

GUATEMALA

Instituto Nacional de Electrificación (INDE)

Additional Financing for the Pueblo Viejo-Quixal
Hydroelectric Project on the Chixoy River

(GU-0026)

LOAN PROPOSAL

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Datos Socioeconómicos Básicos de Guatemala

1. Datos Generales

Población total (miles de habitantes, 1984)	7.737,0
Población rural (%)	67,2
Extensión territorial (Km2)	108.889,0
Habitantes por Km2	64,3
Habitantes por tierra arable	131,2
Tasa de Crecimiento demográfico (1970-1984)	2,8
Producto Interno Bruto por habitante (dólares de 1980)	988,9
Tasa de mortalidad general por mil habitantes (1983)	9,7
Tasa de mortalidad infantil por mil nacidos vivos (1983)	64,7
Habitantes por médico (1983)	1.600,0
Habitantes por cama de hospital (1976)	460,0
Alfabetismo (1983) (%)	53,0
Tasa de inscripción (%)	64,0
Secundaria (1980)	22,7
Carreteras (kilómetros) (1980)	14.592,0
Asfaltadas	2.887,0
Mejoradas	6.642,0
Tierra	5.063,0
Línea férrea (kilómetros) (1979)	922,0
Consumo de energía eléctrica por habitante (Kwh)	183,0
Tasa de cambio oficial (Quetzales por US\$) (1984)	1,0
Nivel de bajos ingresos (Quetzales anuales por habitante) (diciembre 1984) 1/	819,0

<u>Distribución de la tierra</u> <u>por tamaño (1979)</u>	<u>Número de fincas</u> <u>(%)</u>	<u>Superficie total</u> <u>(%)</u>
0 - 0,7 has.	31,5	1,3
0,7 - 7,0 "	56,7	15,2
7,0 - 45,0 "	9,3	18,8
Más de 45,0 "	2,5	64,7

<u>Población económicamente activa</u> <u>por sectores (PEA) 1980</u>	<u>En miles de</u> <u>personas</u>	<u>Porcentajes</u> <u>sobre el total</u>
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Sectores

Agricultura y pesca	1.169,0	53,3
Minería	11,3	0,5
Industria fabril	87,5	4,0
Artesanía	221,1	10,1
Construcción	128,5	5,9
Comercio	183,0	8,3
Transporte y almacenaje	70,1	3,2
Gobierno	84,3	3,8
Servicios privados	218,3	10,0
Banca y seguro	11,8	0,5
Electricidad, gas y agua	8,1	0,4
<u>T o t a l</u>	<u>2.193,0</u>	<u>100,0</u>

Desempleo abierto (1984)	8,0
Sub-empleo (1984)	33,0

Distribución del ingreso familiar (1980)

<u>(%) de las familias</u>	<u>(%) del ingreso</u>
Deciles I-II	5,5
Deciles III-V	14,5
Deciles VI-VIII	25,0
Deciles IX-X	55,0

1/ Estimación.

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2. Producto Interno Bruto

Por gasto (a precio de mercado 1/)

Producto Interno Bruto	(Porcentajes)					Tasa de crecimiento anual 2/				
Por gasto (a precio de mercado 1/	1980	1981	1982	1983	1984 a/	1980	1981	1982	1983	1984 a/
Inversión Interno Bruto	100,0	100,0	100,0	100,0	100,0	3,7	0,7	-3,5	-2,7	0,1
Inversión Interna Bruta	15,9	17,0	14,2	10,9	10,5	-14,7	15,3	-18,2	-18,4	-2,3
Consumo	86,8	89,5	89,8	90,6	91,4	4,1	1,7	-2,9	-1,2	1,0
Exportaciones	22,2	17,1	14,8	13,0	13,2	5,2	-14,4	-9,3	-10,9	-1,8
Importaciones	24,9	23,6	18,7	14,6	15,1	-8,6	-4,1	-21,0	-19,5	2,3
Por origen 2/										
Agricultura	24,8	27,9	25,1	25,1	25,2	1,6	1,0	-3,0	-2,8	0,5
Minería	0,5	0,3	0,4	0,4	0,3	71,2	-35,8	13,8	0,9	-12,0
Manufactura	16,7	16,0	15,8	15,9	15,9	5,6	-3,1	-5,2	-1,9	0,4
Construcción	3,2	3,7	3,4	2,6	2,1	3,7	19,0	-11,6	-25,4	-18,0
Transporte y Comunicaciones	6,9	6,8	6,7	6,8	6,8	8,2	-2,1	-4,7	-0,3	0,3
Comercio	27,0	27,0	26,4	26,0	26,0	1,7	0,6	-5,6	-4,3	0,3
Gobierno	5,2	5,4	5,9	6,4	6,5	10,6	4,4	3,9	6,2	1,8
Otros	15,7	12,9	16,3	16,8	17,2	3,5	1,4	0,2	-0,1	1,4

3. Comercio Exterior

(En millones de US\$)

Comercio Exterior	(En millones de US\$)					Tasa de crecimiento anual				
	1980	1981	1982	1983	1984 a/	1981	1982	1983	1984 a/	
Exportaciones de Bienes (FOB)	1.519,8	1.290,1	1.170,4	1.091,7	1.153,1	-15,1	-9,3	-6,7	5,6	
Tradicionales	773,8	664,7	601,4	540,6	565,5	-14,1	-9,5	-10,1	4,6	
No tradicionales	746,0	625,4	569,0	551,1	587,6	-16,2	-9,0	-3,2	6,6	
Productos Principales										
Café	463,9	325,4	374,6	308,8	349,2	-29,9	15,1	-17,6	13,1	
Algodón	166,1	173,4	95,0	67,4	72,0	4,4	-45,2	-29,1	6,8	
Azúcar	69,3	85,2	43,7	95,3	73,5	22,9	-48,7	118,1	-22,9	
Banano	45,4	51,4	71,3	53,5	56,9	13,2	38,7	-25,0	6,4	
Carne	29,1	29,3	16,8	15,6	13,9	0,7	-42,7	-7,2	-10,9	
Importaciones de Bienes (CIF) 3/	1.598,2	1.673,5	1.388,0	1.135,0	1.220,2	4,7	-17,1	-18,2	7,5	
Productos de consumo	292,8	312,0	284,4	235,3	242,7	6,6	-8,9	-17,3	3,1	
Productos intermedios	725,7	779,1	627,0	603,6	663,0	7,4	-19,5	-3,7	9,8	
Bienes y equipos de capital	280,0	287,1	243,0	115,3	133,0	2,5	-15,4	-52,6	15,3	
Combustibles	199,3	182,8	149,6	113,0	120,0	-8,3	-18,2	-24,5	6,2	
Materiales de construcción	92,5	98,7	77,3	59,9	56,3	6,7	-21,7	-22,5	-6,0	
Otros	7,8	13,8	6,8	7,8	5,2	76,9	-50,7	14,7	-33,3	

a/ Cifras preliminares.

1/ Precios corrientes.

2/ Precios constantes de 1958.

3/ Agrupación CUDE.

Fuente: Banco de Guatemala.

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4. Balanza de Pagos

	(En millones de US\$)						Tasa de crecimiento anual				
	1978	1979	1980	1981	1982	1983	1980	1981	1982	1983	1984 a/
Exportaciones (FOR)	1.092,4	1.241,4	1.519,8	1.291,3	1.170,4	1.091,7	13,6	22,4	-15,1	-9,4	5,6
Importaciones (FOR)	1.283,8	1.394,7	1.472,6	1.540,0	1.284,2	1.056,0	8,6	5,6	4,6	-16,6	7,4
Servicios (netos)	-186,4	-149,8	-333,4	-414,7	-348,0	-290,3	-19,6	122,6	24,4	-16,1	-12,2
Transferencias (netas)	115,7	126,7	109,8	90,9	62,7	30,7	9,5	-13,3	-17,2	-31,0	-15,3
Saldo en cuenta corriente	-262,1	-176,4	-176,4	-572,4	-399,1	-224,0	-32,7	-	224,5	-30,3	-6,1
Movimientos de Capital (netos)	342,1	177,3	-64,9	406,5	377,6	312,6	-48,2	-	-	-7,1	-23,1
A largo plazo	256,2	273,8	244,1	406,8	349,7	239,8					
Público	101,9	129,4	106,1	243,3	269,1	210,6					
Privado	154,3	144,4	138,0	163,5	80,6	29,2					
A corto plazo	74,7	-112,6	-317,3	-32,2	38,5	73,2					
Cambios Reservas Internacionales	-68,8	15,1	249,6	197,8	10,9	-89,3					
(-aumento)											

5. Finanzas Públicas (en % del PIB)

	Gobierno Central					1984 a/
	1978	1979	1980	1981	1982	
Ingresos corrientes	10,9	9,7	9,5	8,7	8,4	6,8
Ingresos tributarios	10,3	9,1	8,6	7,6	7,2	5,1
Gastos corrientes	7,5	7,4	8,0	8,1	8,1	7,8
Ahorro en cuenta corriente	3,5	2,3	1,5	0,6	0,2	-1,0
Gasto de capital	4,6	4,9	6,1	7,9	4,9	2,5
Déficit	-1,1	-2,6	-4,7	-7,3	-4,7	-3,6
Financiamiento						
Interno	-0,4	0,9	3,3	6,2	3,6	3,2
Externo	1,5	1,7	1,4	1,1	1,1	0,4

a/ Cifras preliminares.
i/ Incluye errores y omisiones.

Fuente: Banco de Guatemala.

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6. Sistema Bancario Nacional

	(Millones de quetzales al 31 de diciembre)						Tasa de crecimiento anual				
	1978	1979	1980	1981	1982	1983	1978	1979	1980	1981	1982
Activos Internacionales netos	732,8	700,2	442,9	127,0	72,2	-221,6	10,8	-4,4	-36,8	-71,3	-43,2
Crédito interno total	919,5	1.130,4	1.608,8	2.259,8	2.632,2	3.010,3	21,7	22,9	42,3	40,5	16,5
Sector público	63,7	99,6	338,6	760,0	1.060,7	1.222,3	-26,4	56,4	240,0	124,5	39,6
Sector privado	827,8	999,0	1.222,2	1.387,7	1.515,8	1.709,6	26,9	20,7	22,3	13,5	9,2
Liquidez monetaria	1.423,6	1.537,2	1.692,4	1.906,7	2.190,7	2.155,1	14,0	8,0	10,1	12,7	14,9
Medio circulante	664,0	734,9	752,8	777,8	786,6	833,8	11,8	10,7	2,4	3,3	1,1
(% del PIB)	(10,9)	(10,7)	(9,6)	(9,0)	(9,0)	(9,6)					
Quasi-dinero	759,6	802,3	939,6	1.128,9	1.404,1	1.321,3	16,0	5,6	17,1	20,2	24,4
(% del PIB)	(12,5)	(11,6)	(11,9)	(13,1)	(16,1)	(14,6)					

7. Precios (tasa de crecimiento)

	1976	1977	1978	1979	1980	1981	1982	1983	1984
Deflactor del PIB (base 1959=100)	11,5	16,4	5,5	8,6	10,0	9,0	6,5	6,5	5,7
Al consumidor (1975=100)	10,7	12,5	7,9	11,5	10,7	11,4	0,2	7,8 b/	8,0 c/
Al por mayor (1959=100)	10,5	13,0	3,6	10,3	16,0	11,7	-5,8	0,9	n.d.

8. Deuda pública externa pagadera en divisas

	(En millones de US\$)						1984 c/	
	1978	1979	1980	1981	1982	1983	1984 c/	1984 c/
Total	744,6	820,4	1.050,4	1.383,6	1.510,4	1.452,7	1.780,0	
Desamortizado	(304,0)	(427,1)	(549,1)	(809,5)	(1.119,4)	(1.187,0)	(1.313,0)	

Por tipo de acreedor

	1978	1979	1980	1981	1982	1983	1984 c/
Proveedores	3,9	2,5	0,9	-	-	-	-
Bancos privados	6,9	6,9	14,2	71,2	161,7	-	-
Bolsión de bonos	-	-	-	-	-	-	-
Organismos internacionales	544,4	565,4	608,4	794,5	801,7	-	-
BID	(224,3)	(221,5)	(233,0)	(370,8)	(254,8)	-	-
Gobiernos	189,3	245,6	426,8	517,9	547,0	-	-
Servicio de la deuda	26,1	37,3	44,8	60,3	87,9	128,7	186,0
Servicio total	2,0	2,5	3,7	4,1	6,8	11,0	15,0
biens y servicios (2)							

a/ A noviembre.

b/ Promedio mayo-diciembre con base en el período marzo-abril 1983.

c/ Cifras estimadas.

n.d. No disponible.

