

UNCLASSIFIED

**UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D. C. 20523**

ROCAP

PROJECT PAPER

REGIONAL INDUSTRIAL ENERGY EFFICIENCY

AID/LAC/P-099

Project Number: 596-0095

UNCLASSIFIED

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE

A = Add
 C = Change
 D = Delete

Amendment Number

DOCUMENT CODE

3

2. COUNTRY/ENTITY

ROCAP

3. PROJECT NUMBER

596-0095

4. BUREAU/OFFICE

Latin America and the Caribbean

5. PROJECT TITLE (maximum 40 characters)

Regional Industrial Energy Efficiency

6. PROJECT ASSISTANCE COMPLETION DATE (PACD)

MM DD YY
 07 15 87

7. ESTIMATED DATE OF OBLIGATION
 (Under "B" below, enter 1, 2, 3, or 4)

A. Initial FY 82 B. Quarter 4 C. Final FY 85

8. COSTS (\$000 OR EQUIVALENT \$1 =)

A. FUNDING SOURCE	FISCAL YEAR			LIFE OF PROJECT		
	B. FY	C. L/C	D. Total	E. FY	F. L/C	G. Total
AID Appropriated Total	200	400	600	815	5,185	6,000
(Grant)	(200)	(400)	(600)	(815)	(5,185)	(6,000)
(Loan)	()	()	()	()	()	()
Other U.S.						
1.						
2.						
Host Country	-	-	-	-	1,600	1,600
Other Donor(s)						
TOTALS	200	400	600	815	6,785	7,600

9. SCHEDULE OF AID FUNDING (\$000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE		D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1) SD	740	878				600		6,000	
(2)									
(3)									
(4)									
TOTALS						600		6,000	

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each)

840 874 967

11. SECONDARY PURPOSE CODE

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code BL RGEN TECH TNG
 B. Amount

13. PROJECT PURPOSE (maximum 480 characters)

To improve energy efficiency in industry and to reduce industrial consumption of imported petroleum by introducing (1) energy audits, (2) conservation measures, and (3) energy-efficient machinery.

14. SCHEDULED EVALUATIONS

Interim MM YY MM YY Final MM YY
 07 84 07 86 10 87

15. SOURCE/ORIGIN OF GOODS AND SERVICES

000 941 Local Other (Specify)

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a _____ page PP Amendment)

17. APPROVED BY

Signature: *Rol A. Montem*
 Title: DIRECTOR

Date Signed MM DD YY
 06 11 82

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION

MM DD YY

INSTRUCTIONS

The approved Project Data Sheet summarizes basic data on the project and must provide reliable data for entry into the Country Program Data Bank (CPDB). As a general rule blocks 1 thru 16 are to be completed by the originating office or bureau. It is the responsibility of the reviewing bureau to assume that whenever the original Project Data Sheet is revised, the Project Data Sheet conforms to the revision.

Block 1 - Enter the appropriate letter code in the box, if a change, indicate the Amendment Number.

Block 2 - Enter the name of the Country, Regional or other Entity.

Block 3 - Enter the Project Number assigned by the field mission or an AID/W bureau.

Block 4 - Enter the sponsoring Bureau/Office Symbol and Code. *(See Handbook 3, Appendix 5A, Table 1, Page 1 for guidance.)*

Block 5 - Enter the Project Title *(stay within brackets; limit to 40 characters).*

Block 6 - Enter the Estimated Project Assistance Completion Date. *(See AIDTO Circular A-24 dated 1/26/78, paragraph C, Page 2.)*

Block 7A. - Enter the FY for the first obligation of AID funds for the project.

Block 7B. - Enter the quarter of FY for the first AID funds obligation.

Block 7C. - Enter the FY for the last AID funds obligations.

Block 8 - Enter the amounts from the 'Summary Cost Estimates' and 'Financial Table' of the Project Data Sheet.

NOTE: The L/C column must show the estimated U.S. dollars to be used for the financing of local costs by AID on the lines corresponding to AID.

Block 9 - Enter the amounts and details from the Project Data Sheet section reflecting the estimated rate of use of AID funds.

Block 9A. - Use the Alpha Code. *(See Handbook 3, Appendix 5A, Table 2, Page 2 for guidance.)*

Blocks 9B., C1. & C2. - See Handbook 3, Appendix 5B for guidance. The total of columns 1 and 2 of F must equal the AID appropriated funds total of 8G.

Blocks 10 and 11 - See Handbook 3, Appendix 5B for guidance.

Block 12 - Enter the codes and amounts attributable to each concern for Life of Project. *(See Handbook 3, Appendix 5B, Attachment C for coding.)*

Block 13 - Enter the Project Purpose as it appears in the approved PID Facesheet, or as modified during the project development and reflected in the Project Data Sheet.

Block 14 - Enter the evaluation(s) scheduled in this section.

Block 15 - Enter the information related to the procurement taken from the appropriate section of the Project Data Sheet.

Block 16 - This block is to be used with requests for the amendment of a project.

Block 17 - This block is to be signed and dated by the Authorizing Official of the originating office. The Project Data Sheet will not be reviewed if this Data Sheet is not signed and dated. Do not initial.

Block 18 - This date is to be provided by the office or bureau responsible for the processing of the document covered by this Data Sheet.

PROJECT AUTHORIZATION

Name of Entities: Central American Industrial Research Institute
General Secretariat for Central American Integration

Name of Project: Regional Industrial Energy Efficiency

Number of Project: 596-0095

1. Pursuant to Section 106 of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Regional Industrial Energy Efficiency project, involving planned obligations of not to exceed Six Million United States Dollars (\$6,000,000) in grant funds for grants to the Central American Industrial Research Institute ("ICAITI") and the General Secretariat for Central American Integration ("SIECA") over a five-year period from the date of authorization, subject to the availability of funds in accordance with the A.I.D. OYB/allotment process, to help in financing foreign exchange and local currency costs for the project.

2. The project ("Project") consists of supporting a regional effort within Central America and Panama to improve energy efficiency in industry and to reduce industrial consumption of imported petroleum by introducing (i) energy audits; (ii) conservation measures; and (iii) energy-efficient machinery.

3. The Project Agreements, which may be negotiated and executed by the officer to whom such authority is delegated in accordance with A.I.D. regulations and Delegations of Authority, shall be subject to the following essential terms and covenants and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate.

a. Source and Origin of Goods and Services

Goods and services, except for ocean shipping, financed by A.I.D. under the Grants shall have their source and origin in the United States or in countries that are members of the Central American Common Market and Panama, except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the Grants, shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the United States.

b. Condition Precedent to First Disbursement

Prior to any disbursement, or the issuance of any commitment documents under the Project Agreements, Grantees shall furnish, except as A.I.D. may otherwise agree in writing, in form and substance satisfactory to A.I.D., a detailed workplan for the first year of the Project.

c. Condition Precedent to Disbursement for ICAITI Activities with Industries

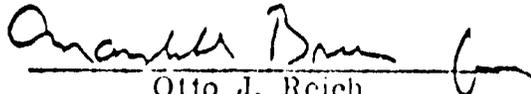
Prior to any disbursement, or the issuance of any commitment documents under the Project Agreements to finance activities with industries in any of the countries in Central America or Panama, ICAITI shall furnish, except as A.I.D. may otherwise agree in writing, in form and substance satisfactory to A.I.D., executed agreements with a national chamber of industry, or equivalent organization, outlining the promotional support to be provided by the chambers of industry, or equivalent organizations, and formally establishing working relationships between ICAITI country representatives and such national organizations.

d. Covenants

The Grantees shall covenant, except as A.I.D. may otherwise agree in writing, as follows:

(1) ICAITI and SIECA, prior to undertaking annual project activities, will furnish, in form and substance satisfactory to A.I.D., a consolidated workplan and budget for their respective activities for each such year.

(2) ICAITI will establish, except as A.I.D. may otherwise agree in writing, a special account for reflows to be comprised of all payments received from user firms as a result of participating in the project, and the reflows will be used solely to finance project costs mutually agreed upon between A.I.D. and ICAITI.



Otto J. Reich
Assistant Administrator
Bureau for Latin America
and the Caribbean

July 24, 1982
(Date)

Clearances:

GC/LAC:BVeret: lv date 7/16

LAC/CEN:PFarley: lv date 7/16

LAC/DR:DJohanson: lv date 7/27/82

GC/LAC:TCarter:ckp:7/13/82:s23272

REGIONAL INDUSTRIAL ENERGY EFFICIENCY
596-0095

TABLE OF CONTENTS

	<u>Page</u>
I. PROJECT SUMMARY AND RECOMMENDATIONS	
A. Recommendations	i
B. Summary Description	i
C. Summary Findings	iii
D. Composition of Project Development Committee	iv
II. PROJECT BACKGROUND	
A. Petroleum in the C.A. Economy	1
B. Petroleum and the Industrial Sector	2
C. National Efforts in Energy	3
D. Other Donors	5
E. Opportunities for Saving Energy	6
1. Survey of Industries and Energy Use	6
2. Overview of Consultants	7
III. PROJECT DESCRIPTION	
A. Goal and Purpose	9
B. Relationship of Project to CDSS	9
C. Project Rationale	10
D. Target Industries and Priority Energy Savings Measures	11
E. Project Components	13
1. Industry Program	15
2. Training	22
3. Promotion and Field Extension	27
4. Data Base and Analysis	32
5. Financing and Public Policy Issues	36
F. End of Project Status	41
IV. PROJECT ANALYSIS	
A. Technical Analysis	45
B. Economic Analysis	46
C. Institutional Analysis	58
D. Social Analysis	64

	<u>Page</u>
V. FINANCIAL PLAN AND ANALYSIS	69
VI. IMPLEMENTATION ARRANGEMENTS	
A. Administrative Arrangements	74
B. Implementation Plan	76
C. Evaluation Plan	76
D. Procurement Plan	77
E. Disbursement Procedures	78
F. Waivers	78
G. Conditions, Covenants, and Negotiating Status	78

ANNEX A - STANDARD EXHIBITS

1. Logical Framework
2. Draft Project Authorization
3. Application Letters - ICAITI and SIECA
4. PID Approval Cable
5. Project Checklist
6. Timetable of Major Project Events
7. Energy Balance
8. Other Donors
9. Financial Plan Detail
10. ICAITI Comparative Financial Statements
11. Initial Environmental Examination
12. SIECA Energy Studies

ANNEX B - TECHNICAL EXHIBITS

1. Analysis of Industrial Energy Questionnaires and Available Data
2. DSI/ICAITI Plant Visits
3. Classification of Energy Efficiency Mechanisms
4. Proposed Pilot Plant Substitution Activities
5. DSI Benefit/Cost Analysis
6. Scopes of Work for Major Project Personnel
7. Institutional Analysis
8. Mechanisms for Involving U.S. and C.A. Private Sector
9. Estimates of Project Revenue

LIST OF ACRONYMS

CABEI	Central American Bank for Economic Integration
COMENER	Central American Energy Commission
DSI	Development Sciences Incorporated
FECAICA	Regional Federation of Chambers of Industry
IBRD	International Bank for Reconstruction and Development
ICAITI	Central American Technical and Industrial Research Institute
IDB/BID	Interamerican Development Bank
INCAE	Central American Business Institute
OLADE	Latin American Energy Organization
SIECA	Secretariat for Central American Economic Integration
UNDP	United Nations Development Program

I. PROJECT SUMMARY AND RECOMMENDATIONS

A. Recommendations

The Project Development Committee recommends that a \$6.0 million grant be authorized as follows to implement the Regional Industrial Energy Efficiency Project:

ICAITI	\$5.4 million
SIECA	<u>\$0.6 million</u>
Total	\$6.0 million

B. Summary Description

1. Goal and Purpose

The goal of the project is to reduce the balance of payments deficit of Central America and Panama. The purpose of the project is to improve energy efficiency in industry and to reduce industrial consumption of imported petroleum by introducing energy audits, conservation measures, and energy efficient machinery.

2. Background and Project Activities

Industry demand accounts for approximately one-third of oil imports in Central America. A survey of industrial energy use and visits to plants throughout the region show that most industries do not have energy conservation programs and are unaware of their options. Most industries, however, indicate a high degree of enthusiasm about participating in such a program, and cited technical assistance, training, knowledge and financing as the major constraints to taking action.

In response to the needs identified by the survey and expressed by plant owners and managers, this project will support the initiation of a comprehensive program to assist the private industrial sector improve its energy efficiency.

The components selected to carry out this project represent an integrated approach to respond to industrial needs and will make improved energy efficiency a realistic goal for most industries. The project will provide information to plant managers and engineers on new energy efficiency and fuel substitution opportunities, and will train engineers (ICAITI staff at first, who will subsequently

train others) to carry out audits and identify requirements for equipment changes which will lead to increased efficiency.

The five project-financed components are:

a. Industry Program (ICAITI)

This is the major element of the project because of its direct impact on industry. The program consists of:

- Energy Audits: a series of technical services affecting how a plant uses energy, including a diagnosis of energy consumption and how it can be reduced;

- Field and Pilot Demonstrations: actual in-plant installations of energy reduction measures and equipment;

- Seminars: A series of one to two-day presentations to plant management and engineering personnel throughout the region to inform them of immediate opportunities to reduce energy consumption and of services available under the project; and

- Exhibits: displays of energy conserving technology, audio-visual materials and related presentations aimed at stimulating an awareness of the need and means to conserve energy.

b. Training (ICAITI)

The training component will develop the technical capacity of ICAITI staff to carry out project activities and to transfer that capacity to national level counterparts. Various levels of training are planned in all aspects of energy efficiency programs.

c. Promotion and Field Extension (ICAITI)

This major project component is designed to address the lack of awareness of energy alternatives, to stimulate the demand for services that the project has to offer, and to stimulate industries to undertake self-help measures. The component will include publications, seminars and exhibits, visits to on-site demonstrations and an inquiry service.

d. Data Base and Analysis (ICAITI)

A data base will be developed consisting of project-generated information as well as information available from other sources to provide the basis for making appropriate technical decisions. The data base will consist of automated information and hard copy reference materials.

e. Financing and Policy Issues (SIECA)

For this component, SIECA will undertake studies in the public and private sectors with the objective of improving the policy framework that will encourage industries to improve energy productivity. A related effort will be to improve supporting services, particularly through mobilizing financing for energy investments both at the donor level and through the commercial banking system.

3. Summary Financial Plan

SUMMARY FINANCIAL PLAN
(US\$ 000)

<u>Project Component</u>	<u>ROCAP</u>	<u>ICAITI</u>	<u>SIECA</u>	<u>Industries and Private Sector Organizations</u>	
				<u>Organizations</u>	<u>Total</u>
I. Industry Program	1,789	-	-	300	2,089
II. Training	279	-	-	100	379
III. Promotion	1,014	-	-	500	1,514
IV. Data Base & Analysis	182	-	-	-	182
V. Financing & Policy Issues	526	-	260	-	786
VI. Management	1,207	-	-	-	1,207
VII. Evaluation	60	-	-	-	60
VIII. Overhead	74	440	-	-	514
IX. Contingencies	869	-	-	-	869
	<u>6,000</u>	<u>440</u>	<u>260</u>	<u>900</u>	<u>7,600</u>

C. Summary Findings

The Project Committee has reviewed all aspects of the proposed Regional Industrial Energy Efficiency Project and finds that it is technically, financially, socially and economically sound, and consistent with those objectives set forth in ROCAP's CDSS strategy. The Committee has further found that both ICAITI and SIECA are institutionally capable of administering their respective components of the project.

D. Composition of Project Development Committee

ROCAP

Ramiro Eduardo, Chief Accountant
Victor Dardón, Engineer
Clark Joel, Regional Economic Advisor
Kevin Kelly, Project Development Officer
Peter Lopera, Asst. Project Development Officer
Edward Nadeau, General Development Officer
Gustavo Ruiz, Asst. General Development Officer

AID/W

Carl Duisberg, LAC Energy Advisor

ICAITI

Ludwig Ingram, Deputy Director
Mario Santos, Chief Accountant
Justin Whipple, Deputy Chief, Division for Technical
and Industrial Services

SIECA

Julio Obiols, Economist
Rafael Perez, Chief, Department of Physical
Integration

Consultants

Marsha Gorden, Development Sciences Incorporated
Lance Heiko, Development Sciences Incorporated
Fred Marsh, Development Sciences Incorporated
James Westfield, Development Sciences Incorporated

Elias Hill
Robert Reynolds

II. BACKGROUND

A. Petroleum in the Central American Economy

The regional economy is in a state of crisis. The overall balance of payments deficit for the five Central American countries increased from \$320 million in 1979 to \$1,132 million in 1980. International reserves plummeted to an estimated \$385.4 million in 1981. Between 1979 and 1981 the total budget deficit of the Central American governments more than doubled from \$640 million to an estimated \$1,465 million. After an impressive average 5% annual growth rate had been sustained over a twenty-year period in Central America, in 1981 only Guatemala had a positive growth rate at 1%, while the other countries sustained either no growth or a decline of 1% or 2% in their real Gross Domestic Products.

The rising cost of energy is a major contributor to this crisis. The region's two major energy sources, fuelwood and petroleum, have both become more expensive. Fuelwood is costing more because of growing scarcity and demand, while world oil prices have risen sharply since 1973 and have had a very adverse impact on the region's balance of payments.

Specifically, the bill for the imported oil consumed in Central America and Panama has risen considerably in the past twenty years and has drastically increased in the past ten years. In 1960, the imported oil bill for Central America (excluding Panama)* was \$41 million; in 1971, it was \$77 million. By 1980, however, Central America paid \$928 million for imported oil, and in 1981 the cost increased to \$1,077 million.

The following table illustrates Central America's quickly rising petroleum import cost and its comparison to the region's export earnings.

TABLE 1

In Millions of Current U.S. \$

<u>Year</u>	<u>Oil Imports</u>	<u>Exports</u>	<u>Oil Imports as % of Exports</u>
1973	101.4	\$1,663.6	6%
1974	277.4	2,109.1	13%
1975	295.1	3,007.7	10%
1978	399.2	3,855.3	10%
1980	928.0	4,703.4	20%
1981	1,077.0	4,938.0	22%

Source: SIECA, "Trends in the Central American Economy 1979-1980", June 1981, Guatemala City (export totals and 1980-81 oil imports). "International Financial Statistics", Vols. XXXI and XXXIV, International Monetary Fund, June 1978 and November 1981, Washington, D.C.

* Panama is excluded from the subsequent analysis because of its large imports of crude oil for refinement and resale.

In 1960, one dollar of every seventeen earned through exports went toward the cost of the region's imported oil. In 1981, nearly one dollar out of every four of total export earnings was needed to pay for Central America's oil imports.

The impact of the rising cost of imported oil on the deteriorating balance of payments situation in Central America is clear. The cost of oil imports in 1981 represented almost 62% of the foreign exchange earned from coffee exports (the region's principal source of foreign exchange) and, at \$1,077 million, exceeded the estimated overall balance of payments deficit of \$748 million by 40%.

B. Petroleum and the Industrial Sector

Until the present economic crisis, industry has been the most dynamic element contributing to the region's economic growth. From the establishment of the Central American Common Market in 1960 until 1980, the value of intraregional trade increased from \$32.7 million to \$1,160 million, of which 87% consisted of manufactured products.

Table 2, below, indicates that during this growth period, the industrial sector has become a major user of energy, and that, by 1978, industry was responsible for 24% of total energy consumed in the region.*

Industry is also the second largest consumer of imported petroleum. As shown in Table 3, in 1978 industry demand accounted for 24.4% of total direct petroleum requirements. If industry's consumption of oil-fired (thermal) electricity is considered, a total of 32% of all petroleum consumption is attributable to industry.

If, as expected, industry is to continue to have a key role in the economic growth of Central America, then its demand for petroleum will continue to rise. Therefore, a major effort to improve efficiency in energy consumption is needed. An idea of the magnitude of savings which may be possible through conservation in the industrial sector is suggested by the "Targets" program promoted by the U.S. Department of Energy between 1973 and 1980. During this period, ten major industry groups in the U.S. reduced their energy use per unit of output by over 17% on a weighted average basis. Since many Central American industries are technically less advanced than their U.S. counterparts, they offer even greater potential for conservation.

* A detailed Energy Balance, or tabulation of sources and applications by consumption sector of various types of energy is presented in Annex A-7.

TABLE 2
FINAL ENERGY CONSUMPTION BY SECTORS*

	1 9 7 0		1 9 7 8	
	10^3 TEP	%	10^3 TEP	%
Industry	1,546	19.8	2,624	24.0
Transportation	1,235	15.8	2,166	19.8
Residential, Commercial and Public	4,865	62.2	5,886	53.8
Others (mostly Agriculture)	172	2.2	263	2.4
Total	7,818	100.0	10,939	100.0

TABLE 3
PETROLEUM USE BY SECTORS -1978

	10^3 TEP	%
Utilities	1,085	21.7
Transport	2,165	43.4
Industry	1,218	24.4
Residential, Commercial and Public	431	8.6
Other (mostly Agriculture)	96	1.9
Total	4,995	100.0

*Expressed in terms of thousands of Tons Equivalent Petroleum (TEP)

The primary responsibility and the immediate rewards for accomplishing greater efficiency in energy consumption in the industrial sector rests with the individual plants. To act on this responsibility, plant managers and owners need to be aware of the energy problem and acquire the information necessary to implement energy efficiency measures. Appropriate national and regional institutions need to be prepared to participate in this endeavor, first by promoting the need for action and, subsequently, by serving as a mechanism for assisting industries in adapting appropriate measures.

C. National Efforts in Energy

Table 4 shows that in 1980, in their energy development efforts, the national governments of Central America placed the greatest emphasis on the development of hydroelectricity. This is true of other recent years. For example, of the \$249.8 million total in energy projects approved in 1979, \$199.8 million (80%) were for hydroelectric projects.

TABLE 4

New Investments in Central America Energy
Projects Approved in 1980
(In Millions of Dollars)

	<u>G</u>	<u>ES</u>	<u>H</u>	<u>N</u>	<u>CR</u>	<u>TOTAL</u>
Hydroelectric	129.7	81.5	82.0	-	55.0	348.2
Geothermal	4.1	6.1	0.3	2.6	2.7	25.8
Thermal Electric	0.4	-	3.6	-	-	4.0
Transmission Lines	3.8	0.8	-	0.5	6.0	11.1
Hydrocarbons	56.2	-	-	-	-	56.2
Non-Conventional Fuels	-	-	-	0.2	-	0.2
	<u>194.2</u>	<u>88.4</u>	<u>85.9</u>	<u>3.3</u>	<u>63.7</u>	<u>435.5</u>

Source: Tenth Report on the Inventory of Regional Infrastructural Projects in Central America through December, 1980, SIECA 81/INF/PF/16, Published November, 1981.

Although the national efforts in hydroelectric development will do much to reduce amounts of petroleum consumed for thermal electric production, the demand for petroleum by the region's largest consumers will continue. For example, no cost effective alternatives for petroleum have been developed for the transportation sector and, in industry, conversion to electrical machinery has been limited. Nonetheless, as the cost of imported oil rises and places an increasing burden on the foreign exchange earnings of the region, means for limiting this impact must be developed and implemented.

To date, however, the national governments have not initiated any major programs to reduce petroleum consumption through conservation measures. The few conservation-related activities which exist are being carried out with the financing of international donors.

D. Other Donors *

There are two minor energy conservation efforts currently being financed by other donors. A World Bank loan to Panama for petroleum assistance includes a small amount for studies on the rational use of energy. In Costa Rica, the Inter-American Development Bank has just funded a study of the potential for using hydro and geothermal electricity as a substitute for petroleum in the industrial sector.

Other activities being financed by the donor community do not address energy conservation directly. The national activities shown in Table 2, above, are financed by large amounts of foreign exchange from the World Bank and the IDB. In many cases local currency financing is from the Mexican and Venezuelan oil facilities. Large amounts of assistance from World Bank and IDB also finance grid interconnection and, to a limited extent, petroleum exploration and energy planning. The United Nations Development Program (UNDP) through its Energy Program for the Central American Isthmus plans to elaborate national energy plans and to provide training, institutional organization and financial analysis of the energy sector in each country.

In conclusion, other donor-financed activities do not include any major efforts which address the need for energy conservation or, specifically, for industrial energy efficiency.

* For a more detailed discussion of other donor activities - see Annex A-8.

E. Opportunities for Saving Energy

To design a project for the industrial sector which would result in widespread awareness of energy efficiency measures and technologies, define the role to be played by regional institutions, and identify the most appropriate opportunities for energy efficiency activities, ROCAP carried out a survey of industrial energy use and subsequently contracted Development Sciences Inc. (DSI) to assist in analyzing the results of the survey. The activities proposed under this project are based on that analysis and the opportunities for efficiency identified by DSI. The highlights of the survey and the work performed by DSI are summarized below. (See Annex B-1 for a detailed discussion.)

1. Survey of Industries and Energy Use

A ROCAP contractor with substantial prior experience in working with Central American industry developed a questionnaire in consultation with Central American engineers, industry experts, and ROCAP staff. Of the approximately 1600 questionnaires mailed out, a total of over 300 were returned. (This response rate of 19% is considered excellent by Central American standards). The analysis of the questionnaires returned, including many letters which were received, indicates substantial enthusiasm on the part of the private sector for an assistance program in improving energy efficiency.

Highlights of the survey include:

- Although the cost of energy is very important to the industries, little has been done at the plant level to improve efficiency. (73% of the respondents have no energy program.)

- Major technical factors for absence of efficiency activities are a lack of trained staff, information, and technical assistance.

- Although financing is a major problem, most industries are willing to invest in energy saving improvements, if the payback period is short.

- There are substantial opportunities for saving energy at relatively low cost, particularly in improving the use of electrical energy in motors, in leveling power loads, and in saving liquid fuels used in boilers.

2. Overview of the Consultants on the Potential Impact of the Proposed Project

Four members of Development Sciences Inc. spent approximately 14 person weeks in Guatemala City with brief trips to Panama City, San Jose, and Tegucigalpa. The purpose of this effort was to analyze the results of the survey and other available industrial data, including the technical capabilities of selected regional institutions in order to develop a practical approach for the proposed project. To accomplish this work, meetings were held with directors and appropriate personnel at a large number of participating institutions: ICAITI, SIECA, FECAICA, national Chambers of Commerce, CABEI, and national banks. In addition, ICAITI field representatives, the industrial consultant who prepared the survey report, and ROCAP personnel were extensively interviewed. As a result of the above activities, the following conclusions were drawn by DSI:

- Industry needs and desires an energy efficiency program, but does not understand how to organize and implement appropriate plant activities.

- Equipment to solve most of industry's needs is readily available.

- There is presently an extremely small amount of financing available to industry due mostly to the present economic situation in Central America.

- A program capable of meeting industry's needs can be developed to reach a target audience over the planned five year time period for the project and then be expanded to reach a still larger audience afterwards.

- ICAITI is capable of implementing such a program, but will need specific support at the start in promotion activities and also technical assistance in training, data base management, and industrial activities which make up a well coordinated outreach program.

- SIECA can play an important role in promoting national policies which can have an impact on industry's present and future use of energy and identifying financing options for implementing efficiency and fuel substitution alternatives.

- FECAICA and the National Industry Chambers and Associations can assist in coordinating national efforts with the ICAITI field representatives in order to publicize and implement the program.

- The U.S. and Central American private sectors, including companies manufacturing energy efficiency equipment and consulting firms can play an important implementing role.

- If the program develops and expands, the Central American private sector will be a direct beneficiary.

- The indirect beneficiary will be the region's economy since a major savings will be possible in the use of imported oil and reduced pressure on the balance of payments will help restore economic growth and development.

III. PROJECT DESCRIPTION

A. Goal and Purpose

The goal of the project is to reduce the balance of payments deficit of Central America and Panama. Implementing effective means for decreasing the region's dependence on increasingly costly petroleum imports will make foreign exchange currently required to finance petroleum imports available for other investments. To the extent that efficient energy use is achieved, the competitive position of Central American industry in export markets will be strengthened.

The purpose of the project is to improve energy efficiency in industry and to reduce industrial consumption of imported petroleum by introducing (1) energy audits, (2) conservation measures, and (3) energy-efficient machinery. Efficiency in the consumption of petroleum will be improved not only by reductions in the direct consumption of petroleum and its derivatives, but also by the improved use of electrical machinery and by the use of waste products as alternative energy sources. The project is thus compatible with Central American efforts to develop hydroelectric and other domestic sources of energy.

B. Relationship of the Project to the CDSS Strategy and Regional Priorities

The project uses the private sector as a major element in project implementation. By reducing industry's dependency on imported petroleum, the project seeks to strengthen the private sector's viability and thereby enable it to enhance its contribution to economic growth and development of the region.

The project will utilize a regional institution, ICAITI, as a means of introducing energy efficiency to the private sector. In order to do this, the project will assist ICAITI to attain the technical skills to deliver such services as energy audits and efficiency recommendations to industries.

This project forms part of ROCAP's strategy to carry out a more balanced energy program to respond to the major energy problems of the region in the sectors that use the most energy. ROCAP's energy strategy addresses Central America's long-term economic well being by seeking to increase production of energy from fuelwood and other domestic sources and to decrease consumption of energy by improving efficiency. The various approaches, described in the 1984-1988 CDSS, depend upon the economic sector in question.

In ROCAP's rural energy program, the most important effort to date is the Fuelwood and Alternative Energy Sources project which, since 1979, has financed both research on fast growing trees, fuel efficient stoves, and other alternative energy sources for fuelwood, and the search for ways of disseminating the technologies developed.

ROCAP's role in the transportation sector, a sector which receives its direction from national policies, is best limited to the funding of studies which identify alternatives to the heavy petroleum consumption of that sector. For example, ROCAP has funded an assessment by Solar America which indicated that sorghum or Sudan grass may be grown on marginal pasture lands and still be produced in quantities sufficient to make the production of ethanol economically feasible. Further research and studies are needed.

This project, directed at and carried out with the participation of the private industrial sector, entails certain economic advantages over ROCAP's efforts in the rural and transportation sectors. The benefit stream is designed to begin in the early years of the project life. Since the project consists mostly of the application of known technologies directly to industry, project benefits need not be delayed by a long research period. The dissemination of beneficial technologies will begin immediately and will continue long after the project ends.

In terms of the regional economic perspective, the economic analysis assumes an 11% increase in energy efficiency for the industrial sector resulting from the project, and conservatively projects total annual savings of approximately \$79 million in petroleum imports. Even under the assumption of modest energy efficiency gains, this project provides an opportunity to make a favorable and enduring contribution towards resolving the region's balance of payments problem.

C. Project Rationale

In light of the needs of the industrial sector identified by the industrial energy survey and DSI analysis described above, the strategy of this project is to create an awareness of the opportunities for greater efficiency in the energy use of the industrial sector and to provide the means for identifying and carrying out measures that will reduce energy consumption in that sector.

The project will focus on industry and not on other sectors for several reasons. First, the public sector with

financing from other donors is appropriately giving priority to developing domestic energy sources, mostly hydropower, to substitute for electricity now being produced by imported petroleum. Secondly, while transportation consumes nearly one half of imported petroleum, it will also require more time and research before any cost-effective measures (e.g., alternative liquid fuels) can be instituted. Thirdly, the residential/commercial sector consumes only 9% of imported petroleum and, therefore, offers smaller opportunities for energy savings.

The project and the profit motive will motivate plant owners to initiate conservation measures that will reduce the amount of energy used in the production process. With costs per unit of output reduced, greater profit margins will make more funds available for working capital and investment at a time when funds for these purposes are inadequate in the region.

D. Target Industries and Priority Energy Savings Measures

The project provides an opportunity to work with private sector organizations and to reach a large segment of industry in the region. There is also a wide range of available technology of varying degrees of sophistication and cost to respond to industries' needs. A substantial part of the project design was devoted to establishing: (1) the criteria for those industries which will constitute the target group for the project and (2) the priorities for introducing appropriate energy saving techniques and technologies. This process will continue under the project as the data base expands and feedback is available from case studies and other sources.

1. Target Industries

The overall objectives in establishing a group of target industries was to make sure that the project would be working primarily with industries (1) that consume the most energy, (2) that present the best opportunities for replication in terms of plant numbers and the availability of relatively low cost technologies, and (3) that could be easily serviced by ICAITI. At the macro level, further concerns were the importance of these industries to the national economies in terms of value added and their impact on oil imports. The following six criteria were used for selection:

(a) Which industries are the major users of petroleum derivatives and electrical energy?

(b) In what processes and operations are these energy forms used and are there applicable and available technologies for energy savings at relatively low cost?

(c) How can these plants be identified by category and size?

(d) What is the number of plants in each category?

(e) How much do they contribute to the national economies in terms of value added?

(f) Are they candidates for ICAITI services based upon ICAITI's past industrial services?

The DSI consulting team analyzed available data on 9,000 industries with five or more employees and subjected them to the above criteria as well as their own experience based on their technical background, reviews of the energy questionnaires and plant visits. A further part of the effort was to identify the four largest energy consumers of petroleum derivatives and electrical energy in each country. This process resulted in the selection of a target group of over three thousand plant sites in the food processing, beverages, textile mills and chemical industries. These industries contribute 57.8% of the value added for the manufacturing sector.

The three thousand industries selected for the target group are generally small, medium, and medium-large industries. Larger industries were excluded because they ordinarily have in-house capability or can obtain assistance in energy efficiency matters. Also, they often are of a scale or type where it is very difficult to introduce significant improvements without major changes in processes or in the plant itself. On the other hand, industries with less than five employees were excluded because it was simply not cost-effective to include them. Some of the industries in categories not selected for the target group will be candidates for inclusion in the future by ICAITI as they continue the program after ROCAP funding ends.*

The targeting process is used for planning purposes in designing the various project components and in providing a focus for the overall program. As discussed in more detail in the Project Components and other sections, many of

*For more information on the targeting process and categories of industries by energy use and country, see Annex B-1.

the activities to be carried out under the project will extend beyond the immediate target group. There will also be a spread effect, and it is expected that many other industries employing five persons or more and numerous small industries will benefit from the project. As indicated in the following section, many of the steps which can be taken to save energy do not require direct technical assistance from ICAITI to the industry.

2. Priority Energy Saving Measures

The above targeting process has also included an identification of specific uses of energy both by process or operation as well as by form. With these known, appropriate energy conserving techniques and technologies which are readily available have been identified. Much of this evaluation is discussed in Annex B-1 and also in the Survey of Industrial Energy Use. Table 5, "Industrial Energy Efficiency Techniques by Priority Based Upon Need and Cost" presents a list of steps designed to respond to these opportunities for energy conservation within the major energy using industries. The steps start with the simplest and least expensive techniques, including maintenance and housekeeping, and work up to overall plant energy optimization as appropriate for the specific company.

The table outlines an overall framework for the types of energy savings knowledge and technology that the project will communicate to plant managers and engineers. In general, the table also establishes priorities for many of the activities to be carried out under the project components. Most of these activities assume a low level of technical sophistication and relatively small investments. The project's emphasis on the less costly steps indicated on the table is appropriate because very little has been done thus far to improve industrial energy efficiency by the public or private sectors, and, therefore, many opportunities exist for energy savings.

E. Project Components

The project includes five components which have been carefully selected to help achieve greater industrial energy efficiency in Central America and Panama. The components represent an integrated approach that will make improved energy efficiency a realistic goal for most industries, provide information to plant managers and engineers on new energy efficiency and fuel substitution opportunities, and train engineers (ICAITI staff first, who will subsequently train others) to carry out audits and equipment changes in such a way that they will be

TABLE 5

Industrial Energy Efficiency Techniques by Priority
Based upon Need and Cost

STEP

1. PROVIDE MAINTENANCE OR HOUSEKEEPING PROCEDURES FOR ALL ENERGY USING EQUIPMENT
 - a. Combustion Efficiency on Burners
 - b. Cleaning of Boilers and Heat Exchanges
 - c. Identification of Steam Leaks
 - d. Optimization of Electrical Units
 - e. Review of Building for Lighting, Heating, Cooling Changes
2. PLAN DATA COLLECTION, TABULATION, AND ANALYSIS OF ELECTRICAL AND THERMAL ENERGY USE
 - a. Organization of Records to Encourage Standards of Energy Use by Process of Department
 - b. Review of all Metering Equipment of Energy Uses
 - c. Development of Energy Plan Including Personnel Program and Selection of Energy Coordinator
3. BEGIN TRACING OF THERMAL ENERGY IN PLANT
 - a. Review Possible Changes for Boilers and/or Furnaces: Replacement or Modification, Preheat Air, Recover Waste Heat, Add Insulation, Reuse Condensate.
 - b. Evaluate Fuel Substitution: Use of Waste Materials or Renewable Alternatives
4. BEGIN TRACING OF ELECTRICAL ENERGY IN PLANT
 - a. Review Billing Procedures: Minimize Peak Demands
 - b. Evaluate Size and Timing of Units
 - c. Evaluate Cogeneration
5. OPTIMIZE ENERGY USE AS APPROPRIATE
 - a. Develop Energy Balances to Determine Energy Alternatives
 - b. Evaluate Plant Processes and Operations to Identify Potential Changes
 - c. Evaluate Investments in Energy and Process Changes.

capable of continuing with these services on a self-sustaining basis. Table 6 lists the components and summarizes the activities and outputs expected.

1. Industry Program Component

This component is the heart of the project and will have a direct impact on industry through the actual delivery of technical services. Four activities designed to identify, implement and illustrate energy efficiency alternatives are included in this component:

- Energy Audits: a series of technical services affecting how a plant uses energy, including a diagnosis of energy consumption and how it can be reduced;

- Field and Pilot Demonstrations: actual in-plant installations of energy reduction measures and equipment.

- Energy Efficiency Seminars: a series of one to two-day presentations to plant management and engineering personnel throughout the region to inform them of immediate opportunities to reduce energy consumption and of services available under the project; and

- Exhibits: displays of energy conserving technology, audio-visual materials, and related presentations aimed at stimulating an awareness of the need and means to conserve energy.

Following a period of on-the-job and formal training, technical personnel from ICAITI (and eventually participating technical organizations in the region) will provide all of the services described. The services will progressively become self-funding as industry is motivated to pay the costs in anticipation of the savings to be realized. While ICAITI personnel are being trained in the first year, a "rapid impact" activity is planned in which selected audits and minor demonstrations will be conducted by a U.S. consulting firm. This will demonstrate to industries that savings can be achieved and provide ICAITI trainees with opportunities to participate in actual energy audits and demonstrations.

a. Energy Audits

1) Description

The purpose of an energy audit is to define the utilization of energy within a plant and to recommend methods for decreasing the use and cost of energy. Audits

TABLE 6
Summary of Project Components

PROJECT COMPONENT	DESCRIPTION	MAJOR PARTICIPANTS	SPECIFIC OUTCOMES
1. INDUSTRY PROGRAMS	<ul style="list-style-type: none"> . Energy Audits . Demonstrations . Seminars to industry . Exhibits 	<ul style="list-style-type: none"> . ICAITI Technical & Industrial Services Division . ICAITI Applied Research Div. . Technical Institute Engineers (National level) 	<ul style="list-style-type: none"> . 290 Level 1 Audits . 45 Level 2 Audits . 72 Minor Plant Demonstrations . 13 Major Plant Demonstrations . 2 Pilot Plant Demonstrations . 105 Seminars and 8 Exhibits
2. TRAINING	<ul style="list-style-type: none"> . Engineers trained to be experts in industrial energy management . Capability to conduct energy audits 	<ul style="list-style-type: none"> . Consultant for training . ICAITI engineers . Technical Institute engineers (national level) 	<ul style="list-style-type: none"> . High impact audit course . Basic industrial energy courses . 10 technical modules . Well trained local and regional capability
3. PROMOTION ACTIVITIES	<ul style="list-style-type: none"> . Promote and organize seminars and audits . Organize conferences . Disseminate reports, exhibits, Newsletter, direct contacts . Promote institutional participation 	<ul style="list-style-type: none"> . ICAITI Coordinator . Field Representatives . Chamber of Associations . Advisors and PICAICA 	<ul style="list-style-type: none"> . Quarterly newsletter . 10 Special technical publications . Monthly activity reports . Annual regional conferences . Industry visits to demo sites . Brochures
4. DATA BASE AND ANALYSIS	<ul style="list-style-type: none"> . Computerized data base on industry and energy . Library service . Periodic analysis reports and statistical publications 	<ul style="list-style-type: none"> . ICAITI Documentation and Information Division 	<ul style="list-style-type: none"> . Computerized data bases . User manuals . Project Library and catalogue . Series of technical studies. . Industry-energy statistical reports
5. FINANCING AND PUBLIC POLICY	<ul style="list-style-type: none"> . Macro-Economic studies of energy policy . Relation of project activities to national plans and policies 	<ul style="list-style-type: none"> . SIRECA/COPEMEX 	<ul style="list-style-type: none"> . Identification of funding resources . Current national policies impacting industrial energy . Low range economic-energy policy evaluation . Input to plant & long term energy pricing

will primarily deal with all energy conversion, shortage and transfer systems such as burners, boilers, tanks, conduits and surfaces, and fuel quality. They will also deal with a description of energy use by production process, which is a valuable tool to the plant engineer who may decide to effect process changes or to call in a specialist for assistance. Two types of energy audits will be conducted under this activity:

a) Level 1 - a visual and qualitative diagnosis of energy utilization resulting in the identification of immediate opportunities to improve energy efficiency at low cost through such measures as elimination of obvious wastage, equipment scheduling, maintenance procedures and general awareness of practices that needlessly waste energy. Each Level 1 audit will have the following possible outcomes: (1) changes in maintenance and energy management implemented with no capital cost; (2) low cost energy savings measures are taken; or (3) a Level 2 audit is contracted. Part of the cost of Level 1 audits, about \$1,500 each, will be financed by fees to be charged industry based on a cost sensitivity analysis.

b) Level 2 - a quantitative diagnosis of energy flows through the plant using a basic package of measuring equipment in order to document how energy is used and lost. This includes a technical evaluation of performance of major energy systems such as furnace, burners, boilers, tanks, heat transfer surfaces, pumps, motors and other electrical machinery. The basic output of a Level 2 audit is a plant or process energy balance and recommendations on ways to reduce the energy consumption of the major energy systems. The recommendations may also deal with the economics of fuel switching and of substituting electricity for liquid or solid fuel where appropriate. Level 2 audits, which in some cases may be initiated without preliminary Level 1 audits, will have the following possible outcomes: (1) no further action (unlikely if careful selection has been made; (2) adoption of further energy saving measures requiring minor installations; or (3) design feasibility studies for major installations. The cost of a Level 2 audit will be funded partly by the project and partly by the industries receiving the audit. Of the average estimated cost of \$4,500 for a Level 2 audit, the industry will pay a minimum \$500. This fee is expected to increase over the life of the project as industry becomes more aware of the benefits of an audit.

