Table 4-1 Installed Generating Capacity

As of end of 1994

		Plant Name	Type	No. of Machine	Capacity (MW)		Generation Engery (MWh)		Commission Year
					Installed	Dependable Available	Average	Firm	
I C E	Hydro	La Garita	F	2	30	20	162	162	1958
		Rio Macho	P	5	120	90	501	396	1963
		Cachi	F	3	100	90	596	565	1966
		Arenal	F	3	156	156	601	601	1979
		Corobici	F	3	174	174	672	672	1982
		Ventanas Garita	F	2	100	70	434	361	1987
		Sandillal	K	2	32	32	124	124	1993
		Plantas Menores	-	6	74	37	261	180	--
		Generacion Privada			12	6	68	20	--
		Sub Total			798	675	3,419	3,081	
	Thermal	Colima	D	6	19.5	14.0	136.6	136.6	1956
		San Antonio	V-G	4	48.1	40.0	170.1	170.1	1954
		Barranca	Gas	2	41.6	30.0	109.3	109.3	1974
		Moin	D Gas	7	140.3	125.0	508.0	508.0	1977
		Pto. Jimenez	D	4	1.3	1.2	9.1	9.1	--
		Miravalles	Ge.	1	55	52.3	433.6	433.6	1994
		Sub Total			305.5	262.5	1,366.7	1,366.7	
Another Company		ESPH	-	5	2.3	1.2	--	7.3	--
		JASEC	-	4	22.7	11.3	--	69.3	--
		CNFL	-	19	37.5	18.7	--	114.7	--
		Mata Moros	-	7	3.3	1.6	--	9.8	--
		Sub Total			65.8	32.8		201.1	
Co. Gene.		Varias	T	1	4	2		12.2	
		Varias	M	4	4.5	2.3		19.7	
		Sub Total			8.5	4.3		31.9	
		Total			1,177.8	974.6		4,680.7	

P : Pelton
F : Francis
D : Diesel
V-G : Vapor Gas
Gas : Gas Turbine
D Gas : Diesel Gas
Ge : Geo Thermal
T : Thermal
M :

Table 4-2 Major Transmission Lines in Operation

As of end of 1994

	Voltage	Location (From ~ To)	Length (km)	Conductor
Existent	230 kV	Peñas Blancas (Frontera Nicaragua) ~ Liberia	77.0	DRA
		Liberia ~ Canas	42.0	DRA
		Sandillal ~ Corobici	3.0	DRA
		Miravalles ~ Arenal	42.0	DRA
		Arenal ~ Corobici	11.0	DRA
		Corobici ~ Canas	7.0	DRA
		Canas ~ Barranca	70.0	GRO
		Arenal ~ Barranca (2 cct)	68.0	CON
		Arenal ~ Ciudad Quesada	83.0	2 x GRO
		Ciudad Quesada ~ Toro	30.0	2 x GRO
		Toro ~ San Miguel	50.0	2 x GRO
		Barranca ~ La Caja (2 cct)	62.0	DRA
		Rio Macho ~ San Isidro	65.0	DRA
		San Isidro ~ Rio Claro	110.0	DRA
		Rio Claro ~ Progreso (Panama)	30.0	DRA
		Total	880.0	
	138 kV	Guayabal ~ Canas	58.2	ORI
		Canas ~ Colorado	25.0	LIN
		Canas ~ Santa Rita	32.0	CAN
		Canas ~ Cempa	1.2	LIN
		Barranca ~ Ventanas Garita	34.4	LIN
		Ventanas Garita ~ Naranjo	17.3	ORI
		Naranjo ~ Daniel Guetierrez	25.0	GRO
		Ventanas Garita ~ El Coco	19.2	GRO
		El Coco ~ La Caja	15.9	GRO
		Ventana Garita ~ La Caja	21.8	GRO
		La Caja ~ Heredia	7.9	GRO
		Heredia ~ Colima	7.1	GRO
		La Caja ~ Colima	8.5	GRO
		Colima ~ San Miguel	10.0	GRO
		San Miguel ~ SBN	6.0	GRO
		SBN ~ Cachi	19.2	GRO
		Colima ~ El Este	8.5	GRO
		La Caja ~ El Este	18.5	GRO
		El Este ~ Cachi	29.0	GRO
		La Caja ~ Escazu	3.0	GRO
		Escazu ~ Desamparados	17.0	GRO
		Desamparados ~ El Este	10.4	GRO
		La Caja ~ Alajuelita	11.6	GRO
		Alajuelita ~ El Este	19.1	GRO
		El Este ~ Concavas	16.4	GRO
		Concavas ~ Rio Macho	9.1	GRO
		El Este ~ Rio Macho	25.5	GRO
		Rio Macho ~ Cachi (2 cct)	14.6	DRA
		Cachi ~ PIS	19.2	GRO
		Leesville ~ PIS	33.0	GRO
		PIS ~ Siquirres	20.0	GRO
		Siquirres ~ Moin (2 cct)	41.5	LIN
		Cachi ~ Siquires	42.7	GRO
		Total	703.9	

