

Table 6.5.1 Flood Damage Factors

Class	Flood damage Factor for Inundated Each Landuse Area	
	[Rs/ha]	[Rs/km ²]
Crops	4,439	443,900
Private Housing		
in City/Town (Urban) areas	37,248	3,724,800
in Local Village areas	111,045	11,104,500
Road Linkage	282	28,160
Other Direct Damages 30% * ¹	-	-
Indirect Damages 20% * ²	-	-

Note:

*¹ : Other direct loss including damages to irrigation channels and Kathas, Livestock, stored grain, electrical distribution system, telecommunication, etc. are estimated assuming a ratio of crop/housing/road damages to total direct damages of 1:1.3.

*² : Indirect damages due to suspension of irrigation supplies and traffic as well as the emergency costs, associated with such a flood include economic and physical linkages are estimated at 20% of the total direct damages within the flood plain area.

Table 6.6.1 (I) Total Flood Damage Cost of the Swat River Flood Plain Area ("A")

1929 Flood

Class	Flood damage Factor [Rs./km ²]	Land Use-Wise Inundated Area (km ²)							Total Losses (Flood Damage Cost) (Million Rs.)
		Cultivated area (Farm)	Orchard or Green area	Village	Town/City	Wasteland (not used)	River (Surface Water)	River area (Flood Area)	
		119.75km ²	0.00km ²	20.75km ²	6.00km ²	0.00km ²	35.75km ²	6.50km ²	
Crops	443,900	Rs.53,157,025							53.16
Private Housing									0.00
in City/Town (Urban) areas	3,724,800				Rs.22,348,800				22.35
in Local Village areas	11,104,500			Rs.230,418,375					230.42
Road Linkage	28,160	Rs.3,372,129	Rs.0	Rs.584,315	Rs.168,958	Rs.0			4.13
Other Direct Damages 30% ^{*1}									93.01
Indirect Damages 20% ^{*2}									80.61
									483.68

1995 Flood

Class	Flood damage Factor [Rs./km ²]	Land Use-Wise Inundated Area (km ²)							Total Losses (Flood Damage Cost) (Million Rs.)
		Cultivated area (Farm)	Orchard or Green area	Village	Town/City	Wasteland (not used)	River (Surface Water)	River area (Flood Area)	
		48.00km ²	0.00km ²	10.00km ²	1.50km ²	0.00km ²	29.75km ²	6.50km ²	
Crops	443,900	Rs.21,307,200							21.31
Private Housing									0.00
in City/Town (Urban) areas	3,724,800				Rs.5,587,200				5.59
in Local Village areas	11,104,500			Rs.111,045,000					111.05
Road Linkage	28,160	Rs.1,351,667	Rs.0	Rs.281,597	Rs.42,240	Rs.0			1.68
Other Direct Damages 30% ^{*1}									41.88
Indirect Damages 20% ^{*2}									36.30
									217.80

Normal Year Flood

Class	Flood damage Factor [Rs./km ²]	Land Use-Wise Inundated Area (km ²)							Total Losses (Flood Damage Cost) (Million Rs.)
		Cultivated area (Farm)	Orchard or Green area	Village	Town/City	Wasteland (not used)	River (Surface Water)	River area (Flood Area)	
		19.25km ²	0.00km ²	3.75km ²	0.50km ²	0.00km ²	28.25km ²	5.75km ²	
Crops	443,900	Rs.8,545,075							8.55
Private Housing									0.00
in City/Town (Urban) areas	3,724,800				Rs.1,862,400				1.86
in Local Village areas	11,104,500			Rs.41,641,875					41.64
Road Linkage	28,160	Rs.542,075	Rs.0	Rs.105,599	Rs.14,080	Rs.0			0.66
Other Direct Damages 30% ^{*1}									15.81
Indirect Damages 20% ^{*2}									13.70
									82.23

No Damage Flood

Class	Flood damage Factor [Rs./km ²]	Land Use-Wise Inundated Area (km ²)							Total Losses (Flood Damage Cost) (Million Rs.)
		Cultivated area (Farm)	Orchard or Green area	Village	Town/City	Wasteland (not used)	River (Surface Water)	River area (Flood Area)	
		0.00km ²	0.00km ²	0.00km ²	0.00km ²	0.00km ²	28.25km ²	5.75km ²	
Crops	443,900	Rs.0							0.00
Private Housing									0.00
in City/Town (Urban) areas	3,724,800				Rs.0				0.00
in Local Village areas	11,104,500			Rs.0					0.00
Road Linkage	28,160	Rs.0	Rs.0	Rs.0	Rs.0	Rs.0			0.00
Other Direct Damages 30% ^{*1}									0.00
Indirect Damages 20% ^{*2}									0.00
									0.00

Note:

*1: Other direct loss including damages to irrigation channels and Kathas, Livestock, stored grain, electrical distribution systems, telecommunication, etc. are estimated assuming a ratio of crop/housing/road damages to total direct damages of 1:1:3.

*2: Indirect damages due to suspension of irrigation supplies and traffic as well as the emergency costs, associated with such a flood include economic and physical linkages are estimated at 20% of the total direct damages within the flood plain area.

Table 6.6.1 (2) Total Flood Damage Cost of the Kabul River Flood Plain Area ("B-1")

1929 Flood

Class	Flood damage Factor (Rs./km ²)	Land Use-Wise Inundated Area (km ²)							Total Losses (Flood Damage Cost) (Million Rs.)
		Cultivated area (Farm)	Orchard or Green area	Village	Town/City	Wasteland (not used)	River (Surface Water)	River area (Flood Area)	
		128.75km ²	1.25km ²	40.00km ²	0.00km ²	2.50km ²	44.75km ²	10.00km ²	
Crops	443,900	Rs.57,152,125							57.15
Private Housing									0.00
in City/Town (Urban) areas	3,724,800				Rs.0				0.00
in Local Village areas	11,104,500			Rs.444,180,000					444.18
Road Linkage	28,160	Rs.3,625,566	Rs.35,200	Rs.1,126,389	Rs.0	Rs.70,399			4.86
Other Direct Damages 30% ¹									151.86
Indirect Damages 20% ²									131.61
									789.66

1995 Flood

Class	Flood damage Factor (Rs./km ²)	Land Use-Wise Inundated Area (km ²)							Total Losses (Flood Damage Cost) (Million Rs.)
		Cultivated area (Farm)	Orchard or Green area	Village	Town/City	Wasteland (not used)	River (Surface Water)	River area (Flood Area)	
		71.50km ²	1.25km ²	23.25km ²	0.00km ²	1.75km ²	44.00km ²	7.75km ²	
Crops	443,900	Rs.31,738,850							31.74
Private Housing									0.00
in City/Town (Urban) areas	3,724,800				Rs.0				0.00
in Local Village areas	11,104,500			Rs.258,179,625					258.18
Road Linkage	28,160	Rs.2,013,421	Rs.35,200	Rs.654,714	Rs.0	Rs.49,280			2.75
Other Direct Damages 30% ¹									87.80
Indirect Damages 20% ²									76.09
									456.57

Normal Year Flood

Class	Flood damage Factor (Rs./km ²)	Land Use-Wise Inundated Area (km ²)							Total Losses (Flood Damage Cost) (Million Rs.)
		Cultivated area (Farm)	Orchard or Green area	Village	Town/City	Wasteland (not used)	River (Surface Water)	River area (Flood Area)	
		16.50km ²	0.50km ²	4.25km ²	0.00km ²	1.25km ²	42.50km ²	7.00km ²	
Crops	443,900	Rs.7,324,350							7.32
Private Housing									0.00
in City/Town (Urban) areas	3,724,800				Rs.0				0.00
in Local Village areas	11,104,500			Rs.47,194,125					47.19
Road Linkage	28,160	Rs.464,635	Rs.14,080	Rs.119,679	Rs.0	Rs.35,200			0.63
Other Direct Damages 30% ¹									16.55
Indirect Damages 20% ²									14.34
									86.04

No Damage Flood

Class	Flood damage Factor (Rs./km ²)	Land Use-Wise Inundated Area (km ²)							Total Losses (Flood Damage Cost) (Million Rs.)
		Cultivated area (Farm)	Orchard or Green area	Village	Town/City	Wasteland (not used)	River (Surface Water)	River area (Flood Area)	
		0.00km ²	0.00km ²	0.00km ²	0.00km ²	0.00km ²	42.50km ²	7.00km ²	
Crops	443,900	Rs.0							0.00
Private Housing									0.00
in City/Town (Urban) areas	3,724,800				Rs.0				0.00
in Local Village areas	11,104,500			Rs.0					0.00
Road Linkage	28,160	Rs.0	Rs.0	Rs.0	Rs.0	Rs.0			0.00
Other Direct Damages 30% ¹									0.00
Indirect Damages 20% ²									0.00
									0.00

Note:
¹: Other direct loss including damages to irrigation channels and Kathas, Livestock, stored grain, electrical distribution systems, telecommunication, etc. are estimated assuming a ratio of crop/housing/road damages to total direct damages of 1:1:3.
²: Indirect damages due to suspension of irrigation supplies and traffic as well as the emergency costs, associated with such a flood include economic and physical linkages are estimated at 20% of the total direct damages within the flood plain area.

Table 6.6.1 (3) Total Flood Damage Cost of the Kabul River Flood Plain Area ("B-2")

1929 Flood

Class	Flood damage Factor [Rs/km ²]	Land Use-Wise Inundated Area (km ²)							Total Losses (Flood Damage Cost) (Million Rs.)
		Cultivated area (Firm)	Orchard or Green area	Village	Town/City	Wasteland (not used)	River (Surface Water)	River area (Flood Area)	
		63.75km ²	0.00km ²	19.00km ²	0.00km ²	0.00km ²	27.75km ²	2.00km ²	
Crops	443,900	Rs.28,298,625							28.30
Private Housing									0.00
in City/Town (Urban) areas	3,724,800				Rs.0				0.00
in Local Village areas	11,104,500			Rs.210,985,500					210.99
Road Linkage	28,160	Rs.1,795,183	Rs.0	Rs.535,035	Rs.0	Rs.0			2.33
Other Direct Damages 30% ¹									72.48
Indirect Damages 20% ²									62.82
									376.92

1995 Flood

Class	Flood damage Factor [Rs/km ²]	Land Use-Wise Inundated Area (km ²)							Total Losses (Flood Damage Cost) (Million Rs.)
		Cultivated area (Firm)	Orchard or Green area	Village	Town/City	Wasteland (not used)	River (Surface Water)	River area (Flood Area)	
		52.00km ²	0.50km ²	15.00km ²	0.00km ²	0.00km ²	27.75km ²	2.00km ²	
Crops	443,900	Rs.23,082,800							23.08
Private Housing									0.00
in City/Town (Urban) areas	3,724,800				Rs.0				0.00
in Local Village areas	11,104,500			Rs.166,567,500					166.57
Road Linkage	28,160	Rs.1,464,306	Rs.14,080	Rs.422,396	Rs.0	Rs.0			1.90
Other Direct Damages 30% ¹									57.47
Indirect Damages 20% ²									49.80
									298.82

Normal Year Flood

Class	Flood damage Factor [Rs/km ²]	Land Use-Wise Inundated Area (km ²)							Total Losses (Flood Damage Cost) (Million Rs.)
		Cultivated area (Firm)	Orchard or Green area	Village	Town/City	Wasteland (not used)	River (Surface Water)	River area (Flood Area)	
		18.75km ²	0.00km ²	3.00km ²	0.00km ²	0.00km ²	27.00km ²	2.00km ²	
Crops	443,900	Rs.8,323,125							8.32
Private Housing									0.00
in City/Town (Urban) areas	3,724,800				Rs.0				0.00
in Local Village areas	11,104,500			Rs.33,313,500					33.31
Road Linkage	28,160	Rs.527,995	Rs.0	Rs.84,479	Rs.0	Rs.0			0.61
Other Direct Damages 30% ¹									12.67
Indirect Damages 20% ²									10.98
									65.91

No Damage Flood

Class	Flood damage Factor [Rs/km ²]	Land Use-Wise Inundated Area (km ²)							Total Losses (Flood Damage Cost) (Million Rs.)
		Cultivated area (Firm)	Orchard or Green area	Village	Town/City	Wasteland (not used)	River (Surface Water)	River area (Flood Area)	
		0.00km ²	0.00km ²	0.00km ²	0.00km ²	0.00km ²	27.00km ²	2.00km ²	
Crops	443,900	Rs.0							0.00
Private Housing									0.00
in City/Town (Urban) areas	3,724,800				Rs.0				0.00
in Local Village areas	11,104,500			Rs.0					0.00
Road Linkage	28,160	Rs.0	Rs.0	Rs.0	Rs.0	Rs.0			0.00
Other Direct Damages 30% ¹									0.00
Indirect Damages 20% ²									0.00
									0.00

Note:

*1: Other direct loss including damages to irrigation channels and Kathas, Livestock, stored grain, electrical distribution system, telecommunication, etc. are estimated assuming a ratio of crop/housing/road damages to total direct damages of 1:1:3.

*2: Indirect damages due to suspension of irrigation supplies and traffic as well as the emergency costs, associated with such a flood include economic and physical linkages are estimated at 20% of the total direct damages within the flood plain area.

Table 6.6.1 (4) Total Flood Damage Cost of the Kabul River Flood Plain Area ("C")

1929 Flood

Class	Flood damage Factor [Rs/km ²]	Land Use-Wise Inundated Area (km ²)							Total Losses (Flood Damage Cost) (Million Rs.)
		Cultivated area (Farm)	Orchard or Green area	Village	Town/City	Wasteland (not used)	River (Surface Water)	River area (Flood Area)	
		84.00km ²	0.00km ²	10.25km ²	9.25km ²	6.50km ²	33.25km ²	26.00km ²	
Crops	443,900	Rs.37,287,600							37.29
Private Housing									0.00
in City/Town (Urban) areas	3,724,800				Rs.34,454,400				34.45
in Local Village areas	11,104,500			Rs.113,821,125					113.82
Road Linkage	28,160	Rs.2,365,418	Rs.0	Rs.288,637	Rs.260,478	Rs.183,038			3.10
Other Direct Damages 30%									56.60
Indirect Damages 20%									49.05
									294.31

1995 Flood

Class	Flood damage Factor [Rs/km ²]	Land Use-Wise Inundated Area (km ²)							Total Losses (Flood Damage Cost) (Million Rs.)
		Cultivated area (Farm)	Orchard or Green area	Village	Town/City	Wasteland (not used)	River (Surface Water)	River area (Flood Area)	
		42.00km ²	0.00km ²	4.25km ²	2.00km ²	2.00km ²	33.00km ²	22.50km ²	
Crops	443,900	Rs.18,643,800							18.64
Private Housing									0.00
in City/Town (Urban) areas	3,724,800				Rs.7,449,600				7.45
in Local Village areas	11,104,500			Rs.47,194,125					47.19
Road Linkage	28,160	Rs.1,182,709	Rs.0	Rs.119,679	Rs.56,319	Rs.56,319			1.42
Other Direct Damages 30%									22.41
Indirect Damages 20%									19.42
									116.54

Normal Year Flood

Class	Flood damage Factor [Rs/km ²]	Land Use-Wise Inundated Area (km ²)							Total Losses (Flood Damage Cost) (Million Rs.)
		Cultivated area (Farm)	Orchard or Green area	Village	Town/City	Wasteland (not used)	River (Surface Water)	River area (Flood Area)	
		6.75km ²	0.00km ²	1.25km ²	1.50km ²	1.50km ²	33.00km ²	20.00km ²	
Crops	443,900	Rs.2,996,325							3.00
Private Housing									0.00
in City/Town (Urban) areas	3,724,800				Rs.5,587,200				5.59
in Local Village areas	11,104,500			Rs.13,880,625					13.88
Road Linkage	28,160	Rs.190,073	Rs.0	Rs.35,200	Rs.42,240	Rs.42,240			0.31
Other Direct Damages 30%									6.83
Indirect Damages 20%									5.92
									35.53

No Damage Flood

Class	Flood damage Factor [Rs/km ²]	Land Use-Wise Inundated Area (km ²)							Total Losses (Flood Damage Cost) (Million Rs.)
		Cultivated area (Farm)	Orchard or Green area	Village	Town/City	Wasteland (not used)	River (Surface Water)	River area (Flood Area)	
		0.00km ²	0.00km ²	0.00km ²	0.00km ²	0.00km ²	33.00km ²	20.00km ²	
Crops	443,900	Rs.0							0.00
Private Housing									0.00
in City/Town (Urban) areas	3,724,800				Rs.0				0.00
in Local Village areas	11,104,500			Rs.0					0.00
Road Linkage	28,160	Rs.0	Rs.0	Rs.0	Rs.0	Rs.0			0.00
Other Direct Damages 30%									0.00
Indirect Damages 20%									0.00
									0.00

Note:

*1: Other direct loss including damages to irrigation channels and Kathas, Livestock, stored grain, electrical distribution system, telecommunication, etc. are estimated assuming a ratio of crop/housing/road damages to total direct damages of 1:1:3.

*2: Indirect damages due to suspension of irrigation supplies and traffic as well as the emergency costs, associated with such a flood include economic and physical linkages are estimated at 20% of the total direct damages within the flood plain area.

Table 6.7.1 Pre Munda Dam Probability of Exceedence Calculation

(WITHOUT PROJECT)

FLOOD CONTROL VOLUME [Million m³]= 0

Return Period (Years)	Probability (Frequency)	Flood Peak Inflow Discharge (m ³ /s)	Flood Peak Outflow Discharge (m ³ /s)	Flood Damage (Million Rs.)	Average Damage (Million Rs.)	Frequency Interval	Average Annual Damage (Million Rs.)
1.5	0.6667	730	730	0.00	1.00	0.1667	0.17
2	0.5000	1,050	1,050	2.00	44.39	0.3000	13.32
5	0.2000	2,050	2,050	86.78	116.00	0.1000	11.60
10	0.1000	2,740	2,740	145.22	173.30	0.0500	8.67
20	0.0500	3,410	3,410	201.38	210.87	0.0100	2.11
25	0.0400	3,630	3,630	220.35	251.82	0.0200	5.04
50	0.0200	4,370	4,370	283.28	310.39	0.0100	3.10
100	0.0100	5,010	5,010	337.49	367.43	0.0050	1.84
200	0.0050	5,720	5,720	397.38	435.19	0.0030	1.31
500	0.0020	6,610	6,610	473.01	501.34	0.0010	0.50
1,000	0.0010	7,280	7,280	529.68	646.99	0.0009	0.58
10,000	0.0001	10,050	10,050	764.30			
Total Annual Average Damage (Million Rupces)							48.22
							(1999 Prices)

Table 6.7.2 Post Munda Dam Probability of Exceedence Calculation

(WITH PROJECT)

FLOOD CONTROL VOLUME [Million m³]= 1

Return Period (Years)	Probability (Frequency)	Flood Peak Inflow Discharge (m ³ /s)	Flood Peak Outflow Discharge (m ³ /s)	Flood Damage (Million Rs.)	Average Damage (Million Rs.)	Frequency Interval	Average Annual Damage (Million Rs.)
1.5	0.6667	730	-	0.00	0.00	0.1667	0.00
2	0.5000	1,050	987	0.00	40.52	0.3000	12.16
5	0.2000	2,053	1,985	81.05	110.34	0.1000	11.03
10	0.1000	2,743	2,677	139.64	167.59	0.0500	8.38
20	0.0500	3,406	3,337	195.53	204.77	0.0100	2.05
25	0.0400	3,630	3,555	214.00	245.59	0.0200	4.91
50	0.0200	4,373	4,301	277.17	304.37	0.0100	3.04
100	0.0100	5,013	4,943	331.56	361.56	0.0050	1.81
200	0.0050	5,720	5,651	391.57	429.45	0.0030	1.29
500	0.0020	6,613	6,546	467.33	495.71	0.0010	0.50
1,000	0.0010	7,282	7,216	524.08	641.42	0.0009	0.58
10,000	0.0001	10,052	9,987	758.75			
Total Annual Average Damage (Million Rupees)							45.74
							(1999 Prices)

Table 7.2.1 Summary of Development Scale Alternative (1/2)

