Energy Conservation Services Program
End of Contract Report
(9/15/83-4/30/87)

Contract No. DAN-5728-C-00-3073-00

HBC Reference No. 87-150(Final)

Prepared for:
U.S. Agency for International Development
Office of Energy

Washington, DC 20523

Prepared by:
Hagler, Bailly & Company
2301 M Street, NW
Washington, DC 20037

July 7, 1987

CONTENTS

TITLE PAGE

PREFACE

SUMMARY i

ACTIVITY REPORTS:

150-151: General Program Management 1

152: Energy Demand Management and Conservation Training Course 11

153: Technology Transfer for Energy Management Project Paper 14

154: Data Base Development for AID Energy Efficiency Projects and Energy Management Information System 17

155: Preparation of an Energy Auditing Manual 19

156a: Energy Demand Management and Conservation Training Course Phase II -- Energy Auditing 21

156b: Preparation of Audit Reports and Detailed Feasibility Studies for a Tire Plant and Textile Mill 23

157: ECPIE: Energy Conservation Project Investment Evaluation Model 27

158: Monograph on Innovative Approaches to Financing Energy Conservation Investments in Less Developed Countries 29

159: Feasibility Study of a Guide and Directory of U.S. Energy Efficient Equipment 31

160: ASEAN Conference on Energy Conservation in Buildings in Singapore and Mission to Manila, Bangkok, and Jakarta and ASEAN Buildings Energy Conservation Activities 35

161: Transportation Energy Conservation 37

162: Latin American/Caribbean Regional Energy Conservation Workshop 39

163: Industrial Energy Conservation Program Assistance 43

164: Ecuador Industrial Energy Conservation Training, Curriculum Development, and Audits 45

165: Revision of the Energy Demand Management and Conservation Training Manual 47

166: Revision of Industrial Energy Auditing Manual 48

167: Evaluation of the IIE/TVA Conventional Energy Training Project (CETP) Course 50

168: Organization and Planning of the Pakistan National Energy Conservation Center 51

169: Industrial Energy Conservation Program Evaluation 54

170: Regional Industrial Energy Efficiency Project Evaluation 56

171: Djibouti Energy Initiatives Project Evaluation 58

173: Haiti Fact-Finding Mission 60

177: Sri Lanka Energy Use in Agriculture 62

178: Road Transportation Energy Conservation Program 64

179: Private-Sector Involvement in Non-Utility Power Generation 69

180: Market Analysis of Cogeneration Opportunities in USAID-Assisted Countries 73

181: Institutional Barriers to Private Sector Investment in Energy Conservation 75

182: General Field Technical Assistance 78

183: Innovative Private Sector Financing 83

184: Technology Transfer Teams for Energy Conservation 85

185: Regional Energy Conservation Workshops/Seminars: Asia/Near East Workshop on Energy Conservation and Private Power Generation 89

186: Information Exchange and Energy Conservation Network Development....92

187: Asia-Near East Workshop on Energy Conservation and Private Power Generation: Followup Tasks....94

188: Egypt Energy Conservation and Efficiency Project....96

189: Energy Demand Management in Morocco....98

199: Non-Utility Power Generation in India....100

APPENDIX: ACTIVITY REPORTS

LIST OF EXHIBITS

Exhibit 1 Summary of ECSP Activities

Exhibit 2 Total ECSP Expenditures by Type

Exhibit 3 Total ECSP Expenditures by Quarter

Exhibit 4 ECSP Expenditures for Labor, Other Direct Costs, and Fees, by Quarter

Exhibit 5 ECSP Projects by Activity Area

PREFACE

This report is a comprehensive account of all major activities performed during the four years of the Energy Conservation Services Program. This report was prepared from material in the program's 14 quarterly reports, from various activity reports, and from the "corporate memory" at Hagler, Bailly & Company. This report describes all major activities and attempts to give an overview of the many other small research and information dissemination efforts that occurred throughout the program. Inevitably some of the smaller activities and informal activities are not and need not be included.

This report is intended to be a reference document to provide a single source of information on ECSP activities. It thus concentrates on describing who did what, where, when, and how. Information on results is also included, where relevant, but for more detailed information on the results of these ECSP activities, the reader is referred to the ECSP activity reports listed in each section and in the Appendix.

SUMMARY

The Energy Conservation Services Program (ECSP) provided a broad range of technical advisory services, training, and information dissemination activities to AID-assisted countries.* The objective of this 4-year program was to promote energy conservation in industry, transportation, electric power generation and transmission, and commercial and institutional building design and operation. On September 15, 1983, the U.S. Agency for International Development (AID) contracted with Hagler, Bailly & Company (prime contractor) and Reliance Energy Services (subcontractor) to provide technical and management assistance to the program. In November of 1984, Hagler, Bailly & Company became a subsidiary of RCG International. As part of this acquisition, the operations of Reliance Energy Services, another RCG subsidiary, were merged with Hagler, Bailly & Company. All ECSP-funded work ended in May 1987, although many of the activities begun under ECSP continued, either on their own initiative or with other funding from AID. AID issued a request for proposals in April 1987 to continue ECSP for 5 more years.

ACTIVITY SUMMARY

ECSP's primary goal was to realize the immediate opportunities for achieving energy savings in AID-assisted countries and to improve the efficiency of energy use. It focused on high-payoff areas in countries that are likely to achieve large and immediate improvements in their energy efficiency, and thus accelerate their development in the near term. ECSP's primary strategy for accomplishing this goal was to build a capability within AID-assisted countries to perform energy conservation activities, both at the level of individual industrial plants and at the national level. ECSP projects worked at both the grass-roots level -- training and educating engineers, operators, and owners -- and at the national level -- developing energy conservation legislation and designing and initiating national energy conservation programs. Many of ECSP's activities were directed toward the private sector in AID-assisted countries to strengthen their ability to implement economically-attractive energy conservation projects.

Over the course of the program, 37 major projects were initiated, plus a large number of minor projects (see Exhibit 1 for a summary of all major ECSP activities). These projects can be organized into 7 categories:

---

* This program is part of the Energy Policy Development and Conservation Project (Project No. 936-5728).

(1) Program Planning: Provided extensive information for the development of energy conservation program plans in the Philippines, Pakistan, Thailand, Egypt, and Morocco. In addition, provided support to S&T/EY in developing their program plan.

(2) Training: Energy audit and energy demand management training in Sri Lanka and Ecuador and development of training manuals for use throughout the world. Transportation energy conservation in Costa Rica.

(3) Energy Conservation Potential Analysis: Evaluation of energy conservation potential in transportation in Costa Rica and the Dominican Republic, in agriculture in Sri Lanka, in industry in Haiti, and energy audits and feasibility studies in Sri Lanka.

(4) Non-Utility Power Generation and Cogeneration Potential Analysis: Evaluation of the potential for and barriers to non-utility power generation in Pakistan, Thailand, India, and the Dominican Republic. Market analysis of cogeneration worldwide, and a technology transfer team facilitating cooperation between the U.S. private sector and LDCs.

(5) Policy Analysis: In-depth evaluation of the issues on well-defined topics of importance to energy conservation in developing countries, such as: financing energy conservation, guide to U.S. energy efficient equipment, road transportation energy conservation measures, and barriers to private sector investment in energy conservation.

(6) Program Evaluations: Evaluations of energy conservation programs in Ecuador, Peru, Dominican Republic, Djibouti, and a regional effort in Central America and Panama.

(7) Conferences and Information Dissemination: Organized and ran workshops on energy conservation and power generation in Latin America and Asia-Near East. Wrote, published, and distributed a wide variety of material to disseminate information about AID energy conservation activities.

Since the inception of the program, over 110 reports, presentations, manuals, and other papers were prepared (not including numerous working papers and memoranda). A comprehensive list is provided in the Appendix.

Major ECSP activities were undertaken in 18 countries: Costa Rica, Djibouti, Dominican Republic, Ecuador, Egypt, Haiti, Honduras, India, Indonesia, Guatemala, Morocco, Pakistan, Panama, Peru, Philippines, Singapore, Sri Lanka, Thailand

CONTINUING ACTIVITIES

ECSP projects were designed to have long-lasting effects and to inspire replication. Several activities led to major, multi-million dollar energy conservation programs that are now being implemented. Other activities proved so successful and promising that AID, other development organizations, or national governments provided funding to continue the work.

As an example of the first case, ECSP work provided the basic analysis that AID used to design and fund the 6-year, $10 million project in Pakistan to initiate and run a national energy conservation center (HBC Reference 168). Similarly, ECSP provided the project design analysis for the Philippines Technology Transfer for Energy Management project, a $2 million project funded by AID. The Egypt Energy Conservation and Efficiency Project and the Energy Demand Management in Morocco Project should also lead to multimillion dollar projects, complemented by additional funding from other bilateral and multilateral organizations (e.g., the EEC, World Bank). As an example of the second case, as a follow-on to ECSP feasibility studies in Sri Lanka, the Energy Department of the World Bank funded, and Hagler, Bailly prepared terms of reference for energy audits and feasibility studies in 18 energy-intensive facilities representing 25 percent of all energy consumed in the Sri Lankan industrial sector.

ECSP support to the private sector will continue under separate funding as the Technology Transfer Team (TTT) continues its efforts to reduce the barriers to cooperation between the private sectors in developing countries and the United States. Trips and activities have already been scheduled for the TTT to enable them to continue this important project.

Finally, ECSP established an in-country ability to carry out energy conservation activities in a number of countries. For instance, engineers were trained to perform industrial energy audits in several countries, including Sri Lanka, Pakistan, and Ecuador. In the transport sector, instructors were trained in Costa Rica to enable them to train others in energy efficient driving techniques. ECSP has also helped develop networks of energy professionals and managers in AID-assisted countries through its support of organizations such as the Energy Managers Association of the Philippines and the Sri Lanka Energy Managers Association.

EXPENDITURES

Total ECSP expenditures as of April 30, 1987, were $2,959,777 (see Exhibit 2). ECSP expenditures averaged approximately $200,000 per quarter (see Exhibits 3 and 4).

Several projects received additional funding from AID missions and bureaus, together they contributed $1,035,000, or 35 percent of the total. These mission buy-ins included:

- $70,000 from the mission in Manila, Philippines for the Technology Transfer for Energy Management study (HBC Reference 153)
- $60,000 from the mission in Colombo, Sri Lanka for the Energy Demand Management and Conservation Training Course (HBC Reference 156(a))
- $50,000 from the Bureau for Latin America and the Caribbean for the Latin American/Caribbean Regional Energy Conservation Workshop (HBC Reference 162)
- $300,000 from the mission in Islamabad, Pakistan for the Organization and Planning of a Pakistan National Energy Conservation Center project (HBC Reference 168)
- $13,000 from the mission in Santo Domingo, Dominican Republic for the Industrial Energy Conservation Program Evaluation (HBC Reference 169)
- $20,000 from the AID Regional Office for Central America and Panama (ROCAP) for the Regional Industrial Energy Efficiency Project Evaluation (HBC Reference 170)
- $30,000 from the mission in San Jose, Costa Rica for the transportation energy conservation demonstration project (HBC Reference 178)
- $100,000 from the Bureau for Asia and the Near East for the Private Sector Involvement in Non-Utility Power Generation work (HBC Reference 179)
- $60,000 from the Bureau for Asia and the Near East for the Asia/Near East Workshop on Energy Conservation and Private Power Generation (HBC Reference 185)
- $250,000 from the mission in Cairo, Egypt for the Energy Efficiency Technology Investment Promotion project (HBC Reference 188)
- $82,000 from the Bureau for Asia and the Near East for the Non-Utility Power Generation in India project (HBC Reference 199).

In addition, the Office of Industrial Programs in the U.S. Department of Energy contributed $25,000 to the Feasibility Study of a Guide and Directory of U.S. Energy Efficient Equipment (HBC Reference 159), through a separate task order contract with Hagler, Bailly & Company. Finally, the Government of the Dominican Republic contributed $13,000 for the transportation energy conservation project (HBC Reference 182).

ORGANIZATION OF THIS REPORT

The activities described in this report are organized chronologically, for the most part, based on the date they were initiated. Each activity was assigned an HBC Reference number upon initiation and this number is used for determining the order of its appearance in this report. Exhibit 5 organizes all activities according to 7 topics and can be used to identify activities based on the type of work performed. Over 110 activity reports were produced under ECSP. These are listed under the appropriate activity and again at the end of the report in the Appendix.

Exhibit 1

Summary of ECSP Activities
(Inception to date)

ACTIVITY	Period of Performance	Cumulative Expenditures (4/30/87)*
1. Program management and development, including preparation of in-country missions and program planning activities; prepare white paper on private power generation; revise financing energy conservation report; energy use standards work; summarize ECSP work; (HBC reference 150/151)	9-15/83-ongoing	$564,352
2. Organization, preparation, and presentation of 2-week energy demand management and conservation training course in Sri Lanka for Ministry of Power and Technology -- December 7-17, 1983 (HBC reference 152)	10/10/83-12/30/83	$125,561
3. Support in preparation of Technology Transfer for Energy Management Project Paper with U.S.AID/Philippines and Ministry of Energy/Bureau of Energy Utilization (HBC reference 153)	9/15/83-4/30/84	$88,638
4. Development of data base on AID-funded energy conservation initiatives (HBC reference 154)	10/8/83-5/11/84	$13,312
5. Preparation of energy auditing manual for use in Sri Lanka (HBC reference 155)	10/21/83-2/27/84	$43,715
6. Organization, preparation, and presentation of 4-week energy auditing course in Sri Lanka for Ministry of Power and Energy -- February 27-April 10, 1984 (HBC reference 156(a))	1/3/84-4/10/84	$77,788
7. Completion of full audit reports and feasibility study of energy conservation projects for Sri Lanka Tyre Corporation and Thulhiriya Textile Mills (HBC reference 156(b))	3/15/84-8/15/84	$71,017

*Based on labor costs incurred and invoices received only.

Summary of ECSP Activities
(Inception to date)

ACTIVITY	Period of Performance	Cumulative Expenditures (4/30/87)*
8. Development of ECPIE: Energy Conservation Project Investment Evaluation Model and user manual (HBC reference 157)	1/3/84-8/30/84	$43,879
9. Preparation of monograph on innovative approaches to financing energy conservation investments in less developed countries (HBC reference 158)	1/3/84-9/10/84	$10,295
10. Completion of feasibility study of guide and directory of U.S. energy-efficient equipment for distribution to developing countries -- activity jointly sponsored with Office of Industrial Programs, U.S. Department of Energy (HBC reference 159)	1/3/84-7/12/84	$26,059
11. Missions to ASEAN countries to assist in the project planning for regional building energy conservation activities (HBC reference 160)	5/5/84-6/4/84	$31,785
12. Mission to assess current energy situation in the transportation sector of Costa Rica and identify possible AID-funded activities to improve energy use efficiency; conducted in cooperation with Oak Ridge National Laboratory (HBC reference 161)	5/14/84-3/31/85	$29,138
13. Planning and preparation for the Latin America/Caribbean Regional Energy Conservation Seminar (HBC reference 162)	5/14/84-6/30/85	$111,419
14. Missions to Ecuador and Peru to assist in developing industrial energy conservation outreach services and programs (HBC reference 163)	5/14/84-3/31/85	$19,769

*Based on labor costs incurred and invoices received only.

Exhibit 1

Summary of ECSP Activities
(Inception to date)

ACTIVITY	Period of Performance	Cumulative Expenditures (4/30/87)*
15. Ecuador industrial energy conservation training, curriculum development, and audits (HBC reference 164)	7/14/84-3/31/85	$97,286
16. Revision of training manual for energy demand management and conservation training course for industry and buildings (HBC reference 165)	7/14/84-3/31/85	$13,431
17. Revision of industrial energy audit manual (HBC reference 166)	7/14/84-9/1/84	$15,242
18. Evaluation of the IIE/TVA Conventional Energy Training Project (CETP) Course (HBC reference 167)	6/30/84-8/30/84	$21,704
19. Organization and planning of the Pakistan National Energy Conservation Center (HBC reference 168)	9/8/84-6/15/85	$129,182
20. Industrial Energy Conservation Program (Dominican Republic) Evaluation (HBC reference 169)	10/1/84-2/28/85	$23,817
21. Regional Industrial Energy Efficiency Project (Central America and Panama) Evaluation (HBC reference 170)	10/1/84-3/15/85	$38,763
22. Energy Initiatives Project (Djibouti) Evaluation (HBC reference 171)	11/30/84-2/15/85	$16,823
23. Fact-finding mission to Haiti to examine the energy efficiency of the sugar and manufacturing industries (HBC reference 173)	2/20/85-12/31/85	$12,291

*Based on labor costs incurred and invoices received only.

Exhibit 1

Summary of ECSP Activities
(Inception to date)

ACTIVITY	Period of Performance	Cumulative Expenditures (4/30/87)*
24. Joint reconnaissance visit to Sri Lanka to identify energy bottlenecks in the agricultural sector (HBC reference 177)	4/16/85-12/31/85	$15,090
25. Demonstration program and public information campaign to increase energy efficiency in the transportation sector in Costa Rica; and study of transportation energy conservation in developing countries (HBC reference 178)	6/1/85-12/31/86	$143,797
26. Study of impediments to private sector involvement in non-utility power generation (HBC reference 179/1004)	9/1/85-4/30/87	$166,412
27. Market analysis of cogeneration opportunities in USAID-assisted countries (HBC reference 180)	9/15/85-4/30/87	$16,749
28. Institutional barriers to private sector investment in energy conservation (HBC reference 181)	10/14/85-4/30/87	$51,307
29. General technical assistance: Thailand, Indonesia, Dominican Republic (HBC reference 182)	10/16/85-ongoing	$113,218
30. Innovative private sector financing (HBC reference 183)	10/15/85-12/31/86	$22,062
31. Technology Transfer Teams for Energy Conservation (HBC reference 184)	10/16/85-ongoing	$72,391

*Based on labor costs incurred and invoices received only.

Exhibit 1

Summary of ECSP Activities
(Inception to date)

A C T I V I T Y	Period of Performance	Cumulative Expenditures (4/30/87)*
32. Regional Energy Conservation Workshops/Seminars: Asia/Near East Workshop (HBC reference 185)	10/15/85-12/31/86	$131,572
33. Information exchange and energy conservation network development (HBC reference 186)	10/15/85-4/30/87	$62,303
34. Asia/Near East Workshop Followup (HBC reference 187)	10/1/86-4/30/87	$39,478
35. Egypt Energy Conservation and Efficiency Project (HBC reference 188)	10/1/85-6/30/87	$271,918
36. Energy Demand Management in Morocco (HBC reference 189)	10/1/86-12/31/86	$35,037
37. Non-Utility Power Generation in India (HBC reference 199)	4/29/86-ongoing	$99,189

Exhibit 2

Summary of ECSP Expenditures, by Type

	Revised Contract Budget[2]	Cumulative Expenditures Through 4/30/87[1]	
		$	%
Salaries	$803,383	$807,746	100.5
Fringe benefits	241,015	231,049	95.9
Overhead	992,179	984,274	99.2
Travel/trans./per diem	320,000	341,596	106.7
Other direct costs	250,000	242,278	96.9
Subcontractor	250,000	247,691	99.1
Total estimated costs	**$2,856,977**	**2,854,634**	**99.9**
Fixed fee	123,698	105,143	85.0
Total estimated costs and fixed fee	**$2,980,275**	**2,959,777**	**99.3**

1 Based on labor costs incurred and invoices received as of 4/30/87 and a review conducted by Hagler, Bailly's accountants. Some additional charges are expected before the contract books are closed.

2 $2,980,275 was obligated, of which $1,035,000 was directly contributed by Regional Bureaus and Missions. Another $70,000 has been contributed through another contract.

Exhibit 3

ECSP Expenditures by Quarter

	First year	
First quarter	(9/15/83-12/15/83)	$132,613
Second quarter	(12/15/83-4/1/84)	195,109
Third quarter	(4/2/84-6/30/84)	230,243
Fourth quarter	(7/2/84-9/28/84)	134,537
Yearly total		**$692,502**
	Second year	
First quarter	(10/1/84-12/31/84)	$290,126
Second quarter	(1/2/85-3/31/85)	224,056
Third quarter	(4/1/85-6/30/85)	146,682
Fourth quarter	(7/1/85-9/30/85)	84,581
Yearly total		**$745,445**
	Third year	
First quarter	(10/1/85-12/31/85)	$250,503
Second quarter	(1/1/86-3/31/86)	242,866
Third quarter	(4/1/86-6/30/86)	170,701
Fourth quarter	(7/1/86-9/30/86)	250,420
Yearly total		**$914,490**
	Fourth year	
First quarter	(10/1/86-12/31/86)	$378,617
Second quarter[1]	(1/1/87-4/30/87)	$228,723

[1] This "quarter" covers four months, to cover all final activities under ECSP.