Table 5-1 Basic Data for Demand Forecast

(At the price levels and exchange rate of 1980)

Year	GDP US$		Energy (Generation)		Population		GDP/Capita		Energy/Capita	
	(Million)	Rate (%)	(GWh)	Rate (%)	(Thousand)	Rate (%)	(US$)	Rate (%)	(kWh)	Rate (%)
1980	4,482	0.81	2,144	12.25	2,296	3.02	1,952	-2.16	934	8.98
1981	4,380	-2.28	2,291	6.86	2,365	3.04	1,852	-5.12	969	3.75
1982	4,061	-7.28	2,292	0.04	2,437	3.04	1,666	-10.04	941	-2.89
1983	4,177	2.86	2,372	3.49	2,511	3.02	1,663	-0.12	945	0.43
1984	4,513	8.04	2,568	8.26	2,578	2.68	1,751	5.17	996	5.40
1985	4,545	0.71	2,708	5.45	2,646	2.61	1,718	-1.83	1,023	2.71
1986	4,796	5.53	2,968	9.60	2,713	2.53	1,768	2.91	1,094	6.94
1987	5,025	4.77	3,246	9.37	2,781	2.53	1,807	2.32	1,167	6.67
1988	5,198	3.44	3,324	2.40	2,851	2.53	1,823	2.71	1,166	-0.08
1989	5,492	5.66	3,493	5.08	2,941	3.13	1,867	0.00	1,188	1.89
1990	5,687	3.55	3,707	6.13	3,015	2.51	1,886	1.78	1,221	2.78
1991	5,816	2.27	3,827	3.24	3,086	2.35	1,885	2.96	1,240	1.56
1992	6,240	7.29	4,079	6.58	3,132	1.49	1,992	2.29	1,302	5.00
1993	6,615	6.01	4,382	7.43	3,199	2.14	2,068	2.84	1,370	5.22
1994	6,922	4.64	4,723	7.78	3,243	1.38	2,134	3.50	1,456	6.28

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Table 5-2 Demand Forecast by ICE 1995 ~ 2015

