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ENERGY CONSERVATION AND EFFICIENCY PROJECT

(ECEP)

MID-TERM EVALUATION

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Submitted to:

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TABLE OF CONTENTS

PAGE

PREFACE

LIST OF ACRONYMS

EXECUTIVE SUMMARY i

THE EVALUATION REPORT 1

I. INTRODUCTION 1

II. BACKGROUND AND DESCRIPTION OF THE PROJECT 4

III. ASSESSMENT METHODOLOGY 8

IV. FINDINGS REGARDING THE PROGRESS OF PROJECT IMPLEMENTATION 10

V. EVALUATION FINDINGS/RECOMMENDATIONS. 18

VI. CONCLUSIONS 33

APPENDICES:

APPENDIX A: Project Paper
APPENDIX B: Scope Of Work For Evaluation
APPENDIX C: Subgrant Agreement Between Egypt and USA On ECEP
APPENDIX D: M/TA Contract Scope Of Word And Tasks
APPENDIX E: People Interviewed
APPENDIX F: Field Trips To Industries
APPENDIX G: List Of Documents Reviewed
APPENDIX H: Comments on Manuals Produced
APPENDIX I : Training/Promotion Activities
APPENDIX J : Comments on ECEP Technical Procedures
APPENDIX K: List of Technical Applications (TAS)
APPENDIX L: Reports on Industries Visited
APPENDIX M: ECEP Future Options by M/TA
APPENDIX N: Institutionalizing Energy Efficiency in the Private Sector by M/TA
APPENDIX O: A GOE Agency In Charge Of Energy

PREFACE

The attached evaluation report, concerning the Energy Conservation and Efficiency Project (ECEP) being funded by USAID/Cairo, was prepared by Development Associates Inc., in conjunction with its mid-term evaluation of USAID/Cairo's $136.75 million Science and Technology for Development (STD) program. It is one in a series of five individual evaluation reports prepared concurrently by Development Associates for the five component projects of the STD program, which include the following:

Project Number	Project Name	LOP Amount ($ mill.)
263-140	S&T for Development	136.75
	Includes Phase I - Start Up Component	3.00
263-140.1	S&T Cooperation	36.00
263-140.2	Schistosomiasis Research	39.65
263-140.3	Energy Conservation and Efficiency	49.50
263-140.4	Energy Manpower Development	8.60

Participants in the evaluation exercise included expatriate as well as Egyptian S&T specialists, as indicated on the cover sheets of the individual reports. Specialists in the design and implementation of U.S. AID projects and programs were also involved. The Chief of Party for the overall evaluation effort was Mr. Donald Dembowski.

LIST OF ACRONYMS

AAP	Award/Authorization to Procure
AFT	Application Finalization Team
AG	Agencies
AID	U.S. Agency for International Development
AJS	Arrive Job-Site
CC	Combustion Control
CCS	Combustion Control Systems
CEI	Combustion Efficiency Improvement
COG	Cogeneration
COP	Chief of Party
CTT	Complete Testing/Turnover
DA	Development Associates Evaluation Contractor
DMS	Demand Management System
DRTPC	Cairo University's Development Research and Technological Planning Center
ECEP	Energy Conservation and Efficiency Project
ECO	Energy Conservation Opportunity
EWCO	Energy and Water Conservation Opportunity
EEA	Egyptian Electricity Authority
EMS	Energy Management System
EN	Engineering
EPPP	Energy Policy and Planning Project
ECEPA	Energy and Water Conservation and Environment Protection Agency
FEI	Federation of Egyptian Industries
GOE	Government of Egypt
HBI	Reliance Consultancy Group/Hagler, Bailly, International
HEL	High Efficiency Ligting
HEM	High Efficiency Motors
HMO	Home Office
ICI	Initial Contact with Enterprise
IHM	In-House Modifications
IMC	Implementation Contract
IMF	International Monetary Fund
IRM	Insulation and Refractory Materials

LNECO	Low-cost, No-cost Energy Conservation Opportunity
LNEWCO	Low-cost, No-cost Energy and Water Conservation Opportunity
LOI	Letter of Intent
MOE	Ministry of Education
MOEE	Ministry of Energy and Electricity
MOP	Ministry of Petroleum
M/TA	Management/Technical Assistance
NLECO	No-cost, Low-cost Energy Conservation Opportunity
OBI	Overseas Bechtel International
OEP	Organization for Energy Planning, Government of Egypt
PCD	Project Completion Date
PCS	Process Control Systems
PFI	Power Factor Improvement
PP	Project Paper (A.I.D.)
PROAG	Project Activity Grant Agreement
PROC	Procurement
RFP	Request for Proposal
RPM	ECEP Resident Project Manager
RTAC	Resident Technology Application Coordinator
SFB	Solid Fuel Boilers
SOW	Statement of Work
SWH	Solar Water Heater
TA	Technical Application
TIMS	Tabbin Institute for Mettalurgical Studies
TTS	Targeted Technical Services
USAID	Cairo Mission of A.I.D.
WHR	Waste Heat Recovery

EXECUTIVE SUMMARY

The Energy Conservation and Efficiency Project (ECEP) has been effectively implemented and will likely achieve at least one of its objectives, to establish about 60 demonstrations of replicable Technology Applications (TAs) by the end of the project in 1996. To date 135 applications have been received from industries, 58 feasibility studies have been prepared, and signed implementation letters have been completed with 7 public sector industries and 9 private sector industries. The energy savings from these alone is estimated to be $3.4M. Three of these applications are now operational, and a fourth is operational with equipment purchased locally by the industry.

The second purpose "to improve Egyptian institutional capabilities.....," will likely be only partially achieved the way the ECEP is designed and being operated at the present time. With some modifications and refocusing, however, there is sufficient time remaining in the project for the original purposes (plus a number of others) to be achieved. At the same time the ECEP could be the basis of an enhanced USAID environmental initiative. This is particularly true in the light of the GOE commitments made to transform the economy to one driven by market forces by establishing sound GOE energy and environmental policies, by privatizing business and industry, by pricing energy at border prices and by removing a wide range of subsidies.

One of the most serious problems facing Egypt today is the pollution of the air caused by excessive and inefficient use of energy in industry, particularly heavy industry in the public sector. This is caused by the type of fuel, incomplete combustion, and inefficient equipment. The ECEP project is focused directly on this problem and is aimed, as its name states, on improving energy conservation and efficiency. In addition to saving energy and money, this project will reduce the amount of serious pollutants being emitted, which are associated with combustion of conventional fuels. Consequently, the ECEP project is a central player in any environmental program. For this reason, it should be included as an important part of the environmental program that USAID is now considering with the Egyptian government.

Below are the specific findings, conclusions and recommendations which have resulted from the study, including an evaluation of the ECEP and the role it might play in future energy conservation and efficiency programs, and environmental programs.

1. If the ECEP is to have a continuing effect on energy conservation and efficiency after the USAID funding is ended, there must also be the necessary human resources to carry out these activities. Therefore, the ECEP should be refocused to put heavy emphasis on privatization by:

    a. Establishing a series of on-the-job training programs and a support system for private engineering companies so that they can provide the required engineering services to Egyptian industries,

b. Establish linkages and a series of on-the-job training programs and a support system for technicians in service companies for servicing equipment and systems, and

c. Establish linkages and a series of training programs for spare parts and equipment suppliers to develop close and effective connections with U.S. industry.

The foregoing recommended steps will create a reservoir of talent in Egypt (in the ECEP agencies and among the private entrepreneurs) which will be able to continue the activities set in motion by the ECEP.

2. The list of approved TAs needs to be expanded to include at least LNECOs, complete energy and environmental protection audits, and fuel substitution.

   As experience has been gained, it is evident that additional TAs need to be added. Low-cost, no-cost energy conservation opportunities (LNECOs) could conserve large amounts of energy with supplies and equipment from the local market without USAID commodity support. The Gas Analyzers can help not only to conserve energy, but they can simultaneously make enormous reductions in pollution by more complete and efficient combustion. Converting from mazout/solar to natural gas will also result in a much cleaner exhaust and greatly increased efficiency.

3. During the remainder of the ECEP, industries should be asked to do cost-sharing for the services, training and commodities they receive so that they will be prepared to bear the total cost when the ECEP is completed in 1996. This may require a modification to the Project Paper.

   At the present time, all costs for technical services, training and commodities are being paid by the ECEP, which creates an artificial situation that cannot be expected to continue on into the future. By charging the industries on a cost-sharing basis, industry will adjust to paying a share of the costs before they must pay all of the costs after 1996.

4. USAID needs to develop a coordination system with all of its energy-related projects in order to maximize the output and benefit from them.

   Although it may appear that these projects (e.g. the STD sub-projects, energy management development, and the power sector support program of $200M) have little or no relationship, because they are in different ministries or sectors, it is highly likely that much would be gained by closer coordination. Energy and environmental protection training and research, and the application of the information produced, are all interrelated and should be coordinated.

5. Overall Policy Guidance, from the Steering Committee and the USAID, should be provided in a timely manner to the ECEP implementing agencies and the M/TA.

There have been two large-scale projects for which the ECEP has requested approval but have not had a reply for 5 months in one case and 10 months in the other. The Steering Committee has not been meeting and has not been providing policy guidance for at least the past year.

6. USAID should encourage the GOE not to charge customs duties on commodities for the private sector industries for either energy saving equipment or for environmental protection equipment.

The practice of requiring the private sector to pay customs duties on energy saving equipment, while the public sector does not, discriminates against private sector industries and tends to discourage the privatization program.

7. The training manuals should be translated into Arabic.

The training manuals developed by HBI, and edited and published by the ECEP agencies, are of high quality, but they are now all in English and may not be used as much as they would be if they were in Arabic. Much of the other literature being produced by the ECEP is in Arabic and is being used extensively. Furthermore, if these technical publications were in Arabic they could be used throughout the Arabic speaking countries in other parts of the world.

8. Purchasing equipment in the local market should be permitted when the price is significantly lower than in the U.S. and if there will be a considerable saving of time. At least the ECEP should pay for all engineering services and then the industry pay for the equipment locally.

The Team found that in some cases energy saving equipment was available in the local market at far less cost and much faster delivery than going through U.S. suppliers. Purchasing locally has several advantages. In addition to cost savings, there are also spare parts and service available. USAID should consider this in light of AID policy.

9. The Steering Committee should meet more frequently and become more active in carrying out its responsibilities.

The Steering Committee has several important functions to perform in the public sector. In addition, it needs to be used as a means of informing other organizations and agencies about the ECEP and to help the ECEP to perform its functions.

10. The contract between USAID and OBI should be revised to take into consideration the foregoing recommendations and the role that the M/TA must play to accomplish them. At the same time, the budget would have to be increased in order to provide the additional support system that is necessary to accomplish the additional responsibilities.

The foregoing recommendations add greatly to the responsibilities of the Management/Technical Assistance (M/TA) contractor. Since the present M/TA team has demonstrated the necessary skills to carry out these types of activities, it is the logical organization to perform these new responsibilities.

11. The M/TA offices should be moved to a more convenient location where the space is more adequate.

The present offices of the M/TA are located on the campus of Cairo University adjacent to the DRTPC. This location severely limits the access of the M/TA to its offices because the campus is closed after 5 pm and on Fridays. Furthermore, the space is extremely inadequate and inconvenient. Heavy campus security also makes it very difficult for the business community to access the offices. In addition to relocating the M/TA, space should be made available for a common ECEP office which could be used for the common elements of the ECEP, such as management, data base, training, promotion and engineering activities, and a meeting room. It is also essential to have proper and adequate space for consultants, both Egyptian and Ex-pats.

12. The ECEP three implementing agencies and the M/TA should have closer contact and more frequent interaction.

Coordination among the three agencies and the M/TA is presently very difficult because of telephone problems and the distance their offices are apart. This results in much less coordination than is desirable and tends to leave coordination to the monthly meetings -- which overloads the agenda for these meetings.

13. The ECEP has a vital and significant role to play in an environmental protection program in Egypt.

As Egypt responds to its responsibilities in the worldwide environmental crisis and develops sound policies and programs to improve its environment, the ECEP can play a highly significant role in helping Egypt to attain its environmental objectives.

14. In order for the ECEP to have the maximum possible success, there is an urgent need for the GOE to: develop sound energy and environmental policies, increase energy prices to border levels, and move into a market economy with privatization as rapidly as possible. The Organization for Energy Planning (OEP) should become involved in ECEP activities.

Developing sound energy and environmental policies, including the increase of energy prices, is essential to be realistic about the actual cost of energy so that the industry realizes significant savings from energy conservation and efficiency. In order for industry to feel the maximum pressure to introduce such steps, however, it is essential to have privatization and competition under a market economy. Otherwise, the industry will just raise prices of its products (to pay for excessive use of energy) and thereby simply pass the cost on to the customer. The ECEP should work more closely with the OEP and have greater dialogue and activity with respect to overall policy issues.

THE EVALUATION REPORT

I. INTRODUCTION

1. Overview/Background of the Project

Egypt has a rather large Science and Technology (S&T) community as evidenced by more than 260 public sector research institutes and 12 public universities. Unfortunately, however, there are very few linkages between Egypt's S&T community and the R&D needs of industry and other productive enterprises in both the public and private sectors. Within the S&T community, there are also gaps in expertise and a bias toward basic or fundamental research in contrast to applied research which would be directly useful to industry and other applied aspects of the Egyptian economy (see Appendix A).

Therefore, USAID has stated that it wishes to focus on key national development problems with R&D efforts based on the goals and needs of the end-user. There is also a need for coordination among the more experienced Egyptian research groups, and they should give greater attention to key S&T areas as energy conservation, efficiency and productivity. The Energy Conservation and Efficiency Project (ECEP) grew out of this need. This report is concerned with the ECEP (see Appendix A).

A. The Goal of the ECEP is to improve the productivity and competitiveness of the Egyptian economy by improving the energy efficiency of its industrial and commercial processes and practices.

B. The ECEP has two primary purposes:

(1) To promote and accelerate the adoption of improved commercial technologies, processes, and practices in order to save energy and increase energy efficiency.

(2) To improve Egyptian institutional capabilities, particularly in the private sector, to promote and implement energy-saving and productivity enhancing investments.

C. The ECEP consists of three types of activities:

(1) Energy technology applications, which entail identifying, evaluating, selecting, designing, financing, installing, operating, monitoring, and maintaining energy efficient technologies in industrial and commercial facilities.

(2) Training programs in both Egypt and the U.S., to approximately 1250 plant and other personnel, of which 300 will receive training directly related to technology applications. Also, upgrading the capabilities of at least two Egyptian organizations to train personnel beyond the life of the ECEP.

(3) Technology investment promotion which entails developing Egyptian institutional capabilities to identify, evaluate, finance, procure, install, operate, monitor, and maintain energy-efficient technologies, increase awareness of energy-efficient technologies through project promotion and dissemination of information on technology applications, and reducing policy and regulatory barriers to energy conservation investments by analyzing Government of Egypt (GOE) policies or regulations that constrain the implementation of cost-effective technologies.

D. The ECEP is divided into two components -- one for the public sector and one for the private sector -- which were to be managed and implemented by existing Egyptian institutions. However, it is recognized that most Egyptian organizations require management and technical assistance and training to perform their project tasks. Therefore, a management and technical assistance (M/TA) contractor was competitively selected to provide these services to both project components as well as technical advisory services to USAID.

E. Egyptian Implementing Agencies

These activities are accomplished through three agencies (see Appendix A):

(1) The Tabbin Institute of Metallurgical Studies (TIMS) which is located within the Ministry of Industry. TIMS is the location of the public sector part of the program under the policy guidance and TA approval of a Steering Committee. A Project Secretariat, comprised of TIMS, is responsible for project management and implementation.

(2) The Development Research and Technological Planning Center (DRTPC) which is in Cairo University under the Ministry of Education. The DRTPC is implementing the private sector of the program.

(3) The Federation of Egyptian Industries (FEI), an independent organization, is responsible for publications and promoting the ECEP among Egyptian business enterprises.

2. The Assessment

A. Need for the Assessment

An evaluation of the ECEP was planned in the original Project Paper (see Appendix A). Accordingly, this project has been underway since 1988 without any external review. Therefore, there is a need for an evaluation of the accomplishments of the STD project in general and the sub-projects in particular.

B. Purposes of the Assessment

The overall purposes of this first evaluation are as follows (see Appendix B):

(1) To assess the original project designs and their relevance to current Agency and Mission strategic objectives.

(2) To evaluate implementation progress.

(3) To assess the potential for achievement of project purposes.

C. Assessment Personnel

Maurice Albertson arrived in Cairo on February 21, 1992, and departed Cairo on March 20, 1992. Claude Garrigues arrived in Cairo on February 19, 1992, and departed Cairo on March 25, 1992. The field visits started on March 8, 1992, and were completed on March 16, 1992. Ayman Soliman provided valuable assistance during the numerous meetings and plant visits as well as with report writing.

II. BACKGROUND AND DESCRIPTION OF THE PROJECT

1. The Country Context

In recent decades, Egypt has had a rapid growth in GNP which has been accompanied by a correspondingly rapid growth in the consumption of energy. This growth in energy use has been associated with an expansion of both urban and rural electrification, and the rapid expansion of energy-intensive industries. The GOE has been giving a high priority to the expansion of electric power generation, transmission and distribution systems. It has been estimated that 75% of Egyptian households have access to electricity. The GOE is also planning to develop and expand a variety of energy sources, including a shift to greater use of natural gas, an energy source which has previously been unexploited or wasted (see Appendix C).

The consumption of petroleum products and natural gas has increased an average of 12% annually, and the annual increase in use of electricity has been 8% since the mid-1980s, although it has levelled off recently to some extent. At the same time, power generation capacity has increased from 3,800 MW in 1976 to 10,700 MW in 1990 -- a nearly 3-fold increase.

The per capita oil equivalent consumption in Egypt is unusually large, 588 kg in 1987. Compared with Morocco's (220 kg) it is clear that there is a large scope for energy conservation. The estimated potential for energy conservation in Egypt is 66%.

This wasteful and inefficient use of energy has resulted in an enormous degradation of the environment -- particularly the air surrounding the industries. This project to improve energy conservation and efficiency, particularly improvement of combustion efficiency, will no doubt have a major beneficial effect on the quality of the air and its impact on the environment.

2. GOE Energy Policies

An important reason for the rapid growth in the use of energy in Egypt has been the very low price of energy. The GOE subsidizes energy so heavily that the price is only a fraction of the world market rates. Although the GOE recognized the need to reform energy pricing policies, and indeed has raised energy prices, they are still about half of the world market. In fact, until recently these small price increases have lagged behind the inflation rate. Other policies include monopoly markets for many industries, cost-plus pricing policies and a predominately public sector economy. Compounding these issues is that many industries are without maintenance or modernization.

3. Effects of Pricing Policy

Keeping the price of energy at such a low level has had a number of deleterious effects including: it causes inefficient, wasteful and inappropriate use of energy; it creates distorted production patterns and investment decisions; it puts a heavy burden on the national budget; it creates a wide gap between economic cost and the subsidized cost; and it provides little or no incentive to improve the environment by energy conservation and efficiency.

4. Relationship of the Project to USAID's Overall Strategy

A part of the overall strategy of USAID is to assist the energy sector of the Egyptian government, as an aid to rehabilitating, modernizing and expanding the country's capital infrastructure base. Between 1975 and 1990, USAID has provided over $1.2 billion in project and commodity assistance to support the GOE in the development of electric power. In fact, USAID assistance contributed to the installation of 2500 MW of additional generating capacity, which is nearly 25% of the total installed capacity in Egypt. Current projects in the energy sector emphasize expanded generation, rehabilitation of facilities, a more rational pricing structure, energy policy planning, renewable energy technologies and energy conservation -- which is the subject of this report (see Appendix A).

Another very important part of overall strategy is to improve the environment globally as well as locally in Egypt. The deteriorating health conditions for the people, and the wasteful use of non-renewable resources, make it imperative that action be taken immediately to greatly reduce and eventually stop the relentless destruction of the environment that is occurring today.

An important part of USAID's policy is to relate funding levels, for capital assistance to electricity projects, to progress on the incremental increases in energy rates.

As a part of this overall strategy, USAID initiated the ECEP with the goal, purposes and objectives stated in Chapter I.

5. Scope of the Project

The STD project is composed of four components or sub-projects. These components are in four different ministries of the GOE. As such, there is little opportunity for coordination or interaction among them.

6. Scope of the ECEP Sub-project

The ECEP sub-project is composed of technical assistance, management advice, training programs, promotion and information dissemination, and commodities procurement. It has a specific focus on the conservation and efficient use of energy in Egyptian industries with an emphasis on the following technology applications:

energy management systems, high efficiency lighting, combustion control, cogeneration, process controls, energy-efficient motors and controls, power-factor improvement, waste heat recovery, insulation and refractories, and solid-fuel boilers.

Public sector companies in the metals, chemicals and cement industries were selected in the Project Paper for initial ECEP participation. The Steering Committee later added food and textile companies. All private sector industrial and commercial companies in Egypt are eligible for participation.

The initial project design provided for helping both private and public sector companies with technical assistance (TA) and funds (loans and grants) for the implementation of up to 60 applications (sub-projects) of energy efficient technologies. The loan aspect, which was to operate through the banking sector, was later dropped. Project grants for energy-efficient technologies are split about 50-50 between the private and public sectors. While AID's policy strongly favors encouragement of the private sector, the public sector in Egypt is clearly the largest energy user and offers by far the best opportunities for energy conservation.

Because of the importance of spending large amounts of money on this project, no-cost low-cost energy conservation technologies (NLECOs) were not included because they would be too time-consuming for the amount of money spent.

7. Organizational Structure

The Tabbin Institute for Metallurgical Studies (TIMS) of the Ministry of Industry (MOI) is implementing the public sector applications, with a Steering Committee providing guidance, while the Cairo University, Development Research and Technological Planning Center (DRTPC) is handling the private sector. The Federation of Egyptian Industries (FEI) is responsible for promoting ECEP among Egyptian business enterprises (see Appendix B).

It was expected that by implementing the project, TIMS, DRTPC and FEI would improve their ability to promote, identify, engineer, install, operate and maintain energy-efficient technologies. The ECEP will enhance the energy conservation capabilities of Egyptian companies through training in Egypt and the U.S., as well as through implementation of technology applications.

To help facilitate all these activities a contractor was selected to provide Management and Technical Assistance (M/TA) to the ECEP and all its components.

Detailed responsibilities for each of these components of the organizational structure are spelled out in Appendix D.

8. Documents Implementing ECEP

USAID signed the initial Sub-grant Agreement with the GOE on August 4, 1988, obligating $15M. The ProAg was amended on June 15, 1989, increasing the obligated amount to $21M. In February 1989, ECEP funded a one-year, $891 000 buy-in to an AID/W contract with HBI to assist DRTPC, TIMS, and FEI to start up the project including: the organization of the ECEP Secretariats, the establishment of project procedures, and the completion of feasibility studies for the first set of technology applications.

In April 1989, AID provided funds to DRTPC, TIMS, and FEI Secretariats. These agencies then hired staff and began implementing the projects.

During 1989-90, AID procured a long-term M/TA contractor and signed a three-year (extendable to the PACD) $10.1 M/TA contract with OBI. The OBI contract includes a sub-contract with HBI.

III. ASSESSMENT METHODOLOGY

The assessment methodology that was followed has a series of steps, including rapid appraisal, interviews, informal survey, formal survey, direct observation and review of documents.

1. Rapid Appraisal

The first step in this assessment was to become acquainted with the ECEP project as rapidly as possible by assembling and reading all pertinent documents and information that were available. From this material it was possible to make a rapid appraisal of the project, which then made it possible to plan in detail the remainder of the study.

2. Interviews

After the rapid appraisal, steps were taken immediately to set up interviews with key informants and other individuals who could provide information that greatly improved an understanding of the ECEP. Documents were obtained from each of these individuals about their work. Appendix E provides a list of the people interviewed.

3. Key Informants

The first interviews were with USAID and OBI personnel. Rick Rhoda was interviewed briefly in Washington, D.C. (in the office of Development Associates, Inc). At this time, it was pointed out that S&T was to be dissolved within USAID/Egypt and an environmental program might replace it, which meant that our report should include analysis of ways in which ECEP might impinge on environmental factors, and how the ECEP might be modified to incorporate environmental activities. Mr. Rhoda was later interviewed in Cairo.

Most of the interviews in Cairo have been held with M/TA personnel, personnel in the three agencies (TIMS, DRTPC and FEI), personnel in the industries (end-users) and other USAID personnel.

4. Community

A few interviews (mostly informal) were held with individuals in the Cairo community, and some information was obtained from the public press and from a professional review of "energy" literature.

5. Informal Survey

Throughout the period in Cairo, team members have conducted informal surveys to gather statistical and other information relevant to the ECEP. This information frequently led to obtaining more formal information.

6. Formal Survey

In addition to reading documents and conducting interviews for information, one of the main efforts of the team was to systematically gather data in more formal ways, including field trips to a sampling of the industries involved in the study. These data were used to evaluate, in a more objective manner, accomplishments of the ECEP.

7. Direct Observation

The team conducted a number of field trips to end-user industries in order to observe directly the activities and accomplishments of the ECEP (see Appendix F).

8. Documents Reviewed

The documents reviewed are listed in Appendix G. This massive array of information was absolutely essential in order to gain a clear understanding of the various aspects of the ECEP. Especially helpful were the original Project Paper, the Scope of Work for this evaluation, the Subgrant Agreement, the USAID/Egypt Status Report of December 1990, and numerous other reports, papers, information and documents provided by the M/TA and USAID.

9. Evaluation Criteria

The evaluation criteria for this report were:

a. Is the ECEP designed to meet the goal, purposes and objectives as stated in the Project Paper?

b. Has the ECEP been conducted in a way that meets the stated goal, purposes and objectives?

c. Is the quantity of the ECEP output adequate?

d. Is the quality of the ECEP output adequate?

e. Is the ECEP consistent with the current goals and objectives of USAID and GOE, e.g., environmental and privatization objectives?

f. Are there ways that the ECEP could be improved?

IV. FINDINGS REGARDING THE PROGRESS OF PROJECT IMPLEMENTATION

The expected outputs of the ECEP are the identification and implementation of TAs, training programs in Egypt and in the U.S., promotion of the ECEP and the publication and distribution of published materials, and the development of personnel and organizational structures which can carry on the activity of the ECEP after 1996.

1. Energy Technology Applications (TAs)

The PP stated that about 60 TAs should be identified and implemented by 1996 from a list of 10 technologies. To date 135 applications have been received from industries, a total of 58 feasibility studies have been completed and implementation letters have been signed with 7 public sector industries and 9 private sector industries. Energy savings from these 16 industries alone are estimated to be $3.4M. Three TAs are actually in place and operating with a fourth TA in operation where the industry purchased the equipment with their own funds. At present, 13 TAs are at the procurement/implementation stage (see Appendix K).

2. Identifying Technologies and Sites

The ECEP has used several methods to attract the attention of industry managers:

a. Publicity and personal contact to attract Managers to participate in training sessions. An example is Alumisr.

b. Visits by the HBI COP personnel to industries. An example is Coke.

c. Establishing personal relationships between TIMS and DRTPC executives and industry managers.

These methods of attracting and identifying industries to participate in the ECEP have been successful in obtaining 135 applications, as stated above. There has been no attempt to publicize the ECEP through the mass media. Instead, the ECEP promotion activities have been slanted towards support of TAs without mass exposure of the project. With the arrival of the present Manager of the FEI office, a significant increase occurred in the publicity of the ECEP within the industrial sector -- both private and public. This was aided greatly with an increase in the number of publications being issued and distributed among the industries.

3. Demonstration Sub-projects

Of the 10 technologies included in the ECEP, the following specific locations are where these TAs have been identified to date (see Appendix K).

a. Energy management systems (EMS)
   DO1 Ramses Hilton
   D20 Egyptian International Pharmaceutical Company
   T03 El-Nasr for Coke and Chemicals

b. Autornatic combustion controls (CC)
   D06 Asfour Glass
   D10 Arab Pharmaceutical Glass
   T01 Egyptian Copper Works
   T02 Delta Steel

c. Waste heat recovery systems (WHR)
   D06 Asfour Glass
   T16 Abu Zaabal Fertilizer*

d. Cogeneration systems (COG)
   D09 Alumisr (Aluminum sections)

e. Power factor improvement systems (PFI)
   D02 Arab Contractors Medical Center (building)
   D03 Cairo Beverages
   D04 Giza Cables Company
   D32 Bishara Textile Manufacture**
   T08 NAMETIN (metallurgy)
   T09 TRENCO (Tires)
   T10 El Shourbagi (Textiles)

f. High efficiency lighting (HEL)
   D01 Ramses Hilton

Four of the original 10 TAs have no specific industry identified. These include: micro-computer and microprocessor based process controls, advanced insulation systems, high efficiency electric motors, and solid fuel-fired combustors.

It has been recommended that energy substitution (e.g., substitution of natural gas for mazout/solar) be included as a TA. There are many advantages for doing so, including:

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* Abu Zaabal Fertilizer is wrongly classified under cogeneration, it is merely a waste heat recovery, recovery being carried out not by an heat exchanger but by a steam turbine.

** Bishara Textile Manufacture went along with ECEP up to the specs stage, then facing the long time lag to get equipment from the States and the heavy penalties it should have paid in the meantime, it decided to purchase them locally.

a. Lower energy costs
b. Improved boiler efficiency
c. Reduction in CO_2 emissions
d. Reduction in SO emissions

Some projects do not come directly under the foregoing TA headings, such as:

a. T22 Improvement to a water treatment plant at SEMADCO (Chemicals): this project increases the efficiency of a power plant.

b. T39 Portable Gas Analyzer: investment cost of the gas analyzer is far less than the $50, 000 limit. If the project is considered as a whole, it is more a replication of a TA than a TA as such. However, this TA is very successful, the savings are far more than assumed, and it gives a bright image to the ECEP.

4. Monitoring Technology Performances

At the present there are 3 TAs (4 if BTM is included) which are running and are being monitored. All of them are PFI systems:

a. Cairo Beverages
b. Arab Contractors Medical Center (building)
c. Giza Cables Company
d. BTM

5. Plant Visits

A total of 11 plants were visited to evaluate those TAs and the ECEP procedure:

a. ALUMISR (COG)
b. El-Nasr for Coke and Chemicals (CC)
c. Ramses Hilton (Cairo). (PFI,EMS, Infrared sensors)
d. Seven-Up Beverages Co (Cairo). (PFI)
e. Abu Zaabal For Fertilizers and Chemicals Co (Abu Zaabal) (WHR)
f. National Metal (Abu Zaabal) (PFI)
g. Asfour Glass (South Cairo) (WHR)
h. EIPICO (10 Ramadan) (EMS)
i. BTM (10 Ramadan) (PFI implemented by BTM)
j. SEMADCO (Suez) (Water treatment)
k. Arab Pharmaceutical Glass (Suez) (CC)

At these 11 plants, a total of 13 TAs were evaluated at various stages of implementation, 2 of them not being implemented by ECEP (BTM/PFI) or not implemented at all (Ramses Hilton/infra-red sensor). Short reports on these visits are presented in Annex L.

Some general comments are:

Out of the 11 plants/industries (13 TAs) inspected, there are 2 successful projects implemented (*) and 4 projects being implemented without large problems:

a. Egyptian Beverages (PFI)*

b. Abu Zaabal (WHR)

c. EIPICO (EMS)

d. Bishara Textile Garment (PFI)*

e. Asfour Crystal

f. ALUMISR is proceeding to the satisfaction of the plant manager, even if it is not replicable.

g. SEMADCO

The compulsory purchase of US equipment has been a major cause for delays. Other causes of delays have been:

a. The Gulf War

b. Specs modifications, e.g., National Metals Industries (PFI)

c. Defect in equipment supplied, e.g., Ramses Hilton (HEL and EMS)

d. Cautiousness of plant management, e.g., Asfour Crystal (CC and WHR)

e. TAs to be accepted by the licensor, e.g., EIPICO (EMS)

Some TAs were found to be not replicable by the Team (ALUMISR - COG, COKE - COG), or by Hotel Management (Ramses Hilton -infra-red sensors).