Alternatives	FSL-505			FSL-510			FSL-515			FSL-520			FSL-525			FSL-530			FSL-535			FSL-540			FSL-545													
	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c	a	b
FSL (ELm)	505.0	505.0	505.0	510.0	510.0	510.0	515.0	515.0	515.0	520.0	520.0	520.0	525.0	525.0	525.0	530.0	530.0	530.0	535.0	535.0	535.0	540.0	540.0	540.0	540.0	540.0	540.0	545.0	545.0	545.0	545.0	545.0	545.0	545.0	545.0	545.0		
MOE (ELm)	487.0	490.0	495.0	488.0	495.0	500.0	490.0	495.0	505.0	491.0	500.0	510.0	505.0	515.0	515.0	505.0	505.0	505.0	494.0	505.0	495.0	498.0	500.0	515.0	500.0	515.0	530.0	497.0	505.0	520.0	505.0	520.0	535.0	474.0	474.0	474.0		
Sediment level (ELm)	470.0	470.0	470.0	470.0	470.0	470.0	471.0	471.0	471.0	471.0	471.0	471.0	472.0	472.0	472.0	473.0	473.0	473.0	473.0	473.0	473.0	473.0	473.0	473.0	473.0	473.0	473.0	473.0	473.0	473.0	473.0	473.0	473.0	473.0	473.0	473.0		
Dam crest (ELm)	514.0	514.0	514.0	519.0	519.0	519.0	524.0	524.0	524.0	529.0	529.0	529.0	534.0	534.0	534.0	539.0	539.0	539.0	544.0	544.0	544.0	544.0	544.0	544.0	549.0	549.0	549.0	549.0	549.0	549.0	553.0	553.0	553.0	553.0	553.0	553.0		
Dam height (m)	164.0	164.0	164.0	169.0	169.0	169.0	174.0	174.0	174.0	179.0	179.0	179.0	184.0	184.0	184.0	189.0	189.0	189.0	194.0	194.0	194.0	194.0	194.0	194.0	199.0	199.0	199.0	203.0	203.0	203.0	203.0	203.0	203.0	203.0	203.0	203.0		
Effective storage (Million m ³)	213	171	120	260	188	137	308	257	137	366	273	137	433	293	136	521	381	176	589	401	176	667	625	420	772	672	467	772	672	467	772	672	467	772	672	467		
Rated head (m)	124.5	125.4	127.0	127.9	130.2	131.7	133.3	136.5	136.5	134.3	136.1	141.2	142.8	146.0	146.0	141.6	146.0	150.7	145.0	150.7	155.5	148.5	149.8	155.5	155.5	160.2	172.0	154.5	159.3	165.0	154.5	159.3	165.0	154.5	159.3	165.0		
Maximum discharge (m ³ /sec)	250	230	205	270	240	210	325	259	210	394	349	268	435	374	290	484	404	313	537	449	323	590	575	477	658	614	518	658	614	518	658	614	518	658	614	518		
Peak power output (MW)	280	260	235	310	280	250	350	280	250	400	349	268	440	374	290	490	404	313	537	449	323	590	575	477	658	614	518	658	614	518	658	614	518	658	614	518		
Number of unit	140 x 2	130 x 2	120 x 2	155 x 2	140 x 2	125 x 2	175 x 2	165 x 2	130 x 2	190 x 2	175 x 2	135 x 2	223 x 2	200 x 2	145 x 2	260 x 2	230 x 2	160 x 2	290 x 2	250 x 2	180 x 2	320 x 2	300 x 2	230 x 2	350 x 2	330 x 2	260 x 2	380 x 2	360 x 2	290 x 2	410 x 2	390 x 2	320 x 2	440 x 2	420 x 2	350 x 2		
Installed capacity (MW)	280	260	240	310	280	250	350	300	260	390	350	270	440	370	290	490	400	310	540	450	320	590	570	470	660	610	520	660	610	520	660	610	520	660	610	520		
Dependable peak output (MW) ^{*1}	250	240	220	280	260	240	300	290	250	330	310	260	370	330	280	400	380	300	430	400	310	470	460	420	510	500	460	510	500	460	510	500	460	510	500	460		
Annual energy																																						
Total (GWh)	1,270	1,212	1,144	1,375	1,289	1,199	1,499	1,454	1,240	1,620	1,527	1,286	1,753	1,610	1,370	1,875	1,771	1,446	1,992	1,846	1,492	2,093	2,090	1,937	2,222	2,170	2,053	2,222	2,170	2,053	2,222	2,170	2,053					
Firm (GWh)	363	347	324	403	377	346	441	423	359	483	455	372	530	484	403	578	548	449	623	575	447	683	674	610	745	731	666	745	731	666	745	731	666					
Secondary (GWh)	907	865	820	972	913	853	1,058	1,031	881	1,137	1,072	915	1,224	1,126	967	1,297	1,224	997	1,368	1,271	1,045	1,410	1,410	1,327	1,477	1,439	1,387	1,477	1,439	1,387	1,477	1,439	1,387					
Plant factor	51%	53%	54%	52%	52%	54%	48%	50%	54%	47%	49%	54%	45%	49%	53%	43%	47%	53%	42%	46%	53%	40%	41%	46%	38%	40%	45%	38%	40%	45%	38%	40%	45%					
Economic cost (US\$ Million)	470.3	462.8	456.9	484.8	471.7	458.5	503.8	491.9	468.7	536.2	509.4	478.5	559.9	528.5	492.7	592.4	567.3	506.4	629.1	576.8	522.1	665.9	643.1	595.1	711.3	674.6	636.9	711.3	674.6	636.9	711.3	674.6	636.9					
Economic analysis																																						
*2 NPV (US\$ M)	39.6	27.2	12.1	58.2	41.6	23.2	78.6	71.8	26.6	89.5	77.9	30.5	107.5	80.9	38.0	116.8	96.8	44.4	128.7	109.5	44.6	138.7	145.9	122.5	153.9	152.6	127.9	153.9	152.6	127.9	153.9	152.6	127.9					
*2 B/C	1.12	1.09	1.04	1.13	1.13	1.08	1.24	1.22	1.09	1.26	1.24	1.10	1.30	1.24	1.12	1.31	1.27	1.14	1.32	1.30	1.14	1.33	1.36	1.32	1.34	1.36	1.32	1.34	1.36	1.32	1.34	1.36	1.32					
IRR	11.1%	10.7%	10.5%	11.1%	10.7%	10.7%	11.9%	11.0%	10.7%	12.1%	12.0%	10.8%	12.4%	12.0%	11.0%	12.5%	12.2%	11.1%	12.6%	12.4%	11.1%	12.6%	12.6%	12.6%	12.7%	12.7%	12.8%	12.7%	12.8%	12.8%	12.7%	12.8%	12.8%					

Note: *1: Peaking hour = 4 hours, Dependability of 95 %

*2: Discount rate = 10%

Table 7.2.1 Summary of Development Scale Alternative (2/2)

Alternatives	FSL 550				FSL 555				FSL 560				FSL 565				FSL 570				FSL 575				FSL 580							
	a	b	c	d	a	b	c	d	a	b	c	d	a	b	c	d	a	b	c	d	a	b	c	d	a	b	c	d	a	b	c	d
FSL (EL _m)	530.0	550.0	550.0	530.0	555.0	555.0	555.0	555.0	560.0	560.0	560.0	560.0	565.0	565.0	565.0	565.0	570.0	570.0	570.0	570.0	575.0	575.0	575.0	575.0	580.0	580.0	580.0	580.0	580.0	580.0	580.0	580.0
MOL (EL _m)	499.0	510.0	525.0	540.0	493.0	510.0	530.0	530.0	500.0	530.0	530.0	530.0	500.0	510.0	530.0	530.0	500.0	515.0	535.0	555.0	497.0	515.0	535.0	555.0	497.0	530.0	530.0	540.0	497.0	530.0	530.0	540.0
Sediment level (EL _m)	474.0	474.0	474.0	474.0	474.0	474.0	474.0	474.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0
Diem crest (EL _m)	583.0	583.0	583.0	583.0	583.0	583.0	583.0	583.0	588.0	588.0	588.0	588.0	573.0	573.0	573.0	573.0	577.0	577.0	577.0	577.0	582.0	582.0	582.0	582.0	587.0	587.0	587.0	587.0	587.0	587.0	587.0	587.0
Diem height (m)	208.0	208.0	208.0	208.0	213.0	213.0	213.0	213.0	218.0	218.0	218.0	218.0	223.0	223.0	223.0	223.0	227.0	227.0	227.0	227.0	232.0	232.0	232.0	232.0	237.0	237.0	237.0	237.0	237.0	237.0	237.0	237.0
Effective storage (Million m ³)	866	719	495	231	1,043	834	766	522	950	637	637	231	1,206	1,108	795	389	1,455	1,198	866	432	1,592	1,356	1,024	590	1,751	1,446	1,094	633				
Rated head (m)	154.9	159.3	164.0	169.7	156.1	162.5	164.0	168.8	174.5	159.6	164.7	172.0	163.1	167.8	175.1	182.4	166.6	172.6	178.9	186.2	170.1	175.8	182.1	189.4	173.2	180.5	186.8	194.1				
Maximum discharge (m ³ /sec)	520	460	370	255	580	505	475	380	545	425	425	255	665	605	490	330	715	635	515	345	755	685	575	405	800	710	600	425				
Peak power output (MW)	727	661	548	391	816	740	702	578	893	810	660	412	979	916	774	543	1,075	989	852	580	1,159	1,087	945	692	1,249	1,155	1,011	744				
Number of unit	183 x 4	165 x 4	138 x 4	130 x 3	205 x 4	185 x 4	175 x 4	145 x 4	133 x 3	148 x 6	203 x 4	165 x 4	163 x 6	153 x 6	193 x 4	135 x 4	180 x 6	165 x 6	158 x 6	145 x 4	193 x 6	182 x 6	158 x 6	173 x 4	208 x 6	193 x 6	168 x 6	185 x 4				
Installed capacity (MW)	730	660	550	390	820	740	700	580	890	810	660	410	980	920	770	540	1,080	990	830	580	1,160	1,090	900	690	1,250	1,160	1,010	740				
Dependable peak output (MW) *1	560	540	490	370	590	590	580	510	630	640	570	390	680	700	660	510	740	760	710	540	780	820	790	630	820	880	850	680				
Annual energy																																
Total (GWh)	2,326	2,285	2,144	1,771	2,402	2,402	2,377	2,230	2,481	2,497	2,385	1,861	2,559	2,610	2,561	2,224	2,606	2,697	2,677	2,334	2,645	2,755	2,803	2,560	2,665	2,816	2,881	2,669				
Firm (GWh)	808	789	706	543	839	847	842	747	925	928	832	573	991	1,022	954	732	1,078	1,109	1,033	780	1,140	1,194	1,140	918	1,189	1,281	1,232	987				
Secondary (GWh)	1,518	1,496	1,438	1,229	1,563	1,555	1,483	1,259	1,556	1,569	1,553	1,288	1,567	1,588	1,607	1,493	1,528	1,589	1,644	1,554	1,505	1,560	1,654	1,642	1,475	1,535	1,649	1,682				
Plant factor	36%	39%	44%	51%	33%	37%	38%	43%	35%	32%	35%	41%	30%	32%	33%	47%	27%	31%	36%	46%	26%	29%	33%	42%	24%	27%	32%	41%				
Economic cost (US\$ Million)	751.0	707.4	663.5	598.7	817.6	766.9	748.6	746.4	827.5	804.8	742.1	656.5	927.9	901.9	814.7	736.1	1,025.6	960.7	894.4	783.2	1,098.8	1,032.9	957.0	840.4	1,165.3	1,103.9	1,016.7	889.0				
Economic analysis																																
*2 NPV (US\$ Mil)	169.0	167.2	135.8	64.1	168.8	175.5	169.5	107.5	56.6	156.4	183.1	155.6	44.8	164.7	188.0	184.9	161.3	183.9	171.2	104.9	127.9	163.1	172.1	123.8	92.6	126.6	143.0	106.0				
*3 B/C	1.35	1.37	1.32	1.17	1.33	1.36	1.36	1.23	1.14	1.28	1.36	1.33	1.11	1.29	1.35	1.38	1.24	1.27	1.33	1.23	1.20	1.27	1.30	1.25	1.13	1.19	1.23	1.20				
IRR	12.8%	13.0%	12.6%	11.4%	12.6%	12.9%	12.8%	11.9%	11.2%	12.3%	12.8%	12.6%	10.9%	12.3%	12.8%	13.0%	11.9%	12.7%	12.6%	11.9%	11.6%	12.1%	12.4%	12.0%	11.1%	11.5%	11.8%	11.5%				

Note: *1: Peaking hour = 4 hours, Dependability of 95 %
 *2: Discount rate = 10%

Table 8.2.1 Concrete Face Rockfill Dams Classified by Rockfill Material

LIMESTONE							SHALE AND SCHIST						
Name of Dam	Country	Dam Height (m)	Year Completed	Upstream Slope	Downstream Slope		Name of Dam	Country	Dam Height (m)	Year Completed	Upstream Slope	Downstream Slope	
Dix River	Calif. USA	84	1925	1 - 1.2	1.4		Salazar	Portugal	70	1949	1.25	1.4	
El Tejo	Spain	40	1974	1.3	1.4		Kangaroo	Creek/Australia	50	1968	1.3	1.4	
Neveti	Venezuela	115	1981	1.4	1.5		Oasa	Romania	91	1971	1.3	1.6	
Alfloritos	Spain	75	1983	1.4	1.4		Mangrove Cr.	Australia	80	1981	1.5	1.6	*4
Khao Laem	Thailand	130	1984	1.4	1.4		Wuluwadi	China	138	1998	1.6	1.6	
Alkasua	Spain	50	1985	1.5	1.4		Tala	Romania	64	U/D	1.65	1.55	
Bolboci	Romania	56	1985	1.3	1.3		Bejiaotan	China	70	P	1.4	1.4	
Xibeokou	China	95	1989	1.4	1.4		Dim	Turkey	135	2001	1.4	1.5	
Shushuqiao	China	78	1990	1.4	1.7	*1	Granite and GNEISS						
U.Siah Bishe	Iran	100	1994	1.5	1.6	*2	Morena	Calif. USA	54	1895	0.5 - 0.9	1.3	
L. Siah Bishe	Iran	130	1994	1.5	1.6		Strawberry	Calif. USA	50	1916	1.1 - 1.2	1.3	
Messochoba	Greece	135	1994	1.4	1.4		Salt Springs	Calif. USA	100	1931	1.1 - 1.4	1.4	
Baiyun	China	120	1996	1.4	1.4		Cogswell	Calif. USA	85	1934	1.55	1.6	
Tianshengqiao I	China	178	1998	1.4	1.4	*3	L. Bear No.2	Calif. USA	50	1952	1.0	1.4	
Hon Gjiadu	China	182	U/D	1.4	1.4		Paradela	Portugal	112	1955	1.3	1.3	
Pankou	China	123	U/D	1.4	1.5		Courtright	Calif. USA	98	1958	1.3	1.3	
Poacasca	Romania	52	U/D	1.3	1.4		Wishon	Calif. USA	82	1958	1.0 - 1.3	1.4	
Nam Ngum 3	Lao	220	2001	1.4	1.4		Vilar	Portugal	55	1965	1.1 - 1.3	1.3	
Shui Bu Ya	China	252	U/D	1.4	1.4		Fades	France	70	1967	1.3	1.3	
Gordes	Turkey	95	2001	1.4	1.5		Koolenay	Canal / Canada	37	1975	2.0	1.4	
Xiaoxikou	China	68	U/C	1.4	1.3		Rouchain	France	60	1976	1.4	1.4	
Antamina	Peru	115	U/C	1.3	1.3		Fantanele	Romania	92	1978	1.3	1.3	
							Outarde no.2	Canada	55	1978	1.4	1.4	
							Bejar	Spain	71	1984	1.3	1.3	
							Spicer	Meadows/Calif. USA	82	1988	1.5	1.5	
							Balsam	Meadows/Calif. USA	40	1988	1.4	1.4	
							Xingo	Brazil	150	1994	1.4	1.3	
							Wanauxi	China	94	1995	1.4	1.4	
							Haibaoba	China	57	1996	1.4	1.4	
							Douyan	China	58	1996	1.4	1.6	
							Lianhua	China	72	1997	1.4	1.4	
							Runcv	Romania	90	1999	1.4	1.4	
							Cariaebi	Venezuela	80	1999	1.3	1.3	
							Aeena	Spain	65	U/D	1.3	1.5	
							Merowe	Sudan	83	P	1.3	1.4	
							Yang Yang	S. Korea	93	2000	1.4	1.4	
							Mukosi	Zimbabwe	89	2002	1.3	1.3	
							Intebi	Brazil	100	2003	1.3	1.3	
							Qiezishan	China	107	U/C	1.4	1.4	
							Gongbaixia	China	130	U/D	1.4	1.4	*8

*1 Limestone & Slate *2 Limestone & Basalt *3 Limestone & Sandstone *4 Gravel & Schist *5 Gravel and Gneiss *6 Gravel and Ignimbrite *7 Gravel and Limestone *8 Granite and Gravel

(Source : International Water Power and Dam Construction, Year Book 1999)

Table 9.2.1 Labour Wage

Particular	Unit	LC (Rs.)	FC (US\$)
Foreman, foreign	m.d.		200
Foreman	m.d.	400	
Operator A	m.d.	300	
Operator B	m.d.	250	
Assistant operator	m.d.	200	
Driver	m.d.	250	
Rigger	m.d.	300	
Carpenter	m.d.	300	
Concrete worker	m.d.	200	
Driller	m.d.	200	
Rebar worker	m.d.	160	
Skilled labor	m.d.	200	
Common labor	m.d.	130	

Table 9.2.2 Unit Price of Major Construction Materials

Material	Unit	LC (Rs.)	FC (US\$)
Light oil	lit.	10.9	
Gasoline	lit.	26.3	
Portland cement	ton	4,200.0	
Sulfate resistant cement	ton	4,600.0	
AE agent	kg	80.0	
Deformed bar (Grade-30)	ton	20,000.0	
Deformed bar (Grade-40)	ton	21,200.0	
Dynamite, in open	kg	93.0	
Dynamite, in tunnel	kg	130.0	
ANFO powder	kg	33.0	
Electric detonator	no.	140.0	
Timber	cu.m	480.0	
Plywood	cu.m	580.0	
Metal form, 300*1500	no.		40.0
Cross bit, 65 mm	no.		260.0
Drilling rod, 38mm, L=3.0m	no.		360.0
Joint sleeve, 38 mm	no.		80.0
Shank rod, 38 mm	no.		230.0

Table 9.2.3 Hourly Cost of Construction Equipment

Equipment	Unit	LC (Rs.)	FC (US\$)	Total (US\$)
Bulldozer, 21 t	hr	459	39.5	48.7
Bulldozer, 32 t	hr	669	54.0	67.4
Bulldozer, 44 t	hr	880	71.0	88.6
Bulldozer, 66 t	hr	1,287	104.0	129.7
Bulldozer, w/ripper, 21 t	hr	519	43.1	53.5
Bulldozer, w/ripper, 32 t	hr	666	53.6	66.9
Bulldozer, w/ripper, 44 t	hr	915	73.6	91.9
Bulldozer, w/ripper, 66 t	hr	1,343	108.0	134.9
Wheel loader, 2.3 m ³	hr	269	22.8	28.2
Wheel loader, 2.9 m ³	hr	316	26.8	33.1
Wheel loader, 3.5 m ³	hr	411	34.8	43.0
Wheel loader, 4 m ³	hr	499	42.3	52.3
Wheel loader, 4.5 m ³	hr	597	50.6	62.5
Wheel loader, 5.4 m ³	hr	906	76.8	94.9
Wheel loader, 11 m ³	hr	1,760	149.2	184.4
Backhoe, 0.8 m ³	hr	239	23.1	27.9
Backhoe, 1 m ³	hr	296	28.5	34.4
Backhoe, 1.2 m ³	hr	349	33.7	40.7
Backhoe, 1.5 m ³	hr	415	40.1	48.4
Dump truck, 11 t	hr	138	10.3	13.1
Dump truck, 20 t	hr	301	24.3	30.3
Dump truck, 32 t	hr	413	32.4	40.7
Dump truck, 46 t	hr	547	43.0	53.9
Dump truck, 60 t	hr	711	55.9	70.1
Crawler drill, air, 180 kg	hr	210	19.8	24.0
Crawler drill, hyd., 150 kg	hr	722	68.2	82.7
Crawler drill, hyd., 180 kg	hr	802	75.8	91.8
Wheel jumbo, 2boom, 150 kg	hr	2,308	184.0	230.1
Wheel jumbo, 3boom, 150 kg	hr	3,290	262.2	328.0
Tamping roller, pull, 13.5-20.7t	hr	140	11.7	14.5
Vibrating roller, 3-5t	hr	140	11.9	14.7
Vibrating roller, 11-12t	hr	444	38.0	46.9
Vibrating roller, 15-18t	hr	626	53.6	66.1
Agitator truck, 3 m ³	hr	99	8.5	10.5
Agitator truck, 4.5 m ³	hr	144	12.4	15.3
Concrete pumpcar, 60 m ³ /hr, boom	hr	457	38.9	48.0
Concrete pumpcar, 100 m ³ /hr, boom	hr	679	57.7	71.3
Sprinkler truck, 10 kl	hr	144	12.2	15.1