Fuente: IMI. Estadísticas Financieras Internacionales marzo 1985 y Banco de Guatemala. Deuda Pública Externa: BID, BIRF e Informe del país.

9. Préstamos del BID
(Aprobados hasta el 12-XII-84)

	Millones US\$	% del Total
<u>Por Fuente de Fondos</u>	<u>798,0</u>	<u>100,0</u>
Capital Ordinario	152,2	19,0
Capital Interregional	58,1	7,3
FOE	486,6	61,0
Fondos de Administración	61,2	7,7
LCC	40,0	5,0
 <u>Por Sector</u>	 <u>798,0</u>	 <u>100,0</u>
Agricultura y pesca	114,9	14,4
Industria y minería	76,2	9,5
Turismo	5,1	0,6
Transporte y comunicaciones	75,3	9,4
Energía	226,8	28,4
Educación, ciencia y tecnología	45,9	5,7
Vivienda y obras urbanas	41,9	5,2
Salud	211,8	26,5

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Document: DATA-GU
Diskette: RG1GU

GUATEMALA -

INSTITUTO NACIONAL DE ELECTRIFICACION (INDE)

Additional Financing for the Pueblo Viejo-Quixal
Hydroelectric Project on the Chixoy River
(GU-0026)

LOAN PROPOSAL

I. BASIC INFORMATION

1.01 Borrower: Republic of Guatemala.

1.02 Executing agency: Instituto Nacional de Electrificación (INDE).

1.03 Nature of the project: Specific.

1.04 The application, and priority of the project: The request for additional financing for the Pueblo Viejo-Quixal Hydroelectric Project on the Chixoy river was presented by the Minister of Finance on behalf of the Republic of Guatemala on August 6, 1984. During the programming mission of February 1985, the government reaffirmed the priority assigned to this additional financing by virtue of the importance to Guatemala of starting up the Chixoy Hydroelectric Power Station which will make it possible on the one hand to meet the country's urgent electric power generation requirements, and on the other hand to reduce substantially the need to import fuels for electric power generation.

A. Pueblo Viejo-Quixal Hydroelectric Project

1.05 The purpose of the Pueblo Viejo-Quixal Hydroelectric Project is to expand the generating plant of the Instituto Nacional de Electrificación (INDE) by building on the middle section of the Chixoy river a hydroelectric station with a generating capacity of 300 MW for a mean energy generation of 1,493 GWh a year. The project comprises (i) a rock-fill dam at the Pueblo Viejo site, (ii) a spillway, (iii) a power tunnel about 26 km long, (iv) an outdoor powerhouse at Quixal equipped with five turbines and generator sets, and (v) a 120-km transmission line from the power station to Guatemala City. 1/

1.06 On December 18, 1975 the Bank approved loans 301/OC-GU, 302/OC-GU, 454/SF-GU and 6/VF-GU in the equivalent of US\$105 million to the Republic of Guatemala to finance, in conjunction with the World Bank,

1/ For a detailed technical description of the project works, see Appendix I-1 of the Project Report.

the Pueblo Viejo-Quixal Hydroelectric Project on the Chixoy river, to be executed by INDE at a total cost estimated at the equivalent of US\$340.9 million. The World Bank financing was for the dam, the Quixal substation, and the transmission line, while the Bank financed the costs for engineering and administration, the power tunnel and the powerhouse. The Bank's loan contracts were signed on January 15, 1976, and disbursement of the US\$105 million under the four aforementioned loans was completed on December 31, 1981.

- 1.07 By July 1981, the cost of the project had risen to US\$630 million, 1/ that is, an increase of US\$289.1 million, or about 84% more than the original budget at prices of March 1975. A significant portion of this cost overrun was due to additional works. The Bank contributed to the financing of these additional costs by loans 301-A/OC-GU and 302-A/OC-GU in the equivalent of US\$70 million, approved on November 11, 1981, which brought the total financing provided by the IDB to date to US\$175 million. On June 30, 1985, US\$6.53 million was still pending disbursement under loan 301-A/OC-GU.

B. Progress of construction under the project since 1981

- 1.08 Since the approval of the Bank's second financing in 1981, construction of the project has adhered to schedule, at a cost for the components financed by the Bank, similar to the estimate made that year. The cost of the dam, financed by the IBRD, was raised considerably above the 1981 estimate chiefly by rises in the prices established in the works contract and the severity of the karsticity 2/ encountered at the foundation site, which required a considerable lengthening of the galleries and an increase in the number of boring and groutings. Despite this cost overrun, the project was completed and became commercially operational on June 15, 1983. 3/
- 1.09 Having become operational, the station generated electric energy for six months, until December 17, 1983, when it was shut down owing to a failure of the power tunnel which at this writing has not yet been repaired.

1/ The causes and details of this increase in the cost of the project are described in document PR-1142-A.

2/ Karst formations are of sedimentary origin (limestone), and are characterized by the presence of caverns and sinkholes in unexpected places.

3/ The details on the cost increases since 1981 are explained in Appendix III-1 of the Project Report.

C. The Power Tunnel

- 1.10 The salient feature of the project is the power tunnel owing to its length - it is one of the longest ever built in Latin America - and to the geological features of the terrain, which include sedimentary rock with karst formations and areas of anhydrite and gypsum. The tunnel has two sections: one about 8 km long from Pueblo Viejo to Agua Blanca, and the other about 16 km long from Agua Blanca to Quixal. The tunnel is interrupted at Agua Blanca by the Chixoy river which, flowing in a "S" curve from Pueblo Viejo to Quixal, at that point cuts between the two mountains traversed by the tunnel. The river crossing is by an aqueduct 180 m long mounted on five piles.
- 1.11 Because of the stated characteristics, it was expected from the beginning that this project would be difficult to execute, that it would demand much of the local and international contractors and of the local professional and technical staff, who were facing works of those proportions for the first time. At the same time, it was known that execution of the project would ultimately depend on the financial contribution of the government and the sustained collaboration of the Bank and other sources of international financing.
- 1.12 During the prefeasibility and feasibility stages of the project there were carried out with the assistance of the LAMI consultants 1/ geological studies of different types which identified the formations in the area, and particularly those along the tunnel route. Except at a few spots, the exact location of the zones of contact between two different geological conformations was not determined, it was known that anhydrite and karstic cavities were present and that the project was located in a region of seismic activity. The discovery of these factors in good time made it possible to take some measures to reduce the construction risks involved. In addition, owing to the difficulty and characteristics of the project, INDE hired a Consultative Group. 2/
- 1.13 On February 4, 1976, a few weeks after the loan contracts for the first IDB operation were signed, there was a strong earthquake in Guatemala. The Bank accordingly hired an expert institution 3/ to make an analysis of the seismological design of the project. The recommendations were to make changes in the design criteria for the dam and other civil works of the project, which was done and had the effect of raising its cost.

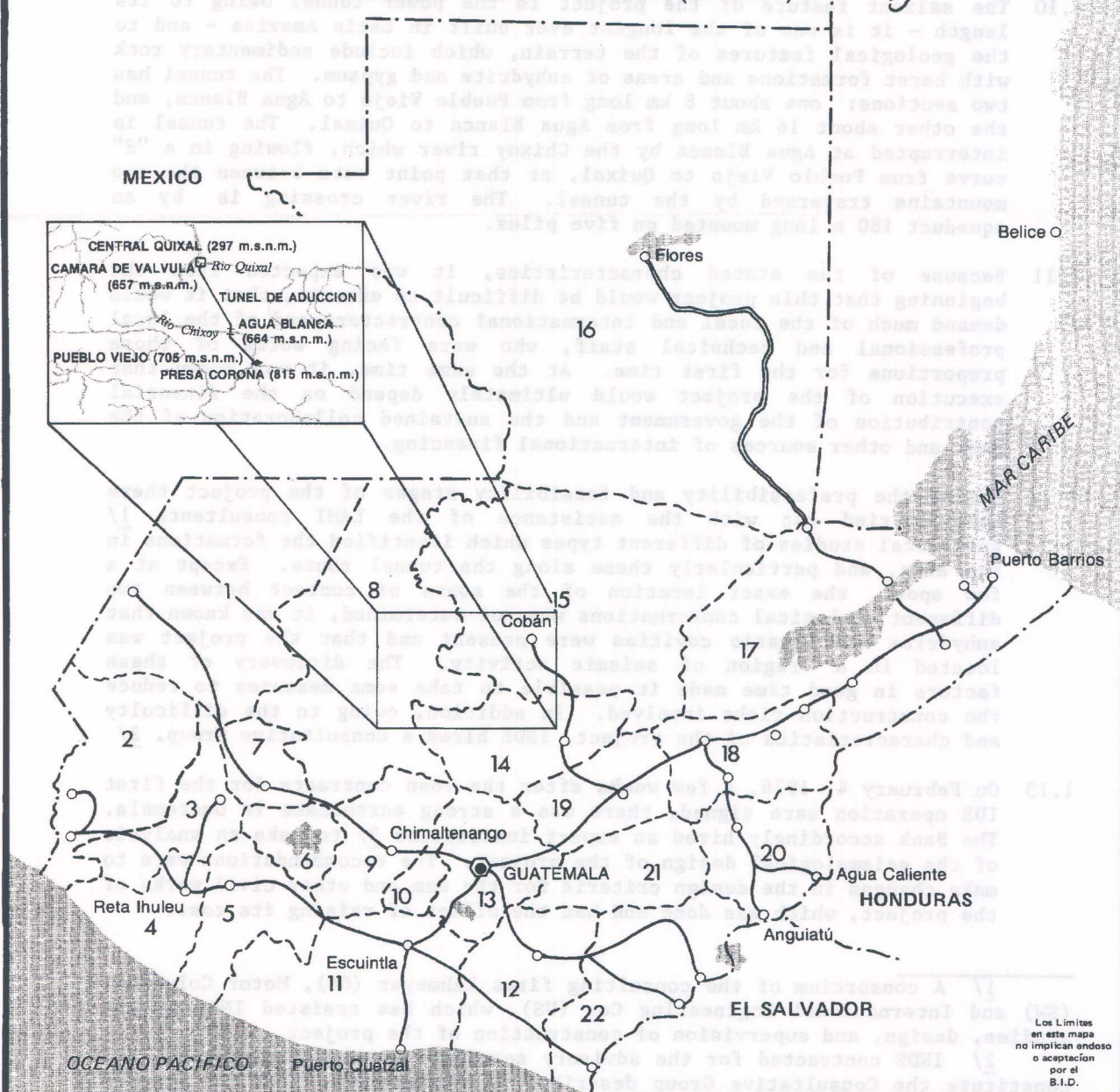
1/ A consortium of the consulting firms Lahmeyer (GE), Motor Columbus, (SW) and International Engineering Co. (US), which has assisted INDE in the studies, design, and supervision of construction of the project.

2/ INDE contracted for the advisory services of three technicians, who constitute the Consultative Group described in paragraph 4.08 of the Project Report.

3/ The Geological Survey of the U.S. Department of the Interior, which dispatched some of the experts who participated beforehand in the preparation of a report on the earthquake.

GUATEMALA

PROYECTO HIDROELECTRICO PUEBLO VIEJO — QUIXAL (CHIXOY)



Los límites en este mapa no implican endoso o aceptación por el B.I.D.

DEPARTAMENTOS

- | | |
|------------------|------------------|
| 1. HUEHUETENANGO | 12. SANTA ROSA |
| 2. SAN MARCOS | 13. GUATEMALA |
| 3. QUEZALTENANGO | 14. BAJA VERAPAZ |
| 4. RETALHULEU | 15. ALTA VERAPAZ |
| 5. SUCHITEPEQUEZ | 16. PETEN |
| 6. SOLALA | 17. IZABAL |
| 7. TOTONICAPAN | 18. ZACAPA |
| 8. QUICHE | 19. EL PROGRESO |
| 9. CHIMALTENANGO | 20. CHIQUIMULA |
| 10. SACATEPEQUEZ | 21. JALAPA |
| 11. ESQUINTLA | 22. JUTIAPA |

PRESA

Altura max. apr. 109 m.
Longitud apr. 250 m.
Volumen total apr. 3.2×10^6 m.³

EMBALSE

Volumen max. apr. 460×10^6 m.³

TUNEL DE ADUCCION

Longitud apr. 26 Km.
Diametro interior 4.93 m.
Caudal maximo 75 m³/s

CASA DE MAQUINAS

Caida bruta apr. 520 m.
Cap. nom. de turbinas 5 x 60 Mw.

