PD-AAY-559

UNCLASSIFIED

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D.C. 20523

PROJECT PAPER

Proposal and Recommendations
For the Review of the
Development Loan Committee

GUATEMALA - RURAL ELECTRIFICATION

AID-DLC/P-2269

UNCLASSIFIED

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C. 20523

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September 23, 1977

MEMORANDUM FOR THE DEVELOPMENT LOAN COMMITTEE

SUBJECT: Guatemala - Rural Electrification

Attached for your review are recommendations for authorization of a loan to Guatemala (the "Borrower") in an amount not to exceed Ten Million Eight Hundred Thousand United States Dollars ($10,800,000) to help in financing certain foreign exchange and Central American Common Market local currency costs of goods and services required to carry out a rural electrification program.

This loan is scheduled for consideration by the Development Loan Staff Committee on Thursday, September 29, 1977, at 2:30 p.m., in Room 3886 New State. If you are a voting member, a poll sheet has been enclosed for your response.

Development Loan Committee
Office of Development Program
Review and Evaluation

Attachments:
Summary and Recommendations
Project Analyses
Annexes A - L

N

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

1. TRANSACTION CODE: [A] (A = ADD, C = CHANGE, D = DELETE)

PP

2. DOCUMENT CODE: 3

3. COUNTRY/ENTITY: GUATEMALA

4. DOCUMENT REVISION NUMBER:

5. PROJECT NUMBER (7 digits): 520-0248

6. BUREAU/OFFICE: A. SYMBOL: LA; B. CODE: 05

7. PROJECT TITLE (Maximum 40 characters): RURAL ELECTRIFICATION

8. ESTIMATED FY OF PROJECT COMPLETION: FY 82

9. ESTIMATED DATE OF OBLIGATION: A. INITIAL FY 77; B. QUARTER 4 (Enter 1, 2, 3, or 4); C. FINAL FY 77

10. ESTIMATED COSTS ($000 OR EQUIVALENT $1 - Q1.00

A. FUNDING SOURCE	FIRST FY B. FX	FIRST FY C. L/C	FIRST FY D. TOTAL	LIFE OF PROJECT E. FX	LIFE OF PROJECT F. L/C	LIFE OF PROJECT G. TOTAL
AID APPROPRIATED TOTAL						
(GRANT)	( )	( )	( )	( )	( )	( )
(LOAN)	(-)	(-)	(-)	(5,300)	(5,500)	(10,800)
OTHER U.S. 1.						
OTHER U.S. 2.						
HOST COUNTRY					7,400	7,400
OTHER DONOR(S)						
TOTALS				5,300	12,900	18,200

11. PROPOSED BUDGET APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE C. GRANT	PRIMARY TECH. CODE D. LOAN	E. 1ST FY 77 F. GRANT	E. 1ST FY 77 G. LOAN	H. 2ND FY 78 I. GRANT	H. 2ND FY 78 J. LOAN	K. 3RD FY 79 L. GRANT	K. 3RD FY 79 M. LOAN
(1) F + N	749		062		10,800				
(2)									
(3)									
(4)									
TOTALS					10,800				

A. APPROPRIATION	N. 4TH FY 80 O. GRANT	N. 4TH FY 80 P. LOAN	Q. 5TH FY 81 R. GRANT	Q. 5TH FY 81 S. LOAN	LIFE OF PROJECT T. GRANT	LIFE OF PROJECT U. LOAN
(1)						10,800
(2)						
(3)						
(4)						
TOTALS						10,800

12. IN-DEPTH EVALUATION SCHEDULED: MM 01 YY 80

13. DATA CHANGE INDICATOR. WERE CHANGES MADE IN THE PID FACESHEET DATA, BLOCKS 12, 13, 14, OR 15 OR IN PRP FACESHEET DATA. BLOCK 12? IF YES, ATTACH CHANGED PID FACESHEET.

[1] 1 = NO, 2 = YES

14. ORIGINATING OFFICE CLEARANCE

SIGNATURE: Frederick W. Nelson

TITLE: DIRECTOR

DATE SIGNED: MM 08 DD 26 YY 77

15. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MM 08 DD 30 YY 77

AID 1330-4 (5-76)

3

b

RURAL ELECTRIFICATION

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* in LA/DR Files

B. Recommendations

The following recommendations are submitted for approval:

(Loan terms: 30 years with 10 year grace period on amortization; 2% interest during the grace period and 3% thereafter.)	$ 10,800.00
GOG Counterpart	7,400.00
Total Project	$ 18,200.00

C. Description of Project

1. Borrower

The Government of Guatemala will be the Borrower. Loan proceeds and the Borrower's counterpart contribution will be provided on a non-reinbursable basis to the implementing agency, the Instituto Nacional de Electrificación (INDE). INDE is a government owned autonomous agency responsible for electric power generation and distribution through bulk (block) electricity sales and direct retail distribution.

2. Project Summary

This project will contribute to a balanced power development program for Guatemala by assuring the participation of low income rural populations in INDE's energy investment program. The project will finance 75,000 new rural residential and commercial users in villages in the Western and Central Highlands and Eastern Region of Guatemala. In addition technical assistance, training, maintenance equipment and vehicles will be financed to strengthen INDE's administrative and outreach capability for servicing the 75,000 additional new customers. Approximately 29,000 of these connections will be made in villages which are already partially electrified. The remaining 46,000 new users

will be hooked up in villages which are not presently served. Approximately 95% of all connections will be residential and 5% will be commercial.

To ensure minimally acceptable quality of service in the areas where distribution systems are to be extended and expanded, 170 Kms. of 69 KV subtransmission lines will be financed with counterpart funds from the GOG in order to avoid unacceptable voltage fluctuations and energy losses which would otherwise occur due to the increased demand being placed on existing systems. Two sub-stations are also required to provide transformation of voltage and protection for the new distribution lines.

The new and expanded distribution systems will require a total of approximately 1,350 Kms. of primary and secondary lines to serve a total of 75,000 customers. Service drops, meters, and customer-owned housewiring will be installed. Funds to finance house wiring, which will be repaid by customers through monthly charges to their bills over a four year period, are included in the project. An impact evaluation which measures the rate of adoption of electricity for productive purposes by low income rural families will be carried out during the last years of the project.

A key element of the project is INDE's agreement to remove its present requirement for payment in advance of connection charges. This "front-end charge" is a major obstacle preventing low income families from obtaining electric service.

After the five year project has terminated, INDE will continue to connect a minimum of 10,000 new low income users annually in rural areas of Guatemala. Financing for these hook-ups will come from INDE's own resources.

The project complements recently initiated projects for large scale development of the country's hydroelectric resources which will be financed through IBRD, IDB, CABEI, and Venezuelan Development Fund loans totaling about $260 million. It builds on transmission investments made under AID's previous rural electrification loan (019, authorized in 1971 for $7 million and fully disbursed in 1976). This investment will allow INDE to serve a large number of low income families who otherwise would not receive service for many years to come.

3. Project Beneficiaries

The primary beneficiaries of this project will be 75,000 customers in villages throughout the Western and Central Highlands and the Eastern Region of Guatemala. A fundamental concern during project negotiation was ensuring that project activities were focused in geographic areas of high target group concentration. The selection of the Western and Central Highlands and Eastern Region as the target areas reflects this concern and parallels the concentration of other AID projects underway.

It is expected that 80% of the residential customers will have average annual family incomes below $400 in 1969 dollars. (See Table on the next page of Average Annual Family Income By Region Where the AID Project will Operate). This is approximately $754 per family in 1976 dollars, or $116 per capita.

Guatemala's rural population in 1970 consisted of approximately 661,000 farm and landless worker families. Of these, 90% were landless workers or small farmers. The poorest members of this group, who are heavily concentrated in the Western Highlands and the Eastern Region of Guatemala, comprise AID's target group. The average size of farms in the Western Highlands area where the largest concentration of target group members live has decreased to 5.3 hectares. Data on education and health status in these areas being developed through sector assessments (currently underway) show that the residents of these departments also

TABLE OF AVERAGE ANNUAL FAMILY INCOME IN RURAL AREAS BY REGION WHERE AID PROJECT OPERATES. YEAR 1970. * (in 1969 Dollars)

REGIONS DECILES	CENTRAL	WESTERN HIGHLANDS	SOUTH EASTERN	VERAPACES
I	170	142	175	189
II	224	193	223	236
III	270	223	269	270
IV	305	257	303	298
V	350	277	349	323
VI	397	319	392	364
VII	468	358	451	410
VIII	535	420	530	477
IX	672	603	655	570
X	1,054	771	1,008	850
Standard deviation	262	184	248	195
Average	444	346	436	399

* Secretary General of the National Economic Planning Council, Agricultural Development Plan 1975-1979, November, 1974.

have lower literacy levels and greater health problems than residents of the rest of the country.

The potential beneficial impact of electrical service on rural incomes and quality of life are described in this Project Paper in Section IV. Of significance is the extent to which the target group is aware of these benefits. A Village Electricity Utilization Survey conducted by the USAID and INDE concluded that a significant demand for electrical services exists within the target group. The relative value and priority placed on the service is clearly reflected in the fact that the target group indicated willingness to pay up to 13% of their average total annual income for electricity (based on non-users surveyed).

An unknown number of secondary benefits will accrue to consumers whose living standards improve due to the availability of electricity. Additional secondary benefits will arise through increased employment created in the target areas by investments which will be induced by the availability of reliable electric power. Other qualitative benefits will arise, such as those made possible because of improved health services and expanded educational programs resulting from the availability of electricity.

Of the 46,000 new connections proposed for towns which have never had electricity, over 8,500 will be in towns of fewer than 500 inhabitants. An additional 17,000 will

be in towns of less than 1,000 inhabitants. Therefore, more than half of all new connections in villages without electricity will be made in villages of 1,000 people or less. In the already electrified villages, more than 6,300 connections will be made in towns of fewer than 1,000 people. Thus a total of 40% of all new connections financed by this project will be made in villages of less than 1,000 people. Almost 100% of the population of villages of this size consist of target group families.

The project involves a substantial redirection of GOG resources towards the target group. As a result of the project, INDE will adopt new operational policies which will eliminate present financial barriers to serving the target group, will hook-up an estimated 75,000 new rural customers, and will develop the financial and operational base for continuing target group family hook-ups after the end of the project.

D. Summary Findings

The Project Committee has reviewed the technical, economic, social and financial aspects of the proposed project. On the basis of this review and the investigations of specialized consultants the Committee recommends that a loan be authorized. The availability of electricity to the target group will complement and reinforce many other developmental projects directed towards these low-income rural families. The Committee believes that all technical and administrative barriers to successful implementation of this project have been addressed.

The project meets all applicable statutory criteria (See Annex D). The Mission Director's 611(e) Certification is included as Annex E. Per State 016547 dated January 25, 1977, paragraph 7 the Mission IEE Recommendation for a Negative Determination has been approved by the Assistant Administrator.

E. Project Issue

A key constraint to the expansion of electric service to AID's target group is INDE's current practice of requiring prepayment by customers of construction costs required to serve a new customer or group of customers. Historically, the front-end, lump-sum contribution has ranged from 30% to almost 100% of the costs of new installations, or $50 to more than $500 per user. This requirement has effectively prevented low income families from obtaining electric service. Accordingly, one of the primary objectives of the loan has been to obtain INDE agreement to eliminate this front-end charge. This condition, which accords with modern utility practice, has been accepted by INDE.

With respect to the cost of electricity, the USAID did not negotiate a specific monthly rate for new customers which will be connected under the project. Obviously the ability of the target group to pay for electric service is a key concern in view of their low incomes. INDE is currently in the process of carrying out a major rate study as a condition to a $55 million World Bank loan to INDE for the Aguacapa Hydro-electric project. Under terms of this loan, INDE must, by June, 1978, establish rates which will generate system-wide earnings adequate to finance a reasonable portion of the sector's new investment requirements as well as return 9% on assets.

This World Bank condition will undoubtedly be included as well in their proposed $65 million loan for the Chixoy Hydro-electric project which is already under construction. Thus INDE could not commit itself to specific rates at this time.

Analysis of INDE's current rate structure indicates that rates for block customers (certain municipalities as well as the electric company serving Guatemala City) and industrial users may be below cost. Rates to direct customers (which include AID's target group), are substantially higher. During project discussions, INDE staff made it clear that large increases for direct customers were not contemplated. (They currently constitute only 9% of total INDE power sales anyway). To develop projected financial and economic returns for the project, high, base, and low assumptions were made for possible rate changes. These financial analyses demonstrate that it will be feasible to establish a rate within this range which will satisfy the IBRD minimum return requirement, be affordable by AID's target group, and provide sufficient cash flow to continue the expansion of the rural electrification program.

A condition precedent to disbursement of the loan has been included which requires AID concurrence with the new rate which will be adopted as required by the World Bank loan. In view of the large stakes involved for INDE with the two hydro-electric projects (total construction cost is $568 million) we do not feel that the AID loan represents a great deal of leverage in setting rates. However, the condition ensures that the project will not go ahead in the absence of an affordable rate for the project's target group.

The criteria by which the Mission will evaluate the rate structure adopted by INDE are:

1. The total charges (electricity, house wiring repayment, public lighting, etc.) for the average low income user are within the target group's ability to pay; and

2. The contribution to construction requirement (front-end charges) is eliminated and if a deposit or prepayment from a customer is required prior to connection, it will not exceed a minimum bill for six months or $15.00, whichever is less.

The current rate structure is highly skewed, as evidenced by the fact that 9% of KWH sales to INDE's direct customers provides 19% of INDE's revenues. The new rates must provide more equitable treatment for the low income customers. Currently, INDE rates for residential and rural customers discriminate against the small user because the highest charge per KWH is in the first block with progressively lower rates in successive blocks. This rate structure also promotes greater but possibly wasteful use of electricity. The Mission's preferred alternative to the present rate schedule is to make the charges in successive blocks the same or higher

than the first block.[1/] This would favor the small user and encourage the conservation of energy.

II. PROJECT BACKGROUND

A. AID Rural Development Strategy

A revised Mission DAP is scheduled for submission to AID/W in the fall of 1977. This timing will permit incorporation of on-going sector assessments in health and education which are scheduled for completion in the near future.

The USAID's current program has been developed in close coordination with the GOG's 1975-79 development plan which emphasizes development of effective government programs for meeting the needs of the rural poor. It has been based on: (1) growing knowledge of the target group and its problems; (2) stated GOG priorities which have coincided with AID-mandate requirements; (3) considerations of other IFI activities, and (4) existence of institutional capacity for implementing programs. The Mission's program objectives and proposed response to target groups constraints as now contemplated are outlined below:

1. Program Objectives

The Mission in defining its rural development program objectives has sought first to identify accurately the target population in economic, social, and geographic terms and, second, to identify the priority needs of this population in terms of those resources, services and basic infrastructure required to improve its own economic and social well-being. The analytical basis for identification of the target group and its priority needs includes the recently completed Tri-Partite (IBRD, IDB and AID) Agricultural Sector Assessment and the soon to be completed Health and Education Sector Assessments. These and prior studies have provided significant knowledge about the rural population of Guatemala.

Guatemala's total rural population in 1970 consisted of approximately 661,000 farm and landless worker families. Of

1/ Rural Electrification Rate Study - Guatemala, March 31, 1977, Sanderson & Porter, Inc., N.Y. p. 5.

these, 596,000 or 90%, were landless workers or small farmers (less than seven hectares) whose annual family incomes averaged $232 or $42 per capita in 1970 dollars. The table on the following page provides a breakdown of the rural population by farm size and income.

Further information on the geographic dispersion of the poorest farm families and landless laborers is also available. As can be seen in the maps of the following pages (poverty and unemployment), although members of each of these sub-groups live throughout rural Guatemala, they are heavily concentrated in the Western Highlands and Eastern Lowlands. Further indication of the concentration of rural poverty in these two areas can be seen in the index of gross value of agricultural production per rural inhabitants by municipality. Of the 166 municipalities in the Highland Departments more than 80% fall below the national average index while only 44% of the municipalities outside the Highland Departments fall below the national average, most of those in the poor Eastern region. Data on education and health developed through sector assessments in those areas show that the residents of these departments have lower literacy levels and greater health problems than residents of the rest of the country.

Based on the Tri-Partite and other studies 1/, the most serious problems and needs of the target group which constrain their potential for increased income and an improved quality of life have been identified as follows:

1/ Some of the more significant are: (a) Guatemala's Economic Development The Role of Agriculture, Fletcher et al; ISU press, 1970; (b) Long-Run Prospects for Increasing Income Levels in Guatemala's Highlands, William C. Merrill, CNPE, Guatemala, Jan. 1974; (c) Evaluation of Prior Assistance - AID Loan 520-L-024, USAID/Guatemala, October 1975; (d) Guatemala National Development Plan, 1975-79, CNPE, Guatemala, June 1970 and May 1975; (e) Agricultural and Rural Development in Guatemala, Tri-Partite Study (General Report, Vols. I & II), June 1976.

a. Limited Farm Size and Land Availability

The 1964 Agricultural Census disclosed that the average farm size in Guatemala was 8.3 hectares or less. Over 75% of the farms were 3.5 hectares or less. In the areas inhabited by the target group, average farm size was far smaller than the national mean. In the nine Western Highland departments, for example, average farm size was 6.2 hectares. Furthermore, since the 1964 census, the mean farm size has decreased as population has increased. There is limited potential for expanding farm area and availability of rental lands is limied. At present, it is estimated that cultivable land per person in the target area is less than one hectare per person.

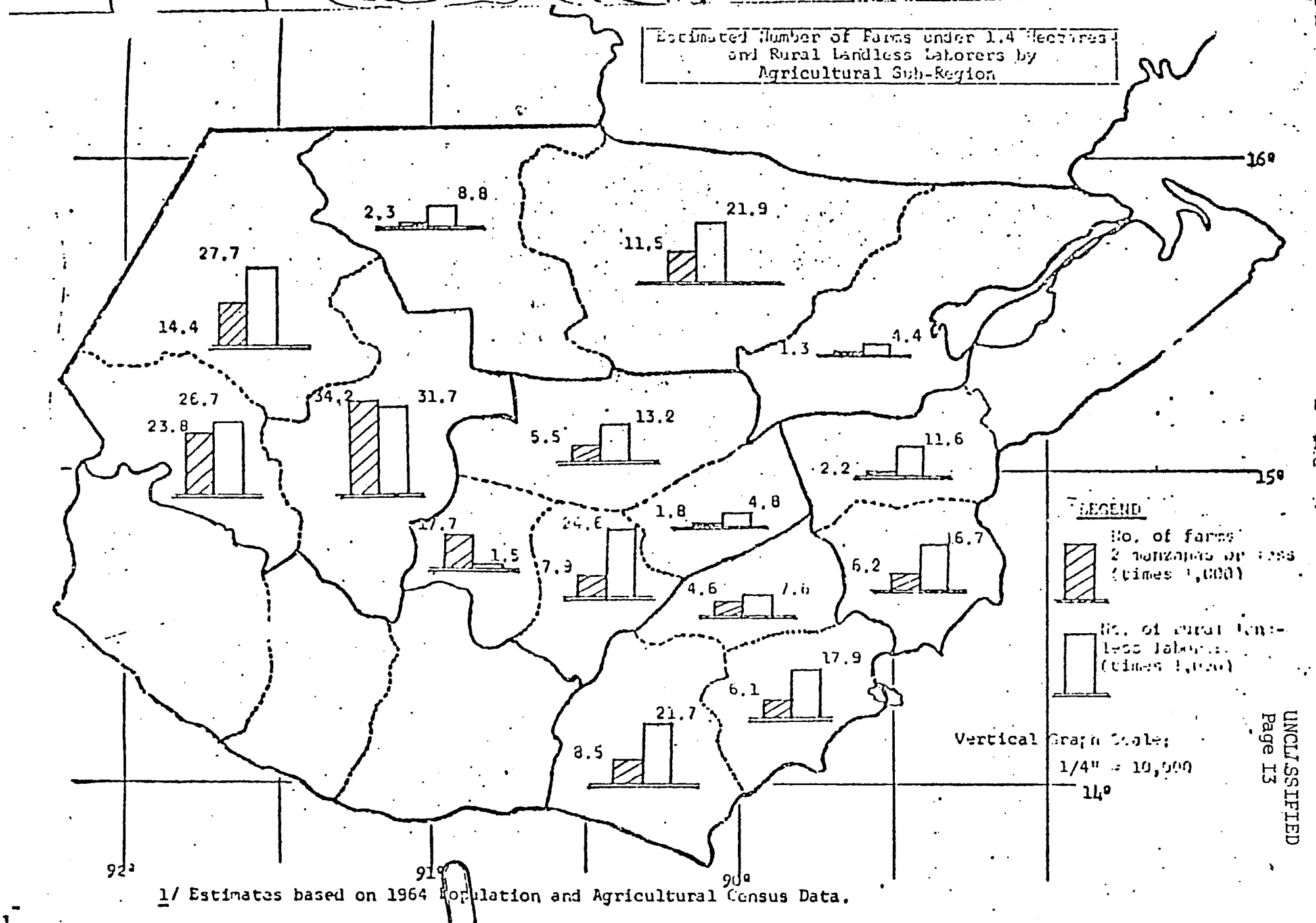
b. Lack of Productive Resources and Services

Compounding the land constraint are the limited availability of resources and services which could stimulate increased farm productivity and incomes in the region. Although since 1970 there have been various GOG efforts (some AID-financed) to address this constraint, coverage is still limited in the following areas:

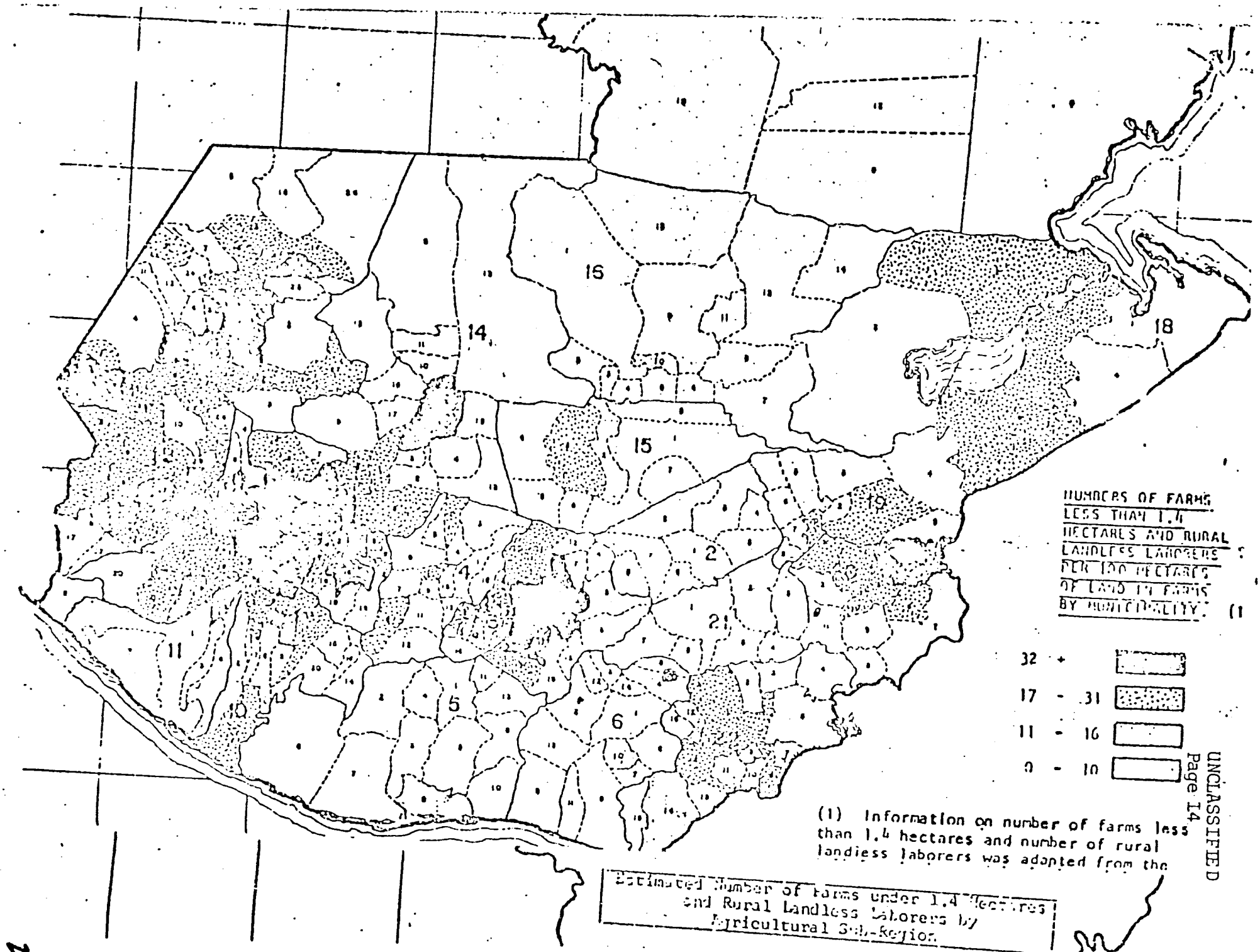
(i) Production credit
(ii) Farm improvement credit
(iii) Improved production inputs
(iv) Improved appropriate farming technologies
(v) Extension services

Population pressures have also brought under cultivation land unsuited for intensive use which contributes to low productivity and severe soil erosion problems. Production of alternative, higher value crops is hampered by lack of knowledge about appropriate technology and inefficient marketing systems for non traditional crops. Moreover,

than 1.4 hectares and number of rural landless laborers was adapted from the



1/ Estimates based on 1964 Population and Agricultural Census Data.


NUMBERS OF FARMS
LESS THAN 1.4
HECTARES AND RURAL
LANDLESS LABORERS
PER 100 HECTARES
OF LAND IN FARMS
BY MUNICIPALITY (1
32 +
17 - 31
11 - 16
0 - 10
(1) Information on number of farms less than 1.4 hectares and number of rural landless laborers was adapted from the
Estimated Number of Farms under 1.4 Hectares and Rural Landless Laborers by Agricultural Sub-Region

ESTIMATED AGRICULTURAL INCOME DISTRIBUTION BY TYPE OF FARM, 1970

Farms & Families	Area (thousands hects.)	No. of Farms & Families (thousnds)	Rural Population (thousands)	Income		Income Distribution	
				Total (Thousands Q)[2]	Per Capita (Q)	Population %	Income %
Landless workers	---	174.9	976	64.3[a]			
Microfarms (under 0.7) Has.	36	98.2	540	3.4	35[b]	83.3	34.8
Small Subfamily Farms (0.7-4.0)	427	277.9	1528	39.6			
Medium Subfamily Farms (4.0-7.0)	235	45.0	248	31.1	125	6.8	10.1
Family Farms (7-35)	568	48.5	267	36.2	136	7.3	11.7
Multifamily Farms (35-350)	896	9.5	52	72 3	1390	1.4	23.5
Large Multifamily Farms (over 350)	1590	2.5	14	53.1	3793	0.4	17.2
Administrators	---	5.4	30	8.2	273	0.3	2.7
Total	3752	661.9	3655	308.2		100.0	100.0

[1]Average family size : 5.5 persons

[2]Corresponds to the domestic product of crops and livestock.

[a]Includes all type of income earnings.

[b]Forestry and fishing salaries excluded.

Source: SIECA-FAO Perspectivas para el Desarrollo y la Integración de la Agricultura Centro América Vol. II, Table C-4, Guatemala, 1974.

NUMBER AND AREA OF FARMS IN GUATEMALA BY SIZE: 1964

Size (hectares)	No. of Farms	%	Total Area (Hectares)	%
0.7	85.083	20.4	32.678	0.9
0.7-1.4	98.658	23.6	95.427	2.8
1.4-3.5	129.115	30.9	270.692	7.8
3.5-7.0	52.023	12.5	242.832	7.1
7.2-22.4	37.025	8.9	446.563	13.0
22.4-44.8	6.631	1.6	203.508	5.9
45-450	7.859	1.9	915.078	26.5
450-900	561		345.739	10.0
900-2.250	294	0.2	387.093	11.2
2.250-4.500	56		169.747	4.9
4.500-9.000	30		178.448	5.2
9.000-and above	9		160.927	4.7
	417.344	100.	3.448.736 Has.	100.0

Source: Second Agricultural Census. 1964, Volume IV

PROJECTED FARM SIZE IN WESTERN HIGHLANDS 1970 - 2000

MEDIUM PROJECTIONS

	NINE HIGHLAND DEPARTMENTS		
	Number of Farms(1000) 1/	Average Farm Size (ha.) 2/	Farm Land per Person in Rural Population (ha./person) 3/
CENSUS			
1950	203	8.1	1.35
1964	256	6.2	1.03
PROJECTIONS			
1970	279	5.6	0.92
1975	298	5.3	0.86
1980	317	5.0	0.81
1990	355	4.5	0.70
2000	392	4.0	0.61

Notes:

1/ Projected number of farms based on the average annual increase in the number of farms between 1950 and 1964.

2/ Projections based on the assumption that total land in farms remains equal to the 1964 value of 1,581,600 hectares.

3/ Projections based on the assumptions that population will increase at the 1950-1964 rates, and total land area in farms remains constant at 1,581,600 hectares. Highland departments are: Chimaltenango, Sololá, Totonicapán, Quezaltenango, San Marcos, Huehuetenango, Quiché, Baja Verapaz, and Alta Verapaz.

POTENTIAL FOR EXPANDING FARM AREA IN HIGHLAND DEPARTMENTS

DEPARTMENT	LAND AREA IN FARMS 1964 (%)	POTENTIAL ARABLE LAND (%)	ESTIMATED ARABLE LAND NOT IN FARMS 1964 (ha.)	1974 (ha.)
Chimaltenango	60	65	9,895	--
Sololá	36	41	5,305	1,657
Totonicapán	35	46	11,671	5,895
Quezaltenango	65	67	3,902	--
San Marcos	53	49	--	--
Huehuetenango	34	37	22,200	--
Quiché	29	36	58,646	8,336
Baja Verapaz	43	46	9,372	--
Alta Verapaz	50	59	78,174	8,676
HIGHLAND SUB-TOTAL	42	47	199,165	24,564
Percent of Total Area in Highland Departments:			5	0.7
Location of Arable Land Not Farmed:				
a. Percent in Highlands			32	33
b. Percent on Pacific Coast Slopes			4	2
c. Percent in Tropical Areas			64	65

small farmers generally have no alternative to selling their crops at harvest due to lack of proper storage facilities and the need for immediate income.

c. Limited Off-Farm Employment Opportunities

For those target group members who have no land of their own, or small farmers whose actual and potential income limits them to a subsistence level existence, attaining a better standard of living depends on full, or at least part-time, off-farm employment. The Tri-Partite Study found that there is sufficient agricultural land in the Western and Central Highlands to provide employment for 256,000 persons out of a labor force of 556,000. 1/ The remaining 300,000 persons need full, part-time or seasonal employment to attain even a minimal standard of living for their families. For most of these persons, opportunities at present are limited to seasonal jobs of from 1-4 months on farms in the Pacific Coastal Plain. Additional family income is often provided through the sale of artisanal products made in the home. Perhaps 50,000 people are employed at least part-time in such crafts. While existing agro-industries offer some full-time employment (estimated at 14,000 jobs in 1971), they are largely located outside the target group area and process products of the modern sector (sugar, beef, cotton, etc.).

The GOG has placed increasing emphasis on expanding off-farm employment in the target group area. In view of the constraints to increasing income from agriculture discussed previously, the importance of expanding rural, off-farm employment opportunities is clearly evident.

1/ These figures are based on 1964 data. The target group size would seem to indicate a much larger labor force at present -- perhaps on the order of 800,000/900,000 persons, including the target group in the Eastern Region.

d. Lack of Basic Infrastructure

The quality of life in the target areas is significantly affected by the lack of basic infrastructure. Historically, the flow of public investment in both economic and social infrastructure has favored the urban areas. Thus, in the rural areas, such basic requirements as access roads, power, water (for drinking and irrigation) and improved education and health facilities, fall far short of the needs. Considerable public investment is needed to provide minimum levels of services to the rural areas. Past governmental neglect of rural areas has left a legacy of unmet needs, and despite attempts in recent years by the public sector to address these deficiencies, the vast majority of the target group is inadequately served. The situation is aggravated by inadequate budgets, inefficient and overcentralized administration, poor coordination at the national and local levels in the public sector, and inadequate planning. Much of the stock of physical infrastructure in the zones affected by the February 4, 1976, earthquake was damaged or destroyed, further aggravating the lack of services to target group members in these areas.

e. Educational Opportunity

The high rate of illiteracy, especially among the Indian population, is a result of lack of access to the formal education system due to a variety of factors: non-existence of physical educational infrastructure, language impediments (classes are taught only in Spanish), overcrowding, inappropriate curriculum, and economic need for services of children on the farm. Until recently, non-formal educational programs were operated only by private groups with most concentrating on literacy programs for adults.

f. Health Conditions

The almost complete lack of public health infrastructure in rural areas has resulted in high infant

mortality indices, low average life spans, and high incidence of illness arising from easily preventable diseases. Lack of potable water and sanitary facilities, plus poor nutritional practices, are the key factors bearing on the general health levels of the rural population.

g. Population Growth

Guatemala's population is increasing at about 2.9% annually, which means that total population will double in less than 25 years. Although the country has extensive unused land resources, the population is concentrated in certain areas, particularly in the Highlands. The result is intense pressure on land resources which has caused significant drops in average farm size over the past 30 years. The growing population has also meant that provision of government services, such as schools, health facilities, and out-reach programs of the public agriculture sector, becomes increasingly difficult especially when provision of such services was inadequate under any circumstances.

2. USAID Response

To address the constraints noted above, the USAID has developed and is pursuing a coordinated grant and loan rural development program designed to improve the income and general well-being of the target group as follows:

a. Farm Size and Land Availability

With relatively large areas of the country still unsettled, one alternative for alleviating some of the pressure on land in the populated areas of the country is the development of an effective colonization program. Past GOG efforts to resettle the landless have met with little success due to a heavily paternalistic approach and due to budgetary limitations. To address these problems, the USAID funded a pilot colonization program under Loan 026 (authorized FY 1976) whereby 5,000 families from the Highlands will be

resettled in the Northern Transversal Strip. A key objective of this project is to demonstrate an alternative approach to colonization, using cooperatives as the vehicle for organizing and selecting participating families and for channelling necessary inputs. Government control is minimized, and because self-help activities are encouraged, heavy GOG investment in infrastructure is not required. The loan is also financing land use and cadastral studies for the remaining area of the Northern Transversal Strip so that colonization can continue after the initial pilot program is underway.

In terms of dealing with the land constraint in the target group area itself, the USAID is exploring a possible FY 1979 project which would be designed to facilitate the transfer of farm property to the poor. While experience is limited to date, three PVO project which are financing the sale of fairly large farms to groups of campesinos have demonstrated the strong interest on the part of the rural poor in obtaining land and their willingness to repay mortgages. Expropriation and redistribution of large land holdings does not appear to be politically feasible.

b. Farm Productivity

The constraints bearing on small farm productivity have received much attention from the USAID and other international donors. Approximately $12 million from Loan 018 (authorized in 1970 and fully disbursed in 1976) was allocated for small farmer credit. Of this amount, $2 million was channeled through cooperatives with the remainder being lent directly by BANDESA, the GOG's agricultural credit bank. An additional $4.5 million was made available to the cooperatives for credit under Loan 024, now fully disbursed. In 1976, the IDB lent $25 million to the GOG for small and medium farmer credit through BANDESA, and the IBRD is considering a loan for $10 million in 1978 for the same purpose.

Loan 018 also financed the expansion of the GOG's ag extension capability, with the number of extensionists increasing from about 90 in 1970 to 450 in 1975. Agricultural research is being supported through an AID grant to ICTA (the GOG's research institute), which also received funds under Loan 018 for equipment. The Rockefeller Foundation is providing two technicians to complement those contracted under the USAID grant, and the IDB has made a grant to ICTA for seed multiplication facilities. The USAID financed research is concentrating on basic grains (corn and beans) with emphasis on adapting high-lysine corn varieties to highland conditions. As part of its FY 1979 ABS, the USAID included a PID for a project to develop an applied research, extension and intermediate credit program for farm diversification in the Western Highlands which will concentrate on increased production of temperate climate vegetables and fruits and small farm animals.

To improve the existing land base, funds from Loan 026 will finance pilot programs in small-scale irrigation and improved soil and water conservation practices. This activity complements a reforestation project being developed by the Canadian International Development Agency (CIDA), and will form the basis for a possible USAID loan for erosion control on small farms in 1980.

A nationwide system of public storage facilities for basic grains was financed through a CABEI loan (using IDB funds), and USAID Loan 018 provided financing for private grain storage facilities.

Finally, to develop alternate marketing channels for fruits and vegetables which will return higher prices to small farmer producers, the USAID prepared and submitted to AID/W a loan and grant PP for FY 1977 authorization which will finance a cooperative-owned marketing facility for these products.

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c. Employment Opportunities

As one alternative for increasing off-farm employment opportunities in rural areas, the USAID is developing a combined grant and loan project for FY 1978 funding which will provide credit, technical assistance and training for small rural enterprises. Small businesses eligible for assistance under the loan will include those involved in processing of locally available raw materials, provision of supplies and services for the surrounding farm population and small-scale cottage industry and handicrafts production. The IDB has authorized a loan to CORFINA for $7 million for larger rural industries.

The increased USAID emphasis on assisting farmers to switch into more labor intensive, higher value crops is also expected to have significant impact on increasing on-farm employment opportunities for landless laborers.

USAID Loan 026 is also assisting the GOG in a pilot effort in labor-intensive construction of minimum standard, all-weather roads in areas with the highest un- and under-employment.

d. Rural Infrastructure and Government Services

The USAID has provided assistance for construction of small infrastructure projects in rural areas through Loan 017 ($2.1 million which is fully disbursed) to the GOG's Municipal Development Institute (INFOM). The loan financed the construction of water and sewer systems, market places and slaughter houses in the cabeceras municipales (equivalent to a small U.S. county seat). Following the February, 1976, earthquake, the USAID authorized a loan to the GOG for reconstruction activities in the earthquake devasted area (Municipal Earthquake Recovery Loan 027 - $8.0 million) which is administered by INFOM for the 100 plus

municipalities destroyed or severely damaged by the earthquake. Funds are included in the loan for improving INFOM planning and management capacity, as well as the administrative and financial capacity of the participating municipalities. It is contemplated that the experience gained by INFOM in implementing this loan will enable it to undertake an integrated rural infrastructure development program financed by a projected FY 1979 USAID loan. To support development of this loan, USAID is preparing an FY 1978 area studies grant project to assist the GOG in the design of an analytical framework for rationalizing rural investments made by INFOM and other government agencies. Based on projected agricultural productivity and population data for rural towns and villages, and an inventory of the existing economic and social infrastructure base, rural investment requirements and optimal locations for future investments can be derived. This will serve as a basis for coordinating GOG and other donor investments. At this time major infrastructure investments are being financed by IDB and IBRD in primary and secondary highway construction, water and sewerage systems for larger towns, and large scale power generation and transmission systems.