The data collected from the audits will become part of the project's data base for statistical purposes, but information relating to any particular plant will be considered strictly confidential. Each energy audit (at each level) will result in a technical report to the plant manager presented in a standardized format. Case study reports may result if the audit demonstrates techniques or energy savings applicable to numerous other industrial facilities.

2) Implementation

The project will begin with a series of "high impact" Level 1 audits in the first year. These will serve to motivate early action, to obtain energy savings, to produce tangible results, and to train ICAITI engineers. Selection will be based primarily on potential visibility to stimulate the demand for energy audits throughout the region. Beyond the rapid impact audits, the following steps will be followed in selecting industries for audits at both levels. Application forms will be distributed and a file of requests developed. The applications will indicate how much the company already knows and what it is doing about its energy situation. Recommendations then will be made by the ICAITI field representatives along with a local industry committee.

In the process of identifying firms for Level 1 and Level 2 audits, information will be obtained in the questionnaire on price sensitivity so as to establish fees that will be commensurate with ICAITI's output capacity and consistent with the overall objectives of the project. Further adjustments in fees may be made over the life of the product.

b. Field and Pilot Demonstrations

1) Description

Demonstration activities will be used to show that appropriate measures, properly installed and monitored, can result in significant energy savings for industries in Central America and Panama. Two types of demonstrations are planned under this activity: 85 in-plant demonstrations of actual energy savings using existing technologies, and two pilot plant demonstrations using new technologies.

a) In Plant Demonstrations

These demonstrations will include the following elements: feasibility study, engineering design, equipment purchase and installation, startup and monitoring and a case study report.

A minor demonstration will not require that the first two elements be executed in any detail. Equipment for these simple demonstrations will consist of items such as gauges, meters, low cost controls, and spare parts. These demonstrations will generally cost on the order of a few hundred to several thousand dollars (no more than \$5,000). The project will finance the complete cost of the 72 minor demonstrations which are planned but will require a commitment from the industry to maintain energy efficiency measures and to allow plant visits by others.

A major demonstration will involve substantive performance of all of the above six elements. These demonstrations will typically involve an overhaul or replacement of the major energy using equipment of a plant, the introduction of improved technologies and/or the introduction of new fuels. The extensive engineering design and supervisory services for these demonstrations will be provided by ICAITI engineers, as will supervisory services for the start-up and monitoring phases. The project will finance up to 100% of cost of the 13 planned demonstrations; however, the plants which receive financing for equipment will be required to repay to ICAITI a depreciated value starting at the end of the demonstration period.

Recovered funds as well as funds received from fees for the audits and demonstrations will be used to finance project costs and should result in an increase in interventions. In carrying out feasibility studies for the major demonstrations, ICAITI will specifically address the question of the impact of the investment on employment and consider labor intensive processes as a result to save energy.

b) Pilot Plant Demonstrations

While the overall objective of the project is to promote immediate energy conservation measures by industry, there is also a need for pilot plants to demonstrate new technologies which can be feasible in the Central America environment within the five year time frame of the project. This serves to identify and develop those energy saving measures which go beyond the immediate possibilities. The most promising pilot plant applications relate to the use of biomass materials which may be waste products, or which can be produced locally at low cost. The two pilot plants planned under the project will meet the following criteria before being started:

- A reasonable chance for a successful application within the time frame of the overall project;
- Significant potential market for the application;
- The pilot plant does not duplicate a similar effort in the same country;

- Cooperation of a private sector firm in the pilot plant, and, if possible, contributing material support, as well as a site for the pilot plant.

Several projects proposed by the ICAITI Applied Research Division are described in Annex B-4. The two to be implemented under the project will be selected from this list.

2) Implementation

As with the energy audits, this activity will begin with a series of selected "high impact" actions focussed on in-plant demonstrations. These will involve the demonstration of a set of technological features, such as boilers and combustion equipment, which are common in several industries. The objective of the initial demonstrations is to gain early visibility for ICAITI as an institutional asset to industry in reducing operating costs through energy efficiency measures. Also, the initial demonstrations will provide further on-the-job training for ICAITI engineers.

The ICAITI project director and field representatives will organize an industry committee in each country for selecting the industries to participate in the inplant demonstrations. The committees will include government and industry representatives. (See Section III.E.3.b for more detail on these committees).

In selecting the demonstration projects, the following criteria will be applied:

- Does the opportunity exist to save the plant energy and to reduce operating costs?
- What is the anticipated demonstration effect: will the demonstration be highly visible, is the firm one whose actions are noticed by others?
- Is the firm willing to participate actively, including contributing to the cost and permitting plant visits by others?
- Has the firm expressed a willingness to promote its action in reducing energy consumption, including making presentations at seminars and sharing their experience with others?

c. Energy Efficiency Seminars

1) Description

The objective of the seminars will be to acquaint the participants with the opportunities for reducing plant operating costs through energy efficiency, to acquaint them with services available through the project and to indicate appropriate private sector services and products that are available. The seminars will be of one to two days duration and will involve the presentation of lectures, exhibits, audio-visual materials and workshop sessions.

The seminars will be specialized to provide an overview of energy management within a single category of industries and to treat particular energy subjects that may be common to many industries. Initially, the seminars will focus on the four industries which have been targeted by the project: food products, beverages, chemicals, and textiles. Topics common to several industrial categories will be presented at the seminars, and will cover general principles, case studies, approaches to energy savings, available technology and how to proceed. The following topics, selected on the basis of the responses received from the survey questionnaires and on plant visits, are illustrative of what a seminar will cover:

- Fuels management
- Heat transfer and pressure control
- Furnace and flame operations
- Boilers and water heaters
- Electrical load management
- Electro-mechanical equipment (motors)
- Pumps and compressors
- Solar energy applications
- Biofuels applications

The cost of the seminars will be financed by the project, but the participating companies will be expected to bear the salary, travel and per diem costs of their employees.

2) Implementation

The seminars will be presented by a team of two ICAITI engineers in cooperation with the local industry representatives. Approximately four seminars will be held in each country each year of the project. The format for the seminars will vary according to the audience and will focus as much as possible on actual experience and cases. Materials from the Exhibits activity (discussed below) will be employed as appropriate.

Each seminar is viewed as an opportunity to collect additional information about industry. Thus, as part of the seminars, participants will be asked to fill out questionnaires regarding energy use in their plant. The information collected will help build the project's data base and will provide a basis for identifying energy saving opportunities. Follow-up will also provide an opportunity to remind potential clients of the technical services available from the project and to see what they have done as a result of the seminar.

d. Exhibits

This will be the smallest of the four activities in the Industry Program Component. The purpose of the exhibits will be to promote energy efficiency by concrete example. Over the life of the project, exhibits will be produced in the form of actual electrical or mechanical energy displays, desk-top models, video-cassette, slide and view-graph presentations, and posters. Exhibits will be designed both for display at ICAITI headquarters and at industry chambers or associations, industrial conferences and trade fairs throughout the region. In addition, the exhibits will be designed to support the seminars as modules that can be incorporated into discussions sessions.

ICAITI staff will design all of the exhibits and will be responsible for assuring that they receive as wide an exposure as possible. The project will finance the cost of preparing the exhibits, while ICAITI will be responsible for distribution and dissemination throughout the region.

e. Inputs

For the activities of this component, the project will finance both long and short-term technical assistance, materials and some equipment for audits, selected costs associated with minor and major in-plant demonstrations and pilot plant demonstrations, and the cost (including salary, travel and per diem) of ICAITI engineers who will be hired for this component. See Section V, Financial Plan, for details on the cost of this component.

2. Training Component

The training component has two functions: developing the technical capacity of ICAITI staff to carry out project activities, and using ICAITI staff to transfer that capacity to national level counterparts.

To achieve project objectives, ICAITI must have a trained staff capable of providing services from basic "good housekeeping" measures up to advising on plant process changes. This component, therefore, will train ICAITI staff to carry out audits, implement energy efficient techniques and technologies, and understand plant processes well enough to incorporate appropriate designs into a comprehensive energy management program for a particular company.

The training program will also be used as a part of the ICAITI promotion and outreach effort to involve public and private sector officials in energy efficiency activities. For this purpose, the training program is designed so that it can be given as short courses at ICAITI as well as at seminars throughout the region. All materials will be developed in Spanish and examples from the Central American industrial experience will be used extensively.

a. Description

The program is designed to match the various skill levels and needs of the trainees, as well as the industrial alternatives available to the energy-using companies of Central America and Panama. A set of ten topics considered most important in meeting the institutional as well as industrial requirements of the region have been identified and will form the nucleus of the training program. These topics will be developed as individual modules capable of standing alone in their level of completeness or of being organized in different groupings in order to meet specific needs.

Table 7 identifies the ten topics, provides a brief outline of what each topic will cover, and the initial ICAITI staff that will participate in the training activities.

b. Implementation

ICAITI will name a training manager and contract a training consultant to develop the modules and to provide assistance until the ICAITI staff is capable of continuing on its own. The structure of the modules is such that they can be given in different order or in groups to permit maximum utilization. For example, plant visits can be scheduled either along with one or more modules as desired to illustrate specific topics, or separately to stress audit procedures. In addition, outside groups will be encouraged to participate in certain parts of the basic course at the very beginning. In this way, the issue of electricity optimization from Module 4, Electricity Generation and Use, could

TABLE 7

TRAINING MODULES

<u>TITLE:</u>	<u>OUTLINE OF TOPICS:</u>	<u>PARTICIPANTS:</u>
1. Introduction	General Description of Industries, Companies and Processes	Staff Engineers, Field Representatives, Initial High Impact Team and others requiring general background.
2. Concept and Application of Energy Audits	Provide Formats for Data Collection Review Test Equipment Develop Techniques for Energy Balances	Staff Engineers, Field Representatives, Initial High Impact Team and others requiring general background.
3. Energy Sources and Uses	Description of Existing and Potential Forms. Alternative Sources Relationships of Source to Industrial Use by Process and Operation	Staff Engineers, Field Representatives, others requiring general background.
4. Electricity Generation and	Electric Circuit Theory and Measurement Techniques Hydraulic Power Systems Uses and Costs	Staff Engineers, Initial High Impact Team (Utility Engineers could assist in Group Discussions)
5. Thermal Management	Thermodynamic Issues Combustion Systems including Measurement Techniques System Efficiency Heat Transfer and Recovery Cogeneration Alternative Fuels Uses and Costs	Staff Engineers, Initial High Impact Team
6. Specific Industrial Process and Energy Conserving Alternatives for C.A.	Drying and Evaporation Distillation Other Process Changes Building Design Space Heating and Cooling	Staff Engineers, Specific Industrial plant Engineers as appropriate
7. Industrial Energy Management Program	Role of Energy Coordinator Monitoring Procedures Maintenance Programs Use of Specialized Consultants Future Planning	Staff Engineers Specific Industrial Plant Engineers as appropriate Plant and Management Personnel
8. Energy Economics	Techniques for Costing Alternative Sources for Capital Cost Organization by Project	Staff Engineers, Field Representatives, Specific Industrial Plant Engineers as appropriate, Plant Management and Personnel (Banking Officials could assist in Group Discussions)
9. Plant visit(s)	Energy Audit Procedures Descriptions of Past, Present and Future Energy Technologies Plant Optimization as overall Goal	Staff Engineers Field Representatives Initial High Impact Team
10. Review and discussion	Coordination and Audit and Design Procedures System Turnkey Approach Specific Problems and Solutions	Staff Engineers Field Representatives

include a discussion of rate structures with utility personnel and be used to illustrate load management and power factor management. Similarly, banking groups could participate in Module 8, Energy Economics, as appropriate to discuss financing procedures.

Four levels of training activities are planned (see Table 8 for a summary). The first consists of a two week course of instruction that will be tied into the high impact activities of the Level 1 audits and demonstration projects planned for the first year. This will be a one-time training initiative and will include on-the-job training for ICAITI engineers and field representatives.

The second level of training will start toward the end of the first project year and will consist of the basic ten modules identified above. The course will be taught by the training consultant for ICAITI engineers and field representatives.

The third level will be a follow-on to the second, incorporating updates and modifications which result from the previous course. In addition, the ICAITI engineers will have gained sufficient experience in performing audits and designing energy efficiency alternatives so that they will be able to assist the consultant in teaching the course. Participants at this level will be previously untrained ICAITI engineers and national level counterparts.

At the fourth level, which will occur in the fourth year of the project, ICAITI engineers will be fully capable of providing instruction on any of the modules of the total course as a service to industries in the region as well as to financial and other institutions.

With this schedule, ICAITI's staff will gradually change from the trainees to the teachers, thus assuring the continuation and broadening of the project's impact by offering individual modules or the entire course to public and private sector institutions at the national level.

c. Inputs

The project will finance long and short-term consulting assistance for the preparation of training modules and instruction during the first two years of the project. A total of 12 work months of US consultant assistance is required for the preparation of the basic course. Updating and follow-on training will require an additional 8 work months. Outside attendees (non-ICAITI engineers,

TABLE 8

TRAINING OUTLINE

<u>TYPE OF ACTIVITY</u>	<u>TRAINERS</u>	<u>TRAINEES</u>	<u>DURATION</u>	<u>TIMING</u>
1. High impact audit course	U.S. Consulting Group	Selected ICAITI engineers with industrial experience in combustion and/or electricity	2-3 weeks	7th-9th month of first year
2. Basic Industrial Energy Efficiency Course	U Consulting Group	Selected Staff ICAITI Engineers	6-10 weeks first year to second month of second year	10th month of first year and 2nd month of second year
3. Updated Basic Industrial Energy Efficiency Course	U.S. Consulting Group ICAITI Engineers	Selected Staff ICAITI engineers plus additional engineers from national institutions	6-10 weeks	8th-12th month of third year
4. ICAITI-taught Basic Industrial Energy Efficiency Course	ICAITI Engineers	As required	As required	8th-12th month of fourth year and later

industry participants, bankers, etc.) will be expected to pay their own expenses and travel costs. ICAITI will charge registration fees for courses given after the third year.

3. Promotion and Field Extension Component

The ROCAP-sponsored Regional Industrial Energy Efficiency Baseline Data Survey Study^{1/} found a lack of awareness of energy choices in the industries of the region. Further, the data show that 73% of the respondents do not have an energy program. The survey results probably understate the degree of unawareness and lack of action because the survey did not include the smallest industries.

A strong promotional effort will be carried out in order to overcome this lack of awareness of energy alternatives, choices and options and to stimulate the demand for the services, particularly audits and demonstrations, that the project has to offer. Promotion activities will help industry progress to being aware of energy efficiency choices and from interest in considering an energy program, to decisions and, finally, actions in undertaking an energy maintenance or management program. To achieve this objective, the Promotion and Field Extension component includes the following activities:

- Publications: the provision of technical and economic information through newsletters, press items, brochures, pamphlets, and case studies.

- Seminars and Exhibits: the field implementation of seminars, workshops, and expositions developed under the Industry Program and Training components.

- On-site Demonstrations: the arrangement of visits to plant demonstrations financed under the Industry Program component.

- Inquiry Service: the response to private sector inquiries for additional information and service.

These activities will be closely coordinated with the other components of the project, particularly the demonstration, seminar and exhibit activities of the industrial program.

An important consequence of a strong promotional effort is the opportunity it provides to create an outreach mechanism for indirectly involving the smaller Central American

^{1/} Final Report, Elias C. Hill, Guatemala City, March, 1982

industrial companies in project activities. These companies are too numerous (over 120,000) to provide technical services to individually, but with access to adequate technical information, many will be able to take direct action on their own.

a. Description

Common to the various activities of this component will be (1) the promotion of the concept of energy efficiency in industry and its importance to industrial profitability and competitiveness and (2) publicity for the project activities, including audits, audit training opportunities, demonstrations, and ICAITI's information and technical services.

Priority will be given to using industry promotional channels such as those available through FECAICA and the Chamber of Industries in the respective countries. Specific examples include "La Cámara Informa", the bulletin of the Chamber of Commerce, Industry and Agriculture in Panama, and "Industria", the official publication of the Guatemalan Chamber of Industry. Other industry associations or local industry groups will also be used, as will the public media when donated space or time is available.

1) Publications

Newsletters, bulletins, brochures, pamphlets, etc. will be produced by ICAITI project staff, including the national field representatives and ICAITI's Technical Publications Division, with assistance from SIECA, FECAICA and the National Chambers of Industry as appropriate. In addition, consultant services will be used in the first year to assist with writing, design, paste up, and printing various publications. Table 9 provides examples of some of the publications to be prepared by this activity.

Case studies of specific industries in the region have the potential of being a powerful promotional and educational tool. Such studies will represent publications in their own right as well as serve as industry examples in seminars and workshops, and as part of the training program. ICAITI will develop the case studies as part of the energy audit and follow-up system and will be assisted by INCAE graduate students and faculty who will concentrate on the managerial, economic and financial issues associated with the introduction of energy efficient equipment. Individual companies implementing energy programs will be encouraged to develop their own case studies or success stories and to contribute them for wider use.

TABLE 9

Partial List of Publications

1. "The ICAITI/FECAICA/SIECA Industrial Energy Efficiency Project" (Regional Brochure).
2. "Why Save Energy?" (A Guide for plant managers, plant owners, etc. on why saving energy is important to their company; a regional brochure).
3. "What is an Energy Audit?" (Regional Brochure)
4. "Simple Maintenance for Energy Efficiency and Cost Reduction" (Regional pamphlet).
5. "Guide to Energy Investments" (National pamphlets).
6. Project Newsletters, Bulletins (regional and national required)
7. "Energy Efficient Case Studies" (Brochures and technical reports for each case).

2) Seminars and Exhibits

The national field representatives, with the support of ICAITI's technical divisions, will arrange for seminars and exhibits throughout the life of the project. (Once the arrangements are made, the seminars and exhibits will be carried out as part of the industry program). During the first year emphasis will be placed on (1) why saving energy is important for industry and (2) simple maintenance and operating techniques that save energy and reduce costs without new investments. In subsequent years, the seminars and exhibits will focus on the experience gained from project activities, new developments in energy efficiency measures, and their application for industry.

3) Visits to Demonstration Projects

The demonstration projects of the Industry Program represent a major opportunity for industry to learn about energy audits, energy efficient maintenance, and new conservation or alternative energy technology. Over the life of the project, the Project Director and the national field representatives will arrange for periodic site visits by industry to the various demonstration projects.

4) Energy Inquiry Service

An important function of the project is to provide technical information to industry that will assist in improving energy efficiency. As more and more information becomes available under the project, the demand by industry for the information is expected to increase. This activity, therefore, will focus on responding to these inquiries and assuring that all appropriate information is made available in a timely fashion.

The ICAITI field representatives, with support from ICAITI's Documentation and Information Division, will be responsible for responding to industry inquiries and for following up on whether the information is understood, appropriate and actionable, and whether any technical support services are necessary. Three different types of printed information will be made available to industries:

(a) Non-technical information such as project announcements, schedules, etc.;

(b) Technical information in non-technical formats, including the publications shown in Table 9; and

(c) Technical information in technical form, including ICAITI and NTIS technical reports and results from the project data base.

b. Implementation

To undertake the promotion and information dissemination activities of this component, it will be necessary to develop a network of participating institutions to share information and advice and to act as promotion channels. This network will consist of regional and national consultative committees. In addition, the capacity of ICAITI, and particularly its field offices, must be strengthened.

1) Private Sector Energy Consultative Committees

A regional energy consultative committee will be established to assist the Project Director and the Deputy Project Director for Promotion and Field Extension in coordinating the project at the regional level. The committee will assist in making effective use of the promotional and information dissemination channels of appropriate regional institutions and be asked to provide feedback on the performance and impact of the project. ICAITI, FECAICA, SIECA, CABEI, and selected major industry representatives will serve on the committee. In the first year of implementation, as the project goes through an initial period of rapid evolution, quarterly meetings will be held; subsequently, no more than two meetings a year will be held.

In addition, national energy consultative committees will be established in each participating country to help ICAITI field representatives in coordinating the project at the national and local level. The national chamber of industry as well as other national institutions, such as the central bank and national electric utility, major industrial banks, and selected industry representatives will participate. The same preliminary schedule of meetings as discussed above is planned, although the final schedule will vary with each country's different requirements.

2) ICAITI Staff

ICAITI will have the Project Director, the Deputy Director for Promotion and Field Extension, and the field representative at the national level involved in the implementation of this component. (The relationship of the consultative team committees to the ICAITI staff is shown

in Figure 1). Frequent coordination meetings with the national field representatives are planned, at least bimonthly in the first year of the project, and quarterly thereafter.

The existing ICAITI structure of national field representatives developed with the assistance of ROCAP's program of Technology Transfer, will be expanded so that Panama, too, will have a field representative. The field representatives will be responsible for all national activities undertaken in the project. It is estimated that approximately 50% of the national field representatives time will be spent on this project alone, except for the Panamanian field representative who will be full time.

To assist the field representatives in El Salvador, Honduras, Nicaragua and Costa Rica, ICAITI will hire junior engineers for a one year period. These engineers will be hired from the local utilities, engineering firms or as recent university graduates, and they will receive training by working closely with ICAITI engineers and consultants. The one-year period is seen as a type of internship, preparing the junior engineers to continue work in industrial energy when they leave.

c. Inputs

In addition to the direct project staff, a firm specializing in public relations and promotion and which is familiar with the media in Central America will provide consulting services in the development of the regional and national promotion activities, particularly in the first year. This will include assistance in preparing the technical aspects of early versions of the newsletter, brochures, and case studies.

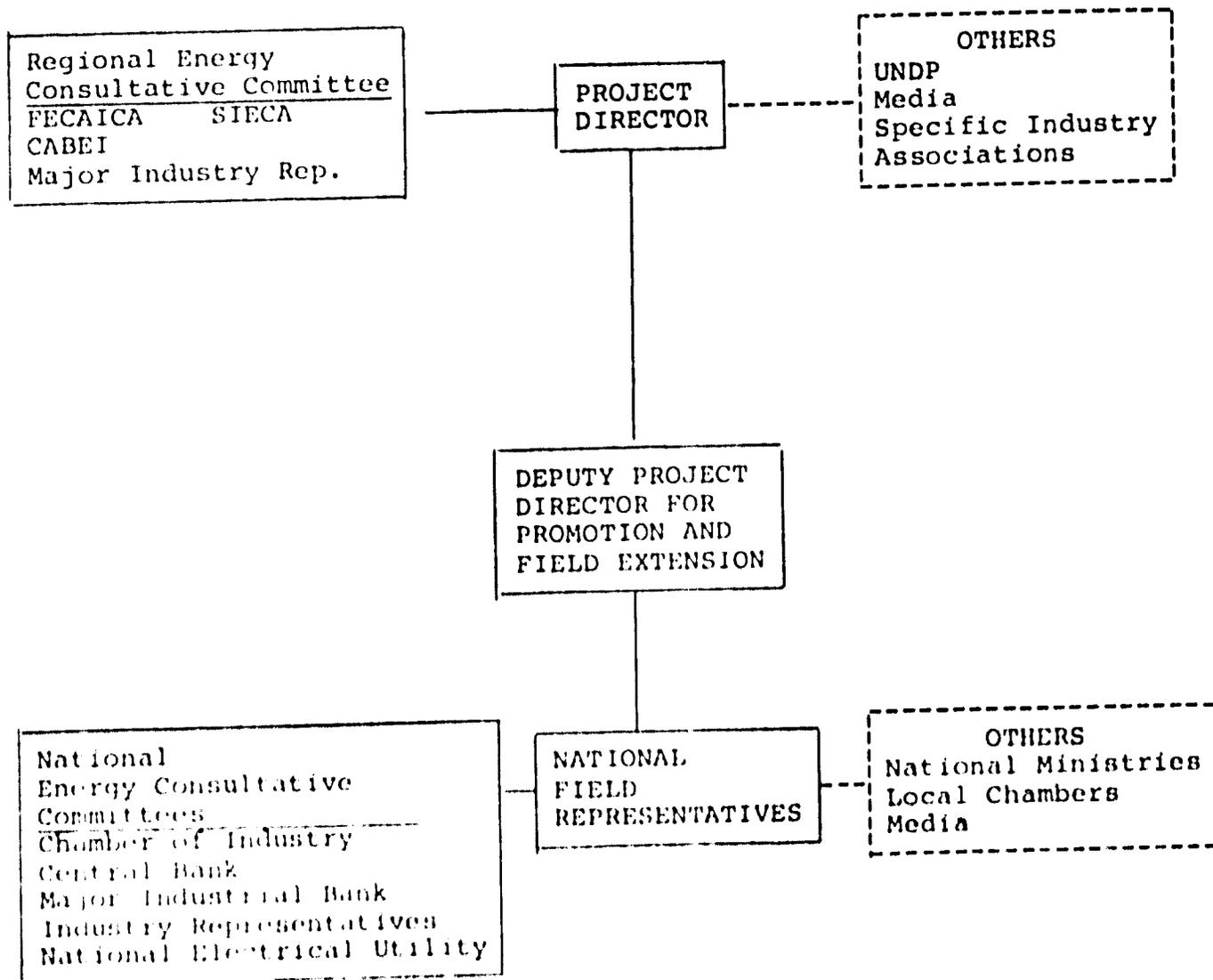
The project will also fund the cost of preparing and conducting regional and national meetings and seminars. The regional and national private sector consultative committee members, however, will volunteer their time as will participants in all meetings and seminars. Further details on unit cost for promotional activities can be found in Section V, Financial Plan.

4. Data Base and Analysis Component

In a rapidly growing and changing field such as energy efficiency, it is important to have access to comprehensive (and periodically updated) information from international sources in addition to information generated by the project.

Figure 1

PROJECT ORGANIZATION FOR PROMOTION AND FIELD
EXTENSION DISSEMINATION



The objective of this component, therefore, is to develop such a data base and to augment the ICAITI library and data handling facilities to manage this additional requirement. The data base will be generated in a phased manner so that project personnel can participate in the collection of input materials and, given this familiarity, use the data base effectively.

a. Description

The industrial energy data base will reside at ICAITI but will be a resource shared with all institutions participating in the project. The data base will include both hard copy reference materials, which will not be automated, and project specific information, which will grow over the life of project activities to a size where computerized storage and handling will be essential.

Expansion of ICAITI's library to provide documentation on energy efficiency and fuel substitution activities taking place in both developed and developing countries is essential because of the need to understand and benefit from actions which have occurred in other locations. There is considerable documentation such as baseline studies produced by the U.S. Department of Energy and the Bureau of Mines on Energy use patterns by industry that will be helpful. In addition, technical journals such as ASHARE, Power Engineering, Plant Energy Management and the various publications of professional engineering societies contain useful materials on available technologies.

For the project specific information, the data base will initially take the form of nationally available charts and tables of industrial production values, numbers of industries and employees, and the use of electricity and other energy forms for the six countries. Also, data from the initial project design questionnaires will be included. (A brief review of this data is found in Annex B-1).

As project activities progress, individual plant data (coded to ensure confidentiality of site-specific industrial data) will be added showing the technique or technology utilized by unit process or operation, the specific form of energy, and the relevant cost data. Gradually, the information will build to a substantial size and permit analyses at both the macro and micro levels of energy efficiency options and fuel substitution potential applicable and advisable by industry sector and process.

The development of case studies will be an important element in the expansion of the original data base. Included will be examples of successful audits leading to installations which produce energy savings and information from the most successful demonstration projects. In developing the case studies, attention will be paid to appropriate coverage of the most relevant industries and processes in all of the countries. INCAE is expected to participate in the development and use of the case studies, through a collaborative arrangement with ICAITI.

Along with the case studies, which will be coded by location, type of industry, process and/or operation, energy form, and applied technology or technique, will be additional data collected on the technical resources of the region. These will be similarly coded and identify technical personnel and consultants who are available within the region by participating group, local manufacturing capability or experience and general expertise. These individuals and establishments will be identified by ICAITI and other participating in the project to complement the data base and be available for technical assistance as required.

In addition to simple coding procedures to permit confidentiality, data collected from project activities will be structured by key-word systems to facilitate searches for appropriate information.

b. Implementation

ICAITI's Division of Documentation and Information will be responsible for the development and maintenance of the data base. To handle the additional work associated with this data base, ICAITI will hire a full-time manager (project funded). In addition, a consultant will be hired on a short-term basis to help prepare the data base design. The consultant will have energy planning experience in both the public and private sectors which will facilitate the review of available data, the identification of future requirements and the organization of both hardware and software requirements to meet these needs.

Given the current state of computer technology, a micro-computer such as an Apple II+ will be able to handle the requirements of the project. As the data base grows and the potential for analysis increases, specific software packages for sub-routines such as equipment investment decision analysis, conservation payback, and engineering analysis and calculations will be needed. These subroutines will most likely be purchased from software specialty firms

in the U.S. so that ICAITI can limit its internal programming efforts to date retrieval and display programs. As time permits and to the extent that the capacity exists, however, ICAITI's computer staff will also work on special programs that may be required by the project.

c. Inputs

In addition to a full time manager for the data base, the project will finance approximately eight work months of technical services from a U.S. consulting firm to review data needs and to design the data base. Computer hardware, software programs, data searches, some translation costs and necessary library materials will also be financed by the project. Storage, analysis and dissemination of the data will be performed by ICAITI personnel.

5. Financing and Public Policy Issues Component

Public policy is an important instrument for promoting efficient use of energy in industry through its effect on the structure of production costs and on investment decisions. This component will address the policy framework in the industrial and other sectors and the need to stimulate public and private sector support services, particularly financing, to encourage more efficient energy use.

In spite of the importance of energy and particularly the demand for petroleum, the Central American countries have not yet developed an integrated approach to the macro-economic issues, let alone developed plans for policies in the industrial sector. Public investment programs in the energy sector have been almost entirely in developing hydroelectric power and have been largely financed by the IFI's and the Venezuelan and Mexican Oil agreements. Private development banks and commercial banks have also done very little to provide financing to industry for energy efficient investments. Finally, other support services, such as reports on energy pricing and studies on specific industrial energy issues, have received almost no attention.

This component, therefore, has the following objectives:

- to identify public policies which act as disincentives to efficient energy use and to the adoption of alternative energy sources;
- to recommend policy changes and encourage their adoption; and

- to promote the development of private and public sector financial and other support services that will facilitate and encourage the adoption by industry of more energy efficient production techniques.

a. Description

The above objectives will involve undertaking studies of public policy issues that impact on energy as well as identifying support services needed from the public and private sector entities concerned. SIECA will use the results of these studies to complement other project components (particularly the efforts of Promotion and Field Extension to reach plant managers and engineers) by providing documentation to policy makers, planners, bankers, investors, and donor institutions on the importance of industrial energy efficiency from a broader point of view and through this mechanism attempt to bring about better policies and supporting services.

Other components of the project provide an excellent framework for the above effort. Quickly generated results from audits and demonstrations will show the importance of industrial energy savings to the national economies and resolving balance of payments problems. Feedback from plant studies and surveys will help make the case for policy changes and a higher priority for investment and other support services to spur energy savings in industry.

SIECA has had a long history of involvement in policy issues such as developing a common external tariff and harmonizing industrial incentives within the C.A.M. SIECA also has substantial experience in developing reports and studies on Central American energy problems. SIECA can thus complement the technical aspects of the project to be carried out by ICAITI and bring the broader issues to the attention of policy makers in the donor community and at the national level in both the public and private sectors.

1) Studies on Current Public Policies Affecting Energy Investments and Conservation

SIECA in conjunction with ICAITI, will undertake national studies of the micro-economic impact of current public policies such as the existing tax and tariff structure, industrial incentives, and energy pricing on industrial energy investments, conservation and other energy issues. Cross comparisons among the countries will also be performed in order to identify

opportunities for appropriate policy transfer among the governments of the region. A number of possible related studies that SIECA could undertake include:

- A study of energy pricing and tariffs policy outside the region and implications for Central America;

- A study of worldwide investment incentives including tax credits, for encouraging industrial energy efficient investments; and

- A study of the impact of the tax deduction of fuels in the industrial sector as a disincentive for energy efficiency investment.

2) Encouraging the Financing of Energy Saving Investments

Investment is likely to become a key constraint to improving industrial energy efficiency in the future when the simple low cost steps for savings have been exhausted and industries must invest in high cost machinery, new processes or, in some cases, new plants to obtain further gains. Investment in alternative energy technologies presents special problems. As a new type of investment, they are often perceived to carry a higher degree of risk. During the life of the project, therefore, SIECA will make a major effort to provide information to the banking community on saving energy in industry and attempt to mobilize financing for energy investments. Table 10 summarizes the role of SIECA and other institutions in this effort. Following SIECA's lead ICAITI, FECAICA and the national chambers of industry will assist in providing relevant energy efficiency information and identifying policy problems which affect industrial energy use in the region.

SIECA will also meet with the international financial institutions and representatives of the Venezuelan and Mexican Oil Facilities in order to identify potential sources of financing for industrial energy efficiency investments and to keep them informed of the project and its progress. In addition, SIECA will also explore the export finance programs of industrial countries who produce energy efficiency equipment. Special attention will be given to CABEI, including the possibility of its collaboration in approaching donors and its future direct participation in the project.

The reports produced under this activity will contribute to a better ability of the banking sector in

TABLE 10

Policy Information Exchange with Financial Institutions

	<u>SIECA/COMENER</u>	<u>ICAITI</u>	<u>FECAICA</u>
<u>International Financial Institutions</u>			
Outside of Central America			
International Bank for Re- construction and Development	X		
Inter-American Development Bank	X		
Inside Central America			
Central American Bank for Economic Integration	X	X ¹	X
<u>Central American National Banks</u>	X	X ²	X ³
<u>Central American Industrial/ Agricultural/Commercial Banks</u>		X ²	X ³

1 ICAITI Project Director

2 ICAITI National Field Representatives

3 National Chambers of Industry

each country to formulate policies that could have a positive effect towards encouraging industrial energy efficiency and will explore the possibility of involving other institutions in energy investments. Possible reports include:

- An annual Status Report on the availability of financing for the industrial sector, examining the regional and national sources of capital and loans as well as international financial sources. (Both market and subsidized loan programs would be included in the report; applicable qualifying conditions would also be identified for each loan or capital source);

- An examination of the use of the national electric utility companies as a mechanism for financing or promoting energy investments by industry; and

- An examination of using national petroleum companies as a financing or promotion mechanism for energy efficient investment. (For example, ESSO Petroleum is currently initiating a program to sell boiler audits in Nicaragua and Panama).

3) Other Supporting Services and Related Studies

To make informed investment decisions, industry needs more information on the future price and availability of various energy alternatives. Other studies are also needed for government and industry on energy alternatives and to consider specific policies. Possible reports and studies that SIECA could undertake in response to this requirement include:

- An annual compilation of energy prices and availability by type of fuel on world wide energy markets (much of which could be acquired from the multilateral banks for SIECA use);

- An annual study of petroleum refining in the region or refined products and distribution;

- The substitution of hydro or geothermal electricity for direct use by industry instead of petroleum or its refined products;

- The impact of co-generation in industry on the future capacity requirements of the electric utilities in Central America;

- The feasibility of locating major industries requiring large amounts of process heat in Central America's geothermal zones;

- The medium and long-term incentives required to encourage production of crops that can be used as renewable fuels and to encourage potential industrial consumers to use this source of energy; and

- The medium and long term incentives required to promote alternative energy sources such as solar, wind, bio-gas, etc.

b. Implementation

The Department of Physical Integration of SIECA is in charge of the energy sector and for the coordination of those projects that promote the development of the infrastructure of energy supply and demand and will be in charge of implementing this component. Other departments of SIECA which will contribute to these activities include: Statistics and Calculations, Industrial Department, Economic and Social Programming, Fiscal and Tariffs, and the Center for Central American Studies of Integration and Development.

With SIECA's review and analysis of policy and financial situations regarding energy in the region, ICAITI and the regional and national energy consultative committees will be able to keep the private sector up to date on the progress of this project component, and the impact of existing incentives and tax structure on industry investments in energy efficiency. FECAICA will also have an important supporting role in this activity, using its influence in the national level chambers of industry to lobby for favorable policies, as they are identified.

c. Inputs

The project will provide funding to SIECA to hire a full-time senior economist and one statistician to support the activities outlined in the description. Funding for producing and distributing some reports and for participation in major meetings is also included.

F. End-of-Project Status

The major outputs of the project are presented in the Logical Framework, Annex A-1. The macro-economic results of the project in terms of savings of imported oil are included

in the Economic Analysis section. The discussion here, therefore, focuses on what may be expected from the private sector after the project ends and the prospective roles of ICAITI, SIECA and national institutions.

1. Private Sector

The various programs to be carried out under the project will reach essentially all 3,000 of the target industries in varying degrees of intensity, with many more industries being reached at least indirectly. Most target industries will have on-going energy efficiency activities ranging in technical sophistication from housekeeping activities to changes in their industrial processes and in the use of alternative energy sources. The industries will have a much sharper awareness of the benefits of increasing energy efficiency and much better understanding of where to go for information, technical assistance and financing. Thus, the project will set in motion activities which will have a certain momentum capable of carrying on the objectives of the project well beyond its end. This expectation is based on plant visits where it was noted that plants with someone designated to be in charge of saving energy, or where an energy committee exists, usually undertake a series of measures over a period of time that results in energy saving becoming an accepted part of the plant's operation.

Supporting services will also develop in the private sector. Engineering consulting firms and engineering departments in universities are expected to start offering energy audits and other services to industry. More firms will also be selling and manufacturing equipment to improve energy efficiency and offering services in the use of alternative energy sources, as a result of the demand generated by the project. The banking community is expected to have an increased awareness of the importance of investing to save energy as well as experience in making various types of energy loans. The training courses and seminars which ICAITI will continue to offer after the project ends will reinforce all of the above.

2. ICAITI

As a result of this project, as well as the Fuelwood and Alternative Energy and other projects, ICAITI will become a leading institution in all aspects of energy. It will be particularly strong in industrial energy as a result of having trained personnel, experience and an excellent data base. It will not be necessary for ICAITI to maintain the high staff levels provided by this project,

because so many industries will have been reached during the implementation of the project and because of the increasing availability of assistance at the national level from the private sector, universities, national electric companies, and others trained in energy efficiency techniques. ICAITI will, however, maintain a top quality core staff in the area of industrial energy efficiency. ICAITI will:

- Gradually turn over much of the Level 1 audit business to private sector consultants and possibly national institute engineers;

- Develop course materials from the training component into specific "sales" items for bankers, public officials and plant managers;

- Expand energy consulting from Level 2 audits into the wider field of overall plant optimization engineering, new plant design and location, and opportunities for fuel substitutions and cogeneration; and

- Provide project evaluation services stressing energy efficiency to engineering companies and consulting services to banks considering new investments which involve energy.