Table 9.2.4 Summary of Project Cost Estimate

Description	F.C. (million US\$)	L.C. (million US\$)	Total (million US\$)
I. Base Cost			
(1) Local Contract			
L-1 : Access Road	0.0	3.3	3.3
L-2 : WAPDA Camp	0.0	5.0	5.0
L-3 : Power supply system	0.0	1.0	1.0
Sub-total (1)	0.0	9.3	9.3
(2) International Contract			
I-1 : Diversion Tunnel	37.5	33.4	70.9
I-2 : Main Civil Works	188.2	163.6	351.8
I-3 : Gate and Penstock	45.7	8.1	53.8
I-4 : Turbines and Auxiliaries	50.2	5.6	55.8
I-5 : Generators and Auxiliaries	70.0	7.9	77.9
I-6 : Switchgear Equipment	16.8	1.8	18.6
I-7 : Transmission Line & S/S	14.8	5.0	19.8
I-8 : Irrigation Facilities	16.8	23.0	39.8
Sub-total (2)	440.0	248.4	688.4
Sub-total (1)+(2)	440.0	257.7	697.7
(3) Engineering Service	34.0	11.3	45.3
(4) Administration	0.0	17.4	17.4
(5) Land Compensation	0.0	2.5	2.5
(6) Environmental Mitigation	0.0	5.0	5.0
Sub-total (1) to (6)	474.0	293.9	767.9
(7) Tax	0.0	120.1	120.1
Sub-total I (Base cost)	474.0	414.0	888.0
II. Contingency			
Price Contingency	91.5	77.6	169.1
Physical Contingency	46.3	45.5	91.8
Sub-total II (Contingency)	137.8	123.1	260.9
Total Project Cost	611.8	537.1	1,148.9

Table 9.2.5 Breakdown of Cost Estimate for Diversion Tunnel

Description	Unit	Quantity	Unit Price (US\$)			Amount (1000 US\$)		
			FC	LC	Total	FC	LC	Total
1 Site Installation						4,900	4,400	9,300
2 No.1 Diversion Tunnel								
Stripping	m ²	53,000	0.6	0.4	1.0	32	21	53
Excavation, open cut, rock	m ³	1,057,000	7.0	3.0	10.0	7,399	3,171	10,570
Excavation, tunnel, all class	m ³	151,000	35.0	20.0	55.0	5,285	3,020	8,305
Shotcrete, 10 cm	m ²	42,200	12.0	18.0	30.0	506	760	1,266
Rockbolt, 25 mm	m	10,050	5.0	20.0	25.0	50	201	251
Grout, consolidation	m	5,600	20.0	10.0	30.0	112	56	168
Concrete, portal	m ³	5,180	50.0	100.0	150.0	259	518	777
Concrete, lining	m ³	53,180	65.0	120.0	185.0	3,457	6,382	9,838
Miscellaneous	%	10				1,710	1,413	3,123
Subtotal						18,810	15,541	34,351
3 No.2 Diversion Tunnel (River Outlet Tunnel)								
Stripping	m ²	20,000	0.6	0.4	1.0	12	8	20
Excavation, open cut, rock	m ³	388,000	7.0	3.0	10.0	2,716	1,164	3,880
Excavation, tunnel, all class	m ³	153,000	35.0	20.0	55.0	5,355	3,060	8,415
Shotcrete, 10 cm	m ²	42,710	12.0	18.0	30.0	513	769	1,281
Rockbolt, 25 mm	m	11,040	5.0	20.0	25.0	55	221	276
Concrete, portal	m ³	5,180	50.0	100.0	150.0	259	518	777
Grout, consolidation	m	5,660	20.0	10.0	30.0	113	57	170
Concrete, lining	m ³	53,820	65.0	120.0	185.0	3,498	6,458	9,957
Miscellaneous	%	10				1,252	1,225	2,478
Subtotal						13,773	13,480	27,253
Total						37,484	33,421	70,905

Table 9.2.6 Breakdown of Cost Estimate for Main Civil Works

Description	Unit	Quantity	Unit Price (US\$)			Amount (1000 US\$)		
			FC	LC	Total	FC	LC	Total
1 Site Installation						31,400	27,300	58,700
2 River Diversion								
Upstream primary cofferdam	m ³	176,000	5.0	3.0	8.0	880	528	1,408
Downstream cofferdam	m ³	114,000	5.0	3.0	8.0	570	342	912
Concrete, plug in diversion tunnel	m ³	2,150	40.0	65.0	105.0	86	140	226
Grout, curtain	m	480	60.0	40.0	100.0	29	19	48
Miscellaneous	%	15				235	154	389
Sub-total						1,800	1,183	2,983
3 Concrete Faced Rockfill Dam								
Stripping	m ²	345,000	0.6	0.4	1.0	207	138	345
Excavation, open cut, common	m ³	521,000	1.9	1.0	2.9	990	521	1,511
Excavation, open cut, rock	m ³	521,000	7.0	3.0	10.0	3,647	1,563	5,210
Embankment, Zone 1A	m ³	91,500	4.0	2.3	6.3	366	210	576
Embankment, Zone 1B	m ³	286,000	3.3	1.7	5.0	944	486	1,430
Embankment, Zone 2A	m ³	7,600	17.9	7.7	25.6	136	59	195
Embankment, Zone 2B	m ³	273,000	14.5	6.9	21.4	3,959	1,884	5,842
Embankment, Zone 3A	m ³	512,000	6.6	3.2	9.8	3,379	1,638	5,018
Embankment, Zone 3B	m ³	5,900,000	5.5	2.5	8.0	32,450	14,750	47,200
Embankment, Zone 3C	m ³	7,175,000	3.3	1.7	5.0	23,678	12,198	35,875
Embankment, Zone 3D	m ³	2,066,000	1.2	2.5	3.7	2,479	5,165	7,644
Embankment, Zone 3E	m ³	154,000	15.2	7.0	22.2	2,341	1,078	3,419
Face slab concrete	m ³	109,000	80.0	165.0	245.0	8,720	17,985	26,705
Grout, curtain	m	23,500	60.0	40.0	100.0	1,410	940	2,350
Grout, consolidation	m	8,200	30.0	20.0	50.0	246	164	410
Anchor bars, 28 mm	m	10,600	5.0	15.0	20.0	53	159	212
Shotcrete, 5 cm	m ²	192,000	8.0	12.0	20.0	1,536	2,304	3,840
Concrete, parapet wall	m ³	5,810	50.0	100.0	150.0	291	581	872
Miscellaneous	%	10				8,683	6,182	14,865
Sub-total						95,513	68,005	163,519
4 Spillway								
Stripping	m ²	132,000	0.6	0.4	1.0	79	53	132
Excavation, open cut, common	m ³	208,000	1.9	1.0	2.9	395	208	603
Excavation, open cut, rock	m ³	1,871,000	7.0	3.0	10.0	13,097	5,613	18,710
Mass concrete	m ³	29,500	40.0	50.0	90.0	1,180	1,475	2,655
Structural concrete	m ³	199,000	50.0	100.0	150.0	9,950	19,900	29,850
Grout, curtain	m	6,420	60.0	40.0	100.0	385	257	642
Cofferdam for plunge pool excavation	m ³	93,000	5.0	3.0	8.0	465	279	744
Miscellaneous	%	10				2,555	2,778	5,334
Sub-total						28,107	30,563	58,670
5 Power Intake								
Excavation, open cut, common	m ³	15,000	1.9	1.0	2.9	29	15	44
Excavation, open cut, rock	m ³	135,000	7.0	3.0	10.0	945	405	1,350
Structural concrete	m ³	8,500	50.0	100.0	150.0	425	850	1,275
Miscellaneous	%	10				140	127	267
Sub-total						1,538	1,397	2,935

Table 9.2.6 Breakdown of Cost Estimate for Main Civil Works

Description	Unit	Quantity	Unit Price (US\$)			Amount (1000 US\$)		
			FC	LC	Total	FC	LC	Total
6 Headrace Tunnel								
Excavation, open cut, common	m ³	2,000	1.9	1.0	2.9	4	2	6
Excavation, open cut, rock	m ³	7,000	7.0	3.0	10.0	49	21	70
Excavation, shaft, all class	m ³	10,200	20.0	10.0	30.0	204	102	306
Excavation, tunnel, all class	m ³	80,000	35.0	20.0	55.0	2,800	1,600	4,400
Shotcrete, 10 cm	m ²	24,000	12.0	18.0	30.0	288	432	720
Rockbolt, 25 mm	m	5,640	5.0	20.0	25.0	28	113	141
Concrete, lining	m ³	28,900	65.0	120.0	185.0	1,879	3,468	5,347
Grout, consolidation	m ³	3,200	20.0	10.0	30.0	64	32	96
Miscellaneous	%	10				532	577	1,109
Sub-total						5,847	6,347	12,194
7 Surge Tank								
Excavation, open cut, common	m ³	2,000	1.9	1.0	2.9	4	2	6
Excavation, open cut, rock	m ³	5,000	7.0	3.0	10.0	35	15	50
Excavation, shaft, all class	m ³	15,000	20.0	10.0	30.0	300	150	450
Excavation, tunnel, all class	m ³	8,000	35.0	20.0	55.0	280	160	440
Shotcrete, 10 cm	m ²	5,240	12.0	18.0	30.0	63	94	157
Rockbolt, 25 mm	m	1,120	5.0	20.0	25.0	6	22	28
Concrete, lining	m ³	8,390	65.0	120.0	185.0	545	1,007	1,552
Grout, consolidation	m ³	630	20.0	10.0	30.0	13	6	19
Miscellaneous	%	10				125	146	270
Sub-total						1,370	1,603	2,972
8 Penstock								
Excavation, open cut, common	m ³	25,000	1.9	1.0	2.9	48	25	73
Excavation, open cut, rock	m ³	100,000	7.0	3.0	10.0	700	300	1,000
Excavation, tunnel, all class	m ³	25,000	35.0	20.0	55.0	875	500	1,375
Shotcrete, 10 cm	m ²	11,000	12.0	18.0	30.0	132	198	330
Rockbolt, 25 mm	m	4,100	5.0	20.0	25.0	21	82	103
Concrete, lining	m ³	12,500	65.0	120.0	185.0	813	1,500	2,313
Grout, consolidation	m ³	2,310	20.0	10.0	30.0	46	23	69
Miscellaneous	%	10				263	263	526
Sub-total						2,897	2,891	5,788
9 Powerhouse and Switchyard								
Stripping	m ²	24,000	0.6	0.4	1.0	14	10	24
Excavation, open cut, common	m ³	32,000	1.9	1.0	2.9	61	32	93
Excavation, open cut, rock	m ³	287,000	7.0	3.0	10.0	2,009	861	2,870
Concrete in substructure	m ³	133,500	50.0	100.0	150.0	6,675	13,350	20,025
Superstructure	m ²	3,780	800.0	600.0	1400.0	3,024	2,268	5,292
Miscellaneous	%	10				1,178	1,652	2,830
Sub-total						12,962	18,173	31,134
10 River Outlet								
Excavation, shaft, all class	m ³	2,000	50.0	30.0	80.0	100	60	160
Excavation, tunnel, all class	m ³	4,000	35.0	20.0	55.0	140	80	220
Shotcrete, 10 cm	m ²	1,320	12.0	18.0	30.0	16	24	40
Rockbolt, 25 mm	m	1,000	5.0	20.0	25.0	5	20	25
Concrete lining	m ³	2,310	65.0	120.0	185.0	150	277	427
Plug concrete	m ³	1,930	40.0	65.0	105.0	77	125	203
Grout, curtain	m	480	60.0	40.0	100.0	29	19	48
Miscellaneous	%	10				52	61	112
Sub-total						569	666	1,235

Table 9.2.6 Breakdown of Cost Estimate for Main Civil Works

Description	Unit	Quantity	Unit Price (US\$)			Amount (1000 US\$)		
			FC	LC	Total	FC	LC	Total
11 Re-regulating Dam								
Excavation, open cut, common	m ³	33,000	1.9	1.0	2.9	63	33	96
Excavation, open cut, rock	m ³	274,000	7.0	3.0	10.0	1,918	822	2,740
Upstream cofferdam	m ³	156,000	5.0	3.0	8.0	780	468	1,248
Downstream cofferdam	m ³	156,000	5.0	3.0	8.0	780	468	1,248
Embankment, earth	m ³	53,000	5.0	3.0	8.0	265	159	424
Mass concrete	m ³	22,600	40.0	50.0	90.0	904	1,130	2,034
Structural concrete	m ³	19,300	50.0	100.0	150.0	965	1,930	2,895
Miscellaneous	%	10				567	501	1,068
Sub-total						6,242	5,511	11,753
Total						188,244	163,638	351,883

Table 9.2.7 Breakdown of Cost Estimate for Gate and Penstock

Description	Unit	Quantity	Unit Price (US\$)			Amount (1000 US\$)		
			FC	LC	Total	FC	LC	Total
1 Diversion Tunnel								
Gate	ton	600	6,800	1,200	8,000	4,080	720	4,800
2 Spillway								
Stoplogs	ton	510	6,800	1,200	8,000	3,468	612	4,080
Gates	ton	850	6,800	1,200	8,000	5,780	1,020	6,800
3 Power Intake								
Stoplogs	ton	290	6,800	1,200	8,000	1,972	348	2,320
Trashracks	ton	240	3,400	600	4,000	816	144	960
Gates	ton	290	6,800	1,200	8,000	1,972	348	2,320
4 Waterway								
Penstock steel liners	ton	5,000	2,975	525	3,500	14,875	2,625	17,500
5 Powerhouse Draft Tube Outlet								
Gates	ton	240	6,800	1,200	8,000	1,632	288	1,920
6 River Outlet								
Trashracks	ton	50	3,400	600	4,000	170	30	200
Inlet gates	ton	550	6,800	1,200	8,000	3,740	660	4,400
River outlet gates w/housing	ton	320	8,500	1,500	10,000	2,720	480	3,200
Steel liners	ton	100	2,975	525	3,500	298	53	351
7 Re-regulating Facilities								
Stoplogs (1 set)	ton	130	6,800	1,200	8,000	884	156	1,040
Gates	ton	480	6,800	1,200	8,000	3,264	576	3,840
Total						45,671	8,060	53,731

Table 9.2.8 Breakdown of Cost Estimate for Electrical Works

Description	Unit	Quantity	Unit Price (US\$)			Amount (1000 US\$)		
			FC	LC	Total	FC	LC	Total
1 Turbines and Auxiliaries								
Hydraulic turbine	LS		-	-	-	45,800	5,100	50,900
	LS		-	-	-	2,000	200	2,200
Others	%	5	-	-	-	2,400	300	2,700
Subtotal						50,200	5,600	55,800
2 Generators and Auxiliaries								
Generators	LS		-	-	-	53,800	6,000	59,800
Generator Cubicles	LS		-	-	-	1,500	200	1,700
Supervisory control	LS		-	-	-	6,100	700	6,800
Others	%	14	-	-	-	8,600	1,000	9,600
Subtotal						70,000	7,900	77,900
3 Switchgear Equipment								
Transformers	LS		-	-	-	11,100	1,200	12,300
220 kV switchgear	LS		-	-	-	3,500	400	3,900
Others	%	15	-	-	-	2,200	200	2,400
Subtotal						16,800	1,800	18,600
4 Transmission Line								
Transmission line (30 km)	LS		-	-	-	10,500	4,500	15,000
SS 220 kV switchgear	LS		-	-	-	2,000	200	2,200
Others	%	15	-	-	-	2,300	300	2,600
Subtotal						14,800	5,000	19,800
Total						151,800	20,300	172,100

Table 9.2.9 Breakdown of Cost Estimate for Irrigation Facilities (Right Bank Area)

Description	Unit	Q'ty	Unit Price (US\$)			Amount (1000 US\$)		
			FC	LC	Total	FC	LC	Total
1 Site installations						600.0	800.0	1,400.0
2 Excavation common								
by backhoe	m ³	256,648	1.20	0.70	1.9	308.0	179.7	487.6
3 Backfilling	m ³	20,736	1.20	0.70	1.9	24.9	14.5	39.4
4 Embankment								
by machine	m ³	307,035	0.90	0.50	1.4	276.3	153.5	429.8
5 Stone Pitching	m ²	14,232	1.08	2.52	3.6	15.4	35.9	51.2
6 Brick Work	m ³	17,234	13.50	31.50	45.0	232.7	542.9	775.5
7 Concrete								
A (14N/mm ³)	m ³		25.00	40.00	65.0			
B (18N/mm ³)	m ³		27.50	42.50	70.0			
C (21N/mm ³)	m ³	36,445	30.00	45.00	75.0	1,093.4	1,640.0	2,733.4
Concrete lining	m ³	19,040	25.00	40.00	65.0	476.0	761.6	1,237.6
Form Work	m ²	83,764	2.00	6.00	8.0	167.5	502.6	670.1
Reinforcement bar	ton	2,887	100.00	900.00	1,000.0	288.7	2,598.3	2,887.0
Waterstop	m	4,608	1.68	0.72	2.4	7.7	3.3	11.1
8 Gabion	m ³	25,356	7.32	17.08	24.4	185.6	433.1	618.7
9 Gravel	m ³	136	3.75	3.75	7.5	0.5	0.5	1.0
10 Asphalt	kg	3,600	4.98	3.32	8.3	17.9	12.0	29.9
11 Piles								
Piles (d=800)	m	200	348.00	232.00	580.0	69.6	46.4	116.0
Piles (d=750)	m	80	207.00	138.00	345.0	16.6	11.0	27.6
12 Angle Iron	kg	750	0.48	0.72	1.2	0.4	0.5	0.9
13 Expansion Joint	m	75	4.98	3.32	8.3	0.4	0.2	0.6
14 Neoprene Bearing Pad	nos.	100	441.00	189.00	630.0	44.1	18.9	63.0
15 Railing	m	600	2.80	1.20	4.0	1.7	0.7	2.4
16 Bridge	m	32	84.00	84.00	168.0	2.7	2.7	5.4
17 Stars		48	2.00	2.00	4.0	0.1	0.1	0.2
18 Stop Log								
Stop Log (1500)	nos.	22	8.10	18.90	27.0	0.2	0.4	0.6
Stop Log (800)	nos.	47	4.20	9.80	14.0	0.2	0.5	0.7
Stop Log (500)	nos.	5	2.70	6.30	9.0	0.0	0.0	0.0
Stop Log (400)	nos.	23	2.10	4.90	7.0	0.0	0.1	0.2
Pipe (d=300)	m	115	17.40	11.60	29.0	2.0	1.3	3.3
P.C.Cover	nos.	23	10.20	6.80	17.0	0.2	0.2	0.4
19 Gate								
(3.00x1.50)	nos.	16	7,080.00	4,720.00	11,800.0	113.3	75.5	188.8
(2.00x1.20)	nos.	10	3,780.00	2,520.00	6,300.0	37.8	25.2	63.0
(1.00x1.00)	nos.	10	1,560.00	1,040.00	2,600.0	15.6	10.4	26.0
20 Pump								
D500 x 200 kW x 4	LS	1	2,403,000	267,000	2,670,000.0	2,403.0	267.0	2,670.0
21 On-Farm development	ha	2,043	117.60	176.40	294.0	240.3	360.4	600.6
Total						6,642.7	8,499.4	15,142.1

Table 9.2.10 Breakdown of Cost Estimate for Irrigation Facilities (Left Bank Area)

