

表4.4.1 WAPDAの電源別発電電力量

(GWh)

Fiscal Year Ending 30th June	HYDEL		THERMAL				TOTAL Generation :
	Generation :	Percentage to total :	WAPDA Generation :	Percentage to total :	Private Generation :	Percentage to total :	
1965	1362	55.3	1101	44.7			2463
1966	1425	49.0	1484	51.0			2909
1967	1530	50.7	1486	49.3			3016
1968	2482	68.0	1166	32.0			3648
1969	2792	63.9	1579	36.1			4371
1970	2915	56.5	2247	43.5			5162
1971	3449	60.1	2291	39.9			5740
1972	3679	61.0	2350	39.0			6029
1973	4355	63.7	2481	36.3			6836
1974	4141	57.7	3038	42.3			7179
1975	4359	54.2	3682	45.8			8041
1976	5436	65.7	2840	34.3			8276
1977	5183	59.3	3551	40.7			8734
1978	7466	74.0	2623	26.0			10089
1979	8353	78.7	2256	21.3			10609
1980	8718	71.9	3406	28.1			12124
1981	9046	68.5	4160	31.5			13206
1982	9526	64.5	5242	35.5			14768
1983	11366	68.9	5126	31.1			16492
1984	12822	71.0	5230	29.0			18052
1985	12245	65.2	6532	34.8			18777
1986	13804	65.6	7251	34.4			21055
1987	15251	64.5	8379	35.5			23630
1988	16689	60.8	10762	39.2			27451
1989	16974	58.7	11924	41.3			28898
1990	16925	53.9	14502	46.1			31427
1991	18298	53.1	16137	46.9			34435
1992	18647	49.0	19419	51.0			38066
1993	21111	51.8	19680	48.2			40791
1994	19436	45.8	22960	54.2			42396
1995	22858	49.6	23268	50.4			46126
1996	23206	47.5	25653	50.4			48859
1997	20858	41.1	19184	37.8	10740	21.1	50782
1998	22060	41.4	17619	33.1	13580	25.5	53259

Source: WAPDA Power Systems Statistics

表4.4.2 各州の電圧別送電線全長

Province Voltage/ Fiscal Year Ending 30 June	Punjab			Sindh			N.W.F.P.			Balochistan			Total		
	500 KV	220 KV	132 KV	500 KV	220 KV	132 KV	500 KV	220 KV	132 KV	500 KV	220 KV	132 KV	500 KV	220 KV	132 KV
1980	330	1466	6699	3171	11666	0	438	1219	265	1922	0	0	506	90	596
1981	539	1466	6975	3269	12249	0	438	1223	297	1958	0	0	506	154	660
1982	849	1471	7237	3408	12965	0	438	1256	333	2027	0	0	658	154	812
1983	849	1491	9134	3986	15460	0	574	1339	387	2300	0	0	807	154	961
1984	849	1491	9733	4112	16185	438	574	1524	387	2485	0	0	1539	154	1693
1985	849	1491	9956	4131	16427	438	574	1524	529	2627	0	0	1539	154	1693
1986	1170	1491	10717	4603	17981	438	574	1611	529	2714	0	0	1663	154	1817
1987	1170	1701	11637	4699	19207	438	574	1839	603	3016	0	0	1677	154	1831
1988	1170	1899	11834	4774	19677	438	574	1937	603	3114	0	0	1739	154	1893
1989	1170	1899	11940	4794	19803	438	574	2009	683	3266	0	0	1812	154	1966
1990	1488	1953	12042	4794	20277	438	574	2044	683	3301	0	0	1835	229	2064
1991	1800	2155	12376	4896	21227	438	574	2225	683	3482	0	0	2043	229	2272
1992	1800	2181	12700	4905	21586	438	574	2269	683	3526	0	0	2061	229	2290
1993	1800	2241	12840	4939	21820	438	574	2393	683	3650	0	0	2221	229	2450
1994	2242	2535	13138	5113	23028	438	574	2393	683	3650	0	0	2468	229	2697
1995	2777	2877	17119	5190	27963	595	576	2652	723	3951	0	0	2468	241	2709
1996	2777	3105	17440	5222	28544	1065	822	2678	729	4346	0	280	2468	241	2989
1997	2777	3465	17665	5222	29129	1246	822	2678	729	4346	117	822	2552	241	3073
1998	2782	3731	17699	5226	29438	1246	822	2678	729	4346	117	822	2588	241	3109