3. SIECA

While only a relatively small amount of project funds will go to support the component to be carried out by SIECA, this project will result in having SIECA give energy a much higher priority in its activities in the future. Under the project, SIECA will gain a wider audience by developing links between the private and public sectors. The private sector will gain by understanding the public sector role in financing and by having a more effective voice in requesting policy changes. The public sector will gain by knowing private sector needs in energy and by understanding changes which affect national planning.

4. National Organizations

The national chambers and associations of industry will have had the valuable experience of helping carry out a successful energy efficiency effort. For many of these institutions, it will be the first time they have had a role in helping resolve a critical national development problem. It is expected that these institutions will continue to promote energy efficiency in connection with ICAITI's future activities and new energy activities promoted by national level institutions.

One of the more lasting benefits of the project will come from the high level of participation by other national institutions. For example, engineering associations, research institutes, universities and national electric companies are only a few of the national level institutions that will benefit from participation in the project. Of particular value will be the training programs and technical materials made available to these national organizations.

IV. PROJECT ANALYSES

A. Technical Analysis

The rationale for the project focussing on the industrial sector has been discussed above in Section III.C. This analysis reviews the technical factors associated with the design of the proposed project and the approach selected for its implementation.

The cost of energy, and particularly for imported petroleum, is a major factor contributing to the economic crisis in Central America. Since the industries of Central America and Panama are relatively intensive users of imported petroleum and petroleum derivatives, one result of this increasing cost has been a corresponding increase in the cost of industrial production. Therefore, the need to reduce petroleum consumption without curtailing production is clear.

Based on the results of consultations with regional and national organizations, as well as a survey of Central American industries, ROCAP (in conjunction with ICAITI, SIECA, and FECAICA and with assistance from AID/W and DSI) determined that although industry knew that the increases in the cost of energy over the past several years had affected the cost of production they were not aware of the degree of the affect. Nonetheless, through interviews and plant visits conducted as part of the intensive review, a strong willingness to begin addressing the problem was identified.

Given the existence of technologies which elsewhere have been shown to result in improved energy efficiency, the design of the project has been limited so as to draw primarily upon this experience and not to introduce new, or even costly technologies. In general, these technologies are not complex and are easily understood by appropriate industry personnel.

The approach selected for the project is to begin with the technologies at the most simplified level and gradually move to more complicated solutions as project personnel are trained and gain sufficient experience in the field. Thus, the industry program starts with rapid impact activities such as Level 1 audits and minor demonstrations, while the training component draws on those activities to provide on-the-job training. In addition, the training component is concerned with the development of a course focussed on the needs and capabilities of the project personnel and which can improve their capacity to provide technical services to the industrial sector.

The promotion component promotes and maintains interest in project activities, and distributes technical information generated by and for the Industry Program as widely as possible within the industrial sector.

The data base will provide technical information necessary for up-to-date and effective assistance. It will also provide a reference point for other regional or national activities related to industrial energy efficiency. The data base design will be developed with outside assistance, but ICAITI staff has the technical capacity to operate and maintain it.

Finally, the energy price, financing and policy studies will provide the analytical basis for programs and measures aimed at alleviating the hindrances to fuel efficient innovations. It is the type of assignment with which SIECA has considerable experience and capacity to undertake. (See list of SIECA energy studies, Annex A-12).

In limiting the project design to these activities, other possible activities such as long-term, degree-oriented training and large scale demonstration projects have been excluded. The high cost and relatively low benefit to industry and to the countries of such activities led to this decision. Similarly, a previously anticipated loan component was dropped while priority was given to the creation of a framework under which the technical basis and support structure will exist to attract funding from CABEI and multilateral sources as well as from national efforts to extend credits under the Mexican and Venezuelan Oil Facilities.

As designed, therefore, the project takes into consideration the availability of known technologies and seeks to improve the capacity of project personnel to work with those technologies. Consequently, after reviewing the above factors, the project committee has determined that the proposed design is technically responsive to the problem identified and that no technical constraints exist which will impede the implementation of the project.

B. Economic Analysis

The data and basic methodology used in this analysis are based on the benefit/cost analysis undertaken for this project by Development Science Incorporated (see Annex B-5). This section summarizes DSI's analysis and carries it further by projecting both benefits and costs on an annual basis over the ten-year period 1983-92, discounting the stream of benefits and

costs to obtain present value, and adding a sensitivity analysis that assumes that only half the audits and minor and major demonstration installations projected by the DSI team will in fact be carried out.

1. Methodology Applied and Assumptions Made

a. Estimation of Investment Outlays and Costs

The analysis is based on a total project cost of \$8.0 million. ROCAP will contribute \$6.0 million to cover the startup costs of the project, including consulting fees, training costs, audits (both Level 1 and 2), equipment and other fixed as well as operating costs of ICAITI's project staff over the implementation period (1983-87). These costs are expected to decline after 1986. ICAITI, SIECA and national institutions will contribute in-kind services worth about \$2.0 million over the project implementation period, and cover the full operating costs thereafter. Finally, revenues obtained from industrial audits will begin to pay some of the costs even before the end of the project implementation period. The year-to-year projection of the AID/ROCAP contribution and of the in-kind services to be provided by ICAITI and SIECA appears in Columns (1) and (2) of Table 11.

It is expected that most of the economic costs (\$24.6 million - see column 8 of Table 11) incurred on behalf of the region's private sector will be covered by the private sector, either directly (for improvements and installations effected in the manufacturing plants) or as payment of fees for the services rendered by ICAITI. In the early years, however, the project will cover a portion of these expenses.

Although the project will directly finance only a limited number of direct actions (535 audits, demonstrations, pilot plants, seminars and exhibits, see Table 6 in Section III.E), it is assumed that a multiplier effect will indirectly result in a much larger number of actions actually taking place. This multiplier effect is expected, first, because the project involves training, consulting services and equipment which will enable ICAITI engineers to advise major energy-using industries on the application of energy-saving technologies and, second, because the seminars and in-plant demonstrations conducted under the project are expected to have a major demonstration effect on energy-using enterprises (including many that will not participate in project activities over its five year life) since the expected benefits are large compared to the relatively minor costs involved. DSI has estimated that, as a result of the 535

TABLE 11

COST PROJECTION
(In Number of Actions and Thousands of Constant 1982 Dollars)

(1) USAID/ROCAP Program	(2) In-Kind Services	(3) Level 1 Audits		(4) Level 2 Audits		(5) Private Sector Expenditures				(7) Maintenance	(8) Total Private (Col. 3 through 7)	(9) Total Costs (1)+(2)+(8)
		Number	Cost	Number	Cost	Minor		Major				
						Installations Number	Installations Cost	Installations Number	Installations Cost			
\$1,000	\$1,000	200	\$1,000 ^{2/}	30	\$1,000 ^{3/}	40	\$1,000 ^{4/}	2	\$1,000 ^{5/}	\$1,000 ^{6/}	\$1,000	\$1,000
1,000 ^{1/}	400 ^{1/}	300	300	30	135	40	200	2	70	40	745	2,145
1,500	400	300	450	50	225	80	400	6	210	92	1,377	3,277
1,500	400	400	600	80	360	130	650	8	280	140	2,030	3,930
1,250	400	500	750	120	540	170	850	12	420	190	2,750	4,400
750	400	600	900	120	540	180	900	12	420	198	2,958	4,108
-	400	600	900	120	540	180	900	12	420	198	2,958	3,356
-	400	600	900	120	540	180	900	12	420	198	2,958	3,358
-	400	600	900	120	540	180	900	12	420	158	2,958	3,358
-	400	600	900	120	540	180	500	12	420	198	2,958	3,358
-	400	600	900	120	540	180	900	12	420	198	2,958	3,358
6,000	4,000	5,000	7,500	1,000	4,500	1,500	7,500	100	3,500	1,650	24,650	34,650

Note: All cost estimates are consistent with the Contractor's Benefit-Cost Analysis Table 5, Appendix G of DSI's Report. The annual distribution was projected by ROCAP.

^{1/}Projected by ROCAP.

^{2/}Assumes a unit cost of \$1,500 per Level 1 Audit.

^{3/}Assumes a unit cost of \$4,500 per Level 2 Audit.

^{4/}Assumes a unit cost for "minor installations" of \$5,000.

^{5/}Assumes a unit cost for "major installations" of \$35,000.

^{6/}Projected at 15% of the cost of minor and major installations, as suggested by the Contractor

actions directly related to the project, more than 3,000 actions will be generated over 1983-1987 and another 4,560 actions generated over the period 1988-1992, for a total of 7,600 actions over the ten-year period covered by this analysis. Columns (3) - (6) of Table 11 reflect this assumption.

The total cost projection based on these assumptions is also presented in Table 11. As can be seen, the analysis has assigned the cost of all audits, minor and major installations and maintenance to "private sector expenditures", though part of the costs entailed by the early audits and pilot demonstrations will be borne by ICAITI and financed under the AID/ROCAP project. Thus, Table 11 reflects total social costs to be incurred not only under the project itself, but including the secondary actions expected to result from the project on which the projected stream of benefits is based.

b. Estimation of Benefits

Tables 12 and 13 contain the analysis of the benefits expected as a result of the project. Table 12 projects the amount of energy saving that the contractor expects to result from the project in the target year 1992.

The detailed year-by-year projection over 1983-92 of the total benefits to be expected from the project is presented in Table 13. This table quantifies two major sources of savings or benefits: (1) savings in direct fossil fuels used by the manufacturing industry, excluding fuel used in electricity generation which is by far the most important source of saving; and (2) savings in the electricity used by the industrial manufacturing sector.

The saving in fossil fuel that can be obtained in the area of electricity generation is shown on line 7. Total saving in fossil fuel, in millions of 1982 dollars, is shown on line 8. Annual savings in fossil fuel, valued at \$35 per barrel, is projected to go up from \$4.7 million in 1983 to \$79 million in 1992.

2. Sensitivity Analysis

The following sensitivity analysis assumes a more

Table 12

ESTIMATE OF % REGIONAL ENERGY SAVINGS
FROM INDUSTRIAL ENERGY CONSERVATION ACTIONS

	(1) Total Actions by 1992	(2) % of Energy Use Addressed <u>B/C Analysis</u>	(3) % of Energy Saved Per Action	(4) Weighted Energy Savings <u>B/C Analysis</u>
Level 1 Audit	5,000	90%	5%	4.5%
Level 2 Audit	1,000	35%	5%	1.8%
Minor Instal- lations	1,500	40%	8%	3.2%
Major Instal- lations	100	10%	15%	1.5%
Total Actions	<u>7,600</u>			
Annual reduction in energy use by 1992				11.0%

Table 13

REGIONAL ENERGY CONSERVATION PROJECT:
PROJECTION OF BENEFITS OVER 1983-92

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1. Target Group Direct Use of Fossil Fuels (millions of TEPs) ^{1/}	1.69	1.77	1.86	1.96	2.05	2.16	2.26	2.38	2.50	2.62	2.75
2. Unit Cost per TEP in \$ (\$35 x 7 barrels) ^{2/}	245	245	245	245	245	245	245	245	245	245	245
3. Assumed Energy Saving (t) ^{3/}	0	12	22	42	52	62	72	82	92	102	112
4. Target Group Saving in Fossil Fuel in Direct Use (Excluding Electricity Generation), in millions of 1982 dollars (Lines 1 x 2 x 3)	0	4.3	9.1	19.2	25.1	31.7	38.8	46.6	55.1	64.2	74.1
5. Target Group Electricity Use, in millions of TEP ^{4/}	-33	-35	-36	-38	-40	-42	-44	-46	-49	-51	-53
6. Projected Percentage of Oil Used in Electricity Generated (t) ^{5/}	502	492	482	462	442	422	412	392	372	362	352
7. Target Group Saving in Fossil Fuels Used in Electricity Generation (Lines 5 x 6 x 2 x 3), in millions of 1982 dollars	0	.4	.8	1.7	2.2	2.6	3.1	3.5	4.0	4.5	5.0
8. Total Saving in Fossil Fuel (in millions of 1982 dollars) ^{6/} (Lines 4 + 7)	0	4.7	9.9	20.9	27.3	34.3	41.9	50.1	59.1	68.7	79.1
9. Oil Saved in millions of TEPs (Lines 1 x 3) + (5 x 6 x 3) ^{7/}	0	.019	.041	.085	.111	.140	.171	.205	.241	.280	.323
10. Oil Saved in Thousand Barrels (Lines 9 x 7 barrels x 1,000) ^{7/}	0	133	287	595	777	980	1197	1435	1687	1960	2261

^{1/}The 1982 figure is based on 1980 consumption of 1,535,870 ton equivalent of petroleum (TEP) (see Table 1), projected to increase at \$2 a year through 1982.

^{2/}Assuming a price of \$35 a barrel, and that 7 barrels of oil are required to generate a ton equivalent of petroleum (TEP).

^{3/}Energy saving as a result of project as projected by Development Sciences, Inc. (DSI) team. The projection assumes 7,600 actions by some 5,000 enterprises by 1982. For the detailed basis of their projection, see Appendix C, Table 6 of their report (attached) and related discussion.

^{4/}The 1982 figure is based on 1980 consumption of 298,000 TEP (see Table 1) projected to rise by 52 a year through 1982.

^{5/}Estimated by DSI team. The team projects the proportion of electricity generated by fossil fuel to decline gradually through 1982 as the region is expected to meet new power requirements mostly through hydroelectric and geothermal plants.

^{6/}This is the key line of the table as it provides the quantification of the total value of fossil fuel savings (i.e. benefits) expected to result from the project. It is the sum of lines 4 and 7.

^{7/}Lines 9 and 10 refer to the total physical volume of fossil fuel saved, expressed in ton equivalent of petroleum (TEP) and thousands of barrels, respectively.

moderate increase in fossil fuel saving than that projected in the preceding analysis. This analysis assumes that only half of the total number of "actions" or "interventions" projected for the period 1983-92 will in fact take place. As a result, the proportion of energy saving that can be effected by the target group in 1992 is projected at 7.2% in lieu of the 11% applied in the benefit/cost analysis presented above. The difference in basic assumptions between the two alternative savings projection is summarized in Table 14.

The benefits under the sensitivity analysis are presented in Table 15. The projected energy saving (on line 3) starts with only 0.5% in 1983, increases to 1% in 1984 and rises by 1% a year through 1988 when it reaches 5%. It then increases by only 0.5% a year to reach a maximum of 7% in 1992. These lower energy savings are the result of halving the number of actions or interventions throughout the period, and as a result, the total savings on fossil fuel (or benefits) rise from \$2.4 million in 1983 to a maximum of \$50 million in 1992, or 35% below the \$79 million level projected above in Table 13.

The sensitivity analysis also requires the recalculation of costs. While the total project investment input by ROCAP, ICAITI and SIECA is assumed to remain the same, the costs borne by the private sector will decline substantially with the cut-back in the projected number of audits and installations. The total costs consistent with the sensitivity analysis were recalculated in Table 16.

3. Conclusions of the Benefits Cost Analysis

The conclusions of the benefit/cost and sensitivity analyses are summarized in Tables 17 and 18, respectively. Note that the analysis in Table 17 discounts benefits and costs at an annual rate of 10%, while the sensitivity analysis uses a 12% discount rate (in addition to assuming only half the number of actions projected in the main B/C analysis). These discount rates are actually on the high side since the whole analysis is in real terms, i.e., projects both benefits and costs in constant 1982 dollars.

The main benefit/cost analysis in Table 17 indicates a benefit/cost ratio of 9.7 over the ten-year period, while the sensitivity analysis in Table 18 shows a B/C ratio only slightly lower, i.e., 8.8. The small size of the difference may appear surprising since the sensitivity analysis assumed that only half of the audits and installations projected by the contractor would take place over the projection period. The reasons for the small difference in the B/C ratio between the two analysis is the result of three factors:

TABLE 14

ESTIMATE OF % REGIONAL ENERGY SAVINGS
FROM INDUSTRIAL ENERGY CONSERVATION ACTIONS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	<u>Total Actions by 1992</u>		<u>% of Energy Use Addressed</u>		<u>% of Energy Saved by Actions in Col. (1)</u>	<u>Weighted Energy Savings</u>	
	Main B/C Analysis	Sensitivity Analysis	Main B/C Analysis	Sensitivity Analysis		Main B/C Analysis (Col. 3x5)	Sensitivity Analysis (Col. 4x5)
Level 1 Audit	5,000	2,500	90%	60%	5%	4.5%	3.00%
Level 2 Audit	1,000	500	35%	23%	5%	1.8%	1.15%
Minor Installations	1,500	750	40%	25%	8%	3.2%	2.00%
Major Installations	<u>100</u>	<u>50</u>	10%	7%	15%	1.5%	1.05%
Total Actions	7,600	3,800					
<hr/>							
Annual reduction in energy use by 1992						11.0%	7.20%

Table 15

SENSITIVITY ANALYSIS
PROJECTION OF BENEFITS OVER 1983-92

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>
1. Target Group Direct Use of Fossil Fuels (millions of TEPs)	1.69	1.77	1.86	1.96	2.05	2.16	2.26	2.38	2.50	2.62	2.75
2. Unit Cost per TEP in \$ (\$35 x 7 barrels)	245	245	245	245	245	245	245	245	245	245	245
3. Assumed Energy Saving (%)	0	0.52	12	22	32	42	52	5.52	62	6.52	72
4. Target Group Saving in Fossil Fuel in Direct Use (Excluding Electricity Generation), in millions of 1982 dollars (Lines 1 x 2 x 3)	0	2.2	4.6	9.6	15.1	21.2	27.7	32.1	36.8	41.7	47.2
5. Target Group Electricity Use, in millions of TEP	.33	.35	.36	.38	.40	.42	.44	.46	.49	.51	.53
6. Projected Percentage of Oil Used in Electricity Generated (%)	502	492	482	462	442	422	412	392	372	362	352
7. Target Group Saving in Fossil Fuels Used in Electricity Generation (Lines 5 x 6 x 2 x 3), in millions of 1982 dollars	0	.2	.4	.9	1.3	1.7	2.2	2.4	2.7	2.9	3.2
8. Total Saving in Fossil Fuel (in millions of 1982 dollars) (Lines 4 + 7)	0	2.4	5.0	10.5	16.4	22.9	29.9	34.5	39.5	44.6	50.4
9. Oil Saved in millions of TEPs (Lines 1 x 3) + (5 x 6 x 3)	0	.010	.021	.043	.067	.093	.122	.141	.161	.182	.206
10. Oil Saved in Thousand Barrels (Lines 9 x 7 barrels x 1,000)	0	70	147	301	469	651	854	987	1127	1274	1442

TABLE 16

SENSITIVITY ANALYSIS: COST PROJECTION
(In Number of Actions and Thousands of Dollars)

<u>Year</u>	<u>USAID/ROCAP Program</u>	<u>In-Kind Services</u>	<u>Private Sector Expenditures</u>	<u>Total Costs (1)+(2)=(8)</u>
	\$1,000	\$1,000	\$ 1,000	\$ 1,000
1983	1,000	400	372	1,772
1984	1,500	400	689	2,589
1985	1,500	400	1,015	2,915
1986	1,250	400	1,375	3,025
1987	750	400	1,479	2,629
1988	-	400	1,479	1,879
1989	-	400	1,479	1,879
1990	-	400	1,479	1,879
1991	-	400	1,479	1,879
1992	-	400	1,479	1,879
TOTAL	6,000	4,000	12,325	22,325

TABLE 17

SUMMARY TABLE OF BENEFIT/COST PROJECTIONS
(In millions of constant 1982 dollars)

		Annual Benefits		Annual Costs	
		Total ^{1/}	Discounted at 10%/yr.	Total ^{2/}	Discounted at 10%/yr.
1983	0	4.7	4.7	2.1	2.1
1984	1	9.9	9.0	3.3	3.0
1985	2	20.9	17.3	3.9	3.2
1986	3	27.3	20.5	4.4	3.3
1987	4	34.3	23.4	4.1	2.8
1988	5	41.9	26.0	3.36	2.1
1989	6	50.1	28.3	3.36	1.9
1990	7	59.1	30.3	3.36	1.7
1991	8	68.7	32.0	3.36	1.6
1992	9	79.1	33.5	3.36	1.4
TOTAL	1983-92	396.0	225.1	34.6	23.1

Benefit-Cost Ratio: $\frac{225.1}{23.1}$ Million = 9.7

^{1/}From Table
^{2/}From Table

TABLE 18

SENSITIVITY ANALYSIS: SUMMARY OF BENEFIT/COST PROJECTIONS
(In millions of constant 1982 dollars)

Year	Annual Benefits		Annual Costs		
	Total ^{1/}	Discounted at 12%/yr.	Total ^{2/}	Discounted at 12%/yr.	
1983	0	2.4	2.4	1.8	1.8
1984	1	5.0	4.5	2.6	2.4
1985	2	10.5	8.4	2.9	2.3
1986	3	16.4	11.7	3.0	2.1
1987	4	22.9	14.6	2.6	1.7
1988	5	29.9	17.0	1.9	1.1
1989	6	34.5	17.5	1.9	1.0
1990	7	39.5	17.9	1.9	.9
1991	8	44.6	18.0	1.9	.8
1992	9	50.4	18.2	1.9	.7
TOTAL 1983-92		256.1	130.2	22.3	14.8

Benefit/Cost Ratio: $\frac{130.2}{14.8}$ million = 8.8

^{1/}From Table
^{2/}From Table

a. When the number of projected actions drops, it cannot be assumed that the energy saving will drop proportionately, since it must be assumed that the largest users with the biggest potential energy saving are likely to remain among the adopters of the improvements; thus, while the number of projected actions drops by 50%, we estimated that energy savings are likely to drop by only about 35%.

b. The reduction in actions, including audits and installations, also results in a reduction in costs. As shown by comparison of Tables 11 and 16, total undiscounted costs over the ten-year period are expected to drop by 36% (or from \$34.6 million to \$22.3 million).

c. Finally, raising the discount rate from 10 to 12% does not significantly affect the benefit/cost ratio when the costs are fairly evenly distributed through the projection period (instead of being concentrated in the early years), as is the case of this project.

The conclusion is that, on the reasonable assumption of a significant spread effect resulting from the seminars, audits and demonstrations undertaken by the project, a substantial benefit/cost ratio can be expected. The assumption is considered to be reasonable because the analysis done by DSI was based on the findings that energy is inefficiently utilized in most industrial plants, and that there are, therefore, opportunities for potential savings. The sensitivity analysis shows that even a 7% savings rate in energy consumption in the manufacturing sector by 1992 would result in savings equal to 8 to 9 times the total estimated economic costs of achieving them.

C. Institutional Analysis

A detailed institutional analysis has been included in the paper in Annex B-7. Presented here is a summary description of the institutions involved in the paper, an analysis of how they will contribute to achieving the project goal and purposes, prior AID involvement with these institutions, and how institutional deficiencies will be resolved.

These regional institutions will participate in the project ICAITI, SIECA and FECAICA. At the national level, the six chambers or associations of industry will also participate in the project.

1. Regional Institutions

The three regional institutions participating in the project are described below:

a. ICAITI

1) Background

ICAITI is a non-profit regional organization founded in July 1955 under United Nations auspices by the five Central American Republics to advise and provide technical services to the region's industrial sector and to conduct appropriate technical research on products and processes utilizing raw materials and natural resources. It has been in its present Guatemala facilities, donated and maintained by the Government of Guatemala, since March 1957.

ICAITI has seven technical divisions and a staff of 154 employees, including 76 professional and technical personnel (see Figure 2 for ICAITI's Organizational Chart). Professional personnel cover such fields as chemical, industrial and mechanical engineering, economics, and other technical fields. ICAITI's facilities include various laboratories, pilot plants and an up-to-date reference center and research service.

2) Prior AID Experience

ROCAP had had a great deal of prior experience with ICAITI and has the highest regard for the institution's integrity and technical capabilities. The ROCAP Transfer of Technology Project (596-0066), which ended in 1981, resulted in the provision of technical services to many small and medium size industries covering a wide spectrum of industrial sectors throughout Central America. The project also resulted in an enhancement of ICAITI's institutional capability to carry out projects with industries at the national level. The outreach effort of the project established offices and field representatives at the national level and an information service to industry. The field representatives are housed in the national chambers of industry and have established excellent contacts and working relationships with the private sector. These contacts will be particularly valuable to the proposed project.

ICAITI is currently implementing a portion of the Fuelwood and Alternative Energy Sources Project (596-0089). The ICAITI portion of this project involves technical assistance in wood burning technologies, research in wood cooking and baking, training of personnel in the region, and actual construction of wood stoves in various rural communities throughout the region. In addition the project encompasses research on more efficient lime kilns, and experiments with solar energy and biogas digestors. ROCAP's judgement is that this project in rural energy is progressing well. ICAITI has been able to attract and maintain a core

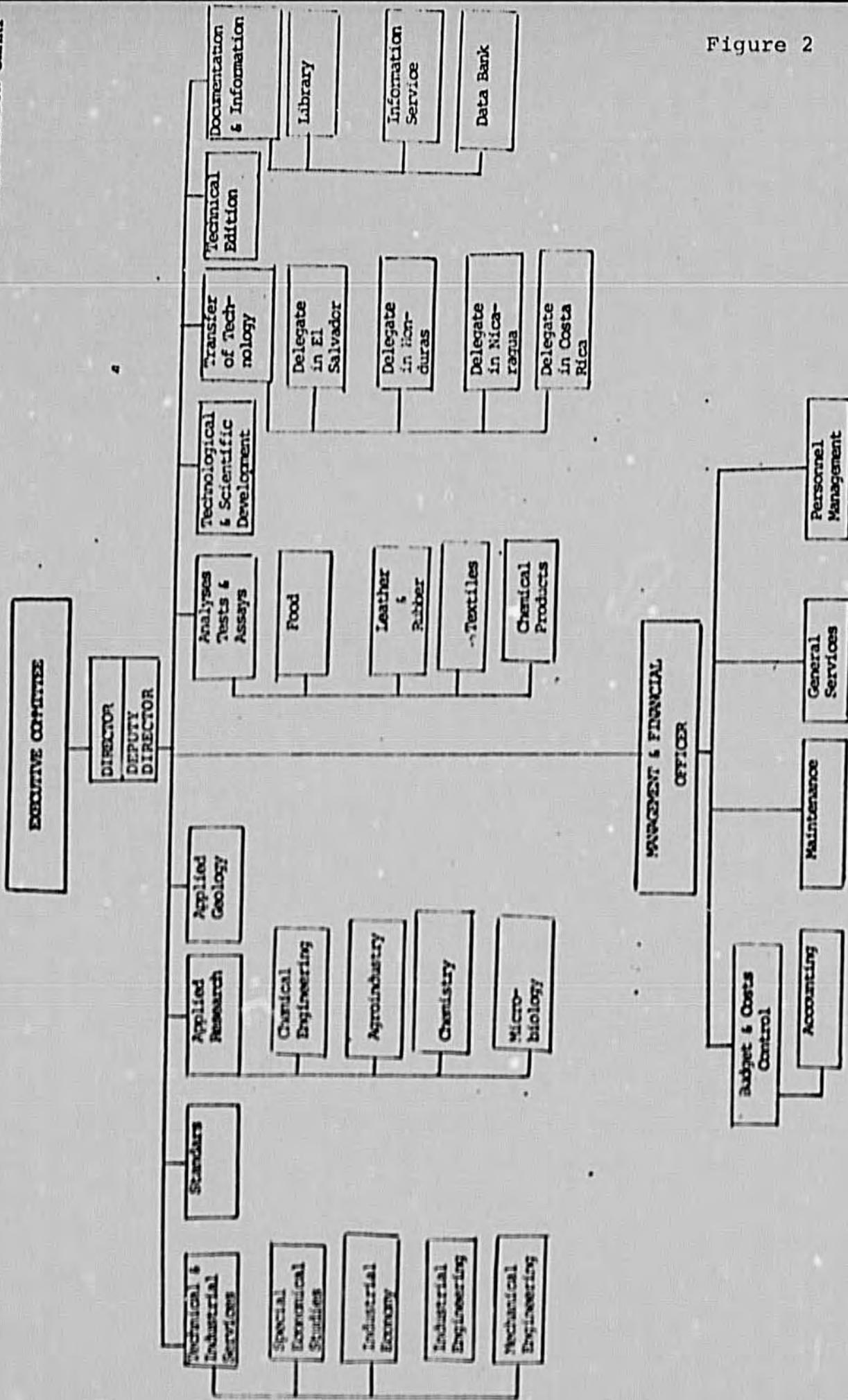


Figure 2

staff of dynamic young engineers who have rapidly acquired energy skills in solar, biogas and combustion engineering. A recent manual on constructing fuel efficient cooking stoves was very well done and demonstration projects on the stoves will be underway in all six countries of the region in 1982. Many of the skills and experiences acquired under the Fuelwood project can be applied by ICAITI to industrial energy efficiency, particularly in the area of alternative energy technology.

3) Institution Deficiencies

Despite recent progress, two institutional deficiencies persist and will be addressed by the project. First, outside of Guatemala, ICAITI is perceived to have an insufficient presence; its technical reputation is strong, but it is sometimes regarded as a remote and relatively inaccessible organization. Secondly, ICAITI is dependent upon funding sources from the industries and institutions of the various countries it serves. This funding is not sufficient to support the full range of activities which ICAITI is capable. As a result of the funding problem, ICAITI has only a limited staff currently on board to provide many of the services which will be rendered under the various components of this project.

The project will be a major factor in remedying these deficiencies. It will establish stronger mechanisms for coordination between headquarters and the field representatives. It will also create an aggressive outreach program to the industries in each country giving a greater sense of "presence". In addition, the project will finance the hiring of the key technical personnel needed to deliver services to the plant level.

Finally, the project is designed to assist ICAITI in generating funds which can be applied to continuing services beyond the life of the project. The primary source of funds will be consulting fees for actual services rendered in conducting energy audits and installing energy saving measures. However, as the program proceeds and as a result of the promotional activities, ICAITI should be able to increase the contributions from the governments of the region. Additionally, as a result of the enhanced capabilities of ICAITI demonstrated by the project, it will be in a good position to qualify for additional program moneys in future years from such organizations as the United Nations Development Program, and other international financial institutions.

The role of the national field representatives is critical to the success of ICAITI in providing information and technical services to industries in Central America and Panama. In this

regard the project will add a new field representative in Panama and will reinforce the representatives in Costa Rica, Honduras, El Salvador and Nicaragua by providing junior engineering assistants.

b. SIECA

1) Background

SIECA's Department of Physical Integration serves as an executive secretariat to the Comisión Centroamericana de Energía (COMENER). SIECA itself is a policy and research institute for the integration of Central America in areas of common economic interest. SIECA has a staff of approximately 150, including administration and support personnel.

The Department of Physical Integration is in charge of the energy sector and the coordination of projects which promote the development of infrastructure for the sector, as well as of obtaining basic information for preparing the consolidated energy balances and performing supply and demand predictions that allow the governments to take the necessary policy measures for the development of the sector. (See Annex A-12 for a list of energy studies carried out by SIECA).

Other technical divisions in SIECA that will contribute to the studies planned under the project include the Department of Statistics and Analysis, the Industrial Department, the Department of Economic and Social Programming, the Department of Fiscal Policy and Tariffs, the Department of Science and Technology and the Center for Central American Integration and Development Studies.

2) Prior AID Experience with SIECA

ROCAP has sponsored several projects with SIECA over the past twenty years. Currently, three projects are being implemented. The Central American Agricultural Model (MOCA) Project (596-0040), a tool to design agricultural policies at national or regional level in Central America, was completed and is in the dissemination process. The Ministry of Agriculture in El Salvador has installed the model and is using it for their programs. Following an expression of interest in the model, negotiations to install it are taking place between SIECA and the Ministries of Planning and Agriculture in Guatemala.

SIECA is also implementing the Social Progress Indicators Project (931-0236.05) which was designed to develop and utilize a methodology to describe the limited resources of the rural population and to reflect changes in their living standards over time. The data obtained will strengthen the capacity of national level sectoral and institutional planning units to better define rural development problems, and to design and evaluate programs directed towards these development activities. The project has been fully supported by the Government of El Salvador planning authorities and in some cases has proved to be useful in reorienting policy.

Finally, SIECA is also implementing the project "Effects of Agricultural Development Policies on Food Consumption of Central American Population" (931-1274) designed to modify/refine the agricultural planning methods which have been developed in Central America so they can be used to analyze the impact of government policies on the food consumption patterns of various socio-economic groups, and to demonstrate the use of these methods for policy analysis. The first project evaluation established that significant progress has been made.

In general, ROCAP's experience has been that SIECA is a serious, very professional institution capable of carrying out the responsibilities assigned to it.

3) Institutional Deficiencies

COMENER has not been an active organization and as a consequence SIECA has not devoted a major amount of time to energy. The Chief of SIECA's Department of Physical Integration will devote about half time to this project, while a SIECA advisor for energy will be essentially full time.

As part of the discussion on SIECA's participation in the project, SIECA has also agreed to give energy a higher priority. SIECA will contribute an additional-full time economist and other SIECA divisions will contribute actively to the activities covered by their portion of the project.

ROCAP will finance the cost of an additional senior economist and a statistician during the life of the project. With these added personnel, SIECA will have sufficient staff to carry out its project responsibilities.

b. Regional and National Private Sector Organizations

1) FECAICA

The Federación de Cámaras y Asociaciones In-

dustriales (FECAICA) was founded by the various national industrial chambers and associations of industry at the national level.

While FECAICA itself has very little staff, it will serve primarily as a channel or conduit to reach the national chambers to represent region-wide interests on behalf of the chambers. For example, the energy questionnaire was sent out under a covering letter from FECAICA and the Secretary General contacted the Board (Presidents of the National Chambers and Industry Associations) to explain the proposed program. FECAICA will perform a similar function during the initial stage of the program (see the Promotion component) and will help insure the cooperation of the National Chambers and Associations. The programs, however, will be increasingly carried out at the national level where the institutions are better staffed and where the field representatives will represent ICAITI and manage the effort in each country.

2) National Chambers of Industry

For the purpose of this project, the National Chambers and Industry Associations are promotion and information dissemination channels for project prepared materials, and for distributing through their own in-house newsletters appropriate energy information as well as project announcements regarding seminars, audits, training programs, etc.

Since the offices of the ICAITI field representatives are located in the chambers, there is an opportunity for an efficient system to provide useful information and to promote ICAITI's energy services. (A brief summary of the chambers or associations in each country is included in Annex B-7).

The only recent experience ROCAP has had with the National Chambers and Associations was in connection with the energy survey and the follow-up visits by the DSI consultants. In all cases, the chambers and associations demonstrated a strong desire to cooperate in the project in any way they could. For example, the local chambers all added supporting letters to the survey questionnaires, supplied the lists of industries, and in most cases paid for mailing costs.

D. Social Analysis

1. Project Beneficiaries

Industry, in general, is the primary target group of the project for a number of interrelated reasons. First, industry is a high energy user, consuming approximately 25% of

the total energy utilized in the region. Secondly, it is the smallest sector in terms of discrete units. The small number of units combined with factors such as more formal and efficient lines of communication make industry a very accessible group to influence with energy efficiency activities. Finally, industry's position in the Central American social structure provides for excellent opportunities to spread energy efficiency activities to other sectors. In social terms, industry employs 14.1% of the total labor force in Central America and Panama. In an economic sense, industry currently contributes \$2,094.4 million in production value added, which represents 24.9% of the region's Gross National Product. Additionally, industry is responsible for 42.8% of the total exports of the countries of the region.

Within the industrial sector, the target group of the project is narrowly focused. Of the more than 128,000 Central American and Panamanian productive industrial plants, the beneficiary group of this project will be the approximately 9,000 industrial plants in manufacturing, construction, mining and energy production which employ five or more persons. (See Table 19 for breakdown of industrial units). In order to make a significant impact on industrial plants individually, and the regional economy as a whole, the project will be specifically directed at 3000 industries whose consumption of both electrical energy and petroleum-based combustibles and lubricants are high. These industries are: food processors, including beverage plants, textile mills, and manufacturers of chemicals.

A key to the success of the project will be the willingness of the different industrial plants to share their experiences with others. Although this is a sensitive question, the plant owners and managers visited as part of the intensive review were very cooperative and indicated that this will not present a problem. To avoid any potential difficulties, however, the project data base will be created so as to guarantee confidentiality.

Individuals employed by industry will also benefit directly from the project. As energy efficiency is improved, the contribution of energy to the cost of production will decrease as will the overall cost of production. This improved productivity will make plants more competitive and generate increased employment opportunities.

Finally, ICAITI will be a beneficiary of the project because it will attain considerable technical skills in energy efficiency, will become more oriented towards the private sector, and with an enhanced institutional reputation throughout the region, will enjoy increased demand for its services.

TABLE 19

CENTRAL AMERICA - INDUSTRY TOTAL UNITS BY COUNTRY

EMPLOYEES PER UNIT	1 COSTA RICA	2 EL SALVADOR	3 GUATEMALA	4 HONDURAS	5 NICARAGUA	6 PANAMA	CENTRAL AMERICA
LESS THAN 5	4403	20,223	51,844	38,303	2217	2259	119,249
5 AND MORE	2870	1,128	2,107	849	932	962	8,849
TOTAL	7273	21,351	53,152	39,152	3159	3221	128,097

SOURCE:

1. OSPI Basic Industrial Data 1979
2. Statistics and Census 1979
3. CDI Industrial Survey
4. Ministry of Industry and Central Bank 1979
5. Industrial Census and CIGSS 1980
6. Statistics and Census 1976

2. Industrial Receptivity

Firms which have instituted adequate energy efficiency programs are very few in number. The impediment to a more persuasive adoption of energy efficiency measures has been a general lack of awareness of the energy efficiency technologies available and relatedly the steps necessary to implement such measures and technologies.

The Industrial Energy Use Survey received over 300 responses out of a total of 1600 questionnaires mailed to industries. This is considered to be excellent by Central American standards. Of the returned questionnaires, 73% responded that they would be interested in participating in an energy conservation program. Visits to plants which were included in the survey and DSI's follow-up visits confirmed the enthusiasm of plant owners and managers for a regional efficiency program.

The discussion of project beneficiaries above cites industry's lines of communication as a reason for the project's accessibility to industry. Compared to other sectors in the regional economy, industry is very well organized. There is a chamber of industry or equivalent organization in all six countries. In addition, in each country there are some industry-specific associations such as pharmaceuticals, cotton and coffee producers, etc., which play a strong role in their country's economy. These organizations effectively communicate with their members through meetings, newsletters and other means. The project will use the national chambers of industry and other industrial organizations to convey energy efficiency activities to the industries through formal agreements between ICAITI and the chambers of industry.

The project will not be limited to industries which are active members of the national chambers of industry or trade associations, but will be directed towards owners and managers whose plants provide opportunities for cost-cutting, energy efficiency actions. Analysis of the survey and site visits indicate that these owners and managers will react positively to measures and technologies which are proven to provide benefits within several years.

3. Spread Effects

The spread effect of this project must be examined in terms of the industrial, residential-commercial and national government sectors.

Within the industrial sector, energy efficiency measures and technologies are expected to spread to the 9000 industries

with five or more employees. To help accomplish this objective, over 40% of the project budget has been designated for promotion, extension, seminars, and other activities designed to reach beyond the 3000 industrial plants specifically targeted by the project. In addition, ICAITI staff will be prepared to answer all inquiries which deal with energy efficiency and arrange visits to demonstration projects for any interested individuals. To a much lesser extent, energy efficiency will also be diffused to the 119,000 industrial units with less than five employees, when appropriate opportunities exist.

The diffusion of energy saving activities to the residential/commercial sector will also occur on a limited basis, at two levels. First, industry employees will be influenced by those housekeeping measures which are adaptable to their residences. For example, employees who witness increased efficiency in hot water heating in their plants may be prone to adapt such a measure to their own residential water heater. Secondly, energy efficiency activities in the industrial sector could also spread to the commercial sector. For example, more efficient fluorescent lighting installed in a given industrial plant could be adapted by a commercial retail outlet or warehouse next door. Some industrial energy efficiency measures could also directly influence municipal or national governments. For example, more efficient fluorescent lighting could be used for street lighting.

A successful industrial energy efficiency project may also impress national governments to strengthen and consolidate their own energy programs and to adopt policies which will encourage industrial energy efficiency. The project includes a component with SIECA to channel the results of project activities to the national governments/public sector. Through studies, meetings, data collection, and close coordination with ICAITI, SIECA will insure the interchange of information between the industrial sector and the public sector as well as with both public and private financial institutions and national governments.