Projecciones de Demanda de Energia Electrica 1995-2015, Mayo, 1995

Year	High Case			Base Case (Middle Case)			Low Case			Population	
	Energy (GWh)	Power (MW)	L.f (%)	Energy (GWh)	Power (MW)	L.f (%)	Energy (GWh)	Power (MW)	L.f (%)	(Thousand)	Rate (%)
1995	5,089	925	62.8	5,046	917	62.8	5,020	912	62.8	3,651	
1996	5,477	995	62.8	5,384	979	62.8	5,323	967	62.8	3,732	2.2
1997	5,883	1,069	62.8	5,729	1,041	62.8	5,627	1,024	62.7	3,829	2.6
1998	6,309	1,146	62.9	6,082	1,106	62.8	5,933	1,079	62.8	3,917	2.3
1999	6,707	1,216	63.0	6,439	1,171	62.8	6,239	1,135	62.8	4,005	2.2
2000	7,124	1,289	63.1	6,813	1,241	62.7	6,555	1,193	62.7	4,103	2.4
2001	7,561	1,368	63.1	7,201	1,311	62.7	6,890	1,254	62.7	4,202	2.4
2002	8,021	1,449	63.2	7,602	1,384	62.7	7,237	1,317	62.7	4,312	2.6
2003	8,497	1,532	63.3	8,017	1,459	62.7	7,600	1,382	62.8	4,412	2.3
2004	8,990	1,620	63.4	8,449	1,537	62.8	7,978	1,453	62.7	4,502	2.0
2005	9,504	1,712	63.4	8,885	1,618	62.7	8,359	1,522	62.7	4,558	1.2
2006	10,023	1,803	63.4	9,320	1,699	62.6	8,735	1,592	62.7	4,587	0.6
2007	10,556	1,898	63.5	9,764	1,778	62.7	9,117	1,660	62.7	4,614	0.6
2008	11,107	1,995	63.6	10,220	1,862	62.7	9,507	1,732	62.7	4,652	0.8
2009	11,670	2,093	63.6	10,681	1,947	62.6	9,898	1,804	62.6	4,723	1.5
2010	12,251	2,195	63.7	11,153	2,031	62.7	10,295	1,875	62.7	4,794	1.5
2011	12,862	2,302	63.8	11,647	2,122	62.7	10,710	1,951	62.7	4,866	1.5
2012	13,505	2,418	63.8	12,165	2,217	62.6	11,142	2,031	62.6	4,939	1.5
2013	14,182	2,536	63.8	12,705	2,316	62.6	11,591	2,110	62.7	5,013	1.5
2014	14,895	2,660	63.9	13,272	2,417	62.7	12,060	2,197	62.7	5,088	1.5
2015	15,647	2,795	63.9	13,866	2,526	62.7	12,550	2,287	62.6	5,165	1.5

Table 5-3 Demand Forecast by Macro Method

(At the price levels and exchange rate of 1980)

Year	GDP/Capita		Energy/Capita		Population		GDP (USA)		Energy Demand		Power
	(US$)	Rate (%)	(KWh)	Rate (%)	(Thousand)	Rate (%)	(Million)	Rate (%)	(GWh)	Rate (%)	(MW)
1995	2,206	3.47	1,486	4.13	3,304	1.88	7,289	5.42	4,910	6.09	934
1996	2,282	3.44	1,547	4.10	3,378	2.22	7,709	5.76	5,226	6.43	994
1997	2,360	3.41	1,610	4.07	3,466	2.60	8,180	6.11	5,580	6.77	1,062
1998	2,439	3.38	1,673	3.91	3,545	2.29	8,646	5.70	5,931	6.29	1,128
1999	2,521	3.34	1,738	3.88	3,624	2.24	9,136	5.67	6,298	6.19	1,198
2000	2,604	3.30	1,804	3.80	3,713	2.45	9,669	5.83	6,698	6.35	1,274
2001	2,689	3.26	1,872	3.77	3,803	2.41	10,226	5.76	7,119	6.29	1,354
2002	2,776	3.22	1,942	3.74	3,902	2.61	10,832	5.93	7,578	6.45	1,442
2003	2,864	3.18	2,012	3.60	3,993	2.33	11,436	5.58	8,034	6.02	1,529
2004	2,954	3.14	2,083	3.53	4,075	2.05	12,038	5.26	8,488	5.65	1,615
2005	3,045	3.09	2,156	3.50	4,125	1.24	12,561	4.34	8,894	4.78	1,692
2006	3,138	3.04	2,230	3.43	4,151	0.63	13,026	3.70	9,257	4.08	1,761
2007	3,232	2.99	2,304	3.32	4,176	0.60	13,497	3.61	9,621	3.93	1,830
2008	3,327	2.94	2,379	3.26	4,210	0.81	14,007	3.78	10,016	4.11	1,906
2009	3,423	2.89	2,455	3.19	4,274	1.53	14,630	4.45	10,493	4.76	1,996
2010	3,520	2.84	2,532	3.14	4,339	1.50	15,273	4.40	10,986	4.70	2,090
2011	3,618	2.79	2,609	3.04	4,404	1.50	15,934	4.33	11,490	4.59	2,186
2012	3,717	2.74	2,687	2.99	4,470	1.50	16,615	4.27	12,011	4.53	2,285
2013	3,817	2.69	2,766	2.94	4,537	1.50	17,318	4.23	12,549	4.48	2,387
2014	3,918	2.63	2,845	2.86	4,605	1.50	18,042	4.18	13,101	4.40	2,493
2015	4,019	2.58	2,924	2.78	4,674	1.50	18,785	4.12	13,667	4.32	2,600

