

D-4 CIVIL WORK COST OF THE PROJECT

Civil Work Cost of the Project (Case-1. 1st Stage)

Description	C O S T (Million Baht)		
	F. C.	L. C.	TOTAL
1. UPPER RESERVOIR	<u>582.4</u>	<u>508.9</u>	<u>1,091.3</u>
Dam	(578.2)	(500.8)	(1,079.0)
Drainage Tunnel	(4.2)	(8.1)	(12.3)
2. INTAKE	<u>5.1</u>	<u>21.6</u>	<u>26.7</u>
3. PENSTOCK	<u>85.9</u>	<u>94.7</u>	<u>180.6</u>
Penstock	(23.3)	(18.8)	(42.1)
Upper Access Tunnel	(25.0)	(30.8)	(55.8)
Lower Access Tunnel	(37.6)	(45.1)	(82.7)
4. POWERHOUSE	<u>156.0</u>	<u>242.0</u>	<u>398.0</u>
Powerhouse	(95.6)	(171.7)	(267.4)
Access Tunnel	(44.0)	(49.8)	(93.9)
Drainage Tunnel	(9.2)	(12.8)	(22.0)
Power Cable Tunnel	(7.2)	(7.6)	(14.8)
5. TAILRACE	<u>175.6</u>	<u>293.5</u>	<u>469.1</u>
Tailrace Tunnel	(99.1)	(129.9)	(228.9)
Tailrace Surge Chamber	(18.0)	(28.1)	(46.1)
Tailrace Gate Chamber	(6.2)	(10.7)	(16.9)
Outlet	(47.5)	(120.6)	(168.1)
Work Adit	(4.7)	(4.3)	(9.0)
6. SWITCHYARD	<u>4.0</u>	<u>2.0</u>	<u>6.0</u>
7. T O T A L	<u>1,009.0</u>	<u>1,162.8</u>	<u>2,171.8</u>

(UNIT: BAHT)

CASE-1 (1) UPPER RESERVOIR (1st Stage)

Description	Unit	Quantity	Unit Price		Total	Cost		
			F.C	L.C		F.C	L.C	Total
(1) DAM								
Common Excavation (dam)	m ³	2,607,000	43	12	55	112,101,000	31,284,000	143,385,000
Rock Excavation (dam)	m ³	1,737,000	55	55	110	95,535,000	95,535,000	191,070,000
Rock Excavation (gallery)	m ³	25,300	55	55	110	1,391,500	1,391,500	2,783,000
Embankment Rockfill	m ³	4,968,000	35	10	45	173,880,000	49,680,000	223,560,000
Embankment Transition (base)	m ³	50,000	249	51	300	12,450,000	2,550,000	15,000,000
Embankment Transition (slope)	m ³	85,000	374	76	450	31,790,000	6,460,000	38,250,000
Asphalt Facing (base)	m ²	100,100	220	580	800	22,022,000	58,058,000	80,080,000
Asphalt Facing (slope)	m ²	141,000	450	1,150	1,600	63,450,000	162,150,000	225,600,000
Structural Concrete	m ³	21,400	384	1,716	2,100	8,217,600	36,722,400	44,940,000
Reinforcement Bar	ton	770	622	1,278	1,900	478,940	984,060	1,463,000
Miscellaneous Works	L.S	1				52,131,604	44,481,496	96,613,100
Sub Total						573,447,644	489,296,456	1,062,744,100
(2) DRAINAGE TUNNEL								
Tunnel Excavation (horizontal)	m ³	4,400	417	233	650	1,834,800	1,025,200	2,860,000
Shaft Excavation	m ³	360	462	238	700	166,320	85,680	252,000
Lining Concrete	m ³	2,730	622	1,278	1,900	1,698,060	3,488,940	5,187,000
Shaft Concrete	m ³	220	475	2,125	2,600	104,500	467,500	572,000
Reinforcement Bar	ton	120	0	19,000	19,000	0	2,280,000	2,280,000
Miscellaneous Works	L.S	1				380,368	734,732	1,115,100
Sub Total						4,184,048	8,082,052	12,266,100
TOTAL						577,631,692	497,378,508	1,075,010,200

(UNIT: BAHT)

CASE-1 (2) INTAKE (1st Stage)

Description	Unit	Quantity	Unit Price		Cost		
			F.C	L.C	F.C	L.C	Total
Rock Excavation	m ³	1,900	55	55	104,500	104,500	209,000
Shaft Excavation	m ³	4,700	462	238	2,171,400	1,118,600	3,290,000
Structural Concrete	m ³	2,700	384	1,716	1,036,800	4,633,200	5,670,000
Mass Concrete	m ³	2,430	271	1,329	658,530	3,229,470	3,888,000
Filling Concrete	m ³	2,660	250	750	665,000	1,995,000	2,660,000
Reinforcement Bar	ton	450	0	19,000	0	8,550,000	8,550,000
Miscellaneous Works	L.S	1			463,623	1,963,077	2,426,700
Sub Total					5,099,853	21,593,847	26,693,700
T O T A L					5,099,853	21,593,847	26,693,700

(UNIT: BAHT)

CASE-1 (3) PENSTOCK (1st Stage)

Description	Unit	Quantity	Unit Price		Cost		Total
			F.C	L.C	F.C	L.C	
(1) PENSTOCK							
Tunnel Excavation (horizontal)	m ³	9,100	417	233	3,794,700	2,120,300	5,915,000
Tunnel Excavation (inclined)	m ³	18,600	773	327	14,377,800	6,082,200	20,460,000
Filling Concrete	m ³	11,900	250	750	2,975,000	8,925,000	11,900,000
Miscellaneous Works	L.S	1			2,114,750	1,712,750	3,827,500
Sub Total					23,262,250	18,840,250	42,102,500
(2) UPPER ACCESS TUNNEL							
Tunnel Excavation (horizontal)	m ³	37,100	417	233	15,470,700	8,644,300	24,115,000
Lining Concrete	m ³	10,200	622	1,278	6,344,400	13,035,600	19,380,000
Plug Concrete	m ³	2,450	384	1,716	940,800	4,204,200	5,145,000
Reinforcement Bar	ton	110	0	19,000	0	2,090,000	2,090,000
Miscellaneous Works	L.S	1			2,275,590	2,797,410	5,073,000
Sub Total					25,031,490	30,771,510	55,803,000
(3) LOWER ACCESS TUNNEL							
Common Excavation	m ³	2,000	43	12	86,000	24,000	110,000
Rock Excavation	m ³	2,000	55	55	110,000	110,000	220,000
Tunnel Excavation (horizontal)	m ³	55,800	417	233	23,268,600	13,001,400	36,270,000
Lining Concrete	m ³	16,000	622	1,278	9,952,000	20,448,000	30,400,000
Plug Concrete	m ³	2,100	384	1,716	806,400	3,603,600	4,410,000
Reinforcement Bar	ton	200	0	19,000	0	3,800,000	3,800,000
Miscellaneous Works	L.S	1			3,422,300	4,098,700	7,521,000
Sub Total					37,645,300	45,085,700	82,731,000
T O T A L					85,939,040	94,697,460	180,636,500

(UNIT: BAHT)

CASE-1 (4) POWERHOUSE (1st Stage)

Description	Unit	Quantity	Unit Price		Total	Cost				
			F.C	L.C		F.C	L.C	Total		
									F.C	L.C
(1)POWERHOUSE										
ARCH EXCAVATION	m ³	28.000	283	237	520	7,924.000	6,636.000	14,560.000		
CAVERN EXCAVATION	m ³	63.900	165	105	270	10,543.500	6,709.500	17,253.000		
TUNNEL EXCAVATION (horizontal)	m ³	6.000	417	233	650	2,502.000	1,398.000	3,900.000		
ARCH CONCRETE	m ³	7.160	567	2,533	3,100	4,059.720	18,136.280	22,196.000		
POWERHOUSE CONCRETE	m ³	14.300	475	2,125	2,600	6,792.500	30,387.500	37,180.000		
STRUCTUAL CONCRETE	m ³	5.530	384	1,716	2,100	2,123.520	9,489.480	11,613.000		
LINING CONCRETE	m ³	2.020	622	1,278	1,900	1,256.440	2,581.560	3,838.000		
FILLING CONCRETE	m ³	525	250	750	1,000	131.250	393.750	525.000		
REINFORCEMENT BAR	ton	2.400	0	19.000	19.000	0	45,600.000	45,600.000		
GROUTING	m	23.000	1.615	885	2.500	37,145.000	20,355.000	57,500.000		
PRESTRESSED ROCK ANCHOR (φ 33, L =20m)	PC	1.376	6.000	6.000	12.000	8,256.000	8,256.000	16,512.000		
PRESTRESSED ROCK ANCHOR (φ 24, L =10m)	PC	1.376	4.500	4.500	9.000	6,192.000	6,192.000	12,384.000		
MISCELLANEOUS WORKS	L.S	1				8,692.593	15,613.507	24,306.100		
Sub Total						95,618,523	171,748,577	267,367,100		

Description	Unit	Quantity	Unit Price		Cost					
			F.C	L.C	Total	F.C	L.C	Total		
(2) ACCESS TUNNEL										
COMMON EXCAVATION	m ²	600	43	12	55	25,800	7,200	33,000		
ROCK EXCAVATION	m ²	500	55	55	110	27,500	27,500	55,000		
TUNNEL EXCAVATION (horizontal)	m ²	63,900	417	233	650	26,646,300	14,888,700	41,535,000		
LINING CONCRETE	m ²	18,340	622	1,278	1,900	11,407,480	23,438,520	34,846,000		
REINFORCEMENT BAR	ton	310	0	19,000	19,000	0	5,890,000	5,890,000		
GROUTING	m	1,200	1,615	885	2,500	1,938,000	1,062,000	3,000,000		
MISCELLANEOUS WORKS	L.S	1				4,004,508	4,531,392	8,535,900		
Sub Total						44,049,588	49,845,312	93,894,900		
(3) DRAINAGE TUNNEL										
TUNNEL EXCAVATION (horizontal)	m ²	7,500	417	233	650	3,127,500	1,747,500	4,875,000		
LINING CONCRETE	m ²	3,340	622	1,278	1,900	2,077,480	4,268,520	6,346,000		
PLUG CONCRETE	m ²	830	384	1,716	2,100	318,720	1,424,280	1,743,000		
REINFORCEMENT BAR	ton	140	0	19,000	19,000	0	2,660,000	2,660,000		
GROUTING	m	1,760	1,615	885	2,500	2,842,400	1,557,600	4,400,000		
MISCELLANEOUS WORKS	L.S	1				836,610	1,165,790	2,002,400		
Sub Total						9,202,710	12,823,690	22,026,400		
(4) POWER CABLE TUNNEL										
TUNNEL EXCAVATION (horizontal)	m ²	6,700	417	233	650	2,793,900	1,561,100	4,355,000		
LINING CONCRETE	m ²	2,860	622	1,278	1,900	1,778,920	3,655,080	5,434,000		
REINFORCEMENT BAR	ton	33	0	19,000	19,000	0	627,000	627,000		
GROUTING	m	1,200	1,615	885	2,500	1,938,000	1,062,000	3,000,000		
MISCELLANEOUS WORKS	L.S	1				651,082	690,518	1,341,600		
Sub Total						7,161,902	7,595,698	14,757,600		
TOTAL						156,032,723	242,013,277	398,046,000		

(UNIT: BAHT)

CASE-1 (5) TAILRACE (1st Stage)

Description	Unit	Quantity	Unit Price		Total	Cost		Total
			F.C	L.C		F.C	L.C	
(1)TAILRACE TUNNEL								
TUNNEL EXCAVATION (horizontal)	m ³	96,400	417	233	650	40,198,800	22,461,200	62,660,000
SHAFT EXCAVATION	m ³	3,620	462	238	700	1,672,440	861,560	2,534,000
LINING CONCRETE	m ³	27,540	622	1,278	1,900	17,129,880	35,196,120	52,326,000
FILLING CONCRETE	m ³	3,360	250	750	1,000	840,000	2,520,000	3,360,000
SHAFT CONCRETE	m ³	2,080	475	2,125	2,600	988,000	4,420,000	5,408,000
REINFORCEMENT BAR	ton	1,925	0	19,000	19,000	0	36,575,000	36,575,000
GROUTING	m	18,100	1,615	885	2,500	29,231,500	16,018,500	45,250,000
MISCELLANEOUS WORKS	L.S	1				9,006,062	11,805,238	20,811,300
Sub Total						99,066,682	129,857,618	228,924,300
(2)TAILRACE SURGE CHAMBER								
TUNNEL EXCAVATION (horizontal)	m ³	8,100	417	233	650	3,377,700	1,887,300	5,265,000
SHAFT EXCAVATION	m ³	10,800	462	238	700	4,989,600	2,570,400	7,560,000
LINING CONCRETE	m ³	2,980	622	1,278	1,900	1,853,560	3,808,440	5,662,000
SHAFT CONCRETE	m ³	2,470	475	2,125	2,600	1,173,250	5,248,750	6,422,000
FILLING CONCRETE	m ³	1,380	250	750	1,000	345,000	1,035,000	1,380,000
REINFORCEMENT BAR	ton	445	0	19,000	19,000	0	8,455,000	8,455,000
GROUTING	m	2,880	1,615	885	2,500	4,651,200	2,548,800	7,200,000
MISCELLANEOUS WORKS	L.S	1				1,639,031	2,555,369	4,194,400
Sub Total						18,029,341	28,109,059	46,138,400

Description	Unit	Quantity	Unit Price		Cost				
			F.C	L.C	Total	F.C	L.C	Total	
(3) TAILRACE GATE CHAMBER									
COMMON EXCAVATION	m ³	11,400	43	12	55	490,200	136,800	627,000	
ROCK EXCAVATION	m ³	11,400	55	55	110	627,000	627,000	1,254,000	
SHAFT EXCAVATION	m ³	4,600	462	238	700	2,125,200	1,094,800	3,220,000	
SHAFT CONCRETE	m ³	2,060	475	2,125	2,600	978,500	4,377,500	5,356,000	
STRUCTURAL CONCRETE	m ³	140	384	1,716	2,100	53,760	240,240	294,000	
REINFORCEMENT BAR	ton	130	0	19,000	19,000	0	2,470,000	2,470,000	
GROUTING	m	870	1,615	885	2,500	1,405,050	769,950	2,175,000	
MISCELLANEOUS WORKS	L.S	1				567,971	971,629	1,539,600	
Sub Total						6,247,681	10,687,919	16,935,600	
(4) OUTLET									
COMMON EXCAVATION	m ³	512,000	43	12	55	22,016,000	6,144,000	28,160,000	
ROCK EXCAVATION	m ³	220,000	55	55	110	12,100,000	12,100,000	24,200,000	
EMBANKMENT	m ³	43,000	35	10	45	1,505,000	430,000	1,935,000	
STRUCTURAL CONCRETE	m ³	18,000	384	1,716	2,100	6,912,000	30,888,000	37,800,000	
REINFORCEMENT BAR	ton	1,370	0	19,000	19,000	0	26,030,000	26,030,000	
MISCELLANEOUS WORKS	L.S	1				5,000,000	45,000,000	50,000,000	
Sub Total						47,533,000	120,592,000	168,125,000	
(5) WORK ADIT									
TUNNEL EXCAVATION (horizontal)	m ³	10,300	417	233	650	4,295,100	2,399,900	6,695,000	
PLUG CONCRETE	m ³	1,100	384	1,716	2,100	422,400	1,887,600	2,310,000	
Sub Total						4,717,500	4,287,500	9,005,000	
T O T A L						175,594,204	293,534,096	469,128,300	

(UNIT: BAHT)

CASE-1 (6) SWITCHYARD (1st Stage)

Description	Unit	Quantity	Unit Price		Total	Cost		
			F.C	L.C		F.C	L.C	Total
COMMON EXCAVATION	m ³	84,000	43	12	55	3,612,000	1,008,000	4,620,000
STRUCTURAL CONCRETE	m ³	1,000	55	55	110	55,000	55,000	110,000
REINFORCEMENT BAR	ton	40	0	19,000	19,000	0	760,000	760,000
MISCELLANEOUS WORKS	L.S	1				366,700	182,300	549,000
Sub Total						4,033,700	2,005,300	6,039,000
TOTAL						4,033,700	2,005,300	6,039,000

(UNIT: BAHT)

CASE-1 (7) HYDRAULIC EQUIPMENT (1st Stage)

Description	Unit	Quantity	Unit Price			Cost		
			F.C	L.C	Total	F.C	L.C	Total
STEEL LINING (SM41, intake)	ton	260	0	48,000	48,000	0	12,480,000	12,480,000
PENSTOCK (SM58)	ton	860	0	55,000	55,000	0	47,300,000	47,300,000
PENSTOCK (HT80)	ton	2,730	112,000	48,000	160,000	305,760,000	131,040,000	436,800,000
BIFURCATION (HT80)	ton	155	112,000	48,000	160,000	17,360,000	7,440,000	24,800,000
STEEL LINING (SM50, tailrace)	ton	1,045	0	53,000	53,000	0	55,385,000	55,385,000
DRAFT GATE	set	229,600,000	7,400,000	37,000,000	37,000,000	59,200,000	14,800,000	74,000,000
TAILRACE GATE	set	224,800,000	6,200,000	31,000,000	31,000,000	49,600,000	12,400,000	62,000,000
TOTAL						431,920,000	280,845,000	712,765,000

CASE-1 (8) CONNECTING CONDUIT (1st Stage) (UNIT: BAHT)

Description	Unit	Quantity	Unit Price			Cost		
			F.C	L.C	Total	F.C	L.C	Total
COMMON EXCAVATION	m ³	2,000	43	12	55	86,000	24,000	110,000
ROCK EXCAVATION	m ³	2,000	55	55	110	110,000	110,000	220,000
TUNNEL EXCAVATION	m ³	4,730	417	233	650	1,972,410	1,102,090	3,074,500
SHAFT EXCAVATION	m ³	840	462	238	700	388,080	199,920	588,000
EMBANKMENT	m ³	650	35	10	45	22,750	6,500	29,250
LINING CONCRETE	m ²	1,690	622	1,278	1,900	1,051,180	2,159,820	3,211,000
SHAFT CONCRETE	m ²	530	475	2,125	2,600	251,750	1,126,250	1,378,000
STRUCTURAL CONCRETE	m ²	1,160	384	1,716	2,100	445,440	1,990,560	2,436,000
REINFORCEMENT BAR	ton	200	0	19,000	19,000	0	3,800,000	3,800,000
MISCELLANEOUS WORKS	L.S	1				432,761	1,051,914	1,484,675
Sub Total						4,760,371	11,571,054	16,331,425
TOTAL						4,760,371	11,571,054	16,331,425

Civil Work Cost of the Project (Case-1, 2nd Stage)

Description	C O S T (Million Baht)		
	F. C.	L. C.	TOTAL
1. UPPER RESERVOIR	<u>433.8</u>	<u>472.5</u>	<u>906.4</u>
Dam	(430.6)	(466.3)	(896.8)
Drainage Tunnel	(3.2)	(6.3)	(9.5)
2. INTAKE	<u>5.1</u>	<u>21.6</u>	<u>26.7</u>
3. PENSTOCK	<u>79.7</u>	<u>86.0</u>	<u>165.7</u>
Penstock	(23.5)	(19.1)	(42.6)
Upper Access Tunnel	(37.7)	(43.4)	(81.1)
Lower Access Tunnel	(18.4)	(23.5)	(42.0)
4. POWERHOUSE	<u>136.9</u>	<u>223.1</u>	<u>360.0</u>
Powerhouse	(98.4)	(179.5)	(277.9)
Access Tunnel	(21.9)	(22.8)	(44.7)
Drainage Tunnel	(9.3)	(13.1)	(22.4)
Power Cable Tunnel	(7.2)	(7.7)	(14.9)
5. TAILRACE	<u>108.5</u>	<u>146.1</u>	<u>254.6</u>
Tailrace Tunnel	(85.7)	(111.0)	(196.6)
Tailrace Surge Chamber	(22.6)	(33.9)	(56.4)
Tailrace Gate Chamber	(0.0)	(0.0)	(0.0)
Outlet	(0.0)	(0.0)	(0.0)
Work Adit	(0.3)	(1.3)	(1.5)
6. SWITCHYARD	<u>4.0</u>	<u>2.0</u>	<u>6.0</u>
7. T O T A L	<u>768.0</u>	<u>951.4</u>	<u>1,719.4</u>

