** OPERATION STUDY OF KALIWA P/T ** (PEAK POWER GENERATION T = 4 HOUR/DAY)

** CASE 13 ** PR = 180 MW , MAX,T,W,L, = 165,000 M , DIA, OF H,R,TUNNEL = 8,3 M
QR = 238,50 CMS , RH = 89,550 M , ALPHA = 0,0000517

KW KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0234
KW V,	63,35	111,76	160,25

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION						PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	95 % POWER (MW)	ANNUAL P,B, (M,D,)	ENERGY GENERATED (GWH)	ANNUAL E,B, (M,D,)	PRESENT WORTH (M,D,)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M,D,)	PRESENT WORTH (M,D,)
1994	0,90909	1460,	149,4	9,47	255,9	17,46	24,47	2450,	441,0	18,74	18,74
1995	0,82645	1460,	149,8	9,49	256,1	17,46	22,27	2451,	441,2	18,75	17,05
1996	0,75131	1460,	150,1	9,51	256,2	17,47	20,27	2452,	441,3	18,76	15,50
1997	0,68301	1460,	150,4	9,53	256,3	17,48	18,45	2453,	441,5	18,76	14,10
1998	0,62092	1460,	150,8	9,55	256,4	17,49	16,79	2454,	441,7	18,77	12,82
1999	0,56447	1460,	151,1	9,57	256,5	17,49	15,28	2455,	441,8	18,78	11,66
2000	0,51316	1460,	151,4	9,59	256,6	17,50	13,90	2456,	442,0	18,79	10,60
2001	0,46651	1460,	151,8	9,62	256,7	17,51	12,65	2456,	442,1	18,79	9,64
2002	0,42410	1460,	152,2	9,64	256,8	17,51	11,52	2457,	442,2	18,80	8,77
2003	0,38554	1460,	152,6	9,67	256,9	17,52	10,48	2458,	442,4	18,80	7,97
2004	0,35049	1460,	153,0	9,69	257,0	17,52	9,54	2458,	442,5	18,81	7,25
2005	0,31863	1460,	153,3	9,71	257,0	17,53	8,68	2459,	442,6	18,81	6,59
2006	0,28966	1460,	153,6	9,73	257,1	17,53	7,90	2459,	442,7	18,81	5,99
2007	0,26333	1460,	153,9	9,75	257,1	17,54	7,19	2460,	442,7	18,82	5,45
2008	0,23939	1460,	154,2	9,77	257,2	17,54	6,54	2460,	442,8	18,82	4,96
2009	0,21763	1460,	154,5	9,79	257,2	17,54	5,95	2460,	442,9	18,82	4,51
2010	0,19784	1460,	154,5	9,79	257,2	17,54	5,41	2460,	442,9	18,82	4,10
2042	0,00937	1460,	154,5	9,79	257,2	17,54	0,26	2460,	442,9	18,82	0,19
2043	0,00852	1460,	154,5	9,79	257,2	17,54	0,23	2460,	442,9	18,82	0,18
SUMMARY	9,91481	1460,	153,7	9,74	257,1	17,53	269,04	2459,	442,6	18,81	204,90

********** SUMMARY OF OPERATION STUDY **********

	PEAK POWER GENERATION								PUMP OPERATION				
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)
1994	257,51	161,12	98,85	2,56	0,86	175,3	222,11	1460,	255,9	2450,	441,0	96,40	97,33	132,36
2000	257,51	160,63	94,35	2,54	0,86	175,8	221,55	1460,	256,6	2456,	442,0	96,89	97,80	131,72
2005	257,51	160,31	94,67	2,54	0,86	176,1	221,14	1460,	257,0	2459,	442,6	97,21	98,11	131,31
2009	257,51	160,15	94,84	2,53	0,86	176,2	220,93	1460,	257,2	2460,	442,9	97,37	98,27	131,10

** OPERATION STUDY OF KALIWA P/T ** (W,S, AND P,G, BY EXCESS WATER)

** CASE 14 ** PR = 180 MW , MAX,T,W,L, = 155,000 M , DIA, OF H,R,TUNNEL = 8,3 M
QR = 213,87 CMS , RH = 99,860 M , ALPHA = 0,0000576

	KWH VALUE IN US D (POWER GENERATION)			KWH COST IN US D (PUMP OPERATION)	
TIME	0,	1950,	2550,	TIME 0,	
KWH V,	0,0682	0,0425	0,0234	COST	0,0425

********** BENEFIT AND COST CALCULATION **********

	POWER GENERATION				PUMP OPERATION			
YEAR P,W,F,	OPERATION HOUR (H)	ENERGY GENERATED (GWH)	ANNUAL BENEFIT (M US D)	PRESENT WORTH (M US D)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M US D)	PRESENT WORTH (M US D)
1994 0,90909	131,	23,6	1,61	1,46	94,	16,9	0,72	0,72
1995 0,82645	118,	21,2	1,45	1,20	341,	61,5	2,61	2,37
1996 0,75131	105,	18,9	1,29	0,97	589,	106,0	4,51	3,72
1997 0,68301	92,	16,5	1,13	0,77	837,	150,6	6,40	4,81
1998 0,62092	79,	14,2	0,97	0,60	1084,	195,2	8,30	5,67
1999 0,56447	66,	11,9	0,81	0,46	1332,	239,8	10,19	6,33
2000 0,51316	53,	9,5	0,65	0,33	1580,	284,4	12,09	6,82
2001 0,46651	49,	8,9	0,60	0,28	1715,	308,8	13,12	6,73
2002 0,42410	46,	8,2	0,56	0,24	1851,	333,2	14,16	6,61
2003 0,38554	42,	7,6	0,52	0,20	1986,	357,6	15,20	6,44
2004 0,35049	38,	6,9	0,47	0,16	2122,	382,0	16,23	6,26
2005 0,31863	35,	6,2	0,43	0,14	2258,	406,4	17,27	6,05
2006 0,28966	33,	5,9	0,41	0,12	2349,	422,9	17,97	5,73
2007 0,26333	31,	5,6	0,38	0,10	2441,	439,5	18,68	5,41
2008 0,23939	30,	5,3	0,36	0,09	2533,	456,0	19,38	5,10
2009 0,21763	28,	5,0	0,34	0,07	2625,	472,6	20,08	4,81
2010 0,19784	28,	5,0	0,34	0,07	2625,	472,6	20,08	4,37
2042 0,00937	28,	5,0	0,34	0,00	2625,	472,6	20,08	0,21
2043 0,00852	28,	5,0	0,34	0,00	2625,	472,6	20,08	0,19
SUMMARY 9,91481	39,	6,9	0,47	7,91	2300,	414,0	17,59	129,76

********** SUMMARY OF OPERATION STUDY **********

	----- POWER GENERATION BY EXCESS WATER -----						--- PUMP OPERATION FOR WATER SUPPLY---						
YEAR R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)	W,S, (CMS)
1994 257,51	151,30	111,95	2,10	0,86	180,0	187,89	131,	23,6	94,	16,9	105,36	106,22	121,29	1,46
2000 257,51	150,62	112,29	2,09	0,86	180,0	186,35	53,	9,5	1580,	284,4	106,46	107,30	120,13	23,50
2005 257,51	150,33	112,85	2,06	0,86	180,0	185,79	35,	6,2	2258,	406,4	106,93	107,77	119,68	33,07
2009 257,51	150,17	112,84	2,06	0,86	180,0	185,68	28,	5,0	2625,	472,6	107,19	107,98	119,44	38,17

** OPERATION STUDY OF KALIWA P/T ** (PEAK POWER GENERATION T = 4 HOUR/DAY)

** CASE 14 ** PR = 180 MW , MAX,T,W,L, = 155,000 M , DIA, OF H,R,TUNNEL = 8,3 M
QR = 213,87 CMS , RH = 99,860 M , ALPHA = 0,0000576

KW KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0264
KW V,	63,35	111,76	160,25

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION						PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	95 % POWER (MW)	ANNUAL P,B, (M,D,)	ENERGY GENERATED (GWH)	ANNUAL E,B, (M,D,)	PRESENT WORTH (M,D,)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M,D,)	PRESENT WORTH (M,D,)
1994	0,90909	1460,	149,7	9,48	256,2	17,47	24,50	2437,	438,6	18,64	18,64
1995	0,82645	1460,	150,0	9,50	256,3	17,48	22,30	2438,	438,8	18,65	16,95
1996	0,75131	1460,	150,4	9,53	256,5	17,49	20,30	2439,	439,0	18,66	15,42
1997	0,68301	1460,	150,7	9,55	256,6	17,50	18,47	2440,	439,2	18,67	14,02
1998	0,62092	1460,	151,0	9,57	256,7	17,51	16,81	2441,	439,4	18,67	12,75
1999	0,56447	1460,	151,4	9,59	256,9	17,52	15,30	2442,	439,6	18,68	11,60
2000	0,51316	1460,	151,7	9,61	257,0	17,53	13,93	2443,	439,8	18,69	10,55
2001	0,46651	1460,	152,1	9,63	257,1	17,53	12,67	2444,	439,9	18,69	9,59
2002	0,42410	1460,	152,4	9,65	257,1	17,54	11,53	2444,	440,0	18,70	8,72
2003	0,38554	1460,	152,7	9,68	257,2	17,54	10,49	2445,	440,1	18,70	7,93
2004	0,35049	1460,	153,1	9,70	257,2	17,54	9,55	2445,	440,2	18,71	7,21
2005	0,31863	1460,	153,4	9,72	257,3	17,55	8,69	2446,	440,3	18,71	6,56
2006	0,28966	1460,	153,8	9,74	257,4	17,55	7,91	2446,	440,3	18,71	5,96
2007	0,26333	1460,	154,2	9,77	257,4	17,55	7,19	2447,	440,4	18,72	5,42
2008	0,23939	1460,	154,5	9,79	257,4	17,56	6,55	2447,	440,4	18,72	4,93
2009	0,21763	1460,	154,9	9,81	257,5	17,56	5,96	2447,	440,5	18,72	4,48
2010	0,19784	1460,	154,9	9,81	257,5	17,56	5,42	2447,	440,5	18,72	4,07
2042	0,00937	1460,	154,9	9,81	257,5	17,56	0,26	2447,	440,5	18,72	0,19
2043	0,00852	1460,	154,9	9,81	257,5	17,56	0,23	2447,	440,5	18,72	0,18
SUMMARY	9,91481	1460,	154,1	9,76	257,3	17,55	269,40	2446,	440,3	18,71	203,82

********** SUMMARY OF OPERATION STUDY **********

	PEAK POWER GENERATION								PUMP OPERATION				
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)
1994	257,51	151,30	103,90	2,32	0,86	175,5	200,71	1460,	256,2	2437,	438,6	106,22	107,07	120,26
2000	257,51	150,62	104,59	2,31	0,86	176,0	200,03	1460,	257,0	2443,	439,8	106,90	107,73	119,53
2005	257,51	150,33	104,89	2,30	0,86	176,2	199,72	1460,	257,3	2446,	440,3	107,19	108,02	119,22
2009	257,51	150,17	105,05	2,30	0,86	176,4	199,55	1460,	257,5	2447,	440,5	107,35	108,18	119,05

** OPERATION STUDY OF KALIWA P/T ** (W,S, AND P,G, BY EXCESS WATER)

** CASE 15 ** PR = 180 MW , MAX,T,W,L, = 145,000 M , DIA, OF H,R,TUNNEL = 8,3 M
QR = 194,33 CMS , RH = 109,900 M , ALPHA = 0,0000688

	KWH VALUE IN US D (POWER GENERATION)			KWH COST IN US D (PUMP OPERATION)	
TIME	0,	1950,	2550,	TIME	0,
KWH V,	0,0682	0,0425	0,0234	COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION				PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	ENERGY GENERATED (GWH)	ANNUAL BENEFIT (M US D)	PRESENT WORTH (M US D)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M US D)	PRESENT WORTH (M US D)
1994	0,90909	143,	25,7	1,75	1,59	102,	18,4	0,78	0,78
1995	0,82645	128,	23,1	1,58	1,30	373,	67,2	2,85	2,60
1996	0,75131	114,	20,6	1,40	1,05	644,	116,0	4,93	4,07
1997	0,68301	100,	18,0	1,23	0,84	915,	164,8	7,00	5,26
1998	0,62092	86,	15,5	1,05	0,65	1186,	213,5	9,08	6,20
1999	0,56447	72,	12,9	0,88	0,50	1457,	262,3	11,15	6,92
2000	0,51316	58,	10,4	0,71	0,36	1728,	311,1	13,22	7,46
2001	0,46651	54,	9,7	0,66	0,31	1877,	337,8	14,36	7,37
2002	0,42410	50,	8,9	0,61	0,26	2025,	364,5	15,49	7,23
2003	0,38554	46,	8,2	0,56	0,22	2173,	391,2	16,63	7,05
2004	0,35049	42,	7,5	0,51	0,18	2322,	417,9	17,76	6,85
2005	0,31863	38,	6,8	0,46	0,15	2470,	444,6	18,89	6,62
2006	0,28966	36,	6,5	0,44	0,13	2570,	462,6	19,66	6,26
2007	0,26333	34,	6,1	0,42	0,11	2670,	480,5	20,42	5,92
2008	0,23939	32,	5,8	0,40	0,09	2770,	498,5	21,19	5,58
2009	0,21763	30,	5,5	0,37	0,08	2870,	516,5	21,95	5,26
2010	0,19784	30,	5,5	0,37	0,07	2870,	516,5	21,95	4,78
2042	0,00937	30,	5,5	0,37	0,00	2870,	516,5	21,95	0,23
2043	0,00852	30,	5,5	0,37	0,00	2870,	516,5	21,95	0,21
SUMMARY	9,91481	42,	7,6	0,52	8,61	2514,	452,6	19,23	141,92

********** SUMMARY OF OPERATION STUDY **********

					POWER GENRRATION BY EXCESS WATER				PUMP OPERATION FOR WATER SUPPLY					
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)	W,S, (CMS)
1994	257,51	141,77	121,92	2,11	0,86	180,0	172,58	143,	25,7	102,	18,4	114,84	115,70	111,34	1,46
2000	257,51	140,55	122,27	2,10	0,86	180,0	171,21	58,	10,4	1728,	311,1	116,55	117,38	109,79	23,50
2005	257,51	140,22	122,83	2,08	0,86	180,0	170,70	38,	6,8	2470,	444,6	117,04	117,87	109,39	33,07
2009	257,51	140,15	122,81	2,08	0,86	180,0	170,60	30,	5,5	2870,	516,5	117,17	118,00	109,28	38,17

** OPERATION STUDY OF KALIWA P/T ** (PEAK POWER GENERATION T = 4 HOUR/DAY)

** CASE 15 ** PR = 180 MW , MAX,T,W,L, = 145,000 M , DIA, OF H,R,TUNNEL = 8,3 M
QR = 194,33 CMS , RH = 109,900 M , ALPHA = 0,0000688

KW KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0234
KW V,	63,35	111,76	160,25

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION						PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	95 % POWER (MW)	ANNUAL P,B, (M,D,)	ENERGY GENERATED (GWH)	ANNUAL E,B, (M,D,)	PRESENT WORTH (M,D,)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M,D,)	PRESENT WORTH (M,D,)
1994	0,90909	1460,	148,9	9,43	255,8	17,45	24,44	2427,	436,9	18,57	18,57
1995	0,82645	1460,	149,7	9,49	256,1	17,46	22,27	2429,	437,2	18,58	16,89
1996	0,75131	1460,	150,6	9,54	256,3	17,48	20,30	2431,	437,6	18,60	15,37
1997	0,68301	1460,	151,4	9,59	256,6	17,50	18,50	2433,	438,0	18,61	13,99
1998	0,62092	1460,	152,3	9,65	256,8	17,51	16,86	2435,	438,4	18,63	12,73
1999	0,56447	1460,	153,1	9,70	257,1	17,53	15,37	2438,	438,8	18,65	11,58
2000	0,51316	1460,	153,9	9,75	257,3	17,55	14,01	2440,	439,1	18,66	10,53
2001	0,46651	1460,	154,1	9,76	257,4	17,55	12,74	2440,	439,2	18,67	9,58
2002	0,42410	1460,	154,2	9,77	257,4	17,56	11,59	2440,	439,3	18,67	8,71
2003	0,38554	1460,	154,3	9,77	257,5	17,56	10,54	2441,	439,3	18,67	7,92
2004	0,35049	1460,	154,4	9,78	257,5	17,56	9,58	2441,	439,4	18,67	7,20
2005	0,31863	1460,	154,5	9,79	257,6	17,57	8,72	2442,	439,5	18,68	6,55
2006	0,28966	1460,	154,6	9,79	257,6	17,57	7,93	2441,	439,5	18,68	5,95
2007	0,26333	1460,	154,7	9,80	257,6	17,57	7,21	2441,	439,5	18,68	5,41
2008	0,23939	1460,	154,7	9,80	257,6	17,57	6,55	2441,	439,5	18,68	4,92
2009	0,21763	1460,	154,8	9,81	257,6	17,57	5,96	2441,	439,5	18,68	4,47
2010	0,19784	1460,	154,8	9,81	257,6	17,57	5,42	2441,	439,5	18,68	4,06
2042	0,00937	1460,	154,8	9,81	257,6	17,57	0,26	2441,	439,5	18,68	0,19
2043	0,00852	1460,	154,8	9,81	257,6	17,57	0,23	2441,	439,5	18,68	0,18
SUMMARY	9,91481	1460,	154,3	9,77	257,4	17,56	269,81	2440,	439,2	18,67	203,32

********** SUMMARY OF OPERATION STUDY **********

						PEAK POWER GENERATION				PUMP OPERATION				
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	G (CMS)
1994	257,51	141,77	113,43	2,32	0,86	175,2	183,51	1460,	255,8	2427,	436,9	115,75	116,60	110,39
2000	257,51	140,55	114,68	2,30	0,86	176,2	182,62	1460,	257,3	2440,	439,1	116,97	117,80	109,29
2005	257,51	140,22	115,01	2,29	0,86	176,4	182,28	1460,	257,6	2442,	439,5	117,30	118,12	109,00
2009	257,51	140,15	115,08	2,29	0,86	176,4	182,17	1460,	257,6	2441,	439,5	117,37	118,19	108,94

** OPERATION STUDY OF KALIWA P/T ** (W,S, AND P,G, BY EXCESS WATER)

** CASE 16 ** PR = 160 MW , MAX,T,W,L, = 175,000 M , DIA, OF H,R,TUNNEL = 7,6 M
QR = 275,01 CMS , RH = 77,660 M , ALPHA = 0,0000638

KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0234

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION				PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	ENERGY GENERATED (GWH)	ANNUAL BENEFIT (M US D)	PRESENT WORTH (M US D)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M US D)	PRESENT WORTH (M US D)
1994	0,90909	106,	19,1	1,30	1,18	77,	13,8	0,59	0,59
1995	0,82645	95,	17,2	1,17	0,97	280,	50,4	2,14	1,95
1996	0,75131	85,	15,3	1,04	0,78	483,	87,0	3,70	3,05
1997	0,68301	74,	13,4	0,91	0,62	686,	123,5	5,25	3,94
1998	0,62092	64,	11,5	0,78	0,49	889,	160,1	6,80	4,65
1999	0,56447	53,	9,6	0,66	0,37	1092,	196,6	8,36	5,19
2000	0,51316	43,	7,7	0,53	0,27	1296,	233,2	9,91	5,59
2001	0,46651	40,	7,2	0,49	0,23	1407,	253,3	10,76	5,52
2002	0,42410	37,	6,7	0,45	0,19	1518,	273,3	11,62	5,42
2003	0,38554	34,	6,1	0,42	0,16	1630,	293,4	12,47	5,29
2004	0,35049	31,	5,6	0,38	0,13	1741,	313,4	13,32	5,14
2005	0,31863	28,	5,1	0,35	0,11	1853,	333,5	14,17	4,97
2006	0,28966	27,	4,8	0,33	0,10	1928,	347,1	14,75	4,70
2007	0,26333	25,	4,6	0,31	0,08	2004,	360,7	15,33	4,44
2008	0,23939	24,	4,3	0,30	0,07	2080,	374,4	15,91	4,19
2009	0,21763	23,	4,1	0,28	0,06	2156,	388,0	16,49	3,95
2010	0,19784	23,	4,1	0,28	0,06	2156,	388,0	16,49	3,59
2042	0,00937	23,	4,1	0,28	0,00	2156,	388,0	16,49	0,17
2043	0,00852	23,	4,1	0,28	0,00	2156,	388,0	16,49	0,15
SUMMARY	9,91481	31,	5,6	0,38	6,40	1888,	339,9	14,44	106,50

********** SUMMARY OF OPERATION STUDY **********

							----- POWER GENERATION BY EXCESS WATER -----		--- PUMP OPERATION FOR WATER SUPPLY---					
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)	W,S, (CMS)
1994	257,51	171,03	90,54	3,56	0,86	180,0	232,09	106,	19,1	77,	13,8	85,66	87,08	147,96	1,46
2000	257,51	170,45	90,88	3,53	0,86	180,0	229,97	43,	7,7	1296,	233,2	86,65	88,04	146,47	23,50
2005	257,51	170,17	91,47	3,48	0,86	180,0	229,21	28,	5,1	1853,	333,5	87,10	88,48	145,84	33,07
2009	257,51	169,99	91,47	3,48	0,86	180,0	229,07	23,	4,1	2156,	388,0	87,33	88,70	145,47	38,17

** OPERATION STUDY OF KALIWA P/T ** (PEAK POWER GENERATION T = 4 HOUR/DAY)

** CASE 16 ** PR = 180 MW , MAX.T.W.L. = 175.000 M , DIA. OF H.R.TUNNEL = 7.6 M
QR = 275.01 CMS , RH = 77.660 M , ALPHA = 0.0000638

KW KWH VALUE IN US D (POWER GENERATION)

TIME	0.	1950.	2550.
KWH V.	0.0682	0.0425	0.0234
KW V.	63.35	111.76	160.25

KWH COST IN US D (PUMP OPERATION)

TIME	0.
COST	0.0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION						PUMP OPERATION			
YEAR	P.W.F.	OPERATION HOUR (H)	95 % POWER (MW)	ANNUAL P.B. (M.D.)	ENERGY GENERATED (GWH)	ANNUAL E.B. (M.D.)	PRESENT WORTH (M.D.)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M.D.)	PRESENT WORTH (M.D.)
1994	0.90909	1460.	145.3	9.21	255.5	17.42	24.21	2516.	452.9	19.25	19.25
1995	0.82645	1460.	146.1	9.26	255.6	17.43	22.06	2517.	453.1	19.25	17.50
1996	0.75131	1460.	146.9	9.30	255.8	17.44	20.09	2518.	453.2	19.26	15.92
1997	0.68301	1460.	147.6	9.35	255.9	17.45	18.31	2519.	453.4	19.27	14.48
1998	0.62092	1460.	148.4	9.40	256.1	17.46	16.68	2520.	453.6	19.28	13.17
1999	0.56447	1460.	149.1	9.45	256.2	17.47	15.20	2521.	453.8	19.29	11.98
2000	0.51316	1460.	149.9	9.50	256.3	17.48	13.84	2522.	454.0	19.29	10.89
2001	0.46651	1460.	150.3	9.52	256.4	17.49	12.60	2523.	454.1	19.30	9.90
2002	0.42410	1460.	150.7	9.54	256.5	17.49	11.47	2523.	454.2	19.30	9.00
2003	0.38554	1460.	151.0	9.57	256.6	17.50	10.44	2524.	454.3	19.31	8.19
2004	0.35049	1460.	151.4	9.59	256.7	17.50	9.50	2524.	454.3	19.31	7.44
2005	0.31863	1460.	151.8	9.62	256.7	17.51	8.64	2525.	454.4	19.31	6.77
2006	0.28966	1460.	152.0	9.63	256.8	17.51	7.86	2525.	454.5	19.32	6.15
2007	0.26333	1460.	152.3	9.65	256.8	17.52	7.15	2525.	454.6	19.32	5.60
2008	0.23939	1460.	152.5	9.66	256.9	17.52	6.51	2526.	454.6	19.32	5.09
2009	0.21763	1460.	152.7	9.68	257.0	17.52	5.92	2526.	454.7	19.32	4.63
2010	0.19784	1460.	152.7	9.68	257.0	17.52	5.38	2526.	454.7	19.32	4.21
2042	0.00937	1460.	152.7	9.68	257.0	17.52	0.25	2526.	454.7	19.32	0.20
2043	0.00852	1460.	152.7	9.68	257.0	17.52	0.23	2526.	454.7	19.32	0.18
SUMMARY	9.91481	1460.	151.8	9.62	256.8	17.51	267.35	2525.	454.5	19.31	210.40