Not all the ECO potential has been identified. Consequently, there are in these plants a large number of additional ECOs, such as the following:

a. ALUMISR (lighting, WHR, EMS).

b. Ramses Hilton (heat recovery on compressors, reduction in air change, condensates recovery, lighting, EMS).

c. Egyptian Beverages (Heat recovery on compressor, Cold recovery on liquid CO_2, lighting, electricity contract).

d. EIPICO (Replacement of electromagnetic ballasts by electronic ballasts, replacing V belts by flat belts, insulation of valves and flanges, installing photoelectric cells in the compressor room, reduction of excessive lighting in the offices, install turbulator in the fume tubes of the boiler, shifting from solar to mazout, improving the boiler efficiency (it is only 80%, instead of 90%), cold recovery (out of cold air extracted from the rooms).

e. BTM (Improving the boiler efficiency, installing a case around the steam drum dryer, reducing the leaks, insulating the pipes).

f. ASFOUR Glass factory.

Basically, the relationship between ECEP project officers and the plant management were found to be excellent. In only one case there was a bad relationship with the plant management (National Metals Industries). In APG the management is not happy about the slowness of the process, and they will be even more unhappy when they discover the actual date of equipment delivery.

If audit implementation is accepted as a TA, as recommended, ECEP should capitalize on its good name and complete audits should be proposed to the plants where successful TAs are implemented or are being implemented, in order to identify other TAs. The ideal candidates are:

a. Egyptian Beverages
b. Abu Zaabal
c. EIPICO
d. Bishara Textile Garment
e. Asfour Crystal
f. ALUMISR
g. SEMADCO

Efforts should be made to build up a good image for the project in the hotel sector and make hotel managers forget the bad image created by the Hilton sub-projects. In this sector the potential for energy conservation is both large and growing fast.

6. Gas Analyzers

It was proposed by ECEP to introduce the use of portable combustion control analyzers (Gas Analyzers) in 100 industrial plants which are major fuel consumers. USAID agreed to purchase only 50 initially. Each analyzer costs $4500 plus $500 per year for supplies and spare parts (filters, batteries etc.). The energy savings were expected to be about 1%, which the team found to be very conservative. Experience elsewhere has shown 5% to be a more realistic figure.

Initially, 10 Gas Analyzers were distributed and the reports start flowing back to ECEP. The first results of this TA were given to the ECEP executive at the monthly meeting of March 17. They are quite impressive. Before tuning, combustion efficiencies were in the range of 49.6 to 90%. After tuning, efficiencies ranged between 60.9 to 91%. Thus, savings ranged from 1% to 48.5%.

However, some problems remain to be solved:

a. It has been observed that two Gas Analyzers give conflicting results on the same boiler (BTM).

b. One cannot rely on local suppliers for the maintenance and calibration. This must be carried out by ECEP. Some training will be provided to the ECEP staff by the US supplier.

7. Technology Application Promotion

The ECEP publicized the TAs by issuing many different informational pamphlets together with 11 manuals on technical subjects. The pamphlets have been distributed to 3500 people, and the technical manuals have been distributed in technical training programs and to other interested technical people. These materials do not yet refer to the ECEP's TA results, as the results of the monitoring are not yet known.

8. Mailing List/Newsletters/ Promotional Seminars

The FEI's mailing list has been increased to 3500 individuals and organizations.

ECEP issued technical newsletters on subjects related to energy conservation. They were previously in English only. They are now available in Arabic and these new editions are in much greater demand.

Twelve of the 19 planned Course Manuals have been produced as of November 1991. These are discussed in Appendix H.

9. Training

There have been 19 in-country courses conducted as of November 1991 (see Appendix I). This is about half of the 39 total planned for the project life, with half of the project life remaining. At the same time, the number of trainees which were planned over the project life at 800 has been nearly reached by 768 trainees as of November 1991. The same situation is generally true for the in-house courses. For U.S.-based training tours and U.S.-based study tours, the number again is about half or more at mid-term in the project life. In summary, the training program has been completed by half or more at mid-term in the project life.

One problem which has confronted the ECEP in the training programs is the large number of trainees who want to attend far exceeds planned capacity. In fact the large number of participants (100-200) turned those training sessions more into "awareness" seminars than in real training sessions, for which the ideal number of attendants would be 25 to 50. This has meant that the in-depth, hands-on type of training that was initially planned has not been possible -- hence the concept of "awareness" seminars. Recommendations are made in Chapter VI to overcome this problem, at least in part.

Training directly related to sub-projects is included in the commodity package and provided by the U.S. supplier.

As a part of the training program, 11 manuals have been prepared by the M/TA which provide technical information on the following TAs:

a. Micro-computer and micro-processor based process controls
b. Electronic energy management systems
c. Energy management systems
d. Automatic combustion controls
e. Improving combustion efficiency
f. Waste heat recovery systems
g. Waste heat recovery
h. Cogeneration systems
i. Cogeneration
j. Advanced insulation systems for large scale operations
k. Insulation and refractories
l. High efficiency motors
m. Energy efficient electric motors and drives
n. Solid fuel-fired combustors
o. Power factor improvement systems
p. High efficiency lighting for large scale industrial operations
q. High efficiency lighting

Two manuals refer to the main energy distribution system or consumers:

a. Industrial furnaces
b. Energy efficiency in steam systems

Two manuals refer to the energy management as such:

a. Energy measurement and instrumentation
b. Energy management for companies

These documents are technically very good and well presented. More detailed evaluation of these manuals is presented in Chapter VI and Appendix H.

Translation into Arabic and Updating -- Following the success of the newsletters in Arabic, consideration is now being given to updating the technical manuals and then translating them into Arabic.

V. EVALUATION FINDINGS/RECOMMENDATIONS

This chapter is a discussion of the previous chapters plus evaluations, comments and recommendations. It also addresses the questions posed in the Scope of Work, Appendix B. The overall situation and assessment is first presented, followed by discussions and evaluations of the various components of the ECEP. Finally, recommendations are given for refocus and redesign of the project.

1. Overall Situation and Assessment

Considerable progress has been made on the ECEP project. It has accomplished a large part of the initial goals, purposes and objectives as set forth in the original Project Paper. Although there still remains a great deal to be accomplished, much of this will be done by 1996. However, it is not clear what will be the output from the agencies and organizations associated with the project beyond that date because very likely there will not be the necessary incentives and organizational structure for the project purpose to succeed as originally intended. Consequently, only a limited part of the replication and sustainability features will be achieved. Although spare parts are provided for one year, there is no provision for stabilizing the trained personnel and organizational structure that is necessary for maintenance, repair and spare parts on into the future. Therefore, it is possible that many of the commodities provided under the project will be inoperable within a few years. This is the experience with many commodities that USAID and other donor agencies have provided in the past to Third World countries. Recommendations are made later in this chapter to help remedy this situation.

2. Technology Applications (TAs)

The primary objective of identifying and installing about 60 TAs is well on its way with 135 applications received from industries and 58 feasibility studies completed (see Chapter IV and Appendix K). Although there are only 4 TAs actually in place and operating, there are enough additional potential TAs in the pipeline that the target of 60 will very likely be achieved by 1996.

From the outset, however, the number 60 was an approximation and not a fixed or magic number. With 10 technologies identified initially in the Project Paper, this meant that there would be an average of 6 replications for each technology. The evaluation team believes that half this number (3) would be adequate to demonstrate a TA. As shown in Chapter IV and Appendix K, there have been 3 replications identified for Energy Management Systems, 4 for Automatic Combustion Controls, 2 for Waste Heat Recovery Systems, one Cogeneration System, 7 Power Factor Improvement Systems, and one High Efficiency Lighting. There are several TAs for which there are no applications yet identified. It is highly likely, however, that most of these will be included by 1996.

Additional TAs were added by the Steering Committee and more are being recommended, so that the total number of TAs would be 15, as explained in a later section of this report. It is therefore concluded that satisfactory progress has been made in identifying and installing demonstration TAs.

3. Larger Sub-projects

Larger sub-projects can be debated at length. However, based on the original Project Paper, only one or two demonstration projects are needed to establish the viability of a Technology Application. Furthermore, the ECEP project was originally established for projects greater than $50,000. No upper limit was given. For cogeneration, which is a rather large TA that is being proposed, the allocated funds would be used up very quickly and other TAs would not be possible. Furthermore, these cogeneration projects have very limited replicability. It is the opinion of the team that if at least $20-$30M is added to the project then one or two large projects might be acceptable as demonstrations. However, without this increased funding, these larger projects should be financed by other programs such as CIP in AID or the World Bank.

There are some very good institutional reasons for using ECEP as a vehicle to provide engineering design and project management support for the implementation of up to 3 larger projects, if these are used to provide direct technical assistance to local private sector consulting engineering firms. Currently, all major engineering effort is being provided directly by the M/TA with only limited input from TIMS and DRTPC. Both agencies are unlikely ever to develop this skill given the nature of the parent organizations. Since much of the work is being done in the US, there is only minor transfer of ability and little institution building being done in the country. It would be more appropriate to build this into Egyptian engineering companies who now provide engineering services, i.e., private sector consulting companies.

4. Additional TAs

In addition to the original 10 TAs identified in the Project Paper, two additional TAs (Food and Textiles) were added by the Steering Committee. Another, the Gas Analyzers, was also added. As a result of this evaluation study, it is recommended that two additional TAs be added as follows:

a. Energy substitution.
b. Low-cost No-cost Energy Conservation Opportunities (LNECOs).

The addition of the Gas Analyzers was a very wise move because they can result in enormous savings in both energy conservation and environmental degradation, which are far beyond those estimated by the ECEP. Furthermore, using the portable Gas Analyzers helps to get industry personnel into the frame of mind of wanting to conserve energy and use it more efficiently. It is recommended that several hundred more portable Gas Analyzers be purchased and distributed to industries in Egypt.

There is also a need to train many more technicians to operate and service these instruments properly.

The Energy Substitution TA will result in more efficient use of energy and much less pollution emitted into the atmosphere. Substituting natural gas for Mazout/solar is especially appropriate. Likewise, adding LNECOs as a TA can result in enormous energy conservation through a very large number of small steps. In fact, in other countries where industrial plants are operating inefficiently, these LNECOs have accounted for as much as 70% of the savings in energy consumption. Since they are low-cost or no-cost, the supplies and equipment needed are inexpensive and can be purchased locally; however, they were not included in the Project Paper. One exception to this is the purchase of portable combustion analyzers to determine the exhaust gases from combustors. Normally a full-scale and detailed energy audit must be made of each industry if full advantage is to be taken of LNECOs. Since it is essential eventually to include the entire spectrum of ECOs for both energy conservation and environmental benefits, the LNECO projects should be incorporated into the ECEP, together with training for conducting full-scale energy audits.

A number of energy audits have already been made in the country, 17 by the Office of Energy Planning (OEP). The local counterparts TIMS and DRTPC have received training in conducting audits. As part of screening and feasibility studies, TIMS and DRTPC often identify LNECOs. Data from the work done shows there are several measures that are non-industry specific and applicable throughout industry. For example, combustion efficiency improvement, energy metering, steam leaks, pipe insulation, the use of high efficiency lighting are measures that are found as LNECOs in most of the OEP audits.

5. Publications and Promotions

The entire publications program of ECEP has been very successful. Furthermore, many plans exist to continue and expand this activity. Without question the publications of the ECEP have played a major role in the excellent progress that has been made in identifying TAs and in getting the interest and cooperation of Egyptian industries.

It is also clear that the promotional effort by ECEP has been highly successful in increasing the awareness among energy managers of ECEP as a useful source of service. At the same time, however, it has the adverse effect of associating energy conservation with the idea that every service in this area should be free of charge. As observed in other countries, when this condition exists, the first reaction when an industry faces an energy problem is to look for the government or some institution to pay the cost. Since this is usually not feasible, the industry drops its energy problem and looks for another attractive project in an area more suitable to obtaining outside resources. This can be overcome in Egypt, at least in part, by the costsharing and other recommendations made in this report.

The training manuals developed by HBI, and edited and published by the ECEP agencies, are of high quality, but they are now all in English and may not be used as much as they would be if they were in Arabic. Much of the other literature being produced by the ECEP is in Arabic and is being used extensively. Furthermore, if these technical publications were in Arabic they could be used throughout the Arabic-speaking countries in other parts of the world.

6. Training Activities

The training activities for the ECEP have been highly successful, and the trainees have been enthusiastic about what they are learning. As shown in Chapter IV and Appendix I, these activities are on schedule or ahead of schedule. In summary, the Training Program of the ECEP is a real credit to those responsible for planning and producing it.

However, there is one problem which is confronting the Training Program which must be addressed. This is the problem of too many participants in a training course to permit an in-depth, hands-on experience. To address this issue two alternatives are proposed:

a. Limit the number of people by making them pay a fee.
b. Increase the number of courses and keep them free.

The second alternative would mean that attending the ECEP training sessions will become the first step to enter into ECEP and this step could be free. As long as USAID can finance this training it is the best option for the time being. But this subsidization should progressively end, as soon it is felt that the industries are ready to proceed on a payment basis. This could also be a part of an overall costsharing component of refocusing and redesigning the ECEP.

7. Impact on GOE Energy Policy

ECEP has undertaken several policy related studies and opened a dialogue with organizations such as the OEP and the Ministry of Electricity. Specifically the following studies have been completed:

a. Financial barriers to implementing cogeneration projects

b. No cost/low cost measures as an ECEP technology application

c. Conversion from mazout/solar to natural gas as an ECEP technology application

d. An assessment of the Energy Conservation and Pollution Control potential in the Helwan area

The above have not had any real impact on GOE policy but have focused on ECEP policy options. The major result of the M/TA effort has been to get the MOEE to formally restate the GOE policy on cogeneration. Other policy-related work done has basically been studies related to implementation of technology applications.

In order for the ECEP to have the maximum possible success, there is an urgent need for the GOE to: develop sound energy and environmental policies, increase energy prices to border levels, and move into a market economy with privatization as rapidly as possible. The Organization for Energy Planning (OEP) should become involved in ECEP activities. Developing sound energy and environmental policies, including the increase of energy prices, is essential to be realistic about the actual cost of energy so that the industry realizes significant savings from energy conservation and efficiency. In order for industry to feel the maximum pressure to introduce such steps, however, it is essential to have privatization and competition under a market economy. Otherwise, the industry will just raise prices of its products (to pay for excessive use of energy) and thereby simply pass the cost on to the customer. The ECEP should work more closely with the OEP and have greater dialogue and activity with respect to overall policy issues.

8. Evaluation of the Organizational Structure

The present system and organizational structure has turned out to be difficult to operate (see Chapter II and Appendix A). Initially, each of the agencies was very anxious to maintain its individual identity and the ECEP concept was considered only as a funding source. Gradually, with the continual pushing of the M/TA and USAID, these agencies began to identify more and more with ECEP. Today the concept of the ECEP is out front on all the literature, the organization of meetings and training programs, and the procurement of commodities. This has not been an easy process and has taken the full two years, as the Project Paper predicted from the outset. One difficulty today is that the three agencies are widely scattered geographically, which makes communication, coordination and working together very difficult.

It is very important to move the M/TA personnel out of the confining situation at Cairo University. At the same time, space should be made available for a common ECEP office (and a meeting room) which could be used not only to house the M/TA but also at least the common elements of the ECEP, such as management, data base, training, promotion and engineering activities. It is also essential to have space for consultants, both Egyptian and ex-pats. Coordination among the three agencies and the M/TA is presently very difficult because of telephone problems and the distance between their offices. This results in much less coordination than is necessary and desirable and tends to leave coordination to the monthly meetings which overloads the agenda for those meetings. One way to accomplish this would be to have more frequent meetings than the monthly meetings (e.g., weekly staff meetings), and another way would be to have a representative of each agency spend at least one day each week in the joint office area. Being in close proximity would not only make

for more frequent interaction and more rapid decision-making, but there would be a synergistic effect that would result in serendipity and much greater accomplishment.

Under the existing circumstances and arrangements, it is not likely that the ECEP concept will continue to exist once the ECEP funding is ended in 1996. Since there is no arrangement for continued funding of each of the agencies from other sources, there will be no incentive for each of the three agencies to do any more than revert back to doing only their original activities, for the following reasons:

a. Privatization was not built into the engineering aspects of the ECEP. Consequently, the only adequately-trained engineers that will be available to industry are the agency engineers (TIMS and DRTPC) who will no longer be paid by USAID and, being on the GOE payroll, will have little or no incentive to aggressively pursue and work with industry. Furthermore, since each of these engineers will have developed a special and unique capability, they will likely be highly attractive to a number of private sector organizations. As a consequence, they will be scattered so that the necessary team of engineers required for energy conservation and efficiency work will no longer exist.

b. Any industry that is interested in energy conservation and efficiency will be required to pay for engineering services, and for the necessary equipment. With the price of energy being artificially low (because it is being subsidized by the GOE), and because industry will be required to pay for both engineering services and the equipment, there will be little or no incentive for industry to install energy conservation and efficiency equipment and systems.

c. If the energy prices for each industry do increase to meet the world market prices, then many industries may explore ways to reduce their energy costs. However, without full privatization and a market economy to create competition, the industry can simply pass energy cost increases on to the consumer.

Therefore, it is the opinion of the evaluation team that there will be no teams of Egyptian engineers capable of providing the necessary services to these industries. Consequently, without the availability of private sector Egyptian engineering firms, it is quite likely that foreign engineering firms will move in to meet the limited demand and charge higher prices than Egyptian engineering firms would charge. There will also be a limited capability to repair the new equipment and to provide spare parts.

With any of the foregoing scenarios, the objective of creating examples of energy conservation and efficiency in a number of industries will have been achieved, but an on-going, replication system will not have been established, and there will not be a private sector engineering capability to service industry. Recommendations to help remedy this situation are presented later in this chapter.

9. Project Operational and Administrative Procedures

The organizational and administrative procedures built into the project are functioning, but with considerable difficulty for several aspects of the project. More specifically:

a. Communications among the agencies, the M/TA and USAID are difficult with the telephone and transportation problems which exist. Furthermore, there is a tendency to channel communications through the M/TA, which puts the M/TA in a line position instead of an advisory staff position. This strains the resources of the M/TA.

b. Some decisions from USAID are slow in coming, e.g., a decision on the large co-generation projects.

c. The distance between the offices of the agencies and the M/TA creates difficulties in communication.

Coordination among the Secretariats has been accomplished largely by the M/TA, and to some extent by USAID, in an informal manner. Since there is no organization or individual in ECEP who is responsible for coordination, it has been necessary for the M/TA to initiate action with each agency and to accomplish coordination informally as it is required primarily during the project monthly meetings and during training and publication projects and programs.

10. Speed of Project Achievements

The ECEP sub-project has been operating under difficult circumstances, including:

a. The Gulf War delayed arrival of personnel.

b. The time required to staff the Secretariats.

c. The time required to train the Secretariat personnel.

d. The time required to inform the industries.

e. The time required to work out arrangements with the industries.

f. The time required to do the studies for each industry.

g. The time required to write and approve the specifications.

h. The time required to select the M/TA.

i. The time required to staff the M/TA office.

j. The slowness of USAID response to needs.

k. The time required for many processes in the pipeline.

l. The time required to establish working procedures.

m. The time required to procure commodities from the U.S.

n. The loss of trained personnel (including management) from the secretariats who had to be replaced and retrained.

The Project Paper estimated that it would take two years as start-up time, which has proven to be quite accurate. On the basis of previous studies under the interim contract USAID personnel believed that 11 industries were essentially ready to go ahead with energy conservation and efficiency programs and systems at the beginning of the M/TA contract. In reality, however, there was much to be done in setting up the system and establishing the procedures (see the above items) which required the full two years before any real progress could be made with the 11 industries and the other industries that were found to be prospects.

In view of the foregoing circumstances, it is really remarkable that by early 1992 the stage is set at the mid-point of the project to achieve the target of approximately 60 technology applications with energy conservation and efficiency equipment and systems installed and operating -- provided funding adjustments are made as recommended in this report.

11. Major Problems

The ECEP has been experiencing a number of major problems, as follows:

a. Local purchase has been disallowed when it is approved by other USAID Missions in other countries. Local USAID personnel tried valiantly to get this approved for Egypt.

b. Technology applications are sometimes too complex by requiring extensive engineering/design.

c. Uncertainty over funding, primarily about making additional funds available to be able to proceed with the project when there were overruns on the current budget for reasons explained elsewhere in this report.

d. Lack of engineering capability in local counterpart agencies.

e. Lack of guidance from above: e.g., the Steering Committee as discussed elsewhere.

f. No impact on policy reform -- project follows behind policy.

g. No clear path to replication.

h. Grants for services not stimulating private sector consulting companies to provide energy conservation services.

i. Grants for equipment distorting market for local suppliers and manufacturers of energy efficient technology equipment.

j. Communication chains are lengthy.

k. Need to match project spending, particularly commodities, with USAID funding obligations.

12. Evaluation of USAID

Local USAID personnel have been constrained by the Project Paper and the many rules and regulations governing its operation. For this and other reasons, USAID has been a contributor to the slowness and the delays of the ECEP. In addition to the delays in approvals already explained, USAID has sometimes delayed responding to urgent inquiries, and caused uncertainty over funding.

Purchasing equipment in the local market should be permitted when the price is significantly lower than in the U.S., and if there will be a considerable saving of time. At least the ECEP should pay for all engineering services and then the industry pay for the equipment locally. When the Project Paper was written, there were fewer local suppliers but the team found that in some cases energy saving equipment was available in the local market at far less cost and much faster delivery than going through U.S. suppliers. Purchasing locally has several advantages. In addition to cost savings, there are also spare parts and service available. USAID should consider this in light of AID policy.

In the early stages of the ECEP, the M/TA perceived that the USAID was putting pressure on the ECEP personnel to spend more money, frequently at the expense of optimum long-range production within the project. More recently, however, this pressure has not been present, but the pattern had already been set early on that caused the M/TA, in the interest of saving time, to bypass the opportunity to train Egyptian engineers with hands-on experience in preparing designs and writing specifications. This is now leaving a vacuum of experienced Egyptian personnel.

A number of the USAID regulations and special requests have increased the expense of the project and have caused over-runs on budget, i.e., inability to purchase locally at much less expense and performing additional services by the M/TA which are not in the budget. Recently, there has been a slowdown on ECEP activities because of

budget overruns and indecision about additional funds to keep the M/TA operating without a slow down.

USAID needs to develop a coordination system with all of its energy-related projects in order to maximize the output and benefit from them. Although it may appear that these projects (e.g., the STD sub-projects, energy management development, and the power sector support program of $200M) have little or no relationship, because they are in different ministries or sectors, it is highly likely that much would be gained by closer coordination. Energy and environmental protection training and research, and the application of the information produced are all interrelated and should be coordinated.

USAID should encourage the GOE not to charge customs duties on commodities for the private sector industries for either energy saving equipment or for environmental protection equipment. The practice of requiring the private sector to pay customs duties on energy saving equipment, while the public sector does not, discriminates against private sector industries and tends to discourage the privatization program.

The current USAID staff are highly competent, they have been very pleasant to work with and they have usually been accessible when needed,despite their very busy schedules.

13. Evaluation of ECEP Secretariats

The personnel in the Egyptian agencies have had satisfactory basic training for accomplishing what is needed, but initially they were not acquainted with the specific application of these basics to the American system for analyzing industrial processes, making energy audits, analyzing energy consumption, designing conservation and efficiency measures and writing specifications (specs) for American equipment to be procured, shipped, received, installed and set into operation.

Consequently, the energy audits and analyses, followed by the specs, which were prepared initially by the Egyptian engineers of TIMS, DRTPC, a local engineering firm and the industries, were unsatisfactory for the American system and had to be redone and rewritten by the ex-pat engineers from the M/TA contractor. Furthermore, this procedure did not allow for the purchase of equipment that was available in the local market, such as power-factor equipment and lighting equipment. At the same time, the M/TA did not seem to have the ability to adapt its procedures quickly to the local conditions. To add to these difficulties, the USAID procurement regulations are very strict and have no flexibility. Consequently, it is not possible to adapt to local ways of making purchases.

As soon as it was clear that the local agencies (TIMS, DRTPC and the local consulting firms) were unable to prepare the necessary documents in a way that would satisfy American industrial requirements, the contractor should have sent a consultant for the project under development and initiated a crash training program

for the Egyptian personnel involved. Unfortunately, at this time pressure was being put on the M/TA to spend money more rapidly. This situation required that the M/TA not take the time for training local engineers in specification writing. Consequently, this has resulted in Bechtel writing all specifications with very little involvement of the local engineers.

14. Evaluation of the Steering Committee

Although the Steering Committee concept has merit as a means of obtaining guidance and getting public sector industries involved, it has never functioned as originally intended. This is largely due to the fact that it was designed to bring together high-level administrators who have never worked together in the past. Consequently, it has met only three times instead of the ten times which were called for by the Project Paper. Although the Steering Committee was intended to establish policy for the public sector aspects of the ECEP, there have been no serious policy decisions to be made. Policy matters have been settled, instead, by the informal initiative of the M/TA.

Meetings of the Steering Committee are called by the TIMS Secretariat. One reason that meetings have not been called recently may be a reluctance of TIMS personnel to call a meeting when to they do not have a decision regarding the request to USAID on the Talkha cogeneration project which was submitted nearly a year ago.

15. Evaluation of the M/TA

The M/TA office was originally established under an interim contract with Hagler Bailly in February 1989 which is a year after the Project Paper was signed. The M/TA contract with OBI was signed in February 1990. Then the OBI representative left the office after one year and had to be replaced. The present OBI representative came on board on March 1, 1991. The present Hagler Bailly representative came on the project on June 3, 1990. Consequently, the present representatives have been attached to the project for less than two years. In this short time span, an enormous amount has been accomplished and it is expected that much more will be accomplished by this team in the next four years. The accomplishments of the M/TA are documented elsewhere.

Although the M/TA has had a close connection with each of the local ECEP Agencies, the M/TA was not completely established during the first two years of the project. Furthermore, the M/TA was expected to serve only as an advisor on management and technical questions, and be responsible for U.S.based training and as a procurement agent for the commodities provided by USAID. Consequently, they were not in a position to insist that the agencies take action to initiate numerous dialogues with industry to get a large number of industries interested in utilizing the services of the Secretariats and the M/TA. As a result, the project moved very slowly until the agencies gradually became staffed and learned how to operate and the industries obtained the information about the program and then realized the excellent opportunity

that was available to them. Today many industries have become aware of the ECEP and the agencies have learned much better how to function within the project. Consequently, many more inquiries have been received than can be serviced with the available funds. However, it has taken several years to reach this point.

The M/TA staff has worked diligently and successfully in providing technical and management assistance to the agencies and to the individual industries. Much of this service has been from the M/TA staff members themselves but when necessary, specialists have been brought from their home offices to help on special needs and requirements. This has included help on technical engineering problems, advice on management questions, and lecturing in various kinds of training courses. The agencies' personnel have indicated that the M/TA performance has been satisfactory.

In sum, the Evaluation Team concludes that the M/TA is performing in a highly satisfactory manner and should be congratulated for their accomplishments.

16. Evaluation of ECEP-M/TA Accounting and Procurement

This sub-project is structured around three (3) separate agencies with a Management/Technical Assistance (M/TA) contractor functioning as the implementor of this activity. Overseas Bechtel, Inc., the M/TA contractor, does the procurement for the commodity component of the activity.

The three agencies together are forecasted to spend about $675,000 during FY 1992 for staff and office support costs. TIMS is to spend about $249,000, DRTPC about $276.000, and FEI about $150,000. All of these costs are incurred to pay staff and office support costs. These costs are vouchered and paid directly between the agencies and USAID. There have been no audits of the agency expenses since the current M/TA Chief of Party arrived. However, this project was being surveyed for audit by the AID Regional Inspector General for audit (RIG/A) at the time of this evaluation. We presume if an audit is deemed appropriate, it will be conducted.

The M/TA also vouchers expenses directly with USAID. These expenses include both commodity procurement and operating expenses. These expenses seem to be well documented and supported. This function was also included in the RIG/A survey.

17. Evaluation of Commodity Procurement

Commodity procurement, under this sub-project, is performed by Overseas Bechtel, Inc., through the Bechtel-San Francisco office. These commodities are, for the most part, the technological equipment necessary for installation in Egyptian enterprises to conserve energy. To this end, $12 million has been obligated and $4.7 expended as of the time of this evaluation.

The procurement process is supposed to work as follows: DRTPC and TIMS identify potential applications of technology with T/A from the contractor. Once agreement is

reached, DRTPC and TIMS are to write the specifications for the needed equipment with T/A from the contractor. The specifications are then reviewed by Bechtel-San Francisco; once the specifications are agreed to, Bechtel-San Francisco obtains competitive quotes and evaluates them. The recommended supplies must then be approved by the agencies and the USAID contracting office. Once approved the commodities are bought. This procedure certainly seems to assure that the right equipment is procured at a fair price.

The Evaluation Team studied representative examples of these procurement documents and found them to be in order.

18. Redesign of the ECEP

In retrospect, the Evaluation Team believes that a much more effective design would have been for USAID, in cooperation with the M/TA contractor, to select several Egyptian engineering firms who have staff with the technical background that is needed by the project, and have these firms provide the services for the diagnosis, the energy audit, the feasibility study, the installation of an energy management system, and writing of the specifications -- then later be responsible for helping with the installation and operation of the equipment after the M/TA contractor has purchased it.

During this process, the M/TA contractor would provide training and assistance as necessary for the engineers working on the project so that they would gradually develop the capability to carry out each step without outside help. With this type of training program it would have been possible to establish a "critical mass" of engineers and managers in the private Egyptian engineering firms who have the necessary skills to successfully apply their basic knowledge to the American system.

In this way, the private sector of engineering design firms could be greatly strengthened and they would have been trained to continue working with both private and public industries on into the future. These engineers would also have established close ties with American industry, and they would depend heavily on American industry for the supply of commodities and spare parts in the future. At the same time, the ECEP would be strengthening the private sector of engineering firms, instead of by-passing them and having the engineering aspects of the project carried out by engineers in the public sector.

If the ECEP is to have a continuing effect on energy conservation and efficiency after the USAID funding is ended, there must also be the necessary human resources to carry out these activities. Therefore, the ECEP should be refocused to put heavy emphasis on privatization by:

a. Establishing a series of on-the-job training programs and a support system for private engineering companies so that they can provide the required engineering services to Egyptian industries,

b. Establish linkages and a series of on-the-job training programs and a support system for technicians in service companies for servicing equipment and systems, and

c. Establish linkages and a series of training programs for spare-parts and equipment suppliers, to develop close and effective connections with U.S. industry.

The foregoing recommended steps will create a reservoir of talent in Egypt (in the ECEP agencies and among the private entrepreneurs) which will be able to continue the activities set in motion by the ECEP. The agencies, the Tabbin Institute for Metallurgical Studies (TIMS), The Development Research and Technological Planning Center (DRTPC), and The Federation of Egyptian Industries (FEI), who have been helping this process can continue to be facilitators. The demonstration projects, which will have been put in place by the ECEP, will be excellent reference points for this reservoir of talent to do numerous replications throughout Egypt. They will also be available to service the equipment and provide spare parts to keep these projects (both the demonstration projects and the new projects) operating effectively and efficiently. By the end of the project in 1996, it is expected that privatization and a market economy, together with energy prices at border levels, will create a demand for conservation technology that can be carried on through the private sector.

The foregoing recommendations add greatly to the responsibilities of the Management/Technical assistance (M/TA) contractor. Therefore, the contract between USAID and M/TA should be revised to take into consideration the foregoing recommendations and the role that the M/TA must play to accomplish them. At the same time, the budget would have to be increased in order to provide the financial support that is necessary to accomplish the additional responsibilities. Since the present M/TA team has demonstrated the necessary skills to carry out these types of activities, it is the logical organization to perform these new responsibilities.

The M/TA offices should be moved to a more convenient location where the space is more adequate. The present offices of the M/TA are located on the campus of Cairo University adjacent to the DRTPC. This location severely limits the access of the M/TA to its offices because the campus is closed after 5 pm and on Fridays. Furthermore, the space is extremely inadequate and inconvenient. Heavy campus security also makes it very difficult for the business community to access the offices. In addition to relocating the M/TA, space should be made available for a common ECEP office and a meeting room which could be used for the common elements of the ECEP, such as management, data base, training, promotion and engineering activities. It is also essential to have proper and adequate space for consultants, both Egyptian and Ex-pats.