(UNIT: BAHT)

CASE-1 (1) UPPER RESERVOIR (2nd Stage)

Description	Unit	Quantity	Unit Price		Total	Cost			
			F.C	L.C		F.C	L.C	Total	
(1) DAM									
Common Excavation (dam)	m ³	2,739,000	43	12	55	117,777,000	32,868,000	150,645,000	
Rock Excavation (dam)	m ³	1,825,000	55	55	110	100,375,000	100,375,000	200,750,000	
Rock Excavation (gallery)	m ³	23,200	55	55	110	1,276,000	1,276,000	2,552,000	
Embankment Rockfill	m ³	762,000	35	10	45	26,670,000	7,620,000	34,290,000	
Embankment Transition (base)	m ³	46,400	249	51	300	11,553,600	2,366,400	13,920,000	
Embankment Transition (slope)	m ³	89,700	374	76	450	33,547,800	6,817,200	40,365,000	
Asphalt Facing (base)	m ²	92,800	220	580	800	20,416,000	53,824,000	74,240,000	
Asphalt Facing (slope)	m ²	149,500	450	1,150	1,600	67,275,000	171,925,000	239,200,000	
Structural Concrete	m ³	21,300	384	1,716	2,100	8,179,200	36,550,800	44,730,000	
Reinforcement Bar	ton	780	622	1,278	1,900	485,160	996,840	1,482,000	
Miscellaneous Works	L.S	1				38,755,476	41,461,924	80,217,400	
Sub Total						426,310,236	456,081,164	882,391,400	
(2) DRAINAGE TUNNEL									
Tunnel Excavation (horizontal)	m ³	3,300	417	233	650	1,376,100	768,900	2,145,000	
Shaft Excavation	m ³	420	462	238	700	194,040	99,960	294,000	
Lining Concrete	m ³	2,020	622	1,278	1,900	1,256,440	2,581,560	3,838,000	
Shaft Concrete	m ³	260	475	2,125	2,600	123,500	552,500	676,000	
Reinforcement Bar	ton	90	0	19,000	19,000	0	1,710,000	1,710,000	
Miscellaneous Works	L.S	1				295,008	571,292	866,300	
Sub Total						3,245,088	6,284,212	9,529,300	
TOTAL						429,555,324	462,365,376	891,920,700	

(UNIT: BAHT)

CASE-1 (2) INTAKE (2nd Stage)

Description	Unit	Quantity	Unit Price		Total	Cost		Total
			F.C	L.C		F.C	L.C	
Rock Excavation	m ³	1,900	55	55	110	104,500	104,500	209,000
Shaft Excavation	m ³	4,700	462	238	700	2,171,400	1,118,600	3,290,000
Structural Concrete	m ³	2,700	384	1,716	2,100	1,036,800	4,633,200	5,670,000
Mass Concrete	m ³	2,430	271	1,329	1,600	658,530	3,229,470	3,888,000
Filling Concrete	m ³	2,660	250	750	1,000	665,000	1,995,000	2,660,000
Reinforcement Bar	ton	450	0	19,000	19,000	0	8,550,000	8,550,000
Miscellaneous Works	L.S	1				463,623	1,963,077	2,426,700
Sub Total						5,099,853	21,593,847	26,693,700
TOTAL						5,099,853	21,593,847	26,693,700

(UNIT: BAHT)

CASE-1 (3) PENSTOCK (2nd Stage)

Description	Unit	Quantity	Unit Price		Total	Cost		Total
			F.C	L.C		F.C	L.C	
(1)PENSTOCK								
Tunnel Excavation (horizontal)	m ³	9,500	417	233	650	3,961,500	2,213,500	6,175,000
Tunnel Excavation (inclined)	m ³	18,600	773	327	1,100	14,377,800	6,082,200	20,460,000
Filling Concrete	m ³	12,100	250	750	1,000	3,025,000	9,075,000	12,100,000
Miscellaneous Works	L.S	1				2,136,430	1,737,070	3,873,500
Sub Total						23,500,730	19,107,770	42,608,500
(2)UPPER ACCESS TUNNEL								
Tunnel Excavation (horizontal)	m ³	56,700	417	233	650	23,643,900	13,211,100	36,855,000
Lining Concrete	m ³	15,600	622	1,278	1,900	9,703,200	19,936,800	29,640,000
Plug Concrete	m ³	2,450	384	1,716	2,100	940,800	4,204,200	5,145,000
Reinforcement Bar	ton	110	0	19,000	19,000	0	2,090,000	2,090,000
Miscellaneous Works	L.S	1				3,428,790	3,944,210	7,373,000
Sub Total						37,716,690	43,386,310	81,103,000
(3)LOWER ACCESS TUNNEL								
Common Excavation	m ³	0	43	12	55	0	0	0
Rock Excavation	m ³	0	55	55	110	0	0	0
Tunnel Excavation (horizontal)	m ³	27,100	417	233	650	11,300,700	6,314,300	17,615,000
Lining Concrete	m ³	7,500	622	1,278	1,900	4,665,000	9,585,000	14,250,000
Plug Concrete	m ³	2,100	384	1,716	2,100	806,400	3,603,600	4,410,000
Reinforcement Bar	ton	100	0	19,000	19,000	0	1,900,000	1,900,000
Miscellaneous Works	L.S	1				1,677,210	2,140,290	3,817,500
Sub Total						18,449,310	23,543,190	41,992,500
T O T A L						79,666,730	86,037,270	165,704,000

(UNIT: BAHT)

CASE-1 (4) POWERHOUSE (2nd Stage)

Description	Unit	Quantity	Unit Price		Total	Cost		
			F.C	L.C		F.C	L.C	Total
(1)POWERHOUSE								
ARCH EXCAVATION	m ³	29.000	283	237	520	8,207.000	6,873.000	15,080.000
CAVERN EXCAVATION	m ³	64.600	165	105	270	10,659.000	6,783.000	17,442.000
TUNNEL EXCAVATION (horizontal)	m ³	6.000	417	233	650	2,502.000	1,398.000	3,900.000
ARCH CONCRETE	m ³	7.420	567	2,533	3,100	4,207.140	18,794.860	23,002.000
POWERHOUSE CONCRETE	m ³	14.620	475	2,125	2,600	6,944.500	31,067.500	38,012.000
STRUCTURAL CONCRETE	m ³	7.590	384	1,716	2,100	2,914.560	13,024.440	15,939.000
LINING CONCRETE	m ³	2.010	622	1,278	1,900	1,250.220	2,568.780	3,819.000
FILLING CONCRETE	m ³	525	250	750	1,000	131.250	393.750	525.000
REINFORCEMENT BAR	ton	2.460	0	19,000	19,000	0	46,740.000	46,740.000
GROUTING	m	23.500	1,615	885	2,500	37,952.500	20,797.500	58,750.000
PRESTRESSED ROCK ANCHOR (φ 33, ℓ =20m)	PC	1.403	6,000	6,000	12,000	8,418.000	8,418.000	16,836.000
PRESTRESSED ROCK ANCHOR (φ 24, ℓ =10m)	PC	1.403	4,500	4,500	9,000	6,313.500	6,313.500	12,627.000
MISCELLANEOUS WORKS	L.S	I				8,949.967	16,317.233	25,267.200
Sub Total						98,449,637	179,489,563	277,939,200

Description	Unit	Quantity	Unit Price		Cost					
			F.C	L.C	Total	F.C	L.C	Total		
(2) ACCESS TUNNEL										
COMMON EXCAVATION	m ²	0	43	12	55	0	0	0	0	0
ROCK EXCAVATION	m ²	0	55	55	110	0	0	0	0	0
TUNNEL EXCAVATION (horizontal)	m ²	31,800	417	233	650	13,260,600	7,409,400	20,670,000		
LINING CONCRETE	m ²	9,130	622	1,278	1,900	5,678,860	11,668,140	17,347,000		
REINFORCEMENT BAR	ton	60	0	19,000	19,000	0	1,140,000	1,140,000		
GROUTING	m	600	1,615	885	2,500	969,000	531,000	1,500,000		
MISCELLANEOUS WORKS	L.S	1				1,990,846	2,074,854	4,065,700		
Sub Total						21,899,306	22,823,394	44,722,700		
(3) DRAINAGE TUNNEL										
TUNNEL EXCAVATION (horizontal)	m ²	7,500	417	233	650	3,127,500	1,747,500	4,875,000		
LINING CONCRETE	m ²	3,340	622	1,278	1,900	2,077,480	4,268,520	6,346,000		
PLUG CONCRETE	m ²	990	384	1,716	2,100	380,160	1,698,840	2,079,000		
REINFORCEMENT BAR	ton	140	0	19,000	19,000	0	2,660,000	2,660,000		
GROUTING	m	1,770	1,615	885	2,500	2,858,550	1,566,450	4,425,000		
MISCELLANEOUS WORKS	L.S	1				844,369	1,194,131	2,038,500		
Sub Total						9,288,059	13,135,441	22,423,500		
(4) POWER CABLE TUNNEL										
TUNNEL EXCAVATION (horizontal)	m ²	6,800	417	233	650	2,835,600	1,584,400	4,420,000		
LINING CONCRETE	m ²	2,900	622	1,278	1,900	1,803,800	3,706,200	5,510,000		
REINFORCEMENT BAR	ton	33	0	19,000	19,000	0	627,000	627,000		
GROUTING	m	1,200	1,615	885	2,500	1,938,000	1,062,000	3,000,000		
MISCELLANEOUS WORKS	L.S	1				657,740	697,960	1,355,700		
Sub Total						7,235,140	7,677,560	14,912,700		
TOTAL						136,872,142	223,125,958	359,998,100		

(UNIT: BAHT)

CASE-1 (5) TAILRACE (2nd Stage)

Description	Unit	Quantity	Unit Price		Total	Cost		Total
			F.C	L.C		F.C	L.C	
(1)TAILRACE TUNNEL								
TUNNEL EXCAVATION (horizontal)	m ³	86.300	417	233	650	35,987,100	20,107,900	56,095,000
SHAFT EXCAVATION	m ³	3.620	462	238	700	1,672,440	861,560	2,534,000
LINING CONCRETE	m ³	22.500	622	1,278	1,900	13,995,000	28,755,000	42,750,000
FILLING CONCRETE	m ³	3.360	250	750	1,000	840,000	2,520,000	3,360,000
SHAFT CONCRETE	m ³	2.080	475	2,125	2,600	988,000	4,420,000	5,408,000
REINFORCEMENT BAR	ton	1.625	0	19,000	19,000	0	30,875,000	30,875,000
GROUTING	m	15.100	1,615	885	2,500	24,386,500	13,363,500	37,750,000
MISCELLANEOUS WORKS	L.S	1				7,786,904	10,090,296	17,877,200
Sub Total						85,655,944	110,993,256	196,649,200
(2)TAILRACE SURGE CHAMBER								
TUNNEL EXCAVATION (horizontal)	m ³	12.600	417	233	650	5,254,200	2,935,800	8,190,000
SHAFT EXCAVATION	m ³	10.800	462	238	700	4,989,600	2,570,400	7,560,000
LINING CONCRETE	m ³	4.720	622	1,278	1,900	2,935,840	6,032,160	8,968,000
SHAFT CONCRETE	m ³	2.470	475	2,125	2,600	1,173,250	5,248,750	6,422,000
FILLING CONCRETE	m ³	1.380	250	750	1,000	345,000	1,035,000	1,380,000
REINFORCEMENT BAR	ton	514	0	19,000	19,000	0	9,766,000	9,766,000
GROUTING	m	3.600	1,615	885	2,500	5,814,000	3,186,000	9,000,000
MISCELLANEOUS WORKS	L.S	1				2,051,189	3,077,411	5,128,600
Sub Total						22,563,079	33,851,521	56,414,600

Description	Unit	Quantity	Unit Price			Cost		
			F.C	L.C	Total	F.C	L.C	Total
(5)WORK ADIT								
TUNNEL EXCAVATION (horizontal)	m ³	0	417	233	650	0	0	0
PLUG CONCRETE	m ³	730	384	1,716	2,100	280,320	1,252,680	1,533,000
Sub Total						280,320	1,252,680	1,533,000
TOTAL						108,499,343	146,097,457	254,596,800

(UNIT: BAHT)

CASE-1 (6) SWITCHYARD (2nd Stage)

Description	Unit	Quantity	Unit Price			Cost		
			F.C	L.C	Total	F.C	L.C	Total
COMMON EXCAVATION	m ³	84,000	43	12	55	3,612,000	1,008,000	4,620,000
STRUCTURAL CONCRETE	m ³	1,000	55	55	110	55,000	55,000	110,000
REINFORCEMENT BAR	ton	40	0	19,000	19,000	0	760,000	760,000
MISCELLANEOUS WORKS	L.S	1				366,700	182,300	549,000
Sub Total						4,033,700	2,005,300	6,039,000
TOTAL						4,033,700	2,005,300	6,039,000

(UNIT: BART)

CASE-1 (7) HYDRAULIC EQUIPMENT (2nd Stage)

Description	Unit	Quantity	Unit Price			Cost		
			F.C	L.C	Total	F.C	L.C	Total
STEEL LINING (SM41, intake)	ton	260	0	48,000	48,000	0	12,480,000	12,480,000
PENSTOCK (SM58)	ton	890	0	55,000	55,000	0	48,950,000	48,950,000
PENSTOCK (HT80)	ton	2,730	112,000	48,000	160,000	305,760,000	131,040,000	436,800,000
BIFURCATION (HT80)	ton	155	112,000	48,000	160,000	17,360,000	7,440,000	24,800,000
DRAFT GATE	set	229	600,000	7,400,000	37,000,000	59,200,000	14,800,000	74,000,000
CHANNEL GATE	set	110	0,000,000	2,500,000		10,000,000	2,500,000	12,500,000
TOTAL						392,320,000	217,210,000	609,530,000

CASE-1 (8) CONNECTING CONDUIT (2nd Stage) (UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Total	Cost		Total
			F.C	L.C		F.C	L.C	
COMMON EXCAVATION	m ³	2,000	43	12	55	86,000	24,000	110,000
ROCK EXCAVATION	m ³	2,000	55	55	110	110,000	110,000	220,000
TUNNEL EXCAVATION	m ³	4,800	417	233	650	2,001,600	1,118,400	3,120,000
SHAFT EXCAVATION	m ³	150	462	238	700	69,300	35,700	105,000
EMBANKMENT	m ³	650	35	10	45	22,750	6,500	29,250
LINING CONCRETE	m ³	1,690	622	1,278	1,900	1,051,180	2,159,820	3,211,000
SHAFT CONCRETE	m ³	150	475	2,125	2,600	71,250	318,750	390,000
STRUCTURAL CONCRETE	m ³	1,200	384	1,716	2,100	460,800	2,059,200	2,520,000
REINFORCEMENT BAR	ton	180	0	19,000	19,000	0	3,420,000	3,420,000
MISCELLANEOUS WORKS	L.S	1				387,288	925,237	1,312,525
SUB TOTAL						4,260,168	10,177,607	14,437,775
TOTAL						4,260,168	10,177,607	14,437,775

Civil Work Cost of the Project (Case-2, 1st Stage)

Description	C O S T (Million Baht)		
	F.C.	L.C.	TOTAL
1. UPPER RESERVOIR	<u>904.0</u>	<u>778.8</u>	<u>1,682.8</u>
Dam	(900.2)	(771.5)	(1,671.7)
Drainage Tunnel	(3.8)	(7.4)	(11.2)
2. INTAKE	<u>8.7</u>	<u>40.3</u>	<u>49.0</u>
3. PENSTOCK	<u>96.0</u>	<u>112.0</u>	<u>208.0</u>
Penstock	(26.3)	(22.0)	(48.4)
Upper Access Tunnel	(30.3)	(40.4)	(70.7)
Lower Access Tunnel	(39.4)	(49.6)	(89.0)
4. POWERHOUSE	<u>162.8</u>	<u>253.7</u>	<u>416.5</u>
Powerhouse	(99.9)	(181.0)	(280.9)
Access Tunnel	(44.6)	(50.4)	(95.0)
Drainage Tunnel	(10.9)	(14.4)	(25.3)
Power Cable Tunnel	(7.4)	(7.9)	(15.3)
5. TAILRACE	<u>168.8</u>	<u>289.0</u>	<u>457.8</u>
Tailrace Tunnel	(95.5)	(127.9)	(223.4)
Tailrace Surge Chamber	(14.9)	(24.3)	(39.2)
Tailrace Gate Chamber	(6.2)	(10.7)	(16.9)
Outlet	(47.5)	(120.6)	(168.1)
Work Adit	(4.7)	(5.5)	(10.2)
6. SWITCHYARD	<u>4.0</u>	<u>2.0</u>	<u>6.0</u>
7. T O T A L	<u>1,344.4</u>	<u>1,475.8</u>	<u>2,820.2</u>

(UNIT: BAHT)

CASE-2 (1) UPPER RESERVOIR (1st Stage)

Description	Unit	Quantity	Unit Price		Cost			
			F.C	L.C	F.C	L.C	Total	
(1) DAM								
Common Excavation (dam)	m ³	4,595,000	43	12	55	197,585,000	55,140,000	252,725,000
Rock Excavation (dam)	m ³	3,063,000	55	55	110	168,465,000	168,465,000	336,930,000
Rock Excavation (gallery)	m ³	38,000	55	55	110	2,090,000	2,090,000	4,180,000
Embankment Rockfill	m ³	6,807,000	35	10	45	238,245,000	68,070,000	306,315,000
Embankment Transition (base)	m ³	71,000	249	51	300	17,679,000	3,621,000	21,300,000
Embankment Transition (slope)	m ³	134,000	374	76	450	50,116,000	10,184,000	60,300,000
Asphalt Facing (base)	m ²	141,000	220	580	800	31,020,000	81,780,000	112,800,000
Asphalt Facing (slope)	m ²	223,000	450	1,150	1,600	100,350,000	256,450,000	356,800,000
Structural Concrete	m ³	31,500	384	1,716	2,100	12,096,000	54,054,000	66,150,000
Reinforcement Bar	ton	1,150	622	1,278	1,900	715,300	1,469,700	2,185,000
Miscellaneous Works	L.S	1				81,836,130	70,182,370	151,968,500
Sub Total						900,197,430	771,456,070	1,671,653,500
(2) DRAINAGE TUNNEL								
Tunnel Excavation (horizontal)	m ³	4,000	417	233	650	1,668,000	932,000	2,600,000
Shaft Excavation	m ³	260	462	238	700	120,120	61,880	182,000
Lining Concrete	m ³	2,500	622	1,278	1,900	1,555,000	3,195,000	4,750,000
Shaft Concrete	m ³	200	475	2,125	2,600	95,000	425,000	520,000
Reinforcement Bar	ton	110	0	19,000	19,000	0	2,090,000	2,090,000
Miscellaneous Works	L.S	1				343,812	670,388	1,014,200
Sub Total						3,781,932	7,374,268	11,156,200
T O T A L						903,979,362	778,830,338	1,682,809,700

(UNIT: BAHT)

CASE-2 (2) INTAKE (1st Stage)