Description	Unit	Qty	Unit Price (US\$)			Amount (US\$)		
			FC	LC	Total	FC	LC	Total
1 Site installations						1,300.0	1,900.0	3,200.0
2 Excavation common								
by backhoe	m ³	373,612	1.20	0.70	1.9	448.3	261.5	709.9
3 Backfilling	m ³	54,064	1.20	0.70	1.9	64.9	37.8	102.7
4 Excavation, tunnel (incl. support)	m ³	33,300	70.00	50.00	120.0	2,331.0	1,665.0	3,996.0
5 Excavation, shaft	m ³	1,300	87.50	62.50	150.0	113.8	81.3	195.0
6 Construction adit	m	300	800.00	400.00	1,200.0	240.0	120.0	360.0
7 Tunnel portal preparation	LS					200.0	100.0	300.0
8 Embankment								
by machine	m ³	651,322	0.90	0.50	1.4	586.2	325.7	911.9
by manual	m ³			0.80	0.8			
9 Stone Pitching	m ²	16,698	1.08	2.52	3.6	18.0	42.1	60.1
10 Brick Work	m ³	22,910	13.50	31.50	45.0	309.3	721.7	1,031.0
11 Concrete work								
A (14N/mm3)	m ³		25.00	40.00	65.0			
B (18N/mm3)	m ³		27.50	42.50	70.0			
C (21N/mm3)	m ³	39,831	30.00	45.00	75.0	1,194.9	1,792.4	2,987.3
Tunnel lining (incl. formwork)	m ³	14,500	60.00	90.00	150.0	870.0	1,305.0	2,175.0
Shaft lining (incl. Formwork & Re-bar)	m ³	500	70.00	130.00	200.0	35.0	65.0	100.0
Canal lining	m ³	29,288	25.00	40.00	65.0	732.2	1,171.5	1,903.7
Form Work	m ²	105,005	2.00	6.00	8.0	210.0	630.0	840.0
Reinforcement bar	ton	3,166	100.00	900.00	1,000.0	316.6	2,849.4	3,166.0
Waterstop	m	4,464	1.68	0.72	2.4	7.5	3.2	10.7
12 Gabion	m ³	25,944	7.32	17.08	24.4	189.9	443.1	633.0
13 Gravel	m ³	368	3.75	3.75	7.5	1.4	1.4	2.8
14 Asphalt	kg	3,744	4.98	3.32	8.3	18.6	12.4	31.1
15 Piling work								
Piles (d=800)	m	208	348.00	232.00	580.0	72.4	48.3	120.6
Piles (d=750)	m	120	207.00	138.00	345.0	24.8	16.6	41.4
16 Angle Iron	kg	780	0.48	0.72	1.2	0.4	0.6	0.9
17 Expansion Joint	m	78	4.98	3.32	8.3	0.4	0.3	0.6
18 Neoprene Bearing Pad	nos.	104	441.00	189.00	630.0	45.9	19.7	65.5
19 Railing	m	900	2.80	1.20	4.0	2.5	1.1	3.6
20 Bridge	m	48	84.00	84.00	168.0	4.0	4.0	8.1
21 Stars		72	2.00	2.00	4.0	0.1	0.1	0.3
22 Stop Log								
Stop Log (1500)	nos.	50	8.10	18.90	27.0	0.4	0.9	1.4
Stop Log (800)	nos.	213	4.20	9.80	14.0	0.9	2.1	3.0
Stop Log (500)	nos.	10	2.70	6.30	9.0	0.0	0.1	0.1
Stop Log (400)	nos.	37	2.10	4.90	7.0	0.1	0.2	0.3
Pipe (d=300)	m	185	17.40	11.60	29.0	3.2	2.1	5.4
P.C.Cover	nos.	37	10.20	6.80	17.0	0.4	0.3	0.6
23 Gate								
(3.00x1.50)	nos.	14	7,080.00	4,720.00	11,800.0	99.1	66.1	165.2
(2.00x1.20)	nos.	8	3,780.00	2,520.00	6,300.0	30.2	20.2	50.4
(1.00x1.00)	nos.	8	1,560.00	1,040.00	2,600.0	12.5	8.3	20.8
H.P.gate (D=600)	LS					121.50	13.50	135.0
24 On-Farm development	ha	4,066	117.60	176.40	294.0	478.2	717.2	1,195.4
Total						10,084.7	14,450.0	24,534.7

Table 9.2.11 Breakdown of Cost Estimate for Land Compensation

Description	Unit	Quantity	Unit Price (Rs.)	Amount (Rs.)	Amount (US\$ equiv.)
1 Land acquisition (10 ha)	LS			20,000,000	400,000
3 Replace ment cost of privately owned				2,500,000	50,000
- Irrigation tubewells/ Pumps	LS			1,000,000	20,000
- Cattle and goat shelter	LS			1,000,000	20,000
	LS			500,000	10,000
4 Compensation for farm produce				1,000,000	20,000
- Crops	LS			500,000	10,000
- Trees	LS			500,000	10,000
5 Relocation of community infrastructures				12,000,000	240,000
- Relocation of graves and mosque	LS			1,000,000	20,000
- Relocation of village roads	LS			1,000,000	20,000
- Relocation of bridges	LS			10,000,000	200,000
6 Cost of Resettlement Villages				50,000,000	1,000,000
- Development of resettlement village	LS			30,000,000	600,000
- Social infrastructure for resettlement village	LS			20,000,000	400,000
7 Contribution to integrated regional development programme	LS			5,000,000	100,000
8 Cost of studies				2,500,000	50,000
- Integrated regional development plan	LS			1,000,000	20,000
- Sewerage and treatment facilities for resettlement village	LS			1,000,000	20,000
- Town planning	LS			500,000	10,000
9 Monitoring cost				10,000,000	200,000
- Monitoring consultant	LS			5,000,000	100,000
- Visit of environmental review pannel	LS			5,000,000	100,000
10 WAPDA administration costs	LS			4,000,000	80,000
11 Contingencies	LS			16,000,000	320,000
Total				123,000,000	2,460,000

Table 9.2.12 Breakdown of Cost Estimate for Environmental Mitigation

Description	Unit	Quantity	Unit Price (Rs.)	Amount (Rs.)	Amount (US\$ equiv.)
1 Fisheries				20,250,000	405,000
- Stocking / Restocking (During 7 Years of Construction)	year	7	750,000	5,250,000	105,000
- Research/Development/Demonstration	year	10	1,500,000	15,000,000	300,000
2 Archeology & Cultural Heritage				51,150,000	1,023,000
- Relocation of Cultural Property	nos.	1	150,000	150,000	3,000
- Savage operations in RB/LB	site	10	3,000,000	30,000,000	600,000
- Establish museum at F.C. post, dam site	LS			20,000,000	400,000
- Access road construction to F.C. post & shine	LS			1,000,000	20,000
3 Ecological Conditions				92,900,000	1,858,000
- Forestry & Scenic Value	trees	4,800,000	8	38,400,000	768,000
- Erosion control reservoir terracing	m ²	1,000,000	16	16,000,000	320,000
- Environmental Enhancement	LS			18,000,000	360,000
- Downstream Flow Variation - Mitigation by Restocking fish	LS			4,500,000	90,000
- Downstream river bank protection within re-regulating pond	LS			8,000,000	160,000
- Ramps for boating, 1 km u/s of dam and close to Panjkora on both banks	ramps	4	750,000	3,000,000	60,000
- Conservation of quarry site, borrow area and spoil bank after construction	LS			5,000,000	100,000
4 Agriculture/Water Usage				9,000,000	180,000
- L.B & R.B. main canals' environmental	LS			4,000,000	80,000
- Canal area terracing and vegetation	LS			5,000,000	100,000
5 Environmental management expense	LS			40,000,000	800,000
6 Monitoring Program expense	LS			25,000,000	500,000
7 Miscellaneous	%	5		11,900,000	238,000
Total				250,200,000	5,004,000

Table 12.2.1 Disbursement Schedule

Year		Foreign	Local	Total	
		(Mill.US\$)	(Mill.US\$)	(Mill.US\$)	(%)
Years Considered for Evaluation	2001				
1st Year	2002	20.8	24.3	45.1	3.9%
2nd Year	2003	27.6	38.8	66.4	5.8%
3rd Year	2004	43.7	49.1	92.8	8.1%
4th Year	2005	65.5	53.4	118.9	10.3%
5th Year	2006	117.0	90.0	207.0	18.0%
6th Year	2007	136.0	103.9	239.9	20.9%
7th Year	2008	136.0	118.2	254.2	22.1%
8th Year	2009	65.1	59.4	124.5	10.8%
		611.8	537.0	1,148.8	100.0%

Table 12.3.1 Munda Avoided Cost Assumption

	Combined Cycles (CCHO)	Combustion Turbine (CTGS)
Thermal Characteristics		
Installed Capacity (MW)		589
Gas Turbine Converted to Hydro (Adjustment Factor, 1.127)		663.803
Mean generation	1540.67	835.60
Implied capacity factor		16.4%
Construction Cost of Thermal Plants		
Per kW installed (exclude IDC) in 1999		480.00
Total cost excluding transmission Line (USD million)		318.63
Construction period/allocation		2 yrs (0.4/0.6)
Local cost of the total		15%
Economic cost (SCF: 0.89)		313.37
Economic life, year		20
Fuel Costs		
Natural gas price in 2008 (imported in store Karachi) brought up to 1997 price level, US\$/MCF	3.17	3.17
Domestic transportation USD/MCF,	0.43	0.43
Fuel price 2008 including transport, USD/MCF	3.60	3.60
Fuel price 2008 USD/mmBTU	3.53	3.53
Average net heat rate (KJ/kWh), 1mmbtu=1.055GJ	8,784.00	13,447.00
Fuel price 2008 USD/MWh	29.39	44.99
Thermal Converted to Hydro, Adjustment Factor:	1.02	1.01
Fuel price including Transmission cost, USD/MWh	29.89	45.30
Operation and Maintenance Cost		
percentage of total economic cost	2%	3%
Annual Cost	0.00	9.40

Source: HEPD-WAPDA and the World Bank

Table 12.5.1 Avoided Cost Analysis (Sensitivity Analysis) (Base Case)

(Unit: Million US\$)

Year	Total Cost	Benefits								Total Benefits	Net Benefits (N-E)
		Avoided Cost of Gas Turbine			Avoided Cost of C.C.			Agri.	Flood		
		Cost.	O&M	Fuel	Cost.	O&M	Fuel				
1999											
2002	28.88									0	-29
2003	42.52									0	-43
2004	59.42									0	-59
2005	76.13									0	-76
2006	132.54									0	-133
2007	153.61									0	-154
2008	162.76	125			0					125	-37
2009	79.72	188			0					188	108
2010	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2011	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2012	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2013	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2014	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2015	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2016	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2017	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2018	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2019	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2020	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2021	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2022	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2023	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2024	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2025	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2026	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2027	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2028	3.68	125	9.40	37.86	0	0.00	46.05	5.8	0.9	225	222
2029	3.68	188	9.40	37.86	0	0.00	46.05	5.8	0.9	288	284
2030	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2031	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2032	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2033	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2034	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2035	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2036	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2037	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2038	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2039	139.38	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	-39
2040	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2041	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2042	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2043	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2044	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2045	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2046	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2047	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2048	3.68	125	9.40	37.86	0	0.00	46.05	5.8	0.9	225	222
2049	3.68	188	9.40	37.86	0	0.00	46.05	5.8	0.9	288	284
2050	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2051	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2052	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2053	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2054	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2055	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2056	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2057	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2058	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
2059	3.68	0	9.40	37.86	0	0.00	46.05	5.8	0.9	100	96
Total	1055	940	470	1893	0	0	2302	289.7	46.0	5941	4586

Assumptions:

Exchange Rate, US\$ 1=Rupees	50
Standard Conversion Factor (SCF)	0.89
Total Hydro Generation Capacity (MW)	740
US\$ per kW	994.01
Capacity Utilization Factor	37%
EIRR	13.65%
NPV of Total Avoid Cost at 10%	5640.61
NPV of Total Generation (GWh) at 10%	19,471.262
Avoided AIC, US\$	0.033
Peak per kWh (energy cost)	0.11
Off Peak per kWh (energy cost)	0.03
Agricultural benefit	5.79
Flood control benefit	0.92

Table 12.5.2 Cost-Benefit Analysis(Without Environmental Benefits)

(Unit: Million US\$)

Year	Cost			Benefits							Total	Net Benefits	
	Economic Cost 1999 Price	O&M	Total	Primary Generation	Primary Benefit	Secondary Generation	Secondary Benefit	Agriculture	Flood	Environ.			
1	28.88		28.88										(28.88)
2	42.52		42.52										(42.52)
3	59.42		59.42										(59.42)
4	76.13		76.13										(76.13)
5	132.54		132.54										(132.54)
6	153.61		153.61										(153.61)
7	162.76		162.76										(162.76)
8	79.72		79.72										(79.72)
9	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
10	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
11	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
12	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
13	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
14	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
15	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
16	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
17	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
18	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
19	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
20	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
21	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
22	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
23	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
24	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
25	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
26	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
27	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
28	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
29	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
30	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
31	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
32	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
33	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
34	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
35	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
36	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
37	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
38	135.70	3.68	139.38	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	3.87	
39	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
40	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
41	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
42	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
43	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
44	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
45	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
46	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
47	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
48	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
49	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
50	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
51	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
52	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
53	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
54	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
55	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
56	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
57	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
58	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.8	0.9	0.0	143.25	139.57	
Total	871.27	181.89	1053.16	41779.78	2553.66	77033.47	4273.48	289.7	46.0	0.0	7162.26	6107.10	

Exclude Irrigation Cost
 Exchange Rate, 1 US\$= 740
 Capacity 37.14%
 Capacity Factor 1.3%
 Auxiliary Rate & Line Loss 0.50%
 O & M Cost \$0.061
 LRMC Peak \$0.055
 LRMC Off-peak 994.01
 Economic Cost per KW 5.79
 Agricultural benefit 0.92
 Flood control benefit 0
 Environment benefit per year
 EIRR 13.248%
 NPV of Net Benefit at 10% \$194.17
 NPV of Cost, Million US\$ \$468.39
 NPV of Generation, GWh 23,560.23
 Average Incremental Cost, \$/kWh 0.020

Table 12.5.3 Cost-Benefit Analysis (With Environmental Benefits)

(Unit: Million US\$)

Year	Cost			Benefits								Net Benefits
	Economic Cost 1999 Price	O&M	Total	Primary Generation	Primary Benefit	Secondary Generation	Secondary Benefit	Agriculture	Flood	Environ.	Total	
1	28.88		28.88									(28.88)
2	42.52		42.52									(42.52)
3	59.42		59.42									(59.42)
4	76.13		76.13									(76.13)
5	132.54		132.54									(132.54)
6	153.61		153.61									(153.61)
7	162.76		162.76									(162.76)
8	79.72		79.72									(79.72)
9	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
10	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
11	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
12	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
13	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
14	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
15	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
16	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
17	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
18	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
19	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
20	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
21	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
22	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
23	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
24	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
25	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
26	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
27	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
28	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
29	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
30	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
31	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
32	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
33	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
34	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
35	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
36	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
37	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
38	135.70	3.68	139.38	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	28.15
39	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
40	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
41	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
42	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
43	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
44	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
45	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
46	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
47	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
48	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
49	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
50	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
51	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
52	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
53	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
54	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
55	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
56	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
57	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
58	0.00	3.68	3.68	835.60	51.06	1540.67	85.47	5.79	0.92	24.3	167.52	163.85
Total	871.27	183.89	1055.16	41779.78	2553.06	77033.47	4273.48	289.7	46.0	1,214.0	8376.24	7311.08

Exclude Irrigation Cost

Exchange Rate, 1 US\$=

50

Capacity

740

Capacity Factor

0.3714

Auxiliary Rate & Line Loss

1.30%

O & M Cost

0.005

LRMC peak

0.061107603

LRMC Off-peak

0.055475603

Economic Cost per KW

994.0148649

Agricultural benefit

5.79446

Flood control benefit

0.92

Environment benefit per year

24.27961917

EIRR

14.900%

NPV of Net Benefit at

10% \$306.47

NPV of Cost, Million US\$

\$468.39

NPV of Generation, GWh

23,560.23

Average Incremental Cost, \$/kWh

0.020

Table 12.5.4 Cost-Benefit Analysis Using Consumer Surplus (Million US\$)

Year	Cost (C)			Benefit (B)					Total	B-C
	Const.	O&M	Total	Peak	Off-Peak	Agri.	Flood	Env.		
1	28.9		28.9						0	-28.9
2	42.5		42.5						0	-42.5
3	59.4		59.4						0	-59.4
4	76.1		76.1						0	-76.1
5	132.5		132.5						0	-132.5
6	153.6		153.6						0	-153.6
7	162.8		162.8						0	-162.8
8	79.7		79.7						0	-79.7
1	9	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
2	10	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
3	11	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
4	12	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
5	13	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
6	14	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
7	15	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
8	16	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
9	17	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
10	18	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
11	19	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
12	20	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
13	21	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
14	22	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
15	23	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
16	24	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
17	25	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
18	26	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
19	27	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
20	28	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
21	29	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
22	30	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
23	31	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
24	32	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
25	33	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
26	34	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
27	35	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
28	36	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
29	37	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
30	38	135.7	139.4	91.4	84.3	5.8	0.9	0.0	182	43.0
31	39	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
32	40	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
33	41	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
34	42	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
35	43	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
36	44	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
37	45	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
38	46	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
39	47	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
40	48	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
41	49	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
42	50	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
43	51	0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
44		0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
45		0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
46		0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
47		0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
48		0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
49		0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
50		0.0	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
Total	871.3	183.9	1,055.2	4,569.7	4,212.8	289.7	46.0	0.0	9,118.3	

Installed capacity (MW)	680		
Firm energy (GWh)	836		
Secondary energy (GWh)	1,541		
O & M			0.5%
Economic Cost	736		
Discount rate	10%		
Consumer Surplus Price	0.1094 US\$/kW		
Off-peak, % of Peak	50.00%	0.0547 US\$/kW/year	
Net Present Value	375.1		
NPV of Cost	468.4		
NPV of Energy Generated	23560.23		
IRR	15.8%		
AIC	0.01988		

Table 12.5.5 Cost-Benefit Analysis (Power Only)

(Unit: Million US\$)

Year	Cost			Benefits				Net Benefits	
	Economic Cost 1999 Price	O&M	Total	Primary Generation	Primary Benefit	Secondary Generation	Secondary Benefit		Total
1	27.01		27.01					(27.01)	
2	39.76		39.76					(39.76)	
3	55.57		55.57					(55.57)	
4	71.20		71.20					(71.20)	
5	123.95		123.95					(123.95)	
6	143.66		143.66					(143.66)	
7	152.22		152.22					(152.22)	
8	74.55		74.55					(74.55)	
9	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
10	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
11	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
12	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
13	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
14	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
15	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
16	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
17	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
18	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
19	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
20	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
21	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
22	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
23	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
24	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
25	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
26	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
27	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
28	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
29	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
30	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
31	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
32	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
33	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
34	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
35	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
36	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
37	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
38	135.70	3.44	139.14	835.60	51.06	1540.67	85.47	136.53	(2.61)
39	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
40	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
41	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
42	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
43	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
44	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
45	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
46	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
47	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
48	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
49	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
50	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
51	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
52	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
53	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
54	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
55	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
56	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
57	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
58	0.00	3.44	3.44	835.60	51.06	1540.67	85.47	136.53	133.09
Total	823.62	171.98	995.60	41779.78	2553.06	77033.47	4273.48	6926.54	5830.94

Exclude Irrigation Cost

Exchange Rate, 1 US\$=	50	EIRR	13.440%
Capacity	740	NPV of Net Benefit at	10% \$193.22
Capacity Factor	37.14%	NPV of Cost, Million US\$	\$438.28
Auxiliary Rate & Line Loss	1.3%	NPV of Generation, GWh	23,560.23
O & M Cost	0.50%	Average Incremental Cost, \$/kWh	0.019
LRMC Peak	\$0.061		
LRMC Off-peak	\$0.055		
Economic Cost per KW	994.01		
Agricultural benefit	0.00		
Flood control benefit	0.00		
Environment benefit per year	0		

Table 12.5.6 Financial Analysis on Total Project

(Unit: Million US\$)