LINEA DE TRANSMISION

Longitud apr. 120 km.

1.14 Excavations were begun 15 months behind the schedule described in the aforementioned report, and INDE took steps to overcome that lag. These measures reduced considerably the types of studies to confirm the appropriateness of the concrete facing design. ^{1/} As a result, the tunnel and its facing were completed on November 25, 1982, about 55 months after commencement of the works, that is, in about 85% of the originally scheduled time. ^{2/}

1.15 As construction of the tunnel proceeded, the studies were pursued, and the geology of the excavated ground was surveyed in detail. All this information was put to use in designing the tunnel facing. On completion of the tunnel, it was filled on December 6, 1982, and three weeks later was emptied and inspected, and an area of about 0.5 x 0.5 m² was found in which the concrete facing had been destroyed, behind which a cavity was discovered, and the destroyed area was surrounded by cracks. Leaks had been minimal up to that time - on the order of 200 l/sec. A study was made of the cause of the failure, the type of surrounding rock and its behavior relative to the seepages that took place in the tunnel. Drillings were made to detect other cavities, and only one was found other than that at the site of the facing failure. The technical report on this problem indicated that a sure way to repair the failure would be to build a steel lining, which, however, appeared a solution disproportionate to this local and isolated case. What was done, therefore, was to fill in the cavity with cement, restore the concrete facing to its original condition, and seal the cracks.

D. Tunnel Failure

1.16 The tunnel having been repaired in the manner proposed by the LAMI Consortium, and accepted by the Consultative Group and INDE, filling was again begun in April 1983. In October of that year the reservoir reached the level of 800 m.a.s.l. without any abnormality emerging until the 24th of that month, when inhabitants of Agua Blanca noticed a landslide on the slope of the right bank of the Chixoy river, and the emergence of a spring at a place about 4.5 km downstream from the tunnel entrance. The discharge of this spring increased from an initial 40 l/sec, to 2 m³/sec in early December 1983. Later the tunnel was closed at both ends and the level in the wells was measured, major water leaks being found; at the same time, other springs were discovered through which, as it was estimated in a new test of the tunnel, water was leaking at a rate of several cubic meters per second, and probably as much as 10 m³/sec. It was therefore decided to empty the tunnel, which was done from December 17 to 19, 1983, and the tunnel was inspected on December 21.

^{1/} See paragraph 1.12 of the Project Report and paragraph 1.19, below.
^{2/} See Appendix I-3 of the Project Report for further details on the tunnel facing.

- 1.17 The inspection showed that the most serious damage had taken place in the section between Agua Blanca Norte (ABN) 1 + 500 and 1 + 550 where, in addition to the concrete being dislodged, a sizable cavity had formed behind the facing. Lesser damage was found in other areas. In general, the damage was of three types:

- (a) Outward deformation of concrete and cavities behind the facing, found only between ABN 1 + 500 and 1 + 550, and directly connected with the presence of anhydrite.
- (b) Detachment of pieces of concrete from the tunnel roof and walls in association with areas of permeable calcareous rock.
- (c) Presence of predominantly irregular or longitudinal cracks connected with anhydrite (only at Pueblo Viejo), sandy-marly rocks of the Todos Los Santos formation, or highly fractured calcareous rock.

The studies indicated that the serious damage was associated with soluble rock, that is, anhydrite transformed into gypsum, and the efforts were concentrated in areas where these rocks were found.

- 1.18 Several investigations and studies were carried out to acquire a better understanding of the problem. Some of them were as follows:

- Mapping of the cracks in the concrete.
- Boring for core samples.
- Geophysical studies using radar and thermography.
- Controlled boring, including extraction of core samples, permeability tests under pressure, and inspection of boreholes by television camera.
- A general reinterpretation of geologic and hydrogeologic condition.
- Measurement of groundwater levels and pressures, and chemical analysis of the groundwater.

- 1.19 Particularly noteworthy are the geophysical studies, which had not previously been employed in excavation of the tunnel and yielded valuable information. ^{1/} The study, using radar techniques, was carried out by the Weston Geophysical Corporation, of the United States, and those based on thermography by Air Geodetection, of France; they made clear the conditions of the facing and in the surrounding rock to a distance of 3 meters behind the facing. The two studies embraced a total of 21 km of the tunnel, which amply covered the zone of interest.

^{1/} See paragraph 1.14.

In stretches in which the studies revealed some anomaly, drillings were performed to determine the actual situation.

- 1.20 The studies established that the risk of seepage out of the tunnel depended on three factors:

- The presence of soluble rock (gypsum, or anhydrite, which could become gypsum).
- The presence of highly permeable rock in or near the sulfatic rock.
- A groundwater level below the tunnel pressure line.

- 1.21 On the basis of these studies, the LAMI Consortium, the Consultative Group and INDE agreed to line in steel 1,402 m of the tunnel. In their opinion, this steel lining would provide reasonable assurance that a failure similar to the one that had already occurred would not arise in the future. ^{1/}

- 1.22 All these factors, the additional studies done, the improved understanding of the problem, the steel lining, the groutings, the sealing of the cracks, and the pressure-reduction works in the El Jute area, enable INDE, the LAMI Consortium and the Consultative Group to conclude that all reasonable measures have been taken to avert a new failure in the tunnel. When the failure occurred in the power tunnel, the measures described above were taken immediately and culminated in the extension on June 18 and September 21, 1984, of the contract with the works contractor, HOCHTIEF, which was still at the project site. Chapter IV (paragraphs 4.16 to 4.20) of the Project Report describes the procedure by which INDE contracted for the additional works for repair of the tunnel.

E. Legal Aspects of the Tunnel Failure

- 1.23 Subsequent to the determination in December 1983 that the feeder tunnel had failed, and up to the present, the Bank has followed closely INDE's efforts to define the legal consequences of the tunnel failure. The Bank's concern has been that INDE take those steps necessary to protect whatever legal right it might have, ultimately, to recover all or part of its losses from the insurance coverage or the outstanding performance bonds, or through legal action directly against whatever party in the execution of the project might be deemed responsible for the failure.

- 1.24 INDE's management has not taken any tunnel-related legal action which could lead to further delay in putting the hydroelectric plant back into operation. Specifically, this approach contributed to INDE's wait until January, 1985 in making a claim upon the insurance company through which

^{1/} For greater details on the failure in the tunnel and the steel lining, see paragraphs 1.16 to 1.26 of the Project Report.

HOCHTIEF obtained Contractors All Risks coverage (CAR). 1/ In addition, INDE has so far not attempted to execute the performance bonds of either HOCHTIEF or LAMI, or to insist that either or both of these companies bear the cost of repairs. 2/

- 1.25 Early in 1985 INDE took two important legal actions. First, on January 8 the Presidente Interventor 3/ of INDE, through Resolution 1-85, retroactively nullified the April 19, 1983 appointment by INDE's then General Manager of the Committee which on May 13, 1983 accepted the tunnel and related works. Second in a letter dated January 9, INDE filed a claim with the insurance company. 4/
- 1.26 The nullification of the appointment of the acceptance committee has resulted in litigation between HOCHTIEF and INDE as HOCHTIEF has sought the revocation of Resolution 1-85, first through administrative channels and then through the courts. At issue is the question of whether the works were accepted by INDE in May, 1983 and, consequently, whether the construction phase ended and the two year warranty period began at that time. In essence, INDE contends that the acceptance process was void ab initio by virtue of the fact that the acceptance process was procedurally flawed. HOCHTIEF, on the other hand, argues that it should not be held responsible for INDE's procedural mistakes and that in any case the acceptance was subsequently ratified by INDE's actions. If HOCHTIEF prevails in this litigation, the tunnel failure occurred during the warranty period. The ultimate legal effect of INDE's attempted nullification of the acceptance of the works on HOCHTIEF's liability for the tunnel failure is not clear, however. First, the cause of the tunnel failure and HOCHTIEF's liability for that failure are not at issue in this litigation. Second, even if ultimately HOCHTIEF were to be held responsible for the failure, its liability with respect to that failure would likely be the same whether the failure occurred during the construction phase or the warranty period. HOCHTIEF, by virtue of its contract, was required to repair at its own expense whatever defects appeared in the works during the warranty period for which it was responsible.
- 1.27 During the analysis undertaken in preparation of this loan proposal INDE informed the Bank that HOCHTIEF did not renew the above described Contractors All Risk insurance policy after January 10, 1985, the last day of its most recent renewal term, and did not obtain a new such

1/ INDE's claim and the insurance coverage are described in paragraph 1.32.

2/ See Appendix I-4.

3/ By virtue of Decree 60-84, the President Interventor of INDE exercises the authority of both the General Manager and the Board of Directors of INDE.

4/ According to information provided by INDE, HOCHTIEF notified the reinsurance carrier of the tunnel failure in December, 1983 and, in turn, the reinsurance carrier notified the firm which issued the insurance policy.

policy to cover the repair work. INDE offered to bear the cost of a six month extension of the policy, but this offer was rejected by the insurance company, which stated that the firm reinsuring the policy had denied the request for an extension because, according to it, the works were in INDE's "service" and the policy was not meant to cover user's risks. At present, therefore, the tunnel and related works in lot 2 are not covered by any insurance policy. (See Paragraph 4.13).

F. The Bank's Action in Connection with the Failure

- 1.28 Owing to a great urgency of commencing the repair of the tunnel as early as possible so that the plant could be returned quickly to operation, and in view of the country's critical foreign exchange situation then as now, all the Bank could do at that time to cooperate constructively and quickly in this unusual situation was to accede to INDE's request for the use of funds still available under loan 301-A/OC-GU to cover the more urgent needs for repair of the tunnel while additional funds were being obtained. ^{1/} The funds of that loan, with a balance of US\$9.61 million, were originally intended for the payment of invoices for construction of the tunnel, ^{2/} which were put in suspense to give priority to the steel lining for repair work. At this writing, that balance has been entirely committed, and on June 30, 1985, US\$6.53 million remained to be disbursed. The Bank also reviewed all the updated costs of the project, which are estimated at US\$889.32 million, US\$259.32 million (41.1%) higher than the budget approved in 1981. To help cover part of this cost increase, particularly for the works originally financed by the Bank and as partial relief of the country's financial burden, it is recommended in this report that the Bank channel to INDE funds in the equivalent of US\$57 million in addition to those already granted.

II. FRAME OF REFERENCE ^{3/}

A. The Electric Energy Sector

1. The electric power system of Guatemala

- 2.01 Public electric power service began in 1914 with a small hydroelectric power station that supplied electricity in and around Guatemala City. In 1922, the Empresa de Energía de Guatemala, S.A. (EEGSA), acquired the

^{1/} As stated in paragraphs 4.19 and 4.20 of the Project Report, these disbursements were made under a contract that was originally awarded in an international bidding operation pursuant to the Bank's policies.

^{2/} It is worth mentioning that, while construction of the works had been completed, not all the loan resources had been disbursed when the tunnel failure arose owing to the time required for review and approval by INDE of the invoices presented by contractors.

^{3/} An analysis of the recent economic situation in Guatemala is presented in Appendix II-1 of the Project Report.

concession for the provision of electricity in other departments. The Instituto Nacional de Electrificación (INDE) was established in 1959 to develop electrification throughout the country.

2. Organization of the sector

(a) Planning and coordination

- 2.02 To coordinate measures in the electric power sector, on February 8, 1985, the High-level Commission (Comisión de Alto Nivel) was established with functions subject to regulations promulgated by the Ministry of Energy and Mines on February 20, 1985. The Commission consists of the Minister of Energy and Mines as Chairman, the Chairman of INDE's Auditing Commission (Comisión Interventora), and the Chairman of the Board of Directors of the Empresa Eléctrica de Guatemala, S.A. (EEGSA). The specific functions of the Commission are to chart for the electric power sector the policies on the development, investment, generation, rates and operation of the national interconnected system. ^{1/}

(b) Institutional structure

- 2.03 In Guatemala, electric energy is generated, transmitted and distributed by two government-owned public-sector enterprises: (i) the Instituto Nacional de Electrificación (INDE), which is responsible for the generation and transmission of electric energy and its distribution everywhere in the country (except Guatemala City and its environs) and (ii) the Empresa Eléctrica de Guatemala, S.A. (EEGSA), which distributes electricity in Guatemala City and its environs. INDE holds 98% of the shares in EEGSA, the balance being in private hands. EEGSA still generates energy in its own power stations, but is not authorized to expand its generating capacity. Entry into operation of the Chixoy hydroelectric project will endow Guatemala with enough hydroelectric energy to meet all its needs in this sector, in consequence of which EEGSA, which has only thermal generating stations, will discontinue its energy production operations.