Description	Unit	Quantity	Unit Price		Total	Cost		Total
			F.C	L.C		F.C	L.C	
Rock Excavation	m ³	3,700	55	55	110	203,500	203,500	407,000
Shaft Excavation	m ³	7,400	462	238	700	3,418,800	1,761,200	5,180,000
Structural Concrete	m ³	5,000	384	1,716	2,100	1,920,000	8,580,000	10,500,000
Mass Concrete	m ³	4,900	271	1,329	1,600	1,327,900	6,512,100	7,840,000
Filling Concrete	m ³	4,300	250	750	1,000	1,075,000	3,225,000	4,300,000
Reinforcement Bar	ton	860	0	19,000	19,000	0	16,340,000	16,340,000
Miscellaneous Works	L.S	1				794,520	3,662,180	4,456,700
Sub Total						8,739,720	40,283,980	49,023,700
T O T A L						8,739,720	40,283,980	49,023,700

(UNIT: BAHT)

CASE-2 (3) PENSTOCK (1st Stage)

Description	Unit	Quantity	Unit Price		Cost					
			F.C	L.C	Total	F.C	L.C	Total		
(1)PENSTOCK										
Tunnel Excavation (horizontal)	m ³	14,500	417	233	650	6,046,500	3,378,500	9,425,000		
Tunnel Excavation (inclined)	m ³	18,600	773	327	1,100	14,377,800	6,082,200	20,460,000		
Filling Concrete	m ³	14,100	250	750	1,000	3,525,000	10,575,000	14,100,000		
Miscellaneous Works	L.S	1				2,394,980	2,003,570	4,398,550		
Sub Total						26,344,230	22,039,270	48,383,500		
(2)UPPER ACCESS TUNNEL										
Tunnel Excavation (horizontal)	m ³	43,900	417	233	650	18,306,300	10,228,700	28,535,000		
Lining Concrete	m ³	11,400	622	1,278	1,900	7,090,800	14,569,200	21,660,000		
Plug Concrete	m ³	5,600	384	1,716	2,100	2,150,400	9,609,600	11,760,000		
Reinforcement Bar	ton	120	0	19,000	19,000	0	2,280,000	2,280,000		
Miscellaneous Works	L.S	1				2,754,750	3,668,750	6,423,500		
Sub Total						30,302,250	40,356,250	70,658,500		
(3)LOWER ACCESS TUNNEL										
Common Excavation	m ³	2,900	43	12	55	124,700	34,800	159,500		
Rock Excavation	m ³	2,900	55	55	110	159,500	159,500	319,000		
Tunnel Excavation (horizontal)	m ³	57,500	417	233	650	23,977,500	13,397,500	37,375,000		
Lining Concrete	m ³	15,900	622	1,278	1,900	9,889,800	20,320,200	30,210,000		
Plug Concrete	m ³	4,300	384	1,716	2,100	1,651,200	7,378,800	9,030,000		
Reinforcement Bar	ton	200	0	19,000	19,000	0	3,800,000	3,800,000		
Miscellaneous Works	L.S	1				3,580,270	4,509,080	8,089,350		
Sub Total						39,382,970	49,599,880	88,982,850		
TOTAL						96,029,450	111,995,400	208,024,850		

(UNIT: BAHT)

CASE-2 (4) POWERHOUSE (1st Stage)

Description	Unit	Quantity	Unit Price		Cost	
			F.C	L.C	F.C	L.C
		Total				Total
(1) POWERHOUSE						
ARCH EXCAVATION	m ³	29,000	283	237	8,207,000	6,873,000
CAVERN EXCAVATION	m ³	66,700	165	105	11,005,500	7,003,500
TUNNEL EXCAVATION (horizontal)	m ³	5,100	417	233	2,126,700	1,188,300
ARCH CONCRETE	m ³	7,500	567	2,533	4,252,500	18,997,500
POWERHOUSE CONCRETE	m ³	16,300	475	2,125	7,742,500	34,637,500
STRUCTURAL CONCRETE	m ³	4,850	384	1,716	1,862,400	8,322,600
LINING CONCRETE	m ³	1,680	622	1,278	1,044,960	2,147,040
FILLING CONCRETE	m ³	530	250	750	132,500	397,500
REINFORCEMENT BAR	ton	2,550	0	19,000	0	48,450,000
GROUTING	m	24,600	1,615	885	39,729,000	21,771,000
PRESTRESSED ROCK ANCHOR (ϕ 33, ℓ =20m)	PC	1,403	6,000	6,000	8,418,000	8,418,000
PRESTRESSED ROCK ANCHOR (ϕ 24, ℓ =10m)	PC	1,403	4,500	4,500	6,313,500	6,313,500
MISCELLANEOUS WORKS	L.S	1			9,083,456	16,451,944
Sub Total					99,918,016	180,971,384
						280,889,400

(UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Cost				
			F.C	L.C	F.C	L.C	Total		
(2) ACCESS TUNNEL									
COMMON EXCAVATION	m ²	900	43	12	55	38,700	10,800	49,500	
ROCK EXCAVATION	m ²	900	55	55	110	49,500	49,500	99,000	
TUNNEL EXCAVATION (horizontal)	m ²	64,600	417	233	650	26,938,200	15,051,800	41,990,000	
LINING CONCRETE	m ²	18,600	622	1,278	1,900	11,569,200	23,770,800	35,340,000	
REINFORCEMENT BAR	ton	310	0	19,000	19,000	0	5,890,000	5,890,000	
GROUTING	m	1,200	1,615	885	2,500	1,938,000	1,062,000	3,000,000	
MISCELLANEOUS WORKS	L.S	1				4,053,360	4,583,490	8,636,850	
Sub Total						44,586,960	50,418,390	95,005,350	
(3) DRAINAGE TUNNEL									
TUNNEL EXCAVATION (horizontal)	m ²	8,950	417	233	650	3,736,320	2,087,680	5,824,000	
LINING CONCRETE	m ²	4,000	622	1,278	1,900	2,488,000	5,112,000	7,600,000	
PLUG CONCRETE	m ²	580	384	1,716	2,100	222,720	995,280	1,218,000	
REINFORCEMENT BAR	ton	160	0	19,000	19,000	0	3,040,000	3,040,000	
GROUTING	m	2,120	1,615	885	2,500	3,423,800	1,876,200	5,300,000	
MISCELLANEOUS WORKS	L.S	1				987,084	1,311,116	2,298,200	
Sub Total						10,857,924	14,422,276	25,280,200	
(4) POWER CABLE TUNNEL									
TUNNEL EXCAVATION (horizontal)	m ²	7,100	417	233	650	2,960,700	1,654,300	4,615,000	
LINING CONCRETE	m ²	3,000	622	1,278	1,900	1,866,000	3,834,000	5,700,000	
REINFORCEMENT BAR	ton	33	0	19,000	19,000	0	627,000	627,000	
GROUTING	m	1,200	1,615	885	2,500	1,938,000	1,062,000	3,000,000	
MISCELLANEOUS WORKS	L.S	1				676,470	717,730	1,394,200	
Sub Total						7,441,170	7,895,030	15,336,200	
TOTAL						162,804,070	253,707,080	416,511,150	

(UNIT: BAHT)

CASE-2 (5) TAILRACE (1st Stage)

Description	Unit	Quantity	Unit Price		Cost			
			F.C	L.C	F.C	L.C	Total	
(1)TAILRACE TUNNEL								
TUNNEL EXCAVATION (horizontal)	m ³	88.400	417	233	650	36,862,800	20,597,200	57,460,000
SHAFT EXCAVATION	m ³	3.650	462	238	760	1,686,300	868,700	2,555,000
LINING CONCRETE	m ³	27,600	622	1,278	1,900	17,167,200	35,272,800	52,440,000
FILLING CONCRETE	m ³	3,360	250	750	1,000	840,000	2,520,000	3,360,000
SHAFT CONCRETE	m ³	2,080	475	2,125	2,600	988,000	4,420,000	5,408,000
REINFORCEMENT BAR	ton	1,925	0	19,000	19,000	0	36,575,000	36,575,000
GROUTING	m	18,100	1,615	885	2,500	29,231,500	16,018,500	45,250,000
MISCELLANEOUS WORKS	L.S	1				8,677,580	11,627,220	20,304,800
Sub Total						95,453,380	127,899,420	223,352,800
(2)TAILRACE SURGE CHAMBER								
TUNNEL EXCAVATION (horizontal)	m ³	5,200	417	233	650	2,168,400	1,211,600	3,380,000
SHAFT EXCAVATION	m ³	10,800	462	238	700	4,989,600	2,570,400	7,560,000
LINING CONCRETE	m ³	1,880	622	1,278	1,900	1,169,360	2,402,640	3,572,000
SHAFT CONCRETE	m ³	2,480	475	2,125	2,600	1,178,000	5,270,000	6,448,000
FILLING CONCRETE	m ³	1,390	250	750	1,000	347,500	1,042,500	1,390,000
REINFORCEMENT BAR	ton	400	0	19,000	19,000	0	7,600,000	7,600,000
GROUTING	m	2,280	1,615	885	2,500	3,682,200	2,017,800	5,700,000
MISCELLANEOUS WORKS	L.S	1				1,353,506	2,211,494	3,565,000
Sub Total						14,888,566	24,326,434	39,215,000

Description	Unit	Quantity	Unit Price		Cost			
			F.C	L.C	F.C	L.C	Total	
(3) TAILRACE GATE CHAMBER								
COMMON EXCAVATION	m ³	11,400	43	12	55	490,200	136,800	627,000
ROCK EXCAVATION	m ³	11,400	55	55	110	627,000	627,000	1,254,000
SHAFT EXCAVATION	m ³	4,600	462	238	700	2,125,200	1,094,800	3,220,000
SHAFT CONCRETE	m ³	2,060	475	2,125	2,600	978,500	4,377,500	5,356,000
STRUCTURAL CONCRETE	m ³	140	384	1,716	2,100	53,760	240,240	294,000
REINFORCEMENT BAR	ton	130	0	19,000	19,000	0	2,470,000	2,470,000
GROUTING	m	870	1,615	885	2,500	1,405,050	769,950	2,175,000
MISCELLANEOUS WORKS	L.S	1				567,971	971,629	1,539,600
Sub Total						6,247,681	10,687,919	16,935,600
(4) OUTLET								
COMMON EXCAVATION	m ³	512,000	43	12	55	22,016,000	6,144,000	28,160,000
ROCK EXCAVATION	m ³	220,000	55	55	110	12,100,000	12,100,000	24,200,000
EMBANKMENT	m ³	43,000	35	10	45	1,505,000	430,000	1,935,000
STRUCTURAL CONCRETE	m ³	18,000	384	1,716	2,100	6,912,000	30,888,000	37,800,000
REINFORCEMENT BAR	ton	1,370	0	19,000	19,000	0	26,030,000	26,030,000
MISCELLANEOUS WORKS	L.S	1				5,000,000	45,000,000	50,000,000
Sub Total						47,533,000	120,592,000	168,125,000
(5) WORK ADIT								
TUNNEL EXCAVATION (horizontal)	m ³	9,550	417	233	650	3,982,350	2,225,150	6,207,500
PLUG CONCRETE	m ³	1,880	384	1,716	2,100	721,920	3,226,080	3,948,000
Sub Total						4,704,270	5,451,230	10,155,500
TOTAL						168,826,897	288,957,003	457,783,900

(UNIT: BAHT)

CASE-2 (6) SWITCHYARD (1st Stage)

Description	Unit	Quantity	Unit Price		Cost		
			F.C	L.C	F.C	L.C	
COMMON EXCAVATION	m ³	84,000	43	12	3,612,000	1,008,000	4,620,000
STRUCTURAL CONCRETE	m ³	1,000	55	55	55,000	55,000	110,000
REINFORCEMENT BAR	ton	40	0	19,000	0	760,000	760,000
MISCELLANEOUS WORKS	L.S	1			366,700	182,300	549,000
Sub Total					4,033,700	2,005,300	6,039,000
TOTAL					4,033,700	2,005,300	6,039,000

CASE-2 (7) HYDRAULIC EQUIPMENT < 1st Stage > (UNIT: BAHT)

Description	Unit	Quantity	Unit Price			Cost		
			F.C	L.C	Total	F.C	L.C	Total
STEEL LINING (SM41, intake)	ton	430	0	48,000	48,000	0	20,640,000	20,640,000
PENSTOCK (SM58)	ton	1,250	0	55,000	55,000	0	68,750,000	68,750,000
PENSTOCK (HT80)	ton	2,730	112,000	48,000	160,000	305,760,000	131,040,000	436,800,000
BIFURCATION (HT80)	ton	155	112,000	48,000	160,000	17,360,000	7,440,000	24,800,000
STEEL LINING (SM50, tailrace)	ton	1,045	0	53,000	53,000	0	55,385,000	55,385,000
DRAFT GATE	set		229,600,000	7,400,000	237,000,000	59,200,000	14,800,000	74,000,000
TAILRACE GATE	set		224,800,000	6,200,000	231,000,000	49,600,000	12,400,000	62,000,000
T O T A L						431,920,000	310,455,000	742,375,000

Civil Work Cost of the Project (Case-2, 2nd Stage)

Description	C O S T (Million Baht)		
	F. C.	L. C.	TOTAL
1. UPPER RESERVOIR	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
Dam	(0.0)	(0.0)	(0.0)
Drainage Tunnel	(0.0)	(0.0)	(0.0)
2. INTAKE	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
3. PENSTOCK	<u>20.3</u>	<u>15.8</u>	<u>36.1</u>
Penstock	(20.3)	(15.8)	(36.1)
Upper Access Tunnel	(0.0)	(0.0)	(0.0)
Lower Access Tunnel	(0.0)	(0.0)	(0.0)
4. POWERHOUSE	<u>121.8</u>	<u>206.7</u>	<u>328.6</u>
Powerhouse	(97.7)	(176.8)	(274.6)
Access Tunnel	(9.1)	(11.6)	(20.7)
Drainage Tunnel	(7.7)	(10.6)	(18.3)
Power Cable Tunnel	(7.3)	(7.7)	(15.0)
5. TAILRACE	<u>90.4</u>	<u>126.2</u>	<u>216.6</u>
Tailrace Tunnel	(72.4)	(98.1)	(170.6)
Tailrace Surge Chamber	(17.9)	(28.0)	(46.0)
Tailrace Gate Chamber	(0.0)	(0.0)	(0.0)
Outlet	(0.0)	(0.0)	(0.0)
Work Adit	(0.0)	(0.0)	(0.0)
6. SWITCHYARD	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
7. T O T A L	<u>232.5</u>	<u>348.7</u>	<u>581.3</u>

(UNIT: BAHT)

CASE-2 (1) PENSTOCK (2nd Stage)

Description	Unit	Quantity	Unit Price		Cost		
			F.C	L.C	F.C	L.C	
(1)PENSTOCK							
Tunnel Excavation (horizontal)	m ³	4,000	417	233	1,668,000	932,000	2,600,000
Tunnel Excavation (inclined)	m ³	18,600	773	327	14,377,800	6,082,200	20,460,000
Filling Concrete	m ³	9,800	250	750	2,450,000	7,350,000	9,800,000
Miscellaneous Works	L.S	1			1,849,580	1,436,420	3,286,000
Sub Total					20,345,380	15,800,620	36,146,000
TOTAL					20,345,380	15,800,620	36,146,000

(UNIT: BAHT)

CASE-2 (2) POWERHOUSE (2nd Stage)

Description	Unit	Quantity	Unit Price		Cost				
			F.C	L.C	F.C	L.C	Total		
			Total	Total	Total	Total	Total		
(1) POWERHOUSE									
ARCH EXCAVATION	m ³	28,000	283	237	7,924,000	6,636,000	14,560,000		
CAVERN EXCAVATION	m ³	65,000	165	105	10,725,000	6,825,000	17,550,000		
TUNNEL EXCAVATION (horizontal)	m ³	5,100	417	233	2,126,700	1,188,300	3,315,000		
ARCH CONCRETE	m ³	7,200	567	2,533	4,082,400	18,237,600	22,320,000		
POWERHOUSE CONCRETE	m ³	16,000	475	2,125	7,600,000	34,000,000	41,600,000		
STRUCTURAL CONCRETE	m ³	4,800	384	1,716	1,843,200	8,236,800	10,080,000		
LINING CONCRETE	m ³	1,690	622	1,278	1,051,180	2,159,820	3,211,000		
FILLING CONCRETE	m ³	530	250	750	132,500	397,500	530,000		
REINFORCEMENT BAR	ton	2,490	0	19,000	0	47,310,000	47,310,000		
GROUTING	m	24,100	1,615	885	38,921,500	21,328,500	60,250,000		
PRESTRESSED ROCK ANCHOR (ϕ 33, ℓ = 20m)	PC	1,376	6,000	6,000	8,256,000	8,256,000	16,512,000		
PRESTRESSED ROCK ANCHOR (ϕ 24, ℓ = 10m)	PC	1,376	4,500	4,500	6,192,000	6,192,000	12,384,000		
MISCELLANEOUS WORKS	L.S	1			8,885,448	16,076,752	24,962,200		
Sub Total					97,739,928	176,844,272	274,584,200		

Description	Unit	Quantity	Unit Price			Cost				
			F.C	L.C	Total	F.C	L.C	Total		
(2) ACCESS TUNNEL										
COMMON EXCAVATION	m ³	0	43	12	55	0	0	0	0	0
ROCK EXCAVATION	m ³	0	55	55	110	0	0	0	0	0
TUNNEL EXCAVATION (horizontal)	m ³	12,300	417	233	650	5,129,100	2,865,900	7,995,000		
LINING CONCRETE	m ³	3,520	622	1,278	1,900	2,189,440	4,498,560	6,688,000		
REINFORCEMENT BAR	ton	140	0	19,000	19,000	0	2,660,000	2,660,000		
GROUTING	m	600	1,615	885	2,500	969,000	531,000	1,500,000		
MISCELLANEOUS WORKS	L.S	1				828,754	1,055,546	1,884,300		
Sub Total						9,116,294	11,611,006	20,727,300		
(3) DRAINAGE TUNNEL										
TUNNEL EXCAVATION (horizontal)	m ³	6,280	417	233	650	2,618,760	1,463,240	4,082,000		
LINING CONCRETE	m ³	2,800	622	1,278	1,900	1,741,600	3,578,400	5,320,000		
PLUG CONCRETE	m ³	690	384	1,716	2,100	264,960	1,184,040	1,449,000		
REINFORCEMENT BAR	ton	110	0	19,000	19,000	0	2,090,000	2,090,000		
GROUTING	m	1,470	1,615	885	2,500	2,374,050	1,300,950	3,675,000		
MISCELLANEOUS WORKS	L.S	1				699,937	961,663	1,661,600		
Sub Total						7,699,307	10,578,293	18,277,600		
(4) POWER CABLE TUNNEL										
TUNNEL EXCAVATION (horizontal)	m ³	6,900	417	233	650	2,877,300	1,607,700	4,485,000		
LINING CONCRETE	m ³	2,900	622	1,278	1,900	1,803,800	3,706,200	5,510,000		
REINFORCEMENT BAR	ton	33	0	19,000	19,000	0	627,000	627,000		
GROUTING	m	1,200	1,615	885	2,500	1,938,000	1,062,000	3,000,000		
MISCELLANEOUS WORKS	L.S	1				661,910	700,290	1,362,200		
Sub Total						7,281,010	7,703,190	14,984,200		
T O T A L						121,836,539	206,736,761	328,573,300		

(UNIT: BAHT)

CASE-2 (3) TAILTRACE (2nd Stage)