********** SUMMARY OF OPERATION STUDY **********

	PEAK POWER GENERATION							PUMP OPERATION					
YEAR	R.W.L. (M)	T.W.L. (M)	E.HEAD (M)	H.LOSS (M)	EATA	POWER (MW)	Q (CMS)	O.HOUR (H)	ENERGY (GWH)	O.HOUR (H)	ENERGY (GWH)	N.HEAD (M)	G.HEAD (M)	Q (CMS)
1994	257.51	171.03	82.40	4.09	0.86	175.0	252.76	1460.	255.5	2516.	452.9	86.50	87.89	146.68
2000	257.51	170.45	83.01	4.06	0.86	175.6	251.82	1460.	256.3	2522.	454.0	87.07	88.45	145.77
2005	257.51	170.17	83.31	4.04	0.86	175.9	251.30	1460.	256.7	2525.	454.4	87.35	88.72	145.33
2009	257.51	169.99	83.50	4.03	0.86	176.0	250.95	1460.	257.0	2526.	454.7	87.53	88.89	145.05

** OPERATION STUDY OF KALIWA P/T ** (W,S, AND P,G, BY EXCESS WATER)

** CASE 17 ** PR = 180 MW , MAX,T,W,L, = 165,000 M , DIA, OF H,R,TUNNEL = 7,6 M
GR = 241,54 CMS , RH = 88,420 M , ALPHA = 0,0000698

KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0234

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

	POWER GENERATION				PUMP OPERATION			
YEAR P,W,F,	OPERATION HOUR (H)	ENERGY GENERATED (GWH)	ANNUAL BENEFIT (M US D)	PRESENT WORTH (M US D)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M US D)	PRESENT WORTH (M US D)
1994 0,90909	118,	21,3	1,45	1,32	85,	15,4	0,65	0,65
1995 0,82645	106,	19,1	1,31	1,08	311,	56,0	2,38	2,16
1996 0,75131	95,	17,0	1,16	0,87	536,	96,5	4,10	3,39
1997 0,68301	83,	14,9	1,02	0,70	762,	137,1	5,83	4,38
1998 0,62092	71,	12,8	0,87	0,54	987,	177,7	7,55	5,16
1999 0,56447	59,	10,7	0,73	0,41	1213,	218,3	9,28	5,74
2000 0,51316	48,	8,6	0,59	0,30	1438,	258,8	11,00	6,21
2001 0,46651	44,	8,0	0,55	0,25	1562,	281,1	11,95	6,13
2002 0,42410	41,	7,4	0,51	0,21	1685,	303,3	12,89	6,01
2003 0,38554	38,	6,8	0,47	0,18	1809,	325,6	13,84	5,87
2004 0,35049	35,	6,2	0,42	0,15	1932,	347,8	14,78	5,70
2005 0,31863	31,	5,6	0,38	0,12	2056,	370,1	15,73	5,51
2006 0,28966	30,	5,4	0,37	0,11	2140,	385,2	16,37	5,22
2007 0,26333	28,	5,1	0,35	0,09	2224,	400,3	17,01	4,93
2008 0,23939	27,	4,8	0,33	0,08	2307,	415,3	17,65	4,65
2009 0,21763	25,	4,6	0,31	0,07	2391,	430,4	18,29	4,38
2010 0,19784	25,	4,6	0,31	0,06	2391,	430,4	18,29	3,98
2042 0,00937	25,	4,6	0,31	0,00	2391,	430,4	18,29	0,19
2043 0,00852	25,	4,6	0,31	0,00	2391,	430,4	18,29	0,17
SUMMARY 9,91481	35,	6,3	0,43	7,13	2095,	377,1	16,03	118,19

********** SUMMARY OF OPERATION STUDY **********

	----- POWER GENERATION BY EXCESS WATER -----						--- PUMP OPERATION FOR WATER SUPPLY---							
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)	W,S, (CMS)
1994	257,51	161,12	100,94	3,13	0,86	180,0	208,28	118,	21,3	85,	15,4	95,56	96,81	133,07	1,46
2000	257,51	160,63	101,28	3,11	0,86	180,0	206,49	48,	8,6	1438,	258,8	96,46	97,69	131,98	23,50
2005	257,51	160,31	101,86	3,07	0,86	180,0	205,83	31,	5,6	2056,	370,1	96,95	98,17	131,40	33,07
2009	257,51	160,15	101,85	3,07	0,86	180,0	205,71	25,	4,6	2391,	430,4	97,17	98,38	131,13	38,17

** OPERATION STUDY OF KALIWA P/T ** (PEAK POWER GENERATION T = 4 HOUR/DAY)

** CASE 17 ** PR = 180 MW , MAX.T,W,L, = 165,000 M , DIA, OF H,R,TUNNEL = 7,6 M
QR = 241,54 CMS , RH = 88,420 M , ALPHA = 0,0000698

KW KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0234
KW V,	63,35	111,76	160,25

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION						PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	95 % POWER (MW)	ANNUAL P,B, (M,D,)	ENERGY GENERATED (GWH)	ANNUAL E,B, (M,D,)	PRESENT WORTH (M,D,)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M,D,)	PRESENT WORTH (M,D,)
1994	0,90909	1460,	149,4	9,47	255,9	17,46	24,47	2484,	447,1	19,00	19,00
1995	0,82645	1460,	149,8	9,49	256,1	17,46	22,27	2485,	447,2	19,01	17,28
1996	0,75131	1460,	150,1	9,51	256,2	17,47	20,27	2486,	447,4	19,01	15,71
1997	0,68301	1460,	150,4	9,53	256,3	17,48	18,45	2486,	447,5	19,02	14,29
1998	0,62092	1460,	150,8	9,55	256,4	17,49	16,79	2487,	447,7	19,03	13,00
1999	0,56447	1460,	151,1	9,57	256,5	17,49	15,28	2488,	447,9	19,03	11,82
2000	0,51316	1460,	151,4	9,59	256,6	17,50	13,90	2489,	448,0	19,04	10,75
2001	0,46651	1460,	151,8	9,62	256,7	17,51	12,65	2490,	448,1	19,05	9,77
2002	0,42410	1460,	152,2	9,64	256,8	17,51	11,52	2490,	448,2	19,05	8,89
2003	0,38554	1460,	152,6	9,67	256,9	17,52	10,48	2491,	448,3	19,05	8,08
2004	0,35049	1460,	153,0	9,69	257,0	17,52	9,54	2491,	448,5	19,06	7,35
2005	0,31863	1460,	153,3	9,71	257,0	17,53	8,68	2492,	448,6	19,06	6,68
2006	0,28966	1460,	153,6	9,73	257,1	17,53	7,90	2492,	448,6	19,07	6,08
2007	0,26333	1460,	153,9	9,75	257,1	17,54	7,19	2493,	448,7	19,07	5,52
2008	0,23939	1460,	154,2	9,77	257,2	17,54	6,54	2493,	448,7	19,07	5,02
2009	0,21763	1460,	154,5	9,79	257,2	17,54	5,95	2493,	448,8	19,07	4,57
2010	0,19784	1460,	154,5	9,79	257,2	17,54	5,41	2493,	448,8	19,07	4,15
2042	0,00937	1460,	154,5	9,79	257,2	17,54	0,26	2493,	448,8	19,07	0,20
2043	0,00852	1460,	154,5	9,79	257,2	17,54	0,23	2493,	448,8	19,07	0,18
SUMMARY	9,91481	1460,	153,7	9,74	257,1	17,53	269,04	2492,	448,6	19,06	207,68

********** SUMMARY OF OPERATION STUDY **********

							PEAK POWER GENERATION				PUMP OPERATION				
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)
1994	257,51	161,12	92,88	3,53	0,86	175,3	224,46	1460,	255,9	2484,	447,1	96,40	97,44	131,94
2000	257,51	160,63	93,38	3,51	0,86	175,8	223,87	1460,	256,6	2489,	448,0	96,89	98,11	131,31
2005	257,51	160,31	93,72	3,49	0,86	176,1	223,44	1460,	257,0	2492,	448,6	97,21	98,42	130,91
2009	257,51	160,15	93,88	3,49	0,86	176,2	223,22	1460,	257,2	2493,	448,8	97,37	98,58	130,71

** OPERATION STUDY OF KALIWA P/T ** (W,S, AND P,G, BY EXCESS WATER)

** CASE 10 ** PR = 180 MW , MAX,T,W,L, = 155,000 M , DIA, OF H,R,TUNNEL = 7,6 M
QR = 216,04 CMS , RH = 98,860 M , ALPHA = 0,0000779

KWH VALUE IN US D (POWER GENERATION) 1950, 0,0682 — KWH COST IN US D (PUMP OPERATION) 2550, 0,0425

TIME 0, 0,0425 — TIME 0, 0,0425
KWH V, 0,0682 — COST

********** BENEFIT AND COST CALCULATION **********

YEAR	P,W,F,	POWER GENERATION ENERGY GENERATED (GWH)	POWER GENERATION OPERATION HOUR (H)	POWER GENERATION PRESENT WORTH BENEFIT (M US D)	PUMP OPERATION ENERGY CONSUMED (GWH)	PUMP OPERATION OPERATION HOUR (H)	PUMP OPERATION ANNUAL COST (M US D)	PUMP OPERATION PRESENT WORTH (M US D)
1994	0,90909	130,	25,4	1,60	16,9	94,	0,72	0,72
1995	0,82645	117,	21,1	1,44	61,6	342,	2,62	2,38
1996	0,75131	104,	18,8	1,28	106,3	591,	4,52	3,73
1997	0,68301	91,	16,4	1,12	151,0	839,	6,42	4,82
1998	0,62092	78,	14,1	0,96	195,7	1087,	8,32	5,68
1999	0,56447	65,	11,8	0,80	240,4	1336,	10,22	6,34
2000	0,51316	53,	9,5	0,65	285,1	1584,	12,12	6,84
2001	0,46651	49,	8,8	0,60	309,6	1720,	13,16	6,75
2002	0,42410	45,	8,2	0,56	334,1	1856,	14,20	6,66
2003	0,38554	42,	7,5	0,51	358,5	1992,	15,24	6,46
2004	0,35049	38,	6,9	0,47	383,0	2128,	16,28	6,28
2005	0,31863	34,	6,2	0,42	407,4	2264,	17,32	6,07
2006	0,28966	33,	5,9	0,40	424,0	2356,	18,02	5,74
2007	0,26333	31,	5,6	0,38	440,6	2448,	18,73	5,42
2008	0,23939	29,	5,3	0,36	457,2	2540,	19,43	5,12
2009	0,21763	28,	5,0	0,34	473,8	2632,	20,14	4,82
2010	0,19784	28,	5,0	0,34	473,8	2632,	20,14	4,38
2042	0,00937	28,	5,0	0,34	0,00	2632,	473,8	20,14	0,21
2043	0,00852	28,	5,0	0,34	0,00	2632,	473,8	20,14	0,19
SUMMARY	9,91481	30,	6,9	0,47	7,85	2306,	415,1	17,64	130,13

********** SUMMARY OF OPERATION STUDY **********

----- POWER GENERATION BY EXCESS WATER ----- --- PUMP OPERATION FOR WATER SUPPLY---

YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD LOSS (M)	EATA POWER (MW)	Q (CMS)	D,HOUR ENERGY (M) (GWH)	D,HOUR ENERGY (M) (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)	H,S, (CMS)
1994	257,51	151,30	2,88	0,86	189,19	130,	23,4	94,	16,9	105,36	106,51	120,95	1,46
2000	257,51	150,62	2,86	0,86	187,63	53,	9,5	1584,	285,1	106,46	107,59	119,80	23,50
2005	257,51	150,33	2,83	0,86	187,05	34,	6,2	2264,	407,4	106,93	108,05	119,36	33,07
2009	257,51	150,17	2,83	0,86	186,95	28,	5,0	2632,	473,8	107,15	108,27	119,12	38,17

** OPERATION STUDY OF KALIWA P/T ** (PEAK POWER GENERATION T = 4 HOUR/DAY)

** CASE 16 ** PR = 180 MW , MAX,T,W,L, = 155,000 M , DIA, OF H,R,TUNNEL = 7,6 M
QR = 216,04 CMS , RH = 98,860 M , ALPHA = 0,0000779

KW KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0264
KW V,	63,35	111,76	160,25

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION						PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	95 % POWER (MW)	ANNUAL P,B, (M,D,)	ENERGY GENERATED (GWH)	ANNUAL E,B, (M,D,)	PRESENT WORTH (M,D,)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M,D,)	PRESENT WORTH (M,D,)
1994	0,90909	1460,	149,7	9,48	256,2	17,47	24,50	2464,	443,5	18,85	18,85
1995	0,82645	1460,	150,0	9,50	256,3	17,48	22,30	2465,	443,7	18,86	17,14
1996	0,75131	1460,	150,4	9,53	256,5	17,49	20,30	2466,	443,9	18,87	15,59
1997	0,68301	1460,	150,7	9,55	256,6	17,50	18,47	2467,	444,1	18,87	14,18
1998	0,62092	1460,	151,0	9,57	256,7	17,51	16,81	2468,	444,3	18,88	12,90
1999	0,56447	1460,	151,4	9,59	256,9	17,52	15,30	2469,	444,5	18,89	11,73
2000	0,51316	1460,	151,7	9,61	257,0	17,53	13,93	2470,	444,7	18,90	10,67
2001	0,46651	1460,	152,1	9,63	257,1	17,53	12,67	2471,	444,8	18,90	9,70
2002	0,42410	1460,	152,4	9,65	257,1	17,54	11,53	2471,	444,8	18,91	8,82
2003	0,38554	1460,	152,7	9,68	257,2	17,54	10,49	2472,	444,9	18,91	8,02
2004	0,35049	1460,	153,1	9,70	257,3	17,54	9,55	2472,	445,0	18,91	7,29
2005	0,31863	1460,	153,4	9,72	257,3	17,55	8,69	2473,	445,1	18,92	6,63
2006	0,28966	1460,	153,8	9,74	257,4	17,55	7,91	2473,	445,2	18,92	6,03
2007	0,26333	1460,	154,2	9,77	257,4	17,55	7,19	2473,	445,2	18,92	5,48
2008	0,23939	1460,	154,5	9,79	257,4	17,56	6,55	2474,	445,3	18,92	4,98
2009	0,21763	1460,	154,9	9,81	257,5	17,56	5,96	2474,	445,3	18,93	4,53
2010	0,19784	1460,	154,9	9,81	257,5	17,56	5,42	2474,	445,3	18,93	4,12
2042	0,00937	1460,	154,9	9,81	257,5	17,56	0,26	2474,	445,3	18,93	0,20
2043	0,00852	1460,	154,9	9,81	257,5	17,56	0,23	2474,	445,3	18,93	0,18
SUMMARY	9,91481	1460,	154,1	9,76	257,3	17,55	269,40	2473,	445,1	18,92	206,08

********** SUMMARY OF OPERATION STUDY **********

	PEAK POWER GENERATION								PUMP OPERATION				
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	Q,HOUR (H)	ENERGY (GWH)	Q,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)
1994	257,51	151,30	103,02	3,20	0,86	175,5	202,44	1460,	256,2	2464,	443,5	106,22	107,36	119,95
2000	257,51	150,62	103,72	3,18	0,86	176,0	201,73	1460,	257,0	2470,	444,7	106,90	108,02	119,22
2005	257,51	150,33	104,02	3,17	0,86	176,2	201,41	1460,	257,3	2473,	445,1	107,19	108,30	118,91
2009	257,51	150,17	104,19	3,16	0,86	176,4	201,23	1460,	257,5	2474,	445,3	107,35	108,46	118,75

** OPERATION STUDY OF KALIWA P/T ** (W,S, AND P,G, BY EXCESS WATER)

** CASE 19 ** PR = 180 MW , MAX,T,W,L, = 145,000 M , DIA, OF H,R,TUNNEL = 7,6 M
QR = 196,19 CMS , RH = 108,860 M , ALPHA = 0,0000947

KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0234

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION				PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	ENERGY GENERATED (GWH)	ANNUAL BENEFIT (M US D)	PRESENT WORTH (M US D)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M US D)	PRESENT WORTH (M US D)
1994	0,90909	142,	25,5	1,74	1,58	102,	18,4	0,78	0,78
1995	0,82645	128,	23,0	1,57	1,29	374,	67,4	2,86	2,60
1996	0,75131	113,	20,4	1,39	1,05	646,	116,3	4,94	4,08
1997	0,68301	99,	17,9	1,22	0,83	918,	165,2	7,02	5,27
1998	0,62092	85,	15,4	1,05	0,65	1190,	214,1	9,10	6,22
1999	0,56447	71,	12,8	0,87	0,49	1461,	263,0	11,18	6,94
2000	0,51316	57,	10,3	0,70	0,36	1733,	311,9	13,26	7,48
2001	0,46651	53,	9,6	0,65	0,31	1682,	338,7	14,40	7,39
2002	0,42410	49,	8,9	0,61	0,26	2030,	365,5	15,53	7,25
2003	0,38554	45,	8,2	0,56	0,21	2179,	392,2	16,67	7,07
2004	0,35049	41,	7,5	0,51	0,18	2328,	419,0	17,81	6,87
2005	0,31863	38,	6,8	0,46	0,15	2476,	445,7	18,94	6,64
2006	0,28966	36,	6,4	0,44	0,13	2577,	463,8	19,71	6,28
2007	0,26333	34,	6,1	0,42	0,11	2677,	481,8	20,48	5,93
2008	0,23939	32,	5,8	0,39	0,09	2777,	499,8	21,24	5,59
2009	0,21763	30,	5,5	0,37	0,08	2877,	517,9	22,01	5,27
2010	0,19784	30,	5,5	0,37	0,07	2877,	517,9	22,01	4,79
2042	0,00937	30,	5,5	0,37	0,00	2877,	517,9	22,01	0,23
2043	0,00852	30,	5,5	0,37	0,00	2877,	517,9	22,01	0,21
SUMMARY	9,91481	42,	7,5	0,51	8,55	2521,	453,8	19,28	142,29

********** SUMMARY OF OPERATION STUDY **********

				POWER GENERATION BY EXCESS WATER					PUMP OPERATION FOR WATER SUPPLY					
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)	W,S, (CMS)
1994	257,51	141,77	121,09	2,95	0,86	180,0	173,76	142,	25,5	102,	18,4	114,84	116,02	111,04	1,46
2000	257,51	140,55	121,43	2,93	0,86	180,0	172,37	57,	10,3	1733,	311,9	116,55	117,69	109,50	23,50
2005	257,51	140,22	122,00	2,98	0,86	180,0	171,85	38,	6,8	2476,	445,7	117,04	118,18	109,18	33,07
2009	257,51	140,15	121,98	2,98	0,86	180,0	171,76	30,	5,5	2877,	517,9	117,17	118,30	108,99	38,17

** OPERATION STUDY OF KALIWA P/T ** (PEAK POWER GENERATION T = 4 HOUR/DAY)

** CASE 19 ** PR = 180 MW , MAX.T.W.L. = 145,000 M , DIA. OF H.R.TUNNEL = 7.6 M
QR = 196.19 CMS , RH = 108.860 M , ALPHA = 0.0000947

	KW KWH VALUE IN US D (POWER GENERATION)			KWH COST IN US D (PUMP OPERATION)	
TIME	0.	1950.	2550.	TIME 0.	
KWH V.	0.0682	0.0425	0.0234	COST	0.0425
KW V.	63.35	111.76	160.25		

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION						PUMP OPERATION			
YEAR	P.W.F.	OPERATION HOUR (H)	95 % POWER (MW)	ANNUAL P.B. (M.D.)	ENERGY GENERATED (GWH)	ANNUAL E.B. (M.D.)	PRESENT WORTH (M.D.)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M.D.)	PRESENT WORTH (M.D.)
1994	0.90909	1460.	148.9	9.43	255.8	17.45	24.44	2454.	441.7	18.77	18.77
1995	0.82645	1460.	149.7	9.49	256.1	17.46	22.27	2456.	442.0	18.79	17.08
1996	0.75131	1460.	150.6	9.54	256.3	17.48	20.30	2458.	442.4	18.80	15.54
1997	0.68301	1460.	151.4	9.59	256.6	17.50	18.50	2460.	442.8	18.82	14.14
1998	0.62092	1460.	152.2	9.64	256.8	17.51	16.86	2462.	443.1	18.83	12.86
1999	0.56447	1460.	153.1	9.70	257.1	17.53	15.37	2464.	443.5	18.85	11.70
2000	0.51316	1460.	153.9	9.75	257.3	17.55	14.01	2466.	443.9	18.86	10.65
2001	0.46651	1460.	154.0	9.76	257.4	17.55	12.74	2466.	443.9	18.87	9.68
2002	0.42410	1460.	154.2	9.77	257.4	17.56	11.59	2467.	444.0	18.87	8.80
2003	0.38554	1460.	154.3	9.77	257.5	17.56	10.54	2467.	444.0	18.87	8.00
2004	0.35049	1460.	154.4	9.78	257.5	17.56	9.58	2467.	444.1	18.87	7.28
2005	0.31863	1460.	154.5	9.79	257.6	17.57	8.72	2468.	444.2	18.88	6.62
2006	0.28966	1460.	154.6	9.79	257.6	17.57	7.92	2467.	444.1	18.88	6.01
2007	0.26333	1460.	154.7	9.80	257.6	17.57	7.21	2467.	444.1	18.88	5.47
2008	0.23939	1460.	154.7	9.80	257.6	17.57	6.55	2467.	444.1	18.88	4.97
2009	0.21763	1460.	154.8	9.81	257.6	17.57	5.96	2467.	444.1	18.88	4.52
2010	0.19784	1460.	154.8	9.81	257.6	17.57	5.42	2467.	444.1	18.88	4.11
2042	0.00937	1460.	154.8	9.81	257.6	17.57	0.26	2467.	444.1	18.88	0.19
2043	0.00852	1460.	154.8	9.81	257.6	17.57	0.23	2467.	444.1	18.88	0.18
SUMMARY	9.91481	1460.	154.3	9.77	257.4	17.56	269.79	2466.	443.9	18.87	265.51

********** SUMMARY OF OPERATION STUDY **********

	PEAK POWER GENERATION							PUMP OPERATION					
YEAR	R.W.L. (M)	T.W.L. (M)	E.HEAD (M)	H.LOSS (M)	EATA	POWER (MW)	Q (CMS)	O.HOUR (H)	ENERGY (GWH)	O.HOUR (H)	ENERGY (GWH)	N.HEAD (M)	G.HEAD (M)	Q (CMS)
1994	257.51	141.77	112.50	3.25	0.86	175.2	185.04	1460.	255.8	2454.	441.7	115.75	116.91	110.10
2000	257.51	140.55	113.76	3.22	0.86	176.2	186.11	1460.	257.3	2466.	443.9	116.97	118.11	109.01
2005	257.51	140.22	114.09	3.20	0.86	176.4	183.76	1460.	257.6	2468.	444.2	117.30	118.43	108.73
2009	257.51	140.15	114.17	3.20	0.86	176.4	183.64	1460.	257.6	2467.	444.1	117.37	118.50	108.66