Source: WAPDA Power Systems Statistics

表4.4.3 北西辺境州で稼働中の変電所

YEAR	500 kV*		220 kV**		132 kV		66 kV		Total	
	No.	Capacity MVA	No.	Capacity MVA	No.	Capacity MVA	No.	Capacity MVA	No.	Capacity MVA
1980	0	0	0	0	18	531			18	531
1981	0	0	0	0	21	625			21	625
1982	0	0	0	0	23	638			23	638
1983	0	0	1	320	25	659			26	979
1984	0	0	1	320	23	633			24	953
1985	0	0	1	320	27	751			28	1071
1986	0	0	1	320	27	874			28	1194
1987	0	0	1	320	30	797			31	1117
1988	0	0	1	320	30	797			31	1117
1989	1	474	1	320	33	836			35	1630
1990	1	474	1	320	36	1162			38	1956
1991	1	474	1	320	37	1279			39	2073
1992	1	474	1	320	37	1463			39	2257
1993	1	474	2	800	37	1503			40	2777
1994	1	474	2	800	39	1542			42	2816
1995	1	474	2	800	42	1600			45	2874
1996	2	924	1	480	48	1828	33	451	84	3683
1997	2	924	1	480	49	1906	32	423	84	3733
1998	2	924	1	653	49	2010	32	468	84	4055

* Tarbela & Peshawar (Kohat Road)

** Mardan

Source: WAPDA Power System Statistics

表4.5.1 第9次5ヶ年計画期間中の発電力増強

Name of Power Station/ Fiscal Year ending 3th June	9TH FIVE YEAR PLAN					
	1998	1999	2000	2001	2002	2003
A. PUBIC SECTOR						
1 Chashma Nuclear	0	0	325	325	325	325
2 Chashma Low Head Hydel	0	0	184	184	184	184
3 Ghazi Barotha Hydel 1-5	0	0	0	0	1160	1450
Subtotal (A)	0	0	509	509	1669	1959
Addition during the year	0	0	509	0	1160	290
B. PRIVATE SECTOR						
1 AES Lal Pir Ltd.	362	362	362	362	362	362
2 Southern Elec. Power Co. Ltd.	117	117	117	117	117	117
3 AES Pak Gen. Ltd.	365	365	365	365	365	365
4 Habib Ullah Energy Ltd.	140	140	140	140	140	140
5 Liberty Power Project	235	235	235	235	235	235
6 Japan Power Gen. Ltd.	0	120	120	120	120	120
7 Rousch Pak Power Ltd.	0	412	412	412	412	412
8 Uch Power Project	0	586	586	586	586	586
9 Fauji Kabirwala	0	157	157	157	157	157
10 Altern Energy Ltd.	0	14	14	14	14	14
11 Eeshatech Ltd.	0	20	20	20	20	20
12 Davis Energon	0	10	10	10	10	10
13 Power Gen. System	0	116	116	116	116	116
14 Saba Power Co.	0	114	114	114	114	114
15 Northern Electric Co.	0	6	6	6	6	6
Subtotal (B)	1219	2774	2774	2774	2774	2774
Addition during the year (Thermal)	1219	1555	0	0	0	0
Total (A+B)	1219	2774	3283	3283	4443	4733
Total Addition during the year	1219	1555	509	0	1160	290

Source: WAPDA Power Systems Statistics

表4.5.2 北西辺境州における私企業の水力発電プロジェクト

Sr. No.	Project Name	Site / Location	Peak power (MW)	Annual energy (GWh)	Approx. cost (Mill US \$)	Start of Feasibility Study	Expected completion date	REMARKS
1	Ranolia	Kohistan	12	64	11,000	-	-	Feasibility completed
2	Batal Khwar	Swat	8	45	11,000	-	-	Feasibility completed
3	Shishi	Chitral	2	17	4,000	-	-	Feasibility completed
4	Summar Gah	Kohistan	28	102	17,000	-	-	Feasibility completed
5	Matiltan	Swat	84	345	95,000	-	-	Feasibility completed
6	Daral Khwar	Swat	37	128	22,000	July 1993	June 1998	Feasibility in progress
7	Duber	Kohistan	122	566	97,000	Feb. 1995	Oct. 1998	Feasibility in progress
8	Khan Khwar	Swat	66	333	72,000	-	-	Feasibility completed
9	Allai-IV	Mansehra	124	518	93,000	-	-	Feasibility completed
10	Malakand-III	Swat	75	527	74,000	-	-	Pre-feasibility completed
11	Spat Gah / Chor Nala Stage I & II	Kohistan	851	3661	829,000	-	-	PC-II under preparation
12	Kanidiob System Stage-I: Karrang Stage-II: Kaigah	Kohistan	454 549	1635 1942	348,000 808,000	-	-	PC-II under preparation
13	Swat System Swat scheme B1 Swat scheme A1	Swat	429 105	1783 390	401,000 113,000	-	-	PC-II under preparation
14	Kaghan System Stage-I: Naran Stage-II: Suki Kinari	Mansehra	219 652	866 2797	720,000 611,000	-	-	PC-II under preparation
			3817	15719				