Description	Unit	Quantity	Unit Price		Cost				
			F.C	L.C	Total	F.C	L.C	Total	
(1)TAILTRACE TUNNEL									
TUNNEL EXCAVATION (horizontal)	m ³	66.600	417	238	650	27,772,200	15,517,800	43,290,000	
SHAFT EXCAVATION	m ³	3,650	462	238	700	1,686,300	868,700	2,555,000	
LINING CONCRETE	m ³	20,000	622	1,278	1,900	12,440,000	25,560,000	38,000,000	
FILLING CONCRETE	m ³	3,360	250	750	1,000	840,000	2,520,000	3,360,000	
SHAFT CONCRETE	m ³	2,080	475	2,125	2,600	988,000	4,420,000	5,408,000	
REINFORCEMENT BAR	ton	1,485	0	19,000	19,000	0	28,215,000	28,215,000	
GROUTING	m	18,700	1,615	885	2,500	22,125,500	12,124,500	34,250,000	
MISCELLANEOUS WORKS	L.S	1				6,585,200	8,922,600	15,507,800	
Sub Total						72,437,200	98,148,600	170,585,800	
(2)TAILTRACE SURGE CHAMBER									
TUNNEL EXCAVATION (horizontal)	m ³	8,000	417	238	650	3,336,000	1,864,000	5,200,000	
SHAFT EXCAVATION	m ³	10,800	462	238	700	4,989,600	2,570,400	7,560,000	
LINING CONCRETE	m ³	2,940	622	1,278	1,900	1,828,680	3,757,320	5,586,000	
SHAFT CONCRETE	m ³	2,480	475	2,125	2,600	1,178,000	5,270,000	6,448,000	
FILLING CONCRETE	m ³	1,390	250	750	1,000	347,500	1,042,500	1,390,000	
REINFORCEMENT BAR	ton	445	0	19,000	19,000	0	8,455,000	8,455,000	
GROUTING	m	2,860	1,615	885	2,500	4,618,900	2,531,100	7,150,000	
MISCELLANEOUS WORKS	L.S	1				1,629,868	2,549,032	4,178,900	
Sub Total						17,928,548	28,039,352	45,967,900	
T O T A L						90,365,748	126,187,952	216,553,700	

(UNIT: BAHT)

CASE-2 (4) HYDRAULIC EQUIPMENT (2nd Stage)

Description	Unit	Quantity	Unit Price		Cost		
			F.C	L.C	F.C	L.C	
PENSTOCK (SM58)	ton	500	0	55,000	0	27,500,000	27,500,000
PENSTOCK (HT80)	ton	2,730	112,000	48,000	305,760,000	131,040,000	436,800,000
BIFURCATION (HT80)	ton	155	112,000	48,000	17,360,000	7,440,000	24,800,000
DRAFT GATE	set	229,600,000	7,400,000	37,000,000	59,200,000	14,800,000	74,000,000
T O T A L					382,320,000	180,780,000	563,100,000

Civil Work Cost of the Project (Case-3, 1st Stage)

Description	C O S T (Million Baht)		
	F. C.	L. C.	TOTAL
1. UPPER RESERVOIR	<u>904.0</u>	<u>778.8</u>	<u>1,682.8</u>
Dam	(900.2)	(771.5)	(1,671.7)
Drainage Tunnel	(3.8)	(7.4)	(11.2)
2. INTAKE	<u>8.7</u>	<u>40.3</u>	<u>49.0</u>
3. PENSTOCK	<u>112.2</u>	<u>122.4</u>	<u>234.6</u>
Penstock	(46.4)	(37.6)	(84.0)
Upper Access Tunnel	(26.4)	(35.2)	(61.6)
Lower Access Tunnel	(39.4)	(49.6)	(89.0)
4. POWERHOUSE	<u>217.9</u>	<u>344.5</u>	<u>562.4</u>
Powerhouse	(153.4)	(269.0)	(422.4)
Access Tunnel	(44.6)	(50.4)	(95.0)
Drainage Tunnel	(12.7)	(17.3)	(30.0)
Power Cable Tunnel	(7.3)	(7.7)	(15.0)
5. TAILRACE	<u>255.8</u>	<u>410.6</u>	<u>666.4</u>
Tailrace Tunnel	(167.7)	(226.0)	(393.7)
Tailrace Surge Chamber	(30.1)	(49.0)	(79.1)
Tailrace Gate Chamber	(6.2)	(10.7)	(16.9)
Outlet	(47.5)	(120.6)	(168.1)
Work Adit	(4.1)	(4.3)	(8.5)
6. SWITCHYARD	<u>4.0</u>	<u>2.0</u>	<u>6.0</u>
7. T O T A L	<u>1,502.6</u>	<u>1,698.6</u>	<u>3,201.3</u>

Civil Work Cost of the Project (Case-3, 2nd Stage)

Description	C O S T (Million Baht)		
	F. C.	L. C.	TOTAL
1. UPPER RESERVOIR	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
Dam	(0.0)	(0.0)	(0.0)
Drainage Tunnel	(0.0)	(0.0)	(0.0)
2. INTAKE	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
3. PENSTOCK	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
Penstock	(0.0)	(0.0)	(0.0)
Upper Access Tunnel	(0.0)	(0.0)	(0.0)
Lower Access Tunnel	(0.0)	(0.0)	(0.0)
4. POWERHOUSE	<u>4.2</u>	<u>29.6</u>	<u>33.8</u>
Powerhouse	(4.2)	(29.6)	(33.8)
Access Tunnel	(0.0)	(0.0)	(0.0)
Drainage Tunnel	(0.0)	(0.0)	(0.0)
Power Cable Tunnel	(0.0)	(0.0)	(0.0)
5. TAILRACE	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
Tailrace Tunnel	(0.0)	(0.0)	(0.0)
Tailrace Surge Chamber	(0.0)	(0.0)	(0.0)
Tailrace Gate Chamber	(0.0)	(0.0)	(0.0)
Outlet	(0.0)	(0.0)	(0.0)
Work Adit	(0.0)	(0.0)	(0.0)
6. SWITCHYARD	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
7. T O T A L	<u>4.2</u>	<u>29.6</u>	<u>33.8</u>

(UNIT: BAHT)

CASE-3 (1) UPPER RESERVOIR

Description	Unit	Quantity	Unit Price		Total	Cost		Total
			F.C	L.C		F.C	L.C	
(1) DAM								
Common Excavation (dam)	m ³	4,595.000	43	12	55	197,585,000	55,140,000	252,725,000
Rock Excavation (dam)	m ³	3,063.000	55	55	110	168,465,000	168,465,000	336,930,000
Rock Excavation (gallery)	m ³	38.000	55	55	110	2,090,000	2,090,000	4,180,000
Embankment Rockfill	m ³	6,807.000	35	10	45	238,245,000	68,070,000	306,315,000
Embankment Transition (base)	m ³	71.000	249	51	300	17,679,000	3,621,000	21,300,000
Embankment Transition (slope)	m ³	134.000	374	76	450	50,116,000	10,184,000	60,300,000
Asphalt Facing (base)	m ²	141.000	220	580	800	31,020,000	81,780,000	112,800,000
Asphalt Facing (slope)	m ²	223.000	450	1,150	1,600	100,350,000	256,450,000	356,800,000
Structural Concrete	m ³	31.500	384	1,716	2,100	12,096,000	54,054,000	66,150,000
Reinforcement Bar	ton	1.150	622	1,278	1,900	715,300	1,469,700	2,185,000
Miscellaneous Works	L.S	1				81,836,130	70,132,370	151,968,500
Sub Total						900,197,430	771,456,070	1,671,653,500
(2) DRAINAGE TUNNEL								
Tunnel Excavation (horizontal)	m ³	4.000	417	238	650	1,668,000	932,000	2,600,000
Shaft Excavation	m ³	260	462	238	700	120,120	61,880	182,000
Lining Concrete	m ³	2,500	622	1,278	1,900	1,555,000	3,195,000	4,750,000
Shaft Concrete	m ³	200	475	2,125	2,600	95,000	425,000	520,000
Reinforcement Bar	ton	110	0	19,000	19,000	0	2,090,000	2,090,000
Miscellaneous Works	L.S	1				343,812	670,388	1,014,200
Sub Total						3,781,932	7,374,268	11,156,200
TOTAL						903,979,362	778,830,338	1,682,809,700

CASE-3 (2) INTAKE

(UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Cost	
			F.C	L.C	F.C	L.C
Rock Excavation	m ³	3,700	55	110	203,500	407,000
Shaft Excavation	m ³	7,400	462	700	3,418,800	5,180,000
Structural Concrete	m ³	5,000	384	2,100	1,920,000	10,500,000
Mass Concrete	m ³	4,900	271	1,600	1,327,900	7,840,000
Filling Concrete	m ³	4,300	250	1,000	1,075,000	4,300,000
Reinforcement Bar	ton	860	0	19,000	0	16,340,000
Miscellaneous Works	L.S	1			794,520	4,456,700
Sub Total					8,739,720	49,023,700
TOTAL					8,739,720	49,023,700

CASE-3 (3) PENSTOCK

(UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Cost			
			F.C	L.C	F.C	L.C	Total	
(1)PENSTOCK								
Tunnel Excavation (horizontal)	m ³	18.100	417	233	650	7,547,700	4,217,300	11,765,000
Tunnel Excavation (inclined)	m ³	37.100	773	327	1,100	28,678,300	12,131,700	40,810,000
Filling Concrete	m ³	23.800	250	750	1,000	5,950,000	17,850,000	23,800,000
Miscellaneous Works	L.S	1				4,217,600	3,419,900	7,637,500
Sub Total						46,393,600	37,618,900	84,012,500
(2)UPPER ACCESS TUNNEL								
Tunnel Excavation (horizontal)	m ³	38.500	417	233	650	16,054,500	8,970,500	25,025,000
Lining Concrete	m ³	9.800	622	1,278	1,900	6,095,600	12,524,400	18,620,000
Plug Concrete	m ³	4.900	384	1,716	2,100	1,881,600	8,408,400	10,290,000
Reinforcement Bar	ton	110	0	19,000	19,000	0	2,090,000	2,090,000
Miscellaneous Works	L.S	1				2,403,170	3,199,330	5,602,500
Sub Total						26,434,870	35,192,630	61,627,500
(3)LOWER ACCESS TUNNEL								
Common Excavation	m ³	2,900	43	12	55	124,700	34,800	159,500
Rock Excavation	m ³	2,900	55	55	110	159,500	159,500	319,000
Tunnel Excavation (horizontal)	m ³	57.500	417	233	650	23,977,500	13,397,500	37,375,000
Lining Concrete	m ³	15.900	622	1,278	1,900	9,889,800	20,320,200	30,210,000
Plug Concrete	m ³	4.300	384	1,716	2,100	1,651,200	7,378,800	9,030,000
Reinforcement Bar	ton	200	0	19,000	19,000	0	3,800,000	3,800,000
Miscellaneous Works	L.S	1				3,580,270	4,509,080	8,089,350
Sub Total						39,382,970	49,599,880	88,982,850
TOTAL						112,211,440	122,411,410	234,622,850

(UNIT: BAHT)

CASE-3 (4) POWERHOUSE (1st Stage)

Description	Unit	Quantity	Unit Price		Cost				
			F.C	L.C	Total	F.C	L.C	Total	
(1) POWERHOUSE									
ARCH EXCAVATION	m ³	48,000	283	237	520	13,584,000	11,376,000	24,960,000	
CAVERN EXCAVATION	m ³	116,200	165	105	270	19,173,000	12,201,000	31,374,000	
TUNNEL EXCAVATION (horizontal)	m ³	8,800	417	233	650	3,669,600	2,050,400	5,720,000	
ARCH CONCRETE	m ³	12,300	567	2,533	3,100	6,974,100	31,155,900	38,130,000	
POWERHOUSE CONCRETE	m ³	22,800	475	2,125	2,600	10,830,000	48,450,000	59,280,000	
STRUCTURAL CONCRETE	m ³	6,100	384	1,716	2,100	2,342,400	10,467,600	12,810,000	
LINING CONCRETE	m ³	2,800	622	1,278	1,900	1,741,600	3,578,400	5,320,000	
FILLING CONCRETE	m ³	1,050	250	750	1,000	262,500	787,500	1,050,000	
REINFORCEMENT BAR	ton	3,690	0	19,000	19,000	0	70,110,000	70,110,000	
GROUTING	m	36,240	1,615	885	2,500	58,527,600	32,072,400	90,600,000	
PRESTRESSED ROCK ANCHOR (ϕ 33, l = 20m)	PC	2,125	6,000	6,000	12,000	12,750,000	12,750,000	25,500,000	
PRESTRESSED ROCK ANCHOR (ϕ 24, l = 10m)	PC	2,125	4,500	4,500	9,000	9,562,500	9,562,500	19,125,000	
MISCELLANEOUS WORKS	L.S	1				13,941,730	24,456,170	38,397,900	
Sub Total						153,359,030	269,017,870	422,376,900	

(UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Cost					
			F.C	L.C	Total	F.C	L.C	Total		
(2)ACCESS TUNNEL										
COMMON EXCAVATION	m ²	900	43	12	55	38,700	10,800	49,500		
ROCK EXCAVATION	m ²	900	55	55	110	49,500	49,500	99,000		
TUNNEL EXCAVATION (horizontal)	m ²	64,600	417	233	650	26,938,200	15,051,800	41,990,000		
LINING CONCRETE	m ²	18,600	622	1,278	1,900	11,569,200	23,770,800	35,340,000		
REINFORCEMENT BAR	ton	310	0	19,000	19,000	0	5,890,000	5,890,000		
GROUTING	m	1,200	1,615	885	2,500	1,938,000	1,062,000	3,000,000		
MISCELLANEOUS WORKS	L.S	1				4,053,360	4,583,490	8,636,850		
Sub Total						44,586,960	50,418,390	95,005,350		
(3)DRAINAGE TUNNEL										
TUNNEL EXCAVATION (horizontal)	m ²	10,200	417	233	650	4,253,400	2,376,500	6,630,000		
LINING CONCRETE	m ²	4,540	622	1,278	1,900	2,823,880	5,802,120	8,626,000		
PLUG CONCRETE	m ²	1,150	384	1,716	2,100	441,600	1,973,400	2,415,000		
REINFORCEMENT BAR	ton	180	0	19,000	19,000	0	3,420,000	3,420,000		
GROUTING	m	2,470	1,615	885	2,500	3,989,050	2,185,950	6,175,000		
MISCELLANEOUS WORKS	L.S	1				1,150,793	1,575,807	2,726,600		
Sub Total						12,658,723	17,333,877	29,992,600		
(4)POWER CABLE TUNNEL										
TUNNEL EXCAVATION (horizontal)	m ²	6,900	417	233	650	2,877,300	1,607,700	4,485,000		
LINING CONCRETE	m ²	2,920	622	1,278	1,900	1,815,240	3,731,760	5,548,000		
REINFORCEMENT BAR	ton	33	0	19,000	19,000	0	627,000	627,000		
GROUTING	m	1,200	1,615	885	2,500	1,938,000	1,062,000	3,000,000		
MISCELLANEOUS WORKS	L.S	1				663,154	702,846	1,366,000		
Sub Total						7,294,694	7,731,306	15,026,000		
TOTAL						217,899,407	344,501,443	562,400,850		

CASE-3 (5) TAILRACE

(UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Total	Cost		Total
			F.C	L.C		F.C	L.C	
(1)TAILRACE TUNNEL								
TUNNEL EXCAVATION (horizontal)	m ³	155,000	417	233	650	64,635,000	36,115,000	100,750,000
SHAFT EXCAVATION	m ³	7,300	462	238	700	3,372,600	1,737,400	5,110,000
LINING CONCRETE	m ³	47,600	622	1,278	1,900	29,607,200	60,832,800	90,440,000
FILLING CONCRETE	m ³	6,720	250	750	1,000	1,680,000	5,040,000	6,720,000
SHAFT CONCRETE	m ³	4,160	475	2,125	2,600	1,976,000	8,840,000	10,816,000
REINFORCEMENT BAR	ton	3,410	0	19,000	19,000	0	64,790,000	64,790,000
GROUTING	m	31,720	1,615	885	2,500	51,227,800	28,072,200	79,300,000
MISCELLANEOUS WORKS	L.S	1				15,249,860	20,542,740	35,792,600
Sub Total						167,748,460	225,970,140	393,718,600
(2)TAILRACE SURGE CHAMBER								
TUNNEL EXCAVATION (horizontal)	m ³	10,500	417	233	650	4,378,500	2,446,500	6,825,000
SHAFT EXCAVATION	m ³	21,600	462	238	700	9,979,200	5,140,800	15,120,000
LINING CONCRETE	m ³	3,840	622	1,278	1,900	2,388,480	4,907,520	7,296,000
SHAFT CONCRETE	m ³	4,950	475	2,125	2,600	2,351,250	10,518,750	12,870,000
FILLING CONCRETE	m ³	2,770	250	750	1,000	692,500	2,077,500	2,770,000
REINFORCEMENT BAR	ton	805	0	19,000	19,000	0	15,295,000	15,295,000
GROUTING	m	4,690	1,615	885	2,500	7,574,350	4,150,650	11,725,000
MISCELLANEOUS WORKS	L.S	1				2,736,428	4,453,672	7,190,100
Sub Total						30,100,708	48,990,392	79,091,100

Description	Unit	Quantity	Unit Price		Cost					
			F. C	L. C	Total	F. C	L. C	Total		
(3) TAILRACE GATE CHAMBER										
COMMON EXCAVATION	m ³	11,400	43	12	55	490,200	136,800	627,000		
ROCK EXCAVATION	m ³	11,400	55	55	110	627,000	627,000	1,254,000		
SHAFT EXCAVATION	m ³	4,600	462	238	700	2,125,200	1,094,800	3,220,000		
SHAFT CONCRETE	m ³	2,060	475	2,125	2,600	978,500	4,377,500	5,356,000		
STRUCTURAL CONCRETE	m ³	140	384	1,716	2,100	53,760	240,240	294,000		
REINFORCEMENT BAR	ton	130	0	19,000	19,000	0	2,470,000	2,470,000		
GROUTING	m	870	1,615	865	2,500	1,405,050	769,950	2,175,000		
MISCELLANEOUS WORKS	L. S	1				567,971	971,629	1,539,600		
Sub Total						6,247,681	10,687,919	16,935,600		
(4) OUTLET										
COMMON EXCAVATION	m ³	512,000	43	12	55	22,016,000	6,144,000	28,160,000		
ROCK EXCAVATION	m ³	220,000	55	55	110	12,100,000	12,100,000	24,200,000		
EMBANKMENT	m ³	43,000	35	10	45	1,505,000	430,000	1,935,000		
STRUCTURAL CONCRETE	m ³	18,000	384	1,716	2,100	6,912,000	30,888,000	37,800,000		
REINFORCEMENT BAR	ton	1,370	0	19,000	19,000	0	26,030,000	26,030,000		
MISCELLANEOUS WORKS	L. S	1				5,000,000	45,000,000	50,000,000		
Sub Total						47,533,000	120,592,000	168,125,000		
(5) WORK ADIT										
TUNNEL EXCAVATION (horizontal)	m ³	8,700	417	233	650	3,627,900	2,027,100	5,655,000		
PLUG CONCRETE	m ³	1,350	384	1,716	2,100	518,400	2,316,600	2,835,000		
Sub Total						4,146,300	4,343,700	8,490,000		
TOTAL						255,776,149	410,584,151	666,360,300		

CASE-3 (6) SWITCHYARD

(UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Cost			
			F.C	L.C	Total	F.C	L.C	Total
COMMON EXCAVATION	m ³	84,000	43	12	55	3,612,000	1,008,000	4,620,000
STRUCTURAL CONCRETE	m ³	1,000	55	55	110	55,000	55,000	110,000
REINFORCEMENT BAR	ton	40	0	19,000	19,000	0	760,000	760,000
MISCELLANEOUS WORKS	L.S	1				366,700	182,300	549,000
Sub Total						4,033,700	2,005,300	6,039,000
TOTAL						4,033,700	2,005,300	6,039,000

(UNIT: BAHT)

CASE-3 (7) POWERHOUSE (2nd Stage)

Description	Unit	Quantity	Unit Price		Cost		
			F.C	L.C	F.C	L.C	Total
POWERHOUSE CONCRETE	m ³	5,200	475	2,125	2,470,000	11,050,000	13,520,000
STRUCTURAL CONCRETE	m ³	3,600	384	1,716	1,382,400	6,177,600	7,560,000
REINFORCEMENT BAR	ton	510	0	19,000	0	9,690,000	9,690,000
MISCELLANEOUS WORKS	L.S	1			385,240	2,691,760	3,077,000
Sub Total					4,237,640	29,609,360	33,847,000
TOTAL					4,237,640	29,609,360	33,847,000