In summary, the Evaluation Team believes that Purpose No. 1 has been and is being satisfactorily achieved, but that, for Purpose No. 2, a golden opportunity has been missed to help create an extremely important resource in the private sector i.e., a group of Egyptian engineering consulting firms which have the capability to work directly with industry on solving problems of energy conservation and efficiency, with the potential of also helping industry in solving their environmental problems.

19. Cost-sharing

At the present time, all costs for technical services, training and commodities are being paid by the ECEP, which creates an artificial situation that cannot be expected to continue on into the future. By charging the industries on a cost-sharing basis, industry will adjust to paying a share of the costs before they must pay all of the costs after 1996. This will also provide time for the ECEP to make adjustments to best help this process. Cost-sharing puts value on what is received and helps to be more selective. A loan program was initially included in the Project Paper, in part for cost-sharing, but was later dropped because of complications.

Therefore, during the remainder of the ECEP, industries should be asked to do cost-sharing for the services, training and commodities they receive so that they will be prepared to bear the total cost when the ECEP is completed in 1996. This may require a modification to the Project Paper.

20. Reinstating the Loan Program

The evaluation team believes that the loan component in the original design of the ECEP was a good idea, and that it is unfortunate it had to be eliminated. Therefore, we recommend that special consideration be given to reinstating the loan component, at least in some form. This would help greatly to ease the ECEP into continuation after 1996 when the industries will have to pay the full amount for energy conservation and efficiency equipment and systems.

A loan program could be especially useful if the GOE were to set up a Super Fund to initiate expensive environmental clean-up projects on a matching fund basis.

VI. CONCLUSIONS

These conclusions are formulated to address the questions which were stated in the Scope of Work for this Evaluation (see Appendix B). Each conclusion is a brief statement that is explained and documented in Chapter V and elsewhere in the report.

6.1. ECEP Sub-project Process

6.1.1 Now that the personnel of the agencies are in place and trained, the sub-project processes have been accelerated considerably. Reasons for the slow beginning are explained in the report.

6.1.2 The personnel in the local agencies have been trained to do much of the simpler aspects of engineering, energy audits, cost estimating and procurement. However, they are not trained to do engineering designs, and complete and final specification writing.

6.1.3 There is such a great demand for the local 2-day training programs that ECEP is having difficulty holding down the number of participants in each course to a reasonable figure. A small fee should be charged for these courses and additional training programs should be created to meet the demand.

6.1.4 An opportunity was missed to train Egyptian engineering firms to service the industries for the ECEP so that they would be prepared to continue this activity after USAID funding has ended.

6.1.5a One option for undertaking the detailed engineering required for each industry project is to continue to depend upon the agency personnel for the simpler aspects and to depend on ex-pats for the more complex engineering.

6.1.5b A second option for the engineering work is to launch a training program for private engineering firms so that by the end of the USAID funding in 1996 they will be prepared to continue this service to Egyptian industries. It would be good to include environmental training at the same time.

6.1.6 The second of these two is by far the best option, especially since there is still time and money to do the training of the engineering firms, which is a program that Richard Smith conducted for Pakistan engineering firms.

6.1.7 All of the detailed engineering work should be done by private engineering firms under a sub-contract with the M/TA and with the help of U.S. consultants.

6.1.8 Ultimately, the engineering work must be paid for by the industry receiving the services. However, the industries will generally not be willing to pay for this until economic pressure is put on them:

- by energy prices being increased to world levels; and
- by competition (coming out of privatization and a market economy) forcing them to produce their products with the lowest possible cost.

Since the GOE is planning to increase their energy prices to world levels by 1995 and the GOE states they are going to a market economy, it may be that both of these economic pressures will be in place (or well on their way) by the end of USAID funding in 1996.

6.1.9 The participating companies have demonstrated a remarkable understanding of their responsibilities and the implications of these responsibilities -- especially those industries in the private sector. These industries are either qualified, or are becoming qualified, through the training programs that ECEP has been conducting to carry out their responsibilities. These training programs should be continued and expanded, and a fee should be charged for them.

6.1.10 The procurement process is moving as rapidly as can be expected given the pipeline explained in this report.

6.1.11 There is an appropriate mix in the first 10 technologies, given the constraints set out in the Project Paper. The Steering Committee added food and textiles as TAs and the ECEP added the Gas Analyzers. The ECEP should now add other TAs, as follows: LNECOs, complete energy conservation and environmental protection audits, and fuel substitution.

6.1.12 Under the present arrangements, the ECEP has had and will continue to have very little impact on GOE energy policy. To have an impact, the overall agency must become involved, which should include the OEP (Office for Energy Planning in the Ministry of Petroleum and Mineral Wealth).

6.1.13 The organizational structure is awkward and time-consuming. A more effective and efficient structure is needed to carry out existing and new responsibilities recommended in the report.

6.1.14 The criteria for selecting industries is appropriate for the stated objectives of the ECEP. If the objectives and criteria were broadened, it would be possible to cast a wider net and have a much greater impact.

6.1.15 ECEP should encourage and help larger projects in the $5-$15M range, but it is not possible with the present budget to provide the commodities for these and at the same time to complete 60 TAs as specified in the Project Paper.

6.2. USAID

6.2.1 USAID is fulfilling its ECEP monitoring and accountability responsibilities largely through the monthly meetings with M/TA and the agencies and through informal contacts between meetings.

6.2.2 The requirements of USAID have been communicated to TIMS, DRTPC and FEI through the M/TA, through the monthly meetings and through direct contacts.

6.2.3 USAID should change the objectives of the ECEP to include an environmental program, which would require a sizeable increase in the funding commitment.

6.2.4 USAID should increase the current authorized level of $36M to meet the requirements of the revised ECEP/Environmental Program, as recommended in this report. The obligated amount of $21M should be increased immediately and then redistributed between commodities and support services. Progress on putting more TAs into the pipeline has been slowed because of the lack of funds. The immediate increase should be $4M.

6.2.5 There is no coordination between ECEP and USAID's other energy activities. The reason given is that one is "demand-driven" and the other is "supply-driven," and never the twain shall meet. However, a major effort should be made to hold regular coordination meetings to be able to join forces in accomplishing the overall goal of the Mission.

6.3. ECEP Agencies (Secretariats)

6.3.1 Although the organizational structure for ECEP is cumbersome, the administrative and coordination procedures, including the monthly meetings of the Coordinating Committee, are working effectively, but not efficiently. The M/TA needs to be moved to larger, more accessable quarters and there need to be more frequent meetings of ECEP personnel, as explained in the report.

6.3.2 The financial control systems for the ECEP are adequate to meet GOE and USAID monitoring requirements.

6.3.3 The agencies are satisfactorily meeting the sub-project processes now that they have been trained and have had experience. Initially, there was much hesitating and faltering because of inexperience and uncertainty. They do,

however, need additional training, which is planned in the future Training Program.

6.3.4 Coordination among the three agencies is effective (due to the monthly meetings and working together on training programs) but it is not very efficient. Both the efficiency and effectiveness would be greatly increased by bringing all together under one roof.

6.3.5 The agencies are adequately housed, equipped, funded, and staffed to achieve their objectives, but this has become true only recently. The M/TA, however, is very badly housed because of inadequate space and because they do not have access to their offices after 5 PM and before 8 AM and on Fridays. This means they must operate out of their homes much of the time which is highly inefficient.

6.3.6 The agencies have developed effective linkages with public and private industries. They have also developed some linkages with Egyptian suppliers and Egyptian consulting engineers, but not to the extent that is desirable. All these linkages could be significantly expanded with more adequate funding.

6.3.7 The Steering Committee has not been providing guidance to the ECEP because it has met only three times during the life of the project. Special efforts should be made to activate the Steering Committee.

6.3.8 The OBI and HBI contracts have contributed effective technical assistance, management and training advice. In fact, without their help the project would have achieved little or nothing.

6.3.9 The existing project organizational and administrative procedures have been established and routinized largely by the M/TA and are adequately facilitating the achievement of the ECEP objectives. These would be greatly enhanced if the M/TA offices were moved to more efficient quarters.

6.3.10 The overall functioning of the agencies is satisfactory, given the fact that most of the personnel are there temporarily and are already making plans for what they will do when they go back to their regular positions after the USAID funding has ended. This, of course, means the team talent that the ECEP has worked so hard to create will be scattered.

6.4. M/TA

6.4.1 The strong points of Bechtel are the very strong backup from the home office, the high caliber consultants they have sent to Egypt, and the experienced and very dedicated representative (who speaks Arabic) that they have stationed in Cairo. The strong points for HBI are the extremely well qualified home

office and its support together with the highly experienced and effective representative in the Cairo office.

6.4.2 The weak point for Bechtel is the lack of experience their experts have in working with and training local engineers in a Third World country. The extensive experience of Bechtel in Third World countries has been large-scale turn-key projects where all aspects of a project are done by Bechtel personnel.

6.4.3 OBI is effectively procuring ECEP's commodities. This cannot be done efficiently, however, because of the reasons listed. The training is being done efficiently as well as effectively.

6.4.4 The OBI contract is adequately focused on ECEP's objectives and goals as stated in the present Project Paper. This PP should be modified, however, to incorporate additional training of Egyptian engineers, technicians and suppliers, together with environmental components for the future. The contract, including the budget, should be changed accordingly.

6.4.5 The relationship and communications between OBI in Cairo and the home office in San Francisco are satisfactory.

6.4.6 The relationship and communications between HBI in Cairo and the home office in Washington, D.C., are satisfactory.

6.4.7 Because of unanticipated expenses in providing consultants to the ECEP, there has been a serious shortage of funds to support the M/TA activities. This shortage has been largely corrected but some funding problems still exist.

6.4.8 The role of the M/TA is clearly understood by both the agencies and USAID. However, they both expect the M/TA to assume much more line responsibility and authority than is spelled out in the Bechtel contract. This is a good arrangement as long as all parties are satisfied.

6.4.9 The M/TA is providing technical assistance to the ECEP agencies in accordance with the contract guidelines and the way in which USAID is interpreting these guidelines.

6.4.10 The interpretation of the PP and the contract could be in a broader scope of activities which would result in a much greater impact on energy conservation and efficiency and on environmental programs in Egypt.

6.5. Overall

6.5.1 The ECEP is on a track which will lead to achievement of most of its goal and purposes. However, changes are needed to achieve the maximum impact. More specifically, the ECEP needs to be refocused to provide training for private engineering firms and to incorporate an environmental program. These same changes are needed to enhance replication and sustainability.

6.5.2 The GOE and USAID should enter into a major agreement for a highly sustainable environmental program which would include energy, air, water, and renewable resources in a package where privatization and a market economy would be the driving forces. This would require the establishment of an organization within the GOE in charge of natural and renewable resources and environmental protection which would have the power to set policy and enforce it, while working within the motivational framework of privatization and a market economy.

6.5.3 The ECEP should not undertake a large $10-$12M cogeneration project unless the funding for commodities and support staff is significantly increased. A budget increase of about $20M needs to be made available so that two cogeneration projects could be funded as TAs by the ECEP.

6.5.4 The ECEP has an enormous potential impact on Egyptian natural resources and the environment as already explained.

6.6 Long-range Activities

For environmental reasons, the entire world will be forced ultimately to leave the petroleum energy economy based on petroleum, and go to an energy economy based on renewable energy. This will probably be done as a series of steps with the first one being a shift to natural gas and solar-thermal. Ultimately, it will probably be necessary to go to a hydrogen energy economy. The ECEP should help start this transition in Egypt by moving first to natural gas and solar thermal for heavy industries and for electricity production.

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APPENDICES

APPENDIX A:	Project Paper
APPENDIX B:	Scope Of Work For Evaluation
APPENDIX C:	Subgrant Agreement Between Egypt and USA On ECEP
APPENDIX D:	M/TA Contract Scope Of Word And Tasks
APPENDIX E:	People Interviewed
APPENDIX F:	Field Trips To Industries
APPENDIX G:	List Of Documents Reviewed
APPENDIX H:	Comments on Manuals Produced
APPENDIX I :	Training/Promotion Activities
APPENDIX J	Comments on ECEP Technical Procedures
APPENDIX K:	List of Technical Applications (TAS)
APPENDIX L:	Reports on Industries Visited
APPENDIX M:	ECEP Future Options by M/TA
APPENDIX N:	Institutionalizing Energy Efficiency in the Private Sector by M/TA
APPENDIX O:	A GOE Agency In Charge Of Energy

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APPENDIX A

PROJECT PAPER

I. PROJECT RECOMMENDATIONS AND SUMMARY

A. Recommendations:

The Project Committee recommends that an Economic Support Fund (ESF) grant of $49.5 million be authorized for the Energy Conservation and Efficiency component (The Project) of the Science and Technology for Development Project (263-0140). This eight year project should be incrementally funded as follows:

FY 88: $15.0 million
FY 90: $11.1 million
FY 92: $23.4 million

B. Host Country Contributions*:

The Government of Egypt (GOE) contributions, in-kind and cash are L.E 25.2 million ($11.45 million) and L.E. 12.5 million ($5.68 million) respectively totalling L.E. 37.7 million ($17.3 million). The private sector contributions will also be in-kind and cash and are estimated at L.E. 16.6 million ($7.54 million) and L.E. 16.2 million ($7.36 million) respectively totalling L.E. 32.8 million ($14.7 million). The total host country contribution (GOE and private sector) is estimated at L.E. 70.5 million ($32.03 million). Details are provided in Table I-1.

C. Summary Project Description:

1. Project Rationale:

Egypt faces a number of serious energy problems that are placing severe strains on the economy and are likely to constrain future economic development. Among these is an extremely inefficient use of energy in industry. A project to promote energy conservation and efficiency will help rectify this problem. In addition, by decreasing the energy content of goods and services, the Project will ease the transition to higher energy prices required under the IMF structural adjustment program. Finally, the Project directly supports the GOE's industrial development plan and supports USAID's long-term development strategy and goals.

2. Project Goal and Purpose:

The goal of this Project is to improve the productivity and competitiveness of the Egyptian economy by improving the energy efficiency of its industrial and commercial processes and practices.

* The Conversion rate of US dollars at $1=LE2.2 rate is only made for presentation purposes and does not imply "maintenance of value" if the exchange rate changes during the life of the project.

The Project's purposes are to promote and accelerate the adoption of improved commercial technologies, processes, and practices in order to save energy and increase energy efficiency, and improve Egyptian institutional capabilities, particularly in the private sector, at promoting and implementing energy-saving and productivity-enhancing investments.

3. Project Outputs:

The following major outputs are expected over the life of the Project:

- Approximately 60 applications of energy-efficient technologies and practices in both the private and public sectors, saving an estimated 200,000 tons of oil equivalent per year by 1995 or $25 million per year at 1987 international oil prices.

- Improved capabilities in at least three Egyptian organizations to promote, identify, engineer, install, operate and maintain such technologies. These capabilities will be developed in organizations such as the Development Research and Technological Planning Center, the Tabbin Institute for Metallurgical Studies, and the Federation of Egyptian industries. In addition, training will be provided (in Egypt and the U.S.) to approximately 1250 plant and other personnel, of which 300 will receive training directly related to technology applications. Finally, the capabilities of at least two Egyptian organizations will be upgraded to train personnel beyond the Project's life.

4. Project Organization and Management:

The Project is divided into two components: one private sector and one public sector, with management, technical assistance, project promotion and information dissemination support provided to both.

- The private sector component (which includes Law 43 companies) will be managed and implemented by Cairo University's Development Research and Technological Planning Center (DRTPC). The firms will be reponsible for monitoring the performance of the technology applications.

- The public sector component will be implemented through the Ministry of Industry. A Steering Committee will provide overall policy guidance and approve technology applications. A Project Secretariat, comprised of the Tabbin Institute for Metallurgical Studies (TIMS), will be responsible for project management and implementation.

- Management and technical assistance will be provided to DRTPC, TIMS, the Federation of Egyptian Industries (responsible for project

41

promotion and information dissemination), and participating companies by a contractor, competitively selected by USAID.

5. Project Funding:

USAID will provide $49.5 million from a grant, of which approximately $37 million will be for purchasing and installing energy conserving and productivity-enhancing technologies. A combination of loans and grants will be provided to public and private companies to finance the foreign currency cost of the technologies. The balance of the USAID grant will be used to pay for technical assistance, investment promotion activities and project evaluation. Table I-1 summarizes project costs by activities and funding source.

The project will be incrementally funded in three obligations. Before the second and third obligations are made, USAID will review the performance and demands of the private and public sector components to determine the amount of obligation and the funding share between the two sectors.

6. Analyses: Summary Findings:

The design team conducted more than 150 interviews with Egyptian private and public organizations and international donor agencies. The team used the results of these interviews to evaluate the ability of Egyptian organizations in: implementing an effective energy conservation program; determining technical assistance and training needs; identifying specific organizations to participate in the Project, and designing the most efficient and effective organization and management framework.

These interviews revealed that the private sector's willingness to participate in the Project depended, to a large extent, on keeping the public sector out of the organization and management structure and decision-making process for private sector projects and on ensuring that the entire energy conservation investment process be as simple as possible. On the other hand, the production and investment activities of public industrial enterprises are planned and managed by various ministries and public sector authorities.

The Project Committee has reviewed and discussed the Energy Conservation and Efficiency Project in detail. The Project is considered economically, administratively, and technically feasible, socially sound and without negative environmental effect. The net present value of the Project, excluding replications, is estimated conservatively at $120 million (using a 10 percent discount rate). The cost estimates are reasonable and the Project meets all applicable statutory criteria.

42

III. PROJECT DESCRIPTION

A. Goal and Purpose:

The goal of this Project is to improve the productivity and competitiveness of the Egyptian economy by improving the energy efficiency of its industrial processes and practices.

The Project's purposes are promoting and accelerating the adoption of improved commercial technologies, processes, and practices in order to save energy and increase energy efficiency; and improving Egyptian institutional capabilities at promoting and implementing energy-saving and productivity-enhancing investments.

B. Project Strategy:

This Project is the outcome of extensive preparation and analysis. A design team conducted over 150 interviews with more than 85 Egyptian private and public organizations and international donor agencies, public and private industrial enterprises (including 44 plant visits), energy equipment and services suppliers, banks, trade associations, government institutions, research institutes and universities, USAID personnel, the United Nations Development Program, and the World Bank. In addition, many studies, reports, and articles were reviewed and consulted.

Seven important strategic considerations guided the Project's design:

- Focusing on areas which have potential for large energy savings and efficiency improvement. Since the Project's major objective is improving productivity by increasing energy efficiency, the technologies selected should result in large energy savings. This refers both to the relative energy savings in a specific plant for a particular operation as well as the overall effect on the country. Therefore, the Project's initial targets are the cement, chemicals and metallurgical sectors, which together account for 53 percent of industrial energy consumption and the private commercial sector.

- Considering only applications and companies which are economically viable. To foster economic efficiency the Project concentrates on technologies which have a positive economic value to the country, i.e. those with an economic return of at least 15 percent. In addition, public companies that are not economically viable, such as Nag Hammady, will not be eligible to participate in the Project.

- Focusing on technologies that can be widely replicated. The Project is a technology demonstration and investment promotion effort. Therefore, one of the criteria for selecting target technologies and sectors is the extent to which these applications can be replicated in Egypt. The Project will consider only those applications that can be replicated in private and public sector facilities.

- Promoting only proven technologies. To maximize near-term energy savings, the Project concentrates on technologies that have been proven in other countries, particularly the United States, but have not yet been used widely in Egypt.

- Recognizing the differences between the private and public sectors. The Project's implementation strategy must recognize the divergent structures, decision-making processes, and concerns of the private and public sectors. To this end, the Project has been divided into two separate components: one for the private sector and one for the public sector.

- Maximizing incentives for private sector participation. The Project has been designed to be attractive to the private sector. First, because energy prices paid by private companies have been increasing, they have a strong incentive to reduce energy costs. Second, to maximize private sector participation, the Project will be open to all industrial and commercial enterprises in the private sector. Third, the private sector technology application process has been streamlined to eliminate any delays and ensure rapid implementation. No government entities will be involved in the managing and implementing of the private sector component. Fourth, grants will be provided to help finance part of the foreign exchange portion of technology applications and any foreign exchange loans will be repaid in pounds at a fixed exchange rate. Fifth, technical assistance and training will be provided to further increase the energy efficiency, and hence the productivity and competitiveness, of private companies.

- Focusing on firms whose total use of energy could be reduced while sustaining, or even increasing production, and/or on firms whose use of energy could remain constant while their production expanded. Firms using a technology which increases both in output and energy use cannot be considered.

C. <u>End of Project Status</u>:

The Project Assistance Completion Date (PACD) is September 30, 1996, assuming a start-up date of May 1, 1988. At the end of the Project, its outputs will include both technology applications and improved institutional capacity to deliver these technologies to other Egyptian energy users.

- Approximately 60 demonstration applications of energy conserving technologies and practices in private and public industrial and commercial facilities.

- Awareness of the technical and cost performance of these applications to promote their replicability in other facilities.

- Improved capacity in at least 3 Egyptian organizations and local architecture/engineering firms to promote, identify, engineer, install, operate, and maintain energy conserving technologies. The Development Research and Technological Planning Center (DRTPC) and the Tabbin Institute for Metallurgical Studies (TIMS) will have an improved capability to train personnel in the technical and managerial skills needed to identify and implement these technologies and practices. In addition, the Federation of Egyptian Industries' (FEI) ability to disseminate energy conservation information to its members and to make recommendations to the GOE for policy reforms to improve industrial productivity will be improved. At least 1250 personnel will receive energy conservation training, of which 300 will be trained in all aspects of energy technology applications including project identification and evaluation, design, procurement, installation, operation and monitoring.

D. Project Activities:

The Project will carry out two types of activities: (1) energy technology applications, and (2) promoting investments in these technologies.

1. Energy Technology Applications:

These efforts will be directed at selecting, designing, installing, operating, and monitoring energy efficient technologies that are economically, financially and technically viable, and replicable in other facilities. This involves the following three major subactivities:

a. Identifying Technologies and Sites: An important activity will be identifying and selecting those technologies and practices that will result in significant benefits to Egypt, and will have the highest pay-off for the resources spent. Ten technologies emerged as targets for the initial phase of the Project (see Annex D for details on these technologies and the rationale for their selection). They include:

- Micro-computer and micro-processor based process controls
- Electronic energy management systems
- Automatic combustion controls
- Waste heat recovery systems
- Cogeneration systems (topping and bottoming, including organic Rankine cycles)
- Advanced insulation materials for large-scale applications
- High efficiency electric motors
- Solid fuel-fired combustors (such as fluidized bed boilers)
- Power factor improvement systems (including automatic power factor correction systems and large synchronous motors), and
- High efficiency lighting systems for large-scale industrial applications.

Additional technologies may be added during the Project if they meet the crtieria of economic, financial, and technical viability and replicability. Additional technologies will be recommended by the management and technical assistance (M/TA) contractor and approved by USAID.

To ensure that activity sites have the greatest potential for serving project purposes, they should have the following characteristics:

- The owner/operators are willing to allow others to visit the site and to share information on actual costs and performance
- The owner/operators are committed to ensuring the technologies work properly
- The site is similar to others that may use this technology in important characteristics such as type of process equipment (i.e., replications can occur), and
- The site is convenient to visit

During the early Project years, technical assistance will have to be provided to the firms (at no cost to them) to identify and evaluate opportunities for technology applications. This assistance will be provided by DRTPC (private firms) and TIMS (public firms), with support from a long-term management and technical assistance contractor (M/TA).

b. Applying Technologies: Most of the Project activities (and thus expenditures) will be associated with technology application. These activities include evaluating (including energy auditing), designing, adapting, financing, installing, operating, and maintaining a specific application at a given site. Technical assistance will be provided by the Project throughout this process (see Project Elements: Inputs for funding sources). The technology application process for both the private and public sectors is summarized below. Four institutions play key roles in this process: the Development Research and Technological Planning Center (DRTPC) in the private sector, the Tabbin Institute for Metallurgical Studies (TIMS) in the public sector, and [illegible]deration of Egyptian Industries (FEI) and commercial banks in b[illegible] sectors.

Technology Application Process - Private Sector Component: As the result of a promotional campaign conducted by DRTPC and FEI, a private sector firm submits a technology application request to a participating private commercial bank. The bank forwards the request to DRTPC. DRTPC, with M/TA contractor assistance as needed, reviews the request and assists the firm in preparing a detailed proposal. This proposal includes a description of the technology application, preliminary cost estimates, expected savings, and general business information on the company. DRTPC, again with M/TA contractor assistance as needed, evaluates the technical and economic feasibility

of the proposal, determines its replicability potential, ensures that the proposal is not repetitive of other applications that have already been implemented, and determines the size of the grant portion that will be offered to the company in accordance with guidelines established by USAID (see Section VI, Implementation Plan). Depending on the size of the investment and the complexity of the technology, DRTPC might ask the company to prepare a more detailed feasibility analysis.

For technology applications of more than $1 million, or where the recommended grant is more than 40 percent of the total funds to be provided by USAID, DRTPC must receive USAID approval of the technology application. If the proposal is approved by DRTPC (and USAID when required), it is returned to the bank, along with instructions for the technology application's grant element. The bank evaluates the financial viability of the proposed technology application and conducts any other necessary analyses of the company. If the proposal is financially acceptable to the bank, it prepares a financing package which includes loan agreements (grant and loan shares of foreign currency component, equity and debt shares of local currency component), collateral, and other documentary requirements. The bank finances the local currency component of the loan through its existing sources if the company does not have sufficient equity.

After financing has been arranged, the bank opens an L/C (or several L/Cs if more than one U.S. supplier is involved) for the commodities and equipment with its corresponding bank in the United States. The bank acts as guarantor on the foreign exchange loans and is responsible for administering the loan to ensure compliance with the loan agreement.

The company executes contracts with all suppliers on the basis of good commercial procurement practices. Equipment and commodities arrive and are installed by the company, with technical assistance and training from DRTPC and the M/TA contractor if necessary. The technology application begins.

Technology Application Process - Public Sector Component: As the result of a promotional campaign conducted by FEI, a public industrial enterprise, either alone or with assistance from TIMS, identifies a potential technology application and prepares a detailed proposal. TIMS evaluates the technical and economic feasibility of the proposal, determines its replicability potential, and ensures that it is not repetitive of other applications that have already been implemented. All of TIMS' tasks are carried out with assistance from the M/TA contractor. Depending on the size of the investment and the complexity of the technology, TIMS might ask the company to prepare a more detailed feasbility analysis. If TIMS and the M/TA contractor accept the proposal, it is submitted to the the public sector component's Steering Committee for approval, along with a recommended

grant element determined in accordance with guidelines establisehd by USAID. For technology applications of more than $1 million or where the recommended grant is more than 40 percent of the total funds to be provided by USAID for the technology application, the Steering Committee must receive final approval from USAID.

If the proposal is approved by the Steering Committee (and USAID when required), the proposal is submitted to a public bank (National Investment Bank or another public bank). The bank evaluates the financial viability of the proposed technology application and conducts any other necessary analyses of the company. If the proposal is financially acceptable to the bank, its prepares the financing package. Local currency is provided from the company's own budget or is arranged by the bank. After financing has been arranged, the bank opens the L/C(s) with its corresponding bank in the United States. The bank is also responsible for guaranteeing and administering the loan.

The company executes contracts with all suppliers on the basis of procurement practices agreed upon by USAID and the GOE. Equipment and commodities arrive and are adapted and installed by the company, with technical assistance and training from TIMS and the M/TA contractor if necessary. The technology application begins.

c. Monitoring Technology Performance: An important tool in technology promotion is reliable information on each technology application. To this end, the firms participating in the program will monitor (with DRTPC, TIMS, and M/TA contractor assistance) the technical and economic performance of each application. This information will be used by DRTPC and TIMS to prepare detailed case studies of each application which will then be disseminated widely by FEI. Additional costs to the firm (such as instrumentation costs) will be covered by the grant.

2. Technology Investment Promotion:

The balance of the Project's efforts will be aimed at promoting investments (i.e., replication) by other enterprises in the technologies that have been successfully applied. This includes the following subactivities:

a. Developing Institutional Capabilities: A key Project purpose is developing capabilities in Egyptian institutions to identify, evaluate, finance, procure, install, operate, monitor, and maintain advanced energy conservation technologies so that energy conservation activities will continue after the Project ends. To achieve this, the implementing agencies (DRTPC, TIMS and FEI) will receive training in these areas, as needed. The same training will be provided to others participating in the project, for example private and public companies and commercial banks (see Section VI and Annex I). Particular emphasis will be placed on helping DRTPC and TIMS to become the

initial energy conservation and technical services organizations for the private and public sectors, respectively. In addition, to assist in identifying potential energy conservation opportunities, a comprehensive data base of industrial plant characteristics such as products, processes, size, and energy use will be developed by DRTPC.

b. Increasing Awareness of Energy Efficient Technologies: FEI, DRTPC, and TIMS (with assistance from the M/TA contractor) will increase technology awareness by disseminating reliable cost and energy saving information through workshops, seminars and trade meetings, publications in professional and trade journals, and special studies. In addition, visits will be sponsored to plants using technologies of interest to the Project. These efforts will be targeted to potential users, engineering firms, equipment vendors, and policy makers.

c. Reducing Policy and Regulatory Barriers to Investment: As part of their assessments of individual technology applications, DRTPC, TIMS, and the M/TA contractor will analyze specific GOE policies and regulations, such as energy pricing, import duties or taxes, that affect project implementation and technology adoption. Where these constrain introducing cost-effective technologies, they will suggest modifications to address these barriers.

E. Project Elements:

1. Inputs:

USAID, the GOE, and the Egyptian private sector will provide both funds and in-kind support to undertake these activities (see Annex K for details).

a. USAID: USAID support will consist of a grant of $49.5 million to the GOE which will be used to provide the following inputs:

- Energy conservation and productivity-enhancing equipment and monitoring instrumentation for a total of $37 million.

- Management and Technical support services for a total of $7.09 million. Specialized expertise will be provided by the Project in the areas of engineering, finance, economic analysis, and policy analysis. Assistance will be provided by US and Egyptian experts hired directly by the Project.

- Training for a total of $1.91 million. This includes both in-country and US based training of approximately 1250 participants.

- Management support services provided by the Project Secretariat, the University of Cairo, and the Federation of Egyptian Industries for $2.6 million during the first five years of project implementation.

- Project evaluation and audit estimated at $0.90 million.

b. Host Country: Host country contributions to the Project will come from the GOE and the private sector.

- The GOE contribution will be cash and in-kind and is estimated at L.E. 12.5 million ($5.68 million) and L.E. 25.2 million ($11.45 million), respectively. The GOE contribution will cover the following:

  - Local currency loans to participating public sector companies for equipment and related services. Public sector companies will provide demonstration sites.
  - Steering Committee and Project Secretariat operations, and information dissemination activities of FEI for the last three years of project implementation.
  - Salaries of participants in training programs, seminars, and workshops.

- Private Sector: The Egyptian private sector will contribute sites where energy conserving technologies can be installed and monitored. These sites will be open to visits for other firms interested in the technology. In addition, the private sector will make major contributions, both cash and in-kind, to the Project. These contributions are estimated at L.E. 16.2 million ($7.36 million) and L.E. 16.6 million ($7.54 million), and cover the following:

  - Installing equipment and related services for the technology demonstrations.
  - Salaries of participants in information dissemination and other promotion activities in training programs, and in seminars and workshops.

2. Project Organization:

The Project is divided into two components, one for the private sector and one for the public sector, with management and technical assistance (M/TA contractor) and information dissemination services (Federation of Egyptian Industries) provided to both.