** OPERATION STUDY OF KALIWA P/T ** (W.S. AND P.G. BY EXCESS WATER)

** CASE 20 ** PR = 180 MW , MAX.T.W.L. = 175.000 M , DIA. OF H.R.TUNNEL = 6.5 M
QR = 298.00 CMS , RH = 71.670 M , ALPHA = 0.0001221

KWH VALUE IN US D (POWER GENERATION)

TIME	0.	1950.	2550.
KWH V.	0.0682	0.0425	0.0234

KWH COST IN US D (PUMP OPERATION)

TIME	0.
COST	0.0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION				PUMP OPERATION			
YEAR	P.W.F.	OPERATION HOUR (H)	ENERGY GENERATED (GWH)	ANNUAL BENEFIT (M US D)	PRESENT WORTH (M US D)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M US D)	PRESENT WORTH (M US D)
1994	0.90909	102.	18.3	1.25	1.13	78.	14.0	0.60	0.60
1995	0.82645	91.	16.5	1.12	0.93	284.	51.1	2.17	1.97
1996	0.75131	81.	14.7	1.00	0.75	490.	88.2	3.75	3.10
1997	0.68301	71.	12.8	0.88	0.60	696.	125.2	5.32	4.00
1998	0.62092	61.	11.0	0.75	0.47	902.	162.3	6.90	4.71
1999	0.56447	51.	9.2	0.63	0.35	1107.	199.3	8.47	5.26
2000	0.51316	41.	7.4	0.50	0.26	1313.	236.4	10.05	5.67
2001	0.46651	38.	6.9	0.47	0.22	1426.	256.7	10.91	5.60
2002	0.42410	35.	6.4	0.44	0.18	1539.	277.0	11.77	5.49
2003	0.38554	33.	5.9	0.40	0.15	1652.	297.3	12.64	5.36
2004	0.35049	30.	5.4	0.37	0.13	1765.	317.6	13.50	5.20
2005	0.31863	27.	4.9	0.33	0.11	1877.	337.9	14.36	5.03
2006	0.28966	26.	4.6	0.32	0.09	1954.	351.8	14.95	4.76
2007	0.26333	24.	4.4	0.30	0.08	2031.	365.6	15.54	4.50
2008	0.23939	23.	4.2	0.28	0.07	2108.	379.4	16.12	4.25
2009	0.21763	22.	3.9	0.27	0.06	2184.	393.2	16.71	4.00
2010	0.19784	22.	3.9	0.27	0.05	2184.	393.2	16.71	3.64
2042	0.00937	22.	3.9	0.27	0.00	2184.	393.2	16.71	0.17
2043	0.00852	22.	3.9	0.27	0.00	2184.	393.2	16.71	0.16
SUMMARY	9.91481	30.	5.4	0.37	6.14	1913.	344.4	14.64	107.94

********** SUMMARY OF OPERATION STUDY **********

						POWER GENERATION BY EXCESS WATER		PUMP OPERATION FOR WATER SUPPLY					
YEAR	R.W.L. (M)	T.W.L. (M)	E.HEAD (M)	H.LOSS (M)	EATA	POWER (MW)	Q (CMS)	O.HOUR (H)	ENERGY (GWH)	O.HOUR (H)	ENERGY (GWH)	N.HEAD (M)	G.HEAD (M)	Q (CMS)	W.S. (CMS)
1994	257.51	171.03	86.67	7.43	0.86	180.0	242.24	102.	18.3	78.	14.0	85.66	88.30	145.92	1.46
2000	257.51	170.45	87.06	7.35	0.86	180.0	239.87	41.	7.4	1313.	236.4	86.65	89.23	144.50	23.50
2005	257.51	170.17	87.71	7.24	0.86	180.0	239.03	27.	4.9	1877.	337.9	87.10	89.66	143.90	33.07
2009	257.51	169.99	87.71	7.24	0.86	180.0	238.88	22.	3.9	2184.	393.2	87.33	89.88	143.55	38.17

** OPERATION STUDY OF KALIWA P/T ** (PEAK POWER GENERATION T = 4 HOUR/DAY)

** CASE 20 ** PR = 180 MW , MAX.T.W.L. = 175.000 M , DIA. OF H.R.TUNNEL = 6.5 M
QR = 298.00 CMS , RH = 71.670 M , ALPHA = 0.0001221

KW KWH VALUE IN US D (POWER GENERATION)

TIME	0.	1950.	2550.
KWH V.	0.0682	0.0425	0.0294
KW V.	63.35	111.76	160.25

KWH COST IN US D (PUMP OPERATION)

TIME	0.
COST	0.0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION						PUMP OPERATION			
YEAR	P.W.F.	OPERATION HOUR (H)	95 % POWER (MW)	ANNUAL P.B. (M.D.)	ENERGY GENERATED (GWH)	ANNUAL E.B. (M.D.)	PRESENT WORTH (M.D.)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M.D.)	PRESENT WORTH (M.D.)
1994	0.90909	1460.	145.3	9.20	255.4	17.42	24.20	2710.	487.8	20.73	20.73
1995	0.82645	1460.	146.0	9.25	255.6	17.43	22.05	2711.	487.9	20.74	18.85
1996	0.75131	1460.	146.8	9.30	255.7	17.44	20.09	2711.	488.0	20.74	17.14
1997	0.68301	1460.	147.6	9.35	255.9	17.45	18.30	2712.	488.1	20.74	15.58
1998	0.62092	1460.	148.3	9.40	256.0	17.46	16.68	2712.	488.2	20.75	14.17
1999	0.56447	1460.	149.1	9.44	256.2	17.47	15.19	2712.	488.2	20.75	12.88
2000	0.51316	1460.	149.8	9.49	256.3	17.48	13.84	2713.	488.3	20.75	11.72
2001	0.46651	1460.	150.2	9.52	256.4	17.49	12.60	2713.	488.4	20.76	10.65
2002	0.42410	1460.	150.6	9.54	256.5	17.49	11.46	2713.	488.4	20.76	9.68
2003	0.38554	1460.	151.0	9.56	256.6	17.50	10.45	2713.	488.4	20.76	8.80
2004	0.35049	1460.	151.3	9.59	256.6	17.50	9.50	2714.	488.4	20.76	8.00
2005	0.31863	1460.	151.7	9.61	256.7	17.51	8.64	2714.	488.5	20.76	7.28
2006	0.28966	1460.	152.0	9.63	256.8	17.51	7.86	2714.	488.5	20.76	6.61
2007	0.26333	1460.	152.2	9.64	256.8	17.52	7.15	2714.	488.5	20.76	6.01
2008	0.23939	1460.	152.4	9.66	256.9	17.52	6.51	2714.	488.5	20.76	5.47
2009	0.21763	1460.	152.7	9.67	256.9	17.52	5.92	2714.	488.5	20.76	4.97
2010	0.19784	1460.	152.7	9.67	256.9	17.52	5.38	2714.	488.5	20.76	4.52
2042	0.00967	1460.	152.7	9.67	256.9	17.52	0.25	2714.	488.5	20.76	0.21
2043	0.00852	1460.	152.7	9.67	256.9	17.52	0.23	2714.	488.5	20.76	0.19
SUMMARY	9.91481	1460.	151.7	9.61	256.7	17.51	267.29	2714.	488.4	20.76	* 226.32

********** SUMMARY OF OPERATION STUDY **********

			PEAK POWER GENERATION						PUMP OPERATION				
YEAR	R.W.L. (M)	T.W.L. (M)	E.HEAD (M)	H.LOSS (M)	EATA	POWER (MW)	Q (CMS)	O.HOUR (H)	ENERGY (GWH)	O.HOUR (H)	ENERGY N. (GWH)	HEAD (M)	G.HEAD (M)	Q (CMS)
1994	257.51	171.03	77.63	8.86	0.86	175.0	268.84	1460.	255.4	2710.	487.8	86.50	89.09	144.83
2000	257.51	170.45	78.29	8.78	0.86	175.6	267.52	1460.	256.3	2713.	488.3	87.07	89.63	143.97
2005	257.51	170.17	78.62	8.73	0.86	175.8	266.81	1460.	256.7	2714.	488.5	87.35	89.90	143.55
2009	257.51	169.99	78.83	8.70	0.86	176.0	266.34	1460.	256.9	2714.	488.5	87.53	90.06	143.28

** OPERATION STUDY OF KALIWA P/T ** (W,S, AND P,G, BY EXCESS WATER)

** CASE 21 ** PR = 180 MW , MAX,T,W,L, = 165,000 M , DIA, OF H,R,TUNNEL = 6,5 M
QR = 254,65 CMS , RH = 83,870 M , ALPHA = 0,0001333

KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682,	0,0425	0,0234

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION				PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	ENERGY GENERATED (GWH)	ANNUAL BENEFIT (M US D)	PRESENT WORTH (M US D)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M US D)	PRESENT WORTH (M US D)
1994	0,90909	114,	20,6	1,40	1,28	86,	15,6	0,66	0,66
1995	0,82645	103,	18,5	1,26	1,05	314,	56,6	2,40	2,19
1996	0,75131	92,	16,5	1,13	0,85	542,	97,6	4,15	3,43
1997	0,68301	80,	14,5	0,99	0,67	770,	138,6	5,89	4,43
1998	0,62092	69,	12,4	0,85	0,53	998,	179,6	7,63	5,21
1999	0,56447	58,	10,4	0,71	0,40	1226,	220,6	9,38	5,82
2000	0,51316	46,	8,3	0,57	0,29	1454,	261,7	11,12	6,28
2001	0,46651	43,	7,8	0,53	0,25	1579,	284,2	12,08	6,20
2002	0,42410	40,	7,2	0,49	0,21	1704,	306,6	13,03	6,08
2003	0,38554	37,	6,6	0,45	0,17	1828,	329,1	13,99	5,93
2004	0,35049	34,	6,0	0,41	0,14	1953,	351,6	14,94	5,76
2005	0,31863	30,	5,5	0,37	0,12	2078,	374,1	15,90	5,57
2006	0,28966	29,	5,2	0,35	0,10	2163,	389,3	16,55	5,29
2007	0,26333	27,	4,9	0,34	0,09	2246,	404,6	17,19	4,98
2008	0,23939	26,	4,7	0,32	0,08	2332,	419,8	17,84	4,70
2009	0,21763	24,	4,4	0,30	0,07	2417,	435,1	18,49	4,48
2010	0,19784	24,	4,4	0,30	0,06	2417,	435,1	18,49	4,02
2042	0,00937	24,	4,4	0,30	0,00	2417,	435,1	18,49	0,19
2043	0,00852	24,	4,4	0,30	0,00	2417,	435,1	18,49	0,17
SUMMARY	9,91481	34,	6,1	0,41	6,91	2117,	381,1	16,20	119,47

********** SUMMARY OF OPERATION STUDY **********

			POWER GENERATION BY EXCESS WATER					PUMP OPERATION FOR WATER SUPPLY							
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)	W,S, (CMS)
1994	257,51	161,12	97,69	6,38	0,86	180,0	215,09	114,	20,6	86,	15,6	95,56	97,90	131,60	1,46
2000	257,51	160,63	98,06	6,33	0,86	180,0	213,15	46,	8,3	1454,	261,7	96,46	98,76	130,54	23,50
2005	257,51	160,31	98,69	6,24	0,86	180,0	212,45	30,	5,5	2078,	374,1	96,95	99,23	130,00	33,07
2009	257,51	160,15	98,68	6,24	0,86	180,0	212,32	24,	4,4	2417,	435,1	97,17	99,43	129,73	38,17

** OPERATION STUDY OF KALIWA P/T ** (PEAK POWER GENERATION T = 4 HOUR/DAY)

** CASE 21 ** PR = 180 MW , MAX,T,W,L, = 165,000 M , DIA, OF H,R,TUNNEL = 6,5 M
QR = 254,65 CMS , RH = 83,870 M , ALPHA = 0,0001333

KW KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0234
KW V,	63,35	111,76	160,25

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION						PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	95 % POWER (MW)	ANNUAL P,B, (M,D,)	ENERGY GENERATED (GWH)	ANNUAL E,B, (M,D,)	PRESENT WORTH (M,D,)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M,D,)	PRESENT WORTH (M,D,)
1994	0,90909	1460,	149,4	9,46	255,9	17,45	24,47	2620,	471,5	20,04	20,04
1995	0,82645	1460,	149,7	9,48	256,0	17,46	22,27	2620,	471,6	20,04	18,22
1996	0,75131	1460,	150,1	9,51	256,2	17,47	20,27	2621,	471,7	20,05	16,57
1997	0,68301	1460,	150,4	9,53	256,3	17,48	18,44	2621,	471,9	20,05	15,07
1998	0,62092	1460,	150,7	9,55	256,4	17,49	16,79	2622,	472,0	20,06	13,70
1999	0,56447	1460,	151,1	9,57	256,5	17,49	15,28	2623,	472,1	20,06	12,46
2000	0,51316	1460,	151,4	9,59	256,6	17,50	13,90	2623,	472,2	20,07	11,33
2001	0,46651	1460,	151,8	9,61	256,7	17,51	12,65	2624,	472,3	20,07	10,30
2002	0,42410	1460,	152,2	9,64	256,8	17,51	11,51	2624,	472,3	20,07	9,36
2003	0,38554	1460,	152,5	9,66	256,9	17,52	10,48	2624,	472,4	20,08	8,51
2004	0,35049	1460,	152,9	9,69	256,9	17,52	9,54	2625,	472,5	20,08	7,74
2005	0,31863	1460,	153,3	9,71	257,0	17,53	8,68	2625,	472,5	20,08	7,04
2006	0,28966	1460,	153,6	9,73	257,1	17,53	7,90	2625,	472,6	20,08	6,40
2007	0,26333	1460,	153,9	9,75	257,1	17,54	7,18	2626,	472,6	20,09	5,82
2008	0,23939	1460,	154,2	9,77	257,2	17,54	6,54	2626,	472,6	20,09	5,29
2009	0,21763	1460,	154,5	9,79	257,2	17,54	5,95	2626,	472,7	20,09	4,81
2010	0,19784	1460,	154,5	9,79	257,2	17,54	5,41	2626,	472,7	20,09	4,37
2042	0,00937	1460,	154,5	9,79	257,2	17,54	0,26	2626,	472,7	20,09	0,21
2043	0,00852	1460,	154,5	9,79	257,2	17,54	0,23	2626,	472,7	20,09	0,19
SUMMARY	9,91481	1460,	153,7	9,74	257,0	17,53	268,99	2625,	472,5	20,08	218,87

********** SUMMARY OF OPERATION STUDY **********

							PEAK POWER GENERATION				PUMP OPERATION			
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)
1994	257,51	161,12	89,07	7,34	0,86	175,3	234,27	1460,	255,9	2620,	471,5	96,40	98,71	130,57
2000	257,51	160,63	89,60	7,29	0,86	175,8	233,53	1460,	256,6	2623,	472,2	96,89	99,17	129,97
2005	257,51	160,31	89,95	7,26	0,86	176,1	233,00	1460,	257,0	2625,	472,5	97,21	99,47	129,58
2009	257,51	160,15	90,13	7,24	0,86	176,2	232,72	1460,	257,2	2626,	472,7	97,37	99,62	129,39

** OPERATION STUDY OF KALIWA P/T ** (W,S, AND P,G, BY EXCESS WATER)

** CASE 22 ** PR = 180 MW , MAX,T,W,L, = 155,000 M , DIA, OF H,R,TUNNEL = 6,5 M
QR = 224,91 CMS , RH = 94,960 M , ALPHA = 0,0001492

KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0234

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION				PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	ENERGY GENERATED (GWH)	ANNUAL BENEFIT (M US D)	PRESENT WORTH (M US D)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M US D)	PRESENT WORTH (M US D)
1994	0,90909	127,	22,8	1,55	1,41	95,	17,1	0,73	0,73
1995	0,82645	114,	20,5	1,40	1,16	346,	62,2	2,64	2,40
1996	0,75131	101,	18,3	1,25	0,94	596,	107,3	4,56	3,77
1997	0,68301	89,	16,0	1,09	0,75	847,	152,4	6,48	4,87
1998	0,62092	76,	13,7	0,94	0,58	1097,	197,5	8,40	5,73
1999	0,56447	64,	11,5	0,78	0,44	1348,	242,7	10,31	6,40
2000	0,51316	51,	9,2	0,63	0,32	1599,	287,8	12,23	6,90
2001	0,46651	48,	8,6	0,59	0,27	1736,	312,5	13,28	6,81
2002	0,42410	44,	7,9	0,54	0,23	1873,	337,1	14,33	6,68
2003	0,38554	41,	7,3	0,50	0,19	2010,	361,8	15,38	6,52
2004	0,35049	37,	6,7	0,46	0,16	2147,	386,5	16,43	6,33
2005	0,31863	34,	6,0	0,41	0,13	2284,	411,2	17,48	6,12
2006	0,28966	32,	5,8	0,39	0,11	2377,	427,9	18,19	5,79
2007	0,26333	30,	5,5	0,37	0,10	2470,	444,7	18,90	5,47
2008	0,23939	29,	5,2	0,35	0,08	2563,	461,4	19,61	5,16
2009	0,21763	27,	4,9	0,33	0,07	2656,	478,1	20,32	4,86
2010	0,19784	27,	4,9	0,33	0,07	2656,	478,1	20,32	4,42
2042	0,00937	27,	4,9	0,33	0,00	2656,	478,1	20,32	0,21
2043	0,00852	27,	4,9	0,33	0,00	2656,	478,1	20,32	0,19
SUMMARY	9,91481	37,	6,7	0,46	7,65	2327,	418,9	17,80	131,32

********** SUMMARY OF OPERATION STUDY **********

				POWER GENERATION BY EXCESS WATER					PUMP OPERATION FOR WATER SUPPLY					
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)	W,S, (CMS)
1994	257,51	151,30	108,24	5,81	0,86	180,0	194,25	127,	22,8	95,	17,1	105,36	107,52	119,81	1,46
2000	257,51	150,62	108,40	5,77	0,86	180,0	192,59	51,	9,2	1599,	287,8	106,46	108,59	118,70	23,50
2005	257,51	150,33	109,21	5,71	0,86	180,0	191,98	34,	6,0	2284,	411,2	106,93	109,04	118,27	33,07
2009	257,51	150,17	109,19	5,71	0,86	180,0	191,87	27,	4,9	2656,	478,1	107,15	109,25	118,05	38,17

** OPERATION STUDY OF KALIWA P/T ** (PEAK POWER GENERATION T = 4 HOUR/DAY)

** CASE 22 ** PR = 180 MW , MAX.T.W.L. = 155.000 M , DIA. OF H.R.TUNNEL = 6.5 M
QR = 224.91 CMS , RH = 94.960 M , ALPHA = 0.0001492

KW KWH VALUE IN US D (POWER GENERATION)

TIME	0.	1950.	2550.
KWH V.	0.0682	0.0425	0.0264
KW V.	63.35	111.76	160.25

KWH COST IN US D (PUMP OPERATION)

TIME	0.
COST	0.0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION							PUMP OPERATION			
YEAR	P.W.F.	OPERATION HOUR (H)	95 % POWER (MW)	ANNUAL P.B. (M.D.)	ENERGY GENERATED (GWH)	ANNUAL E.B. (M.D.)	PRESENT WORTH (M.D.)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M.D.)	PRESENT WORTH (M.D.)
1994	0.90909	1460.	149.7	9.48	256.2	17.47	24.50	2571.	462.9	19.67	19.67
1995	0.82645	1460.	150.0	9.50	256.3	17.48	22.30	2572.	463.0	19.68	17.89
1996	0.75131	1460.	150.3	9.52	256.4	17.49	20.30	2573.	463.1	19.68	16.27
1997	0.68301	1460.	150.7	9.55	256.6	17.50	18.47	2574.	463.3	19.69	14.79
1998	0.62092	1460.	151.0	9.57	256.7	17.51	16.81	2575.	463.4	19.70	13.45
1999	0.56447	1460.	151.4	9.59	256.8	17.52	15.30	2575.	463.6	19.70	12.23
2000	0.51316	1460.	151.7	9.61	257.0	17.53	13.92	2576.	463.7	19.71	11.12
2001	0.46651	1460.	152.0	9.63	257.0	17.53	12.67	2576.	463.8	19.71	10.11
2002	0.42410	1460.	152.4	9.65	257.1	17.53	11.53	2577.	463.8	19.71	9.20
2003	0.38554	1460.	152.7	9.67	257.2	17.54	10.49	2577.	463.9	19.72	8.36
2004	0.35049	1460.	153.0	9.69	257.2	17.54	9.55	2578.	464.0	19.72	7.60
2005	0.31863	1460.	153.4	9.72	257.3	17.55	8.69	2578.	464.0	19.72	6.91
2006	0.28966	1460.	153.8	9.74	257.4	17.55	7.91	2578.	464.1	19.72	6.28
2007	0.26333	1460.	154.1	9.76	257.4	17.55	7.19	2578.	464.1	19.72	5.71
2008	0.23939	1460.	154.5	9.79	257.4	17.56	6.55	2579.	464.2	19.73	5.19
2009	0.21763	1460.	154.9	9.81	257.5	17.56	5.96	2579.	464.2	19.73	4.72
2010	0.19784	1460.	154.9	9.81	257.5	17.56	5.42	2579.	464.2	19.73	4.29
2042	0.00937	1460.	154.9	9.81	257.5	17.56	0.26	2579.	464.2	19.73	0.20
2043	0.00852	1460.	154.9	9.81	257.5	17.56	0.23	2579.	464.2	19.73	0.18
SUMMARY	9.91481	1460.	154.0	9.76	257.3	17.55	269.38	2578.	464.0	19.72	214.91

********** SUMMARY OF OPERATION STUDY **********

	PEAK POWER GENERATION							PUMP OPERATION					
YEAR	R.W.L. (M)	T.W.L. (M)	E.HEAD (M)	H.LOSS (M)	EATA	POWER (MW)	Q (CMS)	Q.HOUR (H)	ENERGY (GWH)	Q.HOUR (H)	ENERGY (GWH)	N.HEAD (M)	G.HEAD (M)	Q (CMS)
1994	257.51	151.30	99.67	6.55	0.86	175.5	209.37	1460.	256.2	2571.	462.9	106.22	108.35	118.87
2000	257.51	150.62	100.40	6.50	0.86	176.0	208.52	1460.	257.0	2576.	463.7	106.90	109.00	118.18
2005	257.51	150.33	100.71	6.48	0.86	176.2	208.14	1460.	257.3	2578.	464.0	107.19	109.28	117.88
2009	257.51	150.17	100.89	6.46	0.86	176.4	207.93	1460.	257.5	2579.	464.2	107.35	109.44	117.72

** OPERATION STUDY OF KALIWA P/T ** (W,S, AND P,G, BY EXCESS WATER)

** CASE 23 ** PR = 180 MW , MAX,T,W,L, = 145,000 M , DIA, OF H,R,TUNNEL = 6,5 M
QR = 203,79 CMS , RH = 104,800 M , ALPHA = 0,0001857

KWH VALUE IN US D — KWH COST IN US D
(POWER GENERATION) — (PUMP OPERATION)
TIME 0, 2550, — TIME 0, 0,0425
KWH V, 0,0682 0,0425 0,0234 — COST 0,0425