(UNIT: BAHT)

CASE-3 (8) HYDRAULIC EQUIPMENT

Description	Unit	Quantity	Unit Price			Cost		
			F.C.	L.C.	Total	F.C.	L.C.	Total
STEEL LINING (SM41, intake)	ton	430	0	48,000	48,000	0	20,640,000	20,640,000
PENSTOCK (SM58)	ton	1,720	0	55,000	55,000	0	94,600,000	94,600,000
PENSTOCK (HT80)	ton	5,460	112,000	48,000	160,000	611,520,000	262,080,000	873,600,000
BIFURCATION (HT80)	ton	310	112,000	48,000	160,000	34,720,000	14,880,000	49,600,000
STEEL LINING (SM50, tailrace)	ton	2,090	0	53,000	53,000	0	110,770,000	110,770,000
DRAFT GATE	set		429,600,000	7,400,000	37,000,000	118,400,000	29,600,000	148,000,000
TAILRACE GATE	set		224,800,000	6,200,000	31,000,000	49,600,000	12,400,000	62,000,000
T O T A L						814,240,000	544,970,000	1,359,210,000

Civil Work Cost of the Project (Case-4)

Description	C O S T (Million Baht)		
	F. C.	L. C.	TOTAL
1. UPPER RESERVOIR	<u>904.0</u>	<u>778.8</u>	<u>1,682.8</u>
Dam	(900.2)	(771.5)	(1,671.7)
Drainage Tunnel	(3.8)	(7.4)	(11.2)
2. INTAKE	<u>8.7</u>	<u>40.3</u>	<u>49.0</u>
3. PENSTOCK	<u>112.2</u>	<u>122.4</u>	<u>234.6</u>
Penstock	(46.4)	(37.6)	(84.0)
Upper Access Tunnel	(26.4)	(35.2)	(61.6)
Lower Access Tunnel	(39.4)	(49.6)	(89.0)
4. POWERHOUSE	<u>222.0</u>	<u>373.4</u>	<u>595.4</u>
Powerhouse	(157.5)	(297.9)	(455.4)
Access Tunnel	(44.6)	(50.4)	(95.0)
Drainage Tunnel	(12.7)	(17.3)	(30.0)
Power Cable Tunnel	(7.3)	(7.7)	(15.0)
5. TAILRACE	<u>255.8</u>	<u>410.6</u>	<u>666.4</u>
Tailrace Tunnel	(167.7)	(226.0)	(393.7)
Tailrace Surge Chamber	(30.1)	(49.0)	(79.1)
Tailrace Gate Chamber	(6.2)	(10.7)	(16.9)
Outlet	(47.5)	(120.6)	(168.1)
Work Adit	(4.1)	(4.3)	(8.5)
6. SWITCHYARD	<u>4.0</u>	<u>2.0</u>	<u>6.0</u>
7. T O T A L	<u>1,506.7</u>	<u>1,727.5</u>	<u>3,234.3</u>

(UNIT: BAHT)

CASE-4 (1) UPPER RESERVOIR

Description	Unit	Quantity	Unit Price		Total	Cost		Total
			F.C	L.C		F.C	L.C	
(1) DAM								
Common Excavation (dam)	m ³	4,595,000	43	12	55	197,585,000	55,140,000	252,725,000
Rock Excavation (dam)	m ³	3,063,000	55	55	110	168,465,000	168,465,000	336,930,000
Rock Excavation (gallery)	m ³	38,000	55	55	110	2,090,000	2,090,000	4,180,000
Embankment Rockfill	m ³	6,807,000	35	10	45	238,245,000	68,070,000	306,315,000
Embankment Transition (base)	m ³	71,000	249	51	300	17,679,000	3,621,000	21,300,000
Embankment Transition (slope)	m ³	134,000	374	76	450	50,116,000	10,184,000	60,300,000
Asphalt Facing (base)	m ²	141,000	220	580	800	31,020,000	81,780,000	112,800,000
Asphalt Facing (slope)	m ²	223,000	450	1,150	1,600	100,350,000	256,450,000	356,800,000
Structural Concrete	m ³	31,500	384	1,716	2,100	12,096,000	54,054,000	66,150,000
Reinforcement Bar	ton	1,150	622	1,278	1,900	715,300	1,469,700	2,185,000
Miscellaneous Works	L.S	1				81,836,130	70,132,370	151,968,500
Sub Total						900,197,430	771,456,070	1,671,653,500
(2) DRAINAGE TUNNEL								
Tunnel Excavation (horizontal)	m ³	4,000	417	233	650	1,668,000	932,000	2,600,000
Shaft Excavation	m ³	260	462	238	700	120,120	61,880	182,000
Lining Concrete	m ³	2,500	622	1,278	1,900	1,555,000	3,195,000	4,750,000
Shaft Concrete	m ³	200	475	2,125	2,600	95,000	425,000	520,000
Reinforcement Bar	ton	110	0	19,000	19,000	0	2,090,000	2,090,000
Miscellaneous Works	L.S	1				343,812	670,388	1,014,200
Sub Total						3,781,932	7,374,268	11,156,200
TOTAL						903,979,362	778,830,338	1,682,809,700

CASE-4 (2) INTAKE

(UNIT: BAHT)

Description	Unit	Quantity	Unit Price			Cost		
			F.C	L.C	Total	F.C	L.C	Total
Rock Excavation	m ³	3,700	55	55	110	203,500	203,500	407,000
Shaft Excavation	m ³	7,400	462	238	700	3,418,800	1,761,200	5,180,000
Structural Concrete	m ³	5,000	384	1,716	2,100	1,920,000	8,580,000	10,500,000
Mass Concrete	m ³	4,900	271	1,329	1,600	1,327,900	6,512,100	7,840,000
Filling Concrete	m ³	4,300	250	750	1,000	1,075,000	3,225,000	4,300,000
Reinforcement Bar	ton	860	0	19,000	19,000	0	16,340,000	16,340,000
Miscellaneous Works	L.S	1				794,520	3,662,180	4,456,700
Sub Total						8,739,720	40,283,980	49,023,700
TOTAL						8,739,720	40,283,980	49,023,700

CASE-4 (3) PENSTOCK

(UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Cost			
			F.C	L.C	Total	F.C	L.C	Total
(1) PENSTOCK								
Tunnel Excavation (horizontal)	m ³	18,100	417	233	650	7,547,700	4,217,300	11,765,000
Tunnel Excavation (inclined)	m ³	37,100	773	327	1,100	28,678,300	12,131,700	40,810,000
Filling Concrete	m ³	23,800	250	750	1,000	5,950,000	17,850,000	23,800,000
Miscellaneous Works	L.S	1				4,217,600	3,419,900	7,637,500
Sub Total						46,393,600	37,618,900	84,012,500
(2) UPPER ACCESS TUNNEL								
Tunnel Excavation (horizontal)	m ³	38,500	417	233	650	16,054,500	8,970,500	25,025,000
Lining Concrete	m ³	9,800	622	1,278	1,900	6,095,600	12,524,400	18,620,000
Plug Concrete	m ³	4,900	384	1,716	2,100	1,881,600	8,408,400	10,290,000
Reinforcement Bar	ton	110	0	19,000	19,000	0	2,090,000	2,090,000
Miscellaneous Works	L.S	1				2,403,170	3,199,330	5,602,500
Sub Total						26,434,870	35,192,630	61,627,500
(3) LOWER ACCESS TUNNEL								
Common Excavation	m ³	2,900	43	12	55	124,700	34,800	159,500
Rock Excavation	m ³	2,900	55	55	110	159,500	159,500	319,000
Tunnel Excavation (horizontal)	m ³	57,500	417	233	650	23,977,500	13,397,500	37,375,000
Lining Concrete	m ³	15,900	622	1,278	1,900	9,889,800	20,320,200	30,210,000
Plug Concrete	m ³	4,300	384	1,716	2,100	1,651,200	7,378,800	9,030,000
Reinforcement Bar	ton	200	0	19,000	19,000	0	3,800,000	3,800,000
Miscellaneous Works	L.S	1				3,580,270	4,509,080	8,089,350
Sub Total						39,382,970	49,599,880	88,982,850
T O T A L						112,211,440	122,411,410	234,622,850

CASE-4 (4) POWERHOUSE

(UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Cost				
			F.C	L.C	Total	F.C	L.C	Total	
(1) POWERHOUSE									
ARCH EXCAVATION	m ³	48,000	283	237	520	13,584,000	11,376,000	24,960,000	
CAVERN EXCAVATION	m ³	116,200	165	105	270	19,173,000	12,201,000	31,374,000	
TUNNEL EXCAVATION (horizontal)	m ³	8,800	417	233	650	3,669,600	2,050,400	5,720,000	
ARCH CONCRETE	m ³	12,300	567	2,583	3,100	6,974,100	31,155,900	38,130,000	
POWERHOUSE CONCRETE	m ³	28,000	475	2,125	2,600	13,300,000	59,509,000	72,800,000	
STRUCTURAL CONCRETE	m ³	9,300	384	1,716	2,100	3,571,200	15,958,800	19,530,000	
LINING CONCRETE	m ³	2,800	622	1,278	1,900	1,741,600	3,578,400	5,320,000	
FILLING CONCRETE	m ³	1,050	250	750	1,000	262,500	787,500	1,050,000	
REINFORCEMENT BAR	ton	4,200	0	19,000	19,000	0	79,800,000	79,800,000	
GROUTING	m	36,270	1,615	885	2,500	58,576,050	32,098,950	90,675,000	
PRESTRESSED ROCK ANCHOR (ϕ 33, l = 20m)	PC	2,125	6,000	6,000	12,000	12,750,000	12,750,000	25,500,000	
PRESTRESSED ROCK ANCHOR (ϕ 24, l = 10m)	PC	2,125	4,500	4,500	9,000	9,562,500	9,562,500	19,125,000	
MISCELLANEOUS WORKS	L.S	1				14,316,455	27,081,945	41,398,400	
Sub Total						157,481,005	297,901,395	455,382,400	

Description	Unit	Quantity	Unit Price		Cost			
			F.C	L.C	F.C	L.C	Total	
(2) ACCESS TUNNEL								
COMMON EXCAVATION	m ³	900	43	12	38,700	10,800	49,500	
ROCK EXCAVATION	m ³	900	55	55	49,500	49,500	99,000	
TUNNEL EXCAVATION (horizontal)	m ³	64,600	417	233	26,938,200	15,051,800	41,990,000	
LINING CONCRETE	m ³	18,600	622	1,278	11,569,200	23,770,800	35,340,000	
REINFORCEMENT BAR	ton	310	0	19,000	0	5,890,000	5,890,000	
GROUTING	m	1,200	1,615	885	1,938,000	1,062,000	3,000,000	
MISCELLANEOUS WORKS	L.S	1			4,053,360	4,583,490	8,636,850	
Sub Total					44,586,960	50,418,390	95,005,350	
(3) DRAINAGE TUNNEL								
TUNNEL EXCAVATION (horizontal)	m ³	10,200	417	233	4,253,400	2,376,600	6,630,000	
LINING CONCRETE	m ³	4,540	622	1,278	2,823,880	5,802,120	8,626,000	
PLUG CONCRETE	m ³	1,150	384	1,716	441,600	1,973,400	2,415,000	
REINFORCEMENT BAR	ton	180	0	19,000	0	3,420,000	3,420,000	
GROUTING	m	2,470	1,615	885	3,989,050	2,185,950	6,175,000	
MISCELLANEOUS WORKS	L.S	1			1,150,793	1,575,807	2,726,600	
Sub Total					12,658,723	17,333,877	29,992,600	
(4) POWER CABLE TUNNEL								
TUNNEL EXCAVATION (horizontal)	m ³	6,900	417	233	2,877,300	1,607,700	4,485,000	
LINING CONCRETE	m ³	2,920	622	1,278	1,816,240	3,731,760	5,548,000	
REINFORCEMENT BAR	ton	33	0	19,000	0	627,000	627,000	
GROUTING	m	1,200	1,615	885	1,938,000	1,062,000	3,000,000	
MISCELLANEOUS WORKS	L.S	1			663,154	702,846	1,366,000	
Sub Total					7,294,694	7,731,306	15,026,000	
T O T A L					222,021,382	373,384,968	595,406,350	

CASE-4 (5) TAILRACE

(UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Cost			
			F.C	L.C	F.C	L.C	Total	
(1)TAILRACE TUNNEL								
TUNNEL EXCAVATION (horizontal)	m ³	155,000	417	233	650	64,635,000	36,115,000	100,750,000
SHAFT EXCAVATION	m ³	7,300	462	238	700	3,372,600	1,737,400	5,110,000
LINING CONCRETE	m ³	47,600	622	1,278	1,900	29,607,200	60,832,800	90,440,000
FILLING CONCRETE	m ³	6,720	250	750	1,000	1,680,000	5,040,000	6,720,000
SHAFT CONCRETE	m ³	4,160	475	2,125	2,600	1,976,000	8,840,000	10,816,000
REINFORCEMENT BAR	ton	3,410	0	19,000	19,000	0	64,790,000	64,790,000
GROUTING	m	31,720	1,615	885	2,500	51,227,800	28,072,200	79,300,000
MISCELLANEOUS WORKS	L.S	1				15,249,860	20,542,740	35,792,600
Sub Total						167,748,460	225,970,140	393,718,600
(2)TAILRACE SURGE CHAMBER								
TUNNEL EXCAVATION (horizontal)	m ³	10,500	417	233	650	4,378,500	2,446,500	6,825,000
SHAFT EXCAVATION	m ³	21,600	462	238	700	9,979,200	5,140,800	15,120,000
LINING CONCRETE	m ³	3,840	622	1,278	1,900	2,388,480	4,907,520	7,296,000
SHAFT CONCRETE	m ³	4,950	475	2,125	2,600	2,351,250	10,518,750	12,870,000
FILLING CONCRETE	m ³	2,770	250	750	1,000	692,500	2,077,500	2,770,000
REINFORCEMENT BAR	ton	805	0	19,000	19,000	0	15,295,000	15,295,000
GROUTING	m	4,690	1,615	885	2,500	7,574,350	4,150,650	11,725,000
MISCELLANEOUS WORKS	L.S	1				2,736,428	4,453,672	7,190,100
Sub Total						30,100,708	48,990,392	79,091,100

Description	Unit	Quantity	Unit Price			Cost				
			F.C	L.C	Total	F.C	L.C	Total		
(3)TAILRACE GATE CHAMBER										
COMMON EXCAVATION	m ³	11,400	43	12	55	490,200	136,800	627,000		
ROCK EXCAVATION	m ³	11,400	55	55	110	627,000	627,000	1,254,000		
SHAFT EXCAVATION	m ³	4,600	462	238	700	2,125,200	1,094,800	3,220,000		
SHAFT CONCRETE	m ³	2,080	475	2,125	2,600	978,500	4,377,500	5,356,000		
STRUCTUAL CONCRETE	m ³	140	384	1,716	2,100	53,760	240,240	294,000		
REINFORCEMENT BAR	ton	130	0	19,000	19,000	0	2,470,000	2,470,000		
GROUTING	m	870	1,615	885	2,500	1,405,050	769,950	2,175,000		
MISCELLANEOUS WORKS	L.S	1				567,971	971,629	1,539,600		
Sub Total						6,247,681	10,687,919	16,935,600		
(4)OUTLET										
COMMON EXCAVATION	m ³	512,000	43	12	55	22,016,000	6,144,000	28,160,000		
ROCK EXCAVATION	m ³	220,000	55	55	110	12,100,000	12,100,000	24,200,000		
EMBANKMENT	m ³	43,000	35	10	45	1,505,000	430,000	1,935,000		
STRUCTUAL CONCRETE	m ³	18,000	384	1,716	2,100	6,912,000	30,888,000	37,800,000		
REINFORCEMENT BAR	ton	1,370	0	19,000	19,000	0	26,030,000	26,030,000		
MISCELLANEOUS WORKS	L.S	1				5,000,000	45,000,000	50,000,000		
Sub Total						47,533,000	120,592,000	168,125,000		
(5)WORK ADIT										
TUNNEL EXCAVATION (horizontal)	m ³	8,700	417	233	650	3,627,900	2,027,100	5,655,000		
PLUG CONCRETE	m ³	1,350	384	1,716	2,100	518,400	2,316,600	2,835,000		
Sub Total						4,146,300	4,343,700	8,490,000		
TOTAL						255,776,149	410,584,151	666,360,300		

CASE-4 (6) SWITCHYARD

(UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Cost		
			F.C	L.C	F.C	L.C	Total
COMMON EXCAVATION	m ³	84,000	43	12	3,612,000	1,008,000	4,620,000
STRUCTURAL CONCRETE	m ³	1,000	55	55	55,000	55,000	110,000
REINFORCEMENT BAR	ton	40	0	19,000	0	760,000	760,000
MISCELLANEOUS WORKS	L.S	1			366,700	182,300	549,000
Sub Total					4,033,700	2,005,300	6,039,000
T O T A L					4,033,700	2,005,300	6,039,000

CASE-4 (7) HYDRAULIC EQUIPMENT

(UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Total	Cost		Total
			F.C	L.C		F.C	L.C	
STEEL LINING (SM41, intake)	ton	430	0	48,000	48,000	0	20,640,000	20,640,000
PENSTOCK (SM58)	ton	1,720	0	55,000	55,000	0	94,600,000	94,600,000
PENSTOCK (HT80)	ton	5,460	112,000	48,000	160,000	611,520,000	262,080,000	873,600,000
BIFURCATION (HT80)	ton	310	112,000	48,000	160,000	34,720,000	14,880,000	49,600,000
STEEL LINING (SM50, tailrace)	ton	2,090	0	53,000	53,000	0	110,770,000	110,770,000
DRAFT GATE	set	429	600,000	7,400,000	37,000,000	118,400,000	29,600,000	148,000,000
TAILRACE GATE	set	224	800,000	6,200,000	31,000,000	49,600,000	12,400,000	62,000,000
TOTAL						814,240,000	544,970,000	1,359,210,000

Civil Work Cost of the Project (Alternative-1, 1st Stage)

Description	C O S T (Million Baht)		
	F. C.	L. C.	TOTAL
1. UPPER RESERVOIR	<u>784.1</u>	<u>637.0</u>	<u>1,421.2</u>
Dam	(780.4)	(629.9)	(1,410.3)
Drainage Tunnel	(3.7)	(7.1)	(10.9)
2. INTAKE	<u>8.7</u>	<u>40.4</u>	<u>49.1</u>
3. PENSTOCK	<u>109.0</u>	<u>126.3</u>	<u>235.3</u>
Penstock	(26.8)	(22.2)	(49.0)
Upper Access Tunnel	(35.3)	(49.4)	(84.7)
Lower Access Tunnel	(46.9)	(54.7)	(101.5)
4. POWERHOUSE	<u>158.8</u>	<u>245.5</u>	<u>404.3</u>
Powerhouse	(96.0)	(172.9)	(268.9)
Access Tunnel	(44.5)	(50.3)	(94.8)
Drainage Tunnel	(10.9)	(14.4)	(25.3)
Power Cable Tunnel	(7.4)	(7.9)	(15.3)
5. TAILRACE	<u>169.9</u>	<u>290.4</u>	<u>460.2</u>
Tailrace Tunnel	(96.5)	(129.3)	(225.9)
Tailrace Surge Chamber	(14.9)	(24.3)	(39.1)
Tailrace Gate Chamber	(6.2)	(10.7)	(16.9)
Outlet	(47.5)	(120.6)	(168.1)
Work Adit	(4.7)	(5.3)	(10.2)
6. SWITCHYARD	<u>4.0</u>	<u>2.0</u>	<u>6.0</u>
7. T O T A L	<u>1,234.5</u>	<u>1,341.7</u>	<u>2,576.2</u>