A related objective (apart from impact on the target group) of the projects already financed, or projected for financing by the USAID, has been the strengthening of public sector agencies to facilitate follow-through once AID financing is disbursed. To accomplish this, conditions have been included requiring increased personnel and budget, and technicians have been provided to assist implementing agencies when new programs are being introduced. The USAID has also financed training costs for GOG personnel to attend courses developed by AID in project management and public administration. Technical assistance is also being financed for a new GOG office charged with monitoring internationally financed projects. Project control systems are being established by this office within implementing agencies. Finally, a major effort is being undertaken with Loan 026 funding to up-grade in-service training capabilities within the Ministry.

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of Agriculture (both in administrative and technical skills), and to create an effective sector planning capability within the Ministry.

e. Educational Opportunity

The USAID is currently providing assistance for both formal and non-formal education programs. A recent loan (025 for $7 million) will extend qualitative improvements and teacher training programs throughout the rural primary education system. These improvements were developed under an earlier AID loan and grant. Construction of rural primary schools is included as well. A recently approved loan (029) will finance reconstruction of primary schools damaged or destroyed in the earthquake of February, 1976. In FY 1975, the USAID signed a grant to provide technical assistance to a new GOG non-formal education agency. UNICEF and UNDP are also providing technical assistance and commodities. The program is based on AID's regionally funded Basic Village Education project which was implemented in Guatemala and which sought to test a number of communication approaches to supplying relevant information to rural adults. A combination of radio and audio-visual techniques are being utilized along with local monitors. Information basically deals with agricultural matters and is developed from baseline data collected through surveys of the target group. A second stage of the program will be providing primary level educational inputs to children and adults not reached by the formal system. The USAID is submitting a PID for a proposed FY 1979 grant to assist the Ministry of Education in developing an experimental bilingual education program.

f. Health Conditions

As is true with many developing countries, Guatemala's health system heavily emphasizes curative services, with the great majority of doctors being concentrated in the capital. In an effort to extend the outreach of the

public health system, as well as address many of the conditions which cause a high percentage of illnesses and deaths (mainly gastro-intestinal disorders and communicable diseases), the USAID financed (with two loans, 020 and 021) the initiation of a paramedic program within the Ministry of Health. Under this program, candidates from rural areas receive two years of training as Rural Health Technicians (TSR's), and are then assigned to rural health posts and health centers. While they practice limited forms of curative medicine, the TSR's are expected to concentrate on mobilizing community support for preventive health measures such as proper sanitary procedures, safe disposal of garbage, and ensuring safe drinking water sources. In order to give impetus to this key aspect of TSR activities, the USAID will develop a PP for a loan in FY 1978 which will provide financing for these village projects. The loan will also provide assistance for up-grading the Ministry of Health's administrative capacity. A current grant is financing a program for creating a capability within the Ministry for evaluating the impact of rural health programs in order to provide feedback for planning and program management.

g. Population Growth

Since 1968 the USAID has been supporting family planning activities in Guatemala. Until the end of CY 1976, the program worked with the Ministry of Health as well as with a private family planning organization (APROFAM). Because of disappointing results with the public sector program, stemming in large measure from lack of top-level policy support, the USAID withdrew assistance from the Ministry's program and concentrated, instead, on expanding APROFAM's activities to rural areas. (APROFAM's program had been concentrated in Guatemala City.) APROFAM is now responsible for supplying contraceptives to Ministry of Health facilities in rural areas (with the Ministry's authorization), and is conducting promotional programs through radio and printed materials. Family planning instruction is also being

conducted through local campesino leagues, cooperatives, and community based distribution programs.

B. Role of Rural Electrification in the USAID Program

The goal of USAID rural development programs is to increase the income and quality of life of rural families. Programs being carried out by the GOG, the USAID and other donors, as described above, have been designed to achieve these ends. Of necessity, many of these are innovative programs which during their initial implementation periods will affect relatively limited numbers of people. Fullest achievement of their potential for modernizing the rural sector will be dependent in many instances on the availability of electric power. It is difficult to see how broad scale development of rural areas will occur over time in the absence of this basic resource.

Present GOG policies seriously limit the expansion of electric power service to AID's target group with the result that only a small percentage are currently being served. Even so, the USAID is not asserting that lack of electric power in rural areas is a major constraint at this time to increasing incomes (although levels of well being would certainly be improved); the justification for the program essentially lies in providing a very basic element of rural infrastructure at a favorable cost which will complement and reinforce many developmental efforts directed toward the target group. In so doing, ultimate effectiveness of these programs will be enhanced, thereby improving prospects for significant levels of goal achievement.

The anticipated links between ongoing and planned programs and the availability of electric power are described below:

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1. Agricultural Diversification

A major USAID program objective is to improve the incomes of poor rural families with limited land holdings by diversifying their production from basic grains to higher value crops, including small animals. In addition to the development and extension of agronomic technology, intermediate credit for increased production inputs, and training of farmeres, a number of ancillary constraints are being addressed. Among these are: (a) the need for irrigation to maximize production possibilities from fruits and vegetables: (b) the need to organize more sophisticated marketing channels including product storage capacity for perishable products; and (c) the need to control the environment necessary for the survival of small farm animals and the storage of animal products.

Much of the infrastructure required to support a continued expansion of the agricultural diversification program depends on the availability of affordable electric power. For example:

a. Irrigation

Under Loan 520-T-026, the USAID is financing a pilot program to develop small scale irrigation systems on some 5,000 hectares in the Western and Eastern Highlands. While it is anticipated that the majority of the systems which would be financed under the loan will be gravity fed, there are a number of irrigation sites where such systems are not feasible and where pumping would be required. The initial purchase price and operating and maintenance costs for electric pumps are considerably lower than for diesel or gasoline operated pumps, which make them an attractive and affordable alternative for expanding the amount of small farmer land area under irrigation. Thus, the rural electrification project would directly complement the implementation and replication of the on-going small scale

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irrigation project by : (1) allowing greater latitude in selecting sites for irrigated crop production; and (2) improving the returns for farmers where only pump irrigation is feasible.

b. Small Farm Animals

On-going and planned AID, IBRD, and IDB programs are funding credit and services to small farmers through the cooperative movement. At present most of this assistance is directed towards increased crop production. However, some local level cooperatives are beginning to sponsor and finance diversified activities such as poultry and livestock production. 1/

The proposed USAID FY 1979 project for agricultural diversification will further this initiative by improving technology and providing intermediate term credit for small farm animal production. The extension of rural electrification will contribute directly to this effort by enabling small farmers to store vaccines and other medicines under refrigeration, improve poultry production by using modern incubation procedures, and facilitate temporary retention of milk and other animal products.

c. Produce Storage and Processing

The planned FY 77 Small Farmer Marketing Loan will finance a system of storage facilities for fruits and vegetables through small farmer cooperatives. These facilities will need electric power for cold storage and efficient grading, sorting and weighing operations. Over time, additional operations, such as drying, slicing, blanching, crushing and juicing may be added to these cooperatively run ventures. Expansion of the rural electrification system will facilitate the establishment of these and other produce storage and processing facilities in the target group area.

1/ Tripartite Study, p. 43.

2. Increased Employment Opportunities in Rural Areas

As described in the previous section, a major focus of the USAID strategy is to assist in creating conditions which will foster increased employment opportunities in the rural areas. The planned FY 1978 Rural Enterprises Loan is expected to provide financing for some 6,000 artisans, 700 small agro-industrial enterprises and 1,300 other businesses providing services to the rural population. This financing is expected to create directly 3,000 full time jobs for target group members. The multiplier effect is expected to generate at least as many additional jobs. Moreover, it is anticipated that IDB financed lines of credit for larger scale agro-industry in CORFINA and BANDESA will provide substantial additional new employment in the rural areas.

The Rural Electrification Loan will directly complement these programs by: (1) facilitating the establishment in the target area of new enterprises which require electric power for efficient production; and (2) permitting increases in efficiency of existing enterprises. Increases in efficiency will permit these rural enterprises to maintain or increase their competitiveness and increase their sales and employment over time.

3. Quality of Life

An important aspect of improved quality of life is the availability of an assured source of water for human consumption and other essential uses. Current and planned USAID programs for small town development provide for financing, through INFOM, of water systems for residential, commercial and industrial uses.

Most of the existing water systems in the target area are gravity-fed. However, terrain considerations limit the

number of unserved populations which will be able to use this type of water system in the future. A number of towns are now using, or are planning to install, diesel or electric pumps for their water supply systems. To date, INFOM has financed 59 water systems which utilize pumps, 42 of which are electric. Due to their lower initial cost, operating efficiency, reliability, and lower maintenance costs, electric pumps are the most efficient, cost/effective way of providing water where pumping is necessary. Expansion of rural electrification distribution systems will allow the conversion of existing diesel pumps to electric service and the installation of additional electric powered water systems in towns which are not presently served.

C. The Power Sector - INDE Past and Future Investments.

1. Generation and Transmission

While INDE's present installed generating capacity is still higher than demand, there is little excess capacity for accomodating further demand increases at this time. Thus significant expansion in generating capacity is planned to accomodate the steady growth in demand arising from overall economic development.

Prior to 1973, when generation costs per KWH of thermal units were comparable to the cost of hydroelectric generation, surges in demand could be easily met by the installation of additional thermal generators -- a process which required little advance planning. While this solution is still technically feasible, the rapid rise in oil prices over the last few years has not made it economically feasible. The rapid increase in demand coupled with rapidly rising costs from its existing facilities caused INDE to look for alternative generation solutions. A key step in the process was the preparation of a Master Plan for power generation which was financed by the West German Government in 1975. Related feasibility studies for major hydroelectric generating facilities were completed, and loans were approved by the IBRD, IDB and other sources to finance the most viable generation projects -- Aguacapa and Chixoy. These facilities are expected to come on stream between 1979 and 1982 and provide sufficient generation capacity until the early 1990's.

2. Planned Generation Projects

a. Aguacapa Hydroelectric Complex

This project involves construction of a three stage hydroelectric plant and connection to the

national grid at a total cost of $100 million. The World Bank has approved a $55 million loan for the project. The loan agreement has been signed and is in the process of being ratified by the GOG. A construction firm has been selected to build the dam and work is underway. Additional financing for the project was authorized and approved by CABEI ($2.2 million) and the Venezuelan Investment Fund ($30.0 million) which is administered by the IDB. The project will increase the interconnected system's 1/ generating capacity by 90 MW by 1979, an increase of 25% over its 1977 capacity of 362 MW. (See Table in Section IV. A. Technical Analysis.)

b. Chixoy Hydroelectric Project

Feasibility studies for this 300 MW generating plant and related transmission lines have been completed and the World Bank has programmed a $65 million loan in Cy 1978 for this $350 million project. Additional financing has already been authorized by the IDB ($105 million including $35 million from the Venezuelan Trust Fund).

The project consists of the construction of a rockfill dam on the Chixoy River, a spillway, and a power tunnel approximately 16 miles in length; a powerhouse at Quixal with 300 MW generating capacity, and a 230 KV transmission line approximately 75 miles in length from the power plant to the grid load center near Guatemala City. The tunnel and spillway are already under construction by Italian and German companies. The project is projected to be completed in 1982, and will increase the interconnected system's generating capacity by an additional 66% over the planned 1979 level.

In summary INDE expects to invest $568 million in generation and transmission during the 1977-1982 period.

1/ The interconnected system includes INDE, Empressa Electric (which serves Guatemala City and environs) and several municipally owned generating plants.

Significant additional investment in generation and transmission will not be needed until the 1990's.

3. Rural Electrification

INDE's approach to rural electrification in the past was to extend subtransmission and distribution lines to larger towns and villages. Because many of these were already partially served by diesel generators minimal investment in local distribution systems was needed. For newly electrified towns INFOM funds were used to pay the high contribution to construction costs for the required distribution system. The rural system until now has largely bypassed the smaller villages, because they were either too poor to pay the front-end charge and too small for INFOM to make funds available to cover the construction costs, or they were simply too far from existing subtransmission lines to make it cost effective for INDE to serve them. Currently INDE serves directly some 70,000 customers in 462 cities, villages and towns (see tables on following pages). However, these customers amount to less than 10% of the country's total rural population.

The subtransmission and distribution lines that serve these customers were largely built under the previous AID financed rural electrification program. Under this loan, INDE constructed 479.4 kms of 69 KV and 34.5 KV subtransmission lines and built 405 kms of 13.2 KV and 7.6 KV distribution lines for connections in 34 Highland communities, benefiting approximately 35,000 customers. Ten substations and two warehouses were also constructed. These lines and related substations were located in the Western and Central Highland Departments of San Marcos, Huehuetenango, Quiché, Baja Verapaz and Alta Verapaz. Reliable, full-time power in many cases replaced the old diesel systems which were typically run only a few hours per day in these areas. The $7 million loan was fully disbursed on September 30, 1976. INDE has invested approximately $2.4 million in additional funds (over its $4 million loan counterpart funding) to

construct transmission lines, substations, and distribution networks in the Eastern Region, thereby laying the foundation for further expansion in this area.

Under AID Loan 520-W-027, Municipal Earthquake Reconstruction, approximately $900,000 of loan funds have been allocated for repair of earthquake damaged distribution systems in the Department of Chimaltenango. This area had previously been served by a privately owned company which was bought out by the GOG after the earthquake. Under this project, INDE will construct approximately 130 kilometers of subtransmission and distribution lines with its own funds, while INFOM (the Municipal Development Bank and Implementing Agency under Loan 027) will fund the cost of repair and reconstruction of the existing system.

The proposed project builds on previous and on-going efforts. Subtransmission and distribution lines built under previous AID supported efforts will be the physical base from which the new distribution system expansion will be built and the new hook-ups made under the proposed project.

Due to the anticipated increase in generataion capacity which now makes it feasible and desirable to seek additional customers, INDE now places a higher priority on its rural electrification program. However, the massive new investments in generating and transmission capacity will absorb the bulk of INDE's financial resources until 1982 and will leave few resources for investing in an expanded rural electrification program. The AID loan and GOG counterpart contribution will make this expansion possible thereby serving villages which otherwise would not receive electricity for many years.

TABLE OF SALES AND GROWTH DATA BY CLASS OF CONSUMERS RURAL AREAS
(INDE Direct Customers)

	1972	1973	1974	1975	1976	% Increase 1972-1976
1. Total Sales (in GWH)						
- Residential	10.3	12.8	16.1	20.2	23.9	132
- Commercial	7.6	9.4	10.7	12.3	14.2	87
- Industrial (a)	6.1	6.5	10.0	11.7	29.2	379
- Government	1.7	2.4	3.2	4.4	5.7	235
- Municipal	.8	1.0	1.2	1.0	1.7	113
- Public Lighting	4.4	4.0	5.3	4.8	6.3 (b)	43 (b)
T O T A L	30.0	37.0	46.5	55.0	81.0 (c)	162 (c)
2. Number of Customers (as of 12/31, year indicated)						
- Residential	31,135	38,134	44,960	50,061	58,832	89
- Commercial	5,003	5,420	5,973	6,277	7,019	40
- Industrial (a)	186	196	235	236	289	55
- Government	413	431	525	608	717	74
- Municipal	512	544	638	696	732	43
- Public Lighting	213	265	351	190 (b)	203 (b)	-5 (b)
T O T A L	37,462	44,990	52,682	58,068 (c)	67,792 (c)	81 (c)
3. Average KWH/Customers						
- Residential	336	337	357	404	407	31
- Commercial	1,512	1,734	1,789	1,962	2,016	33
- Industrial (a)	33,120	32,966	42,525	49,500	100,884	205
- Government	4,188	5,658	6,103	7,254	7,881	88
- Municipal	1,524	1,832	1,942	2,353	2,270	49
- Public Lighting	20,448	18,382	15,154	25,148 (b)	31,192 (b)	53 (b)
O V E R A L L	828	828	883	948 (c)	1,195 (c)	44 (c)
4. Number of Cities, Towns and Villages Served	273	320	379	416	462	69

(a) Cementos Novella, S.A., the biggest industrial customer of INDE, consumes approximately 25% of all of INDE's direct sales and is excluded to avoid distortion of these general sales data.

(b) Apparent error in number of customers and average KWH/Customer.

(c) Slight error introduced by error explained in Note (b) above.

TABLE OF SALES AND GROWTH DATA BY REGION
RURAL AREAS (INDE Direct Customers)

	1972	1973	1974	1975	1976	% Increase - 1973 to Latest Year
1. Total Sales (GWH)						
Western (a)	21.0	23.1	28.1	33.3		44.2
Eastern (b)	10.0	13.2	17.0	19.0		43.9
North Central (c)(e)	-	0.2	0.7	1.1		450.0
Atlantic (d)	-	0.4	0.7	1.6		300.0
T O T A L	31.0	37.3	46.5	55.0		47.5
2. Number of Customers (as of 12/31, year indicated)						
Western (a)	19,737	23,175	26,572	28,906	34,720	47.0
Eastern (b)	17,725	20,414	23,185	24,799	26,061	27.7
North Central (c)(e)	-	748	1,843	2,326	4,479	498.8
Atlantic (d)	-	653	1,082	2,037	2,532	287.7
T O T A L	37,462	44,990	52,682	58,068	67,792	50.7
3. Average KWH/Customer						
Western	1,068	996	1,056	1,152		15.7
Eastern	564	648	732	768		18.5
North Central	-	324	408	463		42.9
Atlantic	-	672	684	780		16.1
OVERALL	828	829	883	948		14.4
4. Number of Towns and Villages Served (f)						
Western	101	116	140	160	187	61.2
Eastern	172	188	215	227	234	24.5
North Central	-	9	16	20	31	244.4
Atlantic	-	7	8	9	10	42.9
T O T A L	273	320	379	416	462	44.4

NOTE: These are INDE Operating Regions and do not coincide with geographic areas of AID concentration defined under this project.

(a) The WESTERN SYSTEM includes all of the Departments of Sololá, Totonicapán, Quezaltenango, Suchitepéquez, Retalhuleu, San Marcos, Chimaltenango and two towns in Escuintla.

(b) The EASTERN SYSTEM includes all of the Departments of El Progreso, Santa Rosa, Zacapa, Chiquimula, Jalapa, Jutiapa and two towns in Escuintla.

(c) The NORTH CENTRAL SYSTEM includes the Departments of Huehuetenango, El Quiché, Baja Verapaz and Alta Verapaz.

(d) The ATLANTIC SYSTEM includes the Coastal Department of Izabal. For 1976 the newly served small town, Melchor de Mencos (the only town in Petén served by INDE) is also shown as part of the Atlantic System.

(e) The NORTH CENTRAL SYSTEM defined above together with the Department of San Marcos of the WESTERN SYSTEM made up the original six Department Altiplano area of the first AID financed rural electrification project.

(f) Ranges in number of customers served from a low of 3 to a high of 2814. The average is 147/City, town or village served.

III. PROJECT DESCRIPTION

A. Introduction

The proposed project is designed to contribute to AID's ultimate program objectives, i.e., increased incomes and improved quality of life for Guatemala's rural poor, by providing the target group with access to electricity. This service heretofore either has not been available or, if available, was provided at a cost which effectively precluded their participation. The potential beneficial impact of electrical service on rural incomes and quality of life are described in other sections of this paper. It is important to note the extent to which the target group is aware of these benefits. The INDE-AID Village Electricity Utilization Survey described a significant demand for electrical services on the part of the target group. The relative value and priority they place on the service is also clearly reflected in the fact that they are willing to pay up to 13% of their average total annual income for electricity (based on non-users surveyed). The project thus provides AID with the opportunity to assist the GOG in providing a basic public service to the target group, a service which they themselves perceive as a high priority need.

The project has been designed around two fundamental concerns related to targeting: first, that the expansion of the subtransmission/distribution systems be in areas of high target group concentration; and secondly, that the rate structure be within the limits of the target group's ability to pay. Both of these conditions are essential to assure that the maximum possible project benefits flow to the target group.

The first concern, that of geographic area, is addressed in the context of both those participating villages already

partially electrified and those without electricity. Because of the existing rate structure -- i.e. the front-end charge -- the vast majority of hook-ups in partially electrified villages are now commercial/industrial and the better-off residential users, who were able to afford the high front-end charge. Thus, the unmet demand in these villages is almost entirely the poorer households. The project investment in distribution lines in these electrified villages will therefore primarily benefit the poorer households. Those villages to be newly electrified under the program are smaller and poorer than the villages already electrified, which is the primary reason they have not had access to electricity in the past.

The second major concern, the rate structure, is addressed through a significant change in INDE's existing tariff schedule. INDE has agreed to discontinue the requirement for a cash contribution and instead establish nation-wide rates which generate sufficient earnings to finance continued system expansion. The rate structure will be determined when a rate study required by the IBRD has been completed. The financial analysis carried out for this project demonstrates that it is possible to establish such a rate within the limits of the target group's capacity and willingness to pay. Based on these efforts in targeting, it is anticipated that 80% of the new customers will be target group families and an additional 5% will be commercial users.

In developing the project, the Mission dealt with one other major issue, i.e., replicability. The feasibility of continuing the process of rural electrification begun under the project at an acceptable rate is dependent on both the cost per beneficiary and a source of post project financing. The rural electrification project, because it builds on the heavy infrastructure investments in generation and transmission already in place or programmed by other

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donors (i.e., IBRD and IDB), is able to extend electrical service to a large number of target group consumers at a relatively low incremental cost. The average total incremental investment (including T.A. and training) per customer under the AID project is only $243 per household, or approximately $37 per capita. The subtransmission and distribution systems to be financed under this project are thus analogous to AID financed feeder road systems which begin at the point where the higher cost primary and secondary road system ends.

With respect to a continued source of financing for the rural electrification program, the projected cash flow for the project demonstrates that sufficient funds will be generated to cover the cost of future investment requirements. Thus, after the project period the rural electrification program will be on a self-financing basis.

B. Goal

This project supports the overall rural development sector goal of improving the quality life of rural Guatemalans by increasing small farmer incomes and increasing employment in the rural areas. The project will complement AID and other donor financed activities aimed at assisting small farmers and landless laborers in Guatemala. Goal achievement will be verified by the fact that average incomes of users increase more rapidly than the incomes of non-users.

C. Purpose

The purpose of the project is to increase the number of electric connections in low-income rural areas and improve INDE's capacity for continuing the extension of local power services to additional low-income rural

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areas. Achievement of the project purpose will be measured by the connection of 75,000 users in low income areas to INDE's distribution system by 1982 and a plan for financing the connection of at least 10,000 additional low income users in each year thereafter.

The project area is defined by the departmental boundaries of the seven Highland Departments of Totonicapan, El Quiché, Huehuetenango, Sololá, Chimaltenango, Alta Verapaz, and Baja Verapaz, and the natural boundaries formed by the mountain range cutting across the Highland Departments of San Marcos and Quezaltenango. The project area in these two Departments is determined by altitude; the project area will be 5,000 feet and above. Below that elevation are large coffee plantations which clearly do not include the target group. In the Eastern Region the project will operate in all the Departments of Jutiapa, Jalapa, El Progreso, Chiquimula, and Santa Rosa. In the Department of Zacapa, only the area south of the Montagua River Valley will be included in the project.

Reliable, affordable electric power will enable the low-income rural families of AID's target group to improve their incomes and living standards by making productive use of electricity in the home, on the farm and in small enterprises and workshops. Target group families will benefit from improved living conditions and a reduction of household drudgery (with the addition of small appliances, such as irons). In addition, rural enterprises and other industry will be attracted to the project area, thereby generating additional employment for low-income families.

D. Project Outputs

The loan and GOG counterpart will finance the following activities:

1. Rural Electric Distribution Systems

a. New Connections

A total of 727.2 Kms. of primary distribution lines (34.5 KV, 19.1 KV, 13.2 KV, and 7.6 KV) and 654 Kms. of secondary (120/240 V) lines will be needed to connect low income families to INDE's system. An estimated 1,211 transformers will be installed on secondary lines for 46,000 hook-ups in towns which have never had electricity and 29,000 hook-ups in already electrified villages. Finally, service drops, meters, and customer-owned house wiring will be installed in order to connect 75,000 new users.

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b. House Wiring

House wiring is included in the construction plan. The cost incurred for this element will be recovered from each customer over a four year period by affixing a special charge to the user's monthly utility bill. For purposes of the financial and economic analyses the house wiring cost was estimated at $20 per customer amortized over four years plus a 3% fee to INDE for administrative costs. On a monthly basis this charge was estimated to be 44 ¢ per user. These recuperations for house wiring will create a source of funds in INDE for continuing the house wiring program after the loan is disbursed, i.e., for the 6,000 connections to be made annually in the geographic area of the project. Income from the house wiring payments will eventually exceed the amount required for wiring houses for the 6,000 annual new connections. Any additional such income will be earmarked to finance the construction costs for new hookups in the geographic area of the project.

Independent construction crews will be employed to perform house wiring throughout the areas to be served, and timing will coincide with construction of the distribution systems. Selected residents of the villages will form part of the house wiring crews. These people will be trained in house wiring techniques in order to assure that there will be indigenous people in the villages with capacity to continue this service in the future. Only houses that fit the standard plan of about three light fixtures and two outlets will be wired in this manner. All wiring will be inspected by INDE before meters are installed. Larger houses that require additional services and special wiring will not be elegible for this service.

c. Subtransmission Lines and Distribution Substations

To make the above connections and additional hook ups possible, 69 KV subtransmission lines will be needed in three parts of the project area. A 94 kms. line will be built to provide additional capacity to the subtransmission system to meet planned increased demand in the Western Highlands. An additional line of 22 kms. will be built to permit expansion and improved quality of service in the El Porvenir-San Marcos area near the Mexican border. In the Eastern Region a 69 KV line extending for 56 kms. from El Progreso, Department of Jutiapa to Quezaltepeque, Department of Chiquimula will be constructed. Two 5 MWA substations to transform 69 KV to 34.5 KV will be constructed in Quezaltepeque and San Marcos.

2. Improved INDE Field Service Capability

INDE's field service capability will be improved in three ways: first, by strengthening the capacity of INDE's regional field offices to maintain the system and provide customer services; secondly, the Commercial Department will receive training in promotion of electricity in the rural areas and will develop programs of customer education in power uses and safety; and lastly, the accounting and billing services of the Commercial Department will be expanded to serve the increased number of customers.

In addition, INDE personnel will be trained on the job as local managers, linesmen, maintenance persons and meter readers. Local electricians will receive on-the-job training in house wiring from INDE or contract personnel. The marked increase in the number of customers to be attended, lines to be maintained, and meters to be tested, will require the purchase of additional special tools, test equipment, and approximately 15 standard line maintenance vehicles so that quality of service can be maintained at reasonable cost.

3. Improved INDE Management and Technical Capacity

INDE's ability to implement and expand its rural electrification program will depend in part upon strengthening certain management and technical capabilities. Five areas for assistance have been identified for loan financing:

a. INDE Technical Practices

Technical assistance will be provided to review, with the assistance of INDE personnel, certain technical practices and standards with the purpose of recommending lower cost solutions. Specific areas of interest are:

(i) Sub-station design in terms of reducing costs while still complying with acceptable standards; and

(ii) Distribution system design (trade-offs between economics of various distribution voltages) and development of standard unit costs.

Required are six person months of consultant services.

b. Rate Analysis

Provide INDE with expertise in analyzing its current procedures for determining rates so as to ensure all factors bearing on development of equitable rates are considered. Required are six person months of consultant services.

c. Commercial Operations

Provide technical assistance to INDE's Commercial Department so as to prepare it to handle the

greatly expanded workload represented by the increased number of new customers which will be financed under this project. Specific areas where assistance will be provided are:

(i) Billing and collection procedures including computer applications;

(ii) Promotional and education programs in power use for rural customers; and

(iii) Customer services such as connections and disconnections, responding to special voltage requests, etc. Required are 18 person months of consultant services.

d. Contract Personnel for Evaluation

Local contract personnel (enumerators) to carry out baseline surveys and the impact evaluation survey at the end of the project will be hired by INDE and will be under the direction of the Planning Department. Survey instrument printing and processing and data tabulation will also be financed by the loan, for a total estimated cost of $30,000. Non-loan funds will be used to finance the consultant(s) who will design the evaluation and analyze the results of the impact survey.

e. Other short-term consulting services

Other consultant services may be identified during project implementation. Estimated are six person months.

f. Participant Training

Training for INDE management and technical personnel will also be loan financed. Ten members of INDE's management staff will be sent to the United States for

two weeks' and four weeks' training in special courses arranged by REA, NRECA, and Michigan State in all aspects of utility company management and practices. In addition 15 lower level personnel will receive short term training in rural electrification in Nicaragua and Costa Rica. Three people will be selected from the technical departments to receive academic and specialized training for periods of one year in the U.S. Study will be in such areas as rate analysis, systems planning, project design and customer relations for the power sector. (See Section IV.A. for detailed cost estimates for technical assistance and training.)

4. Evaluation System

An evaluation to measure the rate of adoption of electricity for productive purposes by low-income rural families and assess the impact on their productivity will be undertaken.

The impact evaluation methodology and plan of implementation will be designed by the end of the first year of the project by a consultant contracted by TAB/Office of Rural Development in AID/W, who will work closely with INDE staff. Baseline data gathering activities, which will be designed to fit into INDE's normal operations to the extent possible will begin sometime during the first year of the project. In the final year of the project, USAID will obtain services required to study the project's impact. Loan funds will pay for personnel hired by INDE as enumerators and analysts for the evaluation. In addition, annual progress evaluations (output level) will be conducted by INDE and the USAID in January of each year of project implementation beginning in CY 1979.

IV. PROJECT ANALYSIS

A. Technical Analysis

1. Description of INDE System

In the eighteen years since its creation INDE has grown to be the dominant electric power entity of the country supplying electrical energy to approximately 250,000 users. Approximately 70,000 of these users are served directly by INDE while the remainder are served through block sales to municipalities and the Empresa Eléctrica (the electric power company which serves Guatemala City and nearby towns). There are approximately 6,000 employees on its payroll.

As of December 31, 1976, INDE's system had total assets of $175,420,000 of which $70,963,000 was net property, plant and equipment. INDE's average rate base for 1976 was $61,780,544 on which it earned a rate of return of 6.69%. A recent analysis indicates that this low return is caused by the fact that current block sales and industrial user rates do not appear to cover the cost of generation.

At the end of 1976 INDE owned 77% of the in-service generation capacity in the country with a mix of hydroelectric, steam, gas turbine and diesel plants. The remaining capacity is owned by Empresa Eléctrica and isolated municipalities. Another 390 MW will be added by 1982 when Chixoy and Aguacapa are completed.

Approximately 91% of INDE's KWH sales are to block customers including the government owned Empresa Eléctrica de Guatemala and other municipalities. As a result, INDE's transmission substation and line requirements for providing services to these entities are minimal. The major generating plants are located in Palin and Escuintla, near

Guatemala City and are tied together with 138 KV transmission lines.

Substations outside the Guatemala City complex serve distribution systems which are tied together by subtransmission lines. To these substations are connected INDE's own distribution systems and 13 municipal block customers. With the exception of small isolated plants in the North and North Eastern areas of the country, all of INDE's system is interconnected.

INDE's subtransmission and distribution system is very modern and well built generally following REA Standards. It is a mix of five different voltages as indicated in the table below:

69	KV (3ø)	693.3	kms.
34.5	KV (3 ø)	513.8	kms.
19.1	KV (1 ø)	9.0	kms.
13.2	KV (3 ø)	1,587.04	kms.
7.6	KV (1 ø)	143.32	kms.

Detailed information on INDE's existing and planned facilities is provided in Annex J.

Present and projected generating capacity is shown in the table on the following page. Present firm capacity 1/ is about 310 MW and projected to reach about 693 MW in 1983. Projected demand in 1977 is estimated at 277 MW and is estimated to reach 412 MW in 1983. Demand for energizing new customers connected by this project is estimated to reach about 12 MW in 1983. This represents less than two percent of the projected firm generating capacity and

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1/ Firm capacity is the installed capacity less the largest single generating unit in service.

GUATEMALAN INTERCONNECTED SYSTEM CAPACITY AND DEMAND

YEAR	CAPACITY - MW			DEMAND - MW		
	Installed Capacity	Largest Unit	Firm Capacity	Total Real	Total Projected	Projected for This Project
1974	209.5	33	176.5	163.1	-	-
1975	209.5	33	176.5	185.0	-	-
1976	259.5	33	226.5	199.5	-	-
1977	362.5	53	309.5	-	227	-
1978	362.5	53	309.5	-	250	-
1979	452.5	53	399.3	-	275	1.1
1980	452.5	53	399.3	-	304	3.3
1981	452.5	53	399.5	-	336	5.9
1982	752.5	60	692.5	-	371	8.5
1983	752.5	60	692.5	-	412	10.2

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5.

about three percent of projected demand. In the period following 1983, demand created by this project is projected to increase at seven percent annually. Therefore, it is evident that even though large numbers of rural inhabitants will receive electrical services, the project will have insignificant impact on the overall generation and transmission system. Furthermore, the rural electric system expansion does not require additional high voltage transmission. The incremental costs for delivering this service are limited to expansion of the distribution system and construction of three subtransmission lines and two substations.

2. Technical Description - Construction Activities

This project will finance subtransmission lines, distribution substations, primary and secondary distribution lines, distribution transformers, meters, and service drops for 75,000 customers. Essential equipment, technical assistance, and house wiring for 75,000 customers will also be financed. The total estimated cost is $18,200,000.

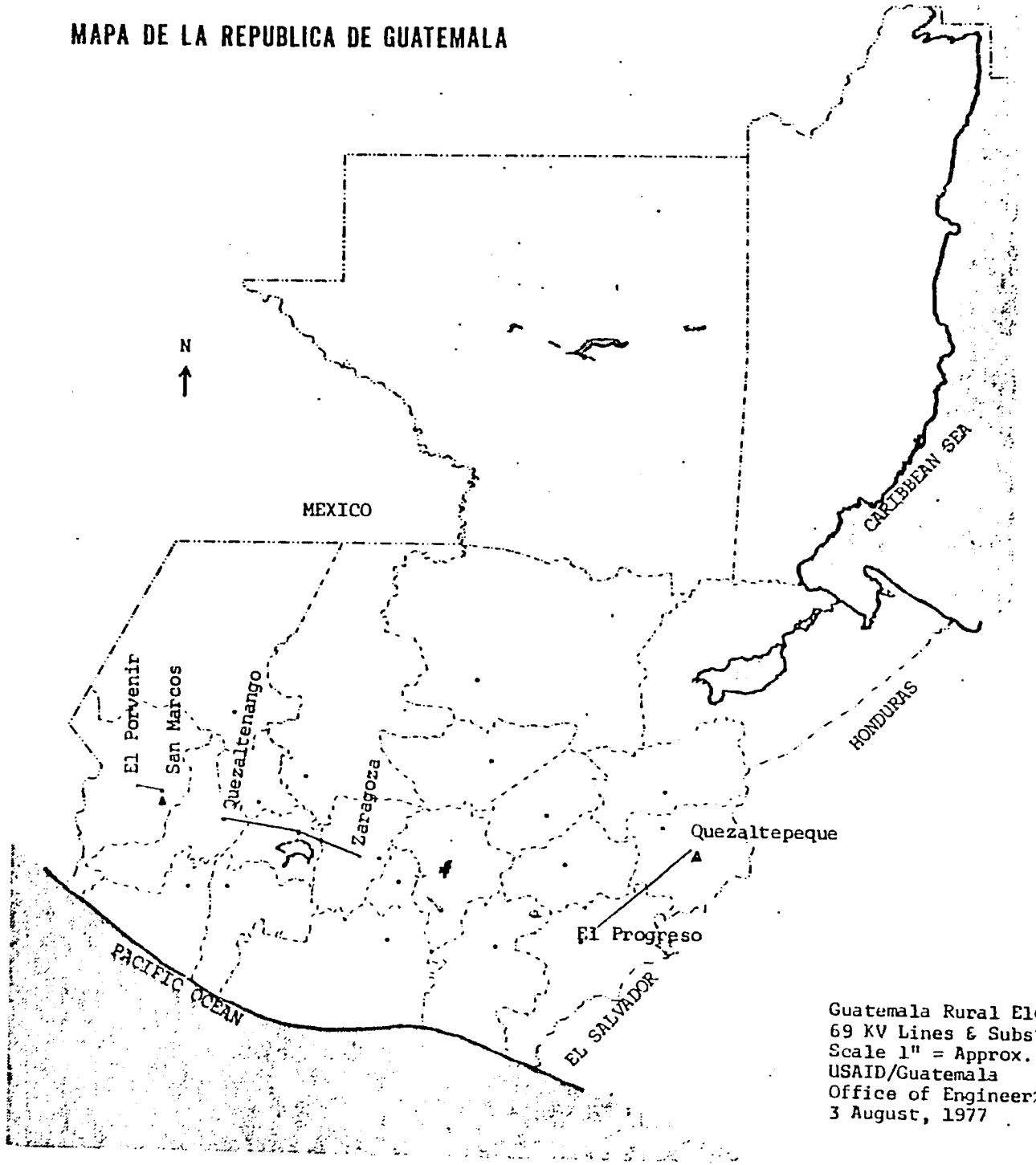
The project will serve 46,000 new customers in approximately 375 villages presently without electricity and connect an additional 29,000 customers in 300 already electrified villages. The total estimated population to be served is about 463,000.

a. Subtransmission Lines (See maps on following pages)

Under the project three 69 KV subtransmission lines totaling 172 kms, will be constructed. These three subtransmission lines are designed to bring power from transfer points in the system to load centers; existing 138 KV transmission lines bring the power from generation stations to the system transfer points.