********** BENEFIT AND COST CALCULATION **********

OPERATION HOUR (H)	POWER GENERATION ENERGY GENERATED (GWH)	ANNUAL BENEFIT (M US D)	PRESENT WORTH (M US D)	PUMP OPERATION OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M US D)	PRESENT WORTH (M US D)
YEAR P,W,F,							
1994 0,90909	138,	24,8	1,69	103,	18,6	0,79	0,79
1995 0,82645	124,	22,4	1,53	378,	66,0	2,89	2,63
1996 0,75131	111,	19,9	1,36	652,	117,3	4,99	4,12
1997 0,68301	97,	17,4	1,19	926,	166,7	7,08	5,32
1998 0,62092	83,	15,0	1,02	1200,	216,0	9,18	6,27
1999 0,56447	69,	12,5	0,85	1474,	265,4	11,28	7,00
2000 0,51316	56,	10,0	0,68	1749,	314,8	13,38	7,55
2001 0,46651	52,	9,3	0,64	1899,	341,8	14,52	7,45
2002 0,42410	48,	8,7	0,59	2049,	368,8	15,67	7,31
2003 0,38554	44,	8,0	0,54	2199,	395,7	16,82	7,13
2004 0,35049	40,	7,3	0,50	2349,	422,7	17,97	6,93
2005 0,31863	37,	6,6	0,45	2499,	449,7	19,11	6,70
2006 0,28966	35,	6,3	0,43	2600,	467,9	19,89	6,34
2007 0,26333	33,	5,9	0,41	2701,	486,1	20,66	5,98
2008 0,23939	31,	5,6	0,38	2802,	504,3	21,43	5,64
2009 0,21763	30,	5,3	0,36	2903,	522,5	22,21	5,32
2010 0,19784	30,	5,3	0,36	2903,	522,5	22,21	4,83
2042 0,00937	30,	5,3	0,36	2903,	522,5	22,21	0,23
2043 0,00852	30,	5,3	0,36	2903,	522,5	22,21	0,21
SUMMARY 9,91481	41,	7,3	0,50	2543,	457,8	19,46	143,57

********** SUMMARY OF OPERATION STUDY **********

----- POWER GENERATION BY EXCESS WATER ----- --- PUMP OPERATION FOR WATER SUPPLY---

YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)	W,S, (CMS)
1994	257,51	141,77	117,94	6,09	0,86	180,0	178,33	136,	24,8	103,	18,6	114,84	117,10	110,00	1,46
2000	257,51	140,55	118,31	6,05	0,86	180,0	176,86	56,	10,0	1749,	314,8	116,55	118,75	108,52	23,58
2005	257,51	140,22	118,91	5,99	0,86	180,0	174,32	37,	6,6	2499,	449,7	117,04	119,23	108,13	33,07
2009	257,51	140,15	118,89	5,99	0,86	180,0	176,22	30,	5,3	2903,	522,5	117,17	119,35	108,03	38,17

** OPERATION STUDY OF KALIWA P/T ** (PEAK POWER GENERATION T = 4 HOUR/DAY)

** CASE 23 ** PR = 180 MW , MAX,T,W,L, = 145,000 M , DIA, OF H,R,TUNNEL = 6,5 M
QR = 203,79 CMS , RH = 104,800 M , ALPHA = 0,0001857

KW KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0234
KW V,	63,35	111,76	160,25

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION						PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	95 % POWER (MW)	ANNUAL P,B, (M,D,)	ENERGY GENERATED (GWH)	ANNUAL E,B, (M,D,)	PRESENT WORTH (M,D,)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M,D,)	PRESENT WORTH (M,D,)
1994	0,90909	1460,	148,9	9,43	255,8	17,45	24,43	2557,	460,3	19,56	19,56
1995	0,82645	1460,	149,7	9,48	256,1	17,46	22,27	2559,	460,6	19,58	17,80
1996	0,75131	1460,	150,6	9,54	256,3	17,48	20,30	2561,	460,9	19,59	16,19
1997	0,68301	1460,	151,4	9,59	256,6	17,50	18,50	2562,	461,2	19,60	14,73
1998	0,62092	1460,	152,2	9,64	256,8	17,51	16,86	2564,	461,5	19,62	13,40
1999	0,56447	1460,	153,1	9,70	257,1	17,53	15,37	2566,	461,8	19,63	12,19
2000	0,51316	1460,	153,9	9,75	257,3	17,55	14,01	2567,	462,1	19,64	11,09
2001	0,46651	1460,	154,0	9,76	257,4	17,55	12,74	2568,	462,2	19,64	10,08
2002	0,42410	1460,	154,1	9,77	257,4	17,55	11,59	2568,	462,2	19,64	9,16
2003	0,38554	1460,	154,3	9,77	257,5	17,56	10,54	2568,	462,2	19,65	8,33
2004	0,35049	1460,	154,4	9,78	257,5	17,56	9,58	2568,	462,3	19,65	7,57
2005	0,31863	1460,	154,5	9,79	257,5	17,56	8,72	2568,	462,3	19,65	6,89
2006	0,28966	1460,	154,6	9,79	257,6	17,56	7,92	2568,	462,3	19,65	6,26
2007	0,26333	1460,	154,6	9,80	257,6	17,57	7,21	2568,	462,3	19,65	5,69
2008	0,23939	1460,	154,7	9,80	257,6	17,57	6,55	2568,	462,3	19,65	5,17
2009	0,21763	1460,	154,8	9,81	257,6	17,57	5,96	2568,	462,2	19,65	4,70
2010	0,19784	1460,	154,8	9,81	257,6	17,57	5,42	2568,	462,2	19,65	4,28
2042	0,00937	1460,	154,8	9,81	257,6	17,57	0,26	2568,	462,2	19,65	0,20
2043	0,00852	1460,	154,8	9,81	257,6	17,57	0,23	2568,	462,2	19,65	0,18
SUMMARY	9,91481	1460,	154,2	9,77	257,4	17,55	269,78	2567,	462,1	19,64	214,00

********** SUMMARY OF OPERATION STUDY **********

	PEAK POWER GENERATION							PUMP OPERATION				
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)
1994	257,51	141,77	108,95	6,80	0,86	175,2	191,15	1460,	255,8	2557,	460,3	115,75	117,99	109,13
2000	257,51	140,55	110,25	6,72	0,86	176,2	190,05	1460,	257,3	2567,	462,1	116,97	119,16	108,07
2005	257,51	140,22	110,61	6,69	0,86	176,4	189,63	1460,	257,5	2568,	462,3	117,30	119,47	107,80
2009	257,51	140,15	110,69	6,68	0,86	176,4	189,50	1460,	257,6	2568,	462,2	117,37	119,54	107,74

** OPERATION STUDY OF KALIWA P/T ** (W,S, AND P,G, BY EXCESS WATER)

** CASE 24 ** PR = 100 MW , MAX,T,W,L, = 175,000 M , DIA, OF H,R,TUNNEL = 8,3 M
QR = 151,69 CMS , RH = 78,220 M , ALPHA = 0,0001857

KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0234

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0428

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION				PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	ENERGY GENERATED (GWH)	ANNUAL BENEFIT (M US D)	PRESENT WORTH (M US D)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M US D)	PRESENT WORTH (M US D)
1994	0,90909	192,	19,2	1,31	1,19	138,	13,8	0,59	0,59
1995	0,82645	173,	17,3	1,18	0,97	503,	50,3	2,14	1,94
1996	0,75131	154,	15,4	1,05	0,79	868,	86,8	3,69	3,09
1997	0,68301	135,	13,5	0,92	0,63	1233,	123,3	5,24	3,94
1998	0,62092	116,	11,6	0,79	0,49	1598,	159,8	6,79	4,64
1999	0,56447	97,	9,7	0,66	0,37	1963,	196,3	8,34	5,18
2000	0,51316	77,	7,8	0,53	0,27	2328,	232,8	9,90	5,59
2001	0,46651	72,	7,2	0,49	0,23	2529,	252,9	10,75	5,51
2002	0,42410	67,	6,7	0,46	0,19	2729,	272,9	11,60	5,41
2003	0,38554	61,	6,1	0,42	0,16	2929,	292,9	12,45	5,28
2004	0,35049	56,	5,6	0,38	0,13	3129,	312,9	13,30	5,13
2005	0,31863	51,	5,1	0,35	0,11	3329,	332,9	14,15	4,96
2006	0,28966	48,	4,8	0,33	0,10	3465,	346,5	14,73	4,69
2007	0,26333	46,	4,6	0,31	0,08	3602,	360,2	15,31	4,43
2008	0,23939	43,	4,3	0,30	0,07	3738,	373,8	15,89	4,18
2009	0,21763	41,	4,1	0,28	0,06	3874,	387,4	16,46	3,94
2010	0,19784	41,	4,1	0,28	0,06	3874,	387,4	16,46	3,58
2042	0,00937	41,	4,1	0,28	0,00	3874,	387,4	16,46	0,17
2043	0,00852	41,	4,1	0,28	0,00	3874,	387,4	16,46	0,15
SUMMARY	9,91481	56,	5,6	0,39	6,43	3393,	339,3	14,42	106,34

********** SUMMARY OF OPERATION STUDY **********

						----- POWER GENERATION BY EXCESS WATER -----		--- PUMP OPERATION FOR WATER SUPPLY---						
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	O,HEAD (M)	Q (CMS)	W,S, (CMS)
1994	257,51	171,03	90,93	3,17	0,86	100,0	128,39	192,	19,2	138,	13,8	85,66	86,94	82,34	1,46
2000	257,51	170,45	91,27	3,14	0,86	100,0	127,23	77,	7,8	2328,	232,8	86,65	87,90	81,50	23,50
2005	257,51	170,17	91,85	3,10	0,86	100,0	126,81	51,	5,1	3329,	332,9	87,10	88,34	81,15	33,07
2009	257,51	169,99	91,85	3,10	0,86	100,0	126,73	41,	4,1	3874,	387,4	87,33	88,57	80,94	38,17

** OPERATION STUDY OF KALIWA P/T ** (PEAK POWER GENERATION T = 4 HOUR/DAY)

** CASE 24 ** PR = 100 MW , MAX.T.W.L. = 175,000 M , DIA. OF H.R.TUNNEL = 8.3 M
QR = 151.69 CMS , RH = 78,220 M , ALPHA = 0.0001857

	KW KWH VALUE IN US D (POWER GENERATION)			KWH COST IN US D (PUMP OPERATION)	
TIME	0.	1950.	2550.	TIME 0.	
KWH V.	0.0682	0.0425	0.0234	COST	0.0425
KW V.	63.35	111.76	160.25		

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION						PUMP OPERATION			
YEAR	P.W.F.	OPERATION HOUR (H)	95 % POWER (MW)	ANNUAL P.B. (M.D.)	ENERGY GENERATED (GWH)	ANNUAL E.B. (M.D.)	PRESENT WORTH (M.D.)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M.D.)	PRESENT WORTH (M.D.)
1994	0.90909	1460.	80.7	5.11	141.9	9.68	13.45	2498.	249.8	10.62	10.62
1995	0.82645	1460.	81.2	5.14	142.0	9.68	12.25	2499.	249.9	10.62	9.65
1996	0.75131	1460.	81.6	5.17	142.1	9.69	11.16	2500.	250.0	10.62	8.78
1997	0.68301	1460.	82.0	5.20	142.2	9.70	10.17	2501.	250.1	10.63	7.99
1998	0.62092	1460.	82.4	5.22	142.2	9.70	9.27	2502.	250.2	10.63	7.26
1999	0.56447	1460.	82.8	5.25	142.3	9.71	8.44	2503.	250.3	10.64	6.61
2000	0.51316	1460.	83.3	5.28	142.4	9.71	7.69	2504.	250.4	10.64	6.01
2001	0.46651	1460.	83.5	5.29	142.5	9.72	7.00	2505.	250.5	10.65	5.46
2002	0.42410	1460.	83.7	5.30	142.5	9.72	6.37	2505.	250.5	10.65	4.97
2003	0.38554	1460.	83.9	5.32	142.5	9.72	5.80	2506.	250.6	10.65	4.52
2004	0.35049	1460.	84.1	5.33	142.6	9.72	5.28	2506.	250.6	10.65	4.11
2005	0.31863	1460.	84.3	5.34	142.6	9.73	4.80	2507.	250.7	10.65	3.73
2006	0.28966	1460.	84.4	5.35	142.7	9.73	4.37	2507.	250.7	10.66	3.40
2007	0.26333	1460.	84.6	5.36	142.7	9.73	3.97	2508.	250.8	10.66	3.09
2008	0.23939	1460.	84.7	5.37	142.7	9.73	3.61	2508.	250.8	10.66	2.81
2009	0.21763	1460.	84.8	5.37	142.8	9.74	3.29	2508.	250.8	10.66	2.55
2010	0.19784	1460.	84.8	5.37	142.8	9.74	2.99	2508.	250.8	10.66	2.32
2042	0.00937	1460.	84.8	5.37	142.8	9.74	0.14	2508.	250.8	10.66	0.11
2043	0.00852	1460.	84.8	5.37	142.8	9.74	0.13	2508.	250.8	10.66	0.10
SUMMARY	9.91481	1460.	84.3	5.34	142.6	9.73	148.52	2507.	250.7	10.65	116.06

********** SUMMARY OF OPERATION STUDY **********

	PEAK POWER GENERATION								PUMP OPERATION					
YEAR	R.W.L. (M)	T.W.L. (M)	E.HEAD (M)	H.LOSS (M)	EATA	POWER (MW)	Q (CMS)	Q.HOUR (H)	ENERGY (GWH)	Q.HOUR (H)	ENERGY (GWH)	N.HEAD (M)	G.HEAD (M)	Q (CMS)
1994	257.51	171.03	82.87	3.63	0.86	97.2	139.62	1460.	141.9	2498.	249.8	86.50	87.75	81.61
2000	257.51	170.45	83.47	3.60	0.86	97.5	139.11	1460.	142.4	2504.	250.4	87.07	88.31	81.10
2005	257.51	170.17	83.76	3.59	0.86	97.7	138.83	1460.	142.6	2507.	250.7	87.35	88.58	80.86
2009	257.51	169.99	83.95	3.58	0.86	97.8	138.64	1460.	142.8	2508.	250.8	87.53	88.76	80.70

** OPERATION STUDY OF KALIWA P/T ** (W,S, AND P,G, BY EXCESS WATER)

** CASE 25 ** PR = 100 MW , MAX,T,W,L, = 165,000 M , DIA, OF H,R,TUNNEL = 8,3 M
QR = 133,50 CMS , RH = 88,880 M , ALPHA = 0,0002027

KWH VALUE IN US D (POWER GENERATION)

TIME	D,	1950,	2550,
KWH V,	0,0682	0,0425	0,0234

KWH COST IN US D (PUMP OPERATION)

TIME	D,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION				PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	ENERGY GENERATED (GWH)	ANNUAL BENEFIT (M US D)	PRESENT WORTH (M US D)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M US D)	PRESENT WORTH (M US D)
1994	0,90909	213,	21,3	1,45	1,32	154,	15,4	0,65	0,65
1995	0,82645	192,	19,2	1,31	1,08	559,	55,9	2,38	2,16
1996	0,75131	171,	17,1	1,17	0,88	964,	96,4	4,10	3,39
1997	0,68301	150,	15,0	1,02	0,70	1369,	136,9	5,82	4,37
1998	0,62092	129,	12,9	0,88	0,54	1774,	177,4	7,54	5,15
1999	0,56447	107,	10,7	0,73	0,41	2180,	218,0	9,26	5,75
2000	0,51316	86,	8,6	0,59	0,30	2585,	258,5	10,99	6,20
2001	0,46651	80,	8,0	0,55	0,26	2807,	280,7	11,93	6,12
2002	0,42410	74,	7,4	0,51	0,22	3029,	302,9	12,88	6,01
2003	0,38554	68,	6,8	0,47	0,18	3252,	325,2	13,82	5,86
2004	0,35049	62,	6,2	0,43	0,15	3474,	347,4	14,76	5,69
2005	0,31863	57,	5,7	0,39	0,12	3696,	369,6	15,71	5,51
2006	0,28966	54,	5,4	0,37	0,11	3847,	384,7	16,35	5,21
2007	0,26333	51,	5,1	0,35	0,09	3998,	399,8	16,99	4,92
2008	0,23939	48,	4,8	0,33	0,08	4148,	414,8	17,63	4,64
2009	0,21763	46,	4,6	0,31	0,07	4299,	429,9	18,27	4,37
2010	0,19784	46,	4,6	0,31	0,06	4299,	429,9	18,27	3,98
2042	0,00937	46,	4,6	0,31	0,00	4299,	429,9	18,27	0,19
2043	0,00852	46,	4,6	0,31	0,00	4299,	429,9	18,27	0,17
SUMMARY	9,91481	63,	6,3	0,43	7,16	3766,	376,6	16,01	118,03

********** SUMMARY OF OPERATION STUDY **********

				POWER GENERATION BY EXCESS WATER				PUMP OPERATION FOR WATER SUPPLY						
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	D,HOUR (H)	ENERGY (GWH)	D,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)	W,S, (CMS)
1994	257,51	161,12	101,29	2,78	0,86	100,0	115,32	213,	21,3	154,	15,4	95,56	96,69	74,03	1,46
2000	257,51	160,63	101,62	2,76	0,86	100,0	114,34	86,	8,6	2585,	258,5	96,46	97,56	73,41	23,50
2005	257,51	160,31	102,20	2,73	0,86	100,0	113,98	57,	5,7	3696,	369,6	96,95	98,05	73,10	33,87
2009	257,51	160,15	102,49	2,73	0,86	100,0	113,91	46,	4,6	4299,	429,9	97,17	98,26	72,94	38,17

** OPERATION STUDY OF KALIWA P/T ** (PEAK POWER GENERATION T = 4 HOUR/DAY)

** CASE 25 ** PR = 100 MW , MAX,T,W,L, = 165,000 M , DIA, OF H,R,TUNNEL = 8,3 M
QR = 133,50 CMS , RH = 88,880 M , ALPHA = 0,0002027

KW KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0264
KW V,	63,35	111,76	160,25

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

	POWER GENERATION						PUMP OPERATION			
YEAR P,W,F,	OPERATION HOUR (H)	95 % POWER (MW)	ANNUAL P,B, (M,D,)	ENERGY GENERATED (GWH)	ANNUAL E,B, (M,D,)	PRESENT WORTH (M,D,)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M,D,)	PRESENT WORTH (M,D,)
1994 0,90909	1460,	83,0	5,26	142,2	9,70	13,60	2470,	247,0	10,50	10,50
1995 0,82645	1460,	83,2	5,27	142,3	9,70	12,37	2471,	247,1	10,50	9,55
1996 0,75131	1460,	83,4	5,28	142,3	9,71	11,26	2472,	247,2	10,51	8,68
1997 0,68301	1460,	83,6	5,29	142,4	9,71	10,25	2473,	247,3	10,51	7,90
1998 0,62092	1460,	83,8	5,31	142,4	9,72	9,33	2474,	247,4	10,51	7,18
1999 0,56447	1460,	84,0	5,32	142,5	9,72	8,49	2475,	247,5	10,52	6,53
2000 0,51316	1460,	84,1	5,33	142,6	9,72	7,73	2475,	247,5	10,52	5,94
2001 0,46651	1460,	84,3	5,34	142,6	9,73	7,03	2476,	247,6	10,52	5,40
2002 0,42410	1460,	84,6	5,36	142,7	9,73	6,40	2477,	247,7	10,53	4,91
2003 0,38554	1460,	84,8	5,37	142,7	9,73	5,82	2477,	247,7	10,53	4,47
2004 0,35049	1460,	85,0	5,38	142,8	9,74	5,30	2478,	247,8	10,53	4,06
2005 0,31863	1460,	85,2	5,40	142,8	9,74	4,82	2479,	247,9	10,53	3,69
2006 0,28966	1460,	85,4	5,41	142,8	9,74	4,39	2479,	247,9	10,54	3,36
2007 0,26333	1460,	85,5	5,42	142,9	9,74	3,99	2479,	247,9	10,54	3,05
2008 0,23939	1460,	85,7	5,43	142,9	9,74	3,63	2480,	248,0	10,54	2,78
2009 0,21763	1460,	85,9	5,44	142,9	9,75	3,30	2480,	248,0	10,54	2,52
2010 0,19784	1460,	85,9	5,44	142,9	9,75	3,00	2480,	248,0	10,54	2,29
2042 0,00937	1460,	85,9	5,44	142,9	9,75	0,14	2480,	248,0	10,54	0,11
2043 0,00852	1460,	85,9	5,44	142,9	9,75	0,13	2480,	248,0	10,54	0,10
SUMMARY 9,91481	1460,	85,4	5,41	142,8	9,74	149,47	2479,	247,9	10,53	114,75

********** SUMMARY OF OPERATION STUDY **********

	PEAK POWER GENERATION								PUMP OPERATION				
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)
1994	257,51	161,12	93,27	3,13	0,86	97,4	124,17	1460,	142,2	2470,	247,0	96,40	97,51	73,39
2000	257,51	160,63	93,78	3,11	0,86	97,7	123,84	1460,	142,6	2475,	247,5	96,89	97,99	73,04
2005	257,51	160,31	94,11	3,10	0,86	97,8	123,61	1460,	142,8	2479,	247,9	97,21	98,30	72,81
2009	257,51	160,15	94,27	3,10	0,86	97,9	123,49	1460,	142,9	2480,	248,0	97,37	98,45	72,70

** OPERATION STUDY OF KALIWA P/T ** (W,S, AND P,G, BY EXCESS WATER)

** CASE 26 ** PR = 100 MW , MAX,T,W,L, = 155,000 M , DIA, OF H,R,TUNNEL = 8,3 M
QR = 119,51 CMS , RH = 99,280 M , ALPHA = 0,0002253

KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0234

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION				PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	ENERGY GENERATED (GWH)	ANNUAL BENEFIT (M US D)	PRESENT WORTH (M US D)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M US D)	PRESENT WORTH (M US D)
1994	0,90909	235,	23,5	1,60	1,46	169,	16,9	0,72	0,72
1995	0,82645	211,	21,1	1,44	1,19	614,	61,6	2,62	2,38
1996	0,75131	188,	18,8	1,28	0,96	1062,	106,2	4,51	3,73
1997	0,68301	165,	16,5	1,12	0,77	1509,	150,9	6,41	4,82
1998	0,62092	141,	14,1	0,96	0,60	1955,	195,5	8,31	5,68
1999	0,56447	118,	11,8	0,81	0,45	2402,	240,2	10,21	6,34
2000	0,51316	95,	9,5	0,65	0,33	2848,	284,8	12,10	6,83
2001	0,46651	88,	8,8	0,60	0,28	3092,	309,2	13,14	6,74
2002	0,42410	82,	8,2	0,56	0,24	3337,	333,7	14,18	6,62
2003	0,38554	75,	7,5	0,51	0,20	3581,	358,1	15,22	6,45
2004	0,35049	69,	6,9	0,47	0,16	3826,	382,6	16,26	6,27
2005	0,31863	62,	6,2	0,42	0,14	4070,	407,0	17,30	6,06
2006	0,28966	59,	5,9	0,40	0,12	4236,	423,6	18,00	5,74
2007	0,26333	56,	5,6	0,38	0,10	4401,	440,1	18,71	5,42
2008	0,23939	53,	5,3	0,36	0,09	4567,	456,7	19,41	5,11
2009	0,21763	50,	5,0	0,34	0,07	4733,	473,3	20,11	4,82
2010	0,19784	90,	5,0	0,34	0,07	4733,	473,3	20,11	4,38
2042	0,00937	50,	5,0	0,34	0,00	4733,	473,3	20,11	0,21
2043	0,00852	50,	5,0	0,34	0,00	4733,	473,3	20,11	0,19
SUMMARY	9,91481	69,	6,9	0,47	7,87	4146,	414,6	17,62	129,99