ALTERNATIVE-1 (1st STAGE)

(1) UPPER RESERVOIR

(UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Total	Cost		Total
			F.C	L.C		F.C	L.C	
(1) DAM								
Common Excavation (dam)	m ³	4,595,000	43	12	55	197,585,000	55,140,000	252,725,000
Rock Excavation (dam)	m ³	3,064,000	55	55	110	168,520,000	168,520,000	337,040,000
Rock Excavation (gallery)	m ³	37,800	55	55	110	2,079,000	2,079,000	4,158,000
Embankment Rockfill	m ³	5,579,000	35	10	45	195,265,000	55,790,000	251,055,000
Embankment Transition (base)	m ³	70,500	249	51	300	17,554,500	3,595,500	21,150,000
Embankment Transition (slope)	m ³	75,200	374	76	450	28,124,800	5,715,200	33,840,000
Asphalt Facing (base)	m ²	141,000	220	580	800	31,020,000	81,780,000	112,800,000
Asphalt Facing (slope)	m ²	125,400	450	1,150	1,600	56,430,000	144,210,000	200,640,000
Structural Concrete	m ³	31,670	384	1,716	2,100	12,161,280	54,345,720	66,507,000
Reinforcement Bar	ton	1,150	622	1,278	1,900	715,300	1,469,700	2,185,000
Miscellaneous Works	L.S	1				70,945,488	57,264,512	128,210,000
Sub Total						780,400,368	629,909,632	1,410,310,000
(2) DRAINAGE TUNNEL								
Tunnel Excavation (horizontal)	m ³	3,990	417	233	650	1,663,830	929,670	2,593,500
Shaft Excavation	m ³	260	462	238	700	120,120	61,880	182,000
Lining Concrete	m ³	2,470	622	1,278	1,900	1,535,340	3,156,660	4,693,000
Shaft Concrete	m ³	160	475	2,125	2,600	76,000	340,000	416,000
Reinforcement Bar	ton	105	0	19,000	19,000	0	1,995,000	1,995,000
Miscellaneous Works	L.S	1				339,629	648,321	987,950
Sub Total						3,735,919	7,131,531	10,867,450
T O T A L						784,136,287	637,041,163	1,421,177,450

ALTERNATIVE-1 (1st STAGE)

(2) INTAKE

(UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Total	Cost		Total
			F.C	L.C		F.C	L.C	
Rock Excavation	m ³	3,800	55	55	110	209,000	209,000	418,000
Shaft Excavation	m ³	7,400	462	238	700	3,418,800	1,761,200	5,180,000
Structural Concrete	m ³	4,920	384	1,716	2,100	1,888,280	8,442,720	10,332,000
Mass Concrete	m ³	4,890	271	1,329	1,600	1,325,190	6,498,810	7,824,000
Filling Concrete	m ³	4,240	250	750	1,000	1,060,000	3,180,000	4,240,000
Reinforcement Bar	ton	875	0	19,000	19,000	0	16,625,000	16,625,000
Miscellaneous Works	L.S	1				790,227	3,671,673	4,461,900
Sub Total						8,692,497	40,388,403	49,080,900
TOTAL						8,692,497	40,388,403	49,080,900

(UNIT: BAHT)

(3) PENSTOCK

ALTERNATIVE-1 (1st STAGE)

Description	Unit	Quantity	Unit Price		Cost		
			F.C	L.C	F.C	L.C	
			Total	Total	Total	Total	
(1) PENSTOCK							
Tunnel Excavation (horizontal)	m ³	14,700	417	233	650	3,425,100	
Tunnel Excavation (inclined)	m ³	19,030	773	327	1,100	6,222,810	
Filling Concrete	m ³	14,100	250	750	1,000	10,575,000	
Miscellaneous Works	L.S	1				2,022,291	
Sub Total						22,245,201	
(2) UPPER ACCESS TUNNEL							
Tunnel Excavation (horizontal)	m ³	49,200	417	233	650	11,463,600	
Lining Concrete	m ³	15,100	622	1,278	1,900	19,297,800	
Plug Concrete	m ³	5,710	384	1,716	2,100	9,798,360	
Reinforcement Bar	ton	230	0	19,000	19,000	4,370,000	
Miscellaneous Works	L.S	1				4,492,976	
Sub Total						49,422,736	
(3) LOWER ACCESS TUNNEL							
Common Excavation	m ³	2,900	43	12	55	34,800	
Rock Excavation	m ³	2,900	55	55	110	159,500	
Tunnel Excavation (horizontal)	m ³	70,900	417	233	650	16,519,700	
Lining Concrete	m ³	18,820	622	1,278	1,900	24,051,960	
Plug Concrete	m ³	2,720	384	1,716	2,100	4,667,520	
Reinforcement Bar	ton	225	0	19,000	19,000	4,275,000	
Miscellaneous Works	L.S	1				4,970,848	
Sub Total						54,679,328	
T O T A L						108,972,985	126,347,265
						235,320,250	

(UNIT: BAHT)

(4) POWERHOUSE

ALTERNATIVE-1 (1st STAGE)

Description	Unit	Quantity	Unit Price		Cost			
			F.C	L.C	F.C	L.C		
			Total		Total			
(1) POWERHOUSE								
ARCH EXCAVATION	m ³	29,000	283	237	520	8,207,000	6,873,000	15,080,000
CAVERN EXCAVATION	m ³	64,300	165	105	270	10,609,500	6,751,500	17,361,000
TUNNEL EXCAVATION (horizontal)	m ³	5,080	417	233	650	2,118,360	1,183,640	3,302,000
ARCH CONCRETE	m ³	7,420	567	2,533	3,100	4,207,140	18,794,860	23,002,000
POWERHOUSE CONCRETE	m ³	14,760	475	2,125	2,600	7,011,000	31,365,000	38,376,000
STRUCTURAL CONCRETE	m ³	4,590	384	1,716	2,100	1,762,560	7,876,440	9,639,000
LINING CONCRETE	m ³	1,680	622	1,278	1,900	1,044,960	2,147,040	3,192,000
FILLING CONCRETE	m ³	525	250	750	1,000	131,250	393,750	525,000
REINFORCEMENT BAR	ton	2,450	0	19,000	19,000	0	46,550,000	46,550,000
GROUTING	m	23,200	1,615	885	2,500	37,468,000	20,532,000	58,000,000
PRESTRESSED ROCK ANCHOR (ϕ 33, l = 20m)	PC	1,403	6,000	6,000	12,000	8,418,000	8,418,000	16,836,000
PRESTRESSED ROCK ANCHOR (ϕ 24, l = 10m)	PC	1,403	4,500	4,500	9,000	6,313,500	6,313,500	12,627,000
MISCELLANEOUS WORKS	L.S	1				8,729,127	15,719,873	24,449,000
Sub Total						96,020,397	172,918,603	268,939,000

Description	Unit	Quantity	Unit Price			Cost			
			F.C	L.C	Total	F.C	L.C	Total	
(2) ACCESS TUNNEL									
COMMON EXCAVATION	m ²	960	43	12	55	41,280	11,520	52,800	
ROCK EXCAVATION	m ²	960	55	55	110	52,800	52,800	105,600	
TUNNEL EXCAVATION (horizontal)	m ²	64,550	417	233	650	26,917,350	15,040,150	41,957,500	
LINING CONCRETE	m ²	18,520	622	1,278	1,900	11,519,440	23,668,560	35,188,000	
REINFORCEMENT BAR	ton	310	0	19,000	19,000	0	5,890,000	5,890,000	
GROUTING	m	1,210	1,615	885	2,500	1,954,150	1,070,850	3,025,000	
MISCELLANEOUS WORKS	L.S	1				4,048,502	4,573,388	8,621,890	
Sub Total						44,533,522	50,307,268	94,840,790	
(3) DRAINAGE TUNNEL									
TUNNEL EXCAVATION (horizontal)	m ²	8,950	417	233	650	3,732,150	2,085,350	5,817,500	
LINING CONCRETE	m ²	4,000	622	1,278	1,900	2,488,000	5,112,000	7,600,000	
PLUG CONCRETE	m ²	580	384	1,716	2,100	222,720	995,280	1,218,000	
REINFORCEMENT BAR	ton	160	0	19,000	19,000	0	3,040,000	3,040,000	
GROUTING	m	2,120	1,615	885	2,500	3,423,800	1,876,200	5,300,000	
MISCELLANEOUS WORKS	L.S	1				986,667	1,310,883	2,297,550	
Sub Total						10,853,337	14,419,713	25,273,050	
(4) POWER CABLE TUNNEL									
TUNNEL EXCAVATION (horizontal)	m ²	7,030	417	233	650	2,931,510	1,637,990	4,569,500	
LINING CONCRETE	m ²	3,000	622	1,278	1,900	1,866,000	3,834,000	5,700,000	
REINFORCEMENT BAR	ton	33	0	19,000	19,000	0	627,000	627,000	
GROUTING	m	1,200	1,615	885	2,500	1,938,000	1,062,000	3,000,000	
MISCELLANEOUS WORKS	L.S	1				673,551	716,099	1,389,650	
Sub Total						7,409,061	7,877,089	15,286,150	
TOTAL						158,816,317	245,522,673	404,338,990	

(UNIT: BAHT)

(5) TAILRACE

ALTERNATIVE-1 (1st STAGE)

Description	Unit	Quantity	Unit Price		Cost			
			F.C	L.C	F.C	L.C	Total	
(1)TAILRACE TUNNEL								
TUNNEL EXCAVATION (horizontal)	m ³	90,300	417	233	650	37,655,100	21,039,900	58,695,000
SHAFT EXCAVATION	m ³	3,620	462	238	700	1,672,440	861,560	2,534,000
LINING CONCRETE	m ³	27,880	622	1,278	1,900	17,341,360	35,630,640	52,972,000
FILLING CONCRETE	m ³	3,420	250	750	1,000	855,000	2,565,000	3,420,000
SHAFT CONCRETE	m ³	2,080	475	2,125	2,600	988,000	4,420,000	5,408,000
REINFORCEMENT BAR	ton	1,950	0	19,000	19,000	0	37,050,000	37,050,000
GROUTING	m	18,100	1,615	885	2,500	29,231,500	16,018,500	45,250,000
MISCELLANEOUS WORKS	L.S	1				8,774,340	11,758,560	20,532,900
Sub Total						96,517,740	129,344,160	225,861,900
(2)TAILRACE SURGE CHAMBER								
TUNNEL EXCAVATION (horizontal)	m ³	5,160	417	233	650	2,151,720	1,202,280	3,354,000
SHAFT EXCAVATION	m ³	10,800	462	238	700	4,989,600	2,570,400	7,560,000
LINING CONCRETE	m ³	1,880	622	1,278	1,900	1,169,360	2,402,640	3,572,000
SHAFT CONCRETE	m ³	2,470	475	2,125	2,600	1,173,250	5,248,750	6,422,000
FILLING CONCRETE	m ³	1,380	250	750	1,000	345,000	1,035,000	1,380,000
REINFORCEMENT BAR	ton	400	0	19,000	19,000	0	7,600,000	7,600,000
GROUTING	m	2,280	1,615	885	2,500	3,682,200	2,017,800	5,700,000
MISCELLANEOUS WORKS	L.S	1				1,351,113	2,207,687	3,558,800
Sub Total						14,862,243	24,284,557	39,146,800

Description	Unit	Quantity	Unit Price			Cost				
			F.C	L.C	Total	F.C	L.C	Total		
(3) TAILRACE GATE CHAMBER										
COMMON EXCAVATION	m ³	11,400	43	12	55	490,200	136,800	627,000		
ROCK EXCAVATION	m ³	11,400	55	55	110	627,000	627,000	1,254,000		
SHAFT EXCAVATION	m ³	4,600	462	238	700	2,125,200	1,094,800	3,220,000		
SHAFT CONCRETE	m ³	2,060	475	2,125	2,600	978,500	4,377,500	5,356,000		
STRUCTURAL CONCRETE	m ³	140	384	1,716	2,100	53,760	240,240	294,000		
REINFORCEMENT BAR	ton	130	0	19,000	19,000	0	2,470,000	2,470,000		
GROUTING	m	870	1,615	885	2,500	1,405,050	769,950	2,175,000		
MISCELLANEOUS WORKS	L.S	1				567,971	971,629	1,539,600		
Sub Total						6,247,681	10,687,919	16,935,600		
(4) OUTLET										
COMMON EXCAVATION	m ³	512,000	43	12	55	22,016,000	6,144,000	28,160,000		
ROCK EXCAVATION	m ³	220,000	55	55	110	12,100,000	12,100,000	24,200,000		
EMBANKMENT	m ³	48,000	35	10	45	1,505,000	430,000	1,935,000		
STRUCTURAL CONCRETE	m ³	18,000	384	1,716	2,100	6,912,000	30,888,000	37,800,000		
REINFORCEMENT BAR	ton	1,370	0	19,000	19,000	0	26,030,000	26,030,000		
MISCELLANEOUS WORKS	L.S	1				5,000,000	45,000,000	50,000,000		
Sub Total						47,533,000	120,592,000	168,125,000		
(5) WORK ADIT										
TUNNEL EXCAVATION (horizontal)	m ³	9,550	417	233	650	3,982,350	2,225,150	6,207,500		
PLUG CONCRETE	m ³	1,880	384	1,716	2,100	721,920	3,226,080	3,948,000		
Sub Total						4,704,270	5,451,230	10,155,500		
T O T A L						169,864,934	290,359,866	460,224,800		

ALTERNATIVE-1 (1st STAGE)

(6) SWITCHYARD

(UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Cost		
			F.C.	L.C	F.C	L.C	
COMMON EXCAVATION	m ²	84,000	43	12	3,612,000	1,008,000	4,620,000
STRUCTURAL CONCRETE	m ²	1,000	55	55	55,000	55,000	110,000
REINFORCEMENT BAR	ton	40	0	19,000	0	760,000	760,000
MISCELLANEOUS WORKS	L.S	1			366,700	182,300	549,000
Sub Total					4,033,700	2,005,300	6,039,000
TOTAL					4,033,700	2,005,300	6,039,000

ALTERNATIVE-I (1st STAGE)

(7) HYDRAULIC EQUIPMENT

(UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Cost			
			F.C	L.C	Total	F.C	L.C	Total
STEEL LINING (SM41. intake)	ton	440	0	48,000	48,000	0	21,120,000	21,120,000
PENSTOCK (SM58)	ton	1,306	0	55,000	55,000	0	71,830,000	71,830,000
PENSTOCK (HT80)	ton	2,803	112,000	48,000	160,000	313,936,000	134,544,000	448,480,000
BIFURCATION (HT80)	ton	155	112,000	48,000	160,000	17,360,000	7,440,000	24,800,000
STEEL LINING (SM50. tailrace)	ton	1,045	0	53,000	53,000	0	55,385,000	55,385,000
DRAFT GATE	set	229	600,000	7,400,000	37,000,000	59,200,000	14,800,000	74,000,000
TAILRACE GATE	set	224	800,000	6,200,000	31,000,000	49,600,000	12,400,000	62,000,000
T O T A L						440,096,000	317,519,000	757,615,000

Civil Work Cost of the Project (Alternative-1,2nd Stage)

Description	C O S T (Million Baht)		
	F. C.	L. C.	TOTAL
1. UPPER RESERVOIR	<u>120.9</u>	<u>147.1</u>	<u>268.0</u>
Dam	(120.9)	(147.1)	(268.0)
Drainage Tunnel	(0.0)	(0.0)	(0.0)
2. INTAKE	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
3. PENSTOCK	<u>55.4</u>	<u>43.7</u>	<u>99.1</u>
Penstock	(20.3)	(15.8)	(36.1)
Upper Access Tunnel	(0.0)	(0.0)	(0.0)
Lower Access Tunnel	(35.1)	(27.9)	(63.0)
4. POWERHOUSE	<u>117.9</u>	<u>198.9</u>	<u>316.7</u>
Powerhouse	(93.8)	(169.0)	(262.9)
Access Tunnel	(9.1)	(11.6)	(20.7)
Drainage Tunnel	(7.7)	(10.6)	(18.3)
Power Cable Tunnel	(7.3)	(7.7)	(15.0)
5. TAILRACE	<u>90.5</u>	<u>126.3</u>	<u>216.7</u>
Tailrace Tunnel	(72.6)	(98.3)	(170.9)
Tailrace Surge Chamber	(17.9)	(28.0)	(45.9)
Tailrace Gate Chamber	(0.0)	(0.0)	(0.0)
Outlet	(0.0)	(0.0)	(0.0)
Work Adit	(0.0)	(0.0)	(0.0)
6. SWITCHYARD	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
7. T O T A L	<u>384.7</u>	<u>515.9</u>	<u>900.6</u>

(UNIT: BAHT)

(1) UPPER RESERVOIR

ALTERNATIVE-1 (2nd STAGE)

Description	Unit	Quantity	Unit Price		Cost		
			F.C	L.C	F.C	L.C	Total
(1) DAM							
Common Excavation (dam)	m ³	0	43	12	0	0	0
Rock Excavation (dam)	m ³	0	55	55	0	0	0
Rock Excavation (gallery)	m ³	0	55	55	0	0	0
Embankment Rockfill	m ³	1,229,000	35	10	43,015,000	12,290,000	55,305,000
Embankment Transition (base)	m ³	0	249	51	0	0	0
Embankment Transition (slope)	m ³	58,600	374	76	21,916,400	4,453,600	26,370,000
Asphalt Facing (base)	m ²	0	220	580	0	0	0
Asphalt Facing (slope)	m ²	97,600	450	1,150	43,920,000	112,240,000	156,160,000
Structural Concrete	m ³	2,750	384	1,716	1,056,000	4,719,000	5,775,000
Reinforcement Bar	ton	0	622	1,278	0	0	0
Miscellaneous Works	L.S	1			10,990,740	13,370,260	24,361,000
Sub Total					120,898,140	147,072,860	267,971,000
(2) DRAINAGE TUNNEL							
Tunnel Excavation (horizontal)	m ³	0	417	233	0	0	0
Shaft Excavation	m ³	0	462	238	0	0	0
Lining Concrete	m ³	0	622	1,278	0	0	0
Shaft Concrete	m ³	0	475	2,125	0	0	0
Reinforcement Bar	ton	0	0	19,000	0	0	0
Miscellaneous Works	L.S	0			0	0	0
Sub Total					0	0	0
TOTAL					120,898,140	147,072,860	267,971,000

(UNIT: BAHT)

(2) INTAKE

ALTERNATIVE-1 (2nd STAGE)

Description	Unit	Quantity	Unit Price		Total	Cost		Total
			F.C	L.C		F.C	L.C	
Rock Excavation	m ³	0	55	55	110	0	0	0
Shaft Excavation	m ³	0	462	238	700	0	0	0
Structural Concrete	m ³	0	384	1,716	2,100	0	0	0
Mass Concrete	m ³	0	271	1,329	1,600	0	0	0
Filling Concrete	m ³	0	250	750	1,000	0	0	0
Reinforcement Bar	ton	0	0	19,000	19,000	0	0	0
Miscellaneous Works	L.S	0				0	0	0
Sub Total						0	0	0
TOTAL						0	0	0

ALTERNATIVE-1 (2nd STAGE)