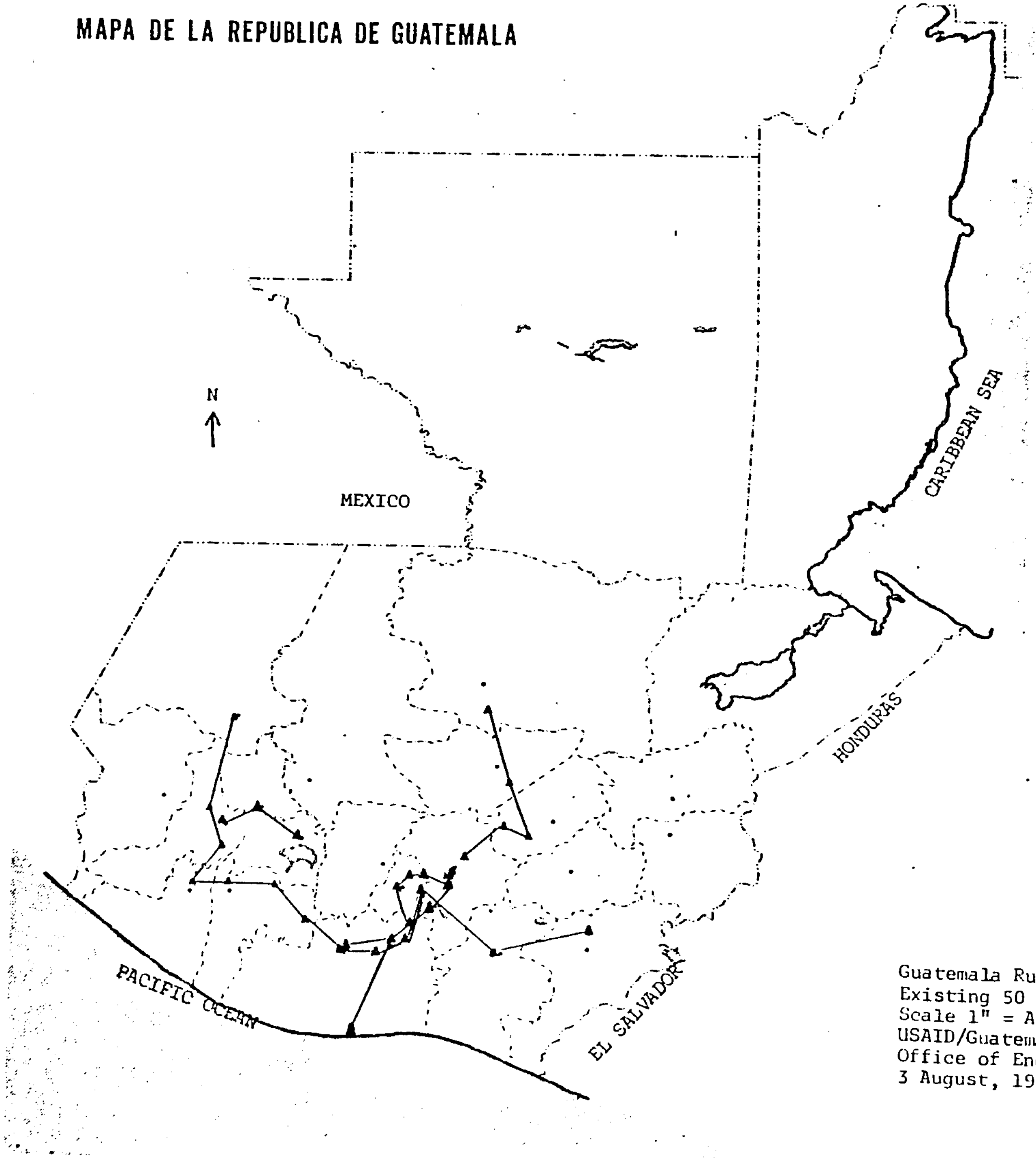
Because of the topography of the land and the distances

MAPA DE LA REPUBLICA DE GUATEMALA



Guatemala Rural Electrification System
69 KV Lines & Substations this Project
Scale 1" = Approx. 38 Miles
USAID/Guatemala
Office of Engineering
3 August, 1977

MAPA DE LA REPUBLICA DE GUATEMALA



Guatemala Rural Electrification System
Existing 50 kV Lines and Above
Scale 1" = Approx. 38 Miles
USAID/Guatemala
Office of Engineering
3 August, 1977

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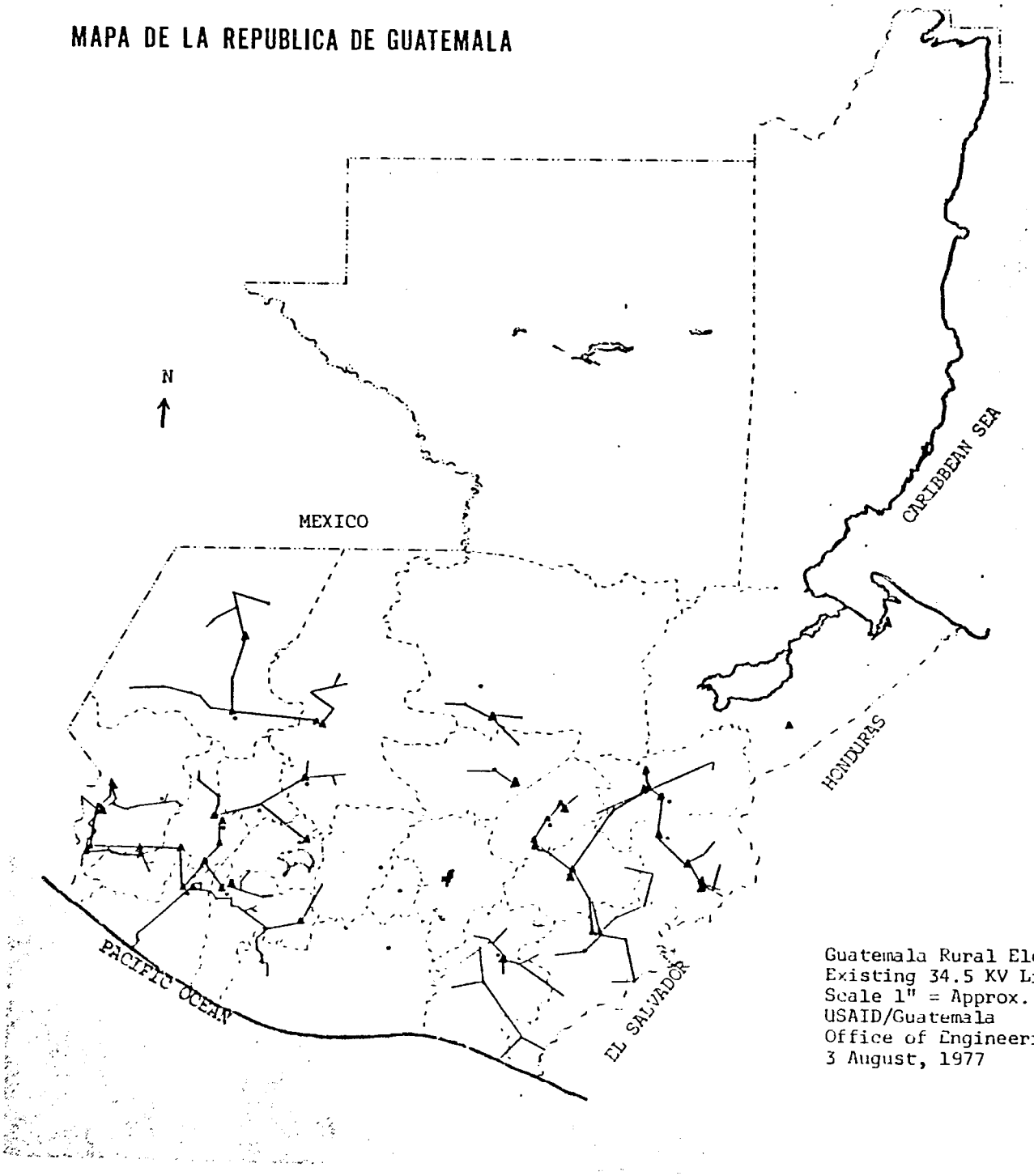
MAPA DE LA REPUBLICA DE GUATEMALA



Guatemala Rural Electrification System
Existing 34.5 KV Lines and Lower
Scale 1" = Approx. 38 Miles
USAID/Guatemala
Office of Engineering
3 August, 1977

involved, 69 KV subtransmission is appropriate for reaching the remote areas of this project. The alternative to building 69 KV subtransmission system which will supply sufficient power for rural distribution is to replicate the past pattern of isolated diesel generators. Experience has shown that this alternative is not very practical in view of logistic problems, the training required, fuel quality and supply, maintenance, and spare parts. In addition, the cost would frequently be greater, and the probable useful life of the equipment might be in the range of 10-20 years (depending on the quality of maintenance); whereas the useful life of 69 KV lines and substations could be 40-50 years or more.

- Zaragoza-Quezaltenango Line

The first and most important line will extend from a substation being built by INDE in Zaragoza to Quezaltenango in the Western Highlands where it will connect to an existing substation. These substations and others financed under loan 019 in the Western Highland area which are connected into an existing 69 KV network would be the foci for distribution expansion in this AID geographic target area. The line to be constructed using counterpart funds extends 94 kms.

The Quezaltenango substation is presently served by a 69 KV subtransmission line from Escuintla, a distance of about 200 kms., with a 12 MW capacity on 477 MCM aluminium cable which is standard. There is an additional distance of 100 kms. to Huehuetenango which is also served by this line.

The actual loading on the existing 69 KV line in recent months has been as follows:

	Actual Loading	Peak Loading 1)
January	9.4 MW	11.75 MW
February	10.3 MW	12.875 MW
May	8.942 MW	11.1775 MW
June	7.948 MW	9.935 MW

As can be seen from the above this line is already overloaded during peak periods. It is not technically possible to load this line any further. Thus, the new line by completing a loop from Antigua, Zaragoza, Quezaltenango, South Coast, and Escuintla will add considerably to INDE's capacity to provide quality service by reducing outages and maintaining stable voltage.

- El Progreso-Quezaltepeque Line

The second line will be built in the Eastern target group area from El Progreso, Department of Jutiapa to a new substation, which will be financed under the loan, in Quezaltepeque, Department of Chiquimula. With a length of 56 kms. this line will make it possible to serve about 40 villages that cannot be served from the substation in Quezaltepeque because of the distances involved. The small substation (0.6 MW) presently located in Quezaltepeque and fed by an overloaded 34.5 KV line from Zacapa is providing poor quality services for only three towns. Larger volumes of power must be introduced in order to adequately serve the area.

- El Porvenir-San Marcos Line

The third line will extend 22 kms. from an existing substation at the El Porvenir hydro-electric plant located in San Pablo, Department of San Marcos to a new substation to be built with GOG funds near the town of San Marcos, which is an important departmental capital in the Western Highlands.

Present service is limited to that supplied by a 13.2 KV distribution line that cannot be extended to adequately serve the entire area. Service here is poor

1) Calculated on a power factor of 80%.

because the source of power for energizing the distribution line is an old 50 KV subtransmission line built in the 1930's that runs from San Felipe to El Porvenir. This line does not have lightening protection. It is being rebuilt by INDE to operate at 69 KV. Loan funds will be used to construct the El Porvenir - San Marcos extension of this line that will make reliable services to the outlying villages possible.

The estimated costs for the subtransmission lines are given below:

Subtransmission (69 KV) Lines - Estimated Costs

	Qty.	Unit	Unit Price	Total Cost
a. Zaragoza-Quezaltenango	94	kms.	$15,150	$1,424,100
b. El Progreso-Quezaltepeque	56	kms.	15,150	848,400
c. El Porvenir-San Marcos	22	kms.	15,150	333,000
				$2,605,500

b. Substations

In order to step down the 69 KV line voltage, substations are required. Two such substations will be built with loan funds. These will be located in San Marcos and Quezaltepeque each with a capacity of 5 MVA. REA standards and specifications will be used. A one line diagram of the existing typical standard substation is shown in Annex J. Estimated costs for the substations are shown below:

Distribution Substations
(5 MWA 69/34.5 KV)

	Qty.	Unit Price	Total Cost
a. Quezaltepeque	1	$250,000	$250,000
b. San Marcos	1	250,000	250,000
			$500,000

c. Distribution Systems

1) Primary Distribution Lines

About 727 kms. of primary line of different voltages will be built to relay power from sub-stations to line transformers in population groupings. REA standards for spacing and insulation on the lines will be followed. Aluminium conductor will be used for the lines and compression-type connectors will be used to the maximum extent possible. The location of the principal primary lines are shown on the set of maps in the Annex J. The breakdown of the lines by voltage and costs is shown at the end of this section.

2) Secondary Distribution Lines

A total of 654 kms. of secondary distribution lines (120/240 V), will be built to extend the electric service from the line transformers in the villages to the customer service drops. These lines will also follow REA design standards. Aluminium conductor will be used for the lines and compression-type connectors will be generally used.

3) Distribution Transformers

Distribution transformers will be installed to reduce primary distribution line voltage to 120/240 V for secondary distribution. These transformers will be conventional multiple and/or single phase, and standard 10 KVA size was used for cost analysis purposes.

4) Meters and Service Drops

In order to deliver power from the secondary distribution lines to the customers, meters and service drops will be installed. Presently INDE is using socket-type meters for all services following the example

introduced in Guatemala City by the once American-owned EEGSA. There has been favorable experience in Central America with the much less expensive A-Base type meters for low consumption services. During the design phase this and other meter types will be considered to determine the most appropriate and cost effective meter for use under the project.

5) House Wiring

Independent construction crews will be contracted to install house wiring with work to be timed with construction of distribution systems. A standard house wiring plan will be used consisting of three light sockets and two outlets. Owners of houses and businesses that require more extensive wiring will make their own arrangements for the work. House owners will be billed for the cost of wiring as a component of the monthly service bill over a four year period. Based on an estimated $20 per house this will add 44 ¢ per month which includes a 3% service fee. Local labor will be hired as part of the wiring crews so as to provide training for villagers who will continue to be available to users for repairs (internal wiring is considered to be property of the house owner). Over the life of the project part of the house wiring costs will be financed through repayments received from customers hooked up in the initial years of the project.

DISTRIBUTION SYSTEM ESTIMATED COSTS

Item	Quantity	Unit Price	Total Cost
1. Primary Distribution Lines			
a. 34.5 KV (3 ø)	12.4 kms.	$6,225	$ 77,190
b. 19.1 KV (1 ø)	135.9 kms.	4,370	593,883
c. 13.2 KV (3 ø)	80.1 kms.	5,290	423,729
d. 7.6 KV (1 ø)	498.8 kms.	3,465	1,728,342
	727.2 kms.		$2,823,144
2. Secondary Distribution Lines			
a. 120/240 V new villages	586.26 kms.	$4,980	$2,919,575
b. 120/240 V electrifie villages	67.59 kms.	4,980	336,598
	653.85 kms.		$3,256,173
3. Distribution Transformers (10 KVA 7.6 KV/120-240 V)			
a. New villages	1,164	$ 315	$ 366,660
b. Electrified villages	47	315	14,805
	1,211		$ 381,465
4. Meters and Service Drops (Meter at $16 and service drops at $15)			
a. New villages	46,490	$ 31	$1,441,190
b. Electrified villages	29,394	31	911,214
	75,884		$2,352,404
5. House Wiring			$ 700,000 1/

1/ The $700,000 for house wiring was calculated on the actual cost of construction materials required to wire a house with three light sockets and two outlets. This total was $20 per house. In addition, annual recuperations of 44¢ per month per customer were also taken into account.

Project Year	Gross Outlay	Income	Net Outlay	Acc. Net Outlay
1	—	—	—	—
2	$379,500	$ 50,094	$329,406	$329,406
3	379,500	150,279	229,221	558,627
4	455,400	260,489	194,911	753,538
5	303,600	360,677	-57,077	696,461

Rounded: $700,000

d. Method of Construction

INDE has decided that all new works, subtransmission lines, substations and distribution systems in areas not presently served will be built by contract. Additional services in areas where distribution systems exist will be installed directly by INDE. The procurement plan for the Project Paper is based on INDE's procuring the materials directly. For both contract and force account work INDE will hire a consulting engineer financed under the loan to prepare bidding documents and supervise construction. (See Annex J for breakdown of consulting engineering services and Section V.B. for the procurement plan).

e. Service and Maintenance

As service is extended to increasing numbers of customers, INDE must expand its capacity to maintain and service the system. INDE and the USAID have reviewed regional office and warehouse requirements and believe that physical facilities in place are adequate to meet project needs. There is, however, a requirement for additional testing and line maintenance equipment. There is also a requirement that additional linemen and maintenance personnel be trained. INDE will undertake to train and add staff to perform the linesmen and maintenance function. Since this training is all on-the-job, there are basically no costs to be financed. INDE will expand its cadre of linesmen and maintenance personnel, if required, and finance it from its own operational budget. Essential equipment requirements are estimated to cost $350,000. A list of equipment is shown in Annex J.

3. Technical Description - Training and Technical Assistance

The project will double the number of INDE direct customers in rural areas. INDE will hookup as many new rural customers during project implementation as it has hooked up since its creation. Furthermore, elimination of the front end charges is likely to create a large effective demand for a continued high level of hookups in rural areas after the project implementation period. This expansion of rural electrification services requires that INDE not only correct some minor deficiencies in its present administrative capability, but also enhance its capability to provide customer services and develop a promotional program for the use of electricity in the rural areas.

a. Improved INDE Management and Technical Capacity

Several consultants have studied INDE's administrative capability and have made observations on areas in which INDE's management, planning and operations need improvement.

A World Bank analysis prepared for the Aguacapa Project Appraisal Report detected weaknesses in financial management, rate analysis and asset evaluation. Funds were provided under the loan for the Aguacapa project to provide technical assistance in financial management to INDE, carry out a rate study, and perform an asset reevaluation.

USAID personnel and consultants have detected certain weaknesses that may constrain INDE from providing efficient rural electrification services. These areas are: lack of an overall program for development of rural electrification; use of overly complex or inefficient components in the rural electric distribution system; and lack of an in-house capability for rate analysis and rural electrification systems planning.

Training and technical assistance will be financed under the loan to strengthen INDE's capacity in each of these areas:

(i) Development of Comprehensive Program for Extension of Rural Electrification. Many of the technical and non-technical problems INDE faces in rapidly expanding rural electrification have been faced by other developing countries. INDE has competent technicians at all levels of management who can rapidly adapt solutions that have proven effective elsewhere to technical problems in INDE's system. INDE's technicians and executives can also quickly adopt techniques used elsewhere to improve comprehensive planning for Guatemala's rural electrification expansion program. INDE and the Mission have agreed that the most effective way to develop INDE's comprehensive programming capability is through participant training.

A total of ten executive level managers from INDE will receive short-term training in all aspects of utility company management and practices in order to strengthen and reinforce INDE's overall capability in providing effective service to 75,000 additional customers. These courses will be sponsored by REA, NRECA, Michigan State, and other institutions experienced in utility management. These courses are specifically oriented to utility system managers from developing countries. Participation of INDE executives will allow ample opportunity for discussion of common problems and development of practical solutions. In addition, fifteen technical personnel from INDE will be sent to other Central American countries, such as Nicaragua and Costa Rica, to observe the technical practices of on-going rural electrification programs. These countries have had a long experience with rural electrification and resemble the Guatemalan environment. They should be able to demonstrate practical ways of extending electrification to low income rural areas.

The ideas developed through participant training will help INDE prepare, during the third and fourth years of the project, a program for extending rural electrification services to additional rural consumers after the end of the project. This program will be a major exercise for INDE due to its long term focus (25 years) and will be a good test of the effectiveness of the participant training program.

(ii) Simplification of INDE System Components. INDE's substations in its existing rural electrification network are costly and over-designed. USAID consultants have estimated that the cost of substations could be reduced by 20 - 30% without endangering other system components, by simpler, more functional designs. Furthermore, with INDE's patchwork of different voltage lines, the Institute may be incurring diseconomies in operation due to the need for more frequent and costly high voltage transformation. INDE and the Mission have agreed that improvements in these areas could be best effected by assistance to INDE's technical staff. The technical advisors will help INDE to: design simpler substations without lessening design standards or system capability; and improve distribution system design, including the development of unit cost data for lines of different voltages and analysis of economic tradeoffs between them. Other areas where technical assistance will be required to help INDE achieve greater efficiency in rural electrification systems have been identified in consultant reports.1/ INDE is studying its needs and will advise AID of the areas in which assistance is most needed in a technical assistance plan to be submitted as a condition precedent to initial disbursement.

(iii) Developing an In-house Capability in Rate Analysis and Rural Electrification Systems Planning. Because INDE will be required to review periodically the rate structure, once a year after the IBRD-financed rate study has been completed, an increased capability for undertaking rate analysis is essential to INDE's institutional development. INDE at present does not have this capability and has placed heavy reliance on foreign consultants who specialize in power rates. INDE technicians will receive long term training in power rate analysis. In addition, one of the loan's objectives is the institutionalization of the rural electrification program within INDE's overall power development program. In furtherance of this objective long term training in overall planning, including rural electrification distribution systems, will be provided under the loan. In total, three years of long term training in these technical areas will be financed by the loan.

11

1/ Rural Electrification Rate Study-Guatemala, March 31, 1977, Sanderson & Porter, Inc. N.Y. and Review of Proposed Rural Electrification Plan for Guatemala and Recommendations for Technical Assistance to INDE, July 20, 1977, Alf Carroll, Little Valley, New York.

b. Improved INDE Field Service Capability.

Because INDE will double the number of direct customers under this project, INDE will need to improve its customer services, maintenance capability and other outreach programs in order to attend effectively these new users.

(i) Improved Maintenance Capability. The capacity of INDE's regional field offices to maintain the rural electrification distribution system will be strengthened by the training of additional linesmen and maintenance personnel. Where required, additional staff to perform these functions will be hired. Because the training will be on-the-job, there are basically no costs to be financed over and above the labor costs for construction. Added staff will be financed out of INDE's own operating budget.

(ii) Improved Billing and Collection Procedures. While INDE's collections of user charges have been good, there is room for improvement in both the percentage of charges collected and the timeliness of collections. Technical assistance will be required to help INDE improve and expand its billing and collections system in rural areas. Presently collections data and meter readings are sent from regional field offices to the central office where they are processed by computer to record collections and calculate new charges. Bills are emitted by headquarters and sent back to the field offices. The meter readers collect outstanding amounts for which they are paid on a commission basis. This procedure results in the largest users of electricity, where the highest commissions will be earned, being visited first by the collection agents. The meters of many of the smaller users are read irregularly and the users do not pay on a month-to-month basis because the collection agent simply does not appear at the house, and the nearest INDE office is too far away to justify a special trip. The technical assistance will help INDE to conduct a systematic analysis of the entire process and develop a more efficient and effective billing and collection system. Alternatives to the system of paying collection agents on a commission basis, as well as the more innovative and effective use of the new computer system INDE has ordered, will be studied in developing a billing and collection system which takes into account both INDE's need for prompt collections and the payment capacities of low income rural users. The loan will finance approximately six months of technical assistance to improve INDE's capability in this area.

(iii) Improved Customer Services. Related to the problem of billing and collections are the customer services rendered by the regional field offices to their rural customers. Since the number of rural customers will increase, a greater demand for such services as connections and disconnections, special voltage installations, and other similar requests will be placed on INDE field services. In order to improve INDE's outreach capability in this area, up to six months of technical assistance has been budgeted under the loan.

(iv) Development of an Education/Promotional Program for the Rural Areas. At present, INDE does not have sufficient generating capacity to provide regular and reliable service to all of its customers. Consequently, it has not developed a program to increase the sale and use of electricity in rural areas. Two new hydrogeneration projects are now under construction and by 1979 (when this program is starting to connect new users), INDE will have excess generating capacity and will need to increase sales. INDE wishes to promote the productive use of electricity for two reasons: increased profitability for the Institute, and a recognition that low income users can increase their incomes by employing electricity in productive activities. INDE also recognizes that most new users will need to be educated to ensure safety in the use of electricity. Consequently, INDE will design, test, and implement a promotional and educational program for potential new customers in rural areas. Approximately six months of technical services will be financed with loan funds to develop instructional materials and demonstration programs and train INDE field promoters to carry out a promotional and educational campaign in power use for rural users.

A breakdown of all technical assistance and training estimated costs is included on the following pages.

TECHNICAL ASSISTANCE AND TRAINING ESTIMATED COSTS

TECHNICAL ASSISTANCE			$350,000
a. Technical Practices		$53,340	
6 months x $7,560/month (includes salary, overhead $ fee)	= $45,360		
Travel 1 x $600/r.t.	= 600		
Per Diem 180 days x $41	= 7,380		
b. Rate Analysis		$53,340	
6 months x $7,560/month	= $45,360		
Travel 1 x $600/r.t.	= 600		
Per Diem 180 days x $41	= 7,380		
c. Commercial Operations		$160,020	
18 months x $7,560/month	= $136,080		
Travel 3 x $600/r.t.	= 1,800		
Per Diem 540 days x $41	= 22,140		
d. Other Consultants		$53,340	
6 months x $7,560/month	= $45,360		
Travel 1 x $600/r.t.	= 600		
Per Diem 180 days x $41	= 7,380		
e. INDE Contract Personnel and Evaluation Local Costs		$29,960	
TRAINING			$100,000
a. One month course in rural electrification in Nicaragua and Costa Rica for 15 persons		$20,500	
Travel	= $ 1,500		
Per Diem	= 18,000		
Other	= 1,000		

b.	Five INDE Executives to special courses in U.S. for 15 days		$17,200
	Travel	= $ 3,000	
	Per Diem	= 2,700	
	Course expenses	= 10,000	
	Travel in U.S.	= 1,500	
c.	Five INDE Executives to U.S. for 30 days		$19,820
	Travel	= $ 3,000	
	Per Diem	= 5,250	
	Course expenses	= 10,000	
	Travel in U.S.	= 1,570	
d.	Equivalent of three Technicians for one-year training in U.S. at $14,160 each		$42,480

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B. Financial Analysis

1. Financial Plan

The total estimated cost of the project is $18.2 million of which $10.8 million, or 59%, will be financed by AID. The Government of Guatemala will provide the remaining $7.4 million.

The AID contribution is projected as follows:

a. All of the foreign exchange costs of off-shore procurement of equipment, materials and services required for the construction of the distribution system including substations and related maintenance and service equipment. ($3,300,000).

b. 64% of the local currency costs of construction of the distribution system. ($4,520,000).

c. All of the total cost (including local currency) of the consulting engineers and technical assistance and training. ($850,000).

d. Contingency and Inflation factors. ($2,130,000).

The GOG contribution is projected as follows:

a. All of the foreign exchange costs of off-shore procurement of equipment, materials and services required for the construction of the subtransmission lines. ($520,000).

b. 36% of the local currency costs of materials and construction of the distribution system, and materials for the substations ($2,550,000).

c. All of the local currency costs for construction of the subtransmission lines and substations. ($2,080,000).

d. All of the total costs of INDE engineering and administrative expense related to the project ($715,000).

e. Inflation ($1,535,000).

The source and uses of funds, disbursement schedule and costing of project outputs are shown in the following tables. A more detailed cost breakdown for the subtransmission/distribution systems is contained in Section IV.A, Technical Analysis.

TABLE

Costing of Project Outputs
(in 000)

	Project Outputs			
Project Inputs	No.1	No.2	No.3	TOTAL
1. Construction	12,620	-	-	12,620
2. Consulting Engineer	400	-	-	400
3. INDE Engineering and Administration	415	150	150	715
4. Equipment	350	-	-	350
5. Technical Assistance & Training	-	225	225	450
6. Inflation	2,770	90	90	2,950
7. Contingency	685	15	15	715
Total	17,240	480	480	18,200

No. 1 -- Subtransmission/Distribution system installed and operating.

No. 2 -- Trained personnel.

No. 3 -- INDE administrative procedures improved.

TABLE

Source and Use of Funds
(in 000)

		AID LOAN $	AID LOAN Q	GOG	TOTAL $ Equiv.
1.	Construction of Sub-transmission/Distribution 1/	2,950	4,520	5,150	12,620
2.	Consulting Engineer	320	80	-	400
3.	INDE Engineering & Administration	-	-	715 2/	715
4.	Maintenance & Service Equipment	350	-	-	350
5.	Technical Assistance & Training	385	65	-	450
6.	Inflation 3/	520	895	1,535	2,950
7.	Contingency	255	460	-	715
	TOTAL -	4,715	6,085	7,400	18,200

1/ Based on actual cost data gathered under prior AID loan No. 520-L-019 with allowance for inflation from the time 019 construction was completed.

2/ $715,000 is based on allocating 6% of material and labor costs of construction for INDE Engineering and Administrative costs. The 6% of construction cost figure is considered standard practice for utility companies based on experience. The breakdown by construction line item is included in Annex J, page 13.

3/ Provides for 5% annual compounded inflation rate in foreign exchange costs and 8% annual compounded inflation rate on local currency costs. These rates were applied against projected disbursements (excluding those for house wiring).

2. Financial Viability

a. Rates of Return

Financial rates of return were calculated for the project using both the internal rate of return (IRR) method and the World Bank utility rate of return method (annual rate of return on average value of net fixed assets). The financial IRR was calculated using a base case projection and high and low option projections. The utility rate of return was calculated on the high and low option projections. The results are as follows:

	Financial Returns	
	IRR	Utility 1/
Base Case	12.0%	-
High Option	13.4%	23.9%
Low Option	10.5%	19.3%

The IRR for the low option compares favorably with the current cost of borrowing money through government bonds (8%). The project is thus considered to be financially viable.

The utility return method yields higher rates since it is more an accounting measure and does not consider the time value of cash flows, i.e., it does not discount cash flows. The utility returns reach the stipulated IBRD minimum of 9% in the tenth year of the project for the low option and in the fifth year of the project for the high option.

1/ Utility rates of return are calculated on an annual basis. The figures shown here thus represent the average annual rate of return over a 30 year period.

b. Basis for Financial Projections

Base Case and High/Low Projections

Because INDE's revised system-wide rate structure is yet to be determined it is necessary to make certain assumptions in order to arrive at the cash flow to be derived from INDE sales. The new rate structure will have to consider the elimination of the front-end charge which is a fundamental objective of this project. Therefore, some increase of the monthly rate is anticipated in order to, in effect, amortize the construction cost.

The current minimum monthly bill is $1.00 which covers 12 KWH of use. In a recent AID-INDE survey, the most frequently cited monthly amount which could be afforded by the respondants was $2.00. To provide a lower limit for the likely range into which a new minimum rate would fall, it was assumed that the rate would have to be increased by $0.50. The financial analysis is therefore calculated on the basis of three different minimum monthly rates.

(i) Base Case: $0.75/month (for a total minimum bill of $1.75)*. This represents the best estimate at this time of what the fee may likely be.

(ii) High Option: $1.00/month (for a total minimum bill of $2.00)*. This is the most frequently cited figure which survey respondants said was affordable.

(iii) Low Option: $0.50/month (for a total minimum bill of $1.50)*. This represents the estimated minimum rate increase which is anticipated.

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* Excludes house wiring.

Sales and Cost of Sales:

The annual new connections projected over the period of the project (30 years) are comprised of the 75,000 new residential and commercial hook ups during the disbursement period plus the continuation of hook ups at the rate of least 6,000 per year after the disbursement period. Residential connections were assumed to comprise 95% and commercial 5% of total new connections.

The average rate of consumption of residential users was estimated initially at 200 KWH/household/year, increasing at the rate of 3.2%/year until the seventh year and at 4.5%/year thereafter. The average annual consumption per household thus reaches 658 KWH by the end of the 30 year period.

The annual consumption rate for commercial users was estimated initially at 600 KWH, increasing at the rate of 5% through the seventh year, and 3% thereafter, to a high of 1,510 KWH.

Public lighting and government municipal consumption rates were estimated at the rate of 40 KWH per year and 8 KWH per year, respectively, per new residential and commercial connection in the newly electrified villages (on the assumption that already electrified villages already had these services).

Industrial consumption was estimated at 1.5% of residential consumption.

All of these projections were arrived at jointly between AID and INDE and are essentially conservative estimates based on an analysis of INDE historical data. A comparison of INDE's historical experience and the estimates used in the financial analysis is included in Section IV.C., Economic Analysis, along with a discussion of the underlying rationale for the figures that were selected.

The cost per KWH over time was computed from INDE projections (See table next page). It includes adjustments for both expected unusual increases in the price of fuel (already the largest single cost component in the generation of electricity) and the phased changeover to the use of less expensive hydroelectric generation. Average cost per KWH fluctuate slightly until 1982 at which time there is significant reduction in per KWH production cost resulting from the introduction of INDE's largest hydro-electric generating facility. From 1983 on INDE's generating facilities will be almost entirely hydro-electric. Production cost per KWH beyond 1983 was therefore held constant since any fluctuations in fuel cost would have only minimal impact on INDE's overall generation costs.

The sales price per KWH electricity used for the projections is the current sales price ($1.00 for 12 KWH) for the target group in the areas covered by this project. This price was kept constant as no unusual increase in price is projected (other than normal inflationary increases). The three amortization fee assumptions and other revenues have been set forth separately as a function of the number of users rather than the KWH consumption.

IRR Cash Flows

The cash flow projections for purposes of the Financial IRR consists of the following (See tables on the next pages):

- Net sales and cost of sales calculated in the manner described above.
- Projected rate increase for three monthly amortization fees (low option, high option and base case).
- Reflows from amortization of housewiring costs.
- Consumer Deposits ($2.00 per new hook up).

I N D E

TOTAL ADMIN., OPERATIONS, AND MAINT. COST PROJECTIONS

	1978	1979	1980	1981	1982	1983
1) Net Energy Sales (in GWH)	960	1,142	1,259	1,389	1,646	1,799
2) Operating Expenses (US$000)						
A) Fuel	22,635	19,231	23,711	28,129	2,541	---
B) Gener., Trans., Distr. O & M	3,959	5,795	6,066	7,031	11,524	11,009
C) Insurance	650	1,272	1,289	1,396	2,928	2,950
D) Direct Admin. Expenses	1,992	2,311	2,679	3,108	3,606	4,183
E) Indirect General Expenses	1,308	1,504	1,730	1,881	2,164	2,489
Sub-Total Before Depreciation and Interest	30,544	30,113	35,475	41,545	22,763	21,531
3) Interest Expense (US$000)	5,394	9,642	10,264	10,454	19,714	18,239
4) Depreciation Expense (US $000)	5,314	8,086	8,938	9,804	17,317	18,252
5) Average Cost w/o Int. & Depr. (¢/KWH)	3.18	2.64	2.82	2.99	1.38	1.20
6) Average Cost Incl. Interest (¢/KWH)	3.74	3.48	3.63	3.74	2.48	2.21
7) Average Cost Incl. Deprec. (¢/KWH)	3.74	3.34	3.53	3.70	2.44	2.21
8) Average Cost Incl. Int. & Dep. (¢/KWH)	4.30	4.19	4.34	4.45	3.63	3.22

- Total project investments.
- Interest charges on AID loan.

(Supporting financial tables are shown in Annex K.)

Utility Rate of Return

To ensure that this project would not prejudice INDE's position relative to the IBRD requirement that INDE maintain at least a 9% annual utility rate of return on its total investments, the utility rate of return for the AID project was calculated. This required adjustment of certain figures in the financial IRR calculation. Cummulative fixed investment was adjusted to reflect accumulated depreciation at the rate of 3%/year. Net income was also adjusted to reflect the annual depreciation charge and to exclude interest payments. The utility rate of return was calculated for both the high and low options. The results are shown in the table on the following page.

ANNUAL UTILITY RATE OF RETURN ON AVERAGE VALUE OF NET FIXED ASSETS

(Computed in Accordance with IBRD Method)

Year	Annual Fixed Investment	Cumulative Fixed Investment	Annual Depreciation at 3%	Cumulative Depreciation	Net Fixed Assets 1/	Annual Average Net Fixed Assets	Net Income at Current Rates 2/	Annual Depreciation Charges at 3%	Increment Due to Rate Increase		Total Net Income		Rate of Return on Average Fixed Assets	
									Low	High	Low	High	Low	High
1	5,250	5,250	158	158	5,092	2,546	93	158	57	114	(8)	49	(.3)	.2
2	5,580	10,830	325	483	10,347	7,720	271	325	159	318	105	264	1.4	3.4
3	4,300	15,130	454	937	14,193	12,270	468	454	296	592	310	606	2.5	4.9
4	3,070	18,200	546	1,483	16,717	15,455	966	546	410	820	830	1,240	5.4	8.0
5	1,301	19,501	585	2,068	17,433	17,075	1,198	585	473	947	1,086	1,560	6.4	9.1
6	1,292	20,793	624	2,692	18,101	17,767	1,332	624	509	1,019	1,217	1,727	6.8	9.7
7	1,289	22,082	662	3,354	18,728	18,415	1,472	662	545	1,091	1,355	1,901	7.4	10.3
8	1,264	23,346	700	4,054	19,292	19,010	1,637	700	581	1,163	1,518	2,100	8.0	11.0
9	1,262	24,608	738	4,792	19,816	19,554	1,812	738	617	1,235	1,691	2,309	8.6	11.8
10	1,251	25,859	756	5,548	20,311	20,064	2,001	756	653	1,307	1,898	2,552	9.5	12.7
11	1,240	27,099	813	6,361	20,738	20,525	2,198	813	689	1,379	2,074	2,764	10.1	13.5
12	1,229	28,328	850	7,211	21,117	20,928	2,451	850	725	1,451	2,326	3,052	11.1	14.6
13	1,218	29,546	886	8,097	21,449	21,283	2,647	886	761	1,523	2,522	3,284	11.8	15.4
14	1,206	30,752	923	9,020	21,732	21,591	2,891	923	797	1,595	2,765	3,563	12.8	16.5
15	1,194	31,946	958	9,978	21,968	21,850	3,151	958	833	1,667	3,026	3,860	13.8	17.7
16	1,182	33,128	994	10,972	22,156	22,062	3,433	994	869	1,739	3,308	4,178	15.0	18.9
17	1,170	34,298	1,029	12,001	22,297	22,227	3,730	1,029	905	1,811	3,606	4,512	16.2	20.3
18	1,157	35,455	1,064	13,065	22,390	22,344	4,045	1,064	941	1,883	3,922	4,864	17.6	21.8
19	1,144	36,599	1,098	14,163	22,436	22,413	4,383	1,098	977	1,955	4,262	5,240	19.0	23.4
20	1,131	37,730	1,132	15,295	22,435	22,436	4,746	1,132	1,013	2,027	4,627	5,641	20.6	25.1
21	1,117	38,847	1,165	16,460	22,387	22,411	5,122	1,165	1,049	2,099	5,006	6,056	22.3	27.0
22	1,102	39,949	1,198	17,658	22,291	22,339	5,523	1,198	1,085	2,171	5,410	6,496	24.2	29.1
23	1,089	41,038	1,231	18,889	22,149	22,220	5,953	1,231	1,121	2,243	5,843	6,965	26.3	31.3
24	1,073	42,111	1,263	20,152	21,959	22,054	6,408	1,263	1,157	2,315	6,302	7,460	28.6	33.8
25	1,058	43,169	1,295	21,447	21,722	21,841	6,891	1,295	1,193	2,387	6,789	7,983	31.1	36.6
26	1,043	44,212	1,326	22,773	21,439	21,581	7,405	1,326	1,229	2,459	7,308	8,538	33.9	39.6
27	1,027	45,239	1,357	24,130	21,109	21,274	7,952	1,357	1,265	2,531	7,860	9,126	36.9	42.9
28	1,011	46,250	1,388	25,518	20,732	20,921	8,527	1,388	1,301	2,603	6,440	9,742	40.3	46.6
29	994	47,244	1,417	26,935	20,309	20,521	9,138	1,417	1,337	2,675	9,058	10,396	44.1	50.7
30	977	48,221	1,447	28,382	19,839	19,839	9,793	1,447	1,373	2,747	9,719	11,093	49.0	55.9
						Average = 19,418					Average= 3,739	Average= 4,637	Average= 19.3	Average= 23.9

1/ End of Year

2/ Excluding Interest and Depreciation Charges

NET CASH FLOW - FINANCIAL RATE OF RETURN 1/

Year	Base Case Economic Net Cash Flow	(Interest Adj.)	Base Case Net Financial Cash Flow	(Low Option) Adjustment)	Low Option Flow	High Option + Adjustment	High Option Flow
1	(4984)	18	(5002)	28	(5030)	29	(4973)
2	(4893)	53	(4946)	79	(5025)	80	(4866)
3	(3082)	92	(3174)	148	(3322)	148	(3026)
4	(1098)	199	(1297)	205	(1502)	205	(1092)
5	986	219	767	237	530	237	1004
6	1114	244	870	255	615	255	1125
7	1232	270	962	273	689	273	1235
8	1408	300	1108	291	817	291	1399
9	1615	331	1284	309	975	309	1593
10	1869	365	1504	327	1177	327	1831
11	2131	400	1731	345	1386	345	2076
12	2413	438	1975	363	1612	363	2338
13	2710	480	2230	381	1849	381	2611
14	3020	523	2497	399	2098	399	2896
15	3346	569	2777	417	2360	417	3194
16	3694	618	3076	435	2641	435	3511
17	4057	670	3387	453	2934	453	3840
18	4439	725	3714	471	3243	471	4185
19	4844	785	4059	489	3570	489	4548
20	5274	848	4426	507	3919	507	4933
21	5718	914	4804	525	4279	525	5329
22	6188	983	5205	543	4662	543	5748
23	6685	1058	5627	561	5066	561	6188
24	7210	1137	6073	579	5494	579	6652
25	7762	1220	6542	597	5945	597	7139
26	8345	1310	7035	615	6420	615	7650
27	9862	1404	7558	633	6925	633	8191
28	9607	1503	8104	651	7453	651	8755
29	10289	1608	8681	669	8012	669	9350
30	11015	1722	9293	687	8606	687	9980
			FINANCIAL IRR = 12.0%		FINANCIAL IRR = 10.5%		FINANCIAL IRR = 12.4%

1/ Including interest as a cost.