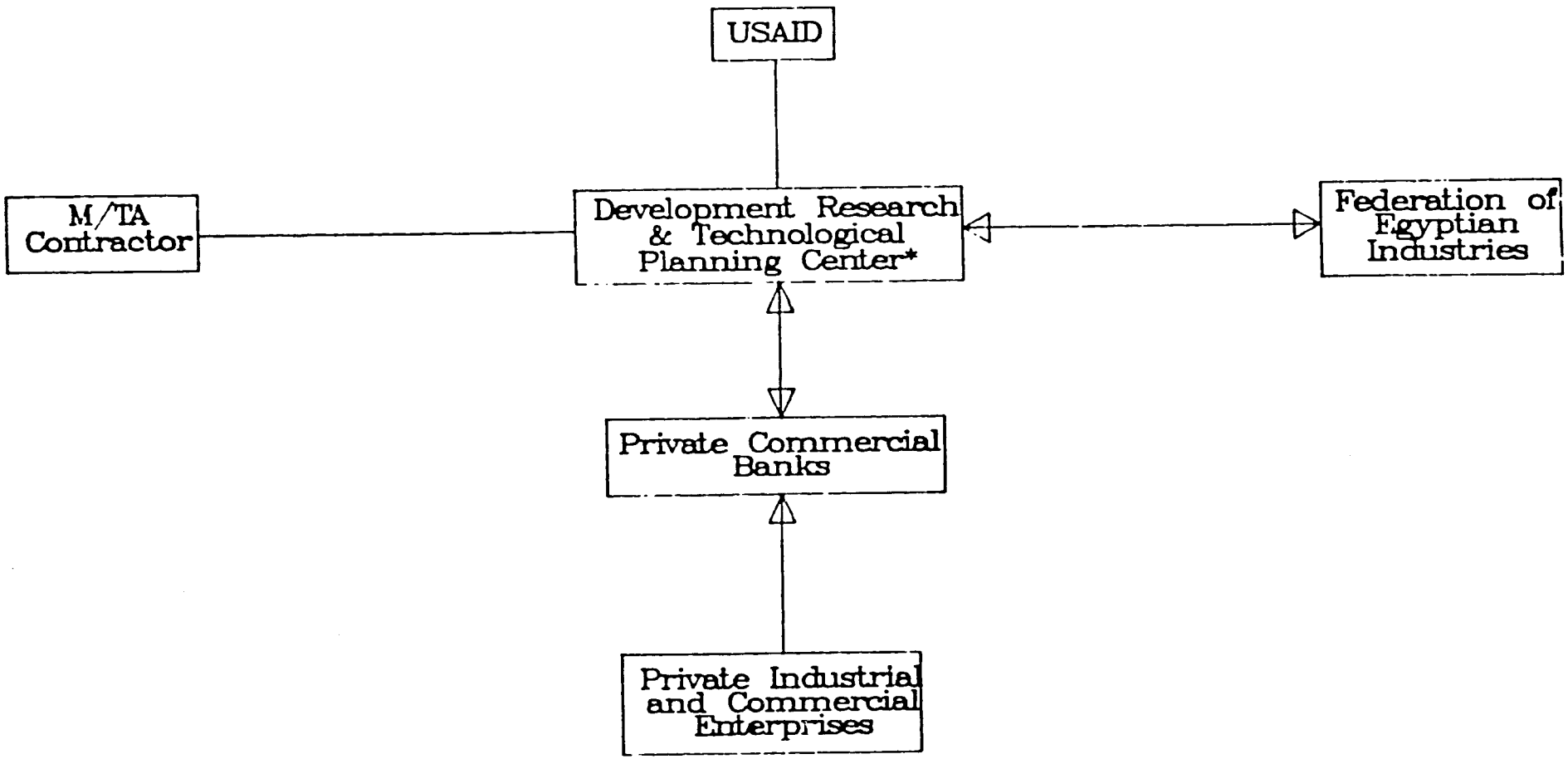
a. Private Sector Component: The organizational structure of the private sector component is presented in Figure III-1. Cairo University's Development Research and Technological Planning Center (DRTPC) will implement the private sector component and is the Egyptian counterpart agency. DRTPC will have both project management and technical services responsibilities. Private commercial banks will arrange and administer the financing for private sector technology applications. FEI will promote the Project and disseminate information on its

results, with assistance from DRTPC. Support will be provided by the M/TA contractor as needed. No public sector entity will be involved in managing or implementing technology applications in the private sector.

b. Public Sector Component: The organizational structure of the public sector component is presented in Figure III-2. This component will be implemented by the Ministry of Industry, as represented by the Tabbin Institute for Metallurgical Studies (TIMS). TIMS is the Egyptian counterpart agency for the public sector component. The organizational structure consists of a Steering Committee, which will provide policy guidance and approve technology applications, and a Project Secretariat (comprised of TIMS staff), which will have both project management and technical services responsibilities. TIMS will be supported in all of its activities by the M/TA contractor. Public sector banks will arrange and administer the financing for public sector technology applications. FEI will promote the public sector component, with assistance from the M/TA contractor as necessary.

The responsibilities of all participating organizations are summarized in Section VI and presented in detail in Annex H.

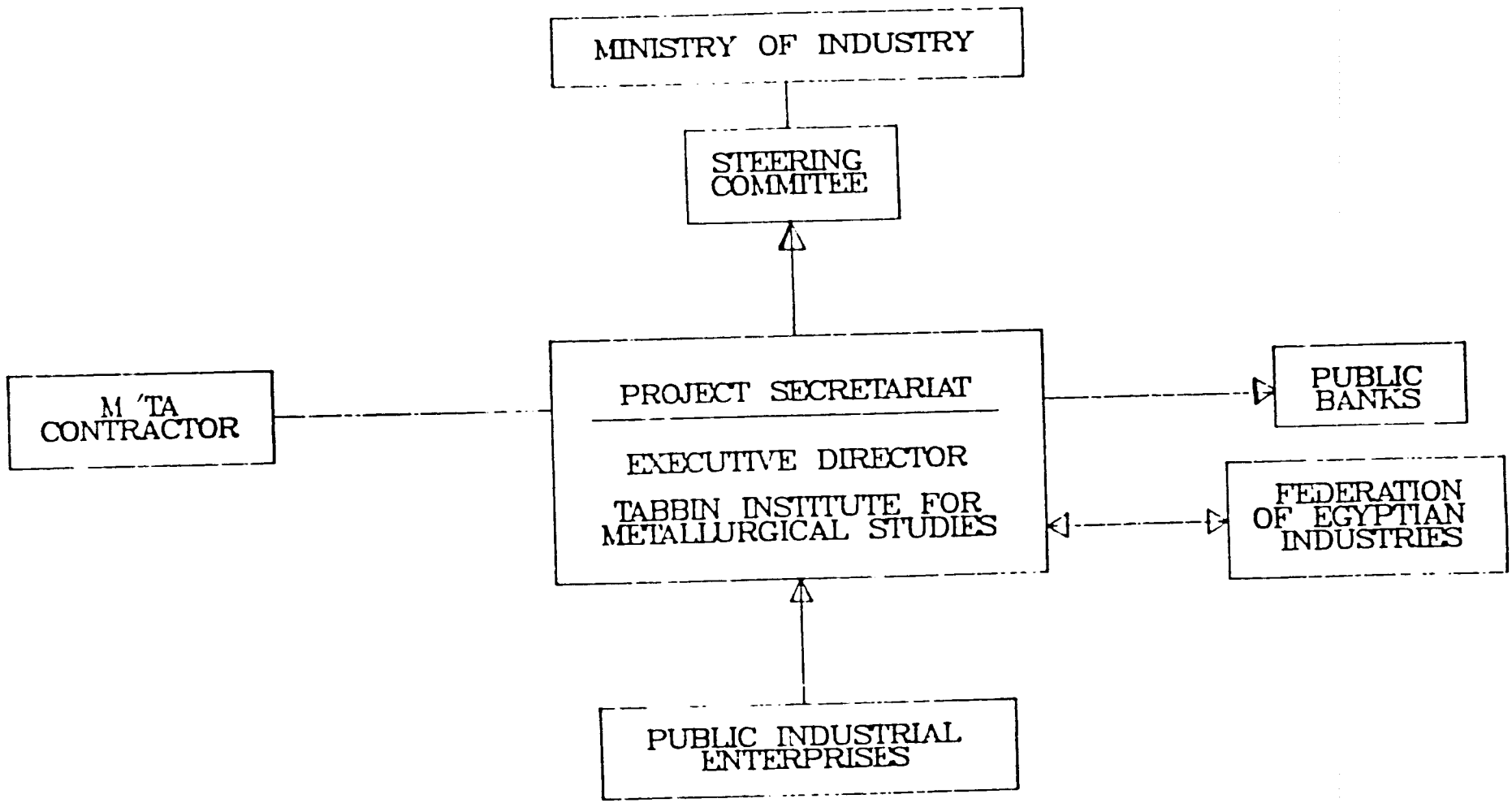
FIGURE III–1
PROJECT ORGANIZATION: PRIVATE SECTOR COMPONENT



* Part of Cairo University

52

FIGURE III-2
PROJECT ORGANIZATION: PUBLIC SECTOR COMPONENT



23

IV. RELATIONSHIP WITH OTHER PROGRAMS

This Project will be closely coordinated with and complement related programs sponsored by USAID, the GOE, and other donors.

A. USAID:

As noted in Section II-B-3, this Project is a key component of USAID's CDSS for energy and supports the Agency's "four pillars" of development. In addition, the Project will relate to other USAID industrial, energy planning, research, and private sector programs. The Project will use the results of industrial projects and surveys conducted under the Industrial Technology Applications Program's (ITAP), audits and energy conservation studies prepared by the Organization for Energy Planning (OEP) and studies on energy use conducted under the Cairo University/MIT (CU/MIT) project to identify potential technology applications and sites and training and technical assistance needs. In addition, CU's Development Research and Technological Planning Center (DRTPC) will implement the Project's private sector component. To the extent possible, this Project will also rely upon the Private Investment Encouragement Fund (PIEF), Commodity Import Program (CIP) and the Small Scale Enterprise Credit Guarantee Program to fund replications of technology applications that have been successfully demonstrated by the Project. The International Executive Services Corps (IESC) and the U.S. Investment Promotion Office (USIPO) will complement this Project's efforts by publicizing its activities, providing contacts with private sector companies, and helping develop business ventures to provide energy conservation technologies and related services to Egyptian industrial enterprises.

B. Government of Egypt:

This Project directly supports the GOE's industrial development strategy in the Second Five-Year Plan (1987/88 - 1991/92). By applying new technologies and reducing energy costs, this Project will increase industrial productivity and competitiveness and assist the GOE in achieving its industrial and economic development goals.

C. Other Donors:

The United Nations Development Program (UNDP) and MOI are currently funding a small Energy Conservation in Industry Project (ECIP), which is being implemented by the Tabbin Institute for Metallurgical Studies. The project's limited funding (approximately LE 1,665,000 from MOI and $800,000 from UNDP) precludes the installation of any major energy-conserving equipment and limits the number of industries that can participate. This Project will complement the UNDP-MOI project by using the UNDP's findings to help identify technology applications and building on the management and technical skills already developed at TIMs.

5. USAID

- Is USAID effectively fulfilling its SRP monitoring and accountability responsibilities? Has USAID effectively communicated its requirements to the Secretariat, MSCI, NAMRU-3, and Lowell University? Does HRDC/S&T have sufficient staff levels and skills to fulfill its project monitoring responsibilities? What improvements should be made?

- What changes can USAID make to improve implementation of SRP?

- Should the AID obligated amount of $18M be increased? If so, when and by what amount? If additional funds are not forthcoming, what will happen to SRP?

6. Overall

- Is the project on a track leading to achievement of its goal and purpose? What changes are needed?

- How will the positive aspects of the project be sustained when AID's assistance ends in 1996? What changes are needed now to enhance sustainability?

- How is the project contributing to the Administrator's initiatives, USAID's strategic objectives and GOE S&T priorities? What can be done to enhance the contribution?

- What policy or program changes could the GOE or AID make to facilitate accomplishment of project goal and purpose?

V. ENERGY CONSERVATION AND EFFICIENCY PROJECT (ECEP) 263-0140.3

A. PROJECT DESCRIPTION

1. Project Overview

The ECEP Project's two purposes are: 1) to promote and accelerate the adoption of improved commercial technologies, processes, and practices in order to save energy and increase energy efficiency;

and 2) to improve Egyptian institutional capabilities, particularly
in the private sector, for promoting and implementing energy-saving
and productivity-enhancing investments.

The initial project design provides private and public sector companies with technical assistance and funds (loans and grants) for the implementation of up to 60 applications (sub-projects) of energy-efficient technologies. The loan aspect, which was to operate through the banking sector, was later dropped. Project grants for energy-efficient technologies are split about 50-50 between the private and public sectors. While AID's policy strongly favors encouragement of the private sector, the public sector in Egypt is clearly the largest energy user and offers by far the best opportunities for energy conservation. Public sector companies in the metals, chemicals and cement industries were selected for initial ECEP participation, later, food and textile companies were added. All private sector industrial and commercial
companies in Egypt are eligible for participation.

The Tabbin Institute for Metallurgical Studies (TIMS) of the Ministry of Industry is implementing the public sector applications, while the Cairo University, Development Research and Technological Planning Center (DRTPC) is handling the private sector. The Federation of Egyptian Industries (FEI) is responsible for promoting ECEP among Egyptian business enterprises.

By implementing the project, TIMS, DRTPC, and FEI will improve their ability to promote, identify, engineer, install, operate and maintain energy-efficient technologies. ECEP will enhance the energy conservation capabilities of Egyptian companies through training in Egypt and the U.S. as well as through implementation of technology applications.

2. Project Implementation Start-up

USAID signed the initial Subgrant Agreement (ProAg) with the GOE in September 1988, obligating $15M for the eight-year project. The ProAg was amended in June 1989, increasing the obligated amount to $21M.

In February 1989, ECEP funded a one-year, $891,000 buy-in to an AID/W contract with RCG/Hagler-Bailly (HB) to assist DRTPC, TIMS, and FEI with: the organization of their ECEP Secretariats,

the establishment of project procedures, and the completion of feasibility studies for the first set of technology applications.

In April 1989, AID provided funds to DRTPC, TIMS, and FEI Secretariats after they successfully established procedures and met AID's other requirements. Shortly thereafter, the three Secretariats hired staff and started implementing the project. Initial activities included preparation of informational materials, presentation of the project to various industrial groups, and screening of companies interested in participating in ECEP.

During 1989, AID competitively procured a long-term management/ technical assistance (M/TA) contractor. After proposal review (by DRTPC, TIMS and AID), AID negotiated and signed a two-year (extendable to the PACD) $10.1M M/TA contract with Overseas Bechtel Inc. (OBI). The OBI contract includes a sub-contract with RCG/Hagler-Bailly (HB) which enhances continuity from project design through implementation.

3. Current Status

From a screening of 135 private and public industrial plants, DRTPC and TIMS have identified and completed feasibility studies for 36 technology applications. By September 1991, thirteen companies had signed contracts to implement sub-projects. Under these contracts, the companies pay for detailed engineering work, procurement of locally available equipment, installation of all energy conservation equipment, and monitoring of energy savings (roughly one third of the total sub-project cost). ECEP pays for feasibility studies and the procurement and delivery of the energy conservation equipment imported from the U.S. (roughly two-thirds of the total sub-project cost).

Of the first 13 sub-projects: six are in the private sector (power factor improvement in Seven-up Beverage Co., Giza Cables, and Arab Contractors Medical Center; energy management systems at the Ramsis Hilton and Egyptian International Pharmaceuticals; and cogeneration at ALUMISR)) and seven are in the public sector (combustion efficiency in Egyptian Copper Works and Delta Steel; cogeneration at Abu Zaabal Fertilizer; and power factor improvement at National Metals, Shorbagy Textile, and Transport and Engineering Tire Company; and water treatment at SEMADCO

Fertilizer). Energy savings from the first thirteen sub-projects are expected to be about $800,000/year. By September 1991, installation of the first three sub-projects was complete and a fourth was nearing completion (Ramsis Hilton, Seven-Up, Giza cables, and Arab Contractors Medical Center).

By September 1991, 784 plant and other personnel had already been trained in Egypt on modern energy conservation. An additional 14 have received training in the U.S..

USAID is currently reviewing a request from the GOE to use ECEP funds to implement a large $10-$12M cogeneration project.

B. EVALUATION QUESTIONS AND ISSUES

1. ECEP Sub-project Process

- What can be done to improve or accelerate the sub-project process (screening, letter of intent, feasibility study, development of specifications for equipment, implementation contract, Request for Quotations (RFPs), shipping, detailed engineering, installation, monitoring)? Why has it taken so long to launch the first set of sub-projects?

- What are the options for undertaking the detailed engineering required for each sub-project? What is the best option? Who should do the detailed engineering work? Who should pay for the detailed engineering work?

- Do participating companies clearly understand their sub-project responsibilities (engineering, local procurement installation, monitoring, and maintenance)? Are the companies qualified to fulfill these responsibilities? Do implementation contracts have sufficient detail?

- What can be done to improve or accelerate the procurement process?

- Is there an appropriate mix of technologies in the first 13 sub-projects? Which technologies have the greatest potential for widespread replication?

- How can the project better encourage companies to implement low-cost, no-cost energy conservation opportunities?

- How can ECEP have a stronger impact on GOE energy policy?

- Is the existing organizational structure the most appropriate to meet the overall objectives of ECEP?

- Given that 135 factories have been screened and only 13 have signed implementation contracts, are sub-project selection criteria appropriate? Should ECEP seek larger sub-projects in the $5-$15M?

- What are the major problems of sub-project process as viewed by TIMS? DRTPC? FEI? client companies? Bechtel? USAID? energy conservation equipment vendors?

2. USAID

- Is USAID effectively fulfilling its ECEP monitoring and accountability responsibilities? Has USAID effectively communicated its requirements to the TIMS, DRTPC and FEI Secretariats and OBI? Does HRDC/S&T have sufficient staff levels and skills to fulfill their project monitoring requirement? What improvements should be made?

- What changes can USAID make to improve implementation of ECEP?

- Given project progress to date and USAID/Cairo's overall priorities, should the authorized level of $36M be adjusted? Should the AID obligated amount of $21M be increased? If so, when and by what amount?

  Is there effective coordingation between ECEP and USAID;s other energy activities, including USAID;s policy dialogue on energy prices? What can be done to improve coordination to better achieve USAID;s energy sector objectives?

3. The ECEP Secretariats (at TIMS, DRTPC, and FEI)

- Are administrative and organizational structures and procedures effective and efficient? Are administrative,

commodity, and financial control systems adequate to meet GOE and USAID monitoring requirements?

- Are the Secretariats effectively and efficiently implementing the sub-project process (screening, pre-feasibility study, etc.)? Is coordination among DRTPC, TIMS and FEI effective and efficient?

- Are the Secretariats sufficiently housed, equipped, funded, and staffed to achieve their objectives? Are they allocating staff to the highest priority ECEP activities?

- Have effective linkages been developed with public and private companies, with Egyptian suppliers, with Egyptian consulting engineers, with other related development projects? Are these linkages a distraction or a direct contribution to achievement of ECEP objectives?

- Is the Steering Committee providing effective guidance and leadership to TIMS? Have the RCG/Hagler Bailly and OBI contracts contributed effective technical assistance?

- To what extent is the achievement of ECEP project objectives being facilitated by the existing project organizational and administrative procedures?

- What steps should be taken to improve the overall functioning of the Secretariats?

4. Overseas Bechtel Inc. (OBI)

- What are the strong points and weak points of OBI's performance under the contract?

- Is OBI effectively and efficiently procuring ECEP's commodities and training?

- Is the OBI contract adequately focused on ECEP's objectives and goals? What can be done to improve the contract?

- Are the responsibilities, relationships and communications among OBI's project staff in Cairo, OBI in San Francisco,

and Hagler-Bailly in Washington appropriate? What can be done to improve the situation?

- Is the role of OBI (technical assistance & procurement) clearly understood by USAID and the secretariats?

- Is OBI providing effective technical assistance to ECEP agencies (TIMS, DRTPC and FEI)? What overall improvements should be made?

5. Overall

- Is the project on a track leading to achievement of its goal and purpose? What changes are needed?

- How will the positive aspects of the project be sustained when AID's assistance ends in 1996? What changes are needed now to enhance sustainability?

- How is the project contributing to the Administrator's initiatives, USAID's strategic objectives and GOE S&T priorities? What can be done to enhance the contribution?

- What policy or program changes could the GOE or AID make to facilitate accomplishment of project goal and purpose?

- Should ECEP undertake a large $10-12M cogeneration project?

- What is the current and potential future impact of ECEP on Egyptian natural resources and the environment? What changes are needed to enhance this impact?

APPENDIX C

SUBGRANT AGREEMENT BETWEEN EGYPT AND USA ON ECEP

Doc #0555A

Final, 8/1/88

Attachment A

Energy Conservation and Efficiency
Subproject Description
(AID Subproject No. 263-0140.03)

1. Subproject Purpose:

The Subproject's purposes are to: promote and accelerate the adoption of improved commercial technologies, processes, and practices in order to save energy and increase energy efficiency; and improve Egyptian institutional capabilities at promoting and implementing energy-saving technologies that enhance productivity.

2. Subproject Description:

To achieve its purposes, the Subproject will carry out during the estimated 8 years life of the subproject, two types of activities: (1) energy technology applications, and (2) promoting investments in these technologies.

a. Energy Technology Applications:

This activity will be directed at selecting, designing, installing, operating, and monitoring energy efficient technologies that are economically, financially and technically viable in both private and public sector companies, and replicable in other facilities. Approximately 60 applications will be undertaken during the life of the subproject.

Ten technologies were initially selected for this subproject, among which are: micro-computer and micro-processor based process controls; electronic energy management systems; automatic combustion controls; and waste heat recovery systems.

Additional technologies may be added during the Subproject if they meet the criteria of economic, financial, and technical viability and replicability and if approved by AID.

b. Technology Investment Promotion:

This activity will be aimed at promoting replication by other enterprises of the technologies that have been successfully applied. This will be accomplished by:

- developing institutional capabilities of three Egyptian institutions, the Development Research and Technology Planning Center (DRTPC) of Cairo University, the Tebbin Institute of Metallurgical Sciences (TIMS) of the Ministry of Industry and the Federation of Egyptian Industries (FEI), to identify, evaluate, finance, procure, install, operate, monitor and maintain advanced energy conservation technologies.

- increasing awareness of energy conservation technologies to promote replications through activities such as information dissemination, workshops, seminars, advertisements, publications and special studies.

- reducing policy and regulatory barriers that affect subproject implementation and technology adoption.

3. Participating Company Selection:

The subproject will be open to both private and public sector firms, in accordance with the following conditions and focus:

- a) firms whose total use of energy could be reduced while sustaining, or even increasing, production; and b) firms whose use of energy could remain constant while their production expanded.

- Technologies that are commercially proven and can be widely replicated in other private and public sector firms.

- Only technology applications and public sector companies that are economically viable in the following sectors: chemical, metallurgical and cement industries. Textiles and food industry could be subsequently considered. Technologies and public sector companies will be selected by the Subproject Steering Committee with the assistance of a Management and Technical Assistance Contractor after consultation with AID.

- All industrial and commercial enterprises of the private sector. Technologies and companies will be selected with the assistance of the Development Research and Technology Planning Center of Cairo University and the Management and Technical Assistance Contractor after consultation with AID.

4. Financial Arrangements:

Although the subproject is a Grant to the GOE, a portion of the Grant related to commodities procurement will be a combination of loans and grants to the private and public sector companies participating in this subproject.

These selected private and public sector companies will be expected to pay for the imported technologies through a combination of loans and grants provided by the Subproject. Companies will not have to repay the grant portion to the subproject on condition that the companies will: a) monitor the performance of the technology applications; b) provide agreed upon technical information; and

64

c) provide a demonstration of these technologies to other companies to promote replications.

The portion of the grant for the import of technology will be in the range of 15-40% of the foreign exchange for small technology applications of $100,000 or less, and in the range of 25-40 % of the foreign exchange cost for large technology applications exceeding $100,000. Determination of the grant portion will be made on an individual case basis and will conform to specific criteria to be developed during subproject implementation and approved by AID. Such criteria will take into consideration the additional costs incurred by the company for participating in the subproject (such as proposal preparation, purchase of measuring equipment, installation cost and monitoring), a percentage discount from the commodity costto equate the cost of U.S. flag carrier to a non-U.S. flag carrier and a percentage discount related to the company's reduction of total energy used and/or reduced energy required per unit of output.

Private commercial banks will be responsible for arranging and administering the foreign exchange loan for technology applications for the private sector. However, private banks will not be excluded from arranging financing for public sector technology applications if they are approached by public enterprises, provided that the company and the proposed technology meet the banks' financial and creditworthiness requirements.

Participating banks will be those banks already selected for, and which have demonstrated good performance in, AID's Private Investment Encouragement Fund and the Commodity Import Program. They will sign a Participating Bank Agreement, which stipulates the rules, regulations, and procedures for using funds under the Subproject. This agreement will be modeled after the Participating Bank Agreement (General Circular No. 1, Agreement No. 263-0201.1) for the Private Enterprise Credit Project, and will include eligibility requirements of borrowers, eligible activities and commodities, application, evaluation, and approval procedures, disbursement and repayment procedures, and documentation and reporting requirements.

Funds will be made available by AID to the banks through Bank Letters of Commitment (L/COM). The banks will repay the Subproject for the foreign exchange loan at an exchange rate that is fixed upon executing the loan. They will collect principal and interest payments from the companies at their customary commercial terms and conditions.

5. Loan Repayment:

Participating banks will deposit the loan repayments in Egyptian pounds into two special accounts specifically reserved for this subproject. The first special account will be for the loan repayments from the public sector companies, and the other account is for the loan repayments from the private sector companies.

The special account of the public sector will be administered by the subproject Steering Committee but reviewed by AID on a quarterly basis. The monies collected in this account will be used first to provide sufficient local currencies to cover administrative and assistance costs of the Steering Committee, Subproject Secretariat, and the Federation of Egyptian Industries (for public sector activities only) for the last 3 years of the subproject. The fund will then be used to sponsor research on energy conservation, and to pay for the local currency portion of energy conservation investments by public industrial enterprises. Prior to using these amounts, the Steering Committee will submit for AID approval, a plan for funds use and the procedures and mechanism for expenditures.

The special account for the private sector will be administered by the Development Research and Technological Planning Center of Cairo University, but reviewed by AID on a quarterly basis. The monies collected in this account will be used first to provide sufficent local currencies to cover current and future administrative and assistance costs of the Development Research and Technology Planning Center and the Federation of Egyptian

Industries (for private sector activities). The funds will then be used to finance research on energy conservation and efficiency related to the private sector, and also to provide loans in Egyptian pounds to other private sector companies for purchasing energy efficient equipment. Prior to using these repayments, DRTPC will submit for AID approval, a plan for funds use and the procedures and mechanism for expenditures.

6. Subproject Organization:

The Subproject is divided into two components; one for the private sector and the other for the public sector, with a management and technical assistance contractor providing services to both sectors.

a. Private Sector Component:

The implementing agency for the subproject's private sector component will be Cairo University's Development Research and Technological Planning Center (DRTPC). The Director of DRTPC will appoint a full-time Executive Director to meet its responsibilities under the Subproject. The Center will have the following management and technical services responsibilities:

- Subproject administration, accounting, and financial management
- Marketing and promoting energy conservation activities, along with the Federation of Egyptian Industries
- Identifying technology applications
- Evaluating and approving the technical, economic, and replication feasibility of proposals, with the assistance of a Management and Technical Assistance Contractor
- Providing technical assistance and training for private companies at all stages of technology applications, including proposal preparation
- Monitoring and tracking technology applications
- Analyzing and presenting results of technology applications

- Administering a special account consisting of loan repayments from the private sector
- Monitoring the cash and in-kind contributions of the private sector to the subproject.

b. Public Sector Component:

1. Ministry of Industry:

The Ministry of Industry, through the Tebbin Institute of Metallurgical Studies, will be the implementing agency of the public sector component. The Minister of Industry will issue a decree establishing the Energy Conservation and Efficiency Subproject Steering Committee, and a Subproject Secretariat under the umbrella of the Ministry of Industry.

a. Steering Committee: The Steering Committee will be chaired by the Minister of Industry or his designated representative, and will be composed of the following members:

- Chairman of the Metallurgical Authority
- Chairman of the Chemical Authority
- Chairman of the Federation of Egyptian Industries
- Administrator of the Economic Cooperation with U.S.A. at the Ministry of International Cooperation
- Director of the Tebbin Institute of Metallurgical Studies
- Executive Director of the Subproject
- One representative of the Cement Industry
- The Director of the Development Research and Technological Planning Center at Cairo University as an ex-officio member
- The AID subproject officer as an ex-officio member

The Steering Committee's responsibilities include:

- Providing overall policy guidance to the public sector component
- Approving the Subproject Secretariat's recommendations for technology applications for up to $1 million
- Providing policy direction for energy conservation in the industrial sector
- Administering the special account generated from loan repayments from the public sector companies

b. Subproject Secretariat: The Subproject Secretariat is responsible for day-to-day subproject management and implementation of the public sector component. It can be staffed by the Tebbin Institute of Metallurgical Studies and will be managed by a full-time Executive Director, with technical and management responsibilities for:

- Subproject administration, accounting, and financial management
- Identifying technology applications
- Evaluating technical, economic, and replication feasibility of proposals
- Selecting proposals and submitting them to Steering Committee for final approval
- Providing technical assistance and training to public industrial enterprises at all stages of technology application, including proposal preparation
- Monitoring and tracking technology applications and their funding
- Analyzing and presenting results of technology applications
- Submitting budget and expenditure plans for using reflows to the Steering Committee
- Monitoring the GOE cash and in-kind contributions to the subproject.

The Subproject Secretariat will carry out all activities with assistance from, and close collaboration with the Management/Technical Assistance (M/TA) contractor.

7. Procurement Plan:

a. Technical Services:

AID will contract the services of a Management/Technical Assistance Contractor, to assist DRTPC, TIMS, FEI and private and public sector enterprises in implementing the activities under this Subproject. The contractor will also provide advisory services to AID. In order to proceed quickly with implementation, AID will use the services, on an interim basis, of a contractor who was competitively selected during the original Agreement.

AID will also contract for services to assist AID in monitoring, evaluation and audit; and for conducting technical audits of selected technology applications to ensure they have been selected in accordance with criteria established by AID.

b. Local Management Services:

AID will provide funds to DRTPC, TIMS and FEI for the first five years of subproject implementation to be used for:

a. Assisting in establishing their offices
b. Recruiting technical and administrative personnel
c. Procuring office equipment, materials and supplies
d. Subcontracting Egyptian consultants for technical services
e. Arranging or conducting local training, workshops and seminars

d. Commodity Procurement Services:

The private and public sector companies will have primary responsibility for developing technical specifications for the technologies to be installed, releasing the bidding document, and analyzing and selecting the winning offer. TIMS and DRTPC, with the assistance of the Management/Technical

70

Assistance Contractor, will have responsibility for ensuring the procedures used in selecting the winning offer are in compliance with AID procurement regulations for the public and private sector companies respectively. The Management and Technical Assistance Contractor will perform procurement services when requested by the individual companies.

8. Financial Plan:

Table 1 summarizes the illustrative AID contribution. Table 2 provides an illustrative budget for the host country contribution (private and Government of Egypt). Subproject financing involves an initial obligation of $15.0 million in AID funds and subsequent incremental obligations totalling an additional of $34.5 million for subsequent years. Before any subsequent obligations are made, AID will review the performance and demands of the private and public sector components to determine the amount of obligation and the funding share between the two sectors.

AID will fund the foreign exchange costs of the commodities including cost of equipment, maintenance services and installation. AID will also fund administrative, management and technical services for the subproject in both local and foreign currency in accordance with the Procurement Plan described above.

The Ministry of Industry and its industrial public sector companies will match the purchase of the U.S. commodities with the cash contribution for financing the local costs of these commodities. They will also cover the costs for basic salaries of personnel, facilities and construction. The local currency required for the last three years of subproject implementation for local management and technical assistance will be provided to TIMS, DRPTC and FEI from the special subproject accounts.

Commodity procurement includes equipment, materials, supplies, spare parts, accessories, computer hardware and software and field vehicles (excluding sedans).

Illustrative Budget

Table 1
AID Contribution
$(000)

	FY 88 Obligation FX	LC	Total	Future Obligation FX	LC	Total	Life of Project FX	LC	Total
I. Commodities									
- Public Sector	3200	-	3200						
- Private Sector	3200	-	3200						
SUBTOTAL Commodities	6400	-	6400	30600	-	30600	37000	-	37000
II. Technical and Management Services	6100	2500	8600	2900	100	3000	9000	2600	11600
III. Evaluation/Audit	-	-	-	900	-	900	900	-	900
TOTAL	12500	2500	15000	34400	100	34500	46900	2600	49500

Table 2
Host Country Contribution (Life of Project)
LE (000)

	Public Sector In-kind	Cash	Private Sector In-kind	Cash	Host Country Total
I. Commodities	24200	8100	16200	16200	64700
II. Training	400	-	400	-	800
III. Local Management and Services					
- Public/Private Sectors	560	3825	-	-	4385
- Information Dissemination	40	575	-	-	615
TOTAL	25200	12500	16600	16200	70500

APPENDIX D

M/TA CONTRACT SCOPE OF WORK AND TASKS

SECTION C - WORK STATEMENT - BECHTEL and USAID/Egypt Negotiations Resulting in BECHTEL best and final offer are incorporated by reference.