Source: SHYDO

表4.5.3 500/220 kV 送電線擴張計畫

New Substation	Line Description	From Substation	To Substation	No. of SC Lines	Length of SC Lines	Year of Completion
500 kV Lines						
Rousch PH	In/Out at Rousch PH	Multan	Gatti	2	3	1998
M. Garh	In/Out at M. Garh	Guddu	Multan	2	8	1999
		M. Garh	Gatti	1	277	2000
R.Y. Khan	In/Out at R.Y. Khan	Guddu	Multan	2	56	2001
Moro		Jamshoro	Moro	1	174	2001
		Moro	R.Y. Khan	1	355	2001
		Moro	Dadu	1	35	2001
G.Barotha	In/Out at G.Barotha	Tarbela	Gatti	2	30	2001-02
	In/Out at G.Barotha	Tarbela	Gatti	2	37	2001-02
		G.Barotha	Rewat	1	108	2001-02
		G.Barotha	Rewat	1	108	2001-02
Gujranwala	In/Out at Gujranwala	Tarbela	Lahore	2	10	2001-02
		Rewat	Gujranwala	1	179	2001-02
		Gujranwala	Lahore	1	65	2001-02
	In/Out at	Lahore	Multan	2		2002
				No. of	Length of	
220 kV Lines				DC Lines	DC Lines	
	Circuit #2 & 3	Guddu	Sibbi	1	249	1998
	In/Out at M. Garh	Kot Addu	Multan	1	2.5	1998
		Kot Addu	Multan	1	85	1998
Samundri Rd	In/Out at Samundri Rd	Nishatabad	Multan	1	4	1998
Ibd. P. Rd.	In/Out at Ibd. P. Rd.	Tarbela	Rewat	2	5	1998
Vehari	In/Out at Vehari	Multan	Yousufula	2	5	1998
AES Pak Gen.		AES Pak Gen	M. Garh	1	20	1998
	In/Out at Burhan	Tarbela	Rewat	1	10	1998
Sialkot	In/Out at Sialkot	Ghakar	K.S. Kaku	1	25	1998
Uch PH	In/Out at Uch PH	Guddu	Sibbi	2	20	1998
		K.S. Kaku	Ravi	1	25	1998
Chashuma		Chashuma	Daudkhel	1	75	1999
Shikarpur	In/Out at Shikarpur	Guddu	Sibbi	1	30	1999-00
Islamabad-U		Rewat	Islamabd-U	1	25	1999-00
		Ibd. P. Rd.	Islamabd-U	1	35	1999-00
Ludewala		Gatti	Ludewala	1	100	1999-00
Bannu		Daudkhel	Bannu	1	100	1999-00
Shahibagh		Peshawar	Shahibagh	1	20	1999-00
		Shahibagh	Mardan	1	56	1999-00
Hydelabad		Jamshoro	Hydelabad	1	30	1999-00
Bahawalpur		M. Garh	Bahawalpur	1	90	1999-00
Noshera Ind.		G. Barotha	Noshera Ind.	1	69	2001
		Shahibagh	Noshera Ind.	1	40	2001
Gujranwala	In/Out at Gujranwala	Mangla	Ghakar	2	9	2001-02
Mianchannu	In/Out at Mianchannu	Vehari	Multan	2	20	2003
Manshehra		Manshehra	Ibd. P. Rd.	1	110	2003
Allai IV		Manshehra	Allai IV	1	90	2003
DI Khan		Kot Addu	D.I. Khan	1	140	2003
		D.I. Khan	Daudkhel	1	110	2003

Source: WAPDA

表 6.5.1 土地利用別・洪水被害単価まとめ

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.

表 6.6.1(1) スワット川氾濫区域("A"エリア)における既往洪水被害額
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)	
		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 (Firm)	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 (Firm)	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 (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	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% ^{*1}									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.

表 6.6.1(2) カブール川氾濫区域("B-1"エリア)における既往洪水被害額

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
									456.67

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.464,636	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 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.

表 6.6.1(3) カブール川氾濫区域("B-2"エリア)における既往洪水被害額

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)	
		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 (Farm)	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 (Farm)	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 (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	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.

表 6.6.1(4) カブール川氾濫区域("C"エリア)における既往洪水被害額
1929 Flood

Class	Flood damage Factor	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)	
	[Rs/km ²]	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.283,637	Rs.260,478	Rs.183,038			3.10
Other Direct Damages 30% ^{*1}									56.60
Indirect Damages 20% ^{*2}									49.05
									294.31

1995 Flood

Class	Flood damage Factor	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)	
	[Rs/km ²]	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% ^{*1}									22.41
Indirect Damages 20% ^{*2}									19.42
									116.54

Normal Year Flood

Class	Flood damage Factor	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)	
	[Rs/km ²]	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.190,078	Rs.0	Rs.35,200	Rs.42,240	Rs.42,240			0.31
Other Direct Damages 30% ^{*1}									6.83
Indirect Damages 20% ^{*2}									5.92
									35.53

No Damage Flood

Class	Flood damage Factor	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)	
	[Rs/km ²]	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% ^{*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.