3. Analysis of INDE's Financial Statements

INDE's comparative Balance Sheets, Income Statements and Statements of Changes in Financial Position for the years ending December 31, 1973 through 1976, along with certain financial indicators shown in the lower margin of the Balance Sheets and Income Statements are shown in Annex K, Exhibits 8, 9, 10 and 11. All financial information was extracted from statements on which unqualified opinions were given by external auditors.

The Financial Statements reflect growth in total assets of 230% ($76.3 million in 1973 to $175.4 million in 1976) and an increase in net income of 196% ($1.3 million in 1973 to $2.5 million in 1976).

In 1975 the historical growth of net income was reversed, falling from $2.0 million in 1974 to $28,600 in 1975. The 1975 drop in net income was primarily due to the increase in petroleum prices combined with general inflation. Profitability recovered in 1976 as a result of rate increases to INDE's customers.

Financial indicators shown on the Balance Sheets reflect an excellent current position. Current ratios of 1.68:1.00; 1.85:1.00; 2.35:1.00; and 2.0:1.00 in 1973, 1974 1975 and 1976 respectively, combined with debt equity rations of 0.6:1.0 in 1973; 0.6:1.0 in 1974; 0.7:1.0 in 1975 and 0.6:1.0 in 1976 indicate a solid current position financed principally by government contributions to equity. These contributions accounted for over 54% of total available resources between 1973 and 1976.

The Table of Breakdown of INDE's Capital Account reflects an increase in Government contributions of $60.2 million over the four year period 1973-1976 which represents 71% of the total Capital Account.

Comparative Income Statements for the years 1973 and 1976 show an increase in net income of $1.2 million. This increase is attributed mostly to an increase in block sales from $8.2 million in 1973 to $20.4 million in 1976. Block sales in 1976 accounted for 91% of total KWH sold. Such sales account for 81% of dollar sales. INDE's largest block customer is the Empresa Eléctrica de Guatemala, which accounted for 92% of total block sales.

Direct Sales which have also shown an increase in volume from $1.8 million in 1973 to $4.8 million in 1976, accounted for 19% of total sales in 1976. Income from direct sales was generated through the following classes of services:

	TOTAL INCOME (in US $000's)	
Services	Amount $	Amount %
Residential	1,829.3	38.1
Commercial	833.2	17.4
Industrial	1,467.8	30.6
Public Lighting	269.3	5.6
Municipal Lighting	85.6	1.8
Government Lighting	271.2	5.6
Other	44.7	.9
Total	4,801.1	100.0

Operating costs and General and Administrative Expenses increased by $14.3 million, or 156% during the four-year period. Fuel prices increased $11.3 million and accounted for 78.8% of the total increase in costs.

The Comparative Statements of Changes in Financial Position disclose that 75.8% (41.4 million) of INDE's 1976 resources were applied to expanding services through cons-

truction and purchase of property plant and equipment, and $2.4 million (4.4%) to debt servicing. In 1976 INDE had net income of $2.5 million. It is significant to note that such income would have enabled INDE to service the principal portion of their external debt and retire bonds even if they had received no GOG assistance. The lack of GOG subsidies would, of course, have prevented any significant expansion of INDE's operations. Only a dramatic increase in rates would enable INDE to continue its growth at past levels if GOG contributions are not available in future years.

C. Economic Analysis:

1. Macro-Economic Impact

a. Rates of Return

Economic internal rates of return for the project were first calculated using the base case projections of project revenues and the high and low options projections without consideration of consumer surplus benefits. The set of assumptions for these projections are the same as those used for the financial analysis with the exception that interest on investment in generation is excluded. An additional calculation of the economic IRR was then made adding consumer surplus benefits to the base case projections. This latter calculation is considered to be the most representative estimate of the projects' economic viability. The results of these calculations are as follows:

ECONOMIC RETURNS

	Without Surplus Benefits	With Surplus Economic Benefits
Base case	13.7%	16.2%
High Option	15.0%	
Low Option	12.3%	

(see tables on the following pages).

Analysis of the sensitivity of these results to changes in several key variables demonstrated that the project would be economically sound even if the projections were somewhat optimistic. For example, an increase in projected costs of 15 percent would lower the IRR only to 12.4 percent while a 20 percent shortfall in expected benefits would lower the IRR only to 11.1 percent. In both cases, inclusion of surplus economic benefits would raise the IRR by an additional 2-3 percent.

In the above analyses, investment in generating capacity is considered a "sunk cost" with no alternative use in the short or medium term. The costs of electricity

charged to the project are thus the variable or marginal costs rather than the average costs. Although this treatment of costs is fairly standard, it would seem more appropriate in this case to include a charge for the fixed investment in generation, in view of the fact that INDE is currently investing over $350 million to double its generating capacity. Recalculation of the IRR including amortization and interest on investment in generating capacity (from line 8, page 71), yields a 10.0 percent return in the base case and 11.9 percent and 9.0 percent respectively in the high and low option cases. Adding the estimated surplus benefits yields returns of 13.5 percent, 14.5 percent, and 12.1 percent respectively for the base case and high and low options. (Cash flows on which these rates of return are based are shown in Annex M.)

b. Basis for Economic Projections

(i) Power Demand

The area to be served by the project is the poorest in the country. Within this area the villages to be newly electrified are primarily the smaller, more remote towns which contain the highest concentrations of Guatemala's poor. Furthermore the customers to be added in already electrified villages are expected to be the

NET CASH FLOW - ECONOMIC RATE OF RETURN (US$ 000)

Year	Net Sales	Cost of Sales w/o interest nor Depreciation	Cash Sources: Net Income	House Wiring Repay	Rate Increase	Consumer Deposits	Cash Less Investment	Base Case Net Economic Cash Flow	Low Option Adjustment	Low Option Flow	High Option Adj.	High Option Flow
1	149	56	93	50	85	38	5250	(4984)	28	(5012)	29	(4955)
2	455	184	271	140	238	38	5580	(4893)	79	(4972)	80	(4813)
3	835	367	468	260	444	46	4300	(3082)	148	(3230)	148	(2934)
4	1215	249	966	361	615	30	3070	(1098)	205	(1303)	205	(893)
5	1459	261	1198	367	710	12	1301	986	237	749	237	1223
6	1622	290	1332	298	764	12	1292	1114	255	859	255	1369
7	1792	320	1472	219	818	12	1289	1232	273	959	273	1505
8	1993	356	1637	151	972	12	1264	1408	291	1117	291	1699
9	2205	393	1812	127	926	12	1262	1615	309	1306	309	1924
10	2434	433	2001	127	980	12	1251	1869	327	1542	327	2196
11	2674	476	2198	127	1034	12	1240	2131	345	1786	345	2476
12	2936	521	2415	127	1088	12	1229	2413	363	2050	363	2776
13	3217	570	2647	127	1142	12	1218	2710	381	2329	381	3091
14	3512	621	2891	127	1196	12	1206	3020	399	2621	399	3419
15	3827	676	3151	127	1250	12	1194	3346	417	2929	417	3763
16	4168	735	3433	127	1304	12	1182	3694	435	3259	435	4129
17	4526	796	3730	127	1358	12	1170	4057	453	3604	453	4510
18	4907	862	4045	127	1412	12	1157	4439	471	3968	471	4910
19	5315	932	4383	127	1466	12	1144	4844	489	4355	489	5333
20	5753	1007	4746	127	1520	12	1131	5274	507	4767	507	5781
21	6207	1085	5122	127	157[illegible]	12	1117	5718	525	5193	525	6243
22	6692	1169	5523	127	1628	12	1102	6188	543	5645	543	6731
23	7210	1257	5953	127	1682	12	1089	6685	561	6124	561	7246
24	7759	1351	6408	127	1736	12	1073	7210	579	6631	579	7789
25	8342	1451	6891	127	1790	12	1058	7762	579	7165	597	8359
26	8961	1556	7405	127	1844	12	1043	8345	615	7730	615	8960
27	9620	1668	7952	127	1898	12	1027	8962	633	8329	633	9595
28	10313	1786	8527	127	1952	12	1011	9607	651	8956	651	10258
29	11049	1911	9138	127	2006	12	994	10289	669	9620	669	10958
30	11838	2045	9793	127	2060	12	977	11015	687	10328	687	11702
								ECONOMIC IRR = 13.7%		ECONOMIC IRR = 12.3%		ECONOMIC IRR=15.0%

ECONOMIC RATE OF RETURN ADJUSTING BASE CASE
ECONOMIC 1/
NET CASH FLOW FOR SURPLUS BENEFITS

Year	(1) Residential Commercial Industrial	(2) x .25	(3) Base Case Economic Net Cash Flow	(4) Adjusted Net Cash Flow
1	152	38	(4984)	(4946)
2	456	114	(4893)	(4779)
3	815	204	(3082)	(2878)
4	1168	292	(1098)	(806)
5	1397	349	986	1335
6	1553	388	1114	1502
7	1718	430	1232	1662
8	1913	478	1408	1886
9	2120	530	1615	2145
10	2344	586	1869	2455
11	2580	645	2131	2776
12	2837	709	2413	3122
13	3114	779	2710	3489
14	3405	851	3020	3871
15	3718	930	3346	4276
16	4056	1014	3694	4708
17	4411	1103	4057	5160
18	4791	1198	4439	5637
19	5198	1300	4844	6144
20	5636	1409	5274	6683
21	6090	1523	5718	7241
22	6577	1644	6188	7832
23	7095	1774	6685	8459
24	7646	1912	7210	9122
25	8233	2058	7762	9820
26	8856	2214	8345	10,559
27	9518	2380	8962	11,342
28	10217	2554	9607	12,161
29	10959	2740	10289	13,029
30	11757	2939	11015	13,954

IRR = 16.2%

1/ Without interest Cost

poorer segments of these population centers which have not been able to afford electricity under INDE's current tariff structure. The projections of power demand used in the financial and economic projections are thus based on a predominance of low income consumers. The following table provides a comparison of demand assumptions used for the project with actual INDE experience on a nationwide basis:

Selected Comparisons: Project with INDE Actual Direct Sales for 1976

	National Averages	Project Area Assumptions
- Monthly per household consumption 1/	440 KWH	200 KW
- Rate of Increase of Average Household Domestic Consumption	23%	3.2%-4.5%
- Commercial sector as percent of connections and consumption	10% & 18%	5% & 12%
- Industrial sector as percent of total consumption	36%	1-1½%
- Government and Municipal sector as percent of total consumption	11%	1-2%
- Public Lighting as percent of total consumption	9%	4-8%

1/ A selective review of per household consumption in aldeas similar to those in project area indicated a monthly average of 230 KWH.

These assumptions essentially reflect a view of slowly improving economic conditions in the region, and moderately increasing commercial and industrial activity starting from a very low base. They are considered conservative in view of the stated intentions of the international lending institutions and the GOG of assigning higher priority to the social and economic development of the area. For instance, the Master Plan for National Electrification prepared by personnel from INDE and a technical assistance team provided by the Federal Republic of Germany in 1974-1976 was far more optimistic about the region's future growth. The general magnitude of these projections were similar to the ones used by the IBRD in its AGUACAPA appraisal study. Electricity consumption for the nation as a whole is projected to increase at a rate of about 11-12% p.a. through the balance of the century. For the 15 Departments in the project region, the Master Plan projects a growth in demand of about 18% p.a. ranging from about 14% in Zacapa and El Progreso to about 30% in Alta Verapaz and Huehuetenango.1/

(ii) Factors That May Increase Power Demand

The implicit assumption underlying the projections is that public policy to improve economic conditions in the project area will be moderately successful, but will not result in any major increases in industrial and commercial activities. This outlook is more likely a short-run situation. The following plans and policies may significantly improve the longer run situation to the extent they are implemented and successful.

- The National Industrial Development Plan 1976-1979 states that industrial decentralization is one of the plan's fundamental strategies.

1/ Pgs. 4-50 to 4-59 of SYNOPSIS, Master Plan for National Electrification

- The Draft Law for Industrial Decentralization Incentives declares as a national necessity and priority the establishment of industrial enterprises outside of the Department of Guatemala.

- The Decree of June 22, 1976 established a commission to plan industrial projects in Chimaltenango and Baja Verapaz, departments that were severely affected by the earthquake. Industrial parks are now being planned for these two Departments and also for Quezaltenango.

In studies conducted by the National Economic Planning Council (CNPE) of conditions in Baja Verapaz and Chimaltenango, the lack of industrial activity was evident. In Baja Verapaz, with an economically active population of 34,638 (in 1975), nine "industrial" firms employed 63 persons. Eight of the firms were producers of cinamon and the other of flower pots. In contrast, there were 109 artesan shops employing 3,053 persons.

Chimaltenango had 19 industrial establishments in 1976 including food processing, textiles, non-metalic minerals and wood-working. They employed 816 persons of a total labor force of 56,951. An additional 2,381 artisan shops employed 6683.

These figures demonstrate both the minimal amount of industrial activity and the substantial number of artisan enterprises presently in these departments.

The program developed for Baja Verapaz includes, the construction of an industrial park, and road and telecommunications improvement, totalling $4.1 million, plus $9.1 in industrial investments. The industries proposed are all food-processing plants for tomatoes, oranges, chile and garlic and are expected to generate 1,516 new jobs in industry and 2,168 others indirectly.

The infrastructure investments programmed for Chimaltenango total $12.1 million, and industrial investments $7.5 million. Direct employment in the new enterprises is projected to be 889, with an additional 1,271 induced employment. The range of new industries proposed includes food processing, wood-products, paper, non-metallic minerals and metal-mechanics.

The Corporación Financiera Nacional (CORFINA) has identified 60 new projects totalling about $50 million,1/ earmarked for rural areas. It has requested a $21 million budget appropriation to finance these projects. Additional financing totalling $34 million for industrial development will be sought from the IDB and IBRD.

Irrigation is another potential use of electric power. A number of diesel powered irrigation systems are located near Aguacatán, Santiago, and along the banks of Lake Atitlán. Also a number of gravity systems exist, which indicate opportunities for using electric pumps. The AID financed pilot project to put 5,000 hectares into irrigated agriculture in 4 years will emphasize gravity systems simply because electricity is not available in most of the areas to be irrigated. The project will extend the areas serviced and make it possible to provide electricity for electric pumps to perhaps 10% of the irrigation systems - 500 hectares.

The USAID financed Small Farm Marketing Project will expand the marketing infrastructure for buying, assembling, storing, grading, sorting, washing, producing and selling of fruits and vegetables. Cooling plants, cold storage, and many types of electrically operated machinery and equipment will represent a significant consumption of electricity.

1/ A pulp plant and cement plant are also being considered but are not included in the $50 million in programmed investments.

The potential additional demand for electricity described above for industrial and agricultural uses that possibly would be served by the project were not considered in the projections of demand. They are treated here as a reserve that provides additional assurance that the projected demand estimates will be realized.

c. Surplus Economic Benefits

The project economic benefits consist of two types - the direct benefits as measured by the net revenues received by INDE, and additional benefits, external to INDE, received by the consumers of electricity, referred to as "surplus" benefits.

There are two broad classes of consumers: domestic and productive. For both classes, surplus benefits are of three types:

- the reduced cost of the electrical energy, compared with alternative energy sources for providing the same service (producing light, powering machinery, pumping water, etc.);

- the excess of the value to the consumer of an incremental increase in the service over its incremental cost; and

- the additional value placed on the higher quality, availability, and dependability of the service.

These benefits are in excess of the direct benefits, i.e. the amounts paid for electricity.

The productive users' surplus benefits are much more conducive to measurement than those of domestic consumers. Essentially, the benefit to the productive user is equivalent to the change in profits when electrical energy is

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substituted for its alternative (diesel generation, for example). In cases where an economic activity cannot take place at all without electrical energy, the total net profit of that enterprise is a surplus benefit. For example, the retail sale of frozen foodstuffs, is such a case.

(i) Domestic Consumer Surplus Benefits

The first of the three considerations entering into the estimate of domestic surplus benefits is the possible monetary savings resulting from the reduced cost of using electricity as compared with the alternative power sources previously used. The cost comparisons include the ammortized cost of connection and appliances used, as well as the power cost.

Typically, in newly electrified rural communities, the first uses to which electricity are put are electric lights (essentially all households with electricity) and an electric iron (perhaps 50%) followed by a group including electric radios and refrigerators, (20% to 40%) and finally by electric powered sewing machines and stoves (less than 10%). In poor communities, only about one-fifth of the households would have more than lights and an electric iron.

It has not been firmly established that converting to electricity saves domestic consumers money. The evidence seems to demonstrate that households connect to electricity primarily for non-monetary benefits. This was confirmed in a survey conducted in the Honduran village of Nacaome1/ in which respondents stated they wanted electric power because of its convenience, quality, reliability and continual availability. In no case did they mention cost. The

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1/ This survey was conducted for the Aguan Valley Rural Electrification Project PRP.

relatively low weight given to expected cost savings was also documented in an AID sponsored study of several communities in Costa Rica and Brazil.1/

The quantification of these surplus benefits involves placing a value on these qualitative improvements. A measure of this benefit is what the consumer would be willing to pay, over and above what INDE will charge for its service.

An indication of this differential is the higher rates that consumers actually have paid in various areas of the country served by municipal or private systems.

The most recently made comparison of rates was for the year 1970, comparing INDE's rates with those of various municipalities.2/ (See Table on following page.)

For each consumption level, households in areas served by municipalities paid from 58% to 270% more than households serviced directly by INDE. What these figures indicate is that consumers were willing to pay considerably higher rates than those charged by INDE. The rates shown are at least what they were willing to pay. The presumption is that many would be willing to pay even higher rates.

1/ Rural Electrification, An Evaluation of Effects on Economic and Social Change in Costa Rica and Brazil. Institute for Food and Agricultural Sciences, University of Florida at Gainesville.

2/ Informe del INDE a la IX Asamblea Nacional de Municipalidades Celebrado en la Ciudad de Huehuetenango del 2 al 5 de diciembre de 1970. December 2, 1970. INDE.

RATIO OF PRICES OF SELECTED MUNICIPAL DISTRIBUTION SYSTEMS TO INDE'S DIRECT SALES PRICES, 1970

	Consumption in KWH per month					
	10	20	40	60	80	100
COMPANIES	Price Ratios					
INDE	100	100	100	100	100	100
Empresa Servicios del Sur (Tiquisate)	198	106	103	113	118	141
Retalhuleu	370	199	120	115	120	121
San José	296	159	158	174	179	226
Sanarate	124	149	146	160	173	229
San Lucas Tolimán	124	116	117	128	138	
Malacatán	100	119	117	128	139	
Joyabaj	154	123	105	109	111	
Unweighted Average	183	134	121	128	135	163

Lacking specific studies as to what the price differerential might be for conumers served by the project, it is probable that at least some of those willing to take the minimum service would balk at prices higher than those INDE will charge. On the other hand, the above table shows that the widest range of prices and the highest unweighted average of price occurs among those using 10 KWH per month or less.

A third element of the consumer surplus estimate is "the excess of the value to the consumer of an incremental increase in the service over its incremental cost". An example of this would be initially replacing one kerosene lamp with one 25 watt light bulb used 3 hours a night as an equivalent. Subsequently, as a result of the higher value placed on the light bulb, a service might be extended to 5 hours per night, the wattage of the bulb might be increased to 50, and/or additional bulbs might be used. The additional service would be valued by the consumer more than the price paid to INDE. This surplus should be added to that associated with a simple substitution of one source of power for another at the same level of demand.

An estimate of domestic consumer's surplus amounting to about 100% of the rate paid to INDE would not appear to be too high.1/ However, the dearth of data, and consistency with the conservative approach taken in this evaluation suggest the use of a lower value.

(ii) Productive Consumer's Surplus Benefits

The productive uses of electricity will cover a wide range of activities, including such home

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1/ This was the estimate for a group of rural villages in El Salvador in an unpublished report prepared by the World Bank. The Title is Costs and Benefits of Rural Electrification - a case study in El Salvador. Central Projects Staff Public Utilities Department. The study is an internal document, not for distribution.

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industries as corn grinding, weaving and other cottage industries; a diversity of small services, processors and manufacturers; the larger industries; privately and publically owned water pumps for potable and sanitary systems; pumps for irrigation and machinery for other farm uses.

To estimate the change in profits that would result from switching from an alternative power source to electricity requires a survey of a representative range of productive users. In a study done in El Salvador,1/ it was estimated that surplus benefits for small productive users amounted to about 93% of electricity charges and to about 31% for large productive users. The average for farm and agro-industrial consumers was estimated to be 162% of electricity charges not taking into consideration qualitative benefits.

Although costs vary from country to country, the basic relationships underlying these estimates for El Salvador are assumed to be similar to those in neighboring Guatemala, and the results should be roughly similar.

(iii) Quantification of Surplus Benefits

A value of 25% was selected to represent surplus benefits for both domestic and productive users. This value is not an estimate of actual value - it is, rather, an estimate of minimum value based on the limited data at hand, experience in other countries, and judgement. As such, it is a valid addition to project benefits. In effect, it is stated that the direct benefits of the project (INDE's net revenues) only partially account for the project's economic benefits which should be increased substantially (possibly by

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1/ World Bank, Ibid.

as much as 60-100%) by taking into account the quantitative and qualitative aspects of consumers' surplus.

d. Methodological Note

The aggregate benefits of this rural electrification project are the sum of revenues to INDE (direct benefits) and consumers' surplus benefits. The revenues are based directly on accounting statements and future projections of costs, prices and demand. An estimate of surplus benefits is dependent on sample studies of each use of electricity and its substitutes to determine the average surplus for each category of consumer calculated as a percentage of their electricity bills. As noted above, findings from studies made in other countries were used in arriving at these calculations.

If there are no distortions in the pricing system, the use of market prices is acceptable in the economic analysis. If market prices are not considered to be an accurate measure of real costs,1/ "accounting" or "shadow prices" reflecting these real costs should be used. The evaluation of possible distortions in the pricing system with respect to this rural electrification project, is concerned primarily with foreign exchange, unskilled labor, capital (the interest rate) and scarcity of credit.

Foreign exchange earnings have been high for several years. There has been no fundamental disequilibrium in the balance of payments or unusually heavy protection. In fact, duties have recently been reduced on some major import items, including automobiles. Thus, no shadow price adjustment is deemed necessary.

1/ The real economic cost of a factor of production is its marginal opportunity cost - the loss in output, in the present marginal use of the input that would result if the marginal unit of the factor of production were transferred to the project.

Unskilled labor costs will amount to about 5 percent of investment costs. Whereas theoretically the excess of market wages over shadow wages should be deducted from the cost stream, the effect on the IRR calculations would not be significant.

Similarly for other prices it was judged that the use of market prices would not introduce significant distortions into the analysis of economic benefits.

2. Micro-Economic Impact

a. Target Group Benefits

The beneficiaries of this project are the low income families living in the Western and Central Highlands and Eastern Lowlands of Guatemala. The project will provide electrical services to approximately 75,000 consumers. Of these, it is estimated that 71,000 or 95% are residences and 4,000 or 5% are commercial establishments. Of the 71,000 residential users, it is estimated that 5,000 residences are the work place for artisans, as well as family living space.

Approximately 29,000 of the new users live in towns that are electrified but, because of the previous INDE requirement of customer contributions to the cost of construction, are not at present receiving electrical services. Another 46,500 users live in areas that are not yet electrified.

Of the 46,500 new connections proposed for towns which have never had electricity, over 8,500 will be in towns of fewer than 500 inhabitants. An additional 17,000 will be in towns of less than 1,000 inhabitants. Therefore, more than half of all new connections in villages without electricity will be made in villages of 1,000 people or less. In addition, in the already electrified villages, more than 6,300

connections will be made in towns of fewer than 1,000 people. Thus, a total of 40% of all connections in this project will be in villages of less than 1,000 people.

The project involves a substantial redirection of GOG resources towards the target group. Over the past five years INDE has hooked up an average of about 7,500 new direct customers per year countrywide. Almost all of these customers are higher income rural residents. As a result of the project, INDE will: adopt new operational policies which will eliminate the present financial barriers to serving the target group; hook-up an estimated 75,000 new consumers, the large majority of which will be target group members; and develop the financial and operational base for reaching a continued high level of target group families after the end of the project.

While the precise number of target group members among the households and businesses to be hooked up is hard to estimate, they will probably account for about 80% of the population due to their predominance in the geographic areas where the project will operate.

There are several factors that provide assurances that the project resources will primarily serve the target group. First, the richest towns in the area already have their own municipal systems. Second, the higher income residents of areas where INDE provides service are already hooked up. Third, the criterion for determining the towns which will be electrified will be investment cost per customer rather than maximization of sales. This criterion helps to avoid undue bias in favor of serving richer areas. Fourth, while economic and practical considerations preclude an approach that would focus exclusively on the poorest of the poor, regardless of where they live, the geographic concentration of project investments in the

poorest rural areas ensures that most of the beneficiaries will be part of the AID target group. Although townsfolk on the average have higher incomes than residents of isolated villages, the majority of small town dwellers form part of the target group. A common pattern in these areas is for families to live together, but depend on their surrounding agricultural plots for their livelihood. As distribution lines are brought in to serve larger towns, it also becomes more feasible to serve smaller, nearby villages. As these villages are electrified, it becomes more feasible to extend service even farther into the hinterland, thereby benefitting additional target group members.

b. Intangible Benefits and Impact on Women

There are benefits which arise from electrification which improve the quality of life of the rural poor and contribute to a heightened perception that living standards have improved, but which do not lend themselves well to quantification. These benefits occur at both the household and community levels within the target group.

At the household level, electricity will lengthen the time available for productive work. Because cultural mores require that Indian women spend the major portion of their daylight hours on such tasks as food preparation and child care, they have little time for income-producing activities such as weaving and other handicrafts. With electricity, women will be able to weave in the evenings with reduced eye strain. Weavers report[1/] that an embroidered blouse (hüipil) valued at $25 or $30, requires between three to six weeks to complete. With electric lighting, production time will be reduced and, by extension, household incomes

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1/ Information supplied by Dr. James Converse, Department of Rural Sociology, Cornell University, based on personal interviews.

increased. Electric irons will decrease the drudgery of rural women. Electrically powered corn grinders, which are likely to be installed in the community, can save women as much as three hours a day in labor time. Radios will add a source of entertainment, news, and education, and children will be able to study their lessons at night.

At the community level, electricity will make a contribution to improved health of the target group by making feasible low-cost pumping of potable water, refrigeration of medicines and certain foods, and sterilization of medical instruments in health posts. Adult education courses can be offered in the evenings, thereby affording people education without the cost and separation from family involved in attending schools in urban areas.

The decreasing demand for charcoal due to the introduction of electric irons will lead to less cutting of scarce trees, which will save an economic resource for future, profitable exploitation, as well as help reduce erosion. Street lighting will contribute to the safety of residents. Electricity will facilitate the organization of recreation, entertainment, and civic and religious activities after dark.

The target group will also benefit from the opening of new employment possibilities; especially general store operators. In electrified towns, a large number of these stores are run by women, and there is no reason to assume that the pattern will not be the same in the villages affected by this project. The same result can be predicted for the tailor and seamstress occupations. Economically, therefore, women will benefit from these new employment opportunities. Perhaps the greatest potential impact on women of this project depends on the hypothesis that birth rates will decline with the introduction of electricity because of increased employment opportunities that are created.

In summary, target group members will benefit from this project by adopting electricity for productive uses. The Village Electricity Utilization Study showed that 15% of low income users claim to use electricity in their work. The non-user responses indicate that target group members recognize the potential for applying electricity to work uses. This high rate of adoption for productive purposes by the target group (compared to productive uses found in evaluations of rural electrification projects elsewhere in Latin America) may be partially explained by the high level of artisan activity and cottage industries found among Guatemalan's poor rural residents.

D. Social Analysis

1. Target Group Description

A description of the socio-economic characteristics of the target group to be served by this project is found in Annex L.

2. Socio - Cultural Feasibility

USAID/Guatemala and INDE designed and conducted a survey in April, 1977, to obtain data on the demand for and anticipated benefits of rural electricity. In addition, a social anthropologist conducted a series of field visits to complement the survey data. The survey was conducted over a two-week period in 378 households in 22 randomly selected rural villages in the Western and Central Highlands and the Eastern part of the country.

The seven villages surveyed in the Eastern part of Guatemala had populations which were virtually all Ladino (non-Indian). Of these, only three were not at least partially electrified. Of the 15 villages surveyed in the Western and Central Highlands, five, which had almost exclusively indigenous populations, were without electricity. Five other villages with majority indigenous populations had 30% or less of their households electrified. (See Table on next page.) These ten highland villages had an average population of 1,300, a size large enough to permit the delivery of electrical services with reasonable efficiency.

The survey defined households of low income as those with annual incomes of less than $800. The average family income among these low-income electricity users was $400; among non-users, approximately $340.

Neither the survey nor the field visits identified social or cultural mores which precluded the use of electricity among the indigenous population groups.

TABLE OF VILLAGES SURVEYED

Village	Department	Population *	Percent of Population which is Indigenous	Per cent Electrified
San Juan Ixcoy	Huehuetenango	982	87	27.8
Soloma	Huehuetenango	2,116	58	47.6
San Marcos Huista	Huehuetenango	1,935	100	0.0
Tzisbaj	Huehuetenango	1,017	100	0.0
Nahualá	Sololá	1,742	99	22.1
Chirijox	Sololá	831	100	0.0
Los Encuentros	Sololá	1,935	99	0.0
Sacapulas	El Quiché	1,439	65	49.7
Cunén	El Quiché	1,369	68	30.7
Uspantán	El Quiché	1,898	54	-**-
Chicamán	El Quiché	1,069	3.6	0.0
Chisón	Alta Verapaz	500	99	0.0
Tactic	Alta Verapaz	2,260	62	61.6
Tamahú	Alta Verapaz	633	73	40.6
Senahú	Alta Verapaz	1,444	69	- + -
Pasaco	Jutiapa	1,364	0	52.4
Conguaco	Jutiapa	723	0	37.0
El Salamar	Jutiapa	473	0	0.0
San José Mogollón	Escuintla	743	3.2	0.0
Nueva Concepción	Escuintla	6,115	2.5	45.5
Sanarate	El Progreso	5,228	32	74.8
San Antonio La Paz	El Progreso	923	0	0.0

* 1973 Population Census.

** Municipal Plant of 37 KW capacity.

\+ Municipal plant of 32 KW capacity. Percentage electrified unknown but presumed to be minimal in view of low generating capacity.

3. Demand for Electricity

a. Survey Results

More than 95 percent of the families interviewed expressed a strong desire for electrical services. Survey interviewers felt that even more wanted electricity, but that a few families feared that a positive expression of interest would mean an on-the-spot commitment to pay some unknown charge. In addition, those who expressed a desire for electricity indicated a willingness and ability to pay for monthly service charges. Moreover, low-income families who did have electricity indicated that they had no difficulty in meeting monthly payments.

An important conclusion of the survey was that the major constraint to effective demand among all non-users surveyed was the existence of heavy installation costs. Under current INDE practices, these "front-end" or "hook-up" charges must be paid by the consumer before service can begin. The elimination of this bottleneck under the project and thereafter will greatly increase the effective demand for electricity among AID's target group.

b. Observed Uses of Electricity

Survey respondents were asked about intended or actual uses of electricity. Although there were some differences exhibited between actual uses and desired uses, the overall consistency was quite high. The three most frequently cited uses of electricity were: (1) lighting; (2) household appliances (principally radios and irons); and (3) work related uses. Other general uses of electricity included recreation, refrigeration, security and hygiene. The table on the next page shows the comparison between the actual use made of electricity by low income families in the survey with the desired use of electricity by low income families without electrical power.

USES OF ELECTRICITY

Use Category	Frequency Among Users	Frequency Among Non-users
Lighting	126	163
Household Appliance	92	127
Work	21	36
Recreation	40	15
Refrigeration	11	20
Hygiene	0	9
Security	6	2

Approximately 48% of the survey questionnaires were reviewed to ascertain the types of work applications mentioned by respondents. Thirty-eight of the 183 questionnaires which were reviewed mentioned work applications.

LIST OF WORK APPLICATIONS AMONG USERS AND NON-USERS OF ELECTRICITY

(From Village Electricity Utilization Survey)

Weaving (6)
Operation of Dental-Medical Devices (1)
Sewing (3)
Carpentry (4)
Radio Repair (2)
Store (Tienda) (7)
Blacksmith (1)
Gasoline Station - Cage (1)
Bar (Cantina) (1)
Corn Mill (2)
Unspecified 1/ (10)

Total (38)

1/ General responses as : "to work", or "to work at night". (Trabajos Nocturnos).

c. Profile of Users and Non-Users

On-site field observations by the social anthropologist in the Western Highlands revealed that existing INDE services do not reach many of AID's target group.1/ Currently, electricity is being provided in most instances to those towns and villages which are nearest to major transportation and communication routes. In these towns, the typical patterns is for the electric service to exist in the town center which corresponds to the neighborhoods generally inhabited by higher income Ladino families and Transitional Indians. Outlying neighborhoods and adjacent villages, areas inhabited almost exclusively by Indian peasants, are generally without service.

The survey and field visits confirmed that users generally enjoy a better standard of living. Their sources of income are varied, ranging from practicing a profession, operating a modest scale commercial or service enterprise, or owning a medium sized farm with a strong market orientation. For non-users, major sources of income are day labor wages, the output from their small farms, and revenue generated by the manufacture and sale of handicrafts.2/

Concerning income generation and recreation activities, the contrast between electrified and non-electrified communities is dramatic. From the survey it was noted that villages with extensive electrification had a more varied set of occupations. Villages with more than 40% of houses electrified showed an average of 10 occupations among heads of households interviewed, those with less than 40% elec-

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1/ See Annex L for description of characteristics of target sub-groups.

2/ For an additional description of users and non-users see USAID/Guatemala's Interim Report, pp. 28-31, June, 1977.

trified showed an average of only 7 occupations. In villages without electricity less than four occupations were noted, on the average.

The survey results were supported by the findings of the social anthropologist that the range of employment opportunities was considerably wider in villages with electrical services; in large degree as a direct result of electrical power. For example, new jobs have been created in such fields as repair of electrical appliances, wire installation service, and ice making. Working conditions have been improved for tailors and dress makers and auto mechanics. Saw mill operators and corn and coffee mill owners claim that their businesses are more profitable because of the use of electrically operated machines and the ability to work after dusk. In a similar manner, managers of plaza kiosks, local general stores, and restaurant owners state that business has improved because they can now provide service afterdark. Store and restaurant owners also report that electrically operated refrigerators enable them to preserve perishable foodstuffs for much longer periods of time. In non-electrified villages such conditions and supplementary employment opportunities do not exist.

In summary, the on-site field observations and the Village Electricity Utilization Survey have shown initial indications that there are observable differences in the quality of life of users and non-users of electricity. However, it has not been possible to attribute a cause-and-effect relationship between the presence of electricity and indicators of economic, educational, or health status.

4. Target Group Demand Constraints and Affordability of Electric Services

The ability of low-income rural families to afford electrical services depends upon two factors: the initial installation costs; and the recurring monthly cost for services.

a. Prepayable Costs to Obtain Electricity

At present anyone wishing to obtain electrical services from INDE must pay the following costs in advance:

(1) A cash contribution to cover all or part of the costs of the lines, transformers, service drop and meter required to serve the house;

(2) The cost of internal house wiring; and

(3) A deposit totaling no less than the estimated amount of the electric service bill for two months.

The construction contribution charge is the most significant of the three charges. INDE's regulations require the payment of amounts ranging from 30 dollars for only the meter and service drop to thousands of dollars if primary distribution lines, transformers, and secondary lines are required in addition to the meter and service drop. Minimal house wiring costs an average of $20. Finally, a deposit equivalent to no less than two months' bills is required which amounts to approximately $2.00 for the target group households.

The majority of low income, non-users surveyed indicated that they cannot afford to pay such a large hook-up fee in one installment. Confirming data from INDE reveals that eleven out of twelve (or 92%) applications for service are subsequently withdrawn once installation charges are known.

b. Affordability

The survey disclosed that low income families who have electricity are currently paying an average of $3.23 per month, 1/ and are having no difficulty in meeting this obligation. The families that do not have electricity indicated in the survey that they could pay an average of $2.00 per month for the service.

As indicated in the Table on the next page, minimum charges for families who will receive electricity under the loan have been tentatively estimated at three levels using rate increases ranging from a low of 50¢ to a maximum of $1.00 over and above the basic charge. These increases are sufficient to amortize the full cost of INDE's investment in the distribution system over a period of 20 to 30 years, depending on the level of increase, e.g. a 50¢ rate increase will amortize the average investment per customer of $157 over approximately 25 years. This minimum charge will provide 12 KWH.

1/ Average charges were calculated by examining a respondent's most recent electric bill receipt. It is possible that more than one month's cost was inadvertently included for some respondents and that the average is somewhat less than this figure.

An average bill has also been figured utilizing the 3 levels of rate increases. As the reader can see, minimum users of electricity will be below the $2.00 they said they could pay, including housewiring, if rate increases do not surpass 50¢. Minimum bills will be 10¢ above the $2.00 maximum if a 75¢ rate increase is imposed and 44¢ above with a $1.00 increase which is very unlikely. Of course, all bills will be reduced by 44¢ per month after the four years when the housewiring has been fully paid for. (See Tables on the following pages.)

While it is evident that the target group families could afford the basic monthly charge, the major constraint to demand for electricity is the INDE requirement that the consumer contribute a sizeable percentage (20-80%) of the cost of construction of the line, poles, and transformer involved in taking the electricity from the nearest secondary distribution line to the dwelling.

INDE has agreed to eliminate the front-end construction charge and instead establish a nation-wide, minimum standard rate which will amortize most of the front-end costs for continuing expansion of the distribution system.