I. BACKGROUND

A. PROJECT OBJECTIVE

The goal of the Energy Conservation and Efficiency Project (ECEP) (The Project) is to improve the productivity and competitiveness of the Egyptian economy by improving the energy efficiency of its industrial and commercial processes and practices.

The Project purposes are to promote and accelerate the adoption of improved commercial technologies, processes, and practices in order to save energy and increase energy efficiency, and to improve Egyptian institutional capabilities to promote and implement energy-saving and productivity-enhancing investments. The Project is divided into two components — one for the public sector and one for the private sector.

B. PROJECT DESCRIPTION

To achieve its purposes, the Project will carry out two types of activities: (1) energy technology applications, and (2) promoting investments in these technologies.

1. Energy Technology Applications:

This activity will be directed at selecting, designing, installing, operating, and monitoring energy efficient technologies that are economically, financially and technically viable in both private and public sector companies, and replicable in other facilities. Approximately 50 applications will be undertaken during the remaining life of the project. This activity includes:

a. Identifying technologies and sites: An important activity will be identifying and selecting those technologies and practices that will result in significant benefits to Egypt, and will have the highest pay-off for the resources spent. Ten technologies emerged as targets for the initial phase of the Project.

- Micro-computer and micro-processor based process controls
- Electronic energy management systems
- Automatic combustion controls
- Waste heat recovery systems
- Cogeneration system (topping and bottoming, including organic Rankine cycles)
- Advanced insulation materials for large-scale applications

- High efficiency electric motors
- Solid fuel-fired combustors (such as fluidized bed boilers)
- Power factor improvement systems (including automatic power factor correction systems and large synchronous motors), and
- High efficiency lighting systems for large-scale industrial applications.

Additional technologies may be added during the Project if they meet the criteria of economic, financial, and technical viablity and replicability.

b. Demonstration Projects: will be associated with technology applications. These activities include evaluating (including energy auditing), designing, adapting, financing, installing, operating, and maintaining a specific application at a given site for demonstration purposes.

c. Monitoring Technology Performance: An important tool in technology promotion is reliable information on each technology application. To this end, public and private sector firms participating in the project will monitor (with the Contractor and the implementing agencies' assistance) the technical and economic performance of each application. This information will be used to prepare detailed case studies of each application which will then be widely disseminated.

2. Technology Investment Promotion:

This activity will be aimed at promoting replication by other enterprises of the technologies that have been successfully applied. This will be accomplished by:

a. Developing Institution Capabilities of Three Egyptian Institutions: the Development Research and Technology Planning Center (DRTPC) of Cairo University which is the main implementing agency for private sector activities, the Tebbin Institute of Metallurgical Sciences (TIMS) of the Ministry of Industry, which is the main implementing agency for public sector activities, and the Federation of Egyptian Industries (FEI) responsible for promotion activities. DRTPC & TIMS are to identify, evaluate, finance, procure, install, operate, monitor and maintain advanced energy conservation technologies so that energy conservation activities will continue after the project ends. FEI will assist these two agencies in promoting energy conservation activities in both public and private sector firms.

To achieve this, the implementing agencies (DRTPC, TIMS and FEI) will receive training in these areas, as needed. The same training will be provided to others participating in the project, for example private and public companies. Particular emphasis will be placed on helping DRTPC and TIMS to become the initial energy conservation and technical services organizations for the private and public sectors, respectively. In addition, to assist in identifying potential energy conservation opportunities, a comprehensive data base of industrial plant characteristics such as products, processes, size, and energy use will be developed by DRTPC and TIMS, with the assistance of the Contractor, and using FEI resources.

b. Increasing Awareness of Energy Efficient Technologies: DRTPC, TIMS and FEI (with assistance from the Contractor) will increase technology awareness by disseminating reliable cost and energy saving information through workshops, seminars and trade meetings, publications in professional and trade journals, and special studies. In addition, visits will be sponsored to plants using technologies of interest of the Project. These efforts will be targeted to potential users, engineering firms, equipment vendors, and policy makers.

c. Reducing Policy and Regulatory Barriers to Investment: As part of their assessments of individual technology applications, DRTPC, TIMS, and the Contractor will analyze specific GOE policies and regulations, such as energy pricing, import duties or taxes, that affect project implementation and technology adoption. Where these constrain introducing cost-effective technologies, they will suggest modifications to address these barriers.

C. ELIGIBILITY CRITERIA

1. Participating Company Selection:

The Project will be open to both private and public sector firms. The Project will provide them with grants for the foreign exchange portion of the technology application in accordance with the following conditions and focuses:

- Firms whose total use of energy could be reduced while sustaining, or even increasing, production; and firms whose use of energy could remain constant while their production expanded.

15

- Technologies that are commercially proven and can be widely replicated in other private and public sector firms.

- Only technology applications and public sector companies that are economically viable in the following sectors: chemical, metallurgical and cement industries. Textiles and food industry could be subsequently considered. Technologies and public sector companies will be selected by the Project Steering Committee with the assistance of the Contractor after consultation with AID.

  All industrial and commerical enterprises of the private sector are eligible. Technologies and companies will be selected with the assistance of DRTPC and the Contractor after consultation with AID.

2. Company Screening Criteria:

To be considered for participation in the ECEP, public sector and private sector companies must meet the following requirements. This criteria can be revised and updated during project implementation.

- The company must express formal interest in participating in the Energy Conservation and Efficiency Project (ECEP).

- The plant must have had an operating factor greater than 0.6 for the last two years. This means that actual production for the last two years should be at least 60% of the "design" production capacity.

- The company must consume annually more than 5,000 (public sector) and 1000 (private sector), metric tons (mT) of petroleum fuel or the equivalent of that amount in natural gas, or more than 14,000 MWh (public sector) and 3,000 MWh (private sector) of electricity. For power factor improvement projects, the plant power factor must be less than 0.75.

- The management of the company must agree to pay all of the local currency implementation cost of the project. This includes installation costs, commissioning, salaries of personnel and company logistics. The company must also post a performance bond guaranty in Egyptian pounds of up to 20 percent of the foreign exchange cost of the project in favor of USAID. The performance guaranty will be returned upon satisfactory installation, commissioning, and operation of the equipment, and after monitoring the results for a period of six months. In case of non performance by the company, the money from the performance guarantee will be recredited to the Project.

76

- The management of the company must agree to allow others to visit the site to observe the technology in operation and to assist in documenting its performance.

- The company must be economically - (for public sector) and financially - (for private sector) sound and well managed, and be able to demonstrate the technical competence of its engineering staff.

3. Demonstration Project Criteria:

In order to be implemented under ECEP, demonstration projects must meet the following requirements.

a. The annual energy savings from the technology must meet at least one of the following conditions:

   - achieve annual savings of more than 500 mT (for public sector) or 100/mT (for private sector) of petroleum fuel, or the equivalent in natural gas.
   - achieve annual savings of more than 1,400 MWH (for public sector) 300 MWh (for private sector) of electricity.

   - achieve savings of more than 5 percent of the company's total energy use at the site.

   - improve power factor to a minimum of 0.90

   - reduce peak electric demand at the site by at least 10 percent.

b. The foreign exchange component of the demonstration project for public sector should be at least $150,000 and $50,000 for the private sector.

c. The economic (for public sector) or financial (for private sector) payback period of the demonstration project should not exceed 5 years.

d. Procurement of the equipment for the project will be performed according to USAID rules and regulations.

e. The technology must be replicable in other plants and industries.

D. PROJECT ORGANIZATION:

The Project is divided into two components; one for the private sector and the other for the public sector, with the Contractor providing services to both sectors.

a. Private Sector Component

The implementing agency for the project's private sector component will be Cairo University's Development Research and Technological Planning Center (DRTPC). The Director of DRTPC has appointed a full-time Executive Director as well as technical and administrative staff to meet its responsibilities under the Project. An organization of the ECEP unit in DRTPC is provided in Exhibits A and B. The unit will have the following management and technical responsibilities.

- Project administration, accounting, and financial management.
- Marketing and promoting energy conservation activities, along with the Federation of Egyptian Industries (FEI).
- Identifying technology applications.
- Evaluating and approving the technical, economic, and replication feasibility of proposals.
- Providing technical assistance and training for private companies at all stages of technology applications, including proposal preparation.
- Monitoring and tracking technology applications.
- Analyzing and presenting results of technology applications.
- Monitoring the cash and in-kind contributions of the private sector to the project.

b. Public Sector Component:

The organization of the Project in the public sector is provided in Exhibit C and consists of:

1. Ministry of Industry:

The Ministry of Industry, through the Tebbin Institute of Metallurgical Studies is the implementing agency of the public sector component. The Minister of Industry (MOI) issued a decree establishing the Energy Conservation and Efficiency Project Steering Committee, and a Project of Secretariat under the umbrella of the Ministry of Industry.

-13

EXHIBIT A

ORGANIZATION OF PRIVATE SECTOR COMPONENT

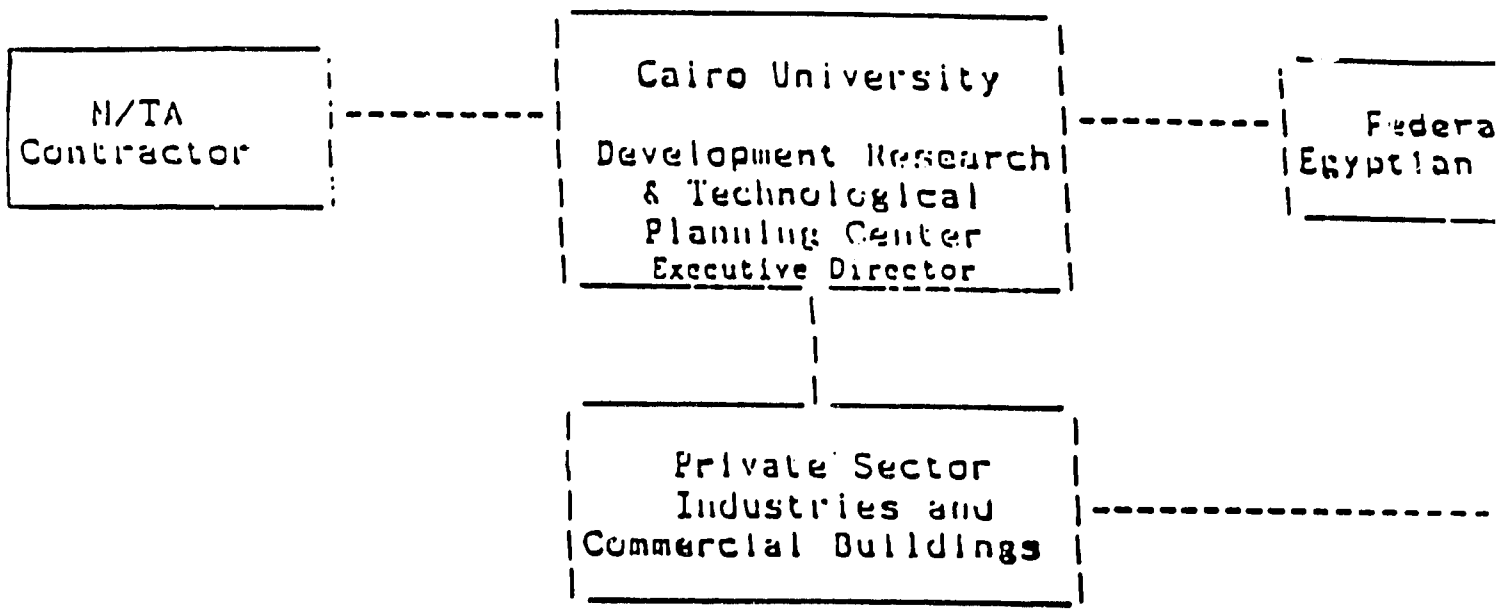
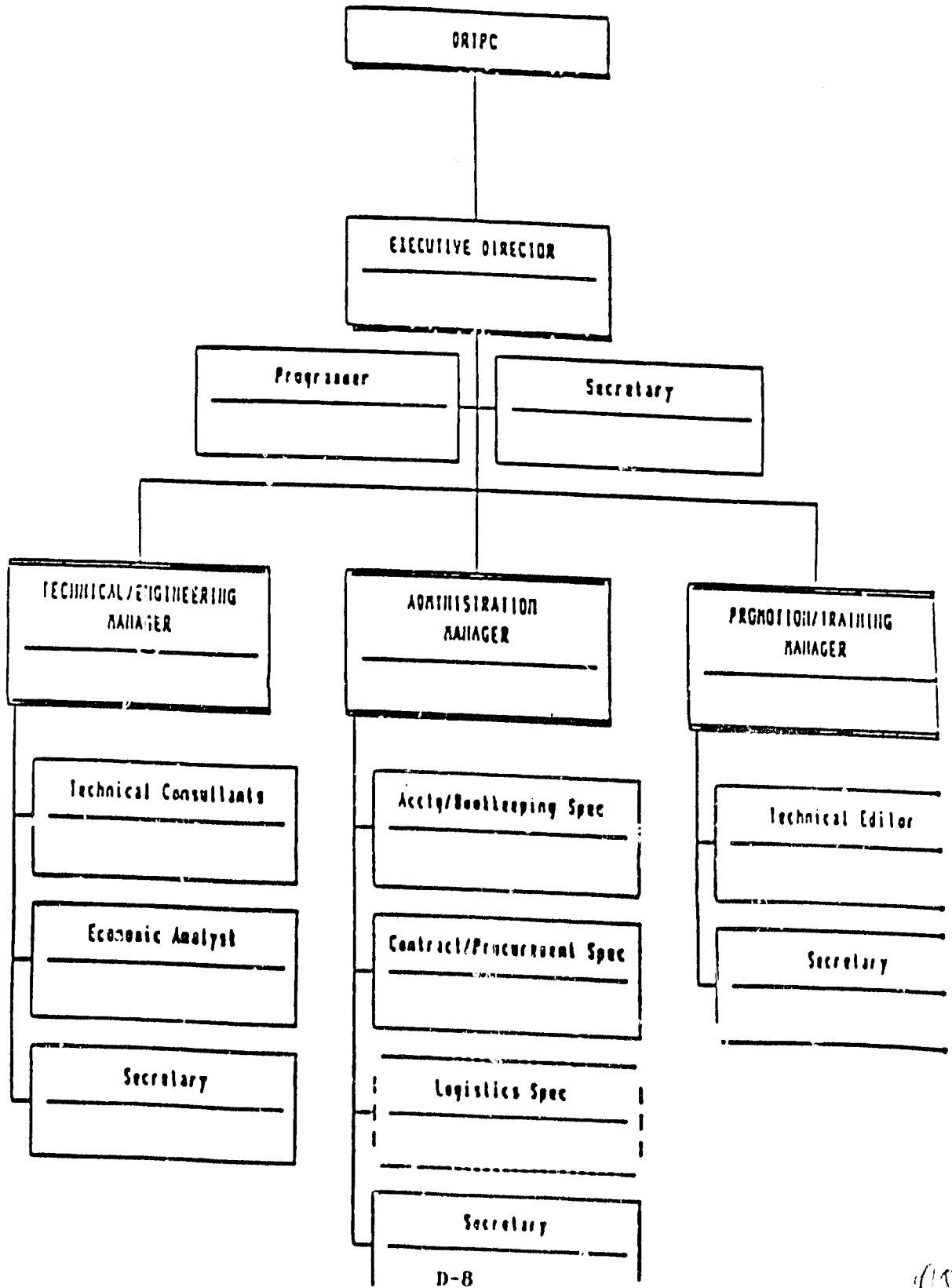


EXHIBIT B

ORGANIZATION CHART
DRTPC/ECEP



a) Steering Committee: The Steering Committee is chaired by the Chairman of the Metallurgical Authority and is composed of the following members:

- A representative of the Ministry of Industry.
- A representative of the Chemical Authority.
- The chairman of the Federation of Egyptian Industries.
- The administrator of the Economic Cooperation with U.S.A. at the Ministry of International Cooperation.
- The director of the Tebbin Institute of Metallurgical Studies.
- The executive Director of the Project Secretariat.
- One representative of the Cement Industry (as appropriate).
- The Director of the Development Research and Technological Planning Center at Cairo University as an ex-officio member.
- The AID project officer as an ex-officio member.

The Steering Committee's responsibilities include:

- Providing overall policy guidance to the public sector component
- Approving the Project Secretariat's recommendations for technology applications
- Providing policy direction for energy conservation in the industrial sector.

b) Project Secretariat: The Project Secretariat is responsible for day-to-day project management and implementation of the public sector component. It is staffed by the Tebbin Institute of Metallurgical Studies (TIMS) and is managed by a full-time Executive Director, with technical and management responsibilities similar to the private sector component as stated in Section D.a. An organization of the Project Secretariat is in Exhibit D.

31

EXHIBIT C

ORGANIZATION OF PUBLIC SECTOR COMPONENT

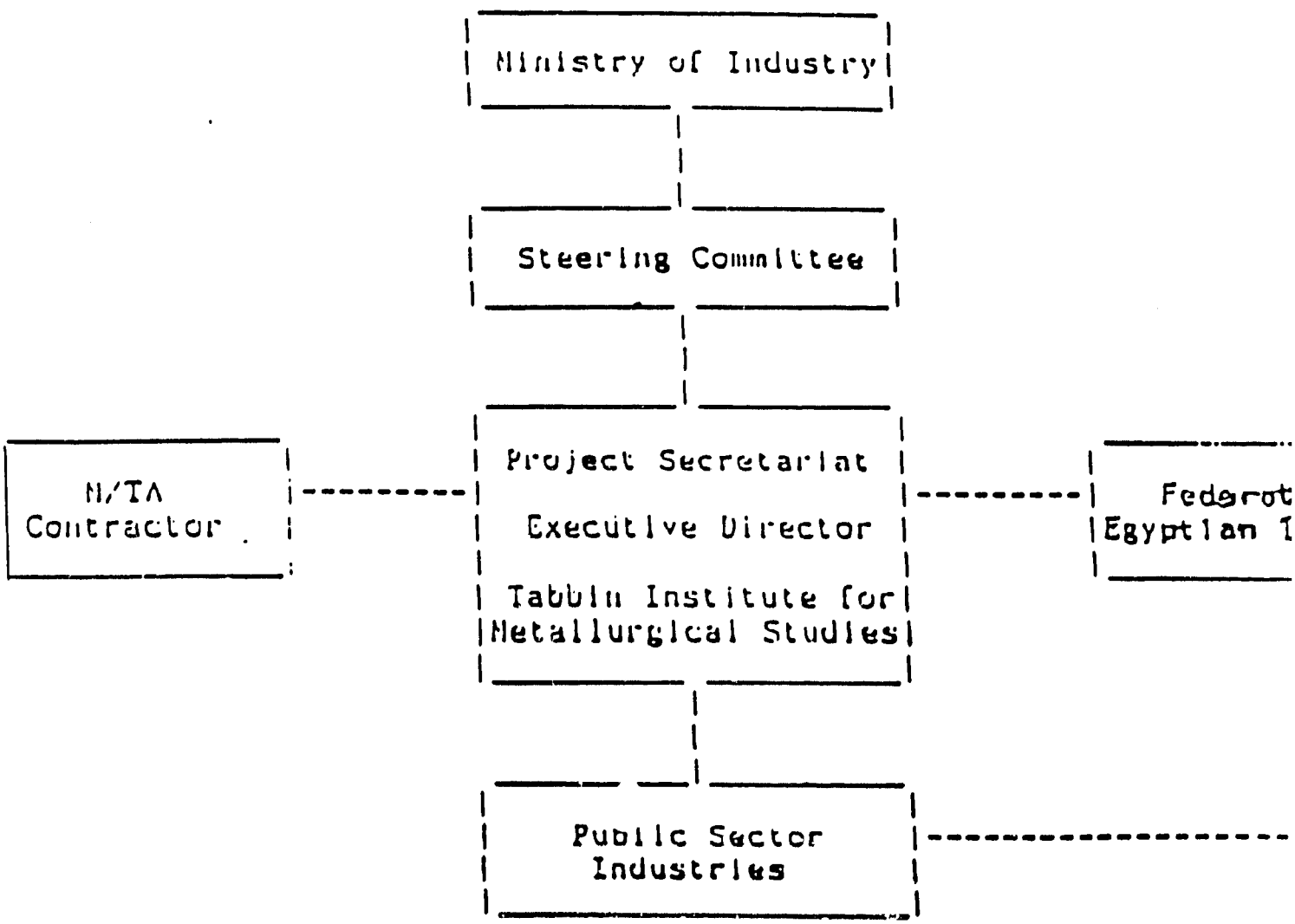
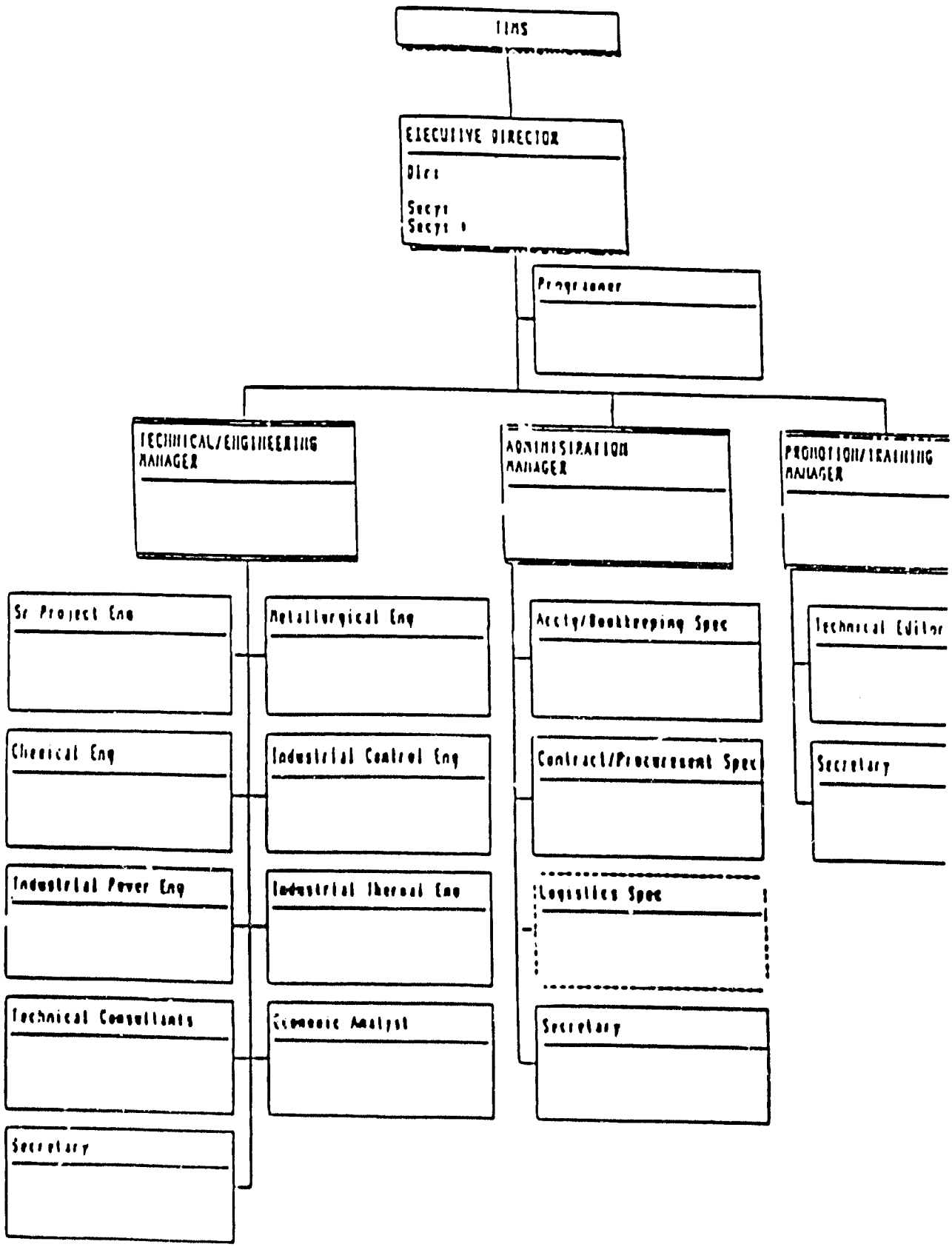


EXHIBIT D
ORGANIZATION CHART
TIMS/ECEP



1 - Personnel provided from TIMS budget

c) Federation of Egyptian Industries (FEI)

FEI will provide project promotion and information dissemination services to both the private and public sector components. FEI established a unit for energy conservation headed by an executive director as shown in Exhibit E. FEI responsibilities include:

- Project promotion throughout Egypt through seminars, publications and advertisements.
- Assisting DRTPC and TIMS in developing conservation data bases.
- Publicizing results of technology applications.

E. PROCEDURES FOR IMPLEMENTING TECHNOLOGY APPLICATIONS

The following procedures will be used for selecting, installing and monitoring technology applications:

- FEI, DRTPC, and TIMS promote ECEP through advertisements, workshops, seminars, brochures, and publications.
- A company submits a written request to DRTPC or TIMS to participate in ECEP.
- DRTPC or TIMS (with assistance from the Contractor) conducts an initial screening of potential demonstration projects (through audits, prefeasibility studies, or existing data and studies provided by company).
- A company submits a Letter of Intent to DRTPC or TIMS stating that it intends to implement a demonstration project under ECEP if the feasibility study confirms the project's viability.
- DRTPC or TIMS (with assistance from the Contractor) performs a detailed feasibility study of the proposed demonstration project.
- If the project is technically, economically, and financially viable, the company signs a contract with DRTPC or TIMS.
- The company posts the performance bond.
- Equipment is procured according to USAID regulations, by the Contractor.
- Equipment is installed at plant site.
- The company technical staff are trained in the installation, operation and maintenance of equipment.

- The company technical staff operate and maintain equipment.
- The company and DRTPC or TIMS monitor results of project.
- The performance bond is released after the company has monitored project for six months.
- FEI publicizes results of demonstration projects through seminars, workshops, and publications.
- DRTPC and TIMS offer training courses on the design, installation and operation of energy conservation technologies to management and technical staff of other industrial plants and commercial buildings.

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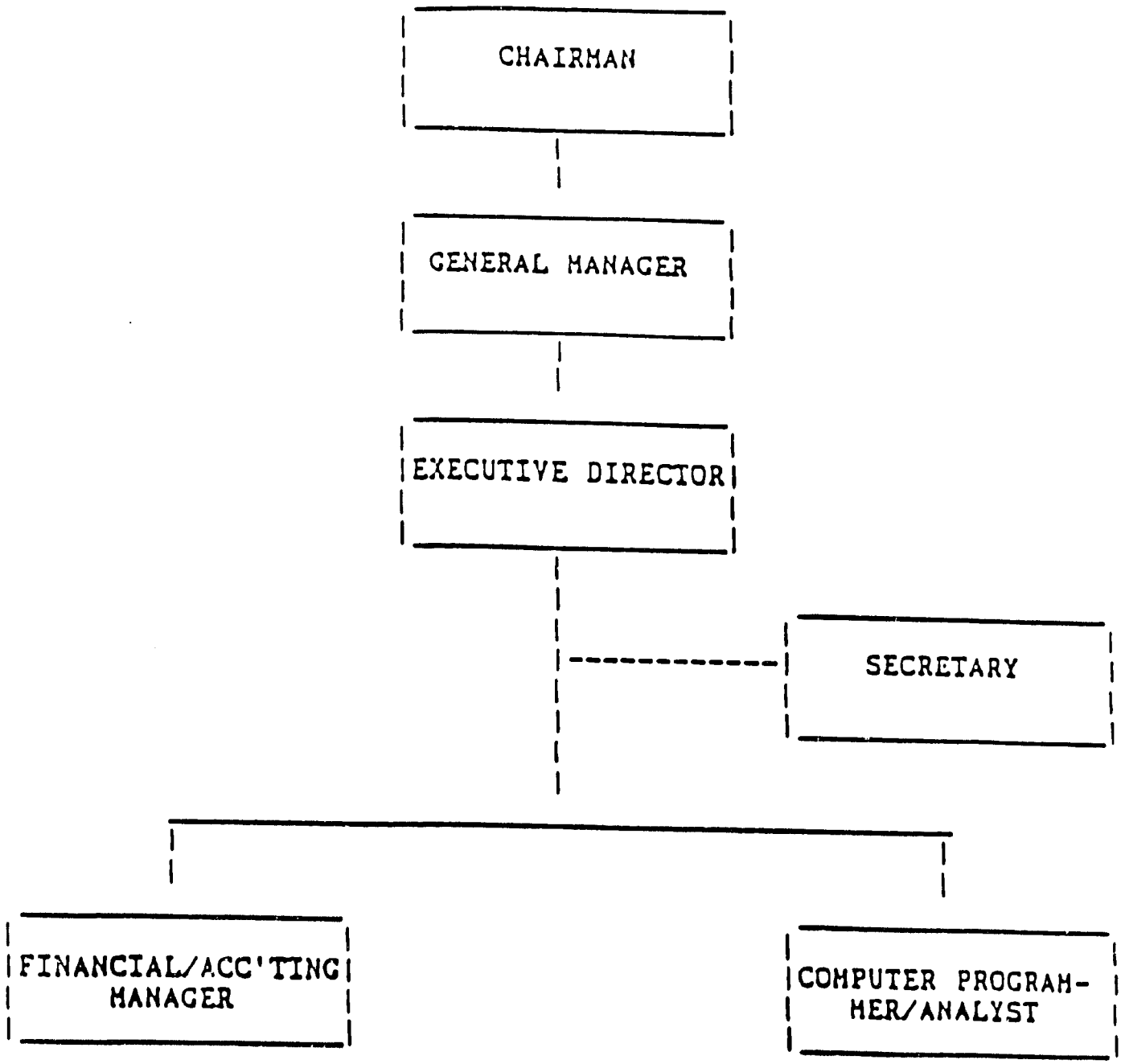
EXHIBIT E

FEDERATION OF EGYPTIAN INDUSTRIES
ORGANIZATION CHART
ENERGY CONSERVATION AND EFFICIENCY PROJECT



64

II. SCOPE OF WORK

The Contractor's responsibilities shall be to:

a) Provide technical and management assistance to TIMS (the Project Secretariat) and DRITPC and FEI units as to their organization, operating procedures, and administration.

b) Provide technical and engineering support for demonstrating the technology applications.

c) Assist TIMS, DRITPC and FEI units in marketing and promotion services.

d) Act as a Procurement Service Agent (PSA) and procure commodities, equipment and supplies for the private and public sector firms participating in the technology demonstrations.

e) Identify and arrange for training in the U.S., third world, and in-country for Egyptian participants.

f) Perform policy analyses related to ECEP.

Specific Tasks to be performed:

TASK 1: Provision of Management and Technical Support:

1) Management Support:

a. Resident Manager: The Contractor shall provide a full time resident manager to direct all the technical and administrative activities related to the Project. His responsibilities will include, but will not be limited to:

- Supervising and coordinating of overall contractor assistance in Egypt including the assistance in the selection of U.S. specialists for short-term assignments to Egypt.

- Working with the Executive Directors of TIMS, DRITPC and FEI on the preparation of an annual work plan for the different activities of the Project in close collaboration with USAID.

- Assisting the Project Secretariat (TIMS) in the organization of the Project Steering Committee meetings.

- Assisting the three Project Directors (of TIMS, DRITPC and FEI) in their day-to-day management operation.

- Reviewing and updating project evaluation criteria and project selection procedures for technology applications.

- Identifying, with the assistance of TIMS and DRTPC, specific demonstration targets.

- Identifying technical assistance, information needs, and organization of courses, seminars, and workshops to meet these needs.

- Following up, with the U.S. Resident Technology Application Coordinator, on the implementation of selected demonstration projects(including the supervision of engineering, financing, procurement, and monitoring activities) as implementation activities

- Preparing annual reports and budgets, as required.