表 6.7.1 年平均洪水被害額(ムンダダム建設前)

洪水調節容量のケース [10⁶ m³]= 0

生起 確率年 (Years)	生起確率	洪水ピーク 流入量 (m ³ /s)	洪水ピーク 流出量 (洪水調節後) (m ³ /s)	下流 洪水被害額 (10 ⁶ Rs.)	平均 被害額 (10 ⁶ Rs.)	生起確率 の間隔	年平均 洪水被害額 (10 ⁶ 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			
年平均洪水被害想定額 (10 ⁶ Rupees)=							48.22
							(1999 Prices)

表 6.7.2 年平均洪水被害額(ムンダダム建設後)

洪水調節容量のケース [10^6 m^3]= 1

生起 確率年 (Years)	生起確率	洪水ピーク 流入量 (m^3/s)	洪水ピーク 流出量 (洪水調節後) (m^3/s)	下流 洪水被害額 (10^6 Rs.)	平均 被害額 (10^6 Rs.)	生起確率 の間隔	年平均 洪水被害額 (10^6 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			
				3403527847	年平均洪水被害想定額 (10^6 Rupees)=		45.74 (1999 Prices)

表7.2.1 開發規模比較表一覽(1/2)

Alternatives	PSL-505			PSL-510			PSL-515			PSL-520			PSL-525			PSL-530			PSL-535			PSL-540			PSL-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
PSL (EL.m)	305.0	305.0	305.0	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	545.0	545.0	545.0	545.0	545.0	545.0	545.0	545.0	545.0		
MOL (EL.m)	487.0	490.0	495.0	488.0	495.0	500.0	490.0	495.0	505.0	491.0	491.0	500.0	493.0	505.0	515.0	494.0	505.0	520.0	495.0	510.0	525.0	496.0	500.0	515.0	497.0	505.0	520.0	497.0	505.0	520.0	497.0	505.0	520.0		
Sediment level (EL.m)	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	474.0	474.0	474.0	474.0	474.0	474.0	474.0	474.0	474.0		
Dam crest (EL.m)	51.0	51.0	51.0	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	549.0	549.0	549.0	553.0	553.0	553.0	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	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	156	521	381	176	589	401	176	667	625	420	772	672	467	772	672	467	772	672	467		
Rated head (m)	124.5	125.4	127.0	130.2	131.7	131.7	131.7	133.3	136.5	134.5	138.1	141.2	137.8	142.8	146.0	141.6	146.0	150.7	145.0	150.7	155.5	148.5	149.8	155.5	152.0	152.0	152.0	152.0	152.0	152.0	152.0	152.0	152.0		
Maximum discharge (m ³ /sec)	250	230	205	270	240	210	295	270	210	325	280	210	350	290	220	380	330	230	410	330	230	440	425	340	480	440	360	480	440	360	480	440	360		
Peak power output (MW)	280	260	235	281	260	235	351	325	259	394	349	268	435	374	290	484	434	313	537	449	323	590	575	477	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	150 x 2	190 x 3	175 x 2	155 x 2	147 x 3	123 x 3	145 x 2	160 x 3	149 x 3	155 x 2	135 x 4	150 x 3	160 x 2	148 x 4	145 x 4	160 x 3	165 x 4	165 x 4	130 x 4	165 x 4	165 x 4	130 x 4	165 x 4	165 x 4	130 x 4		
Installed capacity (MW)	280	260	240	310	280	250	350	330	260	390	350	270	440	370	290	490	430	310	540	450	320	590	570	480	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		
Annual energy	1,270	1,212	1,144	1,375	1,289	1,159	1,499	1,454	1,240	1,620	1,527	1,266	1,753	1,610	1,370	1,875	1,771	1,446	1,992	1,846	1,492	2,093	2,090	1,997	2,222	2,222	2,053	2,222	2,222	2,053	2,222	2,222	2,053		
Total (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	745	666	745	745	666	745	745	666		
Firm (GWh)	907	865	820	972	913	848	1,038	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	1,416	1,327	1,477	1,477	1,387	1,477	1,477	1,387	1,477	1,477	1,387		
Secondary (GWh)	51%	53%	54%	50%	52%	54%	48%	50%	54%	47%	49%	54%	45%	49%	53%	43%	47%	53%	42%	46%	53%	40%	41%	46%	38%	38%	45%	38%	38%	45%	38%	38%	45%		
Plant factor	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	524.5	492.7	592.4	567.3	506.4	629.1	576.8	522.1	665.9	643.1	595.1	711.3	711.3	636.9	711.3	711.3	636.9	711.3	711.3	636.9		
Economic cost (US\$ Million)	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		
Economic analysis	11.1%	10.7%	10.3%	11.5%	11.1%	10.7%	12.0%	11.9%	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%	12.8%	12.6%	12.7%	12.7%	12.8%	12.7%	12.7%	12.8%	12.7%	12.7%	12.8%		
NPV (US\$ Mil)	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%		
B/C	11.1%	10.7%	10.3%	11.5%	11.1%	10.7%	12.0%	11.9%	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%	12.8%	12.6%	12.7%	12.7%	12.8%	12.7%	12.7%	12.8%	12.7%	12.7%	12.8%		
IRR	11.1%	10.7%	10.3%	11.5%	11.1%	10.7%	12.0%	11.9%	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%	12.8%	12.6%	12.7%	12.7%	12.8%	12.7%	12.7%	12.8%	12.7%	12.7%	12.8%		