Table 5-4 Construction Schedule by ICE 1995 ~ 2015

Escenario de Demanda : Base (Abril 1995)
Escenario de Combustibles : Caso Base

Año	Energía (GWh)	Crecim. (%)	Pot. (MW)	Crecim. (%)	Proyectos de generación	Año	Mes
1994	4,723		858			1994	
1995	5,046	6.8	917	6.9	P.G. Boca del Pozo (5 MW)	1995	1
					P.H. Generación Privada (15 MW)		7
					P.H. Toro I (1° etapa, 12 MW)		9
					P.H. Daniel Gutiérrez (1° etapa, 14 MW)		11
1996	5,384	6.7	979	6.8	P.H. Toro I (2° etapa, 12 MW)	1996	1
					P.T. Gas (1 x 36 MW)		1
					P.H. Generación Privada (13 MW)		1
					P.H. Generación Privada (6 MW)		6
					P.H. Daniel Gutiérrez (2° etapa, 6 MW)		6
1997	5,729	6.4	1,041	6.3	P.H. Toro II (66 MW)	1997	1
					P.H. Generación Privada (30 MW)		1
					P.H. Generación Privada (20 MW)		1
1998	6,082	6.2	1,106	6.2	P.H. Generación Privada (27 MW)	1998	1
					P.E. Tejona (1 x 20 MW)		3
					P.G. Miravalles II (55 MW)		4
1999	6,439	5.9	1,171	5.9	P.G. Miravalles III (1 x 55 MW)	1999	1
					P.H. Angostura (177 MW)		6
2000	6,183	5.8	1,241	6.0	----------	2000	
2001	7,201	5.7	1,311	5.6	P.T. Ciclo Combinado (1 x 108 MW)	2001	1
2002	7,602	5.6	1,384	5.6	----------	2002	
2003	8,017	5.5	1,459	5.4	P.H. Pirrís (128 MW)	2003	1
2004	8,449	5.4	1,537	5.3	P.G. Tenorio (1 x 55 MW)	2004	1
					P.T. Gas (1 x 36 MW)		1
2005	8,885	5.2	1,618	5.3	P.H. Los Llanos (84 MW)	2005	1
2006	9,320	4.9	1,699	5.0	P.H. Ayil (127 MW)	2006	1
2007	6,764	4.8	1,778	4.6	P.H. Laguna Hule (66 MW)	2007	1
2008	10,220	4.7	1,862	4.7	P.H. Pacuare (156 MW)	2008	1
2009	10,681	4.5	1,947	4.6	P.T. Gas (1 x 36 MW)	2009	1
2010	11,153	4.4	2,031	4.3	P.T. Gas (2 x 36 MW)	2010	1
2011	11,647	4.4	2,122	4.5	P.H. Guayabo (234 MW)	2011	1
2012	12,165	4.6	2,217	4.5	P.H. Siquirres (1° etapa, 206 MW)	2012	1
2013	12,705	4.4	2,316	5.5	----------	2013	
2014	13,272	4.5	2,417	4.4	P.H. Siquirres (2° etapa, 206 MW)	2014	1
					P.T. Gas (3 x 36 MW)		1
2015	13,866	4.5	2,526	4.5	----------	2015	

- Período : 1995-2015
- Valor presente del plan de expansión : 1,447.32
  (Millones de dólares)
- Costo marginal de largo plazo ($/MWh) : 58.59
- Nivel de precios : Diciembre 1994
- Año base : 1994
- Actualización a : Diciembre 1994
- Fecha : Agosto 1995