- Performing administrative and management activities related to the Project as the USAID Project Officer may reasonably require.

b) Resident Technology Application Coordinator (RTAC)

As deputy to the RFM, the RTAC will have specific operational duties related primarily to the private sector, in-country training and promotion activities. The RTAC duties will include:

- Identifying and evaluating, with TIMS & DRTPC technical managers, specific demonstration proposals.

- Assisting in the implementation of the demonstration projects selected in the private and public sectors.

- Organizing and conducting on-going demonstration project monitoring activities.

- Preparing and disseminating (with PEI) project information to interested parties.

- Designing the in-country training programs in cooperation with DRTPC and TIMS training managers.

- Developing and organizing short courses in energy conservation technologies and applications as well as training of trainers.

- Coordinate the U.S. training by providing course information to potential participants, screening and assisting applicants in completing their various training arrangements.

2) Technical Support to TIMS, DRTPC and FEI: The Contractor, through its Resident Project Manager and its Technology Application Coordinator, shall provide technical and management support to TIMS, DRTPC, and FEI.

In particular, the Contractor shall assist the three Executive Directors, and their technical staff in:

- Organizing their respective ECEP operations such as upgrading their administrative and financial procedures.

- Updating and modifying, if necessary, the project development and implementation process which include: screening, evaluation and selection of technology applications, equipment selection, installation and start up, and project monitoring and reporting.

- Assisting in negotiating agreements with the company in which the technology application will be demonstrated.

- Assisting in organizing and conducting monitoring activities, analyzing results, and preparing technical and management reports.

3) Database Development and Management: The Contractor shall assist DRTPC, TIMS and FEI in identifying specific databases related to ECEP. These include identification of project database needs, identification/review of existing databases in energy in general, and energy conservation in particular. The Contractor shall provide DRTPC, TIMS, and FEI the necessary software and hardware to be able to implement these databases (a list of available software and hardware, already purchased, is attached as Annex 1). The databases will include:

- The names and addresses of registered companies in FEI.

- A mailing list for private and public sector firms.

- A tracking and reporting system for each technology application from its initiation, selection, audit, prefeasibility and feasibility stage to installation and monitoring of the energy efficient commodities.

The Contractor shall be required to build and expand on the database development and management for the project so that a Management Information System (MIS) is established for TIMS and DRTPC for technology applications. This will include, but is not limited to:

- a comprehensive data base of industrial plant characteristics such as products, processes, size and energy use.
- collection and storage of data about energy efficiency and energy saving for technology applications.

89

- an equipment procurement database.
- A U.S. equipment cost directory.
- establishment of monitoring and evaluation system to include:

  - a system of baseline survey, data collection, and analysis.
  - a follow-up and monitoring system for each technology application in each of the selected industrial firms.
  - an evaluation and follow-up system at the level of the ECEP inputs and outputs.

TASK 2: Technical and Engineering Support for Demonstrating Technology Applications:

During the remaining seven years, the Project will finance the foreign exchange cost of approximately 50 technology applications, half of which will be demonstrated in private sector firms and the other half in public sector industrial firms. During project implementation, the split of demonstration projects between the private and public sectors can be altered, subject to the demands from both sectors, the replicability of the applications to other firms, energy saving potentials, as well as the financial and economic merits.

The Project has so far identified four technology applications in power factor correction and energy management system; two applications are in the public sector and the two others are in the private sector. Currently, TIMS and DRTPC are conducting energy audits and feasibility studies.

The foreign exchange cost of the technology application that will be financed by the Project through the Contractor is:

- Energy audit, pre-and feasibility studies, conceptual and detailed engineering design.
- Purchase of the equipment and accessories including waranty and performance guarantee.
- Erection and installation supervision.
- Training; and
- Monitoring and evaluation.

It is expected that during the first three years of this contract there will be approximately 20 technology applications for the private and public sector among 10 types of technology applications stated in section B.1.a.; however, this figure should remain tentative. The Contractor should be aware that identification of demonstration targets and feasibility studies for technology applications are an on-going process that should not be interrupted before the 6th year of the contract.

In order to be able to design and implement energy efficient demonstration projects, the Contractor shall carry out or subcontract for, the following services:

a) Performing industrial energy audits at selected private and public sector firms to identify technology applications that fulfill the criteria set forth in Section C.

b) Carrying-out, with DRTPC and TIMS, detailed feasibility studies for demonstrating technology applications including data analyses, cost estimates, economical and financial analyses, conceptual and detailed engineering designs, as well as preparation of technical and performance specifications.

c) Working directly, with the client firm and with the cooperation of DRTPC and TIMS to prepare an implementation action plan as well as a plan for monitoring the energy saving for each installed technology. The Contractor will draw upon the services of Egyptian contractors and consultants as appropriate. If the in-country expertise is not available, the Contractor shall draw upon expatriate consultants or contractors to perform these services.

TASK 3: Procurement of Equipment and Commodities:

The Contractor shall be responsible for procuring all U.S. equipment and commodities for the Project. Because ECEP will set up commercial scale demonstration projects to prove the technical, financial, and institutional viability of using energy conservation techniques, processes, and procedures, the commodities to be purchased should be commercially available in the U.S, and, to the extent possible, ready made.

The type of commodities to be procured by the Contractor, can only be identified after the technology applications are selected and the feasibility studies undertaken. However, the 50 technology applications, to be implemented during the remaining 7 years of the project, may be broken down as follows: (numbers are given in parenthesis)

- Process Controls: (5)
- Energy Management Systems: (5)
- Combustion Controls: (6)
- Waste Heat Recovery Systems: (6)

- Cogeneration Systems: (3)
- High Efficiency Electric Motors; (6)
- Power Factor Improvement Systems: (8)
- Insulation Materials: (6)
- Solid Fuel-Fired Combustors: (3)
- High Efficiency Lighting: (2)

The above closely reflects industry needs, although actual implementation is likely to result in a slightly different mix of technology applications.

Each generic technology consists of a number of specific pieces of equipment as shown in Annex 2 of the Statement of Work. In the case of the generic technology "Waste Heat Recovery Systems", the specific pieces include:

- Waste gases scrap preheaters.
- Condensing heat exchangers.
- Ceramic and non-ceramic recuperators.
- Heat pipes.
- Shell-in-tube heat exchangers.
- Flat plate heat exchangers, and,
- Air preheaters and economizers.
- Recuperative burners.

Foreign exchange cost of the commodities widely varies from one technology to another. It may be as low as $60,000 for waste heat recovery technology, and as high as $1.2 million for bottoming cogeneration. It is, however, difficult, at this time, to estimate the exact type, quantity, and price of the commodities. For budgetary purposes, it is estimated that the cost of the commodities and services is $5.0 million dollars (CIF Cairo airport or Alexandria port). In the event this amount is insufficient to cover the cost of 20 technology applications, a modification to the contract, subject to the availability of funds, may be made after 75% of the commodity cost has been committed.

In addition to the commodities and equipment for the demonstration projects, the Contractor shall purchase:

a) Auditing and monitoring equipment at a cost not to exceed $150,000 to assist DRTPC and TIMS and its technical staff in energy audit and monitoring.

b) Microcomputer, accessories and supplies to assist TIMS and DRTPC in calculating energy intensity rates, tracking the energy consumptions and their constituents and managing project activities in other particular sectors.

c) Two (2) field vehicles and 2 passenger vans to facilitate the transportation of the contractor staff, TIMS' DRTPC's and FEI's technical staff (subject to USAID prior approval). The authorized source and origin code for these vehicles is 000 (U.S. only). Sedan vehicles are not authorized under this contract.

To facilitate the procurement process, a waiver from USAID procurement regulations set forth in Handbook 11, chapter 3, was authorized. This will allow procurement procedures to fall under Handbook 15, chapter 3, section 3.B.1., which uses AID Regulation 1 for the Commodity Import Program (CIP). Reg. 1 procedures are known to the public and private sectors. This is important to Project success. In particular, private sector firms are very concerned that unnecessarily stringent requirements will delay procurement and implementation while increasing administrative costs. In addition, installing these technologies in some cases make it difficult to define precise technical specifications at present. Finally, these technologies can be an integral part of an industrial process, and will likely affect the entire process or product quality. Thus cost alone may not be the best determinant of the best option.

The Contractor shall perform the following services as a Procurement Service Agent (PSA):

- Prepare a procurement plan.
- Prepare technical specifications for each commodity to be procured and/or review the specifications, if submitted by the firm or DRTPC or TIMS, in order to ensure their adequacy.
- Prepare listing of spare parts, supplies and accessories needed for the purchased equipment.
- In collaboration with client firm, DRTPC and TIMS, prepare the necessary requirements and equipment layout to ensure that equipment will be operational after installation.
- Determine requirements for necessary utilities (water, air, gas) and confirm that they are satisfactorily installed at the proper site prior to shipment of equipment.
- Determine operator training requirements for all purchased equipment/commodities.
- Procure equipment and supplies and obtain all necessary approvals including export licences.
- Obtain from AID/Washington Office of Information Resources Management (IRM) its approval for all software and hardware to be purchased for the technology applications.
- Provide for consolidated shipment of equipment and supplies to the project site on a timely basis, packaging for export, arrange and contract for freight.

- Arrange for independent or visual inspection to assure that all plans are executed for set-up and initial operation after confirming the facility readiness;

- Provide for warehouse-to-warehouse insurance coverage of equipment to its destination at Cairo Airport or Alexandria port. Marine or air freight insurance shall be in the name of the buyer on all cargos at 120% of the CIF value;

- Determine charge and promptly file, process and handle any claims;

- Arrange for equipment service maintenance contracts;

- Clear equipment from U.S. customs and ensure that firms have cleared customs after obtaining the necessary documentation from TIMS and DRTPC.

- Submit, on a quarterly basis, a status report to the Project Secretariat, DRTPC and USAID/Cairo which indicates, at a minimum, what procurements are currently being advertized or solicited, which commodities have been ordered and their CIF prices, names of the suppliers as available, expected shipping dates, actual shipping dates and names of vessels.

For all the above services, the Contractor shall maintain a computerized system of procurement management, and administration to assure smooth and expeditious procurement operations, supplier's performance with terms and conditions, specifications of contracts or purchase orders as well as to assure adequate and prudent deliveries.

TASK 4: Marketing and Promotion Services:

A vital output of this Project will be the development and implementation of awareness campaigns as well as the publication and dissemination of information in energy conservation so that other industrial firms could replicate and introduce these technologies. The Federation of Egyptian Industries (FEI) will provide project promotion and information dissemination services to both the private and public sector components. In all of its private sector activities, FEI will be assisted by DRTPC and the Contractor. FEI will also be assisted by the Contractor and TIMS, in carrying out its responsibilities for the public sector activities.

1. Information and Awareness Campaigns

As part of its information and awareness campaigns the Contractor shall:

a. Contact, with DRTPC's, TIMS' and FEI's assistance, Egyptian A/E firms, professional associations, and GOE agencies specialized in energy to exchange information on the potential of energy savings and to provide update on energy efficient technologies and practices in Egypt and worldwide.

b. Identify potential equipment suppliers and costs by obtaining catalogues from suppliers and developing and updating energy equipment and cost directories to be kept in DRTPC and TIMS. This information will also be available to A/E firms, private and public sector firms that have, or intend to introduce, energy conservation and efficiency technologies.

c. Prepare and implement a strategy and action plan to inform the industrial and commercial sectors, the participating firms, of the benefits available through energy efficiency and energy conservation.

d. Conduct energy use surveys on an annual basis. These surveys will form the basis for monitoring change in energy consumption with special emphasis on private energy sector industrial and commercial use. The Contractor shall also process and analyze the data to determine the performance of project activities (in percent change of energy saving and energy intensity by firm and subsector) and the overall performance of these demonstration projects toward this end.

2. Publication and Dissemination of Information

As part of publication and dissemination of information, the Contractor shall provide, through the following channels:

a) Newsletters and pamphlets: issued regularly and will be directed primarily to the industrial or commercial sector, GOE energy agencies, universities, A/E firms to inform them about project implementation, installation of the demonstration projects, technical and economic benefit for installing these technologies. The Contractor shall prepare, with DRTPC, FEI, and TIMS, the necessary materials for publication. Printing costs of these newsletters and pamphlets will not be part of the contract but will be paid directly by the GOE implementing agencies.

b) Workshops and seminars: organized at least twice a year, for 2-3 days, by each of the three agencies and will be directed towards the different aspects of energy conservation, system design, construction, and financing energy conservation, management policy analysis, such as companies' energy use, sectoral demand analysis and consideration of energy pricing policies. Case studies on local and foreign examples will also be used. The Contractor shall be required

to prepare the materials, manuals, and case studies for these activities. The Contractor shall also pay for international travel and per diem for a total of 50 person days during the three years of the project in order to enable U.S. experts to participate in these seminars. All other logistics related to the organization and preparation of these workshops will be provided by the implementing agencies. Details on the topics of these seminars are found in Task 5 below.

TASK 5: Training:

The objectives of the training program are to: (1) develop end-user skills and capabilities to adopt and assimilate energy efficient technologies in industry, and (2) to upgrade the skills of local institutions to support and accelerate this process.

Both short- and medium-term training will be conducted, mostly in-country, but also in the U.S. Training will differ in type and duration for each institution involved, industry group, and type of personnel (e.g., engineers vs. management).

Up to 255 persons may receive local training (mostly through on-the-job activities, workshops, and seminars) during the first three years of the Project. The Contractor will be requested to provide 10 persons month of U.S consultants and 5 persons-month of Egyptian consultants for in-country training. Furthermore, 20 Egyptian participants will receive short term training in the U.S. and in third countries.

1. In-Country Training:

a. Training for Industrial Enterprises and Architecture/Engineering (A/E) Firms:

Training will focus on developing skills among technical and management personnel at sites selected for technology applications in the following areas: proposal preparation; design, procurement, installation, maintenance, operation, and monitoring of energy efficient technologies. Particular attention will be given to improving the skills of technical staff in selecting, maintaining, and operating instrumentation. Local A/E firms may also require some training to adapt U.S. technology design and operating characteristics to Egyptian conditions.

b. Training for TIMS, DRIPC, and FEI:

The Project Secretariat and the DRIPC unit will need training in day-to-day project management, evaluating and selecting proposals, preparing financing packages, project monitoring and providing technical assistance and training to public sector enterprises.

.96

Training will also be provided to FEI to assist in Project publicity, promotion, database development, and information dissemination, through a series of workshops and seminars, and preparation of publications.

c. Training for Industry-at-Large:

Industry, especially private enterprises, needs extensive technical and managerial training in order to reduce energy consumption. A large number of private firms are unaware of their energy consumption, and have little knowledge of what to do to reduce it. Similarly, public enterprises are demanding a major effort to train their staff in energy efficiency practices and energy conservation project evaluation, with a strong preference for on-site, practical training. Therefore, this training component is intended to: (1) meet this demand and need; and (2) extend the Project benefits beyond their direct and immediate effects (i.e., installing a number of energy efficient technology applications). Activities considered under this component would include studies, seminars, and workshops tailored to target industries (e.g., metallurgy, chemicals, cement), and topics such as instrumentation, controls, and energy management systems.

Training will also include energy audit techniques, overall energy management, project identification and evaluation, and specific topics such as:

- Efficient boiler operation (classroom and on-the-job).
- Housekeeping of steam systems (classroom and on-the-job).
- Selecting and operating combustion controls (classroom and on-the-job).
- New technologies (mostly classroom, with site visits, where possible).
- Instrumentation (a TIMS laboratory is established for this type of training).

2. a. Training in the U.S.:

Training in the U.S. will be limited to selected technical and management personnel from the industrial firms in which the technology applications will be installed. During the first three years, approximately 20 will receive on-the-job training in the U.S. for a total of 30 person-months. Their selection should be based on the importance of these technology applications (i.e. investment size), their replicability, potential in Egypt, and complexity.

97

US training may also be extended to developing countries at a similar organization, such as ENMAP in the Philippines, or ENERCON in Pakistan, so that participants can be acquainted with the local capabilities and the energy conservation programs of these institutions.

b. Study tour visits: by selected personnel from the participating firms, DRTPC, TIMS, and FEI staff, to visit similar facilities in the U.S. and learn from observation and discussion with U.S. firms and agencies on how energy conservation technologies are applied. A total of 35 persons, for an average of three weeks each, will be required.

The number of persons trained and the areas of training disciplines may change as conditions warrant. Specifically, the Contractor shall be responsible for:

- Preparing a training implementation plan which schedules the proposed training activities for the participants.

- Providing training description, type of courses, duration, proposed participants and qualifications. Such description will be for inclusion in a Project Implementation Order for Participants (PIO/P) to be submitted by the Contractor to USAID/Cairo, Office of Science and Technology. (See Appendix I, Attached)

- Paying for subsistence, medical insurance, training fees and related allowance.

- Submitting to USAID's Project Officer, on a quarterly basis, the following information: trainee's names, job title, training objective, training duration, and the training cost.

- Monitoring, following up and reporting to AID on the training results.

All participant training (either in the U.S., third country, or in-country) will be accomplished in accordance with the policies, allowances, guidance and reporting requirements of AID Handbook 10, Participant Training and appropriate USAID Mission Order related to training. Please note that travel for Egyptian participants will be paid from Egyptian pound funds provided by USAID/Cairo. It is, however, expected that the Contractor will be required to administer these travel funds on behalf of USAID/Cairo.

TASK 6: Policy Analyses:

The Project will provide policy analyses through two types of studies; technical, and policy oriented, to advise decision makers in the public and private sectors on further steps necessary to support energy conservation program activities. The Contractor, with the assistance of DRTPC and TIMS, shall prepare terms of reference, and conduct these studies after submitting them to USAID for approval.

Tentative topics for possible technical and policy studies are:

- Review of policy constraints to energy conservation in the industrial sectors in particular in the chemical and metallurgical industries.
- Review of government laws, regulations and taxes affecting energy conservation technology and policy options for introducing and replicating energy efficient technologies in the commercial and industrial sectors.
- Energy policy options for improving efficiency of existing suppliers and better energy demand management to find ways to rationalize energy use.
- Impact of demand side options in electricity supply and demand.

Each of these studies will describe the data collected, the analysis made, the mechanisms and the recommendations made. The Contractor will present the results to USAID, TIMS and DRTPC and modify them, as appropriate, based on their comments.

APPENDIX E

PEOPLE INTERVIEWED

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PLANT VISITS

Out of the 11 plants or hotels or 12 TAs we inspected, there are 2 successful projects implemented (*) and 4 projects being implemented without large problem:

- *Egyptian Beverages (PFI)
- Abu Zaabal (WHR)
- EIPICO (EMS)
- *Bishara Textile Garment (PFI)
- Asfour Crystal
- ALUMISR is proceeding at the satisfaction of the plant manager, even it is not replicable.

Beside the compulsory purchase of US equipment, the major delays originated from:

- the Gulf War
- Specs not accepted - National Metals Industries (PFI)
- Defect in equipment supplied - Ramses Hilton (HEL and EMSs)
- Cautiousness of the plant management - Asfour Crystal (CC and WHR)
- TAs to be accepted by the licensor - EIPICO (EMS)

Some TA were found or are nor replicable: ALUMISR (COG), COKE (COG), Ramses Hilton (infra-reds sensors).

We found out that not all the potential has been identified in the following plants. There is in these plants a large number of ECOs:

- ALUMISR (lighting, WHR, EMS),
- Ramses Hilton (heat recovery on compressors, reduction in air change, condensates recovery, lighting, EMS),
- Egyptian Beverages (Heat recovery on compressor, Cold recovery on liquid CO2, lighting, electricity contract),
- EIPICO (Replacement of electromagnetic ballasts by electronic ballasts, replacing V belts by flat belts, insulation of valves and flanges, installing photoelectric cells in the compressor room, Reduction of excessive lighting in the offices, install turbulator in the fume tubes of the boiler, shifting from solar to mazout, improving the boiler efficiency (it is only 80%, instead of 90%), cold recovery on cold air extracted from the rooms), B
- BTM (Improvement of the boiler efficiency, Installing a case around the steam drum dryer, reduce the leaks, insulation of the pipes).

In only one case we found a bad relationship with the plant management (National Metals Industries).

RECOMMENDATION (To be under 7.23)

We recommend that audits should be proposed to the plant where successful TAs are implemented or are being implemented to identify other TAs:

- Egyptian Beverages,
- Abu Zaabal (WHR),
- EIPICO (EMS),
- Bishara Textile Garment (PFI) to identify other TAs,
- Asfour Crystal,
- ALUMISR.

Efforts should be made to build up a good image for the project in the hotel sector and make hotel managers forget the bad image created by the Hilton project. In this sector the potential is large fast growing.

COMMENT ON VISITS

ALUMISR (COG) - Equipment should arrive in Alexandria in June 1992. According to the DRTPC calculations (based on international energy prices), the payback of the 525 kVA COG plant is 3.56 years. No plant manager will be attracted by such a high payback; he has many other opportunities with a shorter payback. Moreover there is now a trend for medium size plants to get away from this kind of cogeneration, just be cause plant managers realize that their job is to make textile, ceramic and aluminum section and not electricity. I see no chance of replication for such a small capacity plant, as long as there is no action from the GOE to make them economical from the entrepreneur point of view.

Under ECEP guidance the management implemented several other ECOs: Cover on tanks, PFI, steam distribution improvement, etc.

However there is still in the plant other ECOs on lighting, WHR, EMS. WHR payback was found to be about 7 years This figure looks very high and is not backed by any calculation. As there is neither WHR nor regenerative burners, the potential for energy conservation is still about 50% on gas burnt in the kilns. This plant should be audited.

COKE (CC and COG) - Both are good projects on technical and economical grounds. The 22 MVA COG plant payback is about two years and the Coke management seems eager to implement the COG project as soon as possible. The two projects are linked as the boilers and the COG will be controlled by the same EMS. USAID decided not to finance this project under ECEP. There are within USAID or other agencies (the World Bank seems the ideal candidate) funds for such a project.

RAMSES HILTON - When visiting the hotel and discussing with the technical staff we identified several ECOs (heat recovery on compressors, reduction in air change, condensates recovery, lighting) that were not identified by the studies. We found out also that a basic indicator (kWh on bed night) is not known. This means that neither an audit nor even a diagnosis has been carried out.

RAMSES HILTON (HEL) - If the 250 fluorescent compact lamps had been purchased on the local market after the short study required for such a simple project, these would have been installed in May 1989. Short of that, we have to face a long stories of expensive lamps (US$ 38-LE 125 instead of LE 55-75 on the local market) without electronic ballast (potential saving: 21%), that blew up, failed lamps sent back to the supplier, replaced by lamps that blew up again, duties paid on replacement lamps, etc. And finally, after about three years, the lamps are not installed yet. To get out of this mess, Ramses Hilton should be allowed to buy the lamps on the local market as soon as possible.

RAMSES HILTON (Infrared sensor) - An experiment was made on installation of infrared sensor that detects the presence of a guest and disconnect lighting and air conditioning when there is nobody. The sensor was said to pay back in 18 months. This payback looks very lo

Supposing the staff has not been trained in energy conservation, we found a payback of 6 years (ECEP document states 8.7 years with a COP of 4.7, which is too high). If the staff has been trained, the payback goes up to 12 years).

The 18 month payback was found too long for the Hilton Management. Moreover what is acceptable for a 3 star hotel, is not for a 5 star hotel. A client cannot enter a room which is not cool. There are other ways to save on energy in a 5 star hotel and some of them have a far shorter payback and yhey keep high the hotel's image. An audit would identify them.

We noted switches installed on the windows. This the only saving device which is economical to install in an existing hotel room.

196

RAMSES HILTON (EMS) - The equipment was shipped and it was found out that some items were missing and some drawings did not correspond to the equipment. It is clear that as soon as those problems arose, the supplier lost interest in the project and let it down. The responsibility for the project shifted from one person to another one, and even from one country to another one. At present after two years, still there are some missing parts, the 20% deposit is still frozen, the local contractor is claiming some compensation, the project is still at the erection stage.

EGYPTIAN BEVERAGES (PFI) - A part from a six month delay due to the Gulf War, the project went on very smoothly and finally the management is very happy with the equipment, the warrant deposit was refunded. When discussing with the management we identified several ECO (Heat recovery on compressor, Cold recovery on liquid CO2, lighting, electricity contract). Here again no audit has been made.

ABU ZAABAL FERTILIZER (WHR) - This is a complex project involving TIMS, OBI and a french firm who supplied one of the sulphuric plants, where one steam turbine will be installed. The other turbine will be installed on another sulphuric plant from romanian origin that will probably be partially revamped by the same french firm. As soon as the steering committee accepted the project, things went smoothly. The TIMS Project Officer was very instrumental in coordinating all the partner involved.

NATIONAL METALS INDUSTRIES - A project running into trouble:

- Specs drafted by WAFA Consultant, non accepted by OBI (one year delay).
- Specs modified be cause no american supplier could bid for capacitors for two different voltages. Bid split into two different bids (6 month delay), when finally only one supplier (ABB) was selected.
- Project officer unable to give to the plant management a timetable (when the TIMS Gantt chart gives for the project a completion date, 14 August 1992).
- Not very good relationship with the plant management.

A project that would have required about one year from the feasibility study up to commissioning, if the equipments had been purchased locally, will require at least two years and a half.

ASFOUR CRYSTAL - The management is cautious and this slowed down the project's implementation but probably made it more replicable. In house modifications were implemented before the TAs (CC and WHR) were considered. The proposals by DRTPC, were found too advanced and too sophisticated; they were not accepted; a new study was carried out and its results accepted by the plant. In the report in our hand only three ECOs were identified (CC, PGI and demand reduction). For a large plant like ASFOUR's one can expect a list of about ten to twenty ECOs. The energy conservation specialist of the Team did not visit the plant but thinks many ECOs have been missed and thinks an Energy audit is required for this plant.

EIPICO (EMS) - There are in this plant about 60 air handling units sending treated air in rooms with different programs. It would be feasible to make this intallation work by hand and save energy. ECEP recommended EIPICO to do it by installing a central programmming station. This system will procure savings but most of them could be have been obtained by manual control. This would have been time consumming. This is the reason why EIPICO adopted what ECEP calls an EMS. I would rather call it an air handling unit management system.

EIPICO is a large consumer of ECEP services (training, lighting improvement, boiler tuning) and is making good use of them. They are very energy saving conscious and competent.

The implementation process was slow be cause all suggested modifications have to be agreed by their licensors (Squibb, Upjohn, Merck, Allergan, etc.).

We inspected the plant and identified several ECOs:

- Replacement of electromagnetic ballasts by electronic ballasts.
- Replacing V belts by flat belts.
- Insulation of valves and flanges.
- Installing photoelectric cells in the compressor room.
- Reduction of excessive lighting in the offices.
- Install turbulator in the fume tubes of the boiler.
- Shifting from solar to mazout.
- Improving the boiler efficiency (it is only 80%, instead of 90%).
- If energy prices allows it, cold recovery on cold air extracted from the rooms.
- I have also serious doubt on the EIPICO deshumidification. equipment. They use a very complex and energy consumming process. I would recommend ECEP to contact a firm or a consultant specialized in HVAC in pharmaceutical plant.

An energy audit is required for this plant.

BISHARA TEXTILE GARMENT (PGI) - Starting from the first contact between ECEP and BTM (a FEI letter) and the commissioning it took ECEP not least than a year and a half to implement the project. No wonder that BTM facing huge power factor penalities decided to buy the capacitors immediately on the local market.

We identified a few ECO's:

- Improvement of the boiler efficiency by increasing the fuel oil temperature from 75 to 90°C.
- Installling a case around the steam drum dryer.
- Reduce the leaks.
- Insulation of the pipes.

BTM has an excess of condensates. This means the plant is not very energy efficient and an audit is required to reach the usal set of 10-15 ECOs, instead of the 4 ECOs we have noted.

The BTM chairman, is not very interrested by energy conservation is is much more concerned about Environment Protection: his plant is a big polluter.

SEMADCO - This sub-project is not related directly to energy conservation. However its aim is to treat water with a very high mineral content and make it suitable for energy related equipment (condenseur and cooling tower). The result is a multiplication of the efficiency of the SEMADCO power station by a factor of three. The generated power will go up from 14.6 MW to 46 MW, without additional fuel consumption. Moreover the project is highly replicable.

APG - The Management recognized that ECEP "helped them a lot" but it is very impatient to get the CC equipment as soon as possible and connect it on its process control equipment. When requested to indicate a delivery date, the officer in charge quoted June 1992. The Gantt Chart submitted to us the next day indicated December 15, 1992 instead.

We noted that the heat losses are very high on the new kiln, particularly on hte surfaces next to the recuperator. Is it possible to reduces them when the kiln is running? this should be investigated.

APPENDIX G

LIST OF DOCUMENTS REVIEWED

ECEP

LIST OF DOCUMENTS CONSULTED

Documents consulted as part of the evaluation included (but were not limited to the following:

USAID

1 Draft Mission Strategy Statement, November 18, 1991.

2 An assessment of science and technologu and aid assistance in Egypt, circa 1984.

3 USAID - Energy Efficiency Program.

4 USAID - World Bank Views on Egyptian Environmental Activities, July 28, 1991

Terms of reference

5 Science and Technology for Development (263-0140) - Master evaluation scope of work for all components.

6 HBI - Draft for Scopes of Work for Glass/Ceramic Sectors Survey and for ASSFOR Glass Factory Feasibility study.

ECEP

7 ECEP/Public Sector component - Steering Comittee of January, 10, 1991 - List of attendees.

8 Science and Technology for Development (263-0140) - Project Paper

9 Summary of the OBI survey on the opportunity to introduce maintenance and operations related activities in their list of TA.

10 ECEP - Technical Procedures, September 1990.

11 Ramses KHALIL personnal résumé

12 ECEP/OBI - Engineering shortfall awareness

OEP-ECEP relationship

13 USAID - GOE Designated Representatives for S&T Development Components, July 28,1991

14 USAID - Cooperation ECEP/OEP, September-October 1991

15 OBI - Letter to Dr Mohi S. Selim Chairman, OEP, December 16, 1991.

Contracts

16 USAID - Sub Grant Agreement between the Arab Republic of Egypt and the United States of America for Energy Conservation and Efficiency, Science and Technology for Development Project. August 4, 1988.

17 USAID - First Amendment to SubGrant Agreement between the Arab Republic of Egypt and the United States of America for Energy Conservation and Efficiency,

Science and Technology for Development Project. June 15, 1989.

18 USAID - TIMS PIL 1. November 27, 1988

19 USAID - TIMS PIL 1, Amendment 1. April 29, 1989

20 USAID - Letter to the Ministry of International Cooperation. November 28, 1988

21 USAID - TIMS PIL N°3. April 29, 1989

22 USAID - TIMS PIL N°3, Amendment 1. January 17, 1990

23 USAID - TIMS PIL N°3, Amendment 2. March 4, 1991

24 USAID - TIMS PIL N°3, Amendment 3. April, 1991

25 USAID - DRTPC PIL N°4. April 2, 1988

26 USAID - FEI PIL N°5. April 2, 1988

27 USAID - Two letters to TIMS requesting quaterly reports. November 15, 1989 and April 23, 1990

28 USAID - TIMS PIL N°6. April 12, 1989

29 USAID - TIMS PIL N°9. April 30, 1990

30 USAID - TIMS PIL N°12. October 21, 1990

Procurement

31 USAID - Approval of the Bechtel Procurement Procedures Manual.

Description of the Project

32 ECEP - Description (pamphlets)

33 ECEP - Electricity Conservation and Efficiency Project

34 ECEP - Gas Conversion Assessment

The partners

35 FEI - Private Sector Pavillon. Cairo International Fair 1992.

36 TIMS - Prospectus 1991

37 TIMS - The Bulletin, January 1991, N°57

38 FEI - Executive Director; Job description. April 12, 1989.

39 TIMS - Steering Committee Attendees.

Workplan

40 FEI - Statement of Work. March 25, 1989.

41 OBI - Work Plan May 1991, May 1992

Progress reports

42 OBI - Current statistics on ECEP trough the end of September 1991.

43 ECEP/ΓIMS Progress Report

43.1 - March 1991
43.2 - April 1991
43.3 - May 1991

44 ECEP - Annual Report. March 1990.

45 FEI Year book

46 HBI - Energy Conservation Services Program, Sixteenth Quaterly Report, April 1, 1991 - June 30, 1991.

47 ECEP/FEI - Monthly report December 1991.

48 ECEP - Projects Implementation Charts

49 ECEP - Annual report 1990-1991

50 ECEP/OBI - February 1992 monthly project meeting

51 ECEP/OBI - Quartely Progress and Fiscal Report. October 1, 1990 - December 31, 1990.

52 ECEP/OBI - Quartely Progress and Fiscal Report. January 1, 1991 - March 31, 1991.

53 ECEP/OBI - Quartely Progress and Fiscal Report. April 1, 1991 - June 31, 1991.

54 ECEP/OBI - Progress and Fiscal Report. July 1, 1991 - December 31, 1991.

55 MOI - Letter of the Minister to be included in the 1991 ECEP Annual Report (not yet officially released)

Training

56 ECEP - Training Program 1990-1991

57 ECEP - Training Program 1992 (arabic and english versions)

58 ECEP - Workshop on industrial furnaces, Cairo, February 25 - 25, 1992; Agenda

59 ECEP - Technical Manuals prepared by HBI

59.1 Energy efficiency in steam systems (manual)
59.2 Improving combustion efficiency (manual)
59.3 Waste heat recovery (manual)
59.4 Energy management for companies (manual)
59.5 High efficiency lighting (manual)
59.6 Insulation and refractories (manual and descriptive pamphlet)
59.7 Energy efficient electric motors and drives (manual and descriptive pamphlet in arabic)
59.8 Energy measurement and instrumentation (manual and descriptive pamphlet in arabic)
59.9 Industrial furnaces (manual and descriptive pamphlet in arabic) Cogeneration (manual and descriptive pamphlet in arabic)
59.10 Energy management systems (manual and descriptive pamphlet in arabic).