Notes: 1) Feeding hour = 4 hours. Dependability of 95%
2) Discount rate = 10%

表 7.2.1 開發規模比較表一覽 (2/2)

Alternatives	PSL-550				PSL-565				PSL-570				PSL-580			
	a	b	c	d	a	b	c	d	a	b	c	d	a	b	c	d
PSL (EL, m)	550.0	550.0	550.0	550.0	565.0	565.0	565.0	565.0	570.0	570.0	570.0	570.0	575.0	575.0	575.0	575.0
MOL (EL, m)	499.0	510.0	510.0	510.0	494.0	510.0	510.0	510.0	495.0	515.0	515.0	515.0	497.0	515.0	515.0	515.0
Sediment level (EL, m)	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
Dam crest (EL, m)	558.0	558.0	558.0	558.0	563.0	563.0	563.0	563.0	568.0	568.0	568.0	568.0	582.0	582.0	582.0	582.0
Dam 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	232.0	232.0	232.0	232.0
Effective storage (Million m ³)	866	719	495	231	1,043	894	766	322	1,148	950	637	231	1,296	1,108	795	389
Rated bend (m)	154.9	159.3	164.0	169.7	156.1	162.5	164.0	168.8	174.5	164.7	172.0	179.2	163.1	167.8	175.1	182.4
Maximum discharge (m ³ /sec)	520	460	370	255	580	505	475	380	620	545	425	255	665	605	490	330
Peak power output (MW)	727	661	548	391	816	740	702	578	893	810	660	412	979	916	774	543
Number of unit	183 x 4	165 x 4	138 x 4	120 x 3	205 x 4	185 x 4	175 x 4	145 x 4	148 x 6	203 x 4	165 x 4	133 x 3	163 x 6	153 x 6	193 x 4	135 x 4
Installed capacity (MW)	730	660	550	390	820	740	700	580	890	810	660	410	980	920	770	540
Dependable peak output (MW) *1	560	540	490	370	590	590	580	510	650	640	570	390	680	700	660	510
Annual energy Total (GWh)	2,326	2,285	2,144	1,771	2,402	2,407	2,377	2,230	2,481	2,497	2,385	1,861	2,539	2,610	2,561	2,224
Firm (GWh)	808	789	706	543	859	847	842	747	925	928	832	573	991	1,022	954	732
Secondary (GWh)	1,518	1,496	1,438	1,229	1,543	1,560	1,535	1,483	1,556	1,569	1,553	1,288	1,567	1,589	1,607	1,492
Plant factor	36%	39%	44%	51%	35%	37%	38%	43%	32%	35%	41%	51%	30%	32%	34%	47%
Economic cost (US\$ Million)	751.0	707.4	663.5	598.7	817.6	768.9	748.6	746.4	883.3	804.8	742.1	656.5	957.9	901.0	814.7	736.1
Economic analysis *2 NPV (US\$ M)	169.0	167.2	135.8	64.1	168.8	175.5	169.5	107.5	156.4	183.1	155.6	44.8	164.7	188.0	184.9	105.2
*2 B/C	1.35	1.37	1.32	1.17	1.33	1.36	1.36	1.23	1.28	1.28	1.28	1.33	1.25	1.25	1.25	1.24
IRR	12.8%	13.0%	12.6%	11.4%	12.6%	12.9%	12.8%	11.9%	12.3%	12.8%	12.8%	10.9%	12.3%	12.8%	13.0%	11.9%

