash disposal	22.9	8.6	8.6			
Construction Cost	Anthracite	1,053	1,145	1,108			
(USD/kW)	Subbituminous	906	998	961			

Table 5-2-4 Construction Cost of Three Projects

Here, below capital recovery factor is applied for calculation of annual fixed cost.

Capital Recovery Factor
Discount Rate= 10.0%
Plant Life= 25ys
$$CRF = \frac{R}{1 - (1 + R)^{-n}} = 0.110$$

b. O & M Cost

Total of fixed O&M cost and variable O&M cost is assumed 3% of the construction cost.

c. Fuel Cost

Price (FOB) and heat value of each brand of coal is set as shown in Table 5-2-5 based on the

past results. And the heat efficiency and plant factor are assumed as follows.

Heat efficiency : 40.5% (Either of 300MW/unit and 600MW/unit)

Plant factor : 75%

Table 5-2-5 Assumptions for Calculation of Fuel Cost and the Results

Thermal Efficiency= 40.5%		Station service rate = 7%				exchange rate:		15,430	VND/US	\$\$		
	Heat	Coolarias	Fuel Cost (USc/kWh)									
Coal value	FOR(VND /+)	Phong So			Vinh Hy			Son Hai				
	(Kcal/Kg)		case1	case2	case3	case1	case2	case3	case1	case2	case3	
Hon Gai #3	7,100	432,040	1.13	1.04	1.08	1.13	1.06	1.09	1.13	1.07	1.10	
Hon Gai #4	6,050	332,000	1.08	0.98	1.03	1.08	1.00	1.04	1.08	1.01	1.04	
Hon Gai #5	5,500	305,000	1.11	1.00	1.06	1.11	1.02	1.07	1.11	1.03	1.07	
Red River V3	5,100	305,000	0.01	1.08	1.14	1.20	1.10	1.15	1.20	1.11	1.16	
transportation cost /Haiphong to Son Hai: 1,100 km case1: 7.0US\$/t (same as Haiphong to Ho Chi Minh City:1,500km by 6,000DWT) case2: 5.1US\$/t (=7/1,500*1,100) case3: 6.1US\$/t (=7/2+7/2/1,500*1,100)												
	case1: case2: case3: case1: case2: case3:	7.0US\$/t (s 4.9US\$/t (= 6.0US\$/t (= /Haiphong t 7.0US\$/t (s 4.4US\$/t (= 5.7US\$/t (=	ame as 7/1,500 7/2+7/ o Phong ame as 7/1,500	Haiphoi)*1050) 2/1,500 5 So: Haiphoi)*950) 2/1,500	ng to Ha *1050) ng to Ha *950)	950 950 O Chi Mi	nh City: km nh City:	1,500km 1,500km	n by 6,0 n by 6,0	000WT)		

d. Unit Generation Cost

Unit generation cost at the busbar of each power plant as of 2003 is shown in Table 5-2-6. Order of economical efficiency is Pkong So, Son Hai and Vinh Hy. Every unit generation cost is cheaper than GTCC's 3.75 UScents/kWh.

Capacity factor= 75.0%		Station service rate = 7%										
	Heat	Heat value cal/Kg) Coal price FOB(VND/t)	Total Cost (USc/kWh)									
Coal value (Kcal/ł	value		Phong So			Vinh Hy			Son Hai			
	(Kcal/Kg)		case1	case2	case3	case1	case2	case3	case1	case2	case3	
Hon Gai #3	7,100	432,040	3.54	3.46	3.50	3.74	3.67	3.70	3.67	3.61	3.64	
Hon Gai #4	6,050	332,000	3.49	3.40	3.44	3.69	3.61	3.65	3.62	3.55	3.58	
Hon Gai #5	5,500	305,000	3.53	3.42	3.47	3.72	3.63	3.68	3.65	3.57	3.61	
Red River V3	5,100	305,000	3.28	3.16	3.22	3.47	3.38	3.42	3.40	3.32	3.36	

Table 5-2-6 Unit Generation Cost at the Busbar of Each Power Plant

(5) Evaluation

In conclusion, coal TPP development in the south using domestic north coal can improve the whole power system efficiency in Vietnam.