3. Installed capacity and transmission system

- 2.04 The installed capacity of the major generating enterprises in January 1985 is shown in the following table (in MW):

^{1/} The Chairman of INDE's Auditing Commission is currently the Chairman of the Board of Directors of EEGSA as well, so that the electric power subsector is at present internally coordinated. The energy sector is coordinated by the High-level Commission.

Installed Capacity and Generating System

<u>Enterprise</u>	<u>Hydraulic</u>	<u>Thermal</u>	<u>Total</u>	<u>Percentages</u>
INDE	187.72	162.20	349.92	78.25
EEGSA	-	94.40	94.40	21.25
Total	187.72	256.60	444.32	100.00
	=====	=====	=====	=====
Percentage (%)	42.25	57.75	100	

- 2.05 Thermal generation is by diesel oil, bunker C (fuel oil) and crude petroleum. While part of this fuel is produced locally, its characteristics make it unfit for processing in the country's existing refinery, and it is therefore exported, to be replaced by imports of petroleum that can be processed in that plant, which is done in much larger quantities than are exported. In consequence, Guatemala is a net importer of hydrocarbons, and thermal generation adversely affects her balance of trade.
- 2.06 The Chixoy hydroelectric project is scheduled to go on-stream with one turbine, the first, in November 1985. Others will be added gradually until the plant is fully operational in March 1986. It will entirely supplant thermal-electric generation. This project complements the hydroelectric generation of the power stations now in operation. While in theory the present installed capacity should be enough to meet the demand of the system, some units have suffered breakdowns and are kept out of service, and are not expected to be usable in less than a year. Any breakdown in the available units raises severe problems, including rationing, and breakdowns are fairly frequent. Moreover, the prevailing critical situation has prevented proper maintenance of the generating units, and their reliability has declined and will continue to decline. The problem cannot be solved until Chixoy becomes operational, at which time those units can be withdrawn from service and given proper maintenance. This factor emphasizes the urgency of starting up Chixoy.
- 2.07 The transmission system consists of 230 and 69 kv lines and the primary distribution network of 13.8-kv lines.
4. Plan for expansion of the generation system, 1985-1995
- 2.08 The start-up of Chixoy would make it possible to meet the country's electric energy needs down to 1993, at which time a new generating station would have to be in operation. In view of the time normally required to study, design, finance and construct a project, recent loans 456/OC-GU and 739/SF-GU, for construction of the Zunil Geothermal Power Station, included funds for drawing up a program for expansion of the generating system.

- 2.09 The growth rate of the electricity market has been negative since 1981, reflecting the world economic situation in general and Guatemala's in particular. Additional factors limiting the growth of the market have been the diminished reliability of the supply, rationing, and the cost of energy. It is estimated that there is an unsatisfied demand and a number of self-suppliers who in the future could be served by the national interconnected system when Chixoy goes on-stream.

B. Operations of the Bank in the Sector

- 2.10 The Bank has granted financing for three electric-sector projects in Guatemala totaling US\$230.76 million, and two of them--those of Chixoy and Zunil--are currently in execution. The third project was the one for the Los Esclavos hydroelectric power station, which is now in operation. 1/

C. Rates

- 2.11 The study, formulation and supervision of the application of rates both for blocks of energy and for sales to final users is the function of INDE as the agency charged with regulating electric utility service in Guatemala. This applies as well to the rates of the Empresa Eléctrica of Guatemala City (EEGSA) and to the municipal electric power enterprises. 2/
- 2.12 The electric power rates of Guatemala are high compared with those of other Latin American countries at a similar stage of development chiefly because much of the generation is thermal and hydroelectric projects have proved costly to construct, apart from their high administrative costs. It is probable that the existing level helped prompt an important consumer to produce the electric energy needed in his plant. For these reasons, in considering further rate increases an evaluation must be made of the possible impact of such a measure on future demand. However, if INDE's operations are to be profitable, rates should be held to realistic levels and the observed growth of operating and administrative costs should be kept under control.
- 2.13 In regard to the rates for block sales to EEGSA, it must be mentioned that in February 1985 they were increased about 20% for the purpose of transferring funds to INDE during 1985. Chapter V of the project report contains an analysis of the income statements down to 1984 and of compliance with the Bank's contractual clauses in this regard.

1/ For further details, see paragraphs 2.13 to 2.16 in the Project Report.

2/ For further details, see paragraphs 2.17 and 2.18 of the Project Report.

D. Conclusions

- 2.14 The country's present needs and difficulties in the energy field have made the Chixoy hydroelectric facilities the project of highest priority to the Government of Guatemala, which in conjunction with INDE has been making major financial efforts to restore the power station to operation at the earliest opportunity. In providing the additional financing for repair of the power tunnel, the IDB would be providing decisive support to INDE and the Government of Guatemala in the attainment of this important objective.

III. THE PROJECT AND THE ADDITIONAL FINANCING

A. Objectives and Description of the Project

- 3.01 The purpose of the Pueblo Viejo-Quixal hydroelectric project is to expand INDE's generation system by constructing a hydroelectric power station in the middle reach of the Chixoy river with a power output of 300 MW and an average energy output of 1,493 GWh a year. It consists of: (i) a rock-fill dam at the Pueblo Viejo site, (ii) a spillway, (iii) a power tunnel about 26 km long, (iv) a plant at Quixal with an outdoors powerhouse equipped with five turbine-generator sets, and (v) a 120 km-long transmission line from the power station to Guatemala City.

B. Total Cost and Financing Plan of the Project

1. Cost and financing table

- 3.02 The updated total cost of the project is estimated at the equivalent of US\$889.32 million, including all investments already effected since 1976 and those required for completion of the project. The following table sets out the total cost of the project broken down by investment categories and sources of financing:

Total Cost and Financing Plan

(Equivalents in US\$ millions)

Category	I D B					Govt./ INDE	Total
	Previous loans 1/	Proposed	IBRD	VIF	CABEI		
1. <u>Engineering and Administration</u>	16.81	8.62	-	-	0.36	42.35	68.14
1.1 Engineering and supervision	16.81	8.62	-	-	0.36	10.81	36.60
1.2 Administration	-	-	-	-	-	31.54	31.54
2. <u>Direct Construction Cost</u>	156.84	41.06	92.63	74.80	12.90	353.59	731.82
2.1 Lot A. Complementary works	-	-	-	-	12.90	7.60	20.50
2.2 Lot 1. Dam, diversion, spillway	-	-	75.90	-	-	176.74	252.64
2.3 Lot 2. Power tunnel	134.78	36.29	-	74.80	-	64.90	310.77
2.4 Lot 3. Powerhouse	22.06	4.77	-	-	-	33.98	60.81
2.5 Lot 4. Hydromechanical equipment	-	-	-	-	-	17.13	17.13
2.6 Lot 5. Electromechanical equipment	-	-	-	-	-	19.45	19.45
2.7 Lot 6. Steel structures	-	-	-	-	-	15.14	15.14
2.8 Lot 7. Quixal substation and transmission line	-	-	16.73	-	-	10.60	27.33
2.9 Land purchases and relocations	-	-	-	-	-	8.05	8.05
3. <u>Finance Charges</u>	1.35	7.32	9.09	-	-	71.60	89.36
3.1 Interest and commissions	-	6.75 2/	9.09	-	-	71.60	87.44
3.2 Inspection and supervision	1.35	0.57	-	-	-	-	1.92
TOTAL	175.00	57.0	101.72	74.80	13.26	467.54	889.32
Percentages	19.7	6.4	11.5	8.4	1.5	52.5	100.0

1/ Loans 301/OC-GU, 302/OC-GU, 454/SF-GU, 6/VF-GU, 301-A/OC-GU, 302-A/OC-GU.

2/ Includes US\$3.52 million to reimburse INDE for interest paid during 1984 and first semester of 1985 and US\$1.68 million in interest from 1 July 1985 to 31 March 1986 on loan 6/VF-GU. It also includes US\$1.55 million for payment of interest in the proposed loan through 31 March 1986.

2. Increase in project cost

- 3.03 The project's updated cost of US\$889.32 million, was obtained on the basis of prices in June 1985 for a work practically completed, without any awards pending in bidding operations, which made it possible to arrive at current realistic data for quantities of work and unit costs.

- 3.04 The budget for repair of the tunnel is based on agreements already concluded with the contractor, and it is therefore considered that the updated cost estimate is reasonable and reliable.
- 3.05 The increase in the project costs from the estimate of US\$630 million given in PR-1142-A in 1981 to the present figure is broken down in detail in Appendix III-1 of the Project Report. In addition, paragraph 3.06 of that report presents a table on the development of the cost of the project from 1981 to June 30, 1985.

3. The Bank's financing

- 3.06 The possible financing in the equivalent of US\$57.0 million for the Chixoy Hydroelectric Project would cover the following items: 1/

- (i) Engineering and administration (US\$8.62 million) for the following payments: To the LAMI Consultants for outstanding invoices (US\$6.5 million); for work to be done down to 1987 (US\$0.73 million); reimbursements to INDE for payments made to LAMI since January 1, 1984 (US\$0.56 million). To the Consultative Group (US\$0.22 million); the University of Texas (US\$0.27 million); insurance studies (US\$0.25 million) and bathymetric studies (US\$0.09 million); for activities to be carried on down to 1987.
- (ii) Direct construction costs: US\$41.06 million distributed as follows:
- Lot 2 - Power tunnel, US\$36.29 million as follows: HOCHTIEF invoices pending payment (US\$20.49 million), work to be done (US\$9.50 million), and reimbursement to INDE for payments made to HOCHTIEF since January 1, 1984 (US\$6.30 million);
 - Lot 3 - Powerhouse, US\$4.77 million in outstanding invoices of the contracting firm of ICA (US\$3.75 million) and repayment to INDE for payments to ICA since 1 January 1984 (US\$1.02 million).
- (iii) Finance charges: (copiar 3.10 (iii) del informe de proyecto.

1/ The use that would be made of the proposed IDB financing of US\$57.0 million is summarized in Appendix III-2.

- 3.07 Based on the foregoing, it is recommended that up to US\$11.40 million be credited to INDE for expenditures made prior to approval of the possible loan, and be charged thereto provided requirements have been complied with substantially similar to those to be established in the loan contract. 1/
- 3.08 The Bank's financing from its own resources would be subject to the following conditions:

IC Resources:

Amortization term	20 years
Disbursement period	2 years
Grace period	2 years
Interest	variable, subject to the Bank's policy
Credit fee	1.25%
Inspection and supervision fund	1%

- 3.09 With this third-stage financing the IDB's cumulative contribution in foreign exchange would amount to 26.1% of the total cost of the project far below the proportion set by the matrix for projects of this type, which in Guatemala is 70%.
- 3.10 Because of the current restrictive situation on the capital market as to the limits imposed by commercial banks on extending their financial participation to new operations, the prospect of INDE's obtaining funds from such sources is dim. The Bank's efforts to obtain financing from commercial banks were without result, which makes the Bank the only available source for this purpose at this time.
4. Situation as to payments made and pending, and works to be executed
- 3.11 Of the project's updated total cost of US\$889.32 million, down to June 30, 1985, INDE paid US\$763.28 million for works completed, leaving a balance due of US\$126.04 million. The payments made and pending and works to be executed are itemized in paragraph 3.18 of the Project Report.

1/ See Proposed Resolution.

5. Additional local counterpart contribution

- 3.12 The additional local contribution to complete the project will be US\$62.01 million, to be provided by INDE and the Government of Guatemala.

C. Funds Needed for Completion of the Project

- 3.13 As previously indicated, paying the outstanding invoices and completing the project down to final acceptance of the tunnel in October 1987 will require the equivalent of US\$126.04 million, to be provided as follows: US\$6.53 million from current IDB loan 301-A/OC-GU, US\$45.60 million from the proposed loan, US\$11.90 million from the IBRD, and a Government/INDE contribution of US\$62.01 million. The details on these funding requirements are given in paragraph 3.19 of the Project Report.

IV. EXECUTION OF THE PROJECT

A. The Borrower and Guarantor

- 4.01 General responsibility would lie with the Government of Guatemala as borrower.