Table of Estimated User Charges Under AID Project Using Three Possible Rates Increases of Low, Medium, and High

I. Minimum Monthly Bill (12 KWH)

	Low	Medium	High
Basic Charge (12 KWH)	$1.00	$1.00	$1.00
Rate Increase	.50	.75	1.00
Housewiring*	.44	.44	.44
Total	$1.94	$2.19	$2.44

II. Average Monthly Bill (17 KWH)

	Low	Medium	High
Basic Charge (12 KWH)	$1.00	$1.00	$1.00
Additional Consumption of 5 KWH at .07 KWH	.35	.35	.35
Rate Increase	.50	.75	1.00
Housewiring*	.44	.44	.44
Total	$2.29	$2.54	$2.79

* Is dropped from monthly bill after 4 years

Without Housewiring, After 4 Years

I. Minimum Monthly Bill (12 KWH)

	Low	Medium	High
Basic Charge (12 KWH)	$1.00	$1.00	$1.00
Rate Increase	50	.75	1.00
Total	$1.50	$1.75	$2.00

II. Average Monthly Bill (17 KWH)

	Low	Medium	High
Basic Charge (12 KWH)	$1.00	$1.00	$1.00
Additional Consumption of 5 KWH (at 7¢ KWH)	.35	.35	.35
Rate Increase	.50	.75	1.00
Total	$1.85	$2.10	$2.35

The Village Electricity Utilization Survey respondents indicated that they could pay an initial lump sum connection fee of $8.00 and monthly amortization payments of $1.00 in addition to an estimated $2.00 monthly bill for electrical use. This would make a total of $3.00 per month. In no case with a rate increase of either 50¢, 75¢, or $1.00, and including housewiring, does the monthly bill, under the project, exceed this $3.00 maximum limit. The initial lump sum fee for connection proposed by the project is a $2.00 deposit on one month's bill, well below the $8.00 maximum cited by survey respondents for the connection fee. Housewiring costs remain an average of $20.00 but will be spread out over a period of 4 years and only total 44¢ per month, also affordable by the target group.

The affordability of the monthly outlay was confirmed by the survey's comparison of expenditures for electricity made by users with the expenditures for other lighting sources (mostly kerosene and candles) made by low income people without electricity. Both users and non-users were spending an average of 10%, ranging from 8 to 13%, of their annual incomes on lighting, a yearly average of $40 for users, $34 for non-users.

Consequently, the Mission has concluded that target group families can afford electricity. Although it is difficult to determine the magnitude of suppressed demand because of the high front-end charge, the Master Plan for Electricity Supply written by the German Agency for Technical Cooperation has estimated such demand to be between 20% and 25% of present consumption. In addition to assessing the suppressed demand among customers whom it would be profitable for INDE to serve, the Master Plan noted that many individual applications have been withdrawn due to the high customer contribution for construction costs required by INDE. The table below summarizes the low number of connections made as a proportion of applications received by INDE.

TABLE OF ELECTRICITY SUPPLY

ANNUAL APPLICATIONS AND CONNECTIONS

INDE - 1973/1975

YEAR	APPLICATIONS	CONNECTIONS	PERCENTAGE OF CONNECTIONS MADE
1973	7,611	610	8.0%
1974	9,600	769	8.0%
1975 *	6,605	331	5.0%

USAID's examination of annual rural connection applications confirms that at the present time about one out of 12 applications results in electric service connection. As a result, the USAID is confident that there is more than sufficient demand for the number of connections programmed under this project.

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* Only part of 1975.

Source: INDE, Department of Planning, August 1975

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V. IMPLEMENTATION

A. Project Implementation Agency

1. INDE Creation and Growth

The creation of INDE in 1959 provided the GOG with an institutional framework for undertaking nationwide electric power planning, investment and operation. At that time, Guatemala City (and its surrounding industrial base) was served by a U.S.-owned private power company, (Empresa Eléctrica), while outside the City a few privately and municipally-owned systems generated and distributed power to other selected areas of the country relying on small hydro and diesel generators. Except for the Guatemala City system, service was of poor quality and unreliable.

INDE has grown rapidly since its creation. It has invested in new generation facilities (primarily thermal plants) and has extended electric service to 14 block customers (who serve approximately 180,000 consumers in the country's urban areas) and to approximately 70,000 rural consumers (who are direct INDE customers). Total sales have increased from $1.8 million in 1966 to $25.2 million in 1976 -- a fourteen fold increase. While some of this increase is due to rate adjustments, sales in GWH increased from 79.0 to 611.0 over the same period - an eightfold increase. Key indicators of INDE's growth are shown in the table on the next page.

In order to accomodate this extraordinary growth, INDE has had to improvise. Many small systems of diverse designs and capabilities have been absorbed or joined into the national grid as block customers. New generation facilities and transmission lines have been added to keep up with the rapidly increasing demand. The national grid - a patchwork of different voltage lines serves, the more populated areas of the country. Despite the shortcomings caused by its ad hoc

INDE GROWTH INDICATORS*

Concept	Unit Measurement	1966	1967	1968	1969	1970	1971	19.2	1973	1974	1975
1. Production											
Installed Capacity 1/	MW										
Hydraulic		20.4	33.4	35.6	55.6	95.7	96.3	95.7	95.7	95.7	95.7
Thermal		14.9	15.4	28.4	28.4	28.6	32.4	66.1	65.8	67.5	67.5
Total		35.3	48.8	64.0	84.0	124.3	128.7	161.8	161.5	163.2	163.2
Gross Generation	GWH										
Hydraulic		39.4	79.8	133.3	159.2	312.6	319.8	283.6	295.9	318.6	283.1
Thermal		45.4	53.6	87.9	98.1	46.1	66.9	168.1	259.2	285.3	366.3
Total		84.8	133.4	221.2	257.3	358.7	386.7	451.7	555.1	603.9	649.4
Own Consumption	GWH	1.7	1.4	1.9	3.9	5.3	1.6	5.2	13.3	16.1	16.3
Total Net Generation	GWH	83.1	132.0	219.3	253.4	353.4	385.1	246.5	541.8	587.8	633.1
Maximum Demand	MW	25.5	35.2	50.1	57.6	81.0	90.5	101.2	116.4	123.4	142.3
Losses 2/	%	4.9	5.0	2.6	3.9	4.6	3.8	3.2	4.3	3.0	3.5
2. Sales	GWH										
Detailed Sales											
Residential		8.4	9.8	9.2	4.8	6.0	7.9	10.3	12.8	16.1	20.2
Commercial		---	---	1.7	4.8	6.4	6.8	7.6	9.4	10.7	12.3
Industrial		1.7	3.0	1.5	1.7	2.9	4.9	6.1	6.5	10.0	11.7
Governmental		---	---	---	1.2	1.5	1.5	1.7	2.4	3.2	4.4
Municipal		---	---	1.5	0.5	0.6	0.7	0.8	1.0	1.2	1.6
Public Lighting		0.4	---	---	3.0	3.5	4.0	4.4	4.9	5.3	4.8
Sub-Total	GWH	10.5	12.8	13.9	16.0	20.9	25.8	30.9	37.0	46.5	55.0
Gross Sales	GWH	68.5	112.6	199.6	227.5	316.4	344.5	401.2	481.6	523.5	556.0
Total Sales	GWH	79.0	125.4	213.5	243.5	337.3	370.3	432.1	518.6	570.0	611.0
3. Charges	Thousand Q										
Detailed		520.5	554.9	611.7	773.5	961.4	1,168.8	1,468.6	1,776.7	2,098.2	2,593.9
Gross		1,235.3	2,203.0	3,426.0	4,064.1	5,425.5	6,127.7	7,049.3	8,205.9	12,383.3	16,387.6
Total	Thousand Q	1,755.8	2,757.9	4,037.7	4,837.6	6,386.9	7,296.5	8,517.9	9,982.6	14,481.5	18,981.5
4. Average Price	¢ / KWH										
Detailed		4.96	4.34	4.40	4.83	4.60	4.53	4.75	4.80	4.51	4.72
Gross		1.80	1.96	1.72	1.79	1.71	1.78	1.76	1.70	2.37	2.95
Total	¢ / KWH	2.22	2.20	1.89	1.99	1.89	1.97	1.97	1.92	2.54	3.11
5. Combustion (used for generation)											
Diesel Consumption 3/	Thousand Barrels	164	154	279	302	135	205	337	267	202	346
Diesel Cost	Thousand Q	477.4	530.1	1,000.6	1,190.6	547.3	863.4	1,430.8	1,432.5	3,194.3	5,381.0
Bunker Consumption	Thousand Barrels	----	----	----	----	----	----	116	348	427	498
Bunker Cost	Thousand Q	----	----	----	----	----	----	275.7	899.3	4,679.7	5,879.0
6. Others											
Consumers 1/	Number	16,258	15,525	17,326	22,571	26,287	30,905	37,462	44,725	52,682	58,071
Villages Served	Number	73	84	102	108	129	224	273	320	379	416

* Taken from the 1975 Statistics Report of INDE
1/ Taken up to the 31st of December of each year
2/ 1- Sales / Net Generation
3/ Barrel = 42 gallons

problem solving approach, INDE's system is providing reasonably adequate service, except near the end of over-extended lines.

INDE's rapid growth has been financed mainly through bond issues and GOG contributions. The GOG equity in INDE now amounts to $108.5 million. In addition INDE has a total long term debt of over $53.6 million, including $35 million owed to AID, CABEI, IBRD and IDB.

2. INDE Organization and Project Implementation Responsibilities

INDE is an autonomous government corporation whose Board of Directors consists of representatives from the private sector and the Office of the Presidency. A General Manager is the chief executive officer. There are three line divisions: Administration, Technical Services, and Special Projects. Each is headed by and Assistant Manager. INDE's organization chart is shown in the Graph on the following page.

This project has been largely planned in conjunction with the Technical Services Division, which will bear the major implementation responsibility. Each of the Divisions' five Departments - Planning, Projects, Construction, Operations and Commercial - will have a role in implementing the project.

The Planning Department developed much of the data and conducted the basic analyses for the Project Paper. In implementing the project, this department will be responsible for the evaluation activities described in the Implementation Plan.

The Projects Department will prepare the Invitation for Bids and Requests for Proposals needed for procurement actions. The department is familiar with AID procedures.

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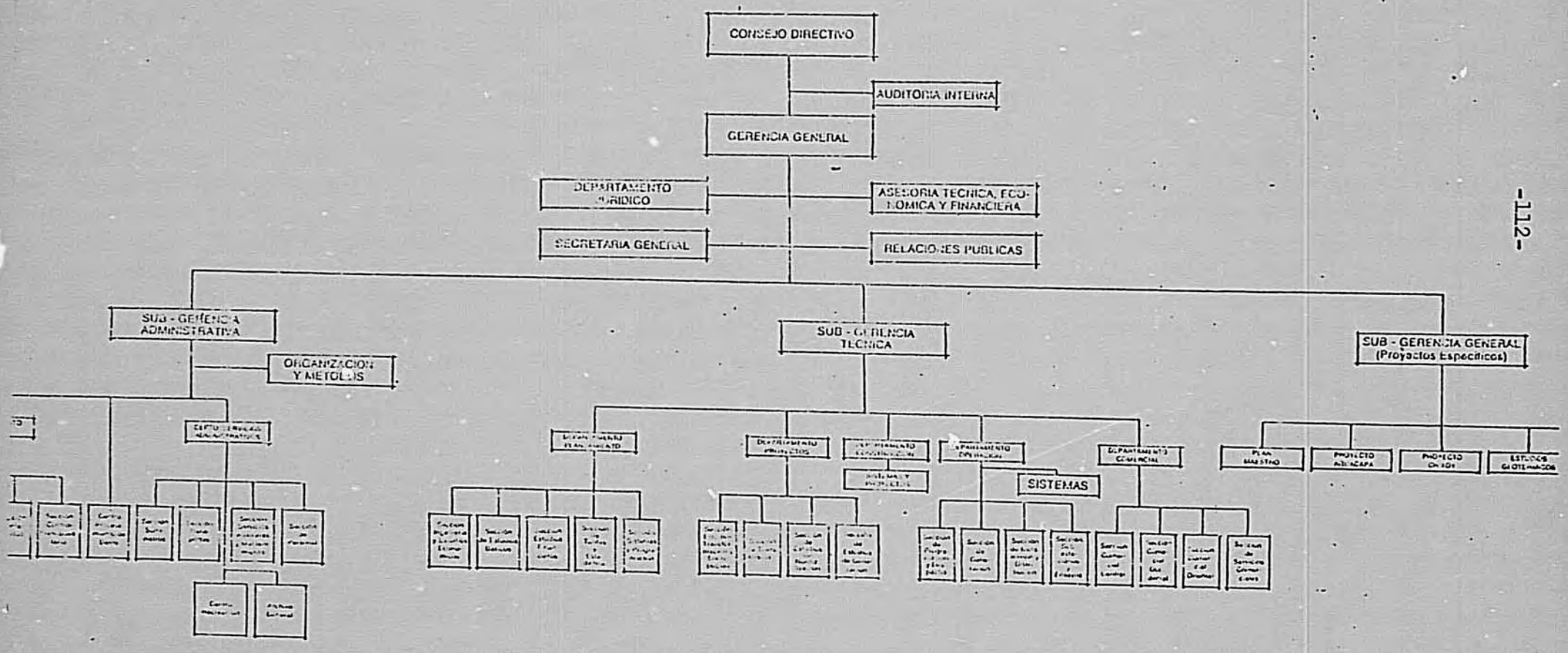
INDE ORGANIZATIONAL CHART

ORGANIGRAMA DEL INSTITUTO NACIONAL DE ELECTRIFICACION

I N D E



based on the experience in implementing AID Loan 019. Review of bids and awards will be carried out by an inter-departmental review board.

The Construction Department will be responsible for all construction aspects of the project. Consulting engineering services will be retained for supervision of construction and certification of payments. This department has had extensive experience in force account construction, including the distribution systems built through Loan 019. The department maintains 13 warehouses throughout the country which will be adequate for storing materials during project implementation.

Service drops in already electrified towns (including short extensions of secondary distribution lines) will be carried out by the Operations Department. This department also performs minor customer service functions such as disconnects and reconnects.

The Commercial Department is responsible for consumer service functions such as consumer education, processing applications for connections, meter reading, and connect/disconnect orders. The department has 30 field offices most of which are in the target area. It will open additional offices and expand existing ones as needed to serve the consumers hooked up under the project.

This department has not carried out any promotion/consumer education activities in the recent past. Technical assistance will be provided to the department to assist in developing a promotion and consumer education campaign for the rural areas. In addition to regular functions the department will be responsible for the baseline data needed for the impact evaluation.

The Administration Division will have two roles during project implementation. First, it will prepare reimburse-

ment requests for loan disbursements and keep complete financial records for the project. Secondly, it will provide data processing services to the Commercial Department for customer billing and Planning Department for processing and computer analysis of baseline data.

3. Implementation Activities

a. Field

The Commercial Department will have first contact with the target group. Department representatives will attempt to develop "Pro-electrification committees" in each town or area to be electrified. These committees will be asked to arrange a meeting of the villagers to discuss electrification. At an agreed upon time and place department representatives will arrive and explain the uses and costs of electricity and will provide practical demonstrations of the use of electricity in household and productive activities.

Subsequently, villagers will be interviewed individually to determine if they desire the service and to collect baseline data for the impact evaluation. An application will be taken from those who wish the service. If house wiring services are desired, an agreement for repayment will be included on the application form. The potential customers will be informed of the approximate date of connection. During these site visits, Construction Department engineers will also accompany the Commercial Department representatives to answer technical questions, assess construction requirements, and identify possible candidates for short term construction jobs.

It may happen that during the site visits and canvassing INDE discovers that it is not feasible to hook up certain villages, either because not enough people want the service

or the investment cost is too high. INDE is currently figuring a maximum cost per customer of $300. If villages already identified for electrification under this project fall out, INDE will have a list prepared of other feasible villages at a slightly higher investment per customer which can be electrified under this project. The total number of connections may be reduced because of the higher average investment per customer.

b. Headquarters

After the initial site visits a determination will be made by the Construction Department on the quantifies and types of materials needed. Material delivery and construction will be scheduled for those already electrified villages where construction will be carried out through force account. Contract construction schedules will be developed by the Projects Department based on data collected through the initial site visits for those villages to be newly electrified and for the construction of substations and subtransmission lines.

Construction supervisors and field crews, both contract or force account, will carry out construction activities according to the schedules prepared at headquarters. House wiring will be accomplished according to the procedures already described in Sections III and IV. A. Service will start when the meter is installed, by which time the customer will have paid a $2 deposit which approximates a month's utility bill.

In addition to their normal duties, meter readers will deliver bills for user charges, and collect payments from the customers. INDE will analyze its billing and collection procedures during project implementation with the aid of loan financed technical assistance. Depending on the design

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of the data collection procedures adopted for the impact evaluation, the meter reader may also periodically interview target group users to collect additional data on the uses of electricity. Alternatively, special enumerators hired by INDE may be used for this purpose.

4. Overall Assessment of INDE Capacity to Carry Out the Project

INDE has sound management and in general its 6,000 employees are well trained and perform adequately. A recent analysis by the World Bank detected some areas, such as financial management, asset evaluation and rate analysis, where improvement is needed. Technical assistance is being made available in these areas as part of the Aguacapa IBRD loan for generation facilities signed this year. A subsequent analysis by an AID consultant identified additional areas in which technical assistance would help to improve INDE's overall capacity. Technical assistance will be provided by the loan in these areas to complement IBRD financed assistance and improve INDE's capacity to rapidly expand its rural electrification distribution system.

From a technical standpoint AID's Loan Project was implemented in a satisfactory and timely manner except for delays encountered in delivery of some materials beyond the control of INDE. A consultant's review of the project indicated high quality construction and maintenance. Although design standards used for substations and line construction may be excessive in some instances resulting in unjustified expenditures. Specifications for these elements of this project will be examined by consultants provided by the TA element of this project and INDE engineers before bidding documents are prepared in order to reduce standards to the extent possible consistent with sound construction practices and quality of service.

INDE is also the GOG's executing agency for implementation of the international loans which are financing the the Aguacapa and Chixoy projects. While INDE will not actually carry out construction work with its own personnel under these projects, it will be responsible for construction contracting (much of which has already been accomplished) and procurement of certain major equipment items. The World Bank and IDB have concluded that INDE has the capacity to adequately manage these functions.

B. Implementation Plan

1. Overview

The project will be implemented over a five-year period. It is anticipated that the process of negotiating, signing, and ratifying the loan agreement will take approximately one year. During this time, INDE will undertake certain pre-project activities that will facilitate initiation of field activities on completion of CP's. Procurement specifications and bidding documents for procurement of hardware will be prepared. Construction activities are expected to begin approximately 19 months after authorization and continue until shortly before the PACD.

The schedule of hookups by year and the corresponding loan and counterpart investments are given below:

Project Year	No. of Connections
1	-
2	18,975 1/
3	18,975 2/
4	22,770 3/
5	15,180 4/
Total 5 yrs.	75,900

Technical assistance will be largely provided during the first two years. Evaluation activities (see Section C)

1/ All connections in previously electrified villages.
2/ 10,425 connections in previously electrified villages and 8,550 connections in new, non-electrified villages.
3/ All connections in new, non-electrified villages.
4/ All connections in new, non-electrified villages.

will continue through the full five years of the project. A PPT which describes the sequence of activities is included at the end of this section. There are several specific implementation issues that require special treatment. These are discussed below:

2. Special Implementation Arrangements

a. Extended Terminal Date for Signing Loan Agreement

AID's experience has been that negotiation and signature of loan agreements in Guatemala takes considerably more time than the 120 days normally allowed. For instance, it has taken approximately 180 days to complete this activity for loans 027 and 029. Required is review and approval of loan agreements by five different entities within the Executive Branch. Accordingly, the Mission anticipates that the TDSL will have to be extended.

b. Extended Terminal Date for Meeting CP's.

After signature, the loan agreement must be ratified by the Guatemalan Congress. It is reviewed by several Congressional committees prior to floor debate and approval. This process typically takes 6 to 12 months. Furthermore, because there are congressional and national elections scheduled for Spring, 1978, and the Congress will be in recess from March until June, 1978, the ratification may take even longer than normal.

c. Eligibility of Contracts for Loan Financing Signed Prior to Meeting CP's for Loan Financing

In order to ensure timely implementation of the project, INDE has agreed to initiate procurement of technical assistance and engineering services as soon as possible after signing the loan agreement. In view of the

long lead time anticipated for meeting CP's to initial disbursement, INDE would like to contract for these services prior to meeting CP's. Because INDE will follow AID procurement regulations, and the Mission will monitor this process, the Mission intends to authorize reimbursement of eligible contract costs incurred prior to the TDCP.

d. INDE Project Manager

INDE has agreed to appoint a project manager. The role of the project manager would be to ensure that necessary coordination is achieved between AID and INDE's Technical Division. The Mission has included the designation of a Project Manager as a CP to loan disbursement.

3. Disbursement Procedures

AID loan funds will finance 100% of all foreign exchange costs, training, technical assistance, vehicles and equipment costs, and housewiring. Disbursements for foreign exchange costs will be made through standard Letter of Commitment procedures. Direct reimbursement methods will be used for local costs.

The Mission and INDE have discussed using the FAR disbursement method. Because of the high proportion of foreign exchange costs to be financed by the loan and the extensive use of contractors for construction, the FAR method was not considered appropriate.

4. Procurement Plan

INDE will be the action agent for all procurement under the project. Approximately 13 different procurement actions are anticipated. The goods and services needed, contracting modes, and basis for award (where relevant) are specified in the Procurement Plan on the next page. INDE is familiar with AID's procurement regulations from Loan 019. The Mission is satisfied that INDE's procurement capability and process are adequate to ensure timely provisions of project inputs.

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INDE PROCUREMENT PLAN SUMMARY - RURAL ELECTRIC DISTRIBUTION SYSTEMS

Action No.	Description of Goods and Services	Estimated Cost $000	Origin(O)/ Source(S) Codes	Contracting Mode	Award Bases	Date G&S needed	Date of Solicitation	Date of Contract	Completion Date	% Loan Financed	Loan Disbursement Procedure
1.	Offshore procurement: (1211 10 KV transformers, 75,884 electric meters and others)	2187	O-941 S-941 and HC*	IFB	Lowest price	25% - 3/79 25% - 12/79 30% - 12/80 20% - 12/81	4/78	10/78	12/81	100%	GOG Financed Letter of Credit
2.	Offshore procurement: equipment for substations	400	O-941 S-941 and HC*	IFB	Lowest price	12/79	3/78	6/78	12/79	100%	GOG Financed Letter of Credit
3.	Construction services for substations	100	O-941 and HC S-HC	IFB	Lowest price	1/80	6/79	12/79	12/81	33%	GOG Reimbursement
4.	Materials procurred locally, and construction services for lines and house wiring	8940	O-941 and HC S-HC	IFB	NA	25% - 3/79 25% - 12/79 30% - 12/80 20% - 12/81	NA	NA	9/82	33%	LC Reimbursement
5.	Vehicles	82	O-000 S-941 and HC*	IFB	Lowest price	4/79	3/78	6/78	4/79	100%	GOG Financed Letter of Credit
6.	Equipment	268	O-941 S-941 and HC*	IFB	Lowest price	4/79	3/78	6/78	4/79	100%	GOG Financed Letter of Credit
7.	Design of consumer education program	80	O/S-941 and HC	RFP	Neg. price	7/78	3/78	6/78	9/78	100%	GOG Financed Letter of credit
8.	TA in improved billing and collection system	80	O/S-941 and HC	RFP	Neg. price	1/79	4/78	10/78	4/78	100%	AID Financed Letter of Credit
9.	TA in various aspects of utility planning and management	190	O/S-941	RFP	Neg. price	1/79	4/78	10/78	10/79	100%	AID Financed Letter of Credit
10.	Engineering Consultant Services	400	O/S-HC	RFP	Neg. price	4/79	4/78	10/78	9/82	100%	LC Reimbursement
11.	Impact Evaluation Study	30	O/S-941	RFP	Neg. price	6/82	9/81	3/82	12/82	100%	LC Reimbursement
	Non-Contract Procurement:										
12.	Training	100	O/S-941 and HC	NA	NA	2/79	NA	NA	12/82	100%	LC Reimbursement
13.	INDE Engineering and Administration	715	O/S-941								
14.	Force Account Construction	1263	O/S-941								
15.	Contingencies and Inflation	3365	O/S-941							100%	
		$18200									

* Bids will be accepted from authorized local representatives of Code 941 manufacturers.

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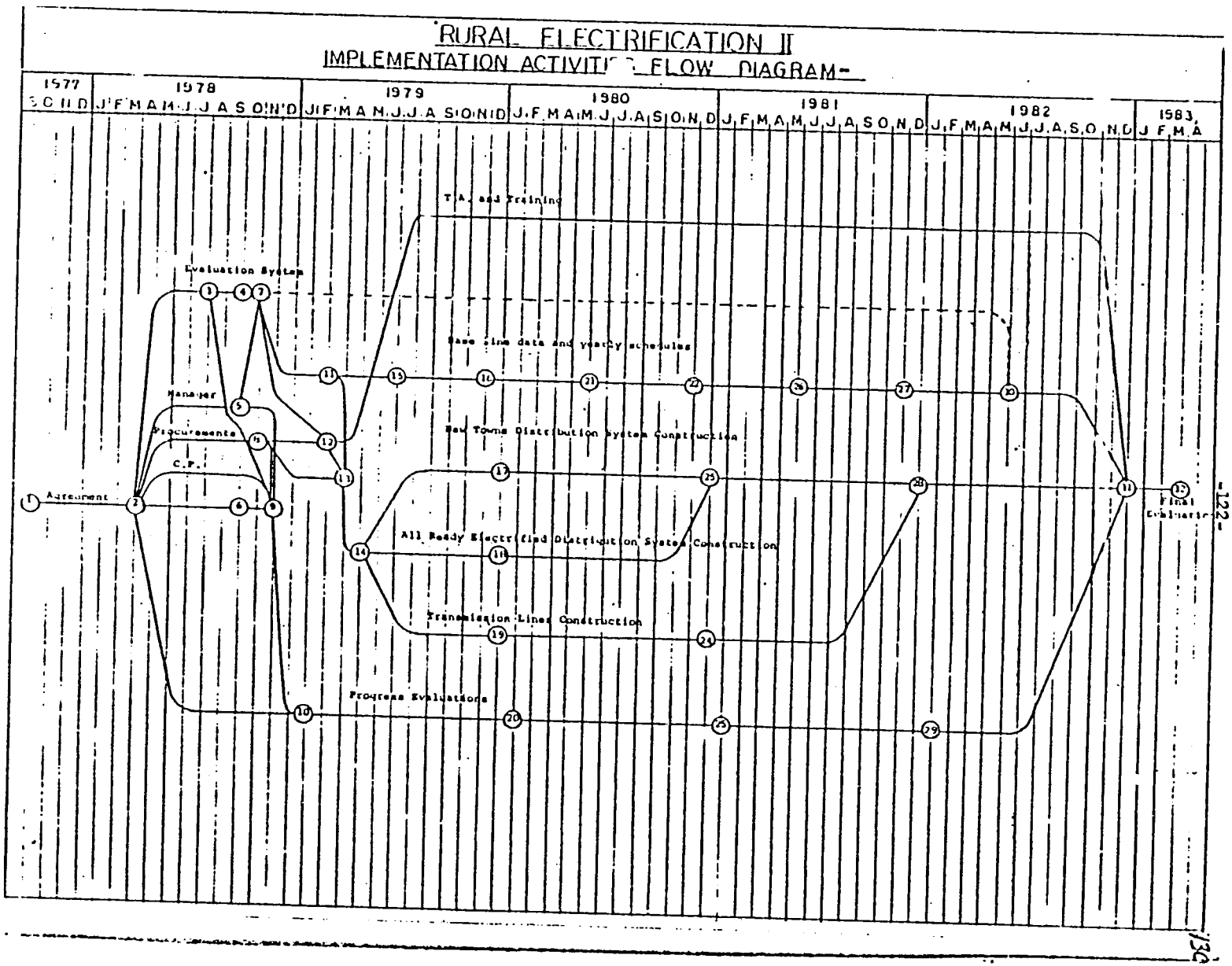
RURAL ELECTRIFICATION II
IMPLEMENTATION ACTIVITI[illegible] FLOW DIAGRAM-
1977
S O N D
1978
J F M A M J J A S O N D
1979
J F M A M J J A S O N D
1980
J F M A M J J A S O N D
1981
J F M A M J J A S O N D
1982
J F M A M J J A S O N D
1983
J F M A
T.A. and Training
Evaluation System
Base line data and yearly schedules
Manager
Procurements
C.P.
New Towns Distribution System Construction
Agreement
All Ready Electrified Distribution System Construction
Transmission Lines Construction
Progress Evaluations
Final Evaluation

E V E N T S

No.	Event	Date
1.	Loan authorized	9/77
2.	Loan agreement signed	3/78
3.	Contract for TA in eval. syst. design signed	7/78
4.	Evaluation System designed	9/78
5.	INDE Project Manager named	9/78
6.	Loan Agreement ratified	9/78
7.	Site Evaluations begin	10/78
8.	All contracts signed & transmitted to AID	10/78
9.	All contracts & CP's documents received	11/78
10.	First annual program evaluation held	7/79
11.	First year construction sites selected	2/79
12.	Training for field crews/electricians begins	2/79
13.	Equipment, materials & supplies received by INDE, personnel trained & construction scheduled	3/79
14.	Construction begins	4/79
15.	Baseline data processed & stored, rights-of-way obtained	6/79
16.	Second year construction schedule prepared;	11/79
17.	First year distribution construction completed (new towns)	12/79
18.	First year distribution construction completed (electrified towns)	12/79
19.	First year transmission lines completed	12/79
20.	Second annual program evaluation held	1/80
21.	Baseline data processed & stored; rights-of-way obtained	5/80
22.	Third year construction schedule prepared	11/80
23.	Second year dist. syst. const. completed (new towns and all electrified towns)	12/80
24.	Second year transmission lines completed	12/80
25.	Third Annual Progress Evaluation held	1/81
26.	Baseline data processed and stored; rights-of-way obtained	5/81
27.	Fourth year construction schedule prepared	11/81
28.	Third year dist. syst. completed (new towns) and all transmission lines)	12/81
29.	Fourth annual progress evaluation held	1/82
30.	Baseline data tabulated & analyzed; TA completed for impact evaluation	5/82
31.	All project activities completed	12/82
32.	Final progress and impact evaluation held	3/83

A C T I V I T I E S

Number	Activities	Responsible
1-2	Loan Agreement negotiation & GOG exeeutive branch review	(AID/GOG)
2-3	Procurement of TA for evaluation system design	(INDE)
2-5	Identify and select INDE project manager	(INDE)
2-7	Guatemalan Congress reviews loan agreement	(GOG)
2-8	Procurement of all TA, training materials, vehicles, & equipment (except 2-3)	(INDE)
2-9	Transmit documents to meet CP's (except 5-9, 7-9, 8-9)	(INDE)
2-10	Prepare progress evaluation report, 1st yr.	(INDE)
3-4	Design evaluation system	(TA, INDE)
3-9	Request confirmation of loan financing (2-3)	(INDE)
4-6	Train canvassers	(TA, INDE)
5-6	Select engineers for field canvassing	(INDE)
5-9	Transmit CV of Project Manager to AID	(INDE)
7-12	Select field crews/local electricians	(INDE)
7-11	Field promotions, canvassing, data collecting activities	(INDE, cont)
6-9	Transmit document to meet CP's 3.01 (a) & (b) (2-8)	(GOG)
8-9	Request confirmation of loan financing for contract	(INDE)
8-12	TA arrives	(Contractors)
8-13	Materials, equipment & vehicles delivered	(Contractors)
9-10	Confirm CP's satisfied and financing of contracts	(AID)
12-13	Training for field crews, electricians	(INDE)
11-13	Prepare 1st year construction schedule	(INDE)
11-15	Process and store baseline data (1st year)	(INDE)
13-14	Field mobilization (materials, workers, engineers to sites)	(INDE)
14-17	Construction of distribution systems and hookups (new towns)	(INDE)
14-18	Construction of distribution systems and hookups (electrified towns)	(INDE)
14-19	Construction of transmission lines	(INDE)
15-16	Site visits, 2nd year construction scheduling	(INDE)
10-20	Prepare progress evaluation report - 2nd year	(INDE)
20-25	Prepare progress evaluation report - 3rd year	(INDE)
11-21	Process & store baseline data (2nd year)	(INDE)

17-23	Construction of distribution systems & hookups (new towns)	(INDE)
18-23	Construction of distribution systems and hook-ups (electrified towns)	(INDE)
19-24	Construction of transmission lines	(INDE)
21-22	Site visits, 3rd year construction scheduling	(INDE)
25-29	Prepare progress and evaluation reports - 4th year	(INDE)
22-26	Process baseline data - 3rd	(INDE)
23-28	Construction of distribution system hookups (new towns)	(INDE)
24-28	Construction of transmission lines	(INDE)
26-27	Site visits, 4th year construction scheduling	(INDE)
27-30	Contract TA for impact evaluation; process & tabulate baseline data	(INDE)
29-31	Prepare final progress evaluation report	(INDE)
28-31	Construction of distribution system and hook-ups	(INDE)
30-31	Carry out survey and analyze impact	(INDE, Advisors)
31-32	Prepare impact analysis and final progress reports	(INDE, AID & Contractors)

C. Evaluation Plan

Two types of evaluations will be carried out under the project.

1. Yearly (Output Level) Progress Evaluations

INDE and AID will hold a yearly progress evaluation in January of each year starting in 1979. INDE's progress report for the preceding quarter will be expanded to include an overall review of progress in implementating the project. This report will serve as the basis for discussing the targets for output achievement vs. actual performance, timeliness of AID and GOG inputs; INDE contracting procedures and AID approval processes; and, in general, any implementation problems that are affecting output achievements. In the later years of the project, these annual evaluations will monitor improvement in INDE's institutional capability to continue to extend electrical service to rural areas as well as the completion of physical project outputs.

2. Impact Evaluation

a. State of the Art

The state of the art of impact evaluations of rural electrification programs was dealt with in some detail in a recent AID financed evaluation of NRECA activities. 1/ That report distinguishes between Type I impact studies, which attempt to establish causality between rural electrification and development objectives, and Type II impact studies which can be, "used to provide evidence of any positive changes among the target population which

1/ Development Alternatives, Inc. An Evaluation of the Program Performance of the International Program Division of NRECA. Prepared under Contract No. AID/otr-c-1383, January, 1977.

coincide with, but are not necessarily attributable to, the introduction of rural electrification programs." Impact studies carried out to date have been type II studies. As such they share the characteristics--negative and positive--noted on page 77 of DAI's report: ".. (they provide) no measure of the magnitudes or levels of benefit and little potential for cost/benefit analysis; (but are sufficient to) suggest to reasonable men that rural electrification... (has) ... positive benefits."

Evaluations planned as part of recently approved rural electrification programs are attempting to move closer towards the type I analysis. At a minimum, the evaluations that will be carried out in Bolivia and Honduras are expected to address the methodological deficiencies that the DAI report noted in its review of studies carried out to date. The impact evaluation that will be carried out under this program will be similar in many respects to the Bolivia and Honduras efforts.

b. Impact Evaluation Strategy

It is difficult, if not impossible, to try to design an evaluation strategy that will provide answers within the project implementation period to a broad range of questions about the impact of rural electrification and the causal links between it and increased incomes and well-being of AID's target group. Thus, TAB funded research may be more appropriate for further analyzing possible causal links between rural electrification and decreased birth rate, improved health, and rising incomes (or savings from current expenditure levels).

Accordingly, the project evaluation strategy will focus on a more limited objective: documenting and analyzing the rate of adoption of electricity for productive purposes by low income rural residents and assessing the direct impact on their productivity. The implicit assumption behind the strategy is that impact on productivity may be measurable

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even over a relatively short period of time (4 years), whereas the impact on other aspects of rural life are too indirect and difficult to quantify to produce results within a short period.

c. Impact Evaluation Plan

Shortly after signature of the loan agreement, USAID will request from TA/RD (Rural Development Office of the Technical Assistance Bureau) the services of an evaluation specialist, who is financed under the FY 1977 interregional project entitled "Rural Development Data Gathering and Analysis Methods,1/ " to design an evaluation methodology for implementing the strategy, collection instruments and a data collection and storage process. The data collection process will be designed to fit into INDE's normal operations to the maximum degree possible in order to minimize data collection costs. The evaluation specialist will train local personnel in the data collection procedures adopted.

INDE will use Loan funds to finance local costs attendant to gathering baseline data such as income, present productive activities (farming, cottage industries, service sector occupations), production volume and processes, and intention to adopt electrification in the productive processes. As these data will be collected throughout the life of the project, the communities surveyed will have had electricity for from one to four years. The evaluation design will match these users against families that don't desire electricity and those who live in villages that will not be electrified under the program for control purposes. Comparisons also will be made with families who were INDE customers before the project began.

Near the end of the project, AID will request the services of a firm specialized in evaluation to carry out the impact evaluation. This contract will involve a sample survey of users for varying periods of time, analysis of the data and preparation of the evaluation report.

1/ This project, funded in FY 1977 for three years for $701,000, will provide Missions with access to consultants who are expert in the design and implementation of evaluation systems for specific types of rural development problems including rural electrification. A "Methods" Paper on rural electrification data gathering and analysis is also included. Guatemala may serve as one of the case studies for the Methods Paper on rural electrification.

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D. Conditions Precedent and Covenants

1. Conditions Precedent to Initial Disbursement

Prior to the first disbursement under the loan, Borrower shall, except as AID may otherwise agree in writing, furnish to AID in form and substance satisfactory to AID:

a. An opinion of the Ministerio Público or other counsel acceptable to AID that this Agreement has been duly authorized and/or ratified by, and executed on behalf of the Borrower, and that it constitutes a valid and legally binding obligation of the Borrower in accordance with all of its terms;

b. A statement of the names of authorized Borrower representatives for loan implementation purposes, and a specimen signature of each person specified in such statement.

c. An executed Agreement between the Ministry of Finance and INDE which provides:

(i) That INDE shall be the GOG institution responsible for execution of the Project;

(ii) That all funds disbursed by the Borrower and AID to INDE will be on a non-reimbursable basis; and,

(iii) That terms and conditions of the loan agreement will govern the use of Project funds by INDE;

d. Evidence that INDE has designated a Project Manager;

e. Evidence that INDE's rate schedule and additional charges are in consonance with the objectives of this project;

f. Evidence that INDE has made satisfactory arrangements to retain consultant engineering services for the project;

g. A detailed financial plan indicating projected annual GOG counterpart contributions which will be made available to support the Project;

h. A detailed technical assistance plan, including the uses to be made of such technical assistance and where and when such assistance will be obtained.

2. Conditions Precedent to Disbursement for Other than Technical and Professional Services

Prior to any disbursement or issuance of any Letter of Commitment other than for Technical and Professional Services, the Borrower shall furnish to AID in form and substance satisfactory to AID a detailed time-phased Implementation Plan and with cost estimates covering:

a. A schedule of training setting forth nature, timing, and source of instruction for INDE personnel and stipulating training to be provided at the village level;

b. A procurement plan for obtaining materials and contract construction services; and,

c. A construction schedule by geographic area.

3. Conditions Precedent to Disbursement or Commitment in Excess of $8 Million of Loan Funds

Prior to any disbursement or to the issuance of commitment documents in excess of $8 million under the Loan, INDE shall submit in form and substance satisfactory to AID a plan for expansion of rural electrification systems to serve additional low income customers following disbursement of the Loan. The plan will provide for the connection of 10,000 additional hook-ups in rural areas in each year subsequent to Loan disbursement which will be financed with INDE's own revenues along with other sources of financing as may be required.