V. FINANCIAL PLAN AND ANALYSIS

A. Summary Financial Plan

The proposed budget for the project is \$7.6 million, of which ROCAP's contribution will be \$6.0 million (79%), the regional institutions' \$0.7 million (9%) and industries and private sector organizations' \$0.9 million (12%). Table 20 contains a summary of the project budget showing each component and the funding source, while Tables 21 and 22 show the expected obligation and expenditure schedules over the implementation period of the project. Finally, Table 23 provides a breakdown of the ROCAP contribution by foreign exchange and local currency requirements. Further detail on the budgets of each of the project components is found in Annex A-9.

The project budget includes a limited amount of funds to cover the evaluations planned for the project. Since personnel from ICAITI, SIECA and ROCAP, as well as the LAC energy advisor, will comprise the major part of the evaluation teams, the cost of outside consultant assistance will be minimized. The amount budgeted for evaluations, therefore, is adequate to meet the needs of the project.

An inflation and contingency factor of 9% compounded yearly beginning in year two of the project has been established. Although this is less than projected inflation over the implementation period of the project, salaries include a built-in annual increase and, therefore, the 9% inflation and contingency rate should be sufficient to cover unexpected cost increases.

B. Financial Viability of ICAITI *

As a non-profit organizations, ICAITI's objective is to match income with expenses while maintaining its ability to provide services to the region.

During the development of the Fuelwood and Alternative Energy Sources project, ICAITI's financial performance was found to be less than satisfactory. As a result, the project financed

* Although the project will have two implementing institutions, ICAITI and SIECA, this analysis has been limited to a review of ICAITI because its implementation role is significantly greater than SIECA's.

TABLE 20
SUMMARY FINANCIAL PLAN
(US\$ 000)

<u>Project Component</u>	<u>ROCAP</u>	<u>ICAITI</u>	<u>SIECA</u>	<u>Industries and Private Sector Organizations</u>	<u>TOTAL</u>
I. Industry Program	1,789	-	-	300	2,089
II. Training	279	-	-	100	379
III. Promotion	1,014	-	-	500	1,514
IV. Data Base & Analysis	182	-	-	-	182
V. Financing & Public Policy	526	-	260	-	786
VI. Management	1,207	-	-	-	1,207
VII. Evaluation	60	-	-	-	60
VIII. Overhead	74	440	-	-	514
IX. Contingencies	869	-	-	-	869
	<u>6,000</u>	<u>440</u>	<u>260</u>	<u>900</u>	<u>7,600</u>

(NOTE: ROCAP funds are allocated as follows - ICAITI \$5,400 and SIECA \$600.)

TABLE 21
OBLIGATION SCHEDULE
(US\$ 000)

FY 82	600
FY 83	1,300
FY 84	1,900
FY 85	2,200
	<u>6,000</u>

TABLE 22

ESTIMATED PROJECT EXPENDITURES
(US\$ 000)

FY 83	1,024
FY 84	1,039
FY 85	1,582
FY 86	1,589
FY 87	766
	<u>6,000</u>

TABLE 23

AID INPUTS BY CURRENCY UTILIZATION
(US\$ 000)

<u>Project Component</u>	<u>Foreign Exchange</u>	<u>Local Currency</u>	<u>Total</u>
I. Industry Program	208	1,581	1,789
II. Training	193	86	279
III. Promotion	-	1,014	1,014
IV. Data Base & Analysis	82	100	182
V. Financing & Public Policy	-	526	526
VI. Management	154	1,053	1,207
VII. Evaluation	60	-	60
VIII. Overhead	-	74	74
IX. Contingency & Inflation	118	751	869
	<u>815</u>	<u>5,185</u>	<u>6,000</u>

technical assistance to review and strengthen ICAITI's financial and management information system. After implementing the recommendations made by the consultants (Coopers, Lybrand & Co. and Montana Research Institute), ICAITI has improved its management capabilities significantly and is now in a more financially viable position. (For example, ICAITI's net income in the last three years was \$98,000 as against losses of \$400,000 during the four preceding years).

The changes adopted by ICAITI included the modification of their general accounting system to reflect project income and expenses more accurately as well as of their cost accounting procedures to establish more accurate prices for services performed. In addition, ICAITI has installed a computer and is in the process of shifting from the current manual accounting system to an automated system. This will allow for more timely reporting of fiscal data which management needs for decision making. A policy to develop long-term (10 years) financial plans has been instituted. These long-term plans will be periodically updated and will give general guidelines to overall ICAITI operations.

Although ICAITI's most recent financial statements do not fully reflect the changes which have been made to the accounting system, it is clear that significant advances have been made. Also, while certain ICAITI activities are non-revenue earning and others have not been adjusted to take into account escalating costs (e.g., older projects with low, fixed overhead rates operate at a loss because of increased administrative costs), the staff now has the financial and management information needed to make proper decisions and to avoid the recurrence of past problems. As a result, it has been determined that ICAITI is financially capable of undertaking the proposed project.

C. Project Replicability

A unique feature of the project is the income generating capacity associated with its various activities. The income (see Annex B-9 for details) will come from charges for Level 1 and 2 audits, major demonstrations, inquiries, data base searches, sales of technical publications, and registration fees for seminars and courses. Although moderate in the early years, project-related income is expected to increase to \$275,000 in the fifth year and \$300,000 in the following year. Also, by the end of the project, ICAITI will have established appropriate cost information to insure that payment for services provided to industries will not only cover costs but will also produce a net income for ICAITI. Efforts will also be made to see if industries can pay a higher share of the costs of the audits and demonstrations by carrying out a cost sensitivity analysis.

During the life of the project, the income received from services provided will help defray costs but will not cover them entirely, primarily because a relatively large staff will be participating in project activities. Since the project will train many private sector technicians to perform services such as audits, however, it will not be necessary for ICAITI to maintain the large staff, and this will facilitate bringing income received into line with the actual costs incurred.

With the significant savings that are expected to result from increased energy efficiency in the production process, industries will be in a position to pay for the costs of project services. In addition, an important objective of the project is to identify sources of commercial credit that will provide industry with the means for financing energy efficiency investments. The demonstration activities planned under the project will have a critical role in convincing industries of the appropriateness of those investments and bankers in the financial feasibility of such investments.

All of these factors will contribute to the replication of project activities once the ROCAP funds have been exhausted.

VI. IMPLEMENTATION ARRANGEMENTS

A. Administrative Arrangments

1. Role of ICAITI

Although several institutions will participate in the various project activities, ICAITI, through its Technical and Industrial Services Division, will have primary responsibility for project implementation. Administratively, ICAITI's duties will encompass a range of functions, including technical management of work performed and the orchestration of a communications network with industries and institutions throughout the region.

To facilitate project implementation ICAITI will create an Executive Committee and will include on its staff a project director and two deputy project directors. The function of each is discussed below.

a. ICAITI Executive Committee

This Committee will be comprised of the Director and Deputy Director of ICAITI and the Project Director. In general the Committee will provide a mechanism for senior level overview of project activities by establishing policies governing the conduct of each of the project components, as well as procedures for the review of activities, the evaluation of work progress and the enforcement of quality control. Additionally, the Committee will provide high level support for the project in relationship with participating institutions throughout the region.

b. Project Director

In addition to being a member of the project's Executive Committee, the project director will have direct responsibility for project implementation. Assisted by two deputies, the project director will also receive advisory services of a U.S. consultant during the first year of the project. Specifically, the Project Manager will:

- manage and coordinate all project components on a day-to-day basis;
- work with technical staff in defining individual tasks, including scope and budget;
- supervise all training activities and coordinate consultant services for this purpose;
- supervise the data base development component and the manager in charge of these activities;

- coordinate project activities with SIECA, FECAICA, and other regional organizations;

- inform international organizations such as the World Bank and Interamerican Development Bank of project activities and results; and

- prepare periodic progress and evaluation reports.

c. Deputy Project Directors

The project will have two deputy directors who will report directly to, and operate under the guidance of the project director. The deputy directors will supervise the two largest project components (Industry Programs and Promotion and Field Extension), each being responsible for one component.

The deputy director for Industry Programs will supervise the technical engineering staff which will be conducting audits, demonstrations, seminars and preparing exhibits, assuring that all technical tasks are properly documented for management evaluation and input into the data base.

The deputy director for Promotion and Field Extension will provide guidance to the ICAITI field representatives on promotional activities, including coordinating requests from industries for ICAITI services. This deputy director will also manage and coordinate the activities of the public relations contractor, organize regional conferences, meetings and symposia, and initiate and implement ideas for brochures, exhibits and publications.

2. Role of SIECA

SIECA, through its Department of Physical Integration, will be responsible for implementing the Financing and Public Policy component of the project. Activities under this component will be carried out in close coordination with the other project components. The Project Director at ICAITI and the Senior Project Economist in the Department of Physical Integration at SIECA will be responsible for assuring sufficient coordination.

3. Role of ROCAP

Within ROCAP, the General Development Office will have overall management responsibility for the project. The Mission is in the process of hiring a long-term technical advisor on a PSC basis who will serve as the project manager. In addition, an implementation committee has been established, with representatives from the Program and Project Development and Controller's offices, to help the project manager address and resolve any implementation issues that may arise.

Both ICAITI and SIECA are familiar with ROCAP's general administrative requirements such as progress reports and financial control. Based on past experience, no problems are expected from either institution on these matters.

B. Implementation Plan

Project activities have been designed to demonstrate as quickly as possible that energy efficiency is important and can have a positive impact on production and competitiveness. As a result, "rapid impact" activities in audits, demonstrations and seminars have been planned to initiate the project. Building on these activities over the five-year implementation period of the project, the ultimate objectives are to train enough technical staff so that ICAITI's role can be minimized and to generate sufficient awareness on the part of industry to continue with energy efficiency measures. Toward that end, the project plans a continual series of training exercises and promotional activities.

Annex A-6 contains a schedule of critical events as they are currently planned to occur over the life of the project. The project director, however, will be updating this plan each year when preparing annual implementation plans. These plans will be based on the progress made to date and will also take into consideration any factors which are currently unforeseen.

C. Evaluation Plan

Due to the unique nature of the project and the relative newness of the regional concept for developing industrial energy efficiency, major evaluations have been planned for the end of the second and fourth years of project implementation. For each evaluation a team consisting of ICAITI, SIECA and ROCAP project staff, the LAC energy advisor and an outside industrial energy efficiency consultant will examine: the progress of each component toward achieving planned objectives, the continued appropriateness of the component mix, the actual impact versus the expected impact, the management and implementation adequacies of the project, and the increase, if any, in the awareness of energy efficiency in industry.

In addition to the two major evaluations, ICAITI and SIECA will provide annual evaluation reports to ROCAP covering status of training activities, progress achieved versus expectations, disbursement of funds, major accomplishments and problems, and activities planned for the next year.

The combination of evaluation activities will provide a mechanism for reviewing project progress and for making appropriate mid-course adjustments.

D. Procurement Plan

ICAITI will serve as its own agent for the procurement of goods and services required for the project. From experience gained under previous ROCAP projects, ICAITI is familiar with AID procurement regulations and, with limited assistance from ROCAP, has the capacity to carry out the planned procurement activities.

1. Technical Services

Both U.S. and local consultants will be contracted to provide technical assistance to the project.

A total of 30 months of long-term and 31 months of short-term assistance will be obtained from the United States. To assure the provision of timely and integrated services and to promote the consistency of the project philosophy, a single contract with one consultant firm is anticipated. ICAITI will prepare an RFTP for the required services and select the most responsive firm to provide the services.

In addition to the services of a U.S. contractor, a Central American firm will be hired to provide the public relations support needed for the Promotion and Field Extension component. A local firm will be used because all the required expertise is available in the region and because of the familiarity local firms have in preparing materials for Central American clients. Specific assistance will be needed, first, in developing the initial approach and publicity materials for this component and, subsequently, in preparing information brochures about the services the project has to offer.

Finally, it is expected that ICAITI will enter into a contract with INCAE to receive assistance in the preparation of case studies to be used in the training component of the project.

2. Commodities

The project anticipates the procurement of a limited amount of commodities, primarily equipment for conducting audits, demonstration projects, and to support the seminars and exhibits. ICAITI will follow normal procedures set out in Handbook 11 for the procurement of these items. Most of the needed commodities will be purchased in the U.S., with perhaps some equipment being bought locally.

The project also includes funds for the procurement of a small, desk-top type mini computer and related software. Prior to procurement of this equipment, SER/DM will be asked to review and approve the specifications developed.

E. Disbursement Procedures

No deviation from established AID disbursement procedures is anticipated. Funds will be disbursed to both ICAITI and SIECA upon presentation of monthly vouchers in the required format indicating expenditures made in conformance with the financial plan of the project. As described above in the Implementation Plan, updated annual work plans will be required and will serve as a basic guide to control the flow of project funds.

F. Waivers

It is not expected that any waivers will be required for the project. All goods and services needed to assure achievement of project objectives should be available from United States or locally within Central America and Panama.

G. Conditions, Covenants and Negotiating Status

As discussed above in Section VI.A.2., implementation of project components will be closely coordinated by ICAITI and SIECA. However, given their status as independent regional institutions, it has been decided that separate grant agreements should be signed rather than signing one agreement with ICAITI as the principal implementing institution and requiring that it work out a subcontract with SIECA. A similar type of arrangement exists under the Fuelwood and Alternative Energy Project where separate agreements were signed by ICAITI and CATIE, and no problems are expected under such an arrangement for this project.

1. Conditions Precedent to Disbursement

a. First Disbursement

The standard conditions precedent to initial disbursement of the grant will apply, including the designation of official representatives for SIECA and ICAITI, and the provision of specimen signatures of the representatives. An additional condition precedent to initial disbursement will require both SIECA and ICAITI to submit a detailed workplan for the first year of the project.

b. Second Disbursement

Prior to disbursement of funds for activities in any of the countries of Central America and Panama, ICAITI

will execute letters of agreement with a national chamber of industry, or equivalent organization outlining the promotional support to be provided by the chambers of industry, or equivalent organizations, and formally establishing working relationships between ICAITI country representatives and such national organizations.

2. Covenants

a. Fees and Project Reflows

ICAITI will covenant that all fees for services provided under the project and funds recovered from demonstration projects will be used to finance project costs.

b. Other services

Both institutions will covenant to provide facilities, support, and data services equivalent to counterpart values estimated in the budgets of the project agreements.

c. Training

ICAITI will covenant to make available all appropriate project personnel for planned training activities. ICAITI will also covenant to provide training activities for technicians from private industries, national governments and other organizations in the fiscal years of the project.

d. Project Coordination

Both ICAITI and SIECA will covenant to coordinate their project activities through information sharing, meetings and other cooperative means.

e. Workplan and Budget

Prior to undertaking project activities each year after the first year of the project, both ICAITI and SIECA will furnish in form and substance satisfactory to AID a consolidated workplan and budget for their respective activities for that year.

3. Negotiating Status

This project has been developed in close consultation with ICAITI and SIECA.

All participating institutions are very knowledgeable of the contents of the project paper and no problems are foreseen in the negotiation of the grant agreements. ROCAP expects both grant agreements to be signed within several weeks of project authorization.

PROJECT DESIGN SUMMARY		LIFE OF PROJECT	
REGIONAL FRAMEWORK		From FY 82	to FY 86
PROJECT TITLE & NUMBER: Regional Industrial Energy Efficiency 596-0095		Total U.S. Funding	6,000,000
		Date Prepared	3/7/77 (R)
CONJECTURE SUMMARY		IMPORTANT ASSUMPTIONS	
Program or Sector Goal: The broader objective to which this project contributes: (A.1)		Assumptions for achieving goal targets: (A.4)	
To reduce the balance of payments deficit of Central America and Panama		Expenditures for petroleum imports will continue to be a major cause of the regional balance of payments deficit.	
CONJECTURE VERIFIABLE INDICATORS		MEANS OF VERIFICATION	
Measures of Goal Achievement: (A.2)		(A.2)	
Proportion of oil imports relative to total imports does not exceed 25%.	World Bank and SIECA Economic, Statistical Publication.		

WB 100000 (11/80)
S.A. (11/80) (11/80)

Project Title & Number: Regional Industrial Energy Efficiency 596-0095

CONJECTURE SUMMARY
Program or Sector Goal: The broader objective to which this project contributes: (A.1)

To reduce the balance of payments deficit of Central America and Panama

CONJECTURE VERIFIABLE INDICATORS
Measures of Goal Achievement: (A.2)

Proportion of oil imports relative to total imports does not exceed 25%.

MEANS OF VERIFICATION
(A.2)

World Bank and SIECA Economic, Statistical Publication.

LIFE OF PROJECT
From FY 82 to FY 86
Total U.S. Funding 6,000,000
Date Prepared 3/7/77 (R)

IMPORTANT ASSUMPTIONS
Assumptions for achieving goal targets: (A.4)

Expenditures for petroleum imports will continue to be a major cause of the regional balance of payments deficit.

PROJECT DESIGN SUMMARY

INDUSTRIAL EFFICIENCY

Life of Project: _____
Firm: _____
Total U.S. Funding: _____
Date Prepared: _____

PAGE 2

OBJECTIVELY VERIFIABLE INDICATORS

Conditions that will indicate purpose has been achieved: End-of-Project status. (B-2)

MEANS OF VERIFICATION

(B-3)

IMPORTANT ASSUMPTIONS

Assumptions for achieving purpose: (B-4)

Project Title & Number:

Project Purpose (B-1)

To improve energy efficiency in industry and to reduce industrial consumption of imported petroleum.

3,000 plants have introduced energy efficient measures.

ICAITI/FICA records-data base.

Industry will respond to efforts to promote energy efficiency by FICAICA and ICAITI.

PROJECT DESIGN SUMMARY LOGICAL FRAMEWORK

Project Title & Number	GOVERNMENT RESPONSIBLE INDICATORS	MEANS OF VERIFICATION	Assumptio for achieving outputs (C-)
<p>11. Adoption of energy efficiency measures and technologies by industries (Industry Programs).</p>	<p>1a. Energy efficiency actions carried out directly by ICAITI in 500 industrial plants.</p>	<p>Reports and surveys from plants ICAITI records</p>	<p>1. Production cost reductions through energy savings will be sufficiently attractive to plant managers.</p>
<p>2. Development of ICAITI's capability to provide industries with technical assistance in improved energy efficiency. (Training)</p>	<p>1b. 2,500 other plants imitate energy efficiency actions with the assistance of ICAITI, national or private sector engineers.</p>	<p>ICAITI records</p>	<p>2. ICAITI will continue to provide qualified technical staff to provide auditing and other services.</p>
<p>3. Development of ICAITI's capability to train national and private sector technicians in energy auditing and other energy efficiency skills. (Training)</p>	<p>2. 20 ICAITI professionals trained in energy auditing application of energy efficient technologies, etc.</p>	<p>ICAITI records reports by training contractor</p>	<p>3. National government and private sector technicians will be available for training by ICAITI.</p>
<p>4. Promotion of awareness of energy efficiency measures and technologies. (Promotion)</p>	<p>3. Ten training modules developed and utilized for training non-ICAITI technicians.</p>	<p>ICAITI records</p>	<p>4. Industries willing to share energy related information.</p>
	<p>4a. Quarterly newsletter published.</p> <p>4b. 10 special technical publications issued.</p> <p>4c. Monthly activity reports issued.</p> <p>4d. Annual regional conferences held.</p> <p>4e. Industry visits to demonstration sites conducted.</p> <p>4f. Brochures published.</p> <p>4g. Seminars conducted.</p>	<p>Receipt by MOCAP of verifiable indicators ICAITI records</p>	

Life of Project:
From FY _____ to FY _____
Total U.S. Funding _____
Date Prepared: _____

PAGE 3

PROJECT DESIGN SUMMARY LOGICAL FRAMEWORK		Life of Project: From FY _____ to FY _____ Total U.S. Funding Date Proposed _____	IMPORTANT ASSUMPTIONS Assumptions for providing inputs (D-4)
PROJECT TITLE & NUMBER	OBJECTIVELY VERIFIABLE INDICATORS (D-2)	MEANS OF VERIFICATION (D-3)	
MAINTAINING SUMMARY Project Input: (D-1)	Implementation Target (Type and Quantity)		
<p>0103 1000000101/001 APP/PL/00000001/01</p> <p>Project Title & Number: _____</p> <p>MAINTAINING SUMMARY Project Input: (D-1)</p> <p>All) Construction</p> <p>Contract Personnel</p> <p>Other Costs*</p> <p>C.A. Consultants</p> <p>U.S. Consultants</p> <p>Excellence</p> <p>Contingency and inflation</p> <p>*Includes Travel and Per Diem, Materials, Equipment and Supplies, Printing and Reproduction.</p> <p>Regional institutions</p> <p>Personnel</p> <p>Facilities and Administrative Support</p>	<p>US \$000)</p> <p>6,000</p> <p>1,778</p> <p>2,470</p> <p>168</p> <p>655</p> <p>60</p> <p>869</p> <p>1,265</p> <p>795</p> <p>470</p>		

AGENCY FOR INTERNATIONAL DEVELOPMENT
ROCAP



ROCAP/GUATEMALA CITY or c/o American Embassy
APO MIAMI 34024 Guatemala City, Guatemala C.A.

Telephones: 321739
66352 / 53
66373 - 66309

Cable: ROCAP/Guatemala

PROJECT AUTHORIZATION

Name of Entities : Central American Industrial Research
Institute

General Secretariat for Central
American Integration

Name of Project :

Number of Project: 596-0095

1. Pursuant to Section 106 of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Regional Industrial Energy Efficiency project for the Central American Industrial Research Institute (ICAITI), involving planned obligations of not to exceed Five Million Five Hundred and Seventy Four Thousand United States Dollars (\$5,400,000) in grant funds (Grant I) and for the General Secretariat for Central American Integration (SIECA), involving planned obligations of not to exceed Five Hundred and Twenty Six Thousand United States Dollars (\$600,000) in grant funds (Grant II) over a five-year period from the date of authorization, subject to the availability of funds in accordance with the AID/OYB/allotment process, to help in financing foreign exchange and local currency costs for the project.

2. The project ("Project") consists of supporting a regional effort within Central America and Panama to improve energy efficiency in industry and to reduce industrial consumption of imported petroleum by introducing (1) energy audits, (2) conservation measures, and (3) energy-efficient machinery.

3. The Project Agreements, which may be negotiated and executed by the officer to whom such authority is delegated in accordance with A.I.D. regulations and

Delegations of Authority shall be subject to the following essential terms and conditions, together with such other terms and conditions as A.I.D. may deem appropriate.

a. Source and Origin of Goods and Services

Goods and services, except for ocean shipping, financed by A.I.D. under the Grants shall have their source and origin in the United States or in countries that are members of the Central American Common Market and Panama, except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the Grant, shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the United States.

b. Conditions Precedent to First Disbursement

Prior to any disbursement, or the issuance of any commitment documents under the Project Agreements Grantees shall furnish in form and substance satisfactory to A.I.D., a detailed workplan for the first year of the project.

c. Condition Precedent to Disbursement for ICAITI Activities with Industries

Prior to any disbursement, or the issuance of any commitment documents under the Project Agreement to finance activities with industries in any of the countries in Central America or Panama, ICAITI shall furnish in form and substance satisfactory to A.I.D. executed agreements with a national chamber of industry, or equivalent organization outlining the promotional support to be provided by the chambers of industry, or equivalent organizations, and formally establishing working relationships between ICAITI country representatives and such national organizations.

d. Covenants

The Grantees shall covenant, unless A.I.D. otherwise agrees in writing, as follows:

1. ICAITI will provide the following full-time personnel to work on the project: a project director; country representatives in all countries except Guatemala and Panama; and, as required, the part time services of other ICAITI engineers to assist with services such as energy inquiries made by industrial plants.

2. ICAITI will provide training activities for

technicians from private industries, national governments and other organizations during the life of the project.

3. SIECA will provide one full-time economist to participate in the energy financing and policy-study activities which it will carry out under the project.

4. ICAITI and SIECA will provide facilities, support and data services equivalent to the counterpart values contained in the project agreement budgets.

5. ICAITI and SIECA will coordinate their project activities through consultation, information sharing and other cooperative means.

6. ICAITI and SIECA prior to undertaking annual project activities will furnish, in form and substance satisfactory to A.I.D., a consolidated workplan and budget for their respective activities for each such year.

Assistant Administrator
Bureau for Latin America
and the Caribbean

Date



COSTA RICA
EL SALVADOR
GUATEMALA
HONDURAS
NICARAGUA

APPLICATION LETTERS
INSTITUTO CENTROAMERICANO DE
INVESTIGACION Y TECNOLOGIA INDUSTRIAL
(ICAITI)

CENTRAL AMERICAN RESEARCH INSTITUTE FOR INDUSTRY
Avenida La Reforma 4-47, Zona 10
GUATEMALA, C. A.

ANNEX A-3
P. 1 of 2

APARTADO POSTAL 1552
Cables: ICAITI
Tele: 3312-ICAITI-GU
TELEFONOS: 310631 y
317466

Mr. Paul Montavon
Director
ROCAP
c/o American Embassy
8a. Calle 7-86, Zona 9
Ciudad de Guatemala

ACTION: GENERAL DEV OF

JUN 3 9 37 AM '82
MAIL ROOM
USAID/GUATEMALA

Su referencia

Fecha de su carta

Nuestra referencia
SD/STI/55/1

Fecha
1982.05.31

Asunto:

Dear Paul:

For a number of years ROCAP and ICAITI have been working jointly on the difficult task of solving development problems in the Central American region.

As we have discussed on several occasions, one of the most serious problems affecting the Central American countries, at the present time, is the high cost of petroleum imports which has been rising drastically, as a result of the dramatic and constant price increase of petroleum derived fuels. As a matter of fact, the present high price of petroleum imports, together with current low prices for regional agricultural export products, is causing especially severe financial difficulties to the Central American nations, since a major part of the hard currency income from traditional exports must now be spent on fuel imports.

In the energy field, and with ROCAP's help, ICAITI and CATIE, during the last three years, have been implementing the fuelwood and alternative energy sources project. This project is progressing very satisfactorily and I am encouraged by the interest and the important impact it is already generating in the rural areas of Central America.

Also, in March, 1981, ROCAP sponsored a regional energy conference, held in Tegucigalpa, Honduras, where the MITRE Corporation presented the results of the AID sponsored Central American regional energy assessment. The MITRE study

• • • •

SECRETARIA PERMANENTE DEL TRATADO GENERAL DE INTEGRACION ECONOMICA CENTROAMERICANA

4a. Av. 10-25, Zona 14 Guatemala, C. A.

Tels. No. 682151 - 4 Ap. Postal No. 1237 Cable: "Integración" - Sica

102707

No.

SG-377 13 de julio de 1982

Señor Paul Montavon Director de ROCAP Ciudad de Guatemala

ACTION: GENERAL DEV

MAIL ROOM USAID/GUATEMALA

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Estimado señor Montavon:

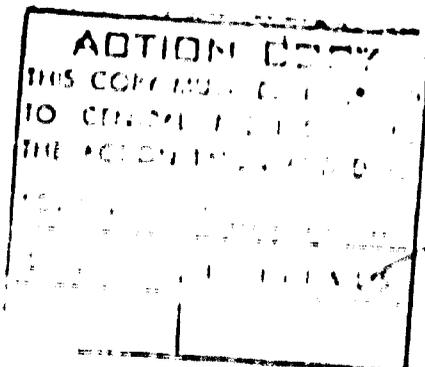
Tengo el agrado de dirigirme a usted en relación con el programa sobre la Eficiencia Energética en la Industria de Centroamérica, que ha sido objeto de pláticas preliminares con vistas a su realización por el Instituto Centroamericano de Investigación y Tecnología Industrial (ICAITI), la Federación de Cámaras de Industrias de Centroamérica (FECAICA), la Secretaría Permanente del Tratado General de Integración Económica Centroamericana (SIECA) y la ROCAP.

Sobre el particular deseo manifestarle el interés de esta Secretaría por participar en el indicado proyecto, de conformidad con los términos de referencia que mutuamente se convengan.

Con las muestras de mi distinguida consideración, me suscribo de usted con todo aprecio atento y seguro servidor,

[Handwritten signature]

Raúl Sierra Franco Secretario General



INCOMING
DEPARTMENT OF STATE
TELEGRAM
AMERICAN EMBASSY GUATEMALA

ANNEX A-4
P. 1 of 2

UNCLASSIFIED

NNNNVV ESB 04 73RA5 76
RR RUESGT
DE RUEHC #1315/01 0360737
ZNR UUUUU ZZK
R 05055 1Z FEB 82
FM SECSTATE WASHDC
TO RUESGT/AMEMBASSY GUATEMALA 7645
INFO RUESTE/AMEMBASSY TEGUCIGALPA 6772
RUESAL/AMEMBASSY SAN SALVADOR 6103
RUESMG/AMEMBASSY MANAGUA 3907
RUESJO/AMEMBASSY SAN JOSE 7976
RUEHZP/AMEMBASSY PANAMA 1799
BT
UNCLAS STATE 031315

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ACTION:	
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51315

AIDAC GUATEMALA FOR ROCAP, AND INFO USAID

E.O. 12065: N/A

ACTION: GENERAL DEV OF
INFO: PROGRAM

TAGS:

SUBJECT: ROCAP REGIONAL INDUSTRIAL ENERGY EFFICIENCY PID

1. THE SUBJECT PID WAS REVIEWED AND APPROVED BY THE DAEC ON JANUARY 18, 1982. THE DAEC IDENTIFIED SEVERAL ISSUES WHICH WILL REQUIRE ATTENTION FROM THE MISSION DURING INTENSIVE REVIEW AND OFFERS THE FOLLOWING GUIDANCE FOR PROJECT PAPER DEVELOPMENT.
2. PROJECT IMPACT. A CAREFUL ANALYSIS OF THE PROBABLE IMPACT OF THE PROJECT ON INDUSTRIAL ENERGY CONSUMPTION AND THE BALANCE OF TRADE OF COUNTRIES IN THE REGION IS NEEDED. ON THE BASIS OF THE QUESTIONNAIRE AND INDUSTRIAL ANALYSES TO BE CARRIED OUT DURING INTENSIVE REVIEW, THE MISSION SHOULD DETERMINE THE SIZES, TYPES, AND ENERGY CONSUMPTION PATTERNS OF THE INDUSTRIAL FIRMS THAT ARE MOST LIKELY TO RESPOND TO PROJECT INITIATIVES. IT MAY BE DESIRABLE TO CONDUCT SAMPLE ENERGY AUDITS OF SOME FIRMS TO OBTAIN A BETTER ESTIMATE OF THE ENERGY SAVINGS THAT CAN BE ACHIEVED. THE MISSION SHOULD ALSO IDENTIFY THE KINDS OF CONSERVATION MEASURES, IF ANY, THAT HAVE ALREADY BEEN ADOPTED BY PARTICULAR FIRMS AND SHOULD TRY TO GAIN A BETTER UNDERSTANDING OF WHY SUCH MEASURES HAVE NOT BEEN MORE WIDELY DISSEMINATED AMONG INDUSTRIES IN THE REGION.
3. DEMONSTRATION PROJECTS. GIVEN THE LARGE AMOUNT OF PROJECT FUNDS (OVER DOLS 2 MILLION) DESIGNATED FOR ON-SITE DEMONSTRATIONS OF ENERGY-CONSERVING TECHNOLOGIES, MANY OF WHICH ARE OF PROVEN TECHNICAL AND ECONOMIC VIABILITY IN OTHER COUNTRIES, THE MISSION NEEDS TO SHOW THAT SUCH DEMONSTRATIONS ARE NECESSARY TO ACHIEVE PROJECT OBJECTIVES AND JUSTIFY THE COST INVOLVED. AS A

2

MEANS OF REDUCING THE COST AND COMPLEXITY OF THE DEMONSTRATIONS COMPONENT OF THE PROJECT, THE MISSION SHOULD CONSIDER THE FEASIBILITY OF INVOLVING PRIVATE SECTOR MANUFACTURERS AND DISTRIBUTORS IN THE DEMONSTRATION AND PROMOTION OF ENERGY-CONSERVING TECHNOLOGIES. IF THE MISSION DECIDES TO PROCEED WITH THE DEMONSTRATION ACTIVITIES, THE PP SHOULD ELABORATE MECHANISMS FOR SELECTING THE DEMONSTRATION FIRMS AND PERHAPS FOR RECOVERING SOME PART OF THE ECONOMIC GAIN REALIZED BY THESE FIRMS AS A RESULT OF THE DEMONSTRATIONS. FULL SUBSIDIALIZATION OF THE DEMONSTRATION PROJECTS, AS PROPOSED IN THE PID, IS STRONGLY DISCOURAGED. THE PP SHOULD ALSO DESCRIBE HOW ANY REFLOWS FROM THE DEMONSTRATION FIRMS WILL BE USED.

4. AID FOLLOW-ON LOAN. ROCAP SHOULD NOT ASSUME THAT SUBSEQUENT AID LOAN FUNDING WILL BE MADE AVAILABLE TO FINANCE INVESTMENTS IN ENERGY-CONSERVING TECHNOLOGIES. THE MISSION SHOULD EVALUATE THE CAPACITY AND WILLINGNESS OF THE USUAL SOURCES OF INDUSTRIAL CREDIT TO FINANCE THIS TYPE OF INVESTMENT. IF THESE SOURCES ARE DEEMED INADEQUATE, OTHER POSSIBLE SOURCES SHOULD BE INVESTIGATED, SUCH AS INDUSTRIAL DEVELOPMENT PROJECTS FINANCED BY OTHER DONORS, PROJECTS FUNDED BY BILATERAL USAIDS, OR THE PROPOSED ROCAP PRIVATE SECTOR FUND PROJECT.

5. INSTITUTIONAL CAPACITY AND COORDINATION. THE PP SHOULD CLARIFY THE ROLES AND CURRENT CAPACITIES OF THE PARTICIPATING INSTITUTIONS, ESPECIALLY FECAICA AND SIECA/COMENER TO UNDERTAKE THE FUNCTIONS ASSIGNED UNDER THIS PROJECT. THE MISSION SHOULD CONSIDER WHETHER FECAICA HAS ADEQUATE ORGANIZATIONAL STRUCTURE AND INCENTIVE TO PROMOTE THE PROJECT DOWN TO THE PLANT LEVEL, AND WHETHER SIECA/COMENER HAS SUFFICIENT EXPERIENCE AND CLOUT TO INFLUENCE NATIONAL ENERGY POLICIES.

THE MISSION SHOULD ALSO CONSIDER WHETHER INCAE COULD PLAY A USEFUL ROLE IN THE PROJECT BY DEMONSTRATING TO BUSINESS MANAGEMENT THE FINANCIAL BENEFITS OF CONSERVATION AND BY PROVIDING CONSULTING SERVICES TO IMPROVE MANAGEMENT'S CONSERVATION SKILLS. THE MISSION SHOULD ALSO DESCRIBE HOW THE ACTIVITIES OF THE PARTICIPATING INSTITUTIONS WILL BE COORDINATED AND FUNDED, AND CONSIDER WHETHER THE PROJECT WOULD BENEFIT FROM A SEPARATE COORDINATOR HIRED THROUGH A PSC OR SIMILAR ARRANGEMENT.

7. POLICY ANALYSIS. THE PP SHOULD INCLUDE AN ANALYSIS OF NATIONAL POLICIES AFFECTING ENERGY CONSUMPTION, INCLUDING PRICING AND INDUSTRIAL POLICIES WHICH BEAR ON THE ENERGY-INTENSIVENESS OF INVESTMENTS AND OPERATIONS. THE PURPOSE OF SUCH AN ANALYSIS IS TO DETERMINE WHETHER EXISTING POLICIES WOULD REINFORCE OR UNDERMINE THE THRUST OF THE EXPLICIT CONSERVATION POLICIES PROPOSED IN THE PID. FURTHERMORE, ANY EXPECTED GAIN FROM THE NEW POLICIES SHOULD BE WEIGHED AGAINST THEIR COSTS IN TERMS OF INCREASED BUREAUCRATIC REGULATION, INTERFERENCE WITH MARKET MECHANISMS, AND REDISTRIBUTION OF INCOME IN FAVOR OF INDUSTRY.

8. THE DAEC UNDERSTANDS THAT THE PID HAS BEEN DISTRIBUTED TO COUNTRY MISSIONS IN THE REGION. IT IS EXPECTED THAT THE PP DEVELOPMENT SCHEDULE WILL ALLOW A REASONABLE PERIOD FOR USAID COMMENTS TO BE RECEIVED AND INCORPORATED INTO THE FINAL PP. HAIG

5C(2) PROJECT CHECKLIST

Listed below are statutory criteria applicable generally to projects with FAA funds and project criteria applicable to individual funding sources: Development Assistance (with a subcategory for criteria applicable only to loans); and Economic Support Fund.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE?
HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PROJECT?

A. GENERAL CRITERIA FOR PROJECT

1. Continuing Resolution
Unnumbered; FAA Sec. 634A;
Sec. 653(b).

(a) Describe how authorizing and appropriations Committees 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 amount)?

a) Congressional Notification Process

b) Yes

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

a) Yes

b) Yes

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? N.A.

4. FAA Sec. 611(b); Continuing Resolution Sec. 501. If for water or water-related land resource construction, has project met the standards and criteria as set forth in the Principles and Standards for Planning Water and Related Land Resources, dated October 25, 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 and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project? N.A.

6. FAA Sec. 209. 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. Project is a regional effort

7. FAA Sec. 601(a). 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; and (c) encourage development and use of cooperatives, and 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.

- a) Yes
- b) Yes
- c) Yes
- d) No Impact
- e) Yes
- f) No

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. technical assistance will be utilized and U.S. commodities will be purchased from U.S. private enterprise.

9. FAA Sec. 612(b), 636(h); Continuing Resolution Sec. 508. 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 in lieu of dollars.

Regional Institutions will contribute 17.4% of project costs

10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and,

No

if so, what arrangements have been made for its release?

11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?

Yes

12. Continuing Resolution Sec. 522. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity?

Project is directed to lower production costs of products for the intra-regional market and will not likely cause injury to U.S. products.

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(b), 111, 113, 281(a). Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using the appropriate U.S. institutions; (b) help develop cooperatives,

- a) Project will assist small and medium industries to become more competitive and as such will improve employment levels.

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; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries?

b. FAA Sec. 103, 103A, 104, 105, 106, 107. Is assistance being made available: (include only applicable paragraph 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 (a) extent to which activity is specifically designed to increase productivity and income of rural poor; 103A if for agricultural research, full account shall be taken of the needs of small farmers, and extensive use of field testing to adapt basic research to local conditions shall be made; (b) extent to which assistance is used in coordination with programs carried out under Sec. 104 to help improve nutrition of the people of developing countries

- b) Project will assist rural poor by assisting rural industries.
- c) Project relies on industry self help efforts.
- d) Project will have a beneficial impact on women employed in industry.
- e) Project is a regional effort carried out by a regional institution in cooperation with national governments and industries.

N.A.

through encouragement of increased production of crops with greater nutritional value, improvement of planning, research, and education with respect to nutrition, particularly with reference to improvement and expanded use of indigenously produced foodstuffs; and the undertaking of pilot or demonstration of programs explicitly addressing the problem of malnutrition of poor and vulnerable people; and (c) extent to which activity increases national food security by improving food policies and management and by strengthening national food reserves, with particular concern for the needs of the poor, through measures encouraging domestic production, building national food reserves, expanding available storage facilities, reducing post harvest food losses, and improving food distribution.

(2) [104] for population planning under sec. 104(b) or health under sec. 104(c); if so, (i) extent to which activity emphasizes low-cost, integrated delivery systems for health, nutrition and family planning for the poorest people, with particular attention to the needs of mothers and young children, using paramedical and auxiliary medical personnel, clinics and health posts, commercial distribution systems and other modes of community research.

N.A.

(4) [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; and (ii) extent to which assistance provides advanced education and training of people in developing countries in such disciplines as are required for planning and implementation of public and private development activities.

(5) [106; ISDCA of 1980, Sec. 304] for energy, private voluntary organizations, and selected development activities; if so, extent to which activity is: (i) (a) concerned with data collection and analysis, the training of skilled personnel, research on and development of suitable energy sources, and pilot projects to test new methods of energy production; (b) facilitative of geological and geophysical survey work to locate potential oil, natural gas, and coal reserves and to encourage exploration for potential oil, natural gas, and coal reserves; and (c) a cooperative program in energy production and conservation through research and development and use of small scale, decentralized,

- a) Project includes data base development, training of ICAITI, and national (government and private sector) professionals involved in energy. Project will result in energy conservation, but includes a small subcomponent for pilot projects.
- b) None
- c) Project will promote a major cooperative conservation effort by rural and urban industry. Housekeeping measures and readily available conservation technologies will be emphasized.

renewable energy sources for rural areas;

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

(iii) research into, and evaluation of, economic development process and techniques;

(iv) reconstruction after natural or manmade disaster;

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

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

c. [107] is appropriate effort placed on use of appropriate technology? (relatively smaller, cost-saving, labor using technologies that are generally most appropriate for the small farms, small businesses, and small incomes of the poor.)

d. FAA Sec. 110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activity with respect to which

U.S. consultants will be involved in data base establishment, training, and initial industry energy audits.