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

表8.2.1 ロックフィル材料によるコンクリート表面遮水ロックフィルダム分類

LIMESTONE						
Name of Dam	Country	Dam Height (m)	Year Completed	Upstream Slope	Downstream Slope	
Dix River	Calif. USA	84	1925	1.1-1.2	1.4	
El Tejo	Spain	40	1974	1.3	1.4	
Nevett	Venezuela	115	1981	1.4	1.5	
Alfiorios	Spain	75	1983	1.4	1.4	
Khao Laem	Thailand	130	1984	1.4	1.4	
Alsasun	Spain	50	1985	1.5	1.4	
Bolboei	Romania	56	1985	1.3	1.4	
Xibokou	China	95	1989	1.4	1.4	
Shushuqiao	China	78	1990	1.4	1.7 *1	
U. Siah Bishe	Iran	100	1994	1.5	1.6	
L. Siah Bishe	Iran	130	1994	1.5	1.6 *2	
Messochobu	Greece	135	1994	1.4	1.4	
Baiyun	China	120	1996	1.4	1.4	
Transhengqiao I	China	178	1998	1.4	1.4	
Hon Gjiadu	China	182	U/D	1.4	1.4 *3	
Pankou	China	123	U/D	1.4	1.5	
Ponazca	Romania	52	U/D	1.3	1.4	
Nam Ngum 3	Lao	220	2001	1.4	1.4	
Shui Bu Ya	China	232	U/D	1.4	1.4	
Gordes	Turkey	95	2001	1.4	1.5	
Xiaoxikou	China	68	U/C	1.4	1.3	
Antamina	Peru	115	U/D	1.3	1.3	
GRAVEL						
Name of Dam	Country	Dam Height (m)	Year Completed	Upstream Slope	Downstream Slope	
Kekeya	China	42	1986	1.5	1.5	
Xiaogan Gou	China	55	1990	1.55	1.6	
Upper Guangzhou	China	68	1992	1.4	1.4	
Agumilpa	Mexico	187	1993	1.5	1.4	
Yacambu	Venezuela	162	1996	1.5	1.6	
Wuluwai	China	135	U/C	1.6	1.6 *4	
M'dez	Moreocco	97	P	1.8	1.6	
Los Molles	Argentina	46	P	1.5	1.5	
La Parota	Mexico	162	P	1.5	1.4 *5	
El Cajon	Mexico	189	P	1.5	1.4 *6	
Quimbo	Colombia	150	P	1.5	1.6	
Corrales	Chile	70	2000	1.5	1.6	
Puclaro	Chile	100	2000	1.5	1.6	
La Regadera II	Colombia	90	2002	1.5	1.6	
Daqiao	China	68	U/C	1.5	1.7	
Sogamoso	Colombia	190	U/C	1.4	1.4	
Gudongkou	China	120	U/C	1.4	1.5 *7	
Heiquan	China	124	U/C	1.55	1.4 *5	
West Seti	Nepal	220	P	1.5	1.6	

SHALE AND SCHIST						
Name of Dam	Country	Dam Height (m)	Year Completed	Upstream Slope	Downstream Slope	
Salazar	Portugal	70	1949	1.25	1.4	
Kangaroo	Creat/Australia	50	1968	1.3	1.4	
Oasa	Romania	91	1971	1.3	1.6	
MangroveCr.	Australia	80	1981	1.5	1.6	
Wuluwadi	China	138	1998	1.6	1.6 *4	
Taia	Romania	64	U/D	1.65	1.55	
Bajaotan	China	70	P	1.4	1.4	
Dim	Turkey	135	2001	1.4	1.5	
Granite and GNEISS						
Name of Dam	Country	Dam Height (m)	Year Completed	Upstream Slope	Downstream Slope	
Morena	Calif. USA	54	1895	0.5 - 0.9	1.3	
Strawberry	Calif. USA	50	1916	1.1 - 1.2	1.3	
Salt Springs	Calif. USA	100	1931	1.1 - 1.4	1.4	
Cogswell	Calif. USA	85	1934	1.35	1.6	
L. Bear No.2	Calif. USA	50	1952	1.0	1.4	
Paradela	Portugal	112	1955	1.3	1.3	
Courtright	Calif. USA	98	1958	1.3	1.3	
Wisbon	Calif. USA	82	1958	1.0 - 1.3	1.4	
Vilar	Portugal	55	1965	1.1 - 1.3	1.4	
Fades	France	70	1967	1.3	1.3	
Kootenay	Canal / Canada	37	1975	2.0	1.3	
Rouchain	France	60	1976	1.4	1.4	
Fantalele	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	Mendows/Calif. USA	82	1988	1.5	1.5	
Balsam	Mendows/Calif. USA	40	1988	1.4	1.4	
Xingo	Brazil	150	1994	1.4	1.3	
Wananxi	China	94	1995	1.4	1.4	
Haichaoba	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	
Caruachi	Venezuela	80	1999	1.3	1.3	
Acena	Spain	65	U/D	1.3	1.3	
Merowe	Sudan	83	P	1.3	1.4	
Yang Yang	S. Korea	93	2000	1.4	1.4	
Mukorsi	Zimbabwe	89	2002	1.3	1.3	
Intebi	Brazil	100	2003	1.3	1.3	
Qiezhishan	China	107	U/C	1.4	1.4	
Gongbaixia	China	130	U/D	1.4	1.4 *8	

*1 Limestone & Slate *3 Limestone & Sandstone *5 Gravel and Gneiss *7 Gravel and Limestone
 *2 Limestone & Basalt *4 Gravel & Schist *6 Gravel and Igmbrite *8 Granite and Gravel
 (Source : International Water Power and Dam Construction, Year Book 1999)

表9.2.1 勞務賃金

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	

表9.2.2 建設材料単価

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

表9.2.3 建設機械時間單價

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

表9.2.4 事業費総括表

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

表9.2.5 積算内訳書(仮排水トンネル)

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

表9.2.6 積算内訳書(土木工事)