Exhibit 4

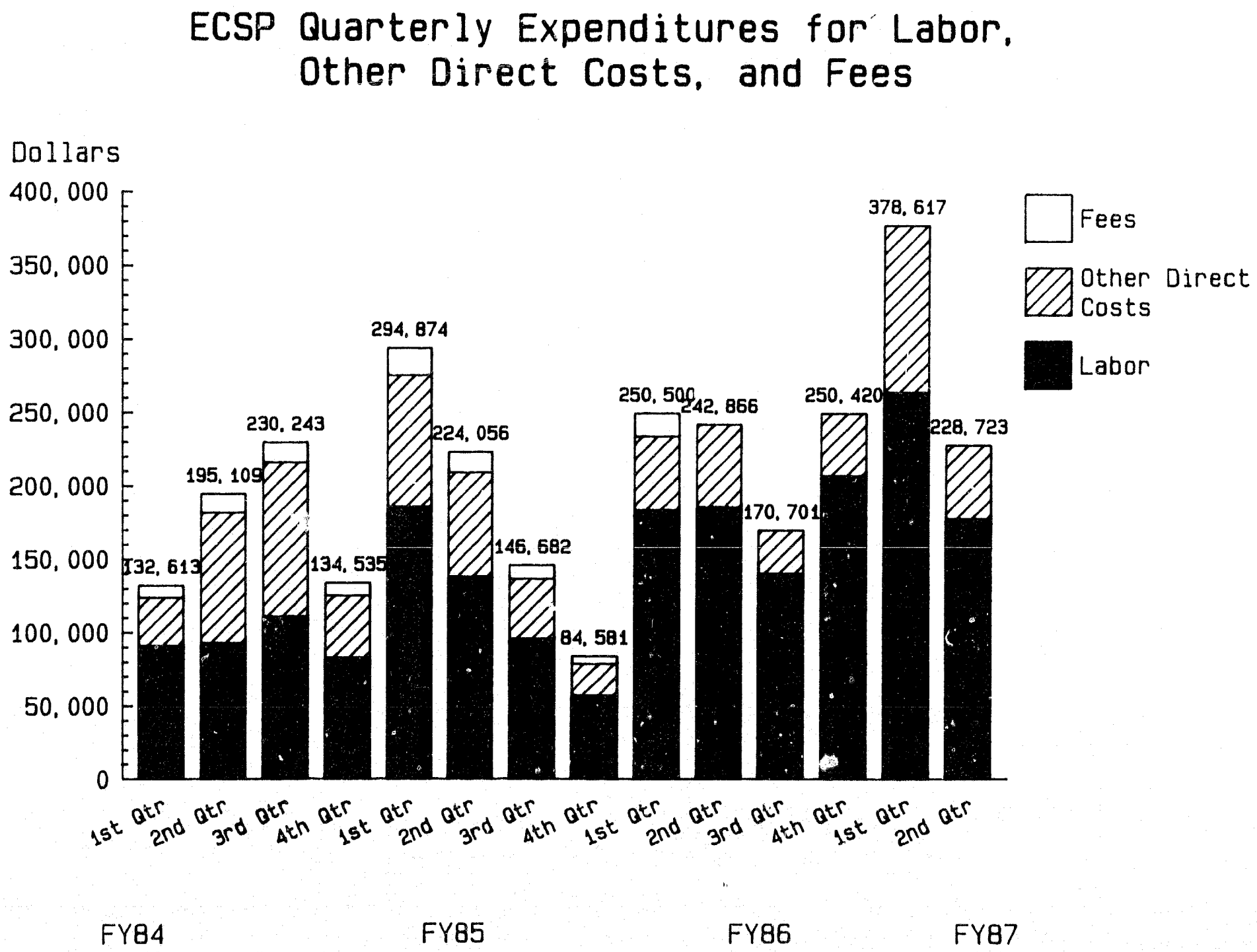
ECSP Quarterly Expenditures for Labor, Other Direct Costs, and Fees
Dollars
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
132,613
195,109
230,243
134,535
294,874
224,056
146,682
84,581
250,500
242,866
170,701
250,420
378,617
228,723
1st Qtr
2nd Qtr
3rd Qtr
4th Qtr
1st Qtr
2nd Qtr
3rd Qtr
4th Qtr
1st Qtr
2nd Qtr
3rd Qtr
4th Qtr
1st Qtr
2nd Qtr
FY84
FY85
FY86
FY87
Fees
Other Direct Costs
Labor

Exhibit 5

ECSP PROJECTS BY ACTIVITY AREA

PROGRAM PLANNING

150-151: General Program Management (Worldwide)
Various tasks
(Repeated under Policy Analysis and Conferences and Information Dissemination)

153: Technology Transfer for Energy Management Project Paper (Philippines)

168: Organization and Planning of the Pakistan National Energy Conservation Center (Pakistan)

182: General Field Technical Assistance (Thailand, Indonesia)
(Repeated under Country-Specific Energy Conservation Potential Analysis)

188: Egypt Energy Conservation and Efficiency Project (Egypt)

189: Energy Demand Management in Morocco (Morocco)

TRAINING

152: Energy Demand Management and Conservation Training Course (Sri Lanka)

155: Preparation of an Energy Auditing Manual (Sri Lanka)

156a: Energy Demand Management and Conservation Training Course Phase II -- Energy Auditing (Sri Lanka)

164: Ecuador Industrial Energy Conservation Training, Curriculum Development, and Audits (Ecuador)

165: Revision of the Energy Demand Management and Conservation Training Manual (Worldwide)

166: Revision of Industrial Energy Auditing Manual (Worldwide)

178: Road Transportation Energy Conservation Program (Worldwide)
Demonstration project in Costa Rica
(Repeated under Policy Analysis)

ENERGY CONSERVATION POTENTIAL ANALYSIS

156b: Preparation of Audit Reports and Detailed Feasibility Studies for a Tire Plant and Textile Mill (Sri Lanka)

161: Transportation Energy Conservation (Costa Rica)

173: Haiti Fact-Finding Mission (Haiti)

177: Energy Use in Agriculture (Sri Lanka)

182: General Field Technical Assistance (Dominican Republic)
Dominican Republic transportation assessment
(Repeated under Program Planning)

NON-UTILITY POWER GENERATION AND COGENERATION POTENTIAL ANALYSIS

179: Private-Sector Involvement in Non-Utility Power Generation (Pakistan, Thailand, India, Dominican Republic)

180: Market Analysis of Cogeneration Opportunities in USAID-Assisted Countries (Worldwide)

184: Technology Transfer Teams for Energy Conservation (Worldwide)

199: Non-Utility Power Generation in India (India)

POLICY ANALYSIS

150-151: General Program Management (Worldwide)
Various tasks
(Repeated under Program Planning and Conferences and Information Dissemination)

154: Data Base Development for AID Energy Efficiency Projects and Energy Management Information System (Worldwide)

157: ECPIE: Energy Conservation Project Investment Evaluation Model (Worldwide)

158: Monograph on Innovative Approaches to Financing Energy Conservation Investments in Less Developed Countries (Worldwide)

159: Feasibility Study of a Guide and Directory of U.S. Energy Efficient Equipment (Worldwide)

178: Road Transportation Energy Conservation Program (Worldwide)
Analysis of energy conservation measures
(Repeated under Training)

181: Institutional Barriers to Private Sector Investment in Energy Conservation (Worldwide)

183: Innovative Private Sector Financing (Sri Lanka, Costa Rica, Dominican Republic, Central America, Pakistan)

PROGRAM EVALUATIONS

163: Industrial Energy Conservation Program Assistance (Ecuador, Peru)

167: Evaluation of the IIE/TVA Conventional Energy Training Project (CETP) Course (Worldwide)

169: Industrial Energy Conservation Program Evaluation (Dominican Republic)

170: Regional Industrial Energy Efficiency Project Evaluation (Central America and Panama)

171: Djibouti Energy Initiatives Project Evaluation (Djibouti)

CONFERENCES AND INFORMATION DISSEMINATION

150-151: General Program Management (Worldwide)
Various tasks
(Repeated under Policy Analysis and Program Planning)

160: ASEAN Conference on Energy Conservation in Buildings in Singapore and Mission to Manila, Bangkok, and Jakarta and ASEAN Buildings Energy Conservation Activities (Singapore, Thailnad, Indonesia, Malaysia, the Philippines)

162: Latin American/Caribbean Regional Energy Conservation Workshop (Latin America/Caribbean Region)

185: Regional Energy Conservation Workshops/Seminars: Asia/Near East Workshop on Energy Conservation and Private Power Generation (Asia/Near East Region)

186: Information Exchange and Energy Conservation Network Development (Worldwide)

187: Asia-Near East Workshop on Energy Conservation and Private Power Generation: Followup Tasks (Asia/Near East Region)

ACTIVITY: Program Management and Development

COUNTRY: Not country specific

START DATE: 9/15/83 **COMPLETION DATE:** 9/30/87

ST/EY MANAGER: Pamela Baldwin, David Jhirad, Alberto Sabadell

HBC MANAGER: Alain Streicher **HBC REFERENCE:** 150-151

DESCRIPTION

This activity consisted of the various management tasks associated with the execution of the contract -- e.g., progress review meetings and preparation of quarterly reports. It also included the extensive planning activities associated with new initiatives. These initiatives were either triggered by the field, the regional bureaus, or directly by ST/EY. If these initiatives became separate activities, for program management purposes they were reported under a different HBC Reference number.

1st Quarter

The first quarter initiatives included:

Industrial Energy Conservation Experts: ECSP staff provided assistance to the Bureau for Latin America and the Caribbean and USAID/Ecuador to identify one or two industrial energy conservation experts for the National Energy Institute.

Energy Conservation Inventory: In coordination with the Department of Energy, ECSP prepared an inventory of industrial and building energy conservation activities in non-industrialized nations sponsored by the World Bank, the Asian Development Bank, UNIDO, IEA, OECD, and the Commission of European Communities.

2nd Quarter

Djibouti Energy Initiatives Project: ECSP staff provided assistance to the Djibouti Energy Initiatives Project (6030013) in response to a request from the USAID Africa Bureau and VITA in (a) the design of a commodity import and loan program for the building energy conservation retrofit project; (b) the

assessment of the potential fuel savings in the transport sector; and (c) the analysis of the electric system.

Industrial Energy Conservation Specialist: ECSP staff continued providing assistance to the Bureau for Latin America and the Caribbean and USAID/Ecuador to identify a long-term industrial energy conservation specialist for the National Energy Institute (INE) and ESPOL/EPN.

Workshop Session: ECSP staff prepared a session on energy conservation in the industrial and urban commercial sectors for the USAID Latin America/Caribbean Bureau Workshop on energy and environment held in the fall of 1984.

Sri Lanka: ECSP staff provided general assistance to the Sri Lanka Ministry of Power and Energy and USAID/Colombo including (a) giving a one-day seminar for financial officers of major public and private industrial firms to develop awareness of energy conservation activities and projects; (b) holding extensive discussions with representatives of the government and private organizations to assess the future availability and prices of fuelwood from natural forest growth and plantations; (c) performing a preliminary study of the future of imported coal as an alternate industrial fuel to replace imported oil and local fuelwood; and (d) conducting an investigation of local capabilities and existing research and development efforts in energy efficient technologies to estimate what proportion of future energy conservation efforts could be undertaken locally.

3rd Quarter

ECSP Brochure: ECSP staff wrote and published an Energy Conservation Services Program brochure in English, French, and Spanish. The brochure promoted the ECSP program and described the types of assistance available to developing countries: technical assistance, training, information, and advisory services. The brochure was sent to all the AID field missions as well as relevant counterpart agencies.

Energy Management Training Program: ECSP staff participated in the two-day (May 3 and 4, 1984) Brookhaven/Stony Brook Energy Management Training Program for AID-sponsored trainees from developing countries. The basics of industrial energy conservation, energy auditing, and national and corporate energy conservation programs were presented and discussed primarily with the participants of the "micro track" but also with most participants of the "macro track" during the opening and closing sessions.

ESCAP Meeting: ECSP staff attended the ESCAP (Economic and Social Commission for Asia and the Pacific) meeting in Jakarta on the local manufacture of energy-efficient equipment. The meeting was held between

May 21 and May 28 and was attended by representatives from ESCAP countries and representatives from the IBRD, ILO, and UNIDO. The meeting included a field trip around Jakarta to visit factories involved in manufacturing heavy electric equipment and electric motors and a testing laboratory specializing in hydraulic turbines. The meeting concluded with the preparation of a final report outlining recommendations for improving regional cooperation in the manufacture of various energy equipment.

Energy and Development Course: ECSP staff gave a half-day lecture and discussion at the Brookhaven National Laboratory on industrial energy conservation for the participants in the "Energy and Development" course for AID energy officers. The lectures focused on basic concepts and the most common pitfalls and difficulties encountered in developing and monitoring energy conservation programs in developing countries.

4th Quarter

Djibouti Energy Initiatives Project: ECSP staff participated in meetings to discuss ECSP support to the Energy Initiatives Project (Project No. 603-0013) in Djibouti. They also assisted in the work being conducted by VITA in the electric utility sector.

5th Quarter

ECPIE Presentation: ECSP staff prepared a paper on the ECSP-funded Energy Conservation Project Investment Evaluation Model (ECPIE). This paper was given during the fifth quarter at a week-long symposium in Colombo, Sri Lanka, on "Microcomputers for Developing Countries." The symposium was sponsored by the Board on Science and Technology for International Development of the U.S. National Research Council.

6th Quarter

Industrial Energy Auditing Manual Translation: During the 6th quarter, the Industrial Energy Auditing Manual was translated into Spanish by the staff at the Escuela Superior Politecnica del Litoral (ESPOL) and reviewed by Hagler, Bailly for editorial changes. The manual, which was originally prepared for use in Sri Lanka as part of the Energy Demand Management and Conservation Training Course, was revised during the fourth quarter for general use in any AID-recipient country.

Energy Conservation Strategy Plan: In support of the efforts of AID's Office of Energy to formulate a 3-year energy conservation strategic work plan, but apart from the ECSP program activities, Hagler, Bailly & Company

-- in cooperation with the Oak Ridge National Laboratory -- assisted AID in analyzing the foreign exchange pressures on the economies of AID-assisted countries caused by dependency on energy imports. Specifically, 45 countries were selected for evaluation of their energy conservation potential. Categories were developed for placing countries into meaningful groups with regard to their potential for energy savings. With this breakdown, a list of targeted activities and the necessary budget for implementing such measures were drawn up for a 3-year period.

Oil Prices in LDCs: ECSP staff provided analytical support to the Office of Energy to explain the continuing phenomenon of high oil prices in AID-assisted countries. The current oil price situation in these countries was attributed to the devaluation of local currencies against the dollar. Hagler, Bailly staff provided the data-gathering and quantitative analysis in support of this AID activity.

Energy Equipment Cost Directory: During the 6th quarter, ECSP researched, compiled, published, and distributed the Energy Equipment Cost Directory. The directory contains suppliers' names and addresses and the prices and operational characteristics of several types of energy-efficient equipment, including boiler systems, electrical systems, lighting systems, heat exchangers, and various types of instrumentation. The directory, intended as a guide for managers in developing countries, is not an exhaustive listing of equipment or manufacturers, but rather serves as a handbook for gathering information that may not be readily available in-country. The directory was updated three times, in the 8th, 9th, and 14th quarters.

7th Quarter

Sri Lanka: During a visit to Sri Lanka, ECSP staff conducted a series of interviews and on-site visits to assess the progress of industrial energy conservation initiatives in Sri Lanka since the training program on energy auditing and management was conducted there in 1983 and 1984. The program was completed in June 1984, and since then, several private initiatives were started with the encouragement of both USAID and the government of Sri Lanka. The evidence indicated that a definitive private-sector capability was being built to carry out audits and typical conservation activities. The prefeasibility studies and terms of reference prepared by Hagler, Bailly and the World Bank for the government of Sri Lanka appeared to be attracting donor organizations for funding the projects proposed in the studies. Also, at the suggestion of the ECSP program staff, the Sri Lanka Energy Managers' Association (SLEMA) was established in late 1984. Its membership was comprised of many of the former participants in the ECSP energy audit program.

Financing Energy Conservation in Developing Countries: As a follow-up to the Costa Rica Seminar (see HBC Reference #162), all papers on financing energy conservation in developing countries were compiled and merged into one comprehensive document. This report, Financing Energy Conservation in Developing Countries, was intended to serve as a planning tool to broaden the understanding of those seeking energy conservation project financing, particularly in instances where there are formidable barriers to overcome. The report was revised and updated during the 14th quarter.

9th Quarter

Office of Energy Program Plan: ECSP staff continued assisting the Office of Energy in preparing a detailed program plan. Much of the plan was based on extensive analyses of energy needs in developing countries and on experience with various technologies and approaches to meet those needs.

Strategy and Program Plan for Energy Conservation FY86 and FY87: ECSP staff completed the revisions and incorporated the recommendations of various participants to produce the Strategy and Program Plan for Energy Conservation FY86 and FY87. This plan outlines a recommended and detailed course of action for implementing energy conservation measures in developing countries. The plan ranks the energy conservation potential of specific countries, identifies barriers to achieving energy conservation in these countries, and recommends ways in which AID can support energy conservation in specific countries. The report was the culmination of a close collaborative effort by the Office of Energy, Hagler, Bailly, & Company, and the Oak Ridge National Laboratory.

Revision of the Energy Demand Management and Conservation Manual for Industry and Buildings: ECSP staff undertook a revision of the Energy Demand Management and Conservation Manual for Industry and Buildings during the ninth quarter. The manual, originally developed for the Sri Lanka Energy Demand Management and Conservation Training Course, was revised in the sixth quarter for general use in any developing country. This latest update incorporated new materials on Energy Systems Maintenance Programs, Energy Conservation Awareness Programs, Project Scheduling, and Preparation of Bid and Specification Documents.

Energy Managers Network: ECSP staff continued to promote a network of energy professionals and managers in countries where ECSP projects are underway. A well established and active organization is functioning in the Philippines; ENMAP (Energy Managers Association of the Philippines) can usefully function as a model for associations in other developing countries. ECSP staff found that prospects exist of forming similar organizations in Sri Lanka, Ecuador, Pakistan, and Central America. During trips carried out in the ninth quarter, ECSP staff held discussions in each of the countries they

visited about the benefits of forming such associations and ultimately the building of an international network of such groups.

Cogeneration in Developing Countries: Prospects and Problems: ECSP staff researched and wrote an analysis of cogeneration during the 9th through 11th quarters. This report, Cogeneration in Developing Countries: Prospects and Problems, is a systematic analysis of the potential for cogeneration in developing countries. It supplemented planning efforts for cogeneration activities initiated in Pakistan, Thailand, and India (see HBC Reference 179). The report estimated the potential for cogeneration in developing countries and discussed the economic, technical, and institutional factors that determine the decision of a government, a firm, or a foreign manufacturer to get involved in cogeneration. It also identified public policy initiatives that can encourage the application of cogeneration technologies as a means of improving economic efficiency. Finally, it discussed the role of AID in promoting private-sector involvement in cogeneration development.

10th Quarter

Dominican Republic: In response to a request from the National Energy Policy Commission to the USAID Mission in the Dominican Republic, ECSP staff carried out a short fact-finding trip in the Dominican Republic from March 23 to March 26, 1986 to develop a detailed work plan and budget for activities in transport energy conservation and cogeneration. This effort came to fruition and is reported under HBC reference 182.

U.S. Information Sources: In response to a request from the American Embassy in Amman, Jordan, ECSP prepared a list of U.S. information sources on energy conservation or energy efficiency. This list included a number of computerized databases, private research organizations, and government-sponsored information sources.

Power Plant Rehabilitation: ECSP staff analyzed the potential for increasing the generating capacity of existing power plants in developing countries through life extension and improved availability. The purpose of this study was to: (1) evaluate the potential for power system rehabilitation; (2) identify the impediments to power system rehabilitation; and (3) identify the role of AID, if any, in promoting power system rehabilitation as a way of increasing the generation supply capacity in developing countries. During the 11th quarter, ECSP staff estimated the rehabilitation potential in the following countries:

Asia/Near East: Bangladesh, Egypt, India, Indonesia, Morocco, Pakistan, the Philippines, and Thailand

Africa: Senegal, Somalia, and Zambia

Latin America and Caribbean: Costa Rica, Guatemala, Haiti, and Honduras

The preliminary results of this study indicated that it is possible to increase the thermal power generation capacity in these countries by over 4,000 MW through various rehabilitation measures. This represents over 10 percent of the existing thermal generation capacity. The financial cost of this improvement would be only a fraction of the cost of building new generation units. To achieve this potential, the electric utilities in these countries must undertake a comprehensive program of equipment upgrading, operator training, improved operation planning, and preventive maintenance.

The study team also examined the potential market for U.S. manufacturers in power system rehabilitation in the countries studied. The team reviewed the existing literature on the design and structure of power plants in these countries, conducted in depth interviews with engineering and consulting firms with experience in these countries, and directly contacted the utilities. The team learned that over 70 percent of power system hardware in these countries is manufactured outside the U.S., which limits the potential market for U.S.-made parts and equipment.

Nevertheless, the study concluded that there is a growing market for U.S. services, such as operations planning, spare parts management, training, data gathering, and management improvement, which compose a substantial part of any successful power system rehabilitation strategy.

11th Quarter

Bolivia: In response to a request from the AID mission in Bolivia, ECSP staff prepared a package of materials describing the energy conservation activities and services of ECSP. The Bolivian Mission was exploring the possibility of establishing an energy conservation program.

Costa Rica: At the request of AID/San Jose, ECSP staff visited Costa Rica to identify possible follow-up energy conservation activities. Four areas for mission funding consideration were identified: 1) Electric load management; 2) Private-sector power generation; 3) Energy cost reduction in inter-city transport; 4) Assistance in energy efficiency project implementation in the industrial sector, including securing appropriate financing. During the 12th quarter, ECSP staff prepared a proposal suggesting work in these four areas.

Power for Rural Development: A Strategy: ECSP staff assisted the Office of Energy in the preparation of a draft strategy on power for rural development. The draft strategy discussed rural energy needs and options, the barriers to meeting rural energy needs, AID's role in overcoming the

barriers, and proposed initiatives to ensure adequate, reliable and affordable rural energy supplies. The objectives of the strategy were to remove energy-related barriers to rural development and to promote private-sector participation in rural power in AID-assisted countries by developing new rural energy supplies and improving the management and efficiency of existing rural energy systems.

12th - 13th Quarter

Peru Paper Presentation: ECSP staff prepared and delivered a paper at the Fourth Annual Latin American and Caribbean Seminar on Electricity Tariffs held in Peru from November 10 to 15, 1986. The paper, entitled "Electricity Pricing and Power System Improvements: AID's Perspective", described S&T/EY's Energy Policy Development and Conservation Program (EPDAC), which includes ECSP, presented some perspectives on energy pricing reform, analyzed the place of power system improvements in energy pricing reforms, and presented conclusions on links between electricity pricing and power system improvements and on the types of projects that AID could support.

Energy Use Standards: During the 13th and 14th quarters, ECSP staff used information from the Thailand National Energy Saving Goals for Industry report and information from other countries to make a first draft of a worldwide database on energy use standards for industrial products and processes. These standards will serve as reference points for industrial managers in LDCs to evaluate quickly the energy conservation potential of proposed activities.

14th Quarter

Financing Energy Conservation in Developing Countries: Following receipt of comments from S&T/EY on the Financing Energy Conservation report, ECSP staff undertook a major revision of the report. The original report was produced in June 1985. The revised version, dated February 1987, benefits from ECSP's more extensive experience in this area.

Private Power: ECSP staff analyzed previous ECSP work in private power generation in developing countries in order to prepare a study of the major issues. The draft report, "Issues in Private Power in Developing Countries: A Preliminary Appraisal", analyzed the capital implications of growing power demand, identified various policy issues of private power, and provided case studies to illustrate the major points.

ACTIVITY REPORTS

ECSP Annual and Quarterly Reports

FY84:	First	9/15/83 - 12/15/83	January 12, 1984
	Second	12/15/83 - 4/1/84	May 11, 1984
	Third	4/2/84 - 6/30/84	July 25, 1984
	Fourth	7/2/84 - 9/28/84	October 31, 1984
Annual Report		9/15/83 - 9/28/84	April 25, 1985
FY85:	First	10/1/84 - 12/31/84	February 9, 1985
	Second	1/1/85 - 3/31/85	May 2, 1985
	Third	4/1/85 - 6/30/85	August 1, 1985
	Fourth	7/1/85 - 9/30/85	October 30, 1985
FY86:	First	10/1/85 - 12/31/85	February 7, 1986
	Second	1/1/86 - 3/31/86	April 30, 1986
	Third	4/1/86 - 6/30/86	July 21, 1986
	Fourth	7/1/96 - 9/30/86	December 10, 1986
FY87:	First	10/1/86 - 12/31/86	February 17, 1987
	Second	1/1/87 - 4/30/87	June 4, 1987

Other Reports

Bi-weekly activity and expenditure summary reports.

Energy Conservation Services Program: Technical Assistance to Developing Countries, brochure, June 1984 (English version).

Programme de Servicios para la Conservacion de la Energia (Spanish version of the ECSP brochure), September 1984.

Programme de Cooperation Pour les Economies d'Energie (French version of the ECSP brochure).

Energy Management Training Program for Development Countries, Industrial Energy Conservation, manual prepared for Brookhaven/ Stony Brook, Institute for Technology Policy Development, the State University of New York at Stony Brook, NY, May 3 and 4, 1984.

"Energy and Development: Energy Use in the Modern Sector, Industry Working Paper," paper given at meeting for AID Energy Officers, Brookhaven National Laboratory, June 17, 1984.

ECPIE: An Energy Conservation Project Investment Evaluation Model (paper presentation on the model for the Sri Lanka symposium), October 31, 1984.

The Energy Conservation Services Program (ECSP), presentation to senior staff/Bureau of Science and Technology, March 7, 1985.

Elements of a Strategy for the United States Agency for International Development in the Area of Energy Conservation (draft report and appendix), March 1985.

Sri Lanka Trip Report, memorandum to Pamela Baldwin from Alain Streicher, May 8, 1985.

Strategy and Program Plan for Energy Conservation FY86 and FY87, October 1985.

Memorandum on energy conservation information centers in the U.S. (to Robert Ichord, USAID, Asia/Near East Bureau for the U.S. Embassy, Amman, Jordan), February 24, 1986.