41 ECEP - 27 Technical papers in arabic

59.11 Bases for energy conservation, July 1991.
59.12 Cogeneration, July 1991.
59.13 Industrial lighting, July 1991.
59.14 Power factor improvement, July 1991.
59.15 Boiler Maintenance, July 1991.
59.16 Waste heat recovery, July 1991.
59.17 High efficiency lighting, July 1991.
59.18 Insulation, July 1991.
59.19 Steam traps, August 1990.
59.20 High efficiency motors, September 1990.
59.21 Substitution of incandescent lamp by fluorescent lamps, October 1990.
59.22 Use of natural lighting, November 1990.
59.23 Waste heat recovery, December 1990.
59.24 Putting a cover on tanks containing hot solutions, January 1991.
59.25 Reducing blowdowns, February 1991.
59.26 Reduction of excess air by acting on the burner blower, March 1991.
59.27 Steam leakages, April 1991.
59.28 Scale prevention, May 1991.
59.29 Boiler tuning, June 1991.
59.30 Steam cost, July 1991.
59.31 Condensate recovery, August 1991.
59.32 Reducing air pressure in air compressed systems, September 1991.
59.33 Reducing air temperature in compressor house, October 1991.
59.34 Leakages in compressed air network, November 1991.
59.35 Reuse of hot water in washing, December 1991.
59.36 Waste heat recovery in dryers, January 1992.
59.37 Use of wastes as fuel, February 1992.

Technical studies

60 OBI - Report on short-term screening assistance for ECEP/DRPTC, August 15, 1990.

61 OBI - Screening Report for Misr el Amria Spinning and Weaving Company, December 3, 1991.

62 DRTPC - Energy conservaiton opportunities at Nile Metallic Industries, February 25, 1991.

63 ECEP/DRTPC - Site visit report to National Company for Maize Products, May 1991.

64 HBI - Report on visit to National Company for Maize, March 20, 1991

65 HBI - Drafts for Scopes of Work for Glass/Ceramic Sectors Survey and for ASSFOR Glass Factory Feasibility study. July 8, 1989.

66 ECP/DRTPC -- Prefeasibility Study. Energy Conservation Projects at Arab Pharmaceutical Glass Company. November 1990.

67 ECP/DRTPC - Feasibility Study for Energy Management System (EMS) at EIPICO (Egyptian International Pharmaceutical Industries Co. March 1991.

68 ECEP/DRTPC - Technoeconomic feasibility of combustion control, waste heat recovery and thermal insulation for aluminum melting furnace in the Arab Aluminium Company. February 1992

69 ECEP/TIMS - Combustion efficiency improvement for Egyptian Copper Works Open Hearth Furnaces, November 1989.

70 ECEP/TIMS - Terminal Technical Report on Thermal and Technological Operation Improvement for the Egyptian Copper Works 50-tons Open Hearth Furnace, February 1990

71 ECEP/TIMS - Feasibility study on Delta Steel Mills Company - Revamping of the Wellmen reheating furnace, December 1989.

72 ECEP/TIMS - Feasibility study on Nationl Metal Industries Co. Energy Conservation in Arc Furnaces. TA Control Process. 1991

73 ECEP/TIMS - Power factor improvement at Nationl Metal Industries Co. November 1989.

74 ECEP/TIMS - Revamping Of The Wellman Reheating Furnace. Delta Steel Mills Co. November 1989.

75 OBI - Feasibility study. SIMO Paper Company. Cogeneration technology Application.

76 Ramses Hilton - Energy savings.

77 Giza Cable - Power factor Improvement.

78 Seven Up - Power factor Improvement.

79 Arab Contractors - Power factor Improvement.

80 Trenco - Power factor Improvement.

81 Nametin - Power factor Improvement.

82 El Shourbagy Textile Co. Feasibility Study. Power Factor Project.

83 Kafr El Zayaat Pesticide Plant. Feasibility study update/revision. May 26, 1990.

84 ECEP/TIMS - Combustion Control Project of Alexandria Portland Cement, July-September 1991.

85 ECEP - A feasibility study on Abou-Zaabal Fertilizer and Chemicals Co.

86 OBI - Survey of the El Nasr Fertilizer Complex, Talkha, June-July 1990

87 ECEP/TIMS - Prefeasibility Study

87.1 - El Nasr for refractories and ceramics (Sornaga). Heat recovery of down draught kilns. TA: 1 - Automatic Combustion Controls. 2 - Waste heat recovery Systems. 3/09/1990
87.2 - Paper Converting Co, "verta". Wastes Incinerator for steam Production. TA: Solid Fuel Boilers. August 1990.
87.3 - Kafr El-Zayat Pesticides ans chemicals Co. Steam System Improvement. Waste Heat Recovery. August 1990.
87.4 - Transportation and Engineering. Wastes Incinerator for Steam Production. Solid Fuel Boilers. September 1990.
87.5 - General Metal Company. Combustion air preheaat for aliminium melting and holdings furnaces. Waste heat recovery. September 1990.
87.6 - Cairo Metal Products. Reduction of coke consumption in cupola furnaces. 1 - Waste combustibles and waste recovery. 2 - Combustion Control. September 1990.
87.7 - Abu Zaabal For Fertilizers and Chemicals Co. Wastes Incinerator For Steam and SO2 Production. Solid Fuel Boilers.
87.8 - Alexandria CO. for Portland Cement. Rotary kiln Efficiency Improvement. 1 - Combustion Control. 2 - Insulation Materials. August 1990.
87.9 - Egypt Spinning and Weaving, Fayoom. Electrical Energy Conservation. 1 - High Efficiency Lighting. 2 - High Efficient Motors.
87.10 - Misr Spinning and Weaving Co, Mahalla El Kubra. Heat recovery in Scouring and Bleaching. Waste Heat Recovery. September 1990.
87.11 - El Nasr Steel Pipes and Pipe Fittings Co. Reduction of Coke

consumption in Cupola Furnaces. 1 - Waste combustibles and waste heat recovery. 2 - Combustion Control. 3 - Control Process. 1990
87.12 - Egyptian Copper Works - Combustion air preheat for Aluminium melting and holding furnaces; Septembre 1990

88 ECEP/OBI - SEMADCO El Nasr Fertilizer Complex, Water and Energy Efficiency, December 1990.

89 ECEP - Demonstration Project. Combustion control using portable combustion analyzers. July 1991.

90 El-Nasr for Coke and Chemicals - Request for USAID for Coke Plant Cogeneration Project

91 El-Nasr for Coke and Chemicals - Improving the boiler's efficiency in Coke Company.

92 El-Nasr for Coke and Chemicals - Study report on cogenerationn, November 1991.

93 DRTPC - Request for Quotation for package cogeneration unit prepared for ALUMISR.

94 DRTPC - Feasibility study. Egyptian Aluminum Products Company. Cogeneration Technology Application.

95 DRTPC - Description sheets of some TAs:

95.1 - Ramses Hilton TAs (EMS and HEL).
95.2 - Arab Contractor Medical Center (PFI)
95.3 - Giza Cables (PFI)
95.4 - Cairo Beverage and Industrial Co. (PFI)
95.5 - ALUMISR (COG)

96 DRTPC - Site visit report to National Company for Maize Products, May 6, 1991

97 HBI - Report on visit to National Company for Maize Products, March 20, 1991
98 OBI - Plant visit report, Misr El Amria Spinning and Weaving Company.

99 ECEP - Energy Conservation Opportunities at Nile Metallic Industries, February 25, 1991.

100 DRTPC - Report on ASFOUR Glass Factory at Shoubra el-Kheima, October, 1989.

101

Procurement

102 ALUMISR TA - Memo from Sierra Power Product on documents sent to OBI (San Francisco); November 26, 1991.

Environment Protection

103 ECEP - Energy Conservation and Pollution Assesment Report for Helwan Industrial District, Cairo, Egypt.

104 TIMS - Central Laboratory for the Study of Industrial Pollution. 1991

105 USAID/Egypt Environment and Natural Resouce Program: A recommended Strategy Statement - Recommendations Proosed by the PRIDE Environmental

Strategy team.

106 ECEP - Energy/Environmental Linkage

Energy

107 USAID - Electricity Pricing Study for EEA

108 ECEP - Electricity tariff structure in Egypt (Annex B of an unknown document)

Miscellaneous

109 ECEP Monthly meeting, January 21, 1992, Agenda

Project future

110 HBI - ECEP Options.

111 OBI - Proposed modified contract. January 1992.

112 OBI - Summary of a OBI report on inclusion of maintenance and operations related activities.

113 TIMS - Extension of the Project Implementation letters (PIL) from March, 1992 to February 28, 1993. January 19, 1992.

114 ECEP - Document on the usefulness to include fuel substitution (Natural gas for Mazout/solar) in the list of TA.

115 HBI - ECEP Future Options, March 10(?), 1991.

116 HBI - Institutionalizing enrgy efficiency in the Private Sector, March 17, 1992.

Energy Policy Planning Project

117 Intermediate evaluation of USAID/CAIRO Energy Policy Planning Project (Subproject 263-0213.1) - Oak Ridge National Laboratory/U.S. Department of Department. August 1989.

118 Energy policy and planning project (final report) - META SYSTEMS Inc. May 1991.

Renewable energies

119 An overview of Egyptian renewable energy programs and the renewable energy field testing project, 1990.

listdocu/CG/18 March 1992

APPENDIX H

COMMENTS ON MANUALS PRODUCED

General Comments

- There is in these documents both metric and british units. We think metric system should be adopted once for all.

- There is no document on:

  - Dryers,
  - Air conditioning,
  - Energy conservation in buildings. Such a document has been made by HBI/ENERCON (Pakistan).

High Efficiency Lighting - Very good and up-to-date document. Even calculation on lighting systems are explained.

Energy Efficient Electric Motors and Drives - No comparison between V, cogged (forgotten) and flat belts. It was demonstrated in an experiment in India that flat belts increase the overall efficiency by 5% and have a payback of less than one year. There are few pages dealing with power factor improvement systems, but the basic calculations are not indicated. A specialized manual is under preparation. No indication on how efficiency decreases when temperature rises.

Energy Management System - What is under this title is more programming than Energy Management Systems. We think that Energy Management is more than switching off and on. This is precisely what it is about in this manual.

Energy Management for companies - This is the real Energy Management. The document was issued in February 1991. All the egyptian consumption data stop at 1987. Good document. It contains an excellent methodology on how to conduct an energy saving effort and indicates the couple Diagnosis + Audit (named here preliminary energy survey and detailed energy survey) as the ideal tool to identify ECOs . This methodology has not been followed by ECEP. It is the best way to obtain energy savings, but it not the best way to identify TAs.

Waste heat recovery - Very good document.

Industrial furnaces - Very good document.

Improving combustion efficiency - Very good document.

Cogeneration - Very good document - The Mollier diagram (Exhibit 2.20) is hardly readable and calculation indicated in page 3.6 could not be repeated. Enlarged charts should be provided with the manual.

Energy measurement and instrumentation - Very good document.

Energy efficiency in steam systems - Very good document. The Mollier diagram (Exhibit 2.3) and the Temperature Entropy Chart for steam (Exhibit 2.4) cannot be used. Enlarged charts should be provided with the manual. Heat losses from bare pipes (Exhibit 9.2) stop at 150 mm. This diameter is too small. 300 mm should be the limit.

Insulation and refractories - Good document.

APPENDIX I

TRAINING/PROMOTION ACTIVITIES

TRAINING/PROMOTION ACTIVITIES STATUS REPORT
NOVEMBER 1991

A. TRAINING:

Activity Summary Table

ITEM	To Date	Planned over Project Life	Trainees to date	Trainees planned over Project Life	Training days to date	Training days over Project Life
In-Country Courses	19	39	768	800	1536	2250
In-house Courses	3	4	37	40	323	350
US based Training Tours	5	8	19	30	370	600
US based Study Tour	3	4	10	21	166	315
Course Manuals	12	19	NA	NA	NA	NA

1. ECEP Training Courses:

a) Courses:

- Cogeneration Course planned in Cairo: December 2-3, 1991; Course manual produced;

- Cogeneration Course planned in Alexandria: January 1992

b) Manuals:

- Produced:

  - Cogeneration

- In Production:

  - Energy Measurement
  - Industrial Furnaces

2. US-based Training/Study Tours:

a) Training Trips:

i) Completed:

- Young Manager's Course at Darden Graduate School, University of Virginia. November 1991; 2 participants

ii) In Planning:

- Combustion Analyzer Maintenance: Energy Efficient Systems Inc, Long Island, New York; 2 participants.

- Procurement Phase 2: Bechtel, San Francisco. 2 participants;

- Evaluating Capital Projects Course at Darden Graduate School, University of Virginia. 3 participants; March 1992.

- Power Factor Correction: University of Wisconsin; ABB Wichita Falls, Texas: 6 participants; May 1992.

b) Study Tours:

i) Completed:

- Project Financing/Investment Promotion: New York; Washington; Atlanta to include visit to 14 th World Energy Engineering Conference; Los Angeles; San Francisco; October 19 - November 3, 1991. 4 participants

ii) In Planning:

- Combustion/Waste Heat Recovery: Planned; January 1991, 6 participants

- Electrical Technologies; 5 participants

3. In-Country Training For Project Staff:

i) Planned:

- Combustion Analyzer Demonstration Staff Training; December 1991;

- Project Start-up and Commissioning for Demonstration Projects; 2-3 day course planned for 1st quarter 1992.

APPENDIX J

COMMENTS ON ECEP TECHNICAL PROCEDURES

Comments on the OBI document ECEP Technical Procedures"

1.1 The normal ideal procedure is:

- To carry out a diagnosis or "walk-through Audit". This usually requires a one day visit and one day report (this means at leat a 10 page report). A diagnosis report contains:

  - Energy Water consumption, production figures, effluents outflows
  - Comment on electricity bills,
  - When possible, specific consumptions,
  - Description of the process and the plant units,
  - Comments on each unit such as: lack of insulation, steam leakages, inefficient lighting, equipment uselessly running, cooling water sent to the drain, etc.,
  - Very rough evaluation of the energy and water saving potential, (5, 10, 15 %).
  - Identification of the major EWCO or pollution areas (boiler, insulation, process).
  - Conclusion and follow-up recommendations: these could be:

    - For an audit, most of the time,
    - When an audit is not required, a feasibility study for a particular project, but this is rarely the case
    - A set of recommendations, when neither an audit nor a feasibility study is required.

- When an audit has been recommended and accepted by the plant management, the auditor should evaluate the following topics:

  - Evaluation of the plant's environment (dust, plant, grass, solar protection).
  - Energy and water used and electricity bills. Cost of the kWh.
  - Utilities (steam, hot water, compressed air) produced by the plant. Per unit cost.
  - Effluents (thermal, chemicals).
  - Production and specific consumption.
  - AND THEN ONLY the process equipments.
  - When a sufficient knowledge of the plant is reached, energy balance and other balances when required (Water, air, steam, C/CO,CO2, sulphur/SO2, NOx etc.) are established.
  - During the whole process, EWCO are identified and roughly quantified (savings and order of magnitude for the pay-back).
  - A preliminary report is submitted to the management. It contains major findings and a first list of EWCO and EPO projects. It is presented to the plant management. Some of the projects are accepted.
  - Further quantification or prefeasibility studies are

made on the accepted EWCO/EPOs.

- A final report is sent to the management. It contains:

  - The main findings, including the comments,
  - A table giving the

    - EWCOs characterized by savings (both in terms of physical units and money), investments and paybacks.
    - EPOs characterized by results (reduction of quantities of pollutants produced by the plant), investments.

  - Recommendations on how to carry out the program.

The other step are well known:

- Setting up an Energy-Water-Environment Protection Management,
- Implementation of the ECEP projects that do not require a feasibility study, say the LNEWCO projects.
- Carrying out the feasibility studies and implement their recommendation as long as the paybacks are low enough to be considered by the management, say three years for energy/water related projects.

Usually, the savings achieved by the LNEWCO are sufficient to pay for the other EWCO project investments.

In two years the plant is ready to confront the next energy prices rises. It will implement the other EWCO as soon as their payback is reduced to less than three years limit.

1.2 If we compare this ideal procedure with the OBI procedure on energy we found that:

- The first step is a visit where very preliminary information is required. For instance at one occasion "consumption figures were not solicited". This is not an efficient use of this visit.
- There is no diagnosis prior to the "OBI energy audit".
- There is no energy audit study either, as an "OBI energy audit" is not a proper audit, as described above. It is merely a diagnosis made by an engineering company or an equipment supplier which focuses on business opportunities rather on energy savings.
- OBI includes some search for housekeeping and LNECO but there is no proposition to look for the interconnection between those ECO and TA. In the Egyptian context the potential in LNECOs is so important that when implemented, it can modify the complete energy profile of the plant. It could make, for example, a cogeneration plant uneconomical just because requirements for steam after revamping have been dramatically reduced by LNEWCOs. (New washing machines require 10 times less water).
- There is no need for a prefeasibility study. The energy

audit should contain all basic data on which a decision can be made. Feasibility studies should immediately follow Energy Audits when they contain recommendation for it.

Recommendation - HBI knows how to carry out Energy audits and should give some training to OBI, TIMS and DRTPC. Additional training should also be given on water and Environment Protection, HBI could do the job and would be only too happy to add this new dimension to their services.

12

APPENDIX K

LIST OF TECHNICAL APPLICATIONS (TAS)

ECEP PROJECT SUMMARY

PLT NO	NAME	TECHNICAL STATUS	PROJ STAT	AFT NAME	PO NO	COMMENTS
T01	Eg Copper Works	CC-Phase 1 Study Compl	Proc.	NCP	12C 12B 12A	Oxygen analyzer,commit.9/16; shipping 1/20/92 Coke inj.,committed 9/16; shipping 1/27/92 Centrif. fan, committed 9/16; shipping11/11/91
T02	Delta Steel	CC-Burners, Fan, Recup	Eng	NCP	11A 11B	Spec. is being revised, issued to the plant for review11/1
T03	El Nasr Coke & Chem. Sys	EMS - Energy Mgmt. System	Eng	RSK	22	Boiler controls & EMS, spec.& MR. Issued to the plt. for approval 3/27. On Hold •
T04	Kafr el Zayat	CC - Not Feasible	No Act	MD		Feasibility study recv'd from TIMS 5/21
T05	Talkha Fertilizer	CGN - $ out of scope	USAID appv'l	GKR		CGN is out of ECEP scope, cost approx. $15M, stm. turbine spec. issued; prelim. proposal issued to USAID for approval
T06	SIMO Paper	CGYN - Backpress. Turbine	Eng.	NCP JHW	19	Plt appv'l recv'd 5/30. RFQ issued 7/12. Recv'd one quote 8/26. Plt. changed criteria 9/16. Applic. is cancelled 10/6. •
T07	EG Iron & Steel	WHR - Study Continues	Eng.	NCP LHE		DOES NOT MEET ECEP CRITERIA
T08	NAMETIN	PFI - Feasible	Proc.	RH	7	RFQ issued 2/15; plt appv'l recv'd 9/30; RFC approved 10/15, PO issued 10/18 •
T09	TRENCO Trans & Engr	PF1 - Feasible	Study	HML		PF specs finalized by AFT 10/14; MR issued to proc. 11/19. •
T10	El Shourbgy Textile	PF1 - Feasible	Proc.	RH RSK	26	Plt appv'l for the spec. recv'd 8/6. RFQ issued 9/5 4 bids recv'd 11/7; in bid eval. •
T11	Nasr Glass & Crys	Burner Controls - Feas	Study	HML		Cost is $1M/furnace and recuperator, still under study
T12	Nasr Refr & Ceram.	WHR - Not Feasible	No Act	HML		NOT FEASIBLE

• NEW CHANGES

ECEP PROJECT SUMMARY

PLT NO	NAME	TECHNICAL STATUS	PROJ STAT	AFT NAME	PO NO	COMMENTS
T13	GEN METAL CO.	WHR - NOT FEASIBLE	NO ACT	HML		NOT FEASIBLE
T14	Cairo Metal Prod	Reduce Coke Cans - Feas	AFT	HML RSK		Study in progress
T15	Abu Zaabal Fert	Steam Turbine	Proc.	JHW	28	Plant appv'l recv'd 5/21, RFQ issued 5/30, RFC approved 11/17; PO issued 11/21 •
T16	Abu Zaabal Fert	SF - Waste Incinerator	Screen	HML		NOT FEASIBLE
T17	MISR Spin & Weave	HEL - Feasible	AFT	HML RSK		Study in progress
T18	Paper Conv Co.	WHR/SF - Not Feasible	No Act	HML		NOT FEASIBLE
T19	Dyestuffs	CGN - Not Feasible	No Act	JHW		NOT FEASIBLE
T20	Dyestuffs	IN - Not Feasible	No Act	HML		NOT FEASIBLE
T21	Alex Port Cement	CC - Feasible	Study	HML		Spec.in preparation, due 11/31 •
T22	SEMADCO - Suex	Acid injection system water treatment	Proc.	EG RSK		RFQ issued 6/21. Recv'd 7 bids on 8/5. In house bids evaluation. RFC to be issued 11/27 •
T23	Nasr Castings Co.	WHR - Screen looks good	Study	NCP		Study in progress
T24	El Nasr Coke & Chem.	CGN-22 MW Unit	USAID Fund			$13 M project, report and cost estimate completed 11/18; pending USAID approval •
T25	SIMO Paper	O&M - Insul/Stm Fittings	LC/Nc	MFS		NOT FEASIBLE
T26	EG IRON & STEEL	O&M - New Steam Line/Insu	Poss. ECEP	MFS		NOT FEASIBLE

• NEW CHANGES

11/21/91

ECEP PROJECT SUMMARY

PLT NO	NAME	TECHNICAL STATUS	PROJ STAT	AFT NAME	PO NO	COMMENTS
T27	NAMETIN	Scrap Processing	Poss. ECEP	MFS		Feasible-Under study
T28	Shorbagy Textile	O&M - Insul/Flame Safety Cir	Poss. ECEP			NOT FEASIBLE
T29	Abu Saabal Fert	O&M - No Projects	No Act	MFS		NOT FEASIBLE
T30	TRANS & ENGRG	O&M - Insul/Flame Safety Circ	Poss. ECEP	MFS		Study in progress
T31	Dyestuffs	O&M - Insul	Non ECEP	MFS		NOT FEASIBLE
T32	Eg Copper Works	O&M - Scrap segreg/baling/ Heat Trace/Anode Ears	Non ECEP	MFS		NOT FEASIBLE
T33	MidEast Spin & Weave	HEL, HEM - Feasible	Study	HML		Study in progress
T34	Eg Copper Works	WHR - Not Feasible	No Act	HML		NOT FEASIBLE
T35	Kafr el Zayat	SF - Not Feasible	No Act	HML		NOT FEASIBLE
T36	Talkha-Feed	Gas Compressor	Pre-Feas	RSK		Pre-feasibility in progress (new project)
T37	Assuie Cement	WHR				Study in Progress. (New Project)
T38	Dishna Sugar	WHR/ Bagass Dryer				Study in Progress. (New Project)
T39	100 Plants	Combustion Control	Proc.		33	Bid eval complt. 8/21; RFC issued 9/11 for 50 units issued PO 10/3; shipped 11/17; rcv'd 11/19 *

* NEW CHANGES

11/21/91

ECEP PROJECT SUMMARY

PLT NO	NAME	TECHNICAL STATUS	PROJ STAT	AFT NAME	PO NO	COMMENTS
D01	Ramses Hilton	EMS - Lighting Controls	Proc.	RPS	6A 6B 6C 6D	Lighting, delivered & failed, New parts shipped Exit signs dlvd,14 failed and replaced July 1 Infrared EMS, delivered, 2 failed EMS delivered, received; failed to meet ld. reqmn't
D02	Arab Cont Med Cent	PF1 - Feasible	Proc.	RH	3A 3	BMI Instrument, delivered 5/15 Power factors arrived at ALEX 6/12 Equipment installed*
D03	Cairo Beverages (7UP)	PFI - Feasible	Proc.	RH	4A 4	BMI Inst. PO issued 3/19, delivered 5/15 Power factors arrived at ALEX 6/12 Equipment installed 8/19.
D04	Giza Cables	PFI - Feasible	Proc.		5A 5	BMI inst. PO issued 3/19, delivered 5/15 Power factors arrived at ALEX 6/12. Equipment installed 8/19.
D05	MISR Iran Co.	Insulation	Study			Feasibility study recv'd from DRTPC 6/3
D06	Asfour Glass; United Co. for crystal product	Combustion control & Heat recovery	Eng.	NCP	27	Specs prepared by AFT 11/5; inhouse review *
D07	Suez Cement Co.	Not Feasible	No Act			NOT FEASIBLE
D08	Cleopatra Hosp.	CGN - Not Feasible	No Act	JHW		NOT FEASIBLE
D09	ALUMISR	CGN - Feasible	Proc.	JHW	25	Spec approved by plt 3/17. RFQ issued 4/11;bid evaluation completed and sent for plt app'vl 9/17 RFC issued 10/3. Issued PO 10/8. *
D10	(APG) Arab Pharm Glass	Burner Controls Feas Cont	Eng.	NCP		Spec is beeing prepared by DRTPC, spec. prepared 10/14, inhouse review. *
D11	ARASEMCO	OEP Study Complete	Study	MO		Feasibility study in progress

* NEW CHANGES

11/21/91

ECEP PROJECT SUMMARY

PLT NO	NAME	TECHNICAL STATUS	PROJ STAT	AFT NAME	PO NO	COMMENTS
D12	Modern Foundaries Co.	NOT FEASIBLE				NOT FEASIBLE
D13	Eg Ceramics Co.	Waste heat recovery				NOT FEASIBLE
D14	Alex - ANSDK	Low Temp Rolling	Study	DDA LHE		NOT FEASIBLE
D15	Alex - ANSDK	WHR - Scrap Reheat	Not Feas	MFS LHE		NOT FEASIBLE
D16	Misr Clay Brick	WHR.CC - Plant Data Req	Study	DDA		NOT FEASIBLE
D17	DOLCE Food	iN STUDY	No Act	DDA		In House Modification
D18	El Menofiya Spin	HEM - Screen looks good	Study	DDA		NOT FEASIBLE
D19	Eg - Japan Steel	HEL - Screen looks good	Study	DDA		Study in progress
D20	EIPICO Eg Int Pharm Co.	PC - HVAC Controls	Spec	RSK		Recv'd spec. from plt10/1; issued MR to proc 10/3 RFQ issued 11/5;due 12/13 •
D21	Pearl Glass	No Feasible Proj	No Act	PJG		NOT FEASIBLE
D22	Alex - ANSDK	O&M - No Projects	No Act	MFS		NOT FEASIBLE
D23	ALUMISR	O&M - Replace Charge Doors	Non ECEP	MFS		Non ECEP, Done by plant
D24	Misr Brick	O&M - Instrumentation	Non ECEP	MFS		NOT FEASIBLE
D25	Eg Int Pharm Co.	O&M - Meter Cooling Towers Comp Maint Plan System	Non ECEP	MFS		NOT FEASIBLE
D26	Asfour Glass	O&M - Hot Glass Recovery Comp Main, Plan Sys.	NONE ECEP	MFS		NOT FEASIBLE

• NEW CHANGES

11/21/91

ECEP PROJECT SUMMARY

PLT NO	NAME	TECHNICAL STATUS	PROJ STAT	AFT NAME	PO NO	COMMENTS
D27	Cairo Beverages	O&M - Boiler Tuning Comp Maint	Non ECEP	MFS		NOT FEASIBLE
D28	Nat'l Co for Maize Product	Combustion Control	Study	RPS		Combustion tune up is done
D29	NMI Nille Metallic Indust. Co.	Waste Heat Recovery	Not Feas	RPS		NOT FEASIBLE (new proj.)
D30	BIM BIM	Cogeneration	Pre-Feas.	RPS		NOT FEASIBLE
D31	Arab Aluminum Col Ismalaia	Waste Heat Recovery	Pre-Feas.	RPS		Pre-feasibility in progress
D32	(BTM) Mary Louis For Dyeing	PFI - Feasible	Compl.	RSK		Spec is written for the plant. They are buying the Equip.
D33	Natl. Co. for Maize Products	WHR - Fuel treatment	Pre-Feas.	RSK		New Project. Pre-feasibility study rcvd 6/2
D34	Arab Cables Co. (EL-SEWEDY)	PFI - Power factors	Pre-Feas.	RSK		NO ECEP, Good operation
D35	Misr Acrilic					Good Operation, No ECEP application
D36	KEPCO Arab Co. For Ceramic	WHR	Pre-Feas.			New Project
D37	El Baraka For Steel	HEM/CC				Good operation, No ECEP application
D38	El Negma For Glue	Insul. (No cost low cost)	Study			Study in progress (New Project)
D39	El Said For Aluminum	WHR				Plant not interested in ECEP
D40	EL Salam Hospital	PF				Plt Purchased PF

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D40	EL Salam Hospital	PF				Plt Purchased PF

VISIT REPORTS

ALUMISR (COG) - Equipment should arrive in Alexandria in June 1992. According to the DRTPC calculations (based on international energy prices the payback of the 525 kVA COG plant is 3.56 years. No plant manager will be attracted by such a high payback; he has many other opportunities with a shorter payback. Moreover there is now a trend for medium size plants to get away from this kind of cogeneration, just be cause plant managers realize that their job is to make textile, ceramic and aluminum section and not electricity. I see no chance of replication for such a small capacity plant, as long as there is no action from the GOE to make them economical from the entrepreneur point of view.

Under ECEP guidance the management implemented several other ECOs: Cover on tanks, PFI, steam distribution improvement, etc.

However there is still in the plant other ECOs on lighting, WHR, EMS. WHR payback was found to be about 7 years This figure looks very high and is not backed by any calculation. As there is neither WHR nor regenerative burners, the potential for energy conservation is still about 50% on gas burnt in the kilns. This plant should be audited.

COKE (CC and COG) - Both are good projects on technical and economical grounds. The 22 MVA COG plant payback is about two years and the Coke management seems eager to implement the COG project as soon as possible. The two projects are linked as the boilers and the COG will be controlled by the same EMS. USAID decided not to finance this project under ECEP. There are within USAID or other agencies (the World Bank seems the ideal candidate) funds for such a project.

RAMSES HILTON - When visiting the hotel and discussing with the technical staff we identified several ECOs (heat recovery on compressors, reduction in air change, condensates recovery, lighting) that were not identified by the studies. We found out also that a basic indicator (kWh on bed night) is not known. This means that neither an audit nor even a diagnosis has been carried out.

RAMSES HILTON (HEL) - If the 250 fluorescent compact lamps had been purchased on the local market after the short study required for such a simple project, these would have been installed in May 1989. Short of that, we have to face a long stories of expensive lamps (US$ 38-£E 125 instead of £E 55-75 on the local market) without electronic ballast (potential saving: 21%), that blew up, failed lamps sent back to the supplier, replaced by lamps that blew up again, duties paid on replacement lamps, etc. And finally, after about three years, the lamps are not installed yet. To get out of this mess, Ramses Hilton should be allowed to buy the lamps on the local market as soon as possible.