********** SUMMARY OF OPERATION STUDY **********

							----- POWER GENERATION BY EXCESS WATER -----				--- PUMP OPERATION FOR WATER SUPPLY---			
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)	W,S, (CMS)
1994	257,51	151,30	111,50	2,55	0,86	100,0	104,81	235,	23,5	169,	16,9	105,36	106,39	67,27	1,46
2000	257,51	150,62	111,84	2,54	0,86	100,0	103,94	95,	9,5	2848,	284,8	106,46	107,48	66,63	23,50
2005	257,51	150,33	112,41	2,51	0,86	100,0	103,62	62,	6,2	4070,	407,0	106,93	107,94	66,38	33,07
2009	257,51	150,17	112,39	2,51	0,86	100,0	103,57	50,	5,0	4733,	473,3	107,15	108,15	66,25	38,17

** OPERATION STUDY OF KALIWA P/T ** (PEAK POWER GENERATION T = 4 HOUR/DAY)

** CASE 26 ** PR = 100 MW , MAX,T,W,L, = 155,000 M , DIA, OF H,R,TUNNEL = 8,3 M
QR = 119,51 CMS , RH = 99,280 M , ALPHA = 0,0002253

KW KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0234
KW V,	63,35	111,76	160,25

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION						PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	95 % POWER (MW)	ANNUAL P,B, (M,D,)	ENERGY GENERATED (GWH)	ANNUAL E,B, (M,D,)	PRESENT WORTH (M,D,)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M,D,)	PRESENT WORTH (M,D,)
1994	0,90909	1460,	83,2	5,27	142,3	9,71	13,61	2453,	245,3	10,42	10,42
1995	0,82645	1460,	83,3	5,28	142,4	9,71	12,39	2454,	245,4	10,43	9,48
1996	0,75131	1460,	83,5	5,29	142,5	9,72	11,28	2455,	245,5	10,43	8,62
1997	0,68301	1460,	83,7	5,30	142,5	9,72	10,26	2456,	245,6	10,44	7,84
1998	0,62092	1460,	83,9	5,32	142,6	9,73	9,34	2457,	245,7	10,44	7,13
1999	0,56447	1460,	84,1	5,33	142,7	9,73	8,50	2458,	245,8	10,45	6,49
2000	0,51316	1460,	84,3	5,34	142,8	9,74	7,74	2459,	245,9	10,45	5,90
2001	0,46651	1460,	84,5	5,35	142,8	9,74	7,04	2460,	246,0	10,45	5,36
2002	0,42410	1460,	84,7	5,36	142,8	9,74	6,41	2460,	246,0	10,46	4,88
2003	0,38554	1460,	84,8	5,37	142,9	9,74	5,83	2461,	246,1	10,46	4,43
2004	0,35049	1460,	85,0	5,39	142,9	9,75	5,30	2461,	246,1	10,46	4,03
2005	0,31863	1460,	85,2	5,40	143,0	9,75	4,83	2462,	246,2	10,46	3,67
2006	0,28966	1460,	85,4	5,41	143,0	9,75	4,39	2462,	246,2	10,46	3,33
2007	0,26333	1460,	85,6	5,43	143,0	9,75	4,00	2462,	246,2	10,46	3,03
2008	0,23939	1460,	85,9	5,44	143,0	9,75	3,64	2463,	246,3	10,47	2,76
2009	0,21763	1460,	86,1	5,45	143,0	9,76	3,31	2463,	246,3	10,47	2,51
2010	0,19784	1460,	86,1	5,45	143,0	9,76	3,01	2463,	246,3	10,47	2,28
2042	0,00937	1460,	86,1	5,45	143,0	9,76	0,14	2463,	246,3	10,47	0,11
2043	0,00852	1460,	86,1	5,45	143,0	9,76	0,13	2463,	246,3	10,47	0,10
SUMMARY	9,91481	1460,	85,6	5,42	143,0	9,75	149,66	2462,	246,2	10,46	113,96

********** SUMMARY OF OPERATION STUDY **********

						PEAK POWER GENERATION				PUMP OPERATION				
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)
1994	257,51	151,30	103,39	2,83	0,86	97,5	112,06	1460,	142,3	2453,	245,3	106,22	107,24	66,71
2000	257,51	150,62	104,08	2,81	0,86	97,8	111,68	1460,	142,8	2459,	245,9	106,90	107,90	66,31
2005	257,51	150,33	104,38	2,81	0,86	97,9	111,50	1460,	143,0	2462,	246,2	107,19	108,19	66,13
2009	257,51	150,17	104,55	2,80	0,86	98,0	111,40	1460,	143,0	2463,	246,3	107,35	108,34	66,04

** OPERATION STUDY OF KALIWA P/T ** (W,S, AND P,G, BY EXCESS WATER)

** CASE 27 ** PR = 100 MW , MAX.T.W.L. = 145.000 M , DIA. OF H.R.TUNNEL = 8.3 M
GR = 108.53 CMS , RH = 109.330 M , ALPHA = 0.0002688

KWH VALUE IN US D (POWER GENERATION)

TIME	0.	1950.	2550.
KWH V.	0.0682	0.0425	0.0234

KWH COST IN US D (PUMP OPERATION)

TIME	0.
COST	0.0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION				PUMP OPERATION			
YEAR	P.W.F.	OPERATION HOUR (H)	ENERGY GENERATED (GWH)	ANNUAL BENEFIT (M US D)	PRESENT WORTH (M US D)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M US D)	PRESENT WORTH (M US D)
1994	0.90909	254.	25.4	1.73	1.58	184.	18.4	0.78	0.78
1995	0.82645	229.	22.9	1.56	1.29	673.	67.3	2.86	2.60
1996	0.75131	204.	20.4	1.39	1.04	1161.	116.1	4.94	4.08
1997	0.68301	179.	17.9	1.22	0.83	1650.	165.0	7.01	5.27
1998	0.62092	154.	15.4	1.05	0.65	2139.	213.9	9.09	6.21
1999	0.56447	128.	12.8	0.88	0.49	2627.	262.7	11.17	6.93
2000	0.51316	103.	10.3	0.70	0.36	3116.	311.6	13.24	7.47
2001	0.46651	96.	9.6	0.66	0.31	3383.	338.3	14.38	7.38
2002	0.42410	89.	8.9	0.61	0.26	3650.	365.0	15.51	7.24
2003	0.38554	82.	8.2	0.56	0.22	3918.	391.8	16.65	7.06
2004	0.35049	75.	7.5	0.51	0.18	4185.	418.5	17.79	6.84
2005	0.31863	68.	6.8	0.46	0.15	4452.	445.2	18.92	6.63
2006	0.28966	64.	6.4	0.44	0.13	4632.	463.2	19.69	6.27
2007	0.26333	61.	6.1	0.42	0.11	4812.	481.2	20.45	5.92
2008	0.23939	58.	5.8	0.40	0.09	4992.	499.2	21.22	5.59
2009	0.21763	55.	5.5	0.37	0.08	5173.	517.3	21.98	5.26
2010	0.19784	55.	5.5	0.37	0.07	2173.	517.3	21.98	4.78
2042	0.00937	55.	5.5	0.37	0.00	5173.	517.3	21.98	0.23
2043	0.00852	55.	5.5	0.37	0.00	5173.	517.3	21.98	0.21
SUMMARY	9.91481	75.	7.5	0.51	8.52	4532.	453.2	19.26	142.12

********** SUMMARY OF OPERATION STUDY **********

							POWER GENERATION BY EXCESS WATER		PUMP OPERATION FOR WATER SUPPLY					
YEAR	R.W.L. (M)	T.W.L. (M)	E.HEAD (M)	H.LOSS (M)	EATA	POWER (MW)	Q (CMS)	O.HOUR (H)	ENERGY (GWH)	O.HOUR (H)	ENERGY (GWH)	N.HEAD (M)	G.HEAD (M)	Q (CMS)	W.S. (CMS)
1994	257.51	141.77	121.47	2.57	0.86	100.0	96.80	254.	25.4	184.	18.4	114.84	115.87	61.76	1.46
2000	257.51	140.55	121.81	2.55	0.86	100.0	95.47	103.	10.3	3116.	311.6	116.55	117.55	60.91	23.56
2005	257.51	140.22	122.38	2.53	0.86	100.0	95.18	68.	6.8	4452.	445.2	117.04	118.04	60.68	33.07
2009	257.51	140.15	122.36	2.53	0.86	100.0	95.13	55.	5.5	5173.	517.3	117.17	118.17	60.62	38.17

** OPERATION STUDY OF KALIWA P/T ** (PEAK POWER GENERATION T = 4 HOUR/DAY)

** CASE 27 ** PR = 100 MW , MAX,T,W,L, = 145,000 M , DIA, OF H,R,TUNNEL = 8,3 M
QR = 108,53 CMS , RH = 109,330 M , ALPHA = 0,0002688

KW KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0234
KW V,	63,35	111,76	160,25

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION						PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	95 % POWER (MW)	ANNUAL P,B, (M,D,)	ENERGY GENERATED (GWH)	ANNUAL E,B, (M,D,)	PRESENT WORTH (M,D,)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M,D,)	PRESENT WORTH (M,D,)
1994	0,90909	1460,	82,7	5,24	142,1	9,69	13,58	2442,	244,2	10,38	10,38
1995	0,82645	1460,	83,2	5,27	142,3	9,70	12,37	2444,	244,4	10,39	9,44
1996	0,75131	1460,	83,7	5,30	142,4	9,71	11,28	2446,	244,6	10,39	8,59
1997	0,68301	1460,	84,1	5,33	142,5	9,72	10,28	2448,	244,8	10,40	7,82
1998	0,62092	1460,	84,6	5,36	142,7	9,73	9,37	2450,	245,0	10,41	7,11
1999	0,56447	1460,	85,1	5,39	142,8	9,74	8,54	2452,	245,2	10,42	6,47
2000	0,51316	1460,	85,5	5,42	143,0	9,75	7,78	2454,	245,4	10,43	5,89
2001	0,46651	1460,	85,6	5,42	143,0	9,75	7,08	2454,	245,4	10,43	5,35
2002	0,42410	1460,	85,7	5,43	143,0	9,75	6,44	2455,	245,5	10,43	4,87
2003	0,38554	1460,	85,7	5,43	143,0	9,75	5,85	2455,	245,5	10,43	4,42
2004	0,35049	1460,	85,8	5,43	143,1	9,76	5,32	2455,	245,5	10,44	4,02
2005	0,31863	1460,	85,9	5,44	143,1	9,76	4,84	2456,	245,6	10,44	3,66
2006	0,28966	1460,	85,9	5,44	143,1	9,76	4,40	2456,	245,6	10,44	3,33
2007	0,26333	1460,	85,9	5,44	143,1	9,76	4,00	2456,	245,6	10,44	3,02
2008	0,23939	1460,	86,0	5,45	143,1	9,76	3,64	2456,	245,6	10,44	2,75
2009	0,21763	1460,	86,0	5,45	143,1	9,76	3,31	2456,	245,6	10,44	2,50
2010	0,19784	1460,	86,0	5,45	143,1	9,76	3,01	2456,	245,6	10,44	2,27
2042	0,00937	1460,	86,0	5,45	143,1	9,76	0,14	2456,	245,6	10,44	0,11
2043	0,00852	1460,	86,0	5,45	143,1	9,76	0,13	2456,	245,6	10,44	0,10
SUMMARY	9,91481	1460,	85,7	5,43	143,0	9,75	149,90	2454,	245,4	10,43	113,62

********** SUMMARY OF OPERATION STUDY **********

	PEAK POWER GENERATION								PUMP OPERATION				
YEAR	R,W,L, (M)	T.W.L. (M)	E.HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)
1994	257,51	141,77	112,93	2,82	0,86	97,3	102,41	1460,	142,1	2442,	244,2	115,75	116,77	61,24
2000	257,51	140,55	114,18	2,80	0,86	97,9	101,91	1460,	143,0	2454,	245,4	116,97	117,97	60,63
2005	257,51	140,22	114,51	2,78	0,86	98,0	101,71	1460,	143,1	2456,	245,6	117,30	118,29	60,47
2009	257,51	140,15	114,59	2,78	0,86	98,0	101,65	1460,	143,1	2456,	245,6	117,37	118,36	60,44

** OPERATION STUDY OF KALIWA P/T ** (W,S, AND P,G, BY EXCESS WATER)

** CASE 28 ** PR = 100 MW , MAX,T,W,L, = 175,000 M , DIA, OF H,R,TUNNEL = 7,6 M
QR = 155,24 CMS , RH = 76,430 M , ALPHA = 0,0002521

KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0234

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION				PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	ENERGY GENERATED (GWH)	ANNUAL BENEFIT (M US D)	PRESENT WORTH (M US D)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M US D)	PRESENT WORTH (M US D)
1994	0,90909	189,	18,9	1,29	1,17	139,	13,9	0,59	0,59
1995	0,82645	170,	17,0	1,16	0,96	506,	50,6	2,15	1,95
1996	0,75131	151,	15,1	1,03	0,78	873,	87,3	3,71	3,04
1997	0,68301	133,	13,3	0,91	0,62	1239,	123,9	5,27	3,98
1998	0,62092	114,	11,4	0,78	0,48	1606,	160,6	6,83	4,66
1999	0,56447	95,	9,5	0,65	0,37	1973,	197,3	8,39	5,21
2000	0,51316	76,	7,6	0,52	0,27	2340,	234,0	9,94	5,61
2001	0,46651	71,	7,1	0,49	0,23	2541,	254,1	10,80	5,54
2002	0,42410	66,	6,6	0,45	0,19	2742,	274,2	11,65	5,44
2003	0,38554	61,	6,1	0,41	0,16	2943,	294,3	12,51	5,30
2004	0,35049	55,	5,5	0,38	0,13	3144,	314,4	13,36	5,15
2005	0,31863	50,	5,0	0,34	0,11	3346,	334,6	14,22	4,98
2006	0,28966	48,	4,8	0,33	0,09	3482,	348,2	14,80	4,72
2007	0,26333	45,	4,5	0,31	0,08	3619,	361,9	15,38	4,44
2008	0,23939	43,	4,3	0,29	0,07	3756,	375,6	15,96	4,20
2009	0,21763	40,	4,0	0,28	0,06	3893,	389,3	16,54	3,96
2010	0,19784	40,	4,0	0,28	0,05	3893,	389,3	16,54	3,60
2042	0,00937	40,	4,0	0,28	0,00	3893,	389,3	16,54	0,17
2043	0,00852	40,	4,0	0,28	0,00	3893,	389,3	16,54	0,14
SUMMARY	9,91481	56,	5,6	0,38	6,34	3410,	341,0	14,49	106,86

********** SUMMARY OF OPERATION STUDY **********

						----- POWER GENERATION BY EXCESS WATER -----				--- PUMP OPERATION FOR WATER SUPPLY---					
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)	W,S, (CMS)
1994	257,51	171,03	69,48	4,42	0,86	100,0	130,16	189,	18,9	139,	13,9	85,66	87,38	81,92	1,46
2000	257,51	170,45	90,03	4,38	0,86	100,0	128,95	76,	7,6	2340,	234,0	86,65	88,33	81,10	23,50
2005	257,51	170,17	90,63	4,32	0,86	100,0	128,52	50,	5,0	3346,	334,6	87,10	88,77	80,76	33,09
2009	257,51	169,99	90,63	4,32	0,86	100,0	128,44	40,	4,0	3893,	389,3	87,33	88,99	80,55	38,17

** OPERATION STUDY OF KALIWA P/T ** (PEAK POWER GENERATION T = 4 HOUR/DAY)

** CASE 28 ** PR = 100 MW , MAX.T.W.L. = 175.000 M , DIA. OF H.R.TUNNEL = 7.6 M
QR = 155.24 CMS , RH = 76.430 M , ALPHA = 0.0002521

	KW KWH VALUE IN US D (POWER GENERATION)			KWH COST IN US D (PUMP OPERATION)	
TIME	0.	1950.	2550.	TIME 0.	
KWH V.	0.0682	0.0425	0.0234	COST	0.0425
KW V.	63.35	111.76	160.25		

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION					PUMP OPERATION			
YEAR	P.W.F.	OPERATION HOUR (H)	95 % POWER (MW)	ANNUAL E.B. (M.D.)	ENERGY GENERATED (GWH)	ANNUAL E.B. (M.D.)	PRESENT WORTH (M.D.)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M.D.)	PRESENT WORTH (M.D.)
1994	0.90909	1460.	80.7	5.11	141.9	9.68	13.45	2556.	255.6	10.86	10.86
1995	0.82645	1460.	81.1	5.14	142.0	9.68	12.25	2557.	255.7	10.87	9.88
1996	0.75131	1460.	81.6	5.17	142.1	9.69	11.16	2558.	255.8	10.87	8.99
1997	0.68301	1460.	82.0	5.19	142.2	9.70	10.17	2559.	255.9	10.88	8.17
1998	0.62092	1460.	82.4	5.22	142.2	9.70	9.27	2560.	256.0	10.88	7.43
1999	0.56447	1460.	82.8	5.25	142.3	9.71	8.44	2561.	256.1	10.88	6.76
2000	0.51316	1460.	83.3	5.27	142.4	9.71	7.69	2562.	256.2	10.89	6.15
2001	0.46651	1460.	83.5	5.29	142.5	9.72	7.00	2563.	256.3	10.89	5.59
2002	0.42410	1460.	83.7	5.30	142.5	9.72	6.37	2563.	256.3	10.89	5.08
2003	0.38554	1460.	83.9	5.31	142.5	9.72	5.80	2563.	256.3	10.89	4.62
2004	0.35049	1460.	84.1	5.33	142.6	9.72	5.28	2564.	256.4	10.90	4.20
2005	0.31863	1460.	84.3	5.34	142.6	9.73	4.80	2564.	256.4	10.90	3.82
2006	0.28966	1460.	84.4	5.35	142.7	9.73	4.37	2565.	256.5	10.90	3.47
2007	0.26333	1460.	84.6	5.36	142.7	9.73	3.97	2565.	256.5	10.90	3.16
2008	0.23939	1460.	84.7	5.37	142.7	9.73	3.61	2565.	256.5	10.90	2.87
2009	0.21763	1460.	84.8	5.37	142.7	9.74	3.29	2565.	256.5	10.90	2.61
2010	0.19784	1460.	84.8	5.37	142.7	9.74	2.99	2565.	256.5	10.90	2.37
2042	0.00937	1460.	84.8	5.37	142.7	9.74	0.14	2565.	256.5	10.90	0.11
2043	0.00852	1460.	84.8	5.37	142.7	9.74	0.13	2565.	256.5	10.90	0.10
SUMMARY	9.91481	1460.	84.3	5.34	142.6	9.73	148.51	2564.	256.4	10.90	118.74

********** SUMMARY OF OPERATION STUDY **********

	PEAK POWER GENERATION								PUMP OPERATION					
YEAR	R.W.L. (M)	T.W.L. (M)	E.HEAD (M)	H.LOSS (M)	EATA	POWER (MW)	Q (CMS)	Q.HOUR (H)	ENERGY (GWH)	Q.HOUR (H)	ENERGY (GWH)	N.HEAD (M)	G.HEAD (M)	Q (CMS)
1994	257.51	171.03	81.38	5.12	0.86	97.2	142.23	1460.	141.9	2556.	255.6	86.50	88.19	81.23
2000	257.51	170.45	81.99	5.08	0.86	97.5	141.67	1460.	142.4	2562.	256.2	87.07	88.74	80.73
2005	257.51	170.17	82.30	5.05	0.86	97.7	141.37	1460.	142.6	2564.	256.4	87.35	89.01	80.49
2009	257.51	169.99	82.49	5.04	0.86	97.8	141.16	1460.	142.7	2565.	256.5	87.53	89.18	80.34

** OPERATION STUDY OF KALIWA P/T ** (W,S, AND P,G, BY EXCESS WATER)

** CASE 29 ** PR = 200 MW , MAX,T,W,L, = 165,000 M , DIA, OF H,R,TUNNEL = 7,6 M
GR = 135,70 CMS , RH = 87,440 M , ALPHA = 0,0002750

KWH VALUE IN US D (POWER GENERATION)

TIME	0,		1950,		2550,	
KWH V,		0,0682		0,0425		0,0234

KWH COST IN US D (PUMP OPERATION)

TIME	0,	
COST		0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION				PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	ENERGY GENERATED (GWH)	ANNUAL BENEFIT (M US D)	PRESENT WORTH (M US D)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M US D)	PRESENT WORTH (M US D)
1994	0,90909	211,	21,1	1,44	1,31	154,	15,4	0,66	0,66
1995	0,82645	190,	19,0	1,30	1,07	561,	56,1	2,38	2,17
1996	0,75131	169,	16,9	1,15	0,87	968,	96,8	4,11	3,40
1997	0,68301	148,	14,8	1,01	0,69	1375,	137,5	5,84	4,39
1998	0,62092	127,	12,7	0,87	0,54	1781,	178,1	7,57	5,17
1999	0,56447	106,	10,6	0,73	0,41	2188,	218,8	9,30	5,77
2000	0,51316	85,	8,5	0,58	0,30	2595,	259,5	11,03	6,23
2001	0,46651	79,	7,9	0,54	0,25	2818,	281,8	11,98	6,15
2002	0,42410	74,	7,4	0,50	0,21	3041,	304,1	12,93	6,03
2003	0,38554	68,	6,8	0,46	0,18	3264,	326,4	13,87	5,88
2004	0,35049	62,	6,2	0,42	0,15	3487,	348,7	14,82	5,71
2005	0,31863	56,	5,6	0,38	0,12	3711,	371,1	15,77	5,53
2006	0,28966	53,	5,3	0,36	0,11	3862,	386,2	16,41	5,23
2007	0,26333	51,	5,1	0,34	0,09	4013,	401,3	17,06	4,94
2008	0,23939	48,	4,8	0,33	0,08	4164,	416,4	17,70	4,66
2009	0,21763	45,	4,5	0,31	0,07	4316,	431,6	18,34	4,39
2010	0,19784	45,	4,5	0,31	0,06	4316,	431,6	18,34	3,99
2042	0,00937	45,	4,5	0,31	0,00	4316,	431,6	18,34	0,19
2043	0,00852	45,	4,5	0,31	0,00	4316,	431,6	18,34	0,17
SUMMARY	9,91481	62,	6,2	0,42	7,08	3781,	378,1	16,07	118,49

********** SUMMARY OF OPERATION STUDY **********

				POWER GENERATION BY EXCESS WATER						PUMP OPERATION FOR WATER SUPPLY					
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)	W,S, (CMS)
1994	257,51	161,12	100,21	3,86	0,86	100,0	116,54	211,	21,1	154,	15,4	95,56	97,07	73,73	1,46
2000	257,51	160,63	100,56	3,83	0,86	100,0	115,53	85,	8,5	2595,	259,5	96,46	97,95	73,13	23,50
2005	257,51	160,31	101,15	3,78	0,86	100,0	115,16	56,	5,6	3711,	371,1	96,95	98,43	72,81	33,07
2009	257,51	160,15	101,14	3,79	0,86	100,0	115,09	45,	4,5	4316,	431,6	97,17	98,63	72,66	38,17

** OPERATION STUDY OF KALIWA P/T ** (PEAK POWER GENERATION T = 4 HOUR/DAY)

** CASE 29 ** PR = 100 MW , MAX,T,W,L, = 165,000 M , DIA, OF H,R,TUNNEL = 7,6 M
QR = 135,70 CMS , RH = 87,440 M , ALPHA = 0,0002750

KW KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0234
KW V,	63,35	111,76	160,25