4. Covenants

The Borrower covenants and agrees that, except as AID may otherwise agree in writing, the Borrower shall:

a. Contribute to the project on a timely basis not less than the equivalent of seven million four hundred thousand United States Dollars ($7,400,000) during the implementation period of the Project;

b. Cause INDE to carry out the plan in accordance with condition precedent number three above;

c. Cause INDE to carry out an impact evaluation in the Project Area prior to the PACD and annual progress evaluations each year of project implementation;

d. Cause INDE to obtain rights-of-way for all construction activities prior to initiation of construction on the property involved;

e. Cause INDE to submit a yearly construction schedule to AID.

E. Negotiating Status

The Project Description, Technical Analysis, Financial Plan and Implementation Plan presented above have been reviewed and agreed upon by INDE's technical staff and Board of Directors. There is agreement on all aspects and few details remain to be worked out.

RESPONSE TO DAEC MESSAGE

STATE 159969 JULY 11, 1977

SUBJECT: RURAL ELECTRIFICATION II - INTERIM REPORT

A. THE INTERIM REPORT WAS REVIEWED BY THE DAEC ON JUNE 10, 1977 AND APPROVAL WAS GIVEN TO PROCEED WITH THE PREPARATION OF THE PROJECT PAPER. THE FOLLOWING COMMENTS AND DECISIONS OF THE DAEC SHOULD BE TAKEN INTO CONSIDERATION IN THE PREPARATION OF THE PP.

1. RURAL DEVELOPMENT STRATEGY. THE DAEC REQUESTED THAT THE PP DISCUSS THE ROLE OF THE ELECTRIFICATION PROJECT WITHIN THE MISSION'S OVERALL RURAL DEVELOPMENT STRATEGY GIVING EXAMPLES OF LINKAGES BETWEEN THE PROPOSED LOAN AND OTHER MISSION AND IFI FINANCED PROGRAMS.

RESPONSE: SEE SECTION II. A. & B., PROJECT BACKGROUND AND STRATEGY.

2. SIZE OF PROJECT AND GOVERNMENT OF GUATEMALA CONTRIBUTION. IN VIEW OF CONGRESSIONAL RESERVATIONS ABOUT THE USE OF AID FINANCING FOR LARGE INFRASTRUCTURE INVESTMENTS, AND THE ALREADY LARGE GOG COUNTERPART CONTRIBUTIONS SCHEDULED FOR THE POWER SECTOR, THE DAEC RECOMMENDED THAT A MORE APPROPRIATE LEVEL OF AID FUNDING FOR THIS PROJECT WOULD BE DOLS. 10 MILLION. AT A MINIMUM, GOG CONTRIBUTION SHOULD NOT BE LESS THAN THE 40 PERCENT RATIO AS SHOWN IN THE INTERIM REPORT.

RESPONSE: SEE SECTION I. SUMMARY AND RECOMMENDATIONS.

3. PROJECT DESIGN. ALTHOUGH THE DAEC RECOGNIZED THAT BUILDING ADDITIONAL SUBTRANSMISSION LINES WOULD ASSURE THE RELIABILITY OF POWER SERVICE TO THE TARGET AREA, THE PP

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SHOULD DEMONSTRATE THAT INSTALLATION OF THESE LINES IS DIRECTLY LINKED TO MAXIMIZING THE NUMBER OF CUSTOMER HOOKUPS TO THE TARGET GROUP AS WELL AS TO PROVIDING THEM WITH RELIABLE POWER SERVICE. THE MISSION IS REQUESTED TO REVIEW DURING PP PREPARATION THE TECHNICAL JUSTIFICATION FOR INCLUDING SUBTRANSMISSION LINES IN THE PROJECT. IF THE DECISION IS MADE THAT SOME OR ALL OF THESE SUBTRANSMISSION LINES ARE NECESSARY TO MAXIMIZE HOOKUP OF AID'S TARGET GROUP, THIS LINKAGE SHOULD BE CLEARLY DEMONSTRATED IN THE PP.

RESPONSE: SEE SECTION IV. A. TECHNICAL ANALYSIS.

4. RATE STRUCTURE. THE DAEC EXPRESSED THREE MAJOR CONCERNS CONCERNING THE RATE STRUCTURE PROPOSALS OUTLINED IN THE INTERIM REPORT. ONE IS THAT A RATE STRUCTURE BE CHOSEN WHICH WOULD BE AFFORDABLE BY THE TARGET GROUP; SECONDLY, THAT A SURCHARGE FEE WOULD DISCRIMINATE AGAINST THE TARGET GROUP AND MIGHT BECOME INSTITUTIONALIZED ONCE ACCEPTED BY INDE EVEN IF A STANDARD RATE IS SUBSEQUENTLY ADOPTED; AND FINALLY, THAT WHATEVER RATE STRUCTURE IS CHOSEN, IT SHOULD ENSURE A SUFFICIENT FLOW OF INCOME INTO INDE TO ALLOW A REASONABLE LEVEL OF HOUSEHOLD CONNECTIONS TO CONTINUE EACH YEAR.

THE MISSION SHOULD SEEK TO EXPLORE WITH INDE THE ADOPTION OF A STANDARD RATE, AND AT A MINIMUM, INDE SHOULD AGREE TO ELIMINATE THE PRIOR CASH PAYMENT OF THE FRONT END CHARGE FOR DISTRIBUTION LINES AND HOUSE SERVICE CONNECTIONS. IN MAKING ANY DECISION ON A STANDARD RATE OR SURCHARGE, BOTH AID AND THE GOG SHOULD BE GUIDED BY THE RATE STUDY CURRENTLY SCHEDULED FOR COMPLETION IN JANUARY, AND COORDINATE SUCH DECISION WITH THE WORLD BANK.

RESPONSE: SEE SECTION III. PROJECT DESCRIPTION AND SECTION IV. D. SOCIAL ANALYSIS.

5. REPLICABILITY. THE DAEC WAS CONCERNED THAT AFTER THE COMPLETION OF THE PROJECT, A HOOKUP CHARGE, IF ELIMINATED, MIGHT BE REINTRODUCED, OR THAT THE LEVEL OF CONNECTIONS MIGHT DROP DRASTICALLY. THE PP SHOULD EXPLAIN HOW CONTINUED INVESTMENT IN DISTRIBUTION FOR THE TARGET GROUP WILL BE INSURED WITHOUT REVERTING TO THE PRACTICE OF REQUIRING A FRONT END HOOKUP CHARGE.

RESPONSE: SEE SECTION III. PROJECT DESCRIPTION AND SECTION V. D. CONDITIONS PRECEDENT, COVENANTS.

6. FINANCIAL ANALYSIS. THE INTERIM REPORT DID NOT CONTAIN A PROJECTED FINANCIAL RATE OF RETURN FOR THE MISSION'S PREFERRED ALTERNATIVE III BECAUSE OF THE ABSENCE OF AN AGREED UPON STANDARD RATE. HOWEVER, FOR THE PURPOSES OF COMPLETING THE REQUIRED FINANCIAL ANALYSES, THE MISSION SHOULD ASSUME A MAXIMUM STANDARD RATE AFFORDABLE BY THE RURAL POOR WHICH WILL ALSO ALLOW FOR EXPANSION OF THE PROJECT, AND COMPUTE A RATE OF RETURN ON THIS BASIS.

RESPONSE: SEE SECTION IV. B. FINANCIAL ANALYSIS.

7. ECONOMIC ANALYSIS. THE DAEC QUESTIONED THE METHODOLOGY USED TO COMPUTE THE SURPLUS BENEFITS TO THE REGION THAT CAN BE EXPECTED FROM THIS PROJECT (ESTIMATED AT 25 PERCENT OF NET SALES). IT IS SUGGESTED THAT THE MISSION USE AVAILABLE DATA FROM INDE IN RECENTLY ELECTRIFIED AREAS TO SHOW INDUSTRIAL AND COMMERCIAL USES OVER TIME WHICH WOULD PROVIDE A MORE REALISTIC BASIS FOR PROJECTING THE PROJECT'S ECONOMIC RATE OF RETURN.

RESPONSE: SEE SECTION IV. C. ECONOMIC ANALYSIS.

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UNCLASSIFIED
ANNEX B
Page 1 of 2

MINISTERIO DE FINANZAS PUBLICAS
GUATEMALA C. A.

01008

Guatemala,
26 de agosto de 1977

Señor Frederick W. Schieck
Director Agencia para el
Desarrollo Internacional
Presente.-

Señor Director:

En mi calidad de representante del Gobierno de la República de Guatemala ante los Organismos Financieros Internacionales, confirmo por este medio nuestras conversaciones y solicito por este medio de la manera más atenta que la Agencia a su digno cargo, nos otorgue financiamiento hasta por el equivalente de US$10,800.000.00 que será reforzado por una contrapartida en moneda nacional durante la vigencia del Proyecto, de una cantidad no menor de Q.7,400,000.00. Los fondos de préstamo y de contrapartida serán proporcionados al INDE en forma no reembolsable.

Los fondos del referido programa serán destinados a un programa de desarrollo que permita la participación de familias de ingresos bajos conectarse al sistema de electrificación del INDE. Se ha previsto que con dichos fondos se podrán conectar aproximadamente unas 75,000 familias que habitan en 375 aldeas y caseríos que se encuentran localizadas en la región oriental, occidental y en el altiplano del país. El sistema comprenderá la instalación de aproximadamente 727 kilómetros de líneas de distribución primarias y 656 kilómetros de líneas secundarias. Para asegurarse una calidad mínima aceptable de servicio en las áreas en donde los sistemas de distribución se extenderán y expandirán, se financiarán también 170 kilómetros de 69 KV de líneas de sub transmisión y dos subestaciones. Para fortalecer la capacidad del INDE de prestar servicio a los 75,000 nuevos usuarios, el programa incluirá asistencia técnica, adiestramiento, equipo para mantenimiento y vehículos. Se ha previsto que el proyecto tendrá una dura--

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MINISTERIO DE FINANZAS PUBLICAS
GUATEMALA, C. A.

/... - 2 -

Señor Director de AID

ción aproximada de cinco años y después de dicho período el Instituto Nacional de Electrificación, INDE, en su calidad de Unidad Ejecutora del Proyecto con sus propios fondos continuará haciendo conecciones similares a un ritmo de 6,000 conecciones anualmente. Finalmente, es importante señalar que la estructura de tarifas del INDE requiere de revisión, con el objeto de incorporar un programa dinámico de electrificación rural.

Al anticiparle nuestra amplia colaboración en el referido programa y en espera de una resolución favorable a nuestra solicitud, hago propicia la oportunidad para reiterarle mi distinguida consideración y suscribirme atentamente,

JORGE LAMPORT RODIL
Ministro Finanzas

JLR/lmc

STATUTORY CHECKLIST

A Country Checklist for Guatemala was included in the first Project Paper presented during the current fiscal year. No items have changed to date.

PROJECT CHECKLIST

A. GENERAL CRITERIA FOR PROJECT.

1. App. Unnumbered; FAA Sec. 653(b)

   (a) Describe how Committees on Appropriations of Senate and House have been or will be notified concerning the project; (b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than $1 million over that figure plus 10%)?

   The project was the subject of a Congressional Notification send on July 5, 1977.

2. FAA Sec. 611(a)(1). Prior to obligation in excess of $100,000, will there be (a) engineering, financial, and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

   Yes, See Parts IV A. and B. The cost estimates of the project are reasonably firm.

3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?

   Further legislation is not required.

4. FAA Sec. 611(b); App. Sec. 101. If for water or water-related land resource construction, has project met the standards and criteria as per Memorandum of the President dated Sept. 5, 1973 (replaces Memorandum of May 15, 1962; see Fed. Register, Vol 38, No. 174, Part III, Sept. 10, 1973)?

   N/A

5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed $1 million, has Mission Director certified the country's capability effectively to maintain and utilize the project?

   Yes, See Annex E.

A.

6. FAA Sec. 209, 619. Is project susceptible of execution as part of regional or multilateral project? If so why is project not so executed? Information and conclusion whether assistance will encourage regional development programs. If assistance is for newly independent country, is it furnished through multilateral organizations or plans to the maximum extent appropriate?	This project will compliment regional assistance programs but is not susceptible to execution as a regional program. Guatemala is not a newly independent country.
7. FAA Sec. 601(a); (and Sec. 201(f) for development loans). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.	Project will improve the technical efficiency of industry and agriculture by substiting electricity for higher cost alternative energy sources.
8. FAA Sec. 601(b). Information and conclusion on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).	U.S. construction contractors may work on construction component. U.S. manufactured equipment and supplies will be used in construction. U.S. vehicles will be purchased.
9. FAA Sec. 612(b); Sec. 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized to meet the cost of contractual and other services.	Guatemala will provide a substantial local currency contribution to the project in accordance with the financial plan set forth in the Project Paper. No U.S. owned foreign currencies are available for utilization in the project.
10. FAA Sec. 612(d). Does the U.S. own excess foreign currency and, if so, what arrangements have been made for its release?	No.

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(c); Sec. 111; Sec. 281a. Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production, spreading investment out from cities to small towns and rural areas; and (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions?	80% of all electrical connections will be made in low-income households. 40% of all connections are in villages of less than 200 families. All connections in the project are in the rural areas.

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B1.

b. FAA Sec. 103, 103A, 104, 105, 106, 107. Is assistance being made available: [include only applicable paragraph -- e.g., a, b, etc. -- which corresponds to source of funds used. If more than one fund source is used for project, include relevant paragraph for each fund source.]

(1) [103] for agriculture, rural development or nutrition; if so, extent to which activity is specifically designed to increase productivity and income of rural poor; [103A] if for agricultural research, is full account taken of needs of small farmers;

Yes. The project is specifically designed to increase the productivity and incomes of rural poor. The beneficiaries will be small scale farmers and landless rural workers and their families.

(2) [104] for population planning or health; if so, extent to which activity extends low-cost, integrated delivery systems to provide health and family planning services, especially to rural areas and poor;

(3) [105] for education, public administration, or human resources development; if so, extent to which activity strengthens nonformal education, makes formal education more relevant, especially for rural families and urban poor, or strengthens management capability of institutions enabling the poor to participate in development;

(4) [106] for technical assistance, energy, research, reconstruction, and selected development problems; if so, extent activity is:

(a) technical cooperation and development, especially with U.S. private and voluntary, or regional and international development, organizations;

(b) to help alleviate energy problem;

(c) research into, and evaluation of, economic development processes and techniques;

(d) reconstruction after natural or manmade disaster;

(e) for special development problem, and to enable proper utilization of earlier U.S. infrastructure, etc., assistance;

(f) for programs of urban development, especially small labor-intensive enterprises, marketing systems, and financial or other institutions to help urban poor participate in economic and social development.

B1

(5) [107] by grants for coordinated private effort to develop and disseminate intermediate technologies appropriate for developing countries.

c. FAA Sec. 110(a); Sec. 208(e). Is the recipient country willing to contribute funds to the project, and in what manner has or will it provide assurances that it will provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or has the latter cost-sharing requirement been waived for a "relatively least-developed" country)?

The Government of Guatemala has provided assurances that it will provide 40% of the total cost of the project.

d. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to Congress been made, and efforts for other financing?

The project does not involve grant financing of capital costs.

e. FAA Sec. 207; Sec. 113. Extent to which assistance reflects appropriate emphasis on; (1) encouraging development of democratic, economic, political, and social institutions; (2) self-help in meeting the country's food needs; (3) improving availability of trained worker-power in the country; (4) programs designed to meet the country's health needs; (5) other important areas of economic, political, and social development, including industry; free labor unions, cooperatives, and Voluntary Agencies; transportation and communication; planning and public administration; urban development, and modernization of existing laws; or (6) integrating women into the recipient country's national economy.

The project will train local electricians in Guatemala in house wiring and appliance repair. The project will make possible improved food storage, medicines and vaccines requiring refrigeration, and increase availability of pumped water in remote rural areas. Irrigation requiring electric pumping will be possible. Increased employment opportunities will be created by small industries attracted to rural areas by electricity. Women especially, will be able to increase their production of woven materials and find jobs as seamstresses and tailors.

f. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civic education and training in skills required for effective participation in governmental and political processes essential to self-government.

A sample survey conducted in low income rural areas found that almost all respondents surveyed desired electricity. The GOG's electrification institute will have full responsibility for project implementation and will receive technical assistance under this project to strengthen its administrative and rural services capability. Villages will form electrification communities to discuss the need for electrification with INDE representatives and to decide for themselves whether to participate in the project.

B1

g. FAA Sec. 201(b)(2)-(4) and -(8); Sec. 201(e); Sec. 211(a)(1)-(3) and -(8). Does the activity give reasonable promise of contributing to the development: of economic resources, or to the increase of productive capacities and self-sustaining economic growth; or of educational or other institutions directed toward social progress? Is it related to and consistent with other development activities, and will it contribute to realizable long-range objectives? And does project paper provide information and conclusion on an activity's economic and technical soundness?	There is a reasonable expectation that the project will stimulate productivity of small enterprises and household users and attract new businesses to locate in the rural areas, thereby contributing to economic growth and the achievement of the GOG's long range development objectives. The Project Analysis section of the project paper provides information and conclusions on the technical and economic feasibility of the project.
h. FAA Sec. 201(b)(6); Sec. 211(a)(5), (6). Information and conclusion on possible effects of the assistance on U.S. economy, with special reference to areas of substantial labor surplus, and extent to which U.S. commodities and assistance are furnished in a manner consistent with improving or safeguarding the U.S. balance-of-payments position.	The project is not expected to adversely affect the US economy or areas of substantial labor surplus in the United States.
2. Development Assistance Project Criteria (Loans only)	
a. FAA Sec. 201(b)(1). Information and conclusion on availability of financing from other free-world sources, including private sources within U.S.	Financing for the project is not forthcoming from other free world sources, including private sources within the U.S.
b. FAA Sec. 201(b)(2); 201(d). Information and conclusion on (1) capacity of the country to repay the loan, including reasonableness of repayment prospects, and (2) reasonableness and legality (under laws of country and U.S.) of lending and relending terms of the loan.	In view of Guatemala's traditional underutilization of its credit capacity, and considering its long term economic prospects, there is a reasonable expectation that Guatemala will have the capacity to repay the loan.
c. FAA Sec. 201(e). If loan is not made pursuant to a multilateral plan, and the amount of the loan exceeds $100,000, has country submitted to AID an application for such funds together with assurances to indicate that funds will be used in an economically and technically sound manner?	Financing for the project has been requested and assurances have been provided that funds will be used in an economically and technically sound manner.
d. FAA Sec. 201(f). Does project paper describe how project will promote the country's economic development taking into account the country's human and material resources requirements and relationship between ultimate objectives of the project and overall economic development?	The Project Analysis and Project Description sections of the project paper contain such descriptions.

B2

e. FAA Sec. 202(a). Total amount of money under loan which is going directly to private enterprise, is going to intermediate credit institutions or other borrowers for use by private enterprise, is being used to finance imports from private sources, or is otherwise being used to finance procurements from private sources?	All loan funds will be channeled to Guatemala's National Electrification Institute, a semi-autonomous agency of the government which will contract much of the construction and materials and equipment in the project with private companies, either U.S. or CACM. Approximately 20 vehicles from private sources in the U.S. will be imported and financed with loan funds.
f. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete in the U.S. with U.S. enterprise, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?	Assistance is not for a productive enterprise which will compete in the United States.
3. Project Criteria Solely for Security Supporting Assistance	
FAA Sec. 531. How will this assistance support promote economic or political stability?	Not applicable.
4. Additional Criteria for Alliance for Progress	
[Note: Alliance for Progress projects should add the following two items to a project checklist.]	
a. FAA Sec. 251(b)(1), -(8). Does assistance take into account principles of the Act of Bogota and the Charter of Punta del Este; and to what extent will the activity contribute to the economic or political integration of Latin America?	The project takes these principles into account. A modest favorable impact on the economic integration of Central America is expected.
b. FAA Sec. 251(b)(8); 251(h). For loans, has there been taken into account the effort made by recipient nation to repatriate capital invested in other countries by their own citizens? Is loan consistent with the findings and recommendations of the Inter-American Committee for the Alliance for Progress (now "CEPCIES," the Permanent Executive Committee of the OAS) in its annual review of national development activities?	Guatemala does not have exchange controls and repatriation of capital is unregulated. The loan is consistent with relevant OAS findings and recommendations.

CERTIFICATION PURSUANT TO SECTION 611 (e) OF THE FOREIGN ASSISTANCE ACT OF 1961, AS AMENDED

I, Frederick W. Schieck, the principal officer of the Agency for International Development in Guatemala, having taken into account, among other things, the maintenance and utilization of projects in Guatemala previously financed or assisted by the United States, do hereby certify that in my judgment Guatemala has both the financial capacity and the human resources capability to effectively utilize and maintain the facilities and equipment provided as part of this capital assistance project, Rural Electrification.

This judgment is based upon the improving implementation record of AID-financed projects in Guatemala and the quality of the planning which has gone into this new project.

(signed) [signature]

(date) August 19, 1977

LOG FRAME

SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
Goal Improve the well-being of rural Guatemalans by increasing small farmer income and increasing employment in the rural areas.	1. Average income of users increases more rapidly than income of non-users. 2. Quality of life improvements such as increased educational opportunities; improved health and nutrition; and reduction of household drudgery.	1. Survey of users and non-users when INDE canvasses selected towns/villages for application survey of users, non-users and disconnectors in those towns prior to final loan disbursement. 2. Index of social indicators such as infant mortality rates, malnutrition rates, and school drop-out rates.	1. Other GOG programs (e.g. Small Farmer Marketing) completed on schedule. 2. Prices for agricultural produce do not decrease
Purpose Increase the number of electric connections in low-income rural areas and improve INDE's capacity for continuing the extension of local power services to additional low income rural areas.	EOPS 1. 75,000 low income users served with reliable electric energy. 2. Plan for connection of 6,000 additional low income users per year following end of program prepared by INDE and accepted by AID.	1. INDE records; final inpact evaluation. 2. USAID loan files.	1. Disconnect rate does not exceed 2%. 2. Increases in generating capacity brought on stream as planned.
Outputs 1. Rural Electric Distribution Systems a. Distribution, Secondary Line, Meters and Service Drops.	1. a. (1) 12.4 kms. of 34.5 KV subtransmission lines. (2) 216 kms. of 19.9 KV and 13.2 KV distribution lines. (3) 498.8 kms. of 7.6 KV distribution lines. (4) 654 kms. of secondary (120/240 V) lines installed. (5) 75,000 service drops, meters and house wiring installed.	1. INDE records and progress reports	1. Timely GOG counterpart contributions. 2. Loan ratified by Guatemalan Congress within one year from date of authorization.

LOG FRAME

SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
b. Subtransmission Lines and Distribution Substations	b. (1) 172 kms. of 69 KV subtransmission lines. (2) Two substations constructed.		
2. Improved INDE Outreach capability.	2. a. Field Offices will have capability to maintain the rural electrification system and provide customer services. b. 250 local electricians will be trained in house wiring and appliance repair. c. Purchase of maintenance equipment and fifteen vehicles. d. Development of a promotional/educational program for the rural areas.	2. INDE records and Progress reports.	Timely TA received.
3. Improved INDE Administrative Capacity	3. a. Technical Assistance provided in key areas. b. Billing & Collection system improved. c. In-house capability for cost to serve and rate analysis developed. d. Fifteen INDE management personnel trained.	3. INDE records and Progress reports.	Timely TA received.
4. Impact Evaluation Conducted	4. Evaluation System developed and installed.		Timely TA received.

LOG FRAME

SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS

Inputs

	(in $000) AID	GOG	TOTAL	
1. Construction of Subtransmission and Distribution Systems	7,470	5,150	12,620	Rate structure adopted by INDE is acceptable to AID.
2. Consulting Engineering Services	400	-	400	
3. INDE Engineering and Administration	-	715	715	
4. Maintenance and Service Equipment	350	-	350	
5. Technical Assistance and Training	450	-	450	
6. Inflation	1,415	1,535	2,950	
7. Contingency	715	-	715	
T O T A L	10,800	7,400	18,200	

DRAFT PROJECT DESCRIPTION

This project will contribute to a balanced power development program for Guatemala by assuring the participation of low-income rural populations in INDE's energy investment program. INDE will accelerate its services to the rural population by connecting 75,000 new users in numerous villages in the Western and Central Highlands and Eastern Region of Guatemala. Technical assistance, training, maintenance equipment and vehicles will be provided directly to INDE to strengthen its administrative and outreach capability to service the 75,000 additional new customers. Approximately 29,000 residential and commercial connections will be made in villages which are partially electrified. An additional 46,000 new residential and commercial users will be hooked up in villages which are non-electrified. Approximately 95% of all connections will be residential and 5% will be commercial.

The project area is defined by the departmental boundaries of the seven Highland Departments of Totonicapan, El Quiche, Huehuetenango, Solola, Chimaltenango, Alta Verapaz, and Baja Verapaz, and the natural boundaries formed by the mountain range cutting across the Highland Departments of San Marcos and Quezaltenango. The project area in these two departments is determined by altitude; the project area will be 5,000 feet and above. Below that elevation are large coffee plantations which clearly do not include the target group. In the Eastern Region the project will operate in all the Departments of Jutiapa, Jalapa, El Progreso, Chiquimula, and Santa Rosa. In the Department of Zacapa, only the area south of the Montagua River Valley will be included in the project.

To ensure minimally acceptable quality of service in the areas where distribution systems are to be extended and expanded, 170 kms. of 69 KV subtransmission lines will be financed. Two substations are also required to provide transformation of voltage and protection for the new distribution lines. A total of 727.2 kms. of primary distribution lines and 654 kms. of secondary lines will be built. Service drops, meters, and customer-owned house wiring for 75,000 new users will be installed. Funds to finance house wiring, which will be paid by the customer by affixing a charge to his monthly utility bill for four years are provided by the loan. An impact evaluation which measures the rate of adoption of electricity for productive purposes by low-income rural families will be carried out during the last year of the project.

After the project has terminated, INDE will continue to connect on an annual basis at least 10,000 low-income users in rural areas. These 10,000 annual connections after the project represent an increase in the rate of connecting target group families during the last four years. The financing for the 10,000 hookups in low income rural areas will come from INDE's own resources.

The total cost of the project is estimated at $18,200,000 of which $10,800,000 will be financed with Loan funds disbursed over the projected five year life of the project. The Government of Guatemala will contribute the equivalent of $7,400,000 during the same period. The National Institute for Electrification (INDE) will be the Implementing Agency and responsible for the extension of rural distribution systems to serve additional low income customers each year after the project has terminated.

DRAFT PROJECT AUTHORIZATION
GUATEMALA - RURAL ELECTRIFICATION

Pursuant to Part I, Chapter I, Section 103 of the Foreign Assistance Act of 1961, as amended, I hereby authorize a Loan to Guatemala (the "Borrower") of not to exceed ten million United States Dollars ($10,800;000) to help in financing certain foreign exchange and Central American Common Market local currency costs of goods and services required to carry out a rural electrification program, which is described in the following paragraph.

The project consists of extending electric services to benefit new users in small villages in the Western and Central Highlands and Eastern Lowland Region of Guatemala and providing technical assistance to strengthen the administrative and outreach capability of the GOG's Electrification Institute (INDE) to continue the program after the loan has been fully disbursed. The entire amount of the AID financing herein authorized for the project will be obligated when the Project Agreement is executed. I hereby authorize the initiation of negotiation and execution of a Project Agreement or Project Agreements as may be appropriate by the officer to whom such authority has been delegated in accordance with AID regulations and Delegations of Authority, which Agreement or Agreements shall be subject to the following essential terms and covenants and major conditions, together with such other terms and conditions as AID may deem appropriate.

I. Interest Rate and Terms of Repayment of the Loan

The Borrower shall repay the Loan to AID in United States Dollars within thirty (30) years from the date of first disbursement of the Loan, including a grace period of not to exceed ten (10) years. The Borrower shall pay to AID in United States Dollars interest from the date of first disbursement of the Loan at the rate of two percent (2%) per annum during the first ten (10) years, and three percent (3%)

per annum thereafter, on the outstanding disbursed balance of the Loan and on any due and unpaid interest accrued thereon.

II. Source and Origin

Except for ocean shipping, goods and services financed by AID under the project shall have their source and origin in the Central American Common Market or in countries included in AID Geographic Code 941, except as AID may otherwise agree in writing. Ocean shipping financed by AID under the project shall be procured in any eligible source country except countries which are members of the Central American Common Market.

III. Conditions Precedent to Initial Disbursement

Prior to the first disbursement under the Loan, Borrower shall, except as AID may otherwise agree in writing, furnish to AID in form and substance satisfactory to AID:

A. An opinion of the Ministerio Público or other counsel acceptable to AID that this Agreement has been duly authorized and/or ratified by, and executed on behalf of the Borrower, and that it constitutes a valid and legally binding obligation of the Borrower in accordance with all of its terms;

B. A statement of the names of authorized Borrower representatives for loan implementation purposes, and a specimen signature of each person specified in such statement.

C. An executed Agreement between the Ministry of Finance and INDE which provides:

1. That INDE shall be the GOG institution responsible for execution of the Project;

2. That all funds disbursed by the Borrower and AID to INDE will be on a non-reimbursable basis; and,

3. That terms and conditions of the loan agreement will govern the use of Project funds by INDE;

D. Evidence that INDE has designated a Project Manager;

E. Evidence that INDE's rate schedule and additional charges are in consonance with the objectives of this project;

F. Evidence that INDE has made satisfactory arrangements to retain consultant engineering services for the project;

G. A detailed financial plan indicating projected annual GCG counterpart contributions which will be made available to support the Project;

H. A detailed technical assistance plan, including the uses to be made of such technical assistance and where and when such assistance will be obtained.

IV. Conditions Precedent to Disbursement for Other than Technical and Professional Services

Prior to any disbursement or issuance of any Letter of Commitment other than for Technical and Professional Services, the Borrower shall furnish to AID in form and substance satisfactory to AID, a detailed time-phased Implementation Plan and with cost estimates covering:

A. A schedule of training setting forth nature, timing, and source of instruction for INDE personnel and stipulating training to be provided at the village level;

B. A procurement plan for obtaining materials and contract construction services; and,

C. A construction schedule by geographic area.

V. Condition Precedent to Disbursement of Commitment in Excess of $8 Million of Loan Funds

Prior to any disbursement or to the issuance of commitment documents in excess of $8 million under the Loan, INDE shall submit in form and substance satisfactory to AID a plan for expansion of rural electrification systems to serve additional low income customers following disbursement of the Loan. The plan will provide for the connection of 10,000 additional hook-ups in rural areas in each year subsequent to Loan disbursement which will be financed with INDE's own revenues along with other sources of financing as may be required.

VI. Covenants

The Borrower covenants and agrees that, except as AID may otherwise agree in writing, the Borrower shall:

A. Contribute to the project on a timely basis not less than the equivalent of seven million four hundred thousand United States Dollars ($7,400,000) during the implementation period of the Project;

B. Cause INDE to carry out the plan in accordance with condition precedent number three above;

C. Cause INDE to carry out an impact evaluation in the Project Area prior to the PACD and annual progress evaluations each year of project implementation.

D. Cause INDE to obtain rights-of-way for all construction activities prior to initiation of construction on the property involved.

E. Cause INDE to submit a yearly construction schedule to AID.

COST ESTIMATES FOR TECHNICAL ASSISTANCE AND TRAINING FOR INDE MANAGEMENT AND TECHNICAL PERSONNEL

I.	**TECHNICAL ASSISTANCE**		$350,000
1.	Technical Practices		$53,340
	6 months x $7,560/month (includes salary, overhead $ fee)	= $45,360	
	Travel 1 x $600/r.t.	= 600	
	Per Diem 180 days x $41	= 7,380	
2.	Rate Analysis		$53,340
	6 months x $7,560/month	= $45,360	
	Travel 1 x $600/r.t.	= 600	
	Per Diem 180 days x $41	= 7,380	
3.	Commercial Operations		$160,020
	18 months x $7,560/month	= $136,080	
	Travel 3 x $600/r.t.	= 1,800	
	Per Diem 540 days x $41	= 22,140	
4.	Other Consultants		$53,340
	6 months x $7,560/month	= $45,360	
	Travel 1 x $600/r.t.	= 600	
	Per Diem 180 days x $41	= 7,380	
5.	INDE Contract Personnel and Evaluation Local Costs		$29,960
II.	**TRAINING**		$100,000
1.	One month course in rural electrification in Nicaragua and Costa		

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Rica for 15 persons		$20,500
Travel	= $ 1,500	
Per Diem	= 18,000	
Other	= 1,000	
2. Five INDE Executives to special courses in U.S. for 15 days		$17,200
Travel	= $ 3,000	
Per Diem	= 2,700	
Course expenses	= 10,000	
Travel in U.S.	= 1,500	
3. Five INDE Executives to U.S. for 30 days		$19,820
Travel	= $ 3,000	
Per Diem	= 5,250	
Course expenses	= 10,000	
Travel in U.S.	= 1,570	
4. Equivalent of Three Technicians for one-year training in U.S. at $14,160 each		$42,480

PRESENT GENERATION PLANTS

No.	NAME	TYPE	TOTAL CAPACITY MW
1.	Jurun Marinalá	Hydro	60.0
2.	Esclavos	Hydro	13.0
3.	El Salto	Hydro	5.5 5/
4.	San Luis	Hydro	5.0 5/
5.	Palín	Hydro	1.6
6.	Río Hondo	Hydro	2.4
7.	Santa María	Hydro	5.9
8.	El Porvenir	Hydro	2.3
9.	Escuintla	Steam	33.0
10.	Escuintla	Gas	75.0
11.	Various 1/	Diesel	4.3
SUBTOTAL INDE INTERCONNECTED PLANTS			208.0
12.	Laguna	Steam	30.0
13.	Laguna	Gas	12.5
14.	Laguna	Diesel	4.0
15.	Castellana	Diesel	5.0
SUBTOTAL EEGSA INTERCONNECTED PLANTS			51.5
16.	Municipal 2/	Hydro	7.1
17.	Various 3/	Diesel	7.0
18.	Private 4/	Diesel	5.2
SUBTOTAL NON CONNECTED PLANTS			19.3
	GRAND TOTAL		278.8

SUMMARY

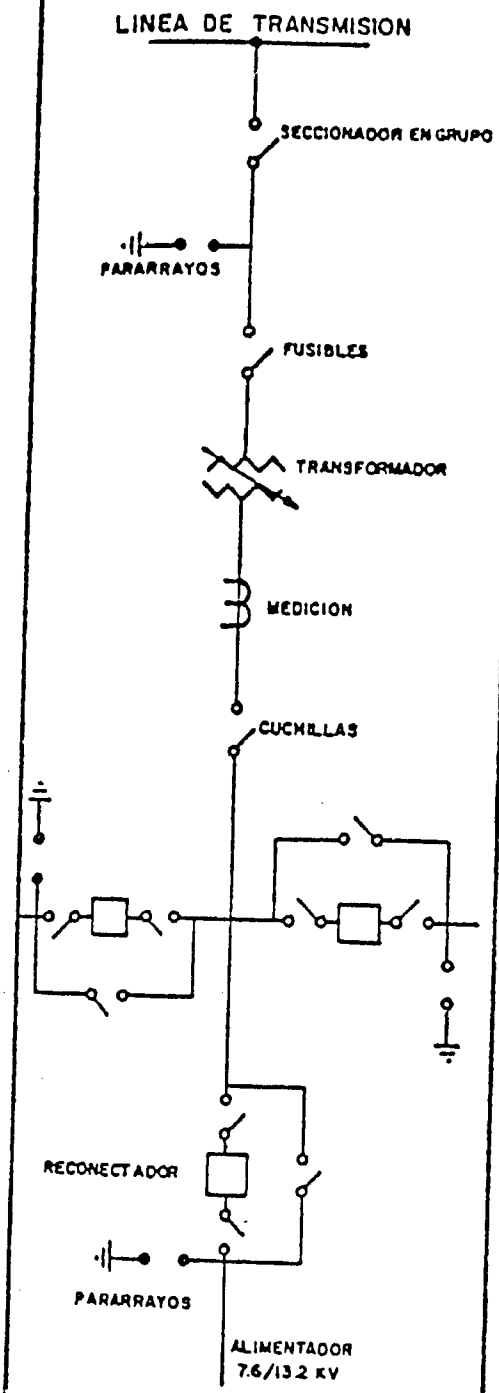
INDE INTERCONNECTED HYDRO	95.7
INDE INTERCONNECTED THERMAL	112.3
EEGSA INTERCONNECTED THERMAL	51.5
INDE NON-CONNECTED THERMAL	7.0
MUNICIPAL NON-CONNECTED HYDRO	7.1
PRIVATE NON-CONNECTED THERMAL	5.2
GRAND TOTAL	278.8
TOTAL INTERCONNECTED CAPACITY	259.5
TOTAL NON-CONNECTED CAPACITY	19.3
GRAND TOTAL	278.8
TOTAL HYDRO	102.8
TOTAL THERMAL	176.0
GRAND TOTAL	278.8

NOTES:

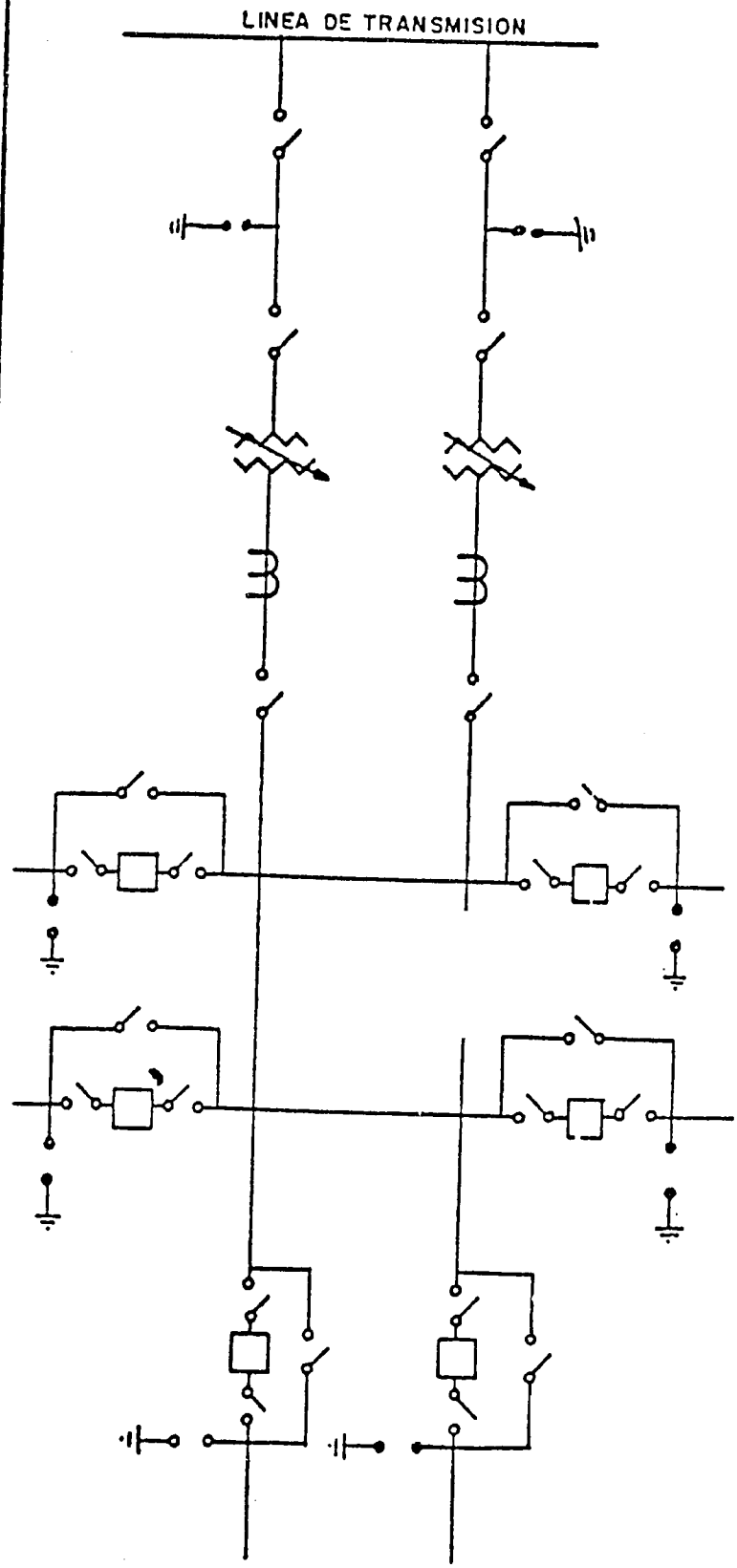
1/ Four in San Felipe, Retalhuleu & one in Meléndez, San Marcos.
2/ Approximately 30 isolated plants average 240 KW each serving small load centers.
3/ Approximately 40 isolated plants serving small load centers.
4/ Approximately 30 plants in various locations.
5/ Very little generation possible since water was rechanneled for Jurún Marinalá plant in 1970.