Table 5-8 Electric Power Development Schedule

Year	Plant Name					
	LOGOS		(HW)	by Demand Supply Program		(MW)
1995	Boca del pozo	P.G.	(5.0)	Boca del Pozo	P.G.	(5.0)
	Generación privada	P.H.	(15.0)	Generación privada	P.H.	(15.0)
	Toro (1°etapa)	P.H.	(12.0)	Toro (1°etapa)	P.H.	(12.0)
	Daniel Gutierrez (1°etapa)	P.H.	(14.0)	Daniel Gutierrez (1°etapa)	P.H.	(14.0)
1996	Toro I (2°etapa)	P.H.	(12.0)	Toro I (2°etapa)	P.H.	(12.0)
	Gas	P.T.	(36.0)	Gas	P.T.	(36.0)
	Generación Privada	P.H.	(13.0)	Generación Privada	P.H.	(13.0)
	Generación Privada	P.H.	(6.0)	Generación Privada	P.H.	(6.0)
	Daniel Gutierrez (2°etapa)	P.H.	(6.0)	Daniel Gutierrez (2°etapa)	P.H.	(6.0)
1997	Toro II	P.H.	(66.0)	Toro II	P.H.	(66.0)
	Generación Privada	P.H.	(30.0)	Generación Privada	P.H.	(30.0)
	Generación Privada	P.E.	(20.0)	Generación Privada	P.E.	(20.0)
1998	Generación Privada	P.H.	(27.0)	Generación Privada	P.H.	(27.0)
	Tejona	P.E.	(20.0)	Tejona	P.E.	(20.0)
	Miravalles	P.G.	(55.0)	Miravalles	P.G.	(55.0)
1999	Miravalles	P.G.	(55.0)	Miravalles	P.G.	(55.0)
	Angostura	P.H.	(177.0)	Angostura	P.H.	(177.0)
2000						
2001	Ciclo Combinado	P.T.	(108.0)	Ciclo Combinado	P.T.	(108.0)
2002						
2003	Pirrís	P.T.	(128.0)	Pirrís	P.H.	(128.0)
2004	Tenorio	P.G.	(55.0)	Tenorio	P.G.	(55.0)
	Gas	P.T.	(36.0)	Gas	P.T.	(36.0)
2005	Los Llanos	P.H.	(85.0)	Los Llanos	P.H.	(85.0)
2006	Ayil	P.H.	(127.0)	Ayil	P.H.	(127.0)
2007	Laguna Hule	P.H.	(66.0)	Laguna Hule	P.H.	(66.0)
				Motor baja	P.T.	(64.0)
2008	Pacuare	P.H.	(156.0)	Pacuare	P.H.	(156.0)
2009	Gas	P.T.	(36.9)	Gas	P.T.	(36.9)
2010	Gas	P.T.	(72.0)	Gas	P.T.	(72.0)
2011	Guayabo	P.H.	(234.0)	Guayabo	P.H.	(234.0)
2012	Siquirres (1°etapa)	P.H.	(206.0)	Siquirres (1°etapa)	P.H.	(206.0)
	Gas	P.H.	(108.0)	Gas	P.H.	(108.0)
2013						
2014	Siquirres (2°etapa)	P.H.	(206.0)	Siquirres (2°etapa)	P.H.	(206.0)
	Gas	P.T.	(108.0)	Gas	P.T.	(108.0)
2015						

Table 8-7 Maximum Accelerations for Six Return Periods

(Unit: gal)

Attenuation Model	Return Period (Year)					
	50	100	200	500	1000	10000
(1) C. Oliveira	64.5	81.9	99.2	120.8	135.6	173.6
(2) R.K. McGuire	157.8	185.8	211.7	242.3	262.2	310.3
(3) Esteva & Rosenblueth	70.6	89.6	108.4	131.5	147.2	186.6
(4) T. Katayama	125.3	148.7	169.2	191.8	205.4	234.3

Table 14 - 4 ECONOMIC EVALUATION

(Unit: Thousand US dollars)