Year	Cost					Total	Primary Generation	Primary Benefit	Secondary Generation	Secondary Benefit	Agrl.	Flood	Env.	Total	Net Benefits
	Financial 1999 Price	O&M	Water Charge	Tax											
1	45.10					45.10									(45.10)
2	66.41					66.41									(66.41)
3	92.81					92.81									(92.81)
4	118.91					118.91									(118.91)
5	207.02					207.02									(207.02)
6	239.92					239.92									(239.92)
7	254.22					254.22									(254.22)
8	124.51					124.51									(124.51)
9	0.00	11.49	5.54	0.00	17.03	835.60	82.43	1540.67	121.59	3.7	1.0	0.0	208.79	191.77	
10	0.00	11.49	5.54	0.00	17.03	835.60	83.26	1540.67	122.81	3.7	1.0	0.0	210.83	193.81	
11	0.00	11.49	5.54	0.00	17.03	835.60	84.09	1540.67	124.04	3.7	1.0	0.0	212.89	195.87	
12	0.00	11.49	5.54	0.00	17.03	835.60	84.93	1540.67	125.28	3.7	1.0	0.0	214.97	197.95	
13	0.00	11.49	5.54	0.00	17.03	835.60	85.78	1540.67	126.53	3.7	1.0	0.0	217.03	200.05	
14	0.00	11.49	5.54	0.00	17.03	835.60	86.64	1540.67	127.80	3.7	1.0	0.0	219.20	202.17	
15	0.00	11.49	5.54	0.00	17.03	835.60	87.51	1540.67	129.07	3.7	1.0	0.0	221.34	204.32	
16	0.00	11.49	5.54	0.00	17.03	835.60	88.38	1540.67	130.37	3.7	1.0	0.0	223.51	206.48	
17	0.00	11.49	5.54	0.00	17.03	835.60	89.26	1540.67	131.67	3.7	1.0	0.0	225.70	208.67	
18	0.00	11.49	5.54	0.00	17.03	835.60	90.16	1540.67	132.99	3.7	1.0	0.0	227.91	210.88	
19	0.00	11.49	5.54	0.00	17.03	835.60	91.06	1540.67	134.32	3.7	1.0	0.0	230.14	213.11	
20	0.00	11.49	5.54	0.00	17.03	835.60	91.97	1540.67	135.66	3.7	1.0	0.0	232.39	215.37	
21	0.00	11.49	5.54	0.00	17.03	835.60	92.86	1540.67	137.01	3.7	1.0	0.0	234.62	217.66	
22	0.00	11.49	5.54	0.00	17.03	835.60	93.75	1540.67	138.37	3.7	1.0	0.0	236.86	219.97	
23	0.00	11.49	5.54	0.00	17.03	835.60	94.64	1540.67	139.74	3.7	1.0	0.0	239.12	222.30	
24	0.00	11.49	5.54	0.00	17.03	835.60	95.54	1540.67	141.12	3.7	1.0	0.0	241.39	224.65	
25	0.00	11.49	5.54	0.00	17.03	835.60	96.44	1540.67	142.51	3.7	1.0	0.0	243.68	227.02	
26	0.00	11.49	5.54	0.00	17.03	835.60	97.34	1540.67	143.91	3.7	1.0	0.0	245.99	229.41	
27	0.00	11.49	5.54	0.00	17.03	835.60	98.24	1540.67	145.32	3.7	1.0	0.0	248.32	231.82	
28	0.00	11.49	5.54	0.00	17.03	835.60	99.14	1540.67	146.74	3.7	1.0	0.0	250.67	234.25	
29	0.00	11.49	5.54	0.00	17.03	835.60	100.04	1540.67	148.17	3.7	1.0	0.0	253.04	236.70	
30	0.00	11.49	5.54	0.00	17.03	835.60	100.94	1540.67	149.61	3.7	1.0	0.0	255.43	239.17	
31	0.00	11.49	5.54	0.00	17.03	835.60	101.84	1540.67	151.06	3.7	1.0	0.0	257.84	241.66	
32	0.00	11.49	5.54	0.00	17.03	835.60	102.74	1540.67	152.52	3.7	1.0	0.0	260.27	244.17	
33	0.00	11.49	5.54	0.00	17.03	835.60	103.64	1540.67	153.99	3.7	1.0	0.0	262.72	246.70	
34	0.00	11.49	5.54	0.00	17.03	835.60	104.54	1540.67	155.47	3.7	1.0	0.0	265.19	249.25	
35	0.00	11.49	5.54	0.00	17.03	835.60	105.44	1540.67	156.96	3.7	1.0	0.0	267.68	251.82	
36	0.00	11.49	5.54	0.00	17.03	835.60	106.34	1540.67	158.46	3.7	1.0	0.0	270.19	254.41	
37	0.00	11.49	5.54	0.00	17.03	835.60	107.24	1540.67	159.97	3.7	1.0	0.0	272.72	257.02	
38	135.70	11.49	5.54	0.00	152.73	835.60	108.14	1540.67	161.49	3.7	1.0	0.0	275.27	259.65	
39	0.00	11.49	5.54	0.00	17.03	835.60	109.04	1540.67	163.02	3.7	1.0	0.0	277.84	262.30	
40	0.00	11.49	5.54	0.00	17.03	835.60	109.94	1540.67	164.56	3.7	1.0	0.0	280.43	264.97	
41	0.00	11.49	5.54	0.00	17.03	835.60	110.84	1540.67	166.11	3.7	1.0	0.0	283.04	267.66	
42	0.00	11.49	5.54	0.00	17.03	835.60	111.74	1540.67	167.67	3.7	1.0	0.0	285.67	270.37	
43	0.00	11.49	5.54	0.00	17.03	835.60	112.64	1540.67	169.24	3.7	1.0	0.0	288.32	273.10	
44	0.00	11.49	5.54	0.00	17.03	835.60	113.54	1540.67	170.82	3.7	1.0	0.0	290.99	275.85	
45	0.00	11.49	5.54	0.00	17.03	835.60	114.44	1540.67	172.41	3.7	1.0	0.0	293.68	278.62	
46	0.00	11.49	5.54	0.00	17.03	835.60	115.34	1540.67	174.01	3.7	1.0	0.0	296.39	281.41	
47	0.00	11.49	5.54	0.00	17.03	835.60	116.24	1540.67	175.62	3.7	1.0	0.0	299.12	284.22	
48	0.00	11.49	5.54	0.00	17.03	835.60	117.14	1540.67	177.24	3.7	1.0	0.0	301.87	287.05	
49	0.00	11.49	5.54	0.00	17.03	835.60	118.04	1540.67	178.87	3.7	1.0	0.0	304.64	289.90	
50	0.00	11.49	5.54	0.00	17.03	835.60	118.94	1540.67	180.51	3.7	1.0	0.0	307.43	292.77	
51	0.00	11.49	5.54	0.00	17.03	835.60	119.84	1540.67	182.16	3.7	1.0	0.0	310.24	295.66	
52	0.00	11.49	5.54	0.00	17.03	835.60	120.74	1540.67	183.82	3.7	1.0	0.0	313.07	298.57	
53	0.00	11.49	5.54	0.00	17.03	835.60	121.64	1540.67	185.49	3.7	1.0	0.0	315.92	301.50	
54	0.00	11.49	5.54	0.00	17.03	835.60	122.54	1540.67	187.17	3.7	1.0	0.0	318.79	304.45	
55	0.00	11.49	5.54	0.00	17.03	835.60	123.44	1540.67	188.86	3.7	1.0	0.0	321.68	307.42	
56	0.00	11.49	5.54	0.00	17.03	835.60	124.34	1540.67	190.56	3.7	1.0	0.0	324.59	310.41	
57	0.00	11.49	5.54	0.00	17.03	835.60	125.24	1540.67	192.27	3.7	1.0	0.0	327.52	313.42	
Total	1284.60	574.45	276.83	0.00	2135.88	41779.78	4919.39	77033.47	2256.19	186.4	51.7	0.0	12413.81	10277.92	

Exchange Rate, 1 US\$=	50
Capacity	740
Capacity Factor (Peak Power)	13.06%
Total Capital cost	1149
Auxiliary Rate & Line Loss	1.3%
O & M Cost	1%
Water charge, US\$/kW	0.0023
Tax on Power Sales only, no used here	0%
Financial Cost per kW	0 1552.568
Agricultural benefit	3.729
Flood control benefit	1.034
Environment benefit	0
FIRR in 50 years	12.743%
NPV of Net Benefit at 12%	555.11
NPV of Cost, Million US\$	5693.68
NPV of Generation, GWh	19,733.69
Average Incremental Cost, \$/kWh	0.035

Table 12.5.7 Financial Analysis (Power Only)

(Unit: Million US\$)

Year	Cost					Primary Generation	Primary Benefit	Secondary Generation	Secondary Benefit	Total	Net Benefits
	Financial 1999 Price	O&M	Water Charge	Tax	Total Cost						
1	42.18				42.18						(42.18)
2	62.10				62.10						(62.10)
3	86.80				86.80						(86.80)
4	111.21				111.21						(111.21)
5	193.61				193.61						(193.61)
6	224.38				224.38						(224.38)
7	237.75				237.75						(237.75)
8	116.44				116.44						(116.44)
9	0.00	10.74	5.54	0.00	16.28	835.60	82.43	1540.67	121.59	204.03	187.75
10	0.00	10.74	5.54	0.00	16.28	835.60	83.26	1540.67	122.81	206.07	189.79
11	0.00	10.74	5.54	0.00	16.28	835.60	84.09	1540.67	124.04	208.13	191.85
12	0.00	10.74	5.54	0.00	16.28	835.60	84.93	1540.67	125.28	210.21	193.93
13	0.00	10.74	5.54	0.00	16.28	835.60	85.78	1540.67	126.53	212.31	196.03
14	0.00	10.74	5.54	0.00	16.28	835.60	86.64	1540.67	127.80	214.44	198.15
15	0.00	10.74	5.54	0.00	16.28	835.60	87.51	1540.67	129.07	216.58	200.30
16	0.00	10.74	5.54	0.00	16.28	835.60	88.38	1540.67	130.37	218.75	202.46
17	0.00	10.74	5.54	0.00	16.28	835.60	89.26	1540.67	131.67	220.93	204.65
18	0.00	10.74	5.54	0.00	16.28	835.60	90.16	1540.67	132.99	223.14	206.86
19	0.00	10.74	5.54	0.00	16.28	835.60	91.06	1540.67	134.32	225.37	209.09
20	0.00	10.74	5.54	0.00	16.28	835.60	91.97	1540.67	135.66	227.63	211.35
21	0.00	10.74	5.54	0.00	16.28	835.60	90.44	1540.67	133.41	223.85	207.57
22	0.00	10.74	5.54	0.00	16.28	835.60	91.35	1540.67	134.74	226.09	209.81
23	0.00	10.74	5.54	0.00	16.28	835.60	92.26	1540.67	136.09	228.35	212.07
24	0.00	10.74	5.54	0.00	16.28	835.60	93.19	1540.67	137.45	230.64	214.36
25	0.00	10.74	5.54	0.00	16.28	835.60	94.12	1540.67	138.83	232.94	216.66
26	0.00	10.74	5.54	0.00	16.28	835.60	95.06	1540.67	140.21	235.27	218.99
27	0.00	10.74	5.54	0.00	16.28	835.60	96.01	1540.67	141.62	237.63	221.34
28	0.00	10.74	5.54	0.00	16.28	835.60	96.97	1540.67	143.03	240.00	223.72
29	0.00	10.74	5.54	0.00	16.28	835.60	97.94	1540.67	144.46	242.40	226.12
30	0.00	10.74	5.54	0.00	16.28	835.60	98.92	1540.67	145.91	244.83	228.54
31	0.00	10.74	5.54	0.00	16.28	835.60	102.61	1540.67	151.35	253.96	237.68
32	0.00	10.74	5.54	0.00	16.28	835.60	103.63	1540.67	152.86	256.50	240.22
33	0.00	10.74	5.54	0.00	16.28	835.60	104.67	1540.67	154.39	259.06	242.78
34	0.00	10.74	5.54	0.00	16.28	835.60	104.67	1540.67	154.39	259.06	242.78
35	0.00	10.74	5.54	0.00	16.28	835.60	104.67	1540.67	154.39	259.06	242.78
36	0.00	10.74	5.54	0.00	16.28	835.60	104.67	1540.67	154.39	259.06	242.78
37	0.00	10.74	5.54	0.00	16.28	835.60	104.67	1540.67	154.39	259.06	242.78
38	135.70	10.74	5.54	0.00	151.98	835.60	104.67	1540.67	154.39	259.06	107.08
39	0.00	10.74	5.54	0.00	16.28	835.60	104.67	1540.67	154.39	259.06	242.78
40	0.00	10.74	5.54	0.00	16.28	835.60	104.67	1540.67	154.39	259.06	242.78
41	0.00	10.74	5.54	0.00	16.28	835.60	104.67	1540.67	154.39	259.06	242.78
42	0.00	10.74	5.54	0.00	16.28	835.60	104.67	1540.67	154.39	259.06	242.78
43	0.00	10.74	5.54	0.00	16.28	835.60	104.67	1540.67	154.39	259.06	242.78
44	0.00	10.74	5.54	0.00	16.28	835.60	104.67	1540.67	154.39	259.06	242.78
45	0.00	10.74	5.54	0.00	16.28	835.60	104.67	1540.67	154.39	259.06	242.78
46	0.00	10.74	5.54	0.00	16.28	835.60	104.67	1540.67	154.39	259.06	242.78
47	0.00	10.74	5.54	0.00	16.28	835.60	104.67	1540.67	154.39	259.06	242.78
48	0.00	10.74	5.54	0.00	16.28	835.60	104.67	1540.67	154.39	259.06	242.78
49	0.00	10.74	5.54	0.00	16.28	835.60	104.67	1540.67	154.39	259.06	242.78
50	0.00	10.74	5.54	0.00	16.28	835.60	104.67	1540.67	154.39	259.06	242.78
51	0.00	10.74	5.54	0.00	16.28	835.60	104.67	1540.67	154.39	259.06	242.78
52	0.00	10.74	5.54	0.00	16.28	835.60	104.67	1540.67	154.39	259.06	242.78
53	0.00	10.74	5.54	0.00	16.28	835.60	104.67	1540.67	154.39	259.06	242.78
54	0.00	10.74	5.54	0.00	16.28	835.60	104.67	1540.67	154.39	259.06	242.78
55	0.00	10.74	5.54	0.00	16.28	835.60	104.67	1540.67	154.39	259.06	242.78
56	0.00	10.74	5.54	0.00	16.28	835.60	104.67	1540.67	154.39	259.06	242.78
57	0.00	10.74	5.54	0.00	16.28	835.60	104.67	1540.67	154.39	259.06	242.78
Total	1210.17	537.24	276.83	0.00	2024.24	41779.78	4919.39	77033.47	7256.29	12175.68	10151.44

Exchange Rate, 1 US\$= 50
 Capacity 740
 Capacity Factor (Peak Power) 13.06%
 Total Capital cost 1074
 Auxiliary Rate & Line Loss 1.3%
 O & M Cost 1%
 Water charge, US\$/kW 0.0023
 Tax on Power Sales only, no used here 0%
 Financial Cost per KW 0 1552.5676
 Agricultural benefit 0
 Flood control benefit 0
 Environment benefit 0

EIRR 13.182%
 NPV of Net Benefit at 12% \$83.04
 NPV of Cost, Million US\$ \$654.17
 NPV of Generation, GWh 19,733.69
 Average Incremental Cost, \$/kWh 0.033150134

**Table 12.5.8 Cost-Benefit Analysis
(Irrigation Only)**

(Unit: Million US\$)					
Year	Economic Cost	O&M	Total Cost	Total Benefits	Net Benefits
1	1.79		1.79		(1.79)
2	2.64		2.64		(2.64)
3	3.69		3.69		(3.69)
4	4.73		4.73		(4.73)
5	8.23		8.23		(8.23)
6	9.54		9.54		(9.54)
7	10.11		10.11		(10.11)
8	4.95		4.95		(4.95)
9	0.00	0.00	0.00	5.79	5.79
10	0.00	0.00	0.00	5.79	5.79
11	0.00	0.00	0.00	5.79	5.79
12	0.00	0.00	0.00	5.79	5.79
13	0.00	0.00	0.00	5.79	5.79
14	0.00	0.00	0.00	5.79	5.79
15	0.00	0.00	0.00	5.79	5.79
16	0.00	0.00	0.00	5.79	5.79
17	0.00	0.00	0.00	5.79	5.79
18	0.00	0.00	0.00	5.79	5.79
19	0.00	0.00	0.00	5.79	5.79
20	0.00	0.00	0.00	5.79	5.79
21	0.00	0.00	0.00	5.79	5.79
22	0.00	0.00	0.00	5.79	5.79
23	0.00	0.00	0.00	5.79	5.79
24	0.00	0.00	0.00	5.79	5.79
25	0.00	0.00	0.00	5.79	5.79
26	0.00	0.00	0.00	5.79	5.79
27	0.00	0.00	0.00	5.79	5.79
28	0.00	0.00	0.00	5.79	5.79
29	0.00	0.00	0.00	5.79	5.79
30	0.00	0.00	0.00	5.79	5.79
31	0.00	0.00	0.00	5.79	5.79
32	0.00	0.00	0.00	5.79	5.79
33	0.00	0.00	0.00	5.79	5.79
34	0.00	0.00	0.00	5.79	5.79
35	0.00	0.00	0.00	5.79	5.79
36	0.00	0.00	0.00	5.79	5.79
37	0.00	0.00	0.00	5.79	5.79
38	0.00	0.00	0.00	5.79	5.79
39	0.00	0.00	0.00	5.79	5.79
40	0.00	0.00	0.00	5.79	5.79
41	0.00	0.00	0.00	5.79	5.79
42	0.00	0.00	0.00	5.79	5.79
43	0.00	0.00	0.00	5.79	5.79
44	0.00	0.00	0.00	5.79	5.79
45	0.00	0.00	0.00	5.79	5.79
46	0.00	0.00	0.00	5.79	5.79
47	0.00	0.00	0.00	5.79	5.79
48	0.00	0.00	0.00	5.79	5.79
49	0.00	0.00	0.00	5.79	5.79
50	0.00	0.00	0.00	5.79	5.79
51	0.00	0.00	0.00	5.79	5.79
52	0.00	0.00	0.00	5.79	5.79
53	0.00	0.00	0.00	5.79	5.79
54	0.00	0.00	0.00	5.79	5.79
55	0.00	0.00	0.00	5.79	5.79
56	0.00	0.00	0.00	5.79	5.79
57	0.00	0.00	0.00	5.79	5.79
57	0.00	0.00	0.00	5.79	5.79
Total	45.67	0.00	45.67	289.72	244.05

Exchange Rate, 1 US\$= 50 EIRR
 O & M Cost 0.000 Total Net Benef 10% -1.00
 Agricultural benefit 5.794 Total Cost 10% \$27.80