SIECA will conduct studies which will relate financial institution and government policies to industrial energy efficiency.

N.A.

N.A.

N.A.

N.A.

N.A. to regional projects. However, out of a total of \$33 million in economic cost, Central American industries will provide \$25 million while counterpart institutions will provide \$1.3 million.

the assistance is to be furnished (or has the latter cost-sharing requirement been waived for a "relatively least developed" country)?

e. 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, or is the recipient country "relatively least developed"?

Yes

Yes

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 civil education and training in skills required for effective participation in governmental processes essential to self-government.

Project responds to the enthusiasm for industrial energy efficiency demonstrated by Central American industry managers and owners.

Project provides for training of ICAITI and national (both government and private sector) technicians.

g. FAA Sec. 122(b). 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?

Yes

2. Development Assistance Project Criteria (Loans Only)

a. FAA Sec. 122(b). Information and conclusion on capacity of the country to

N.A.

repay the loan, at a reasonable rate of interest.

b. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete with U.S. enterprises, 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?

N.A.

3. Project Criteria Solely for Economic Support Fund

a. FAA Sec. 531(a). Will this assistance promote economic or political stability? To the extent possible, does it reflect the policy directions of FAA Section 102?

N.A.

b. FAA Sec. 531(c). Will assistance under this chapter be used for military, or paramilitary activities?

N.A.

5C(3) - STANDARD ITEM CHECKLIST

Listed below are the statutory items which normally will be covered routinely in those provisions of an assistance agreement dealing with its implementation, or covered in the agreement by imposing limits on certain uses of funds.

These items are arranged under the general headings of (A) Procurement, (B) Construction, and (C) Other Restrictions.

A. Procurement

1. FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the furnishing of commodities and services financed? Yes

2. FAA Sec. 604(a). Will all procurement be from the U.S. except as otherwise determined by the President or under delegation from him? Yes

3. FAA Sec. 604(d). If the cooperating country discriminates against U.S. marine insurance companies, will commodities be insured in the United States against marine risk with a company or companies authorized to do a marine insurance business in the U.S.? Yes

4. FAA Sec. 604(e); ISDCA of 1980 Sec. 705(a). If offshore procurement of agricultural commodity or product is to be N.A.

financed, is there provision against such procurement when the domestic price of such commodity is less than parity? (Exception where commodity financed could not reasonably be procured in U.S.)

5. FAA Sec. 603. Is the shipping excluded from compliance with requirement in section 901(b) of the Merchant Marine Act of 1936, as amended, that at least 50 per centum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S.-flag commercial vessels to the extent that such vessels are available at fair and reasonable rates?

Project will comply with Section 901(b) requirements.

7. FAA Sec. 621. If technical assistance is financed, to the fullest extent practicable will such assistance, goods and professional and other services be furnished from private enterprise on a contract basis? If the facilities of other Federal agencies will be utilized, are they particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs?

Yes

8. International Air Transport. Fair Competitive Practices Act, 1974. If air transportation of persons or

Yes

property is financed on grant basis, will provision be made that U.S. carriers will be utilized to the extent such service is available?

9. Continuing Resolution Sec. 505. If the U.S. Government is a party to a contract for procurement, does the contract contain a provision authorizing termination of such contract for the convenience of the United States?

Procurement contracts will contain such provision

B. Construction

1. FAA Sec. 601(d). If capital (e.g., construction) project, are engineering and professional services of U.S. firms and their affiliates to be used to the maximum extent consistent with the national interests?
2. FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable?
3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed \$100 million?

N.A.

N.A.

N.A.

C. Other Restrictions

1. FAA Sec. 122(b). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter? N.F

2. FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller General have audit rights? N.I

3. FAA Sec. 620(h). Do arrangements exist to insure that United States foreign aid is not used in a manner which, contrary to the best interests of the United States, promotes or assists the foreign aid projects or activities of the Communist-bloc countries? Ye

4. Continuing Resolution Sec. 514
If participants will be trained in the United States with funds obligated in FY 1981, has it been determined either (a) that such participants will be selected otherwise than by their home governments, or (b) that at least 20% of the FY 1982 fiscal year's funds appropriated for participant training will be for participants selected otherwise than by their home governments? Project does not contemplate training in U.S.

5. Will arrangements preclude use of financing:

- a. FAA Sec. 104(f). To pay for performance of abortions as a method of family planning or to, motivate or coerce persons to practice abortions; to pay for performance of involuntary sterilization as a method of family planning, or to coerce or provide financial incentive to any person to undergo sterilization? Yes
- b. FAA Sec. 620(g). To compensate owners for expropriated nationalized property? Yes
- c. FAA Sec. 660. To provide training or advice or provide any financial support for police, prisons, or other law enforcement forces, except for narcotics programs? Yes
- d. FAA Sec. 662. For CIA activities?
- e. FAA Sec. 636(i). For purchase, sale, long-term lease, exchange or guaranty of the sale of motor vehicles manufactured outside U.S., unless a waiver is obtained. Yes
- f. Continuing Resolution Sec. 504. To pay pensions, annuities retirement pay, or adjusted service compensation for military personnel? Yes
- g. Continuing Resolution Sec. 506. To pay U.N. assessments, arrearages or dues. Yes
- h. Continuing Resolution Sec. 507. To carry out provisions of FAA section 209 (d) (Transfer of FAA funds to Yes

multilateral organizations for lending.)

i. Continuing Resolution Sec. 509. To finance the export of nuclear equipment fuel, or technology or to train foreign nationals in nuclear fields?

Yes

j. Continuing Resolution Sec. 510. Will assistance be provided for the purpose of aiding the efforts of the government of such country to repress the legitimate rights of the population of such country contrary to the Universal Declaration of Human Rights?

Such assistance will not be provided

k. Continuing Resolution Sec. 516. To be used for publicity or propaganda purposes within U.S. not authorized by Congress?

Yes

SCHEDULE OF MAJOR PROJECT EVENTS

	<u>DATE</u>
AID/W Grant Authorization	7/82
Grant Agreements signed	8/82
CP's met - Annual work plans received from ICAITI and SIECA	10/82
ICAITI and SIECA start to recruit and select project staff	10/82
Selection of U.S. consulting firm(s) for rapid impact audits and demonstrations, training and data base components	11/82
SIECA starts initial studies	11/82
Private Sector committees formed at regional and national level	12/82
Agreements signed between ICAITI and national level institutions	12/82
Promotion program starts	1/83
Procurement of data base materials and computer	1/83
SIECA and ICAITI hold initial regional and national level seminars	1/83
Training course starts for rapid impact audits and demonstrations	3/83
Rapid impact audit and demonstration program starts	4/83
Exhibits are prepared	5/83
Initial case studies prepared	5/83
Visits to demonstration sites start	6/83
Major training program for ICAITI personnel starts	6/83
Regular industry programs start, (Level 1 and Level 2) Audits and minor and major demonstrations	8/83
Work plans are submitted for 2nd year of program	8/83
Pilot demonstration projects start	1/84

Schedule of Major Project Events
Page 2

	<u>DATE</u>
2nd Major training program starts with participation of ICAITI engineers	6/84
First Evaluation	8/84
3rd Major training activity starts (taught by ICAITI engineers primarily for national counterparts)	6/85
Second Evaluation	8/86
PACD	7/87
Final Evaluation	10/87

ENERGY BALANCES FOR CENTRAL AMERICA AND ITS INDUSTRIES

Energy Balances for Latin America, a report prepared by OLADE in 1981, was used to derive the following tables for total energy used in Central America and Panama, and its industries. Table 1 illustrates the growth of the industrial and transportation sectors and their share of total energy used in 1970 and 1978.

Table 2 shows the major categories of energy used and their percentages for final demand. Although this table shows petroleum accounting for 35.7%, this percentage is closer to 43% when adding the petroleum used for electric generation.

Table 3 illustrates petroleum availability for the region, while Table 4 distributes petroleum consumption by end use, showing that industry uses 24.5% of the region's petroleum.

Table 5 further disaggregates regional industrial requirements for energy by fuel types. Petroleum and its products accounted for 46.6% of all energy used by industry. Additionally, industry uses about 36% of all the electricity generated much of which is still generated thermally, using petroleum.

TABLE 1

FINAL ENERGY CONSUMPTION BY SECTORS

	1970		1978	
	<u>10³TEP</u>	<u>%</u>	<u>10³TEP</u>	<u>%</u>
Industry	1,546	19.8	2,614	24.0
Transportation	1,235	15.8	2,166	19.8
Residential, Commercial and Public	4,865	68.2	5,886	53.8
Others (Mostly Agriculture)	<u>172</u>	<u>2.2</u>	<u>263</u>	<u>2.4</u>
TOTAL	7,818	100.0	10,929	100.0

TABLE 2

ENERGY SUPPLY BY TYPE USED FOR
CENTRAL AMERICA AND PANAMA - 1978
(Thousands of Tons Equivalent Petroleum (TEP))

	<u>Total Economy</u>	<u>% of Total</u>
Petroleum and Derivatives*	3,900	35.7
Fuelwood	5,708	52.2
Bagasse and other Plant Residues	678	6.2
Electricity* (Hydro, Geo, and Thermal)	<u>643</u>	<u>5.9</u>
TOTAL	10,929	100.0

*(Note - This table understates petroleum's overall role in the region because electricity includes 1085x10³ Tons of Petroleum for generation.)

TABLE 3

ACCOUNTING FOR PETROLEUM AVAILABILITY IN THE
ECONOMIES OF CENTRAL AMERICA AND PANAMA
1978
(10³ TEP)

Imported Crude	5,464
Imported Products	1,340
Guatemalan Production	31
TOTAL	<u>6,835</u>
Re-exports (mostly Panama)	-1,534
Adjustments for losses, refinery consumption, and inventory changes	- 316
TOTAL AVAILABLE	<u><u>4,985</u></u>

TABLE 4

PETROLEUM USE BY SECTORS - 1978

	<u>10³ TEP</u>	<u>%</u>
Utilities	1,085	21.7
Transport	2,165	43.4
Industry	1,218	24.5
Residential, Commercial and Public	431	8.6
Other (mostly Agriculture)	96	1.9
TOTALS	<u>4,985</u>	<u>100.0%</u>

TABLE 5

DETAILED INDUSTRIAL USE OF ENERGY
BY FUEL TYPE

	<u>10³ TEP</u>	<u>%</u>
Electricity	233	8.9
Crude Oil	27	1.0
Fuel Oil	640	24.5
Diesel Oil	480	18.4
Kerosene	33	1.3
Gasoline	18	.7
LGP	20	.7
Charcoal	1	.1
Wood	537	20.5
Bagasse and Other Plant	625	23.9
	<u>2614</u>	<u>100.0</u>

1210 } 46.6%

OTHER DONORS ASSISTANCE

To define the extent to which the needs of the industrial sector in energy efficiency described by the survey and the DSI analysis were already being addressed, Project Development has included a review of other donor assistance.

1. General Energy Activities

The national activities in the Project Background are financed by large amounts of assistance from other donors; primarily the World Bank and the Interamerican Development Bank, which continue to be lent to Central America and Panama for major energy infrastructure projects. Most of these investments are for hydro and geothermal electric projects, electricity distribution and hydro-carbon exploration. Some of the recent additional petroleum and electricity transmission and non-conventional energy loans are listed below. This list is derived from OLADE Report on energy projects in Latin America - December 1981, and does not include hydroelectric or geothermal loans.

<u>Country</u>	<u>Source</u>	<u>Amount</u>	<u>Content & Timing</u>
<u>PETROLEUM & GAS</u>			
Honduras	World Bank	\$3,650,000	Petroleum planning and exploration
		Timing	- Indefinite
Central America & Panama	OLADE	\$ 20,000	Seminar on Risk contract negotiation for Hydro-carbon exploration
		Timing	- May 1981
Panama	World Bank	\$8,000,000	Petroleum Exploration Energy Planning, and Energy Conservation
		Timing	- 1981 through 1983
<u>ELECTRICITY</u>			
Panama	World Bank	\$35,000,000	Electricity Distribution
		Timing	- 1980-1982
Central America	OPEC Fund	\$17,800,000	Grid Interconnection
	World Bank	Timing	- Indefinite

<u>Country</u>	<u>Source</u>	<u>Amount</u>	<u>Content and Timing</u>
<u>ELECTRICITY</u>			
Costa Rica	IDB	\$38,450,000 Timing	Distribution and Transmission - 1981-1984
Central America	IDB	\$32,000,000 Timing	Grid Interconnection - 1981-1984
Panama	IDB	\$33,000,000 Timing	Rural Distribution - 1981-1984
Costa Rica	IDB, CABEI and others	\$86,600,000 Timing	Grid Interconnection - 1981-1985
Costa Rica	World Bank	\$56,200,000 Timing	Transmission and Rural Distribution - 1979-1982
<u>NON-CONVENTIONAL</u>			
Costa Rica	OLADE OPEC Fund	\$ 310,000 Timing	Assistance for Small Hydro-electric Generation - 1981-1984
El Salvador	BID	\$ 1,623,400 Timing	National Energy Planning Small Hydro Study, Ethanol Study, Biogas Study and Wind and Solar Data - Indefinite

Virtually, all lending to the region has been given for producing and distributing energy. With the exception of the ROCAP Fuelwood and Alternative Energy Sources Project (596-0089), which is concerned, in part, with improved efficiency in the use of wood by households and small rural industries, no attention has been given by the donor community to saving energy until very recently.

The UNDP, through its office for Technical Cooperation (TCD), held two meetings to review proposals for continuation of its Energy Program for the Central American Isthmus (PEICA), in January 1982 in Guatemala City and in April 1982 in Tegucigalpa. The PEICA program which has been working with each of the countries in the region, providing technical assistance and long-term advisors to national teams, has produced historical and current energy balances and preliminary energy plans for most of the countries. If the program obtains the funding sought, it will proceed with the elaboration of national energy plans, training, institutional organization and financial analysis of the energy sector in each country. The program also anticipates conducting further studies

of renewable resources, refining capacity, electrical interconnections between countries, and the rational use of energy in the region. To date the only study completed of direct significance to industrial energy conservation is an Analysis of Energy Conservation for Nicaraguan Industry. Published in March, 1982, this paper details energy use in four major Nicaraguan industries (cement, sugar, textiles and vegetable oils) and makes initial recommendations on conservation options.

The OAS is about to inaugurate its first regional energy program with approximately \$366,000 from the OAS budget funds and \$550,000 from the Government of France. This program, which will concentrate its attention on Panama, Costa Rica and Nicaragua, is designed to help the governments identify and prepare specific projects which encourage the development of new and renewable energy resources for application in critical areas. After reviewing energy supply and demand statistics, the program will identify geographic areas or economic sectors where the energy situation requires concerted attention and then formulate activities and investment strategies to address the problems. Although the program as designed by the OAS does not make references to energy conservation, it seems likely, for example, that certain industries in critical situations will need not only help with alternate energy sources but also in reducing their energy use per unit of product output.

OLADE has a continuing program of assistance to the region for geothermal and biogas development. In addition, OLADE gives periodic training courses and seminars on energy related matters, although no special attention to energy efficiency has been given to date.

The Mexican and Venezuelan Oil Facilities, as a result of the Acuerdo de San Jose of August 1980, will provide credits up to 30% of each countries' oil bill. These credits for 5 years at 4% annual interest can be converted to 20 year loans at 2% if they are used to finance economic and social development, particularly in the energy sector. However, because the countries are so short of capital to finance anything, the only conversion to a long-term energy loan in the region to date is for a fuel alcohol project in El Salvador for \$15 million.

Other bilateral donors (Canada, France, West Germany, and others) and certain private voluntary organizations are giving limited financing for some energy related activities in the region.

2. Activities in Energy Efficiency

In the last few months, several other donors have become concerned with energy use in the industrial sector. The World Bank loan to Panama for petroleum assistance includes a small amount for national energy planning and studies on the rational use of energy. In Costa Rica the IDB has just funded a study of the potential for using hydro and geothermal electricity as a substitute for petroleum in the industrial sector. A similar study is being prepared for Honduras,

In conclusion, there are no major efforts in energy conservation or specifically in industrial energy efficiency. This project is the first major effort in industrial energy efficiency. As described in the Project Description, it will be closely coordinated with relevant ongoing activities or any programs that may be initiated and will encourage greater involvement by other donors in the future. For example, the project contemplates some training of Panamanian government engineers and inclusion of information produced by the studies described in the preceding paragraph into the projects data bank.

A - J
INDEX

Summary Cost Estimate and
Financial Plan

Summary Cost by Components and Years
AID Budget

Summary Cost by Component, Personnel
Salaries/Other Costs/Consultants CA & US
AID Budget

Illustrative Budget AID Funds
By Component, Year and Input

Illustrative Counterpart Budget

Budget Summary Description

SUMMARY COST ESTIMATE AND FINANCIAL PLAN
(US \$)

<u>Project Component</u>	<u>COUNTERPART</u>				<u>TOTAL</u>
	<u>AID</u>	<u>ICAITI</u>	<u>SIECA</u>	<u>PRIVATE SECTOR</u>	
1. Industry Program	1,788,974	---	---	300,000	2,088,974
2. Training	279,217	---	---	100,000	379,217
3. Promotion	1,014,186	---	---	500,000	1,514,186
4. Data Base & Analysis	181,694	---	---	---	181,694
5. Financing & Public Policy *	526,007	---	260,000	---	786,007
Management	1,206,127	---	---	---	1,206,127
ICAITI Overhead		440,000	---	---	440,000
SIECA Overhead/Contingency*	73,993	---	---	---	73,993
Evaluation	60,000	---	---	---	60,000
Contingency & Inflation	869,802	---	---	---	869,802
TOTAL PROJECT	6,000,000	1,140,000	260,000	600,000	8,000,000
TOTAL ICAITI	5,400,000	1,140,000	---	600,000	7,140,000
TOTAL SIECA *	600,000	---	260,000	---	860,000
	6,000,000	1,140,000	260,000	600,000	8,000,000

* SIECA.

SUMMARY COST BY
COMPONENTS AND YEARS
AID - BUDGET IN US\$

COMPONENTS	1/ P/M	TOTAL	YR. 1	YR. 2	YR. 3	YR. 4	YR. 5
1. Industry Program	P/M \$	342 1,788,974	35.4 230,910	84.1 262,941	110.6 556,111	70.1 579,018	41.8 159,994
2. Training	P/M \$	56 279,217	12 119,000	12 23,926	20 109,365	12 26,926	--- ---
3. Promotion	P/M \$	409.6 1,014,186	71.5 226,809	116.8 281,239	116.8 234,122	93.7 210,875	10.5 61,141
4. Data Base and Analysis	P/M \$	38 181,694	14 104,500	6 22,218	6 17,214	6 18,295	6 19,467
MANAGEMENT	P/M \$	190 1,205,127	38 289,800	38 250,772	38 209,856	38 222,180	38 234,019
Evaluation	\$	60,000	---	10,000	---	30,000	20,000
Contingency & Inflation	\$	869,802	---	75,845	252,559	336,668	204,730
TOTAL ICAITI	P/M \$	983.6 5,400,000	168.9 914,737	248.9 926,548	277.4 1,464,309	205.8 1,463,042	82.6 631,364
5. Financing and Public Policy SIECA	P/M \$	143 525,007	28.6 98,923	28.6 101,807	28.6 104,935	28.6 108,329	28.6 112,013
SIECA/ Overhead & Contingency	\$	73,993	10,169	11,323	12,574	17,522	22,405
TOTAL SIECA	P/M \$	143 600,000	28.6 109,092	28.6 113,130	28.6 117,509	28.6 125,851	28.6 134,418
TOTAL PROJECT COST	P/M \$	1,126.6 6,000,000	197.5 1,023,829	277.5 1,039,678	306 1,581,818	234.4 1,588,893	111.2 765,782

1/ P/M = Persons Month - \$ = Amount

SUMMARY COST BY COMPONENT
PERSONNEL SALARIES/OTHER COSTS/CONSULTANTS C.A. US
AID BUDGET IN US\$

	1/ P/M	PERSONNEL SALARIES	OTHER COSTS	TOTAL DIRECT COSTS	C.A. CONSULTANTS	TOTAL	U.S. CONSULTANTS	OTHER COSTS	TOTAL U.S.	TOTAL
1. Industry Program	P/M	327	---	---	---	---	15	---	---	342
	\$	542,964	1,038,450*	1,581,414	---	1,581,414	120,000	87,560*	207,560	1,788,974
2. Training	P/M	36	21,000	76,217	---	76,217	20	43,000	203,000	279,217
	\$	55,217	---	---	---	---	---	---	---	56
3. Promotion	P/M	409.6	332,735	846,586	167,600	1,014,186	---	---	---	409.6
	\$	613,851	---	---	---	---	---	---	---	1,014,186
4. Data Base & Analysis	P/M	30	27,506*	91,494	---	91,494	8	31,000*	90,200	38
	\$	63,994	---	---	---	---	---	---	---	181,694
MANAGEMENT	P/M	120	---	---	---	---	18	---	---	138
	\$	255,980	746,527	1,052,427	---	1,052,427	120,000	33,600	153,600	1,206,027
Evaluation		---	---	---	---	---	---	---	---	---
Contingencies & Inflat.		---	60,000	60,000	---	60,000	---	---	---	60,000
TOTAL ICAITI	P/M	922.6	---	---	---	---	---	---	---	869,802
	\$	1,532,006	2,986,034	4,518,040	167,600	4,685,640	61	195,160	714,360	5,400,000
5. Financing & Public Policy (SIECA)	P/M	143	---	---	---	---	---	---	---	143
	\$	246,007	280,000	526,007	---	526,007	---	---	---	526,007
SIECA Overhead/Conting.		---	73,993	73,993	---	73,993	---	---	---	73,993
TOTAL SIECA	P/M	143	---	---	---	---	---	---	---	143
	\$	246,007	353,993	600,000	---	600,000	---	---	---	600,000
TOTAL PROJECT COSTS	P/M	1,065.6	---	---	---	---	61	---	---	1,126.6
	\$	1,778,013	3,340,027	5,118,040	167,600	5,285,640	519,200	195,160	714,360	6,000,000

1/ P/M = Persons Month - \$ = Amount.
* Includes approximately \$817,500 in commodities

FA:REBardo/ (ID-00009s)

79
79
79

ILLUSTRATIVE BUDGET
AID-FUNDS
BY COMPONENT YEAR AND INPUT
(U.S. Dollars)

TOTAL YR.1 YR.2 YR.3 YR.4 YR.5

1 INDUSTRY PROGRAM

<u>ICAITI</u>							
	P/M	327	24.4	82.1	108.6	70.1	41.8
Salary	\$	542,964	33,300	123,691	179,761	127,218	78,994
Travel & Per Diem		300,950	26,750	82,150	87,750	55,800	48,500
Mat., Equip. & Others		737,500	6,500	35,500	267,000	396,000	32,500
Other Costs		1,038,450	33,250	117,650	354,750	451,800	81,000
TOTAL ICAITI		1,581,414	66,550	241,341	534,511	579,018	159,994
US CONSULTANTS							
	P/M	15	11	2	2	---	---
Salary	\$	120,000	88,000	16,000	16,000	---	---
Travel & Per diem		38,560	27,360	5,600	5,600	---	---
Mat. Equip. & other		49,000	49,000	---	---	---	---
		87,560	76,360	5,600	5,600	---	---
TOTAL US CONSULT.		207,560	164,360	21,600	21,600	---	---
TOTAL INDUSTRY	P/M \$	342 1,788,974	35.4 230,910	84.1 262,941	110.6 556,111	70.1 579,018	41.8 159,994

2. TRAINING

<u>ICAITI</u>							
	P/M	36	---	12	12	12	---
Salaries	\$	55,217	---	16,926	18,365	19,926	---
Other Costs (Travel and Per Diem)		21,000	---	7,000	7,000	7,000	---
TOTAL ICAITI		76,217	---	23,926	25,365	26,926	---
US CONSULTANTS							
	P/M	20	12	---	8	---	---
Salaries	\$	160,000	96,000	---	64,000	---	---
Other Costs:							
Travel & Per Diem		33,000	17,000	---	16,000	---	---
Translation & others		10,000	6,000	---	4,000	---	---
Other Costs		43,000	23,000	---	20,000	---	---
TOTAL US CONSULTANTS		203,000	119,000	---	84,000	---	---
TOTAL TRAINING	P/M \$	56 279,217	12 119,000	12 23,926	20 109,365	12 26,926	--- ---

		TOTAL	YR.1	YR.2	YR.3	YR.4	YR.5
3. PROMOTION							
ICAITI							
	P/M	409.6	71.5	116.8	116.8	93.7	10.8
Salaries	\$	<u>613,851</u>	<u>95,894</u>	<u>163,384</u>	<u>177,267</u>	<u>154,020</u>	<u>23,286</u>
Other Costs							
Travel & Per Diem		75,235	16,495	16,435	16,435	16,435	9,435
Print., Dist., & Exhib.		62,500	22,500	24,500	6,500	6,500	2,500
Hall rentals		25,000	5,000	5,000	5,000	5,000	5,000
Publicity		25,000	5,000	5,000	5,000	5,000	5,000
Data Bank Search		45,000	5,000	10,000	10,000	10,000	10,000
Other Costs		<u>232,735</u>	<u>53,995</u>	<u>60,935</u>	<u>42,935</u>	<u>42,935</u>	<u>31,935</u>
TOTAL ICAITI		<u>846,586</u>	<u>149,889</u>	<u>224,319</u>	<u>220,202</u>	<u>196,955</u>	<u>55,221</u>
CA CONSULTANTS							
Public relations		100,000	60,000	40,000	---	---	---
Broch. design & dist.		32,000	8,000	8,000	8,000	8,000	---
INCAE (Salary, Travel and Per Diem)		29,600	5,920	5,920	5,920	5,920	5,920
Exhibit design		6,000	3,000	3,000	---	---	---
TOTAL CA CONSULTANTS		<u>167,600</u>	<u>76,920</u>	<u>56,920</u>	<u>13,920</u>	<u>13,920</u>	<u>5,920</u>
	P/M	409.6	71.5	116.8	116.8	93.7	10.8
TOTAL PROMOTION	\$	<u>1,014,186</u>	<u>226,809</u>	<u>281,239</u>	<u>234,122</u>	<u>210,875</u>	<u>61,141</u>

4. DATA BASE

ICAITI							
	P/M	30	6	6	6	6	6
Salaries	\$	<u>63,994</u>	<u>10,800</u>	<u>11,718</u>	<u>12,714</u>	<u>13,795</u>	<u>14,967</u>
Other Costs							
Travel & Per Diem		5,000	1,000	1,000	1,000	1,000	1,000
Computer Equip & Search.		16,500	2,500	3,500	3,500	3,500	3,500
Trans. Print & Library		6,000	---	6,000	---	---	---
Other Costs		<u>27,500</u>	<u>3,500</u>	<u>10,500</u>	<u>4,500</u>	<u>4,500</u>	<u>4,500</u>
TOTAL ICAITI		<u>91,494</u>	<u>14,300</u>	<u>22,218</u>	<u>17,214</u>	<u>18,295</u>	<u>19,467</u>
US CONSULTANTS							
	P/M	8	8	---	---	---	---
Salaries	\$	<u>59,200</u>	<u>59,200</u>	<u>---</u>	<u>---</u>	<u>---</u>	<u>---</u>
Other Costs:							
Travel & Per Diem		8,500	8,500	---	---	---	---
Computer Equipment		14,500	14,500	---	---	---	---
Trans. Printing & Lib.		8,000	8,000	---	---	---	---
Other Costs		<u>31,000</u>	<u>31,000</u>	<u>---</u>	<u>---</u>	<u>---</u>	<u>---</u>
TOTAL US CONSULTANTS		<u>90,200</u>	<u>90,200</u>	<u>---</u>	<u>---</u>	<u>---</u>	<u>---</u>
	P/M	38	14	6	6	6	6
TOTAL DATA BASE	\$	<u>181,694</u>	<u>104,500</u>	<u>22,218</u>	<u>17,214</u>	<u>18,295</u>	<u>19,467</u>

	TOTAL	YR.1	YR.2	YR.3	YR.4	YR.5
--	-------	------	------	------	------	------

5. FINANCIAL AND PUBLIC POLICY

<u>SIECA</u>							
Salaries	P/M \$	143 246,007	28.6 42,923	28.6 45,807	28.6 48,935	28.6 52,329	28.6 56,013
Other Costs:							
Travel & Per Diem		125,000	25,000	25,000	25,000	25,000	25,000
Data Bank		100,000	20,000	20,000	20,000	20,000	20,000
Other		55,000	11,000	11,000	11,000	11,000	11,000
Other Costs		<u>280,000</u>	<u>56,000</u>	<u>56,000</u>	<u>56,000</u>	<u>56,000</u>	<u>56,000</u>
Total Financing & Public Policy	P/M \$	143 526,007	28.6 98,923	28.6 101,807	28.6 104,935	28.6 108,329	28.6 112,013

MANAGEMENT

<u>ICAITI</u>							
Contract Salaries (Deputy Project Managers)	P/M \$	120 255,980	24 43,200	24 46,872	24 50,856	24 55,180	24 59,872
Other Costs:							
Travel & Per Diem		58,000	11,600	11,600	11,600	11,600	11,600
Communications		30,000	6,000	6,000	6,000	6,000	6,000
		<u>88,000</u>	<u>17,600</u>	<u>17,600</u>	<u>17,600</u>	<u>17,600</u>	<u>17,600</u>
TOTAL ICAITI		<u>343,980</u>	<u>60,800</u>	<u>64,472</u>	<u>68,456</u>	<u>72,780</u>	<u>77,472</u>
<u>US CONSULTANTS</u>							
Salary	P/M \$	18 120,00	12 80,000	6 40,000	---	---	---
Travel, Per Diem and other		33,600	21,600	12,000	---	---	---
TOTAL US CONSULTANTS		<u>153,600</u>	<u>101,600</u>	<u>52,000</u>	<u>---</u>	<u>---</u>	<u>---</u>
ICAITI MANAGEMENT AND INDIRECT COSTS			127,400	134,100	140,900	149,400	156,547
TOTAL MANAGEMENT	P/M \$	128 1,206,117	74 289,800	68 250,772	24 209,356	62 222,180	62
	P/M	190	38	38	38	38	38
<u>SIECA Overhead & Contingency</u>							
		73,993	10,169	11,323	12,574	17,522	22,405
<u>ICAITI Evaluations for Total Project</u>							
		60,000	---	10,000	---	30,000	20,000
<u>ICAITI Contingency & Inflation</u>							
		<u>869,802</u>	<u>---</u>	<u>75,845</u>	<u>252,559</u>	<u>336,668</u>	<u>204,730</u>
TOTAL TOTAL	P/M \$	1,331.6 6,000,000	235.5 1,080,111	315.5 1,040,071	344 1,496,236	272.4 1,549,813	149.2 833,769

ILLUSTRATIVE ICAITI MANAGEMENT AND INDIRECT COSTS
(IN US \$)

ICAITI	TOTAL	YR. 1	YR. 2	YR. 3	YR. 4	YR. 5
Central Office						
Project Director (full time)	199,000	36,000	37,800	39,200	42,000	44,000
General Director (part time)	30,000	5,400	5,700	6,000	6,300	6,600
Deputy Director (part time)	20,000	3,600	3,800	4,000	4,200	4,400
Secretarial Support	55,577	10,600	11,000	17,400	11,800	10,747
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MANAGEMENT SUB TOTAL	304,547	55,600	58,300	60,600	64,300	65,747
<hr/>						
- Central American Delegates (Part time)	225,000	40,700	42,700	44,900	47,100	49,600
- Secretarial Support	45,000	8,100	8,500	8,900	9,400	10,100
- Delegates Other Costs	71,000	11,600	12,800	14,000	15,400	17,200
Translations	63,000	11,400	12,000	12,500	13,200	13,900
Field SubTOTAL	404,000	71,800	76,000	80,300	85,100	90,800
TOTAL	708,547	127,400	134,300	140,900	149,400	156,547

ILLUSTRATIVE COUNTERPART BUDGET
(in thousands of dollars)

	<u>TOTAL</u>	<u>YR. 1</u>	<u>YR. 2</u>	<u>YR. 3</u>	<u>YR. 4</u>	<u>YR. 5</u>
ICAITI OVERHEAD (PLANT, LABS, ADMINISTRATION, ETC.	440.0	72.9	80.2	88.2	97.0	101.7
SIECA & Public Policy						
Component Manager (full time)	100.0	20.0	20.0	20.0	20.0	20.0
Prof. Assistant	90.0	18.0	18.0	18.0	18.0	18.0
Prof. Support (part time)	60.0	12.0	12.0	12.0	12.0	12.0
Support Costs	10.0	2.0	2.0	2.0	2.0	2.0
FINANCIAL & PUB. POLICY TOTAL	260.0	52.0	52.0	52.0	52.0	52.0
PRIVATE INDUSTRIES *	324.4	.5	9.0	14.2	24.8	275.9
<u>PRIVATE SECTOR ORGANIZATIONS</u>						
<u>PROMOTION</u>						
Publications - Facilities	500.0	100.0	100.0	100.0	100.0	100.0
<u>TRAINING</u>						
Travel and Per Diem	100.0	20.0	20.0	20.0	20.0	20.0
TOTAL PRIVATE SECTOR	924.4	120.5	129.0	134.2	144.8	395.9
TOTAL COUNTERPART	1-624.4	245.4	261.2	274.4	293.8	549.6

* Estimate Industry contributions for audit fees and Demonstration Projects.

27
.9

PROJECT COMPONENT: 1 INDUSTRY PROGRAMS \$1,788,974

TOT. COST	ITEM	SUB-ITEM	UNIT PRICE	REMARKS
	<u>High Impact Audits</u>		<u>AUDITS</u>	
2,400	ICAITI Personnel	SALARIES	\$15,600/year	2 Person Week/Audit (2 people being trained)
3,700		Travel and Perdiem	\$ 600/audit	1 Audit/Week Includes Report Assistance (there are 14 of these in 1st year)
28,900	US Consultant- supplied by US Company (14 HI audits)	TRAV. + OH + Fee (15%)	\$8000/Month	0.5 person months in US for preparation
2,000		Travel	\$2000	3 person months & 1 audit/week including report writing
6,120		Perdiem	\$68/day	US-Guatemala-US and in Central America
6,000	Equipment	Audit Kits	\$1,000 each	3 months or 90 days
90,455	ICAITI Personnel	Salary	<u>Level 1 Audits</u> \$15,600/year	6 are needed. One for consultant and 5 for ICAITI Personnel & training staff
55,200		Travel & Perdiem	\$ 200/audit	1 person week/audit including report preparation (there are 276 of these over project life)
50,460	<u>Level 2 Audits</u>			
31,500	ICAITI Personnel	Salary	\$15,600/year	3 person weeks per level 2 audit including report preparation (there are 45 over project)
22,500	Small Parts	Travel & Perdiem	\$700/Audit	Minor Parts
8,900	US Consultant to be supplied by US company	Small Parts	\$500/Audit	1 person month 1st. year to help with the
		Salary	\$ 8000/Month	1 level two audit to be performed in the first year
1,000		Travel	\$ 1000	US-Guatemala-US & surface
2,000		Perdiem	\$68/day	30 days
18,000	Materials/Training	Level 2 audit kits	\$ 6000/each	3 kits needed - 1 for consultant, 1 for training and 1 for ICAITI personnel.

07
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10

BUDGET SUMMARY DESCRIPTION

PROJECT COMPONENT: 1. INDUSTRY PROGRAMS

TOTAL COST	ITEM	SUB-ITEM	UNIT PRICE	REMARKS
		<u>MINOR DEMO PROJECTS</u>		
36,959	ICAITI Personnel	Salaries	\$15,600/year	2 person weeks/minor demo.
20,000		Travel	\$400/demo.	2 PT to country and surface travel
32,500		Perdiem	\$650/demo	10 person days/demo
98,000		Materials	\$1000/demo	Materials for minor adjustments in industry.
52,000	US Consultants	Salaries + OH + Fee	\$ 8000/month	Sal. includes 38,000 +150% for OH & Fee
4,000	(Supplied by a company) (22 minor demos. high impact demos.)	Travel US & Country	\$ 2000/person	5 days each demo. & 6 person months per minor demo program (2 people 3.25 months)
12,240		Perdiem	\$68/day/person	2 people 3 months each (180 days)
24,000	Materials	Minor demo kits	\$ 8,000/each	3 kits needed (two for consultants & one for training)
1,000	Other	Miscellaneous Costs	\$ 500/person	Film, maps, etc.
		<u>PILOT PLANT DEMOS</u>		
70,581	ICAITI Personnel	Engineers & Other project personnel salary	\$15,600/year	1 Pers/Yr demo for two years each. Includes Salary. These people will design and operate pilot plant and write final report. This includes materials necessary to construct pilot plant.
56,000		Travel, Materials, Equipment	28,000/demo.	
		<u>EXHIBITS</u>		
32,000	Sub-Contracts	Salaries & Materials	\$9000/Exhibit	4 exhibits & costs include audiovisual equipment (video taping, 2 slide projectors, art supplies, small electro-mechanical machines, etc.) Central American subcontractor. These exhibits are different than those in promotion component.