No.		YEAR	LOS LLANOS HYDROPOWER PROJECT					ALTERNATIVE THERMAL POWER PROJECT												(B) - (C)
								GAS TURBINE				SLOW SPEED DIESEL				TRANSMISSION LINE				
			Construct. Cost	Transmssn Line Cost	O & M Cost	Compen-sation	(C) TOTAL COST	Constr. Cost	O & M Cost	Fuel Cost	Subtotal	Constr. Cost	O & M Cost	Fuel Cost	Subtotal	Constr. Cost	O & M Cost	Subtotal	(B) TOTAL COST	
-1		2000	12,755	0			12,755				0				0	49		49	49	-12,706
1		2001	25,795	993			26,788				0				0	290		290	290	-26,497
2		2002	34,090	2,395			36,485	111			111				0	159		159	270	-36,215
3		2003	39,842	1,049			40,892	49,010			49,010	15,195			15,195	1,079		1,079	65,285	24,393
4		2004	9,929	524			10,453	6,258			6,258	30,028			30,028	541		541	36,827	26,374
5	1	2005			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
6	2	2006			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
7	3	2007			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
8	4	2008			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
9	5	2009			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
10	6	2010			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
11	7	2011			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
12	8	2012			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
13	9	2013			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
14	10	2014			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
15	11	2015			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
16	12	2016			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
17	13	2017			1,118	554	1,672	111	554	10,800	11,464		231	3,108	3,339		32	32	14,835	13,162
18	14	2018			1,118	554	1,672	49,010	554	10,800	60,364		231	3,108	3,339		32	32	63,735	62,062
19	15	2019			1,118	554	1,672	6,258	554	10,800	17,611		231	3,108	3,339		32	32	20,982	19,310
20	16	2020			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
21	17	2021			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
22	18	2022			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
23	19	2023			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
24	20	2024			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
25	21	2025			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
26	22	2026			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
27	23	2027			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
28	24	2028			1,118	554	1,672		554	10,800	11,354	15,195	231	3,108	18,534		32	32	29,919	28,247
29	25	2029			1,118	554	1,672		554	10,800	11,354	30,028	231	3,108	33,367		32	32	44,752	43,080
30	26	2030			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339	49	32	80	14,773	13,100
31	27	2031		993	1,118	554	2,665		554	10,800	11,354		231	3,108	3,339	290	32	322	15,015	12,349
32	28	2032		2,395	1,118	554	4,068	111	554	10,800	11,464		231	3,108	3,339	159	32	191	14,994	10,927
33	29	2033		1,049	1,118	554	2,722	49,010	554	10,800	60,364		231	3,108	3,339	1,079	32	1,111	64,814	62,092
34	30	2034		524	1,118	554	2,197	6,258	554	10,800	17,611		231	3,108	3,339	541	32	573	21,523	19,326
35	31	2035			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
36	32	2036	5,073		1,118	554	6,745		554	10,800	11,354		231	3,108	3,339		32	32	14,724	7,979
37	33	2037	8,260		1,118	554	9,933		554	10,800	11,354		231	3,108	3,339		32	32	14,724	4,792
38	34	2038	22,623		1,118	554	24,296		554	10,800	11,354		231	3,108	3,339		32	32	14,724	-9,572
39	35	2039	7,524		1,118	554	9,196		554	10,800	11,354		231	3,108	3,339		32	32	14,724	5,528
40	36	2040			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
41	37	2041			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
42	38	2042			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
43	39	2043			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
44	40	2044			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
45	41	2045			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
46	42	2046			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
47	43	2047			1,118	554	1,672	111	554	10,800	11,464		231	3,108	3,339		32	32	14,835	13,162
48	44	2048			1,118	554	1,672	49,010	554	10,800	60,364		231	3,108	3,339		32	32	63,735	62,062
49	45	2049			1,118	554	1,672	6,258	554	10,800	17,611		231	3,108	3,339		32	32	20,982	19,310
50	46	2050			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
51	47	2051			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
52	48	2052			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
53	49	2053			1,118	554	1,672		554	10,800	11,354		231	3,108	3,339		32	32	14,724	13,052
54	50	2054	-24,846	-1,654	1,118	554	-24,827	-36,919	554	10,800	-25,566		231	3,108	3,339	-706	32	-675	-22,902	1,926
TOTAL			141,045	8,270	55,924	27,700	232,939	184,597	27,690	539,990	752,277	90,446	11,530	155,410	257,386	3,532	1,589	5,121	1,014,784	781,845
Present Value I = 12%							99,117												141,506	42,389

N.P.V.	42,389
E.I.R.R.	20.2%
B / C	1.43

Table 14-5 FINANCIAL EVALUATION

(Unit: Thousand US dollars)