Dominican Republic, Technical Assistance to the National Energy Policy Commission: Proposal for Studying Transport Sector Energy Use and Industrial Cogeneration, April 11, 1986.

Cogeneration in Developing Countries: Prospects and Problems, May 5, 1986.

Energy Equipment Cost Directory, Third Edition, June 1986.

Power for Rural Development: A Strategy, First Draft, June 1986.

Financing Energy Conservation in Developing Countries, February 1987.

Issues in Private Power in Developing Countries: A Preliminary Appraisal, February 1987.

PERSONNEL

Hagler, Bailly & Company: Henri-Claude Bailly, President; Alain Streicher, Senior Vice President; Arun Sanghvi, Senior Vice President; Jack Fritz, Manager; Michael Fisher, Manager; Pirooz Sharafi, Senior Associate; Bruce Appelbaum, Senior Associate; Jeff Erickson, Associate; Richard Smith, Associate; Gerald Schwinn, Associate; Bruce Exstrum, Associate; Marc Babin, Associate; Suzanne Leonard, Associate; Faith Klareich, Research Associate; Beverly Abreu, Research Associate.

ACTIVITY: Energy Demand Management and Conservation Training Course (Contract Task Area 4)

COUNTRY: Sri Lanka

START DATE: 10/10/83 **COMPLETION DATE:** 12/30/83

ST/EY MANAGER: Pamela Baldwin

HBC MANAGER: Henri-Claude Bailly **HBC REFERENCE:** 152

DESCRIPTION

Under this activity ECSP staff organized, prepared, and presented an intensive 2-week training course on energy demand management techniques and equipment for industrial and commercial establishments. This course was followed by another 2-week intensive training course in energy auditing in March 1984 (see HBC Reference Number 155). The course was sponsored by the Ministry of Power and Energy and USAID.

The course was held from December 7 - 17, 1983 and attended by some 45 Sri Lankan engineers. The companies represented at the course accounted for some 60 percent of the total energy consumed by industry in Sri Lanka. Each day of the 9-day course was organized around a major topic as follows:

Day 1: Basic Concepts
Day 2: Equipment/Industry Overview
Day 3: Introduction to Plant Auditing
Day 4: Thermal Energy Management
Day 5: Fuel Substitution
Day 6: Electricity Management
Day 7: Visit/Audit of Tire Factory
Day 8: Analysis of Tire Factory Audit
Day 9: Panel Discussion/Course Review

With the exception of a one-day visit to the Sri Lanka Tyre Corporation to give the participants practical on-site training in the use of portable instrumentation, the program was conducted at the Sri Lanka Institute of Development Administration in Colombo.

ECSP staff prepared an 800 page workbook on energy management techniques and equipment specifically for the course and distributed it to all of the participants. In addition, two sets of portable diagnostic instruments for

energy audits were provided to the Ministry of Power and Energy. These instruments were used during the course's field work and they were also during the energy auditing training course.

Each participant was asked to fill out an evaluation questionnaire to measure the success and effectiveness of the course. Based on 44 evaluations, the course was rated as follows:

How would you evaluate the overall course?

Excellent:	13%
Good:	8%
Fair:	9%
Poor:	0%

How useful overall do you think this course will be to you?

Extremely Useful:	53%
Useful:	47%
Not Useful:	0%

The technical content of the sessions was rated as good or excellent in 83 percent of the cases and the usefulness was rated as high or very high in 70 percent of the cases. The workbook was considered by all participants as particularly useful for their day-to-day work.

ACTIVITY REPORTS

Report on mission of Henri-Claude Bailly to Sri Lanka from 10/10/83 to 10/14/83. Memorandum from Henri-Claude Bailly to Pamela Baldwin dated October 31, 1983 (25 pages).

Energy Demand Management and Conservation Training Course -- Workbook (800 pages).

Report on In-Country Activities from 12/5/83 to 12/21/83. Memorandum from Henri-Claude Bailly to Pamela Baldwin dated December 31, 1983 (50 pages).

Course evaluation questionnaires completed by the participants (44 questionnaires, 264 pages).

KEY PERSONNEL

Hagler, Bailly & Company: Henri-Claude Bailly, President, Alain Streicher, Vice President.

Reliance Energy Services: Richard Smith, Senior Consultant (course lecturer).

USAID/Colombo: Eric Loken

Ministry of Power and Energy: Dr. Mohan Munasinghe, Senior Energy Advisor.

ACTIVITY: Technology Transfer for Energy Management Project Paper (Contract Task Area 6)

COUNTRY: Philippines

START DATE: 9/15/83 **COMPLETION DATE:** 4/15/84

ST/EY MANAGER: Pamela Baldwin

HBC MANAGER: Henri-Claude Bailly **HBC REFERENCE:** 153

DESCRIPTION

Under this activity begun during the first quarter, ECSP staff provided analytical and technical support for the preparation of the project paper (PP) for the Technology Transfer for Energy Management (TTEM) project in the Philippines.

The TTEM project was a proposed joint effort of the USAID mission in the Philippines and the Philippine Bureau of Energy Utilization of the Ministry of Energy. The purpose of this project was to reduce oil imports by improving the energy efficiency of the industrial, commercial, and transportation sectors through the increased use of cost-effective energy conservation measures. These measures included both low cost "housekeeping" improvements such as plugging leaks and modifying temperature settings, and more expensive modifications or retrofits such as waste heat recovery, energy management systems, and fuel substitution.

At present, many potentially effective energy conservation measures are not undertaken for a complex sets of reasons. To change this situation, and promote the adoption of energy efficient equipment, processes, and practices, the TTEM project would focus on encouraging the Philippines private sector to develop the energy conservation services needed by supporting:

1. Studies, seminars, and workshops to provide data on approaches to energy conservation and information on the costs and benefits of energy conservation technologies, and to upgrade the sectors analysis and implementation capabilities.

2. Technical assistance through both long-term and short-term consultant services to provide training, analytic, and management services.

3. Technology demonstrations to demonstrate the technical, economic, and institutional viability of energy conservation technologies, focusing on low-risk technologies already used in other countries which can be adapted quickly and inexpensively for use in the Philippines.

The total funding for this program was to be $10.2 million, of which USAID would provide $7.5 million and the government of the Philippines would provide $2.7 million.

ECSP staff provided analytic support in three major areas: (a) assessment of the institutional capabilities of the technology users, financing institutions, government institutions, intermediaries and technology suppliers; (b) identification of the target sectors/technology responses which should be the focus of the project; and (c) definition of technology transfer guidelines based on the lessons of other countries' programs.

During the second quarter, the analysis of the TTEM subproject targets and the assessment of the institutional capabilities were completed. An initial set of energy technology demonstration subprojects was identified in the industrial and commercial sectors. They included: combustion monitoring and control systems; flue gas heat recovery systems; increased use of insulation in industrial processes; power factor control systems; steam distribution system maintenance procedures; outside air temperature compensation for chillers and building energy management systems. The need for a number of training courses and studies was also identified. Specific courses suggested include: industrial boiler operations; industrial energy auditing; commercial building "housekeeping" practices; controls and energy auditing. For each measure, a detailed analysis was performed to calculate the energy savings, the simple payback period, the foreign exchange payback, the replicability potential, and the demonstration requirements.

As part of the initial assessment, interviews were conducted with over 150 representatives of 70 Philippine private- and public-sector organizations. The results of these interviews were used to evaluate the ability of Philippine organizations to implement an effective energy conservation program and to identify organizations that could help with the project. Finally, the policies for managing the TTEM fund including the lending policies and lending/guarantee terms were also defined. As part of this exercise, a detailed analysis was performed of the first generation reflow funds from loans made by the TTEM Project. This analysis was conducted because the Philippine government wanted assurance that the TTEM loan fund could be totally self-sustaining.

ACTIVITY REPORTS

Philippines Trip Report, 10/17/83

Thoughts on project implementation and management. Memorandum to Lawrence Ervin, USAID/Philippines and Pamela Baldwin dated October 31, 1983 (9 pages).

Report on In-Country Activities from 11/28/83 to 12/16/83. Memorandum from Henri-Claude Bailly to Pamela Baldwin dated December 28, 1983 (77 pages).

The Philippine Energy Situation and Outlook and the USAID Assistance Strategy -- Final Draft Paper dated 12/14/83 (31 pages).

Guidelines for Technology Transfer and Demonstrations -- Case Studies. Draft working paper (19 pages).

TTEM Project Review Meeting (12/14/83) with USAID/Philippines and Ministry of Energy, Bureau of Energy Utilization, presentation (18 pages).

TTEM Project Review Meeting (12/15/83) with USAID/Philippines TTEM Project Review Committee, presentation (18 pages).

Selection of TTEM Subproject Targets and Economic Analysis (15 pages).

Potential TTEM Subprojects (45 pages).

Guidelines for Technology Transfer and Demonstrations -- Case Studies (18 pages).

Assessment of Institutional Capabilities and Project Roles (20 pages).

Organizations Interviewed (10 pages).

Fund Reflow Analysis (11 pages).

KEY PERSONNEL

Hagler, Bailly & Company: Henri-Claude Bailly, President; Jack Stafurik, Manager.

Reliance Energy Services: Bruce Appelbaum, Senior Consultant.

USAID/Manila: Lawrence Ervin, Senior Energy Advisor.

MOE/BEU: Orlando Galang, Director; Benjamin Lim, Chief, Energy Conservation Division.

ACTIVITY: Data Base Development for AID Energy Efficiency Projects and Energy Management Information System (Contract Task Area 5)

COUNTRY: Not country-specific

START DATE: 10/8/83 **COMPLETION DATE:** 2/6/84

ST/EY MANAGER: Pamela Baldwin

HBC MANAGER: Henri-Claude Bailly **HBC REFERENCE:** 154

DESCRIPTION

Under this activity begun during the first quarter, ECSP staff (a) developed a data base on AID-funded energy conservation projects, and (b) prepared a concept paper on the feasibility of a computer-based energy information system to support ECSP. As part of this activity, ECSP staff reviewed all relevant project documents and interviewed all AID energy offices.

According to the initial plans, the concept paper would consider the technical and economic feasibility of initiating an energy management information system to support AID projects. It was anticipated that this energy management information system would develop into a comprehensive, computer-based system that would be regularly revised and updated as projects develop and are implemented. In the initial survey of AID projects, ECSP staff identified 17 energy conservation initiatives. They developed a format to present information on each source of information, as well as a narrative discussion of the project. During the preparation of the first version of the data base, ECSP staff started to prepare a uniform list of keywords and project activities which will facilitate comparison across projects.

The first version of the data base was distributed in May 1984 to Energy Office staff and regional energy officers, however, the project was not continued.

ACTIVITY REPORT

"U.S. Agency for International Development Energy Conservation Initiatives," first report, May 11, 1984.

KEY PERSONNEL

Hagler, Bailly & Company: Gerald Schwinn, Associate, Timothy Bleakley, Associate; Laura Dinterman, Research Associate.

USAID/Washington: Robert Archer, Latin America and the Caribbean; James Bever, Near East; Wes Fisher and Val Mahan, Africa; Robert Ichord, Asia.

ACTIVITY: Preparation of an Energy Auditing Manual (Contract Task Area 4)

COUNTRY: Sri Lanka

START DATE: 10/21/83 **COMPLETION DATE:** 2/27/84

ST/EY MANAGER: Pamela Baldwin

HBC MANAGER: Alain Streicher **HBC REFERENCE:** 155

DESCRIPTION

Under this activity ECSP staff prepared and produced a comprehensive energy auditing manual for use in Sri Lanka during the audit training course. The manual, which was designed to serve as a practical guide that can easily be adapted to the needs of other countries, is organized in five major chapters as follows:

Chapter 1: Introduction

Chapter 2: Steps in an Energy Management Program

Chapter 3: Conducting a Preliminary Energy Audit

- 3.1 Organized Resources
- 3.2 Identify Data Requirements
- 3.3 Collect Data
- 3.4 Analyze Data
- 3.5 Develop Action Plan

Chapter 4: Instrumentation

- 4.1 Temperature Measurement
- 4.2 Flow Measurement
- 4.3 Pressure
- 4.4 Gas Analysis
- 4.5 Electricity Measurement
- 4.6 Light Level Measurement
- 4.7 Water Analysis

Chapter 5: Conducting an Energy Audit

5.1 Energy Audit of Boilers
5.2 Energy Audit of Steam System
5.3 Energy Audit of Dryers
5.4 Energy Audit of Furnaces
5.5 Energy Audit of Electrical Systems

These five chapters are supported by three appendices presenting a detailed case study of the audit of a textile plant, a case study of a wire and cable plant, and finally an overview of the basic engineering and energy conservation principles as they relate to plant energy auditing.

ACTIVITY REPORT

Energy Auditing Manual, February 1984, (500 pages).

KEY PERSONNEL

Hagler, Bailly & Company: Alain Streicher, Vice President.

Reliance Energy Services: Max Lopp (Senior Consultant), Richard Smith (Senior Consultant).

ACTIVITY: Energy Demand Management and Conservation Training Course Phase II -- Energy Auditing (Contract Task Area 4)

COUNTRY: Sri Lanka

START DATE: 1/3/84 **COMPLETION DATE:** 4/10/84

ST/EY MANAGER: Pamela Baldwin

HBC MANAGER: Alain Streicher **HBC REFERENCE:** 156(a)

DESCRIPTION

Under this activity, ECSP staff conducted an intensive 4-week training course on industrial energy auditing for 32 Sri Lankan engineers. These engineers had already participated in the 2-week introductory course on energy demand management that was held in Colombo December 7-17, 1983 (see HBC Reference #152). The audit training course included extensive field work using portable instruments to gather data (two sets of portable diagnostic instruments had already been provided for the December training course). An ultrasonic doppler flow meter (used to measure liquid flows) and a high temperature infrared pyrometer were brought in-country for the auditing course. Prior to the start of the course, ECSP staff gave the members of the energy demand management and conservation team and four members of the Ceylon Petroleum Corporation a special 2-day training program to supplement their knowledge of energy auditing. This training enabled them to better assist the consultants during the field work parts of the training program. The general course was organized into three distinct parts:

- Classroom sessions on audit techniques using the audit manual that was specifically prepared for the course (March 2 and 3).
- Field work audits of the Sri Lanka Tyre Corporation and the Thulhiriya Textile Mills (March 5 - 26).
- Classroom seminars on analysis of data gathered during the field work (March 27 - April 9).

The classroom sessions included all 32 participants. For the fieldwork, the participants were divided into 2 groups of 16, one group being trained at the tire plant and the other at the textile mills. Each group was further sub-divided into 3 teams for actual training and data collection purposes. Each team rotated through the entire audit process over a 2-week period. At the

end of the training course, each participant was awarded a certificate to certify that he had successfully completed the training course.

Each participant was asked to complete an evaluation questionnaire to measure the effectiveness of the course. Based on 28 responses, the course was rated as follows:

How would you evaluate the overall course?

Excellent:	32%
Good:	68%
Fair:	0%
Poor:	0%

How useful do you think this course will be to you?

Extremely Useful:	79%
Useful:	21%
Not Useful:	0%

All the participants stated that they had received sufficient training to undertake energy audits of both their own facilities and other facilities.

KEY PERSONNEL

Reliance Energy Services: Richard Smith, Managing Consultant; Bruce Appelbaum, Managing Consultant.

USAID/Colombo: Eric Loken.

Ministry of Power and Energy: Dr. Mohan Munasinghe, Senior Energy Advisor; EDMAC staff.

ACTIVITY: Preparation of Audit Reports and Detailed Feasibility Studies for a Tire Plant and Textile Mill (Contract Task Area 3)

COUNTRY: Sri Lanka

START DATE: 3/15/84 **COMPLETION DATE:** 7/15/84

ST/EY MANAGER: Pamela Baldwin

HBC MANAGER: Alain Streicher **HBC REFERENCE:** 156(b)

DESCRIPTION

The purpose of this activity, begun during the second quarter, was to prepare full energy audit reports and detailed feasibility studies of various conservation options for the tire plant and textile mills that were the sites of the audit training fieldwork performed under HBC Reference #156(a). The candidate projects that were considered include the rehabilitation of the steam systems, the replacement and/or retrofit of the existing boilers, and cogeneration of steam and electricity. As part of this activity, ECSP staff validated and analyzed in detail the data collected during the auditing training course in order to identify all feasible energy conservation opportunities at the two sites.

In-country activities included information gathering and finalizing the scope and structure of the feasibility studies. Information gathering was divided into three parts: input data, decision-making, and suppliers. Input data consisted of technical project characteristics; fuel prices and availability; labor and material costs; interest rates and other financial parameters. ECSP staff obtained technical information from the analysis of the data from the audits, additional plant visits, and discussions with plant technical management. They obtained fuel prices and fuel availability information through intensive discussions with suppliers (e.g., CEB, CPC, Forest department) and large users (Cement Corporation for coal, National Paper Corporation for wood). They developed labor and materials costs with EDMAC. The team obtained financial data from the plant financial management and from direct discussions with the National Development Bank and the Development Finance Corporation of Ceylon. The team also held discussions with the parent ministries of the textile mill and the tire corporation (Ministry of Textiles and Ministry of Industry). They also visited local companies interested in systems similar to those considered in the feasibility studies (e.g., multifuel boilers) to obtain system quotes and improve the list of foreign and local suppliers. They finalized the study scope and structure in close collaboration with EDMAC and ran a computer

model to make preliminary project economic and financial evaluations to initiate discussions with plant management and identify information gaps and inaccuracies.

Upon return to Washington, D.C. in mid-April 1984, the team compiled the information gathered for the two feasibility studies and formatted it into the ECPIE model (Energy Conservation Project Investment Evaluation) to analyze the financial and economic viability of candidate projects as well as their impact on Sri Lanka's balance of payments. ECSP staff held extensive discussions with about 20 U.S. equipment suppliers to refine the technology cost, performance data, and delivery conditions to Sri Lanka. The results follow.

Sri Lanka Tyre Corporation (SLTC) -- In the energy audits conducted in March 1984 ECSP staff found various problems associated with a low efficiency rating of the steam generating plant. Due to a multitude of causes, they reached the conclusion that it would not be cost effective to try to modify the boiler to increase its efficiency to a satisfactory level. The feasibility study of the tire plant addressed the selection of the best option for a new steam gathering plant to replace the existing one.

ECSP staff identified five options:

- Option 1: new oil-fired packaged boiler
- Option 2: new multifuel (wood/oil) boiler
- Option 3: new multifuel (wood/oil) boiler/back pressure steam turbine
- Option 4: new multifuel (wood/oil) boiler/extraction condensing steam turbine
- Option 5: new multifuel (coal/oil) boiler (stoker or fluidized-bed).

To evaluate the five technical options, ECSP staff conducted financial and economic analyses to determine each option's expected performance. They conducted the financial analyses from the perspective of SLTC to assist SLTC's management in deciding which, if any, of the five technical options to implement. They conducted the economic analyses from the perspective of the Sri Lankan economy to assist the Sri Lankan government in determining the overall social merit of the alternative technical options. On the basis of the analyses, ECSP staff chose Option 2 as the best alternative to satisfy both the financial and economic criteria for project selection.

Thulhiriya Textile Mills -- Based on the energy audits conducted in March 1984 at the Thulhiriya Textile Mills, ECSP staff concluded that the feasibility

study should focus on steam system rehabilitation. Of the six technical options selected for review, ECSP staff considered three suitably attractive to warrant detailed analysis of the financial and economic benefits. The options include:

- Option 1: Converting existing boiler from oil to wood gas using a heat gasifier
- Option 2: Replacing the boiler with a new, multifuel boiler capable of burning wood and oil, and
- Option 3: Replacing the boiler with a new, multifuel boiler capable of burning coal and oil.

ECSP staff also conducted financial and economic analyses for these three options as they did in the SLTC study. They also conducted a social cost/benefit analysis for each option. They concluded that Option 1 is the most attractive option financially, while all three options had negative social costs. Based on the feasibility study, ECSP staff recommended that it is necessary to undertake a more detailed study of the fuel handling system for the gasifier option as well as the reliability of the wood supply.

ECSP staff discussed the draft reports with each plant management during a trip to Sri Lanka for the World Bank between May 28 and June 15, 1984. On the basis of the discussion, only minor changes had to be made to the Tyre Corporation report. Thulhiriya management raised major issues, however, about the viability of the gasifier project and their ability to manage the procurement, startup, and operation of the system.

Because of these concerns, Thulhiriya management expressed interest in receiving additional assistance for the project or having a separate entity take responsibility for owning and operating the gasifier. Consequently, ECSP staff decided to investigate which options are available for third-party private ownership and operation of the project.

During the fourth quarter, ECSP staff completed the final report on the Feasibility Study of Thulhiriya Textile Mills. They also continued efforts to identify potential third-party financiers for the proposed conservation projects at the Sri Lanka Tyre Corporation and the Thulhiriya Textile Mills.

As a follow-on to these ECSP activities, the Energy Department of the World Bank funded (as part of the joint World Bank-UNDP Energy Sector Management Assistance Program), and Hagler, Bailly and Reliance Energy Services prepared terms of reference for energy audits and feasibility studies in 18 energy-intensive facilities representing 25 percent of all energy consumed in the industrial sector.

ACTIVITY REPORTS

Energy Audit Report for Sri Lanka Tyre Corporation, Final Report, June 1984.

Energy Audit Report for Thulhiriya Textile Mills, Final Report, June 1984.

Feasibility Study of Sri Lanka Tyre Corporation Factory, Final Report, June 1984.

Feasibility Study of Thulhiriya Textile Mills, Final Report, July 1984.

KEY PERSONNEL

Hagler, Bailly & Company: Alain Streicher, Vice President; Michael Fisher, Manager; Tim Bleakley, Associate.

Reliance Energy Services: Richard Smith, Managing Consultant, Bruce Appelbaum, Managing Consultant.

Ministry of Power and Energy: Dr. Mohan Munasinghe, Senior Energy Advisor; Dr. Nalin Walpita, EDMAC.

Sri Lanka Tyre Mills: P.P. Subasinghe.

Thulhiriya Textile Mills: J.C. Sethi and K.M. Randeria.

CTSC (Ceylon Tobacco Service Company): Dr. Nalin Walpita (formerly with EDMAC).

ACTIVITY: ECPIE: Energy Conservation Project Investment Evaluation Model (Contract Task Area 7)

COUNTRY: Not country-specific

START DATE: 1/3/84 **COMPLETION DATE:** 8/30/84

ST/EY MANAGER: Pamela Baldwin, David Jhirad

HBC MANAGER: Henri-Claude Bailly **HBC REFERENCE:** 157

DESCRIPTION

Under this activity ECSP staff designed and programed a user-friendly microcomputer-based model to evaluate the financial, economic, and foreign currency requirements of any proposed conservation investment. The model automatically produces reports suitable for presentation to lenders. ECSP staff first tested the model in Sri Lanka to evaluate the proposed improvements to the tire and textile plants (see HBC Reference 156(b). The model is structured as a cash-flow simulation that incorporates the provisions of the Sri Lankan tax code as they apply to business investments and income. The model tracks cash outlays and receipts during a project's construction and operating periods. The model calculates net revenues and costs in cash over the time period of the analysis to develop a net cash-flow. The net cash-flow over time is then analyzed by such traditional methods as payback, net present value, and discounted payback to evaluate the expected financial and economic performance of a project. The model was designed as a very "user-friendly" interactive program. It requests all inputs, allows for editing and modification of inputs, and permits storage, retrieval, and modification of prior sets of inputs as the basis for subsequent analysis. Where appropriate, in requesting a series of inputs over time, the model allows the analyst to choose among the following options:

- Specifying individual input for each time period
- Specifying a single input value as constant for all time periods
- Specifying a single input value for the first time period and an exponential growth rate to establish values for subsequent time periods.