B. Organization of Execution

- 4.02 The Instituto Nacional de Electrificación (INDE) will remain responsible for all technical, administrative and financial aspects of execution of the Pueblo Viejo hydroelectric project on the Chixoy river. This execution is supervised by an Executing Unit headed by a Executive Director. The Executing Unit is functionally and organizationally subordinate to the Subdepartment of Works and Production; it exists on a temporary basis, its operations and functions being confined to the time required for execution of the project, that is, until the last of the five generating units goes into operation, which is expected to happen in March 1986. From then on, INDE would leave in place in the project area the organization required to do the work needed to operate and maintain the system, which will be part of the Institute's Operations Subdepartment.

1. Consulting services

- 4.03 The LAMI Consortium of Consultants was hired by INDE and has been functioning since the beginning of the project. Its services are performed under a typical engineering and supervision contract. In compliance with the Bank's request that the project's supervision be reinforced, INDE also provided for the advisory services of a Consultative Group consisting of three experts of wide experience and international reputation. The Group has continued to advise INDE since the tunnel failure, and the arrangement is that it would continue to do

so, like the Consortium of Consultants, down to final acceptance of the tunnel in October 1987. 1/

- 4.04 In order for INDE to have the necessary support for operation as well as maintenance of the power plant, and in line with INDE's stated views, it is recommended that the current term of the advisory services contract of the consultants and the Consultative Group be extended down to final acceptance of the tunnel, which is scheduled for October 31, 1987. 2/ Consultancies on insurance policy and bathymetry would be contracted for in keeping with the Bank's applicable standards. INDE has advised that the contract with the University of Texas has been expanded to include advisory services in the maintenance, operation and analysis of the data from the seismic network down to 1987.

C. Design, Bidding Documents and Bidding Operations

- 4.05 The works are far enough advanced that no works are anticipated other than those in execution to be financed from the proceeds of the loan. Some equipment still to be installed is itemized in Appendix IV-2 of the Project Report. If for any reason funds of the proposed loan had to be used to finance works other than those covered by the present works contract, the contracts for them would be let in international public bidding operations. 2/

D. Present Status of the Works

- 4.06 At this writing the Project is virtually finished, the repairs to the tunnel being the most important works in progress, which are so far advanced that they are expected to be completed by October 1985. Some work remains to be done as specified in Appendix IV-2 of the Project Report.

E. Status of the Insurance Coverage of the Project Works

- 4.07 As stated in paragraph 1.33, the tunnel and related works in Lot 2 are not covered by any insurance policy. Moreover, INDE's insurance picture is complicated by the fact that, with the possible exception of the electrical and mechanical equipment included in Lots 4 and 5 of the Project 3/, none of the other Project works are covered by any insurance, notwithstanding the fact that all the uninsured Lots, except one, have been accepted by INDE. In light of the foregoing, INDE has expressed its intention to promptly arrange for coverage of those uninsured components of the Project for which insurance is both available and cost-effective. As a semi-autonomous public agency, INDE

1/ See paragraphs 4.04 to 4.09 of the Project Report for further details on the functions and operations of the LAMI Consortium and Consultative Group.

2/ See Recommendations and proposed resolution.

3/ INDE has stated that these Lots are insured.

is required to insure its assets through the Banco de Crédito Hipotecario, also a public agency, which, when applicable, in turn reinsures covered assets in the international insurance markets. In view of the magnitude and complexity of the risks involved in the Chixoy project, as well as in other projects already in operation, and the additional need to take into account complex foreign exchange considerations in the insurance contracts, funds have been included in this financing to permit INDE to undertake a systematic review of all its insurance coverage with expert assistance. Because this review is expected to be time consuming, INDE has been encouraged to insure the Chixoy works in a two-stage process. That is, INDE would not await the results of the mentioned study before obtaining insurance coverage for the project, but, instead, would implement the recommendations that might emerge from it at the time of policy renewal (see Appendix IV-3).

4.08 With respect to the INDE's insurance coverage it is recommended that:

- (a) within 6 months of the effective date of the loan contract, INDE submit to the Bank evidence that it has engaged the services of consultants skilled in insurance matters.
- (b) within 18 months of the effective date of the loan contract, INDE submit to the Bank a report, prepared with the assistance of the insurance experts engaged according to foregoing paragraph (a), which specifies the insurance program INDE will adopt with respect to all its works, and a schedule for the implementation of the program. 1/

4.09 Additionally, in light of INDE's stated intention to take all the necessary and pertinent actions to exercise whatever rights it might have to recover all or part of the losses sustained as a result of the tunnel failure, it is recommended that the loan contract contain a clause pursuant to which INDE would obligate itself to: (a) dedicate its best efforts, using all the appropriate means available to it, to obtain such compensation as may be possible for the losses sustained as a result of the tunnel failure; (b) to present, semi-annually during the term of the loan contract, a report on the actions taken during the preceding six-month period pursuant to the obligation described in (a) above; and (c) in the event that INDE is compensated for all or part of its losses, to consult the Bank regarding the use of said funds, which may include an earlier repayment of the loan. 1/

F. Modality of Execution

1. Contracting for additional repair works

4.10 The construction contract entered into between HOCHTIEF and INDE establishes that the dates of provisional and final acceptance of the

1/ See Recommendations.

works shall be separated by a guarantee period of two years during which the contractor is contractually obligated to repair any defects that may emerge in the tunnel regardless of their origin or cause, but this does not imply that he must necessarily bear the cost of those repairs. The reason for this contractual condition is the need to preserve intact the contractor's responsibility for the integrity of the works during the guarantee period, which would not be possible if another contractor were to be involved in the repair of damages arising prior to final acceptance.

- 4.11 In consequence, when the tunnel failure arose, INDE entrusted the repairs to the contractor, HOCHTIEF which began the work in January 1984. INDE requested HOCHTIEF to acquire, in compliance with the original contract, the services of subcontractors specializing in any areas necessary, which it did by soliciting bids from several qualified enterprises for both the provision of the lining and sealing of cracks and for the grouting. Cognizant that the procedure proposed by INDE adhered to the stipulations in the bidding documents and in the original contract with HOCHTIEF, and that the need in this case to preserve intact the responsibility for and guarantee of the constructed works precluded recourse to the bidding process, the Bank did not object to the Institute's proposed course of action.
- 4.12 For purposes of repairing the tunnel, INDE entered with HOCHTIEF into two Agreements for Extra Work (ATEs) which are covered by the original contract and constitute amplifications thereof for additional works. The details on these ATEs are as follows:
 - ATE-25 of June 18, 1984, which covers all civil works for the repairs, the amount of which have risen from an original US\$5.4 million to a present US\$14 million, and
 - ATE-26 of September 21, 1984, for the fabrication, shipment and installation of about 1,402 meters of lining to be supplied by Noell of Germany, a HOCHTIEF subcontractor, the amount of which has declined from an original US\$21.2 million to a present US\$15.7 million.
- 4.13 With the conclusion of these two Agreements for Extra Work HOCHTIEF was authorized to proceed to repair the tunnel, and all appropriate conditions were set. The agreements were presented in due course to the Bank, which did not object to them. Moreover, in the Progress Reports on the loans since December 31, 1983, the Management of the Bank has been continually reporting to the Board of Executive Directors on the power tunnel failure, on Agreements for Extra Work 25 and 26 and their financing with funds of loan 301-A/OC-GU, and the progress of the tunnel repair works.
- 4.14 The original amount of the contract signed for the excavation and lining of the power tunnel was US\$126.24 million. Owing to the nature of the work, however, this contract was based on unit prices and quantities of

works, and included a clause requiring adjustment of the prices for inflation. In consequence, the said amount could be regarded solely as an estimate and valid only if the prices are not readjusted and if the actual quantities of work are exactly as provided in the bidding documents, which is very improbable in any underground works and even more improbable in this case owing to the length of the tunnel and the geological characteristics of the area. The contractual amount was gradually changed in a series of documents which were brought in due course to the Bank's attention and not objected to by it, as reflected in Project Report PR-1142-A on the IDB's second financing in 1981. The total amount of the agreements signed starting with the Bank's second financing lies within the Management's discretionary limit for the increase of works contracts.

2. Plan for completion of the power tunnel repairs

- 4.15 Based on the current activities timetable (Appendix IV-2 of the Project Report) and the pace of the work in progress, the repairs to the tunnel should be completed in October 1985, and the first unit in the power station should go into operation in November, almost two years after occurrence of the tunnel failure, and the fifth and last unit is expected to be in operation in March 1986.

G. Disbursement Schedule

- 4.16 The tentative schedule for disbursement of the resources both of the Bank's loans and of those from other sources, based on the updated timetable for execution of the works, provides for the payment of substantial amounts for work done during the second half of 1985 and the first half of 1986. Details are provided in paragraph 4.22 of the Project Report.

H. Schedule for Inspection of the Tunnel

- 4.17 INDE, LAMI and the Consultative Group have agreed on a procedure for monitoring the performance of the power tunnel once the power station goes back into operation; the technical details of this procedure are presented in paragraph 4.24 of the Project Report. Owing to the importance of the matter, INDE will have to present to the Bank a schedule for inspection of the tunnel. ^{1/}

I. Operation and Maintenance of the Facilities

- 4.18 The operation and maintenance of the completed project will be entrusted to INDE, acting through its Subdepartment of Operations and a direct responsibility of the Generation Section, which has charge of the maintenance of all the enterprise's generating and transmission installations.

^{1/} See Proposed Resolution.

- 4.19 Owing to the characteristics of the work, which is without parallel in Guatemala, INDE has no local staff experienced in its operation and maintenance. Hence the need for advisory services from the LAMI Consortium of Consultants and the Consultative Group which, as has been said above, will remain at the works until 1987. During that time, in addition to training INDE personnel, they will prepare two manuals, one on operation and the other on maintenance. The first manual would describe the operation of the power station under normal and emergency conditions and the management of the reservoir in the context of the INDE system. The second manual would set out a program of preventive maintenance for the different types of equipment and prescribe the frequency and procedures of the different maintenance operations.
- 4.20 To ensure that INDE will have appropriate technical staff, it is recommended that, prior to the first disbursement from the proceeds of the possible financing, the borrower present to the Bank evidence that the operating and maintenance personnel determined with LAMI 1/ have been hired. Moreover, within a term of twelve months from the effective date of the loan contract, INDE must present to the Bank the manuals referred to in paragraph 4.19, above, for the operation and maintenance of the project. 2/
- J. Relocation of Campesinos
- 4.21 The resettlement of local inhabitants affected by construction of the project has been progressing, albeit more slowly than anticipated. At this time one center of 150 housing units has been completely finished, others are 95% advanced, and the construction of three more is expected to be completed during 1986.
- 4.22 INDE is currently reassessing with care the situation of the beneficiaries of the resettlement program, and the Bank has asked for the presentation at the earliest opportunity of a satisfactory program identifying them and spelling out the scope of the operation (housing, lands, compensation), the timetable for its execution, the participating agencies, and the sources of funds. It is considered that this program should be presented to the Bank as follows: before the first disbursement, the information on the scope of the operation and on the participating agencies, and the rest within six months after the effective date of the contract for the proposed loan. Moreover, INDE must present to the Bank semiannual reports on the progress of the resettlement operation. 2/
- 4.23 The contract for IBRD loan 1605/GU and subsequent agreements establish that INDE must provide housing and other services superior to those that the resettled campesinos had before. The previously-mentioned IDB

1/ See Proposed Resolution.

2/ See Recommendations.

contracts contained no similar provisions, for the campesinos to be resettled are located chiefly in the area of the dam, which is being financed by the IBRD. Nevertheless, in view of the importance of the matter and of the present status of the resettlement operation, it is recommended that a clause be included establishing that INDE must present semiannual reports on the progress of that resettlement.