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION						PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	95 % POWER (MW)	ANNUAL P,B, (M,D,)	ENERGY GENERATED (GWH)	ANNUAL E,B, (M,D,)	PRESENT WORTH (M,D,)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M,D,)	PRESENT WORTH (M,D,)
1994	0,90909	1460,	83,0	5,26	142,2	9,70	13,60	2513,	251,3	10,68	10,68
1995	0,82645	1460,	83,2	5,27	142,2	9,70	12,37	2514,	251,4	10,68	9,71
1996	0,75131	1460,	83,4	5,28	142,3	9,71	11,26	2515,	251,5	10,69	8,83
1997	0,68301	1460,	83,6	5,29	142,4	9,71	10,25	2516,	251,6	10,69	8,03
1998	0,62092	1460,	83,7	5,31	142,4	9,71	9,33	2517,	251,7	10,70	7,30
1999	0,56447	1460,	83,9	5,32	142,5	9,72	8,49	2517,	251,7	10,70	6,64
2000	0,51316	1460,	84,1	5,33	142,6	9,72	7,72	2518,	251,8	10,70	6,04
2001	0,46651	1460,	84,3	5,34	142,6	9,73	7,03	2519,	251,9	10,70	5,49
2002	0,42410	1460,	84,5	5,36	142,7	9,73	6,40	2519,	251,9	10,71	4,99
2003	0,38554	1460,	84,8	5,37	142,7	9,73	5,82	2520,	252,0	10,71	4,54
2004	0,35049	1460,	85,0	5,38	142,8	9,74	5,30	2520,	252,0	10,71	4,13
2005	0,31863	1460,	85,2	5,40	142,8	9,74	4,82	2521,	252,1	10,71	3,76
2006	0,28966	1460,	85,3	5,41	142,8	9,74	4,39	2521,	252,1	10,72	3,41
2007	0,26333	1460,	85,5	5,42	142,8	9,74	3,99	2522,	252,2	10,72	3,10
2008	0,23939	1460,	85,7	5,43	142,9	9,74	3,63	2522,	252,2	10,72	2,82
2009	0,21763	1460,	85,8	5,44	142,9	9,75	3,30	2522,	252,2	10,72	2,57
2010	0,19784	1460,	85,8	5,44	142,9	9,75	3,00	2522,	252,2	10,72	2,33
2042	0,00937	1460,	85,8	5,44	142,9	9,75	0,14	2522,	252,2	10,72	0,11
2043	0,00852	1460,	85,8	5,44	142,9	9,75	0,13	2522,	252,2	10,72	0,10
SUMMARY	9,91481	1460,	85,4	5,41	142,8	9,74	149,45	2521,	252,1	10,71	116,73

********** SUMMARY OF OPERATION STUDY **********

	PEAK POWER GENERATION								PUMP OPERATION					
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)
1994	257,51	161,12	92,04	4,37	0,86	97,4	125,86	1460,	142,2	2513,	251,3	96,40	97,90	73,11
2000	257,51	160,63	92,55	4,34	0,86	97,7	125,51	1460,	142,6	2518,	251,8	96,89	98,37	72,77
2005	257,51	160,31	92,89	4,32	0,86	97,8	125,26	1460,	142,8	2521,	252,1	97,21	98,68	72,55
2009	257,51	160,15	93,05	4,32	0,86	97,9	125,13	1460,	142,9	2522,	252,2	97,37	98,83	72,44

** OPERATION STUDY OF KALIWA P/T ** (W,S, AND P,G, BY EXCESS WATER)

** CASE 30 ** PR = 100 MW , MAX,T,W,L, = 155,000 M , DIA, OF H,R,TUNNEL = 7,6 M
QR = 121,06 CMS , RH = 98,010 M , ALPHA = 0,0003064

KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0234

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION				PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	ENERGY GENERATED (GWH)	ANNUAL BENEFIT (M US D)	PRESENT WORTH (M US D)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M US D)	PRESENT WORTH (M US D)
1994	0,90909	233,	23,3	1,59	1,44	170,	17,0	0,72	0,72
1995	0,82645	210,	21,0	1,43	1,18	618,	61,8	2,62	2,39
1996	0,75131	186,	18,6	1,27	0,96	1066,	106,6	4,53	3,74
1997	0,68301	163,	16,3	1,11	0,76	1514,	151,4	6,43	4,85
1998	0,62092	140,	14,0	0,96	0,59	1962,	196,2	8,34	5,69
1999	0,56447	117,	11,7	0,80	0,45	2410,	241,0	10,24	6,36
2000	0,51316	94,	9,4	0,64	0,33	2858,	285,8	12,14	6,84
2001	0,46651	88,	8,8	0,60	0,28	3103,	310,3	13,19	6,77
2002	0,42410	81,	8,1	0,55	0,23	3348,	334,8	14,23	6,64
2003	0,38554	75,	7,5	0,51	0,20	3593,	359,3	15,27	6,48
2004	0,35049	68,	6,8	0,46	0,16	3838,	383,8	16,31	6,29
2005	0,31863	62,	6,2	0,42	0,13	4083,	408,3	17,35	6,08
2006	0,28966	59,	5,9	0,40	0,12	4250,	425,0	18,06	5,75
2007	0,26333	56,	5,6	0,38	0,10	4416,	441,6	18,77	5,44
2008	0,23939	53,	5,3	0,36	0,09	4582,	458,2	19,47	5,13
2009	0,21763	50,	5,0	0,34	0,07	4748,	474,8	20,18	4,83
2010	0,19784	50,	5,0	0,34	0,07	4748,	474,8	20,18	4,39
2042	0,00937	50,	5,0	0,34	0,00	4748,	474,8	20,18	0,21
2043	0,00852	50,	5,0	0,34	0,00	4748,	474,8	20,18	0,19
SUMMARY	9,91481	69,	6,9	0,47	7,81	4160,	416,0	17,68	130,41

********** SUMMARY OF OPERATION STUDY **********

						----- POWER GENERATION BY EXCESS WATER -----				--- PUMP OPERATION FOR WATER SUPPLY---					
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)	W,S, (CMS)
1994	257,51	151,30	110,52	3,53	0,86	100,0	105,73	233,	23,3	170,	17,0	105,36	106,75	67,04	1,46
2000	257,51	150,62	110,86	3,51	0,86	100,0	104,85	94,	9,4	2858,	285,8	106,46	107,83	66,41	23,50
2005	257,51	150,33	111,44	3,47	0,86	100,0	104,52	62,	6,2	4083,	408,3	106,93	108,29	66,17	33,07
2009	257,51	150,17	111,43	3,47	0,86	100,0	104,46	50,	5,0	4748,	474,8	107,15	108,50	66,04	38,17

** OPERATION STUDY OF KALIWA P/T ** (PEAK POWER GENERATION T = 4 HOUR/DAY)

** CASE 30 ** PR = 100 MW , MAX.T.W.L. = 155,000 M , DIA. OF H.R.TUNNEL = 7.6 M
QR = 121.06 CMS , RH = 98,010 M , ALPHA = 0.0003064

KW KWH VALUE IN US D (POWER GENERATION)

TIME	0.	1950.	2550.
KWH V.	0.0682	0.0425	0.0254
KW V.	63.35	111.76	160.25

KWH COST IN US D (PUMP OPERATION)

TIME	0.
COST	0.0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION						PUMP OPERATION			
YEAR	P.W.F.	OPERATION HOUR (H)	95 % POWER (MW)	ANNUAL ENERGY P.B. (M.D.)	GENERATED (GWH)	ANNUAL E.B. (M.D.)	PRESENT WORTH (M.D.)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M.D.)	PRESENT WORTH (M.D.)
1994	0.90909	1460.	83.2	5.27	142.3	9.71	13.61	2488.	248.8	10.57	10.57
1995	0.82645	1460.	83.3	5.28	142.4	9.71	12.39	2489.	248.9	10.58	9.61
1996	0.75131	1460.	83.5	5.29	142.5	9.72	11.28	2490.	249.0	10.58	8.74
1997	0.68301	1460.	83.7	5.30	142.5	9.72	10.26	2491.	249.1	10.58	7.95
1998	0.62092	1460.	83.9	5.32	142.6	9.73	9.34	2492.	249.2	10.59	7.23
1999	0.56447	1460.	84.1	5.33	142.7	9.73	8.50	2493.	249.3	10.59	6.58
2000	0.51316	1460.	84.3	5.34	142.8	9.74	7.74	2493.	249.3	10.60	5.98
2001	0.46651	1460.	84.5	5.35	142.8	9.74	7.04	2494.	249.4	10.60	5.44
2002	0.42410	1460.	84.7	5.36	142.8	9.74	6.41	2494.	249.4	10.60	4.95
2003	0.38554	1460.	84.8	5.37	142.9	9.74	5.83	2495.	249.5	10.60	4.50
2004	0.35049	1460.	85.0	5.39	142.9	9.75	5.30	2495.	249.5	10.61	4.09
2005	0.31863	1460.	85.2	5.40	143.0	9.75	4.83	2496.	249.6	10.61	3.72
2006	0.28966	1460.	85.4	5.41	143.0	9.75	4.39	2496.	249.6	10.61	3.38
2007	0.26333	1460.	85.6	5.43	143.0	9.75	4.00	2496.	249.6	10.61	3.07
2008	0.23939	1460.	85.9	5.44	143.0	9.75	3.64	2497.	249.7	10.61	2.79
2009	0.21763	1460.	86.1	5.45	143.0	9.76	3.31	2497.	249.7	10.61	2.54
2010	0.19784	1460.	86.1	5.45	143.0	9.76	3.01	2497.	249.7	10.61	2.31
2042	0.00937	1460.	86.1	5.45	143.0	9.76	0.14	2497.	249.7	10.61	0.11
2043	0.00852	1460.	86.1	5.45	143.0	9.76	0.13	2497.	249.7	10.61	0.10
SUMMARY	9.91481	1460.	85.6	5.42	143.0	9.75	149.66	2496.	249.6	10.61	115.56

********** SUMMARY OF OPERATION STUDY **********

						PEAK POWER GENERATION				PUMP OPERATION				
YEAR	R.W.L. (M)	T.W.L. (M)	E.HEAD (M)	H.LOSS (M)	DATA	POWER (MW)	Q (CMS)	Q.HOUR (H)	ENERGY (GWH)	Q.HOUR (H)	ENERGY (GWH)	N.HEAD (M)	G.HEAD (M)	Q (CMS)
1994	257.51	151.30	102.28	3.94	0.86	97.5	113.29	1460.	142.3	2488.	248.8	106.22	107.59	66.49
2000	257.51	150.62	102.98	3.91	0.86	97.8	112.86	1460.	142.8	2493.	249.3	106.90	108.25	66.10
2005	257.51	150.33	103.29	3.90	0.86	97.9	112.70	1460.	143.0	2496.	249.6	107.19	108.54	65.93
2009	257.51	150.17	103.46	3.89	0.86	98.0	112.59	1460.	143.0	2497.	249.7	107.35	108.69	65.83

** OPERATION STUDY OF KALIWA P/T ** (W,S, AND P,G, BY EXCESS WATER)

** CASE 31 ** PR = 100 MW , MAX,T,W,L, = 145,000 M , DIA, OF H,R,TUNNEL = 7,6 M
QR = 109,86 CMS , RH = 108,000 M , ALPHA = 0,0003726

KWH VALUE IN US D (POWER GENERATION)

TIME	0.	1950.	2550.
KWH V.	0,0682	0,0425	0,0234

KWH COST IN US D (PUMP OPERATION)

TIME	0.
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION				PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	ENERGY GENERATED (GWH)	ANNUAL BENEFIT (M US D)	PRESENT WORTH (M US D)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M US D)	PRESENT WORTH (M US D)
1994	0,90909	252,	25,2	1,72	1,56	185,	18,5	0,79	0,79
1995	0,82645	227,	22,7	1,55	1,28	675,	67,5	2,87	2,61
1996	0,75131	202,	20,2	1,38	1,04	1165,	116,5	4,95	4,09
1997	0,68301	177,	17,7	1,21	0,83	1655,	165,5	7,04	5,29
1998	0,62092	152,	15,2	1,04	0,65	2145,	214,5	9,12	6,23
1999	0,56447	127,	12,7	0,87	0,49	2636,	263,6	11,20	6,96
2000	0,51316	102,	10,2	0,70	0,36	3126,	312,6	13,28	7,50
2001	0,46651	95,	9,5	0,65	0,30	3394,	339,4	14,42	7,40
2002	0,42410	88,	8,8	0,60	0,26	3662,	366,2	15,56	7,24
2003	0,38554	81,	8,1	0,55	0,21	3930,	393,0	16,70	7,08
2004	0,35049	74,	7,4	0,51	0,18	4198,	419,8	17,84	6,88
2005	0,31863	67,	6,7	0,46	0,15	4466,	446,6	18,98	6,65
2006	0,28966	64,	6,4	0,44	0,13	4647,	464,7	19,75	6,29
2007	0,26333	61,	6,1	0,41	0,11	4828,	482,8	20,52	5,94
2008	0,23939	57,	5,7	0,39	0,09	5008,	500,8	21,29	5,61
2009	0,21763	54,	5,4	0,37	0,08	5189,	518,9	22,05	5,28
2010	0,19784	54,	5,4	0,37	0,07	5189,	518,9	22,05	4,80
2042	0,00937	54,	5,4	0,37	0,00	5189,	518,9	22,05	0,23
2043	0,00852	54,	5,4	0,37	0,00	5189,	518,9	22,05	0,21
SUMMARY	9,91481	75,	7,5	0,51	8,48	4547,	454,7	19,32	142,58

********** SUMMARY OF OPERATION STUDY **********

				POWER GENERATION BY EXCESS WATER				PUMP OPERATION FOR WATER SUPPLY						
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)	W,S, (CMS)
1994	257,51	141,77	120,41	3,62	0,86	100,0	97,54	252,	25,2	185,	18,5	114,84	116,26	61,56	1,46
2000	257,51	140,55	120,77	3,60	0,86	100,0	96,28	102,	10,2	3126,	312,6	116,55	117,93	40,71	23,50
2005	257,51	140,22	121,34	3,56	0,86	100,0	95,99	67,	6,7	4466,	446,6	117,04	118,62	40,49	33,07
2009	257,51	140,15	121,32	3,56	0,86	100,0	95,94	54,	5,4	5189,	518,9	117,17	118,54	40,43	38,17

** OPERATION STUDY OF KALIWA P/T ** (PEAK POWER GENERATION T = 4 HOUR/DAY)

** CASE 31 ** PR = 100 MW , MAX,T,W,L, = 145,000 M , DIA, OF H,R,TUNNEL = 7,6 M
QR = 109,86 CMS , RH = 108,000 M , ALPHA = 0,0003726

KW KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0234
KW V,	63,35	111,76	160,25

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION						PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	95 % POWER (MW)	ANNUAL P,B, (M,D,)	ENERGY GENERATED (GWH)	ANNUAL E,B, (M,D,)	PRESENT WORTH (M,D,)	OPERAIION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M,D,)	PRESENT WORTH (M,D,)
1994	0,90909	1460,	82,7	5,24	142,1	9,69	13,58	2475,	247,5	10,52	10,52
1995	0,82645	1460,	83,2	5,27	142,3	9,70	12,37	2477,	247,7	10,53	9,57
1996	0,75131	1460,	83,7	5,30	142,4	9,71	11,28	2479,	247,9	10,54	8,71
1997	0,68301	1460,	84,1	5,33	142,5	9,72	10,28	2481,	248,1	10,55	7,92
1998	0,62092	1460,	84,6	5,36	142,7	9,73	9,37	2483,	248,3	10,55	7,21
1999	0,56447	1460,	85,1	5,39	142,8	9,74	8,54	2485,	248,5	10,56	6,56
2000	0,51316	1460,	85,5	5,42	143,0	9,75	7,78	2487,	248,7	10,57	5,97
2001	0,46651	1460,	85,6	5,42	143,0	9,75	7,08	2487,	248,7	10,57	5,43
2002	0,42410	1460,	85,7	5,43	143,0	9,75	6,44	2488,	248,8	10,57	4,93
2003	0,38554	1460,	85,7	5,43	143,0	9,76	5,85	2488,	248,8	10,57	4,48
2004	0,35049	1460,	85,8	5,43	143,1	9,76	5,32	2488,	248,8	10,58	4,08
2005	0,31863	1460,	85,9	5,44	143,1	9,76	4,84	2489,	248,9	10,58	3,71
2006	0,28966	1460,	85,9	5,44	143,1	9,76	4,40	2489,	248,9	10,58	3,37
2007	0,26333	1460,	85,9	5,44	143,1	9,76	4,00	2489,	248,9	10,58	3,06
2008	0,23939	1460,	86,0	5,45	143,1	9,76	3,64	2489,	248,9	10,58	2,79
2009	0,21763	1460,	86,0	5,45	143,1	9,76	3,31	2489,	248,9	10,58	2,53
2010	0,19784	1460,	86,0	5,45	143,1	9,76	3,01	2489,	248,9	10,58	2,30
2042	0,00937	1460,	86,0	5,45	143,1	9,76	0,14	2489,	248,9	10,58	0,11
2043	0,00852	1460,	86,0	5,45	143,1	9,76	0,13	2489,	248,9	10,58	0,10
SUMMARY	9,91481	1460,	85,7	5,43	143,0	9,75	149,89	2488,	248,8	10,57	115,16

********** SUMMARY OF OPERATION STUDY **********

		PEAK POWER GENERATION							PUMP OPERATION				
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)
1994	257,51	141,77	111,75	4,00	0,86	97,3	103,50	1460,	142,1	2475,	247,5	115,75	117,15	61,04
2000	257,51	140,55	113,02	3,96	0,86	97,9	102,97	1460,	143,0	2487,	248,7	116,97	118,35	60,44
2005	257,51	140,22	113,36	3,94	0,86	98,0	102,76	1460,	143,1	2489,	248,9	117,30	118,66	60,29
2009	257,51	140,15	113,43	3,94	0,86	98,0	102,70	1460,	143,1	2489,	248,9	117,37	118,73	60,25

** OPERATION STUDY OF KALIWA P/T ** (W,S, AND P,G, BY EXCESS WATER)

** CASE 32 ** PR = 100 MW , MAX,T,W,L, = 175,000 M , DIA, OF H,R,TUNNEL = 6,5 M
GR = 175,55 CMS , RH = 67,590 M , ALPHA = 0,0004846

KWH VALUE IN US D (POWER GENEPATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0234

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION				PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	ENERGY GENERATED (GWH)	ANNUAL BENEFIT (M US D)	PRESENT WORTH (M US D)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M US D)	PRESENT WORTH (M US D)
1994	0,90909	178,	17,8	1,22	1,11	141,	14,1	0,60	0,60
1995	0,82645	161,	16,1	1,10	0,91	514,	51,4	2,18	1,99
1996	0,75131	143,	14,3	0,98	0,73	887,	88,7	3,77	3,12
1997	0,68301	125,	12,5	0,85	0,58	1260,	126,0	5,35	4,02
1998	0,62092	108,	10,8	0,73	0,46	1633,	163,3	6,94	4,74
1999	0,56447	90,	9,0	0,61	0,35	2005,	200,5	8,52	5,29
2000	0,51316	72,	7,2	0,49	0,25	2378,	237,8	10,11	5,71
2001	0,46651	67,	6,7	0,46	0,21	2583,	258,3	10,98	5,63
2002	0,42410	62,	6,2	0,42	0,18	2787,	278,7	11,84	5,53
2003	0,38554	57,	5,7	0,39	0,15	2991,	299,1	12,71	5,39
2004	0,35049	52,	5,2	0,36	0,13	3196,	319,6	13,58	5,24
2005	0,31863	47,	4,7	0,32	0,10	3400,	340,0	14,45	5,06
2006	0,28966	45,	4,5	0,31	0,09	3539,	353,9	15,04	4,79
2007	0,26333	43,	4,3	0,29	0,08	3678,	367,8	15,63	4,53
2008	0,23939	41,	4,1	0,28	0,07	3817,	381,7	16,22	4,27
2009	0,21763	38,	3,8	0,26	0,06	3955,	395,5	16,81	4,02
2010	0,19784	38,	3,8	0,26	0,05	3955,	395,5	16,81	3,66
2042	0,00937	38,	3,8	0,26	0,00	3955,	395,5	16,81	0,17
2043	0,00852	38,	3,8	0,26	0,00	3955,	395,5	16,81	0,16
SUMMARY	9,91481	53,	5,3	0,36	5,99	3465,	346,5	14,73	108,59

********** SUMMARY OF OPERATION STUDY **********

					POWER GENERATION BY EXCESS WATER				PUMP OPERATION FOR WATER SUPPLY					
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)	W,S, (CMS)
1994	257,51	171,03	84,53	9,57	0,86	100,0	137,90	178,	17,8	141,	14,1	85,66	88,85	80,56	1,46
2000	257,51	170,45	84,95	9,46	0,86	100,0	136,49	72,	7,2	2378,	237,8	86,65	89,77	79,79	23,50
2005	257,51	170,17	85,65	9,30	0,86	100,0	135,99	47,	4,7	3400,	340,0	87,10	90,20	79,47	33,07
2009	257,51	169,99	85,65	9,30	0,86	100,0	135,91	38,	3,8	3955,	395,5	87,33	90,41	79,28	38,17

** OPERATION STUDY OF KALIWA P/T ** (PEAK POWER GENERATION T = 4 HOUR/DAY)

** CASE 32 ** PR = 100 MW , MAX,T,W,L, = 175,000 M , DIA, OF H,R,TUNNEL = 6,5 M
QR = 175,55 CMS , HH = 67,590 M , ALPHA = 0,0004846

KW KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0234
KW V,	63,35	111,76	160,25

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION						PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	95 % POWER (MW)	ANNUAL P,B, (M,D,)	ENERGY GENERATED (GWH)	ANNUAL E,B, (M,D,)	PRESENT WORTH (M,D,)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M,D,)	PRESENT WORTH (M,D,)
1994	0,90909	1460,	80,7	5,11	141,9	9,68	13,45	2838,	283,8	12,06	12,06
1995	0,82645	1460,	81,1	5,14	142,0	9,68	12,25	2838,	283,8	12,06	10,96
1996	0,75131	1460,	81,5	5,17	142,1	9,69	11,16	2838,	283,8	12,06	9,97
1997	0,68301	1460,	82,0	5,19	142,2	9,69	10,17	2838,	283,8	12,06	9,06
1998	0,62092	1460,	82,4	5,22	142,2	9,70	9,26	2838,	283,8	12,06	8,24
1999	0,56447	1460,	82,8	5,25	142,3	9,71	8,44	2838,	283,8	12,06	7,49
2000	0,51316	1460,	83,2	5,27	142,4	9,71	7,69	2837,	283,7	12,06	6,81
2001	0,46651	1460,	83,4	5,29	142,4	9,71	7,00	2837,	283,7	12,06	6,19
2002	0,42410	1460,	83,6	5,30	142,5	9,72	6,37	2837,	283,7	12,06	5,63
2003	0,38554	1460,	83,9	5,31	142,5	9,72	5,80	2837,	283,7	12,06	5,11
2004	0,35049	1460,	84,1	5,33	142,6	9,72	5,27	2837,	283,7	12,06	4,65
2005	0,31863	1460,	84,3	5,34	142,6	9,73	4,80	2837,	283,7	12,06	4,23
2006	0,28966	1460,	84,4	5,35	142,6	9,73	4,37	2836,	283,6	12,05	3,84
2007	0,26333	1460,	84,5	5,36	142,7	9,73	3,97	2836,	283,6	12,05	3,49
2008	0,23939	1460,	84,7	5,36	142,7	9,73	3,61	2836,	283,6	12,05	3,17
2009	0,21763	1460,	84,8	5,37	142,7	9,73	3,29	2836,	283,6	12,05	2,89
2010	0,19784	1460,	84,8	5,37	142,7	9,73	2,99	2836,	283,6	12,05	2,62
2042	0,00937	1460,	84,8	5,37	142,7	9,73	0,14	2836,	283,6	12,05	0,12
2043	0,00852	1460,	84,8	5,37	142,7	9,73	0,13	2836,	283,6	12,05	0,11
SUMMARY	9,91481	1460,	84,3	5,34	142,6	9,73	148,48	2836,	283,6	12,05	131,50