Once all inputs have been specified, the analyst is able to specify whether outputs should be displayed only to the video monitor or should be printed. Monitor display and printed outputs are formatted by the model.

The model was developed for IBM and IBM compatible computers. It requires 128K of memory. A user guide was developed to make use of the model as easy as possible.

ECSP staff first tested the model in Sri Lanka during the third quarter in April 1984 while they were conducting the feasibility studies and Sri Lankans were trained in its use and applications. The model successfully evaluated all financial and economic factors of the proposed conservation investments at the tire plant and textile mills. Comments and suggestions from Sri Lankans were incorporated into a modification of the report format and the analysis. Other changes made to the model included the use of a more generalized tax structure to allow the model's use in other developing countries, additional flexibility with regard to system configurations, and accompanying graphics.

During the 6th quarter, the model was demonstrated during the Energy Conservation Seminar held in Costa Rica by ECSP (see HBC Reference 162) and final revisions were made to the model and the user's manual to reflect comments and suggestions made during the seminar. ECSP staff periodically updated the model throughout the remainder of the ECSP contract to improve its functioning.

ACTIVITY REPORTS

The Energy Conservation Project Investment Evaluation Model (ECPIE): A User's Manual, August 1984, Revised March 1985.

KEY PERSONNEL

Hagler, Bailly & Company: Henri-Claude Bailly, President; Michael Fisher, Manager.

ACTIVITY: Monograph on Innovative Approaches to Financing Energy Conservation Investments in Less Developed Countries (Contract Task Area 7)

COUNTRY: Not country-specific

START DATE: 1/3/84 **COMPLETION DATE:** 3/15/84

ST/EY MANAGER: Pamela Baldwin

HBC MANAGER: Henri-Claude Bailly **HBC REFERENCE:** 158

DESCRIPTION

Under this activity during the second quarter, ECSP staff prepared a monograph that describes several innovative approaches for financing conservation projects and illustrates potential application of the approaches in LDCs. The monograph discusses five innovative arrangements:

- Shared savings
- Energy services agreement
- Joint venture of the energy user and an external investor
- Variable payment loan
- Limited term, guaranteed payback loan.

For each of these five financing arrangements, the monograph describes its structure and operation; the distribution of risk between the energy user and the creditors/external investors; and the financing benefits that accrue to the energy user. In addition, it illustrates each financing arrangement with a simple example. To clarify each of the innovative approaches, ECSP staff analyzed an actual project using each of the five approaches. The example used to illustrate each financing mechanism was the wood gasifier retrofit project at the Thulhiriya Textile Mill in Sri Lanka.

During the seventh quarter, ECSP staff combined several papers on financing energy conservation to prepare a comprehensive report Financing Energy Conservation in Developing Countries (see HBC reference #150-151). This report was revised in the 14th quarter.

ACTIVITY REPORTS

Innovative Approaches to Financing Conservation Investments in Developing Countries, September 10, 1984.

KEY PERSONNEL

Hagler, Bailly & Company: Henri-Claude Bailly, President; Dennis Goins, Vice President; Michael Fisher, Manager.

ACTIVITY: Feasibility Study of a Guide and Directory of U.S. Energy Efficient Equipment (Contract Task Area 4)

COUNTRY: Not country-specific

START DATE: 1/3/84 **COMPLETION DATE:** 7/1/84

ST/EY MANAGER: Pamela Baldwin

HBC MANAGER: Henri-Claude Bailly **HBC REFERENCE:** 159

DESCRIPTION

Under this activity ECSP staff analyzed the feasibility of publishing a privately-financed energy efficient equipment directory for non-industrialized nations. The directory would consist of several volumes each devoted to a particular type of equipment or system. Each volume would be organized by product type and provide potential buyers with the basic information they need to initiate discussions with equipment suppliers. A minimum of 20,000 copies of each volume would be distributed, free of charge, to engineers, architects, plant managers, and other decision-makers in less developed countries.

The first volume of the directory (used to test the feasibility of the concept) would focus on instrumentation for diagnosis and measurement, controls and energy management systems. As part of this analysis, the following major questions were answered:

- Is there a strong enough need in LDCs for information about American-made energy-efficient equipment to warrant production of a directory?
- Are American energy equipment manufacturers interested enough in this market to support production of a directory?
- What are the options with regard to how a directory could be produced, marketed, and distributed?
- Can the costs be covered completely by revenues from participating private companies or would a subsidy be needed?

ECSP staff organized a full test marketing program of the concept, which included mailing a questionnaire to approximately 1,000 manufacturers. They studied production and distribution methods and costs by examining several domestic and international directories, holding discussions with staff of companies that produce directories, and obtaining quotes and information from printers and shippers. The feasibility study was funded jointly by USAID and the Department of Energy, Office of Industrial Programs.

To determine the interest of manufacturers, ECSP staff explored the feasibility of an initial directory on instrumentation and controls for energy efficiency, and most of the companies they contracted during the study manufactured energy-related instruments and controls. The team concluded from its study and survey of U.S. manufacturers that:

- Users of energy-efficient equipment believe that the information available to them on American-made products is inadequate and that there is a need for more information.

- Instrumentation and controls manufacturers have mixed opinions on the need for a directory: some think that adequate information is available and that exposure in the international market is satisfactory; others think that the market does not warrant major attention, given the lack of information on market size and the perceived difficulties (including costs) of conducting business in developing countries. A mail survey of 1,000 companies brought replies from 13 who were interested in the directory. A subsequent telephone survey of 80 companies which had received the mailing brought 5 more positive responses.

- Based on need, possible revenues, projected costs, and business risks, it appears unlikely that the directory project could be initiated and carried out as a fully private-sector initiative; a subsidy from the government or some other source would be needed to avoid initial, unacceptable losses. Production costs of one volume of an energy-efficient equipment directory would be approximately $200,000 (assuming 20,000 copies are distributed to developing countries).

Based on the feasibility study, ECSP staff made the following recommendations:

- Efforts should be intensified to better define the character and magnitude of the market for energy-efficient equipment in developing countries and to communicate more vigorously through

publications and workshops the potential that exists to market American-made equipment.

- USAID and DOE/OIP (the co-sponsor of the feasibility study) should consider additional efforts to promote the participation of more manufacturers or various industry associations that could underwrite/subsidize the effort and consider the possibility of publishing the first volume of the directory as a cost-shared demonstration with private-sector supporters.

- USAID and DOE/OIP should consider jointly forming a public-sector organization to publish the directory with the idea of turning it over to a private-sector vendor when its commercial viability is demonstrated.

During the 6th quarter, ECSP staff developed and distributed (on a much smaller scale than envisioned here) the Energy Equipment Cost Directory containing prices and operational characteristics of several types of energy-efficient equipment (see HBC Reference 150-151).

ACTIVITY REPORTS

Preliminary discussion paper for a directory of energy equipment for non-industrialized nations, dated 2/7/84 (9 pages).

Manufacturer interview guide (9 pages).

Detailed Table of Contents of Volume One: "Instrumentation and Controls" and sample listings (20 pages).

Preliminary discussion paper on quality control in product selection for inclusion in the directory; 326/84 (3 pages).

Study of the Feasibility of Publishing a Directory of U.S.-Manufactured Energy-Efficient Equipment for Distribution in Developing Countries, Final Report, July 12, 1984.

KEY PERSONNEL

Hagler, Bailly & Company: Howard Hagler, Chairman; Henri-Claude Bailly, President; Alan Roth, Consultant; Maxine Savitz, Consultant; Robert Russo, Associate; and Gerald Schwinn, Associate.

DOE/OIP: James Demetrops.

ACTIVITY: ASEAN Conference on Energy Conservation in Buildings in Singapore and Mission to Manila, Bangkok, and Jakarta (Contract Task Area 3) and ASEAN Buildings Energy Conservation Activities (Contract Task Area 6)

COUNTRY: Singapore, Thailand, Indonesia, Malaysia, the Philippines

START DATE: 5/19/84 **COMPLETION DATE:** 6/4/84

ST/EY MANAGER: Pamela Baldwin

HBC MANAGER: John Cable **HBC REFERENCE:** 160

DESCRIPTION

The principal purpose of this activity was to evaluate the potential energy savings in ASEAN commercial buildings through computer simulation and subsequently recommend the framework for setting or revising conservation standards for building in the ASEAN context. ECSP staff attended the ASEAN Conference held in Singapore on May 29-31, 1984 that evaluated the results of building energy conservation work in Singapore. They also traveled to the Philippines, Thailand, and Indonesia to meet with representatives of private and government organizations to explore the status of building energy conservation activities. Discussions were held with the United Architects of the Philippines and the Energy Research and Development Center of the Philippines National Oil Company, who jointly sponsored a "Passively Cooled Detached Urban House." In Thailand, discussions were held with staff at the Asian Institute of Technology on their building-related projects, and in Indonesia there were discussions with the Director General for Power regarding the building component of the "Energy Master Plan," which is currently in preparation.

ECSP staff also provided assistance to the Asia Bureau energy officer in preparing a project paper to be submitted to the ASEAN ministerial meeting in Manila in October 1984. The project paper described the Singapore building energy conservation work and proposed expansion to all ASEAN countries.

ACTIVITY REPORTS

ASEAN Conference on Energy Conservation in Buildings. Memorandum from John Cable to Pamela Baldwin and Robert Ichord dated June 11, 1984.

ASEAN Conference on Energy Conservation in Buildings, May 29-31, 1984.

HBC REFERENCE 160

ASEAN-U.S. Energy Experts meeting, memorandum to Pamela Baldwin from John Cable dated October 24, 1984.

KEY PERSONNEL

Hagler, Bailly & Company: John Cable, Vice President; Alain Streicher, Vice President.

USAID: Lawrence Ervin, Manila; John W. Neave, Bangkok; Desmond O'Riordan, Jakarta; Robert Ichord, ASIA/TR/EFE.

United Architects of the Philippines: Dorothy L. Lucasan, National Secretariat.

Asian Institute of Technology: Don Hertzmark; Philippe Bouiz; Dr. Dan Van Giap.

Indonesia: Dr. A. Arismundan, Director General for Power.

ACTIVITY: Transportation Energy Conservation (Contract Task Area 2)

COUNTRY: Costa Rica

START DATE: 5/14/84 **COMPLETION DATE:** 3/31/85

ST/EY MANAGER: Pamela Baldwin

HBC MANAGER: Robert Kowalski **HBC REFERENCE:** 161

DESCRIPTION

Under this activity beginning in the third quarter, ECSP staff assessed the current energy situation in the transportation sector of Costa Rica and identified opportunities for activities to improve the efficiency of energy use in this sector. A study team from ECSP and the Transportation Energy Group of Oak Ridge National Laboratory spent two weeks, from June 3 to June 16, 1984, in Costa Rica gathering data and identifying the most significant energy efficiency issues in the transportation sector. The team sought to quantify and characterize energy use in the transportation sector. In addition, the team sought to identify conservation opportunities and efficiency improvements in the major petroleum-consuming subsectors (i.e., automobiles, buses, and truck transport) and to specify short-term, practical measures that the government in Costa Rica could adopt and promote.

The team held meetings in Costa Rica with staff from the Energy Sector Division (DSE) of the Ministry of Industry, Energy and Mines, the Ministry of Planning, and the Ministry of Public Works and Transportation. The team also consulted with bus, truck, and taxi companies and the transportation chamber of commerce. Team members also visited an engine repair shop, a tire company, and a truck distributor, and traveled the nation's principal freight corridor -- between San Jose and the Caribbean Port of Limon -- served by both road and rail.

The team concluded that, given Costa Rica's heavy dependence on road transportation, any transportation energy conservation program must focus on this subsector. The team recommended various activities aimed at improving Costa Rica's transport energy efficiency, including:

- Development of direct sources of information on energy use by type of vehicle in order to more accurately analyze Costa Rica's transport energy efficiency in the future.

- Development of an energy conservation information program which should include the following components:

  1. Fuel economy information for vehicles

  2. Energy conservation awareness and training

  3. Fuel economy demonstrations.

- Improvement of the efficiency of the vehicle stock by providing fuel efficiency information for all new vehicles sold in Costa Rica and designing and implementing a fuel efficiency tax based on a study of the structure of vehicle taxes and import duties.

- Correction of any possible fuel quality problems and the establishment of a preventive maintenance program through vehicle inspections.

- Consideration of fuel switching targeted at the rail system and urban mass transit.

The team prepared a detailed report discussing the project and presenting recommendations for a transportation energy conservation program.

ACTIVITY REPORTS

The Transportation Sector in Costa Rica and Opportunities for Energy Conservation, prepared by David Greene and Frank Southworth, Oak Ridge National Laboratory, and Robert Kowalski, Hagler, Bailly & Company, May 20, 1985.

KEY PERSONNEL

Hagler, Bailly & Company: Henri-Claude Bailly, President; Robert Kowalski, Senior Consultant; Gerald Schwinn, Associate; Ana-Mari Carasso, Research Associate.

Oak Ridge National Laboratory: David Greene, Frank Southworth.

USAID/Washington: Robert Archer, LAC/DR.

USAID/San Jose: Heriberto Rodriguez, Energy Officer; Alvaro Umana, Representative to MIEM/DSE.

Costa Rica: Dr. Jorge Blanco, Alexandra Herandez, Ministerio de Industria, Energia y Minas, Directorate Sectorial Energia.

ACTIVITY: Latin American/Caribbean Regional Energy Conservation Workshop (Contract Task Area 4)

COUNTRY: Latin American/Caribbean Region

START DATE: 6/2/84 **COMPLETION DATE:** 6/30/85

ST/EY MANAGER: Pamela Baldwin

HBC MANAGER: Henri-Claude Bailly **HBC REFERENCE:** 162

DESCRIPTION

The Latin American/Caribbean Regional Energy Conservation Workshop was held in Costa Rica from January 14 to 17, 1985. It was organized and run by ECSP staff and was jointly sponsored by the USAID Office of Energy and Bureau for Latin American and the Caribbean and the Costa Rican Ministry of Industry, Energy, and Mines and the Instituto Centroamericano de Administracion de Empresas (INCAE). The meeting was held in INCAE's campus facilities in Alajuela. Its purpose was to bring together the contractors, foreign counterparts, and mission staff involved with energy conservation projects in the region. The goals of the workshop were to:

- Review AID-sponsored energy conservation project experience in the region.
- Examine the impediments to large-scale conservation investment.
- Allow for an exchange of information between mission staff, counterpart staff, and contractors to compare experiences.
- Review other AID-sponsored activities (e.g., the Energy Conservation Services Program) as well as multilateral bank and other donor activities in terms of their relevance to the LAC region.
- Review current AID policies and strategies and discuss future direction for project activities in the LAC region.

Over 65 people pre-registered for the workshop, as follows:

USAID/Washington		3
ECSP contractor (Hagler, Bailly & Company)		5
World Bank		1
InterAmerican Development Bank		1
Organization of American States		1
Latin American Energy Organization		1
Caribbean Community Secretariat		1-2
French Agency for Energy Management (AFME)		2
Regional Industrial Energy Efficiency Project		17
USAID/ROCAP	3	
Georgia Tech	1	
ICAITI	3	
SIECA	2	
Guatemala, El Salvador, Honduras, Costa Rica	2 each	
Dominican Republic		6
Jamaica		5
Ecuador		2-4
Peru		3
Haiti		3
Barbados		3
Costa Rica		13
		66-69

AID energy staff from missions in the following countries attended the seminar: Jamaica, Ecuador and Latin America Region, Peru, Haiti, Barbados and Caribbean Regional Development Office, Costa Rica, and the Regional Office for Central America and Panama (ROCAP), Guatemala City.

The workshop was organized along two dimensions: (a) the projects currently being carried out in the region, and (b) general topics relevant to their implementation. Each project was presented by project sponsors (AID missions and counterpart agencies) and the contractors; they reviewed the project and discussed its current status, problems, and results to date.

Papers were presented on AID-assisted projects in Central America and Panama (ROCAP), Jamaica, Dominican Republic, Costa Rica, and Ecuador, as well as a World Bank-supported activity in Barbados. ECSP staff also prepared papers on various aspects of project activities to share ECSP experience worldwide with those in the Latin American and Caribbean region working on energy conservation. Topics of ECSP-prepared papers include:

- Implementing an energy auditing program
- Fuel conversion

- Econcmics of energy conservation at the enterprise level
- Financing energy conservation investments: issues and traditional approaches
- Innovative financing of energy conservation investments
- ECPIE (Energy Conservation Project Investment Evaluation Model)
- Building energy conservation.

Sixteen papers were prepared and made available to each attendee in English, Spanish, or both. Throughout the sessions, all discussions and papers were simultaneously translated into English or Spanish. A full audio tape of all the sessions, including the original presentation and the translation, was also made. The final session of the seminar provided an opportunity to review and discuss the conclusions and recommendations cited in the papers. Comments made at this final session were later incorporated into a printed edition of the conclusions and recommendations. This expanded and edited copy of the conclusions and recommendations was translated into Spanish and made available to participants of the seminar and energy officials from Spanish-speaking USAID-assisted countries.

Everyone expressed the opinion that the seminar was a valuable source of new insights on energy conservation activities, provided an opportunity to share experiences among those working in the region. and began the development of a network of energy officials that will benefit future activities.

ACTIVITY REPORTS

Report on Mission to Costa Rica, September 16 through September 22, 1984, September 26, 1984.

Seminario sobre la Conservacion de Energia/Energy Conservation Seminar, Papers, (Spanish and English versions) January 1985.

Conclusions and Recommendations of the Latin America and Caribbean Regional Energy Conservation Seminar (Seminario sobre la Conservacion de Energia), March 29, 1985.

Seminario Seminario Regional Sobre la Conservacion de Energia en America Latina y el Caribe: Conclusiones y Recommendaciones, July 25, 1985.

KEY PERSONNEL

Hagler, Bailly & Company: Henri-Claude Bailly, President; Alain Streicher, Vice President; John Cable, Vice President; Michael Fisher, Manager; Gerald Schwinn, Associate; Ana-Mari Carasso, Research Associate.

USAID/Washington: Robert Archer, LAC/DR.

ACTIVITY: Industrial Energy Conservation Program Assistance (Contract Task Area 6)

COUNTRY: Ecuador, Peru

START DATE: 5/14/84 **COMPLETION DATE:** 3/31/85

ST/EY MANAGER: Pamela Baldwin

HBC MANAGER: Alain Streicher **HBC REFERENCE:** 163

DESCRIPTION

Ecuador

Under this activity, ECSP staff provided technical assistance in developing an industrial energy conservation outreach service. An ECSP team traveled to Ecuador during the third quarter to hold a number of meetings at the National Energy Institute (INE) and the Polytechnic School (ESPOL) to discuss the program they were designing which included feasibility studies, audits, training of Ecuadorian personnel, and demonstration projects. The sugar and cement industries were targeted for sectoral and project feasibility studies. Plans were made for conferences and seminars on industrial energy conservation for industry and polytechnic schools. Consideration was being given to lending technical assistance for audits and the preparation of academic programs and research in the industrial energy conservation field. At the conclusion of the trip, a number of recommendations were made concerning ECSP support of industrial energy efficiency in Ecuador.

Peru

Also during the third quarter, ECSP staff traveled to Peru to evaluate the industrial energy conservation program which the Institute of Technological Industrial Research and Technical Standards (ITINTEC) submitted to USAID/Peru. The ITINTEC project was aimed at medium and small companies (essentially private sector) and focused on developing human resources and promoting interest in industry through demonstration projects, as well as on providing R&D resources. It was intended as a first step to set the stage for major investment programs in industrial energy conservation for which World Bank and Inter-American Development Bank funds were expected.

ECSP staff held meetings with AID personnel and staff from ITINTEC and the National Energy Council (CONERG). The team made recommendations following the project which included proceeding with the design of a project based on the ITINTEC proposal to include training of Peruvian engineers and the development of Peruvian energy conservation consultants.

ACTIVITY REPORTS

Ecuador Industrial Energy Conservation Program, memorandum to Pamela Baldwin from Robert Kowalski, June 4, 1984.

Peru Industrial Energy Conservation, memorandum to Pamela Baldwin from Robert Kowalski, July 6, 1984.

KEY PERSONNEL

Hagler, Bailly & Company: Alain Streicher, Vice President; Robert Kowalski, Senior Consultant

USAID/Ecuador: Carl Duisberg, Regional Energy Officer.

Ecuador: INE: Juan Zak, Head of Energy Conservation Division; ESPOL: Eduardo Orces; Dr. Alfredo Barriga.

USAID/Peru: Mario Quiroga, Energy Officer, George Hill, Deputy Director.

Peru: CONERG: Donald Tarnawiecki, Technical Secretary; ITINTEC: Javier Verastegui, Director of Technology.

ACTIVITY: Ecuador Industrial Energy Conservation Training, Curriculum Development, and Audits (Contract Task Areas 3 and 4)

COUNTRY: Ecuador

START DATE: 7/14/84 **COMPLETION DATE:** 3/31/84

ST/EY MANAGER: Pamela Baldwin

HBC MANAGER: Alain Streicher **HBC REFERENCE:** 164

DESCRIPTION

This activity continues activities in Ecuador and Peru described in HBC Reference 163. During the fourth and fifth quarters, ECSP staff again traveled to Quito and Guayaquil three times to meet with the AID mission, the Instituto Nacional de Energia (INE), and the Escuela Superior Politecnica del Litoral (ESPOL) and implement industrial energy audits and audit training.

ECSP staff ran a 1-day seminar on industrial energy audits at ESPOL in Guayaquil on August 28, jointly sponsored by AID, INE, and ESPOL and attended by 30 graduate engineers from ESPOL's staff, INE and other Ecuadorian government agencies, and engineers from private-sector firms. Following the seminar, they ran a 4-week training program for 14 graduate Ecuadorian engineers.

The training program, based on the courses taught in Sri Lanka earlier in 1984, consisted of:

- Four days of classroom instruction at ESPOL
- Two weeks of in-plant auditing work at a textile factory and a brewery near Guayaquil
- One week of data analysis and summary work at ESPOL.

During the training course, ECSP staff held meetings with the faculty and staff of ESPOL to work on the development of a postgraduate curriculum in energy engineering. The program would be offered at ESPOL with assistance from AID and outside consultants. Graduates of the program would be certified as energy engineers.

While the course was in session, ECSP staff conducted preliminary energy audits at a textile factory (Textiles Continental S.A.), a brewery (Las Penas

Brewery, Compania de Cervezas Nacionales C.A.), and a cement factory (La Cemento Nacional). The textile factory and the brewery also were the subject of detailed energy audits with active participation by the students in the training course. The audits indicate that the adoption of low-cost measures would result in energy savings of 17 percent at the textile mill and 11 percent at the brewery. The replacement of the boiler at the brewery would result in an additional savings of 10 percent. A full audit was not conducted at the cement factory because it was already highly energy-efficient.

ACTIVITY REPORTS

Energy Audit Report for Compania Cervezas Nacionales C.A., Guayaquil, Ecuador, October 1984.

Preliminary Energy Audit Report for La Cemento Nacional, C.A., Guayaquil, Ecuador, November 26, 1984.

Energy Audit Report for Textiles Continental S.A., Guayaquil, Ecuador, November 1984.

Mission Trip Report, memorandum to Pamela Baldwin from Alain Streicher, December 3, 1984.

KEY PERSONNEL

Hagler, Bailly & Company: Alain Streicher, Vice President; Robert Kowalski, Senior Consultant.