PROJECT COMPONENT: 1 INDUSTRY PROGRAMS

ITEM	SUB-ITEM	UNIT PRICE	REMARKS
38,441	Seminars	\$15,600/year	2 days per seminar & 105 seminars over project
15,750	Salaries	\$15,600/year	
42,000	Perdiem Travel	\$ 150/seminar \$ 400/seminar	2 people - 1 day each per seminar
	Salaries	\$15,600/year	Person 1 day per seminar (A total of 5 person days/seminar)
26,775	Feasibility Studies (17 over project)	\$18,000/year	1 person/month per study since these result from audits
13,600	Travel	\$ 800/study	
89,057	Salaries (ICAITI)	\$ 1,000/design	4 person months/design
13,000	Travel	\$18,000/year	4 person months/demo
96,626	Equipment	45,000/	Equipment investments will be recuperated from industry after demonstration period at salvage value.
585,000	Installation, startup operation, monitoring (13 over project)		
13,000	Travel/perdiem		
26,210	Salaries	\$18,000/year	1 person/month per demo
32,000	Salaries + OH + Fee	8,000/month	4 person months 2 in yr. 2 and 2 in year 3.
3,000	Travel	\$1,500	This consultant will come to Guatemala for 2 months in second year to help ICAITI prepare specifications and plan projects. He will come back 2 months in 3rd. year for start-up of first set of major demo projects.
8,200	Perdiem	\$68/Day	
1,788,974	total Industry		

2.9
0.12

BUDGET SUMMARY DESCRIPTION

PROJECT COMPONENT: 2. TRAINING

TOTAL COST	ITEM	SUB-ITEM	UNIT PRICE	REMARKS
55,217	ICAFI Personnel	Salary	\$ 15,600/yr.	Training in 2nd., 3rd and 4th years of project at 1 person year per year supported by the project.
21,000		Travel	7,000/yr.	2nd, 3rd. and 4th years.
160,000	U.S. Consultant:			
	Salaries	Salaries	8,000/month	1 Full Year for 1st. year and 8 months for 3rd. year includes 150% Overhead & Fee
33,000	Travel and Perdiem	Transfer to Post and Travel in Area	17,000 16,000	For first year For third year
10,000	Other Cost	Translations Printing Library	6,000 4,000	For first year For third year
279,217	TOTAL TRAINING			

A 9
P 13

BUDGET SUMMARY DESCRIPTION

PROJECT COMPONENT: 3 PROMOTION \$1,014,186

Page 5 of 11

TOTAL COST	ITEM	SUB-ITEM	UNIT PRICE	REMARKS
7,690	Regional Advisory Meetings	Project Staff Salary	\$18,000/year	32 person days 1st. year & 16 each other yr. 4 meetings in 1st. year; 2 each in 2nd through 5th years. 8 trip-days per advisory meetings
6,000		Project Staff Travel	\$ 250/trip	
4,680		Perdiem	\$ 65/day	
7,690	National Advisory Meetings	Project Staff Salary	\$18,000/year	4 in 1st. year; 2 each in 2nd through 5th Yr. 4 meetings in 1st. year; 2 each in 2nd through 5th years. 8 Trip -days per advisory meetings.
6,000		Travel	\$ 250/trip	
4,680		Perdiem	\$ 65/day	
100,000	Public Relations Firm (Sub-Contract)	Project logo, stationery Project Announcements, including posters Project Brochure	\$ 100,000	Required in 1st. and 2nd. years. \$60,000 first year and \$40,000 second Yr. Design and printing included 20,000 copies required
47,030	Magazine articles Technical writing and assistance	Project Staff Salary	\$ 19,200/year	140/days year, none in last year Regional 2/year; National 2/yr./country
14,526	Miscellaneous Promotion & Activities	Project Staff Salary	\$ 19,200/year	2 person months/year ; none in last year This will provide a national rep. in Panama not funded in last year and 1/2 of first Yr. Except first year (\$1,500) 1 each for Costa Rica, Honduras, Panama and El Salvador The Rep. and assistants will work on audit: response inquiries. None will be funded in last year and only half of first year.
77,559		Panama National Rep. Salary	\$ 19,200/year	
10,500		Travel Perdiem, etc.	\$ 3,000/year	
193,897		4 assistant rep. salaries	\$ 12,000/year	
14,000		Total Travel Perdiem, etc.	\$ 1,000/year/rep	

974

BUDGET SUMMARY DESCRIPTION

PROJECT COMPONENT: 3. POSITION

TOTAL COST	ITEM	SUB-ITEM	UNIT PRICE	REMARKS
67,140	Newsletter, Regional/ National	Project Staff Salary	\$19,200/year	56 days per newsletter/year 4 per year except in first year with 2 and none in last year.
14,000		Printing and Distribution	\$ 0.20/copy	10,000 per run regionally, same nationally for all countries
29,051	Brochures	Project Staff Salary	\$19,200/year	4 person months/year, none in last year.
16,000		Design (subcontracting)	\$ 1,000/brochure	3 regional and one national per year
16,000		Printing & Distribution	\$ 0.20/copy	20,000 per run
28,441	Case Studies	Project Staff Salary 1/4 year	\$19,200/year	3 person/months/year
3,750		Case Study Travel	\$ 250/case	3 case studies/per year
2,925		Travel & Perdiem	\$ 30/day	3 trip days per case
20,000		INCE Faculty	\$4,000/month	1 month/year
9,600		" Travel & Per- diem	\$1,920/month	Faculty and Graduate students
12,500		Printing by ICAITI	\$ 0.25/copy	Funs of 1,000 per case

A-9
P-15

BUDGET SUMMARY DESCRIPTION

PROJECT COMPONENT: 3. PROMOTION

TOTAL COST	ITEM	SUB-ITEM	UNIT PRICE	REMARKS
25,000	Seminars Regional, National, Industry	Hall Rentals	\$5,000/year	There will be a total of 11 seminars per year
25,000	Annual	Publicity (subcontract)	\$5,000/year	
24,067	Salaries	Project Staff	\$10,200/year	A total of 55 days of staff time/year for seminars
36,000	Exhibits	Equipment	\$6,000/unit	Portable exhibit 3 units/year for first 2 years - 6 units required
6,000	Design	C.A. firm sub-contracted for Exhibit Design	\$3,000/year	For first two years

BUDGET SUMMARY DESCRIPTION

PROJECT COMPONENT: 3. PROMOTION

TOTAL COST	ITEM	SUB-ITEM	UNIT PRICE	REMARKS
82,967	Consulting Inquiries	Staff Salary	\$15,600/year	500 energy consulting inquiries to ICATTI/year (Field Reps. and assistants will help) 1 day each inquiry. Only half of this will happen first yr. of project. Last 2 years will be funded by ICATTI.
45,000		Data Bank Search	\$ 200/search	Cost of using dialogue, etc. Assume 17% of inquiries require data bank search or 25 searches/first year then 50 each successive year.
	Quick Response Inquiries			2,000 quick response energy inquiries to ICATTI from all countries. Field Reps. and assistants will perform this work. This is costed under '15. Promotion activities.
7,585	Visits	Staff Salary	\$19,200/year	2 regional visits a year 1 person month/yr.
2,500	Regional	Travel	\$ 500/year	60 person days/year
1,300		Per diem	\$ 260/year	2 national visits a year per country
26,308		Staff Salary	19,200/year	
15,000		Travel	\$ 3,000/year	
3,900		Per diem	\$ 780/year	
1,014,086	TOTAL PROMOTION			

A-9
P-17

BUDGET SUMMARY DESCRIPTION

PROJECT COMPONENT: 4. DATA BASE & ANALYSIS

ITEM	SUB-ITEM	UNIT PRICE	REMARKS
59,200	Salaries US & CP	\$7,400/yr	\$35,500/year plus 150% OH and fee
8,500	Travel and Perdiem	8,500	
14,500	Computer Equipment	14,500	
8,000	Translation, Printing Library & Computer Science	8,000	
ICAITI			
63,994	ICAITI Personnel (Data Base & Management)	21,600/year	6 person months per year
4,000	Equipment	1,000/year	Beginning 2nd. year
6,000	Translation, Printing Library	6,000/year	Only 2nd. year
12,500	Computer Services	2,500/year	
5,000	Travel & Perdiem	1,000/year	
181,694	TOTAL DATA BASE		

19
P. 18

BUDGET SUMMARY DESCRIPTION

PROJECT COMPONENT: FINANCING & PUBLIC POLICY

TOTAL COST	ITEM	SUB-ITEM	UNIT PRICE	REMARKS
147,679	1. Finance			
75,000	SIICA Staff Time	260 days/Year	\$18,000/year	Professional Economists
35,000	Travel and Per Diem	30 days/Year	15,000/year	Travel within C.A., Panama and USA
	Publicity and Other Costs	Various	7,000/year	Hall Rentals, Publicity
53,128	2. <u>Current Policy Analysis</u>			
100,000	SIICA Staff Time	1/2 full time	\$18,000/year	Professional Economist
	Data Bank	Data Bank	20,000/year	Includes computer time, programming for both tasks 2 and 3
25,000	Travel and Per Diem	30 days/year	5,000/year	
20,000	Report Production	Price and Other Reports	0.20/copy	20,000 copies
45,000	3. <u>Medium and Long Range Policy Studies</u>			
25,000	SIICA Staff Time	1/2 full time	16,000-18,000/yr	Professional Economist
73,003	Travel and Per Diem	30 days/year	5,000/year	
	Overhead/Contingency			
600,000	TOTAL FINANCING & PUBLIC POLICY			

A-9
P-19

BUDGET SUMMARY DESCRIPTION*

PROJECT COMPONENT: MANAGEMENT

TOTAL COST	ITEM	SUB-ITEM	UNIT PRICE	REMARKS
15,000	Project Director	Travel	\$3,000/year	Annual visits to each country (9 trips/yr and meetings, etc.)
10,000	"	Per Diem	\$ 65/day	30 days/year
127,999	Deputy Director for Promotion	Salary	\$21,600/year	Full time over project life
10,000	Promotion	Travel	2,000/year	5 trips/year in region
6,500		Per Diem	65/day	4 days/trip
127,999	Deputy Director for Industry Program	Salary	21,600/year	
10,000		Travel	2,000/year	
6,500		Per Diem	65/day	
30,000	Communications	Communications	6,000/year	Cables, Telegrams, Telephone, etc.
120,000	Principal Project Consultant (US Firm - 12 months assignment)	Salary	80,000/year	Includes 60% Overhead + Fee
18,000		Allowances	18,000/year	Living, moving, school, etc.
5,000		Travel	5,000	Includes Family 2,500 each year
4,500		In-country Travel	4,500/year	6 trips/year to countries
3,100		Per Diem	\$ 58/day	30 days/year
3,000		Communication & Miscellaneous Expenses	2,000/year	Telephone, Telex, Misc.
497,580	TOTAL MANAGEMENT			
	*These assumptions and decisions were used to create the cost estimate. They are based on the explicit and implicit details of the project components. Budget worksheets have been prepared for each year and totals are included herewith.			

A-9
P. 20

I C A I T I

COMPARATIVE INCOME STATEMENTS (AUDITED)

For the Years Ending December 31, 1975 Through 1978

(US \$000)

	Fiscal Years Ended			
	<u>12/31/75</u>	<u>12/31/76</u>	<u>12/31/77</u>	<u>12/31/78</u>
<u>INCOME</u>				
Government Contributions	208	366	385	392
Contracts, Projects and Programs	1,139	940	411	745
Donations and Subsidies	28	42	25	4
Other	<u>108</u>	<u>315</u>	<u>55</u>	<u>82</u>
TOTAL INCOME	<u>1,483</u>	<u>1,663</u>	<u>876</u>	<u>1,223</u>
<u>EXPENSES</u>				
Cost of Contracts, Projects and Programs	1,443	1,333	868	1,494
Own Activities	33	51	63	70
Other	<u>---</u>	<u>131</u>	<u>100</u>	<u>59</u>
TOTAL EXPENSES	<u>1,476</u>	<u>1,515</u>	<u>1,031</u>	<u>1,623</u>
NET INCOME (LOSS)	<u><u>7</u></u>	<u><u>148</u></u>	<u><u>(155)</u></u>	<u><u>(400)</u></u>

ICAITI

COMPARATIVE INCOME STATEMENTS

For the Years Ending December 31, 1979 Through 1981

(US \$ 000)

	<u>Fiscal Year Ended</u>		
	<u>12/31/79</u> ^{1/}	<u>12/31/80</u> ^{1/}	<u>12/31/81</u> ^{2/}
<u>INCOME</u>			
Government Contributions	403	250	204
Contracts, Projects and Programs	553	1 629	2 693
Donations and Subsidies	23	5	
Other	<u>109</u>	<u>184</u>	<u>264</u>
TOTAL INCOME	<u>1 088</u>	<u>2 068</u>	<u>3 161</u>
<u>EXPENSES</u>			
Cost of Contracts, Projects and Programs	666	1 277	2 845
Own Activities	346 *	678 **	283
Other	<u>75</u>	<u>6</u>	<u>43</u>
TOTAL EXPENSES	<u>1 087</u>	<u>1 961</u>	<u>3 171</u>
NET INCOME (LOSS)	1 =====	107 =====	(10) =====

* \$290 correspond to own activities and \$56 correspond to Contracts & Projects.

** \$282 correspond to own activities and \$396 correspond to Contracts & Projects.

1/ Source: Audited Financial Statements

2/ Source: Unaudited Financial Statements

ICAITI

(US \$000)

	<u>Revenues</u>	<u>Expenditures</u>	<u>Income (Loss)</u>
Projects and Laboratory Services	2 694	2 846	(152)
Government Contributions	204	-	204
Norms and Standards Division	-	40	(40)
Services Not Chargeable to Projects	-	242	(242)
Other Income or Expenditures	246	26	220 (*)
	-----	-----	-----
Total	3 144	3 154	(10)
	=====	=====	=====

(*) Current and Previous Years Adjustments:

Patents amortization,
Pension Plan regularization,
Interest and sale of publications,
Cost Variances,

ICAITI

CONDENSED COMPARTIVE BALANCE SHEETAs of December 31, 1979 through
1981

(In \$ 000)

<u>ASSETS</u>	AS OF		
	<u>12/31/79^{1/}</u>	<u>12/31/80^{1/}</u>	<u>12/31/81^{2/}</u>
<u>Current Assets</u>			
Cash in Bank	16	217	76
Account Receivable C.A. Governments, Ordinary	394	544	739
Account Receivable C.A. Governments, Extraordinary	300	600	900
Accounts Receivable, Other	325	270	566
Projects in Process	888	961	
Inventory	83	87	79
Other	<u>76</u>	<u>81</u>	<u>36</u>
	2 082	2 760	2 396
Employee Benefit Fund	684	777	739
<u>Fixed Assets (Net)</u>	<u>566</u>	<u>608</u>	<u>702</u>
Total Assets	<u>3 332</u>	<u>4 145</u>	<u>3 971</u>
<u>LIABILITIES AND EQUITY</u>			
<u>Current Liabilities</u>			
Accounts Payable	<u>210</u>	<u>215</u>	<u>250</u>
Accumulated Leave	<u>60</u>	<u>68</u>	<u>80</u>
	270	283	330
Long Term Loans Payable	277	277	277
<u>Employee Benefit Fund</u>	<u>812</u>	<u>927</u>	<u>980</u>
<u>Deferred Credits</u>			
Loans Payable	<u>12</u>	<u>51</u>	<u>35</u>
Projects Advances	<u>750</u>	<u>839</u>	<u>95</u>
	762	890	130
<u>EQUITY</u>			
Paid in Capital	517	624	615
C.A. Government Ord. Quotas	394	544	739
C.A. Government Ext. Quotas	300	600	900
	<u>1 211</u>	<u>1 768</u>	<u>2 254</u>
Total Liabilities and Equity	<u>3 332</u>	<u>4 145</u>	<u>3 971</u>

1/ Audited Financial Stat.
2/ Unaudited Financial Statements

ICAITI

ANALYSIS OF PAID-IN CAPITAL ACCOUNT AS
OF 12/31/81
(US \$000)

	<u>Balance</u> <u>12/31/80</u>	<u>1 9 8 1</u>		<u>Balance</u> <u>12/31/81</u>
		<u>Increases</u>	<u>Decreases</u>	
Previous Balance	624			624
Vacation and Fringe Benefits		7		7
Application Cost/Revenue from Operation		3 023	3 151 ^f	(128)
Pension Plan		135	108	27
Patent			4	(4)
Previous Years Adjustment		2	1	1
Cost Changes	<u> </u>	<u>87</u>	<u> </u>	<u>87</u>
TOTAL	<u>624</u> ***	<u>3 254</u> *****	<u>3 264</u> *****	<u>614</u> ***

ICAITICENTRAL AMERICAN GOVERNMENTS CONTRIBUTIONS
AMOUNTS ASSIGNED BY COUNTRY FOR YEARS 79/81

(US \$ 000)

<u>ORDINARY QUOTAS</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>
Costa Rica	75	75	75	75
El Salvador	75	75	75	75
Guatemala	100	100	100	100
Honduras	75	75	75	75
Nicaragua	<u>75</u>	<u>75</u>	<u>75</u>	<u>75</u>
	400 ===	400 ===	400 ===	400 ===
 <u>EXTRAORDINARY QUOTAS</u>				
Costa Rica	75	75	75	75
El Salvador	75	75	75	75
Guatemala	75*	75*	75*	75*
Honduras	75	75	75	75
Nicaragua	<u>75</u>	<u>75</u>	<u>75</u>	<u>75</u>
	375 ===	375 ===	375 ===	375 ===

* Paid only by Guatemala and covered with services given by the Norms and Standards Division to Coquanor.

ICAI
STATUS OF CENTRAL AMERICAN GOVERNMENT
CONTRIBUTIONS AS OF 12/31/81
(US \$ 000)

	<u>Outstanding Balance 12/31/80</u>	<u>1981 Ordinary Quotas</u>	<u>Total</u>	<u>Payments Rcvd. 1981</u>	<u>Outstanding Balance</u>		<u>Last Payment Made</u>
					<u>Amount</u>	<u>Period</u>	
Costa Rica	18	75	93	29	64	1981	1981
El Salvador	75	75	150		150	1980/81	1979
Guatemala		100	100	100	-		
Honduras	23	75	98	75	23	1976*	1981
Nicaragua	<u>427</u>	<u>75</u>	<u>502</u>	<u> </u>	<u>502</u>	1975/81**1978***	
TOTALS	<u>543</u>	<u>400</u>	<u>943</u>	<u>204</u>	<u>739</u>		

* Increased quota for 1976 over 1975

** One quota of \$52, rest of \$75

*** Payment of \$52 for 1974 quota

ICAITI

BUDGET EXECUTION

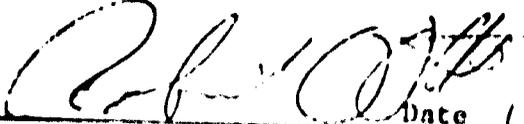
(US \$ 000)

	<u>ITEM</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
I	Personnel Services	1 198	1 299	1 533
II	Training (training Scholarships)	-	-	-
III	Equipment, Materials and Supplies	188	231	199
IV	Other Operative Expenses	<u>233</u>	<u>311</u>	<u>346</u>
	TOTAL	<u>1 619</u>	<u>1 841</u>	<u>2 078</u>

LAC/DR-IEE-82-6

ENVIRONMENTAL THRESHOLD DECISION

Project Location : Central America and Panama (ROCAP)
Project Title and Number : Regional Industrial Energy Efficiency
No. 596-0095
Funding : \$6,000,000
Life of Project : FY 82 - 86
IEE Prepared by : Peter P. Lopera
Asst. Project Development Officer
Recommended Threshold Decision : Negative Determination
Bureau Threshold Decision : Concurrence with Recommendation
Action : Copy to Paul A. Montavon
Director, ROCAP
: Copy to Peter B. Lopera
: Copy to Peter Orr
: Copy to Carl Duisberg
: Copy to IEE file


Date 17 Jun 82

Robert O. Otto
Chief Environmental Officer
Bureau for Latin America
and the Caribbean

INITIAL ENVIRONMENTAL EXAMINATION

Project Location: Central America and Panama

Funding: FY 82-86 \$6,000,000

IEE Prepared by: Peter B. Lopera Date: 12/18/81
Asst. Project
Development Officer

Environmental Action Recommended: Negative Determination

Concurrence: Paul A. Montavon Date: 12/18/81
Paul A. Montavon
Director, ROCAP

Assistant Administrator's Decision:

Approval _____ Date: _____

Disapproval _____

services and exchange activity, newsletters, bulletins, and case studies will include discussions of the impact of energy uses and technologies in the environment.

Questions of environmental impact will be dealt with most directly in the technical assistance provided to industries. Energy audits will examine the environmental impact of the existing energy uses. Recommendations will be made on such items as boiler tune-ups, pipe cleaning, and recovering flue heat or exhaust gases, which are expected to have positive effects on the environment by diminishing thermal pollution. When recommendations for new or innovative technologies are made, special emphasis will be placed on positive environmental impacts. Such recommendations might include the fluidized combustion or gasification of industrial and urban refuse, the utilization of coffee pulp for drying coffee beans and methane generation from animal wastes.

All research conducted under the project will consider the effects of the transfer, adoption, and demonstration of new technologies on the environment. The research will identify and recommend against any negative impacts of a given new technology. Policy studies undertaken by SIECA/COMENER will also include the environmental impacts of given courses of action as a topic for analysis. For example, studies on alternative fuels or potential substitutes for oil, such as sugar based alcohol or coal, will consider possible impacts on the environment.

III. Conclusion and Recommendation

Based on the above considerations, ROCAP believes that the project will have beneficial impacts on the regional environment. Therefore, ROCAP recommends a negative determination.

INITIAL ENVIRONMENTAL EXAMINATION

I. Project Description

The purpose of the project is to improve energy efficiency in industry and to reduce industrial consumption of imported petroleum by introducing (1) energy audits, (2) conservation measures, (3) energy-efficient machinery, and (4) small and medium scale alternative energy technologies. The project will accomplish this purpose through the cooperative efforts of ICAITI, SIECA/COMENER, FECAICA and the Central American national chambers of industry.

Specifically the activities to be carried out by these institutions are:

1. Energy and technical information data base generation and maintenance;
2. Stimulation and promotion of energy concern among industries;
3. Information dissemination to be used as a basis for discussion and action in industries, including the promotion of a "spread effect" among industries, through employees and public media;
4. Technical assistance to industries as they become able and willing to apply it;
5. Demonstration of existing or adopted technologies for energy saving or substitution;
6. Analysis of energy policy measures that would encourage or alleviate hindrances to fuel efficient innovations.

II. Identification and Evaluation of Environmental Impacts

The impact of existing and prospective energy technologies on the environment will be a major consideration in all six activities described above. In the development of the energy and technical information data base, information on the environmental impact of energy use by different categories of industry will be gathered. Promotional activities with industries carried out by FECAICA and the national chambers of industry will stress awareness of the beneficial aspects of energy efficiency. In the technical information

IV. IMPACT IDENTIFICATION AND EVALUATION FORM

Impact
Identification
and
Evaluation^{1/}

Impact Areas and Sub-areas

A. LAND USE

1. Changing the character of the land through:
 - a. Increasing the population..... N
 - b. Extracting natural resources..... N
 - c. Land clearing..... N
 - d. Changing soil character..... N
 2. Altering natural defenses..... N
 3. Foreclosing important uses..... N
 4. Jeopardizing man or his works..... N
 5. Other factors
- _____
- _____

B. WATER QUALITY

1. Physical state of water..... N
 2. Chemical and biological states..... N
 3. Ecological balance..... N
 4. Other factors:
- _____
- _____

^{1/} Use the following symbols: N - No environmental impact
L - Little environmental impact
M - Moderate environmental impact
H - High Environmental Impact
U - Unknown environmental impact
D - Direct effect
I - Indirect effect

IMPACT IDENTIFICATION AND EVALUATION FORM

C. ATMOSPHERIC

- 1. Air additives..... N
 - 2. Air pollution..... L
 - 3. Noise pollution..... N
 - 4. Other factors
-
-

D. NATURAL RESOURCES

- 1. Diversion, altered use of water..... N
 - 2. Irreversible, inefficient commitments..... N
 - 3. Other factors
-
-

E. CULTURAL

- 1. Altering physical symbols..... N
 - 2. Change of cultural traditions..... N
 - 3. Other factors
-
-

F. SOCIO ECONOMIC

- 1. Changes in economic/employment patterns..... N
 - 2. Changes in population..... N
 - 3. Changes in cultural patterns..... N
 - 4. Other factors
-
-

IMPACT IDENTIFICATION AND EVALUATION FORM

G. HEALTH

- | | |
|--|------------------|
| 1. Changing a natural environment | <u> N </u> |
| 2. Eliminating an ecosystem element..... | <u> N </u> |
| 3. Other factors | |
| _____ | _____ |
| _____ | _____ |

H. GENERAL

- | | |
|--------------------------------|------------------|
| 1. International impacts..... | <u> N </u> |
| 2. Controversial impacts..... | <u> N </u> |
| 3. Larger program impacts..... | <u> N </u> |
| 4. Other factors. | |
| _____ | _____ |
| _____ | _____ |

I. OTHER POSSIBLE IMPACTS (not listed above)

_____	_____
_____	_____
_____	_____

INTENTIONALLY
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ENERGY STUDIES AND DOCUMENTS PRODUCED BY SIECA

1. Electric networks interconnection of the five Central American countries Projection for year 1980. Document No. SIECA/INFR/121, April 26, 1966.
2. Preliminary plans for the Central American Agreement on the Electrical Systems Interconnection.
3. Some considerations on the price increase of Petroleum and its derivatives in Central America. Document No. SIECA/RMECA-IV/D.T. November 4, 1971.
4. Some considerations on the future consumption of Petroleum in C.A. and possibilities to install unreconstituent oil refineries.
5. Miscellaneous documents for presentation at the technical meeting on Energy and Petroleum, held in Guatemala on February, 1975.
6. Price growth of crude oil and its derivatives in Central America. Document No. SIECA/75/Inf/ June 23, 1975.
7. Considerations on an Action Plan in the Central American Energy Sector with special emphasis in the possibilities offered by the short-term electric development. Document No. SIECA/RMECA-XV/D.T. September 3, 1975.
8. Considerations on the Central American Imports of Petroleum and Fuels derivatives from Petroleum. Document No. SIECA/RMECA-XVII/D.T. December 6, 1976.
9. Observations on the behaviour of the C.A. fuel imports during the 1967-1976 decade and its effect on the economies. Document from SIECA-BID Project, February 1977.
10. Status of the Energy in C.A. and cooperation possibilities with Venezuela - Joint Report between SIECA and the Secretariat of the Central American Monetary Council, April 1977.
11. Information on Energy and Petroleum in Central America. Document No. SIECA/77/INF/ April 7, 1977.
12. An Energy Demand Model for Central America. Document No. MECA/ECID/SIECA, May, 1977.
13. Activities developed in Central American Energetic Planning. Document No. SIECA/78/INF March 7, 1978.
14. Characteristics of the main electrical tariffs in Central America. Document No. SIECA/78/INF/12, April, 1978.

15. The Energy Status in C.A. and Perspectives for the Future. Document SIECA/78/INF/ August 14, 1978.
16. Evaluation of the Status of Central American Renewable Energy Resources and Possible Technologies for its Use. Document No. SIECA/78/INF/ November 19, 1978.
17. Some effects for Central America from the Increases agreed upon by OPEC for Petroleum, which will be effective in 1979. Document No. SIECA/79/INF/1.
18. Global test of the Energy Status and its Effects in the member countries of the CACM. Suggestions on possible ways to deal with such situation. Document No. SIECA/REMECA/V-III/D.T. April 2, 1979.
19. Considerations on the price System applicable to Petroleum and its main derivatives. Document No. SIECA/79/GNA-24, May, 1979.
20. Commercialization of the Fuels derivatives from Petroleum in C.A. Document No. SIECA-79/COMENER-11/D.T. November 3, 1979.
21. Situation of the Energy Sector in the Member Countries of the CACM. Document No. SIECA/INFRA/79 November 14, 1979.
22. Measures recommended for study to the Government of Reconstruction in Nicaragua to diminish the Energy Crisis Effects. Document No. SIECA/INFRA/79 October 12, 1979.
23. Alternate Sources of Energy in Central America. Document No. SIECA/80/INF September 22, 1980.
24. Technology for the utilization of Alternate Energy Sources. Document No. SIECA/80/INF September 21, 1980.
25. Development of Small Hydraulic Central Stations in Central America and the Small Industry. Document No. SIECA/INF October 25, 1980
26. Nairobi Conference Recommendations for development of Utilization of New and Renewable Energy Sources. Document No. SIECA/INF-81 October 13, 1981.
27. Considerations on Technology to Use Renewable Energetic Resources in Central America. Document No. SIECA/81/INF November 17, 1981.
28. Behaviour of the Energy Sector in 1981 in the Central American Common Market Countries. Document SIECA/INFRA/82 April 2, 1982.

ANNEX B-1

Analysis of Industrial Energy Questionnaires and Available Data

1. Targeting Process

This analysis of industrial questionnaires and related available data was prepared to identify:

- . Major energy users by category
- . Industrial energy use by form or type
- . Major energy consuming processes and operations
- . Existing efforts and constraints in terms of technical factors, management, and information, and
- . Potential targets of the program.

National data were reviewed to establish the major energy users and their types of energy. The Clasificación Internacional Industrial Uniform (CIIU) was used to establish the categories.

A set of industrial profiles was prepared for five of the countries and these were examined to prepare a list of major energy users as shown in the following Table No. _____. In addition, a value added table was prepared to show relative importance in the economy and thus add another factor to the selection of targets process.

These tables plus other available data were used to select the five major energy using industries in each country. Individual country reports were used to establish priorities for Nicaragua and combustible estimates for Guatemala and Panama. These five major industries for each country were selected from a weighted average of combustible and electrical energy use considering that the combustibles or petroleum derivatives make up approximately 85-90% of the industrial commercial energy. These five were then checked against the value added table to show their relative economic position in each country. In all six countries CIIU 311, Food, was first and CIIU 313, Beverages, was second. The following three places included textiles, wood products, chemicals, petroleum refineries, and non-metallic products as shown in the following table, "Project Candidades Showing Number of Plants".

TABLE 1
MAJOR ENERGY USERS IN REGION*

CIIU	Industrial Sector	Guat.		Hond.		El Salv.		C.R.		Panamá ***	
		E	C	E	C	E	C	E	C	E	C
311	Food Ex. Beverages	X	N.A.	X	X	X	X	X	X	X	N.A.
313	Beverages	X		X	X	X	X		X		
321	Textiles	X		X	X	X	X		X		
331	Wood Products			X	X						
341	Pulp & Paper	X				X					X
351	Industrial Chemicals							X	X		
352	Other Chemicals	X		X	X	X		X	X		
353	Petroleum Refineries	X		X	X	X	X				
355	Rubber Products	X						X			
362	Glass	X									
369	Non-Metallic**	X		X	X	X	X				X
371	Iron and Steel	X		X	X	X	X				X
381	Metal Products	X						X	X		
382	Machinery			X							
383	Electrical Mach.					X					
390	Other										X

E = Electric Energy
 C = Combustible (Petroleum Derivatives)
 N.A. = Not Available
 * Data from Nicaragua were not available in this format
 ** 369 includes #3691 which is cement and is largest energy user in category
 *** Panamanian industrial data do not include the refinery.

TABLE 3
PROJECT CANDIDATES SHOWING NUMBER OF PLANTS

CIU	Industrial Sector	Guatemala	El Salvador	Costa Rica	Honduras	Nicaragua	Panama
311	Food, ex. Beverages	515**	213	692	182	542	186
313	Beverages	26	25	31	18	8	19
321	Textiles	113	73	84	x	104	7
331	Wood Products				106		x
341	Pulp and Paper						
351	Industrial Chemicals{						
352	Other Chemicals)	106		76		25	34
353	Petroleum Refineries		1		1		x
355	Rubber Products	x		x			
362	Glass	x					
369	Non Metallic Products*	(136)	(102)	(138)	(47)	(78)	(40)
371	Iron and Steel	x					
381	Metal Products	x	x	x	x		
382	Machinery						
383	Electrical Machinery						
390	Other						x
	Total: 3187	760	312	883	307	679	246

Code: x indicates other large users of energy suitable as future targets.

* CIU 369 includes major energy user cement which has not been selected as primary candidate.

** Numbers of companies in CIU based upon 1975 data for Guatemala, El Salvador, Costa Rica, and Honduras and 1976 data for Panama.

Source of Data: See Annex B1 for major data tables.

CIIU 369, Non-Metallic Products was dropped from the targeting process as it is only the small number of plants producing cement in this category which are a large energy user. It was not believed that the Central American cement plants, which generally need a major process change from wet to dry were a good candidate from ICAITI's perspective.

Using the numbers of plants as a guide to replicability of results, CIIUs 311, 313, 321 and 351 with 352 as combined in the value added table, were selected as the principal targets. These four industries of food, beverages, textiles, and chemicals for the six countries total 3263 plants as shown below.

	<u>Guate.</u>	<u>El Salv.</u>	<u>C.Rica</u>	<u>Hond.</u>	<u>Nic.</u>	<u>Pan.</u>
Food	515	213	692	182	542	186
Beverages	26	25	31	18	8	19
Textiles	113	73	84	20	104	7
Chemicals	<u>106</u>	<u>58</u>	<u>76</u>	<u>27</u>	<u>25</u>	<u>34</u>
Total: 3263	760	369	883	326	679	246

Based upon this evaluation using major energy users, known energy consuming processes and operations with established and available techniques, value added rankings, numbers of plants in categories, and ICAITI's traditional clients in providing services; these four industries producing over 57% of the value added in the region were selected as the project targets.

2. Questionnaire Review

Industrial questionnaires* were developed and distributed as described in the E.C. Hill Report** to 1601 industries and 839 commercial establishments. As of March, 1982, 257 had been received and were tabulated. An additional number (approximately 25) have since been received and others are being received and are being tabulated.

In order to answer certain specific questions; two selected sets of questionnaires, one including only Guatemalan responses to be used in preparation for field visits, and the other containing a selection from Honduras, Costa Rica, El Salvador and Guatemala were further examined. It should be noted that government policy prevented Nicaraguan responses and the lack of a Panama ICAITI representative limited the completeness of Panamanian returns.

* A sample questionnaire appears at the end of this Annex.

**Regional Industrial Energy Efficiency Project Baseline Data Survey Study, ROCAP, March, 1982.

Since certain aspects of the industrial program will focus on energy efficiency technologies by type of industry, a brief review of 1-digit CIIU Code, which was included on the computer printout, was made.

CIIU	Sector	Guatemalan Sample		Regional Sample	
		# Responses	%***	# Responses	%***
1	Food	14	19	34	22
2	Textiles	15	20	23	15
3	Lumber	1	1	9	6
4	Pulp & Paper	5	7	7	4
5	Chemicals	19	25	37	23
6	Non-Metallic	4	5	9	6
7	Metallic	2	3	1	1
8	Machinery	8	11	25	16
9	Other	7	9	12	8
		<u>75</u>		<u>158</u>	

With no breakdown in the CIIU Codes of the questionnaires distributed, this is only usable as a general statement of interest in an energy program. It does show, however, that an evaluation of this type would be useful in action priorities. It would be extremely useful for example in selecting the first set of high impact demonstrations.

The two sets of surveys were then evaluated to determine the need for an industrial program of this nature. Question No.8 (see sample questionnaire at back of Annex) asks if an energy program has been established at the company site. The Guatemalan sample showed a "yes" answer of 18 or 24% and the regional sample showed 46 or 29%. These low percents indicate a potential for services in developing a conservation program. In addition, the Guatemalan sample was checked to establish the relation between those companies which answered "much" to question #7 on level of importance of energy costs and their need for an energy program. Only 33% of those who indicated "much" had developed a company energy program, thus further showing the need for a program.

Next the electrical energy questions were reviewed to determine nature of the answers. There appeared to be confusion over questions 13 and 14 which asked about voltage, power factor, and maximum demand. A subjective review was made to determine if the answers appeared reasonable. If they did not appear logical in terms of the overall questionnaire, it was believed that they could use assistance in electrical energy efficiency activities. In the Guatemalan sample, 76% did not understand and in the regional sample 82% did not understand indicating that there is a role for ICAITI services in developing electricity conservation activities through improving power factor and load management. Similarly, a cross tabulation of those who checked mechanical energy as their largest energy use in the Guatemalan sample

with those who did not understand showed that 42% did not understand. Additional analyses are needed on this aspect of energy use to determine who precisely needs assistance with electricity management.

In the regional sample, 82% showed mechanical energy as their largest use with heat shown as largest use in 32%. As the second largest use, heat was shown in 21%, lighting in 20% and drying in 13% of the cases. No cross tabulations were done, but the leading energy uses were identified.

Next a check of waste materials was done in the regional sample. Sixty two percent indicated that they had wastes with 15% showing organic residues and 14% showing contaminated water. Further analysis is necessary to determine opportunities for either reuse of heat content or material content. Of the 158 companies in the regional sample, 27% had surplus hot air, 20% had surplus hot water and 17% steam. Those with no waste heat numbered 57 or 36%. Again, additional analysis on these opportunities will be an early priority of the energy program.

This brief review of the questionnaires performed by ICAITI staff engineers and Development Sciences indicates the types of analyses which should be continued and expanded in the future and also establishes some energy saving technology priorities for the program.

The Hill report reviewed the principal barriers to industrial improvement of energy use. The results to question number 10 showed that financing was cited as the major barrier in 40% of the responses. The need for information was second with 21% followed by the need for technical assistance in 12% of the responses. A lack of financial incentives was listed by 8%, a lack of trained personnel by 7% and 12% listed other.

The DSI/ICAITI plant visits (See Annex B-2) were not very extensive, but in each case, financing was stressed as the limiting factor to the adoption of new techniques. It appeared, however, that in the plants under non-American ownership, without ready access to American methods of developing energy conservation programs, that there was a lack of knowledge and specific personnel trained in energy related matters. To provide assistance in solving that problem, it has been recommended that ICAITI plan to modify and offer the training program as developed under the project to relevant industrial plant engineers.

It should be noted that interest in the subject of industrial energy audits in the region is growing. The electrical authority in Panama, IRHE, is presently providing an audit program to industry under IBRD financing and French training. In addition there is a private American consulting group providing limited audits in Costa Rica. They appear to specialize

in measuring electrical and steam uses, but additional information was unavailable. Exxon is presently offering boiler evaluations to customers in Panama and Nicaragua, but these also are limited services. There is certainly a need and desire for additional services which ICAITI could provide across Central America.

A review of the questionnaires, as already described, plus the plant visits, additional conversations and corporate experience have produced a list of easily adapted measures which are of high interest. These are shown on the following table by order of priority.