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 excavati	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

表9.2.6 積算内訳書(土木工事)

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

表9.2.6 積算内訳書(土木工事)

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

表9.2.7 積算内訳書(ゲート及びペンストック)

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

表9.2.8 積算内訳書(機電工事)

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

表9.2.9 積算内訳書(灌漑施設-右岸)

Description	Unit	Qty	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

表9.2.10 積算内訳書(灌漑施設-左岸)

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/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	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

表9.2.11 積算内訳書(土地収用・補償費)

Description	Unit	Quantity	Unit Price (Rs.)	Amount (Rs.)	Amount (US\$ equiv.)
1 Land acquisition (10 ha)	LS			20,000,000	400,000
3 Replacement 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 panel	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

表9.2.12 積算内訳書(環境対策費)

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

表9.2.13 年間支出計画表

Description	Foreign Currency Portion (mio US\$)										Local Currency Portion (mio US\$)										Total			
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total	2000	2001	2002	2003	2004	2005	2006	2007		2008	2009	2010
I. Base Cost																								
(1) Local Contract																								
I-1 : Access Road																								
I-2 : WAPDA Camp																								
I-3 : Power supply system																								
Sub-total (1)																								
(2) International Contract																								
I-1 : Diversion Tunnel																								
I-2 : Main Civil Works																								
I-3 : Gate and Penstock																								
I-4 : Turbines and Auxiliaries																								
I-5 : Generators and Auxiliaries																								
I-6 : Switchgear Equipment																								
I-7 : Transmission Line & S/S																								
I-8 : Irrigation Facilities																								
Sub-total (2)																								
Total (1)+(2)																								
(3) Engineering Service																								
(4) Administration																								
(5) Land Compensation																								
(6) Environmental Mitigation																								
Total (1) to (6)																								
(7) Tax																								
Sub-total (base cost)																								
II. Contingency																								
Price Contingency																								
Physical Contingency																								
Sub-total (contingency)																								
Total project cost																								

表 12.1.1 建設支出計画

Year		Foreign (Mill.US\$)	Local (Mill.US\$)	Total (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	90	207	18.0%
6th Year	2007	136	103.9	239.9	20.9%
7th Year	2008	136	118.2	254.2	22.1%
8th Year	2009	65.1	59.4	124.5	10.8%
		611.8	537	1148.8	100.0%

表 12.3.1 回避費用分析

	Combined Cycles (CCHQ)	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: HEPO-WAPDA and the World Bank

表12.5.1 回避費用感度分析 (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	4886

Assumptions:

Exchange Rate, US\$ 1=Ruppes	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%	\$640.61
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

表 12.5.2 回避費用感度分析 (Without 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	5.8	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	871.37	183.89	1055.16	41779.78	2553.06	77833.47	4273.48	289.7	46.0	0.0	7162.26	6107.10

Exclude Irrigation Cost

Exchange Rate, 1 US\$=	50
Capacity	740
Capacity Factor	37.14%
Auxiliary Rate & Line Loss	1.3%
O & M Cost	0.50%
LRMC Peak	\$0.061
LRMC Off-peak	\$0.055
Economic Cost per KW	994.01
Agricultural benefit	5.79
Flood control benefit	0.92
Environment benefit per year	0
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

表12.5.3 回避費用感度分析 (With Environmental Benefits)

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	2583.04	77033.47	4273.48	289.7	46.0	1,214.0	8376.24	7321.88

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

表12.5.4 消費者余剰に基づく費用対効果分析

(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	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
2	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
3	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
4	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
5	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
6	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
7	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
8	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
9	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
10	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
11	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
12	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
13	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
14	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
15	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
16	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
17	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
18	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
19	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
20	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
21	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
22	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
23	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
24	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
25	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
26	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
27	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
28	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
29	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
30	135.7	3.7	139.4	91.4	84.3	5.8	0.9	0.0	182	43.0
31	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
32	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
33	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
34	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
35	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
36	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
37	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
38	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
39	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
40	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
41	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
42	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
43	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
44	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
45	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
46	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
47	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
48	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
49	0.0	3.7	3.7	91.4	84.3	5.8	0.9	0.0	182	178.7
50	0.0	3.7	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		

表12.5.5 費用対効果分析 (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	6826.54	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		

表12.5.6 プロジェクト全体の財務分析

(Unit: Million US\$)