**Table 12.5.9 Financial Analysis
(Irrigation Only)**

(Unit: Million US\$)					
Year	Financial Cost 1999 Price	O&M	Total Cost	Total Benefits	Net Benefits
1	2.80		2.80		(2.80)
2	4.12		4.12		(4.12)
3	5.76		5.76		(5.76)
4	7.38		7.38		(7.38)
5	12.85		12.85		(12.85)
6	14.90		14.90		(14.90)
7	15.79		15.79		(15.79)
8	7.73		7.73		(7.73)
9	0.00	0.00	0.00	3.73	3.73
10	0.00	0.00	0.00	3.73	3.73
11	0.00	0.00	0.00	3.73	3.73
12	0.00	0.00	0.00	3.73	3.73
13	0.00	0.00	0.00	3.73	3.73
14	0.00	0.00	0.00	3.73	3.73
15	0.00	0.00	0.00	3.73	3.73
16	0.00	0.00	0.00	3.73	3.73
17	0.00	0.00	0.00	3.73	3.73
18	0.00	0.00	0.00	3.73	3.73
19	0.00	0.00	0.00	3.73	3.73
20	0.00	0.00	0.00	3.73	3.73
21	0.00	0.00	0.00	3.73	3.73
22	0.00	0.00	0.00	3.73	3.73
23	0.00	0.00	0.00	3.73	3.73
24	0.00	0.00	0.00	3.73	3.73
25	0.00	0.00	0.00	3.73	3.73
26	0.00	0.00	0.00	3.73	3.73
27	0.00	0.00	0.00	3.73	3.73
28	0.00	0.00	0.00	3.73	3.73
29	0.00	0.00	0.00	3.73	3.73
30	0.00	0.00	0.00	3.73	3.73
31	0.00	0.00	0.00	3.73	3.73
32	0.00	0.00	0.00	3.73	3.73
33	0.00	0.00	0.00	3.73	3.73
34	0.00	0.00	0.00	3.73	3.73
35	0.00	0.00	0.00	3.73	3.73
36	0.00	0.00	0.00	3.73	3.73
37	0.00	0.00	0.00	3.73	3.73
38	0.00	0.00	0.00	3.73	3.73
39	0.00	0.00	0.00	3.73	3.73
40	0.00	0.00	0.00	3.73	3.73
41	0.00	0.00	0.00	3.73	3.73
42	0.00	0.00	0.00	3.73	3.73
43	0.00	0.00	0.00	3.73	3.73
44	0.00	0.00	0.00	3.73	3.73
45	0.00	0.00	0.00	3.73	3.73
46	0.00	0.00	0.00	3.73	3.73
47	0.00	0.00	0.00	3.73	3.73
48	0.00	0.00	0.00	3.73	3.73
49	0.00	0.00	0.00	3.73	3.73
50	0.00	0.00	0.00	3.73	3.73
51	0.00	0.00	0.00	3.73	3.73
52	0.00	0.00	0.00	3.73	3.73
53	0.00	0.00	0.00	3.73	3.73
54	0.00	0.00	0.00	3.73	3.73
55	0.00	0.00	0.00	3.73	3.73
56	0.00	0.00	0.00	3.73	3.73
57	0.00	0.00	0.00	3.73	3.73
57	0.00	0.00	0.00	3.73	3.73
Total	71.34	0.00	71.34	186.44	115.10

Exchange Rate, 1 US\$= 50 EIRR
 O & M Cost 0.000 Total Benefi 12% -527.18
 Agricultural benefit 3.729 Total Cost 12% \$39.69

**Table 12.5.10 Cost-Benefit Analysis
(Flood Control Only)**

(Unit: Million US\$)					
Year	Economic Cost	O&M	Total Cost	Total Benefits	Net Benefits
1	0.08		0.08		(0.08)
2	0.11		0.11		(0.11)
3	0.16		0.16		(0.16)
4	0.20		0.20		(0.20)
5	0.35		0.35		(0.35)
6	0.41		0.41		(0.41)
7	0.44		0.44		(0.44)
8	0.21		0.21		(0.21)
9	0.00	0.00	0.00	0.92	0.92
10	0.00	0.00	0.00	0.92	0.92
11	0.00	0.00	0.00	0.92	0.92
12	0.00	0.00	0.00	0.92	0.92
13	0.00	0.00	0.00	0.92	0.92
14	0.00	0.00	0.00	0.92	0.92
15	0.00	0.00	0.00	0.92	0.92
16	0.00	0.00	0.00	0.92	0.92
17	0.00	0.00	0.00	0.92	0.92
18	0.00	0.00	0.00	0.92	0.92
19	0.00	0.00	0.00	0.92	0.92
20	0.00	0.00	0.00	0.92	0.92
21	0.00	0.00	0.00	0.92	0.92
22	0.00	0.00	0.00	0.92	0.92
23	0.00	0.00	0.00	0.92	0.92
24	0.00	0.00	0.00	0.92	0.92
25	0.00	0.00	0.00	0.92	0.92
26	0.00	0.00	0.00	0.92	0.92
27	0.00	0.00	0.00	0.92	0.92
28	0.00	0.00	0.00	0.92	0.92
29	0.00	0.00	0.00	0.92	0.92
30	0.00	0.00	0.00	0.92	0.92
31	0.00	0.00	0.00	0.92	0.92
32	0.00	0.00	0.00	0.92	0.92
33	0.00	0.00	0.00	0.92	0.92
34	0.00	0.00	0.00	0.92	0.92
35	0.00	0.00	0.00	0.92	0.92
36	0.00	0.00	0.00	0.92	0.92
37	0.00	0.00	0.00	0.92	0.92
38	0.00	0.00	0.00	0.92	0.92
39	0.00	0.00	0.00	0.92	0.92
40	0.00	0.00	0.00	0.92	0.92
41	0.00	0.00	0.00	0.92	0.92
42	0.00	0.00	0.00	0.92	0.92
43	0.00	0.00	0.00	0.92	0.92
44	0.00	0.00	0.00	0.92	0.92
45	0.00	0.00	0.00	0.92	0.92
46	0.00	0.00	0.00	0.92	0.92
47	0.00	0.00	0.00	0.92	0.92
48	0.00	0.00	0.00	0.92	0.92
49	0.00	0.00	0.00	0.92	0.92
50	0.00	0.00	0.00	0.92	0.92
51	0.00	0.00	0.00	0.92	0.92
52	0.00	0.00	0.00	0.92	0.92
53	0.00	0.00	0.00	0.92	0.92
54	0.00	0.00	0.00	0.92	0.92
55	0.00	0.00	0.00	0.92	0.92
56	0.00	0.00	0.00	0.92	0.92
57	0.00	0.00	0.00	0.92	0.92
57	0.00	0.00	0.00	0.92	0.92
Total	1.98	0.00	1.98	46.00	44.02

Exchange Rate, 1 US\$ = 50
 Capacity 740 EIRR 24.159%
 Capacity Factor 37.14% Total Net Benefit 10% \$3.05
 Auxiliary Rate & Line Loss 0.0% Total Cost 10% \$1.20
 O & M Cost 0.0000
 Flood Benefit 0.92

**Table 12.5.11 Financial Analysis
(Flood Control Only)**

(Unit: Million US\$)					
Year	Financial Cost 1999 Price	O&M	Total Cost	Total Benefits	Net Benefits
1	0.12		0.12		(0.12)
2	0.18		0.18		(0.18)
3	0.25		0.25		(0.25)
4	0.32		0.32		(0.32)
5	0.56		0.56		(0.56)
6	0.65		0.65		(0.65)
7	0.68		0.68		(0.68)
8	0.33		0.33		(0.33)
9	0.00	0.00	0.00	1.03	1.03
10	0.00	0.00	0.00	1.03	1.03
11	0.00	0.00	0.00	1.03	1.03
12	0.00	0.00	0.00	1.03	1.03
13	0.00	0.00	0.00	1.03	1.03
14	0.00	0.00	0.00	1.03	1.03
15	0.00	0.00	0.00	1.03	1.03
16	0.00	0.00	0.00	1.03	1.03
17	0.00	0.00	0.00	1.03	1.03
18	0.00	0.00	0.00	1.03	1.03
19	0.00	0.00	0.00	1.03	1.03
20	0.00	0.00	0.00	1.03	1.03
21	0.00	0.00	0.00	1.03	1.03
22	0.00	0.00	0.00	1.03	1.03
23	0.00	0.00	0.00	1.03	1.03
24	0.00	0.00	0.00	1.03	1.03
25	0.00	0.00	0.00	1.03	1.03
26	0.00	0.00	0.00	1.03	1.03
27	0.00	0.00	0.00	1.03	1.03
28	0.00	0.00	0.00	1.03	1.03
29	0.00	0.00	0.00	1.03	1.03
30	0.00	0.00	0.00	1.03	1.03
31	0.00	0.00	0.00	1.03	1.03
32	0.00	0.00	0.00	1.03	1.03
33	0.00	0.00	0.00	1.03	1.03
34	0.00	0.00	0.00	1.03	1.03
35	0.00	0.00	0.00	1.03	1.03
36	0.00	0.00	0.00	1.03	1.03
37	0.00	0.00	0.00	1.03	1.03
38	0.00	0.00	0.00	1.03	1.03
39	0.00	0.00	0.00	1.03	1.03
40	0.00	0.00	0.00	1.03	1.03
41	0.00	0.00	0.00	1.03	1.03
42	0.00	0.00	0.00	1.03	1.03
43	0.00	0.00	0.00	1.03	1.03
44	0.00	0.00	0.00	1.03	1.03
45	0.00	0.00	0.00	1.03	1.03
46	0.00	0.00	0.00	1.03	1.03
47	0.00	0.00	0.00	1.03	1.03
48	0.00	0.00	0.00	1.03	1.03
49	0.00	0.00	0.00	1.03	1.03
50	0.00	0.00	0.00	1.03	1.03
51	0.00	0.00	0.00	1.03	1.03
52	0.00	0.00	0.00	1.03	1.03
53	0.00	0.00	0.00	1.03	1.03
54	0.00	0.00	0.00	1.03	1.03
55	0.00	0.00	0.00	1.03	1.03
56	0.00	0.00	0.00	1.03	1.03
57	0.00	0.00	0.00	1.03	1.03
57	0.00	0.00	0.00	1.03	1.03
Total	0.00	0.00	3.09	51.69	48.59

Exchange Rate, 1 US\$ = 50
 Capacity 0 EIRR 19.676%
 Capacity Factor 0.00% Total Net Benefit 12% \$1.75
 Auxiliary Rate & Line Loss 0.0% Total Cost 12% \$1.72
 O & M Cost 0.00
 Flood Benefit 1.03

Table 12.6.1 Levelized Tariff Calculation

Year of commercial operation =									2010
Weighted Average Tariff in 1999 price									0.0661
1st Step Tariff (US\$/kWh) =									0.076
First Step Years									12
Second Step Tariff (US\$/kWh) =									0.074
Second Step Years									10
Third Step Tariff (US\$/kWh) =									0.076
Levelized Average Peak Tariff in 1999									0.092
Total Capacity (MW)									740
Total Available Capacity									37.1%
Primary Energy Factor									13.1%
Secondary Energy Factor									24.1%
Tertiary Energy Factor									0%
Exchange Rate \$1=Rs.									50
Leveling discount rate =									12.0%
FIRR (Public-Private) =									12.8%
Year	Year of Operation	Primary Energy (GWh)	Energy Charge (\$/kWh)	Revenue Primary (Mil. US\$)	Secondary Energy (GWh)	Energy Charge (\$/kWh)	Revenue Secondary (Mil. US\$)	Total Revenue (Mil. US\$)	Weighted Average (\$/kWh)
1999		0	0.0760	0	0	0.0608	0	-	0.0661
2000		0	0.0778	0	0	0.0623	0	-	0.0677
2001		0	0.0797	0	0	0.0638	0	-	0.0694
2002		0	0.0816	0	0	0.0653	0	-	0.0710
2003		0	0.0836	0	0	0.0669	0	-	0.0727
2004		0	0.0856	0	0	0.0685	0	-	0.0745
2005		0	0.0876	0	0	0.0701	0	-	0.0763
2006		0	0.0897	0	0	0.0718	0	-	0.0781
2007		0	0.0919	0	0	0.0735	0	-	0.0800
2008		0	0.0941	0	0	0.0753	0	-	0.0819
2009		0	0.0963	0	0	0.0771	0	-	0.0838
2010	1	836	0.0987	82	1541	0.0789	122	204	0.0859
2011	2	836	0.0996	83	1541	0.0797	123	206	0.0867
2012	3	836	0.1006	84	1541	0.0805	124	208	0.0876
2013	4	836	0.1016	85	1541	0.0813	125	210	0.0885
2014	5	836	0.1027	86	1541	0.0821	127	212	0.0893
2015	6	836	0.1037	87	1541	0.0829	128	214	0.0902
2016	7	836	0.1047	88	1541	0.0838	129	217	0.0911
2017	8	836	0.1058	88	1541	0.0846	130	219	0.0921
2018	9	836	0.1068	89	1541	0.0855	132	221	0.0930
2019	10	836	0.1079	90	1541	0.0863	133	223	0.0939
2020	11	836	0.1090	91	1541	0.0872	134	225	0.0948
2021	12	836	0.1101	92	1541	0.0881	136	228	0.0958
2022	13	836	0.1082	90	1541	0.0866	133	224	0.0942
2023	14	836	0.1093	91	1541	0.0875	135	226	0.0951
2024	15	836	0.1104	92	1541	0.0883	136	228	0.0961
2025	16	836	0.1115	93	1541	0.0892	137	231	0.0971
2026	17	836	0.1126	94	1541	0.0901	139	233	0.0980
2027	18	836	0.1138	95	1541	0.0910	140	235	0.0990
2028	19	836	0.1149	96	1541	0.0919	142	238	0.1000
2029	20	836	0.1160	97	1541	0.0928	143	240	0.1010
2030	21	836	0.1172	98	1541	0.0938	144	242	0.1020
2031	22	836	0.1184	99	1541	0.0947	146	245	0.1030
2032	23	836	0.1228	103	1541	0.0982	151	254	0.1069
2033	24	836	0.1240	104	1541	0.0992	153	256	0.1079
2034	25	836	0.1253	105	1541	0.1002	154	259	0.1090
Net Present Value of Energy in 1999=			GWh	1,884	Primary		3,474	Secondary	Total
Net Present Value of Energy Revenue in 1999=			US\$	198			292		5,358
Levelized Tariff US\$ =			1999	0.1052			0.084		0.092

Table 12.6.3 Financial Evaluation by Public-Privately Owned Model (Base Model)

Project Name: Munda
 Start Year: 2002
 Commercial Operation Year: 2010
 Concession Term: 25
 End Year: 2034
 Unit: million current US\$

Installed Capacity (MW): 740
 Capacity Factor (Primary-Secondary Supply)(%): 37.14%
 Total Project Cost (Nominal): 1,092.69 million US\$ excluding interest during construction and price escalation
 Total Capital Cost Including IDC (Nominal): 1,359.55 million US\$ excluding interest during construction
 Share Equity: 30.0%
 Share of Loans: 70.0%
 O&P Investment Share in Equity: 25.0%
 Developer's Share in Equity: 75.0%
 Interest Rate on Loans (weighted average): 75% commercial and 25% (O&P)
 Interest Rate on Government Equity Loan: 1.80% per year
 Term Loan: 30 years
 Loan Repayment Start: 10 years after commercial operation date
 Sponsor Grant: 0 million US\$
 Operation Cost: 1.0% of Capital Cost Excluding IDC
 Annual O & M and Insurance Cost: 1.00% of Capital Cost
 Annual Insurance Costs and Fee (During Construction): O + M Escalation
 Auxiliary Rate & Line Loss: 1.30%
 Fuel Price \$/kWh: 0.00
 Wheeling Fee \$/kWh: 0.00
 Levelized Primary Tariff in 2008: 0.092

CONCESSION TERMS
 - Royalty Exemption Period: 0 years from commercial operations date
 - Water Charges: 0.0023 per kWh
 - Income tax in Pakistan: 0% of Total Revenue (Net Income)
 - Income Tax Exemption Period: 0 years from commercial operations date
 - Leases carried forward for Tax P: 1. Can be Cnvd. 1 = Carry Forward Losses
Depreciation and Others
 - Depreciation Rate Equipment: 25 years
 - Depreciation Rate Other: 25 years
 - Equity Grant: 0.000 US\$ million
 - Govt. Negative cashflows carried: 0 = not carried forward, 1 = carry forward
 - Debt Service Reserve Period: 6 months
 - Minimum Maintained Cash Balat: 0.000 US\$ million
 - Interest on Cash Balances: 6.0% p.a.
 - Interest on Short: 10.25% p.a.
 - Debts - Electricity Average Level: 1
 - Debts - Other: 0
 - Sundry Creditors, Average Level: 1

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2034
Annual Investment Cost, MMUS\$	40.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Primary Energy Sales, MMUS\$	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	82	83	84	85	86	87	88	88	89	90	91	92	104	104	105
Secondary Energy Sales, MMUS\$	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	122	123	124	125	127	128	129	130	132	133	134	136	153	153	154
Other Income	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Revenue	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	204	206	208	210	212	214	217	219	221	223	225	228	256	256	259
Annual Operating Costs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Annual Wheeling Fee	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11	11	11	11	11	11	12	12	12	12	12	12	14	14	15
Annual O + M + Insurance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54
Land Leasing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water Charges on Electricity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Insurance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total operating costs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16	17	17	17	17	17	17	17	18	18	18	18	20	20	20
Net Operating Cashflow	0	0	0	0	0	0	0	0	188	190	191	193	195	197	199	201	203	205	208	210	237	237	239
Financial Evaluation Based on Total Capital (million current US\$)																							
Capital Cost, exclude IDC	36.6	58.2	83.3	109.5	194.9	231.3	251.0	251.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Operating Cashflow	0	0	0	0	0	0	0	0	188	190	191	193	195	197	199	201	203	205	208	210	237	237	239
Total Net Cashflow (including tax payment)	-39	-58	-83	-109	-195	-231	-251	-251	-126	-126	-126	-126	-126	-126	-126	-126	-126	-126	-126	-126	-126	-126	-126
Cumulative Cashflow	-39	-97	-180	-290	-484	-716	-967	-1093	-905	-716	-524	-331	-135	62	261	463	666	872	1079	1299	1519	1739	1959
IRR CALCULATION																							
Investment Expenditure Excl IDC	39	58	83	109	195	231	251	251	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net after Tax on Profit, excl. Depreciation, Interest and repayments	0	0	0	0	0	0	0	0	189	195	197	199	201	203	205	207	210	212	214	216	244	244	246
Net Cash Flow	-39	-58	-83	-109	-195	-231	-251	-251	-126	-126	-126	-126	-126	-126	-126	-126	-126	-126	-126	-126	-126	-126	-126
IRR= 12.80% During the 25 Concession Years																							
Returns on Total Equity	12.07	19.03	26.20	38.28	67.67	83.73	95.68	63.21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dividends Received	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Cash Flows	-12	-19	-28	-38	-48	-64	-96	-63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DEBT SERVICE COVERAGE RATIO																							
DSCR Definition 1:									1.55	1.64	1.72	1.79	1.87	1.95	2.04	2.14	2.24	2.35	2.27	2.38	2.27	2.38	2.59

NOTE: Definition 1 = (Net after tax profit, excl. deprec., interest and repayments) / (Principal and interest payments)

Table 12.6.4 Financial Evaluation by Govt Receipts (JV Model)

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025		
Loan to Finance Govt Equity																										
Amount Expended	3.0	4.8	7.0	9.6	16.9	20.8	23.9	15.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Equity Input	3.0	7.8	14.8	24.4	41.3	62.2	86.2	102.0	102.0	102.0	102.0	102.0	102.0	102.0	102.0	102.0	102.0	102.0	102.0	102.0	102.0	102.0	102.0	102.0	102.0	
Equity Subsidy	0.0	0.1	0.2	0.4	0.5	1.0	1.4	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Interest on Equity Loan During Construction	3.0	7.9	15.0	25.0	42.5	64.4	89.7	107.2																		
Loan Balance During Construction																										
Opening Balance of Govt Equity Loan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	107.2	107.2	107.2	107.2	107.2	107.2	107.2	107.2	107.2	107.2	107.2	107.2	103.6	60.8	57.2			
Loan Interest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.1	1.0		
Loan Principal Repayments	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	3.6	3.6			
Dividend Received by Govt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Cash Flows for IRR calculation (equity)	-3.0	-4.8	-7.0	-9.6	-16.9	-20.8	-23.9	-15.8	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	
Net Cash Flow from Equity Investment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.9	15.6	19.0	20.4	21.8	23.2	24.5	26.1	27.5	27.9	24.8	26.3	26.3	45.1	51.1			
NET	727.6																									
Dividend	822.7																									
Principal	107.2																									
Interest	49.2																									
Concessions	0.17																									
25 years																										
Govt IRR =	0.17																									
Govt NPV =	66.1																									
Royalties Received	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Taxation Received	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Royalties	132.8	NPV =	17.5																							
Total Taxation	0.0	NPV =	0.0																							
Net Benefit to Govt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Losses carried forward (0)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Interest on Losses (0)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Net Benefit to Govt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Cash Benefit to Govt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Cash Available to Govt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
After allowing for interest on Losses	965.0																									
Nominal Value - Millions USD	12%																									
Discount Rate	2002																									
Base Year	86.7																									
Net Present Value - Millions USD																										
IRR Calculation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Govt Equity Return - Period Modelled																										
Govt Equity Return - Concession Period																										
Government's Receipts (millions US\$)																										
Nominal	159.4																									
NPV at 12%	17.5																									
Total GOL Receipts as IRR on GOL Equity	17.404%																									
Dividends as IRR on GOL Equity	15.185%																									
Developer's Receipts (millions US\$)																										
Dividends Received	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Equity Invested	9.1	14.3	21.1	28.7	50.8	62.8	71.8	47.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Net Cash Flow	-6.1	-14.3	-21.1	-28.7	-50.8	-62.8	-71.8	-47.4	0.0	52.5	62.9	67.1	71.3	75.5	79.7	84.0	86.2	89.5	90.9	95.3	95.3	149.4	167.2			
Developer's IRR on Equity Invested																										