Reliance Energy Services: Richard Smith, Managing Consultant; Bruce Appelbaum, Managing Consultant.

USAID/Ecuador: Carl Duisberg, Regional Energy Officer.

USAID/Washington: Robert Archer, LAC/DR.

Ecuador:
ESPOL: Ing. Ecuador Orces, Head, Department of Mechanical Engineering; Dr. Alfredo Barriga, Research Coordinator; Rodolfo Paz
INE: Juan Zak and Dr. Quevedo.

ACTIVITY: Revision of the Energy Demand Management and Conservation Training Manual (Contract Task Area 5)

COUNTRY: Not country-specific

START DATE: 7/14/84 **COMPLETION DATE:** 3/31/85

ST/EY MANAGER: Pamela Baldwin

HBC MANAGER: Alain Streicher **HBC REFERENCE:** 165

DESCRIPTION

The purpose of this activity was to revise and to generalize for any or all developing countries the workbook on energy management techniques and equipment that was originally prepared for the Sri Lanka Energy Demand Management and Conservation Training Course (see HBC Reference 152). ECSP staff revised the 800-page workbook to explain and illustrate the techniques and equipment necessary for energy management. The participants in this training session considered the manual to be particularly relevant to their day-to-day activities, and its successful application led to this revision. The revised manual is designed primarily to assist building and industrial plant managers and engineers in carrying out their efforts to identify implement, and manage efficient energy demand management and conservation programs in their facilities. As such, the content of the manual embraces a broad variety of technical, economic, financial, and managerial subjects. This manual can also be used as a support book for a training course in energy management and conservation.

ACTIVITY REPORTS

Energy Demand Management and Conservation Manual for Industry and Buildings, December 1984.

KEY PERSONNEL

Hagler, Bailly & Company: Alain Streicher, Vice President; Jean-Louis Poirier, Manager; Max Lopp, Associate; Bruce Appelbaum, Associate; Richard Smith, Associate

ACTIVITY: Revision of Industrial Energy Auditing Manual (Contract Task Area 5)

COUNTRY: Not country-specific

START DATE: 7/14/84 **COMPLETION DATE:** 9/1/84

ST/EY MANAGER: Pamela Baldwin

HBC MANAGER: Alain Streicher **HBC REFERENCE:** 166

DESCRIPTION

During the fall of 1984, ECSP staff made a major revision of the Industrial Energy Auditing Manual. The manual was originally prepared for use in Sri Lanka as part of the Energy Demand Management and Conservation Training Course (see HBC Reference 152).

ECSP staff made the content and approach more general so that the manual can be used in any AID-assisted country. The manual serves both as an instruction course in audit procedure training and a guide to carrying out preliminary and detailed energy audits in industrial facilities. The manual is designed primarily to assist plant managers and engineers in carrying out energy audits. It can also be used as a training manual. The manual describes an organized approach to identifying areas of potential energy efficiency improvement in a facility and determining how these improvements can be implemented at reasonable cost and within a reasonable time frame. All units were changed to Standard International Units (SIU), and new sections were added on energy norms and the use of computers for energy monitoring and management. The revised manual was used in the training that ECSP contractors conducted at the Escuela Superior Politecnica del Litoral (ESPOL) in Guayaquil, Ecuador.

The Manual was also translated into Spanish and French.

ACTIVITY REPORTS

Industrial Energy Auditing Manual, (in English, Spanish, and French), August 1984.

KEY PERSONNEL

Hagler, Bailly & Company: Alain Streicher, Vice President.

Reliance Energy Services: Richard Smith, Senior Consultant.

ACTIVITY: Evaluation of the IIE/TVA Conventional Energy Training Project (CETP) Course (Contract Task Area 4)

COUNTRY: Non country-specific

START DATE: 6/30/84 **COMPLETION DATE:** 8/30/84

ST/EY MANAGER: Pamela Baldwin

HBC MANAGER: Alain Streicher **HBC REFERENCE:** 167

DESCRIPTION

During the fall of 1984, an ECSP team visited Chattanooga, Tennessee to observe and evaluate the 1984 Tennessee Valley Authority's Energy Conservation Training Course (Industrial and Utility). The 1984 course contained 7 major units divided into 105 sessions and ran from June 9th through July 27th, including a 7-day field assignment in a TVA facility. There were 30 participants from 18 countries.

Based on the review of course materials, the on-site evaluation, the observation of classroom sessions, and the interviews with participants, it was clear that the 1984 course was a success. As a result of the course evaluation, ECSP staff made recommendations for some modifications, including a longer field assignment, a change in the sequence of sessions, and a different method of grading and ranking participants.

ACTIVITY REPORTS

Evaluation of the 1984 Tennessee Valley Authority's Energy Conservation Training Course (Industrial and Utility), August 30, 1984.

KEY PERSONNEL

Hagler, Bailly & Company: Alain Streicher, Vice President; James Williams, Vice President; Robert Kowalski, Senior Consultant

Reliance Energy Services: Max Lopp, Senior Consultant.

ACTIVITY: Organization and Planning of the Pakistan National Energy Conservation Center (Contract Task Area 6)

COUNTRY: Pakistan

START DATE: 9/8/84 **COMPLETION DATE:** 6/15/85

ST/EY MANAGER: Pamela Baldwin

HBC MANAGER: Henri-Claude Bailly **HBC REFERENCE:** 168

DESCRIPTION

The purpose of this task was to help the government of Pakistan and USAID/Islamabad organize a national energy conservation center. During a trip to Pakistan during the 4th and 5th quarters, ECSP staff interviewed Pakistani officials and gathered information in a preliminary survey. Using this information, ECSP staff outlined the organizational requirements for the proposed center. Based on the success of this initial activity, ECSP undertook a second effort to assist in the development of a more detailed and comprehensive proposal. In this effort, ECSP staff prepared a microcomputer-based policy presentation on energy conservation, together with a policy proposal for a national energy conservation program that would be coordinated by an energy conservation center.

In conjunction with these efforts, ECSP staff assisted USAID/Islamabad in setting up an energy conservation data base. The data base contained information and calculations of energy conservation potential for each sector of the economy (industry, power, transport, buildings, and agriculture).

The ECSP team recommended that the Ministry of Planning & Economic Development sponsor the proposed national energy conservation program with the support of several industrial, financial, and energy-related ministries of the Pakistani government. The National Energy Conservation Center (ENERCON), a newly-formed quasi-governmental organization, would implement the program. ENERCON would be comprised of representatives from both national and provincial government, public and private industry, trade associations, chambers of commerce and industry, and the buildings, transport, and agricultural sectors.

The team defined a program plan composed of six main components: planning, data base development, technical support, training, outreach, and implementation. In order to write a proposal for creating the program, the ECSP team analyzed the following aspects of the situation: the background of

Pakistani's energy supply and demand situation and current energy conservation efforts; the objectives of and rationale for the program in light of the energy supply imbalance; the program implementation plan, including program components, the role of ENERCON, and an implementation schedule; and overall investment requirements and sources of funds.

ECSP staff prepared a wide range of analyses in preparing the proposal. Their efforts produced the following materials:

- A detailed manpower loading schedule for the first year of ENERCON showing person-weeks and calendar schedule for each activity.
- The proposed activities for a number of public- and private-sector institutions.
- A list of the highest priority industrial facilities, both privately and publicly owned, for conducting energy audits and for implementing low- or no-cost conservation measures.

In formulating a list of the highest priority candidate facilities, ECSP staff developed a computerized data base of roughly 700 entries from information on the largest industrial customers of the Karachi Gas Company, Sui Northern Gas Pipeline Company, Pakistan State Oil, Pak Burma Shell, Caltex, and the Water and Power Development Authority (WAPDA). Once the data were collected and entered into the data base, ECSP staff identified 40 of the largest industrial plants that had not undergone energy audits. Also, they performed an on-site inspection of a standard Pakistani textile plant to view the condition of a typical plant.

The ECSP effort proved very successful as the government of Pakistan decided to establish ENERCON. AID is providing $10 million over 5 years for this effort.

ACTIVITY REPORTS

Organization and Implementation Plan for the Energy Conservation Center (Draft Discussion Paper), October 8, 1984.

Energy Conservation in Pakistan: First Draft and Supporting Analysis, November 16, 1984.

Presentation to the Energy Policy Board on Energy Conservation (Preliminary Draft), December 19, 1984.

Development of a Model to Estimate Pakistan's Energy Conservation Potential, January 18, 1985 (draft discussion paper).

Presentation on Energy Conservation to the Energy Policy Board, by Dr. Donor M. Lion, Mission Director, February 11, 1985.

National Energy Conservation Program (Draft Discussion Paper), March 1985.

Presentation on ENERCON to the Energy Conservation Working Group, May 9, 1985.

National Energy Conservation Programme, Vol. I, April 21, 1985.

National Energy Conservation Programme, Vol. II: Supporting Data and Analysis, April 21, 1985.

National Energy Conservation Programme, Annex I: Detailed ENERCON Programme Activity Schedule for Year 1, May 1985.

National Energy Conservation Programme, Annex II: Indicative Institutional Roles, May 1985.

National Energy Conservation Programme, Annex III: Candidate Industries for Energy Audits and Project Implementation in the First Year (1985-1986), May 1985.

KEY PERSONNEL

Hagler, Bailly & Company: Henri-Claude Bailly, President; Alain Streicher, Vice President; Bruce Appelbaum, Associate; Richard Smith, Associate; Charles Zimmermann, Associate; Bruce Exstrum, Associate.

USAID/Islamabad: Dr. Donor Lion, Charles Moseley, James Bever.

ACTIVITY: Industrial Energy Conservation Program Evaluation (Contract Task Area 6)

COUNTRY: Dominican Republic

START DATE: 10/1/84 **COMPLETION DATE:** 2/28/85

ST/EY MANAGER: Pamela Baldwin

HBC MANAGER: Alain Streicher **HBC REFERENCE:** 169

DESCRIPTION

During the 5th quarter, an ECSP team traveled to the Dominican Republic to evaluate the Energy Conservation and Resource Development Project No. 517-0144. The objectives of the assessment were to determine the soundness of the project and, where necessary, to make recommendations for changes that would ensure the project's success. From October 15-26, 1984, the team conducted in-country activities including interviews, on-site plant inspections, and a review of documents. The team contacted over 50 individuals during the course of this fact-finding trip.

The Energy Conservation and Resource Development Project, which was implemented in 1983, has been seriously hampered by management and resource problems. Its original objectives were (1) to establish an institutional capability in industrial energy conservation to carry out audits, (2) to implement five pilot projects in industrial conservation, and (3) to establish a credit mechanism for assisting industries. Constrained by Dominican government-mandated austerity measures, the governmental coordinating agency -- the National Energy Commission (COENER -- Comision Nacional de Politica Energetica) -- had been unable to meet its commitments to the project.

The ECSP team found that COENER had been reasonably successful in raising awareness for energy conservation and attracting qualified staff, but had failed in projecting an image of efficiency to its industrial audience. The team made recommendations in its evaluation report that suggested steps that AID should immediately take to correct problems with the project's execution. These steps include:

- Provide technical assistance on a flexible basis, with an interim review to determine the need for continued services
- Pressing for restoration of the semi-autonomous status enjoyed by

COENER until April 1984, supporting the effort by adequate documentation of the unfavorable impact on project results

- Proving intensive training of private consulting engineering firms and actively promoting their involvement in implementing the project
- Attracting and retaining qualified professionals through non-financial incentives, such as advanced training in the Dominican Republic and the United States; this training should be programmed in an integrated series of modules over a period of several years
- Improving the quality of the reports generated by the project (e.g., audit reports, progress reports) to increase their effectiveness as working documents that provide a basis for management actions.

ACTIVITY REPORTS

Dominican Republic: Energy Conservation and Resource Development/Component 2: Industrial Energy Conservation Program (Final Evaluation Report), March 1985.

KEY PERSONNEL

Hagler, Bailly & Company: Alain Streicher, Vice President; Robert Kowalski, Senior Consultant.

USAID/Dominican Republic: Larry Armstrong, Energy Officer and Project Development Officer; William Smith, Chief of Engineering.

Dominican Republic: Ing. Jose Ramon Acosta, Head of COENER; Eduardo Maal, Resident Advisor (Fluor).

ACTIVITY: Regional Industrial Energy Efficiency Project Evaluation (Contract Task Area 6)

COUNTRY: Central America and Panama

START DATE: 10/1/84 **COMPLETION DATE:** 3/15/85

ST/EY MANAGER: Pamela Baldwin

HBC MANAGER: Alain Streicher **HBC REFERENCE:** 170

DESCRIPTION

During the fifth quarter, an ECSP team traveled to Central America to evaluate the Regional Industrial Energy Efficiency Project (Project No. 596-0095) of the USAID Regional Office for Central America and Panama (ROCAP). Started under the leadership of ROCAP in 1982, the project set out to improve the balance of payments burden of the Central American countries by reducing their dependence on oil imports. The countries covered under the program are Guatemala, Honduras, El Salvador, Costa Rica, and Panama, the signatories of the agreement between the Chamber of Industries and the Central American Technical and Industrial Research Institute (ICAITI -- Instituto Centroamericano de Investigacion y Tecnologia Industrial). Two regional agencies are implementing the program: ICAITI and the Secretariat for Central American Economic Integration (SIECA -- Secretaria de Integracion Economica Centroamericana). Their role is to coordinate activities and operations among the participating countries to increase the efficiency of energy use in industry by (1) conducting energy audits, (2) implementing conservation measures, and (3) integrating energy-efficient equipment.

In its evaluation, the ECSP team found that the program is unique in (1) being the only regional energy conservation effort in the world, and (2) receiving substantial revenues from the sale of its services to the private sector. The team made recommendations that focused on improving project management by increasing participation of field engineers and national delegates in the planning process and clarifying the responsibilities of the various participants to avoid overlaps and conflicts. Other recommendations called for more involvement of private consulting and engineering firms in energy audits, training, and project implementation; increasing the project's decentralization; and increasing the technical staff and providing them with additional training. The team concluded that the project had the potential to be successful, although the project's original quantitative energy-saving goals

were not likely to be achieved.

ACTIVITY REPORTS

Regional Industrial Energy Efficiency Project: First Evaluation Final Report, February 1985.

KEY PERSONNEL

Hagler, Bailly & Company: Alain Streicher, Vice President; Robert Kowalski, Senior Consultant.

USAID: Robert Archer, LAC/DR

USAID/ROCAP: Edward Nadeau, General Development Officer; David Chavez, General Development Officer; Gustavo Ruiz, Assistant Development Officer

ICAITI: Lic. Francisco Aguirre, Ing. Ludwig Ingram

Costa Rica: Ing. Felix del Barco, Delegate

El Salvador: Ing. Jaime Gonzalez, Delegate

Panama: Ing. Celedonio Moncayo, Delegate

Guatemala: D. Ricardo Castillo, President of the Chamber of Industries

Honduras: Ing. Angel Porfirio Sanchez, Delegate

Georgia Institute of Technology: Mark Oven, Dr. Kenneth Maddock

ACTIVITY: Djibouti Energy Initiatives Project Evaluation (Contract Task Area 6)

COUNTRY: Djibouti

START DATE: 11/30/84 **COMPLETION DATE:** 2/15/85

ST/EY MANAGER: Pamela Baldwin

HBC MANAGER: Alain Streicher **HBC REFERENCE:** 171

DESCRIPTION

During the fifth quarter, ECSP staff participated in an evaluation of the Djibouti Energy Initiatives Project (AID Project No. 603-0013). Started in 1981, the project was designed to reduce Djibouti's balance of payments burden by substituting alternative energy resources for oil imports. Volunteers in Technical Assistance (VITA) was the primary U.S. contractor for the project and was responsible for achieving the overall objectives of the program. As originally conceived, the Energy Initiatives Project would strengthen the linkage between economic development planning and applied research by bolstering Djibouti's scientific and technical institute, the National Higher Institute of Scientific and Technological Research (ISERST). The project was aimed specifically at establishing the institutional capability within ISERST to plan, implement, and evaluate alternative energy development strategies and conservation programs.

ECSP staff were asked to participate in the evaluation of the Djibouti project in order to redefine the scope of the project so that the management burden could be reduced. ECSP prepared a detailed report on their evaluation that provided recommendations for restructuring the program. The major recommendation was that the project should be reoriented toward conservation measures instead of the use of renewable energy resources.

ECSP staff found that the potential for energy conservation in Djibouti was substantial, but virtually untapped. They identified three reasons as probable causes for the country's inability to conserve energy:

1. Lack of awareness of conservation techniques in both the public and private sector

2. Lack of a technical ability in identifying weaknesses and implementing corrective measures

3. Lack of government support for conservation measures.

ECSP staff also made several recommendations aimed at redirecting the project toward institutionalizing energy conservation awareness and capabilities. These were all low-cost measures and included short-term technical assistance (i.e., audits and training), training in retrofitting techniques for technicians, overseas training for the directors of the national technical institutes and energy services, demonstration projects on retrofit prototypes, exhibitions on energy-efficient equipment and techniques, a directory for energy-efficient products and services, promotional campaigns, norms for new construction, and methods of waste oil use.

Since the industrial sector in Djibouti is small and limited to non-energy-intensive activities, the major potential for energy savings resides in the commercial and residential sectors. ECSP staff estimated that energy savings of approximately 25 percent could be attained in Djibouti, where waste is excessive despite high energy prices. This level of savings would save the country over $5 million in energy expenditures, or 25,000 tonnes of oil equivalent annually.

ACTIVITY REPORTS

Djibouti Energy Initiatives: Mid-Term Evaluation/Conservation Component (Draft Report), January 1985.

KEY PERSONNEL

Hagler, Bailly & Company: Alain Streicher, Vice President

USAID/Djibouti: John Lundgren, Energy Office

VITA/Djibouti: Stephen Hirsch

Djibouti: Anis Abdallah, ISERST; Oblik Carton, Service de l'Energie.

ACTIVITY: Haiti Fact-Finding Mission (Contract Task Area 6)

COUNTRY: Haiti

START DATE: 2/20/85 **COMPLETION DATE:** 12/31/85

ST/EY MANAGER: Pamela Baldwin, David Jhirad

HBC MANAGER: Alain Streicher **HBC REFERENCE:** 173

DESCRIPTION

During the 6th quarter, an ECSP team conducted a short fact-finding visit to Haiti to evaluate their energy situation and their need for actions to improve the energy efficiency of the economy. This effort was scheduled in conjunction with the development of the new action plan for the AID mission in Haiti. The findings of the visit were used for the preparation of the mission's action plan.

Haiti's energy situation is constrained by its use of traditional sources of energy, namely wood, charcoal, and bagasse. Its energy supply is highly dependent on the availability of these biomass fuels, which comprise almost 82 percent of the nation's total energy consumption. While the country's demand for commercial energy is growing rapidly, its energy supply is restricted by these less intensive and concentrated forms of energy. Despite these constraints, electrical consumption has grown at an average annual rate of 15 percent. Unfortunately, the extensive use of biomass is causing severe ecological problems -- i.e., deforestation, soil erosion, and accelerated sedimentation. As a result, both the government and AID have targeted their efforts at increasing the efficiency of burning fuel wood, charcoal, and bagasse.

Based on a review of the work already undertaken in this area, the ECSP team made the following recommendations:

- Reduce the use of fuel wood in small distilleries (i.e., guildives), which are the most intensive users of biomass, consuming approximately 2,500 trees annually per employee. (This will require a detailed workplan that would identify potential areas for technology development such as simple instruments for measuring the efficiency of the distillation process.)

- Project industrial energy needs through 1993 and 2000 to forecast the energy requirements of the assembly export industry.
- Promote a program of industrial energy auditing in the manufacturing sector, where it is anticipated that an average energy savings of 15 percent could be achieved in fuel wood and commercial energy.

During the 9-day trip, approximately five on-site plant inspections were conducted as well as interviews with representatives from both the public and private sector.

Based on the fact-finding trip, USAID proposed to the government of Haiti that a technical assistance program in energy conservation be implemented in the country. The program would entail training in energy management, a series of energy audits, the implementation of conservation measures, and a promotional campaign to encourage energy conservation. Small and medium-sized industrial facilities would be targeted for the program, including small distilleries, which are the most intensive users of biomass, the largest component of the nation's energy supply. It is the intensive use of biomass that is creating severe ecological problems for Haiti -- i.e., deforestation, soil erosion, and accelerated sedimentation.

ACTIVITY REPORTS

Haiti: Energy Efficiency in the Sugar and Manufacturing Industries -- report on a fact-finding visit conducted between February 27 and March 7, 1985, March 25, 1985.

KEY PERSONNEL

Hagler, Bailly & Company: Alain Streicher, Vice President.

USAID/Port-au-Prince: Lou O'Connor, Energy Officer; John Lewis, Agriculture Specialist; James Walker, Economist; Muriel Jolivert, Energy Officer.

Haiti government: Ministry of Energy & Mineral Resources: Wilfrid St. Jean, Director of Energy Resources; Claude Delphin, Director of Planning; Clarence Kooi, Consultant (ITSI); Margaret Barkley, Consultant.

Haiti private sector: M. Levy, Chamber of Industries; M. Dietz, La Minoterie d'Haiti; Carmelo A. Daidones, Le Cement d'Haiti S.A.M.

ACTIVITY: Sri Lanka Energy Use in Agriculture (Contract Task Area 1)

COUNTRY: Sri Lanka

START DATE: 4/16/85 **COMPLETION DATE:** 12/31/85

ST/EY MANAGER: Pamela Baldwin, David Jhirad

HBC MANAGER: Alain Streicher **HBC REFERENCE:** 177

DESCRIPTION

During the 7th quarter, ECSP and S&T/EY conducted a joint reconnaissance visit to Sri Lanka to identify areas where energy problems cause a bottleneck in agricultural development. This initiative was the first of its kind undertaken under ECSP, as work had focused on more energy-intensive sectors such as power, industry, buildings, and transportation.

Although the visit was very short (5 days), extensive interviews with USAID/Colombo personnel allowed the team to focus quickly on a few areas and conduct related interviews with government officials. On the basis of the discussions and a review of existing documents, the team developed a simple taxonomy to identify, for major crops and other agricultural products, the most energy-intensive steps of the agriculture process, from land preparation to transport, and storage to primary and secondary processing. The institutional environment and planning activities were also reviewed. On the basis of these analyses, the team identified those areas where energy problems cause a bottleneck, and recommended that USAID/Colombo conduct prefeasibility work in three areas. (1) Agricultural Energy Data: The availability of energy data for energy planning in agriculture should be examined, especially concerning data on land preparation for paddy and processing (cf. land recently developed under the Mahaweli Project). (2) The supply of electric and mechanical power for productive use in the villages. Efforts in this area should take into account (a) the large quantities of agricultural wastes such as rice husks and coconut coir dust (which can be used as fuels to generate direct heat, steam, and power), and (b) the large quantities of off-peak hydropower that would be available from the Mahaweli Project. (3) Water pumping for irrigation in the dry zone.

Discussions continued into the ninth quarter to implement the recommendations made in the study team report prepared in June, 1985.

ACTIVITY REPORTS

Sri Lanka: Energy in Agriculture -- Report on Study Team Visit April 1985, June 28, 1985.

KEY PERSONNEL

Hagler, Bailly & Company: Alain Streicher, Vice President

USAID/S&T/EY: Janine Finnel

USAID/Colombo: Eric Loken, Energy Officer; Charles Uphaus, Agricultural Officer

Sri Lanka: Dr. Anton Belasuriya, Sri Lanka Business Development Center; Dr. Rolando Jiror, National Planning Division, Ministry of Finance and Planning.