GENERATION PLANTS UNDER CONSTRUCTION OR PRESENTLY PLANNED

NAME	OWNER	TYPE	TOTAL CAPACITY MW	EXPECTED IN SERVICE
Escuintla No. 2	INDE	Steam	53	8/77
Laguna 2 & 3	EEGSA	Gas	50	9/77
Aguacapa	INDE	Hydro	90	1979
Chixoy	INDE	Hydro	300	1982



ALIMENTACION SENCILLA



ALIMENTACION DOBLE

INSTITUTO NACIONAL DE ELECTRIFICACION GUATEMALA C.A.	SUBESTACION TIPICA DIAGRAMA UNIFILAR			No16
DEPARTAMENTO DE PLANEAMIENTO	ELABORO: LUIS ARMAS B	DIBUJO. LUIS ARMAS B	FECHA. ABRIL, 1971	

GUATEMALA RURAL ELECTRIC SYSTEM

ESSENTIAL EQUIPMENT

Cost Estimate

Metering Laboratory

Item No.	Qty.	Description	Unit Price	Total
1	2	Meter Calibration Table	7,000	14,000
2	2	Electric Portable Chronometer	150	300
3	2	Accuracy Wattmeter	750	1,500
4	2	Universal Bridges	1,200	2,400
5	2	Portable Meter Testers	3,000	6,000
6	2	Phase Sequence Indicator	75	150
7	4	Portable Multimeters	450	1,800
8	2	Transformer Polarity Testers	100	200
9	2	Portable Current Transformer Tester	150	300
10	2	Portable Volt Meters	300	600
11	2	Portable Amp Meters	300	600
		Protection Laboratory		
12	1	Automatic Reclosure Test Equip.	15,000	15,000
13	1	Relay Test Table	30,000	30,000
		Maintenance & Operation Equip.		
14	60	Lineman Equipment Sets	200	12,000
15	10	Pick up 1 ½/T with body compartments	7,000	70,000
16	4	Winch truck(mechanical) Line construction	40,000	160,000
17	1	Hot Line Trailer	35,000	35,000
		GRAND TOTAL (SAY)		350,000

COST ESTIMATE FOR CONSULTING ENGINEERING SERVICES

Item	Description	Man-Month Estimate
1.	Assist in preparation of Bid Documents for construction and material specifications (3 months x 3 men)	9
2.	Assist in analysis of bids and selection of construction contracts (3 contracts x 2 months x 1 man)	6
3.	Certify force account and/or construction contract vouchers for payment (48 months x 1 man)	48
	T O T A L	63

$35,000/year ÷ 12 = $2,900/month

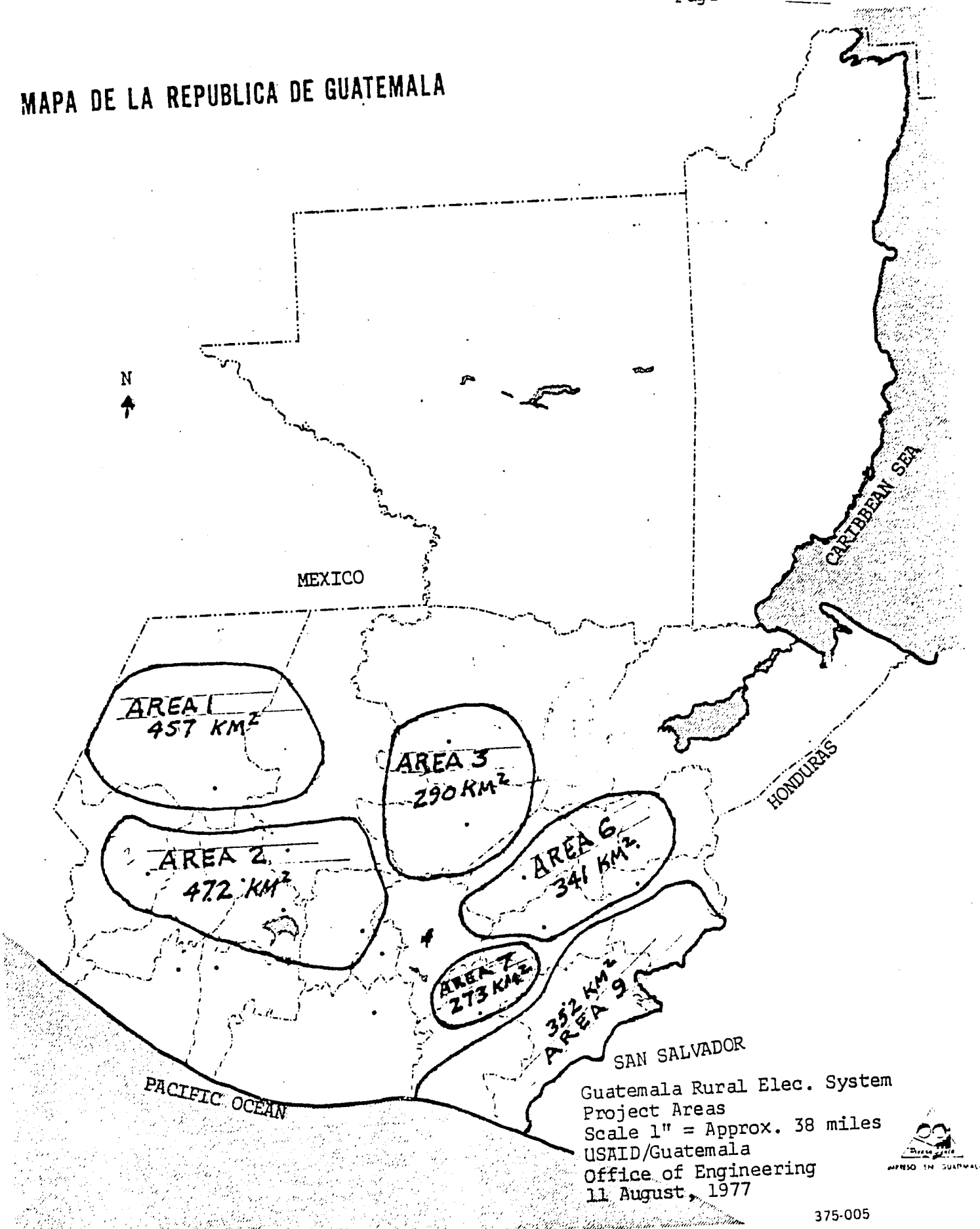
overhead at 75% = $2,190/month

P. D.$41 x 30 = $1,230

$6,320 x 63 = $398,160

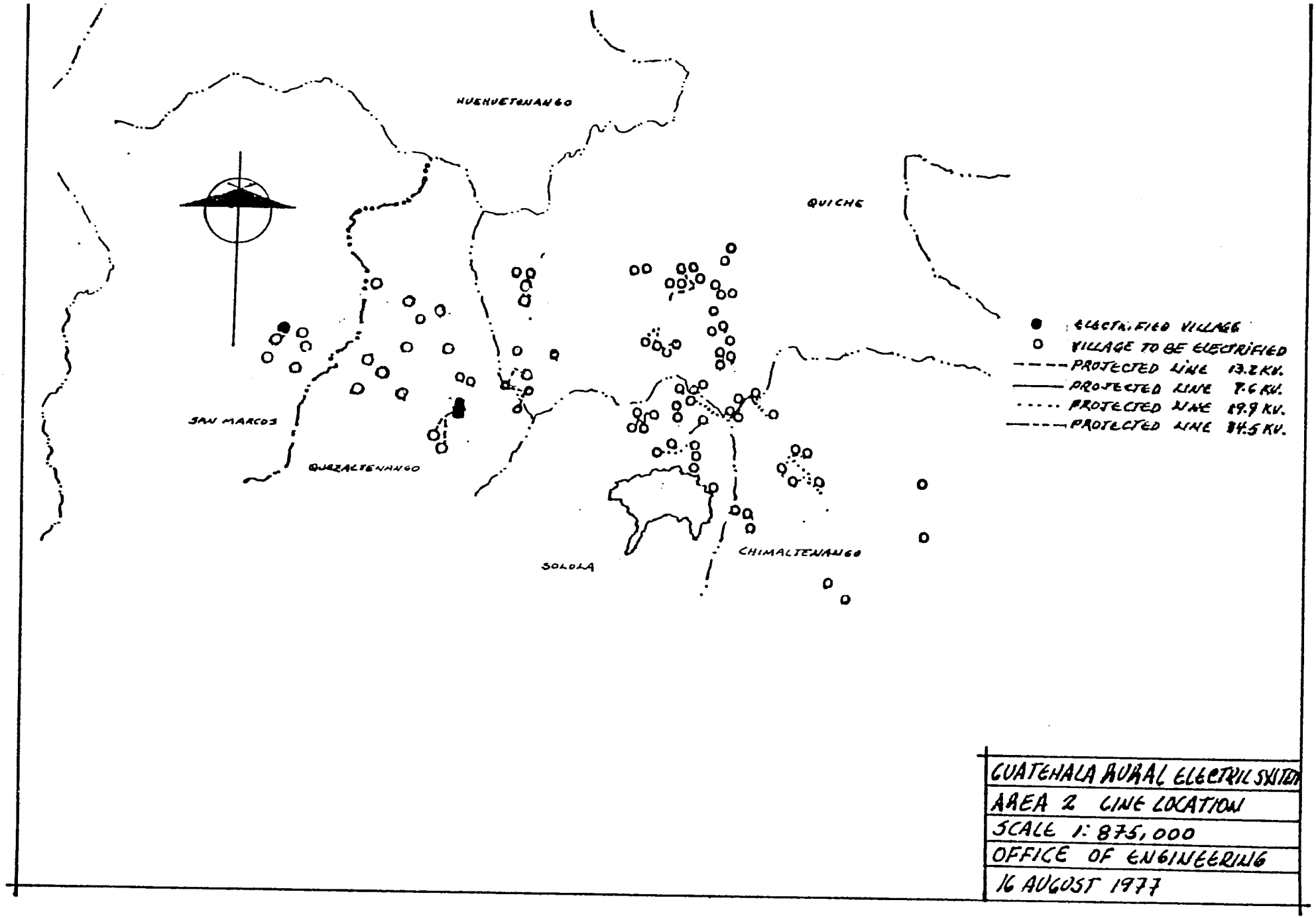
Rounded to $400,000

MAPA DE LA REPUBLICA DE GUATEMALA

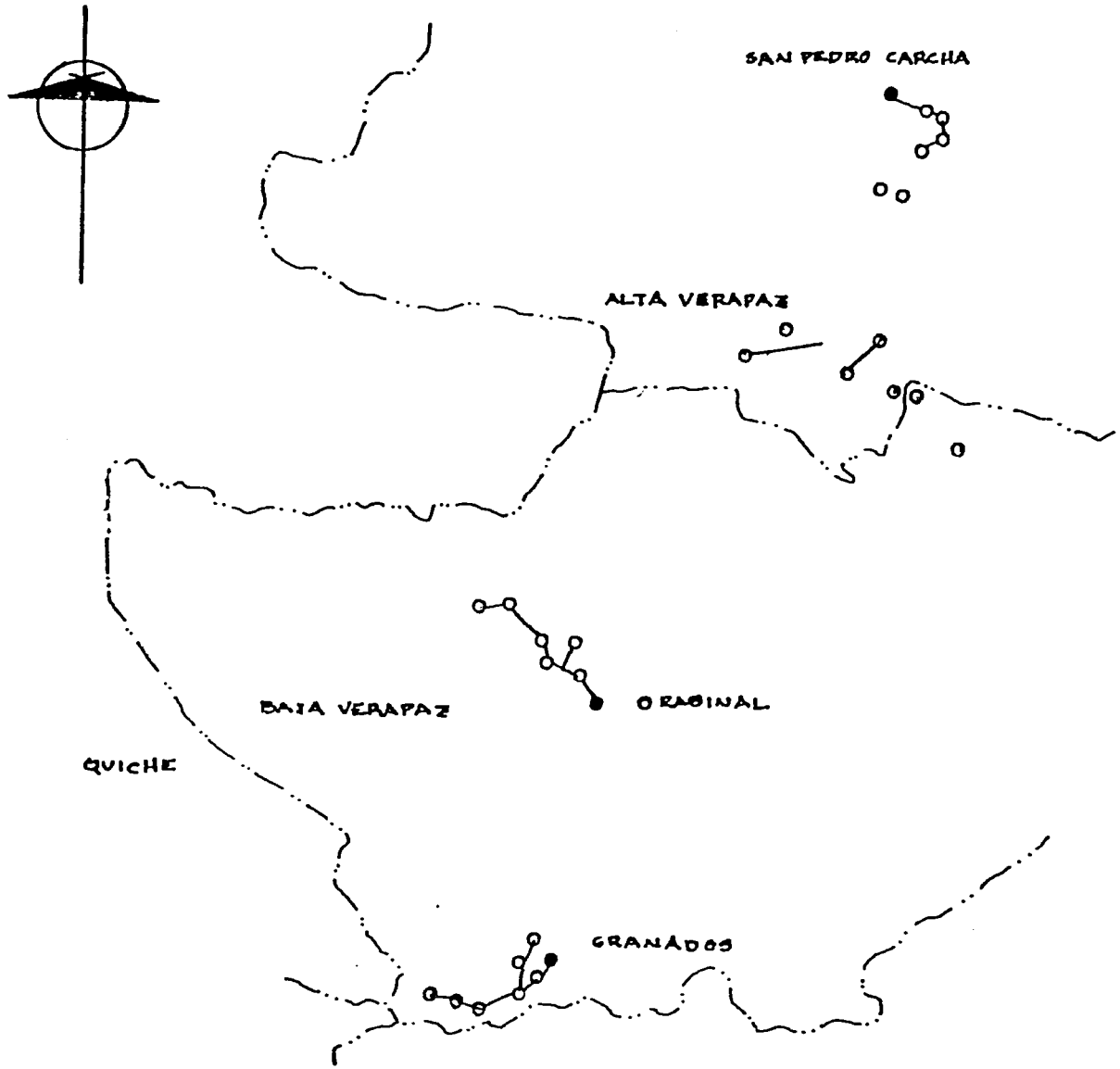


Guatemala Rural Elec. System
Project Areas
Scale 1" = Approx. 38 miles
USAID/Guatemala
Office of Engineering
11 August, 1977

375-005

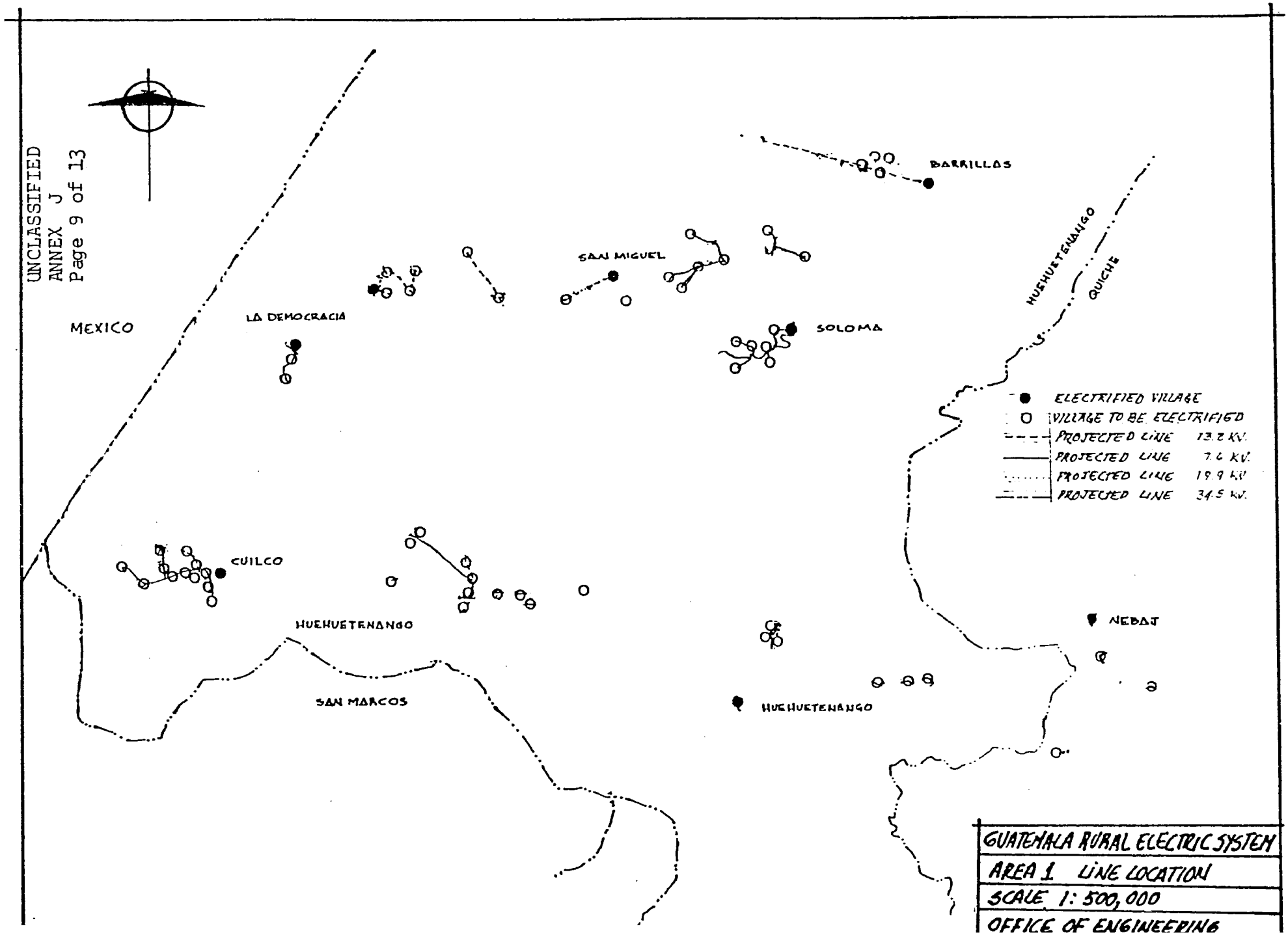


GUATEMALA RURAL ELECTRIC SYSTEM
AREA 2 LINE LOCATION
SCALE 1: 875,000
OFFICE OF ENGINEERING
16 AUGUST 1977



● ELECTRIFIED VILLAGE
○ VILLAGE TO BE ELECTRIFIED
---- PROJECTED LINE 13.2 KV.
——— PROJECTED LINE 7.6 KV.
····· PROJECTED LINE 19.9 KV.
— — — PROJECTED LINE 34.5 KV.

GUATEMALA RURAL ELECTRIC SYSTEM
AREA 3 LINE LOCATION
SCALE 1: 500,000
OFFICE OF ENGINEERING
16 AGUST 1977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CUILCO
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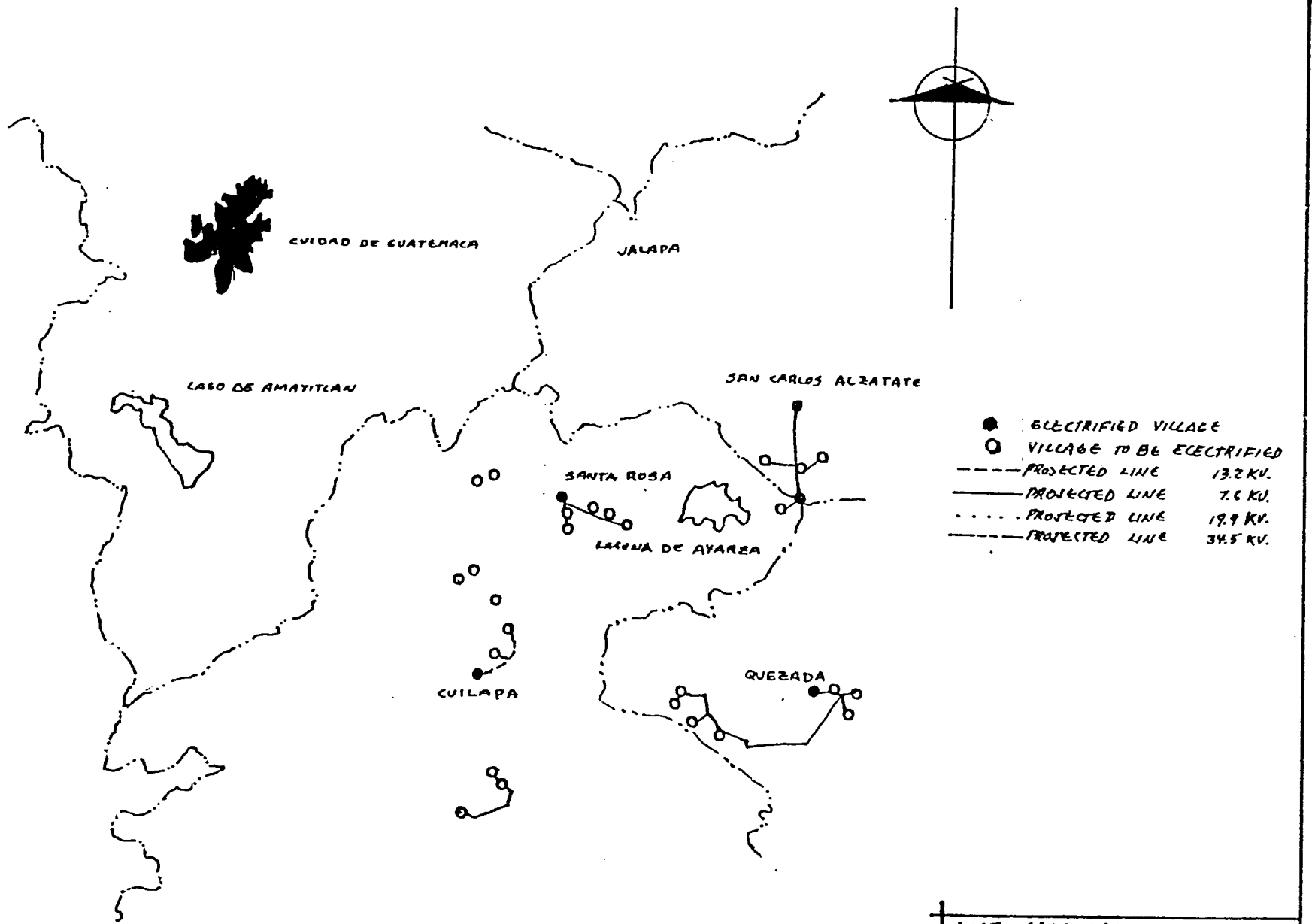
SAN MARCOS
NEBAJ
HUEHUETENANGO
ELECTRIFIED VILLAGE
VILLAGE TO BE ELECTRIFIED
PROJECTED LINE 13.2 KV.
PROJECTED LINE 7.6 KV.
PROJECTED LINE 19.9 KV.
PROJECTED LINE 34.5 KV.
GUATEMALA RURAL ELECTRIC SYSTEM
AREA 1 LINE LOCATION
SCALE 1: 500,000
OFFICE OF ENGINEERING



GUATEMALA RURAL ELECTRIC SYSTEM
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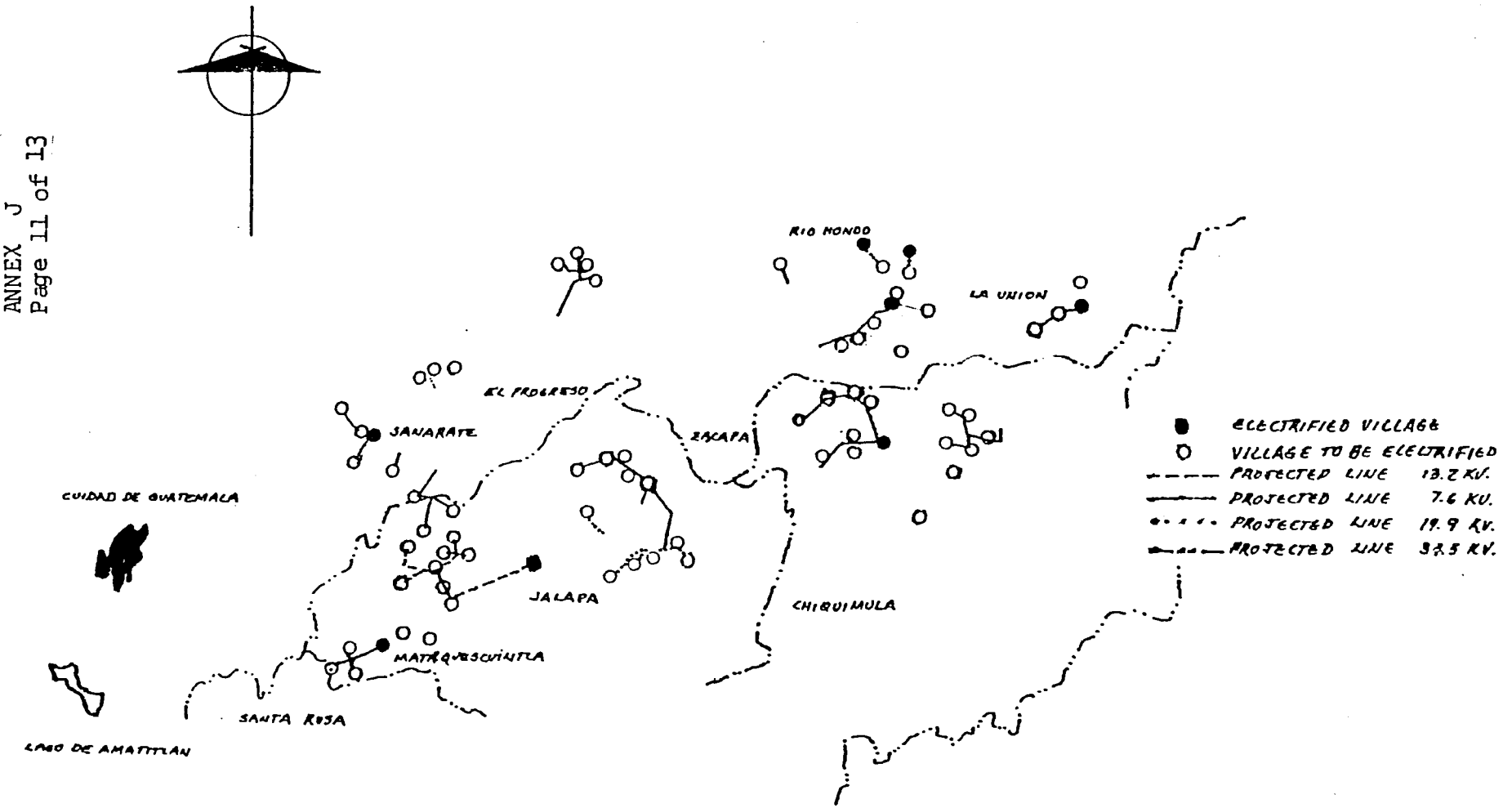
OFFICE OF ENGINEERING
16 AUGUST 1977



GUATEMALA RURAL ELECTRIC SYSTEM
AREA 6 LINE LOCATION
SCALE 1: 875,000
OFFICE OF ENGINEERING
16 AUGUST 1977

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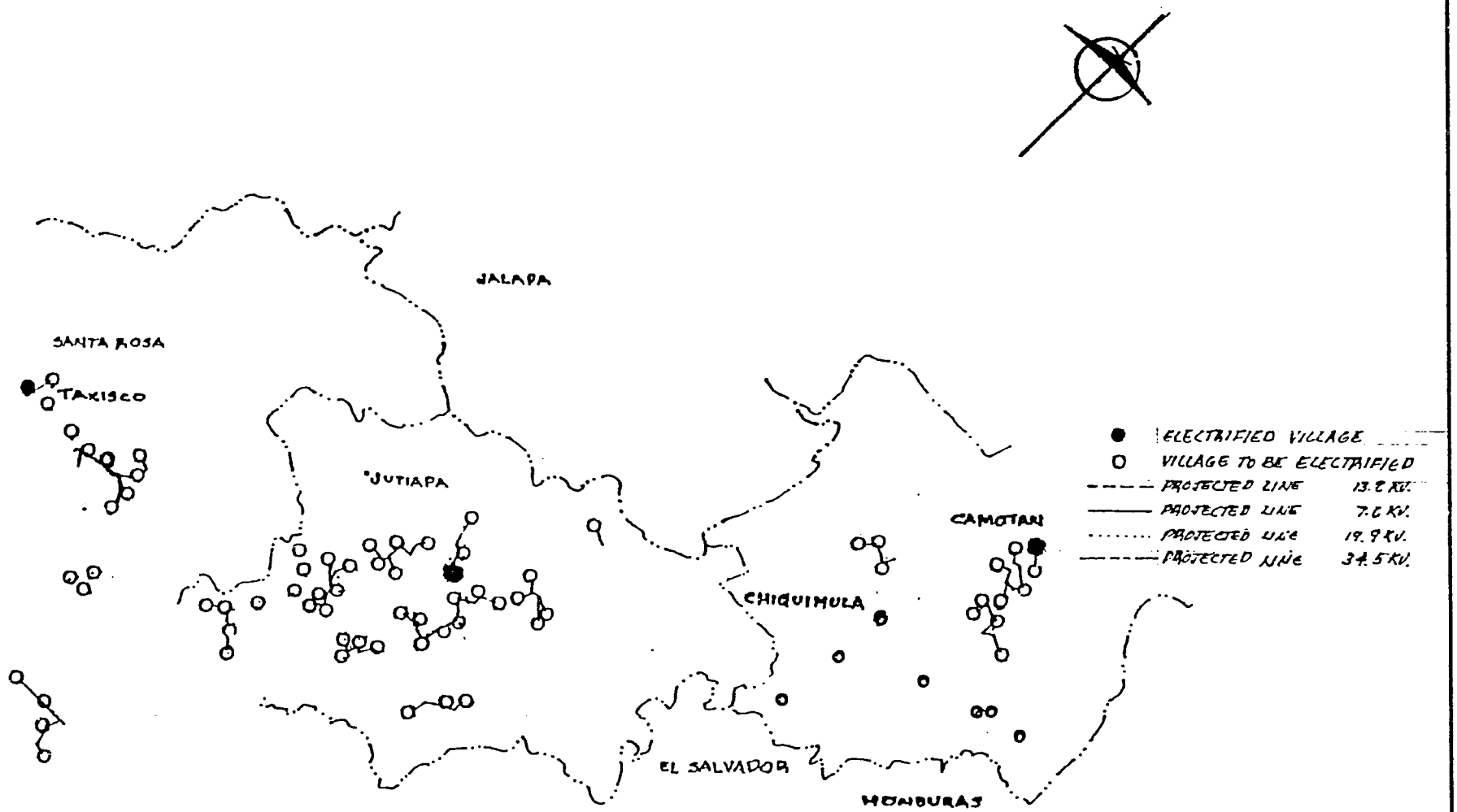

GUATEMALA RURAL ELECTRIC SYSTEM
AREA 9 LINE LOCATION
SCALE 1:875,000
OFFICE OF ENGINEERING
16 AUGUST 1977

INDE ADMINISTRATIVE AND ENGINEERING COSTS

Item		Adm & Engr Cost
1.	Subtransmission	$156,350
	a. Zaragoza to Quezaltenango	$ 85,450
	b. El Progreso to Quezaltepeque	50,900
	c. El Porvenir to San Marcos	20,000
2.	Distribution Substations	$ 30,000
	a. Quezaltepeque	$ 15,000
	b. San Marcos	15,000
3.	Primary Distribution Lines	$169,380
	a. 34.5 KV (3)	$ 4,630
	b. 19.1 KV (1)	35,630
	c. 13.2 KV (3)	25,420
	d. 7.6 KV (1)	103,700.
4.	Secondary Distribution Lines	$195,370
	a. 120/240 V new villages	$175,170
	b. 120/240 V electrified villages	20,200
5.	Distribution Transformers (10 KVA) 7.6 KV/120-240 V	$ 22,890
	a. New Villages	$ 22,000
	b. Electrified villages	890
6.	Meter & Service Drops	$141,140
	a. New villages	$ 86,470
	b. Electrified villages	54,670
	TOTAL	$715,130

AGGREGATION OF TOTAL SALES

(US $000)

Assumptions

1. Columns 1 thru 6. Aggregation of total sales distributed by type of customers. The computation of total sales for each type appears in Exhibits 2 and 3, Computation of Sales.
2. Column 7. Uncollectable billings have been estimated at 2% of each year's sales.
3. Column 8. Net Sales result from the deduction of uncollectable billings from total sales of electricity.

	1	2	3	4	5	6	7	8
Year	Residential	Commercial	Public Lighting	Government and Municipal	Industrial	Total Sales	Less 2% Bad Debts	Net Sales
1	135	16	-	-	1	152	3	149
2	406	47	7	1	3	464	9	455
3	724	86	30	7	5	852	17	835
4	1,037	124	59	13	7	1,240	25	1,215
5	1,237	151	75	17	9	1,489	30	1,459
6	1,373	170	83	19	10	1,655	33	1,622
7	1,516	191	91	20	11	1,829	37	1,792
8	1,691	210	99	22	12	2,034	41	1,993
9	1,877	230	106	24	13	2,250	45	2,205
10	2,079	250	114	26	15	2,484	50	2,434
11	2,292	272	122	27	16	2,729	55	2,674
12	2,524	295	130	29	18	2,996	60	2,936
13	2,776	319	138	31	19	3,283	66	3,217
14	3,040	344	146	33	21	3,584	72	3,512
15	3,325	370	153	34	23	3,905	78	3,827
16	3,634	397	161	36	25	4,253	85	4,168
17	3,957	426	169	38	28	4,618	92	4,526
18	4,304	457	176	40	30	5,007	100	4,907
19	4,677	488	184	41	33	5,423	108	5,315
20	5,078	522	191	43	36	5,870	117	5,753
21	5,496	556	199	45	38	6,334	127	6,207
22	5,942	593	206	46	42	6,829	137	6,692
23	6,419	631	214	48	45	7,357	147	7,210
24	6,927	671	221	50	48	7,917	158	7,759
25	7,468	713	228	51	52	8,512	170	8,342
26	8,044	756	235	53	56	9,144	183	8,961
27	8,655	802	243	55	61	9,816	196	9,620
28	9,303	849	250	56	65	10,523	210	10,313
29	9,990	899	257	58	70	11,274	225	11,049
30	10,731	951	264	59	75	12,080	242	11,838

COMPUTATION OF RESIDENTIAL AND COMMERCIAL SALES

Assumptions

A. Residential

1. Column 1. Average number of connections - computed annual average of residential customers connected calculated by adding ½ of current years increase in residential customers to the previous years cumulative total.

2. Column 2. Estimated KWH usage per year per customer. INDE's estimate of 200 KWH in the first year increased at the rate of 3.2% per year, until year 7 when increase will jump to 4.5%.

3. Column 3. Total MWH sold to residential consumers - average connections (column 1) x KWH/year/consumer (column 2) rounded to thousands of kilowatts.

4. Column 4. Sales Price - INDE's estimate of sales price to residential consumers per MWH.

5. Column 5. Total Sales - total MWH sold (column 3) x sales price (column 4).

B. Commercial

As above except column 2 - estimated KWH per year per consumer - INDE's estimate of 600 KWH in the first year increased at the rate of 5% through year 7; thereafter at 3% to a maximum usage of 1510 KWH.