No.		YEAR	LOS LLANOS HYDRO PROJECT				(B)	(B) - (C)
			Construct. Cost	Transmssn Line Cost	O & M Cost	(C) TOTAL COST	POWER SALES REVENUE	
-1		2000	14,000	0	0	14,000		-14,000
1		2001	27,788	1,055	0	28,843		-28,843
2		2002	37,040	2,456	0	39,496		-39,496
3		2003	42,559	1,176	0	43,735		-43,735
4		2004	10,681	588	0	11,269		-11,269
5	1	2005			1,190	1,190	22,863	21,672
6	2	2006			1,190	1,190	22,863	21,672
7	3	2007			1,190	1,190	22,863	21,672
8	4	2008			1,190	1,190	22,863	21,672
9	5	2009			1,190	1,190	22,863	21,672
10	6	2010			1,190	1,190	22,863	21,672
11	7	2011			1,190	1,190	22,863	21,672
12	8	2012			1,190	1,190	22,863	21,672
13	9	2013			1,190	1,190	22,863	21,672
14	10	2014			1,190	1,190	22,863	21,672
15	11	2015			1,190	1,190	22,863	21,672
16	12	2016			1,190	1,190	22,863	21,672
17	13	2017			1,190	1,190	22,863	21,672
18	14	2018			1,190	1,190	22,863	21,672
19	15	2019			1,190	1,190	22,863	21,672
20	16	2020			1,190	1,190	22,863	21,672
21	17	2021			1,190	1,190	22,863	21,672
22	18	2022			1,190	1,190	22,863	21,672
23	19	2023			1,190	1,190	22,863	21,672
24	20	2024			1,190	1,190	22,863	21,672
25	21	2025			1,190	1,190	22,863	21,672
26	22	2026			1,190	1,190	22,863	21,672
27	23	2027			1,190	1,190	22,863	21,672
28	24	2028			1,190	1,190	22,863	21,672
29	25	2029			1,190	1,190	22,863	21,672
30	26	2030			1,190	1,190	22,863	21,672
31	27	2031		1,055	1,190	2,246	22,863	20,617
32	28	2032		2,456	1,190	3,646	22,863	19,217
33	29	2033		1,176	1,190	2,366	22,863	20,497
34	30	2034		588	1,190	1,778	22,863	21,084
35	31	2035			1,190	1,190	22,863	21,672
36	32	2036	5,201		1,190	6,391	22,863	16,472
37	33	2037	8,669		1,190	9,860	22,863	13,003
38	34	2038	23,515		1,190	24,705	22,863	-1,843
39	35	2039	8,031		1,190	9,221	22,863	13,641
40	36	2040			1,190	1,190	22,863	21,672
41	37	2041			1,190	1,190	22,863	21,672
42	38	2042			1,190	1,190	22,863	21,672
43	39	2043			1,190	1,190	22,863	21,672
44	40	2044			1,190	1,190	22,863	21,672
45	41	2045			1,190	1,190	22,863	21,672
46	42	2046			1,190	1,190	22,863	21,672
47	43	2047			1,190	1,190	22,863	21,672
48	44	2048			1,190	1,190	22,863	21,672
49	45	2049			1,190	1,190	22,863	21,672
50	46	2050			1,190	1,190	22,863	21,672
51	47	2051			1,190	1,190	22,863	21,672
52	48	2052			1,190	1,190	22,863	21,672
53	49	2053			1,190	1,190	22,863	21,672
54	50	2054	-25,952	-1,053	1,190	-25,815	22,863	48,677
TOTAL			151,532	9,496	59,513	220,540	1,143,125	922,585
							F.I.R.R.	12.4%

Table 15-1 Geologic/geotechnic Investigation Planning (1/4)