(3) PENSTOCK

(UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Cost		
			F.C	L.C	F.C	L.C	Total
(1)PENSTOCK							
Tunnel Excavation (horizontal)	m ³	3,940	417	233	1,642,980	918,020	2,561,000
Tunnel Excavation (inclined)	m ³	18,600	773	327	14,377,800	6,082,200	20,460,000
Filling Concrete	m ³	9,800	250	750	2,450,000	7,350,000	9,800,000
Miscellaneous Works	L.S	1			1,847,078	1,435,022	3,282,100
Sub Total					20,317,858	15,785,242	36,103,100
(2)UPPER ACCESS TUNNEL							
Tunnel Excavation (horizontal)	m ³	0	417	233	0	0	0
Lining Concrete	m ²	0	622	1,278	0	0	0
Plug Concrete	m ²	0	384	1,716	0	0	0
Reinforcement Bar	ton	0	0	19,000	0	0	0
Miscellaneous Works	L.S	0			0	0	0
Sub Total					0	0	0
(3)LOWER ACCESS TUNNEL							
Common Excavation	m ³	0	43	12	0	0	0
Rock Excavation	m ³	0	55	55	0	0	0
Tunnel Excavation (horizontal)	m ³	70,940	417	233	29,581,980	16,529,020	46,111,000
Lining Concrete	m ²	2,110	622	1,278	1,312,420	2,696,580	4,009,000
Plug Concrete	m ²	2,650	384	1,716	1,017,600	4,547,400	5,565,000
Reinforcement Bar	ton	84	0	19,000	0	1,596,000	1,596,000
Miscellaneous Works	L.S	1			3,191,200	2,536,900	5,728,100
Sub Total					35,103,200	27,905,900	63,009,100
T O T A L					55,421,058	43,691,142	99,112,200

ALTERNATIVE-1 (2nd STAGE)

(4) POWERHOUSE

(UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Cost			
			F.C	L.C	F.C	L.C	Total	
(1) POWERHOUSE								
ARCH EXCAVATION	m ³	28,000	233	237	7,924,000	6,636,000	14,560,000	
CAVERN EXCAVATION	m ³	62,570	165	105	10,324,050	6,569,850	16,893,900	
TUNNEL EXCAVATION (horizontal)	m ³	5,100	417	233	2,126,700	1,188,300	3,315,000	
ARCH CONCRETE	m ³	7,160	567	2,533	4,059,720	18,136,280	22,196,000	
POWERHOUSE CONCRETE	m ³	14,430	475	2,125	6,854,250	30,663,750	37,518,000	
STRUCTURAL CONCRETE	m ³	4,510	384	1,716	1,731,840	7,739,160	9,471,000	
LINING CONCRETE	m ³	1,690	622	1,278	1,051,180	2,159,820	3,211,000	
FILLING CONCRETE	m ³	525	250	750	131,250	393,750	525,000	
REINFORCEMENT BAR	ton	2,400	0	19,000	0	45,600,000	45,600,000	
GROUTING	m	22,700	1,615	885	36,660,500	20,089,500	56,750,000	
PRESTRESSED ROCK ANCHOR (ϕ 33, ℓ = 20m)	PC	1,376	6,000	6,000	8,256,000	8,256,000	16,512,000	
PRESTRESSED ROCK ANCHOR (ϕ 24, ℓ = 10m)	PC	1,376	4,500	4,500	6,192,000	6,192,000	12,384,000	
MISCELLANEOUS WORKS	L.S	1			8,531,149	15,362,441	23,893,590	
Sub Total					93,842,639	168,986,851	262,829,490	

Description	Unit	Quantity	Unit Price			Cost		
			F.C	L.C	Total	F.C	L.C	Total
(2) ACCESS TUNNEL								
COMMON EXCAVATION	m ³	0	43	12	55	0	0	0
ROCK EXCAVATION	m ³	0	55	55	110	0	0	0
TUNNEL EXCAVATION (horizontal)	m ³	12,250	417	233	650	5,108,250	2,854,250	7,962,500
LINING CONCRETE	m ³	3,520	622	1,278	1,900	2,189,440	4,498,560	6,688,000
REINFORCEMENT BAR	ton	140	0	19,000	19,000	0	2,660,000	2,660,000
GROUTING	m	600	1,615	885	2,500	969,000	531,000	1,500,000
MISCELLANEOUS WORKS	L.S	1				826,669	1,054,581	1,881,050
Sub Total						9,093,359	11,598,191	20,691,550
(3) DRAINAGE TUNNEL								
TUNNEL EXCAVATION (horizontal)	m ³	6,280	417	233	650	2,618,760	1,463,240	4,082,000
LINING CONCRETE	m ³	2,800	622	1,278	1,900	1,741,600	3,578,400	5,320,000
PLUG CONCRETE	m ³	685	384	1,716	2,100	263,040	1,175,460	1,438,500
REINFORCEMENT BAR	ton	110	0	19,000	19,000	0	2,090,000	2,090,000
GROUTING	m	1,470	1,615	885	2,500	2,374,050	1,300,950	3,675,000
MISCELLANEOUS WORKS	L.S	1				699,745	980,805	1,660,550
Sub Total						7,697,195	10,568,855	18,266,050
(4) POWER CABLE TUNNEL								
TUNNEL EXCAVATION (horizontal)	m ³	6,830	417	233	650	2,848,110	1,591,390	4,439,500
LINING CONCRETE	m ³	2,910	622	1,278	1,900	1,810,020	3,718,980	5,529,000
REINFORCEMENT BAR	ton	33	0	19,000	19,000	0	627,000	627,000
GROUTING	m	1,200	1,615	885	2,500	1,938,000	1,062,000	3,000,000
MISCELLANEOUS WORKS	L.S	1				659,613	699,937	1,359,550
Sub Total						7,255,743	7,699,307	14,955,050
T O T A L						117,888,936	198,853,204	316,742,140

ALTERNATIVE-I (2nd STAGE)

(5) TAILRACE

(UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Cost			
			F.C	L.C	F.C	L.C	Total	
(1)TAILRACE TUNNEL								
TUNNEL EXCAVATION (horizontal)	m ³	66,800	417	233	650	27,855,600	15,564,400	43,420,000
SHAFT EXCAVATION	m ³	3,620	462	238	700	1,672,440	861,560	2,534,000
LINING CONCRETE	m ³	20,100	622	1,278	1,900	12,502,200	25,687,800	38,190,000
FILLING CONCRETE	m ³	3,410	250	750	1,000	852,500	2,557,500	3,410,000
SHAFT CONCRETE	m ³	2,080	475	2,125	2,600	988,000	4,420,000	5,408,000
REINFORCEMENT BAR	ton	1,480	0	19,000	19,000	0	28,120,000	28,120,000
GROUTING	m	13,700	1,615	885	2,500	22,125,500	12,124,500	34,250,000
MISCELLANEOUS WORKS	L.S	1				6,599,624	8,933,576	15,533,200
Sub Total						72,595,864	98,269,336	170,865,200
(2)TAILRACE SURGE CHAMBER								
TUNNEL EXCAVATION (horizontal)	m ³	7,930	417	233	650	3,306,810	1,847,690	5,154,500
SHAFT EXCAVATION	m ³	10,800	462	238	700	4,989,600	2,570,400	7,560,000
LINING CONCRETE	m ³	2,940	622	1,278	1,900	1,828,680	3,757,320	5,586,000
SHAFT CONCRETE	m ³	2,470	475	2,125	2,600	1,173,250	5,248,750	6,422,000
FILLING CONCRETE	m ³	1,380	250	750	1,000	345,000	1,035,000	1,380,000
REINFORCEMENT BAR	ton	445	0	19,000	19,000	0	8,455,000	8,455,000
GROUTING	m	2,860	1,615	885	2,500	4,618,900	2,531,100	7,150,000
MISCELLANEOUS WORKS	L.S	1				1,626,224	2,544,526	4,170,750
Sub Total						17,888,464	27,939,786	45,828,250

Description	Unit	Quantity	Unit Price		Cost			
			F.C	L.C	F.C	L.C	Total	
(3) TAURACE GATE CHAMBER								
COMMON EXCAVATION	m ³	0	43	12	55	0	0	0
ROCK EXCAVATION	m ³	0	55	55	110	0	0	0
SHAFT EXCAVATION	m ³	0	462	238	700	0	0	0
SHAFT CONCRETE	m ³	0	475	2,125	2,600	0	0	0
STRUCTURAL CONCRETE	m ³	0	384	1,716	2,100	0	0	0
REINFORCEMENT BAR	ton	0	0	19,000	19,000	0	0	0
GROUTING	m	0	1,615	885	2,500	0	0	0
MISCELLANEOUS WORKS	L.S	0				0	0	0
Sub Total								
(4) OUTLET								
COMMON EXCAVATION	m ³	0	43	12	55	0	0	0
ROCK EXCAVATION	m ³	0	55	55	110	0	0	0
EMBANKMENT	m ³	0	35	10	45	0	0	0
STRUCTURAL CONCRETE	m ³	0	384	1,716	2,100	0	0	0
REINFORCEMENT BAR	ton	0	0	19,000	19,000	0	0	0
MISCELLANEOUS WORKS	L.S	0				0	0	0
Sub Total								
(5) WORK ADIT								
TUNNEL EXCAVATION (horizontal)	m ³	0	417	233	650	0	0	0
PLUG CONCRETE	m ³	0	384	1,716	2,100	0	0	0
Sub Total								
T O T A L						90,484,328	126,259,122	216,743,450

(UNIT: BAHT)

(6) SWITCHYARD

ALTERNATIVE-1 (2nd STAGE)

Description	Unit	Quantity	Unit Price		Cost		
			F.C	L.C	F.C	L.C	Total
COMMON EXCAVATION	m ²	0	43	12	0	0	0
STRUCTURAL CONCRETE	m ³	0	55	55	0	0	0
REINFORCEMENT BAR	ton	0	0	19,000	0	0	0
MISCELLANEOUS WORKS	L.S	0			0	0	0
Sub Total					0	0	0
TOTAL					0	0	0

ALTERNATIVE-1 (2nd STAGE)

(7) HYDRAULIC EQUIPMENT

(UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Cost			
			F.C	L.C	Total	F.C	L.C	Total
STEEL LINING (SM41, intake)	ton	440	0	48,000	48,000	0	21,120,000	21,120,000
PENSTOCK (SM58)	ton	506	0	55,000	55,000	0	27,830,000	27,830,000
PENSTOCK (HT80)	ton	2,740	112,000	48,000	160,000	306,880,000	131,520,000	438,400,000
BIFURCATION (HT80)	ton	155	112,000	48,000	160,000	17,360,000	7,440,000	24,800,000
STEEL LINING (SM50, tailrace)	ton	1,045	0	53,000	53,000	0	55,385,000	55,385,000
DRAFT GATE	set		229,600,000	7,400,000	37,000,000	59,200,000	14,800,000	74,000,000
TAILRACE GATE	set		0	24,800,000	6,200,000	31,000,000	0	0
T O T A L						383,440,000	258,095,000	641,535,000

Civil Work Cost of the Project (Alternative-2)

Description	C O S T (Million Baht)		
	F. C.	L. C.	TOTAL
1. UPPER RESERVOIR	<u>521.7</u>	<u>491.9</u>	<u>1,013.6</u>
Dam	(519.5)	(487.6)	(1,007.1)
Drainage Tunnel	(2.2)	(4.3)	(6.5)
2. INTAKE	<u>4.3</u>	<u>19.5</u>	<u>23.8</u>
3. PENSTOCK	<u>75.8</u>	<u>86.3</u>	<u>162.0</u>
Penstock	(24.5)	(19.8)	(44.3)
Upper Access Tunnel	(19.6)	(24.9)	(44.4)
Lower Access Tunnel	(31.7)	(41.6)	(73.3)
4. POWERHOUSE	<u>245.0</u>	<u>345.4</u>	<u>590.4</u>
Powerhouse	(95.9)	(172.4)	(268.3)
Access Tunnel	(137.2)	(157.6)	(294.8)
Drainage Tunnel	(7.0)	(10.4)	(17.4)
Power Cable Tunnel	(4.9)	(5.0)	(9.9)
5. TAILRACE	<u>266.0</u>	<u>407.4</u>	<u>673.4</u>
Tailrace Tunnel	(217.0)	(285.1)	(502.1)
Tailrace Surge Chamber	(19.3)	(29.9)	(49.2)
Tailrace Gate Chamber	(4.4)	(6.2)	(10.6)
Outlet	(22.3)	(82.5)	(104.8)
Work Adit	(3.0)	(3.7)	(6.7)
6. SWITCHYARD	<u>1.8</u>	<u>1.4</u>	<u>3.1</u>
7. T O T A L	<u>1,114.5</u>	<u>1,351.8</u>	<u>2,466.3</u>

ALTERNATIVE-2

(1) UPPER RESERVOIR

(UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Cost			
			F.C	L.C	F.C	L.C	Total	
(1) DAM								
Common Excavation (dam)	m ³	2,752,000	43	12	55	118,336,000	33,024,000	151,360,000
Rock Excavation (dam)	m ³	1,835,000	55	55	110	100,925,000	100,925,000	201,850,000
Rock Excavation (gallery)	m ³	29,800	55	55	110	1,639,000	1,639,000	3,278,000
Embankment Rockfill	m ³	3,148,000	35	10	45	110,180,000	31,480,000	141,660,000
Embankment Transition (base)	m ²	45,200	249	51	300	11,254,800	2,305,200	13,560,000
Embankment Transition (slope)	m ²	88,700	374	76	450	33,173,800	6,741,200	39,915,000
Asphalt Facing (base)	m ²	90,300	220	580	800	19,866,000	52,374,000	72,240,000
Asphalt Facing (slope)	m ²	147,900	450	1,150	1,600	66,555,000	170,085,000	236,640,000
Structural Concrete	m ³	25,370	384	1,716	2,100	9,742,080	43,534,920	53,277,000
Reinforcement Bar	ton	910	622	1,278	1,900	566,020	1,162,980	1,729,000
Miscellaneous Works	L.S	1				47,223,770	44,327,130	91,550,900
Sub Total						519,461,470	487,598,430	1,007,059,900
(2) DRAINAGE TUNNEL								
Tunnel Excavation (horizontal)	m ³	2,260	417	233	650	942,420	526,580	1,469,000
Shaft Excavation	m ³	260	462	238	700	120,120	61,880	182,000
Lining Concrete	m ³	1,400	622	1,278	1,900	870,800	1,789,200	2,660,000
Shaft Concrete	m ³	160	475	2,125	2,600	76,000	340,000	416,000
Reinforcement Bar	ton	62	0	19,000	19,000	0	1,178,000	1,178,000
Miscellaneous Works	L.S	1				200,934	389,566	590,500
Sub Total						2,210,274	4,285,226	6,495,500
TOTAL						521,671,744	491,883,656	1,013,555,400

ALTERNATIVE-2

(2) INTAKE-2

(UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Total	Cost		Total
			F. C	L. C		F. C	L. C	
Rock Excavation	m ³	1,900	55	55	110	104,500	104,500	209,000
Shaft Excavation	m ³	3,700	462	238	700	1,709,400	880,600	2,590,000
Structural Concrete	m ³	2,460	384	1,716	2,100	944,640	4,221,360	5,166,000
Mass Concrete	m ³	2,210	271	1,329	1,600	598,910	2,937,090	3,536,000
Filling Concrete	m ³	2,120	250	750	1,000	530,000	1,590,000	2,120,000
Reinforcement Bar	ton	420	0	19,000	19,000	0	7,980,000	7,980,000
Miscellaneous Works	L. S	1				388,745	1,771,355	2,160,100
Sub Total						4,276,195	19,484,905	23,761,100
TOTAL						4,276,195	19,484,905	23,761,100

(UNIT: BAHT)

(3) PENSTOCK

ALTERNATIVE-2

Description	Unit	Quantity	Unit Price		Total	Cost		Total
			F.C	L.C		F.C	L.C	
(1)PENSTOCK								
Tunnel Excavation (horizontal)	m ³	9.750	417	233	650	4,065,750	2,271,750	6,337,500
Tunnel Excavation (inclined)	m ³	19.480	773	327	1,100	15,058,040	6,369,960	21,428,000
Filling Concrete	m ³	12.500	250	750	1,000	3,125,000	9,375,000	12,500,000
Miscellaneous Works	L.S	1				2,224,879	1,801,671	4,026,550
Sub Total						24,473,669	19,818,381	44,292,050
(2)UPPER ACCESS TUNNEL								
Tunnel Excavation (horizontal)	m ³	29.330	417	233	650	12,230,610	6,833,890	19,064,500
Lining Concrete	m ²	7.420	622	1,278	1,900	4,615,240	9,482,760	14,098,000
Plug Concrete	m ³	2.450	384	1,716	2,100	940,800	4,204,200	5,145,000
Reinforcement Bar	ton	110	0	19,000	19,000	0	2,090,000	2,090,000
Miscellaneous Works	L.S	1				1,778,665	2,261,085	4,039,750
Sub Total						19,565,315	24,871,935	44,437,250
(3)LOWER ACCESS TUNNEL								
Common Excavation	m ³	2,000	43	12	55	86,000	24,000	110,000
Rock Excavation	m ³	2,000	55	55	110	110,000	110,000	220,000
Tunnel Excavation (horizontal)	m ³	46.230	417	233	650	19,277,910	10,771,590	30,049,500
Lining Concrete	m ²	12.520	622	1,278	1,900	7,787,440	16,000,560	23,788,000
Plug Concrete	m ³	4.130	384	1,716	2,100	1,585,920	7,087,080	8,673,000
Reinforcement Bar	ton	200	0	19,000	19,000	0	3,800,000	3,800,000
Miscellaneous Works	L.S	1				2,884,727	3,779,323	6,664,050
Sub Total						31,731,997	41,572,553	73,304,550
TOTAL						75,770,981	86,262,869	162,033,850

ALTERNATIVE-2 (4) POWERHOUSE (UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Total	Cost		Total
			F.C	L.C		F.C	L.C	
(1) POWERHOUSE								
ARCH EXCAVATION	m ³	29,000	283	237	520	8,207,000	6,873,000	15,080,000
CAVERN EXCAVATION	m ³	63,900	165	105	270	10,543,500	6,709,500	17,253,000
TUNNEL EXCAVATION (horizontal)	m ³	5,100	417	233	650	2,126,700	1,188,300	3,315,000
ARCH CONCRETE	m ³	7,420	567	2,533	3,100	4,207,140	18,794,860	23,002,000
POWERHOUSE CONCRETE	m ³	14,620	475	2,125	2,600	6,944,500	31,067,500	38,012,000
STRUCTURAL CONCRETE	m ³	4,640	384	1,716	2,100	1,781,760	7,962,240	9,744,000
LINING CONCRETE	m ³	1,680	622	1,278	1,900	1,044,960	2,147,040	3,192,000
FILLING CONCRETE	m ³	525	250	750	1,000	181,250	393,750	525,000
REINFORCEMENT BAR	ton	2,440	0	19,000	19,000	0	46,360,000	46,360,000
GROUTING	m	23,200	1,615	885	2,500	37,468,000	20,532,000	58,000,000
PRESTRESSED ROCK ANCHOR (ϕ 33, l = 20m)	PC	1,403	6,000	6,000	12,000	8,418,000	8,418,000	16,836,000
PRESTRESSED ROCK ANCHOR (ϕ 24, l = 10m)	PC	1,403	4,500	4,500	9,000	6,313,500	6,313,500	12,627,000
MISCELLANEOUS WORKS	L.S	1				8,718,631	15,675,969	24,394,600
Sub Total						95,904,941	172,435,659	268,340,600