ACTIVITY: Road Transportation Energy Conservation Program (Contract Task Area 4)

COUNTRY: Costa Rica

START DATE: 6/1/85 **COMPLETION DATE:** 12/31/86

ST/EY MANAGER: Pamela Baldwin, David Jhirad, Alberto Sabadell

HBC MANAGER: Alain Streicher **HBC REFERENCE:** 178

DESCRIPTION

In June 1985, the seventh quarter, several members of the ECSP staff went to Costa Rica to assist the government of Costa Rica in designing and conducting a project to increase fuel savings in the transportation sector through low-cost, quick payback measures. These measures consisted of a demonstration program and public information and awareness campaign for increasing energy efficiency in both public and private transportation. This effort stemmed from the ECSP reconnaissance trip to Costa Rica in June 1984 by staff from the Oak Ridge National Laboratory (ORNL) and ECSP (see HBC Reference 161). The demonstration program sought to demonstrate the fuel savings potential in privately owned and operated bus and taxi companies through vehicle maintenance, radial tires, driver training, and driver incentives.

The bus and taxi demonstrations were carried out under normal operating conditions using fleets of 24 buses and 16 taxis. Fuel conservation measures were applied to the fleets in a random manner, following a statistical design developed by ORNL staff. The measures, or variables, initially applied were optimum maintenance and radial tires. After 4 weeks each demonstration was suspended for a week, during which time all participating drivers were trained in fuel-efficient driving techniques. The courses were Spanish-language versions of the Driver Energy Conservation Awareness Training (DECAT) program developed by the U.S. Department of Energy. Training the 44 bus drivers and 27 taxi drivers proved to be a formidable administrative task due to the limited time they had available for training.

Following completion of driver training, the demonstrations resumed for an additional 4-week period, during which time driver incentives were given to

the bus drivers. Data on kilometers travelled, fuel consumed, routes, drivers, and vehicle types were then edited and analyzed using linear regression analysis to assess the impact on fuel consumption of each of the four conservation measures and of other variables.

The second component of the project, the public information and awareness campaign, was designed and implemented with considerable support from the advertising and public relations agency that had developed a broad energy conservation campaign for RECOPE, the Costa Rican national refinery. Consequently, broad media coverage was obtained for key events such as the certificate award ceremony for taxi driver trainees and the fuel conservation seminar.

The seminar, which was held on December 3-4, 1986, attracted 55 persons who were largely operators of bus, taxi, truck and institutional fleets. Most of the speakers were provided by suppliers of energy-efficient products and services. Subsequently, an 8-page supplement entitled "Fuel Conservation: A Source of Energy for Costa Rica" appeared with the December 22, 1986 issue of a leading national newspaper. The supplement, which was sponsored by 17 suppliers, examined various aspects of the subject in a style that would appeal to a broad audience.

In additional to the seminar, brochures for operators of light vehicles, buses, and trucks were prepared, based largely on promotional material gathered in the United States, they were to be distributed through existing low cost channels, such as fleet operators' associations.

The results from the project were very encouraging, as follows:

Bus savings:	Proper maintenance	6.5%
	Driver training	4.2%
	Driver incentives	1.2%*
	Radial tires	-1.8%
Taxi savings:	Proper maintenance	1.8%*
	Driver training	15.1%
	Radial tires	0.2%*

*Not statistically significant

The measures demonstrated in this project could save $24,900 per year in fuel costs for the participating vehicles -- $14,500 for buses and $10,400 for taxis. Replication throughout the fleet of the cost reduction measures in the host cooperatives would save an estimated $491,500 in fuel costs -- $34,700 in

the bus fleet and $456,800 in the taxi fleet. Further benefits would result from better driving habits, which will produce reduced accident rates, increased vehicle life, lower maintenance costs, and less pollution.

During the 11th quarter, the final report on the Costa Rica demonstration project, Implementation of Fuel Cost Reduction Measures in Costa Rican Private Bus and Taxi Fleets, was completed. The draft report was circulated for comments and was revised based on reviews received from participating organizations in Costa Rica, the Costa Rica AID mission, AID/Washington, and Oak Ridge National Laboratory. The data analysis was completed, and conclusions and recommendations were developed. Finally, the Executive Summary was translated into Spanish and sent to the participating organizations in Costa Rica.

Transportation Energy Conservation Analysis Paper

During the 10th quarter, ECSP staff began working on a policy paper to evaluate transportation energy projects in developing countries and establish a framework for identifying and evaluating transportation energy conservation projects for specific USAID-assisted countries. Among other things, the paper: reviews projects undertaken in developing countries; analyzes transportation energy consumption, oil imports, GNP, and a number of other variables to develop a quantitative system for identifying those USAID-assisted countries that can most benefit from transportation energy conservation projects; categorizes and summarizes conservation policies and programs used in developed countries; and evaluates the applicability of these programs to USAID-assisted countries. The final draft of this report, Road Transportation Energy Conservation: Needs and Options in Developing Countries, was prepared in the 12th quarter and was distributed for review early in July 1986. The report was revised based on the comments received and made final in September 1986.

Experience in transportation energy conservation in developing countries has been very limited. As a result, information for making reasoned choices of new projects is very limited. This report was designed to help alleviate the situation by summarizing developing country experience with transportation energy conservation measures, evaluating the potential for conservation, and evaluating individual conservation measures to choose those most appropriate for developing countries. The report is designed to serve as a reference document to facilitate choosing transportation energy conservation projects for

developing countries. To this end, in preparing the report ECSP staff performed the following tasks:

- Conducted an extensive search for examples of transportation energy conservation efforts in developing countries, evaluated the projects found, and created a series of case studies
- Discussed the importance of increasing energy efficiency in transportation
- Analyzed an extensive set of statistics to identify countries with the greatest need and showing the greatest promise for transportation energy conservation projects
- Identified all transportation energy conservation measures and developed a classification system to facilitate understanding and evaluating these measures
- Evaluated transportation energy conservation measures to select the most appropriate and promising measures for developing countries
- Evaluated the impact of individual transportation energy conservation measures and estimated the potential impact of concerted efforts to improve the energy efficiency of the transportation sector
- Conducted an extensive literature search and created a bibliography to identify some of the more important reports and books on transportation energy conservation.

ACTIVITY REPORT

Transportation Energy Conservation in Costa Rica: Report of In-Country Activities, June 10-19, 1985, June 25, 1985.

Transportation Energy Conservation in Costa Rica: A Work Plan, June 25, 1985.

Implementation of Fuel Conservation Measures in Costa Rican Private Bus and Taxi Fleets, Final Report, June 11, 1986.

Road Transportation Energy Conservation: Needs and Options in Developing Countries, September 1986.

KEY PERSONNEL

Hagler, Bailly & Company: Alain Streicher, Vice President; Robert Kowalski, Senior Associate; Jeff Erickson, Associate

Oak Ridge National Laboratory: David Greene

USAID/San Jose: Heriberto Rodriguez, Energy Officer

Costa Rica: Ministry of Industry, Energy and Mines, Energy Sector Directorate: Dr. Jorge Blanco, Director General; Ing. Alexandra Hernandez; Ing. Antony Araya; Lic. Ana Lorena Leon. Ministry of Public Works and Transportation, Rodrigo Munguia; Dr. Julio Jaen, Directorate of Road Safety, Ministry of Public Works and Transportation.

ACTIVITY: Private-Sector Involvement in Non-Utility Power Generation (Contract Task Area 6)

COUNTRY: Pakistan, Thailand, India, Dominican Republic

START DATE: 9/9/85 **COMPLETION DATE:** 4/30/87

ST/EY MANAGER: David Jhirad, Alberto Sabadell

HBC MANAGER: Alain Streicher **HBC REFERENCE:** 179

DESCRIPTION

The focus of this activity is on evaluating the potential for and barriers to development of cogeneration and other non-utility power generation options by the private sector in developing countries. The successful development of such options will improve fuel efficiency, increase domestic fuel use, enhance the resiliency and reliability of the power supply, and provide opportunities for private sector investment in areas traditionally not available to them. Four countries were studied under this project, Pakistan, Thailand, India, and the Dominican Republic. The efforts in Pakistan and Thailand are described here, India is described under HBC Reference #199, and the Dominican Republic under HBC Reference #182.*

Pakistan

Planning began on a study to identify barriers to private-sector development of non-utility electrical generation in Pakistan during the eighth quarter. The study team, composed of senior level consultants from Hagler, Bailly and Arthur D. Little, traveled to Pakistan in October 1985 to identify impediments to non-utility electrical generation that exist at the policy, regulatory, or institutional levels. The team explored Pakistan's internal energy situation to identify any inherent constraints to non-utility electrical generation such as lack of available capital and skilled man-power, and structural limitations within the industrial base. A cost/benefit analysis of different alternatives to non-utility electrical generation was performed. In addition, the U.S.

---

* The India and the Dominican Republic efforts were performed under a different HBC Reference numbers for accounting reasons.

experience in the area of private-sector non-utility electrical generation was described in the project report to illustrate the success of a government incentive program set up to foster these types of investments.

Based on the team's findings, a draft report on private sector power generation in Pakistan was completed the ninth quarter. The study team determined that the potential for private sector power generation is substantial in Pakistan. However, significant barriers exist to prevent this potential from being fully realized. The barriers include subsidized energy prices, lack of technical information, and institutional constraints. As a result, the team made specific recommendations to USAID with regard to energy source utilization and policy approaches to overcome institutional barriers to Pakistan's electric power deficit. Key recommendations included:

- Development of a buy-back rate structure accounting for seasonalities and load requirements
- Assessment of the natural gas fields and associated gas available in Pakistan
- Study of electric generation tariffs that could lead to further rationalization of the rate structure to encourage the entrance of private sector power generation
- Help utilities and industry become familiar with cogeneration so that opportunities in cogeneration can be pursued
- Detailed study of waste energy and biomass potential for small-scale power generation
- Expansion of the program in hydropower to make sites available to the private sector.

The first draft report on the Pakistan study was sent to AID/Washington and AID/Islamabad for comments during the 10th quarter. In Mid-January 1986, two meetings were held in Washington between the study team, representatives of AID/Islamabad (Charles Moseley and John Morgan), and Robert Archer from the Bureau for Asia and the Near East. At these meetings it was decided that the study team would prepare two separate reports, one for AID/Washington and the other for the mission in Islamabad. The report was written in two parts, the first on cogeneration, and the second on power-only systems. The cogeneration report was prepared by Hagler, Bailly and Company, and the power-only report by Arthur D. Little. The final reports on the Pakistan study were completed and distributed during

the 11th quarter to the mission and other international donor organizations.

Thailand

To perform the cogeneration and non-utility power generation study in Thailand, a team of Hagler, Bailly consultants visited Thailand between January 26 and February 17, 1986. The study focused on the potential for and impediments to development of cogeneration and other non-utility power options by the private sector in Thailand. During the three week trip to Thailand, the team conducted extensive interviews with representatives of the government, including the National Energy Administration, the National Economic and Social Development Board (NESDB), the Ministry of Interior, electric utilities, private industry, public and private banks and financial institutions, the private sector, and international development institutions. The team also conducted an exhaustive search of the literature available on the subject.

The study team determined that the potential for economically attractive cogeneration and other non-utility power generation options in Thailand over the next 10 years is about 900-1250 MW, of that amount 600-950 MW could be developed by the private sector with costs competitive with electricity prices from the utilities. Most of this potential lies in cogeneration and power systems using agroindustrial waste. The study also found that although the government and utilities are very open to the idea of non-utility power generation, there is currently no direct policy for such developments. In addition, the study concluded that the current power supply over-capacity in Thailand provides an excellent window of opportunity for the country to develop and implement such policies in a well planned and well thought out fashion. Key recommendations of the study included:

- Develop and publicize policies that encourage private sector power generation from cogeneration and other non-utility options.
- Develop purchase price provisions reflecting utilities' long term marginal cost of generation, transmission, and distribution.
- Sponsor a demonstration project with utilities purchasing power from sugar mills, to provide data and demonstrate the economic and technical characteristics of such transactions.

The team briefed the AID mission in Bangkok, the National Energy Administration, and the NESDB before leaving the country. After incorporating comments from Thailand and USAID, the report describing the

activities, findings, and conclusions was made final during the 13th quarter.

ACTIVITY REPORT

Cogeneration and Small Power in Thailand: Potential, Impediments and Policy Issues, Final Report, September 19, 1986.

Private-Sector Small-Scale Power Generation in Pakistan: Potential, Impediments, and Policy Issues, Final Report, June 1986.

KEY PERSONNEL

Hagler, Bailly & Company: Alain Streicher, Vice President; James Williams, Vice President; Pirooz Sharafi, Senior Associate; Jack Stafurik, Senior Associate

Arthur D. Little: Peter Teagan

USAID/Washington: Robert Archer, A/NE; James Sullivan, S&T/EY; David Jhirad, S&T/EY.

USAID/Islamabad: John Morgan, Charles Moseley, James Bever, Energy Officers

USAID/Bangkok: John Neave, Energy Officer

ACTIVITY: Market Analysis of Cogeneration Opportunities in USAID-Assisted Countries (Contract Task Area 7)

COUNTRY: Not country-specific

START DATE: 10/15/85 **COMPLETION DATE:** 12/31/86

ST/EY MANAGER: David Jhirad, Alberto Sabadell

HBC MANAGER: Henri-Claude Bailly, Alain Streicher **HBC REFERENCE:** 180

DESCRIPTION

ECSP staff modified the Hagler, Bailly & Company cogeneration market assessment model, which has been used for a number of years in the U.S., to estimate the economic and financial potential of cogeneration in developing countries. Based on the cost of different cogeneration technologies (e.g., fuel oil boiler with steam turbine, natural gas boiler with steam turbine, gas turbine/waste heat recovery boiler, diesel/waste heat recovery boiler), and a market divided into new, replacement, and retrofit segments, the model will estimate, for a range of equipment sizes, the possible market shares. Since every country has a different industrial structure, different fuel inputs, and different regional divisions, the model has to be changed for each country. During the 10th quarter, ECSP staff adapted the model for Pakistan and Thailand and made trial runs to evaluate its performance. During the 11th and 12th quarters, ECSP staff began to modify the model to fit the industrial structure in India and also ran new cases for Pakistan with new fuel and electricity prices. During the 13th quarter, the model was revised to make estimations with and without supplies of natural gas in two states in India. Numerous sensitivity analyses were run and tests of the model's stability were conducted.

ACTIVITY REPORT

None.

KEY PERSONNEL

Hagler, Bailly & Company: Henri-Claude Bailly, President; James Williams, Vice President; Alain Streicher, Vice President; Pirooz Sharafi; Senior Associate; Marc Babin, Associate

ACTIVITY: institutional Barriers to Private Sector Investment in Energy Conservation (Contract Task Area 1)

COUNTRY: Not country-specific

START DATE: 10/1/85 **COMPLETION DATE:** 4/30/87

ST/EY MANAGER: Alberto Sabadell

HBC MANAGER: Henri-Claude Bailly, Alain Streicher **HBC REFERENCE:** 181

DESCRIPTION

As part of S&T/EY's broader initiative to promote private sector participation in energy activities, ECSP staff identified and analyzed the barriers to private investment in energy conservation.

During the ninth quarter a draft work plan was developed to target efforts toward improving the investment climate within developing countries for private sector financing of energy conservation and small power generation. Such activities would stimulate both local and foreign investment in cogeneration and small power production in developing countries. The objectives of the study were to identify and gain a better understanding of the principal barriers to local and U.S. private investment in energy conservation in AID-assisted countries; increase awareness and stimulate discussion of the barriers; provide AID missions and host governments with a useful framework and "checklist" for identifying and addressing the barriers to private investment in energy conservation in country- and sector-specific situations; identify issues requiring further research; and recommend "next steps" for AID in its efforts to address the barriers to private investment in energy conservation.

To achieve these objectives, ECSP staff performed the following tasks:

- Conducted an extensive review of the energy conservation and private investment literature to identify previous analyses of barriers and prepared a bibliography on general and sector-specific barriers

- Discussed the barriers to energy conservation with numerous experts in the energy conservation and private investment fields

- Developed a classification system for organizing the barriers
- Based upon the literature review and discussions, identified the general and sector-specific barriers and entered them into the classification system, and
- Compiled "checklists" of general and sector-specific barriers, grouped according to the classification system, and cross-referenced to the bibliography.

The findings of the study are:

- There has been little formal analysis of the barriers to private investment in energy conservation in developing countries
- The barriers can be classified into four broad categories: technical, economic, financial, institutional
- Most of the literature does not explicitly differentiate between general and sector-specific (industry, agriculture, transport, buildings, electric power) barriers to private investment in energy conservation, although some sector-specific barriers were identified
- In general, the barriers to foreign private investment are not energy conservation-specific
- Further research and analysis are necessary to help S&T/EY and AID missions work with host governments to seek ways to address the barriers in individual AID-assisted countries.

During the 12th quarter, the draft report was reviewed and revised. The focus of the study was broadened to include an analysis of the policy tools available to governments to remove the barriers to private investment in energy conservation and to make energy conservation investments more attractive to the private sector. ECSP staff also began to identify and analyze the barriers in individual AID-assisted countries by designing and distributing a survey on country-specific policies and practices that may inhibit or encourage investment in energy conservation. The results of this survey will provide S&T/EY with a comprehensive and timely "database" of country-specific policies and practices that affect investment in energy conservation projects and programs. This database will enable S&T/EY to take its first systematic look at all the potential areas for energy policy reform in AID-assisted countries and will serve as the basis for defining a private-sector strategy for energy conservation. Following receipt of comments, the report was made final in the 14th quarter.

ACTIVITY REPORT

Assessment of Barriers to Private Sector Investment in Energy Conservation and Cogeneration in Developing Countries (draft work plan), November 8, 1985.

Accelerating Private Investment in Energy Conservation: Identification and Analysis of Key Barriers and Policy Tools, February 1987.

KEY PERSONNEL

Hagler, Bailly & Company: Henri-Claude Bailly, President; John Armstrong, Vice President; Suzanne Leonard, Associate.

ACTIVITY: General Field Technical Assistance (Contract Task Area 6)

COUNTRY: Thailand, Indonesia, Dominican Republic

START DATE: 10/16/85 **COMPLETION DATE:** 9/30/87

ST/EY MANAGER: David Jhirad, Alberto Sabadell

HBC MANAGER: Alain Streicher **HBC REFERENCE:** 182

DESCRIPTION

ECSP provides technical assistance to AID missions in a wide range of technologies and issues. This assistance is generally driven by mission requests. Activities have occurred in three countries.

Thailand

At the request of the Thailand National Energy Administration (NEA) through the AID mission in Thailand, ECSP staff provided support to the government of Thailand and the AID mission in two efforts: (1) performing a study of national energy conservation goals, and (2) preparing a first-year program plan for a new national energy conservation center. These efforts provided support to efforts already underway by the government of Thailand -- specifically NEA and the National Economic and Social Development Board (NESDB) -- to build national momentum for energy conservation measures in the industrial sector.

The purpose of the first study was to help the NEA set energy conservation targets for the industrial sector for the year 1991. The study was initiated with a 10-day in-country visit by a two-person ECSP team between December 9 and 20, 1985. The team reviewed the existing literature and studies and interviewed personnel from the NEA and officials from the following organizations:

- The Association of Thai Industries
- NESDB
- The Industrial Finance Corporation of Thailand
- The Thailand Development Research Institute

Although a number of studies had been conducted on industrial energy conservation potential, the Thai government believed that more work was

needed to define realistic targets for energy savings in each industry. The ECSP study, therefore, focused on energy conservation methodologies and data and proposed targets for Thai industry. The ECSP team prepared a report of their findings, Kingdom of Thailand: The National Energy Saving Goals for Industry, 1986-1991, and sent it to Thailand for review during March 1986. Following discussions in Thailand in the 11th and 12th quarters, the report was approved for final production and distribution during the 12th quarter.

The purpose of the second study was to assist NEA in drafting energy conservation policy legislation and establishing an energy conservation center. Specifically, the ECSP team performed three tasks:

- Reviewed and made suggestions concerning the draft Energy Management Law, which would establish both a national energy conservation policy and center to implement the policy

- Evaluated the merits of a semi-autonomous, public/private national energy conservation center and made specific proposals and drafted a plan of action to establish such a center

- Assessed current energy conservation activities and suggested how to help the energy conservation center move from a cell of the NEA to a fully operational national center.

These ECSP efforts were reported in the report: Kingdom of Thailand: The National Energy Conservation Center: A Mobilization Plan, which was completed in the 10th quarter and was sent to Thailand for review. This report was also approved for final production and distribution following discussions in Thailand in the 11th and 12th quarters.

Indonesia

At the request of the AID mission in Indonesia, ECSP staff discussed potential energy conservation activities in Indonesia. Discussions held with officials from the Directorate General for Power and New Energy, the Asian Development Bank, and World Bank suggested that the country's needs would best be met with a program designed to supply both training and technical assistance.

Several discussions were held concerning initiating a program in Indonesia similar to that conducted in Sri Lanka between December 1983 and June 1984. The objective of the program would be to train 30-35 senior plant engineers, mostly from the private sector, in energy demand management and energy auditing techniques, in order to enable them to reduce some of their energy costs in the short term. In the first phase of the proposed program, ECSP

staff would present the ECSP Energy Demand Management and Conservation training course to 30-35 senior engineers, of which about 20 would be expected to come from the private sector. During the course of this mainly classroom training, the participants would be exposed briefly to the use of energy auditing instrumentation. About 20-25 engineers will be selected to participate in the second phase of the program in which 4 to 5 weeks will be spent, mainly in-plant, in training to perform actual energy audits.

Some discussions were also held about establishing a national energy conservation center with a program of services similar to that designed for Thailand. It was envisioned that close contact would be maintained between the two programs.

These discussions did not produce any activities.

Dominican Republic

In response to a request from the National Energy Policy Commission to the USAID mission in the Dominican Republic for technical assistance follow-up (see HBC Reference #169), ECSP initiated two studies in the Dominican Republic: One in transportation energy conservation and the other in industrial cogeneration.

Transportation Energy Conservation

The objective of the first study was to develop a comprehensive diagnosis of the current and expected energy consumption in the transportation sector and identify policy options for energy efficiency improvement. The effort was to be highly cooperative with ECSP staff acting as consultants, focusing on overall guidance, knowledge transfer, and on-the-job training.

Two ECSP staff spent two weeks in the Dominican Republic, from October 6 to 18, 1986, to help the Dominican National Energy Policy Commission (COENER) find ways to reduce energy consumption in transportation. The consultants worked with COENER to analyze the transportation system, set up a data base to evaluate transportation energy consumption, and evaluate possibilities for improving the energy efficiency of transportation. The primary goal of this project was to analyze the transportation system and develop energy consumption statistics in order to identify promising measures for energy conservation. The project was also designed to set up a system whereby transportation energy data could be collected and analyzed on a regular basis.

During the two week visit, ECSP staff, working with COENER, designed and initiated the project; which COENER would then implement. The study was designed to produce three distinct sets of information: 1) a profile of the

transportation system, identifying the role of the private sector in providing transportation services; 2) a database on transportation energy use; 3) cost-benefit analyses of appropriate transportation energy conservation measures to develop a list of recommended actions.

Following the in-country work, ECSP staff drafted a progress report to provide an initial assessment of the transportation system, its problems, and its needs. A follow-up visit to monitor the progress of the COENER team and assist in evaluating the transportation energy conservation measures was tentatively scheduled for May 1987.