Site/Route	Investigation Methods	General Specifications	Remarks
1. Down-stream damsite	Detailed geologic mapping	• To provide detailed engineering geologic maps to use detailed topographic maps. • To cover the damsite and its vicinities	Detailed topographic map: 1/1000 or more in scale.
	Core drilling and in-hole measurements/tests	• Drillhole PHLL101SP (with all coring) - Location: Aprx. EL 490m on the left bank of the down-stream site. - Length: 50m or more. - Water level measurements: During drilling at the full section. - Lugeon tests: Covering the full section.	A unit length of Lugeon test: 5m or less.
		• Drillhole PHLL102SP (with all coring) - Location: Aprx. EL 422m on the riverbed of the down-stream site. - Length: 30m or more. - Water level measurements: During drilling at the full section. - Lugeon tests: Covering the full section.	
		• Drillhole PHLL103TA (with all coring) - Location: Aprx. EL 480m on the intake site of the down-stream damsite. - Length: 30m or more. - Water level measurements: During drilling at the full section. - Deformation tests: Two (2) points or more around the hole bottom.	

Table 15-1 Geologic/geotechnic Investigation Planning (2/4)

Site/Route	Investigation Methods	General Specifications	Remarks
2. Headrace tunnel route	Detailed geologic mapping	- To provide detailed engineering geologic maps to use topographic maps in scale 1/5,000. - To cover the headrace tunnel route. - Special items to be made sure: To confirm aerophoto lineaments and regional joint patterns.	
	Core drilling and in-hole measurements/tests	● Drillhole PHLL104LT (with all coring) - Location: Aprx. EL.515m, a spot about 1500m down-stream side from the intake, on the bottom of a ravine. - Length: 80m or more. - Water level measurements: During drilling at the full section. - Lugeon tests: Covering the full section. - Deformation tests: Two (2) points or more around the hole bottom.	A unit length of Lugeon test: 5m or less.
		● Drillhole PHLL105LT (with all coring) - location: Aprx. EL 525m, a spot about 2500m down-stream side from the intake, on the bottom of a ravine. - Length: 90m or more. - Water level measurements: During drilling at the full section. - Lugeon tests: Covering the full section. - Deformation tests: Two (2) points or more around the hole bottom.	

Table 15-1 Geologic/geotechnic Investigation Planning (3/4)

Site/Route	Investigation Methods	General Specifications	Remarks
3. Penstock route and power station site	Detailed geologic mapping	● To provide detailed engineering geologic maps to use topographic maps 1/5,000 and/or 1/1,000 in scale. ● To cover the surgetank site, penstock route and powerstation site and their vicinities. ● Special items to be made sure; To confirm on aero photo lineament crossing the penstock route and the boundary of the conglomerate and marlstone around the powerstation site.	
	Core drilling and in-hole measurements/tests	● Drillhole PHLL106TO (with all coring) - Location: Aprx. EL 510m, at the surge tank site. - Length: 70m or more. - Water level measurements: During drilling at the full section. - Lugeon tests: Covering the lower 1/3 section. - Deformation tests: Two (2) points or more around the hole bottom.	A unit length of Lugeon test: 5m or less
		● Drillhole PHLL107TP (with all coring) - Location: Aprx. EL 468m on the penstock route. - Length: 30m or more. - Water level measurements: During drilling at the full section. - Lugeon tests: Covering the lower half section. - Deformation tests: Two (2) points or more around the hole bottom.	

Table 15-1 Geologic/geotechnic Investigation Planning (4/4)

Site/Route	Investigation Methods	General Specifications	Remarks
(3. Penstock route and power station site)	(Core drilling and in-hole measurements/tests)	• Drillhole PHLL108TP (with all coring) - Location: Aprx. EL 304m on the penstock route. - Length: 50m or more - Water level measurements: During drilling at the full section. - Lugeon tests: Covering the lower half section. - Deformation tests: Two (2) points or more around the hole bottom.	A unit length of Lugeon test: 5m or less.
4. Quarry site for concrete aggregates	Detailed geological mapping	• To provide detailed engineering geologic maps to use topographic maps 1/1,000 in scale. - To cover an area around the conjunction of Rio Naranjo and Rio Naranjillo, about 700m up-stream from the down-stream damsite. - Special items to be made sure; To confirm and trace "Layers of sandstone".	
	Core drilling	• Two (2) drillholes with all coring. • Location: Each hole should be decided by the said geological mapping. • Length: 20m or more (each hole).	
	Laboratory tests	• All necessary laboratory tests for concrete aggregates to use drilled cores.