Year	Cost					Total	Primary Generation	Primary Benefit	Secondary Generation	Secondary Benefit	Agrl.	Flood	Env.	Total	Net Benefits
	Financial Price	O&M	Water Charge	Tax	Total										
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	217.06	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	90.14	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	92.94	1540.67	137.01	3.7	1.0	0.0	234.66	217.67	
22	0.00	11.49	5.54	0.00	17.03	835.60	93.35	1540.67	138.41	3.7	1.0	0.0	236.96	219.99	
23	0.00	11.49	5.54	0.00	17.03	835.60	92.26	1540.67	136.09	3.7	1.0	0.0	233.12	216.09	
24	0.00	11.49	5.54	0.00	17.03	835.60	93.19	1540.67	137.45	3.7	1.0	0.0	235.40	218.37	
25	0.00	11.49	5.54	0.00	17.03	835.60	94.12	1540.67	138.83	3.7	1.0	0.0	237.71	220.68	
26	0.00	11.49	5.54	0.00	17.03	835.60	95.06	1540.67	140.21	3.7	1.0	0.0	240.04	223.01	
27	0.00	11.49	5.54	0.00	17.03	835.60	96.01	1540.67	141.62	3.7	1.0	0.0	242.39	225.36	
28	0.00	11.49	5.54	0.00	17.03	835.60	96.97	1540.67	143.03	3.7	1.0	0.0	244.76	227.74	
29	0.00	11.49	5.54	0.00	17.03	835.60	97.94	1540.67	144.46	3.7	1.0	0.0	247.16	230.14	
30	0.00	11.49	5.54	0.00	17.03	835.60	98.92	1540.67	145.91	3.7	1.0	0.0	249.59	232.56	
31	0.00	11.49	5.54	0.00	17.03	835.60	102.61	1540.67	151.35	3.7	1.0	0.0	258.72	241.69	
32	0.00	11.49	5.54	0.00	17.03	835.60	103.63	1540.67	152.86	3.7	1.0	0.0	261.26	244.23	
33	0.00	11.49	5.54	0.00	17.03	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	246.80	
34	0.00	11.49	5.54	0.00	17.03	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	246.80	
35	0.00	11.49	5.54	0.00	17.03	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	246.80	
36	0.00	11.49	5.54	0.00	17.03	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	246.80	
37	0.00	11.49	5.54	0.00	17.03	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	246.80	
38	135.70	11.49	5.54	0.00	152.73	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	111.10	
39	0.00	11.49	5.54	0.00	17.03	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	246.80	
40	0.00	11.49	5.54	0.00	17.03	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	246.80	
41	0.00	11.49	5.54	0.00	17.03	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	246.80	
42	0.00	11.49	5.54	0.00	17.03	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	246.80	
43	0.00	11.49	5.54	0.00	17.03	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	246.80	
44	0.00	11.49	5.54	0.00	17.03	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	246.80	
45	0.00	11.49	5.54	0.00	17.03	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	246.80	
46	0.00	11.49	5.54	0.00	17.03	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	246.80	
47	0.00	11.49	5.54	0.00	17.03	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	246.80	
48	0.00	11.49	5.54	0.00	17.03	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	246.80	
49	0.00	11.49	5.54	0.00	17.03	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	246.80	
50	0.00	11.49	5.54	0.00	17.03	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	246.80	
51	0.00	11.49	5.54	0.00	17.03	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	246.80	
52	0.00	11.49	5.54	0.00	17.03	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	246.80	
53	0.00	11.49	5.54	0.00	17.03	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	246.80	
54	0.00	11.49	5.54	0.00	17.03	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	246.80	
55	0.00	11.49	5.54	0.00	17.03	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	246.80	
56	0.00	11.49	5.54	0.00	17.03	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	246.80	
57	0.00	11.49	5.54	0.00	17.03	835.60	104.67	1540.67	154.39	3.7	1.0	0.0	263.82	246.80	
Total	1294.60	574.45	376.80	0.00	2135.85	41779.78	4919.39	77033.47	7256.25	106.4	51.7	0.0	12413.91	10277.92	

Exchange Rate, 1 US\$=	50
Capacity	740
Capacity Factor (Peak Power)	13.06%
Total Capital cost	11.49
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\$	698.08
NPV of Generation, GWh	19,733.69
Average Incremental Cost, \$/kWh	0.035

表12.5.7 財務分析 (Power Only)

(Unit: Million US\$)

Year	Cost					Total Cost	Primary Generation	Primary Benefit	Secondary Generation	Secondary Benefit	Total	Net Benefits
	Financial 1999 Price	O&M	Water Charge	Tax								
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
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

FIRR in 50 years	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

表12.5.8 費用対効果分析 (Irrigation Only)

表12.5.9 財務分析 (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

(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 9.705%
 O & M Cost 0.000 Total Net Bene 10% -\$1.00
 Agricultural benefit 5.794 Total Cost 10% \$27.80

Exchange Rate, 1 US\$= 50 EIRR 4.053%
 O & M Cost 0.000 Total Benef 12% \$27.18
 Agricultural benefit 3.729 Total Cost 12% \$39.69

表12.5.10 費用対効果分析 (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

表12.5.11 財務分析 (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

表12.6.1 電氣料金計算

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
Levelling 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	Primary	1,884	Secondary	3,474	Total	5,358
Net Present Value of Energy Revenue in 1999=	US\$		198		292		490
Levelized Tariff US\$ =	1999		0.1052		0.084		0.092