K. Protection of the Basin

- 4.24 Owing to the nature of the project site and the characteristics of the works, the project is not expected to have any adverse environmental effect. Owing to the scarcity of the vegetation in the Chixoy river basin there is concern about the possible effects of erosion and silting on the service life of the reservoir. To mitigate these effects, over the last three years INDE has been constructing soil protection works through a Chixoy basin management unit, which is expected to continue executing works for the protection of that basin.
- 4.25 To determine the impact of silting and proposed measures for its control in parallel with the first financing the Bank granted technical cooperation ATCN/CD(PP)/SF-1521-GU with the intent of identifying other possible energy programs in the Chixoy basin which, in addition to the benefits from generation they would yield, would help control silting. Both in this technical cooperation and in the feasibility study for the Chixoy project several hydroelectric projects had been identified upstream, including the one for Palzajel, the feasibility study for which will be done with financing from loan 739/SF-GU. In addition, the Bank recently sent out an orientation mission for a project under consideration for the reforestation and management of the upper Chixoy river basin. With a view to determining the level and rate of silting in the reservoir, the proposed loan will finance a bathymetric study for measurements to be made in 1986 and 1987. 1/

V. THE BORROWER AND EXECUTING AGENCY

- 5.01 As in the case of the earlier loans made by the Bank for this project, in this third additional financing the Republic of Guatemala would be the borrower and the Instituto Nacional de Electrificación (INDE), the Executing Agency.
- 5.02 The legal and institutional basis of INDE was examined on the occasion of the first and second financings and, more recently, during the processing of loans 456/OC-GU and 739/SF-GU for the Zunil geothermal generating plant and studies. 2/ Chapter V of the Project Report mentions only the aspects that involve changes and datings subsequent to the study of the earlier loans.

1/ See paragraphs 4.32 to 4.37 of the Project Report for further details. See Recommendations.

2/ See paragraphs 6.01 to 6.08 of document PR-1335-A.

- 5.03 Nevertheless, it is mentioned that INDE is a government-owned public-sector enterprise authorized to engage in all legal acts needed for the conduct of its operations subject only to the limitations contained in its statute and complementing rules in current legislation, and its organizational scheme is regarded as suitable for enterprises of this type. Its mission is to generate and sell electric energy, for which it is endowed with full powers and authorities.
- 5.04 The organization of the higher management of INDE was changed by Decrees 50-84 and 60-84 of May 31 and June 21, 1984, respectively, under which INDE's management authorities are currently the Auditor President and the Advisory Commission, which was set up as a dependency of the Jefatura del Estado to coordinate and supervise all activities in connection with the Pueblo Viejo hydroelectric power station on the Chixoy river, and was subsequently put in charge of all administration in the Institute. In consequence, the Auditor President has charge of the direction and administration of INDE's activities and his powers are established in Decree-Law 60-84 in keeping with INDE's Organic Law.
- 5.05 In the course of analyzing the operation it was found that INDE would have to improve its current procedures and policies for the selection, hiring, training, promotion and retention of the personnel needed to conduct the Institute's operations. It will also have to make a study of the productivity of its present personnel and of the measures needed to increase it. ^{1/} For further details see paragraphs 5.06 to 5.12 of the Project Report.
- 5.06 The financial and accounting operations are the province of a Financial Subdepartment, which has the support of a Financial Systems Advisor and the Financial and Budget Departments. In regard to the accounting system, in consequence of the views expressed by the external auditors in their certifications of INDE's audited financial statements for 1982 and 1983, loan 739/SF-GU included funds for the hiring of consultants to perform a study for improving the internal control and accounting of INDE. It is further observed that in INDE no financial projections are constructed, there being no unit with the capacity to do so, which severely limits the planning and control of the Institute's operations. ^{1/}
- 5.07 Loan contract 739/SF-GU requires that the accounts for sales to the government sector shall have fallen to an amount equivalent to not more than 60 days of use by that sector. Although the payments made by the Ministry of Finance in March 1985 wiped out the arrears of more than 60 days of the Government and Municipalities, it is considered advisable to retain in the proposed loan the wording of both the clause on general collections and the special clause on the accounts of the aforementioned sectors. ^{1/}

^{1/} See Recommendations.

- 5.08 From 1980 to 1984 INDE's operations yielded growing profits, which ranged between 9% and 4% a year of the working assets. Accounts receivable from electric energy sales have been collected within the terms established in the clauses of the IDB contracts, except for the arrears on the accounts of the municipalities sector on 12/31/84, which were brought up to date during 1985. Internal cash generation was sufficient to pay the annual service on the indebtedness plus a margin for annual contributions to the financing of the Institute's investments. Between 1980 and 1984 INDE maintained a safety margin for the coverage of its short-term liabilities. The long-term indebtedness tended upward during the period considered, and on 12/31/84 reached a limit that should be watched because the annual service on the debt has now climbed to a substantial proportion of INDE's internal cash generation. Part of the liabilities is contracted in foreign exchange, which, given the conditions reigning in the country, implies an exchange risk.

VI. JUSTIFICATION OF THE ADDITIONAL FINANCING CONSIDERED

A. General

- 6.01 Despite the considerable increases in the cost of the project, it remains of vital importance to the country because the electric power generation is now based primarily on the output of thermal power plants, which involves a substantial expenditure for fuels. Moreover, without the Chixoy power station, the country's reliable generating capacity is practically equal to the peak demand, which has prevented provision of the maintenance required by the generating stations, particularly the thermal power plants, and has also resulted in power outages that have had a considerable adverse effect on the national economy. This means that, apart from the fuels burned by the Instituto Nacional de Electrificación and the Empresa de Energía de Guatemala, S.A., unless the Chixoy project goes on-stream in a short time, the country will have to continue paying out substantial sums in foreign exchange to continue the production of electric energy, in addition to which the reliability of the service will plummet to levels far too costly to be sustained by the Guatemalan economy.

B. Technical Feasibility

- 6.02 The studies done prior to the start of construction of the project, the research and analysis carried out during its construction and after the tunnel failure, and the measures taken in its wake, and also the steel lining of 1,402 m of tunnel, the sealing of the cracks and the program of consolidation grouting have brought the parties involved to the conclusion that construction of the project is technically feasible. As in any other engineering work, it is understood that the project involves several implicit risks, including that of earthquakes. Nevertheless, it is the view of the experts that the proper measures have been taken to reduce those risks to a level consistent with normal engineering standards.

- 6.03 The matters considered in the preceding paragraphs of this chapter have been duly taken into account as background to the formulation of this additional financing. The IDB contribution will make a definite contribution to the solution of one of the country's important problems--that of having an abundant and reliable source of energy for attainment of the country's development goals--by enabling the power tunnel to be repaired and the Chixoy hydroelectric power station to resume generation.

C. Institutional Capacity

- 6.04 While the organizational structure of the Instituto Nacional de Electrificación and its general information and control systems could be improved, INDE has been conducting the execution of the project in a satisfactory manner. In addition, loan 739/SF-GU, already granted, provides for the use of resources for a technical cooperation in the accounting and financial areas. All of the foregoing warrants the inference that no technical or administrative problems would arise that could adversely affect the proposed operation.

D. Financial Feasibility

- 6.05 In the recent past the national economy has witnessed events so adverse and intense as to have negatively affected the administration of the Central Government by imposing limitations on the funds available for the financing of public expenditures. The result has been some increase in the levels of external and domestic public debt and a restriction on the levels of operating and investment expenditure. More recently, the country's authorities have endeavored to reduce the fiscal deficit by means of budgetary cuts to bring expenditure authorizations more closely into line with the funds available to finance them.
- 6.06 Despite this tight situation in the Treasury, during the different missions carried out on this project and during recent visits by the President of INDE and the Ministry of Finance to the Bank's headquarters, those two officers reaffirmed the priority of the project, to which the Government of Guatemala and INDE will continue channeling the domestic funds required, as they have been doing, until its execution has been completed. In addition, the magnitude of the additional financing effort that both INDE and the National Government will have to make to provide the local contribution, as concluded in the analysis of the items of the budget, would fall reasonably within the past range of disbursements actually made by both entities.
- 6.07 The source-of-funds analysis shows the sums that the Government will have to deliver to INDE as the local counterpart contribution during 1985, which are provided for in the revised Budget. In addition, it has been assumed that a Government contribution of about US\$43 million would be required to complete the financing of INDE's activities during 1986. To ensure that INDE can count on the financial resources to be provided by the National Government, it is considered advisable to include a

clause stipulating as a condition precedent to the first disbursement ^{1/} that the Borrower is to present evidence that in 1986 it will transfer to the executing agency as a capital contribution the equivalent of a least US\$43 million.

- 6.08 It must be emphasized that the program for other construction work originally presented by INDE called for higher investments both in figures and in the number of projects to be carried out during the projection period. Considering the existing restrictions, the borrower and the Executing Agency will have to undertake ^{2/} that the generating station selected to meet the needs of the system following the start-up of the Zunil geothermal power station will be part of the National Plan for Expansion of the electricity generation system which has been drawn up in accordance with economic criteria.
- 6.09 On the basis of the foregoing it may be concluded that INDE and the Government of Guatemala would be in a position to provide on schedule the local contributions called for in the scheme of sources of funds for the project down to its completion.

E. Economic Feasibility

- 6.10 When the original loans were approved, the economic rate of return of the project was not calculated, but studies based on demand and optimization were done which determined that the Chixoy power station was the alternative of least economic cost. In the second loans, since the resources were intended to cover higher costs of the project under construction, for which the Bank was already providing financial support, the economic rate of return was not calculated either. As a matter of information, the Operations Evaluation Office recently completed an ex-post evaluation of the entire Chixoy project (Report OER-38/84) based on the assumption that the repair of the power station would be completed in mid-1985 and, depending on the assumptions used, the economic rate of return was found to range between 9% and 11.5%.
- 6.11 At this time, an economic rate of internal return calculated for the entire project would be only a theoretical figure owing to the amount of the investment already made and of that still to be made. The only matter to be evaluated for the repair of the tunnel is the advisability of investing additional resources to complete the project and place it in operation in a short time. The cost of the repair, including the related engineering services, is estimated at US\$32.76 million, while the resulting fuel savings would be at least US\$55 million a year from the substitution of thermal generation both in INDE and EEGSA. Assuming the benefits indicated in the aforementioned ex-post evaluation report, the net present value is US\$932 million. ^{3/} The rate of return

^{1/} See Proposed Resolution.

^{2/} See Recommendations.

^{3/} Discounted from the beginning of 1983 at an opportunity cost of capital of 12%.

resulting from the evaluation is of such magnitude (greater than 100%) that it need not be determined exactly in order to arrive at a decision.

VII. SPECIAL ASPECTS

- 7.01 Even though the policy governing financing of expenses made before approval of a loan (GN-95-5) provides that the Bank may retroactively finance expenses made during the twelve months preceding the date of approval of the loan, whenever such expenses have been made after the date of the loan application, Management recommends that the Board of Executive Directors make an exception to the policy for the reasons explained in the following paragraphs.
- 7.02 IDB policy in this connection was designed to regulate contractings and payments made before approval of the loan for, as a general rule, the Bank finances a project for the purpose of carrying it out and not for reimbursing the borrower for expenses made in procurement of goods and services before that approval. The policy also allows for contracting in advance, but within the time limits of the dates specified in the foregoing paragraph, in cases in which without that advanced contracting the project would be delayed or the opportunity of making use of a circumstance offering a major economic advantage would be lost. In this case, contractings that give rise to such expenses as are recommended be recognized, even though they were made before the date of application for the loan that is the object of this proposal, represent procurement and contractings made during the disbursement period of earlier IDB loans, all done according to rules of IDB policy.
- 7.03 As regards the Chixoy hydroelectric generating station, the Bank has taken part in executing the projects from the outset by means of two lending packages granted in 1975 and 1981. When the tunnel failed in 1983, the executing agency, in order to keep up the pace of repair work, had to extend the contract with the contractor that was still at the work site, and the borrower had to make major capital allotments for payment of work certificates, because it could not wait for processing and approval of the loan requested herein.
- 7.04 Even though the letter requesting the loan was submitted to the Bank on August 6, 1984, at the end of 1983 --immediately after failure of the tunnel-- INDE informed the Bank that it would require financial support to repair the tunnel and set the hydroelectric plant in operation as soon as possible.
- 7.05 The Bank acted immediately and sent missions to Guatemala to request special information and closely monitored the various studies that were being made to repair the tunnel, and it responded favorably to INDE's request to make use of the resources of loan 301-A/OC-GU while the IDB financing was being processed. Hence the work of repairing the failure, which took place in December 1983, began in January 1984.

7.06 Considering the greater costs the project has brought about, the Government of Guatemala and the INDE have had to make a much greater financial effort than might be considered normal; so, their financial share of the estimated cost of the project is 52.5%, and the IDB share is 26.1%, well below the limit established by the matrix for projects of this kind, which in Guatemala is 70%.