********** SUMMARY OF OPERATION STUDY **********

			PEAK POWER GENERATION							PUMP OPERATION				
YEAR	R,W,L, (M)	T,W,L, (M)	F,HEAD (M)	H,LOSS (M)	FATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)
1994	257,51	171,03	74,70	11,80	0,86	97,2	155,57	1460,	141,9	2838,	283,8	86,50	89,63	80,04
2000	257,51	170,45	75,41	11,66	0,86	97,5	154,64	1460,	142,4	2837,	283,7	87,07	90,17	79,57
2005	257,51	170,17	75,76	11,59	0,86	97,7	154,15	1460,	142,6	2837,	283,7	87,35	90,43	79,34
2009	257,51	169,99	75,99	11,54	0,86	97,8	153,83	1460,	142,7	2836,	283,6	87,53	90,60	79,20

** OPERATION STUDY OF KALIWA P/T ** (W.S. AND P.G. BY EXCESS WATER)

** CASE 36 ** PR = 100 MW , MAX.T.W.L. = 165.000 M , DIA. OF H.R.TUNNEL = 6.5 M
QR = 146.07 CMS , RH = 61.230 M , ALPHA = 0.0005287

	KWH VALUE IN US D (POWER GENERATION)			KWH COST IN US D (PUMP OPERATION)	
TIME	0.	1950.	2550.	TIME	0.
KWH V.	0.0682	0.0425	0.0234	COST	0.0425

********** BENEFIT AND COST CALCULATION **********

		---------- POWER GENERATION ----------				---------- PUMP OPERATION ----------			
YEAR	P.W.F.	OPERATION HOUR (H)	ENERGY GENERATED (GWH)	ANNUAL BENEFIT (M US D)	PRESENT WORTH (M US D)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M US D)	PRESENT WORTH (M US D)
1994	0.90909	202.	20.2	1.38	1.25	156.	15.6	0.66	0.60
1995	0.82645	182.	18.2	1.24	1.03	569.	56.9	2.42	2.00
1996	0.75131	162.	16.2	1.11	0.83	981.	98.1	4.17	3.44
1997	0.68301	142.	14.2	0.97	0.66	1393.	139.3	5.92	4.45
1998	0.62092	122.	12.2	0.83	0.52	1805.	180.5	7.67	5.24
1999	0.56447	102.	10.2	0.70	0.39	2217.	221.7	9.42	5.85
2000	0.51316	82.	8.2	0.56	0.29	2630.	263.0	11.18	6.31
2001	0.46651	76.	7.6	0.52	0.24	2856.	285.6	12.14	6.23
2002	0.42410	71.	7.1	0.48	0.20	3081.	308.1	13.10	6.11
2003	0.38554	65.	6.5	0.44	0.17	3307.	330.7	14.06	5.96
2004	0.35049	59.	5.9	0.40	0.14	3533.	353.3	15.02	5.79
2005	0.31863	54.	5.4	0.37	0.12	3759.	375.9	15.98	5.60
2006	0.28966	51.	5.1	0.35	0.10	3912.	391.2	16.63	5.30
2007	0.26333	49.	4.9	0.33	0.09	4066.	406.6	17.28	5.00
2008	0.23939	46.	4.6	0.31	0.07	4219.	421.9	17.93	4.72
2009	0.21763	43.	4.3	0.30	0.06	4372.	437.2	18.58	4.45
2010	0.19784	43.	4.3	0.30	0.06	4372.	437.2	18.58	4.04
2042	0.00937	43.	4.3	0.30	0.00	4372.	437.2	18.58	0.19
2043	0.00852	43.	4.3	0.30	0.00	4372.	437.2	18.58	0.17
SUMMARY	9.91481	60.	6.0	0.41	6.79	3830.	383.0	16.28	120.05

********** SUMMARY OF OPERATION STUDY **********

						----- POWER GENERATION BY EXCESS WATER -----				--- PUMP OPERATION FOR WATER SUPPLY---					
YEAR	R.W.L. (M)	T.W.L. (M)	E.HEAD (M)	H.LOSS (M)	EATA	POWER (MW)	Q (CMS)	Q.HOUR (H)	ENERGY (GWH)	Q.HOUR (H)	ENERGY (GWH)	N.HEAD (M)	G.HEAD (M)	Q (CMS)	W.S. (CMS)
1994	257.51	161.12	95.98	8.09	0.86	100.0	121.59	202.	20.2	156.	15.6	95.56	98.39	72.74	1.46
2000	257.51	160.63	96.37	8.02	0.86	100.0	120.46	82.	8.2	2630.	263.0	96.46	99.24	72.17	23.50
2005	257.51	160.31	97.02	7.91	0.86	100.0	120.05	54.	5.4	3759.	375.9	96.95	99.71	71.87	33.07
2009	257.51	160.15	97.01	7.91	0.86	100.0	119.96	43.	4.3	4372.	437.2	97.17	99.91	71.72	38.17

** OPERATION STUDY OF KALIWA P/T ** (PEAK POWER GENERATION T = 4 HOUR/DAY)

** CASE 33 ** PR = 100 MW , MAX,T,W,L, = 165,000 M , DIA, OF H,R,TUNNEL = 6,5 M
QR = 146,07 CMS , RH = 81,230 M , ALPHA = 0,0005287

KW KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0234
KW V,	63,35	111,76	160,25

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION						PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	95 % POWER (MW)	ANNUAL P,B, (M,D,)	ENERGY GENERATED (GWH)	ANNUAL E,B, (M,D,)	PRESENT WORTH (M,D,)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M,D,)	PRESENT WORTH (M,D,)
1994	0,90909	1460,	83,0	5,26	142,2	9,70	13,60	2697,	269,7	11,46	11,46
1995	0,82645	1460,	83,2	5,27	142,2	9,70	12,37	2698,	269,8	11,47	10,42
1996	0,75131	1460,	83,4	5,28	142,3	9,71	11,26	2698,	269,8	11,47	9,48
1997	0,68301	1460,	83,6	5,29	142,4	9,71	10,25	2699,	269,9	11,47	8,62
1998	0,62092	1460,	83,7	5,31	142,4	9,71	9,33	2699,	269,9	11,47	7,84
1999	0,56447	1460,	83,9	5,32	142,5	9,72	8,49	2700,	270,0	11,47	7,12
2000	0,51316	1460,	84,1	5,33	142,6	9,72	7,72	2700,	270,0	11,48	6,48
2001	0,46651	1460,	84,3	5,34	142,6	9,73	7,03	2700,	270,0	11,48	5,89
2002	0,42410	1460,	84,5	5,36	142,7	9,73	6,40	2701,	270,1	11,48	5,35
2003	0,38554	1460,	84,7	5,37	142,7	9,73	5,82	2701,	270,1	11,48	4,87
2004	0,35049	1460,	85,0	5,38	142,8	9,74	5,30	2701,	270,1	11,48	4,43
2005	0,31863	1460,	85,2	5,40	142,8	9,74	4,82	2701,	270,1	11,48	4,02
2006	0,28966	1460,	85,3	5,41	142,8	9,75	4,39	2701,	270,1	11,48	3,66
2007	0,26333	1460,	85,5	5,42	142,8	9,74	3,99	2701,	270,1	11,48	3,33
2008	0,23939	1460,	85,7	5,43	142,9	9,74	3,63	2702,	270,2	11,48	3,02
2009	0,21763	1460,	85,8	5,44	142,9	9,75	3,30	2702,	270,2	11,48	2,75
2010	0,19784	1460,	85,8	5,44	142,9	9,75	3,00	2702,	270,2	11,48	2,50
2042	0,00937	1460,	85,8	5,44	142,9	9,75	0,14	2702,	270,2	11,48	0,12
2043	0,00852	1460,	85,8	5,44	142,9	9,75	0,13	2702,	270,2	11,48	0,11
SUMMARY	9,91481	1460,	85,4	5,41	142,8	9,74	149,45	2701,	270,1	11,48	125,15

********** SUMMARY OF OPERATION STUDY **********

		PEAK POWER GENERATION								PUMP OPERATION				
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)
1994	257,51	161,12	86,97	9,44	0,86	97,4	136,40	1460,	142,2	2697,	269,7	96,40	99,19	72,21
2000	257,51	160,63	87,52	9,37	0,86	97,7	132,93	1460,	142,6	2700,	270,0	96,89	99,65	71,88
2005	257,51	160,31	87,88	9,33	0,86	97,8	132,59	1460,	142,8	2701,	270,1	97,21	99,95	71,67
2009	257,51	160,15	88,07	9,30	0,86	97,9	132,42	1460,	142,9	2702,	270,2	97,37	100,10	71,56

** OPERATION STUDY OF KALIWA P/T ** (W,S, AND P,Q, BY EXCESS WATER)

** CASE 34 ** PR = 100 MW , MAX,T,W,L, = 155,000 M , DIA, OF H,R,TUNNEL = 6,5 M
QR = 127,78 CMS , RH = 92,860 M , ALPHA = 0,0005915

KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0294

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION				PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	ENERGY GENERATED (GWH)	ANNUAL BENEFIT (M US D)	PRESENT WORTH (M US D)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M US D)	PRESENT WORTH (M US D)
1994	0,90909	225,	22,5	1,53	1,39	172,	17,2	0,73	0,73
1995	0,82645	203,	20,3	1,38	1,14	625,	62,5	2,65	2,41
1996	0,75131	180,	18,0	1,23	0,92	1078,	107,8	4,58	3,79
1997	0,68301	156,	15,6	1,08	0,74	1531,	153,1	6,51	4,89
1998	0,62092	136,	13,6	0,92	0,57	1984,	198,4	8,43	5,76
1999	0,56447	113,	11,3	0,77	0,44	2437,	243,7	10,36	6,43
2000	0,51316	91,	9,1	0,62	0,32	2890,	289,0	12,28	6,93
2001	0,46651	85,	8,5	0,58	0,27	3138,	313,8	13,33	6,84
2002	0,42410	76,	7,6	0,53	0,23	3385,	338,5	14,39	6,71
2003	0,38554	72,	7,2	0,49	0,19	3633,	363,3	15,44	6,59
2004	0,35049	66,	6,6	0,45	0,16	3881,	388,1	16,49	6,36
2005	0,31863	60,	6,0	0,41	0,13	4129,	412,9	17,55	6,18
2006	0,28966	57,	5,7	0,39	0,11	4297,	429,7	18,26	5,82
2007	0,26333	54,	5,4	0,37	0,10	4465,	446,5	18,98	5,50
2008	0,23939	51,	5,1	0,35	0,08	4633,	463,3	19,69	5,19
2009	0,21763	48,	4,8	0,33	0,07	4801,	480,1	20,40	4,88
2010	0,19784	48,	4,8	0,33	0,06	4801,	480,1	20,40	4,44
2042	0,00957	48,	4,8	0,33	0,00	4801,	480,1	20,40	0,21
2043	0,00852	48,	4,8	0,33	0,00	4801,	480,1	20,40	0,19
SUMMARY	9,91481	66,	6,6	0,45	7,55	4206,	420,6	17,88	131,87

********** SUMMARY OF OPERATION STUDY **********

						----- POWER GENERATION BY EXCESS WATER -----		--- PUMP OPERATION FOR WATER SUPPLY---						
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)	W,S, (CMS)
1994	257,51	151,30	106,74	7,32	0,86	100,0	109,41	225,	22,5	172,	17,2	105,36	107,98	66,27	1,46
2000	257,51	150,67	107,11	7,26	0,86	100,0	108,45	91,	9,1	2890,	289,0	106,46	109,04	65,67	23,90
2005	257,51	150,33	107,74	7,17	0,86	100,0	108,11	60,	6,0	4129,	412,9	106,93	109,49	65,44	33,07
2009	257,51	150,17	107,73	7,18	0,86	100,0	108,05	48,	4,8	4801,	480,1	107,15	109,69	65,31	38,17

** OPERATION STUDY OF KALIWA P/T ** (PEAK POWER GENERATION T = 4 HOUR/DAY)

** CASE 34 ** PR = 100 MW , MAX.T.W.L. = 155,000 M , DIA. OF H.R.TUNNEL = 6.5 M
QR = 127.78 CMS , RH = 92.860 M , ALPHA = 0.0005915

KW KWH VALUE IN US D (POWER GENERATION)

TIME	0.	1950.	2550.
KWH V.	0.0682	0.0425	0.0204
KW V.	63.35	111.76	160.25

KWH COST IN US D (PUMP OPERATION)

TIME	0.
COST	0.0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION OPERATION HOUR	95 % POWER	ANNUAL P.B.	ENERGY GENERATED	ANNUAL E.B.	PRESENT WORTH	PUMP OPERATION OPERATION HOUR	ENERGY CONSUMED	ANNUAL COST	PRESENT WORTH
YEAR	P.W.F.	(H)	(MW)	(M.D.)	(GWH)	(M.D.)	(M.D.)	(H)	(GWH)	(M.D.)	(M.D.)
1994	0.90909	1460.	83.1	5.27	142.3	9.71	13.61	2629.	262.9	11.17	11.17
1995	0.82645	1460.	83.3	5.28	142.4	9.71	12.39	2630.	263.0	11.18	10.16
1996	0.75131	1460.	83.5	5.29	142.5	9.72	11.27	2630.	263.0	11.18	9.24
1997	0.68301	1460.	83.7	5.30	142.5	9.72	10.26	2631.	263.1	11.18	8.40
1998	0.62092	1460.	83.9	5.31	142.6	9.73	9.34	2632.	263.2	11.18	7.64
1999	0.56447	1460.	84.1	5.33	142.7	9.73	8.50	2632.	263.2	11.19	6.95
2000	0.51316	1460.	84.3	5.34	142.8	9.74	7.74	2633.	263.3	11.19	6.32
2001	0.46651	1460.	84.4	5.35	142.8	9.74	7.04	2633.	263.3	11.19	5.74
2002	0.42410	1460.	84.6	5.36	142.8	9.74	6.41	2634.	263.4	11.19	5.22
2003	0.38554	1460.	84.8	5.37	142.9	9.74	5.83	2634.	263.4	11.19	4.75
2004	0.35049	1460.	85.0	5.39	142.9	9.75	5.30	2634.	263.4	11.20	4.32
2005	0.31863	1460.	85.2	5.40	142.9	9.75	4.83	2634.	263.4	11.20	3.92
2006	0.28966	1460.	85.4	5.41	143.0	9.75	4.39	2635.	263.5	11.20	3.57
2007	0.26333	1460.	85.6	5.42	143.0	9.75	4.00	2635.	263.5	11.20	3.24
2008	0.23939	1460.	85.8	5.44	143.0	9.75	3.64	2635.	263.5	11.20	2.95
2009	0.21763	1460.	86.0	5.45	143.0	9.76	3.31	2635.	263.5	11.20	2.68
2010	0.19784	1460.	86.0	5.45	143.0	9.76	3.01	2635.	263.5	11.20	2.44
2042	0.00937	1460.	86.0	5.45	143.0	9.76	0.14	2635.	263.5	11.20	0.12
2043	0.00852	1460.	86.0	5.45	143.0	9.76	0.13	2635.	263.5	11.20	0.10
SUMMARY	9.91481	1460.	85.6	5.42	142.9	9.75	149.64	2634.	263.4	11.20	122.03

********** SUMMARY OF OPERATION STUDY **********

		PEAK POWER GENERATION								PUMP OPERATION				
YEAR	H.W.L. (M)	T.W.L. (M)	E.HEAD (M)	H.LOSS (M)	EATA	POWER (MW)	Q (CMS)	O.HOUR (H)	ENERGY (GWH)	O.HOUR (H)	ENERGY (GWH)	N.HEAD (M)	Q.HEAD (M)	Q (CMS)
1994	257.51	151.30	97.90	8.32	0.86	97.5	118.49	1460.	142.3	2629.	262.9	106.22	108.81	65.78
2000	257.51	150.62	98.65	8.25	0.86	97.8	117.93	1460.	142.8	2633.	263.3	106.90	109.45	65.40
2005	257.51	150.33	98.98	8.21	0.86	97.9	117.70	1460.	142.9	2634.	263.4	107.19	109.73	65.23
2009	257.51	150.17	99.15	8.20	0.86	98.0	117.57	1460.	143.0	2635.	263.5	107.35	109.88	65.14

** OPERATION STUDY OF KALIWA PAT ** (W,S, AND P,G, BY EXCESS WATER)

** CASE J5 ** PR = 100 MW , MAX,T,W,L, = 145,000 M , DIA, OF H,R,TUNNEL = 6,5 M
QR = 117,64 CMS , RH = 100,860 M , ALPHA = 0,0008419

KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1950,	2550,
KWH V,	0,0682	0,0425	0,0234

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION				PUMP OPERATION			
YEAR	P;W,F,	OPERATION HOUR (H)	ENERGY GENERATED (GWH)	ANNUAL BENEFIT (M US D)	PRESENT WORTH (M US D)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M US D)	PRESENT WORTH (M US D)
1994	0,90909	242,	24,2	1,65	1,50	187,	18,7	0,80	0,80
1995	0,82645	218,	21,8	1,49	1,23	685,	68,5	2,91	2,64
1996	0,75131	194,	19,4	1,32	1,00	1182,	118,2	5,02	4,15
1997	0,68301	170,	17,0	1,16	0,79	1679,	167,9	7,13	5,36
1998	0,62092	146,	14,6	1,00	0,62	2176,	217,6	9,25	6,32
1999	0,56447	122,	12,2	0,83	0,47	2673,	267,3	11,36	7,05
2000	0,51316	98,	9,8	0,67	0,34	3170,	317,0	13,47	7,60
2001	0,46651	91,	9,1	0,62	0,29	3442,	344,2	14,63	7,51
2002	0,42410	84,	8,4	0,58	0,24	3713,	371,3	15,78	7,36
2003	0,38554	78,	7,8	0,53	0,20	3985,	398,5	16,94	7,18
2004	0,35049	71,	7,1	0,48	0,17	4257,	425,7	18,09	6,98
2005	0,31863	64,	6,4	0,44	0,14	4529,	452,9	19,25	6,75
2006	0,28966	61,	6,1	0,42	0,12	4712,	471,2	20,03	6,58
2007	0,26333	58,	5,8	0,40	0,10	4895,	489,5	20,80	6,03
2008	0,23939	55,	5,5	0,37	0,09	5078,	507,8	21,58	5,68
2009	0,21763	52,	5,2	0,35	0,08	5261,	526,1	22,36	5,35
2010	0,19784	52,	5,2	0,35	0,07	5261,	526,1	22,36	4,87
2042	0,00937	52,	5,2	0,35	0,00	5261,	526,1	22,36	0,23
2043	0,00852	52,	5,2	0,35	0,00	5261,	526,1	22,36	0,21
SUMMARY	9,91481	71,	7,1	0,49	8,13	4610,	461,0	19,59	144,58

********** SUMMARY OF OPERATION STUDY **********

						----- POWER GENERATION BY EXCESS WATER -----				--- PUMP OPERATION FOR WATER SUPPLY---					
YEAR	R,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	D,HOUR (H)	ENERGY (GWH)	D,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	G,HEAD (M)	Q (CMS)	W,S, (CMS)
1994	257,51	141,77	115,08	8,96	0,86	100,0	101,50	242,	24,2	187,	18,7	114,84	117,96	60,67	1,46
2000	257,51	140,55	115,47	8,89	0,86	100,0	100,63	98,	9,8	3170,	317,0	116,55	119,59	59,87	23,50
2005	257,51	140,22	116,11	8,79	0,86	100,0	100,32	64,	6,4	4529,	452,9	117,04	120,06	59,66	33,07
2009	257,51	140,15	116,09	8,79	0,86	100,0	100,26	52,	5,2	5261,	526,1	117,17	120,18	59,60	38,17

** OPERATION STUDY OF KALIWA P/T ** (PEAK POWER GENERATION T = 4 HOUR/DAY)

** CASE 35 ** PR = 100 MW , MAX,T,W,L, = 145,000 M , DIA, OF H,R,TUNNEL = 6,5 M
QR = 117,64 CMS , RH = 100,860 M , ALPHA = 0,0008419 .

KW KWH VALUE IN US D (POWER GENERATION)

TIME	0,	1990,	2990,
KWH V,	0,0682	0,0425	0,0244
KW V,	63,35	111,76	160,25

KWH COST IN US D (PUMP OPERATION)

TIME	0,
COST	0,0425

********** BENEFIT AND COST CALCULATION **********

		POWER GENERATION						PUMP OPERATION			
YEAR	P,W,F,	OPERATION HOUR (H)	95 % POWER (MW)	ANNUAL P,B, (M,D,)	ENERGY GENERATED (GWH)	ANNUAL E,B, (M,D,)	PRESENT WORTH (M,D,)	OPERATION HOUR (H)	ENERGY CONSUMED (GWH)	ANNUAL COST (M,D,)	PRESENT WORTH (M,D,)
1994	0,90909	1460,	82,7	5,24	142,1	9,69	13,57	2658,	265,8	11,30	11,30
1995	0,82645	1460,	83,2	5,27	142,3	9,70	12,37	2659,	265,9	11,30	10,27
1996	0,75131	1460,	83,6	5,30	142,4	9,71	11,20	2661,	266,1	11,31	9,35
1997	0,68301	1460,	84,1	5,33	142,5	9,72	10,28	2662,	266,2	11,31	8,50
1998	0,62092	1460,	84,6	5,36	142,7	9,73	9,37	2663,	266,3	11,32	7,73
1999	0,56447	1460,	85,0	5,39	142,8	9,74	8,54	2664,	266,4	11,32	7,03
2000	0,51316	1460,	85,3	5,42	142,9	9,75	7,78	2666,	266,6	11,33	6,39
2001	0,46651	1460,	85,6	5,42	143,0	9,75	7,08	2666,	266,6	11,33	5,81
2002	0,42410	1460,	85,6	5,43	143,0	9,75	6,44	2666,	266,6	11,33	5,29
2003	0,38554	1460,	85,7	5,43	143,0	9,75	5,85	2666,	266,6	11,33	4,80
2004	0,35049	1460,	85,8	5,43	143,1	9,76	5,32	2666,	266,6	11,33	4,37
2005	0,31863	1460,	85,8	5,44	143,1	9,76	4,84	2666,	266,6	11,33	3,97
2006	0,28966	1460,	85,9	5,44	143,1	9,76	4,40	2666,	266,6	11,33	3,61
2007	0,26333	1460,	85,9	5,44	143,1	9,76	4,00	2665,	266,5	11,33	3,28
2008	0,23939	1460,	86,0	5,45	143,1	9,76	3,64	2665,	266,5	11,33	2,98
2009	0,21763	1460,	86,0	5,45	143,1	9,76	3,31	2665,	266,5	11,33	2,71
2010	0,19784	1460,	86,0	5,45	143,1	9,76	3,01	2665,	266,5	11,33	2,47
2042	0,00937	1460,	86,0	5,45	143,1	9,76	0,14	2665,	266,5	11,33	0,12
2043	0,00852	1460,	86,0	5,45	143,1	9,76	0,13	2665,	266,5	11,33	0,11
SUMMARY	9,91481	1460,	85,7	5,43	143,0	9,75	149,88	2665,	266,5	11,33	123,45

********** SUMMARY OF OPERATION STUDY **********

		PEAK POWER GENERATION							PUMP OPERATION				
YEAR	H,W,L, (M)	T,W,L, (M)	E,HEAD (M)	H,LOSS (M)	EATA	POWER (MW)	Q (CMS)	O,HOUR (H)	ENERGY (GWH)	O,HOUR (H)	ENERGY (GWH)	N,HEAD (M)	O,HEAD (M)	Q (CMS)
1994	257,51	141,77	105,61	10,14	0,86	97,3	109,62	1460,	142,1	2658,	265,8	115,75	118,83	60,21
2000	257,51	140,59	106,97	10,00	0,86	97,9	108,89	1460,	142,9	2666,	266,6	116,97	119,99	59,64
2005	257,51	140,22	107,34	9,96	0,86	98,0	108,62	1460,	143,1	2666,	266,6	117,30	120,30	59,49
2009	257,51	140,15	107,43	9,94	0,86	98,0	108,54	1460,	143,1	2665,	266,5	117,37	120,37	59,46

** RESERVOIR OPERATION STUDY OF KANAN NO.5 DAM ** I.C. = 280 MW NIPPON KOEI TOKYO/JAPAN

HIGH WATER LEVEL IN METER 260.000 LOW WATER LEVEL IN METER 220.000 RATED HEAD IN METER 208.580
INSTALLED CAPACITY IN MW 280.000 DEPENDABLE CAPACITY IN MW 228.361 TARGET OPERATION HOUR A DAY 5.06
RATED DISCHARGE IN CMS 159.280 TYPE OF RULE CURVE .. VARIABLE MASS CURVE

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
RULE CURVE IN MWH	43.938	43.938	43.938	43.938	43.938	43.938	43.938	43.938	43.938	43.938	43.938	43.938

LENGTH OF INFLOW SERIES IN YEAR 26

*** BENEFIT CALCULATION ***
DISCOUNT RATE 10.0 POWER DEPENDABILITY IN % 95.0

O.HOUR / YEAR	KW VALUE IN US D	KWH VALUE IN US D
2550.0	160.25	0.0234
1950.0	111.76	0.0425
0.	63.35	0.0682

YEAR	DEPENDABLE POWER (MW)	ANNUAL ENERGY (GWH)	BENEFIT POWER (M US D)	BENEFIT ENERGY (M US D)	BENEFIT TOTAL (M US D)	P.W.F.	PRESENT WORTH (M US D)	OPERATION HOUR (H)
1989	264.0	930.26	42.30	21.77	64.07	0.90909	58.25	3337.
1990	264.0	930.26	42.30	21.77	64.07	0.82645	52.95	3337.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
2037	264.0	930.26	42.30	21.77	64.07	0.00937	0.60	3337.
2038	264.0	930.26	42.30	21.77	64.07	0.00852	0.55	3337.
SUMMARY	264.0	930.26	42.30	21.77	64.07	9.91481	635.27	3337.