Table 12.6.5 Financial Evaluation by 100% Privately Investment Model

Project Name: Munda
 Start Year: 2002
 Commercial Operation Year: 2010
 Concession Term: 25
 End Year: 2034
 Unit: million current US\$

Installed Capacity (MW): 740
 Capacity Factor (Primary-Secondary Supply)(%): 37.14%
 Total Project Cost (Nominal): 1,092.69 million US\$ excluding interest during construction and price escalation
 Total Capital Cost Including IDC (Nominal): 1,440.83 million US\$ including interest during construction
 Share of Loans: 70.0%
 COP Investment Share in Equity: 0.0%
 Developer's Share in Equity: 100.0%
 Interest Rate on Loans: 12.5% per year
 Interest Rate on Government Equity Loan: 0.0%
 Term Loan: 0 years
 Loan Repayment Start: 0 years after commercial operation date
 Sponsor Grant: 0 million US\$
 Operation Cost: 1.0% of Capital Cost Excluding IDC
 Annual O & M and Insurance Cost: 1.000% of Capital Cost
 Annual Insurance Costs and Fee (During Construction): 1.246%
 O & M Escalation: 1.20%
 Auxiliary Rate & Line Loss: 0.00
 Fuel Price \$/GWh: 0.00
 Fuel Escalation Rate: 0.00%
 Wheeling Fee \$/MWh: 0
 Levelized Primary Tariff in 2008: 0.0972

CONCESSION TERMS

- Royalty Exemption Period: 0 years from commercial operations date
 - Water Charges: 0.0023 per kWh
 - Income tax in Pakistan: 0% of Total Revenue (Net Income)
 - Income Tax Exemption Period: 0 years from commercial operations date
 - Losses carried forward for Tax P: 1. 0=No CFWD, 1 = Carry Forward/Losses
 Depreciation and Others:
 - Depreciation Rate Equipment: 25 years
 - Depreciation Rate Other: 25 years
 - Equity Grant: 0.000 US\$ million
 - Govt Negative cashflows carried: 0 0 = not carried forward, 1 = carry forward
 - Debt Service Reserve Period: 6 months
 - Minimum Maintained Cash Bal: 0.000 US\$ million
 - Interest on Cash Balances: 6.0% p.a.
 - Interest on Short: 10.25% p.a.
 Debtors - Other: 1
 Sundry Creditors, Average Level: 1

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Annual Investment Cost, MMUS\$	40.6	20.3	20.4	20.5	20.6	20.7	20.8	20.9	21.0	21.1	21.2	21.3	21.4	21.5	21.6	21.7	21.8	21.9	22.0	22.1	22.2	22.3	22.4
Primary Energy Sales, MMUS\$	0	0	0	0	0	0	0	0	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
Secondary Energy Sales, MMUS\$	0	0	0	0	0	0	0	0	122	123	124	125	127	128	129	130	132	133	134	136	137	138	139
Other Income	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Revenue	0	0	0	0	0	0	0	0	204	206	208	210	212	214	217	219	221	223	225	228	230	232	234
Annual Operating Costs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Annual Wheeling Fee	0	0	0	0	0	0	0	0	11	11	11	11	11	12	12	12	12	12	12	12	12	12	12
Annual O & M + Insurance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Land Leasing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Charges on Electricity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54
Insurance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total operating costs	0	0	0	0	0	0	0	0	16	17	17	17	17	17	17	17	18	18	18	18	18	20	20
Net Operating Cashflow	0	0	0	0	0	0	0	0	188	190	191	193	195	197	199	201	203	205	208	210	212	214	216
Financial Evaluation Based on Total Capital (million current US\$)																							
Capital Cost, exclude IDC	38.6	58.2	60.3	109.3	194.9	231.3	251.0	125.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Operating Cashflow	0	0	0	0	0	0	0	0	188	190	191	193	195	197	199	201	203	205	208	210	212	214	216
Total Net Cashflow (including tax payment)	-39	-58	-60	-109	-195	-231	-251	-126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cumulative Cashflow	-39	-97	-158	-267	-462	-693	-944	-1093	-805	-524	-232	67	133	230	359	520	713	928	1166	1428	1715	2027	2364
IRR CALCULATION																							
Investment Expenditure Excl IDC	39	58	60	109	195	231	251	126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net after Tax on Profit excl. Depreciation, Interest and repayments	0	0	0	0	0	0	0	0	188	191	195	199	201	203	205	207	210	212	214	216	218	220	222
Net Cash Flow	-39	-58	-60	-109	-195	-231	-251	-126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IRR= 12.76% During the 25 Concession Years																							
Return on Total Equity	12.18	19.44	20.06	39.82	70.32	87.99	101.95	71.48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equity Input	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dividends Received	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Cash Flows	-12	-19	-29	-40	-70	-88	-102	-71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DEBT SERVICE COVERAGE RATIO									1.13	1.18	1.24	1.32	1.38	1.44	1.51	1.58	1.66	1.75	1.84	1.95	2.04	2.13	2.22
DSCR Definition 1:									NOTE: Definition 1 = (Net after tax profit excl. depre. interest and repayments) / (Principal and interest payments)														

Table 12.6.6 Financial Evaluation by 100% Public Investment Model

Project Name: Munda
 Start Year: 2002
 Commercial Operation Year: 2010
 Concession Term: 25
 End Year: 2034
 Unit: million current US\$

Installed Capacity (MW): 740
 Capacity Factor (Primary/Secondary Supply)(%): 37.14%
 Total Project Cost (Nominal): 1,092.69 million US\$ excluding interest during construction and price escalation
 Total Capital Cost including IDC (Nominal): 1,143.58 million US\$ including interest during construction
 Share Equity: 30.0%
 Share of Loans: 70.0%
 COP Investment Share in Equity: 100.0%
 Developer's Share in Equity: 0.0%
 Interest Rate on Loans: 1.8% per year
 Interest Rate on Government Equity Loans: 1.80% per year
 Term Loan: 30 years after commercial operation date
 Loan Repayment Start: 10 years after commercial operation date
 Sponsor Grant: 0 million US\$
 Operations Cost: 1.00% of Capital Cost Excluding IDC
 Annual O & M and Insurance Cost: 1.000% of Capital Cost
 Annual Insurance Costs and Fee (During Construction): 1.24%
 O & M Escalation: 1.50%
 Auxiliary Rate & Line Loss: 0.00
 Fuel Price \$/kWh: 0.00
 Fuel Escalation Rate: 0.0%
 Wheeling Fee \$/kWh: 0
 Levelized Primary Tariff in 2008: 0.69\$2

CONCESSION TERMS
 - Royalty Exemption Period: 0 years from commercial operations date
 - Water Charges: 0.0023 per kWh
 - Income tax in Pakistan: 0% of Total Revenue (Net Income)
 - Income Tax Exemption Period: 0 years from commercial operations date
 - Losses carried forward for Tax P: 1 0=NO C/fwd. 1 = Carry Forward Losses
 Depreciation and Others
 - Depreciation Rate Equipment: 25 years
 - Equity Grant: 25 years
 - Govt Negative cashflows carried: 0.000 US\$ million
 - Debt Service Reserve Period: 0 months
 - Minimum Maintained Cash Bal: 0.000 US\$ million
 - Interest on Cash Balances: 6.0% p.a.
 - Interest on Short Term Debt: 10.25% p.a.
 Debtors - Electricity Average Level: 1
 Debtors - Other: 0
 Sundry Creditors, Average Level: 1

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	
Annual Investment Cost, MM/US\$	39.1	59.3	83.7	85.7	113.1	201.3	240.7	263.7	140.3															
Primary Energy Sales, MM/US\$	0	0	0	0	0	0	0	0	82	83	84	85	86	87	88	89	90	90	91	92	104	105		
Secondary Energy Sales, MM/US\$	0	0	0	0	0	0	0	0	122	123	124	125	127	128	129	130	132	133	134	136	153	154		
Other Income:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Revenue	0	0	0	0	0	0	0	0	204	206	208	210	212	214	217	219	221	223	225	228	256	256		
Annual Operating Costs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Annual Wheeling Fee	0	0	0	0	0	0	0	0	11	11	11	11	11	11	12	12	12	12	12	12	12	14	15	
Annual O & M + Insurance	0	0	0	0	0	0	0	0	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	
Land Leasing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Water Charges on Electricity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Insurance	0	0	0	0	0	0	0	0	16	17	17	17	17	17	17	17	18	18	18	18	18	20	20	
Total operating costs	0	0	0	0	0	0	0	0	16	17	17	17	17	17	17	17	18	18	18	18	18	20	20	
Net Operating Cashflow	0	0	0	0	0	0	0	0	188	190	191	193	195	197	199	201	203	205	206	210	237	239		
Financial Evaluation Based on Total Capital (million current US\$)																								
Capital Cost, exclude IDC	38.6	58.2	83.3	85.3	109.3	194.9	231.3	251.0	125.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Net Operating Cashflow	0	0	0	0	0	0	0	0	188	190	191	193	195	197	199	201	203	205	206	210	237	239		
Total Net Cashflow (including tax payment)	-39	-58	-83	-85	-109	-195	-231	-251	-126	188	190	191	193	195	197	199	201	203	205	206	210	237	239	
Cumulative Cashflow	-39	-97	-180	-195	-296	-484	-716	-1093	-905	-716	-524	-331	-135	62	261	463	666	872	1079	1289	3913	4152		
IRR CALCULATION																								
Investment Expenditure excl IDC	39	58	83	85	109	195	231	251	126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Net after Tax on Profit excl. Depreciation, Interest and repayments	0	0	0	0	0	0	0	0	192	195	197	199	201	203	205	207	210	212	214	216	216	244	246	
Net Cash Flow	-39	-58	-83	-85	-109	-195	-231	-251	-126	192	195	199	201	203	205	207	210	212	214	216	216	244	246	
IRR= 12.81% During the 25 Concession Years																								
Returns on Total Equity	11.74	17.85	25.71	33.04	60.39	72.22	79.12	42.09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Equity Invest	0	0	0	0	0	0	0	0	155	181	183	185	187	189	191	193	195	184	173	175	209	212		
Dividends Received	0	0	0	0	0	0	0	0	155	181	183	185	187	189	191	193	195	184	173	175	209	212		
Net Cash Flows	-12	-18	-26	-34	-60	-72	-79	-42	155	181	183	185	187	189	191	193	195	184	173	175	209	212		
DEBT SERVICE COVERAGE RATIO									13.35	13.55	13.69	13.82	13.96	14.11	14.25	14.39	14.54	14.69	5.20	5.32	6.99	7.16		

NOTE: Definition 1 = (Net after tax profit excl. depre. interest and repayments) / (Principal and interest payments)
 DSCR Definition 1:

Table 12.6.7 Financial Evaluation by Govt Receipts (100% Public Model)

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	
Loan to Finance Govt Equity																									
Amount Expended	11.7	17.9	25.7	33.9	60.4	72.2	79.1	42.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Equity Input	11.7	29.6	55.3	89.2	149.8	221.9	301.0	343.1	343.1	343.1	343.1	343.1	343.1	343.1	343.1	343.1	343.1	343.1	343.1	343.1	343.1	343.1	343.1	343.1	343.1
Equity Subsidy	0.1	0.4	0.8	1.3	2.2	3.4	4.5	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interest on Equity Loan During Construction	11.6	30.1	56.1	91.3	153.9	229.6	313.5	361.6																	
Loan Balance During Construction																									
Opening Balance of Govt Equity Loan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	361.6	361.6	361.6	361.6	361.6	361.6	361.6	361.6	361.6	361.6	361.6	361.6	361.6	361.6	361.6	361.6	361.6
Loan Interest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Loan Principal Repayments	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dividends Received by Govt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cash Flow for IRR calculation (equity)	-11.7	-17.9	-25.7	-33.9	-60.4	-72.2	-79.1	-42.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Cash Flow from Equity Investment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	146.5	174.1	176.1	178.1	180.1	182.2	184.2	186.3	188.4	177.2	154.2	137.0	121.4	106.1	91.7	77.7	64.1
NET																									
Nominal Total =	4,346.3																								
Govt IRR =	0.27																								
Govt NPVs	545.2																								
Royalties Received	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Taxation Received	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Royalties	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Taxation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Benefit to Govt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Losses carried forward (0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest on Losses (0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Benefit to Govt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	154.1	179.7	181.7	183.7	185.7	187.7	189.8	191.9	194.0	182.7	159.7	132.6	116.6	101.6	87.6	74.6	62.6
Total Cash Benefit to Govt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	154.1	179.7	181.7	183.7	185.7	187.7	189.8	191.9	194.0	182.7	159.7	132.6	116.6	101.6	87.6	74.6	62.6
Cash Available to Govt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	154.1	179.7	181.7	183.7	185.7	187.7	189.8	191.9	194.0	182.7	159.7	132.6	116.6	101.6	87.6	74.6	62.6
After allowing for interest on losses																									
Nominal Value - Millions USD	4,486.7																								
Discount Rate	12%																								
Base Year	2002																								
Net Present Value - Millions USD	562.7																								
IRR Calculation																									
Govt Equity Return - Period Modelled	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Govt Equity Return - Concession Period	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Government's Receipts (millions USD)																									
Nominal	139.4																								
NPV at 12%	17.5																								
Total GOL Receipts as IRR on GOL Equity	26.666%																								
Dividends as IRR on GOL Equity	26.198%																								
Developers Receipts (millions USD)																									
Dividends Received	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Equity Invested	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Cash Flow	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Developers IRR on Equity Invested																									

Table 12.6.8 Sensitivity Analysis (O&M Up by 20%)

Project Name: Mirinda
Start Year: 2002
Commercial Operation Year: 2010
Concession Term: 25
End Year: 2034
Unit: million current US\$

Installed Capacity (MW): 740
Capacity Factor (Primary+Secondary Supply)(%): 37.1-6%
Total Project Cost (Nominal): 1,092.69 million US\$ excluding interest during construction and price escalation
Total Capital Cost Including IDC (Nominal): 1,143.58 million US\$ including interest during construction
Share Equity: 30.0%
Share of Loans: 70.0% OECF Loan, 1.8%, 30 Yrs, 75% of Cost, 10 Year Grace
GOP Investment Share in Equity: 100.0%
Developer's Share in Equity: 0.0%
Interest Rate on Loans: 1.8% per year
Interest Rate on Government Equity Loan: 1.8% per year
Term Loan: 30 years
Loan Repayment Start: 10 years after commercial operation date
Sponsor Grant: 0 million US\$
Operation Cost: 1.2% of Capital Cost Excluding IDC
Annual O & M and Insurance Cost: 1.00% of Capital Cost
Annual Insurance Costs and Fee (During Construction): 1.24% of Capital Cost
O & M Escalation: 1.30%
Auxiliary Rate & Line Loss: 0.0%
Fuel Price \$/kWh: 0.0%
Fuel Escalation Rate: 0.0%
Wholesale Fee \$/kWh: 0.0%
Levelized Primary/Terriff in 2008: 0.092

CONCESSION TERMS
 - Royalty Exemption Period: 0 years from commercial operations date
 - Water Charges: 0.0023 per kWh
 - Income Tax in Pakistan: 0% of Total Revenue (Net Income)
 - Income Tax Exemption Period: 0 years from commercial operations date
 - Losses carried forward for Tax P: 1 (On No CFWD, 1 = Carry Forward Losses)
Depreciation and Others
 - Depreciation Rate Equipment: 25 years
 - Depreciation Rate Other: 25 years
 - Equity Grant: 0.000 US\$ million
 - Govt Negative cashflows carried: 0 0 = not carried forward, 1 = carry forward
 - Debt Service Reserve Period: 6 months
 - Minimum Maintained Cash Balu: 0.000 US\$ million
 - Interest on Cash Balances: 6.0% p.a.
 - Interest on Short: 10.25% p.a.
 - Debtors - Electricity Average Leve: 1
 - Debtors - Other: 0
 - Sundry Creditors, Average Level: 1

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2034	
Annual Investment Cost, MMUS\$	36.1	55.5	85.7	113.1	240.7	240.7	240.7	144.3																
Primary Energy Sales, MMUS\$	0	0	0	0	0	0	0	0	82	83	84	85	86	87	88	89	90	91	92	93	94	95	105	
Secondary Energy Sales, MMUS\$	0	0	0	0	0	0	0	0	122	123	124	125	127	128	129	130	132	134	136	138	140	142	154	
Other Incomes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Revenue	0	0	0	0	0	0	0	0	204	206	208	210	212	214	217	219	221	223	225	228	231	234	269	
Annual Operating Costs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Annual Wheeling Fee	0	0	0	0	0	0	0	0	13	11	11	11	11	12	12	12	12	12	12	12	12	14	15	
Annual O + M + Insurance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	
Land Leasing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Water Charges on Electricity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Insurance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total operating costs	0	0	0	0	0	0	0	0	19	17	17	17	17	17	17	17	17	17	17	17	17	18	20	
Net Operating Cashflow	0	0	0	0	0	0	0	0	185	190	191	193	195	197	199	201	203	205	208	210	212	214	239	
Financial Evaluation Based on Total Capital (million current US\$)																								
Capital Cost, exclude IDC	36.6	58.2	83.3	109.3	194.9	231.3	251.0	125.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Net Operating Cashflow	0	0	0	0	0	0	0	0	185	190	191	193	195	197	199	201	203	205	208	210	212	214	239	
Total Net Cashflow (including tax payment)	-39	-58	-83	-109	-195	-231	-251	-126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cumulative Cashflow	-39	-97	-180	-290	-484	-716	-967	-1093	-907	-718	-528	-333	-138	-60	249	463	684	869	1077	1287	1511	1741	2034	
IRR CALCULATION																								
Investment Expenditure Excl IDC	36	58	83	109	195	231	251	126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Net after Tax on Profit excl. Depreciation, Interest and repayments	0	0	0	0	0	0	0	0	190	195	197	199	201	203	205	207	210	212	214	216	218	244	246	
Net Cash Flow	-39	-58	-83	-109	-195	-231	-251	-126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IRR = 12.91% During the 25 Concession Years																								
Returns on Total Equity	11.74	17.85	25.71	33.94	60.39	72.22	79.12	42.09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Equity Input	0	0	0	0	0	0	0	0	153	160	163	165	167	169	171	173	175	177	179	181	183	185	212	
Dividends Received	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Net Cash Flows	-39	-58	-83	-109	-195	-231	-251	-126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IRR = 26.157% During the 25 Concession Years																								
DEBT SERVICE COVERAGE RATIO									13.19	13.55	13.69	13.82	13.96	14.11	14.25	14.39	14.54	14.69	5.20	5.32	5.44	5.56	7.16	
DSCR Definition 1:																								
NOTE: Definition 1 = (Net after tax profit excl. deprec. interest and repayments) / (Principal and interest payments)																								

Table 12.6.9 Sensitivity Analysis (Water Charge Up by 20%)

Project Name: Munda
 Start Year: 2002
 Commercial Operation Year: 2010
 Concession Term: 25
 End Year: 2034
 Unit: million current US\$

Installed Capacity (MW): 760
 Capacity Factor (Primary+Secondary Supply %): 37.14%
 Total Project Cost (Nominal): 1,092.69 million US\$ excluding interest during construction and price escalation
 Total Capital Cost Including IDC (Nominal): 1,143.38 million US\$ including interest during construction
 Share Equity: 30.0%
 Share of Loans: 70.0%
 OECF Loan, 1.4%, 30 Yrs, 75% of Cost, 10 Year Grace
 COP Investment Share in Equity: 100.0%
 Developer's Share in Equity: 0.0%
 Interest Rate on Loans: 12% per year
 Interest Rate on Government Equity Loan: 1.80% per year
 Term Loan: 30 years
 Loan Repayment Start: 10 years after commercial operation date
 Sponsor Grant: 0 million US\$
 Operation Cost:
 Annual O & M and Insurance Cost: 1.0% of Capital Cost Excluding IDC
 Annual Insurance Costs and Fee (During Construction): 1.000% of Capital Cost
 O & M Escalation: 1.240%
 Auxiliary Rate & Line Loss: 1.300%
 Fuel Price \$/kWh: 0.00
 Fuel Escalation Rate: 0.00%
 Wheeling Fee \$/kWh: 0
 Levelized Primary Tariff in 2008: 0.092