Description	Unit	Quantity	Unit Price			Cost		
			F.C	L.C	Total	F.C	L.C	Total
(2) ACCESS TUNNEL								
COMMON EXCAVATION	m ³	1,800	48	12	55	77,400	21,600	99,000
ROCK EXCAVATION	m ³	1,800	55	55	110	99,000	99,000	198,000
TUNNEL EXCAVATION (horizontal)	m ³	205,890	417	233	650	85,856,130	47,972,370	133,828,500
LINING CONCRETE	m ³	59,070	622	1,278	1,900	36,741,540	75,491,460	112,233,000
REINFORCEMENT BAR	ton	980	0	19,000	19,000	0	18,620,000	18,620,000
GROUTING	m	1,210	1,615	885	2,500	1,954,150	1,070,850	3,025,000
MISCELLANEOUS WORKS	L.S	1					14,327,528	26,800,350
Sub Total						137,201,042	157,602,808	294,803,850
(3) DRAINAGE TUNNEL								
TUNNEL EXCAVATION (horizontal)	m ³	5,450	417	233	650	2,272,650	1,269,850	3,542,500
LINING CONCRETE	m ³	2,430	622	1,278	1,900	1,511,460	3,105,540	4,617,000
PLUG CONCRETE	m ³	1,160	384	1,716	2,100	445,440	1,990,560	2,436,000
REINFORCEMENT BAR	ton	100	0	19,000	19,000	0	1,900,000	1,900,000
GROUTING	m	1,320	1,615	885	2,500	2,131,800	1,168,200	3,300,000
MISCELLANEOUS WORKS	L.S	1					943,415	1,579,550
Sub Total						6,997,485	10,377,565	17,375,050
(4) POWER CABLE TUNNEL								
TUNNEL EXCAVATION (horizontal)	m ³	3,680	417	233	650	1,534,560	857,440	2,392,000
LINING CONCRETE	m ³	1,570	622	1,278	1,900	976,540	2,006,460	2,983,000
REINFORCEMENT BAR	ton	33	0	19,000	19,000	0	627,000	627,000
GROUTING	m	1,200	1,615	885	2,500	1,938,000	1,062,000	3,000,000
MISCELLANEOUS WORKS	L.S	1					455,290	900,200
Sub Total						4,484,010	5,008,190	9,902,200
TOTAL						244,997,478	345,424,222	590,421,700

(UNIT: BAHT)

(5) TAILRACE

ALTERNATIVE-2

Description	Unit	Quantity	Unit Price		Total	Cost		
			F.C	L.C		F.C	L.C	Total
(1) TAILRACE TUNNEL								
TUNNEL EXCAVATION (horizontal)	m ³	203,800	417	233	650	84,984,600	47,485,400	132,470,000
SHAFT EXCAVATION	m ³	3,620	462	238	700	1,672,440	861,560	2,534,000
LINING CONCRETE	m ³	65,900	622	1,278	1,900	40,989,800	84,220,200	125,210,000
FILLING CONCRETE	m ³	4,610	250	750	1,000	1,152,500	3,457,500	4,610,000
SHAFT CONCRETE	m ³	2,030	475	2,125	2,600	988,000	4,420,000	5,408,000
REINFORCEMENT BAR	ton	4,300	0	19,000	19,000	0	81,700,000	81,700,000
GROUTING	m	41,800	1,615	885	2,500	67,507,000	36,993,000	104,500,000
MISCELLANEOUS WORKS	L.S	1				19,729,434	25,913,766	45,643,200
Sub Total						217,023,774	285,051,426	502,075,200
(2) TAILRACE SURGE CHAMBER								
TUNNEL EXCAVATION (horizontal)	m ³	9,060	417	233	650	3,773,020	2,110,980	5,889,000
SHAFT EXCAVATION	m ³	10,800	462	238	700	4,989,600	2,570,400	7,560,000
LINING CONCRETE	m ³	3,560	622	1,278	1,900	2,214,320	4,549,680	6,764,000
SHAFT CONCRETE	m ³	2,470	475	2,125	2,600	1,173,250	5,248,750	6,422,000
FILLING CONCRETE	m ³	1,380	250	750	1,000	345,000	1,035,000	1,380,000
REINFORCEMENT BAR	ton	470	0	19,000	19,000	0	8,930,000	8,930,000
GROUTING	m	3,100	1,615	885	2,500	5,006,500	2,743,500	7,750,000
MISCELLANEOUS WORKS	L.S	1				1,750,669	2,718,831	4,469,500
Sub Total						19,257,359	29,907,141	49,164,500

Description	Unit	Quantity	Unit Price			Cost		
			F.C	L.C	Total	F.C	L.C	Total
(3)TAILRACE GATE CHAMBER								
COMMON EXCAVATION	m ³	10,500	43	12	55	451,500	126,000	577,500
ROCK EXCAVATION	m ³	10,500	55	55	110	577,500	577,500	1,155,000
SHAFT EXCAVATION	m ³	2,290	462	238	700	1,057,980	545,020	1,603,000
SHAFT CONCRETE	m ³	1,030	475	2,125	2,600	489,250	2,188,750	2,678,000
STRUCTURAL CONCRETE	m ³	70	384	1,716	2,100	26,880	120,120	147,000
REINFORCEMENT BAR	ton	70	0	19,000	19,000	0	1,330,000	1,330,000
GROUTING	m	870	1,615	885	2,500	1,405,050	769,950	2,175,000
MISCELLANEOUS WORKS	L.S	1				400,816	565,734	966,550
Sub Total						4,408,976	6,223,074	10,632,050
(4)OUTLET								
COMMON EXCAVATION	m ³	180,000	43	12	55	7,740,000	2,160,000	9,900,000
ROCK EXCAVATION	m ³	78,000	55	55	110	4,290,000	4,290,000	8,580,000
EMBANKMENT	m ³	43,000	35	10	45	1,505,000	430,000	1,935,000
STRUCTURAL CONCRETE	m ³	9,880	384	1,716	2,100	3,793,920	16,954,080	20,748,000
REINFORCEMENT BAR	ton	720	0	19,000	19,000	0	13,680,000	13,680,000
MISCELLANEOUS WORKS	L.S	1				5,000,000	45,000,000	50,000,000
Sub Total						22,328,920	82,514,080	104,843,000
(5)WORK ADIT								
TUNNEL EXCAVATION (horizontal)	m ³	5,970	417	233	650	2,489,490	1,391,010	3,880,500
PLUG CONCRETE	m ³	1,340	384	1,716	2,100	514,560	2,299,440	2,814,000
Sub Total						3,004,050	3,690,450	6,694,500
T O T A L						266,023,079	407,386,171	673,409,250

ALTERNATIVE-2

(6) SWITCHYARD

(UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Cost	
			F.C	L.C	F.C	L.C
COMMON EXCAVATION	m ³	35.800	43	12	1,539,400	429,600
STRUCTURAL CONCRETE	m ³	1,000	55	55	55,000	55,000
REINFORCEMENT BAR	ton	40	0	19,000	0	760,000
MISCELLANEOUS WORKS	L.S	1			159,440	124,460
Sub Total					1,753,840	1,369,060
TOTAL					1,753,840	3,122,900

ALTERNATIVE-2

(7) HYDRAULIC EQUIPMENT

(UNIT: BAHT)

Description	Unit	Quantity	Unit Price		Cost			
			F.C	L.C	Total	F.C	L.C	Total
STEEL LINING (SM41.intake)	ton	215	0	48,000	48,000	0	10,320,000	10,320,000
PENSTOCK (SM58)	ton	1,410	0	55,000	55,000	0	77,550,000	77,550,000
PENSTOCK (HT80)	ton	2,350	112,000	48,000	160,000	263,200,000	112,800,000	376,000,000
BIFURCATION (HT80)	ton	154	112,000	48,000	160,000	17,248,000	7,392,000	24,640,000
STEEL LINING (SM50.tailrace)	ton	1,050	0	53,000	53,000	0	55,650,000	55,650,000
DRAFT GATE	set	229	229,600,000	7,400,000	37,000,000	59,200,000	14,800,000	74,000,000
TAILRACE GATE	set	124	124,800,000	6,200,000	31,000,000	24,800,000	6,200,000	31,000,000
TOTAL						364,448,000	284,712,000	649,160,000

APPENDIX — E

ECONOMIC EVALUATION

APPENDIX-E ECONOMIC EVALUATION

CONTENTS

E-1 ECONOMIC ANALYSIS OF ALTERNATIVE PLANS

E-1 ECONOMIC ANALYSIS OF ALTERNATIVE PLANS

Appendix E-1 (2) Economic Analysis of Alternative-1 (1st + 2nd Stage)

(Unit: Million B)

Serial Number	No. after Completion	Investment			Cost		Total (N.P.V.)	Investment Cost	O&M Cost	Benefit Fuel Cost	Total	B - C	
		Investment Cost	O&M Cost	Fuel Cost for Pumping	Total	Total (N.P.V.)						Total	
0		0.0				0.0					0.0	0.0	0.0
1		108.0				108.0	94.7				0.0	0.0	-105.0
2		948.6				948.6	754.6				0.0	0.0	-945.6
3		1323.2				1323.2	941.8				0.0	0.0	-1322.2
4		2477.3				2477.3	1574.5				0.0	0.0	-2477.3
5		1896.1				1896.1	1075.9				1317.5	747.5	-578.5
6		223.0				223.0	113.0				5269.3	2669.9	5046.9
7	1		108.4		237.1	345.5		197.6		332.9	530.5	240.0	195.0
8	2		108.4		237.1	345.5		197.6		332.9	530.5	214.3	185.0
9	3		108.4		237.1	345.5		197.6		332.9	530.5	191.3	185.0
10	4		108.4		237.1	345.5		197.6		332.9	530.5	170.8	185.0
11	5		97.0		237.1	334.1		197.6		332.9	530.5	152.5	88.0
12	6		440.1		237.1	677.2		197.6		332.9	530.5	136.2	-355.1
13	7		543.3		237.1	780.4		197.6		332.9	530.5	121.6	-358.8
14	8		1808.5		237.1	2045.6		197.6		332.9	530.5	108.6	-1715.5
15	9		1879.6		237.1	2116.7		197.6		332.9	530.5	337.6	-377.1
16	10		205.4		237.1	442.5		197.6		332.9	530.5	300.3	5249.4
17	11				237.1	442.5		395.2		332.9	728.1	106.0	295.8
18	12				237.1	442.5		395.2		332.9	728.1	94.7	295.8
19	13				237.1	442.5		395.2		332.9	728.1	84.5	295.8
20	14				237.1	442.5		395.2		332.9	728.1	75.5	295.8
21	15				237.1	442.5		395.2		332.9	728.1	67.4	295.8
22	16				237.1	442.5		395.2		332.9	728.1	60.2	295.8
23	17				237.1	442.5		395.2		332.9	728.1	53.7	295.8
24	18				237.1	442.5		395.2		332.9	728.1	48.0	295.8
25	19				237.1	442.5		395.2		332.9	728.1	43.3	295.8
26	20				237.1	442.5		395.2		332.9	728.1	39.5	295.8
27	21	219.2			237.1	451.7		395.2		332.9	728.1	34.1	76.6
28	22	0.0			237.1	432.3		395.2		332.9	728.1	30.5	295.8
29	23	915.6			237.1	1347.9		395.2		332.9	728.1	27.2	-619.8
30	24	1225.7			237.1	1663.0		395.2		332.9	728.1	24.3	-390.9
31	25	219.2			237.1	451.7		395.2		332.9	728.1	21.7	76.6
32	26				237.1	432.3		395.2		332.9	728.1	19.4	295.8
33	27				237.1	432.3		395.2		332.9	728.1	17.3	295.8
34	28				237.1	432.3		395.2		332.9	728.1	15.4	295.8
35	29				237.1	432.3		395.2		332.9	728.1	13.7	1613.3
36	30				237.1	432.3		395.2		332.9	728.1	11.0	5655.8
37	31	203.6			237.1	432.3		395.2		332.9	728.1	9.2	295.8
38	32	0.0			237.1	432.3		395.2		332.9	728.1	8.8	295.8
39	33	851.8			237.1	1284.1		395.2		332.9	728.1	7.8	-853.2
40	34	1145.1			237.1	1581.4		395.2		332.9	728.1	7.0	92.2
41	35	203.6			237.1	432.3		395.2		332.9	728.1	5.2	295.8
42	36				237.1	432.3		395.2		332.9	728.1	5.6	295.8
43	37				237.1	432.3		395.2		332.9	728.1	5.0	295.8
44	38	81.7			237.1	314.0		395.2		332.9	728.1	3.0	214.1
45	39	122.5			237.1	359.5		395.2		332.9	728.1	2.5	1990.8
46	40				237.1	432.3		395.2		332.9	728.1	2.2	5665.6
47	41				237.1	432.3		395.2		332.9	728.1	3.5	295.8
48	42				237.1	432.3		395.2		332.9	728.1	3.2	295.8
49	43				237.1	432.3		395.2		332.9	728.1	2.8	295.8
50	44				237.1	432.3		395.2		332.9	728.1	2.3	295.8
51	45				237.1	432.3		395.2		332.9	728.1	2.2	295.8
52	46				237.1	432.3		395.2		332.9	728.1	2.0	295.8
53	47				237.1	432.3		395.2		332.9	728.1	1.8	295.8
54	48	276.7			237.1	709.4		395.2		332.9	728.1	1.6	191.3
55	49	415.1			237.1	847.4		395.2		332.9	728.1	1.4	-119.3
56	50				237.1	432.3		395.2		332.9	728.1	1.3	295.8
		17923.5	8893.1	11834.9	38671.4	7278.5	32936.3	17785.7	16544.0	67356.3	7520.5	28694.8	

B - C
242.05678
B / C
1.032564
E D R
0.1232556

Appendix E-1 (3) Economic Analysis of Alternative-2

(Unit: Million \$)

Serial Number	No. after Completion	Investment			Cost		Total (N.P.V.)	Investment Cost	O&M Cost	Benefit Fuel Cost	Total (N.P.V.)	B - C
		Investment Cost	O&M Cost	Fuel Cost	Pumping Cost							
0		0.0				0.0					0.0	0.0
1		105.5				84.2					0.0	-105.5
2		899.3				718.9					0.0	-899.3
3		1248.2				888.4					0.0	-1248.2
4		2359.5				1499.6					0.0	-2359.5
5		1816.7				1080.9					0.0	-1816.7
6		221.3				112.1					1311.5	747.6
7		341.8				154.6					5269.8	5048.6
8	1	104.7				287.1					332.9	188.7
9	2	104.7				287.1					332.9	188.7
10	3	104.7				287.1					332.9	188.7
11	4	104.7				287.1					332.9	188.7
12	5	104.7				287.1					332.9	188.7
13	6	104.7				287.1					332.9	188.7
14	7	104.7				287.1					332.9	188.7
15	8	104.7				287.1					332.9	188.7
16	9	104.7				287.1					332.9	188.7
17	10	104.7				287.1					332.9	188.7
18	11	104.7				287.1					332.9	188.7
19	12	104.7				287.1					332.9	188.7
20	13	104.7				287.1					332.9	188.7
21	14	104.7				287.1					332.9	188.7
22	15	104.7				287.1					332.9	188.7
23	16	104.7				287.1					332.9	188.7
24	17	104.7				287.1					332.9	188.7
25	18	104.7				287.1					332.9	188.7
26	19	104.7				287.1					332.9	188.7
27	20	104.7				287.1					332.9	188.7
28	21	104.7				287.1					332.9	188.7
29	22	104.7				287.1					332.9	188.7
30	23	104.7				287.1					332.9	188.7
31	24	104.7				287.1					332.9	188.7
32	25	104.7				287.1					332.9	188.7
33	26	104.7				287.1					332.9	188.7
34	27	104.7				287.1					332.9	188.7
35	28	104.7				287.1					332.9	188.7
36	29	104.7				287.1					332.9	188.7
37	30	104.7				287.1					332.9	188.7
38	31	104.7				287.1					332.9	188.7
39	32	104.7				287.1					332.9	188.7
40	33	104.7				287.1					332.9	188.7
41	34	104.7				287.1					332.9	188.7
42	35	104.7				287.1					332.9	188.7
43	36	104.7				287.1					332.9	188.7
44	37	104.7				287.1					332.9	188.7
45	38	104.7				287.1					332.9	188.7
46	39	104.7				287.1					332.9	188.7
47	40	104.7				287.1					332.9	188.7
48	41	104.7				287.1					332.9	188.7
49	42	104.7				287.1					332.9	188.7
50	43	104.7				287.1					332.9	188.7
51	44	104.7				287.1					332.9	188.7
52	45	104.7				287.1					332.9	188.7
53	46	104.7				287.1					332.9	188.7
54	47	104.7				287.1					332.9	188.7
55	48	104.7				287.1					332.9	188.7
56	49	104.7				287.1					332.9	188.7
57	50	104.7				287.1					332.9	188.7
58	51	104.7				287.1					332.9	188.7
59	52	104.7				287.1					332.9	188.7
60	53	104.7				287.1					332.9	188.7
61	54	104.7				287.1					332.9	188.7
62	55	104.7				287.1					332.9	188.7
63	56	104.7				287.1					332.9	188.7
64	57	104.7				287.1					332.9	188.7
65	58	104.7				287.1					332.9	188.7
66	59	104.7				287.1					332.9	188.7
67	60	104.7				287.1					332.9	188.7
68	61	104.7				287.1					332.9	188.7
69	62	104.7				287.1					332.9	188.7
70	63	104.7				287.1					332.9	188.7
71	64	104.7				287.1					332.9	188.7
72	65	104.7				287.1					332.9	188.7
73	66	104.7				287.1					332.9	188.7
74	67	104.7				287.1					332.9	188.7
75	68	104.7				287.1					332.9	188.7
76	69	104.7				287.1					332.9	188.7
77	70	104.7				287.1					332.9	188.7
78	71	104.7				287.1					332.9	188.7
79	72	104.7				287.1					332.9	188.7
80	73	104.7				287.1					332.9	188.7
81	74	104.7				287.1					332.9	188.7
82	75	104.7				287.1					332.9	188.7
83	76	104.7				287.1					332.9	188.7
84	77	104.7				287.1					332.9	188.7
85	78	104.7				287.1					332.9	188.7
86	79	104.7				287.1					332.9	188.7
87	80	104.7				287.1					332.9	188.7
88	81	104.7				287.1					332.9	188.7
89	82	104.7				287.1					332.9	188.7
90	83	104.7				287.1					332.9	188.7
91	84	104.7				287.1					332.9	188.7
92	85	104.7				287.1					332.9	188.7
93	86	104.7				287.1					332.9	188.7
94	87	104.7				287.1					332.9	188.7
95	88	104.7				287.1					332.9	188.7
96	89	104.7				287.1					332.9	188.7
97	90	104.7				287.1					332.9	188.7
98	91	104.7				287.1					332.9	188.7
99	92	104.7				287.1					332.9	188.7
100	93	104.7				287.1					332.9	188.7
101	94	104.7				287.1					332.9	188.7
102	95	104.7				287.1					332.9	188.7
103	96	104.7				287.1					332.9	188.7
104	97	104.7				287.1					332.9	188.7
105	98	104.7				287.1					332.9	188.7
106	99	104.7				287.1					332.9	188.7
107	100	104.7				287.1					332.9	188.7
108	101	104.7				287.1					332.9	188.7
109	102	104.7				287.1					332.9	188.7
110	103	104.7				287.1					332.9	188.7
111	104	104.7				287.1					332.9	188.7
112	105	104.7				287.1					332.9	188.7
113	106	104.7				287.1					332.9	188.7
114	107	104.7				287.1					332.9	188.7
115	108	104.7				287.1					332.9	188.7
116	109	104.7				287.1					332.9	188.7
117	110	104.7				287.1					332.9	188.7
118	111	104.7				287.1					332.9	188.7
119	112	104.7				287.1					332.9	188.7
120	113	104.7				287.1					332.9	188.7
121	114	104.7				287.1					332.9	188.7
122	115	104.7				287.1					332.9	188.7
123	116	104.7				287.1					332.9	188.7
124	117	104.7				287.1					332.9	188.7
125	118	104.7				287.1					332.9	188.7
126	119	104.7				287.1					332.9	188.7
127	120	104.7				287.1					332.9	188.7
128	121	104.7				287.1					332.9	188.7
129	122	104.7				287.1					332.9	188.7
130	123	104.7				287.1					332.9	188.7
131	124	104.7				287.1					332.9	188.7
132	125	104.7				287.1					332.9	188.7
133	126	104.7				287.1					332.9	188.7
134	127	104.7				287.1					332.9	188.7
135	128	104.7				287.1					332.9	188.7
136	129	104.7				287.1					332.9	188.7
137	130	104.7				287.1					332.9	188.7
138	131	104.7				287						

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