RAMSES HILTON (Infrared sensor) - An experiment was made on installation of infrared sensor that detects the presence of a guest and disconnect lighting and air conditioning when there is nobody. The sensor was said to pay back in 18 months. This payback looks very low.

Supposing the staff has not been trained in energy conservation, we found a payback of 6 years (ECEP document states 8.7 years with a COP of 4.7, which is too high). If the staff has been trained, the payback goes up to 12 years).

The 18 month payback was found too long for the Hilton Management. Moreover what is acceptable for a 3 star hotel, is not for a 5 star hotel. A client cannot enter a room which is not cool. There are other ways to save on energy in a 5 star hotel and some of them have a far shorter payback and yhey keep high the hotel's image. An audit would identify them.

We noted switches installed on the windows. This the only saving device which is economical to install in an existing hotel room.

RAMSES HILTON (EMS) - The equipment was shipped and it was found out that some items were missing and some drawings did not correspond to the equipment. It is clear that as soon as those problems arose, the supplier lost interest in the project and let it down. The responsibility for the project shifted from one person to another one, and even from one country to another one. At present after two years, still there are some missing parts, the 20% deposit is still frozen, the local contractor is claiming some compensation, the project is still at the erection stage.

EGYPTIAN BEVERAGES (PFI) - A part from a six month delay due to the Gulf War, the project went on very smoothly and finally the management is very happy with the equipment, the warrant deposit was refunded. When discussing with the management we identified several ECO (Heat recovery on compressor, Cold recovery on liquid CO2, lighting, electricity contract). Here again no audit has been made.

ABU ZAABAL FERTILIZER (WHR) - This is a complex project involving TIMS, OBI and a french firm who supplied one of the sulphuric plants, where one steam turbine will be installed. The other turbine will be installed on another sulphuric plant from romanian origin that will probably be partially revamped by the same french firm. As soon as the steering committee accepted the project, things went smoothly. The TIMS Project Officer was very instrumental in coordinating all the partner involved.

NATIONAL METALS INDUSTRIES - A project running into trouble:

- Specs drafted by WAFA Consultant, non accepted by OBI (one year delay).
- Specs modified be cause no american supplier could bid for capacitors for two different voltages. Bid split into two different bids (6 month delay), when finally only one supplier (ABB) was selected.
- Project officer unable to give to the plant management a timetable (when the TIMS Gantt chart gives for the project a completion date, 14 August 1992).
- Not very good relationship with the plant management.

A project that would have required about one year from the feasibility study up to commissioning, if the equipments had been purchased locally, will require at least two years and a half.

ASFOUR CRYSTAL - The management is cautious and this slowed down the project's implementation but probably made it more replicable. In house modifications were implemented before the TAs (CC and WHR) were considered. The proposals by DRTPC, were found too advanced and too sophisticated; they were not accepted; a new study was carried out and its results accepted by the plant. In the report in our hand only three ECOs were identified (CC, PGI and demand reduction). For a large plant like ASFOUR's one can expect a list of about ten to twenty ECOs. The energy conservation specialist of the Team did not visit the plant but thinks many ECOs have been missed and thinks an Energy audit is required for this plant.

SEMADCO - This sub-project is not related directly to energy conservation. However its aim is to treat water with a very high mineral content and make it suitable for energy related equipment (condenseur and cooling tower). The result is a multiplication of the efficiency of the SEMADCO power station by a factor of three. The generated power will go up from 14.6 MW to 46 MW, without additional fuel consumption. Moreover the project is highly replicable.

ARAB PHARMACEUTICAL GLASS - The Management aknowledged that ECEP "helped them a lot" but it is very impatient to get the CC equipment as soon as possible and connect it on its process control equipment. When requested to indicate a delivery date, the officer in charge quoted June 1992. The Gantt Chart submitted to us the next day indicated December 15, 1992 instead.

We noted that the heat losses are very high on the new kiln, particularly on hte surfaces next to the recuperator. Is it possible to reduces them when the kiln is running? this should be investigated.

EIPICO (EMS) - There are in this plant about 60 air handling units sending treated air in rooms with different programs. It would be feasible to make this intallation work by hand and save energy. ECEP recommended EIPICO to do it by installing a central programmming station. This system will procure savings but most of them could be have been obtained by manual control. This would have been time consumming. This is the reason why EIPICO adopted what ECEP calls an EMS. I would rather call it an air handling unit management system.

EIPICO is a large consumer of ECEP services (training, lighting improvement, boiler tuning) and is making good use of them. They are very energy saving conscious and competent.

The implementation process was slow be cause all suggested modifications have to be agreed by their licensors (Squibb, Upjohn, Merck, Allergan, etc.).

We inspected the plant and identified several ECOs:

- Replacement of electromagnetic ballasts by electronic ballasts.
- Replacing V belts by flat belts.
- Insulation of valves and flanges.
- Installing photoelectric cells in the compressor room.
- Reduction of excessive lighting in the offices.
- Install turbulator in the fume tubes of the boiler.
- Shifting from solar to mazout.
- Improving the boiler efficiency (it is only 80%, instead of 90%).
- If energy prices allows it, cold recovery on cold air extracted from the rooms.
- I have also serious doubt on the EIPICO deshumidification. equipment. They use a very complex and energy consumming process. I would recommend ECEP to contact a firm or a consultant specialized in HVAC in pharmaceutical plant.

An energy audit is required for this plant.

BISHARA TEXTILE GARMENT (PGI) - Starting from the first contact between ECEP and BTM (a FEI letter) and the commissioning it took ECEP not least than a year and a half to implement the project. No wonder that BTM facing huge power factor penalities decided to buy the capacitors immediately on the local market.

We identified a few ECO's:

- Improvement of the boiler efficiency by increasing the fuel oil temperature from 75 to 90°C.
- Installling a case around the steam drum dryer.
- Reduce the leaks.
- Insulation of the pipes.

BTM has an excess of condensates. This means the plant is not very energy efficient and an audit is required to reach the usal set of 10-15 ECOs, instead of the 4 ECOs we have noted.

The BTM chairman, is not very interrested by energy conservation is is much more concerned about Environment Protection: his plant is a big polluter.

APPENDIX M

ECEP FUTURE OPTIONS BY M/TA

1. BACKGROUND

ECEP was established with the aim of promoting energy efficiency in local industry. It was to accomplish this by improving the institutional capability of 3 agencies, DRTPC, TIMS and FEI and by completing a number (target 60) of energy efficient technology application demonstrations. A total of $ 50 million was made available through a grant from USAID to fund ECEP activities during the life of the project.

2. WORK TO DATE

The 3 counterpart agencies and the M/TA contractor are functioning as working entities and are fulfilling discrete but complementary roles in the implementation of the project as follows:

- DRTPC is the prime interface of the project with private sector industries for technical activities. It is performing the following activities successfully:
  - screening candidate pl ts for potential technology applications
  - conducting prefeasibility and feasibility studies
  - drafting specifications for technology applications
  - monitoring implementation of demonstration equipment
  - reviewing promotional technical materials and training manuals drafted by either the M/TA or others (TIMS or FEI) being produced by the project
  - presenting 2 day training courses for local practicing engineers and industry managers
- TIMS is the prime interface of the project with public sector industries for technical activities. It is performing the following

activities successfully:

- screening candidate plants for potential technology applications

- reviewing promotional technical materials and training manuals drafted by either the M/TA or others (TIMS or FEI) being produced by the project

- presenting 2 day training courses for local practicing engineers and industry managers

- FEI is the prime agency for project promotion. It is performing the following activities successfully:

  - drafting and producing promotional materials for the project

  - ensuring ECEP is featured regularly in the local press and news media

  - presenting 2 day training courses for local practicing engineers and industry managers

- the M/TA is providing both Technical assistance to the three agencies as well as performing certain key functions within the implementation of the project. Specifically the M/TA is:

  - providing design/engineering services in support of the technology application demonstrations

  - producing most specifications from scratch

  - doing all foreign-based commodity procurement

  - organizing all US-based training activities

  - undertaking all policy-related work

This delineation of roles has enabled the project to establish a mechanism that appears to be successful in ensuring demonstration projects are successfully implemented locally and that local

industry has an increased awareness of energy efficiency. However, the present project structure will not lead to major replication of technology applications outside of the project, nor the creation a capability within the private sector or help establishing a market for an energy efficiency industry in Egypt. In addition, the project will have little or no impact upon policy reform within the country. It is a distinct possibility Egyptian industry will have little of the appropriate infrastructure to implement energy conservation activities once the project ceases.

3. NEW STRATEGY

A new approach is needed if the ECEP is to address some of the deficiencies in the existing design and to lay the foundation for a self reliant and sustainable solution to the problems of energy efficiency in the country. The approach will be to combine engineering, management and financial aspects in a single, unified process. The underlying principle of this approach will be of conceptualization/development, commercialization and then "spin-off" as subsidies for various project components are reduced from 100 % to 0 % and the activities become self sustaining and "privatized".

This approach is based upon the principle that energy efficiency will take place if sufficient awareness, information and training exis and barriers to investment are minimized. It envisions expanding activities into areas such as policy and planning and investment promotion as well as strengthening activities in institutional development, outreach, training, and monitoring and evaluation. It also will seek to use the Private Sector as the main catalyst for activity by gradually removing the inherent subsidy that ECEP itself brings to energy efficiency activity in the industrial sector.

Specific proposed activities are discussed in the following section.

4. PROPOSED ACTIVITIES

The new strategy can only work when technical, managerial and financial activities are closely integrated. However, when successfully implemented they can meet the following objectives:

- develop the institutional capability and policy environment within government organizations to accelerate the adoption of energy efficient practices and technologies

- develop the capacity within the private sector through training and technology transfer to deliver high quality services and products

- develop the sustained interest and capability of the public and private sectors to invest in energy efficiency

To do this ECEP activities should be undertaken along the following functional areas:

- Institutional Development
- Policy Reform including Privatization
- Technical Support
- Training
- Outreach
- Investment Promotion
- Monitoring and Evaluation

The specific activities in each area are presented briefly below.

Institutional Development

There is a need for ECEP to develop far more institutional capability locally than it is currently doing. This can be accomplished by directly expanding the organizations with which the M/TA works. Organizations that should be assisted include:

- OEP
- Private Sector Consulting Companies
- Financial Institutions
- EEA

The institutional development will be accomplished through the M/TA working closely with representatives from the local organizations as they work on specific tasks for ECEP and funded either directly from USAID ECEP funds or as commercialization begins to occur from payments from the recipient of the services.

Policy Reform

Policy reform activities should be undertaken by ECEP using the OEP as local counterpart to the M/TA contractor. The purpose of the policy reform activities will be twofold. The first is to improve the institution framework so as to further promote energy efficiency at the national and government level. The second is to

ensure energy efficiency and energy demand strategies are promulgated and used in national energy planning and environmental activities.

The OEP is in a unique position to undertake this role and a direct relationship between OEP and ECEP is a key element in meeting the ECEP objectives.

Key areas to be addressed by OEP (assisted by the M/TA) include;

- Tariffs and Customs Duties
- codes and standards
- cogeneration
- fuel substitution
- annual plan for energy conservation
- input into 5 year plan
- licensing/setting up manufacturing facilities
- industry needs assessment

Technical Support

The current ECEP approach relies mainly on the implementation of Technology Application Demonstrations requiring medium-scale investments (minimum private sector foreign exchange $ 50,000; public sector $ 150,000 per application). This level of investment is expected to provide for up to 60 technology application demonstrations.

The initial focus of ECEP was to seek out applications at a single plant, either public or private and provide the equipment on a single plant basis. In August 1991, however, a novel approach was introduced in which portable combustion analyzers are being distributed to 50 industrial plants enabling them to control and improve combustion in their boiler plants. The overall program equipment cost is around $ 350,000 but it is providing direct help and support to many companies rather than one single facility. The equipment hand over to the companies is coupled with training for the actual engineers and operators of the equipment at the plant. The training is being provided by TIMS and DRTPC staff. In addition, training in improving combustion efficiency through a 2 day course for engineers and managers is offered by the project. The supply of equipment, technical assistance and training is being supported by appropriate information and outreach materials. A standardized reporting format detailing the improvements in

combustion efficiency made at the plant when handing over the instrument is given directly to the senior management of the company. This combined intervention approach is likely to provide better institutionalization of energy efficiency, improve sustainability and reduce the risks from working directly with a single plant.

In addition, the focus on simpler equipment minimizes the need for major engineering capability (and reduces reliance on the M/TA) for success. It is felt the combustion analyzer program could be expanded to up to 1000 companies and service organizations thereby creating a market for tune-up services, instrument maintenance, and possible local manufacture under license.

Similar projects could be launched for the following technologies:

- energy accounting-management information systems for monitoring and targeting energy use in companies
- power factor/lighting/motors to implement electrical demand-side management/electrical system survey
- insulation from a steam system survey/retrofit project

The various projects would be implemented in up to 1000 companies immediately increasing direct participation in the project. The actual work would be done by a combination of organizations, including private sector engineering and contracting companies, energy conservation service companies such as instrumentation and calibration companies, as well as the counterpart agencies TIMS, DRTPC, and FEI. Where appropriate, local procurement of commodities should be permitted.

The activities can involve some form of cost sharing between the ECEP and the company receiving the support and equipment. Unfortunately the existing Project Agreement does not permit reflows of monies to any of the agencies. This does not allow for a progression towards "privatization" and full commercialization of many of the Project Activities. This matter needs to be addressed as a priority as ECEP current activities are not promoting private sector consulting services and manufacturing of energy efficient technologies in the country.

ECEP should also do at least 3 large Cogeneration projects. Rather than being grant-funded directly from ECEP however, they should be funded through loans or other funding mechanisms. These projects should be undertaken with the following aims in mind:

- to promote power purchase agreements between the EEA and outside bodies such as industrial companies and concerned third parties

- to develop a standardized procedure which addresses institutional, managerial, technical and financial matters for implementation of cogeneration in the country

- to provide direct technical assistance to local engineering consulting companies to strengthen their design and project management skills

- to demonstrate the benefits to industry at large of the design/engineer/specify approach

- to illustrate alternate project financing mechanisms for energy conservation and efficiency technologies

The above activities are likely to provide a major impetus to energy efficiency in industry but prove challenging to ECEP. It is appropriate at this time therefore to not further consider technology applications for solid fuel boilers and waste heat recovery systems. These applications involve more than normal levels of design and engineering to implement. In addition the number of replications of solid fuel boiler applications in the country.

Training

The existing ECEP training activities are a good start and its continuing education efforts should continue but training needs to be expanded into the following areas:

- formal education in university/schools through development of undergraduate courses specifically targeted to energy efficiency

- vocational training for boiler/furnace operators, electricians and instrumentation technicians

Materials development and setting up of courses can be done by the existing counterpart agencies in conjunction with the M/TA.

Training activities overseas should also be expanded, with a significant increase of persons from industrial organizations participating. The proposed expanded activities should cover not only short duration training but should expand into long term training.

Outreach

ECEP promotional activities will also need to be increased in direct support of the new approach. In addition to the increased amounts of material needed the emphasis of the information being supplied needs modifying. As industry is primarily concerned with money, there is a need to characterize energy efficiency in financial terms. The materials currently produced have a technical bias that needs to be softened. Such matters that can be addressed include:

- financial rates of return from energy efficient technologies
- case studies of local energy efficient technologies

Materials must also provide more usable and relevant information to assist companies in implementing energy efficient practices. For example directories of consultants and directories of equipment suppliers can be developed as well as sector specific technical materials.

Investment Promotion

One secondary aim of ECEP is to ensure resources available to the project are used effectively. However, with no direct government agency strongly advocating energy efficiency at the policy level there is a potential for duplication of effort by outside agencies or non-use of funds that might be potentially available for energy efficiency in the country. As part of its overall strategy ECEP needs to promote investment in energy conservation. Energy conservation does not occur without the appropriate level of resources being allocated to it. To this end ECEP needs to put resources into investment promotion by coordination with donor agencies and government organizations and working to establish loan funds earmarked for investment in energy efficient equipment. As part of these activities special studies need to be done. Such studies include:

- barriers to investment in energy efficiency
- market surveys for energy efficient equipment

This work can be done by OEP with support from the M/TA, as necessary.

Monitoring and Evaluation

Self evaluation and monitoring of performance is a worthy quality. Unfortunately, the local agencies do not have appropriate resources and capabilities to undertake evaluations of ECEP activities on a national level. These capabilities do exist within

OEP and should be used to the benefit of ECEP. The evaluation function can perform different functions as follows:

- it can be used to track the improvement on a national level in energy efficiency
- it can provide a cost benefit analyses of specific ECEP programs
- it can be used to gauge the amount of private sector participation

The above are needed if the ECEP is to meet its objectives. At a minimum ECEP should be preparing an annual report on the status of energy efficiency in local industry as well as evaluating its projects and training activities to determine their effectiveness.

LOE AND BUDGET COST FOR ACTIVITIES

- Institutional Development

  a) OEP

  b) Private Sector Consulting Companies

  c) Financial Institutions

- Policy Reform including Privatization

  a) Tariffs and Customs Duties

  LOE: Expat = 2 months; Local = 4 months

  b) codes and standards

  LOE: Expat = 2 months per standard assume 4 till 1996 = 8 months; local - 48 months

  c) cogeneration

  d) fuel substitution

  LOE: Local = 6 months

  e) annual plan for energy conservation

  LOE: Expat 1 month per year = 4 months till 1996; local 3 months per year = 12 months

  f) input into 5 year plan

  LOE: Expat 1 month; Local 3 months

  g) licensing/setting up manufacturing facilities

  LOE: Expat 2 months; Local 12 months

  h) industry needs assessment

  LOE: Expat 2 months; Local 10 months senior; 60 months junior

- Technical Support

  a) targeted services

  - Boiler tuning/combustion analyzer

LOE: Expat: 6 months; Local: 600 months technician; 60 months professional; based upon distributing 1000 analyzers: Equipment Cost = $ 5.5 million

- energy accounting-management information systems/monitoring and targeting

  LOE: Expat: 6 months; Local: 1200 months technician; 120 months professional; based upon fully metering up to 1000 plants: Equipment Cost = $ 10 million

- demand-side management/electrical system survey/power factor/lighting/motors

  LOE: Expat: 6 months; Local: 1200 months technician; 120 months professional; based upon surveying up to 1000 plants: Equipment Cost = $ 10 million

- steam system survey/retrofit

  LOE: Expat: 6 months; Local: 1200 months technician; 120 months professional; based upon surveying up to 500 plants: Equipment Cost = $ 10 million

b) Cogeneration projects

LOE: Expat: 48 months; Local: 600 months technician; 200 months professional; based upon doing 3 large cogeneration projects: Equipment Cost = $ 30 - 40 million

- Training

a) formal education: university/schools

LOE: Expat: 4 months; Local: 12 months professional; based upon setting up courses at undergraduate level in the main Universities

b) vocational training

LOE: Expat: 10 months; Local: 60 months professional; based upon setting up 3 courses: boiler operators; instrumentation; electrical

c) continuing education

LOE: Expat: 24 months; Local: 100 months

professional; based upon doing 8 new manuals and translating existing into Arabic

d) above both US-based as well as in-country

LOE: Expat: 18 months; Local: 60 months based upon training over 100 persons per year overseas

- Outreach

a) Rates of return

LOE: Expat: 2 months; Local: 6 months

b) case studies

LOE: Expat: 2 months; Local: 6 months

c) directories of consultants

LOE: Expat: 1 month; Local: 4 months

d) directories of equipment suppliers

LOE: Expat: 3 months; Local: 6 months

e) sector specific technical materials

LOE: Expat: 2 months; Local: 6 months professional; based upon doing 3 largest sectors

- Investment Promotion

a) coordination with donor agencies

LOE: Expat: 2 months; Local: 12 months professional

b) establishing loan funds

LOE: Expat: 4 months; Local: 24 months professional; based upon setting up financing for 3 large cogeneration projects and 2 loan funds

c) market surveys for energy efficient equipment

LOE: Expat: 4 months; Local: 10 months technician; 6 months professional;

- Monitoring and Evaluation

  a) Annual report

     LOE: Expat: 2 months; Local: 8 months professional; based upon doing 4

  b) ECEP self evaluation of projects and training

     LOE: Expat: 6 months; Local: 48 months professional; 100 months data processor;

BUDGET COST

ITEM	EXPAT MAN MONTHS	LOCAL MAN MONTHS	EXPAT COST $	LOCAL COST $	TOTAL COST $
Institutional Development	108	250	2,160,000	100,000	2,260,000
Policy Reform	28	164	560,000	65,600	625,600
Technical Support	72	6420	1,440,000	2,568,000	4,008,000
Training	56	232	1,120,000	92,800	1,212,800
Outreach	10	28	200,000	11,200	211,200
Investment Promotion	10	52	200,000	20,800	220,800
Monitoring and Evaluation	8	156	160,000	62,400	222,400
Total Labor	292	7302	5,840,000	2,920,800	8,760,800
Commodities					75,000,000[1]
GRAND TOTAL					83,760,800

Note: Expat man month costs estimated at $ 20,000
Local man month costs estimated at $ 400

1: It is assumed that at least $ 40 million will be obtained throug loan funds

No account is made for money reflows to the project from charging fo services and commodities

APPENDIX N

INSTITUTIONALIZING ENERGY EFFICIENCY IN THE PRIVATE SECTOR BY M/TA

1. BACKGROUND

This document details an approach to improving the environment and industrial energy efficiency in Egypt by strengthening local institutional capability. The strategy is a multi-faceted approach combining awareness creation, manpower development, and technology transfer to develop business opportunities in the private sector for local private sector energy and environmental service companies. This document builds on a previous document entitled "ECEP Future Options" prepared as background information for the ECEP evaluation team. That document envisions expanding activities into areas such as policy and planning and investment promotion as well as strengthening activities in institutional development, outreach, training, and monitoring and evaluation. It is assumed the work outlined in the future options document will be used as the basis for developing the next phase of ECEP activities. This document takes part of the work detailed in the other document (technical support) and highlights how the activities can be structured so as to provide the improved capability necessary for long term sustainability.

This approach is based upon the principle that energy efficiency will take place if sufficient awareness, information and training exist and barriers to investment are minimized. It also will seek to use the Private Sector as the main catalyst for activity by gradually removing the inherent subsidy that ECEP itself brings to energy efficiency activity in the industrial sector.

2. TECHNICAL ACTIVITIES

The work will be centered around implementation of 4 major ***targeted technical services (TTS)*** programs. These programs will be aimed at capturing the large potential energy savings from implementing low cost energy efficiency measures countrywide.

All of the *TTS* programs will share the following features:

- an implemented improvement in efficiency of equipment or system
- simplified technical documentation including studies, designed for completion on-site, and standardized specifications permitting rapid procurement from either locally (when appropriate) or from the US
- appropriate outreach materials and promotion activities
- a supporting energy efficiency technology application
- complimentary training for all involved in supply, installation and operation and maintenance of the equipment supplied for the technology application

Close integration of the above is very important, and as such they need to be closely coordinated. The general structure of each *TTS* is described in the following paragraphs.

3. ORGANIZATION, IMPLEMENTATION AND ADMINISTRATION OF TTSS

Organization

It is proposed the *TTS* be organized in the following manner:

i) Each *TTS* will be managed/coordinated by either DRTPC or TIMS

ii) In-plant work will be done by local private sector energy consulting/engineering companies

iii) Equipment maintenance and calibration services will be provided for ECEP-supplied commodities for an initial 12 months by local energy equipment service companies

iv) Supporting outreach activities will be done by FEI

v) Appropriate training will be provided to all parties concerned, including vocational training for technicians, on-the-job training for private sector engineers in conducting the field work, preparing specifications and bid packages, for the individual plant staff (including management) engineers and plant equipment operators.

vi) technical assistance will be provided to all parties by an M/TA contractor

Operation

The *TTS* will operate in the following manner:

i) Each *TTS* will be advertized through the media to encourage participation. It is expected direct mailing, newspaper advertizing and a series of promotional seminars will be conducted in initially promoting each *TTS*

ii) Interested participants will apply to the local counterpart agency responsible for management and coordination (DRTPC or TIMS) to participate in the *TTS*. The *TTS* activities will involve cost sharing between the ECEP and the company receiving the support and equipment. Initially, the activities will be subsidized but each will feature a progression towards "privatization" and full commercialization of *TTS* activities.

iii) The managing agency will assign the in-plant work to one of several private sector engineering companies to undertake the actual field work.

iv) the local private sector engineering/consulting company will conduct the in-plant survey and complete on-site a report detailing potential and actual (where applicable) savings possible. A copy of the report will be handed over to plant management. A copy of the report will also be sent to the respective local managing agency.

v) Where equipment is to be provided to a plant based upon the report, the plant will sign and return to the managing agency a standardized letter of agreement which will entitle him to receive equipment through the ECEP. Once again the equipment cost can initially be subsidized, but eventually phased out. The agreement will require the company to provide data at regular intervals to the managing agency.

vi) On receipt of a letter of agreement, the managing agency will assign a local private sector consulting company to complete a specification/procurement/material requisition package and return to the

managing agency

vii) the managing agency will procure the equipment either locally or in the US

viii) on receipt of the equipment, the managing agency will assign the installation work to private sector contractors

ix) the local contractors will install the equipment at the respective plants

x) after installation and commissioning, the plants will provide data on a regular basis to the managing agency

xi) periodically as required, the equipment will be serviced and calibrated by local service organizations. The service companies will be assigned the work by the managing agency

xii) when industrial companies begin to pay at local market rates the *TTS* should be spun-off completely and ECEP no longer provide direct support. ECEP can through FEI continue to promote the activity as part of its overall promotion efforts

Administration

The *TTS* will be administered as follows:

i) the local managing agency will be responsible for coordinating the activities of all local private sector companies. They will assign tasks to the individual companies through a series of work orders.

ii) all local private sector companies will be competitively selected subcontractors of the M/TA. They will receive payment for the work performed based upon data provided by the local managing agencies to the M/TA.

iii) the local managing agency will be responsible for maintaining a *TTS* data base. The data base will include the results of the reports, track participants, and monitor data supplied by the participating companies. This data will be made available on a regular basis (annual report) to other public and private sector agencies for future planning purposes.

iv) FEI will be responsible for promoting the *TTSs* on an on-going basis to ensure maximum participation from industry.

v) the M/TA in conjunction with the managing agencies, will be responsible for providing appropriate training to all concerned parties, involved in implementing the *TTS*

vi) equipment needed by local private sector companies for performing in-plant work, instrumentation calibration and equipment maintenance etc will be made available through ECEP. The equipment will be initially loaned to the private companies with an option for purchase.

vii) the M/TA will provide overall technical assistance as required to meet the overall objectives of the *TTS* and ECEP.

4. TRAINING ACTIVITIES

Training activities will be provided in the following way:

i) Training Centers will be established to provide training activities specific to the *TTS*. The center will provide training and promotion workshops for all concerned individuals including technicians, engineers from industry and from private sector consulting companies, and industry managers and administrators. The facilities will have all necessary equipment to teach people how to operate and maintain equipment to be used in the *TTS*. The predominant mode of training and learning will be through hands-on training. The centers will be staffed by professionals responsible for providing the necessary training. Where necessary the local staff will be trained by expatriates. In most cases the expatriates will be employees of US equipment suppliers or manufacturers. Local professional staff will also where necessary receive training from the US equipment suppliers and manufacturers in the US.

5. OUTREACH AND PROMOTION

Creating awareness of benefits will be coupled with aggressive promotion activities to ensure maximum participation by industry and the service sector. Emphasis will be placed on the development of new businesses and companies within the private sector as business development opportunities become available as a result of the *TTS*. It is expected these opportunities will include:

- offering energy efficiency consulting services
- equipment maintenance services
- import agencies for specific US energy efficient technologies
- local manufacture through license agreements of US energy efficient technologies
- provision of training courses
- publications and journals
- third party investment opportunities in energy efficiency
- energy performance contracting

A key element will be in fostering good working relations with US industry and commerce. Joint trade shows both locally and in the US will be part of the overall activities together with publication of Directories of Consultants and Equipment Suppliers.

AN AGENCY IN CHARGE OF ENERGY AND WATER CONSERVATION AND ENVIRONMENT PROTECTION

The ECO identification process

When visiting an establishment an auditor can face several alternatives:

- If the establishment's energy and water consumption is small (housing, workshop, one to four star hotel), the list of ECO is very short, 3 to 5. There are usually obvious: an audit is not required. A diagnosis is more adapted. Two or three days will be enough to carry out the study. Equipment should be available locally; If they are not the ECO is not implementable. These establishments are the ideal market for Targeted Technical Services (TTS) as described in Annex ???. TTS will implement most of the potential existing in small consumers.

- If the establishment's energy and water consumption is larger, the list of ECOs identified by the auditor can be much more important, 20 to 30. But some of them are not feasible for the following reasons:

  - The savings are too small,
  - The process requirements are too stringent,
  - Etc.

  Finally the list of proposals goes down to 10 to 15. This is far above the list of TTS. Most of the potential is beyond the reach of TTS. Their evaluation requires much more than two or three days. It could be 15 days to two months. An audit is required. This means a more complete diagnosis backed by measurements. Some energy/electricity/water balances are required. This can be expensive and the plant/hotel manager can be reluctant to spent the funds required. So to obtain its confidence an approach trough TTS could be useful.

  It could happen that there are in the country many replications of the audited plant. After two or three audits of similar plants, a list of feasible proposals can be established and its application to the other plant requires just a diagnosis conducted with a fill-the-blanks report. In this case subsidized or free of charge audit-cum-implementation could be the best approach to implement the potential.

- If the establishment's energy and water consumption is far larger, say a refinery or a chemical plant, the best

approach is not to carry out an audit of all the plant but to audit the plant area by area; otherwise the plant management will be flooded by hundreds of proposals and not have the capability to implement all of them.

♦ It may happen that some ECOs can be implemented only by using a technology which do not exist in the country: this is the case for a TA approach.

A multisided approach

From these examples one can understand that neither audits, nor TTSs, nor TAs, nor diagnoses can alone implement the ECOs potential existing in a country. It all depends upon the size of the establishment and number of similar establishments existing in a country.

More over plant/hotel manager will select out of the list proposed by the auditor only the ECOs with a very short payback (rarely above 1 year) and the easiest to implement. The rest of the potential is not touched when it should be.

This is only one side of the problem. Audits, TTS, etc. are not enough to implement the potential existing in a country. Some other actions are also required: press/TV advertisements, technical magazines specialized in energy conservation, specialized associations, a sound energy policy and planning, realistic energy prices, specialized funds, training, reliable equipment suppliers, auditors, engineering firms, specialized R&D, etc. all these have to be there and work together.

An Energy and Water Conservation and Environment Protection Agency (EWCEPA)

An foreign consultant cannot do all these jobs, it is GOE's job; more precisely it will be the job of a specialized agency, an Energy and Water Conservation and Environment Protection Agency (EWCEPA), that will turn all these technicalities into programm, policy proposals, and actions and monitor the progress.

There is a long list of country in this part of the world who adopted this approach: India, Pakistan, Cyprus, Tunisia, Algeria, Morocco (very soon), Senegal, etc.

It is obvious that an EWCEPA would have proposed to USAID a different approach when ECEP was designed.

It would certainly have put more emphasis on TTS and audits than on TAS as they are more productive in the short term.

Examples of successful Tas are very helpful to convince plant

managers that they can save energy in their plant. However in a country where plants are rarely efficient, most of the savings (about 70%) come from NLECOs. Another 15% comes from ECOs requiring investment intensive technologies that are already available in the country. The remaining 15 % comes from Tas.

The GOE should have decided to pursue the OEP activities (Energy Planning/policy cum audit) and make them more useful in terms of savings by modifying its terms of reference (Energy/policy cum diagnoses+audit+implementation cum Tas) and turn it into an EWEPA under a more convenient roof (MOEE or MOI).

The objectives of an EWCEPA

It should be to:

- Promote energy/water conservation and environment protection by press/TV advertisements, technical magazines specialized in energy conservation, specialized associations,
- Identify and promote energy/water conservation and environment protection techniques, specialized R&D.
- Coordinate training specialists, equipment suppliers, auditors, engineering firms, etc.
- Monitors the progress.
- Propose to the GOE an energy policy and planning, suggest realistic energy prices, specialized funds,

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