Industrial Cogeneration

Two ECSP consultants spent two weeks, from October 20 to 31, 1986, in the Dominican Republic to develop an estimate of the potential for industrial cogeneration, identify constraints and impediments to its development, and recommend policy initiatives to stimulate the development of private-sector cogeneration projects. The team toured plants and analyzed energy audit reports for various industries (e.g., sugar, food processing, pulp and paper, etc.) to determine the technical potential for cogeneration. They also interviewed industry executives, government officials, and representatives from the utility and financial institutions to determine the economic and financial potential for cogeneration. In making this assessment they identified legal impediments, knowledge and technology barriers, and financial limitations to the successful implementation of cogeneration retrofit and new installation projects.

The team found that private-sector cogeneration could increase the nation's electricity generation capacity by as much as 15 percent. In the near term the financial potential for cogeneration is a modest 15 MW. (The nation's total installed capacity was approximately 1,010 MW in 1986.) However, over the long term (1987-1997) up to 56 MW of cogeneration projects could be built that would offer investors returns competitive with other investments.

The team recommended several steps for supporting cogeneration, most importantly that a cogeneration policy should be developed to encourage private-sector investments. Demonstration projects should also be supported as a means for establishing procedures, laws, and precedents as well as providing important evidence of the benefits of cogeneration to both the government and the private sector.

The ECSP team distributed a draft report that makes specific recommendations to the mission, the utility, and to other energy policy-making groups. Upon receipt of comments, this report was finalized and distributed to USAID/Washington and to the mission in May 1987.

ACTIVITY REPORT

Memorandum on Fact Finding Visit to Indonesia, to Dr. David Jhirad, et. al., from Alain Streicher, November 11, 1985.

Memorandum on Thailand Trip Report, to Dr. David Jhirad, et. al., from Alain Streicher, November 14, 1985.

Kingdom of Thailand: The National Energy Saving Goals for Industry, 1986-1991, Final Report, March 25, 1986.

Kingdom of Thailand: The National Energy Conservation Center: A Mobilization Plan, Final Report, March 24, 1986.

Memorandum on Indonesia Trip Report, to Dr David Jhirad, et. al., from Alain Streicher, February 28, 1986.

Potential and Policy Issues of Industrial Cogeneration in the Dominican Republic, Final Report, May 1987.

Prospects for Transportation Energy Conservation in the Dominican Republic: Progress Report, January 20, 1987.

KEY PERSONNEL

Hagler, Bailly & Company: Alain Streicher, Senior Vice President; Jack Fritz, Manager; Bruce Appelbaum, Senior Associate; Robert Kowalski, Senior Associate; John Armstrong, Senior Associate; Mark Oven, Senior Associate; Jeff Erickson, Associate.

AID/Washington: Robert Archer and Robert Ichord, A/NE; David Jhirad, S&T/EY

AID/Bangkok: John Neave, Energy Officer

AID/Jakarta: Desmond O'Riordan, Energy Officer

AID/Santo Domingo: William H. Smith, Energy Officer; Leo Perez-Minaya, Energy Project Advisor

Thailand: Prapeth Premani, Secretary General, & Dr. Itthi Bijayendrayodhin, Energy Economics Division, National Energy Administration

Indonesia: Dr. A.J. Sarjadi, Director for New Energy Development, Ministry of Mines and Energy

ACTIVITY: Innovative Private Sector Financing (Contract Task Area 7)

COUNTRY: Sri Lanka, Costa Rica, Dominican Republic, Central America, Pakistan

START DATE: 10/15/85 **COMPLETION DATE:** 12/31/86

ST/EY MANAGER: David Jhirad, Jim Sullivan

HBC MANAGER: Henri-Claude Bailly **HBC REFERENCE:** 183

DESCRIPTION

ECSP has supported exploratory work in the area of innovative financing of energy conservation projects and has prepared a number of documents outlining these concepts. The next logical step was to identify a private sector project which would lend itself to a demonstration of innovative financing. Previously funded USAID work in Costa Rica, Central America, the Dominican Republic, and Pakistan could be the source of such a project.

ECSP contractor staff explored with private and public sector officials possible energy conservation projects that would lend themselves to a demonstration of innovative approaches to financing in a number of places. Visits were made to Sri Lanka, Costa Rica, and the Dominican Republic (usually in conjunction with other ECSP work) and discussions were held with a variety of industries to identify potential projects. Several facilities expressed considerable interest including tire, candy, and cement companies in Costa Rica, a tire company in Sri Lanka, a steel and two cement companies in the Dominican Republic, and other companies in Pakistan, Thailand, and Egypt.

During the ninth quarter, ECSP contractor staff, while in Costa Rica working on the transportation demonstration project, explored with private and public sector officials possible energy conservation projects that would lend themselves to a demonstration of innovative approaches to financing. Visits were made to four large industrial facilities (paper and cement plants and two food processing plants) to explore their interest in financing energy conservation projects through one or another innovative approach. At least two of the facilities expressed considerable interest since decisions were near on major energy-related expenditures and the managements were open to exploring new ways of financing them.

During the 12th quarter, ECSP staff held discussions with S&T/EY officials to reevaluate this activity and find new directions. Although several potential demonstration projects were identified, none came to fruition and it appeared that the need for such approaches may not be as high as previously expected. ECSP staff found that the availability of financing was generally not one of the most significant barriers to implementing energy conservation activities, thus the need for innovative financing mechanisms and demonstrations of such mechanisms was limited.

ACTIVITY REPORT

None.

KEY PERSONNEL

Hagler, Bailly & Company: Henri-Claude Bailly, President; Alain Streicher, Vice-President; Robert Kowalski, Senior Associate; Mark Oven, Senior Associate.

ACTIVITY: Technology Transfer Teams for Energy Conservation (Contract Task Area 6)

COUNTRY: Not country-specific

START DATE: 10/16/85 **COMPLETION DATE:** 9/30/87

ST/EY MANAGER: David Jhirad, Jim Sullivan

HBC MANAGER: Henri-Claude Bailly **HBC REFERENCE:** 184

DESCRIPTION

During the ninth quarter, ECSP staff prepared a discussion document on the concept of Technology Transfer Teams (TTT). The TTT concept was designed to discuss ways to improve the climate for U.S. private investment in AID-assisted countries and to identify power projects that can be financed and implemented by the private sector. These teams would be composed of technical personnel from private U.S. firms with experience in selected technologies and interest in business promotion and technology transfer to developing countries. The technology chosen for the first team was cogeneration.

The overall strategy of the TTT concept was to develop a mix of information, market, and feasibility study activities sufficient to stimulate investment in cogeneration in a target country. The primary objectives of the effort were:

- Development of an information program to familiarize industrial plant managers and owners with the advantages of cogeneration.
- Detailed market analyses of the constraints and opportunities for cogeneration in selected countries
- Identification of specific potential cogeneration sites
- Incorporating the U.S. and host country private sector into all aspects of the project
- Packaging financing for specific projects
- Carrying out information dissemination programs which succeed in stimulating additional private sector investment in cogeneration.

During the tenth quarter, the Cogeneration Technology Transfer Team had its first formal meeting. ECSP staff and officials from AID and private U.S. companies interested in cogeneration in developing countries met in Washington, DC on February 5, 1986 to begin organizing the project and planning a course of action.

This first meeting had three basic thrusts: 1) to provide team members with background information on the program and its goals; 2) to review the status of the search for promising opportunities for technology transfer; and 3) to establish a work plan for the future. ECSP staff presented team members with information on several studies that were underway to analyze cogeneration technology transfer opportunities in AID-assisted countries.

During the 11th quarter, the Technology Transfer Team had its second formal meeting. ECSP staff and officials from AID and private U.S. companies met in Washington, DC on June 24, 1986 to explore, discuss, and decide upon the most appropriate ways for U.S. companies to participate in the emerging cogeneration markets, especially in Asia.

The meeting began with a presentation on the cogeneration market in AID-assisted countries (Pakistan, Thailand, Indonesia, Dominican Republic, Ecuador, and Costa Rica). The presentation was based, in large part, upon the findings of the AID-sponsored assessments of cogeneration and private sector power production potential, impediments, and policy issues in Pakistan and Thailand.

TTT members discussed steps that could be taken to improve the competitiveness of U.S. companies, including focusing on either smaller, "packaged" power systems or forming joint ventures to minimize the installed costs of medium- to large-scale power systems, improving private-sector access to innovative financing, and receiving better market and project information.

The next major step for the TTT was attending the Asia/Near East Workshop on Energy Conservation and Private Power Generation (see HBC Reference 185). Members of the Cogeneration TTT attended the Workshop, toured potential cogeneration sites, and visited with officials in Pakistan and Thailand. From September 29 to October 3, 1986, members attended Workshop sessions and met formally and informally with public and private sector representatives of many Asian and African countries to discuss factors affecting private cogeneration systems in their respective countries. They also attended a dinner meeting with representatives of Thai private and public organizations, including the Association of Thai Industries and The Energy Conservation Center of Thailand, and toured a cogeneration installation now under construction, the Siam Kraft Cogeneration Plant.

From October 5 to October 9, members of the group went to Pakistan where they met with private sector and government representatives to assess the

potential for private investment in cogeneration in Pakistan. Members met with officials from a broad range of organizations, including: BankAmerica; Citibank; National Development Finance Corporation; Senior U.S. Commercial Attache; Pakistan Engineering Firms; Gul Ahmed Textiles; Pakland Companies; Ministry of Water and Power; U.S. Embassy, Counselor for Economic and Financial Affairs; U.S. Agency for International Development Energy Office; World Bank; Pakistan Water and Power Development Authority (WAPDA).

In all TTT members held discussions with representatives of 13 countries: Egypt, India, Indonesia, Jordan, Malaysia, Morocco, Pakistan, Philippines, Singapore, Sri Lanka, Thailand, and Turkey.

Members discussed the potential for private power generation with representatives of each country. Pakistan presents a particularly likely prospect for private power generation. TTT members discussed many factors affecting the development of this market, including capital market factors affecting investments and concerns of American investors. They also identified several specific potential energy project investments.

Following the Asia/Near East trip, ECSP staff prepared a trip report and distributed it to all TTT members. The trip report presented the market information and lessons learned from the many meetings and conversations. The report also presented preliminary conclusions and recommendations.

The TTT held its final meeting under the current contract on January 28, 1987 in Washington, D.C. to review past activities and to discuss future directions for the TTT.

To begin the meeting, ECSP staff presented an overview of the TTT's principal objectives, activities, and lessons learned over the last year. Next, the most recent private power assessments, in India and the Dominican Republic, were reviewed and updated information on the situation in Pakistan was presented to the team. Each member expressed his opinion on the future direction of the TTT and identified the major needs, issues, and obstacles. ECSP staff summarized the information covered in the meeting in a memo to S&T/EY.

ACTIVITY REPORT

Concept and Approach to Technology Transfer Teams for Energy Conservation -- Focus: Cogeneration (Draft), October 28, 1985

Cogeneration Technology Transfer Team Meeting, Briefing Book, June 24, 1986.

HBC REFERENCE 184

Advisory Group Trip Report to Thailand and Pakistan: Cogeneration Technology Transfer, September 29 - October 9, 1986, December 24, 1986.

Summary of Technology Transfer Team (TTT) Meeting, January 28, 1987.

KEY PERSONNEL

Hagler, Bailly & Company: Henri-Claude Bailly, President; John Armstrong, Vice President; Jack Stafurik, Senior Associate; Peter Bos, Consultant; Gerry Schwinn, Associate; Suzanne Leonard, Associate.

Technology Transfer Team:

- Les Casterline, Cooper Industries-Energy Services
- Thomas W. Gardner, Cooper Industries-Energy Services
- Robert M. Herzog, Remtech
- John E. Kadas, Turbodyne Division-Dresser Industries
- Lazaros J. Lazaridis, Thermo Electron Energy Services
- Robert D. McFarren, Stone & Webster Engineering Corp.
- Arthur C. Rolfe, The Garrett Corp.
- Jay Ryder, Catalyst Energy Development Corporation
- Kerry Sachs, Agro Power International
- James M. Tooher, Cogenic Energy Systems, Inc.

AID/Washington: Jim Sullivan, S&T/EY; Robert Archer, ANE/TR.

ACTIVITY: Regional Energy Conservation Workshops/Seminars: Asia/Near East Workshop on Energy Conservation and Private Power Generation (Contract Task Area 4)

COUNTRY: Asia-Near East Region

START DATE: 10/15/85 **COMPLETION DATE:** 12/31/86

ST/EY MANAGER: David Jhirad, Alberto Sabadell

HBC MANAGER: Alain Streicher **HBC REFERENCE:** 185

DESCRIPTION

ECSP staff planned, organized, and conducted a workshop for the Asia/Near East region similar to the Latin America/Caribbean Regional Energy Conservation Seminar that was held in Costa Rica in January 1985. The Asia/Near East Energy Conservation and Private Power Generation Workshop was held from September 29 through October 3, 1986 in Bangkok, Thailand at the Asian Institute of Technology.

The objectives of the workshop were to expand private sector participation and investment in energy conservation and power generation, to strengthen AID energy conservation project design, and to identify key factors for successful project implementation.

The following are the main topics covered:

- Key Issues in Conservation Policy and Program Development, with papers on Thailand, Pakistan, and the Philippines
- Energy Conservation: Price Uncertainty & Policy Issues
- Conservation Opportunities in Buildings, Transportation, Agriculture, and Power Sector
- Fostering Private Sector Investment in Energy Conservation
- Private Sector Investment in Power Generation

Over 75 people attended the workshop from 13 countries: Egypt, India, Indonesia, Jordan, Malaysia, Morocco, Pakistan, the Philippines, Singapore, Sri Lanka, Thailand, Turkey, and the United States. Ten representatives

from the U.S. private sector also attended (see HBC Reference 184 for a description of some of their activities while at the workshop). There was also an opportunity for these U.S. manufacturers to present information on their companies and products through a catalog show. All companies that have been listed in the ECSP Energy Equipment Cost Directory were invited to send catalogs to Bangkok to this end.

Thirty papers were presented giving case studies, analyzing financing and marketing issues, and discussing country-specific policy issues for encouraging energy conservation and private power generation, among other things. Discussions following the papers brought out country-specific examples and amplified and clarified points made in the papers. Eleven panel discussions were held on such issues as conservation investment and implementation issues, country responses to changing oil prices, country perspectives on financing, future directions for energy conservation, and donor and lender lessons and initiatives in conservation.

In order to maintain close budgetary control over the preparation of the proceedings of the Workshop, a new charge code, HBC Reference #187, was designated for workshop follow-up activities. See this reference for a description of the proceedings preparation.

ACTIVITY REPORTS

Papers written for the Asia/Near East Workshop on Energy Conservation and Private Power Generation:

"Pakistan: National Energy Conservation Programs: Critical Planning and Implementation Considerations," Mr. John Armstrong

"Energy Conservation and Changing Oil Prices," Dr. Steven C. Fischer, Mr. Alain Streicher

"Government Policies to Promote Private Investment in Energy Conservation: Policy Tools & Their Effectiveness," Ms. Suzanne Leonard

"Transportation Energy Conservation," Mr. Alberto J. Sabadell, Dr. David L. Greene, Mr. Jeffry J. Erickson

"Innovative Approaches to Electric Power Delivery In Developing Countries," Dr. David Jhirad, Dr. Pirooz Sharafi, Dr. Edward Hillsman

"Energy Conservation Investment Decision-Making: The U.S. Model -- A Textbook Approach," Mr. Michael Fisher

"Cogeneration Application in Commercial Buildings: A Review of the Finance & Trade Center Cogeneration Project in Karachi," Energy Conservation Case Study 4 -- Pakistan, Dr. Pirooz Sharafi, Mr. Mukesh Kumar

"Private-Sector Power Generation in Developing Countries," Dr. Pirooz Sharafi

"Case Studies in Private-Sector Power Generation: Faridabad Captive Power Generation," Private Power Case Study 4 -- India, Dr. Pirooz M. Sharafi

KEY PERSONNEL

Hagler, Bailly & Company: Henri-Claude Bailly, President; Alain Streicher, Senior Vice President; Jean-Louis Poirier, Vice President; Michael Fisher, Manager; Jack Stafurik, Senior Associate; Pirooz Sharafi, Senior Associate; Steven Fischer, Senior Associate; Gerald Schwinn, Associate; Jeff Erickson, Associate; Suzanne Leonard, Associate

AID/Washington: James Sullivan, David Jhirad, and Alberto Sabadell, S&T/EY; Robert Ichord and Robert Archer, A/NE

ACTIVITY: Information Exchange and Energy Conservation Network Development (Contract Task Area 5)

COUNTRY: Not country-specific

START DATE: 10/15/85* **COMPLETION DATE:** 9/30/87

ST/EY MANAGER: David Jhirad, Alberto Sabadell

HBC MANAGER: Gerald Schwinn **HBC REFERENCE:** 186

DESCRIPTION

In order to keep better track of the many information activities of ECSP, this separate task was established to monitor such activities. It is here that we reported each quarter on the number of publications requested and distributed as well as the ECPIE Model and other computer products.

Since the inception of the program, over 110 reports, presentations, manuals, and other papers were prepared and distributed (not including some working papers and memorandum). A comprehensive list is provided in Appendix 1.

ECSP staff performed a large variety of information-generating research tasks for S&T/EY over the course of the contract. For example, during the 14th quarter, they gathered information on USAID activities in the Caribbean to educate USAID energy officers on energy conservation opportunities. During the 13th quarter, ECSP staff spent time preparing a draft cable to USAID missions describing the private power generation activities that have been funded under ECSP.

Update

Six issues of Update were written under this activity. Update is the newsletter for the Energy Conservation Services Program. The purpose of Update is to report on a regular basis on the progress of the ECSP. It also

---

* This date only represents the origination of this activity as a separate task for accounting purposes; the activities described under this task have been ongoing since the inception of the contract and were previously included under HBC Reference 150, General Program Management. Some activities originally charged under #150 have been included here to keep all information exchange-related information together.

described energy conservation efforts undertaken by AID field missions and regional bureaus and other donors. Approximately 500 copies of each issue of Update were distributed to individuals and organizations interested in energy conservation in LDCs, including all AID field missions as well as relevant counterpart agencies.

Publications

During the 14th quarter, the paper "Transportation Energy Conservation" was edited, reformatted, and sent to the journal Transportation for review for eventual publication. This paper was written by staff from ECSP, Oak Ridge National Laboratories, and S&T/EY for the Asia/Near East Workshop on Energy Conservation and Private Power Generation (see HBC Reference #185).

Energy Managers Network

As part of the ECSP mission to enhance the skills of energy professionals in developing countries, ECSP staff promoted an international network of energy managers. The seminar held in Costa Rica helped to promote exchange among private- and public-sector energy professionals in the region. Conversations were held with the Association of Energy Engineers, an Atlanta-based organization with an international membership and the sponsor of the annual World Energy Engineering Conference, to see whether the services and resources of this private organization could be of assistance to ECSP activities.

ACTIVITY REPORTS

ECSP Update

Number 1, June 1984
Number 2, November 1984
Number 3, July 1985
Number 4, April 1986
Number 5, September 1986
Number 6, March 1987

KEY PERSONNEL

Hagler, Bailly & Company: Henri-Claude Bailly, President; Alain Streicher, Senior Vice President; Gerald Schwinn, Associate; Jeff Erickson, Associate; Suzanne Leonard, Associate; Marilyn Tedeschi, Research Associate.

ACTIVITY: Asia-Near East Workshop on Energy Conservation and Private Power Generation: Followup Tasks (Contract Task Area 5)

COUNTRY: Asia-Near East Region

START DATE: 10/1/86* **COMPLETION DATE:** 4/15/87

ST/EY MANAGER: Alberto Sabadell

HBC MANAGER: Alain Streicher **HBC REFERENCE:** 187

DESCRIPTION

Following the Asia/Near East Energy Conservation and Private Power Generation Workshop, an extensive effort was undertaken to prepare proceedings of the papers presented and discussions held. ECSP staff, in consultation with AID, decided to make an extra effort to produce a polished set of proceedings so that the workshop's information and findings can have the maximum impact. ECSP staff performed a variety of tasks to prepare the proceedings, including: writing a paper summarizing the findings of the workshop; preparing abstracts for each paper; carefully editing and proofing each paper; transcribing and summarizing panel and paper discussions; designing a uniform format for each paper; and organizing the proceedings into two volumes, one for energy conservation and one for private power generation.

A draft version of the proceedings was distributed to AID for comment and correction and the proceedings were revised, made final, and distributed during the 14th quarter.

ACTIVITY REPORTS

Asia/Near East Workshop on Energy Conservation and Private Power Generation Proceedings, September 29 to October 3, 1986.

---

* This date only represents the origination of this activity as a separate task for accounting purposes; the activities described under this task have been on-going since the inception of the contract and were previously included under HBC Reference 185, Regional Energy Conservation Workshops/Seminars.

KEY PERSONNEL

Hagler, Bailly & Company: Henri-Claude Bailly, President; Alain Streicher, Senior Vice-President; Jeff Erickson, Associate; Gerald Schwinn, Associate; Marilyn Tedeschi, Research Associate.

ACTIVITY: Egypt Energy Conservation and Efficiency Project

COUNTRY: Egypt

START DATE: 10/1/85 **COMPLETION DATE:** 6/30/87

ST/EY MANAGER: Alberto Sabadell

HBC MANAGER: Henri-Claude Bailly **HBC REFERENCE:** 188

DESCRIPTION

Under the Egypt Energy Conservation and Efficiency Project, ECSP staff have been assisting the AID mission in Cairo design a $50 million energy efficiency program for Egypt. The goal of the project is to improve Egypt's productivity and competitiveness, particularly in private industrial enterprises, and to reduce the shocks of moving to a rationalized energy price system by promoting the adoption of energy-efficient technologies. The project will include the transfer and demonstration of U.S. energy management technologies, such as process controls, electric load management systems, and cogeneration systems, technical assistance, and training.

During November and December 1986, a six person ECSP team spent a total of 156 person-days in Egypt. The team conducted approximately 130 interviews, including 26 industrial plant visits, with key government officials, private and public industrial enterprises, energy equipment vendors, architectural/engineering firms, financial institutions, AID personnel, and representatives of other international donor agencies. The team assessed Egypt's energy situation, identified candidate demonstration projects and target industries, and evaluated the institutional capabilities and needs of Egyptian public and private organizations. The team used the results of these interviews to evaluate the ability of Egyptian organizations to implement an effective energy conservation program, to determine technical assistance and training needs, to identify specific organizations to participate in the project, and to design the most efficient and effective organization and management structure for the project.

The ECSP team spent an additional 114 person-days in Egypt between January and April 1987 to conduct the technical assistance and training needs assessments; finalize the project management structure and fund disbursement procedures; carry out detailed project analyses; prepare the final project design report; and make presentations to USAID/Cairo personnel.

During this time, the team selected 10 technologies (including process controls, waste heat recovery systems, cogeneration systems, and solid fuel-fired boilers) and 3 target sectors (cement, chemicals, and metals). Several specific sites were identified for the first phase of the project.

The cost effectiveness of the target technology applications was analyzed from both an economic and financial perspective. The economic analysis used resource costs actually incurred and factored out the transfer payments such as taxes and duties. The financial analysis looked at the project from the viewpoint of the private sector investor. The economic analysis showed that all selected technologies or applications have economic paybacks of 0.1 to 6 years with an average of less than 2 years.

ECSP staff developed a model to estimate the funding flows over the project's 8-year life and the expected uses of funds under various assumptions of input costs (e.g., foreign exchange portion of each technology application), public/private sector project expenditures, reflow scenarios, and inflation rates.