INDUSTRIAL ENERGY EFFICIENCY BY PRIORITY BASED UPON NEED
AND COST

STEP

1. MAINTENANCE OR HOUSEKEEPING PROCEDURES FOR ALL ENERGY USING EQUIPMENT
 - a. Combustion Efficiency on Burners
 - b. Cleaning of Boilers and Heat Exchanges
 - c. Identification of Steam Leaks
 - d. Optimization of Electrical Units
 - e. Review of Buildings for Lighting, Heating, Cooling Changes
2. DATA COLLECTION, TABULATION, AND ANALYSIS OF ELECTRICAL AND THERMAL ENERGY USE
 - a. Organization of Records to Encourage Standards of Energy Use by Process or Department
 - b. Review of all Metering Equipment of Energy Uses
 - c. Development of Energy Plan Including Personnel Program and Selection of Energy Coordinator
3. TRACING OF THERMAL ENERGY
 - a. Review Possible Changes for Boilers and/or Furnaces: Replacement or Modification, Preheat Air, Recover Waste Heat, Add Insulation, Reuse Condensate
 - b. Evaluate Fuel Substitution: Use of Waste Materials or Renewable Alternatives
4. TRACING OF ELECTRICAL ENERGY
 - a. Review Billing Procedures: Minimize Peak Demands
 - b. Evaluate Size and Timing of Units
 - c. Evaluate Co-Generation
5. OPTIMIZE ENERGY USE AS APPROPRIATE
 - a. Develop Energy Balances to Determine Energy Alternatives
 - b. Evaluate Plant Processes and Operations to Identify Potential Changes
 - c. Evaluate Investments in Energy and Process Changes

<u>INDUSTRIAL PROFILE OF EL SALVADOR* (1979)</u>		<u>No. of Estab**</u>	<u>Electric Energy Consumed KWH</u>	<u>Combustibles Lubricants 000 of \$ C.A.</u>
<u>CIIU</u>	<u>INDUSTRIAL SECTOR</u>			
311	Food Except Beverages	213	60.5	3,424
312	Food: Diverse Products	21	7.7	288
313	Beverages	25	16.3	1,330
314	Tobacco	1	1.7	77
321	Textiles: Production	73	99.5	2,542
322	Clothing Except Shoes	135	6.8	192
323	Leather Production and Products	17	1.6	126
324	Shoes	57	7.5	201
331	Wood Products, ex. Furniture	18	0.3	55
332	Furniture	66	0.8	88
341	Pulp and Paper Products	9	13.0	453
342	Printing	95	6.1	126
351	Industrial Chemicals	7	13.4	262
352	Other Chemical Products	51	6.5	407
353	Petroleum Refineries	1	12.3	3,302
354	Other Derivatives of Oil & Coal	-	-	-
355	Rubber Products	18	3.3	120
356	Plastic Products	25	10.9	101
361	Clay Products	3	0.0	3
362	Production of Glass & Glass Products	2	0.1	4
369	Fabrication of Other Non- Metallic Products	102	54.4	6,410
371	Basic Iron & Steel Industry	5	4.2	146
372	Basic Nonferrous Industry	3	4.4	82
381	Fabrication of Metal Products ex Machinery	79	5.8	309
382	Fabrication of Machinery Ex. Electrical	28	2.6	236
383	Fabrication of Electrical Machinery, etc.	19	11.1	233
384	Transportation Equipment	12	0.3	30
385	Professional and Scientific Equip.	7	0.3	8
390	Other Manufacturing	36	2.0	110
		1128	1101.0	20,665

*Department of Statistics & Census, El Salvador
1979

**Establishments over 5 individuals

INDUSTRIAL PROFILE OF COSTA RICA

<u>CIU</u>	<u>INDUSTRIAL SECTOR</u>	<u>No. of</u>	<u>Electric</u>	<u>Combustibles</u>
		<u>Establishments</u>	<u>Energy Consumed</u> (Pesos CAX10 ³)	<u>(Pesos CAX10)</u>
311	Food Except Beverages	692	2,155	3,330
312	Food: Diverse Products	78	292	230
313	Beverages	31	284	742
314	Tobacco	5	0	102
321	Textiles: Production	84	1,632	826
322	Clothing Except Shoes	476	163	70
323	Leather Production and Products	77	26	62
324	Shoes	97	3	11
331	Wood Products, ex. Furniture	209	492	293
332	Furniture	378	91	63
341	Pulp and Paper Products	20	112	194
342	Printing	93	138	69
351	Industrial Chemicals	9	533	690
352	Other Chemical Products	67	166	234
353	Petroleum Refineries	-	-	-
354	Other Derivatives of Oil & Coal	-	-	-
355	Rubber Products	15	735	258
356	Plastic Products	24	649	104
361	Clay Products	16	6	13
362	Production of Glass & Glass Products	6	46	297
369	Fabrication of Other Non-Metallic Products	138	694	380
371	Basic Iron & Steel Industry	15	27	345
372	Basic Nonferrous Industry	3	112	79
381	Fabrication of Metal Products ex Machinery	199	419	347
382	Fabrication of Machinery Ex. Electrical	38	482	61
383	Fabrication of Electrical Machinery, etc.	30	374	175
384	Transportation Equipment	29	44	182
385	Professional and Scientific Equip.	5	-	0
390	Other Manufacturing	36	74	28
		<u>2870</u>	<u>9749</u>	<u>9192</u>

SOURCE: Census of Manufacturers, Statistics & Census, Costa Rica, 1975

<u>INDUSTRIAL PROFILE OF GUATEMALA*</u> 1979		<u>No. of</u> <u>Estab.</u>	<u>Electric</u> <u>Energy</u> <u>Consumed</u> (GWH)
<u>CLIU</u>	<u>INDUSTRIAL SECTOR</u>		
311	Food Except Beverages	515	71.7
312	Food: Diverse Products	57	5.7
313	Beverages	26	9.5
314	Tobacco	16	2.7
321	Textiles: Production	113	53.1
322	Clothing Except Shoes	227	4.4
323	Leather Production and Products	35	1.8
324	Shoes	57	1.2
331	Wood Products, ex. Furniture	123	2.6
332	Furniture	104	0.7
341	Pulp and Paper Products	16	13.3
342	Printing	143	3.4
351	Industrial Chemicals	15	4.4
352	Other Chemical Products	91	7.0
353	Petroleum Refineries	2	3.8
354	Other Derivatives of Oil & Coal	2	0.1
355	Rubber Products	21	10.6
356	Plastic Products	46	8.9
361	Clay Products	11	0.1
362	Production of Glass & Glass Products	7	22.1
369	Fabrication of Other Non- Metallic Products	136	59.8
371	Basic Iron & Steel Industry	12	10.3
372	Basic Nonferrous Industry	1	0.1
381	Fabrication of Metal Products ex Machinery	113	7.4
382	Fabrication of Machinery Ex. Electrical	13	0.5
383	Fabrication of Electrical Machinery, etc.	33	1.8
384	Transportation Equipment	23	1.0
385	Professional and Scientific Equip.	4	0.1
390	Other Manufacturing	35	0.8
		1999	308.8

*SOURCE: Industrial Survey, Dept. of Statistics
1975

INDUSTRIAL PROFILE OF HONDURAS - 1975

<u>CTIU</u>	<u>INDUSTRIAL SECTOR</u>	<u>No. of Estab.</u>	<u>Electric Energy (Consumed (TWh))</u>	<u>Combustibles Lubricants Pesos C.A.x10³</u>
311	Food Except Beverages	182	52.9	2,823
312	Food: Diverse Products	27	4.1	314
313	Beverages	18	11.2	693
314	Tobacco	8	2.1	131
321	Textiles: Production	20	17.1	548
322	Clothing Except Shoes	85	2.2	25
323	Leather Production and Products	17	1.7	63
324	Shoes	76	0.2	11
331	Wood Products, ex. Furniture	106	17.7	1,953
332	Furniture	56	1.4	70
341	Pulp and Paper Products	7	3.0	131
342	Printing	55	1.5	71
351	Industrial Chemicals	3	1.4	8
352	Other Chemical Products	24	4.0	334
353	Petroleum Refineries	1	11.6	1,740
354	Other Derivatives of Oil & Coal	-	-	-
355	Rubber Products	16	2.6	96
356	Plastic Products	12	6.4	69
361	Clay Products	6	0.4	42
362	Production of Glass & Glass Products	-	-	-
369	Fabrication of Other Non- Metallic Products	47	41.4	3,720
371	Basic Iron & Steel Industry	-	-	-
372	Basic Nonferrous Industry	-	-	-
381	Fabrication of Metal Products ex Machinery	45	5.5	287
382	Fabrication of Machinery Ex. Electrical	4	0.2	13
383	Fabrication of Electrical Machinery, etc.	9	0.6	17
384	Transportation Equipment	4	0.0	1
385	Professional and Scientific Equip.	3	0.0	0
390	Other Manufacturing	18	0.2	19
		845	189.4	13,164

SOURCE: Department of Statistics and Census,
Honduras, 1977

<u>INDUSTRIAL PROFILE OF PANAMA* (1976)</u>		<u>No. of Establishments**</u>	<u>Electric Energy Consumed/G/H</u>
<u>CIU</u>	<u>INDUSTRIAL SECTOR</u>		
311	Food Except Beverages	186	92.7
312	Food: Diverse Products	11	1.4
313	Beverages	19	15.4
314	Tobacco	2	1.4
321	Textiles: Production	7	1.4
322	Clothing Except Shoes	74	9.0
323	Leather Production and Products	7	9.0
324	Shoes	15	1.4
331	Wood Products, ex. Furniture	23	5.3
332	Furniture	43	2.2
341	Pulp and Paper Products	15	14.7
342	Printing	41	4.7
351	Industrial Chemicals	5	3.6
352	Other Chemical Products	29	4.6
353	Petroleum Refineries	-	-
354	Other Derivatives of Oil & Coal	-	-
355	Rubber Products	6	0.7
356	Plastic Products	11	7.8
361	Clay Products	-	-
362	Production of Glass & Glass Products	6	0.2
369	Fabrication of Other Non-Metallic Products	40	39.3
371	Basic Iron & Steel Industry	3	3.7
372	Basic Nonferrous Industry	3	0.8
381	Fabrication of Metal Products ex Machinery	49	5.7
382	Fabrication of Machinery Ex. Electrical	8	0.3
383	Fabrication of Electrical Machinery, etc.	9	1.1
384	Transportation Equipment	6	0.3
385	Professional and Scientific Equip.	3	0.2
390	Other Manufacturing	16	32.5
		<u>637</u>	<u>251.1</u>

*Source: Division of Statistics & Census, Panama/76

**Companies over 5 individuals

CENTRAL AMERICA: VALUE ADDED BY INDUSTRIAL SECTOR IN PER CENTS 1979

	Central America	Guatemala	El Salvador	Honduras	Nicaragua	Costa Rica
<u>Industrial Sector</u>						
311 Food Products, except beverages	30.5	27.3	27.7	28.9	40.2	30.9
313 Beverages	12.1	13.4	10.5	11.0	12.0	12.7
314 Tobacco	4.5	4.9	3.9	3.4	5.3	4.0
321 Textiles	7.2	10.0	10.1	7.2	4.9	4.6
322, 324 Shoes and Clothing	6.3	9.4	8.8	4.0	2.5	4.6
331 Wood and Cork	3.1	2.0	0.8	8.7	2.5	3.9
332 Furniture and Accessories	2.1	1.7	1.7	1.9	0.9	3.4
341 Pulp and Paper Products	1.8	1.7	1.7	1.6	1.2	2.4
342 Printing	1.9	1.5	1.9	2.5	1.6	2.3
343 Production of Leather and Leather Products, except shoes	1.0	0.8	1.2	1.2	1.0	0.8
355 Production of Rubber	1.4	1.3	1.0	2.1	0.4	2.0
351, 352 Industrial Chemicals and other Chemical Products	7.7	2.7	9.6	4.8	9.4	10.1
353, 354 Fabrication of Products derived from Oil	3.7	--	5.0	3.1	7.8	3.6
361, 362, 369 Non-metallic Products	4.7	4.3	5.6	6.9	3.5	4.2
371, 372 Basic Metal Industries (Ferrous and Nonferrous)	0.5	--	1.5	0.0	--	0.3
381 Metal Products	3.3	6.0	1.4	5.5	2.8	2.3
382 Machinery, except Electrical	1.1	1.0	1.4	0.5	1.3	1.1
383 Electrical Machinery, etc.	1.9	1.4	2.6	1.6	--	2.7
384 Transportation Equipment	1.6	1.1	0.9	0.5	0.3	3.8
390 Other Manufacturing	3.6	9.5	2.7	4.6	2.4	0.3
	100.0	100.0	100.0	100.0	100.0	100.0

SOURCE: SIECA, including official information from the countries and estimates.

- FECAICA -

FEDERACION DE CAMARAS Y ASOCIACIONES INDUSTRIALES CENTROAMERICANAS

EDIFICIO CAMARA DE INDUSTRIAS, ZONA 4, TELAS 87000 Y 87200 AN POSTAL 214, GUATEMALA, C. A.

Guatemala,

14 de enero de 1982

Estimado Empresario:

Me es grato informarle que FECAICA, en estrecha colaboración con las Cámaras y Asociaciones Industriales de Centro América, está colaborando con el ICAITI, SIECA, Secretaría de COMENER y ROCAP en la iniciación de un importante programa orientado hacia el uso más eficaz de energía en el sector industrial con el objeto de reducir costos. Además, ayudará a mejorar la productividad y a reducir las importaciones de petróleo, disminuyendo así el déficit de la balanza de pagos en Centro América y Panamá.

El programa trabajará directamente con el Sector Privado de cada país para mejorar el rendimiento energético en la industria, reduciendo el costo de energía por unidad producida a través de la realización de diversas actividades, tales como: auditorías energéticas, medidas de conservación, introducción de maquinaria con mayor eficacia en el uso de energía, implantación de tecnologías de energía alterna, etc.

Programas similares se han llevado a cabo en otros países con -- excelentes resultados. Por ejemplo, un estudio hecho en 1981 muestra que de 36 industrias norteamericanas, 34 de ellas redujeron el uso de energía por unidad producida en un promedio de 25% aproximadamente. Resultados similares en Centro América y Panamá significarían mayores economías para el Sector Privado. Este 25% también implicaría un ahorro en las importaciones de petróleo que podría llegar a \$100,000.00 anuales para la región.

Para diseñar un programa efectivo que responda a las necesidades de la industria, es necesario conocer sobre las fuentes, aplicaciones y uso de la energía en la industria. La información solicitada nos permitirá planificar debidamente la asistencia técnica, capacitación de personal, servicios de información técnica y realizar proyectos de demostración en industrias, etc.

Para tal efecto, se ha preparado el cuestionario de dos páginas adjunto rogándole se sirva proporcionar la información solicitada a la mayor brevedad posible, ya que se contempla iniciar el programa cuanto antes.

Tomando en cuenta la importancia que este programa representa, no sólo para su industria sino para el desarrollo económico de la región, lo exhorto por este medio a proporcionar la información requerida. Además de completar el cuestionario, cualquier comentario adicional que Ud. desee hacer sobre el programa propuesto, será bien recibido.

Agradeciendo su atención, aprovecho la ocasión para saludarlo y suscribirme de Ud. atentamente,

15.2
B-1

CUESTIONARIO PARA INFORMACION ENERGETICA

Su cooperación es sumamente valiosa para este cuestionario. Por favor responda todas las preguntas que le sea posible. En los casos en que no cuente con datos exactos, puede hacer una estimación o dejar la pregunta sin contestar.

Le agradeceríamos su respuesta a este cuestionario a la mayor brevedad posible, ya que de ello depende el poder lograr la aprobación de este programa en beneficio de la industria. La información recibida será tratada confidencialmente. Para facilitar el retorno de este cuestionario, hemos incluido un sobre con porte pagado. En caso de alguna duda, por favor comuníquese con cualquiera de las personas indicadas en la última página.

A. Información General

1. Nombre de la Empresa: _____

2. Dirección: _____ 3. Teléfono: _____

4. Actividad Productora Principal (alimentos, farmacéutica, vestuario, productos de madera, etc.) _____

5. Año en que comenzó a operar la empresa: 6. Número total de Empleados:

7. Indique el grado de importancia que tiene el costo de la energía dentro de su empresa. Marque con una equis el cuadro correspondiente.

Mucha Mediana Poca

De serle posible estime el porcentaje del costo de energía en comparación con el costo total de operación de la empresa

8. ¿Ha iniciado su empresa algún programa formal de conservación de energía?

En caso afirmativo, indique la fecha en que éste se inició:

y quien se encargó del mismo. Nombre: _____

Puesto: _____

9. ¿Estaría su Empresa interesada en participar en un programa especial para el sector privado, como el que aquí se describe?

10. Enumere en orden de importancia los problemas que le dificultan poner en práctica mejoras de energía. El número uno será para el grado mayor y el seis para el menor.

Incentivos Fiscales	Personal Capacitado	Asistencia Técnica	Financiero	Información	Otros

11. ¿Estaría su empresa dispuesta a invertir en incorporar mejoras de aprovechamiento de energía si estas representan ventajas económicas para la empresa?

En caso afirmativo indique el número de años que usted considera razonable para la recuperación de la inversión:

B. Energía Eléctrica

12. ¿A cuántos KWH asciende el consumo anual de energía eléctrica comprada?

13. Precio actual del KWH en moneda de su país:

14. ¿Que voltajes utiliza? _____
 ¿Cuál es el factor de potencia promedio de su empresa ¿Cuál es la demanda máxima? KW

15. Si genera electricidad propia, marque con una equis el tipo de planta que utiliza y proceda a contestar las preguntas 14 a la 18. Si no la genera, pase directamente a la pregunta 19.

Gasolina Diesel Turbina a Vapor Hidráulica Otra

16. Potencia instalada: KW Cuánta electricidad generó en 1981? KWH

17. ¿Cuál es el combustible principal que usan para generar su propia electricidad?

18. Cantidad de este combustible consumido por año (Indique la unidad utilizada, Gal., Kg., Tarea, etc.)

19. ¿Contempla aumentar la capacidad de generación propia?

C. Usos y Aplicaciones

20. Enumere en orden de importancia las actividades existentes en su empresa que consumen energía. El número uno será para la que mayor cantidad de energía consume y así sucesivamente numere las que le siguen.

Producción energía mecánica (motores estacionarios)	Calentamiento	Evaporación
	Secado	Compresión
	Transporte	Refrigeración
	Iluminación	Otros

21. Si tiene caldera(s), indique la capacidad de cada una incluyendo la unidad (HP, Kg/h, etc.)

22. Indique la presión de operación de cada caldera en lbs./plg² o Kg/cm.².

23. ¿Con qué combustible alimenta su(s) caldera(s): _____

D. Excedentes

24. Existen excedentes en su empresa sin ser utilizados, que salgan en forma de:
 Aire caliente Agua caliente Vapor

25. ¿Qué desperdicios produce la empresa?
 Sólidos: (bagazo, cascabillo, etc.): _____
 Líquidos: (Vinasas, aguas contaminadas, etc.): _____

Otros tipos de Energía

Estime el consumo total anual de los siguientes tipos de energía, así como su precio actual en la moneda de su país.

	Consumo Anual*	Precio Unitario
Gasolina		
Kerosene		
Combustible Pesado		

	Consumo Anual*	Precio Unitario
Gas Licuado		
Leña		
Otros**		

*Incluya la unidad utilizada (Gal., Lt., Tarea, etc.)
 **Especifique cada uno (bagazo, cascabillo de arroz, hidráulica, etc.)

PERSONAS CON QUIEN COMUNICARSE

En Costa Rica: Ing. Félix Del Barco
Cámara de Industria de Costa Rica
Teléfono: 23-24-11
San José, Costa Rica

En El Salvador: Ing. Jaime González
Asociación Salvadoreña de Industriales (ASI)
Teléfono: 23-77-88
San Salvador, El Salvador

En Guatemala: Ing. Ricardo García
Instituto Centroamericano de Investigación y
Tecnología Industrial (ICAITI)
Teléfono: 317466, 310631
Guatemala, Guatemala

En Honduras: Ing. Porfirio Sánchez
Asociación Nacional de Industrias (ANDI)
Teléfono: 32-22-21
Tegucigalpa, Honduras

En Nicaragua: Lic. Roberto Quintana
Cámaras de Industrias de Nicaragua
Teléfono: 96-201
Managua, Nicaragua

En Panamá: Sr. Frank Kardonski
Sindicato de Industriales de Panamá
Teléfono: 61-11-30
Panamá, Panamá

PROGRAMA AUSPICIADO POR:

- Federación de Cámaras y Asociaciones Industriales de Centro América (FECAICA)
- Instituto Centroamericano de Investigación y Tecnología Industrial (ICAITI)
- Secretaría Permanente del Tratado General de Integración Económica en su carácter de Secretaría de la Comisión Centroamericana de Energía (SIECA/COMENER)
- Oficina Regional para Programas Centroamericanos (ROCAP)
- Cámara de Industrias de Costa Rica
- Asociación Salvadoreña de Industriales (ASI)
- Cámara de Industria de Guatemala
- Asociación Nacional de Industrias de Honduras (ANDI)
- Cámara de Industrias de Nicaragua
- Sindicato de Industriales de Panamá

ANNEX B-2DSI/ICAITI PLANT VISITS

Short "walk-throughs" of industrial sites can provide a general level of information about a specific plant's use of energy. It is rare that actual data on the energy use per unit of output can be obtained, but many other questions will be answered and opinions can be formed on alternatives for industrial energy use.

In this project, five plants in Guatemala City were visited for short periods of one to two hours. Usually, plant engineers were available for part or all of the period, but in all cases, at least, production engineers participated in an informal question and answer period and plant tour.

A set of specific questions designed to evaluate the plant's level of energy awareness as measured by certain activities and their interest in the project was developed at the start. These questions did not include production rates, but rather focussed on the plant's use of energy and its management of energy resources. Then the plant tour was used to identify potential energy savings' activities and discuss their applicability with the plant personnel.

In all cases plant personnel were extremely helpful, interested in the program, and desirous of participating in some way. It should be noted that plant visits were arranged by ICAITI and were chosen to represent a range of different industries, rather than potential candidates for the program.

Plant Number 1. Laboratorios Miles de C.A.

Under American overseas management and with American technical assistance, Miles has identified several areas of improvement in energy utilization and made minor plant changes. With minimal investment, they have evaluated their use of electricity and reduced the lighting and air conditioning needs. For example, a small change in the roof design of the warehouse permitted sky lights and eliminated the need for lighting in the building. They are now evaluating the potential for electricity generation either as an emergency backup or as a process requirement.

They reviewed their thermal energy use and were able to recirculate the hot air at a modest cost. With a program to detect heat losses and increase insulation, they obtained a three month payback and also helped their production rate.

With technical assistance from the U.S., they have a functioning energy committee under the maintenance department made up of representatives with various plant responsibilities who monitor all energy use by department. At this time they are also evaluating various types of automatic control systems for future use.

They expressed an interest in information on solar preheating opportunities. This is an opportunity for ICAITI assistance and could lead to an on-site evaluation if appropriate in the future.

Plant Number 2. Colgate Palmolive

For the last three years with American assistance, there has been an active energy efficiency program. It began with a complete audit identifying specific energy uses and recognizing the major uses of electricity within the plant. With over 80 percent of the plant's energy coming from electricity, a conservation program for its use was started with good base line data on consumption and the establishment of conservation goals. The plant compiles monthly reports for comparison with other C-P plants around the world.

Changes within the plant have included installation of a block of surplus capacitors to change the power factor for a group of motors. By also reducing lighting needs, installing fluorescents where possible and keeping demand down, the company saved \$15,000 in energy costs the first year of the program. This was at virtually no investment costs, but with one person's time and maintenance expenses.

In addition, with American assistance they developed a highly motivational plant program with a 20 minute audio-visual presentation and other promotional activities for both energy and water conservation. This activity would be an excellent training activity for ICAITI engineers as they begin to learn in-plant energy program requirements.

Colgate Palmolive has since performed other energy evaluations of specific uses such as substitutional LPG for gasoline in small trucks where a \$700 charge per unit for conversion will save \$1000/year in fuel. In their annealing ovens, they have been able to lower the temperature and add insulation for additional electrical savings. They are presently considering more use of LPG and opportunities for additional electrical control systems. The plant could well serve as a model for "how to develop and implement an energy efficiency program."

Plant Number 3. CAVISA

At an older glass manufacturing plant, built between 1955-1960, energy saving retrofitting opportunities tend to be capital intensive. For example, the company has estimated an investment of 1 million dollars is necessary to improve maintenance procedures and install heat recovery apparatus. Two million would be needed for a new furnace.

In this environment where production is also presently low, it is difficult to start a new large program of energy efficiency. There are opportunities, however, for small activities such as steam traps, condensate return, added insulation, etc. that would provide a start on overall energy conservation. As another example, they try to maximize use of cullet. This should provide an opportunity to reduce the furnace temperature and technical assistance on the relation between raw material mix and furnace temperature would encourage energy savings.

A combustion efficiency analysis including the oxygen intake and flue gases for the operating glass melting furnaces would be another important step in identifying energy savings opportunities. Certainly, depending upon space and layout, there is the possibility of either a heat regenerator for preheat or a recuperator for steam, but these are larger, more expensive steps, which follow the simpler steps.

It is important to begin the simpler thermal evaluations first as a beginning action step to demonstrate the low cost alternatives.

Plant Number 4. Hornos, S.A.

The establishment, built in 1935, includes four separate divisions, the arc furnace, a rolling, mill, wire drawing, and a galvanizing operation. As such, it is spread out and not easily retrofitted for energy savings. Electricity is the major energy form and makes up approximately one third of their total cost. With a high demand as well as consumption, they are presently paying over 20 cents per kwhr. It would appear that they could preheat ingots, but the plant layout is not easily rationalized.

Technical assistance in planning production where rates can vary by 20 percent in a six month period appears to be an opportunity for energy saving. Their overall production is down at the present time, and the best conservation measure is scheduling and planning which permits the most efficient use of energy.

Plant Number 5. I.N.A.

This plant producing Italian style macaroni is 15 years old and is a well functioning operation. The largest energy use for this plant is in product drying. There is a series of steps which can be followed in reviewing drying operations to identify energy efficiency measures.

It would appear that some technical assistance would be helpful in the near future as the plant staff is presently considering the change from batch to continuous drying. There is an opportunity to optimize the entire operation with a change in temperature and a shorter drying time. Similarly, there is a need for better moisture

control, heat recovery, heat loss tracing and improved insulation, as well as overall re-timing to match other operations.

The company is interested in energy use improvement and will be considering some of these items as they make the change.

Conclusions

Five short plant visits do not constitute a significant sample, but when combined with the analysis of the questionnaire responses, the Hill report, and many other meetings, some conclusions can be stated. There is indeed a need for and an interest in energy efficiency technical services. Companies are only partially informed and have not generally put the energy savings steps into an overall plan. They have clearly expressed an interest in technical assistance for energy efficiency which combines the overall plant management aspects with the specific technical alternatives.

ANNEX B-3CLASSIFICATION OF ENERGY EFFICIENCY MECHANISMS

Energy efficiency actions of importance in the industrial sector can be classified by a number of systems. One system uses generic categories for energy conservation actions such as management, energy recovery, housekeeping, process alteration, materials substitution, etc. Another well known system focuses on types of industrial processes or operations such as furnaces, boilers, motors, lighting, ventilation, transport, etc. While these and other systems each have their own benefits, and more than one will be used during the project, the following discussion utilizes the first system. This is the easiest to describe and it is in fact energy conservation actions which are the principal subject of this project paper.

Although it is possible to separate the important energy conservation actions into a discrete number of categories it is much more difficult to compare them as to cost, applicability, savings, and other parameters. This difficulty results from the fact that there are no normalizing assumptions which are valid across industries. Industrial processes are not standard and their use of energy is governed by a large number of factors. For instance, boilers vary widely by design, size and industrial application. Because of this difficulty a rigorous comparison of the value of various industrial energy actions is not included.

The development of data and a ranking system to compare each action over a range of parameters specific to Central American industries will, in fact, be one of the outputs of this project. For the purposes of the project paper a preliminary evaluation of the reports and data available has led to the following description. Each major category of conservation action is briefly described and those elements which seem to be important for Central America and the target industries of this project are identified. These elements are then evaluated in a table using the following criteria; cost, energy savings, rate of return, and applicability. The criteria are quantified by using high, medium, low and variable designators. Table 1 presents this evaluation. The last column of the table contains remarks which provide additional information about the action.

Inspection of Table 1 shows that each energy efficiency action has some application in Central American industries. The most applicable and easiest to implement will come from

housekeeping activities. The important areas of housekeeping include cleaning/adjusting, scheduling, maintaining and monitoring energy using processes. For each type of use or process such as those in the second classification system mentioned above these actions can save small amounts of the energy use. As an example routine cleaning of air entrances, filters, evaporators and condenser coils improve performance and saves energy. The greater the number and larger the size of these processes at an industrial plant, the greater will be the savings. The major cost to achieve these type of savings is in personnel time. This type of savings through usually small per improvement can add up and is continuous. Because of its rapidity, low cost and permanency it is a candidate for early implementation. However, because the savings are small and numerous it is difficult to measure or quantify the rate or amount of return achieved.

The second most applicable category of energy efficiency actions is process alteration. It frequently involves capital costs; however, it also frequently produces the largest energy savings. It also often offers additional benefits such as improved product quality, additional production and reduced maintenance.

Examples of this type of action include the following:

- Use of refuse or waste products as fuel;
- Recovery of boiler fuel gas for plant's low-grade heat requirements;
- Installation of heat exchanges on dryers and other processes;
- Collection of waste oil or solvents for combustion;
- Recirculation of exhaust;
- Recycling of condensate;

There is some overlap between this category and energy efficiency. The major difference is that in the previous category the action results in more efficient existing use while this category involves producing new and different uses of energy.

The fourth area of interest is production process change. This includes those actions which involve substituting one type of manufacturing or industrial process for another. The substitution is influenced by energy savings and the overall economic analysis includes many factors other than energy. This type of substitution is often made even though the existing process has remaining years of use. Some typical actions which fall under this category include:

- replacing oversized motors and pumps with smaller sizes;
- substituting more efficient equipment for older but variable equipment;

TABLE 1

INDUSTRIAL ENERGY CONSERVATION ACTIONS POSSIBLE IN

TARGET INDUSTRIES

<u>Energy Efficiency Action</u>	<u>Capital</u>	<u>C o s t Maintenance</u>	<u>Energy Savings</u>	<u>Rate of Return</u>	<u>Applicability</u>	<u>Other</u>
Housekeeping	Low	Medium	Low	Rapid	Wide	Requires training and continuous effort savings, of ten not measurable.
Management	Medium	Medium	Medium	Medium	Medium-Long	Mostly appropriate for large firms, requires high technology and training personnel.
Materials Substitution	Medium	Low	Low	Slow	Limited	Requires extensive study.
Energy Recovery	High	Medium	Medium	Medium	Medium	Varies by industry for heat recovery.
Process Alternative	Variable	Low to Medium	Medium to High	Medium	Variable	Good for many processes but not all applications.
Production Process Change	High	Variable	Medium to High	Medium	Limited	Involves major engineering and effects production.

- upgrading process equipment from batch to continuous flow;
- changing from pressure extraction (mechanical) to solvent extraction (chemical);
- switching from steam pressure pumps to electrical pumps;
- replacing brick furnace with metal fire box type equipment.

In order to implement this type of action, studies other than energy audits must be made. The change from one type of processing to another has production volume, raw materials, space, operator skill, and maintenance implications to name a few. For this reason it is often not only done for energy implications. Other factors such as plans to expand or contract production, raw materials shortages, etc. play a major role in deciding to change processing methods. Materials substitution is much like production process change in that it is influenced by many factors and requires a large amount of study prior to implementation. The emphasis in this action is to discover energy efficient substitutes for existing raw materials. One example would be to use proven chemical additives to increase the efficiency of combustion of oil or to regulate viscosity and thus minimize lost pumping energy. The alternatives are often not numerous; however, there are always raw materials in an industry which are candidates for substitution.

Management is a multifaced conservation action which includes audits, records keeping, automated control and integrated consideration of all plants or industries' actions with a focus on energy conservation. Because this is an action which involves all aspects of an industrial operation it is often a time-phased program. It also is more attractive to large single site plants or to industries with several manufacturing locations. Management starts with extensive audits of energy use and grows to include the items mentioned about as well as some or all of the actions mentioned in Table 1.

One key is record keeping and complete or semi automatic of process operation and energy use. This type of action in the end involves moderate to large expenditures of time and capital and tends to perpetuate energy conservation. This type of approach is applicable even to small industries and can be done on a small scale. The first step is an audit and the results of the audit will determine the utility of adopting management as an energy conservation action.

It is one of the intents of this project to perpetuate energy conservation in industrial operations and to this end the adoption of some level of management as described above will be proposed as a goal for many of the industries involved in the project.

ANNEX B-4PROPOSED PILOT PLANT SUBSTITUTION ACTIVITIESPilot plant for thermal gasification of agricultural and wood by products:

A unit will be designed and tested to optimize the thermal gasification of tropical wood and softwood sawdust. The gases will be used in fixed internal combustion engines to generate electricity. The electric power will be used directly in the sawmill. These units will be designed for the wood mills located near the sites where wood is cut specially in the Central American Atlantic coast.

Pilot plant to produce biogas from liquid effluents from agroindustry:

Agroindustry produces a great quantity of liquid effluents of relatively low concentration of organic matter that prohibits its recuperation but that is a source of tremendous pollution. Technology has been recently developed that allows the economical processing of such residues to produce biogas (60% methane) to be employed directly as fuel in boilers or to generate electricity. The key in this technology is the high rate digester (either of the upflow sludge blanket type (European) or the fixed film type (Canadian) in which high volumetric productivities of biogas can be obtained with residence times of less than 1 day. The unit will be mobile and will be tested at the site in two types of set ups: several agroindustrial companies (such as, slaughter houses, canning operations and dairy plants) and using sewage from small towns. In the first case the gas will be burned in boilers in the second it will be used to generate electricity.

Integrated pilot plant for fluidized combustion:

There is a large demand in Central America agroindustry for a thermal efficient unit for direct combustion of lignocellulosic biomass or byproducts. The unit should consider fluidized bed combustion as it is more efficient and it lends itself to a better control of solids feeding and ash removal in a continuous way. The units should also have a pretreatment system for those raw materials that are too wet for direct feeding (i.e. coffee pulp, fruit skins, fresh biomass) and need to be predried first. One alternative is to use a continuous screwpress and combustion gases for the predrying. The unit will be mobile and will be tested at the site. It will be used to heat air or to heat water for steam (an air tube or a water tube).

Two additional options for pilot plant demonstrations include:

- Substitution of Electricity for Fossil Fuels:

This should be done in a region with cheap surplus hydroelectric and geothermal energy. These may include water heating, and drying processes. This should be done where electric substitution will also serve to enhance the control of temperatures and improve the process.

The importance of this option is demonstrated in detail in a recent report by the IDB.¹

- Industrial Application of Charcoal Fuelwood as a Fuel Oil Substitute

Central America has excellent forest resources, and many regions can supply an ample supply of charcoal to local industries. While wood products for combustion have been a largely rural oriented resources, industrial process heat equipment can be adapted to use biomass fuels in the form of charcoal.² Clearly, mechanisms for the production of the biomass for industry on a sustained yield basis should be established before encouraging this approach.

1 Inter-American Development Bank
Hydro and Geothermal Electricity as an Alternative
for Industrial Petroleum Consumption in Costa Rica
MITRE Corporation, April 1982

2 National Academy of Sciences
Substitution of Fuel Oil in Brazilian Industry
by Fuelwood and Charcoal
Rockefeller Project - Working Paper
Alan Poole, January 1981

ANNEX B-5BENEFIT COST ANALYSISA. Introduction

This submittal provides the basic inputs to the cost-benefit analysis to be completed by ROCAP's economic analysis personnel.

Benefits and costs are estimated for the years 1982-1992, using the best available data, and the collective experience of the DSI team in making assumptions based on professional judgment. In order to complete the analysis, the following is needed:

- . Assumption of an inflation rate for the cost of fossil fuel;
- . assumption of an inflation rate for the unit cost of specific private sector expenditures detailed herein;
- . assumption of a discount rate for present value analysis;
- . modification of any of the assumptions clearly displayed on the tables herein;
- . Assumption of a continuing, but decreasing stream of benefits beyond 1992, taking into account that many of the plants which will have invested in energy efficiency in the 1980's will eventually bring in new production technology.

Even without the economist's final calculation of a benefit cost ratio, it is clear that the program is very favorable in terms of its economic impact, granting the assumptions herein as essentially valid. By 1992 an estimated \$26.7 million (constant 1982 \$) will have been expended on energy efficiency, largely as a result of the program. By that year, the projected annual industrial fuel consumption will be 11% less than otherwise projected, saving almost 3 million barrels, or approximately \$105,000,000, assuming \$35/bbl, the 1982 price. The cumulative oil savings (see Table 4) is estimated to exceed 15 million barrels, which would save over \$500,000,000 (constant 1982 \$) by 1992, assuming no increase in the cost of imported oil. While these benefits and cost estimates are necessarily approximate, and are based on many assumptions in the absence of data, the indication is clear that expected benefits can exceed the estimated costs by an order of magnitude.

During the conduct of the program, data on energy and industry will be accumulated as part of the Component 4, Data Base and Analysis. As part of project evaluation, it is suggested that this benefit-cost analysis be re-estimated in the light of improved available data approximately one year into the project.

B. Analysis of Benefits

1. Introduction

The benefits analysis presented here is an approximation using data from recent studies at an aggregate level for the region. It would have been desirable to estimate the benefits for each individual country taking into account differences in industrial structure, fuel use, and electric utility characteristics, but this is not possible given the data available nor would this have necessarily produced a significantly different aggregate estimate of industrial energy savings.

2. Regional Perspective

Table 1 provides a perspective on industrial energy use in the region, on an aggregate basis for 1980. The source of information was the Hill report.¹ While there are some uncertainties as to the quality and accuracy of data used in this report, it would appear to represent the most current and authoritative assessment of Central American industrial energy use at this time.

The total energy end use in the region is estimated at 12.57×10^6 tons equivalent of petroleum (TEP) for 1980. Of this 25.8%, or 3.24×10^6 TEP is used by the industrial sector which is called the "target group". According to Hill¹, this sector has a total of 128,097 production units, of which 8,849 employ 5 or more persons. Within this sector, 47.4% of end use is fossil fuel including: 1% crude oil, 26.9% fuel oil, 16.9% diesel oil, 1.3% kerosene, 0.6% gasoline, and .7% LPh. Wood constitutes 20.7%, and fuels derived from vegetable and animal sources constitute 23.0%.

It is assumed, for purposes of the benefit estimate, that all of the fossil fuel is consumed by the firms employing 5 or

1 Regional Industrial Energy Efficiency Project Baseline Data Survey Study - Elias Hill
ROCAP/AID No. 596-0000-C-00-2004-6
Guatemala City - March 1982

TABLE 1
PERSPECTIVES - 1980
INDUSTRY TARGET GROUP ENERGY USE

1.	Total Energy End Use	12,566,000	TEP
2.	Target Group End Use	3,240,231	TEP
3.	Target Group Fossil Use (47.4%)	1,535,870	TEP
4.	Target Group Electric Use (9.2%)	298,000	TEP
5.	Target Group Oil Induced by electricity (50% oil, 25% efficiency)	596,000	TEP
6.	Total Fossil Fuel 3 + 5	2,132,000	TEP
7.	Cost at \$210/TEP	\$ 447,690,000	
8.	GDP - 1978	\$ 16,606,000,000	
9.	% Industrial Fossil Ex- penditures of GDP		2.7%
10.	% of total energy use as industrial fossil		17.0%
11.	% fossil of industrial energy use including electric induced		66.0%
12.	% Fossil of industrial energy use excluding electric induced		47.0%
13.	% Fossil induced by electric use only		18.0%

more, and all of the vegetable, animal, and wood fuels are consumed by those employing less than 5. While this is not strictly correct, in the absence of specific data it is a reasonable order of magnitude assumption.* Thus, the target group can be thought to consist of the 8849 units. It should also be indicated that within these target establishments, a large percentage of the fossil fuel consumption will be concentrated in the larger production units. Here again, quantitative data on the distribution of energy consumption by size of establishment is lacking, and assumptions will be made.

*Conversation with Hill, and a review of the data on industrial energy consumption suggest that firms of 5 or more employees use well over 90% of the fossil fuel and electricity.

3. Electrical Energy

With respect to electrical consumption, the Mitre Corporation² estimates that the fossil fuel efficiency of electrical generation in Central America is 25%. This means that for each unit of end user electrical use, four units of fossil fuel are required, taking into account energy losses in generation and transmission. Thus electrical energy conservation has a considerable leverage effect on fuel savings. This saving is offset by the proportion of electric power supply which is hydroelectric or geothermal. For example, El Salvador and Costa Rica currently use little or no petroleum for electric generation. (See Table 2-6 of Mitre report²). Thus Table 1 shows 298,000 TEP of electrical energy end use translating into 596,000 TEP of oil consumption taking into account the estimated 50% of electrical energy produced by fossil fuel equipment at an efficiency of 25%.

4. Importance of Industrial Fossil Fuel Use

Table 1 shows a total fossil fuel consumption of over 2,000,000 TEP costing in the order of \$447 million dollars for the region, largely as imports. Thus, industrial fossil fuel consumption represents 2.7% of the region's Gross Domestic Product, and 17% of the region's total energy use. It is also noteworthy, that 66% of industrial energy use is fossil fuel, including the 18% used in the electric generating sector. Finally, it is useful to cite data from SIECA³ and the IMF⁴ on Table 2.

The \$48 x 10⁶ estimated cost of oil for industry in 1980 is almost 50% of the region's total oil imports. As seen on Table 2, by 1980 oil imports were 20% of the value of all regional exports, and by 1981 they are estimated at 25%.

Thus oil imports are a critical adverse factor in the region's economy, and industrial oil use accounts for about half of these imports. The opportunity to positively impact the region's economy through an effective program of industrial energy conservation is clear. (Most of the non-industrial imports are for transportation, and a portion for hot water heating in the commercial and domestic sectors.)

2 "Energy Development in Central America", The Mitre Corporation AID/SOP/PDC-C-0146, February 1980

3 SIECA, Trends in the Central American Economy 1978-80, Guatemala City, June 1981.

4 International Monetary Fund
International Financial Statistics, Vols. XXXI and XXXII,
Washington, D.C., June 1978 and November 1981

TABLE 2

OIL IMPORTS AS % OF EXPORTS
FOR CENTRAL AMERICA
(Excluding Panama)*

<u>Year</u>	<u>Oil Imports</u>	<u>Exports</u>	<u>Oil Imports as % of Exports</u>
1973	101	1663	6 %
1974	277	2109	13 %
1976	295	3007	10 %
1978	399	3855	10 %
1980	928	4703	20 %
1981 (est.)	1240	4938	25 %

Units in U.S.\$10⁶

* Panama is excluded because of its large imports of crude oil for refinement and resale.

5. Impacts of the Program

Benefits from the program are defined as reduced demand for fossil fuel by industry, without reducing production. The ROCAP Industrial Energy Program will involve an estimated 535 individual program actions directly impacting between 1000 and 1500 industrial plants over the five year funding period, as shown on Table 3. In addition, virtually all of the estimated 8849 firms in the target group will become aware of the program and of opportunities for energy conservation through the Promotion and Field Organization activities.

Finally, information disseminated by the program, including the media, will reach a significant portion of the estimated 119,000 small production units which employ less than 5 persons. Thus the direct impact is expected to be far ranging.

In addition to energy conservation which is a direct result of the program, it is expected that industrial energy conservation will become a private sector consulting and installation services activity. It is expected that such services will continue to be in demand beyond the program as existing industry seeks to minimize energy costs, and as new plant investments take advantage of opportunities to design conservation measures from the beginning. It is also expected that ICAITI will continue to serve industry, promote technological innovation for industrial energy conservation, and work in parallel with the private sector.

6. Scenario for Energy Benefits

Estimation of actual benefit is necessarily speculative. Nevertheless, it is possible to construct a reasonable scenario in order to develop a good order of magnitude basis for benefits. Table 4 summarizes the scenario and the resulting benefits stream. The following assumptions are made:

- . Electrical use will increase at 5% annually as industry expands, and as a shift is made away from fossil fuels for electric use.
- . End user electric use has an efficiency of 25%, with respect to fossil fuel input to the electric utility.
- . The % fuel used in electric generation in the region will progressively decline as the region's extensive hydro-electric and geothermal capability is expanded.
- . Direct fossil use by industry, without the program, will increase by 5% annually, taking into account the growth of the industrial sector.

TABLE 3

INDUSTRIAL PROGRAM OUTPUTS

ACTIONS	TOTAL	PROJECT YEAR				
		1	2	3	4	5
Level 1 ergy Audits	296	36 14*	60	60	60	60
Level 2 ergy Audits	45	1	7	12	12	13
Minor ant DEMO jects	72	10 22*	10	10	10	10
Major ant DEMO jects	13**	7 studies	5 designs 10 studies	5 start ups 8 designs	5 case rports 8 startups	5 case repts.
Pilot nt DEMO jects	2	-	1	1	-	-
inars	105	5	25	25	25	25
ubits	8	1	3	3	1	-
TOTALS	535	98	119	124	122	113

These activities are part of the rapid and large impact energy conservation program.
 These are multi year activities progressing from study thru design and start up to case reports.