7.07 Therefore, inasmuch as: (a) this is a project, the construction whereof is being supervised by the Bank and in which the IDB has taken a financial part from the outset; (b) the additional expenses incurred by the borrower have been of an exceptional nature and of such an urgency as to have made their postponement impossible without causing severe economic damage to Guatemala, Management recommends that expenses made in the project as of January 1, 1984, be recognized as chargeable to the proposed loan. Management further estimates that given the exceptional character of the events associated with this project, the emergence of similar situations in the future, such as might cause this case to be a precedent, is not anticipated.

VIII. RECOMMENDATION

8.01 For the reasons stated above, it is considered that the proposed project is feasible from the technical, economic, financial, institutional and legal standpoints. It is therefore recommended that the loan be approved, to which end the following normative documents are submitted to the Board of Executive Directors for consideration:

- Proposed resolution
- Recommendations
- Description of the project (Annex A of the Loan Contract)

WPC/GU0041-8

Original: Spanish

GU-0026

Appendix I

PROPOSED RESOLUTION ^{1/}

GUATEMALA. LOAN /IC-GU TO THE REPUBLICA DE GUATEMALA
(Additional Financing for the Pueblo Viejo-Quixal
Hydroelectric Project on the Chixoy River)

The Board of Executive Directors

RESOLVES:

That the President of the Bank, or such representative as he shall designate, is authorized, in the name and on behalf of the Bank, to enter into such contract or contracts as may be necessary with the República de Guatemala, as borrower, for the purpose of granting it a loan to assist in the execution of the Pueblo-Quixal Hydroelectric Project on the Chixoy River (hereinafter named the "Project"). This financing shall be subject substantially to the following conditions:

1. Amount and currencies: Up to US\$57,000,000 or the equivalent in other currencies which are part of the interregional capital resources of the Bank, to pay for goods and services acquired through international competition in the member countries of the Bank and for such other purposes as may be specified in the loan contract. Payments of amortization and interests shall be made in the currency or currencies specified by the Bank, in a quantity equivalent to the corresponding amount owed, calculated in units of account in terms of dollars of the United States of America, in accordance with the provisions to be included in the loan contract.
2. Source of funds: The interregional capital resources of the Bank.
3. Guarantee: The general responsibility of the borrower.
4. Credit fee: 1-1/4% per annum on the undisbursed portion of the financing, commencing to accrue 60 days after the date of the contract and payable in dollars of the United States of America on the same dates as the interest.

^{1/} The provisions contained in this Appendix and Appendices II, III, IV, and V will only be final when the Board of Executive Directors has approved the proposed loan.

5. Amortization: The borrower shall amortize the loan in a period of 20 years from the date of the contract, by means of semiannual, consecutive and, insofar as possible, equal installments. The first installment shall be paid six months after the date scheduled for the last disbursement of the financing. The Bank may credit the amortization installments proportionally to the outstanding balance of each of the portions of the loan which accrue different rates of interest.
6. Interest: The borrower shall pay interest semiannually on the outstanding balances of the loan. The first payment shall be made six months after the date of the loan contract. During the disbursement period, the Bank: (a) shall determine the rate of interest to be applied as of the first day of each January and for the life of the loan to any amounts disbursed during the ensuing year; and (b) may modify the interest rate, in accordance with the policy of the Bank, to be applied to disbursements of the loan made during the second half of the year. At the request of the borrower, resources of the financing may be used to pay the interest on this loan as well as on loan 6/VF-GU up until March 31, 1986.
7. Disbursement: The term for disbursement of the financing shall expire two years after the effective date of the contract.
8. Special conditions:
 - (a) The resources of the loan shall be utilized in their entirety by the Instituto Nacional de Electrificación (INDE or executing agency). If modifications in the legal provisions or the basic regulations concerning INDE are approved which, in the opinion of the Bank, may substantially affect the Project, the Bank shall have the right to require the borrower and/or the executing agency, to provide explanatory and detailed information in order to determine whether such modification or modifications may have an adverse impact on the execution of the Project. Only after hearing the borrower and/or the executing agency and assessing its information and clarifications, may the Bank take such measures as it deems appropriate in accordance with the provisions to be set forth in the loan contract.
 - (b) The resources of the loan shall be used to participate in the execution of the Pueblo Viejo-Quixal Hydroelectric Project on the Chixoy River, the cost of which is estimated at the equivalent of US\$889,320,000. Consequently, the loan contract shall contain such provisions as the Bank deems appropriate to ensure that such national resources as may be necessary, in addition to the loan, for the complete execution of the Project, shall be duly provided in an amount estimated at the equivalent of US\$657,320,000, in accordance with a schedule of investments satisfactory to the Bank.

(c) Before the first disbursement of the financing, the borrower shall submit to the satisfaction of the Bank:

- (i) evidence that it has entered into an agreement with INDE wherein the borrower undertakes to transfer to INDE the full amount of the resources of the loan on the same conditions as those set forth in the loan contract, at the rate of exchange in effect at the time of each disbursement;
- (ii) evidence that the borrower has taken the necessary steps to place at the disposal of the executing agency for the year 1986, as a contribution to its capital, resources in the equivalent amount of not less than US\$43,000,000, so that the latter may cover its financial shortfall for that year;
- (iii) evidence that the steel lining has been installed in the power tunnel, that the fissures have been sealed, that the consolidation injections have been undertaken, including those foreseen for the El Jute zone, and that a facility (drainage gallery or other equivalent work) to relieve the external pressure in said zone shall be constructed, as agreed to between the executing agency, the consulting firm, and the Board of Consultants;
- (iv) a program for inspection of the power tunnel, as of the time it is set in operation, which shall pay special attention to the period preceding the final acceptance thereof;
- (v) a study prepared by the consulting firm which defines the human and physical resources which shall be required for the operation and maintenance of the power plant equipment and other installations, as well as for the maintenance of the civil works of the Project;
- (vi) evidence that the operations and maintenance personnel defined by the study described in (v) above have been hired, and that a report has been prepared concerning the measures which INDE will take to improve the working conditions of the personnel assigned to the operation and maintenance of the Project;
- (vii) a program for the resettlement of persons who were affected by the Project which shall specify: (aa) its scope in terms of housing, land, indemnity and compensation; and (bb) the participating institutions;
- (viii) evidence that the executing agency has enlarged the scope of and extended its contracts with the members of the Board of Consultants in order that they may assist, for at

- least two years from the time the Project is put in operation, in the analysis of such information on the operation of the Project as may be obtained from the measuring instruments, and from the inspections to be made of the power tunnel;
- (d) Up to the equivalent of US\$7,880,000 of the resources of the financing may be used to reimburse expenses incurred in the Project for engineering services and in connection with the power tunnel and powerhouse before the date of this resolution but after January 1, 1984, provided that requirements substantially similar to those of this resolution and the loan contract have been fulfilled. In addition, the equivalent of US\$3,520,000 of the resources of this loan may be used to reimburse the INDE for interest paid during 1984 and the first semester of 1985 on loan 6/VF-GU.
- (e) In the acquisition of machinery, equipment and other materials for the Project, and in the awarding of construction contracts, the system of public bids shall be followed in each case in which the value of such acquisitions or contracts exceeds the equivalent of US\$200,000. The biddings shall be subject to the procedures to be appended as an annex to the loan contract.
- (f) The borrower and the executing agency shall take appropriate measures acceptable to the Bank in order that the rates for the sale of electric energy of the system of the executing agency: (i) shall produce revenues at least sufficient to cover all operating expenses of the system, including those related to administration, operation, maintenance and depreciation; and (ii) annually yield a reasonable rate of return on the revalued consolidated net utility investment of the system. If the application of the foregoing does not generate sufficient resources to cover the timely service of all the obligations of the executing agency, the borrower and the executing agency shall take the necessary measures, which may include an increase in tariffs, to obtain the additional resources required to achieve that purpose.
- (g) During the term of the loan contract, the executing agency shall not undertake, without the prior approval of the Bank, any new financial obligations with maturities greater than one year as a consequence of which: (i) its long-term debt shall be more than one half of its equity; (ii) the annual ratio of internal cash generation to total debt service shall be less than 1.3; and (iii) the current ratio shall be less than 1, except for the year 1986 which could be up to 0.8, without including the current portion of the long-term debt in the calculation.
- (h) The Bank shall establish such inspection procedures as it deems necessary to assure the satisfactory execution of the Project, and the borrower and the executing agency shall extend all cooperation which is required for the most effective

accomplishment of this purpose. From the amount of the financing, the sum of US\$570,000 shall be allocated for credit to the income accounts of the Bank to meet expenses of general inspection and supervision.

9. Conditional Provision: This resolution shall enter into effect only when the Board of Executive Directors shall have determined, by means of a resolution, that the Bank has sufficient resources in the interregional capital to cover the loan authorized pursuant to this resolution.

RECOMMENDATIONS

- A. It is recommended that the following conditions, to be performed to the satisfaction of the Bank, be included in the loan contract in addition to the conditions set forth in the Resolution:
1. The borrower and the executing agency shall undertake:
 - (a) to devote their best efforts, using all appropriate measures, to obtain such compensation as may be possible for the losses sustained as a result of the failure of the power tunnel;
 - (b) to present, through the executing agency, semi-annually during the term of the loan contract, a report on the measures taken by the executing agency, during the six month period immediately preceding the report, pursuant to the commitment described in subsection (a) above; and
 - (c) in the event that some compensation for damages is obtained, to consult with the Bank on the use of such funds, which may include payment of the loan in advance.
 2. Within a period of six months after the effective date of the loan contract, the borrower, through the executing agency, shall present to the Bank:
 - (a) evidence that the executing agency has enlarged the scope of the contract with the consulting firm in order that the consulting firm may advise it in the preparation of manuals for operation and maintenance of the Project, which shall include the procedures for exercising control over and monitoring the operation and maintenance program;
 - (b) evidence that the executing agency has organized and put into operation a financial analysis unit with the capacity to prepare prospective analyses of its operations and investment plans;
 - (c) the schedule and origin of resources for the implementation of the resettlement program described in subsection 8(c)(vii) of Appendix I;
 - (d) the schedule for construction of the facility to relieve external pressure in the El Jute zone, to which reference is made in

subsection 8(c)(iii) of Appendix I, and evidence of the availability of funds for its prompt and timely construction;

- (e) evidence that the executing agency has engaged the services of the consultants who will perform the insurance related study referred to in paragraph 6 of this Appendix II.
3. Within a period of 12 months after the effective date of the loan contract, the borrower, through the executing agency, shall present to the Bank the manuals drawn up by the executing agency and the consulting firm with respect to the operation and maintenance of the project, referred to in subsection 2(a) above.
 4. Within a period of 12 months after the effective date of the loan contract, the borrower, through the executing agency, shall present to the Bank:
 - (a) an analysis of the productivity of the personnel currently employed by the executing agency;
 - (b) the measures which the executing agency proposes to adopt to increase said productivity, which shall include the rules, procedures and policies applicable to the selection, hiring, training and promotion of human resources, as well as the incentives necessary to retain personnel; and
 - (c) a schedule for the implementation of said measures.
 5. Within a period of 18 months after the hydroelectric power plant is put in operation, the borrower, through the executing agency, shall demonstrate to the Bank that the personnel assigned to power plant operation and maintenance has been duly trained according to the manuals prepared for that purpose. In addition, the borrower and the executing agency shall undertake that for ten years after the completion of each one of the works, facilities and equipment items included in the Project, these shall be maintained according to generally accepted technical standards implemented through the execution, to the satisfaction of the Bank, of annual maintenance plans, pursuant to Section IV of Appendix III of this document. If it should be determined by means inspections made or of reports received by the Bank that maintenance is being carried out below the standards agreed upon, the borrower and the executing agency shall take such measures as may be necessary to fully correct the deficiencies.
 6. Within a period of 18 months after the effective date of the loan contract, the borrower, through the executing agency, shall present:
 - (a) a study prepared in cooperation with qualified insurance consultants that shall specify the insurance program to be implemented by the executing agency to protect its facilities in operation and under construction; (b) a schedule for the implementation of that program.