** RESERVOIR OPERATION STUDY OF KANAN NO.5 DAM ** I.C. = 280 MW NIPPON KOEI TOKYO/JAPAN

HIGH WATER LEVEL IN METER 260.000 LOW WATER LEVEL IN METER 220.000 RATED HEAD IN METER 208.580
INSTALLED CAPACITY IN MW 280.000 DEPENDABLE CAPACITY IN MW 228.361 TARGET OPERATION HOUR A DAY 5.06
RATED DISCHARGE IN CMS 159.280 TYPE OF RULE CURVE .. VARIABLE MASS CURVE

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
RULE CURVE IN MWH	43,938	43,938	43,938	43,938	43,938	43,938	43,938	43,938	43,938	43,938	43,938	43,938

LENGTH OF INFLOW SERIES IN YEAR 26

*** MONTHLY SUMMARY OF RESERVOIR OPERATION STUDY FOR THE TARGET YEAR 1989 ***

MONTH	INFLOW (CMS)	EVAPO. (CMS)	SPILL (CMS)	Q24 (CMS)	QQ (CMS)	S2 (MCM)	R.W.L. (M)	T.W.L. (M)	F.HEAD (M)	EFFICI.	POWER (MW)	O.HOUR (H)	P.E. (GWH)	S.E. (GWH)	T.E. (GWH)
JAN.	113.07	0.74	4.16	102.97	150.22	472.75	259.191	25.000	221.048	0.860	279.8	511.2	43.94	99.15	143.09
FEB.	83.62	0.96	0.	82.34	149.98	473.51	259.653	25.000	221.521	0.860	280.0	369.3	43.94	59.48	103.41
MAR.	62.50	1.12	0.	61.85	149.98	472.26	259.646	25.000	221.514	0.860	280.0	307.1	43.94	42.05	85.99
APR.	59.13	1.27	0.	61.90	150.25	461.78	259.302	25.000	221.124	0.860	280.0	200.9	43.94	12.33	56.26
MAY	55.84	1.03	0.	60.10	150.99	442.22	258.368	25.000	220.057	0.860	280.0	197.9	43.94	11.48	55.42
JUNE	51.70	0.73	0.	59.36	152.01	420.48	257.004	25.000	218.510	0.860	279.9	186.9	43.94	8.36	52.30
JULY	11.74	0.57	0.	53.10	153.84	359.88	254.751	25.000	215.429	0.860	279.7	161.1	41.94	1.05	44.98
AUG.	10.08	0.42	0.	53.28	155.85	290.60	249.892	25.000	210.708	0.860	276.7	158.9	43.94	0.	43.94
SEP.	19.39	0.51	0.	55.09	156.53	254.59	243.874	25.000	206.568	0.860	272.5	161.5	43.94	0.	43.94
OCT.	79.43	0.51	1.37	62.65	155.22	348.08	248.059	25.000	209.244	0.860	273.7	205.8	43.94	12.57	56.50
NOV.	112.71	0.52	2.72	79.12	151.67	426.74	254.435	25.000	216.337	0.860	276.4	378.0	43.94	61.26	105.20
DEC.	124.51	0.60	11.50	100.42	150.53	458.83	257.806	25.000	219.742	0.860	278.7	498.0	43.94	95.28	139.22
MEAN	60.01	0.75	1.67	57.59	152.27	406.95	255.267	25.000	216.791	0.860	278.1	3336.5	527.25	403.01	930.26

*** THERE ARE POWER DEFICIT OF THE LONGEST DURATION 7 CONTINUOUS MONTH ***
THESE DEFICITS OCCURED 15 TIMES
LONGEST DURATION FROM 20-TH YEAR 6-TH MONTH TO 20-TH YEAR 12-TH MONTH LOWEST POWER 230.1 MW

*** DEPENDABLE DISCHARGE , POWER OUTPUT AND ENERGY OUTPUT ***

	100.0	% DEPENDABLE		95.0	% DEPENDABLE		90.0	% DEPENDABLE		85.0	% DEPENDABLE		80.0	% DEPENDABLE	
YEAR	Q(CMS)	P(MW)	E(GWH)	Q(CMS)	P(MW)	E(GWH)	Q(CMS)	P(MW)	E(GWH)	Q(CMS)	P(MW)	E(GWH)	Q(CMS)	P(MW)	E(GWH)
1989	31.58	230.10	43.94	31.78	263.99	43.94	32.15	275.27	43.94	32.55	280.00	43.94	32.76	280.00	43.94

** RESERVOIR OPERATION STUDY OF KANAN NO.5 DAM ** I.C. = 200 MW NIPPON KOEI TOKYO/JAPAN

HIGH WATER LEVEL IN METER 260.000 LOW WATER LEVEL IN METER 220.000 RATED HEAD IN METER 207.530
INSTALLED CAPACITY IN MW 200.000 DEPENDABLE CAPACITY IN MW 122.781 TARGET OPERATION HOUR A DAY 7.09
RATED DISCHARGE IN CMS 114.457 TYPE OF RULE CURVE .. VARIABLE MASS CURVE

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
RULE CURVE IN MWH	45.95H	45.95H	45.95H	45.95H	43.93H	43.93H	45.95H	43.95H	45.95H	43.95H	45.95H	45.95H

LENGTH OF INFLOW SERIES IN YEAR 26

*** BENEFIT CALCULATION ***
DISCOUNT RATE 10.0 POWER DEPENDABILITY IN % 95.0

O.HOUR / YEAR	KW VALUE IN US D	KWH VALUE IN US D
2550.0	160.25	0.0234
1950.0	111.76	0.0425
0.	65.55	0.0682

YEAR	DEPENDABLE POWER (MW)	ANNUAL ENERGY (GWH)	BENEFIT POWER (M US D)	BENEFIT ENERGY (M US D)	TOTAL (M US D)	P.W.F.	PRESENT WORTH (M US D)	OPERATION HOUR (H)
1989	200.0	880.58	32.05	20.61	52.66	0.90909	47.87	4406.
1990	200.0	880.58	32.05	20.61	52.66	0.82645	43.52	4406.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
2037	200.0	880.58	32.05	20.61	52.66	0.00937	0.49	4406.
2038	200.0	880.58	32.05	20.61	52.66	0.00852	0.45	4406.
SUMMARY	200.0	880.58	32.05	20.61	52.66	9.91481	522.07	4406.

** RESERVOIR OPERATION STUDY OF KANAN NO.5 DAM ** I.C. = 200 MW NIPPON KOEI TOKYO/JAPAN

HIGH WATER LEVEL IN METER 260.000 LOW WATER LEVEL IN METER 220.000 RATED HEAD IN METER 207.330
INSTALLED CAPACITY IN MW 200.000 DEPENDABLE CAPACITY IN MW 172.781 TARGET OPERATION HOUR A DAY 7.09
RATED DISCHARGE IN CMS 114.457 TYPE OF RULE CURVE .. VARIABLE MASS CURVE

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
RULE CURVE IN MWH	43,938	43,938	43,938	43,938	43,938	43,938	43,938	43,938	43,938	43,938	43,938	43,938

LENGTH OF INFLOW SERIES IN YEAR 20

*** MONTHLY SUMMARY OF RESERVOIR OPERATION STUDY FOR THE TARGET YEAR 1989 ***

MONTH	INFLOW (CMS)	EVAPO. (CMS)	SPILL (CMS)	Q24 (CMS)	Q6 (CMS)	S2 (MCM)	R.W.L. (M)	T.W.L. (M)	E.HEAD (M)	EFFICI.	POWER (MW)	O.HOUR (H)	P.E. (GWH)	S.E. (GWH)	T.E. (GWH)
JAN.	113.07	0.74	17.87	90.35	104.02	475.29	259.472	25.000	228.165	0.860	200.0	647.3	43.94	85.53	129.47
FEB.	83.62	0.96	5.40	76.82	103.84	476.33	259.824	25.000	228.522	0.860	200.0	497.4	43.94	55.54	99.48
MAR.	62.50	1.12	1.99	59.90	103.85	474.95	259.833	25.000	228.542	0.860	200.0	429.4	43.94	41.94	85.88
APR.	39.13	1.28	0.54	41.22	104.02	464.80	259.463	25.000	228.145	0.860	200.0	285.5	43.94	13.16	57.10
MAY	53.85	1.05	0.98	38.46	104.43	446.98	258.615	25.000	227.245	0.860	200.0	274.4	43.94	10.94	54.87
JUNE	51.70	0.74	1.30	37.34	105.05	427.10	257.387	25.000	225.940	0.860	200.0	256.4	43.94	7.33	51.27
JULY	11.24	0.57	0.	52.23	106.35	369.35	254.824	25.000	223.214	0.860	200.0	225.6	43.94	1.18	45.12
AUG.	10.08	0.43	0.	52.03	108.43	309.39	250.748	25.000	218.877	0.860	199.9	219.8	43.94	0.	43.94
SEP.	19.39	0.52	0.	33.71	109.99	270.95	247.075	25.000	215.006	0.860	199.2	220.6	43.94	0.	43.94
OCT.	79.43	0.52	4.03	40.20	108.52	363.86	249.417	25.000	217.804	0.860	199.0	277.8	43.94	11.38	55.32
NOV.	112.71	0.53	14.85	69.65	105.70	435.63	255.390	25.000	224.156	0.860	199.5	478.8	43.94	51.70	95.64
DEC.	124.51	0.60	30.26	82.93	104.55	464.30	258.333	25.000	227.075	0.860	200.0	592.9	43.94	74.63	118.57
MEAN	60.01	0.75	6.47	52.79	105.74	414.58	255.844	25.000	224.369	0.860	199.8	4405.8	527.25	353.33	880.58

*** THERE ARE POWER DEFICIT OF THE LONGEST DURATION 4 CONTINUOUS MONTH ***
THESE DEFICITS OCCURED 5 TIMES
LONGEST DURATION FROM 20-TH YEAR 8-TH MONTH TO 20-TH YEAR 11-TH MONTH LOWEST POWER 185.9 MW

*** DEPENDABLE DISCHARGE , POWER OUTPUT AND ENERGY OUTPUT ***

	100.0	% DEPENDABLE		95.0	% DEPENDABLE		90.0	% DEPENDABLE		85.0	% DEPENDABLE		80.0	% DEPENDABLE	
YEAR	Q(CMS)	P(MW)	E(GWH)	Q(CMS)	P(MW)	E(GWH)	Q(CMS)	P(MW)	E(GWH)	Q(CMS)	P(MW)	E(GWH)	Q(CMS)	P(MW)	E(GWH)
1989	50.65	183.91	43.94	50.81	200.00	43.94	51.12	200.00	43.94	51.49	200.00	43.94	51.72	200.00	43.94

*** WATER SUPPLY BENEFIT ***

** PLAN A-2 KALIWA PICOREH DAM **

WATER SUPPLY VALUE IN US $ 0.13333 /C.M.

YEAR	W.SUPPLY (CMS)	BENEFIT (M.US $)	P.W.F.	P.WORTH (M.US $)
1987	1.20	7.16	0.90900	6.51
1988	4.05	17.03	0.82645	14.08
1989	6.40	26.91	0.75131	20.22
1990	9.40	39.53	0.68301	27.00
1991	12.40	52.14	0.62092	32.38
1992	15.40	64.76	0.56447	36.56
1993	18.40	77.38	0.51316	39.71
1994	21.40	89.99	0.46651	41.98
1995	21.40	89.99	0.42410	38.17
	.	.	.	.
	.	.	.	.
	.	.	.	.
	.	.	.	.
	.	.	.	.
2035	21.40	89.99	0.00957	0.84
2036	21.40	89.99	0.00852	0.77
SUMMARY	19.76	85.09	9.91481	630.58

** PLAN A-2 KALIWA PICOREH DAM **

SIMULATED WATER SUPPLY FOR THE TARGET YEAR 1994

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.	MEAN
MEAN	22.98	22.98	22.98	21.77	19.97	19.46	22.37	22.64	22.98	22.98	22.98	22.98	22.26
MIN.	22.98	22.98	22.98	2.30	0.03	1.30	16.96	14.16	22.98	22.98	22.98	22.98	0.95

*** WATER SUPPLY BENEFIT ***

** PLAN A-2 KANAN PICOREM DAM **

WATER SUPPLY VALUE IN US $ 0.15333 /C.M.

YEAR	W.SUPPLY (CMS)	BENEFIT (M.US $)	P.W.F.	P.WORTH (M.US $)
1994	1.40	5.89	0.90909	5.35
1995	4.93	20.75	0.82645	17.13
1996	8.46	35.58	0.75131	26.73
1997	11.99	50.42	0.68301	34.44
1998	15.52	65.27	0.62092	40.53
1999	19.05	80.12	0.56447	45.22
2000	22.58	94.96	0.51316	48.73
2001	24.08	101.27	0.46651	47.24
2002	25.59	107.58	0.42410	45.63
2003	27.09	113.89	0.38554	43.91
2004	28.59	120.20	0.35049	42.13
2005	30.09	126.51	0.31863	40.31
2006	30.77	129.39	0.28966	37.48
2007	31.46	132.27	0.26333	34.84
2008	32.14	135.14	0.23939	32.35
2009	32.82	138.02	0.21763	30.04
2010	32.82	138.02	0.19784	27.31
	.	.	.	.
	.	.	.	.
	.	.	.	.
	.	.	.	.
2042	32.82	138.02	0.00937	1.29
2043	32.82	138.02	0.00852	1.18
SUMMARY	29.25	123.00	9.91481	860.68

** PLAN A-2 KANAN PICOREM DAM **

SIMULATED WATER SUPPLY FOR THE TARGET YEAR 2009

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.	MEAN
MEAN	38.17	38.17	37.69	37.27	37.02	36.52	31.79	21.57	19.66	35.91	38.17	37.91	34.14
MIN.	38.17	38.17	25.65	14.91	8.22	5.76	4.27	2.31	7.80	25.66	38.17	31.45	2.31

*** WATER SUPPLY BENEFIT ***

PLAN A=5 HWL OF AGOS = 165 OF KANAN = 290

WATER SUPPLY VALUE IN US D 0.13333 /C.M.

YEAR	W.SUPPLY (CMS)	BENEFIT (M.US D)	P.W.F.	P.WORTH (M.US D)
1994	1.40	5.89	0.90909	5.35
1995	4.93	20.74	0.82645	17.14
1996	8.47	35.60	0.75131	26.75
1997	12.00	50.46	0.68301	34.46
1998	15.53	65.31	0.62092	40.56
1999	19.07	80.17	0.56447	45.25
2000	22.60	95.03	0.51316	48.76
2001	24.44	102.77	0.46651	47.94
2002	26.28	110.50	0.42410	46.86
2003	28.12	118.24	0.38554	45.59
2004	29.96	125.98	0.35049	44.15
2005	31.80	133.71	0.31863	42.60
2006	33.03	138.86	0.28966	40.22
2007	34.25	144.01	0.26333	37.92
2008	35.48	149.17	0.23939	35.71
2009	36.70	154.32	0.21763	33.58
2010	36.70	154.32	0.19784	30.55
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
2042	36.70	154.32	0.00937	1.45
2043	36.70	154.32	0.00852	1.31
SUMMARY	52.24	135.55	9.91481	915.56

PLAN A=3 HWL OF AGOS = 125 OF KANAN = 300

WATER ACTUALLY PUMPED UP BY KALIWA PUMP TURBINE

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.	MEAN
MEAN	38.17	38.17	38.17	38.17	38.17	38.17	37.78	36.33	36.76	34.94	30.73	24.00	35.80
MIN.	38.17	38.17	38.17	38.17	38.17	38.17	27.97	0.	2.35	0.	4.35	0.	0.

TOTAL WATER SUPPLY INCLUDING THE KALIWA EXCESS WATER UTILIZED

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.	MEAN
MEAN	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17
MIN.	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17

SPILL OUT FROM KALIWA DAM FOR THE TARGET YEAR 1994

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.	MEAN
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	6.48	0.54
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	76.93	65.46	7.70
3	0.	0.	0.	0.	0.	0.	0.	0.	0.	56.44	1.00	44.89	8.53
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	26.46	2.20
5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	5.14	105.40	9.84
8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	16.50	70.65	3.10
12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	7.46	3.39	0.94
13	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.55	22.72	19.39	3.61
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	24.70	45.01	5.11
16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
21	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
22	0.	0.	0.	0.	0.	0.	0.	9.52	0.79	28.99	55.44	55.46	10.72
23	0.	0.	0.	0.	0.	0.	10.20	72.79	55.83	0.95	19.58	29.70	14.50
24	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	27.57	2.30
25	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	8.90	5.84	1.23
26	0.	0.	0.	0.	0.	0.	0.	0.	0.	14.56	26.65	42.13	6.95
MEAN	0.	0.	0.	0.	0.	0.	0.59	3.36	1.41	3.95	7.44	19.06	2.97
MIN.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

*** PLAN A-2 KALIWA PICUREM DAM ***

SIMULATED WATER SUPPLY SERIES FOR THE TARGET YEAR 1994

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.	MEAN
1	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98
2	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98
3	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98
4	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98
5	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98
6	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98
7	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98
8	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98
9	22.98	22.98	22.98	22.98	20.56	7.65	22.98	22.98	22.98	22.98	22.98	22.98	21.49
10	22.98	22.98	22.98	22.98	10.24	2.72	14.95	22.98	22.98	22.98	22.98	22.98	19.89
11	22.98	22.98	22.98	17.29	4.17	9.08	22.98	22.98	22.98	22.98	22.98	22.98	19.78
12	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98
13	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98
14	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98
15	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98
16	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98
17	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98
18	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98
19	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98
20	22.98	22.98	22.98	17.90	0.93	1.50	16.96	22.98	22.98	22.98	22.98	22.98	18.41
21	22.98	22.98	22.98	2.10	0.98	2.51	16.99	14.16	22.98	22.98	22.98	22.98	16.49
22	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98
23	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98
24	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98
25	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98
26	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98	22.98
MEAN	22.98	22.98	22.98	21.77	19.97	19.46	22.57	22.64	22.98	22.98	22.98	22.98	22.26
MIN.	22.98	22.98	22.98	2.10	0.93	1.50	16.96	14.16	22.98	22.98	22.98	22.98	0.93

*** PLAN A-2 KANAN PICURIN DAM ***

SIMULATED WATER SUPPLY SERIES FOR THE TARGET YEAR 2009

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.	MEAN
1	38.17	38.17	38.17	38.17	38.17	38.17	38.17	12.90	8.76	38.17	38.17	38.17	35.61
2	38.17	38.17	38.17	38.17	38.17	38.17	38.17	37.51	10.68	30.79	38.17	38.17	35.21
3	38.17	38.17	38.17	38.17	38.17	38.17	38.17	16.17	17.13	38.17	38.17	38.17	34.58
4	38.17	38.17	38.17	38.17	38.17	38.17	38.17	15.28	7.80	38.17	38.17	38.17	33.73
5	38.17	38.17	38.17	38.17	38.17	38.17	35.54	5.87	8.09	25.66	38.17	38.17	31.56
6	38.17	38.17	38.17	38.17	38.17	38.17	38.17	10.09	11.32	38.17	38.17	38.17	33.59
7	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17
8	38.17	38.17	38.17	38.17	38.17	38.17	6.98	7.01	9.81	35.66	38.17	31.45	29.67
9	38.17	38.17	38.17	38.17	38.17	38.17	38.17	27.09	14.30	38.17	38.17	38.17	35.26
10	38.17	38.17	38.17	38.17	38.17	38.17	24.65	5.15	11.05	32.57	38.17	38.17	31.56
11	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17
12	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17
13	38.17	38.17	38.17	38.17	38.17	38.17	38.17	30.79	32.19	38.17	38.17	38.17	37.06
14	38.17	38.17	38.17	38.17	38.17	38.17	38.17	27.71	22.69	38.17	38.17	38.17	36.01
15	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	32.60	38.17	38.17	38.17	37.70
16	38.17	38.17	38.17	38.17	38.17	38.17	29.59	5.00	11.49	38.17	38.17	38.17	32.47
17	38.17	38.17	38.17	38.17	38.17	38.17	25.24	5.19	13.24	38.17	38.17	38.17	32.10
18	38.17	38.17	38.17	38.17	38.17	38.17	38.17	37.13	12.57	24.51	38.17	38.17	34.81
19	38.17	38.17	38.17	38.17	38.17	38.17	38.17	22.61	14.83	38.17	38.17	38.17	34.93
20	38.17	38.17	25.65	14.93	8.22	5.76	4.27	4.94	10.95	26.49	38.17	38.17	21.16
21	38.17	38.17	38.17	38.17	38.17	27.71	4.28	2.31	18.80	38.17	38.17	38.17	29.87
22	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17
23	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17	38.17
24	38.17	38.17	38.17	38.17	38.17	38.17	38.17	19.95	8.77	38.17	38.17	38.17	34.20
25	38.17	38.17	38.17	38.17	38.17	38.17	38.17	26.67	19.59	37.31	38.17	38.17	35.59
26	38.17	38.17	38.17	38.17	38.17	38.17	9.19	11.18	23.57	38.17	38.17	38.17	32.29
MEAN	38.17	38.17	37.69	37.27	37.02	36.52	31.79	21.37	19.66	35.95	38.17	37.91	34.14
MIN.	38.17	38.17	25.65	14.93	8.22	5.76	4.27	2.31	7.80	23.66	38.17	31.45	2.31