- The energy savings will increase from 1% of industrial consumption in 1983 to 11% by 2000 as a result of the program, and of the private sector activities stimulated by the program.*

The resulting stream of benefits is significant. Even before the end of the program, the regional benefits will clearly exceed the \$6,000,000 of ROCAP contribution. Beyond that the benefits are estimated to become a major factor in reducing the demand for oil imports by the industrial sector.

Table 4 is of course only a scenario. One can easily alter the assumptions and come up with alternative streams of benefits. It is possible to perform detailed energy econometric studies of each country as a basis for refining this estimate. This can be accomplished with data which will be collected in the program as part of the Financial and Public Policy Component.

One can also question the energy future of the region without the ROCAP project. No doubt, as new industrial investments are made, energy efficiency technologies will be introduced into new plants without the program. In particular, as a more modern industry emerges in the next twenty year, there will be some attrition of the older less efficient industry. Energy efficiency of regional industry, in the aggregate, will no doubt improve even without the program in the long term.

However, the program will accelerate the adoption of energy saving measures and have an early and significant impact on existing industry of small to medium size, using less modern technology. In addition to saving energy, the program will help many of these firms actually stay in business because of the cash savings, and allow them the opportunity for capital formation which will result in re-investment into progressive technological improvement. From a structural viewpoint, the program will encourage the stability of small to medium size enterprise, sustaining a diversified and productive manufacturing community.

C. Analysis of Cost

1. Cost Estimate

The cost of achieving the benefits include those related to the AID program, and all of the private sector investments induced by the program. Table 5 provides a summary of the expected cost through 1992 on the assumption that the program will induce four kinds of energy saving action:

*See the Section C - Analysis of Costs for detailed justification of this assumption.

TABLE 4
ESTIMATE OF BENEFITS OR
REGIONAL INDUSTRIAL ENERGY CONSERVATION

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
(1) Electric Use (TEP) (end User) (10 ⁶)	.33	.35	.36	.38	.40	.42	.44	.46	.49	.51	.53
(2) % Oil in generation	50%	49%	48%	46%	44%	42%	41%	39%	37%	36%	35%
(3) Direct Fossil Use (TEP) (10 ⁶)	2.24	2.35	2.47	2.54	2.72	2.85	3.00	3.15	3.30	3.47	3.64
(4) Unit Cost \$/TEP	245	245	245	245	245	245	245	245	245	245	245
(5) Energy Savings (%)	0%	1%	2%	4%	5%	6%	7%	8%	9%	10%	11%
(6) \$ Saved - fossil (10 ⁶)	0	5.8	12.1	25.4	33.3	41.9	51.5	61.7	69.5	85.0	98.0
(7) \$ Saved - electricity (10 ⁶)	0	0.4	0.8	1.7	2.2	2.6	3.1	3.5	4.0	4.5	5.0
(8) Total \$ saved (10 ⁶)	0	6.2	12.9	27.1	35.5	44.5	54.6	65.2	73.5	89.5	103.0
(9) Oil Saved (TEP) (10 ⁶)	0	.025	.052	.110	.144	.182	.223	.266	.313	.365	.421
(10) Oil Saved (bbbls) (10 ⁶)	0	.175	.364	.77	1.00	1.27	1.56	1.86	2.19	2.56	2.95

NOTES

- (1) Based on Hill report p. 21 and 5% annual growth.
- (2) Based on MITRE data and DSI estimates.
- (3) Same as (1).
- (4) Assumed \$35/bbl in 1980 and 5% escalation rate.
- (5) DSI estimate of program impact.
- (7) Assumed 25% fossil plant generation efficiency.
- (8) Assumed ; bbbls/TEP.

- . level 1 audits
- . level 2 audits
- . minor installations
- . major installations

The unit costs of these actions is consistent with costs used in estimating the budget for the ICAITI services to industry programs.

2. Coordination with Benefits Estimate

The actions whose costs are estimated on Table 5, also provide a basis for estimating the benefits in terms of energy sectors. This is summarized on Table 6. Assumptions were made about the % of energy use which would be addressed by each type of action. For example, while only 100 firms are assumed to invest in major installations, these would account for 10% of industrial energy use. In general, there is an expectation that energy conservation investments will be skewed toward firms experiencing higher energy use.

The energy saved per action is an estimate based on engineering experience in the United States. The effect is expected to be cumulative. For example, if a firm were to successively go through the two audit levels, a minor and then a major installation, the expectation is that a 33% reduction in energy consumption will result.

The final column of Table 6 weights the energy savings as a % of the total fossil fuel used by the industrial sector. The net weighted result for 1992 is 11%. This figure was used as a basis for the benefits scenario of Table 4, thus, the costs and benefits are estimated on a consistent basis.

TABLE 5

COST ESTIMATE OF REGIONAL INDUSTRIAL ENERGY

Private Sector Expenditures	Estimated* Cost 1982 \$	Unit Actions		Total Actions	Estimate Cost in Current 1982 \$ -Cumulative to 1992-
		1982-86	1987-92		
Level 1 Audit	1500	2000	3000	5000	\$7.5 x 10 ⁶
Level 2 Audit	4500	400	600	1000	4.5 x 10 ⁶
Minor Installations	2000	600	900	1500	3.0 x 10 ⁶
Major Installations	35000	40	60	100	3.5 x 10 ⁶
<hr/>					
Total Private Sector Expenditures					\$18.5 x 10 ⁶
USAID/ROCAP Program					\$ 6.0 x 10 ⁶
In-kind Services					\$ 2.0 x 10 ⁶
Total Regional Cost of Industrial Energy Efficiency					\$26.5 x 10 ⁶

In addition, the Private Sector will spend 15% of the initial cost on maintenance each year.

TABLE 6

ESTIMATE OF % REGIONAL ENERGY SOURCES
FROM
INDUSTRIAL ENERGY CONSERVATION ACTIONS

	<u>Total</u> <u>Actions</u> <u>by 1992</u>	<u>of Energy</u> <u>Use</u> <u>Addressed</u>	<u>% of Energy</u> <u>Saved Per</u> <u>Action</u>	<u>Weighted</u> <u>Energy</u> <u>Savings</u>
Level 1 Audit	5000	90%	5%	4.5%
Level 2 Audit	1000	35%	5%	1.8%
Minor Installation	1500	40%	8%	3.2%
Major Installations	100	10%	15%	1.5%
Annual reduction in energy use by 1992				11.0%

ANNEX B-6PERSONNEL/COMPANY DESCRIPTIONS1. PROJECT DIRECTORBackground

The Project Director should have at least 10 years of progressively increasing management responsibility working with industry banking and government. He should have at least 5 years of industrial management experience in Central America and be familiar with the structure, characteristics, and business climate of industry in the region. It would be desirable to have a background in the affairs of industrial chambers and associations as well as professional societies.

Skills

The basic professional skills may include engineering, economics, law, and business administration. It would be desirable to have a combination of engineering and one of the other disciplines.

The Project Director should have outstanding communication and organizational skills, be a skilled negotiator and a motivator and leader of people. Experience in marketing, sales and public presentations will be helpful. It is essential that he speak and write Spanish with fluency, and have an excellent working command of English. He should also have a solid track record in management.

Attitudes

The job requires a person who is genuinely committed to industrial development, and is willing to become an expert on energy issues. He should be willing to travel extensively, particularly in the first two years of the program. He should also care about the professional development of those working under him, and be committed to motivating personnel to achieve high quality work. He should work well under pressure, and be willing to solve problems on a continuing basis.

2. DEPUTY DIRECTORS

The Deputy Director for the Industry Program should have a degree in engineering and some experience in industrial processing or in energy use in industry. This individual should have

demonstrated ability in managing projects, including personnel, technical and cost aspects. This person should have some knowledge of the industrial sector in Central America. Fluency in Spanish and at least a reading knowledge of English is necessary.

The Deputy Director for Promotion should have a degree and/or experience in technical writing, public relations or business administration. This individual should have demonstrated experience in setting up and handling meetings, displays and public relations activities. Some experience and understanding of the industrial sector or energy use is also necessary. Fluency in Spanish and English is necessary.

3. PRINCIPAL PROJECT CONSULTANT

Background

- . Have as a minimum an undergraduate degree in Engineering.
- . Have as a minimum three years of experience working with or for private industrial concerns.
- . Have as a minimum three years of supervisory responsibilities of professionals.
- . Be familiar with Central America through extensive travel in the region.
- . Be familiar with the economic, political, social and technical conditions in Central America.
- . Speak Spanish fluently at least at the FSC level 3.

This individual should have the back up of a US firm that has contacts in and knowledge of energy efficiency activities worldwide. This back up will allow the consultant to draw on current knowledge and data and sources beyond his own contacts.

Skills

- . Be an efficient organizer and administrator.
- . Possess excellent communication skills, both orally and in written form.
- . Be able to develop and implement systems for control, monitoring, feedback, scheduling, coordinating.
- . Have a knowledge of energy use in industrial operations.

4. PUBLIC RELATIONS COMPANY

Background

The company should be located in one of the Central American countries. A Guatemalan firm would prove advantages for purposes of easy coordination. At least five years of experience in developing promotional campaigns both those prepared for industrial clients as well as those directed at industrial targets is the most important criterion for selection. The staff should be experienced in providing rapid response services in all aspects of public relations including target identification, preparation of appropriate materials, and dissemination of materials through both its own channels as well as those identified in Component 3, Promotion and Field Extension.

Skills

- . Experience in developing materials for the local press, radio and TV.
- . Familiarity with requirements of an approach designed for private and public industries.
- . Capability to design appropriate logo and set of brochures and other items of promotional campaign.
- . Experience in interviewing clients to determine goals of a project.
- . Balanced set of experienced staff members to include marketing, printing, and other required program items.

Responsibilities

- . Develop program approach which recognizes goals of the program. ICAITI's past and present role in the region, and ICAITI's future responsibilities for successful completion and continuation of this effort.
- . Organize overall promotional effort including logo and letterhead design, regional descriptive brochure and other materials as needed.
- . Renew materials prepared for seminars, exhibits and other meetings to ensure level of consistency with promotional materials.
- . Prepare specific items as needed to announce program activities across the region utilizing regional and national conferences, publications and other methods.

Develop specific set of relations with the media and others which permit distribution of promotional items to the targetes companies, relevant scientific and engineering groups, universities, and others who can encourage energy efficient activities in industry.

ANNEX B-7DSI INSTITUTIONAL ANALYSISA. Introduction

Three organizations with regional functions will participate in the project.

1. ICAITI (Instituto Centroamericano de Investigación y Tecnología Industrial). Officially known in English as the Central American Institute for Industry, ICAITI will play the leading role in the project, and will conduct most of the activities. ICAITI has the in-depth technical capability and the reputation with industry in the region to execute this project.

2. SIECA/COMENER (Secretaría Permanente del Tratado General de Integración Económica Centroamericana/Comisión Centroamericana de Energía - The Permanent Secretariat of the General Treaty for Central American Economic Integration/Central American Commission on Energy). SIECA/COMENER are maintained at a common headquarters, and share personnel. Their understanding of regional economic issues and the relationship to energy at a macro economic level, will be an important input to the project.

3. FECAICA (Federación de Cámaras y Asociaciones Industriales de Centroamérica - Central American Federation of Industrial Chambers and Associations). FECAICA was founded by the various national industrial chamber and associations in 1959, and is well equipped to support the project through its extensive network. All three organizations maintain headquarters in Guatemala and have regional representation in all of Central America, excluding Panama. Since Panama is to be included in the project, ICAITI is planning to add a Panama representative who will cover the project, and will assist the other two organizations in aspects relating to Panama.

B. ICAITI1. Background and Functions

ICAITI is a non-profit regional organization founded in July 1955 under United Nations auspices by the five Central American Republics to advise and provide technical services to the region's industrial sector and to conduct appropriate technical research on products and processes utilizing raw materials and natural resources. It has been in its present Guatemala facilities, donated and maintained by the Government of Guatemala, since March 1957.

ICAITI's fundamental objectives are:

- To advise the private sector in all phases of industrial feasibility studies and their execution;
- To advise and assist private firms in solving any production problems that they might encounter;
- To undertake technical experiments using regional raw materials, develop production methods, design new projects and adapt modern production techniques;
- To promote the adaptation and adoption of modern technology to improve Central American industrial productivity;
- To advise public and private industrial development institutes and investment institutions;
- To develop Central American standards for raw materials, intermediate and finished goods;
- To conduct quality control analyses, tests and trials for raw materials and products;
- To cooperate with the various offices of the governments of the Central American Isthmus, universities, technical organizations and other entities.

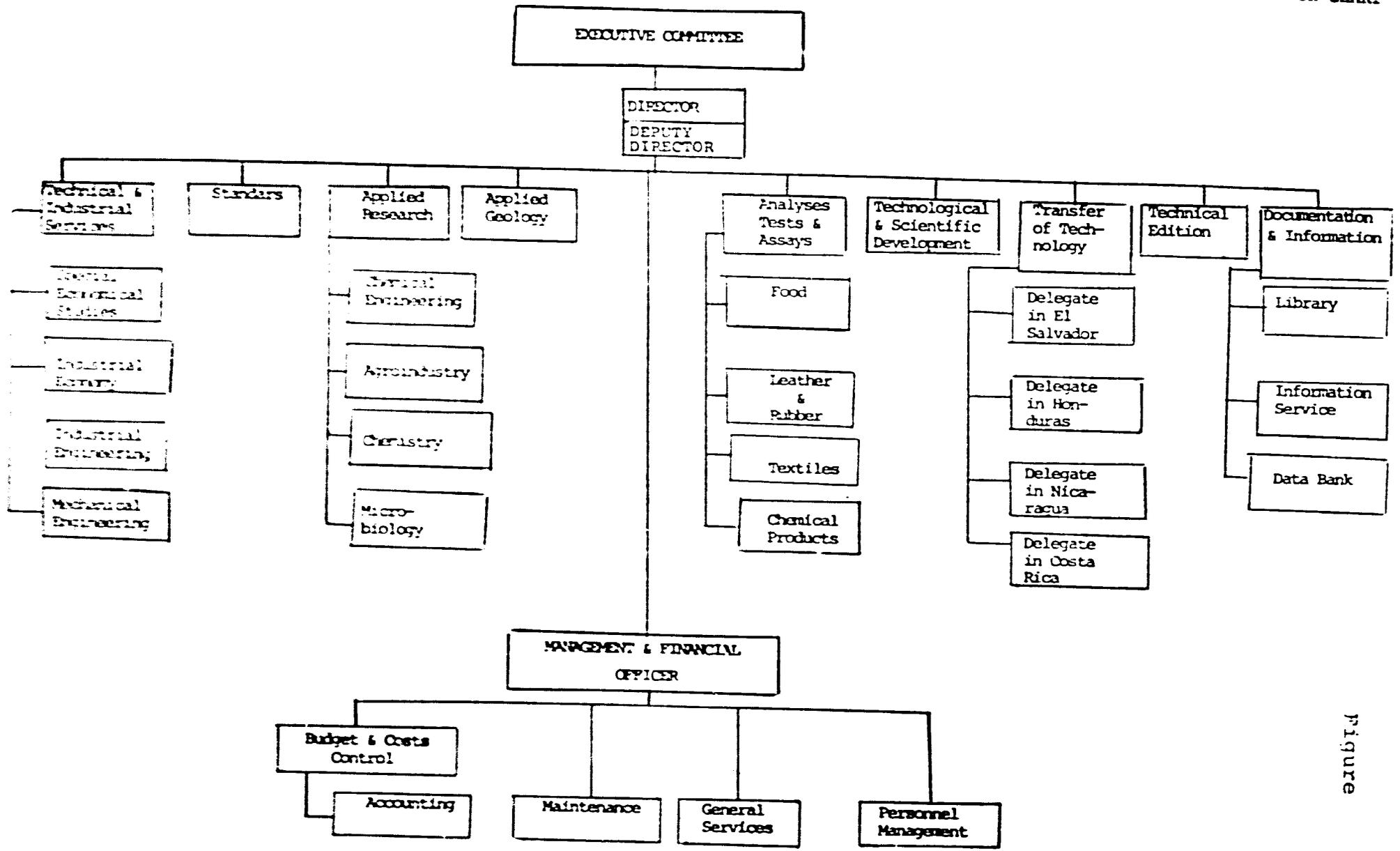
2. Organization

ICAITI's management is headed by a Board of Directors composed of the five Central American Ministers of Economy. The institution's director is nominated by the Board of Directors and is responsible for among other things, the direction, organization and administration of the institute.

The Executive Committee consists of the Director, Assistant Technical Director, Financial and Administrative Manager and the Assistant Director for Planning and Institutional Development. It is responsible for providing advisory services to the Director and assisting in policy making. (See Figure 1)

ICAITI's facilities cover 6,485 square meters where the staff of 154 employees including 63 professionals, are employed as of May, 1982. Professional personnel cover such fields as chemical, industrial and mechanical engineering, other technical fields. For details of personnel by Division, type, and profession, see Table 1.

Figure
ICAITI ORGANIZATION CHART



Figure

ICAITI's facilities include:

- An organic chemistry laboratory;
- An inorganic chemistry laboratory;
- A leather technology laboratory;
- A laboratory and pulp and paper pilot plant;
- A laboratory and textile pilot plant;
- A food technology laboratory;
- An industrial microbiology laboratory;
- A special analysis laboratory equipped with an atomic absorption spectrophotometer, an ultraviolet and visible spectrophotometer, an infrared spectrophotometer, a mass spectrophotometer and various gas chromatographs.
- An up-to-date reference center and research service.

A brief description of each division follows.

Applied Research. This division conducts food technology work and studies processes designed to exploit regional, especially agricultural, natural resources.

Technical and Industrial Services. Marketing, technical and economic feasibility studies, cost control, process expansion, raw material availability, productivity and other economic and industrial engineering activities are conducted by this division. Use of alcohol produced from sugar as a partial gasoline substitute is under current investigation here.

Standards. ICAITI has developed regionwide standards for a variety of manufactured industrial products. It also acts as a reference laboratory to help maintain standards for a variety of exports which have to meet foreign standards.

Applied Geology. This division assists and advises on ecological resources and potential for mineral exploitation in the region.

Analysis, Testing and Trials. A variety of work in food, textiles, leather, paper and cartons, synthetic industrial resins, use and control of insecticides and pesticides and environmental contamination tests are carried out by this division.

Scientific Policy. This division conducts applied studies and special training programs using resources of other divisions in applied science and technology.

Documentation and Information. Information storage, research and retrieval are provided by this division using ICAITI's own library and a variety of other information resources.

Technical Publications. This division publishes popular, technical and research studies for the general public, industrial sectors and specific industries or other clients.

Technical Activities. As of October 31, 1981, ICAITI had a total of 60 projects contracted for a total cost of \$2.5 million. At the beginning of 1981 year, 16 projects were completed for a contracted value of \$700,000; most of these projects were started in previous years.

The types of activities ICAITI is involved in are listed in Table

TABLE 1
ICAITI - LABOR FORCE AS OF MAY 1982

<u>DESCRIPTION</u>	<u>Profes- sional</u>	<u>Techni- cal</u>	<u>Admin.</u>	<u>General Services</u>	<u>Secre- tary</u>	<u>Other (1)</u>	<u>Total</u>
Director's Office (2)	7	-	1	-	2	-	10
Technical Editor	1	-	-	-	1	-	2
Documentation & Informa- tion Division	4	-	3	-	2	-	9
Deputy Director	1	-	-	-	-	-	1
Technical-Industrial Serv- ices Division	25	6	-	-	4	-	35
Applied Geology Division	1	-	-	-	-	-	1
Analysis & Testing Division	5	2	7	-	1	-	15
Applied Research Division	12	2	8	-	2	5	29
Norms & Standards Division	4	-	-	-	2	-	6
Financial & Admin. Mgt. Division	1	3	6	22	3	-	35
Cost & Budget Control Division	<u>2</u>	<u>-</u>	<u>7</u>	<u>-</u>	<u>2</u>	<u>-</u>	<u>11</u>
TOTAL	<u>63</u> (3)	<u>13</u>	<u>32</u>	<u>22</u>	<u>19</u>	<u>5</u>	<u>154</u>

(1) Includes University of San Carlos participants and others

(2) Includes consultants for special projects

(3) <u>Engineers:</u>	<u>35</u>	<u>Licenciados (IA):</u>	<u>28</u>
<u>Agronomists</u>	<u>2</u>	<u>Auditors (CPA)</u>	<u>3</u>
<u>Chemical</u>	<u>24</u>	<u>Biologists</u>	<u>5</u>
<u>Electromechanical</u>	<u>1</u>	<u>Microbiologist</u>	<u>1</u>
<u>Civil</u>	<u>1</u>	<u>Pharmaceutical</u>	<u>5</u>
<u>Geologist</u>	<u>1</u>	<u>Economist</u>	<u>10</u>
<u>Industrial</u>	<u>1</u>	<u>Nutrition</u>	<u>3</u>
<u>Mechanical</u>	<u>5</u>	<u>Lawyer</u>	<u>1</u>

TABLE 2
TYPICAL ICAITI ACTIVITIES

- Production of fuels from agricultural wastes.
- Use of solar drying to preserve grains.
- Application of coffee pulp to cattle feed and/or chemical fertilizer.
- Water purification for human consumption/use of small filters.
- Small cement plant with vertical oven.
- Bricks, roofs and other components of construction using vegetable wastes.
- Production of calcium carbide for use in small rural factories.
- Small cellulose paste plant based on agricultural wastes.
- Program of training for information services to industry.
- Assistance in setting standards, quality control and measurement.
- Evaluation of marble deposits.
- Teaching and training of personnel.
- Market studies for various products.
- Courses on the principles of control of thermal presses and the sealing of containers.
- Seminar on the use and in management of pesticides.
- Assistance in mechanical engineering.
- Emergency repair of plants.
- Program of training, classification, storage and retrieval of data.
- Assistance in the regional system of customs laboratories.
- Training in microbiological analysis.
- Use of solar energy to dry crops.
- Seminar for Directors of Latin American Technical Research Institute
- Consulting services in financial information system and administrative procedures.
- Seminar on preparation and promotion of small enterprise.
- Feasibility study for the production of alcohol as a fuel.
- Preparation of the interamerican seminar on alcohol as a fuel.

4. Relationship to Project

The ICAITI Project Manager will be assigned to the Technical and Industrial Services Division. The ICAITI divisions managing or participating in each project component are identified below.

	<u>LEAD</u>	<u>PARTICIPATE</u>
1. Management	ICAITI Project Manager	ICAITI Executive Committee
2. Industry Programs	Technical and Industrial Services	Applied Research
3. Promotion and Field Organization	Technical and Industrial Services	Applied Research
4. Promotion and Field Organization	Technical and Industrial Services	Technical Editing Documentation and Information
5. Data Base and Analysis	Documentation and Information	Technical Editing
6. Finance & Public Policy	SIECA	Technical and Industrial Services

5. Previous Experience on ICAITI

Two recent management consultant studies have been accomplished for ICAITI.

- a. "Survey Report on Programming Considerations of ICAITI". The Montana Energy and MHD R&D Institute - June 15, 1980.
- b. "Report on Contracted Services for ICAITI" The Montana Energy and MOD R&D Institute, September, 1981.

In these reports the internal management of ICAITI is analyzed in detail, and recommendations were made relating to improving the effectiveness of the institute. A review of these reports, together with recent discussions among ICAITI management provide ample evidence that ICAITI has the basic institutional capability to execute the proposed project. ICAITI recently completed a Final Report:

"Program for the Transfer of Technology"
AID Project No. 596-0066
ICAITI, Elias Hill
December 1981.

The Final Report includes four evaluations of the project over its 1976-1981 lifetime, and was funded at more \$480,722. The project resulted in the provision of technical services to many small and medium size industries covering a wide spectrum of industrial sectors throughout Central America, and resulted in an enhancement of ICAITI's institutional capability. Industrial technologies included tire quality control, hydrated lime, tanning, food processing (seeds, dairy, grain, vegetables, fish), kraft paper production, boiler maintenance, canning & packaging, syringes, sterilization, serum production, cement, waste produce utilization, soups, marine salts, and various chemical analyses.

ICAITI is currently being funded with \$3,240,000 by ROCAP, over the period 4/27/79 to 12/31/84, under AID Grant No. 596-0089-Fuelwood and Alternative Energy Sources. This project is currently undergoing its first evaluation. The project involves technical assistance in wood burning technologies, research in wood cooking and baking, training of personnel in the region, and actual construction of wood stoves in various rural communities throughout the region. In addition the project encompasses research on more efficient lime kilns, and experiments with biogas digestors.

C. SIECA/COMENER

1. General

Comisión Centroamericana de Energía (COMENER) does not have its own permanent staff. SIECA's Department of Physical Integration serves as an executive secretariat to COMENER. COMENER has not had a meeting of the Ministers of Economy of the Central American countries since 1978.

SIECA itself is a policy and research institute for the integration of Central America in areas of common economic interest. SIECA has a staff of approximately 150 people including administration and support.

SIECA is divided into 9 operating departments. These include:

- Industry
- Agriculture
- Fiscal and Tariffs
- Physical Integration
- Commercial Policy
- Statistics and Calculations
- Economic and Social Programs
- Finance and Administration
- Science & Technology

On the following pages is a description of the operating departments that will contribute to this project.

2. Institutional Arrangements*

SIECA, as secretariat to COMENER, will provide the actions needed to increase energy efficiency utilization which are to be recommended to the public sector to utilize; will carry out studies and compile the necessary information to orient the decision-making actions as they relate to energy policies that promote investment and utilization of appropriate technologies for energy saving.

The Department of Physical Integration, is in charge of the energy sector and the coordination of project which promote the infrastructure sector development, as well as of obtaining basic information for making up the consolidated energy balances and performing offer and demand predictions that allow the governments to take the necessary policy measures for the development of the sector.

SIECA includes the collaboration of the department of Statistics and Calculations which is responsible for the compiling, processing and periodical publishing of consolidated statistics for the five countries of the Common Market and Panama; such activity has been taking place during the past 20 years. The Industrial Department manages matters related to industrial development programs of the area, and manages the accomplishment of the Central American agreements for fiscal incentives for the industrial development and benefits provided to industry, as well as other matters related with the industrial sector.

The Department of Economic and Social Programs, through studies made on the situation and perspectives of each country of the region in relation with employment and immigration of labor hand, orients the coordination of national plans towards the establishment of a new coordinated regional planning system. The Department of Fiscal Affairs and Tariffs is in charge of promoting the harmonization of internal taxing of the countries and applying the tariffs regime to promote the equitable development of all the countries in the area.

The Department of Science and Technology promotes the coordination of scientific and technological development and training required for a better development of the area. SIECA also includes a Center for Central American Integration and Development Studies (ECID), which has a wide program of special studies that represent a very significant contribution for the development of this project.

* Source: Draft paper by Obiols at SIECA/COMENER

D. FECAICA and The National Chambers of Industry

1. FECAICA

FECAICA itself has very little staff and it serves primarily as a channel to reach the national chambers and represents region-wide interests on behalf of the chambers.

2. National Chambers of Industry

For the purpose of this project the National Chambers are promotion and information dissemination channels for projects prepared materials, and for distributing through their own in-house newsletters, appropriate energy information as well as project announcements of seminars, audits, training programs, etc.

Since the offices of the National Field Representatives are located in the chambers, there is an opportunity for an efficient system to provide useful information and to promote ICAITI's energy services. Below we present some reading information about the chambers in each country.

Costa Rica, Cámara de Industria

- . Has been used for arranging seminars by the ICAITI Field Representative.

El Salvador, Asociación Salvadoreña de Industriales

- . Has between 300-350 medium and large companies as members
- Also, Cámara de Comercio e Industria
- . It has about 500 members including small companies.
 - . Not associated with FECAICA, but an additional channel in El Salvador for reaching the industrial community.

Guatemala, Cámara de Industria

- . Has about 700 members
- . Has a good sized staff, 15 working full time
- . Publishes newsletter, bulletins, and the magazine "Industria".
- . Holds monthly meetings.
- . Has 38 gremilas, for various industries, including textiles, sweets, etc. Some met 2-3 times a week.
- . Has an office in Quezaltenango.

Honduras, Asociación Nacional de Industrias

- . Has an Executive Director
- . Small staff
- . Does not publish a newsletter or bulletin

Nicaragua, Cámara de Industrias de Nicaragua

- . Has a good sized staff, 30 people.
- . Has a Department of Small Industry with 7-8 staff members.
- . Has a Department of Promotion with its own printing press.
- . Publishes bulletins.

Panama, Cámara de Comercio, Industria y Agricultura de Panamá

- . Associates with 14 local chambers of industry in Panama.
- . Chamber in Panama City has over 900 members.
- . Colon's has over 400 members.
- . Publishes a newsletter, "La Cámara".

Since not all chambers have newsletter, for example Honduras, provision should be made in the national Field Representative's individual budget for any country-specific needs.

E. National Cooperators and In-Country Organizations

Throughout the five year project period, various national and international counterpart organizations will collaborate with ICAITI in carrying out the project tasks. Their effort is expected to cover the following:

- Continuous liaison for information and planning.
- Work directly with ICAITI line personnel in field investigations.
- Provide assistance in the selection of specific sites for demonstration units and obtain official permits as required.
- Take direct responsibility, with ICAITI's technical supervision, for the construction and operation of all demonstration units.
- Joint sponsoring with ICAITI of regional seminars.
- Provide personnel and pay all costs for their participation in regional seminars and in ICAITI workshop sessions.
- Promote wide-scale dissemination of energy conservation after completing the demonstration projects.

The following institutions capable of participating in some or all of the above tasks, are being considered for this collaboration:

- Guatemala University of San Carlos, Peace Corps, VITA, United Nations Central American Energy Program, Mesoamerican Center of Appropriate Technology Studies (CEMAT), Choquí Experimental Station, Solar Energy Association of Guatemala, Instituto de Fomento Municipal (INFOM), Fundación del Centavo, Desarrollo de la Comunidad, INAFOR, Oficina de Planificación Económica.
- El Salvador University of El Salvador, Catholic University, Río Lempa Energy Commission (CEL), United Nations Central American Energy Program, CENAP, Peace Corps, VITA, Solar Energy Association of El Salvador, Banco de Fomento Agropecuario, CENTA.
- Honduras Corporación Hondureña de Desarrollo Forestal (COHDEFOR), National University, United Nations Central American Energy Program, Peace Corps, VITA, Centro de Desarrollo Industrial (CDI)
- Nicaragua National University, INVIERNO, Fundación Nacional de Desarrollo (FUNDE), United Nations Central American Energy Program, Peace Corps, VITA
- Costa Rica National University of Costa Rica, University of Costa Rica, National Board of Scientific and Technological Investigation (CONOCIT), Centro de Investigación de Tecnología de Alimentos (CITA), Instituto Costarricense de Electrificación (ICRE), United Nations Central American Energy Program, Peace Corps, VITA, INVIERNO, Tecnológica de Costa Rica, Centro de Investigaciones de Energía.
- Panama Hydraulic Resource and Electrification Institute (IRHE), Panamanian Institute for Agricultural Research (IDIAP)

Although ICAITI will contact directly all of the above organizations, their assistance for each specific application will be requested through the offices of the national coordinators of the United Nations Central American Energy Program, who are thoroughly familiar with regional energy problems and with the relative capabilities of the local organizations presently active in this field. The criteria for selection of the field counterparts will be that they are extension oriented, are able to provide personnel to receive training in the technologies or systems to be introduced, assist in construction of the demonstration, and follow-up in monitoring the demonstrations.

The coordinators in the countries who already have expressed their willingness to cooperate with ICAITI in this Project, are the following:

Guatemala	Oficina de Planificación Económica Comité de Reconstrucción Nacional
El Salvador	Comisión Ejecutiva Hidroeléctrica del Río Lempa (CEL)
Honduras	Ministerio de Energía Oficina de Planificación Económica
Nicaragua	Instituto Nicaraguense de Energía (INE)
Costa Rica	Ministerio de Energía Instituto Tecnológico de Costa Rica - Centro de Investigación en Energía
Panama	Instituto de Recursos Hidráulicos y Energía (IHRE)

F. Institutional Deficiencies and Remedies

1. General

From the point of view of the project, the following would appear to be deficiencies which can be addressed. Primarily, outside of Guatemala, ICAITI is perceived to have an insufficient presence. While in general the technical reputation of ICAITI is strong, it is regarded as a remote and relatively inaccessible organization. Also, some of the ICAITI delegates have indicated that coordination with headquarters is less than desired. This means that important information sometimes does not flow from the headquarters to the field offices.

Finally, ICAITI is dependent upon funding sources from the industries and institutions of the various countries it serves. The funding is not sufficient to support the full range of activities of which ICAITI is capable. As a result of the funding problem, ICAITI does not have a full complement of staff for some of the services which would be rendered under the ROCAP project.

The project will be a major factor in remedying these deficiencies. It will create stronger mechanisms for coordination between headquarter and the field representatives. It will create an explicit aggressive program of outreach to the industries in each country giving a sense of "presence". It will finance the hiring of key technical personnel to assure the manpower capabilities to deliver the services which will result in energy efficiency implemented at the industrial plant level.

Finally, the project is designed to assist ICAITI in generating funds which can be applied to continuity of services beyond the life of the project. The primary source of funds will be consulting fees for actual services rendered in conducting energy audits and installing energy saving measures.

As the program proceeds, however, as a result of the promotional activities, ICAITI should be able to increase the contributions from its industrial member organizations, and also elicit contributions from the governments of the region. Finally, as a result of the enhanced capabilities of ICAITI demonstrated by the project, it will be in a good position to qualify for additional program monies in future years from such organizations as the United Nations Development Fund, and other international financial institutions.

2. National Field Offices

The role of the national field representatives is critical to the success of ICAITI in providing information and technical services to the industry of Central America and Panama. There are a number of deficiencies with respect to their role that must be addressed. We divide them into three areas: 1) Need for national field representatives for Guatemala and Panama; 2) Staffing and the commitments of national field offices; and 3) Strengthening the support services available at the national field offices.

a. Guatemalan and Panama Field Representatives

Industry in Guatemala has immediate access to ICAITI and as such can direct its inquiries to specific individuals at ICAITI or to the divisions. The result is that a coherent picture of Guatemalan industry's needs and use of ICAITI's services cannot be made available to other countries through the national representative. A Guatemalan field representative or information and technical services coordinator for Guatemala can adequately address this problem. In the case of Panama there will be a need for a new full time national field representative.

b. Staffing and Time Commitments

The staffing requirements for the national field offices are impossible to estimate with accuracy in the first year. These requirements depend on the demand for the energy sources provided through this project. This demand is based on a number of factors:

- 1) Communication with industry requires direct personal contact;
- 2) A project such as this with a limited number of field personnel must continue its direct services to medium and large companies in order to be successful;
- 3) Current conditions in Central American industry lead to a high rate of turnover amongst managers so that frequent contact with the same company becomes necessary.

On the other hand the existing network of national field representatives is already in direct contact with industry, so that adding another service area for their direct promotion is only an incremental change to their current work. We estimate that 55% of their time would be spent on this project alone. If they have no other, non-industry related assignments, the current field representatives should be able to take on the promotion of energy services with an improvement in the efficiency of their office support services. Some diminution in such areas as special studies can, however, be anticipated. The field representatives will, of course, need an introduction to energy and energy services, such as training in audits, energy management programs, etc.

c. Support Services at the National Field Offices

The efficiency of the national field offices can be improved by the following:

- Supplying office equipment such as typewriters, file cabinets, etc.
- Outfitting each office with its own separate telephone line.
- Adding such personnel as an executive secretary, or administrative assistant and using a messenger service for more rapid communication.
- Providing additional budget for an expense account for meals, etc.
- Providing a fund for hiring local expertise where it is cost-effective to do so.
- Supplying each field office with a project station wagon or other vehicle that can be used for transportation and moving exhibits, etc.

3. Promotion and Information

There is a major need in a project of this type to complement the technical skills and expertise of ICAITI with promotion experience. This is addressed in the budget by the provision of a Central American promotion consulting firm in the first year. This will be important in getting the project off to a quick start and obtaining a quick first year impact.

Additionally, ICAITI will need support in producing technical information in non-technical formats for industry's use. Such materials will need to be attractive and readable. Outside design and writing skills will be necessary to complement the existing ICAITI Technical Publications Office of one (1) senior professional.

G. Credit/Financial Hindrances to Industrial Conservation and Suggested Means to Alleviate Them

1. Current Status of the Economy

Central America is expecting a reversal of the economic growth of the past two decades. World wide depression, loss of international and regional markets, increased balance of payments problems have exacted an economic toll.

2. Current Political Status

The unrest, political uncertainty, war, and civil disorder that some countries of Central America are experiencing are having an additional deleterious effect on the industrial sector. Increased industrial costs for security, high management turnover, and capital and management flight add to an already depressed economy.

Under these general economic and political conditions, industry is trying to survive by reducing costs and minimizing additional capital outlays until the overall business and political climate improves. Under these circumstances alleviating any existing credit and financial hindrances requires stimulating demand and stabilizing the political situation first.

Based on our discussion with banks, both national and commercial, as well as the Central American Bank for Economic Integration, loan funds at unsubsidized rates are available at 18 1/2% interest and on short term, a year or less. The Banco Industrial de Guatemala indicated that for its prime industrial clients it has funds at 15% interest and for lower notes up to 3 years. An example of the decline in loan activity in recent years was noted for Honduras. Similar patterns are to be expected in the rest of Central America.

ANNEX B-8

MECHANISMS FOR INVOLVING
US & CENTRAL AMERICAN PRIVATE SECTOR

There are a number of established mechanisms for involving one private sector in projects. Several of these listed below have already been incorporated into this project:

- ° consultants and subcontractors
- ° trainees
- ° demonstration project participation
- ° training services for industry personnel

In addition to the above there are several other alternatives which should be considered. The remaining paragraphs of this section briefly present and describe these mechanisms.

Trade Shows

AID and/or ICAITI could sponsor a U.S.-Latin American trade show for industrial energy conservation during one of the first years of the project (the second or third years). This could include equipment displays and simposia or techniques. The U.S. Department of Commerce could act as the planning and implementing entity in the U.S. and ICAITI and OLADE or some other regional agency could represent Latin America.

Directory Preparation

ICAITI for Central America and a U.S. Consultant or a U.S. energy non-related industrial trade association could each prepare and publish a directory. These directories would describe products and services of relevance to industrial energy conservation. The preparation of these directories could start in the second or third year of the project and be completed in 1 year. The project could subsidize this, more so for the Central American directory.

Private Sector Training

As ICAITI develops in house capability in performing audits and conducting training activities as described in component 1 and 2, they will be prepared to offer courses and seminars in energy management to several types of companies in the private sector. These include members of the banking community, manufacturers of related energy technology, and consultants wishing to offer services in performing energy audits.

PROJECT REVENUES

BY YEARS
(IN US \$)

ACTION	PROJECT TOTAL YRS.1-5	REVENUES BY PROJECT YEAR					
		YR.1	YR.2	YR.3	YR.4	YR.5	YR.6
A. Level 1 Audit	60,000	---	---	---	---	60,000	120,000
B. Level 2 Audits	22,500	500	3,500	6,000	6,000	6,500	120,000
C. Major Demos	150,000	---	---	---	---	150,000	10,000
D. Inquiries	25,000	---	---	---	---	25,000	25,000
E. Data Base Searches	25,000	---	5,000	5,000	5,000	10,000	---
F. Tech.Publications	5,000	---	500	1,000	1,500	2,000	2,500
G. Seminars	9,900	---	---	2,200	3,300	4,400	4,400
H. Courses	<u>27,000</u>	---	---	---	<u>9,000</u>	<u>18,000</u>	<u>18,000</u>
TOTALS	<u>324,400</u>	<u>500</u>	<u>9,000</u>	<u>14,200</u>	<u>24,800</u>	<u>275,900</u>	<u>299,900</u>

- A. 60 done during 5th year and 120 during 6th. Charge estimated at \$1,000/audit.
- B. Charged at \$500 through 5th year. During 6th year, 30 done and cost estimated at \$4000/audit.
- C. One time income of at least 11,500 per each of 13 from payment by industries of depreciated value.
- D. 500 done per year and charged at \$50/each during 5th and 6th and following years.
- E. 50 done per year and charged at cost (\$100) for entry into data base during project and \$200 each in 5th and following years.
- F. A regularly increasing cost for a slightly increasing demand.
- G. Estimates at 11/year with 20 participants/seminars with fee set at \$10/participant for 3rd year, \$15/participant for 4th year and \$20/participant for 5th year.
- H. Estimates at 6 in 4th year with 12 in 5th and following years at 10 participants per course. Fee charges at \$450/course.