7. Before December 31, 1986, the borrower, through the executing agency, shall present to the Bank evidence that the executing agency has extended and enlarged the scope of the contract of the consulting firm in order that the consulting firm may assist the borrower for not less than two years from the time the Project is put in operation in the maintenance and operation of the Project, in the analysis of such information about its performance as is obtained from measuring instruments, in such inspections as are made in the power tunnel, and in the training of personnel.
8. The borrower, through the executing agency, shall present: (a) within 6 months of the effective date of the loan contract, evidence that it has engaged a consultant or a consulting firm which has expertise in bathymetric studies; and (b) at the 24th month from the effective date of the loan contract, a report drawn up by the consultant or the consulting firm described in subsection (a) above that shall include the results of a bathymetric study of the reservoir accomplished by means of measurements taken for two consecutive years.
9. Quarterly, until the construction work referred to in subsection 2(d) above has been completed, the borrower, through the executing agency, shall submit a report on its state of advance.
10. Semi-annually, until the resettlement program referred to in subsection 2(c) above has been completed, the borrower, through the executing agency, shall present a report on the state of advance of the program.
11. The borrower and the executing agency shall undertake that the next electric generating station selected to supply the needs of the system, except the Zunil geothermal electric generating station, shall form part of the National Plan for Expansion of the Electric Generating System drawn up in accordance with economic criteria.
12. Unless the parties agree otherwise, the borrower shall take the necessary measures to ensure, pursuant to Appendix V, that INDE's internal generation of funds represents a reasonable proportion of the financing of its investments in fixed assets in each fiscal year.
13. Effective December 31, 1985, the borrower, through the executing agency, shall present to the Bank, together with the consolidated and audited financial statements of the executing agency: (i) evidence that not less than 85% of the balances outstanding for each class of consumers in the year have been collected, including the balance due and owing at the beginning of each fiscal year for services billed (for these purposes balances owing whose term of payment has not expired shall not be considered balances outstanding); and (ii) evidence that the accounts due from sales to the government sector do not exceed 60 days.
14. The financial statements of the Project, during its execution, and those of the executing agency, during the term of the loan contract,

shall be presented to the Bank annually, certified by a firm of independent public accountants acceptable to the Bank. The first such statements shall be presented to the Bank within a period of 120 days after the fiscal year ending December 31, 1985.

- B. The loan contract shall include an annex substantially similar in content to Appendix III.

THE PROJECT
(Annex A of the Loan Contract)

I. Purpose

- 1.01 The purpose of the Project is to expand the electric generating system of the INDE through the construction of a hydroelectric power plant on the middle reaches of the Chixoy River.

II. Description of the Hydroelectric Project at Pueblo Viejo-Quixal on the Chixoy river

- 2.01 The Project would have 300 megawatts of installed capacity and an annual mean energy generation of 1493 GWh.
- 2.02 The principal components of the Project are:
- (a) a rockfill dam at the place called Pueblo Viejo;
 - (b) a spillway;
 - (c) a power tunnel approximately 26 kms long;
 - (d) a powerhouse at Quixal with a switchyard;
 - (e) a transmission line, approximately 120 kms long, with its corresponding step-down substation, from the hydroelectric plant to Guatemala City.

III. Updated total cost and financing of the Project

- 3.01 The total cost of the Project is estimated at the equivalent of US\$889,320,000, distributed approximately as follows:

Total Cost and Financing Plan

(Equivalent in US\$ millions)

Category	B I D						Gobierno/	
	Earlier loans	1/	Proposed	IBRD	FIV	CABEI	INDE	Total
1. <u>Engineering and Adm.</u>	16.81		8.62	-	-	0.36	42.35	68.14
1.1 Engineering and Supervision	16.81		8.62	-	-	0.36	10.81	36.60
1.2 Administration	-		-	-	-	-	31.54	31.54
2. <u>Direct Construction Cost</u>	156.84		41.06	92.63	74.80	12.90	353.59	731.82
2.1 Lote A. Complementary works.	-		-	-	-	12.90	7.60	20.50
2.2 Lote 1. Dam, diversion, spillway	-		-	75.90	-	-	176.74	252.64
2.3 Lote 2. Power tunnel	134.78		36.29	-	74.80	-	64.90	310.77
2.4 Lote 3. Powerhouse	22.06		4.77	-	-	-	33.98	60.81
2.5 Lote 4. Hydromechanical equipment	-		-	-	-	-	17.13	17.13
2.6 Lote 5. Hydromechanical equipment	-		-	-	-	-	19.45	19.45
2.7 Lote 6. Steel structures	-		-	-	-	-	15.14	15.14
2.8 Lote 7. Quixal substation and transmission line	-		-	16.73	-	-	10.60	27.33
2.9 Purchase of land and resettlement	-		-	-	-	-	8.05	8.05
3. <u>Financing Charges</u>	1.35		7.32	9.09	-	-	71.60	89.36
3.1 Interest and Comissions	-		6.75	9.09	-	-	71.60	87.44
3.2 Inspection and Supervision	1.35		0.57	-	-	-	-	1.92
TOTAL	175.00		57.0	101.72	74.80	13.26	467.54	889.32
Percent	19.7		6.4	11.5	8.4	1.5	52.5	100.0

1/ Loans 301/OC-GU, 302/OC-GU, 454/SF-GU, 6/VF-GU, 301-A/OC-GU, 302-A/OC-GU.

IV. Maintenance of the works, facilities and equipment

- 4.01 The purpose of maintenance will be to keep the works, facilities and equipment included in the Project substantially in the same condition they were in at the time of their completion or procurement.
- 4.02 The annual maintenance plan for the Project shall be submitted to the Bank for consideration at least three months in advance of the beginning of each fiscal year, beginning with the fiscal year following the entry in service of the first work, facility or item of equipment.
- 4.03 The annual maintenance plan shall include: (i) details concerning the organization responsible for maintenance and the personnel in charge as well as the number, type and condition of equipment assigned to maintenance; (ii) the location, size and condition of the storage and repair facilities and maintenance campsites; (iii) information on: actual amounts of funds expended on maintenance during the previous year and the amount of funds allocated in the following year's budget to the maintenance program, specifically showing the amount of funds earmarked for maintenance of the works, facilities and equipment included in the Project; (iv) a description of the maintenance scheduled to be carried out on the works, facilities and equipment financed out of the loan resources; and (v) a detailed report on the maintenance conditions in the previous year based on a sufficiency evaluation system which shall previously have been submitted to and approved by the Bank.

V. Rate of return

- 5.01 It is considered that the reasonable rate of return on the revalued and consolidated fixed capital investment of the system, referred to in clause 8(f)(ii) of Appendix I, shall be at least 6% in real terms through December 31, 1990, and at least 8% from January 1, 1991 onward, calculated on the assets revalued each year in accordance with the methodology specified in Appendix IV.

VI. Procurement

- 6.01 When goods to be procured or services to be contracted are to be financed in whole or in part with foreign exchange from the financing, the procedures and specific requirements for the bidding or other form of purchase or contracting shall permit the unrestricted participation of goods and services, including those related to any mode of transport, from member countries of the Bank. Consequently, no conditions that would limit or restrict the offer of goods or the participation of contractors from such countries may be imposed through such procedures or specific requirements.

VII. Consulting services

- 7.01 In selecting and contracting for consulting services to be financed in whole or in part with resources from this financing, the procedures

specified in the loan contract will be followed, with the understanding that the borrower may not establish provisions or conditions that would restrict or preclude the participation of consultants from member countries of the Bank.

The annual maintenance plan for the Project shall be submitted to the Bank for consideration at least three months in advance of the beginning of each fiscal year, beginning with the fiscal year following the entry in service of the first work, facility or item of equipment.

The annual maintenance plan shall include: (i) details concerning the organization responsible for maintenance and the personnel in charge as well as the number, type and condition of equipment assigned to maintenance; (ii) the location, size and condition of the storage and repair facilities and maintenance compound; (iii) information on actual amounts of funds expended on maintenance during the previous year and the amount of funds allocated in the following year's budget to the maintenance program, specifying the amount of funds earmarked for maintenance of the work, facilities and equipment included in the Project; (iv) a description of the maintenance schedule to be carried out on the work, facilities and equipment financed out of the loan resources; and (v) a detailed report on the maintenance condition in the previous year based on a satisfactory evaluation system which shall previously have been submitted to and approved by the Bank.

V. Rate of return

It is considered that the reasonable rate of return on the retained and consolidated fixed capital investment of the system, related to its clause 8(1)(ii) of Appendix I, shall be at least 8% in real terms through December 31, 1980, and at least 8% from January 1, 1981 onwards, calculated on the assets retained each year in accordance with the methodology specified in Appendix IV.

VI. Procurement

When goods to be procured or services to be contracted are to be financed in whole or in part with foreign exchange from the financing, the procedures and specific requirements for the bidding or other form of purchase or contracting shall permit the unrestricted participation of goods and services, including those related to any mode of transport, from member countries of the Bank. Consequently, no conditions that would limit or restrict the offer of goods or the participation of contractors from such countries may be imposed through such procedures or specific requirements.

VII. Consulting services

In selecting and contracting for consulting services to be financed in whole or in part with resources from this financing, the procedures

METHODOLOGY FOR CALCULATING THE RATE
OF RETURN OF THE SYSTEM

The rate of return referred to in Appendix III, paragraph 5.01, will be calculated annually as a ratio of the net operating income of the INDE electric utility enterprise in the year examined to the average amount of consolidated fixed capital investment. This ratio will be calculated on the basis of the following elements:

- (a) "Net Operating Income" shall be obtained by subtracting from the total operating revenues all expenses of operation, including administration, taxes, operation, maintenance and depreciation.
- (b) "Consolidated Fixed Capital Investment" of INDE in the electric utility business will be the sum of the "Net Fixed Assets" corresponding to plant in service plus the "Working Capital" associated with that business.
- (c) The "Net Fixed Assets" will be obtained by subtracting the "Reserve for Depreciation" from the amount of "Fixed Assets" corresponding to plant in service.
- (d) The annual provision for depreciation shall not be less than two (2) percent of the average current value of the "Fixed Assets" during the year.
- (e) The "Working Capital" will consist of 1/6 of the operating income derived from the electric utility business of the enterprise during the year examined.
- (f) The "Net Fixed Assets" and "Fixed Capital Investment" will be determined, for each calendar year, as follows:
 - (i) the "Reserve for Depreciation" will be subtracted from the amount of the "Fixed Assets" at the beginning of the year, both items revalued according to the change in the cost indexes that took place in the preceding year according to an index acceptable to the Bank and the borrower;
 - (ii) to revalue the "Fixed Assets", the costs incurred in national currency shall be adjusted according to the cost of living index. Investments made in foreign currency, denominated in dollars of the United States of America, will be converted into national currency at the price that the borrower must pay for dollars on the date of revaluation;

- (iii) the "Reserve for depreciation" will be adjusted in the same proportion as the revaluation of the "Fixed Assets";
 - (iv) the difference between the "Fixed Assets" and the "Reserve for Depreciation" so revalued constitutes the "Net Fixed Assets" at the beginning of the year;
 - (v) the "Fixed Assets" and the "Reserve for Depreciation" will be revalued in the manner indicated in (ii) and (iii) herein to establish the "Net Fixed Assets" at the beginning of the next year;
 - (vi) the net average amount of fixed assets at the beginning of the year examined and at the beginning of the next year may constitute the "Net Fixed Assets" for the year. This average will be weighted whenever major additions to the assets take place during the year; and
 - (vii) the "Fixed Capital Investment", which is the basis for calculating the rate of return in the year, will be obtained by adding the "Working Capital", as defined in paragraph (e), to the "Net Fixed Assets" determined according to subsection (vi).
- (g) The initial amounts of the "Fixed Assets" and of the "Reserve for Depreciation" will be the amounts corresponding to December 31, 1982, which were established during the evaluation of loans 739/SF-GU and 456/OC-GU. On the basis of these amounts and adjustments thereto on account of increases or decreases in assets, provision for depreciation and revaluation, the "Net Fixed Assets" in the following years will be determined.

METHODOLOGY FOR ESTIMATING THE PERCENTAGE
OF INTERNAL GENERATION OF FUNDS

The internal generation of funds to which Appendix II, paragraph 12, refers will be calculated annually at the end of each fiscal year, beginning with the fiscal year ending December 31, 1986, in accordance with the audited consolidated financial statements of the executing agency.

1. The term "Internal Generation of Funds" will be understood to mean the difference between:
 - (a) The total operating income derived from the electric utility business and nonreimbursable cash grants; and
 - (b) The total operating expenses of the electric utility business for maintenance and administration, interest and other finance charges (not including interest charged to construction), amortization of debt and any disbursement of funds other than for the acquisition of fixed assets and related investments.
2. The internal generation of funds, as a share of investment in fixed assets in each fiscal year, to which paragraph 12 of Appendix II refers, shall be considered reasonable provided it is at least 25% as of fiscal year 1986. The expression "acquisition of fixed assets" includes interest charged to construction.