CONCESSION TERMS

- Royalty Exemption Period: 0 years (from commercial operations date)
 - Water Charges: 0.002\$/kWh
 - Income tax in Pakistan: 0% of Total Revenue (Net Income)
 - Income Tax Exemption Period: 0 years from commercial operations date
 - Losses carried forward for Tax P: 1 (0=No CFwd, 1 = Carry Forward Losses)
 Depreciation and Others:
 Depreciation Rate Equipment: 25 years
 Depreciation Rate Other: 25 years
 Equity Grant: 0.000 US\$ million
 Govt Negative cashflows carried: 0
 Debt Service Reserve Period: 0 months
 Minimum Maintained Cash Bal: 0.000 US\$ million
 Interest on Cash Balances: 6.0% p.a.
 Interest on Short: 10.25% p.a.
 Debtors - Other: 1
 Debtors - Other: 0
 Sundry Creditors, Average Level: 1

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2033	2034	
Annual Investment Cost, MMUS\$	39.1	59.5	85.7	113.1	201.3	240.7	265.7	140.3															
Primary Energy Sales, MMUS\$	0	0	0	0	0	0	0	0	82	83	84	85	86	87	88	89	90	91	92	92	104	105	
Secondary Energy Sales, MMUS\$	0	0	0	0	0	0	0	0	122	123	124	125	127	128	129	130	132	133	134	136	153	154	
Other Incomes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Revenue	0	0	0	0	0	0	0	0	204	206	208	210	212	214	217	219	221	223	225	228	256	259	
Annual Operating Costs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Annual Wheeling Fee	0	0	0	0	0	0	0	0	11	11	11	11	11	12	12	12	12	12	12	12	14	15	
Annual O & M + Insurance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.64	6.64	6.64	6.64	6.64	6.64	6.64	6.64	6.64	6.64	6.64	6.64	6.64	6.64	
Land Leasing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Water Charges on Electricity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Insurance	0	0	0	0	0	0	0	0	18	18	18	18	18	18	18	18	19	19	19	19	21	21	
Total operating costs	0	0	0	0	0	0	0	0	18	18	18	18	18	18	18	19	19	19	19	19	21	21	
Net Operating Cashflow	0	0	0	0	0	0	0	0	186	188	190	192	194	196	198	200	202	204	206	209	235	238	
Financial Evaluation Based on Total Capital (million current US\$)																							
Capital Cost, ex-cludes IDC	34.6	56.2	83.3	109.3	194.9	231.3	251.0	125.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Net Operating Cashflow	0	0	0	0	0	0	0	0	186	188	190	192	194	196	198	200	202	204	206	209	235	238	
Total Net Cashflow (including tax payment)	-39	-58	-83	-109	-195	-231	-251	-126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cumulative Cashflow	-39	-97	-180	-290	-484	-716	-987	-1093	-906	-718	-527	-335	-141	55	254	454	655	840	1067	1275	3066	4124	
IRR CALCULATION																							
Investment Expenditure Excl IDC	39	56	83	109	195	231	251	126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Net after Tax on Profit excl. Depreciation, Interest and repayments	0	0	0	0	0	0	0	0	191	194	196	198	200	202	204	206	208	210	213	215	242	245	
Net Cash Flow	-39	-58	-83	-109	-195	-231	-251	-126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IRR = 12.77% During the 25 Concession Years																							
Return on Total Equity	11.74	17.85	25.71	33.94	60.39	72.22	79.12	42.09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Equity Input	0	0	0	0	0	0	0	0	154	179	181	183	186	188	190	192	194	183	172	174	208	211	
Dividends Received	0	0	0	0	0	0	0	0	154	179	181	183	186	188	190	192	194	183	172	174	208	211	
Net Cash Flow	-12	-18	-26	-34	-60	-72	-79	-42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IRR = 26.10% During the 25 Concession Years																							
DEBT SERVICE COVERAGE RATIO									13.27	13.47	13.61	13.75	13.89	14.03	14.17	14.31	14.46	14.61	14.77	14.91	15.06	15.21	
DSCR Definition 1: (Net after tax profit excl. depre, interest and repayments) / (Principal and interest payments)																							
DSCR Definition 1:									13.27	13.47	13.61	13.75	13.89	14.03	14.17	14.31	14.46	14.61	14.77	14.91	15.06	15.21	

Table 12.6.10 Sensitivity Analysis (Investment Cost Up by 20%)

Project Name: Munda
 Start Year: 2002
 Commercial Operation Year: 2010
 Concession Term: 25
 End Year: 2034
 Unit: million current US\$

Installed Capacity (MW): 740
 Capacity Factor (Primary-Secondary Supply)(%): 37.14%
 Total Project Cost (Nominal): 1,311.23 million US\$ excluding interest during construction and price escalation
 Total Capital Cost Including IDC (Nominal): 1,372.29 million US\$ including interest during construction
 Share Equity: 30.0%
 Share of Loans: 70.0%
 OBCF Loan, 1.8%, 30 Yrs, 75% of Cost, 10 Year Grace
 COP Investment Share in Equity: 100.0%
 Developer's Share in Equity: 0.0%
 Interest Rate on Loans: 1.25% per year
 Interest Rate on Government Equity Loan: 1.85% per year
 Term Loan: 30 years
 Loan Repayment Start: 10 years after commercial operation date
 Sponsor Grant: 0 million US\$
 Operations Cost: 1.0% of Capital Cost Excluding IDC
 Annual O & M and Insurance Cost: 1.005% of Capital Cost
 Annual Insurance Costs and Fee (During Construction): 0
 O & M Escalation: 1.25%
 Auxiliary Rate & Line Loss: 1.35%
 Fuel Price \$/kWh: 0.00
 Fuel Escalation Rate: 0.0%
 Wheeling Fee \$/kWh: 0
 Levelized Primary Tariff in 2008: 0.092

CONCESSION TERMS

- Royalty Exemption Period: 0 years from commercial operations date
 - Water Charges: 0.0023 per kWh
 - Income tax in Pakistan: 0% of Total Revenue (Net Income)
 - Income Tax Exemption Period: 0 years from commercial operations date
 - Losses carried forward for Tax P: 1. 0=No CF/wd, 1 = Carry Forward/Losses
 Depreciation and Others:
 Depreciation Rate Equipment: 25 years
 Depreciation Rate Other: 25 years
 Equity Grant: 0.000 US\$ million
 Govt Negative cashflows carried: 0 0 = not carried forward, 1 = carry forward
 Debt Service Reserve Period: 6 months
 Minimum Maintained Cash Bal: 0.000 US\$ million
 Interest on Cash Balances: 6.0% p.a.
 Interest on Short: 10.25% p.a.
 Debtor - Electricity Average Level: 1
 Debtor - Other: 0
 Sundry Creditors, Average Level: 1

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024		
Annual Investment Cost, MMUS\$	47.0	71.3	102.8	155.8	241.6	280.9	316.5	184.8																	
Primary Energy Sales, MMUS\$	0	0	0	0	0	0	0	0	0	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	
Secondary Energy Sales, MMUS\$	0	0	0	0	0	0	0	0	0	122	123	124	125	127	128	129	132	133	134	136	138	140	142	144	
Other Incomes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Revenue	0	0	0	0	0	0	0	0	0	204	206	208	210	212	214	217	221	223	225	228	230	232	235	238	
Annual Operating Costs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Annual Wheeling Fee	0	0	0	0	0	0	0	0	0	13	11	11	11	11	12	12	12	12	12	12	12	12	12	12	
Annual O + M + Insurance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Land Leasing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Water Charges on Electricity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	
Insurance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total operating costs	0	0	0	0	0	0	0	0	0	16	17	17	17	17	17	17	18	18	18	18	18	18	18	18	
Net Operating Cashflow	0	0	0	0	0	0	0	0	0	185	190	191	193	195	197	199	201	203	205	208	210	212	214	216	
Financial Evaluation Based on Total Capital (million current US\$)																									
Capital Cost, exclude IDC	46.4	69.9	100.0	131.2	233.9	277.6	301.2	151.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Net Operating Cashflow	0	0	0	0	0	0	0	0	185	190	191	193	195	197	199	201	203	205	208	210	212	214	216	218	
Total Net Cashflow (including tax payment)	-46	-70	-100	-131	-234	-278	-301	-151	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cumulative Cashflow	-46	-116	-216	-347	-581	-859	-1160	-1311	-1126	-936	-745	-551	-356	-159	41	242	445	651	858	1068	1282	1502	1727	1956	
IRR CALCULATION																									
Investment Expenditure Excl IDC	46	70	100	131	234	278	301	151	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Net after tax on Profit excl. Depreciation, Interest and repayments	0	0	0	0	0	0	0	0	190	195	197	199	201	203	205	207	210	212	214	216	218	220	222	224	
Net Cash Flow	-46	-70	-100	-131	-234	-278	-301	-151	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IRR = 10.97% During the 25 Concession Years																									
Return on Total Equity	14.09	21.42	30.85	40.75	72.47	86.67	94.95	50.51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equity Input	0	0	0	0	0	0	0	0	149	178	180	182	184	186	188	190	192	194	196	198	200	202	204	206	
Dividends Received	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Net Cash Flows	-14	-21	-31	-41	-72	-87	-95	-51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IRR = 23.14% During the 25 Concession Years																									
DEBT SERVICE COVERAGE RATIO																									
PSCR Definition 1:									10.99	11.29	11.40	11.52	11.64	11.76	11.87	11.99	12.12	12.24	12.34	12.43	12.51	12.59	12.66	12.73	
PSCR Definition 1: (Net after tax profit excl. depre. interest and repayments) / (Principal and interest payments)																									

Table 12.6.11 Sensitivity Analysis (Energy Sales Decrease by 10%)

Project Name: Munda
 Start Year: 2002
 Commercial Operation Year: 2010
 Concession Term: 25
 End Year: 2034
 Unit: million current US\$

Installed Capacity (MW): 740
 Capacity Factor (Primary/Secondary Supply)(%): 37.14%
 Total Project Cost (Nominal): 1,092.69 million US\$ excluding interest during construction and price escalation
 Total Capital Cost including IDC (Nominal): 1,143.58 million US\$ including interest during construction
 Share Equity: 70.0%
 Share of Loans: 30.0%
 O&M: 1.8% 30 Yrs, 75% of Cost, 10 Year Grace
 100.0%
 GDP Investment Share in Equity: 0.0%
 Developer's Share in Equity: 1.8% per year
 Interest Rate on Loans (weighted average): 75% commercial and 25% ()
 Interest Rate on Government Equity Loan: 1.80% per year
 Term Loan: 30 years
 Loan Repayment Start: 10 years after commercial operation date
 Sponsor Grant: 0 million US\$
 Operator's Cost: 1.0% of Capital Cost Excluding IDC
 Annual O & M and Insurance Cost: 1.000% of Capital Cost
 Annual Insurance Costs and Fee (During Construction): 1.24%
 O + M Escalation: 1.30%
 Auxiliary Rate & Line Loss: 0.00
 Fuel Price \$/kWh: 0.00
 Fuel Escalation Rate: 0.0%
 Wheeling Fee \$/kWh: 0
 Levelized Primary Tariff in 2008: 0.092

CONCESSION TERMS

- Royalty Exemption Period: 0 years from commercial operations date
- Water Charges: 0.0023 per kWh
- Income Tax in Pakistan: 0% of Total Revenue (Net Income)
- Income Tax Exemption Period: 0 years from commercial operations date
- Losses carried forward for Tax P: 1.0 = No C/wd, 1 = Carry Forward Losses

Depreciation and Others:
 Depreciation Rate Equipment: 25 years
 Depreciation Rate Other: 25 years
 Equity Grant: 0.000 US\$ million
 Govt Negative cashflows carried: 0 = not carried forward, 1 = carry forward
 Govt Service Reserve Period: 6 months
 Minimum Maintained Cash Bal: 0.000 US\$ million
 Interest on Short: 6.0% p.a.
 Interest - Electricity Average Lev: 1
 Debtors - Other: 1
 Sundry Creditors, Average Level: 0

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Annual Investment Cost, MMUS\$	39.1	59.5	85.7	113.1	201.3	240.7	263.7	140.3															
Primary Energy Sales, MMUS\$	0	0	0	0	0	0	0	0	74	75	76	76	77	78	79	80	80	81	82	83	83	93	94
Secondary Energy Sales, MMUS\$	0	0	0	0	0	0	0	0	109	111	112	113	114	115	116	117	119	120	121	122	122	138	139
Other Incomes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Revenue	0	0	0	0	0	0	0	0	184	185	187	189	191	193	195	197	199	201	203	205	205	231	233
Annual Operating Costs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Annual Wheeling Fee	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Annual O + M + Insurance	0	0	0	0	0	0	0	0	11	11	11	11	11	11	12	12	12	12	12	12	12	14	15
Land Leasing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54
Water Charges on Electricity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Insurance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total operating costs	0	0	0	0	0	0	0	0	16	17	17	17	17	17	17	17	18	18	18	18	18	20	20
Net Operating Cashflow	0	0	0	0	0	0	0	0	167	169	171	172	174	176	178	179	181	183	185	187	187	211	213
Financial Evaluation Based on Total Capital (million current US\$)																							
Capital Cost, exclude IDC	38.6	58.2	83.5	109.3	194.9	231.3	251.0	125.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Operating Cashflow	0	0	0	0	0	0	0	0	167	169	171	172	174	176	178	179	181	183	185	187	187	211	213
Total Net Cashflow (including tax payment)	-3%	-5%	-8%	-10%	-19%	-21%	-25%	-126%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cumulative Cashflow	-3%	-7%	-18%	-29%	-48%	-71%	-96%	-109%	-92%	-75%	-58%	-41%	-23%	-4%	11%	24%	47%	65%	84%	103%	122%	141%	160%
IRR CALCULATION																							
Investment Expenditure Excl IDC	39	58	83	109	195	231	251	126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net after Tax on Profit excl. Depreciation, Interest and repayments	0	0	0	0	0	0	0	0	171	174	176	178	179	181	183	185	187	189	191	192	192	217	219
Net Cash Flow	-3%	-5%	-8%	-10%	-19%	-21%	-25%	-126%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IRR = 11.65% During the 25 Concession Years																							
Return on Total Equity	11.74	17.85	25.71	33.94	60.39	72.22	79.12	42.09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equity Invest	0	0	0	0	0	0	0	0	136	139	141	143	145	147	149	151	153	155	157	159	161	163	165
Dividends Received	-12	-18	-26	-34	-40	-47	-42	-79	136	139	141	143	145	147	149	151	153	155	157	159	161	163	165
Net Cash Flows									136	139	141	143	145	147	149	151	153	155	157	159	161	163	165
DEBT SERVICES COVERAGE RATIO									11.89	12.07	12.20	12.32	12.45	12.57	12.70	12.83	12.96	13.09	13.21	13.34	13.47	13.60	13.74
DSCR Definition 1:									NOTE: Definition 1 = (Net after tax profit excl. depn, interest and repayments) / (Principal and interest payments)														6.34

Table 12.6.12 Sensitivity Analysis (Project Completion Delay by One Year)

Project Name: Munda
 Start Year: 2002
 Commercial Operation Year: 2010
 Concession Term: 25
 End Year: 2034
 Unit: million current US\$

Installed Capacity (MW): 740
 Capacity Factor (Primary-Secondary Supply)(%): 37.14%
 Total Project Cost (Nominal): 1,092.69 million US\$ excluding interest during construction and price escalation
 Total Capital Cost Including IDC (Nominal): 1,143.58 million US\$ including interest during construction
 Share Equity: 70.0%
 Share of Loans: 30.0%
 COP Investment Share in Equity: 100.0%
 Developer's Share in Equity: 0.0%
 Interest Rate on Loans: 1.8% per year
 Interest Rate on Government Equity Loan: 1.80% per year
 Term Loan: 30 years
 Loan Repayment Start: 10 years after commercial operation date
 Sponsor Grant: 0 million US\$
 Operations Cost: 1.0% of Capital Cost Excluding IDC
 Annual O & M and Insurance Cost: 1.000% of Capital Cost
 Annual Insurance Costs and Fee (During Construction): 1.24%
 O & M Escalation: 1.30%
 Fuel Price \$/kWh: 0.00
 Fuel Escalation Rate: 0.0%
 Wheeling Fee \$/kWh: 0
 Levelized Primary Tariff in 2008: 0.992

CONCESSION TERMS
 - Royalty Exemption Period: 0 years from commercial operations date
 - Water Charges: 0.0023 per kWh
 - Income Tax in Pakistan: 0% of Total Revenue (Net Income)
 - Income Tax Exemption Period: 0 years from commercial operations date
 - Losses carried forward for Tax P: 1 = No C/rd, 1 = Carry Forward Losses
 Depreciation and Others: 25 years
 Depreciation Rate Equipment: 0.000 US\$ million
 Depreciation Rate Other: 0 = not carried forward, 1 = carry forward
 - Equity Grant: 6 months
 - Govt Negative cashflows carried: 0.000 US\$ million
 - Debt Service Reserve Period: 6 months
 - Minimum Maintained Cash Bal: 6.0% p.a.
 - Interest on Cash Balances: 10.25% p.a.
 - Interest on Short: 1
 Debtors - Electricity Average Lev: 1
 Debtors - Other: 1
 Sundry Creditors, Average Level: 1

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2034
Annual Investment Cost, MMUS\$	391	50.5	85.7	113.1	201.3	244.7	283.7	146.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Primary Energy Sales, MMUS\$	0	0	0	0	0	0	0	0	0	83	84	85	86	87	88	88	89	90	91	92	104	105	
Secondary Energy Sales, MMUS\$	0	0	0	0	0	0	0	0	0	123	124	125	127	128	129	130	132	133	134	136	153	154	
Other Incomes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Revenue	0	0	0	0	0	0	0	0	0	206	208	210	212	214	217	219	221	223	225	228	256	259	
Annual Operating Costs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Annual Wheeling Fee	0	0	0	0	0	0	0	0	0	11	11	11	11	11	12	12	12	12	12	12	14	15	
Annual O & M - Insurance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Land Leasing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Water Charges on Electricity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	
Insurance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total operating costs	0	0	0	0	0	0	0	0	0	17	17	17	17	17	17	17	18	18	18	18	20	20	
Net Operating Cashflow	0	0	0	0	0	0	0	0	0	190	191	193	195	197	199	201	203	205	208	210	237	239	
Financial Evaluation Based on Total Capital (million current US\$)																							
Capital Cost, exclude IDC	38.6	38.2	80.3	109.3	194.9	231.3	251.0	125.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Net Operating Cashflow	0	0	0	0	0	0	0	0	0	190	191	193	195	197	199	201	203	205	208	210	237	239	
Total Net Cashflow (including tax payment)	-39	-58	-83	-109	-195	-231	-251	-126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cumulative Cashflow	-39	-97	-180	-290	-484	-716	-967	-1093	-1093	-903	-712	-518	-323	-126	74	275	479	684	892	1101	3725	3954	
IRR CALCULATION																							
Investment Expenditure Incl IDC	39	58	83	109	195	231	251	126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Net after Tax on Profit excl. Depreciation, Interest and repayments	0	0	0	0	0	0	0	0	-1	193	197	199	201	203	205	207	210	212	214	216	246	246	
Net Cash Flow	-39	-58	-83	-109	-195	-231	-251	-126	-1	193	197	199	201	203	205	207	210	212	214	216	246	246	
IRR = 11.63% During the 25 Concession Years																							
Returns on Total Equity																							
Equity Input	11,7425	17,851738	25,7111	33,942	60,3913	72,2242	79,121	42,0864	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Dividends Received	0	0	0	0	0	0	0	0	0	141	183	185	187	189	191	193	195	184	175	175	209	212	
Net Cash Flows	-12	-18	-26	-34	-60	-72	-79	-42	0	141	183	185	187	189	191	193	195	184	175	175	209	212	
IRR = 23.848% During the 25 Concession Years																							
DEBT SERVICE COVERAGE RATIO																							
DSCR Definition 1:																							
NOTE: Definition 1 = (Net after tax profit excl. deprin. interest and repayments) / (Principal and interest payments)																							