ACTIVITY REPORTS

A number of reports were prepared to summarize the methodologies used, assumptions made, and results of the design activities. All are dated April 3, 1987. They include:

- Technical Analysis
- Cost Effectiveness Analysis
- Institutional Assessment
- Administrative Analysis
- Training Needs
- Cost and Financial Analysis

KEY PERSONNEL

Hagler, Bailly & Company: Henri-Claude Bailly, President; Alain Streicher, Senior Vice President; Jack Stafurik, Senior Associate; Pirooz Sharafi, Senior Associate; Suzanne Leonard, Associate; Gerald Schwinn, Associate

USAID/Cairo: Lawrence Ervin, Sherif Arif.

ACTIVITY: Energy Demand Management In Morocco

COUNTRY: Morocco

START DATE: 10/1/86 **COMPLETION DATE:** 12/31/86

ST/EY MANAGER: Alberto Sabadell

HBC MANAGER: Alain Streicher **HBC REFERENCE:** 189

DESCRIPTION

The purpose of this activity was to provide information to USAID/Rabat to support their effort to develop a project identification document (PID) for an energy demand management (EDM) project. During the 13th quarter, the study team performed a prefeasibility analysis of the proposed EDM program in order to identify financially and economically justified actions and investments at the energy end-use level. The team analyzed the Moroccan energy situation in order to: project potential fuel savings, by sector; identify and analyze barriers to project implementation; select program targets; define technical assistance components (information and awareness, training, technical support, technology transfer, general policy guidance); define possible institutional arrangements; define program benefits and costs; and develop recommendations and an action plan.

Economic development in Morocco is constrained by a growing scarcity of both foreign exchange and local currency. Energy import costs and the lack of funds for new exploration and development projects are also constraining the economy. Improving the efficiency of energy use can significantly improve this situation. The ECSP analysis indicated that a national energy demand management program in Morocco targeted to selected industries, mostly private, and other subsectors such as large buildings and commercial road transport could save in excess of U.S. $50 million annually in oil imports alone and a cumulative U.S. $150 million at current energy market prices. The analysis indicated that an EDM program is economically and financially justified and could be successfully implemented, provided the private sector plays a key role in its definition, guidance, and implementation.

Based on the findings, the team recommended three activities in the design and development phase of the program (1) establish a steering committee to guide program design and promotion activities; (2) develop and implement a promotion campaign to gain early support for the program and mobilize the private sector; and (3) conduct special studies, such as a detailed analysis of

the potential for energy demand management by subsector; detailed program economic and financial analysis, including risk analysis; detailed institutional analyses; an analysis of the potential for non-utility power generation; and market studies for EDM services and selected U.S. EDM equipment.

ECSP staff were also requested to prepare an extended executive summary of the report in French. This version was distributed to a large number of Moroccan institutions for review.

ACTIVITY REPORTS

Energy Demand Management in Morocco:

A Prefeasibility Analysis, with an Executive Summary in French, November 10, 1986.

Institutional Analysis, May 29, 1987.

Feasibility Study, May 29, 1987.

Market Study for Energy Demand Management Equipment in Morocco through 1996, Task 4.1, June 5, 1987.

KEY PERSONNEL

Hagler, Bailly & Company: Alain Streicher, Senior Vice President; Pascal Habay, Senior Associate; Pirooz Sharafi, Senior Associate; Suzanne Leonard, Associate; Jeff Erickson, Associate

USAID/Rabat: Dr. Stephen Klein, Energy Officer; Robert Kahn, Program Officer

Morocco: Mr. Ahmed Bouhaouli, Director of Energy, Ministere de L'Energie et des Mines; Mr. Abdelkrim Berrada, Financial Manager, Office National de l'electricite; Mr. Alami Sounni, Director Industriel, Societe Cherifienne des Petroles.

ACTIVITY AREA: Research Development & Demonstration

ACTIVITY: Non-Utility Power Generation in India

COUNTRY: India

START DATE: 4/29/86 **COMPLETION DATE:** 4/30/87

ST/EY MANAGER: Alberto Sabadell

HBC MANAGER: Alain Streicher **HBC REFERENCE:** 199*

DESCRIPTION

An ECSP study team visited India from July 26 to August 23, 1986 to examine the impediments to and potential for non-utility electrical generation primarily in the private sector. They concentrated their efforts in two western states, Maharashtra and Gujarat, which are highly industrialized by Indian standards. The team visited with key power sector, private sector, and government policy officials to determine their views, and collect and analyze existing data and information. Meetings were held with key officials in the USAID Mission in New Delhi; government representatives from Gujarat, Maharashtra, and the national government; state and national utility officials; financial institutions; local experts on energy in India; manufacturers of power equipment; and numerous industry representatives. ECSP staff were assisted in this effort by staff from the National Productivity Council in New Delhi, Gujarat, and Maharashtra.

The team analyzed the economic and financial potential for cogeneration and private sector power production from renewable and indigenous resources. They also identified the policy, regulatory, institutional, and other impediments to non-utility private sector electrical generation from cogeneration or renewable/indigenous resources for sale to the grid. Finally, they developed recommendations and an action plan for addressing the impediments to non-utility generation. In addition to examining the potential for non-utility power generation in traditional industries, the study team looked at the potential for cogeneration applications in commercial buildings in Bombay (i.e., motels, hospitals, etc.).

---

* This activity was created as a separate job code after work was begun under the Private Sector Involvement in Non-Utility Power Generation activity (HBC Reference 179) in order to keep close budgetary control on this specific job.

The team found that energy consumption is growing faster than utility capacity. This is occurring because population growth, agricultural expansion, industrial growth, and rising energy use throughout the economy cause demand for electricity to grow much faster than the supply. For example, electricity demand during the five years of the Seventh Plan (1985-1990) was projected to increase by about 30,000 MW, but only 22,000 MW of new capacity will be added by the largely government-owned utilities. Energy investments absorb well over 30 percent of the total national budget but capacity still cannot meet demand. However, the team also found that some significant help can be found in the private sector: the financially attractive non-utility power generation potential could exceed 2,000 MW. This indicates that the private sector could potentially finance, build, own, and operate enough capacity to significantly reduce the current and projected power shortages in Gujarat and Maharashtra.

Industrial cogeneration accounts for the vast majority of this potential, perhaps exceeding 2,000 MW by itself. The industries with the highest potential are the fertilizer, basic chemicals, refinery, and pharmaceutical industries. The potential from bagasse and cane residue is also quite large at an estimated 425 MW. It is also the least expensive option of those studied. Finally, large-scale conventional power systems fueled by domestic fossil fuels have a great potential. They not only can produce power at costs competitive with those of the electric utilities, but they also can present a valuable addition to state-owned power plants by bringing new private capital into the power sector.

These findings were included in a report that analyzed the power situation in India and the potential for and impediments to non-utility power generation. The report also provides conclusions and recommendations. The report was distributed to AID and officials in India during the 13th quarter for review. Comments from AID were incorporated in the second draft, and comments from India were incorporated in the final report produced following the 14th quarter.

ACTIVITY REPORTS

Non-Utility Power Generation in the Indian States of Gujarat and Maharashtra: Potential, Impediments, and Policy Issues, Final Report, June 1987.

KEY PERSONNEL

Hagler, Bailly & Company: Alain Streicher, Senior Vice-President; Pirooz Sharafi, Senior Associate; Jack Stafurik, Senior Associate; Jeff Erickson, Associate.

APPENDIX: ACTIVITY REPORTS

150-151 General Program Management

ECSP Annual and Quarterly Reports

FY84:	First	9/15/83 - 12/15/83	January 12, 1984
	Second	12/15/83 - 4/1/84	May 11, 1984
	Third	4/2/84 - 6/30/84	July 25, 1984
	Fourth	7/2/84 - 9/28/84	October 31, 1984
Annual Report		9/15/83 - 9/28/84	April 25, 1985
FY85:	First	10/1/84 - 12/31/84	February 9, 1985
	Second	1/1/85 - 3/31/85	May 2, 1985
	Third	4/1/85 - 6/30/85	August 1, 1985
	Fourth	7/1/85 - 9/30/85	October 30, 1985
FY86:	First	10/1/85 - 12/31/85	February 7, 1986
	Second	1/1/86 - 3/31/86	April 30, 1986
	Third	4/1/86 - 6/30/86	July 21, 1986
	Fourth	7/1/96 - 9/30/86	December 10, 1986
FY87:	First	10/1/86 - 12/31/86	February 17, 1987
	Second	1/1/87 - 4/30/87	June 4, 1987

Other Reports

Energy Conservation Services Program: Technical Assistance to Developing Countries, brochure, June 1984 (English version).

Programme de Servicios para la Conservacion de la Energia (Spanish version of the ECSP brochure), September 1984.

Programme de Cooperation Pour les Economies d'Energie (French version of the ECSP brochure).

Energy Management Training Program for Development Countries, Industrial Energy Conservation, manual prepared for Brookhaven/Stony Brook, Institute for Technology Policy Development, the State University of New York at Stony Brook, NY, May 3 and 4, 1984.

"Energy and Development: Energy Use in the Modern Sector, Industry Working Paper," paper given at meeting for AID Energy Officers, Brookhaven National Laboratory, June 17, 1984.

ECPIE: An Energy Conservation Project Investment Evaluation Model, paper presentation on the model for the Sri Lanka symposium, October 31, 1984.

The Energy Conservation Services Program (ECSP), presentation to senior staff/Bureau of Science and Technology, March 7, 1985.

Elements of a Strategy for the United States Agency for International Development in the Area of Energy Conservation, draft report and appendix, March 1985.

Sri Lanka Trip Report, memorandum to Pamela Baldwin from Alain Streicher, May 8, 1985.

Strategy and Program Plan for Energy Conservation FY86 and FY87, October 1985.

Memorandum on energy conservation information centers in the U.S., to Robert Ichord, USAID, Asia/Near East Bureau for the U.S. Embassy, Amman, Saudi Arabian, February 24, 1986.

Dominican Republic, Technical Assistance to the National Energy Policy Commission: Proposal for Studying Transport Sector Energy Use and Industrial Cogeneration, April 11, 1986.

Cogeneration in Developing Countries: Prospects and Problems, May 5, 1986.

Energy Equipment Cost Directory, Third Edition, June 1986.

Power for Rural Development: A Strategy, First Draft, June 1986.

Financing Energy Conservation in Developing Countries, February 1987.

Issues in Private Power in Developing Countries: A Preliminary Appraisal, February 1987.

152 Energy Demand Management and Conservation Training Course

Sri Lanka Trip Report, 10/10/83 to 10/14/83. Memorandum from Henri-Claude Bailly to Pamela Baldwin, October 31, 1983 (25 pages).

Energy Demand Management and Conservation Training Course -- Workbook (800 pages).

Sri Lanka: Report on In-Country Activities from 12/5/83 to 12/21/83. Memorandum from Henri-Claude Bailly to Pamela Baldwin, December 31, 1983 (50 pages).

Course evaluation questionnaires completed by the participants (44 questionnaires, 264 pages).

153 Technology Transfer for Energy Management Project Paper

Philippines Trip Report, 10/17/83, Henri-Claude Bailly

Philippines: Report on In-Country Activities from 11/28/83 to 12/16/83. Memorandum from Henri-Claude Bailly to Pamela Baldwin, December 28, 1983 (77 pages).

The Philippine Energy Situation and Outlook and the USAID Assistance Strategy -- Final Draft Paper, 12/14/83 (31 pages).

Guidelines for Technology Transfer and Demonstrations -- Case Studies. Draft working paper (19 pages).

TTEM Project Review Meeting (12/14/83) with USAID/Philippines and Ministry of Energy, Bureau of Energy Utilization, presentation (18 pages).

TTEM Project Review Meeting (12/15/83) with USAID/Philippines TTEM Project Review Committee, presentation (18 pages).

Selection of TTEM Subproject Targets and Economic Analysis (15 pages).

Potential TTEM Subprojects (45 pages).

Guidelines for Technology Transfer and Demonstrations -- Case Studies (18 pages).

Assessment of Institutional Capabilities and Project Roles (20 pages).

Organizations Interviewed (10 pages).

Fund Reflow Analysis (11 pages).

154 Data Base Development for AID Energy Efficiency Projects and Energy Management Information System

U.S. Agency for International Development Energy Conservation Initiatives, first report, May 11, 1984.

155 Preparation of an Energy Auditing Manual

Energy Auditing Manual, February 1984 (500 pages).

156a Energy Demand Management and Conservation Training Course Phase II -- Energy Auditing

None.

156b Preparation of Audit Reports and Detailed Feasibility Studies for a Tire Plant and Textile Mill

Energy Audit Report for Sri Lanka Tyre Corporation, Final Report, June 1984.

Energy Audit Report for Thulhiriya Textile Mills, Final Report, June 1984.

Feasibility Study of Sri Lanka Tyre Corporation Factory, Final Report, June 1984.

Feasibility Study of Thulhiriya Textile Mills, Final Report, July 1984.

157 ECPIE: Energy Conservation Project Investment Evaluation Model

ECPIE Computer Model, and sample data outputs, May 1984, Revised March 1985, August 1986.

The Energy Conservation Project Investment Evaluation Model (ECPIE): A User's Manual, August 1984, Revised March 1985.

158 Monograph on Innovative Approaches to Financing Energy Conservation Investments in Less Developed Countries

Innovative Approaches to Financing Conservation Investments in Developing Countries, September 10, 1984.

159 Feasibility Study of a Guide and Directory of U.S. Energy Efficient Equipment

Study of the Feasibility of Publishing a Directory of U.S.-Manufactured Energy-Efficient Equipment for Distribution in Developing Countries, Final Report, July 12, 1984.

160 ASEAN Conference on Energy Conservation in Buildings in Singapore and Mission to Manila, Bangkok, and Jakarta and ASEAN Buildings Energy Conservation Activities

ASEAN Conference on Energy Conservation in Buildings. Memorandum from John Cable to Pamela Baldwin and Robert Ichord, June 11, 1984.

ASEAN Conference on Energy Conservation in Buildings, May 29-31, 1984.

ASEAN-U.S. Energy Experts meeting, memorandum to Pamela Baldwin from John Cable, October 24, 1984.

161 Transportation Energy Conservation

The Transportation Sector in Costa Rica and Opportunities for Energy Conservation, prepared by David Greene and Frank Southworth, Oak Ridge National Laboratory, and Robert Kowalski, Hagler, Bailly & Company, May 20, 1985.

162 Latin American/Caribbean Regional Energy Conservation Workshop

Report on Mission to Costa Rica, September 16 through September 22, 1984, September 26, 1984.

Seminario sobre la Conservacion de Energia/Energy Conservation Seminar, Papers, (Spanish and English versions) January 1985.

Conclusions and Recommendations of the Latin America and Caribbean Regional Energy Conservation Seminar (Seminario sobre la Conservacion de Energia), (in English) March 29, 1985.

Seminario Seminario Regional Sobre la Conservacion de Energia en America Latina y el Caribe: Conclusiones y Recommendaciones, (in Spanish) July 25, 1985.

163 Industrial Energy Conservation Program Assistance

Ecuador Industrial Energy Conservation Program, memorandum to Pamela Baldwin from Robert Kowalski, June 4, 1984.

Peru Industrial Energy Conservation, memorandum to Pamela Baldwin from Robert Kowalski, July 6, 1984.

164 Ecuador Industrial Energy Conservation Training, Curriculum Development, and Audits

Energy Audit Report for Compania Cervezas Nacionales C.A., Guayaquil, Ecuador, October 1984.

Preliminary Energy Audit Report for La Cemento Nacional, C.A., Guayaquil, Ecuador, November 26, 1984.

Energy Audit Report for Textiles Continental S.A., Guayaquil, Ecuador, November 1984.

Mission Trip Report, memorandum to Pamela Baldwin from Alain Streicher, December 3, 1984.

165 Revision of the Energy Demand Management and Conservation Training Manual

Energy Demand Management and Conservation Manual for Industry and Buildings, December 1984.

166 Revision of Industrial Energy Auditing Manual

Industrial Energy Auditing Manual, (in English, Spanish, and French) August 1984.

167 Evaluation of the IIE/TVA Conventional Energy Training Project (CETP) Course

Evaluation of the 1984 Tennessee Valley Authority's Energy Conservation Training Course (Industrial and Utility), August 30, 1984.

168 Organization and Planning of the Pakistan National Energy Conservation Center

Organization and Implementation Plan for the Energy Conservation Center, Draft Discussion Paper, October 8, 1984.

Energy Conservation in Pakistan: First Draft and Supporting Analysis, November 16, 1984.

Presentation to the Energy Policy Board on Energy Conservation, Preliminary Draft, December 19, 1984.

Development of a Model to Estimate Pakistan's Energy Conservation Potential, January 18, 1985, draft discussion paper.

Presentation on Energy Conservation to the Energy Policy Board, by Dr. Donor M. Lion, Mission Director, February 11, 1985.

National Energy Conservation Program, Draft Discussion Paper, March 1985.

Presentation on ENERCON to the Energy Conservation Working Group, May 9, 1985.

National Energy Conservation Programme, Vol. I, April 21, 1985.

National Energy Conservation Programme, Vol. II: Supporting Data and Analysis, April 21, 1985.

National Energy Conservation Programme, Annex I: Detailed ENERCON Programme Activity Schedule for Year 1, May 1985.

National Energy Conservation Programme, Annex II: Indicative Institutional Roles, May 1985.

National Energy Conservation Programme, Annex III: Candidate Industries for Energy Audits and Project Implementation in the First Year (1985-1986), May 1985.

169 Industrial Energy Conservation Program Evaluation

Dominican Republic: Energy Conservation and Resource Development/Component 2: Industrial Energy Conservation Program, Final Evaluation Report, March 1985.

170 Regional Industrial Energy Efficiency Project Evaluation

Regional Industrial Energy Efficiency Project: First Evaluation Final Report, February 1985.

171 Djibouti Energy Initiatives Project Evaluation

Djibouti Energy Initiatives: Mid-Term Evaluation/Conservation Component, Draft Report, January 1985.

173 Haiti Fact-Financing Mission

Haiti: Energy Efficiency in the Sugar and Manufacturing Industries, report on a fact-finding visit conducted between February 27 and March 7, 1985, report date: March 25, 1985.

177 Sri Lanka Energy Use in Agriculture

Sri Lanka: Energy in Agriculture -- Report on Study Team Visit April 1985, June 28, 1985.

178 Costa Rica Fuel Efficiency in the Transportation Sector

Transportation Energy Conservation in Costa Rica: Report of In-Country Activities, June 10-19, 1985, June 25, 1985.

Transportation Energy Conservation in Costa Rica: A Work Plan, June 25, 1985.

Implementation of Fuel Conservation Measures in Costa Rican Private Bus and Taxi Fleets, Final Report, June 11, 1986.

Road Transportation Energy Conservation: Needs and Options in Developing Countries, September 1986.

179 Private-Sector Involvement in Non-Utility Power Generation

Pakistan Trip Report, to James Sullivan, David Jhirad, from Alain Streicher, November 1, 1985.

Private-Sector Small-Scale Power Generation in Thailand: Potential, Impediments, and Policy Issues, Final Report, September 19, 1986.

Private-Sector Small-Scale Power Generation in Pakistan: Potential, Impediments, and Policy Issues, Final Report, June 1986.

180 Market Analysis of Cogeneration Opportunities in USAID-Assisted Countries

None.

181 Institutional Barriers to Private Sector Investment in Energy Conservation

Assessment of Barriers to Private Sector Investment in Energy Conservation and Cogeneration in Developing Countries (draft work plan), November 8, 1985.

Accelerating Private Investment in Energy Conservation: Identification and Analysis of Key Barriers and Policy Tools, February 1987.

182 General Field Technical Assistance

Memorandum on Fact Finding Visit to Indonesia, to Dr. David Jhirad, Robert Archer, Robert Ichord, from Alain Streicher, November 11, 1985.

Thailand Trip Report, to Dr. David Jhirad, Jim Sullivan, Robert Ichord, Robert Archer, from Alain Streicher, November 14, 1985.

Kingdom of Thailand: The National Energy Saving Goals for Industry, 1986-1991, Final Report, March 25, 1986.

Kingdom of Thailand: The National Energy Conservation Center: A Mobilization Plan, Final Report, March 24, 1986.

Memorandum on Indonesia Trip Report, to Dr David Jhirad, et. al., from Alain Streicher, February 28, 1986.

Potential and Policy Issues of Industrial Cogeneration in the Dominican Republic, Final Report, April 1987.

Prospects for Transportation Energy Conservation in the Dominican Republic: Progress Report, January 20, 1987.

183 Innovative Private Sector Financing

None.

184 Technical Transfer Teams for Energy Conservation

Concept and Approach to Technology Transfer Teams for Energy Conservation -- Focus: Cogeneration, Draft, October 28, 1985

Cogeneration Technology Transfer Team Meeting, Briefing Book, June 24, 1986.

Advisory Group Trip Report to Thailand and Pakistan: Cogeneration Technology Transfer, September 29 - October 9, 1986, December 24, 1986.

Summary of Technology Transfer Team (TTT) Meeting, January 28, 1987.

185 Regional Energy Conservation Workshops/Seminars: Asia-Near East Workshop -- Energy Conservation and Private Power Generation: Promotion and Investment

Pakistan: National Energy Conservation Programs: Critical Planning and Implementation Considerations," Mr. John Armstrong

"Energy Conservation and Changing Oil Prices," Dr. Steven C. Fischer, Mr. Alain Streicher

"Government Policies to Promote Private Investment in Energy Conservation: Policy Tools & Their Effectiveness," Ms. Suzanne Leonard

"Transportation Energy Conservation," Mr. Alberto J. Sabadell, Dr. David L. Greene, Mr. Jeffry J. Erickson

"Innovative Approaches to Electric Power Delivery In Developing Countries," Dr. David Jhirad, Dr. Pirooz Sharafi, Dr. Edward Hillsman

"Energy Conservation Investment Decision-Making: The U.S. Model -- A Textbook Approach," Mr. Michael Fisher

"Cogeneration Application in Commercial Buildings: A Review of the Finance & Trade Center Cogeneration Project in Karachi," Energy Conservation Case Study 4 -- Pakistan, Dr. Pirooz Sharafi, Mr. Mukesh Kumar

"Private-Sector Power Generation in Developing Countries," Dr. Pirooz Sharafi

"Case Studies in Private-Sector Power Generation: Faridabad Captive Power Generation," Private Power Case Study 4 -- India, Dr. Pirooz M. Sharafi

186 Information Exchange and Energy Conservation Network Development

ECSP Update

Number 1, June 1984
Number 2, November 1984
Number 3, July 1985
Number 4, April 1986
Number 5, September 1986
Number 6, March 1987

187 Asia-Near East Workshop on Energy Conservation and Private Power Generation: Followup Tasks

Asia/Near East Workshop on Energy Conservation and Private Power Generation Proceedings, September 29 to October 3, 1986.

188 Egypt Energy Conservation and Efficiency Project

Draft Reports, April 3, 1987:

Technical Analysis

Cost Effectiveness Analysis

Institutional Assessment

Administrative Analysis

Training Needs

Cost and Financial Analysis

189 Energy Demand Management in Morocco

Energy Demand Management in Morocco:

A Prefeasibility Analysis, with an Executive Summary in French, November 10, 1986.

Institutional Analysis, May 29, 1987.

Feasibility Study, with an Executive Summary in French, May 29, 1987.

Market Study for Energy Demand Management Equipment in Morocco through 1996, Task 4.1, June 5, 1987.

199 Non-Utility Power Generation in India

Non-Utility Power Generation in the Indian States of Gujarat and Maharashtra: Potential, Impediments, and Policy Issues, Final Report, June 1987.