	Residential					Commercial				
	1	2	3	4	5	6	7	8	9	10
Year	Average Number of Connections	KWH Per Consumer	MWH Total	MWH Sales Price	(US $000) Total Sales	Average Number of Connections	KWH Per Consumer	MWH Total	MWH Sales Price	(US $000) Total Sales
1	9,013	200	1,803	75	135	475	600	285	55	16
2	27,040	200	5,408	75	406	1,423	600	854	55	47
3	46,868	206	9,655	75	724	2,468	630	1,555	55	86
4	64,893	213	13,822	75	1,037	3,418	661	2,259	55	124
5	74,955	220	16,490	75	1,237	3,945	694	2,738	55	151
6	80,655	227	18,309	75	1,373	4,245	728	3,090	55	170
7	86,355	234	20,207	75	1,516	4,545	764	3,472	55	191
8	92,055	245	22,553	75	1,691	4,845	787	3,813	55	210
9	97,755	256	25,025	75	1,877	5,145	811	4,173	55	230
10	103,455	268	27,726	75	2,079	5,445	835	4,547	55	250
11	109,155	280	30,563	75	2,292	5,745	860	4,941	55	272
12	114,855	293	33,653	75	2,524	6,045	886	5,356	55	295
13	120,555	307	37,010	75	2,776	6,345	913	5,793	55	319
14	126,255	321	40,528	75	3,040	6,645	940	6,246	55	344
15	131,955	336	44,337	75	3,325	6,945	968	6,723	55	370
16	137,655	352	48,455	75	3,634	7,245	997	7,223	55	397
17	143,355	368	52,755	75	3,957	7,545	1,027	7,749	55	426
18	149,055	385	57,386	75	4,304	7,845	1,058	8,300	55	457
19	154,755	403	62,366	75	4,677	8,145	1,090	8,878	55	488
20	160,455	422	67,712	75	5,078	8,445	1,123	9,484	55	522
21	166,155	441	73,274	75	5,496	8,745	1,157	10,116	55	556
22	171,855	461	79,225	75	5,942	9,045	1,192	10,782	55	593
23	177,555	482	85,582	75	6,419	9,345	1,228	11,476	55	631
24	183,255	504	92,361	75	6,927	9,645	1,265	12,201	55	671
25	188,955	527	99,579	75	7,468	9,945	1,303	12,958	55	713
26	194,655	551	107,255	75	8,044	10,245	1,342	13,749	55	756
27	200,355	576	115,404	75	8,655	10,545	1,382	14,573	55	802
28	206,055	602	124,045	75	9,303	10,845	1,423	15,432	55	849
29	211,755	629	133,194	75	9,990	11,145	1,466	16,339	55	899
30	217,455	658	143,085	75	10,731	11,445	1,510	17,282	55	951

UNCLASSIFIED
ANNEX K
EXHIBIT 3

COMPUTATION OF PUBLIC LIGHTING, GOVERNMENT AND MUNICIPAL, AND INDUSTRIAL SALES

Annual Average Totals Cumulative

		Industrial Lighting					Govm't/Municipal			Industrial		
		1	2	3	4	5	6	7	8	9	10	11
Assumptions	Year	Newly Electrified Connections (Residential)	Average No. of Connections	MWH Used (40 KWH/ Consumer)	MWH Sales Price	(US $000) Total Sales	MWH Used (8 KWH/ Consumer)	MWH Sales Price	(US $000) Total Sales	MWH Used (1.5% of Total Residential Consumption)	MWH Sales Price	(US $000) Total Sales
A. Public Lighting	1	-	-	-	-	-	-	-	-	27	35	1
	2	8,125	4,063	163	45	7	33	45	1	81	35	3
1. Column 1. Total Connections for newly electrified residential users and additional residential connections. See Exhibit 6, Columns 3 and 5.	3	29,750	18,938	758	45	30	152	45	7	145	35	5
	4	44,175	36,963	1,479	45	59	296	45	13	207	35	7
	5	49,177	46,676	1,867	45	75	373	45	17	247	35	9
	6	54,162	51,670	2,067	45	83	413	45	19	275	35	10
	7	59,129	56,646	2,266	45	91	453	45	20	303	35	11
	8	64,078	61,604	2,464	45	99	493	45	22	338	35	12
2. Column 2. Average number of connections - Annual Average of residential customers connected calculated by adding ½ of current years increase in residential customers to the previous years cumulative total.	9	69,008	66,543	2,662	45	106	532	45	24	375	35	13
	10	73,919	71,464	2,859	45	114	572	45	26	416	35	15
	11	78,810	76,365	3,055	45	122	611	45	27	458	35	16
	12	83,681	81,246	3,250	45	130	650	45	29	505	35	18
	13	88,531	86,106	3,444	45	138	689	45	31	555	35	19
	14	93,360	90,946	3,638	45	146	728	45	33	608	35	21
	15	98,167	95,764	3,831	45	153	766	45	34	665	35	23
	16	102,952	100,560	4,022	45	161	804	45	36	727	35	25
3. Column 3. Public lighting consumption rates were established at the rate of 40 KWH per year. Totals in this column are rounded to MWH used.	17	107,714	105,333	4,213	45	169	843	45	38	791	35	28
	18	112,452	110,083	4,403	45	176	881	45	40	861	35	30
	19	117,166	114,809	4,592	45	184	918	45	41	935	35	33
	20	121,856	119,511	4,780	45	191	956	45	43	1,016	35	36
	21	126,520	124,188	4,968	45	199	994	45	45	1,099	35	38
4. Column 4. Sales Price - INDE's estimate of sales price to public lighting consumers in MWH.	22	131,158	128,839	5,154	45	206	1,031	45	46	1,188	35	42
	23	135,770	133,464	5,339	45	214	1,068	45	48	1,284	35	45
	24	140,355	138,063	5,523	45	221	1,105	45	50	1,385	35	48
	25	144,912	142,634	5,705	45	228	1,141	45	51	1,494	35	52
	26	149,440	147,176	5,887	45	235	1,177	45	53	1,609	35	56
5. Column 5. Total Sales - Total MWH sold (column 3) x sales price (column 4).	27	153,939	151,690	6,068	45	243	1,214	45	55	1,731	35	61
	28	158,408	156,174	6,247	45	250	1,249	45	56	1,861	35	65
	29	162,846	160,627	6,425	45	257	1,285	45	58	1,998	35	70
	30	167,253	165,050	6,602	45	264	1,320	45	59	2,146	35	75

B. Government and Municipal Consumption

Columns 6,7 and 8 as above except column 6 consumption rates estimated at 8 KWH per consumer.

C. Industrial Consumption

1. Column 9 was estimated at 1.5% of total MWH of residential consumption. See column 3, Exhibit 2.
2. Column 10. Sales Price - INDE's estimate of sales price for industrial consumption in MWH.
3. Column 11. Total Sales - total of column 9 x column 10.

COMPUTATION OF COST OF SALES

Assumptions		1	2	3	4	5	6	7	8	9	10
		MWH SOLD									
	Year	Residential	Commercial	Public Lighting	Govt. and Municipal	Industrial	Total	Cost MWH Sold Without Interest and Depreciation	Total Cost of Sales Without Interest and Depreciation (US$000)	Cost MWH Sold With Interest Excluding Depreciation	Total Cost of Sales With Interest Excluding Depreciation (US$000)
	1	1803	285	-	-	27	2115	26.40	56	34.80	74
	2	5408	854	163	33	81	6539	28.20	184	36.30	237
	3	9655	1555	758	152	145	12265	29.90	367	37.40	459
	4	13822	2259	1479	296	207	18063	13.80	249	24.80	448
	5	16490	2738	1867	373	247	21715	12.00	261	22.10	480
	6	18309	3090	2067	413	275	24154	12.00	290	22.10	534
	7	20207	3472	2266	453	303	26701	12.00	320	22.10	590
	8	22553	3813	2464	493	338	29661	12.00	356	22.10	656
	9	25025	4173	2662	532	375	32767	12.00	393	22.10	724
	10	27726	4547	2859	572	416	36120	12.00	433	22.10	798
	11	30563	4941	3055	611	458	39628	12.00	476	22.10	876
	12	33653	5356	3250	650	505	43414	12.00	521	22.10	959
	13	37010	5793	3444	689	555	47491	12.00	570	22.10	1050
	14	40528	6246	3638	728	608	51748	12.00	621	22.10	1144
	15	44337	6723	3831	766	665	56322	12.00	676	22.10	1245
	16	48455	7223	4022	804	727	61231	12.00	735	22.10	1353
	17	52755	7749	4213	843	791	66351	12.00	796	22.10	1466
	18	57386	8300	4403	881	861	71831	12.00	862	22.10	1587
	19	62366	8878	4592	918	935	77689	12.00	932	22.10	1717
	20	67712	9484	4780	956	1016	83948	12.00	1007	22.10	1855
	21	73274	10118	4968	994	1099	90453	12.00	1085	22.10	1999
	22	79225	10782	5154	1031	1188	97380	12.00	1169	22.10	2152
	23	85582	11476	5339	1068	1284	104749	12.00	1257	22.10	2315
	24	92361	12201	5523	1105	1385	112575	12.00	1351	22.10	2488
	25	99579	12958	5705	1141	1494	120877	12.00	1451	22.10	2671
	26	107255	13749	5887	1177	1609	129677	12.00	1556	22.10	2866
	27	115404	14573	6068	1214	1731	138990	12.00	1668	22.10	3072
	28	124045	15432	6247	1249	1861	148834	12.00	1786	22.10	3289
	29	133194	16339	6425	1285	1998	159241	12.00	1911	22.10	3519
	30	143865	17282	6602	1320	2146	170435	12.00	2045	22.10	3767

1) Columns 1 thru 6 - aggregation of total MWH of electricity to be sold to project connected customers. The computation of total MWH sold appears in exhibits 2 and 3, computations of sales.

2) Column 7 - INDE's projections of cost per MWH of electricity sold not including interest and depreciation. The reducing costs after year 3 reflects the lower cost of generating electricity through the use of hydropower for the generators.

3) Column 8 - total MWH's sold x the cost per MWH (col. 6 x col. 7).

4) Column 9 - INDE's projections of cost per MWH of electricity including interest as a cost.

5) Column 10 - adjusted cost of sales including interest as a cost (col. 6 x col. 9).

UNCLASSIFIED
ANNEX K
EXHIBIT 5

PROJECTION OF CUSTOMER AMORTIZATION PAYMENTS

Assumptions	Year	2 House Wiring: Annual Average Number of New Connections	3 House Wiring: Number of New Connections Previous 3 Years	4 House Wiring: Annual Average Number of New Connections 5th Prev. Year	5 House Wiring: Annual Total Cus. Repaying	5 House Wiring: Annual Repayments At $5.28/ Customer Per Year (US$000)	6 Rate Increase Adjustment: Total Connections All Prev. Years	7 Rate Increase Adjustment: Annual Number of Customers Paying	8 Rate Increase Adjustment: Additional Recoveries (U.S. $000) At $6.00/yr.	9 Rate Increase Adjustment: Additional Recoveries (U.S. $000) At $9.00/yr.	10 Rate Increase Adjustment: Additional Recoveries (U.S. $000) At $12.00/yr.
Projection of Customer Amortization Payments	1	9,488	-	-	9,488	50	-	9,488	57	85	114
	2	9,488	18,975	-	26,463	140	18,975	26,463	159	238	318
	3	11,385	37,950	-	49,335	260	37,950	49,335	296	444	592
A. Housewiring:	4	7,590	60,720	-	68,310	361	60,720	68,310	410	615	820
	5	3,000	56,925	9,488	69,413	367	75,900	78,900	473	710	947
1) Column 1 - average (total ÷ by 2) of new customers connected each year.	6	3,000	43,950	9,488	56,438	298	81,900	84,900	509	764	1019
	7	3,000	27,180	11,385	41,565	219	87,900	90,900	545	818	1091
	8	3,000	18,000	7,590	28,590	151	93,900	96,900	581	872	1163
	9	3,000	18,000	3,000	24,000	127	99,900	102,900	617	926	1235
2) Column 2 - total number of connections for the previous 3 years.	10	3,000	18,000	3,000	24,000	127	105,900	108,900	653	980	1307
	11	3,000	18,000	3,000	24,000	127	111,900	114,900	689	1034	1379
	12	3,000	18,000	3,000	24,000	127	117,900	120,900	725	1088	1451
	13	3,000	18,000	3,000	24,000	127	123,900	126,900	761	1142	1523
3) Column 3 - average (total ÷ by 2) of new customers connected in the 5th previous year.	14	3,000	18,000	3,000	24,000	127	129,900	132,900	797	1196	1595
	15	3,000	18,000	3,000	24,000	127	135,900	138,900	833	1250	1667
	16	3,000	18,000	3,000	24,000	127	141,900	144,900	869	1304	1739
	17	3,000	18,000	3,000	24,000	127	147,900	150,900	905	1358	1811
4) Column 4 - total number of customers making 4 year amortization payments e.g. ½ of year 1) all of year 2) all of year 3) for each year all of year 4) ½ of year 5)	18	3,000	18,000	3,000	24,000	127	153,900	156,900	941	1412	1883
	19	3,000	18,000	3,000	24,000	127	159,900	162,900	977	1466	1955
	20	3,000	18,000	3,000	24,000	127	165,900	168,900	1013	1520	2027
	21	3,000	18,000	3,000	24,000	127	171,900	174,900	1049	1574	2099
	22	3,000	18,000	3,000	24,000	127	177,900	180,000	1085	1628	2171
	23	3,000	18,000	3,000	24,000	127	183,900	186,900	1121	1682	2243
	24	3,000	18,000	3,000	24,000	127	189,900	192,900	1157	1736	2315
	25	3,000	18,000	3,000	24,000	127	195,900	198,900	1193	1790	2387
	26	3,000	18,000	3,000	24,000	127	201,900	204,900	1229	1844	2459
5) Column 5 - total customers making repayment (col. 4) x $5.28 annual amortization payment per customer.	27	3,000	18,000	3,000	24,000	127	207,900	210,900	1265	1898	2531
	28	3,000	18,000	3,000	24,000	127	213,900	216,900	1301	1952	2603
	29	3,000	18,000	3,000	24,000	127	219,900	222,900	1337	2006	2675
	30	3,000	18,000	3,000	24,000	127	225,900	228,900	1373	2060	2747

B. Rate adjustment for town lines:

6) Column 6 - total number of customers connected in all previous years (cumulative).

7) Column 7 - total number of customers connected in previous year (column 6) plus average new customers connected in current year for each year (year's total new customers ÷ by 2) for a total of all customers making payment.

8) Column 8 - total customers making payments (col. 7) x the low rate adjustment option of $6.00 per year.

9) Column 9 - total customers making payments (column 7) x the probable rate adjustment option of $9.00 per year.

10) Column 10 - total customers making payment (column 7) x the high rate adjustment option of $12.00 per year.

UNCLASSIFIED
ANNEX K
EXHIBIT 6

COMPUTATION OF CUMULATIVE CONNECTIONS AND CUSTOMER DEPOSITS

PROJECT CONNECTIONS

Assumptions	Year	1 Previously Electrified Residential	2 Previously Electrified Commercial	3 Newly Electrified Residential	4 Newly Electrified Commercial	5 Additional Connections Residential	6 Additional Connections Commercial	7 Total Connections Residential	8 Total Connections Commercial	9 Total Connections Total	10 Consumer Deposits (US$000)
Cumulative connections - indicates probable proportions of connections between residential and commercial between previously electrified towns and towns to be newly connected to the national grid. In the early years of project implementation it is expected that previously electrified towns will receive the bulk of project investment while later in the project period and continuing through the project life the proportion will be six connections in every newly electrified town to every 4 connections in previously electrified towns.	1	18,025	950	-	-	-	-	18,025	950	18,975	38
	2	27,930	1,470	8,125	425	-	-	36,055	1,895	37,950	38
	3	27,930	1,470	29,750	1,570	-	-	57,680	3,040	60,720	46
	4	27,930	1,470	44,175	2,325	-	-	72,105	3,795	75,900	30
	5	28,628	1,506	45,280	2,383	3,897	206	77,805	4,095	81,900	12
	6	29,343	1,543	46,412	2,443	7,750	409	83,505	4,395	87,900	12
	7	30,076	1,544	47,570	2,503	11,559	648	89,205	4,695	93,900	12
	8	30,827	1,616	48,761	2,566	15,317	810	94,905	4,992	99,900	12
	9	31,597	1,656	49,980	2,631	19,028	1,008	100,605	5,295	105,900	12
	10	32,386	1,697	51,229	2,696	22,690	1,202	106,305	5,595	111,900	12
	11	33,195	1,739	52,510	2,763	26,300	1,393	112,005	5,895	117,900	12
	12	34,024	1,782	53,822	2,832	29,859	1,581	117,705	6,195	123,900	12
	13	34,874	1,826	55,168	2,903	33,363	1,766	123,405	6,495	129,900	12
	14	35,745	1,871	56,547	2,976	36,813	1,948	129,105	6,795	135,900	12
	15	36,638	1,917	57,961	3,050	40,206	2,128	134,805	7,095	141,900	12
	16	37,553	1,964	59,410	3,127	43,542	2,304	140,505	7,395	147,900	12
	17	38,491	2,013	60,896	3,205	46,818	2,477	146,205	7,695	153,900	12
	18	39,453	2,063	62,418	3,285	50,034	2,647	151,905	7,995	159,900	12
	19	40,439	2,114	63,979	3,367	53,187	2,814	157,605	8,295	165,900	12
	20	41,449	2,166	65,578	3,451	56,278	2,978	163,305	8,595	171,900	12
	21	42,485	2,220	67,217	3,538	59,303	3,137	169,005	8,895	177,900	12
	22	43,547	2,275	68,898	3,626	62,260	3,294	174,705	9,195	183,900	12
	23	44,635	2,331	70,620	3,717	65,150	3,447	180,405	9,495	189,900	12
	24	45,750	2,389	72,386	3,809	67,969	3,597	186,105	9,795	195,900	12
	25	46,893	2,448	74,196	3,905	70,716	3,742	191,805	10,095	201,900	12
	26	48,065	2,509	76,050	4,003	73,390	3,883	197,505	10,395	207,900	12
	27	49,266	2,571	77,952	4,103	75,987	4,021	203,205	10,695	213,900	12
	28	50,497	2,635	79,900	4,205	78,508	4,155	208,905	10,995	219,900	12
	29	51,759	2,700	81,898	4,310	80,948	4,285	214,605	11,295	225,900	12
	30	53,052	2,767	83,945	4,418	83,308	4,410	220,305	11,595	231,900	12

Customer Deposits
The deposits to be held by INDE will be collected at the rate of $2.00 for every new connection. This deposit will be charged to assure payment of monthly electrical bills by the customers and is refundable upon discontinuation of service.

COMPUTATION OF INVESTMENT 1/

Assumptions Computation of Investment

1) Column 1 - Project Investment - (per engineers estimate)
Year 1 - 18,975 new customers at $220 each average cost
Year 2 - 18,975 new customers at $220 each average cost
Year 3 - 22,770 new customers at $220 each average cost
Year 4 - 15,180 new customers at $220 each average cost

2) Column 2 - Number of additional connections in towns connected by project.
Year 5 - 2.5% assumed rate of additional connections x 75,900 customers connected by project.
Year 6 through 30 - annual rate of increased customers - 2.5%

3) Column 3 - number of new customers (Col. 2) x $80 average cost to connect each customer.

4) Column 4 - 6000 customer/year connection agreement by INDE less those connected in already electrified towns.

5) Column 5 - number of new customers in newly electrified towns (Col. 4) x $280 average cost to connect each customer (including town lines).

6) Column 6 - Total investment - Col. 1 plus Col. 3 plus Col. 5.

Year	(1) Project Investment (US $000)	(2) Additional Connections in Project Towns Number	(3) Additional Connections in Project Towns Cost (US$000)	(4) Connections in Newly Electrified Towns Number	(5) Connections in Newly Electrified Towns Cost (US $000)	(6) Total Investment (US$000)
1	5,250	-	-	-	-	5,250
2	5,580	-	-	-	-	5,580
3	4,300	-	-	-	-	4,300
4	3,070	-	-	-	-	3,070
5	-	1,897	152	4,103	1,149	1,301
6	-	1,944	156	4,056	1,136	1,292
7	-	1,952	156	4,048	1,133	1,289
8	-	2,080	166	3,920	1,098	1,264
9	-	2,091	167	3,909	1,095	1,262
10	-	2,145	172	3,855	1,079	1,251
11	-	2,199	176	3,801	1,064	1,240
12	-	2,253	180	3,747	1,049	1,229
13	-	2,311	186	3,689	1,033	1,218
14	-	2,367	189	3,633	1,017	1,206
15	-	2,427	194	3,573	1,000	1,194
16	-	2,488	199	3,512	983	1,182
17	-	2,551	204	3,449	966	1,170
18	-	2,614	209	3,386	948	1,157
19	-	2,680	214	3,320	930	1,144
20	-	2,745	220	3,255	911	1,131
21	-	2,816	225	3,184	892	1,117
22	-	2,886	231	3,114	872	1,102
23	-	2,957	237	3,043	852	1,089
24	-	3,031	242	2,969	831	1,073
25	-	3,108	248	2,892	810	1,058
26	-	3,181	254	2,819	789	1,043
27	-	3,265	261	2,735	766	1,027
28	-	3,345	268	2,655	743	1,011
29	-	3,430	274	2,570	720	994
30	-	3,515	281	2,485	696	977

1/ Project investment and continuing investment of 6000 connections per year in project area.

INSTITUTO NACIONAL DE ELECTRIFICACION (INDE)
Comparative Balance Sheets 1/
As of December 31, 1973, 1974, 1975 and 1976
(US $000's)

A S S E T S	1973	1974	1975	1976
Current Asets				
Cash in Banks	1,321.3	704.5	4,128.1	2,513.5
Internal Debt Amortization Fund	-.-	174.7	560.7	671.4
Accounts Receivable	1,956.0	3,976.8	2,899.3	4,252.2
Contract Advances	-.-	-.-	-.-	8,585.1
Contributions receivable from the GOG	-.-	-.-	4,215.5	13,256.7
Restricted Deposits	818.1	1,686.0	1,094.0	3,003.3
Prepaid Expenses	443.1	409.4	132.2	78.6
Construction and Maintenance Materials	2,185.9	2,278.9	2,943.0	3,365.8
Administrative Supplies	39.0	37.6	13.5	14.5
Total Current Assets	6,763.4	9,267.9	15,986.3	35,741.1
Fixed Assets				
Property, Plant and Equipment (Net)	53,148.9	53,112.6	54,751.0	70,963.0
Construction in Process	4,609.9	13,430.5	26,936.1	48,424.4
Materials and Supplies	3,992.1	4,282.4	5,986.4	6,695.8
Plans and Studies	7,300.6	8,690.0	13,659.4	13,483.9
Total Fixed Assets (Net)	69,051.5	79,515.5	101,332.9	139,567.1
Deferred Charges				
Interest and Various Expenses	479.8	357.0	234.6	112.2
TOTAL ASSETS	76,294.7	89,140.4	117,553.8	175,420.4
LIABILITIES AND CAPITAL				
Current Liabilities				
Bonds Payable - Current Portion	-.-	835.0	1,148.5	1,332.0
External Loans - Current Portion	820.0	855.0	905.0	1,725.0
Accounts Payable	2,648.0	2,568.0	3,680.2	11,559.1
Employee Benefits	310.1	217.6	261.3	339.3
Contract Retainage	67.6	113.1	343.6	699.0
Employee Discounts	69.6	71.0	92.6	124.4
Consumer Deposits	78.6	109.2	128.3	171.3
Undistributed Income	23.0	229.3	237.1	285.2
Total Current Liabilities	4,016.9	4,998.2	6,796.6	16,235.3
Long-Term Debt				
Bonds Payable	-.-	2,465.5	13,449.5	16,757.5
External Loans and Other	23,923.6	24,951.1	26,832.1	33,845.6
Total Long-Term Debt	23,923.6	27,416.6	40,281.6	50,603.1
C A P I T A L				
Donated Capital	41,131.3	47,468.5	61,373.2	96,988.5
Retained Earnings	7,222.9	9,257.1	9,102.4	11,593.5
Total Capital	48,354.2	56,725.6	70,475.6	108,582.0
TOTAL LIABILITIES AND CAPITAL	76,294.7	89,140.4	117,553.8	175,420.4
FINANCIAL INDICATORS:				
Current Ratio	1.68:1.00	1.85:1.00	2.35:1.00	2.20:1.00
Acid-Test Ratio	1.02:1.00	1.31:1.00	1.90:1.00	1.46:1.00
Debt-Equity Ratio	0.58:1.00	0.57:1.00	0.67:1.00	0.62:1.00

1/ Extracted from Financial Statements audited by External Auditors.

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INSTITUTO NACIONAL DE ELECTRIFICACION (INDE)
Comparative Statements of Earnings and Retained Earnings 1/
For Fiscal Years Ended December 31, 1973, 1974, 1975 and 1976
(US $000's)

	1973		1974		1975		1976	
	Amount	%	Amount	%	Amount	%	Amount	%
Income								
Block Sales	8,207.2	82.2	14,758.4	87.4	16,445.4	85.9	20,399.7	81.0
Direct Sales	1,778.1	17.8	2,136.7	12.6	2,710.1	14.1	4,801.1	19.0
Gross Sales	9,985.3	100.0	16,895.1	100.0	19,155.5	100.0	25,200.8	100.0
Expenses								
Operating Costs:								
Generation & Maintenance	571.2	5.8	667.3	4.0	753.0	3.9	820.2	3.3
Transmission & Transformation	186.7	1.9	337.5	2.0	416.5	2.2	507.1	2.0
Distribution	284.8	2.9	393.5	2.3	448.1	2.3	524.1	2.1
Fuel	2,254.9	22.6	7,582.9	44.9	11,355.7	59.3	13,555.3	53.8
Insurance	110.1	1.1	129.7	.8	124.3	.7	142.0	.6
Interest	1,120.3	11.2	1,228.1	7.3	1,205.2	6.3	1,220.3	4.8
Depreciation	1,970.1	19.7	2,236.7	13.2	2,300.7	12.0	2,489.5	9.9
System Administration	1,141.4	11.4	1,102.9	6.5	1,391.3	7.3	1,756.0	7.0
General Administration	653.5	6.5	750.4	4.4	790.6	4.1	1,275.9	5.0
	8,293.0	83.1	14,429.0	85.4	18,785.4	98.1	22,290.4	88.5
General & Administrative Costs	1,909.3	19.1	2,077.5	12.2	2,344.0	12.2	3,092.5	12.3
Less: Capitalized Expenses	(1,077.2)	(10.8)	(1,172.7)	(6.9)	(1,371.3)	(7.2)	(1,409.1)	(5.6)
Charges to Oper. Costs	(653.5)	(6.5)	(750.4)	(4.4)	(790.6)	(4.1)	(1,275.9)	(5.1)
	178.6	1.8	154.4	.9	182.1	.9	407.5	1.6
Income from Operations	1,513.7	15.1	2,311.7	13.7	188.0	1.0	2,502.9	9.9
Other Income (Expense) Net	(241.2)	2.4	(271.9)	1.6	(159.4)	.8	(12.1)	.1
Net Income for the Period	1,272.5	12.7	2,039.8	12.1	28.6	.2	2,490.8	9.8
Retained Earnings at Beggining of Year as Restated 2/	5,950.4		7,217.3		9,073.8		9,102.7	
Retained Earnings at End of Year	7,222.9		9,257.1		9,102.4		11,593.5	
EARNING INDICATORS:								
Rate of Earnings on Total Capital Employed		1.67		2.29		0.02		1.42
Rate of Earnings on Equity		2.63		3.60		0.04		2.29
Net Income as a Percentage of Sales		12.74		12.07		0.15		9.88

1/ Extracted from Financial Statements audited by External Auditors
2/ Beginning year retained earnings restated to reflect $304, $183,217 and $5,629. Prior year adjustments entered in 1976, 1975 and 1974 respectively.

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INSTITUTO NACIONAL DE ELECTRIFICATION (INDE)
Comparative Statement of Changes in Financial Position 1/
For Fiscal Years Ended December 31, 1973, 1974, 1975 and 1976

(US $000's)

RESOURCES PROVIDED	1973	1974	1975	1976
From Operations				
Net Income	1,272.5	2,039.8	28.6	2,490.8
Plus Non-Cash Items:				
Depreciation	2,127.2	2,353.8	2,424.2	2,646.1
Amortization	149.4	122.8	122.4	122.4
	3,549.1	4,516.4	2,575.2	5,259.3
Guatemalan Government Subsidies	4,487.2	6,352.0	13,390.8	35,094.2
Loans from International Institutions	2,883.9	1,882.5	2,785.9	7,938.5
Bond Sales	-.-	3,500.0	11,700.0	4,800.0
Prior Year Adjustments	-.-	69.4	7.6	34.3
Other	32.4	-.-	-.-	-.-
Total Resources Provided	10,952.6	16,320.3	30,459.5	53,126.3
RESOURCES APPLIED				
Construction/Purchase of Property, Plant & Equipment	8,336.4	11,411.7	18,758.2	36,238.2
Project Studies and Plans	1,601.7	1,399.2	4,969.4	4,120.9
Principal Payment - International Loans	820.0	855.0	905.0	925.0
Bond Retirement	-.-	1,034.5	716.0	1,492.0
Prior Year Adjustments	128.4	96.8	190.8	34.0
Increase in Various Deposits and Options	-.-	.2	-.-	-.-
Other	122.7	-.-	-.-	-.-
Total Resources Applied	11,009.2	14,797.4	25,539.4	42,810.1
Increase (Decrease) in Working Capital	(56.6)	1,522.9	4,920.1	10,316.2

1/ Extracted from Financial Statements audited by External Auditors.

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BREAKDOWN OF INDE'S CAPITAL ACCOUNT

(In US $000's)

	1973		1974		1975		1976	
	$	%	$	%	$	%	$	%
Government Subsidies	22,276.2	46.1	28,628.2	50.5	42,019.0	59.6	77,113.2	71.0
Government Bonds	15,000.0	31.0	15,000.0	26.4	15,000.0	21.3	15,000.0	13.8
Other Gov. Contributions	3,419.2	7.1	3,394.4	6.0	3,394.8	4.8	3,394.8	3.1
Municipalities and Other	375.6	.8	385.6	.7	385.7	.6	385.7	.4
Interest on Bonds	60.2	.1	60.2	.1	60.2	.1	60.2	.1
Other	.1	-.-	.1	-.-	513.5	.7	1,034.7	.9
	41,131.3	85.1	47,468.5	83.7	61,373.2	87.1	96,988.5	89.3
Retained Earnings	7,222.9	14.9	9,257.1	16.3	9,102.4	12.9	11,593.5	10.7
	48,354.2	100.0	56,725.6	100.0	70,475.6	100.0	108,582.0	100.0

Characteristics of Target Sub-Groups

1. Rural Setting - An Overview

a. Ethnic Groups

The population in the rural sector of the Highlands is composed of people from two distinct ethnic groups - Ladinos and Indians. Definitions vary considerably, and the drawing of a clear cut line between the two is difficult because of an active process of Indians "passing", i.e. becoming ladinized.

In general the Ladino classification is applied to those people who have a European ancestry or to those Indians who have adopted a Western life style. Spanish is either their first or principal language. Western style clothing is worn, and there is a preference for the mass produced consumer products of modern technology.

Economically, Ladinos earn their main source of income from commerce or service enterprises or as professionals. Although many own agricultural land, few are practicing farmers. They prefer to rent land to the Indians who farm it. Finally, they possess a set of cultural forms and values which is distinct from that of Indians. More prominent practices and attitudes include the nuclear family as the basic social unit, a class consciousness and a quest for upward mobility, a determination of social status on the basis of lineage and source of wealth, a secular brand of Roman Catholicism in which the overt practice of religion is much more expected of women than men, and an ideology which emphasizes the welfare of the individual over that of the group. Machismo is prominent among Ladino men.

The Indians are descendants of the ancient Maya and have not adopted Western practices and values. They are native speakers of one of the numerous indigenous languages, although many of the men and some of the women are conversant in Spanish, and continue to wear native styles of dress (women adhere more strictly to this practice than men). They derive their main source of income from agriculture as either day laborers, subsistence farmers, or small scale market-oriented growers. Many supplement farming income with a

craft specialty. Their religious practices are a curious blend of traditional Mayan and Catholic beliefs in which both men and women participate on an equal basis. Culturally, the basic social and economic unit is often an extended household made up of parents, children and the spouses of married children and grandchildren.

A system of religious brotherhoods (cofradías) ensures participation in community affairs as well as being a method of internal leadership. In general, there is no formal class structure within the Indian sector, although graduations of wealth do exist. Capital gain is desired but it does not elicit status and rank. Rather, social rank is a product of age and prestige, with the latter being acquired through contributions of both time and money to the cofradía system.

It is important to note that the Indians are not a single homogeneous block. The ecologically caused isolation of one settlement area from another and ancient migration patterns have resulted in distinct language groups in the Highlands, with each possessing unique variations in the general cultural traits described above. A principle variation concerns the leadership structure. There are sectors of the target area, the Northwest in particular, where the cofradía system does not exist or plays only a minor ceremonial function.

b. Social Organization

The social organization of the rural Highlands is a more or less rigidly class stratified arrangement which parallels the basic ethnic group divisions. One group consists of the Ladino elites. Although the attributes of this class vary from region to region, generally they are the social and political leaders of the community and set the styles in dress, recreation, and social activity. Their political power has weakened considerably since townships were given the right to elect a local government, but they continue to maintain at least tacit control of the economic, social, and religious affairs of the community.

Ladinos and Transitional Indians who generally reside in the Cabeceras of the Municipios and the larger nucleated Aldeas form a second group. Ladinos in this group tend to occupy distinct neighborhoods near the central plaza and

generally enjoy better housing and access to social services than the traditional Indian. They earn their living from a variety of small commercial and service enterprises (storeowner, truckdriver) or as semi-professionals, such as administrative clerks, nursing auxiliaries, or school teachers. The transitional Indians in this group have either taken up occupations similar to those of the Ladinos or are the owners of small scale holdings.

The Ladinos in this group have received some formal schooling (many have completed primary school), and they encourage their children to continue their education beyond the sixth grade, if possible. Many transitional Indians, on the other hand, are illiterate, although they are perfectly conversant in Spanish and have developed a facility for dealing in a market economy. They do see the value of formal education for their children and encourage them to stay in school through the primary grades.

The third group is composed of the large mass of Indian peasants who earn their living as landless day laborers and (modified) subsistence farmers. Very few have had formal education. Of those who have been to school, many have regressed to illiteracy. Nevertheless, like the transitional Indians, almost all of the men are conversant in Spanish and deal effectively in local markets. Although the Indian peasant recognizes the value of formal training for his children, he considers their economic inputs, as part of the extended household more important. As a result, absenteeism, repetition, and drop-out rates among Indian children are high with few progressing beyond the third grade.

2. Target Sub-Groups

Based on socioeconomic characteristics one can identify three types of rural families as prime targets of AID assisted rural development programs: (1) landless agricultural workers; (2) subsistence farmers, both those without prospects of a significant farming solution as well as those with one; and (3) small to medium market oriented

farmers. These sub-groups will be the primary beneficiaries of this project.

a. Landless Day Laborers

A 1970 SIECA/FAO study estimated that there are approximately 175,000 families in Guatemala who earn their main source of income as agricultural day laborers either with stable full time employment on a larger holding in the area or by migrating from one place to another in search of seasonal employment. It is estimated that a high percentage of these landless laborer families live in the target group area.

In the Western Highlands, almost all these families are Indians who have arrived at their present situation either because they are the offspring of landless day laborers, or because they inherited a parcel of land too small to support themselves and their families. Those who have stable positions on larger farms earn $.50 - $.75 daily for labor as field hands. In some cases food is included; in others not. The arrangement depends upon the discretion of the farm owner. Those day laborers fortunate enough to work for an enlightened owner have higher aggregate incomes than rural campesinos in general. In addition they are considered to be permanent members of the communities in which they live and have access to social services equal to that of the Indian.

Migratory farm laborers generally return from time to time to their native towns and villages where they either maintain a residence of their own or live with relatives. A strategy which they commonly employ is to hire out on local farms in the mountains during the planting and harvesting seasons and then migrate to the South Coast to work as field hands on large coffee, cotton, sugar, and banana plantations in the intervening period.

b. Subsistence Farmers

Subsistence farmers are defined as small scale growers who live on and work farms that are less than four hectares in size. However subsistence farming, in its

classical sense, is a misnomer when applied to the peasants of the Guatemalan highlands. They are as a group small scale capitalists who have devised strategies for dealing in a market economy and mechanisms to avoid, or at least minimize, the risk involved in such undertakings.

In the first instance most do not grow crops solely for home consumption. Rather, in addition to their subsistence plots (milpas) of corns, beans, and squash, they reserve a portion of their land, if possible, for cash generating produce (fruits and vegetables). Furthermore, an ever increasing number are applying modern farming techniques such as terracing, construction of rudimentary irrigation systems, and using fertilizers and other chemical products. There is also increasing evidence of small farmer participation in savings and loan cooperatives for the purpose of borrowing money to purchase land, and technological farm inputs. In addition, many subsistence families are involved in handicraft production which complements the farming and is marketed.

As with the landless day laborers, there is considerable variation within the subsistence farmers. To facilitate effective programming they can be further divided into two sub-groups. The first sub-group is composed of those with holdings so small or of such poor quality, that prospects for a noteworthy contribution to an improved quality of life and increased by better farming methods is highly unlikely. This group includes all families working .7 hectares or less and some of the farms between .7 and 4 hectares. These farms are generally located in the most isolated communities.

The second sub-group is those small farmers whose land quantity and quality and managerial potential provide a reasonable prospect for a better life-style by means of agricultural improvements. This group includes most of the families on farms of .7 to 4 hectares. The total number of families in these two sub-groups in Guatemala was 475,000 in 1970.

c. Small to Medium Market-Oriented Farmers

Members of this group have holdings of between

4 to 7 hectares. In Guatemala they numbered approximately 45,000 families in 1970. At present a high percentage of a larger group lives in the target area. Their major production enterprise is normally in the traditional grains but they maintain a milpa for subsistence purposes. They tend to use technical farming inputs, crop diversification and animal raising to a much greater degree than the smaller scale farmers. In addition, many hire part-time or full-time field workers because they do not have sufficient labor within the household for carrying on the production operation.

Compared to the landless laborers and subsistence farmers, they are generally more integrated into the Western style of life. Most are fluent in Spanish, and some have completed several years of primary school. As a group they recognize the benefits of education for their children. In addition, they have the desire, as well as the higher incomes needed, to acquire the consumer goods produced by modern technology.

Internal Rate of Return

SENSITIVITY ANALYSIS OF
NET CASH FLOWS

(Includes Full Cost of Electricity Generation 1/)

Year	Without Surplus Benefits			With Surplus Benefits		
	Base Cost	High Option	Low Option	Base Cost	High Option	Low Option
1	-5,014.00	-4,985.00	-5,042.00	-4,976.00	-4,947.00	-5,004.00
2	-4,983.00	-4,903.00	-5,062.00	-4,869.00	-4,789.00	-4,948.00
3	-3,699.00	-3,551.00	-3,847.00	-3,495.00	-3,347.00	-3,643.00
4	-1,504.00	-1,298.00	-1,709.00	-1,212.00	-1,007.00	-1,417.00
5	548.00	675.00	311.00	897.00	1,024.00	660.00
6	627.00	882.00	372.00	1,015.00	1,270.00	760.00
7	694.00	967.00	420.00	1,124.00	1,397.00	851.00
8	810.00	1,101.00	518.00	1,288.00	1,579.00	997.00
9	955.00	1,264.00	646.00	1,485.00	1,794.00	1,176.00
10	1,142.00	1,469.00	815.00	1,728.00	2,055.00	1,401.00
11	1,331.00	1,676.00	986.00	1,976.00	2,321.00	1,631.00
12	1,538.00	1,901.00	1,175.00	2,247.00	2,610.00	1,884.00
13	1,752.00	2,133.00	1,371.00	2,531.00	2,912.00	2,150.00
14	1,977.00	2,376.00	1,578.00	2,828.00	3,227.00	2,429.00
15	2,210.00	2,627.00	1,793.00	3,140.00	3,557.00	2,723.00
16	2,459.00	2,894.00	2,023.00	3,473.00	3,908.00	3,038.00
17	2,720.00	3,172.00	2,267.00	3,822.00	4,276.00	3,370.00
18	2,991.00	3,461.00	2,520.00	4,189.00	4,660.00	3,718.00
19	3,278.00	3,767.00	2,788.00	4,578.00	5,067.00	4,089.00
20	3,582.00	4,089.00	3,075.00	4,991.00	5,498.00	4,484.00
21	3,895.00	4,420.00	3,370.00	5,418.00	5,943.00	4,893.00
22	4,224.00	4,767.00	3,681.00	5,868.00	6,411.00	5,325.00
23	4,573.00	5,134.00	4,012.00	6,347.00	6,908.00	5,786.00
24	4,940.00	5,519.00	4,361.00	6,852.00	7,431.00	6,273.00
25	5,324.00	5,921.00	4,727.00	7,382.00	7,979.00	6,784.00
26	5,730.00	6,346.00	5,116.00	7,945.00	8,560.00	7,330.00
27	6,160.00	6,793.00	5,527.00	8,540.00	9,173.00	7,907.00
28	6,607.00	7,258.00	5,956.00	9,161.00	9,812.00	8,510.00
29	7,079.00	7,748.00	6,410.00	9,819.00	10,488.00	9,150.00
30	7,579.00	8,266.00	6,892.00	10,518.00	11,205.00	9,831.00
IRR=	10%	11.9%	9%	13.5%	14.5%	12.1%

1/ The cost of electricity to the project in this table includes interest and depreciation on investment in generating capacity. Neither interest nor depreciation alone would adequately reflect the opportunity cost of capital.